THE IMPACTS OF SOCIO-ECONOMIC FACTORS ON THE PERCEPTION OF RESIDENTS ABOUT URBAN VEGETATION: A COMPARATIVE STUDY OF PLANNED VERSUS SEMI-PLANNED CITIES OF ISLAMABAD AND RAWALPINDI, PAKISTAN

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Abstract. The present study deciphers the impacts of urban planning and role of socio-economic determinants on the perception about urban vegetation. The residents inhabiting the planned (Islamabad) and the semi-planned (Rawalpindi) urban centres were the study population. Both urban areas, lying in close proximity, face rapid transformations in LULC due to urbanization. Despite their closeness, such variants as discrepancies in the standards of urban-planning and socio-economic characteristics of inhabitants make them apt study-sites. The inhabitants' perception was tapped regarding the importance of urban vegetation, temporal and spatial changes and their impacts. The majority concurred to its efficacy, a substantial proportion observed transformations in it over time while a reasonable number perceived these changes as negative and unwelcome. Such socio-economic determinants as location, education, gender, ownership status of residence and income of respondents were studied, deploying Statistical analyses (KW). Responses varied, with location and income weighing-in more heavily. Pair-wise comparison (WRST) further vindicated the results. Urbanization is sure to tarnish the environmental sustainability of both cities. Synchronized efforts from all stake-holders are a must.
Keywords: *urbanization, socio-economic, perception, urban ecology, urban ecosystem services, urban planning*

Introduction

Life on the planet Earth is dependent on constant support and productivity of Ecosystems Services (ES) (De Groot et al., 2002). The biophysical processes and ecological systems have profound effects on the natural and social systems (Pickett et al., 2001; Alberti et al., 2003; Rockström et al., 2009; Collins et al., 2011). Since the early stages of social and societal organization, the human perception regarding the role of ecological products in their lives, witnessed many transformations in response to spatial-temporal changes.

The researchers acknowledge that human perception and interactions with the ecological resources are significantly influenced by the contextual settings (Ward Thompson et al., 2005; Nasar, 2008; Jim and Shan, 2013). The nature of these interactions significantly transform with the awareness about the benefits of these resources. In present times, these benefits are acknowledged as ES, the contributions of ecological resources towards human wellbeing (Costanza et al., 1997, 2014; De Groot et

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al., 2002). The ES are grouped into four categories i.e. provisioning, regulating, supportive and cultural (Millennium Ecosystem Assessment, 2005a; Rodríguez et al., 2006; De Groot et al., 2010).

It has been opined that the paradigm of human wellbeing is dependent upon the cumulative contribution of four types of capitals in a given geographical setting. These capitals are recognized as; the natural capital (natural resources), the human capital (human resources), the built capital (physical infrastructure) and the social capital which includes the social norms and institutions (Chiesura and De Groot, 2003; Mulder et al., 2006; Vemuri and Costanza, 2006). The human, built and social capitals have reflective effects on the contributions of natural capital towards human prosperity. The previous studies observed a symbiotic relationship between vibrant ecosystems and the quality of human life (Millennium Ecosystem Assessment, 2005b; Elmqvist et al., 2013; Gómez-Baggethun and Barton, 2013; Luederitz et al., 2015).

Thus, the evaluation of ES, in a given spatial setting, demands inclusion of trans-disciplinary perspectives based upon contextual requirements. These assessments are also indispensable for postulating sustainable measures to enhance the performance of eco-capital i.e. ecological resources e.g. natural and manmade vegetative covers.

The previous studies have stressed on the evaluation of ecosystem services based upon holistic appraisal about the contextual demands (Millennium Ecosystem Assessment, 2003; Heal Geoffrey et al., 2005; Troy and Wilson, 2006). Thus, the identification of socio-economic factors are needed to ensure the sustainability of ecology and environment (Holling, 2001; Ostrom et al., 2001; Anton et al., 2010; Castro et al., 2011; Colding, 2013; Jim and Shan, 2013; Mcphearson et al., 2014; Kaczorowska et al., 2016; Sutton and Anderson, 2016). This realization is a precondition for sustainable development and warrants a coordinated research effort across the disciplinary divides. In response to these demands, the understanding of linkages between man and the natural environment have begun to gain momentum (Costanza and Folke, 1997; Egoh et al., 2007).

The socio-cultural transformations in a society have noteworthy impacts on the ecological resources and their performance. Agricultural activities have magnified the role of ecological resources in the wellbeing of human society (Goldblatt, 2013; Hannigan, 2014). Agricultural revolution also supported the phenomenon of permanent settlements. The urban centers are the culmination of these earlier settlements. These settlements are classified into three major types on the basis of their physical structure i.e planned, unplanned and semi planned urban settlements. Planned cities are built and progress according to a 'Master Plan', thus, displaying a perfect equilibrium of infrastructure for urban social life and ecological sustainability. While, the unplanned cities reflect no formal structure and design to achieve these goals. As compared to these types of urban settlements, the semi-planned urban settlements, grow haphazardly i.e. without any specific design or form but in the subsequent stages, its expansion and development might be regulated with planning and management instruments.

The 21st century is being labeled as the 'urban century' due to the alarming concentration of human population in the urban areas (Benko and Strohmayer, 2014; Nersesian, 2014). The researchers supported the notions that the proportion of global population living in the urban areas is increasing (Elmqvist et al., 2013; Nations, 2014; Luederitz et al., 2015; Green et al., 2016; Larondelle and Lauf, 2016). The uncontrolled urbanization and socio-economic transformations in the urban-based activities are held responsible for unregulated land use/ land cover changes (LULC), loss of urban

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biodiversity, weather and climatic abnormalities and compromises over urban ecological managements (Grimm et al., 2008; Mcdonald et al., 2008; Seto et al., 2012; Wamsler et al., 2013; Luederitz et al., 2015; Green et al., 2016; Kaczorowska et al., 2016; Schetke et al., 2016). Veeman and Politylo (2003) and Corburn (2017) opined that the ecological degradations in the urban areas are also accountable for rising vunerabilities among the economically deprived and socially marginalized segments of society. The pressures on urban ecological resources will intensify in magnitude and complexity (Grimm et al., 2008; United-Nations, 2014; Schetke et al., 2016). Thus, the uncontrolled urbanization and ecological deteriorations in urban areas are the real challenges of the present times (Marten, 2001; Solecki et al., 2013; Sutton and Anderson, 2016) and synchronization of these two realities is incumbent for the social, economic, ecological and environmental sustainability of urban areas (Luederitz et al., 2015). The assessment of human perception about the ecological resources in a given urban milieu is, thus, a precondition for ensuring wellbeing of urban areas (Mcintyre et al., 2008; Jim and Shan, 2013; Rapoport, 2016). The developing nations are less equipped and hence less prepared to address these challenges (Schetke et al., 2016; Jim, 2013)**.** This lack of preparedness in the developing regions is a potent threat for their urban ecological assets and social life (Morinière, 2012; Schetke et al., 2016).

The phenomena of permanent settlements in Pakistan emerged during the phase of Indus Valley Civilization (Kenoyer et al., 2013) and these settlements were urban in structure and character. The inhabitants were acquainted with the benefits of healthy environment. The subsequent socio-economic and structural transformations in this region such as canalization of the Indus Plain (Shiva, 2016) and more economic opportunities in the big cities stimulated the rural population to migrate towards these urban areas as they were already facing a paucity of basic facilities in their native rural areas. Thus, it triggered an uncontrolled urbanization of certain regions at the cost of their ecological environment. The resulting degradation in ecological resources has added stress for the urban social life in these settlements. The occurrences of erratic weather extremities such as urban heat waves and smog in winter have become a common phenomenon of big cities. These undesirable phenomena are thought to be associated with hyperactive urbanization and urban ecological degradation. Grimm et al. (2008), Wu (2008) and Qureshi et al. (2010b) anticipated that in future the process of urbanization will more accelerate in the developing countries.

The reorientation of policy to reverse the ensuing urban environmental/ecological degradation demands scientifically-based research initiatives (Kaplan and Kaplan, 1989; Jim and Shan, 2013). The inclusion of stakeholder's perception about the urban ecological resources in research and management initiatives is a prerequisite for ensuring ecological integrity and social wellbeing in the urban areas (Elkington, 1997; Sutton and Anderson, 2016).

Pakistan is among those countries where the research regarding urban environment is in its embryonic stages. Therefore, an increased focus on urban studies is required towards the assessments of urban environment and its ecological resources. In response to these demands, the research focusing on urban vegetative resources got impetus in Pakistan during the last decade. Most of the earlier research concerning urban vegetation was carried out in the contextual settings of the coastal city-Karachi. The studies such as Qureshi et al. (2010a, b, 2013) and Schetke et al. (2016) were designed to decipher the impacts and nature of relationship between urban social life and vegetative cover. However, the physical and human geography of Karachi is

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diametrically different from the urban settlements of Pothwar Plateau such as Islamabad and Rawalpindi.

In the similar time period, the researchers also tried to investigate the potentials of ecological resources and impacts of urbanization on the environmental sustainability of Islamabad and Rawalpindi. However, these studies such as Malik and Husain (2006), Jabeen et al. (2009) and Ali and Malik (2010a, b) were either inclined towards plant sciences are the studies such as Adeel (2010), Ali et al. (2011), Butt et al. (2015) and Hassan et al. (2016) were designed to decipher the impacts of urbanization on LULC changes.

Whereas, the evaluation of human perception about ecological resources is a requirement for ensuring integrated management of urban environment (Breuste, 2008; Qureshi and Breuste, 2010; Qureshi et al., 2010b). In this respect, it is apt to note that human interaction and perception about urban environment is significantly determined by societal perception about ecological resources, economic status, technological advancements, standards of urban planning, and management of existing vegetative covers in the urban regions.

The current study was designed to evaluate the impacts of socio-economic factors on the perception of urban residents about urban greenery in the planned (Islamabad) and semi-planned (Rawalpindi) urban settlements. The study hypothesizes that urban planning and socio-economic status of the inhabitants significantly influence the awareness about urban greenery.

Method

Study area

The study context is located between 72°55”E to 73°10”E and from 33°30” N to 33°45” N and comprises urban and peri-urban areas of twin cities, Islamabad and Rawalpindi. Islamabad owes its development to an administrative decision in 1959 (Maria and Imran, 2006) and was designed to serve as the capital city of Pakistan (Doxiadis, 1965). The green landscape of Islamabad was mainly inhabited by government employees besides some rural population in the vicinity. The older city of Rawalpindi, on the other hand, is a sprawling urban settlement with no formal design and infrastructure. It has less developed green areas and which are typically less taken care of.

In the recent times, the structural and social transformations in this region are responsible for the phenomena of rural to urban migration. The educated and resourceful migrants prefer to shift in Islamabad for better opportunities and peaceful urban social life. While, the economic, environmental and social migrants with less financial support find an abode in urban centers such as Rawalpindi. Resultantly, the density of human population in both urban centers is rapidly increasing (*Fig. 1*).

The impacts of population growth in the study area have become more visible over the period of the last ten years in the form of unregulated urban expansion. *Figure 2* depicts the spatial-temporal transformations in the LULC of the study area.

The quantitative and qualitative changes in the LULC of the study area from 2005 to 2016 have been condensed in *Figure 3* for comparison and brevity.

These urban centers are located in close proximity but their contrasting socio-ecological contextual settings and level of urban planning make it a suitable context for conducting this study of human perception. *Figure 4* indicates that the respondents were

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selected from across the study area with the intent of representing the socio-economic heterogeneities of the study population.

Data collection

The data about socio-economic characteristics of respondents and their views about urban vegetation was retrieved through questionnaire method. The questionnaire was designed for deciphering the effects of socio-economic factors on the perception of respondents about urban vegetation in planned and semi planned urban areas. For this purpose, a structured questionnaire based upon literature review and feedbacks of the pilot survey was prepared.

The questionnaire is composed of two sections. The first section was designed to collect information about the economic and demographic characteristics of the respondents. The second part of the questionnaire deals with the views of the respondents about the urban vegetative cover of the study area. The respondents were required to select an option from the given format for depicting their views (*Appendix 1*). The questionnaire with a brief introduction about the scope and significance of the study was translated in the Urdu language for clarity and convenience of the respondents.

The residents, who were living within the metropolitan limits of Islamabad and Rawalpindi for the last ten years, were the target population. In the contextual setting of Pakistan, the head of a household significantly influences the socio-economic status and orientations of the other family members. Thus, the designated head of the family by National Database and Registration Authority (NADRA) was requested to participate in the survey as a respondent.

The sub-division of the study area into neighborhoods is a reliable sampling technique for representing social, economic and ecological heterogeneities of urban areas (Dupont, 2004). The technique was relied upon and deployed. The initial respondent from each selected locality was contacted through convenience sampling method. The rest of the respondents from the same neighborhood were approached with the help of the initial respondent on the principle of the snowballing or chain-referral sampling (Etikan et al., 2016; Marcus et al., 2017).

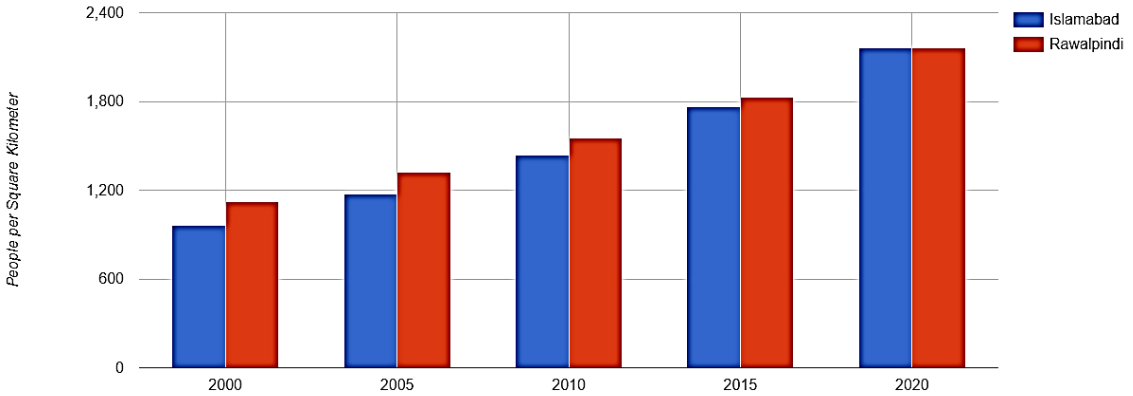

Figure 1. *Estimated and Projected population density of Islamabad/ Rawalpindi. (Source: Gridded Population of the World, Version 4. http://sedac.ciesin.columbia.edu/data/collection/gpw-v4)*

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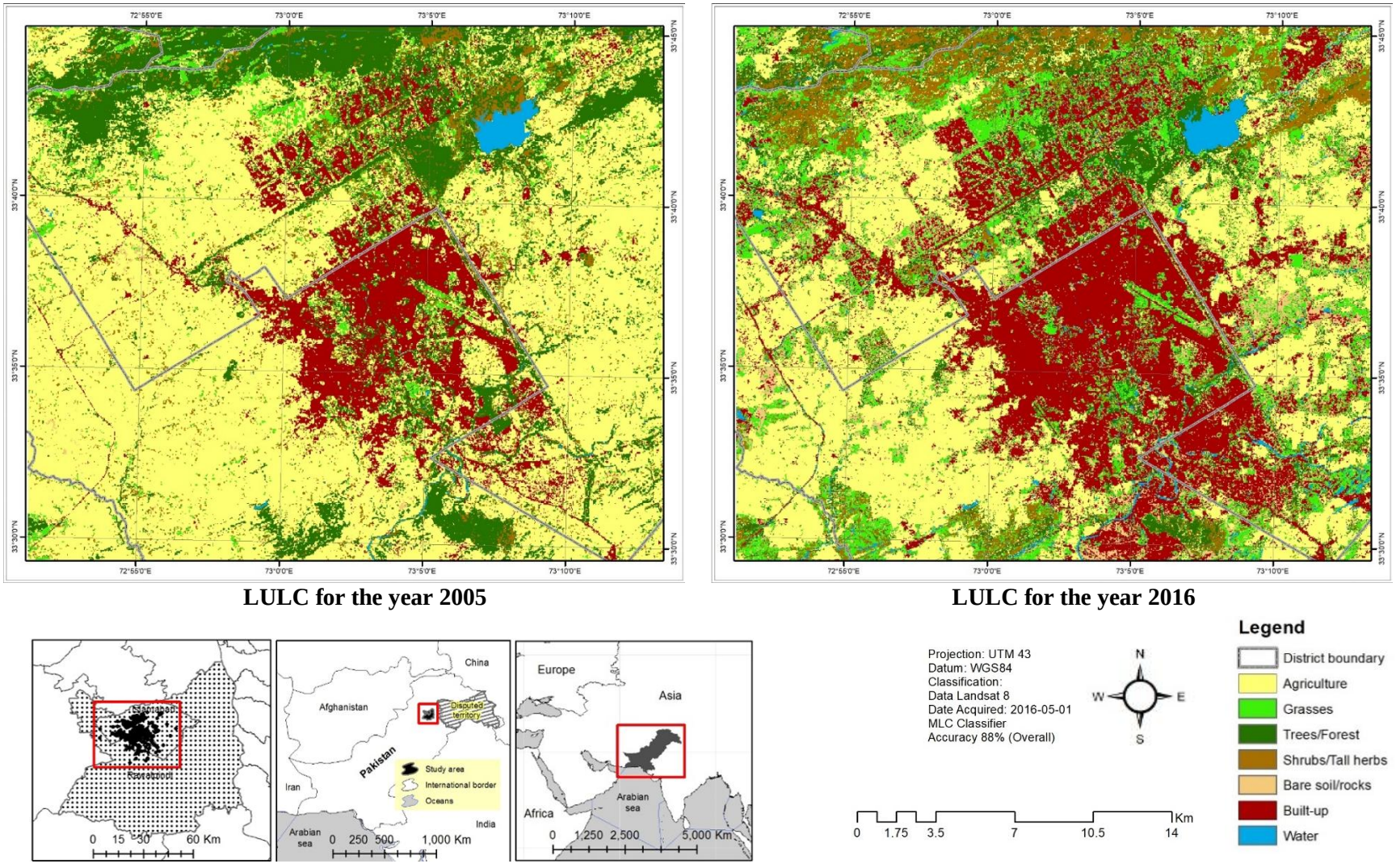

Figure 2. *Portraying the LULC of the study area for the years 2005 and 2016*

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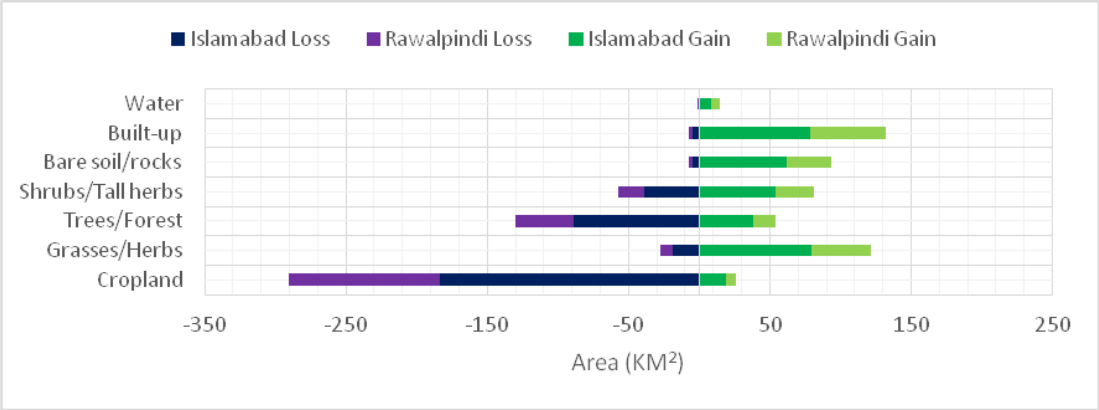

Figure 3. *Comparing the changes in LULC of the study area from 2005 to 2016*

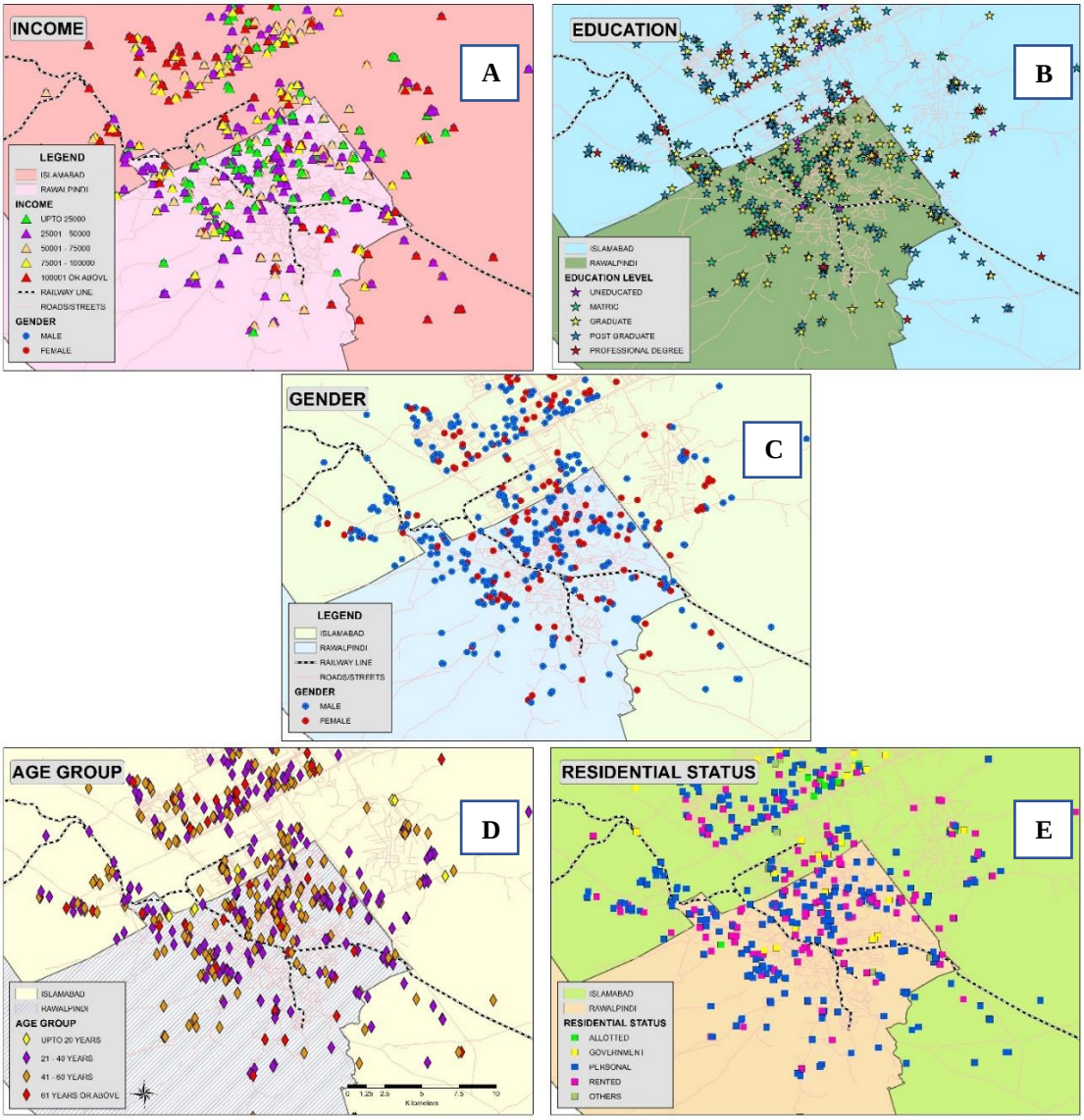

Figure 4. *Maps (A-E) illustrating the spatial distribution of respondents in the study area on the basis of income, education, gender, age and residential status.*

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Vollmer et al. (2015) stressed on the recording of the geo-coordinates for each data point as these information are helpful in portraying the fine scale heterogeneities of a study area. The geographic coordinates were noted down on the questionnaire at the residence of each potential respondent (*Appendix 2*).

The questionnaires were retrieved from the respondents after one week of delivery. On the whole, 531 questionnaires out of the distributed 800 were collected, returning an average of (66.37%). The process was concluded during the months of July & August 2016.

The questionnaires with incomplete records were discarded during the scrutiny. On the whole, 250 questionnaires each, from both urban centers were selected. The initial data entries were made by the researchers in Microsoft Excel (Version 2016) for subsequent processing and analysis in R (R Version 3.4.2) program language and Geographic Information System (GIS). A portion of this data set is being used in this study.

Data analysis

Three questions about urban vegetation were asked from the respondents. The respondents were grouped on the basis of their residential location i.e. Islamabad and Rawalpindi for inter-city comparison. In the next stage, the respondents were classified and their responses were segregated on the basis of gender, education, residential status of dwellings, monthly income, and age for evaluating the role of these predictor variables in opinion building (*Table 1*).

Table 1. *The socio-economic and demographic characteristics of respondents*

Respondents	Islamabad (%)	Rawalpindi (%)
Gender		
Male	178 (71.2%)	174 (69.6%)
Female	72 (28.8%)	76 (30.4%)
Education		
Uneducated	3 (1.2%)	7 (2.8%)
Up to matric	24 (9.6%)	60 (24%)
Graduate	70 (28%)	89 (35.6%)
Postgraduate	33 (13.2%)	9 (3.6%)
Professional	120 (48%)	85 (34%)
Residential/ownership status of dwelling		
Allotted	9 (3.6%)	2 (0.8%)
Government/official	27 (10.8%)	8 (3.2%)
Personal	137 (54.8%)	151 (60.4%)
Rented	73 (29.2%)	85 (34%)
Others	4(1.6%)	4 (1.6%)
Monthly household income (Pak Rupees)*		
Up to 25000	31 (12.4%)	57 (22.8%)
25001 to 50000	57 (22.8%)	113 (45.5%)
50001 to 75000	35 (14%)	36 (14.4%)
75001 to 100000	53 (21.2%)	27 (10.8%)
100001 and above	74 (29.6%)	17 (6.8%)
Age		
Up to 20 years	31 (12.4%)	28 (11.2%)
21 to 40 years	103 (41.2%)	121 (48.4%)
41 to 60 years	110 (44%)	97 (38.8%)
61 and above		4 (1.6%)

*One hundred and thirty six Pak. Rupees are equal to 1€ (EURO) on June 7, 2018

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The responses and attributes of the respondents were subsequently cross-tabulated for subsequent statistical analysis (*Appendix 3*).

Keeping in view the non-parametric nature of data the Kruskal-Wallis (KW) test was performed to discover the significant variations between the responses on the basis of predictor variables. In the next stage, pair -wise comparisons were carried out with the help of Wilcoxon Rank Sum Test (WRST) for those predictive variables in which the significant differences were observed in the initial KW test. The findings of WRST helped in deciphering the intra-group variations in responses. The findings were tabulated for assessments and comparisons.

Results

Perception about the usefulness of urban vegetation

The role and value of ecological contributions in a contextual setting is determined by human perception (Bixler and Floyd, 1997; Jim and Shan, 2013). The urban surroundings and socio-economic factors such as gender, education, residential status of dwellings, monthly income, and age, markedly influence the human perception about urban vegetation. The outcomes of the study (90% respondents agreed or strongly agreed; 4.8% responded "disagree or strongly disagree" while 5.20% stayed neutral) vindicate that the contributions of urban ecological resources stand acknowledged across the study area. However, the statistical findings (KW $\chi^2 = 5.90$; df = 1; $p < 0.02$) pointed out the significant differences between the responses of residents from both cities about the usefulness of urban vegetation.

The findings of KW based upon the predictor variables such as Education (KW χ2 30; df 4; $p < 0.01$), Income (KW χ230; df 4; $p < 0.01$), Age (KW χ220; df 3; $p < 0.01$) and Residential status (KW χ^2 10; df 4; $p < 0.02$) indicated that these predictor variables also have a significant influence on the perception of respondents regarding the usefulness of urban vegetation (*Table 2*). However, the test statistics (KW χ^2 0.3; df 1; $p > 0.05$) indicate that the Gender of respondent has a less significant role in this connection.

Table 2. *The findings of Kruskal-Wallis (KW) test based upon of socio-economic variables*

Kruskal-Wallis (KW) test and views of respondents									
	Chi square value			**Degree of freedom (df)**			**P value**		
Predictor variables	**UVBR**	**VCC**	**ICUV**	**UVBR**	**VCC**	**ICUV**	**UVBR**	**VCC**	**ICUV**
Gender	0.3	0.5	4	1	1	1	0.6	0.5	0.05
Education	30	10	4	4	4	4	0.0000006	0.05	0.4
Residential status	10	10	7	4	4	4	0.02	0.03	0.2
Income	30	20	20	4	4	4	0.000002	0.001	0.0001
Age	20	20	1	3	3	3	0.0007	0.001	0.8

Urban Vegetation is Beneficial for Residents (UVBR); Vegetation Cover Changes (VCC); Impacts of Changes in Urban Vegetation (ICUV)

The predictor variables identified in KW as responsible for significant differences were further tested for pair-wise comparison by WRST. The findings ($p < 0.05$) of

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WRST based upon educational background revealed significant differences in the responses between the lesser or uneducated and educated respondents (*Appendix 4a*). This clearly implies that the level of education has significant bearings on the human perception about the benefits of natural capital. The ownership status of the dwelling is another important socio-economic indicator and meaningfully influences the opinions of people about the benefits of urban ecology. The marked variations ($p < 0.05$) among the views of respondents residing in different categories of accommodations were also observed in the findings of WRST (*Appendix 4b*).

The age-based comparison of WRST among different age groups (*Appendix 4c*) revealed significant differences ($p < 01$) between the responses of the most senior age group (61 years and above) with all other age groups (up to 20 years; 21-40 years; 41-60 years). The significant variations in views were not found between all the other categories of age groups. The income of respondents was also observed to be an influential factor in shaping the perception of respondents about the usefulness of urban vegetation. The pair wise comparison of income based categories in (*Appendix 4d*) indicated that the two lowest income groups (Up to Rs. 25000, Rs. 25001 to 50000) have a significantly different perception about the importance of urban greenery ($p < 01$) than the respondents from three higher income categories (Rs. 50001 to 75000, Rs. 75001 to 100000, and Rs. 100001 and above).

Perception of respondents about change in urban vegetation

The respondents were enquired about the vegetation cover changes in the study area. The majority of the respondents (69.20%) observed that the vegetative cover of Islamabad and Rawalpindi is changing and 12.80% reported that they do not perceive any visible change in it. Whereas, the remaining 18% of respondents have no considered opinion about the phenomenon.

However, the test statistics (KW χ^2 5.26; df 1; $p < 0.02$) identified the significant variations in the responses of inhabitants from both urban centers regarding the changes in vegetation cover. The significant variations in the responses were also found on the basis of socio-economic factors such as Education (KW χ^2 10; df 4; $p < 0.05$), Residential status (KW χ^2 10; df 4; $p < 0.03$), Income (KW χ^2 20; df 4; $p < 0.001$) and Age (KW χ^2 20; df 3; $p < 0.001$). However, the role of Gender was found negligible in this regard (KW χ^2 0.5; df 1; $p > 0.5$) (*Table 2*).

The subsequent findings of WRST ($p < 0.05$) revealed meaningful variations among the different categories of respondents on the basis of education (*Appendix 5a*)**.** In this connection, significant differences ($p < 0.05$) were also observed in the opinions of respondents living in the rented dwellings with those who are living in government residences or in their personal abodes (*Appendix 5b*). These statistical findings infer that the ownership status of dwelling influences the opinions of people about changes in urban vegetation.

The significant differences in the opinions ($p < 0.01$) about the phenomenon were also observed in the findings of WRST between the responses of age group (61years and above) with all other ages based categories (*Appendix 5c*). While, the Income based pair wise comparison based upon WRST indicated that the lowest income group (up to Rs. 25000) had a significantly different perception ($p < 0.01$) about the changes in vegetation cover of the study area than all the other income based categories of respondents (*Appendix 5d*).

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Impacts of vegetative cover changes and respondents

The changes in the vegetative cover of the study area were negatively perceived by the majority (55.80%) of respondents. The significant differences in views regarding the impacts of these changes were also observed on the basis of residential location i.e. Islamabad or Rawalpindi (KW χ^2 7.37; df 1; $p < 0.01$) and socio-economic factors such as Gender (KW χ^2 4; df 1; $p < 0.05$) and Income (KW χ^2 20; df 4; $p < 0.01$). However, the test statistics based upon KW in (*Table 2*) depicted that the predictor variables such as Education, Residential status and Age of respondents have an ineffective influence on the views of residents in the study context.

The (KW) findings revealed that the gender of respondents had, yet, a different type of influence on perceptions regarding outcomes of change in the urban vegetative cover of the study area (*Table 2*).

The succeeding findings based upon WRST suggested that the economic status of urban residents has significant bearings on their views about the consequences of changes in vegetation cover (*Appendix 6e*). The pair wise findings of WRST based upon categories of education (*Appendix 6b*) pointed towards significant variations in perception about the impacts of changes ($p < 0.05$) between uneducated and higher educated respondents. However, such differences were found to be insignificant between uneducated and moderately educated respondents.

Discussion

The study evaluated socio-economic impacts and role of urban planning in shaping the perceptions of urban residents about ecological resources. The study was carried out in the contextual setting of Islamabad and Rawalpindi in Pakistan. The findings of the study establish that the process of urbanization is gaining momentum. The previous studies (Ali and Malik, 2010b; Ali et al., 2011; Ghafoor Chaudhry et al., 2014) returned similar conclusions. The critical findings of the study also formulate that urbanization through LULC changes is responsible for transformations in the ecology of the study area. These findings give credibility to the assertions of Ali and Malik (2010b) and Faeth et al. (2011) that urbanization causes and stimulates changes in the urban vegetation.

The majority (90%) of the respondents affirmed the positive contributions of urban ecological resources. The finding is in line with the opinions of Kaplan and Kaplan (1989) and Qureshi et al. (2010b) that urban residents acknowledge the importance of ecological contributions.

However, the findings divulge that the residential location and socio-economic characteristics of the study population are accountable for significant variations in views about the various aspects of urban vegetation. The outcomes of subsequent analysis vindicate the assertions that human perspectives about vegetative cover are significantly influenced by the level of education (Tidball and Krasny, 2011; Rupprecht and Byrne, 2014), ownership status of the inhabitant (Van Heezik et al., 2013; Shakeel and Conway, 2014), age (Lee and Maheswaran, 2011), income (Lee and Maheswaran, 2011; Majumdar et al., 2011) and gender (Gidlöf-Gunnarsson and Öhrström, 2010; Lee and Maheswaran, 2011).

The statistical findings based on empirical data validate the differences in the views of respondents from both urban centers about the transformation in vegetative cover. These variations in opinions are attributable to quantitative and qualitative differences

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in socio-ecological settings of both cities. The urban vegetative cover, city structure, level of urban planning and management of urban ecological resources in Islamabad and Rawalpindi are inherently different. The former urban settlement is comparatively greener, broader in structure, more planned and administered by a well-structured and resourceful organization. As compared to it, Rawalpindi is a semi planned city, a victim of compromised environmental governance and unregulated and disorderly urban expansion.

However, this acknowledgement of change in urban vegetation is not homogenous among the different socio-economic segments of the study population. The summary statistics of data illustrate significant heterogeneities among the opinions of respondents on the basis of their awareness and sensitivity. The socio-economic trajectories of respondents were found influential in shaping their perception regarding changes in urban vegetation. These observations are in line with the previous assertions (Faeth et al., 2011; Kowarik, 2011) that socio-economic factors suggestively influence the human perception about changes in urban vegetative cover.

The variations in views about the impacts of changes on the basis of gender, support the previous findings (Gidlöf-Gunnarsson and Öhrström, 2010; Lee and Maheswaran, 2011) that the gender of respondents influences the human perception about human-environment relationships. In conservative social settings of the developing world, unequal exposures between male and female, is responsible for differences in normative knowledge about urban vegetation. Thus, it offers a plausible explanation for reported dissimilarities in views.

The study also substantiates the notions of reported findings (Jim and Shan, 2013; Mcguirk, 2013) that income, a proxy variable for economic status of individuals, not only determines socio-economic standings of the individuals but also significantly influences their propensities towards ecological resources. It is the considered opinion of the authors of this study that in the present age of consumerism and knowledge based economy the role of income and education is becoming more influential in shaping the perception of respondents regarding urban ecological resources.

Conclusions

The present study evaluated the role of urban planning and socio-economic factors i.e. gender, education, residential status of dwellings, monthly income, and age, in shaping the perception of respondents about ecological resources in the study area. The findings of the study indicate that the level of urban planning, exposure to ecological resources, socio-economic and demographic characteristics of the urban population have significant bearings on their orientations towards green infrastructure of urban areas. The study also points towards the growing urbanization and rapid transformations in LULC of the study area. The resultant impacts of these intrusions may adversely impact the performance and sustainability of the urban environment in both cities. The synchronized efforts of researchers, opinion builders, policy makers, concerned institutions and proactive participation of urban residents are required for integrated management and sustainability of the urban environment. In this connection further research is needed for evaluating the orientation of spatial and temporal changes in the LULC of the study area. The use of Remote Sensing (RS) data with the help of Geographic Information System (GIS) techniques seems to be a pragmatic option for measuring these trends. The findings of this study also signify the role and importance

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of environmental management for the sustainability of urban green resources. Therefore, further investigations are also required for assessing the role and performance of institutions responsible for the environmental management of the study area. The holistic appraisal about such dimensions of environmental management are imperative for a healthy, green urban infrastructure.

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APPENDIX

Appendix 1. *Questionnaire*

Date		GPS Coordinates	
		LAT.	LONG.

1	Location of respondent	(a) Islamabad (b) Rawalpindi
2	Year of birth	
3	Gender	(a) Male (b) Female
4	Highest education level	
5	Monthly household income	
6	Do you have any knowledge about ecosystem?	Yes No
7	What is the ownership status of your Dwelling?	(a) Personal (b) Official (c) Rented (d) Allotted (e) any other

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8	Do you think that urban vegetative cover is beneficial for urban residents?	(a) Strongly disagree
		(b) Disagree
		(c) Agree
		(d) Strongly agree
		(e) Don't know
9	In your opinion, have the vegetative cover between your work place and home have changed in the past 10 years?	(a) Strongly disagree
		(b) Disagree
		(c) Agree
		(d) Strongly agree
		(e) Don't know
10	What is your opinion about the impacts of these changes in vegetative cover?	(a) Positive change
		(b) Negative change
		(c) Don't know

Appendix 2. *Latitude/longitude coordinates of the respondents*

Sr#	LOC	LAT	LOG	Sr#	LOC	LAT	LOG	Sr#	LOC	LAT	LOG
1	ISB	**33.536923**	**73.174316**	26	ISB	**33.639852**	**73.15182**	51	ISB	**33.672661**	**73.076228**
2	ISB	**33.536846**	**73.172665**	27	ISB	**33.686116**	**72.99567**	52	ISB	**33.667629**	**73.066207**
3	ISB	**33.63617**	**72.978908**	28	ISB	**33.658383**	**73.156036**	53	ISB	**33.649446**	**73.029046**
4	ISB	**33.607847**	**72.850839**	29	ISB	**33.674268**	**73.064078**	54	ISB	**33.64249**	**73.033104**
5	ISB	**33.530552**	**73.153841**	30	ISB	**33.725245**	**73.043077**	55	ISB	**33.664002**	**73.073039**
6	ISB	**33.674121**	**73.140556**	31	ISB	**33.695646**	**73.059183**	56	ISB	**33.628747**	**72.970096**
7	ISB	**33.672931**	**73.141064**	32	ISB	**33.711004**	**73.047149**	57	ISB	**33.635737**	**72.973216**
8	ISB	**33.67256**	**73.141703**	33	ISB	**33.663343**	**72.997037**	58	ISB	**33.637068**	**72.973638**
9	ISB	**33.671609**	**73.14178**	34	ISB	**33.680973**	**73.034108**	59	ISB	**33.630741**	**72.972535**
10	ISB	**33.671251**	**73.14158**	35	ISB	**33.689797**	**73.025659**	60	ISB	**33.647733**	**73.031731**
11	ISB	**33.727595**	**73.056729**	36	ISB	**33.700229**	**73.05811**	61	ISB	**33.634999**	**73.016013**
12	ISB	**33.702391**	**72.973088**	37	ISB	**33.736223**	**73.18053**	62	ISB	**33.701716**	**72.977988**
13	ISB	**33.726474**	**73.056701**	38	ISB	**33.714305**	**73.022111**	63	ISB	**33.626205**	**72.943854**
14	ISB	**33.696425**	**73.002886**	39	ISB	**33.67777**	**73.006601**	64	ISB	**33.679226**	**73.006626**
15	ISB	**33.718631**	**73.03959**	40	ISB	**33.70351**	**73.052849**	65	ISB	**33.68595**	**73.042524**
16	ISB	**33.714255**	**73.030288**	41	ISB	**33.706771**	**73.057767**	66	ISB	**33.671719**	**73.138991**
17	ISB	**33.714187**	**73.035895**	42	ISB	**33.670639**	**73.011922**	67	ISB	**33.67251**	**72.993287**
18	ISB	**33.709318**	**73.047175**	43	ISB	**33.659214**	**73.046819**	68	ISB	**33.656493**	**73.059137**
19	ISB	**33.712017**	**73.032955**	44	ISB	**33.669774**	**72.989071**	69	ISB	**33.669039**	**72.992042**
20	ISB	**33.657152**	**73.156284**	45	ISB	**33.645494**	**73.112561**	70	ISB	**33.694461**	**73.045402**
21	ISB	**33.654241**	**73.153504**	46	ISB	**33.721724**	**73.035479**	71	ISB	**33.694822**	**73.032598**
22	ISB	**33.641731**	**73.153008**	47	ISB	**33.699268**	**73.069618**	72	ISB	**33.697278**	**72.948379**
23	ISB	**33.641161**	**73.151337**	48	ISB	**33.569066**	**73.146967**	73	ISB	**33.647354**	**73.038753**
24	ISB	**33.640303**	**73.154155**	49	ISB	**33.722568**	**73.039925**	74	ISB	**33.655301**	**72.852578**
25	ISB	**33.738727**	**73.184161**	50	ISB	**33.672295**	**73.032692**	75	ISB	**33.670407**	**73.033975**
76	ISB	**33.680982**	**72.979134**	101	ISB	**33.710882**	**73.045141**	126	ISB	**33.707578**	**73.085324**
77	ISB	**33.69022**	**72.978645**	102	ISB	**33.720249**	**73.061964**	127	ISB	**33.708621**	**73.088182**
78	ISB	**33.620439**	**72.996606**	103	ISB	**33.657195**	**73.157919**	128	ISB	**33.708703**	**73.083634**
79	ISB	**33.691769**	**72.999643**	104	ISB	**33.686878**	**73.004887**	129	ISB	**33.706632**	**73.082528**
80	ISB	**33.670827**	**72.948749**	105	ISB	**33.718432**	**73.080917**	130	ISB	**33.706717**	**73.043412**
81	ISB	**33.695233**	**72.976793**	106	ISB	**33.733158**	**73.174369**	131	ISB	**33.710411**	**73.080945**
82	ISB	**33.539643**	**73.095454**	107	ISB	**33.664736**	**73.002125**	132	ISB	**33.700287**	**73.072771**
83	ISB	**33.570388**	**73.117425**	108	ISB	**33.672513**	**73.015797**	133	ISB	**33.698098**	**73.067043**
84	ISB	**33.618189**	**73.141211**	109	ISB	**33.665239**	**73.001066**	134	ISB	**33.710545**	**73.083518**
85	ISB	**33.618473**	**73.140682**	110	ISB	**33.685229**	**73.027236**	135	ISB	**33.702063**	**73.06734**
86	ISB	**33.668057**	**73.076849**	111	ISB	**33.710437**	**73.071021**	136	ISB	**33.700811**	**73.07123**
87	ISB	**33.646749**	**73.102839**	112	ISB	**33.70951**	**73.048247**	137	ISB	**33.705475**	**73.035411**
88	ISB	**33.658427**	**73.106216**	113	ISB	**33.682738**	**73.215079**	138	ISB	**33.495701**	**73.108808**
89	ISB	**33.64129**	**72.95239**	114	ISB	**33.692377**	**73.056488**	139	ISB	**33.71154**	**73.049321**
90	ISB	**33.70373**	**73.066209**	115	ISB	**33.62327**	**72.943758**	140	ISB	**33.708969**	**73.062294**
91	ISB	**33.670355**	**73.138939**	116	ISB	**33.695217**	**72.986642**	141	ISB	**33.557094**	**73.162729**
92	ISB	**33.671886**	**73.071259**	117	ISB	**33.673274**	**73.009671**	142	ISB	**33.556691**	**73.16306**
93	ISB	**33.671893**	**73.139966**	118	ISB	**33.679621**	**72.980374**	143	ISB	**33.623932**	**73.012788**
94	ISB	**33.679005**	**73.024874**	119	ISB	**33.698752**	**73.062879**	144	ISB	**33.643816**	**73.164535**
95	ISB	**33.724127**	**73.03138**	120	ISB	**33.626269**	**72.938704**	145	ISB	**33.690077**	**73.132412**
96	ISB	**33.631234**	**72.924653**	121	ISB	**33.668952**	**73.064887**	146	ISB	**33.689706**	**73.134008**
97	ISB	**33.611977**	**73.132363**	122	ISB	**33.695896**	**73.049999**	147	ISB	**33.619684**	**73.232303**

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Sr#	LOC	LAT	LOG	Sr#	LOC	LAT	LOG	Sr#	LOC	LAT	LOG
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99	ISB	**33.705505**	**73.068856**	124	ISB	**33.692888**	**73.037481**	149	ISB	**33.622654**	**72.950913**
100	ISB	**33.721313**	**73.059746**	125	ISB	**33.712002**	**73.083751**	150	ISB	**33.621713**	**72.953511**
151	ISB	**33.624377**	**72.945877**	176	ISB	**33.72393**	**73.075909**	201	ISB	**33.652231**	**72.963676**
152	ISB	**33.624294**	**72.9349**	177	ISB	**33.624144**	**72.994379**	202	ISB	**33.694964**	**73.037178**
153	ISB	**33.622098**	**72.939162**	178	ISB	**33.671857**	**73.14728**	203	ISB	**33.694515**	**73.038306**
154	ISB	**33.627738**	**72.939469**	179	ISB	**33.675006**	**73.140656**	204	ISB	**33.690772**	**73.013949**
155	ISB	**33.746165**	**73.108932**	180	ISB	**33.657607**	**73.263599**	205	ISB	**33.66934**	**73.140189**
156	ISB	**33.631731**	**73.12582**	181	ISB	**33.672902**	**73.074871**	206	ISB	**33.69016**	**72.999606**
157	ISB	**33.648742**	**73.030719**	182	ISB	**33.700907**	**72.975272**	207	ISB	**33.690384**	**73.001077**
158	ISB	**33.672778**	**73.010005**	183	ISB	**33.661296**	**73.069463**	208	ISB	**33.699618**	**73.04318**
159	ISB	**33.654015**	**73.055582**	184	ISB	**33.714659**	**73.16226**	209	ISB	**33.578604**	**73.139552**
160	ISB	**33.704869**	**73.07659**	185	ISB	**33.639195**	**73.149173**	210	ISB	**33.664313**	**73.06632**
161	ISB	**33.702552**	**73.060185**	186	ISB	**33.639918**	**72.950984**	211	ISB	**33.719713**	**73.03381**
162	ISB	**33.651859**	**73.050697**	187	ISB	**33.669746**	**73.154194**	212	ISB	**33.700223**	**72.982942**
163	ISB	**33.705539**	**73.060612**	188	ISB	**33.674283**	**73.142104**	213	ISB	**33.677745**	**72.988324**
164	ISB	**33.731958**	**73.089311**	189	ISB	**33.738999**	**73.176386**	214	ISB	**33.716911**	**73.035713**
165	ISB	**33.645521**	**73.032133**	190	ISB	**33.652929**	**73.030774**	215	ISB	**33.685183**	**73.117012**
166	ISB	**33.673357**	**72.990421**	191	ISB	**33.568326**	**73.19365**	216	ISB	**33.693015**	**72.979264**
167	ISB	**33.641834**	**73.038741**	192	ISB	**33.656737**	**73.064669**	217	ISB	**33.690581**	**73.034022**
168	ISB	**33.684446**	**73.001262**	193	ISB	**33.656563**	**73.155481**	218	ISB	**33.632235**	**73.117978**
169	ISB	**33.686034**	**73.044555**	194	ISB	**33.67168**	**72.988695**	219	ISB	**33.717299**	**73.099787**
170	ISB	**33.66543**	**73.04874**	195	ISB	**33.646963**	**73.169625**	220	ISB	**33.668248**	**72.922582**
171	ISB	**33.683782**	**73.038985**	196	ISB	**33.688398**	**73.04266**	221	ISB	**33.679733**	**73.02395**
172	ISB	**33.689285**	**73.038217**	197	ISB	**33.65489**	**73.06313**	222	ISB	**33.609548**	**72.969911**
173	ISB	**33.663631**	**73.080545**	198	ISB	**33.648195**	**73.028895**	223	ISB	**33.741304**	**73.186029**
174	ISB	**33.667462**	**73.008266**	199	ISB	**33.636619**	**73.115044**	224	ISB	**33.736595**	**73.183426**
175	ISB	**33.688116**	**73.042364**	200	ISB	**33.72393**	**73.075909**	225	ISB	**33.676618**	**73.020519**
226	ISB	**33.685111**	**73.018406**	251	RWP	**33.60542**	**73.052939**	276	RWP	**33.546159**	**72.994807**
227	ISB	**33.645168**	**73.041884**	252	RWP	**33.636648**	**73.095864**	277	RWP	**33.579375**	**73.093794**
228	ISB	**33.685027**	**73.032223**	253	RWP	**33.629123**	**73.101996**	278	RWP	**33.528213**	**73.060097**
229	ISB	**33.68239**	**73.032029**	254	RWP	**33.618054**	**73.118467**	279	RWP	**33.613769**	**73.045342**
230	ISB	**33.679821**	**73.028481**	255	RWP	**33.529411**	**73.060948**	280	RWP	**33.609851**	**73.06041**
231	ISB	**33.692657**	**73.004114**	256	RWP	**33.61846**	**73.077716**	281	RWP	**33.583442**	**73.034171**
232	ISB	**33.630873**	**72.919074**	257	RWP	**33.625075**	**73.072464**	282	RWP	**33.625576**	**73.094389**
233	ISB	**33.631128**	**72.918588**	258	RWP	**33.644763**	**73.059759**	283	RWP	**33.59639**	**72.989813**
234	ISB	**33.634467**	**72.919605**	259	RWP	**33.620509**	**72.981786**	284	RWP	**33.597883**	**73.128872**
235	ISB	**33.644277**	**72.960679**	260	RWP	**33.622052**	**72.987597**	285	RWP	**33.638069**	**73.045929**
236	ISB	**33.648557**	**73.029628**	261	RWP	**33.630294**	**73.108549**	286	RWP	**33.598722**	**73.111448**
237	ISB	**33.673181**	**72.992671**	262	RWP	**33.610133**	**72.999132**	287	RWP	**33.598205**	**73.109388**
238	ISB	**33.644066**	**72.965343**	263	RWP	**33.564942**	**73.157254**	288	RWP	**33.526769**	**73.048802**
239	ISB	**33.647732**	**72.960076**	264	RWP	**33.580883**	**73.032126**	289	RWP	**33.630557**	**73.091877**
240	ISB	**33.646646**	**72.962626**	265	RWP	**33.580648**	**73.031418**	290	RWP	**33.627447**	**73.107934**
241	ISB	**33.638862**	**72.955265**	266	RWP	**33.496187**	**73.109512**	291	RWP	**33.568446**	**73.062295**
242	ISB	**33.605555**	**72.965436**	267	RWP	**33.573501**	**73.110618**	292	RWP	**33.631717**	**73.092102**
243	ISB	**33.734351**	**73.076717**	268	RWP	**33.57349**	**73.112873**	293	RWP	**33.561403**	**73.070909**
244	ISB	**33.665402**	**73.066916**	269	RWP	**33.57244**	**73.112299**	294	RWP	**33.626592**	**73.09027**
245	ISB	**33.666143**	**73.069079**	270	RWP	**33.496669**	**73.110121**	295	RWP	**33.497421**	**73.047907**
246	ISB	**33.72704**	**73.048121**	271	RWP	**33.583832**	**73.017894**	296	RWP	**33.62862**	**73.085249**
247	ISB	**33.382902**	**72.583522**	272	RWP	**33.59176**	**73.129152**	297	RWP	**33.632333**	**73.086797**
248	ISB	**33.375526**	**72.59311**	273	RWP	**33.600465**	**73.05216**	298	RWP	**33.623945**	**73.100375**
249	ISB	**33.373609**	**72.585332**	274	RWP	**33.61797**	**73.117843**	299	RWP	**33.621574**	**73.106565**
250	ISB	**33.365626**	**73.0743**	275	RWP	**33.54632**	**72.994037**	300	RWP	**33.633611**	**73.046189**
301	RWP	**33.612588**	**72.98724**	326	RWP	**33.616909**	**73.066494**	351	RWP	**33.625679**	**72.970355**
302	RWP	**33.606585**	**72.990838**	327	RWP	**33.618407**	**73.039625**	352	RWP	**33.628053**	**73.091542**
303	RWP	**33.553054**	**73.009223**	328	RWP	**33.618459**	**73.040014**	353	RWP	**33.583316**	**73.016337**
304	RWP	**33.56802**	**73.029772**	329	RWP	**33.618448**	**73.039326**	354	RWP	**33.583413**	**73.016256**
305	RWP	**33.588022**	**73.030076**	330	RWP	**33.613029**	**73.064748**	355	RWP	**33.629109**	**73.089765**
306	RWP	**33.60287**	**73.104445**	331	RWP	**33.523971**	**73.046419**	356	RWP	**33.621758**	**72.995479**
307	RWP	**33.587318**	**73.02142**	332	RWP	**33.587002**	**73.032289**	357	RWP	**33.61356**	**73.007475**
308	RWP	**33.560355**	**73.061775**	333	RWP	**33.586205**	**73.032481**	358	RWP	**33.612644**	**73.009857**
309	RWP	**33.560568**	**73.061434**	334	RWP	**33.607857**	**73.045308**	359	RWP	**33.604799**	**73.058725**
310	RWP	**33.560904**	**73.061845**	335	RWP	**33.612488**	**73.045125**	360	RWP	**33.605096**	**73.058758**
311	RWP	**33.561933**	**73.062401**	336	RWP	**33.621739**	**73.040206**	361	RWP	**33.564843**	**72.99385**
312	RWP	**33.600164**	**73.033664**	337	RWP	**33.650872**	**73.073036**	362	RWP	**33.556354**	**73.0123**
313	RWP	**33.561977**	**73.061278**	338	RWP	**33.651427**	**73.072265**	363	RWP	**33.557308**	**73.012867**
314	RWP	**33.627985**	**73.125366**	339	RWP	**33.558827**	**73.098715**	364	RWP	**33.621178**	**73.03776**
315	RWP	**33.572637**	**73.038673**	340	RWP	**33.636482**	**73.102621**	365	RWP	**33.621521**	**73.037754**

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DOI: http://dx.doi.org/10.15666/aeer/1604_42654287

Sr#	LOC	LAT	LOG	Sr#	LOC	LAT	LOG	Sr#	LOC	LAT	LOG
316	RWP	**33.566926**	**73.030336**	341	RWP	**33.621525**	**73.060629**	366	RWP	**33.631609**	**73.06565**
317	RWP	**33.544268**	**73.067471**	342	RWP	**33.621457**	**73.061821**	367	RWP	**33.597469**	**73.069398**
318	RWP	**33.486988**	**73.099908**	343	RWP	**33.607402**	**73.00942**	368	RWP	**33.597341**	**73.071352**
319	RWP	**33.58562**	**73.091711**	344	RWP	**33.584748**	**73.027598**	369	RWP	**33.600499**	**73.050567**
320	RWP	**33.608074**	**73.04495**	345	RWP	**33.585021**	**73.03487**	370	RWP	**33.62114**	**72.980886**
321	RWP	**33.591667**	**73.046588**	346	RWP	**33.614597**	**73.00681**	371	RWP	**33.582371**	**73.09762**
322	RWP	**33.616621**	**73.065852**	347	RWP	**33.550436**	**73.115782**	372	RWP	**33.583582**	**73.095847**
323	RWP	**33.616167**	**73.065788**	348	RWP	**33.530077**	**73.112428**	373	RWP	**33.641394**	**73.068788**
324	RWP	**33.596916**	**73.053857**	349	RWP	**33.596473**	**73.022209**	374	RWP	**33.638368**	**73.056437**
325	RWP	**33.616496**	**73.06608**	350	RWP	**33.596454**	**73.019341**	375	RWP	**33.635115**	**73.085288**
376	RWP	**33.544563**	**73.055324**	401	RWP	**33.624667**	**73.054338**	426	RWP	**33.557562**	**73.061322**
377	RWP	**33.625636**	**73.064122**	402	RWP	**33.652706**	**73.07189**	427	RWP	**33.589325**	**73.025251**
378	RWP	**33.642315**	**73.081253**	403	RWP	**33.607978**	**73.066514**	428	RWP	**33.628171**	**73.124221**
379	RWP	**33.551925**	**73.027701**	404	RWP	**33.625575**	**73.075722**	429	RWP	**33.596572**	**73.024144**
380	RWP	**33.552281**	**73.013677**	405	RWP	**33.628529**	**73.109527**	430	RWP	**33.596275**	**73.025553**
381	RWP	**33.634119**	**73.090047**	406	RWP	**33.582073**	**73.019416**	431	RWP	**33.594028**	**73.130073**
382	RWP	**33.594477**	**73.02448**	407	RWP	**33.603771**	**73.008261**	432	RWP	**33.621935**	**73.041589**
383	RWP	**33.5936**	**73.021246**	408	RWP	**33.626628**	**73.017598**	433	RWP	**33.586621**	**73.078158**
384	RWP	**33.651597**	**73.065626**	409	RWP	**33.62701**	**73.032636**	434	RWP	**33.605451**	**73.093072**
385	RWP	**33.627663**	**73.057469**	410	RWP	**33.622498**	**73.011807**	435	RWP	**33.598654**	**73.026315**
386	RWP	**33.652161**	**73.090715**	411	RWP	**33.626204**	**73.064411**	436	RWP	**33.605257**	**73.091759**
387	RWP	**33.65293**	**73.091171**	412	RWP	**33.594171**	**73.126695**	437	RWP	**33.58513**	**73.088427**
388	RWP	**33.496017**	**73.110314**	413	RWP	**33.59433**	**73.126932**	438	RWP	**33.614625**	**73.02527**
389	RWP	**33.49659**	**73.108891**	414	RWP	**33.637067**	**73.077261**	439	RWP	**33.596077**	**73.134311**
390	RWP	**33.63229**	**73.038046**	415	RWP	**33.593028**	**73.130417**	440	RWP	**33.626994**	**73.094579**
391	RWP	**33.633104**	**73.03795**	416	RWP	**33.637044**	**73.069514**	441	RWP	**33.616851**	**73.062575**
392	RWP	**33.633113**	**73.037213**	417	RWP	**33.590299**	**73.132788**	442	RWP	**33.522612**	**73.048165**
393	RWP	**33.568377**	**73.052454**	418	RWP	**33.629281**	**73.092291**	443	RWP	**33.474636**	**73.014316**
394	RWP	**33.567956**	**73.052714**	419	RWP	**33.628574**	**73.060012**	444	RWP	**33.583477**	**73.024615**
395	RWP	**33.633629**	**73.07574**	420	RWP	**33.598285**	**72.994212**	445	RWP	**33.62893**	**73.116726**
396	RWP	**33.616649**	**72.990835**	421	RWP	**33.552195**	**73.119747**	446	RWP	**33.651335**	**73.064304**
397	RWP	**33.617502**	**72.991409**	422	RWP	**33.607463**	**73.09511**	447	RWP	**33.635075**	**73.038575**
398	RWP	**33.618942**	**73.079751**	423	RWP	**33.599097**	**73.015775**	448	RWP	**33.634102**	**73.063326**
399	RWP	**33.58213**	**73.03863**	424	RWP	**33.629861**	**73.090781**	449	RWP	**33.620943**	**73.051603**
400	RWP	**33.581969**	**73.039268**	425	RWP	**33.654378**	**73.071851**	450	RWP	**33.634531**	**73.069006**
451	RWP	**33.622218**	**73.050947**	476	RWP	**33.615132**	**73.046074**				
452	RWP	**33.633956**	**73.069073**	477	RWP	**33.617942**	**73.039156**				
453	RWP	**33.63611**	**73.076866**	478	RWP	**33.652163**	**73.082399**				
454	RWP	**33.627316**	**72.941757**	479	RWP	**33.617326**	**73.030224**				
455	RWP	**33.61338**	**72.991244**	480	RWP	**33.605947**	**73.008537**				
456	RWP	**33.602171**	**73.000066**	481	RWP	**33.616002**	**73.043123**				
457	RWP	**33.619449**	**72.997178**	482	RWP	**33.647004**	**73.058734**				
458	RWP	**33.617075**	**72.987958**	483	RWP	**33.64691**	**73.061459**				
459	RWP	**33.623411**	**72.983935**	484	RWP	**33.598928**	**73.049117**				
460	RWP	**33.60239**	**73.018763**	485	RWP	**33.596737**	**73.044823**				
461	RWP	**33.619696**	**73.051036**	486	RWP	**33.631572**	**73.05052**				
462	RWP	**33.590859**	**73.074469**	487	RWP	**33.607581**	**73.006539**				
463	RWP	**33.628651**	**73.060912**	488	RWP	**33.611767**	**73.068567**				
464	RWP	**33.626496**	**73.035736**	489	RWP	**33.630137**	**73.062296**				
465	RWP	**33.604472**	**73.074591**	490	RWP	**33.631233**	**73.061962**				
466	RWP	**33.62491**	**73.03405**	491	RWP	**33.639587**	**73.049848**				
467	RWP	**33.596699**	**73.012665**	492	RWP	**33.621038**	**73.064693**				
468	RWP	**33.62567**	**73.031908**	493	RWP	**33.620015**	**73.077435**				
469	RWP	**33.604092**	**73.072392**	494	RWP	**33.364216**	**73.15347**				
470	RWP	**33.62645**	**73.03099**	495	RWP	**33.37426**	**73.222**				
471	RWP	**33.588147**	**73.025732**	496	RWP	**33.363432**	**73.25764**				
472	RWP	**33.627691**	**73.084004**	497	RWP	**33.3752**	**73.24996**				
473	RWP	**33.536371**	**73.079054**	498	RWP	**33.36576**	**73.4368**				
474	RWP	**33.6254**	**73.050937**	499	RWP	**33.364445**	**73.43563**				
475	RWP	**33.586415**	**73.023293**	500	RWP	**33.374917**	**73.43779**				

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Appendix 3. *The socio-economic and demographic characteristics of respondents and their predilections*

City →	City code ↓	Predictor Categories ↓	Natural capital beneficial for urban residents?					Did vegetation cover change?					Change type?		
			ST.AG	AG	NL	DA	ST.DA	ST.AG	AG	NL	DA	ST.DA	- ve	+ve	NA
City	I	Islamabad	99	131	9	7	4	38	143	40	15	14	126	82	42
	R	Rawalpindi	78	142	17	8	5	20	145	50	24	11	153	53	44
Gender	I	FEMALE	24	40	3	2	2	13	38	12	3	5	27	29	15
		MALE	75	91	6	5	2	25	105	28	12	9	99	53	27
	R	FEMALE	22	45	6	1	3	7	43	18	6	3	40	20	17
		MALE	56	97	11	7	2	13	102	32	18	8	113	33	27
Education	I	1.UE	1	1	1	0	0	1	1	1	0	0	2	1	0
		2.MT	4	16	3	0	1	3	14	4	1	2	11	6	7
		3.GR	24	39	2	3	2	9	34	13	8	6	24	33	13
		4.PG	53	61	3	2	1	22	72	17	5	4	70	33	17
		5.PD	17	14	0	2	0	3	22	5	1	2	19	9	5
	R	1.UE	0	5	1	0	1	0	3	3	1	0	3	1	3
		2.MT	8	40	5	5	2	1	35	14	8	2	35	12	13
		3.GR	32	47	7	1	2	6	56	18	5	4	55	18	16
		4.PG	35	45	4	1	0	13	44	14	9	5	54	21	10
		5.PD	3	5	0	1	0	0	7	1	1	0	6	1	2
Residential Status	I	1.ALT	6	3	0	0	0	2	3	3	1	0	5	2	2
		2.GOV	10	15	0	2	0	3	19	4	1	0	13	11	3
		3.PER	50	73	7	4	2	24	80	15	10	7	67	50	19
		4.REN	31	38	2	1	2	7	40	18	3	6	40	17	17
		5.OTH	2	2	0	0	0	2	1	0	0	1	1	2	1
	R	1.ALT	1	1	0	0	0	1	1	0	0	0	1	1	0
		2.GOV	2	4	2	0	0	0	6	2	0	0	4	1	3
		3.PER	50	91	5	3	2	9	96	27	16	3	95	32	24
		4.REN	21	46	10	5	3	9	39	21	8	8	52	16	17
		5.OTH	4	0	0	0	0	1	3	0	0	0	1	3	0
Age	I	1.A	3	2	0	1	0	1	4	1	0	0	4	2	0
		2.B	37	58	4	2	2	18	57	13	8	7	51	32	20
		3.C	53	62	5	3	2	19	71	22	6	7	67	41	17
		4.D	6	9	0	1	0	0	11	4	1	0	4	7	5
	R	1.A	1	1	3	0	0	1	1	2	0	1	3	0	2
		2.B	40	75	9	2	0	13	63	27	15	8	71	28	27
		3.C	29	53	4	4	5	5	64	16	8	2	63	20	12
		4.D	8	13	1	2	0	1	17	5	1	0	16	5	3
Monthly Incom	I	C.1	6	21	3		1	4	12	11	1	3	13	9	9
		C.2	18	33	2	4		4	40	5	4	4	9	10	38
		C.3	15	17	1	1	1	6	19	6	4		12	5	18
		C.4	28	21	2	1	1	11	30	8	2	2	16	6	31
		C.5	32	39	1	1	1	13	42	10	4	5	32	12	30
	R	C.1	10	33	6	6	2	2	28	13	10	4	14	14	29
		C.2	33	70	8		2	6	70	25	8	4	20	20	73
		C.3	12	22	1		1	6	21	5	3	1	5	5	26
		C.4	15	9	2	1		3	15	6	2	1	7	3	17
		C.5	8	8		1		3	11	1	1	1	7	2	8

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Appendix 4. *Pair-wise findings of Wilcoxon Rank Sum Test (WRST) based upon predictor variables about Urban Vegetation is Beneficial for Residents (UVBR)*

a: Education				
	Matric	**Graduate**	**Postgraduate**	**Professional**
Uneducated	0.449	0.039	0.006	0.014
	Matric	0.0005	0.0000001	0.0001
		Graduate	0.055	0.144
			Postgraduate	0.712
b: Residential Status				
	Rented	**Government**	**Allotted**	**Others**
Personal	0.24	0.78	0.04	0.02
	Rented	0.73	0.03	0.02
		Government	0.07	0.04
			Allotted	0.64
c: Age				
	up to 20 years	**21 to 40 years**	**41 to 60 years**	
61years and above	0.001	0.0003	0.0002	
	up to 20 years	0.452	0.67	
		21 to 40 years	0.065	
d: Monthly Income				
	Up to Rs.25000	**Rs.25001 to 50000**	**Rs.50001 to 75000**	**Rs.75001 to 100000**
Rs.100001 and Above	0.00001	0.015	0.378	0.374
	Up to Rs.25000	0.005	0.001	0.000003
		Rs.25001 to 50000	0.221	0.002
			Rs.50001 to 75000	0.106

Appendix 5. *Pair-wise findings of Wilcoxon Rank Sum Test (WRST) based upon predictor variables about Vegetation Cover Changes (VCC)*

a: Education				
	Matric	**Graduate**	**Postgraduate**	**Professional**
Uneducated	0.795	0.573	0.207	0.279
	Matric	0.442	0.009	0.146
		Graduate	0.029	0.381
			Postgraduate	0.554
b: Residential Status				
	Rented	**Government**	**Allotted**	**Others**
Personal	0.01	0.5	0.72	0.11
	Rented	0.05	0.32	0.06
		Government	0.98	0.15
			Allotted	0.48
c: Age				
	up to 20 years	**21 to 40 years**	**41 to 60 years**	
61years and above	0.0002	0.00009	0.0002	
	up to 20 years	0.9	0.6	

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		21 to 40 years	0.5
d: Monthly Income			
	Up to Rs.25000	**Rs.25001 to 50000**	**Rs.50001 to 75000**	**Rs.75001 to 100000**
Rs.100001 and Above	0.001	0.06	0.851	0.942
	Up to Rs.25000	0.012	0.003	0.001
		Rs.25001 to 50000	0.14	0.087
			Rs.50001 to 75000	0.891

Appendix 6. *Pair-wise findings of Wilcoxon Rank Sum Test (WRST) based upon predictor variables about Impacts of Changes in Urban Vegetation (ICUV)*

a: Gender				
		FEMALE		
MALE		0.05		
b: Education				
	Matric	**Graduate**	**Postgraduate**	**Professional**
Uneducated	0.87	0.039	0.006	0.014
	Matric	0.22	0.73	0.79
		Graduate	0.06	0.24
			Postgraduate	0.97
c: Residential Status				
	Rented	**Government**	**Allotted**	**Others**
Personal	0.31	0.4	0.97	0.05
	Rented	0.16	0.72	0.02
		Government	0.69	0.16
			Allotted	0.15
d: Age				
	up to 20 years	**21 to 40 years**	**41 to 60 years**	
61years and above	0.6	1	0.8	
	up to 20 years	0.4	0.7	
		21 to 40 years	0.5	
e: Monthly Income				
	Up to Rs.25000	**Rs.25001 to 50000**	**Rs.50001 to 75000**	**Rs.75001 to 100000**
Rs.100001 and Above	0.327	0.00002	0.007	0.021
	Up to Rs.25000	0.0006	0.046	0.119
		Rs.25001 to 50000	0.46	0.208
			Rs.50001 to 75000	0.686

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