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List of Acronyms

IPCC	Intergovernmental Panel on Climate Change
PEB	Pro-Environmental Behaviors
SDGs	Sustainable Development Goals
NE	Nature Exposure
UN	United Nations
UGS	Urban Green Spaces
WMO	World Meteorological Organization

Abstract

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

1. Introduction

Pakistan has been ranked as the eighth most vulnerable country to climate by Global Climate Risk Index 2023. 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).

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.

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).

Hence, the promotion of PEB can serve as a tool to deal with such complex issues swiftly. PEB can be automatically caused, like many other social behaviors, by an internal or external stimuli. A potential trigger for such automatic PEB would also be natural environments themselves. Visit to natural environments have been recognized to induce PEB 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.

This study draws on the Nature Exposure Framework for Pro Environmental Behavior (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. In light of the aforementioned theory, this study seeks to answer two burning questions:

- What are the impacts of socio-demographic characteristics on PEB?
- Does NE influence self-reported PEB?

There is an evident research gap in the existing literature concerning the relationship between NE and PEB. To make matters more urgent, majority of the studies in the PEB space are based in the developed world and the differences between the environmental values and institutional quality between the developed and the developing world are found to be statistically significant.

1.2. Research Objectives

This paper focuses on the following key research 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.

A novel contribution of this study is that it establishes a link between nature exposure and PEB. It shows that visits to nature can serve as a tool to promoting PEB as a low-cost, nature-based solution to de-intensifying environmental degradation.

Rest of the study is structured as follows: Section 2 focuses on the Literature Review, which includes a thematic review of topics around the impact of socio-demographic characteristics on self-reported PEB, operationalization of NE and PEB, and link of NE and PEB. Section 3 presents a brief overview of the cost of climate change to Pakistan. Section 4 presents the theoretical framework. Section 5 provides detailed empirical methodology and data description. Section 6 presents the empirical findings and their analysis. Section 7 concludes the study and draws implications for policy.

2. Literature Review

This section will give a detailed review of literature on NE, PEB, the impact of socio-demographic characteristics on self-reported PEB, and the link between NE and PEB.

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).

2.2.1. Measurement of PEB

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.

2.3. Relationship Among Study Variables

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.

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 statistically significant in affecting support for both the adaptation policies against flooding.

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.

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, 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.

3. Data Description, Empirical Model, & Econometrical Techniques

3.1. Data Description

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.

3.2. Study Variables

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

Table 3.1. Data Description & Data Sources

Variable	Definition	Source of Data
Gender	Male = 1 Female = 2	
Age	18 – 24 = 1 25 – 35 = 2 35 – 54 = 3 55 – 74 = 4 ≥ 75 = 5	Whitburn et al., 2018
Education	No formal education = 1 Primary = 2 Middle stage = 3 Secondary = 4 Higher Secondary = 5 Bachelors = 6 Master's = 7 ≥ Postgraduate = 8	UNESCO, 2011
Average Monthly Household Income	< 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
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 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** • 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?	Markle, 2013 Kaiser, 1998 Kaiser et al. 1999 Armel et al. 2011

3.3. Relationship between Socio-Demographic Characteristics and PEB and Nature Exposure and PEB

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

3) The characteristics of the study participants will be reported through frequency tables.
4) 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.

4. Empirical Results & Discussion of Findings

In this Chapter, estimation analysis results are presented with a discussion analysis on the assessment of the relationship between socio-demographic characteristics and PEB and NE and PEB.

4.1. Empirical Results

4.1.1 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 4.1. Mann-Whitney U Test (Gender)

	Gender	N	Mean Rank
Conservation	Male	142	138.77
	Female	155	158.37
	Total	297	
Environmental Citizenship	Male	142	140.54
	Female	155	156.75
	Total	297	
Food	Male	142	134.99
	Female	155	161.84
	Total	297	
Transportation	Male	142	169.33
	Female	155	130.37
	Total	297	

Statistically Significant (P≤ .05); *(P ≤ .005); **(P ≤ .01); ***(P ≤ .001).

4.1.2. Age Groups

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 food consumption has remained more or less unchanged for most people over the past year.

Table 4.2. Kruskal Wallis H Test (Age Groups)

	Age	N	Mean Rank
Conservation	18 - 24	41	120.93
	25 - 34	112	145.55
	35 - 54	85	152.64
	55 - 74	52	179.22
	75 and above	7	99.93
	Total	297	
Environmental Citizenship	18 - 24	41	114.50
	25 - 34	112	153.93
	35 - 54	85	144.59
	55 - 74	52	174.63
	75 and above	7	135.43
	Total	297	
Food	18 - 24	41	130.52
	25 - 34	112	152.52
	35 - 54	85	154.31
	55 - 74	52	148.64
	75 and above	7	139.07
	Total	297	
Transportation	18 - 24	41	174.50
	25 - 34	112	162.15
	35 - 54	85	138.26
	55 - 74	52	131.03
	75 and above	7	53.14
	Total	297	

Statistically Significant (P≤ .05); *(P ≤ .005); **(P ≤ .01); ***(P ≤ .001).

4.1.3. Income Groups

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 4.3. Kruskal Wallis H Test (Income Groups)

	Income	N	Mean Rank
Conservation	< 50,000	104	143.39
	50,001 - 100,000	93	148.78
	100,001 - 200,000	60	160.96
	> 200,000	40	146.16
	Total	297	
Environmental Citizenship	< 50,000	104	143.55
	50,001 - 100,000	93	162.33
	100,001 - 200,000	60	168.90
	> 200,000	40	102.31
	Total	297	
Food	< 50,000	104	183.82
	50,001 - 100,000	93	142.42
	100,001 - 200,000	60	125.14
	> 200,000	40	109.56
	Total	297	
Transportation	< 50,000	104	190.18
	50,001 - 100,000	93	129.80
	100,001 - 200,000	60	124.28
	> 200,000	40	123.65
	Total	297	

Statistically Significant (P≤ .05); *(P ≤ .005); **(P ≤ .01); ***(P ≤ .001).

4.1.4. Education Groups

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 4.4. Kruskal Wallis H Test (Income Groups)

	Education	N	Mean Rank
Conservation	No Formal Education	48	128.18
	Primary	21	123.60
	Middle Stage	20	155.53
	Secondary	12	199.13
	Higher Secondary	55	126.74
	Bachelor's	81	163.06
	Master's	47	175.89
	Postgraduate and above	13	120.00
	Total	297	
Environmental Citizenship	No Formal Education	48	164.70
	Primary	21	149.45
	Middle Stage	20	152.00
	Secondary	12	175.29
	Higher Secondary	55	138.81
	Bachelor's	81	148.63
	Master's	47	140.51
	Postgraduate and above	13	137.54
	Total	297	
Food	No Formal Education	48	192.58
	Primary	21	182.57
	Middle Stage	20	139.98
	Secondary	12	129.33
	Higher Secondary	55	127.17
	Bachelor's	81	134.58
	Master's	47	144.32
	Postgraduate and above	13	165.00
	Total	297	
Transportation	No Formal Education	48	217.18
	Primary	21	203.17
	Middle Stage	20	119.23
	Secondary	12	118.92
	Higher Secondary	55	146.43
	Bachelor's	81	126.91

Statistically Significant (P≤ .05); *(P ≤ .005); **(P ≤ .01); ***(P ≤ .001).

4.1.5. Nature Exposure and PEB

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 visitors 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 statistical 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.

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 4.5. Mann-Whitney U Test (Nature Exposure - Categories)

	Nature Exposure	N	Mean Rank
Conservation	Yes	178	160.65
	No	119	131.58
	Total	297	
Environmental Citizenship	Yes	178	157.39
	No	119	136.45
	Total	297	
Food	Yes	178	147.99
	No	119	150.52
	Total	297	
Transportation	Yes	178	154.97
	No	119	140.07
	Total	297	

Statistically Significant (P≤ .05); *(P ≤ .005); **(P ≤ .01); ***(P ≤ .001.

Table 4.6. Mann-Whitney U Test (Nature Exposure and Proenvironmentalism)

	Nature Exposure	N	Mean Rank
Proenvironmentalism	Yes	178	159.85
	No	119	132.77
	Total	297	

Statistically Significant (P≤ .05); *(P ≤ .005); **(P ≤ .01); ***(P ≤ .001).

5. Conclusion and Policy Implications

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.

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.

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 decision makers, 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.

References

Alcock, I., White, M. P., Pahl, S., Duarte-Davidson, R., & Fleming, L. E. (2020). Associations between pro-environmental behaviour and neighbourhood nature, nature visit frequency and nature appreciation: Evidence from a nationally representative survey in England. *Environment international,* 136, 105441.

Berger-Tal, O., & Saltz, D. (Eds.). (2016). *Conservation behavior: applying behavioral ecology to wildlife conservation and management* (Vol. 21). Cambridge University Press.

Bruderer Enzler, H., & Diekmann, A. (2015). *Environmental impact and pro-environmental behavior: Correlations to income and environmental concern* (No. 9). ETH Zurich, Chair of Sociology.

Chao, Y. L., & Lam, S. P. (2011). Measuring responsible environmental behavior: Self-reported and other-reported measures and their differences in testing a behavioral model. *Environment and Behavior*, *43*(1), 53-71.

Collado, S., Moreno, J. D., & Martin-Albo, J. (2022). Innovation for environmental sustainability: Longitudinal effects of an education for sustainable development intervention on university students' pro-environmentalism. *International Journal of Sustainability in Higher Education*, *23*(6), 1277-1293.

O'Connor, R. E., Bard, R. J., & Fisher, A. (1999). Risk perceptions, general environmental beliefs, and willingness to address climate change. *Risk analysis*, *19*(3), 461-471.

Cottrell, S. P. (2003). Influence of sociodemographics and environmental attitudes on general responsible environmental behavior among recreational boaters. *Environment and behavior*, *35*(3), 347-375.

Cuadrado, E., Macias-Zambrano, L. H., Carpio, A. J., & Tabernero, C. (2022). The moderating effect of collective efficacy on the relationship between environmental values and ecological behaviors. *Environment, Development and Sustainability*, *24*(3), 4175-4202.

De Young, R. (2000). New ways to promote proenvironmental behavior: expanding and evaluating motives for environmentally responsible behavior. *Journal of Social Issues*, 56(3), 509e526. http://dx.doi.org/10.1111/0022-4537.00181.

Dinda, S. (2004). Environmental Kuznets curve hypothesis: a survey. *Ecological economics*, *49*(4), 431-455.

Dietz, T., Gardner, G. T., Gilligan, J., Stern, P. C., & Vandenbergh, M. P. (2009). Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *Proceedings of the national academy of sciences*, *106*(44), 18452-18456.

Gaston, K. J., Fuller, R. A., Loram, A., MacDonald, C., Power, S., & Dempsey, N. (2007). Urban domestic gardens (XI): variation in urban wildlife gardening in the United Kingdom. *Biodiversity and conservation*, *16*, 3227-3238.

Ifegbesan, A. P., & Rampedi, I. T. (2018). Understanding the role of socio-demographic and geographical location on pro-environmental behavior in Nigeria. *Applied Environmental Education & Communication*, *17*(4), 335-351.

Kamitsis, I., & Francis, A. J. (2013). Spirituality mediates the relationship between engagement with nature and psychological wellbeing. *Journal of environmental psychology*, *36*, 136-143.

Keniger, L. E., Gaston, K. J., Irvine, K. N., & Fuller, R. A. (2013). What are the benefits of interacting with nature? *International journal of environmental research and public health*, *10*(3), 913-935.

Khan, U. A., & Hussain, A. (2017). Analysis of Ecological Footprint of Rural-Urban Households in Islamabad. *Department of Environmental Economics Working Papers*, *13*.

Kikstra, J. S., Nicholls, Z. R., Smith, C. J., Lewis, J., Lamboll, R. D., Byers, E., ... & Riahi, K. (2022). The IPCC Sixth Assessment Report WGIII climate assessment of mitigation pathways: from emissions to global temperatures. *Geoscientific Model Development*, *15*(24), 9075-9109.

Larson, L. R., Stedman, R. C., Cooper, C. B., & Decker, D. J. (2015). Understanding the multi-dimensional structure of pro-environmental behavior. *Journal of environmental psychology*, *43*, 112-124.

Lepczyk, C. A., Mertig, A. G., & Liu, J. (2004). Assessing landowner activities related to birds across rural-to-urban landscapes. *Environmental management*, *33*, 110-125.

Luo, W., Tang, P., Jiang, L., & Su, M. M. (2020). Influencing mechanism of tourist social responsibility awareness on environmentally responsible behavior. *Journal of Cleaner Production*, *271*, 122565.

Markle, G. L. (2013). Pro-environmental behavior: Does it matter how it's measured? Development and validation of the pro-environmental behavior scale (PEBS). *Human ecology*, *41*, 905-914.

Martin, L., White, M. P., Hunt, A., Richardson, M., Pahl, S., & Burt, J. (2020). Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology*, *68*, 101389.

Mostafa, M. M. (2013). Wealth, post-materialism and consumers' pro-environmental intentions: A multilevel analysis across 25 nations. *Sustainable Development*, *21*(6), 385-399.

Patel, J., Modi, A., & Paul, J. (2017). Pro-environmental behavior and socio-demographic factors in an emerging market. *Asian Journal of Business Ethics*, *6*, 189-214.

Shao, W., Xian, S., Lin, N., & Small, M. J. (2017). A sequential model to link contextual risk, perception and public support for flood adaptation policy. *Water research*, *122*, 216-225.

Smiley, K. T., Chen, Y. A., & Shao, W. (2022). Being green in a green capital: Assessing drivers of pro-environmental behaviors in Copenhagen. *Cities*, *122*, 103538

Steg, L., Bolderdijk, J. W., Keizer, K., & Perlaviciute, G. (2014). An integrated framework for encouraging pro-environmental behaviour: The role of values, situational factors and goals. *Journal of Environmental psychology*, 38, 104-115.

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

Stern, P. C. (2008). Environmentally significant behavior in the home.

Thorgersen, J. (2006). Norms for environmentally responsible behaviour: an extended taxonomy. *Journal of Environmental Psychology*, 26, 247e261. http://dx.doi.org/10.1016/j.jenvp.2006.09.004.

Trenberth, K. E. (2018). Climate change caused by human activities is happening and it already has major consequences. *Journal of energy & natural resources law*, *36*(4), 463-481.

Ukaogo, P. O., Ewuzie, U., & Onwuka, C. V. (2020). Environmental pollution: causes, effects, and the remedies. In *Microorganisms for sustainable environment and health* (pp. 419-429). Elsevier.

Vaske, J. J., & Kobrin, K. C. (2001). Place attachment and environmentally responsible behavior. J*ournal of Environmental Education*, 32(4), 16e21. http://dx.doi.org/10.1080/00958960109598658.

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