Nature's Influence: Investigating the Relationship between Nature Exposure and Pro-Environmental Behaviors in Islamabad, Pakistan

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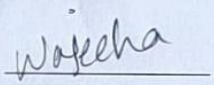

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I dedicate my thesis to my mother. Without her, I would not be here today. It's the only thing she ever asked of me. She said, "If you could give me one happiness, give me this." She passed just one day before the admissions closed. She passed knowing we were one step closer to achieving her dream for me, and what a gift that is.

I love you, mother, and I can't wait to show you my degree.

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LIST OF SYMBOLS, ABBREVIATIONS AND ACRONYMS

IPCC	Intergovernmental Panel on Climate Change
PEB	Pro Environmental Behavior
SDGs	Sustainable Development Goals
NE	Nature Exposure
NV	Nature Visits/Visitors
UN	United Nations
UGS	Urban Green Spaces
WMO	World Meteorological Organization

ABSTRACT

Despite significant technological advancements aimed at fostering a healthier environment, curbing consumer consumption of non-renewable resources, and minimizing overall ecological impact, a substantial portion of the population has yet to adopt sustainable practices. Human behaviors continue to threaten environmental sustainability, where choices of individuals have a dramatic bearing on the environmental conduct. Drawing on Nature Exposure Framework for Pro-Environmental Behavior, this study investigated the relationship between Nature Exposure (NE) (measured through weekly visits to urban green spaces (UGS)) and pro-environmental behaviors (PEB) among residents of Pakistan. By employing quantitative research approach, a cross-sectional survey was conducted in Islamabad City. The data were collected from a representative sample of 297 nature visitors (NV) and non-visitors (non-NV), employing a self-administered questionnaire. This study utilizes the Mann-Whitney U and Kruskal Wallis H tests to determine differences among two and more independent groups. Results revealed statistically significant differences among the sociodemographic characteristic groups and NV and non-NV in terms of their PEB – hence, the null hypothesis stands rejected. Differences between genders in terms of their PEB were statistically significant, and women displayed higher PEB than men; age groups revealed a statistically significant and positive relationship with increasing age; differences among income groups in terms of their PEB were statistically significant in 3 out of 4 categories with PEB decreasing with increasing income levels; education showed a statistically significant and negative link with PEB; and lastly, NE had a statistically significant and positive relationship with PEB. It can be concluded that NE should be encouraged in order to promote PEB and address dangerous environmental problems such as global warming, pollution, and climate change.

Keywords: Environmental Sustainability, Urbanization, Urban Green Spaces, Pro-Environmental Behavior, Nature Exposure

CHAPTER 1: INTRODUCTION

1.1. Background

Rapid population growth and human activities have unequivocally led to climate change, primarily as a result of increased Greenhouse Gases (GHGs) emissions, causing the global temperature to rise 1.1°C (IPCC, 2023). This has led to an increase in both, the intensity and the frequency extreme weather events. As stated by the World Meteorological Organization (WMO), in the last 50 years, natural disasters have killed 115 people and cost $202 million on average every day (WMO, 2021). The Intergovernmental Panel Climate Change (IPCC) state in their Sixth Assessment Report that the rising average global temperatures exhibit grave co-consequences, such as dwindling agricultural productivity and food security, a compounded disease burden, and marginalization, to name a few (IPCC, 2023). The report also expresses that there are significant gaps between current national and global emissions and implementations, rendering current adaptation and mitigation strategies to be insufficient for keeping global warming below 1.5°C during the 21st century and making it difficult to limit the average global temperature rise below 2°C if no additional commitments are made or actions are taken; hence, demanding additional actions to be taken if mankind is to stand a fighting chance against this imminent threat. S

The debilitating effect of urbanization is accelerating environmental problems (Wu et al., 2014). This urbanization contributes to environmental degradation in several different ways such as carbon emissions from expansion of settlements in the urban setting (Lai et al. 2016); wastewater pollution from daily urban activities (Ng et al., 201); industrial wastewater pollution, industrial solid waste pollution,, and industrial smoke and dust pollution (Nedved and Jansz, 2006; Cai et al., 2018; and Lamb, 2010). Keeping in view the damages and losses caused by climate change, governments and policymakers around the world are looking to promote context-specific, cost-effective nature-based solutions (NBS) for battling the consequences, and an upstream solution seems like a promising approach which involves reducing the impact of disasters by being proactive and exercising disaster risk reduction – in this regard Debele (2023) reviewed 547 case studies of implementation of nature-based solutions to various environmental and socio-economic issues and the

results showed that out of the co-benefits achieved from those NBS, 64% were environmental. As it has been established beyond doubt that the current change in climate is induced by human activity, it can only be countered by human activity. One such solution can be the promotion of pro-environmental behavior (PEB), which has the potential to mitigate future risks and reduce the impact of natural disasters – pro-environmental behavior is a singular preventative action taken to remedy primary environmental problems and disasters (Steg et al, 2014; Evans, 2019). This is why PEB has earned a reputable place in literature in achieving multiple sustainability goals simultaneously and creating a potential win-win situation for the economic, societal, and environmental goals. The IPCC advocates engaging in pro-environmental behaviors consistently to reduce environmental problems (IPCC, 2018).

PEB is a behavior that "*can have a major impact on preserving ecosystems and mitigating climate change*" (Dietz, 2009). It can be defined as the inclination to take actions and/or make decisions that result in a pro-environmental impact, and is commonly perceived to be an aftereffect of concerns and attitudes meant for preservation of ecosystem services or mitigating future negative impact on said services (Stern PC, 2000). PEB is exhibited by behaviors such as decreased use of fuel-based transport (Rosa & Collado, 2020); adopting recycling (Escario et al., 2020); choosing environmentally labeled products (Zhang and Dong, 2020); or adopting a more vegetarian diet (Stehfest et al. 2009); and it can be measured by self-reported research instruments (Markle, 2013).

According to the findings of Rosa et al. (2018), nature contact has a positive association with connectedness to nature, and higher nature contact as a child is associated with higher nature contact as an adult. The pleasant experiences being induced as a result of direct contact with nature are translated to nature contact in adulthood, and hence adults embrace PEB. Nature visits are proven to be linked to a stronger sense of morality toward the environment (Hahn and Garrett, 2017). Visiting natural areas at least once a week was linked positively with overall health and household PEB as concluded by Martin et al., (2020). Along similar lines, Larson et al (2011) find supporting evidence after testing socio-demographic characteristics, visits to nature, and environmental inclinations as predictors of PEB, and conclude that adult outdoor recreation showed the strongest positive

relation with PEB. Hence, provision and promotion of outdoor recreation activities could be an effective tool to foster PEB.

PEB can be automatically caused, like many other social behaviors, by an internal or external stimuli – after reviewing 160 experimental interventions, Byerly et al. (2018) posit that adjustments to decision-making settings and social influence can alter PEB; furthermore, Shultz (2014) also concludes that various stimuli such a convenience, social pressure and norms, and incentives and prompts have all successfully promoted PEB. Grilli and Curtis (2021) also present a total of five "treatments" to promoting PEB such as nudges, awareness, and relationship building and conclude that all treatments were successful; however, their selection should be context based and target oriented, meaning they should be selected on the basis of what the intended goals of the treatment are and the population they are targeted toward. Similarly, a potential trigger for such automatic pro-environmental behavior would also be natural environments themselves. Visit to natural environments have been recognized to induce pro environmental behaviors in users as exposure to nature is likely to sensitize them to the value of the services they provide and lead them to more environmentally friendly behaviors.

Environmental scientists Brower and Leon posit that air pollution, land use change, water pollution, and global warming are the most dangerous environmental threats, and food, transportation, and household operations are the three human activities that have the highest contribution to these threats (Brower and Leon 1999). Up to 51% GHG emissions and 25% of water pollution are caused by individuals' modes of transportation. The construction of roads and highways to accommodate this transportation destroys habitat and vegetation. Poultry and beef production significantly affects the water and land resources and has a high contribution to pollution. The chain of meat production as a whole from grazing to growing feed to irrigating land has serious implications for the natural ecosystems and wildlife habitats (Brower and Leon, 1999). Animal waste runoffs pollute water, endanger aquatic habitats, and make drinking water unsafe. Additionally, transportation of these products especially for longer distances leads to GHG emissions. Lastly, lighting, heating, cooling, and use of electric appliances, are some of the household operations that are energy and resource intensive and have the highest contribution to

greenhouse gas emissions and subsequently to air pollution. Water use, sewage, and solid waste disposal from homes are detrimental to the quality of the environment as well.

For Pakistan, the number of vehicles on the ground are causing unfathomable environmental damage especially for a nation that already has too many problems on its plate. According to one estimate, 17,317,600 vehicles are registered in Pakistan. These vehicles include but are not limited to motorbikes, motor cabs and busses, (PBS, 2015), and this number has likely increased since then. The country has diesel-based transportation which is inefficient in terms of fuel-consumption (Hyder et al., 2006). Most of these vehicles are worn out and old, giving out hazardous smoke. In Pakistan, increases exposure to such particulate matter has driven up mortality rate. According to the World Bank, air pollution is causing 22,000 premature deaths every year in Pakistan and costing to 163,432 Disability-Adjusted Life Years (DALYs) (World Bank, 2014), making the disease burden colossal. The major air pollutants such as NOx, SO2, and O3 have been becoming increasingly concentrated over the last 20 years leading the World Bank to state that Pakistan is "*very air-pollutant intensive*." US$ 18.9 per capita of GDP are wasted with an increases of one unit of $PM_{2.5}$. Thus, air pollution is costing Pakistan a colossal sum of $47.8 billion annually or 5.88% of the GDP (Rafik et al., 2022).

The situation of water pollution is equally deplorable. Pakistan stands third among countries that face severe water shortage according to the International Monatory Fund (IMF). In May of 2018, it was announced by the Pakistan Council of Research in Water Resources (PCRWR) that there will be very little or no clean water available in Pakistan by 2025 (Shukla 2018). Per capita availability of water in Pakistan was approximately 5000 m^3 in the1950s but has now declined to below 1000 m^3, which is a threshold recognized internationally for water scarcity (Aziz et al. 2018). Currently, 80% of the country's population is surviving with dirty water and only 20% of the population has access to clean drinking water (Daud et al. 2017; Sahoutara 2017). Water with bacteria like E-coli and fecal traces is responsible for approximately 80% of all diseases and 30% of deaths (Daud et al. 2017). This is costing Pakistan $25-28 billion each year or 0.6-1.44% of the GDP (Bashir et al, 2021).

This study draws on the Nature Exposure Framework for Pro Environmental Behavior where van den Bosch and Depledge (2015). The theory suggests that spending time in nature induces PEB. Previous researches have shown that specific physiological and psychological responses are evoked by natural environments. These have been shown in different ways such as self-reports, brain imaging techniques ,various biomarkers, and epidemiological studies, suggesting that automatic behavioral effects are likely to result from exposure to natural environments.

Berto and Barbiero (2017) suggest exposure to nature as a means of encouraging PEB and show that the associated perceived restorative benefits of nature exposure reinforce environmental knowledge and hence PEB. In short, they propose that the restorativeness perceived to be attached with nature determines positive attitudes toward the environment and works as a motivator for PEB in the Italian public. Similarly, Alcock et al., (2020) quantify the effect on pro-environmental behavior of nature visits and appreciation of nature using a structural equation model to estimate the relationships. It was found that both – nature visits and nature appreciation – had positive impacts on pro-environmental behaviors within a nationally representative sample of 24,204 respondents in the United Kingdom (UK). The study concluded that 1 standard deviation increase in nature visits increased pro-environmental behavior by 17% and 1 standard deviation increase in nature appreciation increased pro-environmental behavior by 45%, strongly suggesting that individuals increasingly appreciated nature with increasing visits to nature and reported higher PEB.

Thus, encourage nature visits and nature contact through e.g. prioritizing quality and quantity of green spaces in urban planning, may be one approach for meeting sustainability targets. Allowing access to and harboring exposure to nature can then serve as a tool for public health and make room for more interdisciplinary research efforts.

However, a majority of the studies took place in developed countries, and the developing region like South Asia is greatly unrepresented. South Asia comprises of seven countries including Pakistan, India, Nepal, Bhutan, Sri Lanka, and Bangladesh and as of 2010 houses a total population of about 1.6 billion people, which is projected to rise to over

2.2 billion by 2050 (World Bank 2013). There has been robust economic growth in this region lately, yet there is widespread poverty which can further be exacerbated in light of the projected changes in the climate where rural economies are especially vulnerable to getting poorer while dense urban communities face the threat of severe urban heat, flooding, and disease. In recent years, Asian countries have been facing serious environmental problems due to rapid economic growth and urbanization; yet, there is hardly any empirical study addressing the issues of PEB in Asia.

In addition, the literature found that environmental values in Asian countries structurally vary from those in the Western countries – for example, Dakhili (2018) assessed the macroeconomic and environmental performance and institutions quality of 187 countries – of which 48 were developed and 139 were developing – over a period of 14 years between 2002 and 2015 and empirically confirmed that level of growth has a positive effect on the level of the environmental performance and institutional quality, (represented by control of corruption, regulatory quality, government effectiveness and rule of law and act) where Gross Domestic Product Growth (GDPG) was used as a proxy for the level of growth. In that case, social factors affecting environmental behaviors might be different between Asian and Western countries, which further necessitates studying the region for its environmental problems and behaviors that can effectively mitigate future risk to produce context-specific strategies to promote such behaviors.

Pakistan is the most urbanized country in South Asia with urban population increasing from 43 million to over 100 million between 1998 and 2017 (PBS, 2017) boasting a population growth rate of 2.4%. Currently, Pakistan houses a population of 241.42 million (PBS, 2023). Pakistan is subject to a number of economic and social challenges, and being a developing country with limited resources and a fast-growing population and needs, the environment takes a backseat. An inverted-U shaped curve known as the Environmental Kuznets Curve (EKC) has been suggested by American economists Krueger and Grossman that establishes a link between pollution and economic growth (Grossman and Krueger, 1995) and Dinda (2004) proves that in developing countries, environmental pollution and economic pollution follow the EKC hypothesis. Though the urbanization has allowed Pakistan to develop and experience economic growth

over the years, it came at the cost of severe environmental degradation. This rapidly changing climate then becomes a stress multiplier from aggravating the disease burden to hampering crop productivity and causing extreme weather events.

Close to 50 million people in Pakistan suffer from mental health disorder (Mumtaz, 2021) and non-communicable diseases which include – cardiovascular, respiratory, digestive, and kidney diseases – account for 58% of total deaths in the country (Bashir and Nazir 2022). Jaffer et al., (2022) projected 3.87 million premature deaths caused by non-communicable diseases between 2010 and 2025 and Malik and Khan (2016) estimate a $862 million welfare loss in connection with the 3.87 million premature deaths in terms of caregiving costs that could be put to more productive uses if not for the disease burden. Pakistan's high poverty rate drives its low adaptive capacity; financial resources that are limited and physical resources that are meagre coupled with continual climatic extremes leave ecosystems vulnerable. This acts as a stress multiplier and affects the population of Pakistan significantly and disproportionately more than those in developed, wealthier nations that have higher adaptive capacities and that tend to be more resilient. This is costing Pakistan anywhere between US$7 and US$14 billion annually (Hussain et al., 2020). Therefore, government intervention is imperative for sustainable and inclusive development.

1.2. Problem Statement

Due to the availability of more opportunities at a better life, Punjab attracts more population influx than other regions of Pakistan, exerting higher pressure on its resources. Islamabad is under the most pressure within Punjab, leading to interprovincial income and resource disparity (Sodhar, 2019). Several factors, such as land use change, population growth and influx from immigration, and increasing demand for energy have immensely shifted the microclimate of Islamabad. In a period of twenty years from 1992 - 2012, land use has drastically changed to keep up with the growing needs of the population with an increase of 163.7% in agriculture cover, a 63.3% increase in bare soil due to deforestation, while vegetation decreased by 38% and settlements increased by 80%, (Butt et al., 2015).

Analyzing data from four weather stations, using four temperature and five rainfall indices, Rizvi et al. (2021) conclude that between 1963 and 2013 temperature extremes and rainfall extremes show positive trends. These trends threaten the very fabric of our society, and adequately protecting against them requires a deeper understanding of the motivation of the individuals behind employing adaptation and mitigation strategies or barriers preventing them from protecting themselves.

Similarly, Waseem and Khayyam (2019) studied the vegetative cover loss over a period of 25 years (from 1992 to 2017) using Geographic Information System (GIS) and remote sensing. The revelations are nothing short of alarming suggesting a 22% reduction in the vegetative cover (VC) between 1992 and 2000 where LST ranged from 13 °C to 27 °C/year. Then, a continuous reduction of the said VC up-to 27% between 2000 and 08, confirming 16–34 °C/year increase in LST. And then, from 2008 to 2017, an alarming 51% VC loss made a contribution to 23–43 °C/year rise in LST in the study area. A correlation between VC loss and LST increase can clearly be seen in these results, raising the alarm for global warming. This shrinking of vegetation owing to continuous changes in land use to meet growing needs is understandable yet dangerous and requires rectification to slow down dangerous climate change trends.

In order to get in front of the challenge of climate change, encouraging nature visits is a cost-effective strategy to promote eco-friendly behaviors – given Pakistan's limited resources and climate change not being higher up on the priority list – cost-effective solutions are what work best in similar contexts. Therefore, it is imperative that we develop a comprehensive understanding of pro-environmental behavior induced by nature exposure in the context of Pakistan.

Hence, the promotion of PEB can serve as a tool to deal with such complex issues swiftly. Several researchers have identified association between PEB and individual health (Clayton et al., 2015; Steffen et al., 2015; and Myers, 2017). More precisely, health problems stemming from environmental problems can subsequently be mitigated by mitigating those source environmental issues. For example, the mitigation of climate change consequences such as agricultural collapse (Myers 2017); government

destabilization (Gillis 2017); and floods (Environmental Protection Agency 2016); prevents health issues such as stress, depression, and even deaths (Clayton et al., 2015; Evans, 2019). Clayton et al. (2015) pointed out that natural disasters can inflict widespread death toll, destroy property and places that hold special sentimental value, accounting for negative psychological impacts. Similarly, Evans (2019) highlighted that extremes such as floods and droughts, and severe storms undermine the quality of life, elevate feelings of stress, and inflict psychological trauma. Research suggests that regardless of the quality of the environmental functions, overall time spent in nature leads individuals to associate higher value with nature, which is associated with PEB. A study reveals promising benefits and co-benefits of air pollution control for Pakistan under various scenarios – the study estimates that under stringent air pollution controls, GHG emissions will reduce by 53% and air pollution-related mortalities by 24% by 2050 (Mir et al., 2022).

Thus, there is a need to assess time spent in nature and its impact on PEB throughout the life course through more researches. Contexts that cultivate PEB and reverse alienation from nature need to be identified in an effort to help sensitize adults to the gravity of the environmental issues such as climate change which adversely affect Identifying contexts which cultivate PEB and reverse alienation from nature beginning in childhood may better sensitize adults to the urgency of environmental issues such as climate change, which adversely impact individual and environmental health.

Other studies in the domain of PEB in Pakistan have discussed issues like corporate social responsibility, green human resource practices, and responsible leadership in small and medium enterprises (Jilani et al. 2019; Li et al. 2023; and Shah et al. 2023). Further areas of research include the impact of tourists' environmental awareness (Aman et al. 2021); environmental concern and PEB within individual religiosity (Ali & Sherwani, 2015); and the impact of environmental interventions on PEB (Shahid, 2015). The novelty this study aims to offer to the existing literature is exploring the effect of socio-demographic characteristics on individual, self-reported PEB and the role of NE usage in promoting individuals' self-reported PEB, which has not been explored previously. Socio-demographic characteristics provide valuable insights to researchers about the population they are studying, and analyzing the impacts of these characteristics on the study outcomes,

such as PEB, can add valuable contributions to literature and help inform policy. However, data on relationship between socio-economic characteristics and PEB is both sparse and contradictory (Sargisson et al, 2020). Therefore, there is a need to develop a deeper understanding of the underlying differences between the developed and the developing world in terms of their environmental values and institutional quality in order to craft context-specific and tailored solutions. Furthermore, the severe lack of representation of the developing world in the domain of PEB makes studies like this necessary and valuable. Socio-demographics. The detrimental impact of environmental issues on the economy and the society discussed throughout this chapter necessitate studies involving PEB as PEB has been established to be an effective way of addressing environmental problems.

1.3. Geographical Significance

Pakistan has been ranked as the eight most vulnerable country to climate by Global Climate Risk Index 2023. The 2022 flooding is a manifestation of the said vulnerability where over 33 million people were affected as estimated by OCHA (2023). Asian Development Bank further projects that the number of people affected by severe flooding will increase by 5 million by the year 2035-2044, with an annual increase of 1 million exposed to coastal flooding by year 2070-2100 (ADB, 2023). The effectiveness of nature visits in inducing such behaviors has not been estimated in the context of the city of Islamabad, and understanding the role of nature exposure may help inform decisions regarding provision and encouraging nature visits. Study findings can also help authorities reevaluate their decisions about allocation of land to various uses and make more optimal decisions to ensure a judicious use of the valuable yet increasingly becoming scarce resource by giving equitable importance to competing uses. It will aid in understanding what activities induce the most pro-environmental behaviors – this will help authorities ascertain how to improve functionality of the green spaces in order to encourage visits to nature.

This research will lend valuable insights to policymakers into the factors that make natural environments attractive to user, which will help future decision-making that incorporates the expectations of the inhabitants. Secondly, this study can help authorities understand nature visits and this understanding can be used to design interventions to make

green spaces attractive to non-users as well – the higher the number of nature visitors, the higher the chances of large-scale pro-environmentalism.

1.5. Hypothesis

H_0: NE will have a statistically insignificant relationship with the visitors' self-reported pro-environmental behaviors induced by nature visits.

H_1: NE will have a statistically significant and positive relationship with the visitors' self-reported pro-environmental behaviors induced by nature visits.

1.6. Research Aims and Objectives

The aim of the present research is to examine the role of nature visits on self-reported pro-environmental behaviors. However, the study has the following objectives:

- To evaluate the differences in pro environmental behaviors among the socio-demographic characteristic groups.
- To analyze the role of nature exposure in inducing pro-environmental behaviors.

1.7. Research Questions

- What are the impacts of socio-demographic characteristics on pro-environmental behavior?
- Does NE influence self-reported pro-environmental behaviors?

1.8. Conceptual Framework

This study proposes the following framework (figure 1.1). The framework suggests that the nature visits differ across all socio-demographic characteristics including gender, age, average monthly household income, and education level of the visitors. Moreover, the framework proposes that nature visits influence the self-reported pro-environmental behaviors.

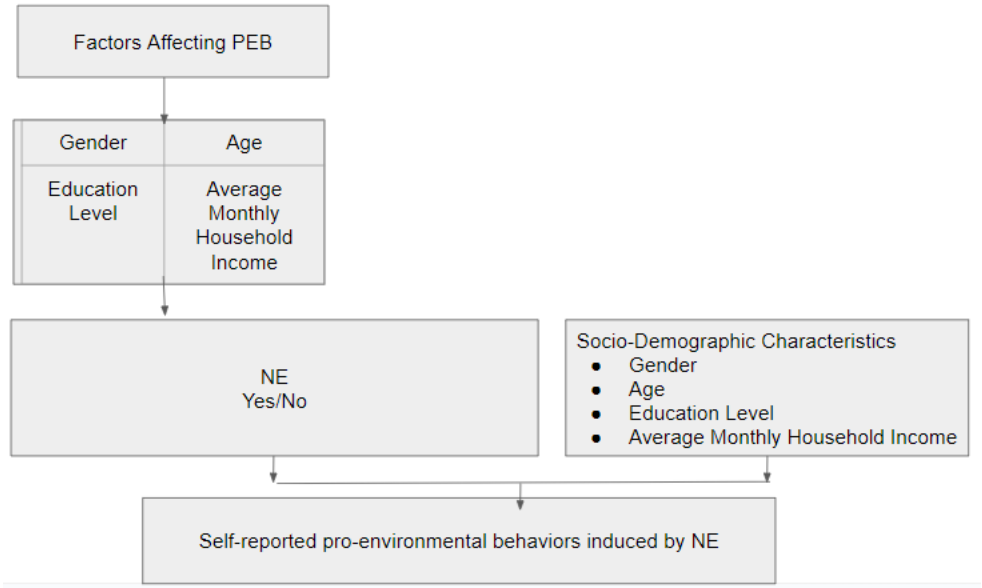

Figure 1.1: ***Conceptual Framework***

The above figure represents the conceptual framework of the study. The details of the variables are as follows:

Factors affecting PEB:

Socio-demographic characteristics:

As seen earlier, socio-demographic profile provides valuable insights to researchers about the population being studied. Each of the characteristics has direct or indirect bearing on an individual's decisions and actions. Gender, age, income, and education level all have direct or indirect influence on an individual's thought process which ultimately get translated into actions. Just like other walks of life, socio-demographic characteristics have also shown to have statistically significant effect on an individual's PEB. Therefore, gender, age, income, and education level are four of the five independent variables in this study to explore an underexplored area of research, which is PEB.

Furthermore, research shows that spending time in nature can have significant effects on one's pro-environmental tendencies. Hence this study has nature visits as its fifth independent variable to. People's visits to green spaces (at least once a week) shows their

exposure to nature, and those who have exposure to nature are expected to show higher pro-environmental tendencies.

1.9. Linkage with Sustainable Development Goals

Agenda 2030 by the United Nations (UN) with its 17 Sustainable Development Goals (SDGs) was embraced in 2015 as a universal call to action to achieve sustainability and inclusive development (Kroll, 2019). Pakistan followed suit soon afterwards in 2016 when the National Assembly Resolution was passed, and swore to uphold the SDGs (UN Pakistan, 2022). In 2022, Pakistan published its first "SDG Status Report 2021," and the progress was termed modest (Cheema, 2022), which amplifies the need for continuous concerted effort to place the country on the path of accelerated progress toward the SDGs.

Goal 13, Climate Action, is the most pertinent in our current discussion. Target 13.1 which talks about strengthening resilience and adaptive capacity to reduce the intensity of and damage caused by environmental hazards and disasters. As noted before, human-induced climate change requires human actions to reverse or mitigate the consequences, and being environmentally responsible is one of the most promising courses of action that can be taken in this regard (Evans, 2019). Furthermore, Goal 12 is of critical importance as it is all about ensuring sustainable production and consumption patterns. Pakistan National Action Plan (PNAP), developed in 2017 with the aim to achieving sustainable goals, particularly goal 12, which talks of Sustainable Consumption and Production (SCP). For goal 12, the PNAP has visualized timeframes, legal framework, supporting activities, establishment of relevant supporting organizations, and short and medium to long-term plans. Khan and Hussain (2017) found the direct link with the food consumption and traveling in their study and concluded that Pakistan, especially Islamabad, has a high ecological footprint which stems from unsustainable consumption patterns. They further estimate that Islamabad alone emits 9.2 tons of CO_2 and boasts an ecological footprint of 4.5 Global Hectares (GHA). As noted prior, household operations and consumption patterns have one of the highest contributions to the most serious environmental problems faced by humanity today, and there is a need to reconsider those patterns. Furthermore, target 3.9 explicitly and categorically aims to substantially reduce the number of deaths

caused by air, water, and soil pollution. Air pollution is causing 22,000 premature deaths annually (World Bank, 2014) in Pakistan and costing $47.8 billion or 5.5% of GDP annually (Rafik et al., 2021). Water pollution is wreaking similar havoc is Pakistan, contributing to 30% of deaths (Daud et al. 2017) and is responsible for national income losses of Rs. 25-28 billion annually, or approximately 0.6–1.44% of the country's GDP (Bashir et al, 2021). The progress on SDG 3, specifically, has gone from bad to worse due to the 2022 flooding as the health infrastructure has been negatively impacted. This is especially a concern because the progress on SDG 3 was already reported to be "modest," and there were appeals to accelerate the progress in this space (Cheema, 2022). Lastly, target 12.5 is of special relevance as recycling and reducing waste is a celebrated way of achieving pro-environmentalism and subsequently, sustainability (Escario et al., 2020).

CHAPTER 2: LITERATURE REVIEW / THEORATICAL BACKGROUND

This section offers comprehensive definitions of the study variables and establishes a nexus between the study variables, defining and elucidating their relationship through exhaustive review of the literature.

2.1 Nature Exposure

Nature exposure is defined as direct physical contact with nature such a sitting in a natural environment (Kamitsis and Francis, 2013). Researchers have previously taken exposure to nature on a continuous spectrum from passive to active. This, however, leaves out the personal intent behind the interaction with nature. Therefore, with regards to nature exposure, researchers make an important distinction – they focus on *intentional* exposure, as only a certain proportion of the population will interact with nature intentionally (Lepczyk et al, 2004; Gaston et al, 2007; Keniger et al., 2013); and arguably, intent to interact may be critical in inducing efforts to behave more environmentally responsibly (Clayton, 2007; Clayton and Myers, 2015).

2.1.1. Measurement of Nature Exposure

NE is operationalized by recreational nature visits (Alcock et al, 2020; Keniger et al., 2013).

2.1.2: Nature Exposure and Pro-Environmental Behaviors

Alcock et al (2020) examine the link between NE and PEB where NE is measured through visits to green spaces and examined its effect on PEB like recycling items, buying locally grown or seasonal foods, walking or cycling instead of driving. They conclude that 1 SD increase in nature visits by 17%. Martin et al (2020) investigate the relationship between nature visits and PEB using visits to green spaces to operationalize NE and explored PEB like buying eco-friendly product, choosing to walk or cycle instead of driving, or donating money or time to conservation organizations. Similarly, using direct contact with nature,

the effect was seen on PEB using PEB scale developed by Larson (2015) that included behaviors such as talking to other people about environmental issues, participating in environmental groups, recycling items.

2.2. Pro-Environmental Behavior

Human behavior has been established as the main driver behind various environmental problems such as environmental pollution, climate change, and loss of biodiversity (Ukaogo, 2020; Trenberth, 2018; Waynes and Nicholas 2017). It is imperative to understand those behaviors that remedy or exacerbate these issues in order to address them. Over the past few decades, this category of behavior has been examined under a variety of names such as "*pro-environmental behaviors*" (Steg et al., 2014), "*responsible environmental behaviors*" (Chao et al. 2011; Cottrell, 2003; Vaske and Kobrin, 2001), "*environmentally responsible behaviors*" (De Young, 2000; Thorgersen, 2006; Luo et al. 2020), "*ecological behaviors*" (Collado et al., 2015; Cuadrado et al. 2022); "*pro-ecological behaviors"* (Collado et al. 2015); "*conservation behaviors*" (Berger-Tal and Saltz, 2016); "*environmentally supportive behaviors*" (Huddart-Kennedy, 2009); and "*environmentally significant behaviors*" (Stern, 2000; Stern, 2008).

In environmental psychology, most studies emphasize on PEB that takes place within the private sphere (Lange, 2019; Hamann, 2019; Larson, 2015). Such behaviors corresponding to conservation "lifestyle" are most commonly studied because they are universal actions (i.e., relevant to nearly everyone) that are typically linked to environmental movement and environmentalism. Commonly studied behaviors in this category include recycling (Oreg and Katz-Gerro, 2006; Escario et al. 2020), waste reduction (Krettenauer, 2017; Collado et al. 2022), water conservation (Chan, 2021), energy conservation (Prabatha, 2020) environmentally-conscious transportation (Maiyar, 2019) and ecofriendly or green purchasing (Stern, 2000; Young et al., 2010; Shimul & Cheah, 2023).

Another tier of actions that has garnered substantial interest among researchers in the PEB space are those that correspond with civic engagement from both an activist and a non-activist standpoint. Terms including "political consciousness," "policy support," and

"environmental citizenship," have been used to refer to actions that are environmentally significant in the socio-political context; these include actions such as donating money to environmental causes or conservation and wildlife organizations, writing letters, signing petitions, or conscientiously voting to support pro-environmental policies (Brown & Harlow, 2019; Young, 2019). Social behaviors such as getting recruited an environmental group or participating in a demonstration or protest related to environmental issues are also commonly seen as environmental activism (Paco & Gouveia Rodrigues, 2016). Furthermore, in addition to the intensive or high-energy PEB, less intensive forms of social interaction or low-energy PEB have emerged in the literature as well, including various forms of pro-environmental persuasion (Rhodes et al. 2016; Midden & Ham, 2018) and, simply educating others or talking to them about their PEB, in some cases, (Vaske and Kobrin, 2001; Collado et al. 2020).

2.2.1. Measurement of Pro-Environmental Behaviors

Many empirical studies examine PEB. A review of 49 studies reveals inconsistencies in the instruments used for measuring pro-environmental behavior (Markle, 2013). The fundamental concept of PEB has been measured by almost every researcher differently, and there is clearly a lack of consistency among the instruments being employed. This lack of consistency was pointed out by Van Liere and Dunlap (1981) more than 30 years ago, which led them to the question "*does it make a difference how environmental concern is measured?*" So far, there is no standard or consistently utilized measure of PEB, and those that are already being used range anywhere between 6 and 97 items. Two types of consistencies were identified by Van Liere and Dunlap (1981) that should exist between measures being instruments of PEB measurement: 1) there should be an intercorrelation among the different measures; and 2) correlations should be of similar magnitude between the measures and specific independent variables.

To overcome the inconsistencies, Markle (2013) developed a Pro-Environmental Behavior Scale (PEBS). The conceptual basis of PEBS lies in the environment-first research strategy that was advanced by Stern et al. (1997). This approach starts at the beginning – identifying the most significant environmental consequences of anthropogenic

activity, and then determining the activities that have the highest contributions to those consequences. Under this strategy, the researched performed endeavors to identify the motivators behind environmental behaviors to ultimately aid in crafting policies and interventions. Stern and his fellow researchers invite social and natural scientists to collaborate in furtherance of these goals.

The utility for practical application of the research increases when its grounded in those behaviors that have the most significant environmental impact (Stern 2000; Stern and Gardner 1981). It is a critical methodological decision to determine which behaviors to include in the research. Stern and Oskamp (1987) point out that often the behaviors being studied are those to which the environmental behavior researchers can readily apply the concepts specific to their discipline, but those behaviors might not be necessarily environmentally significant enough to have reasonable bearing on the environmental issues being investigated.

Examining those behaviors that have the highest impact on the environment ensure efficacy of the scale. It is of utmost importance that the factors that influence environmental behaviors are identified in order to allow policymakers and stakeholders to direct their efforts on developing and implementing strategies to tackle the exigent environmental problems more efficiently. Therefore, as mentioned before, air pollution, water pollution, habitat alteration, and global warming are the most serious existential environmental threats, and the anthropogenic activities making the highest contribution to these issues are transportation, food, and household activities. Markle's PEBS takes into account these environmental issues. The PEBS started as a 38-question scale; after a series of three studies and various validity and consistency tests, it boiled down to 19 questions. It is not only of reasonable length but also addresses the inconsistencies present in other measures of PEB, addressing the four major environmental threats in four separate subscales – Environmental Citizenship; Conservation; Transportation; and Food (Markle, 2013).

In addition to the compelling reasons discussed above for choosing this scale for this study, following are the reasons for keeping the essence of the scale intact and not tweaking it drastically: Firstly, the scale encompasses behaviors that have the most

significant impacts on the environment involving the highest pollution-causing activities. The environmental issues the scale addresses (water pollution, air pollution, habitat alteration, and global warming) are universal – no economy or society are immune to these threats. Similarly, human activities like conservation behaviors, environmental citizenship, consumption of food for survival, and use of various transportation modes to get around are also universal and widespread hence they the activities that have the most bearing on the environment. Therefore, eliminating any subscale will prevent researchers from getting a comprehensive picture of the true PEB situation. Furthermore, eliminating one or more subscales will also greatly compromise the ability of the scale to provide an accurate score of PEB and fulfill the purpose it was built for. Lastly, modifying the scale drastically will also impact the value this study can potentially offer when any direct comparisons across regions need to be made.

2.3 Relationship Among the Study Variables

2.3.1 Socio-demographic Characteristics and Pro-Environmental Behaviors

Environmental impact has been shown to be influenced by individual socioeconomic characteristics such as gender, income, age and education level (Csutora, 2012; Bruderer Enzler & Diekmann, 2015; Abrahamse & Steg, 2009; Bradley et al, 2020; Patel et al, 2017; Ifegbesan and Rampedi, 2018; Smiley et al, 2022)**.**

Examining the role of socio-demographic factors on consumers' (PEB) a subset of ethical behavior – Patel et al. (2017) analyzes its implications in an emerging market with a sample study from India. They performed Multivariate analysis of variance (MANOVA). Men were shown to display higher PEB than women; married consumers scored higher on the PEB scale than unmarried consumers; Consumers in the mid-age bracket (36 – 60 years) also show high PEB scores than younger people and old-age segments of population. Highly educated consumers were more pro-environmental than graduates and post-graduates. This study offers the novelty of being centered on demographic characteristics and microsegment. For instance, unmarried men and women were scoring less than married men on the pro-environmental scale (i.e., public transportation). Unmarried women, on the other hand, showed no hesitation in paying more for energy-efficient goods than married

and unmarried men. Such PEBs can be easily identified as a micro-segment, and marketers can direct their efforts toward these moral standards to tailor their campaigns.

Broadening the horizon of intent-oriented research has led to inclusion of investigating and exploring environmental attitudes, behaviors, and patterns where previously only specific environmental actions were studied. Moser & Kleinhückelkotten (2018) interviewed respondents face-to-face method to collect socio-economic data against respondents' PEB and concluded income level to be the best predictive factor of PEB, but despite their good intent to behave in an ecologically responsible way, their emphasis is typically on actions with lower ecological impact. Similarly, Franzen & Mayer (2010) utilize the International Social Survey Program (ISSP) to test the prosperity hypothesis for wealthy and less wealthy countries and the pro-environmentalism within and between those countries. They conclude that wealthier individuals within countries behave more pro-environmentally while those with lower income levels, and wealthier nations tend to be more environmentally responsible than the countries with lower purchasing power-adjusted per capita GDP. Furthermore, individuals with higher incomes are also more likely to support climate change policy as suggested by Dietz et al. (2007) after investigating preferences for and factors influencing greater climate change policy support. After investigating a sample of 316 Virginian and Michigan residents, an overwhelming majority of the residents supported all climate change mitigation policies except the "gas tax," with income level of the respondent showed to be a promising predictor of greater policy support. Additionally, individuals with higher incomes are also more likely to show support for proactive mitigation of environmental risks as investigated by Shao et al. (2017). They use data for all coastal regions of the United Stated of America and the Gulf Coast and respondents show support for two mitigation policies: i) incentives for relocation; and ii) funding for educational programs for emergency planning and evacuation where the correlation between income level and support for the policies was higher than that of other socio-demographic characteristics.

Studying impact-oriented behavior, such as the ecological footprint, GHG emissions, and overall energy consumption, undermines the predictive power of the underlying pro-environmental motivational variables. These studies consistently conclude

the people's income levels as the most important determinant of people's environmental impact. While this may be true and useful in some forms and contexts, it does not take into consideration the fact that it is the wealthier individuals and nations that typically have the bigger ecological footprint as they can afford to consume more energy – people with lower incomes can be seen to be more cognizant to environmental problems. Mostafa (2013) tested Inglehart's thesis, which claims that environmental attitudes are post-materialist values – a set of attitudes that develops once more basic needs have been met – against 25 nations and finds contradictory evidence. Contrary to Inglehart's claims that pro-environmentalism only prevails among more wealthy nations and post-materialist individuals, Mostafa found that there is a negative and non-significant effect of income on PEB. Similarly, Bruderer Enzler & Diekmann (2015) conduct research on Swiss residents using the Swiss Environmental Survey over a sample of 3,369 respondents and concluded that higher incomes were associated with higher emissions.

Research remains divided over the role of age in individuals' PEB. According to a study conducted to measure support for government policies and voluntary action to address environmental problems, age was statistically significant in predicting support for climate change policies where older respondents were more inclined toward supporting government policies (Connor et al., 1999). Furthermore, Shao et al. (2017) reach a similar conclusion when testing socio-demographic characteristics of the coastal residents in the USA against support for flood adaptation policies; age was found to be significantly significant in affecting support for both the adaptation policies against flooding. Furthermore, Wiernik et al. (2013) postulate that older people are more likely to be concerned about damage to the environment, preventing harm to the environment, and conserving resources. Along similar lines, Lewis et al. (2019) found evidence using the Pew Research Center's Global Attitudes Survey (Stokes et al. 2015) with data for 36 countries that supported the preceding literature – age and concern for the environment are positively associated and that older people are more expressive about their concern for the environment.

However, there is also contrasting evidence where age is not positively linked with environmental concern, and younger people are documented to show higher regard for the

environment than their older counterparts. “Post materialist” values are more likely to be held by younger people than older generations in advanced industrialized economies. Furthermore, “post materialists” are more likely to prioritize free speech and seek greater say in political decision-making than “materialists” who prioritize economic and security issues (Pietsch & McAllister, 2010), and according to Ronald Inglehart (Inglehart, 1997), postmaterialists also emphasize environmental protection to a greater extent than materialists do. Further strengthening this evidence, Tranter (2013) proves that younger voters and candidates cared more about the risk of global warming while investigating the political polarization in the Western world.

Gender has shown the most consistent findings. Differences in gender roles and socialization between men and women have been widely used in social sciences research as a theoretical approach, and women are found to be socialized to be more caring and altruistic (Muthuri, 2018) – these differences carry forward to environmental attitudes and behaviors as well as concluded by Triantafyllidis & Darvin (2021) as they tested social bonding and nature connectedness as predictors of socially and environmentally responsible behaviors.

According to McCright et al. (2016), gender is the third most consistent predictor of environmental beliefs, where women report stronger climate views than men. After surveying 532 Chinese respondents for their green behaviors, Li et al (2022) also came to the conclusion that gender has a lot to do with environmental behaviors, and women appear to be the “greener” counterparts as they concern themselves more with environmental problems, they support plastic ban policies more, and reuse and recycle more by, for example, bringing their own bags for shopping. Similarly, Hansmann et al (2020) surveyed 16,700 respondents, students and staff, of a Swiss university and confirmed that females exhibited significantly higher PEBs, which is an especially great finding as it was a technology university, and the proportion of females was much lower than males.

Lewis (2019), using the Pew Research Center’s survey for 36 countries, also find that women tend to worry less about climate change. Interestingly, one study sheds light on women not being less concerned about climate change, rather it

suggests that their way of expressing the concern is simply different than men, as men are more likely to participate in civic engagements like voting for government policies to address climate change than are women. Seeing women's disproportionate support for voluntary actions, this finding can be viewed as being in stark contrast to it. Men and women tend to feel comfortable in different setting, for example women prefer more personal approaches while men are more In their comfort zones with civic engagement, and simply, this is the tendency being reflected in the above results (Connor et al 1999).

Education and pro-environmental behaviors are widely investigated in conjunction with each other and there typically (though not always) seems to be a positive association – education should increase the understanding of and concern for climate change, though the effects have been registered to be relatively small. Across 36 countries, Lewis (2019) found inconsistent results against education where only a quarter of the countries showed increased environmental concern with education. Moreover, education coefficient was significant in only seven of the 36 countries with positive for three and negative for four. Similarly, Hornsey et al (2016) found after a metal-analysis and synthesizing 25 polls and 171 academic studies across 56 countries that education had a relatively small but significant effect on pro-environmental beliefs and actions and the more educated individuals and nations showed stronger environmental beliefs. Furthermore, Rajapaksa et al (2018) investigated PEB against sociodemographic characteristics for Mumbai for a sample size of 1500 respondents and revealed direct and indirect effects of education on people's willingness to be environmentally responsible. Mikula (2021) also found a clear significant positive association between education level and PEB for the European Union (E27) where the main determinants of PEB were provision formal environmental education and building of environmental awareness. It is evident through research that individuals' environmental concern and behavior improves with their level of education and knowledge of environmental problems and issues (Thomas et al., 2019; Vicente-Molina et al., 2013;). It may thus be assumed that education level and the environmental

orientation of a person's education positively influence environmental knowledge, values, and behavior (Boca and Saraçlı, 2019; Chekima et al., 2016). In line with this assumption, studies on sustainability in higher education have shown that university students who are already more advanced in their studies tended to be more environmentally concerned compared to beginners (Fernández-Manzanal et al., 2007).

Furthermore, Moser & Kleinhückelkotten (2017) found negligible effects of education level on PEB, and education was found to be associated with higher energy use and carbon footprint. Moreover, Gieger (2019) found no direct effects of education on PEB. Shao et al (2017) found education to be predictive of policy support for relocation but plays a significant role in support for funding on education programs for emergency planning and evacuation; however, higher levels of education are associated with less support for emergency planning and evacuation education programs.

2.4. Research Tradition

Pakistan's literature has explored various interesting topics in the green space domain, and these include users' perceptions of or satisfaction with the UGS (Qureshi et al., 2013; Alam et al., 2014, Shoaib et al., 2021); community perspectives about the resilient urban settlements in Pakistan (Rayan et al., 2022); environmental and socio-economic impacts of UGS (Jahan et al., 2019); Urban Green Infrastructure (UGI) indicators for planning resilient urban settlements in Pakistan (Rayan et al., 2021); role of NE in human wellbeing (Jabbar and Yusoff, 2022). At the time of writing, the author could not any published work linking pro environmentalism with NE. One study investigates socio-demographic differences in environmental concern but uses it to determine willingness to pay for climate change (Ogunbode & Rasool, 2015). Yasir et al. (2020) examine the effects of environmental orientation on PEB and also tests the mediating role of green business strategies in the industrial sector of Pakistan. Kalsoom et al (2022) tests environmental consciousness of teachers focusing on educating sustainability. Nazneen and Asghar (2018) test the role of parenting in PEB and find a significant role of parenting in fostering PEB, which is similar to testing the nurturing and restorative properties of NE

in sensitizing individuals to the environment which induces environmental behaviors. However, the evidence base in literature supporting the role of NE in promoting PEB is overwhelming and warrants deeper investigation to inform effective policies to accelerate progress on multiple, cross-cutting SDG goals simultaneously.

This study draws on the Nature Exposure Framework for Pro Environmental Behavior where van den Bosch and Depledge (2015) suggest that spending time in nature induces PEB. Based on evidence from the behavioral sciences, like many social behaviors, PEB can be automatically induced by internal or external stimuli (Osbaldiston & Schott, 2015). A potential stimulus for such automatic PEB would be nature itself. Natural environments evoke specific psychological and physiological reactions, as demonstrated by self-reports, epidemiological studies, brain imaging techniques, and various biomarkers. This suggests that exposure to natural environments could have automatic behavioral effects, potentially in a pro-environmental direction, mediated by physiological reactions. Providing access and fostering exposure to natural environments could then serve as a public health tool, together with other measures, by mitigating climate change and achieving sustainable health in sustainable ecosystems. However, before such actions are implemented, basic research is required to elucidate the mechanisms involved, and applied investigations are needed to explore real world impacts and effect magnitudes. As environmental research is still not sufficiently integrated within medical or public health studies, there is an urgent need to promote interdisciplinary methods and investigations in this critical field.

SUMMARY OF RESEARCH WORK

This study is aimed at determining the relationship between nature exposure and individuals' self-reported PEB. The Nature Exposure Framework for Pro-Environmental Behaviors states that spending time in nature induces pro-environmental behaviors. There is overwhelming evidence in literature supporting this theory.

A disproportionate share of the research on PEB comes from the developed world, while the developing world remains largely underrepresented. Furthermore, the environmental values and institutional quality have been found to be statistically significantly different between the developed and the developing world. These are very compelling reason to conduct studies regarding PEB in the developing world. Such studies are very much needed as they allow the researchers to understand the environmental issues in depth and can help inform policies for a more swift and cost-efficient addressal of these environmental issues that are claiming millions of lives and billions of dollars annually.

The study had two clear objectives: to evaluate the differences in PEB against the various socio-demographic characteristics; and to determine the relationship of NE with PEB. Taking socio-demographic characteristics and NE (or no nature exposure -- measured through weekly nature visits) as independent variables, their relationship was examined with self-reported PEB. The study utilized a questionnaire that had 3 sections, sociodemographic characteristics, weekly nature visits, and self-reported PEB. The data were collected from households in Gulberg Residencia.

The study successfully delivered both its objectives. The results corresponded with existing literature where there was a statistically significant differences between people with NE and those who didn't have NE in terms of their PEB with people with NE showing higher PEB, confirming the Nature Exposure Framework for Pro-Environmental Behavior. Furthermore, women were found to be more pro-environmental than men, also confirming an overwhelming majority of the literature. Age had a statistically significant and positive relationship with PEB, income showed that the lowest income group had higher PEB than

the highest income group; lastly, education had a statistically significant and negative relationship with PEB.

In conclusion, in case of Islamabad, Pakistan, the null hypothesis stands rejected, meaning NE has a statistically significant and positive relationship with PEB.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

This chapter provides a detailed breakdown of the methodological aspects of this study from the research approach to the study variables, and offers a justification of the chosen methods.

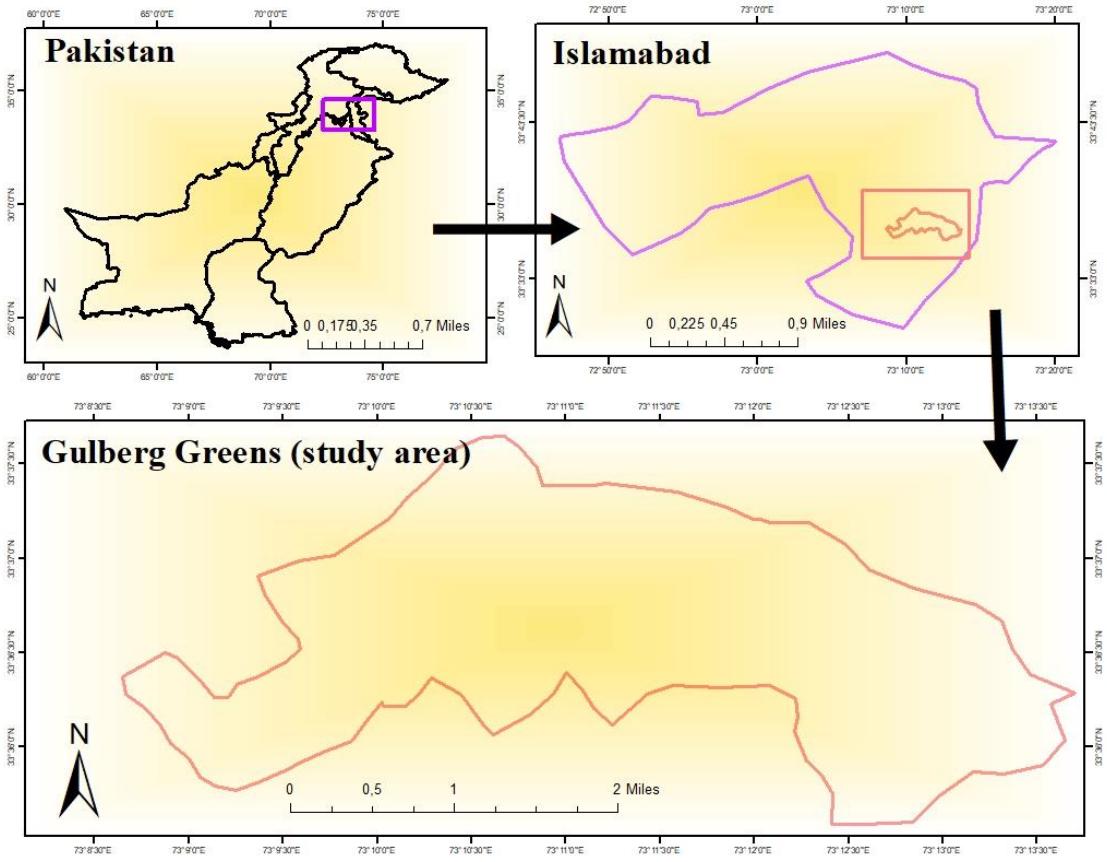

Figure 3.1: Map of Study Area

3.1. Research Approach

The study employed a quantitative approach and will comprise of collecting and statistically testing numerical data. Quantitative research offers several benefits. Some of them are as follows:

Firstly, it allowed for providing concrete relationships among the variables along with being more objective and reliable. Secondly, it eliminated the need for directly observing the phenomenon, and in this study, it was especially beneficial because the behaviors being researched were not directly observable. Thirdly, the results obtained through a quantitative research are generalizable and can be duplicated. Shah et al. (2020) employed structural equation modeling (SEM) to assess the impact of workplace spirituality (WS) and responsible leadership (RL) within the context of small and medium enterprises (SMEs). Fatima and Azhar (2020) employed multiple regression to explore the effect of organizational environmental policy, organizational citizenship behavior, and transformational leadership on employees' PEB.

3.2. Study Area

The study area chosen for this research is Gulberg Residencia, Islamabad. Islamabad is the capital city of Pakistan and spans over and area of 906.5km2 boasts a population of 1.2 million (Population Stat, 2023). Islamabad is divided into five zones. The city receives a mean daily minimum temperature of 15.4 ˚C and a mean daily maximum temperature of 28.9 ˚C according to the National Oceanic Atmospheric Administration (NOAA, 2020). In terms of rainfall, Islamabad receives and average of 1268.6mm in a year as calculated by the Pakistan Meteorological Department (PMD, 2020).

Gulberg Residencia spreads over 2,875 acres and is divided into block A through V. Every block has a community park within a walking distance of ≤ 600 meters, which fulfill the following critical criteria for this study:

1. The study site has to have sufficient provision and an equal distribution of UGS throughout the physical extent of the area
2. The existence of a general trend among the inhabitants to visit the UGS. As the data were collected from the households, meeting these criteria was necessary for data that could be generalized.

The respondents were directly recruited from the neighborhood and data were collected as a result of numerous field visits.

3.3. Sampling and Sample Size

This study employs the Housing Unit (HU) method of population estimation. It is used by public and private agencies in the US to estimate local populations (Smith, 1986). The HU method estimates the population with the accuracy of other commonly used population estimation techniques. Virtually everyone lives in some type of housing structure, whether it is a traditional family house or an apartment building. This basic condition forms the basis of the HU method, and within this framework, a population (Pt) of any geographical area can be calculated, which will be equal to the number of occupied housing units (Ht) times the average number of persons per household (PPH) plus the number of persons living in group quarters (GQ) (like nursing homes, military barracks, college dormitories, and prisons etc).

$$Pt = (Ht*PPH) + GQt$$

As this study is based in Gulberg Residencia, the Gulberg Residencia comprises only of traditional family houses and no apartments or other kinds of group living. There were 450 complete housing units in Gulberg Residencia at the time the survey was conducted. The average number of household members in Pakistan is 6.2 while there are 2.8 young children per household (CEIC, 2019) which brings the target household members to 3.4. The definition calls for *occupied* housing units, and as Gulberg is still a developing community, the population is rather sparse; hence, it was observed during the survey that in every ten houses the researcher surveyed, three to four houses were vacant, for which the lower of the two will be considered, meaning about 7 out of 10 houses are occupied.

Using the HU method, the estimated population size at the time of the survey was 1,071 (using the HU method formula as explained above) and the sample size calculated (using an online sample size calculator) is 283 (or more) for a 95% confidence level and 5% margin of error.

Exclusion Criteria: Young children and the unoccupied housing units.

Young children were left out of the study for two main reasons:

Obtaining data directly from children is a matter of grave sensitivity and great care needs to be taken when researching children. So, in order to avoid any ethical concerns, young children were not part of this study.

Secondly, obtaining information from adults meant there was a higher chance that the questionnaire was properly understood and thoughtfully answered. For a topic like PEB, children are not expected to answer related questions.

Unoccupied housing units:

The housing unit method of estimating population calls for inclusion of occupied housing units only; hence, in order to obtain a more accurate estimation of the population size, unoccupied housing units were removed from the total finished housing units.

3.4. Data Collection Method and Research Instrument

The data were collected on site using a self-administered structured questionnaire with a set of closed-ended questions divided into three sections between August'23 and October'23. This survey was cross-sectional, meaning the respondents had to participate only once and the data were analyzed at a single point in time. The first part gathers demographic information, the second determines whether the respondents visit UGS at least once a week or not, the third section elicits information about their individual pro environmental behaviors which is split into the following: i) Conservation; ii) Environmental Citizenship; iii) Food; and iv) Transportation. The respondents were selected at random. The researcher visited several blocks of Gulberg Residencia. In the more reasonably populated blocks, the researcher visited every house, as it was not possible to skip houses due to high rates of vacancy and unwillingness of many residents to participate. In the more sparsely populated blocks, there were very little constructed housing units to begin with, hence skipping houses was again not an option. The rest of the blocks were either too distant and sparsely populated to make the trip fruitful or they were too secluded that visiting them was a safety concern. Most of the surveys were filled by

the respondents while some were assisted. Survey responses were collected by visiting households in the study area.

3.6. Study Variables

The following tables show the variables and their sources. The income brackets will be determined by the researcher.

Table 3.1: Study Variables

Independent Variables	**Indicators**	**Description**	**Source**
Gender	Gender	Male = 1 Female = 2	
Age	Age groups	18 – 24 = 1 25 – 35 = 2 35 – 54 = 3 55 – 74 = 4 ≥ 75 = 5	Whitburn et al., 2018
Education	Highest level of education degree completed	No formal education = 1 Primary = 2 Middle stage = 3 Secondary = 4 Higher Secondary = 5 Bachelors = 6 Master's = 7	UNESCO, 2011

		≥ Postgraduate = 8	
Household Income	Average Monthly Household Income in PKR	< 50,000 = 1 50,000 – 100,000 = 2 100,001 – 200,000 = 3 > 200,000 = 4	
NE	Do you visit UGS at least once a week?	Yes No	Martin et al., 2020

Dependent Variable	**Indicators**	**Description**	**Source**
Self-Reported PEB	**Conservation** • How often do you turn off the lights when leaving a room? [a] • How often do you switch off stand-by modes on electronic devices? [a] • How often do you cut down on heating or cooling to limit energy use? [a] • How often do you turn off the TV when leaving a room? [a] • How often do you limit your time in the shower to conserve water? [a] • How often do you wait till you have a full load to use	a These items used a 5 point "never" (1), "rarely" (2), "sometimes" (3), "usually" (4), "always" (5) Likert scale b These items used a 3 point "hot" (1), "warm" (3), "cold" (5) Likert scale c Values: "no" (1), "yes" (5) d These items used a 5 point "never" (1), "rarely" (2), "sometimes" (3), "often" (4), "constantly" (5) Likert scale	Markle, 2013 Kaiser, 1998 Kaiser et al. 1999 Armel et al. 2011

	the washing machine and/or the dishwasher? [a] • At which temperature do you mostly wash your clothes? [b] **Environmental Citizenship** • Are you currently a member of any environmental, conservation, or wildlife protection group? [c] • During the past year, have you contributed money to any environmental, conservation, or wildlife protection group? [c] • How often do you watch television programs, movies, or internet videos about environmental issues? [d] • How often do you talk to others about their environmental behavior? [d] • During the past year, have you increased the amount of organically produced fruits and vegetables you consume? [c] • Please answer the following question according to the vehicle you drive most often: Approximately how many miles per gallon does the vehicle get? [e] **Food**	e Values: "24 or less" (1), "25–29" (2), "30–34" (3), "35–39" (4), "40 or more" (5)* | ** • * The values were changed from miles per gallon to km per liter to make them contextually appropriate. • ** The last option was switched with "I do not own a car" to allow for people who do not own personal cars to also participate. • Values: "< 11" (1), "11-13" (2), "13-16" (3), "16-18" (4), "I do not own a car" (5). f Values: "no" (1), "yes" (5), "I do not eat meat/poultry" (5) g These items used a 3 point "never" (1), "occasionally" (3), "frequently" (5) Likert scale	

	• During the past year, have you reduced the amount of food you consume? [f] • During the past year, have you reduced the amount of meat you consume? [f] • During the past year, have you reduced the amount of poultry you consume? [f] **Transportation** • During the past year, how often have you carpooled? [g] • During the past year, how often have you used public transport? [g] • During the past year, how often have you walked or cycled instead of driving? [g]		

3.7. Data Analysis

The quantitative analysis was performed using Statistical Package Social Sciences (SPSS).

1) The characteristics of the study participants will be reported through frequency tables.
2) The Mann-Whitney U and the Kruskal-Wallis H tests were used to answer objective 1 of this study.

Mann-Whitney U test enabled the researcher to compare two independent groups and that whether the differences between the groups were by chance or were significant. Furthermore, it allowed to compare two data sets of different sizes. The survey being of household nature did not allow the researcher to control the proportion of nature visitors and non-visitors and as a result the size of the two datasets were different (178 and 119,

respectively) and Mann Whitney allowed a comparison of the two and answer the second objective of the study.

The Kruskal Wallis H test allowed the researcher to compare variables with more than two independent groups where there were no ties or ranking in the dependent variable.

These tests are an alternative to the one-way analysis of the variance (ANOVA) to report results when the outcome variables are ordinal. These tests are also less sensitive to outliers (Zablotski, 2019). These tests have been widely employed in the literature to assess differences in terms of behavior and attitude etc. across socio-demographic characteristics (e.g., Tscheulin & Lindenmeier, 2005; Puciato, 2019; Zuriguel-Perez et al., 2019). The outcome variables in this study are ordinal for objective 1. The Kruskal-Wallis H test will be used to make a comparison among more than two independent groups (age, education, household income) and the Mann-Whitney U test will be used to compare two independent groups (gender and NE) against PEB.

3.8. Ethical Considerations

This study made a number of very important ethical considerations:

Great care was taken into designing the research to make it anonymous and keeping the personal information of the participants confidential.

The purpose of the study was clearly explained to the respondents.

The participants were ensured that their anonymity will be preserved, and their personal information be kept confidential at all times.

The participation of the respondents was on purely voluntary basis and they were given the liberty to drop out at any moment without any consequences.

The researcher only studied adults and made sure to not include children.

CHAPTER 4: RESULTS AND DISCUSSION

This chapter details the analyses of the gathered data. The results have been presented in the form of tables and are followed by a thorough discussion.

4.1. Demographic Characteristics

Table — exhibits the demographic characteristics of the sample. The statistics show that 52.2% of the study participants were female. A majority of the participants fell in the 25 - 34 age bracket (37.7%), followed by the participants that were between the ages 35 and 54 years (28.6%); age groups 18 - 24 and 55 - 74 were 13.8% and 17.5% respectively. Lastly, 2.5% of the respondents were 75 years of age and above. 35% of the respondents revealed their average household monthly income (PKR) to be < 50,000, 1.3% of the participants belonged to the 50,000 - 100,000 while 20.2% respondents showed 100,000 - 200,000 income and 13.5% were in the > 200,000 bracket. Furthermore, 16% of the respondents had no formal education; 21% and 20% had primary and middle education; 18.5% had higher secondary education; 27.3% and 15.8% had bachelor's and master's degrees respectively while 4.4% had postgraduate and above education.

It is fair to elaborate here that higher or lower representation of a category may have been due to several reasons. For example, women being 52.2% of the responders was mainly due to them being available at home during the weekdays as so many of them are homemakers and within the age group of 25 - 35 years, or they might have been uncomfortable sharing their actual age. Similarly, an overwhelming majority falls in the < 50,000 income bracket, which might have been due to the respondents' reservations over revealing their true income.

Table 4.1: Demographic Characteristics of the sample (N=297)

Characteristics	Classifications	Frequency (f)	Percentage (%)

Gender	Male	155	47.8
	Female	142	52.2
Age (in years)	18 - 24	41	13.8
	25 - 34	112	37.7
	35 - 54	85	28.6
	55 - 74	52	17.5
	75 and above	7	2.40
Average Monthly Household Income (in PKR)	< 50,000	104	35.0
	50,001 - 100,000	93	31.3
	100,001 - 200,000	60	20.2
	> 200,000	40	13.5
Level of Education (highest degree completed)	No Formal Education	48	16.2
	Primary	21	7.1
	Middle Stage	20	6.7
	Secondary	12	4.0
	Higher Secondary	55	18.5
	Bachelor’s	81	27.3
	Master’s	47	15.8
	Postgraduate and above	13	4.4

4.2 Results

4.2.1: Nature Exposure and Demographic Groups

4.2.1.1: Gender

The following section describes the demographic characteristics corresponding to their NE. Gender appears to have shown that 51.1% of the female participants visit UGS at least once a week while 48.9% of males visit UGS at least once a week.

Table 4.2: ***Nature Exposure and Gender***

	NE				
Gender	**Yes**	**Percentage (%)**	**No**	**Percentage (%)**	**Total**
Female	91	51.1	64	53.8	155
Male	87	48.9	55	46.2	142
Total	178	100.0	119	100.0	297

4.2.1.2 Age Group

The frequencies show that a very small proportion (11.2%) of park visitors includes young adults under the age of 25 while 36% of the respondents belonged to 25 - 34 age group, as concluded by Kempermen & Timmermans (2006) that only 5% of park visitors belonged to the age group 24 or younger while 35% of respondents belonged to the age group of 25 - 44 year suggesting parents with children visit public parks for the children's recreation. Furthermore, 24.7% of the UGS users were over 55 years of age while Kempermen & Timmermans (2006) concluded that 24% of the park users were over the age of 64 years suggesting that with increasing age, there is increasing concern among people for maintaining their health and preventing obesity, cardiovascular diseases, diabetes and other

diseases that aging population becomes more susceptible to compared to the younger population.

Table 4.3: ***Nature Exposure and Age Groups***

	UGS Usage				
Age	**Yes**	**Percentage (%)**	**No**	**Percentage (%)**	**Total**
18 - 24	20	11.2	21	11.8	41
25 - 34	64	36.0	48	40.3	112
35 - 54	50	28.1	35	29.4	85
55 - 74	40	22.5	12	10.1	52
75 and above	4	2.2	3	2.5	7
Total	178	100	119	100	297

4.2.1.3: Income Level

31.5% park visitors fall in the lower income level (PKR < 50,000) while 53.6% park visitors belong to the middle income group (PKR 50,001 - 200,000). 15% of the park visitors fall in the high-income bracket. Scopellitti et al (2016) conclude that middle-income group experience better outcomes of spending time in natural environments compared to the higher- and lower income groups and also report higher levels of connectedness to nature and experienced higher levels of physical and psychological well-being – on the other hand, for higher and lower income groups, well-being seems to be much more related to economic factors than the experience of nature thus supporting the composition of income groups and their visits to UGS in the current study where majority of the visitors belong to the middle income group.

Table 4.4: ***Nature Exposure and Income Level***

	UGS Usage				
Average monthly income in PKR	**Yes**	**Percentage (%)**	**No**	**Percentage (%)**	**Total**
< 50,000	56	31.5	48	40.3	104
50,001 - 100,000	53	29.8	40	33.6	93
100,001 - 200,000	42	23.6	18	15.1	60
> 200,000	27	15.2	13	10.9	40
Total	178	85	119	89	297

4.2.1.3. Education Level

Table 4.4 shows the distribution of education level across the sample of the UGS users and non-users. 14.6 of the participants had no formal education and this section of the population mostly belongs to low income groups as well. It can be said that for people with low incomes, there are not many other options for recreation and activities that promote their mental and physical wellbeing. 37.7% of users had primary to higher secondary education. The participants visiting UGS that had bachelor's and higher education comprised 47.8%. Mak and Jim (2019) showed education level to be one of the determinants of visitation to public parks and found that one-third of the visitors had completed higher degrees and one-third had upper secondary education. They further comment that the group that visited public parks more were with low to no education attainment.

Table 4.5: ***Nature Exposure and Education Level***

UGS Usage					
Education	**Yes**	**Percentage (%)**	**No**	**Percentage (%)**	**Total**
No Formal Education	26	14.6	22	18.5	48
Primary - Middle Stage	27	15.2	14	11.8	41
Secondary - Higher Secondary	40	22.5	27	22.7	67
Bachelor's	48	27.0	33	27.7	81
Master's and above	37	20.8	23	19.3	60
Total	178	100	119	100	397

4.2.2: Demographic Characteristics and Pro Environmentalism

This section discusses the various demographic groups and analyzes their PEB.

To fulfill the first objective of the study, Mann Whitney U test and Kruskal Wallis test will be conducted to explore the relationship, if any, between the demographic characteristics and people's pro environmental behaviors.

4.2.2.1. Gender

The Mann Whitney U test reveals that there is a statistically significant difference between male and female respondents in terms of their pro environmental behaviors. The p-values are <.05 for conservation, food, and transportation. This statistically significant difference within 3 out of 4 environmental behavior categories largely establishes that the difference between men and women in terms of their PEB is statistically significant. Mean ranks appear to be greater for women compared to men for conservation, environmental

citizenship, and food, while for transportation, men score higher, which is likely due to a majority of women responding "Never" to use of transportation and that they're not too keen on taking a walk instead of driving either – this behavior, however, is more rooted in the culture than in the pro environmental inclinations.

Table 4.6: ***Mann-Whitney U Test***

	Male		Female		Significance
	N	**Mean Rank**	**N**		
Conservation	142	138.8	155	158.4	0.048
Environmental Citizenship	142	139.7	155	156.5	0.088
Food	142	135.0	155	161.8	0.005
Transportation	142	169.3	155	130.4	0.000

*Statistically significant (p ≤.05); *p ≤.005, ** p ≤.01, ***p≤ .001*

4.2.2.2 Age Group

For this comparison, Kruskal-Wallis one-way analysis was conducted. The variance among the age groups included in the study were compared. The p-values reveal that there exists a statistically significant difference among the age groups in terms of their pro environmental behaviors. The p-values for conservation, environmental citizenship, and transportation are below 0.05 – this largely establishes that the age groups are statistically different from each other when it comes to their pro environmental behaviors.

- The ages 75 and above generally scored lower on all categories of pro environmental behaviors than the rest which may be due to their susceptibility to weather, which does not allow them to conserve on heating and cooling even if they want to, or it does not allow them to walk instead of driving as they are usually not capable of walking distances younger people can easily cover; hence, they have to

rely on ‘energy-intensive’ options to get through their daily lives. This can also explain why the younger participants scored higher on transportation, as they do not own cars and get around mostly by walking shorter distances and carpooling with friends for longer distances.

- The second-lowest scorer is the age group 18 - 24. Their pro environmental inclinations may not be as strong as older adults as older adults tend to have a more responsible outlook on life and understand the value of utilities and environment better – their decisions may not be entirely environmental, and likely more financial than anything, but they are still making a difference.
- There is noticeably no statistically significant difference in age groups in terms of their food consumption as the food consumption has remained more or less unchanged for most people over the past year.

Table 4.7: ***Kruskal Wallis H Test (Age Groups)***

	Age Group	**N**	**Mean Rank**	**Significance**
Conservation	18 - 24	41	120.9	
	25 - 34	112	145.6	
	35 - 54	85	152.6	
	55 - 74	52	179.2	
	75 and above	7	99.9	
	Total	297		0.009
Environmental Citizenship	18 - 24	41	114.4	
	25 - 34	112	153.8	
	35 - 54	84	143.2	

	55 - 74	52	174.4	
	75 and above	7	135.4	
	Total	297		0.015
Food	18 - 24	41	130.5	
	25 - 34	112	152.5	
	35 - 54	85	154.3	
	55 - 74	52	148.6	
	75 and above	7	139.1	
	Total	297		0.604
Transportation	18 - 24	41	174.5	
	25 - 34	112	162.2	
	35 - 54	85	138.3	
	55 - 74	52	131.0	
	75 and above	7	53.1	
	Total	297		0.001

*Statistically significant ($p \leq .05$); *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$*

A post hoc test was conducted to determine the mean ranks of the groups to check which of the pairs were statistically significantly different from each other.

- For conservation, the only significant difference was found between the age group pair 18-24 and 55-74 years ($p \leq .05$). The mean rank for 18-24 (120.9) to be much lower than the mean rank for the age group 55-74 years (176.2). This shows that older adults show greater responsibility toward turning unnecessary lights and equipment off and being judicious about their use of water in their daily lives compared to young adults.
- Environmental citizenship pairwise comparisons also show only one pair of age groups – ≥ 75 years - 55 - 74 years – to be statistically significantly different. The mean rank for the ≥ 75 years group is lower than the mean rank of the 55 - 74 years group (174.4 and 135.4 respectively). No other significant differences were found in the environmental citizenship category.
- Food category does not show any significant differences among the age groups and the mean ranks do not vary greatly.
- Two pairs of age groups show statistically significant differences in the transportation category. The first pair is ≥ 75 years - 35-54 years ($p \leq .05$) and the second pair is ≥ 75 years - 35-54 years. The mean ranks of the 35-54 and 55-74 (138 and 131.3 respectively) years group are much higher than the mean rank of ≥ 75 years (53.1).

Table 4.8: Summary of the Pairwise Comparisons (Age Groups)

Conservation		**Environmental Citizenship**		**Transportation**	
Sample 1 - Sample 2	**Adj. Sig**	**Sample 1 - Sample 2**	**Adj. Sig**	**Sample 1 - Sample 2**	**Adj. Sig**
≥ 75 years - 18 - 24 years	1	≥ 75 years - 18 - 24 years	1	≥ 75 years - 18 - 24 years	0.217
≥ 75 years- 25 - 34 years	1	≥ 75 years- 25 - 34 years	0.744	≥ 75 years- 25 - 34 years	0.102
≥ 75 years - 35 - 54 years	1	≥ 75 years - 35 - 54 years	0.11	≥ 75 years - 35 - 54 years	0.009
≥ 75 years - 55 - 74 years	0.212	≥ 75 years - 55 - 74 years	0.007	≥ 75 years - 55 - 74 years	0.004

18 - 24 years - 25 - 34 years	1	18 - 24 years - 25 - 34 years	1	18 - 24 years - 25 - 34 years	1
18 - 24 years - 35 - 54 years	0.511	18 - 24 years - 35 - 54 years	1	18 - 24 years - 35 - 54 years	0.278
18 - 24 years - 55 - 74 years	0.011	18 - 24 years - 55 - 74 years	1	18 - 24 years - 55 - 74 years	0.135
25 - 34 years - 35 - 54 years	1	25 - 34 years - 35 - 54 years	1	25 - 34 years - 35 - 54 years	0.488
25 - 34 years - 55 - 74 years	0.189	25 - 34 years - 55 - 74 years	0.374	25 - 34 years - 55 - 74 years	0.237
35 - 54 years - 55 - 74 years	0.774	35 - 54 years - 55 - 74 years	1	35 - 54 years - 55 - 74 years	1

*Statistically significant ($p \leq .05$); *$p \leq .005$, **$p \leq .01$, ***$p \leq .001$*

4.2.2.3 Income Level

The Kruskal-Wallis H test results show income levels to be statistically significantly different in 3 out of 4 categories (environmental citizenship, food, and transportation) of pro environmental behaviors. The mean scores for conservation and environmental citizenship appear to be higher for middle -to-high income levels while the mean scores for food and transportation are higher for lower income levels which mean there are higher levels of environmental awareness and concern shown by individuals with higher levels of income, which usually translates into higher levels of education level as well.

- For conservation, there is no pair of income levels that is statistically significantly different. The mean ranks for low-mid income level (143.4 and 148.8) are lower than the 100,001-200,000 level income (161.0), which shows that people with lower levels of income display behaviors that are less pro environmental while respondents in the 100,001-200,000 income bracket display more pro environmentalism. Respondents in the >200,000 income level also display lower levels of pro environmental behaviors when it comes to conserving energy and water.

- For environmental citizenship, there is at least one pair of income levels which is statistically significantly different. Furthermore, middle income groups (50,001-100,000 and 100,001-200,000) show higher mean ranks (162.1 and 167.3) than those in higher and lower income level groups which are 143.4 for <50,000 and 102.2 for >200,000 group.
- The food category also appears to be statistically significant in terms of difference among income groups. The mean ranks for food for lower income are much higher than the other income groups (183.3) showing that this group scored high on their eating habits linked with the environment like reduced consumption of food and/or consumption of meat and poultry. However, these behaviors are more likely rooted in the recent inflation than a concern for the environment. The lower-middle income group shows the second-highest mean rank showing they were the second most pro environmental in this category while the food consumption of the higher two income groups has remained steady over the past year.
- There is at least one pair of income groups that were found statistically significant in their differences. The <50,000 income group scores the highest in the transportation (190.2) while the other 3 groups' scores are fairly similar – 129.8 for 50,001-100,000; 124.3 for 100,001-200,000 group; and 123.5 for >200,000 group, which means majority of the respondents from this group must own cars and use public transportation very minimally or not at all.

Table 4.9: Kruskal Wallis H Test (Income Levels)

		N	Mean Rank	Significance
Conservation	< 50,000	104	143.4	
	50,001 - 100,000	93	148.8	
	100,001 - 200,000	60	161.0	
	> 200,000	40	146.2	

	Total	297		0.641
Environmental Citizenship	< 50,000	104	143.4	
	50,001 - 100,000	93	162.1	
	100,001 - 200,000	60	167.3	
	> 200,000	40	102.2	
	Total	297		0.001
Food	< 50,000	104	183.8	
	50,001 - 100,000	93	142.4	
	100,001 - 200,000	60	125.1	
	> 200,000	40	109.6	
	Total	297		0.000
Transportation	< 50,000	104	190.2	
	50,001 - 100,000	93	129.8	
	100,001 - 200,000	60	124.3	
	> 200,000	40	123.7	
	Total	297		0.000

*Statistically significant ($p \leq .05$); *$p \leq .005$, **$p \leq .01$, ***$p \leq .001$*

A post hoc test was conducted to assess the differences among the various income level pairs.

- No pairs of income level were found to be statistically significant in their difference in the conservation category.
- For environmental citizenship, 2 pairs of income levels were found to be statistically significant. 50,001-100,000 - >200,000 and >200,000 - 100,001-200,000. The mean rank for <50,000 group was 143.4, which is higher than the two middle income groups (162.1 and 167.3) which suggests that the lower income group displays lower levels of awareness and/or concern for the environment. This could be because they have greater concerns such as fulfilling their basic needs than watching content related to environmental issues or contributing money to environmental causes.
- Three pairs of income groups have been found to be statistically significantly different in the food category. >200,000 - 100,001-200,000; <50,000 - 100,001-200,000; and 50,001-100,000 - 100,001-200,000. The mean rank for the >50,000 group (183.8) is the highest, showing that this income group has the highest level of pro environmental behaviors in terms of their food consumption. However, it is more than likely that the reduction in food consumption allowing for a higher score is actually rooted in their financial situation and the recent inflation. The 50,001 - 100,000 group shows the second highest mean rank (142.4) which means the reduction in their consumption of food is slightly less than the previous group. The mean ranks of the remaining two groups is relatively quite low (125.1 and 109.6) meaning these groups have not reduced their food consumption in the past year.
- There are also 3 pairs of income groups that show statistically significant differences in the transportation category. Furthermore, transportation also shows higher mean rank for lowest income level and lower mean ranks for the higher income levels. The <50,000 income group shows a mean of 190.2. The reason they score so high as a group in terms of their pro environmental behaviors in this category is that a large majority of them do not own cars and they use public transportation the most. The remaining 3 groups score somewhat similar on this

category – 129.8, 124.3, and 123.7 respectively, meaning most of them own cars and they do not walk or carpool frequently.

Table 4.10: *Summary of Pairwise Comparisons (Income Level)*

Environmental Citizenship		**Food**		**Transportation**	
Sample 1 - Sample 2	**Adj. Sig**	**Sample 1 - Sample 2**	**Adj. Sig**	**Sample 1 - Sample 2**	**Adj. Sig**
> 200,000-<50,000	0.055	> 200,000-<50,000	1.000	> 200,000-<50,000	1.000
>200,000-100,001-50,000	0.001	>200,000-100,001-50,000	0.208	>200,000-100,001-50,000	1.000
>200,000-100,001-200,000	0.001	>200,000-100,001-200,000	0.000	>200,000-100,001-200,000	0.000
<50,000-50,001-100,000	0.734	<50,000-50,001-100,000	1.000	<50,000-50,001-100,000	1.000
<50,000-100,001-200,000	0.503	<50,000-100,001-200,000	0.000	<50,000-100,001-200,000	0.000
50,001-100,000-100,001-200,000	1.000	50,001-100,000-100,001-200,000	0.003	50,001-100,000-100,001-200,000	0.000

*Statistically significant (p ≤.05); *p ≤.005, **p ≤.01, ***p≤ .001*

4.2.2.4: Education Level

The results of the Kruskal-Wallis H test show that the differences among education level and the associated pro environmentalism are statistically significant as the p-values corresponding with conservation, food, and transportation are <.05 thus establishing overall differences in the pro environmental behaviors to be statistically significant.

- For conservation, the differences among educational attainment groups are found to be statistically significant. The mean ranks for conservation are higher for higher education levels as they tend to be more responsible.
- For environmental citizenship, (no formal education; primary; middle stage; and secondary) show a higher concern for the environment (mean ranks 164; 149; 151.8; and 175.1) than higher levels of education (Higher Secondary; Bachelor's; Master's; and ≥ Postgraduate) that have lower mean ranks (138.64; 147.22; 140.31; and 137.42).
- Low- to middle-income individuals score higher on the food category of their pro environmental behaviors as they have clearly experienced reduction in their food intake as well as the quantities of meat and poultry they consume, for financial reasons that most likely stem from their education levels.
- Low to mid education groups also score higher on the transportation category as they mostly do not own cars and also are most likely to use public transportation.

Table 4.11: *Kruskal Wallis H Test (Education Levels)*

	Education Level	**N**	**Mean Rank**	**Significance**
Conservation	No Formal Education	48	128.2	
	Primary	21	123.6	
	Middle Stage	20	155.5	
	Secondary	12	199.1	
	Higher Secondary	55	126.8	
	Bachelor's	81	163.0	
	Master's	47	175.9	
	≥ Postgraduate	13	120	

	Total	297		0.004
Environmental Citizenship	No Formal Education	48	164.54	
	Primary	21	149.36	
	Middle Stage	21	151.83	
	Secondary	12	175.13	
	Higher Secondary	55	138.64	
	Bachelor's	80	147.22	
	Master's	47	140.31	
	≥ Postgraduate	13	137.42	
	Total	297		0.739
Food	No Formal Education	48	192.6	
	Primary	21	182.6	
	Middle Stage	20	140.0	
	Secondary	12	129.3	
	Higher Secondary	55	127.2	
	Bachelor's	81	134.6	
	Master's	47	144.3	
	≥ Postgraduate		165	

	Total	297		0.000
Transportation	No Formal Education	48	217.2	
	Primary	21	203.2	
	Middle Stage	20	119.2	
	Secondary	12	118.9	
	Higher Secondary	55	146.4	
	Bachelor's	81	126.9	
	Master's	47	123.9	
	≥ Postgraduate	13	122.5	
	Total	297		0.000

*Statistically significant (p ≤.05); *p ≤.005, **p ≤.01, ***p≤ .001*

A post hoc test was conducted to determine the mean ranks of the groups to check which of the pairs were statistically significantly different from each other.

- The pairwise comparisons show that in the conservation category, the only pair of education levels that is statistically significant is the higher secondary-primary group. No other pairs were found statistically different in this category.
- There were no statistically significantly different pairs in the environmental citizenship category. The mean ranks are lower for lower levels of education in this category as respondents in the lower levels of education group are also more than likely to have lower levels of environmental awareness and concern owing to their more pressing problems that might have to do with finances and just getting by, causing the environment to be a lesser priority.

- The food category has two pairs of statistically significant pairs of education levels which are higher secondary-no formal education and bachelor's-primary. The mean rank of the no formal education group is the lowest among the rest which shows this group has experienced a reduction in their food consumption causing them to score high in the pro environmental behaviors. However, this reduction may not be entirely or even remotely environmental, rather, it is expected to be due to the recent inflation.
- There are 9 statistically significantly different pairs in the transportation category: Higher secondary -no formal education; secondary - no formal education; bachelor's - primary; bachelor's - no formal education; middle stage - primary; middle stage - no formal education; master's - primary; master's no formal education; ≥ post graduate - no formal education. No formal education group has the highest mean rank among the education level groups which can be explained by the lower education group also mostly belonging to the low income level groups simultaneously and not owning cars and relying more on public transportation, pushing their scores up.

Table 4.12: Summary of the Pairwise Comparisons (Education Level)

Conservation		**Food**		**Transportation**	
Sample 1 - Sample 2	**Adj. Sig**	**Sample 1 - Sample 2**	**Adj. Sig**	**Sample 1 - Sample 2**	**Adj. Sig**
Higher Secondary-Secondary	.221	Higher Secondary-Secondary	1.000	Higher Secondary-Secondary	1.000
Higher Secondary-Bachelor's	.421	Higher Secondary-Bachelor's	1.000	Higher Secondary-Bachelor's	1.000
Higher Secondary-Middle Stage	1.000	Higher Secondary-Middle Stage	1.000	Higher Secondary-Middle Stage	1.000

Higher Secondary-Master's	.106	Higher Secondary-Master's	1.000	Higher Secondary-Master's	1.000
Higher Secondary-≥Post Graduate	1.000	Higher Secondary-≥Post Graduate	1.000	Higher Secondary-≥Post Graduate	1.000
Higher Secondary-Primary	1.000	Higher Secondary-Primary	0.242	Higher Secondary-Primary	.243
Higher Secondary-No formal education	1.000	Higher Secondary-No formal education	0.002	Higher Secondary-No formal education	.001
Secondary-Bachelor's	1.000	Secondary-Bachelor's	1.000	Secondary-Bachelor's	1.000
Secondary-Middle Stage	1.000	Secondary-Middle Stage	1.000	Secondary-Middle Stage	1.000
Secondary-Master's	1.000	Secondary-Master's	1.000	Secondary-Master's	1.000
Secondary-≥Post graduate	.582	Secondary-≥Post graduate	1.000	Secondary-≥Post graduate	1.000
Secondary-Primary	.041	Secondary-Primary	1.000	Secondary-Primary	.161
Secondary-No formal education	.284	Secondary-No formal education	0.481	Secondary-No formal education	.009
Bachelor's-Middle Stage	1.000	Bachelor's-Middle Stage	1.000	Bachelor's-Middle Stage	1.000
Bachelor's-Master's	1.000	Bachelor's-Master's	1.000	Bachelor's-Master's	1.000
Bachelor's-≥ Post graduate	1.000	Bachelor's-≥ Post graduate	1.000	Bachelor's-≥ Post graduate	1.000
Bachelor's-Primary	1.000	Bachelor's-Primary	0.003	Bachelor's-Primary	0.006
Bachelor's-No formal education	.703	Bachelor's-No formal education	1.000	Bachelor's-No formal education	0.000

Middle stage-≥ Post graduate	1.000	Middle stage-≥ Post graduate	1.000	Middle stage-≥ Post graduate	1.000
Middle stage-Primary	1.000	Middle stage-Primary	1.000	Middle stage-Primary	.040
Middle stage-No formal education	1.000	Middle stage-No formal education	0.455	Middle stage-No formal education	0.000
Master's-Primary	.554	Master's-Primary	1.000	Master's-Primary	0.010
Master's- Middle stage	1.000	Master's- Middle stage	.076	Master's- Middle stage	1.000
Master's-No formal education	.183	Master's-No formal education	1.000	Master's-No formal education	.010
≥Post graduate -Primary	1.000	≥Post graduate -Primary	0.119	≥Post graduate -Primary	0.189
≥Post graduate-No formal education	1.000	≥Post graduate-No formal education	1.000	≥Post graduate-No formal education	0.009
Primary-No formal education	1.000	Primary-No formal education	1.000	Primary-No formal education	1.000

*Statistically significant (p ≤.05); *p ≤.005, **p ≤.01, ***p≤ .001*

4.2.3 Nature Visits and non-Nature Visits and Pro Environmentalism

Mann-Whitney U test was conducted to analyze the differences between the users and non-users of UGS in terms of their pro environmental behaviors. The results reveal that there are statistically significant differences between NE and non-NE groups in terms of their pro environmental behaviors.

- For conservation, the differences between the NV and non-NV are statistically significant. The users show a higher mean rank for their pro environmental

behaviors (160.7; whereas for users, the mean rank is 131.6) meaning they are more responsible when it comes to conserving energy and water.

- Environmental citizenship also shows statistically significant differences among NE and non-NE groups. The visiters display a higher mean rank (156.7) in terms of their pro environmental behaviors in this category than the non-users (136.4), suggesting that the People with NE are more likely to watch content related to environmental issues and discuss environmental behaviors with others as well as financially contributing to such causes.
- The food category does not show any differences between the UGS users and non-users in terms of their pro environmental behaviors that are statistically significant. They mean rank, however, for this category is higher for the non-user group. This is most likely due to a higher number of the respondents belonging to the non-user group who also belong to lower income levels and have experienced a reduction in their food consumption.
- The transportation category also does not show a statistically difference between the NE and non-NE. The mean rank for people with NE is higher (154.9) compared to the mean rank of the non-users (140.0) suggesting that the UGS users are more pro-environmental regarding their transportation habits.

Table 4.13: ***Mann-Whitney U Test***

	Group	**N**	**Mean Rank**	**Significance**
Conservation	Yes	178	160.7	
	No	119	131.6	
	Total	297		0.004
Environmental Citizenship	Yes	178	156.7	
	No	119	136.4	

	Total	197		0.042
Food	Yes	178	147.9	
	No	119	150.5	
	Total	297		0.795
Transportation	Yes	178	154.9	
	No	119	140.0	
	Total	297		0.136

Another Mann-Whitney U test was conducted to determine whether the two groups are statistically significantly different in their pro environmentalism. The results show that there are indeed statistically significant differences between the UGS user and non-users in their overall pro environmental behaviors. The mean rank for UGS users is higher (159.5) than the mean rank of the non-users (132.2) for their overall pro environmental behaviors. Therefore, it can be concluded that the NV are more pro-environmental than the non-NV.

Table 4.14: ***Mann-Whitney U Test***

Group	**N**	**Mean Rank**	**Significance**
Yes	178	159.5	
No	119	132.2	
Total	297		0.007

*Statistically significant (p ≤.05); *p ≤.005, **p ≤.01, ***p≤.001*

Dependent variable: mean of all 4 categories

4.3. Discussion

The study seeks to address the following objectives:

1. *To evaluate the differences between the sociodemographic characteristics and their pro environmental behaviors.*

In terms of gender, 52.% women visit UGS at least once a week. Looking at the literature, Cohen et al. (2007) posit that women are under-represented in UGS usage and are less likely to engage in vigorous activities while at UGS compared to men, and hence, UGS are more important for men's health than women's. Alternatively, Kavanagh et al., (2006) hypothesize that women spend more time in the urban UGS and the neighborhood as they are the primary caregivers, do not work or work part time, and perform chores and supervise children.

Or, this slight over representation may simply be because more women were available in their homes to participate in the study at the time the survey was conducted. In terms of the differences in the pro environmental behaviors, the differences among men and women in terms of their pro environmental behaviors are statistically significant. In this study, women are found to be statistically significantly different from men in three out of four categories of the pro environmental behaviors being studied – women show higher levels of conservation, environmental citizenship, and their food and transportation habits are more environmental as well. The differences between men and women in terms of their conservation, food, and transportation are statistically significant, while the results did not show statistically significant differences between male and female respondents in terms of their environmental citizenship. The literature supports this outcome.

Vicente-Molina et al (2018) conducted a study on the Basque University students. There were (43.7%) men and (56.3%) women in the sample. It was found that descriptive analysis of differences in means reveals that male and female students show significant differences in all factors except attitudes. Furthermore, Patel et al (2017) conclude a few

things – married men score higher on the PEB scale than unmarried men; women prefer green channels (public transportation) more; and women do not show hesitation paying more for energy-saving appliances and equipment compared to married and unmarried men.

In terms of age groups, the differences in pro environmental behaviors found among the groups studied were also statistically significant. For conservation and environmental citizenship, the mean ranks successively increase with the increasing age. This can be seen in the literature. Wang et al (2021) found that older people are more environmentally active, implying that longevity allows for more opportunity for humans to improve their environmental behaviors just like it allows for other kinds of growth and development as individuals.

The scores of food appear to remain less variant in among the age groups as food consumption is more rigid due to it being a necessity, and the variations seen in the food category can be attributed to the financial situation than the environmental inclinations. For transportation, the scores successively reduce with the increasing age. This can be due to the younger people not owning personal cars and also being more capable of being able to walk instead of driving for shorter distances and be able to use public transportation, which is something the elderly are less or not at all capable of doing, hence they score lower on the transportation category compared to the younger respondents.

There is mixed evidence on use of public transportation among older adults. Truong and Somenahalli (2015) imply that older adults will avoid driving and prefer to use public transit in times of higher traffic density and rush hours. Curry and Delbosc (2010) suggested for older adults over 60 years there were 30% fewer trips overall and 16% fewer using public transit compared to those below 60 years of age, and overall concluding that the use of public transport for older adults and elderly is highly sensitive to the ease of access and level of service. They further commented that car use will continue to dominate for mobility in the future.

The differences among the income level groups in terms of their pro environmental behaviors were also found to be statistically significant. The conservation category was not

found to be statistically significant. The mean ranks among the age groups in this category show very little variation suggesting that all income groups show similar conservation behaviors such as turning off lights and electronic devices when not in use and being judicious with their use of water and other types of energy. For environmental citizenship, the middle two groups show similar mean ranks (162.1 and 167.3) while the <50,000 group shows a lower score (143.4) but higher than the >200,000 group (102.2). For the food category, the score decreases as the income level increases. This suggests that the lower income groups score higher on their pro environmental behaviors associated with food like reducing their consumption of food and/or meat. This reduction, however, is suspected to be connected more with the financial context of the individuals than their pro environmental dispositions. The scores on the transportation category is much higher for <50,000 (190.2) compared to the other 3 income groups (129.8, 124.3, and 123.7 respectively).

Plombon (2011) found income to be statistically significant with pro environmental behaviors and showed a positive correlation between the two, concluding that the higher an individual on the country's income scale, the more likely they were to have pro environmental attitudes. Furthermore, Panarello (2021) posits that higher relative income and lower feelings of economic insecurity can explain the increasing level of environmental concern in modern times.

There were statistically significant differences among education level groups in terms of their pro environmental behaviors. For respondents with no formal education, primary education, and higher secondary education, the score for conservation is lowest (128.2, 123.6, and 126.8 respectively). This could be explained through the lower levels of education usually translating into lower levels of environmental awareness and concern causing people to behave somewhat less responsibly. Respondents with middle and secondary level education practice higher levels of conservation (155.5 and 199.1), while bachelor's and master's level show mean ranks of 163.0 and 175.0. The highest level of education surprisingly shows a very low mean rank (120) than what could be expected of them. The environmental citizenship category also shows slightly unexpected results with lower levels of education (no formal education; primary; middle stage; and secondary)

showing a higher concern for the environment (mean ranks 164; 149; 151.8; and 175.1) than higher levels of education (Higher Secondary; Bachelor's; Master's; and ≥ Postgraduate) that have lower mean ranks (138.64; 147.22; 140.31; and 137.42). The food category shows relatively really high scores for no formal education and primary education groups (192.6; and 182.6) while other groups show mean ranks between 144 and 130. This can be due to a reduction in food consumption in the lower education groups due to a weaker financial context and/or the recent inflation. For transportation, the mean ranks for no formal education and primary level are the highest and the only ranks that are >200 (217; and 203) while the rest of the groups score roughly between 120 and 150. This can be explained by a lack of car ownership in this group of respondents, more frequent use of public transportation and more frequent walking which pushes their scores up. The literature shows that high educational attainment is linked with higher pro environmental behaviors and attitudes (Kotchen et al., 2013); De Silva and Pownall, 2014 (De Silva et al., 2014). Tianyu and Meng (2020) also conclude that higher personal educational attainment has a positive significant effect on willingness to pay for environmental causes. Mazur and Welch (1999) found environmentalism to be highly positively correlated with education but negatively correlated with political conservatism. Though this study is very old, it is very insightful as light was shed on the state-to-state variations in environmentalism in all 50 states in the United States and it was concluded that environmentalism should not only be explained through demographic characteristics and economic context but also through the qualitative cultural traditions of the society in discussion. Therefore, in a country like Pakistan where environmental issues are less than a priority, the differences among educational level groups may not paint a complete picture, and it further suggests that pro environmental behaviors, an already understudied topic, should be studied further through other societal contexts and determinants as well.

2. *To analyze the influence of UGS usage on users' self-reported pro-environmental behaviors.*

For the two independent groups, the UGS users and non-users, the results are statistically significant in terms of the differences in their pro environmental behaviors. The mean rank

is higher for UGS users in 3 out of 4 categories (conservation, environmental citizenship, and transportation).

The test for pro environmentalism also shows statistically significant results, proving the theory this study originally set out to test, Nature Exposure Framework for Pro Environmental Behavior, where van den Bosch and Depledge (2015) posit that spending time in nature induces pro environmental behavior. Otto and Pensini (2017) find a substantial effect of nature connectedness on ecological behavior where 69% of the variance was explained through nature connectedness. Rosa et al., (2018) also report that the positive experiences and stimulation of being in nature triggers pro environmental behaviors in adults. DeVille (2021) concluded that due to deployment of inconsistent measures of nature exposure, it is difficult to identify which elements of nature contact directly induce pro environmental behavior and attitude change – hence suggesting that nature contact may be inducing pro environmental behaviors but the subject requires deeper study to determine what aspects of nature to emphasize in order to generate maximum behavior change.

CHAPTER 5: CONCLUSION AND POLICY IMPLI ATIONS

5.1. Conclusion

The study aimed to investigate the influence of socio-demographic characteristics on respondents' self-reported pro environmental behaviors and study the effect of NE on the self-reported pro environmental behavior of the inhabitants of Islamabad, Pakistan.

First, it can be concluded that making the effort to expose oneself to nature at least once a week can induce PEB. The behaviors are divided into 4 categories. For every demographic group and NV and non-NV, every category of PEB is not necessarily statistically significant. It was hypothesized that women will have greater environmental behaviors than men. The results show that for gender differences, women are statistically significantly different in their environmental behaviors than men. For conservation, the differences found between genders are statistically significant and women have a higher mean rank than men. There are no statistically significant differences in the environmental citizenship category but women have a higher mean rank in this category too, suggesting they have greater tendency to watch environment-related content and have discussions regarding others' environmental behaviors. Women are also statistically significantly different than men in their food-related environmental behaviors and show a higher mean rank as well. There were also statistically significant differences found between men and women in the transportation and yet again, women show a much higher mean rank – (this can be due to their lack of ownership of cars), but overall, women proved to be more pro-environmental than men, as widely documented in the literature. Upon deeper look, the differences in food category can also be attributed to women being more food-insecure than men, especially the women who also have little to no education, as higher scores on food category suggest women have experienced greater reduction in their food consumption overall. Furthermore, the transportation score being much higher for women may not be necessarily due to women consciously showing higher PEB, rather it can be due to majority of women not owning cars.

For age groups, statistically significant differences were found among the age groups under study. It was hypothesized that PEB will be statistically significant against age groups and will increase with increasing age. This too was partially seen in the results where for conservation and environmental citizenship, the mean ranks successively increase with the increasing age; whereas for food, the scores remained largely similar as food is a basic necessity and reducing its consumption for environmental purposes may not work for most of the individuals. Lastly, the results for transportation show inverse results for age groups – the scores reduce with increasing age – this can be explained in two main ways: the younger participants and majority of women do not own cars, pushing their scores up on this category while older adults and elderly avoid walking frequently or taking public transportation, pulling their scores down in this category.

The income groups were also expected to show statistically significant differences and the higher income levels were hypothesized to show higher PEB than lower income level groups. Conservation was found to be statistically insignificant in terms of differences among income level groups and the mean ranks for all income level groups were more or less similar. For environmental citizenship, the middle two groups show similar mean ranks (162.1 and 167.3) while the <50,000 group shows a lower score (143.4) but higher than the >200,000 group (102.2). For the food category, lower income groups showed very low mean ranks (180) compared to the other groups that only showed scores between 140 and 110. Transportation was also found to be statistically significant in terms of differences among income groups and follows a similar patterns where lower income groups show much higher scores than mid and high-income groups. It can be drawn from the results that income alone is not an adequate determinant, it does play its role but for categories that show higher scores for lower income groups, such as food and transport, the decisions are most likely rooted in the financial context of the respondent rather than their PEB.

Education levels were also expected to be statistically significant and to increase with increasing education. The results for this group were according to hypothesis in the conservation category only, while for environmental citizenship, food, and transportation, the scores decreased with increasing educational attainment. This is further evidence that

only education cannot determine or induce PEB, and other sociodemographic factors and societal constructs should be evaluated as well.

For UGS users and non-users, the results were expected to be statistically significant, and the UGS users were expected to exhibit higher levels of PEB. This can largely be established through the results as the differences between users and non-users and their PEB were found to be statistically significant in 2 out of 4 categories (conservation and environmental citizenship) and the mean rank is higher for UGS users in 3 out of 4 categories (conservation, environmental citizenship, and transportation). Furthermore, for the computed variable of Pro-Environmentalism, the results show that the differences in the PEB of the two independent groups are statistically significant, and the mean rank for UGS users is higher than non-users.

This points toward two important limitations. The first limitation is linked to the fact that sociodemographic characteristics are not adequate determinants of PEB – as discusses earlier, other societal factors also have an undeniable role to play when it comes to people's PEB such as culture (for example use of public transportation among women in Pakistan is often not perceived to be safe or even appropriate in upper social classes), political scene, availability and accessibility of a particular good or service (for example if public transportation were qualitatively and quantitatively adequate, more male respondents might have chosen to use it and hence their scores would have been much higher), or habits. Secondly, intentions play an important role as well. It is not possible to determine whether a certain PEB was undertaken primarily out of concern for the environment or if environmental benefit was just a spillover effect or by-product of a certain decision; for example it cannot be truly determined whether the increasing shift toward solar power among Pakistani households is purely an environmental move or there are strictly financial motivations behind it. So, if the primary intention behind a behavior is not environmental, it cannot be called a truly environmental behavior.

5.2. Policy Implications

The study's findings highlight the importance of green space interventions to promote urban residents' exposure to nature. The Brief of Action for UGS developed by the World

Health Organization recommends that these green space interventions should be inclusive of social promotion activities accompanied by physical changes (WHO, 2022).

- The physical changes should focus not only on quantitative enhancement like building new ones, but also qualitative actions such as revamping existing UGS to improve facilities and attractiveness. This will help increase UGS usage. A rule of thumb given by the WHO requires access to a minimum of 0.5-1 hectare of public green space that is a 5-minute walk from their residence (300 meters linear distance) (WHO, 2022). Furthermore, these UGS should be well-maintained, well-equipped, and esthetically pleasing to increase their attractiveness and functionality. The primary responsibility lies with the local decisionmakers, public authorities, and the policymakers responsible for urban management and city and town planning.
- The social promotion activities can include awareness campaigns, informative brochures, digital content, and on-site signs; publicity events such as sports events, festivals etc.; or small-scale group activities such as guided walks (WHO, 2022). With that, it is imperative that all such interventions are targeted toward the sub-populations that have low UGS usage (18 – 24 years and older adults ≥ 55 years). A range of actors can come into play in this space including but not limited to local authorities, civil society organizations, and environmental groups.

5.3. Future Studies

- Future research efforts can be employed in a study using a comparison neighborhood with lower availability and accessibility of UGS and a lower socioeconomic status.
- Second, future studies can use other important determinants of PEB, such as culture and political context, to dive deeper into what determines and influences PEB – this will be directly helpful in overcoming the first limitation where it was said that demographic characteristics are not adequate determinants of PEB. This links us back to the argument made in the first chapter stating that the underlying values, political contexts, and institutional quality are different in the developed and developing world, necessitating exploration of this subject while taking those

contextual differences into account. In this endeavor, the Value, Norm, Belief (VNB) conceptual framework can also be utilized.

- Third, future studies can use measure of nature exposure (or multiple measures) other than UGS usage; or use multiple independent variables along with nature exposure such as nature connectedness, nature appreciation etc. Furthermore, Environmental Identity can also be used as (one of the) independent variable(s) – this will help overcome the second limitation where it was stated that certain behaviors are only environmental on face value because the primary intention behind them was not environmental and that, intention matters when evaluating PEB.
- Forth, future studies can also utilize a different scale of measuring PEB as well.

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APPENDIX A: DESCRIPTION OF DEFAULT SUBHEADING SCHEME

Descriptives

Gender				
	Frequency	Percent	Valid Percent	Cumulative Percent
Male	142	52.2	52.2	52.2
Female	155	47.8	47.8	100
		100	100	

Age				
	Frequency	Percent	Valid Percent	Cumulative Percent
18 - 24	41	13.8	13.8	13.8
25 - 34	112	37.7	37.7	51.5
35 - 54	85	28.6	28.6	80.1
55 - 74	52	17.5	17.5	97.6
75 and above	7	2.4	2.4	100
Total	297	100	100	

Income				
	Frequency	Percent	Valid Percent	Cumulative Percent
< 50,000	104	35	35	35
50,001 - 100,000	40	13.5	13.5	48.5
100,001 - 200,000	60	20.2	20.2	68.7
> 200,000	93	31.1	31.1	100

Education				
	Frequency	Percent	Valid Percent	Cumulative Percent
No formal education	48	16.2	16.2	16.2
Primary	21	7.1	7.1	23.3
Middle Stage	20	6.7	6.7	30
Secondary	12	4	4	34
Higher Secondary	55	18.5	18.5	52.2
Bachelor's	81	27.3	27.3	79.9
Master's	47	15.8	15.8	95.6
≥ Postgraduate	13	4.4	4.4	100
Total	297	100	100	

UGS Usage				
	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	178	59.9	59.9	59.9
No	119	40.1	40.1	100
Total	297	100	100	

How often do you turn off lights when leaving a room?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Never	0	0	0	0
Rarely	8	2.6	2.6	2.6
Sometimes	7	2.4	2.4	5
Usually	38	12.8	12.8	17.8
Always	244	82.2	82.2	100
Total	297	100	100	

How often do you switch off stand-by modes on electronic devices?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Never	0	0	0	0
Rarely	51	17.2	17.2	17.2

Sometimes	68	22.9	22.9	40.1
Usually	44	14.8	14.8	54.9
Always	134	45.1	45.1	100
Total	297	100	100	

How often do you cut down on heating or cooling to limit energy use?

	Frequency	Percent	Valid Percent	Cumulative Percent
Never	13	4.3	4.3	4.3
Rarely	14	4.7	4.7	9
Sometimes	31	10.4	10.4	19.4
Usually	58	19.5	19.5	38.9
Always	181	60.9	60.9	100
Total	297	100	100	

How often do you turn off the TV when leaving a room?

	Frequency	Percent	Valid Percent	Cumulative Percent
Never	16	5.4	5.4	5.4
Rarely	15	5.1	5.1	10.5
Sometimes	34	11.4	11.4	21.9

Usually	75	25.3	25.3	47.2
Always	157	52.9	52.9	100
Total	297	100	100	

How often do you limit your time in the shower to conserve water?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Never	0	0	0	0
Rarely	12	4	4	4
Sometimes	49	16.5	16.5	20.5
Usually	99	33.3	33.3	53.8
Always	137	46.1	46.1	100
Total	297	100	100	

How often do you wait till you have a full load to use the washing machine and/or the dishwasher?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Never	0	0	0	0
Rarely	9	3	3	3
Sometimes	73	24.6	24.6	27.6
Usually	112	37.7	37.7	65.3

Always	103	34.7	34.7	100
Total	297	100	100	

At which temperature do you mostly wash your clothes?

	Frequency	Percent	Valid Percent	Cumulative Percent
Hot	51	17.2	17.2	17.2
Warm	91	30.6	30.6	47.8
Cold	155	52.2	52.2	100
Total	297	100	100	

Are you currently a member of any environmental, conservation, or wildlife protection group?

	Frequency	Percent	Valid Percent	Cumulative Percent
No	251	84.5	84.5	84.5
Yes	46	15.5	15.5	100
Total	297	100	100	

During the past year, have you contributed money to any environmental, conservation, or wildlife protection group?

	Frequency	Percent	Valid Percent	Cumulative Percent

No	189	63.6	63.6	63.6
Yes	108	36.4	36.4	100
Total	297	100	100	

How often do you watch television programs, movies, or internet videos about environmental issues?

	Frequency	Percent	Valid Percent	Cumulative Percent
Never	87	29.3	29.3	29.3
Rarely	34	11.4	11.4	40.7
Sometimes	116	39.1	39.1	79.8
Often	53	17.8	17.8	97.6
Constantly	7	2.4	2.4	100
	297	100	100	

How often do you talk to others about their environmental behavior?

	Frequency	Percent	Valid Percent	Cumulative Percent
Never	26	8.6	8.6	8.6
Rarely	38	12.8	12.8	21.4
Sometimes	98	33	33	54.4
Often	96	32.3	32.3	86.7

Constantly	39	13.1	13.1	100
	297	100	100	

During the past year, have you increased the amount of organically produced fruits and vegetables you consume?

	Frequency	Percent	Valid Percent	Cumulative Percent
No	150	50.5	50.5	50.5
Yes	147	49.5	49.5	100
Total	297	100	100	

Approximately how many miles per gallon does the vehicle get?

	Frequency	Percent	Valid Percent	Cumulative Percent
< 11	17	5.7	5.7	5.7
11-13	64	21.5	21.5	27.2
13-16	48	16.3	16.3	43.5
16-18	24	8.1	8.1	51.6
I don't own a car	144	48.5	48.5	100
Total	287	100	100	

During the past year, have you reduced the amount of food you consume?				
	Frequency	Percent	Valid Percent	Cumulative Percent
No	196	66	66	66
Yes	101	34	34	100
Total	297	100	100	

During the past year, have you reduced the amount of meat you consume?				
	Frequency	Percent	Valid Percent	Cumulative Percent
No	164	55.2	55.2	55.2
Yes	114	38.4	38.4	93.6
I do not eat meat	19	6.4	6.4	100
	297	100	100	

During the past year, have you reduced the amount of poultry you consume?				
	Frequency	Percent	Valid Percent	Cumulative Percent
No	198	66.7	66.7	66.7
Yes	56	18.9	18.9	85.6
I do not eat poultry	43	14.5	14.5	100
Total	297	100	100	

During the past year, how often have you carpooled?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Never	127	42.8	42.8	42.8
Occasionally	134	45.1	45.1	87.9
Frequently	36	12.1	12.1	100
	297	100	100	

During the past year, how often have you used public transport?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Never	151	51.2	51.2	51.2
Occasionally	82	27.6	27.6	78.8
Frequently	63	21.2	21.2	100
Total	297	100	100	

During the past year, how often have you walked or cycled instead of driving?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Never	58	19.5	19.5	19.5

Occasionally	143	48.1	48.1	67.6
Frequently	96	32.3	32.3	100
Total	297	100	100	

Mann-Whitney and Kruskal-Wallis H

- **Gender**

	Male		Female			
	N	**Mean Rank**	**Sum of Ranks**	**N**	**Mean Rank**	**Sum of Ranks**
Conservation	142	138.77	19705.5	155	158.37	24547.5
Environmental Citizenship	142	139.67	19694	155	156.53	24262
Food	142	134.99	19168	155	161.84	25085
Transportation	142	169.33	24045	155	130.37	20208

Test Statistic				
	Conservation	Environmental Citizenship	Food	Transportation
Mann-Whitney U	9552.5	9683	9015	8118
Wilcoxon W	19705.5	19694	19168	20208
Z	-1.973	-1.706	-2.811	-3.979
Asymp. Sig. (2-tailed)	0.048	0.088	0.005	0

- **Age**

	Age Group	N	Mean Rank
Conservation	18 - 24	41	120.9
	25 - 34	112	145.6
	35 - 54	85	152.6
	55 - 74	52	179.2
	75 and above	7	99.9
	Total	297	
Environmental Citizenship	18 - 24	41	114.4
	25 - 34	112	153.8
	35 - 54	84	143.2
	55 - 74	52	174.4
	75 and above	7	135.4
	Total	297	
Food	18 - 24	41	130.5
	25 - 34	112	152.5
	35 - 54	85	154.3
	55 - 74	52	148.6

	75 and above	7	139.1
	Total	297	
Transportation	18 - 24	41	174.5
	25 - 34	112	162.2
	35 - 54	85	138.3
	55 - 74	52	131.0
	75 and above	7	53.1
	Total	297	

Test Statistics [a,b]

	Conservation	Environmental Citizenship	Food	Transportation
Chi-Square	13.56	12.39	2.731	19.276
df	4	4	4	4
Asymp. Sig.	0.009	0.015	0.604	0.001

a) Kruskal-Wallis test

b) Grouping Variable: Age Group

- **Income**

		N	Mean Rank
Conservation	< 50,000	104	143.4

	50,001 - 100,000	93	148.8
	100,001 - 200,000	60	161.0
	> 200,000	40	146.2
	Total	297	
Environmental Citizenship	< 50,000	104	143.4
	50,001 - 100,000	93	162.1
	100,001 - 200,000	59	167.3
	> 200,000	40	102.2
	Total	296	
Food	< 50,000	104	183.8
	50,001 - 100,000	93	142.4
	100,001 - 200,000	60	125.1
	> 200,000	40	109.6
	Total	297	
Transportation	< 50,000	104	190.2
	50,001 - 100,000	93	129.8
	100,001 - 200,000	60	124.3
	> 200,000	40	123.7
	Total	297	

Test Statistics a,b				
	Conservation	**Environmental Citizenship**	**Food**	**Transportation**
Chi-Square	1.666	17.56	33.483	38.431
df	3	3	3	3
Asymp. Sig.	0.644	0.001	0	0

a) Kruskal-Wallis test

b) Grouping Variable: Household Income

- **Education**

	Education Level	**N**	**Mean Rank**
Conservation	No Formal Education	48	128.2
	Primary	21	123.6
	Middle Stage	20	155.5
	Secondary	12	199.1
	Higher Secondary	55	126.8
	Bachelor's	81	163.0
	Master's	47	175.9
	≥ Postgraduate	13	120
	Total	297	
Environmental Citizenship	No Formal Education	48	164.54

	Primary	21	149.36
	Middle Stage	21	151.83
	Secondary	12	175.13
	Higher Secondary	55	138.64
	Bachelor's	80	147.22
	Master's	47	140.31
	≥ Postgraduate	13	137.42
	Total	297	
Food	No Formal Education	48	192.6
	Primary	21	182.6
	Middle Stage	20	140.0
	Secondary	12	129.3
	Higher Secondary	55	127.2
	Bachelor's	81	134.6
	Master's	47	144.3
	≥ Postgraduate		165
	Total	297	
Transportation	No Formal Education	48	217.2

	Primary	21	203.2
	Middle Stage	20	119.2
	Secondary	12	118.9
	Higher Secondary	55	146.4
	Bachelor's	81	126.9
	Master's	47	123.9
	≥ Postgraduate	13	122.5
	Total	297	

Test Statistics a,b

	Conservation	Environmental Citizenship	Food	Transportation
Chi-Square	21.007	4.348	24.915	55.154
df	7	7	7	7
Asymp. Sig.	0.004	0.739	0.001	0

a) Kruskal-Wallis test

b) Grouping Variable: Education Level

- **UGS Usage**

	Group	N	Mean Rank	Sum of Ranks
Conservation	Yes	178	160.65	28595
	No	119	131.58	15658
	Total	297		
Environmental Citizenship	Yes	178	156.71	27727
	No	119	136.29	16219
	Total	197		
Food	Yes	178	147.99	26341.5
	No	119	150.52	17911.5
	Total	297		
Transportation	Yes	178	154.97	27584.5
	No	119	140.07	16668.5
	Total	297		

Test Statistics [a,b]				
	Conservation	Environmental Citizenship	Food	Transportation
Chi-Square	8.243	4.115	0.068	2.228
df	1	1	1	1

Asymp. Sig.	0.004	0.042	0.795	0.136

Kruskal-Wallis test

Grouping Variable: UGS Usage

		N	Mean Rank	Sum of Ranks
Pro Environmentalism	Yes	178	159.5	28228
	No	119	132.2	15728
	Total	297		

Test Statistics[a]	
Pro Environmentalism	
Mann-Whitney U	8588
Wilcoxon W	15728
Z	-2.696
Asymp. Sig. (2-tailed)	0.007

a) Grouping Variable: Pro Environmentalism

QUESTTIONNAIRE/INTERVIEW PERFORMA

Questionnaire

1) Demographics

1) What is your gender?

- Male
- Female
- Prefer not to say

2) What age bracket do you fall in?

- 18 – 24
- 25 – 34
- 35 – 54
- 55 – 74
- 75 and above

3) What is your average monthly household income (PKR)?

- < 50,000
- 50,001 - 100,000
- 100,001 - 200,000
- 200,000

4) What is your highest level of education attained?

- No Formal Education Primary
- Middle Stage Secondary
- Higher Secondary Bachelor's
- Master's Postgraduate and Above

2) UGS Usage

5) Do you visit urban green spaces at least once a week?
   - Yes
   - No

3) Pro Environmental Behavior Scale (PEBS)

i) Conservation

1) How often do you turn off lights when leaving a room?

   Never Rarely Sometimes Usually Always

2) How often do you switch off stand-by modes on electronic devices?

   Never Rarely Sometimes Usually Always

3) How often do you cut down on heating or cooling to limit energy use? [a]

Never Rarely Sometimes Usually Always

4) How often do you turn off the TV when leaving a room? [a]

Never Rarely Sometimes Usually Always

5) How often do you limit your time in the shower to conserve water? [a]

Never Rarely Sometimes Usually Always

6) How often do you wait till you have a full load to use the washing machine and/or the dishwasher? [a]

Never Rarely Sometimes Usually Always

7) At which temperature do you mostly wash your clothes? [b]

Hot Warm Cold

ii) Environmental Citizenship

8) Are you currently a member of any environmental, conservation, or wildlife protection group?

No Yes

9) During the past year, have you contributed money to any environmental, conservation, or wildlife protection group?

No Yes

10) How often do you watch television programs, movies, or internet videos about environmental issues?

Never Rarely Sometimes Often Constantly

11) How often do you talk to others about their environmental behavior?

Never Rarely Sometimes Often Constantly

12) During the past year, have you increased the amount of organically produced fruits and vegetables you consume?

No Yes

13) Please answer the following question according to the vehicle you drive most often: Approximately how many miles per gallon does the vehicle get?

< 11 11-13 13-16 16-18 >18 I Don't Own a Car

iii) Food

14) During the past year, have you reduced the amount of food you consume?

No Yes

15) During the past year, have you reduced the amount of meat you consume?

No Yes I don't eat meat/poultry

16) During the past year, have you reduced the amount of poultry you consume?

No Yes I don't eat meat/poultry

iv) Transportation

17) During the past year, how often have you carpooled?

Never Occasionally Frequently

18) During the past year, how often have you used public transport?

Never Occasionally Frequently

19) During the past year, how often have you walked or cycled instead of driving?

Never Occasionally Frequently