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SOCIO-ECONOMIC CHARACTERISTICS AND UTILIZATION OF URBAN GREEN INFRASTRUCTURE IN SOUTHERN ETHIOPIA

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ABSTRACT

User's socio-economic characteristics can influence the visit and utilization pattern of urban green infrastructure. Assessing the influence of socio-economic characteristics of people on the utilization of UGI is an important instrument to show gaps for city/town planners, developers and decision makers. This paper investigates the effect of socio-economic characteristics of people on a monthly visit of green infrastructure in Southern Ethiopia. Data were collected using structured questionnaires and key informant interview, a total of 400 urban communities were interviewed in the entire study area. The collected data were analysed using descriptive statistics, multiple regression models and chi-square test. The majority (54%) of respondents in Hawassa city visit two to three times per month, in Bodity town 22% of respondents visited UGI two to three times per month. Whereas, 30% of respondent in Wolayita Sodo visit UGI once a month. In general, 28.75% and 23.75% of respondents visited green infrastructures two and three times a month respectively in the whole study area. Based on the statistical analysis result gender, annual income and distance to home have significance ($p < 0.05$) association with a monthly visit of urban green infrastructure. The study confirmed that people's socio-economic characteristics have significant relation and/or effect on the monthly visit and utilization of green infrastructure in the study area. Thus, in order to ensure the benefit of people and encourage the participation of communities in UGI development, the government should plan to consider all socio-economic groups, create awareness, enabling environment and publicized on the importance of green infrastructure in the urban settlement.

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INTRODUCTION

Urban green infrastructures are essential components of 21st century cities and towns development (Husqvarna Group, 2012). Urban green infrastructures have both direct and indirect effects on health, in the sense that they are associated not only with good health status amongst local residents, but also with improved environment quality (Santana *et al*., 2009). They represent areas consisting primarily of unsealed and permeable surfaces such as soil and vegetation; ranging from recreational landscapes, such as neighborhood parks and playing fields, through gardens and semi-natural habitats such as wetlands and woodlands (Swanwick *et al*., 2003). Several researchers such as Hartig*et al*. (2003), Maller*et al*. (2005), and Hillsdon *et al*. (2006) indicates that nature provides restorative experiences that directly affect people's psychological well-being and health in a positive way. Urban green infrastructure like many other urban parks, green spaces and green corridors, provide multifunctional benefits for urban communities.

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communities. They are of importance for recreation and mental restoration (Chiesura, 2004) and relieve environmental challenges such as air quality, water storage and urban heat (Demuzere*et al.,* 2014; Lafortezza *et al*., 2013; Roy *et al.,* 2012; Tzoulas *et al*., 2007). The perception of peoples on the environment or landscape may influence user behaviors, preferences and attitudes (Nasar, 2008; Ward Thompson *et al.*, 2005), which could help to inform planning and management of urban green infrastructure (UGIs). Green infrastructures were perceived and used by residents was the focus of the research as opposed to perceptions solely of users of green infrastructure (Katharine, 2009; Sheffield City Council, 2007). The relationship between urban green spaces and public health is relatively new area of research (Santana *et al*., 2009). A number of studies reported that people to greater levels of engagement in physical activity among residents of greener neighborhoods, some of whom also benefit from alow body mass index (Lachowycz and Jones, 2011; Sugiyama *et al*., 2010), though these findings tend to vary by population sub-group (Astell-Burt *et al*., 2014), geographic contexts (Richardson *et al*., 2013; Maas *et al*., 2011), and for particular types of physical activity (Mytton *et al*., 2008). People's perception of green space were also particularly important to consider as they influence both usage and the likelihood of benefiting in any way from green space (Burgess *et al*, 1988). Perceived access to recreational facilities could promote wholesome recreational pursuits (Hoehner *et al.*, 2005).

Studies in different cities indicate that people harbor complex and ambivalent ''half sought and half feared'' perception of UGS (Crewe, 2001; Hunter, 2001). Important perceptions include those of the potential benefits that green spaces may bring as well as perceptions of the qualities (and quantities) of green spaces in the area (Burgess, 1998 Burgess). Studies conducted in the United Kingdom and Germany showed that utilisation of green infrastructure was influenced by various factors. However, socio-economic characteristics of the respondent had an immediate influence on the utilisation of green infrastructure (Kawachi, 2000; Leyden, 2003; Sugiyama *et al.*, 2010; Rosol, 2010). There is some evidence of differences in perceptions and subsequent usages across different characteristics of the peoples. Dunnett *et al* (2002) found that certain groups were more likely to be low or non-users of green space; these were people over 65, people with disabilities, and 12-19-year-old. Mostly some characteristics of the communities such as age, gender and ethnicity were more researched by different scholars (Katharine, 2009).

Studies conducted by Acar *et al*. (2006) showed that the perception of UGS depends on their intrinsic structure and composition, and extrinsic socioeconomic background of users. The young and highly educated have higher environmental awareness (Chung and Poon, 1999) and emphasize the beneficial UGS functions (Jim and Chen, 2006; Tyrväinen *et al.*, 2007). Women, children and the elderly are more likely to perceive UGS as risky places due to worries of personal safety (Nayak, 2003; Sanesi and Chiarello, 2006), which would dampen their use (Miles, 2008). People with more experience with nature during childhood are disposed to a positive attitude towards UGS (Bell *et al*., 2003; Burgess *et al.*, 1988; Sebba, 1991), and become keen visitors in adulthood (Ward Thompson *et al.*, 2008). The availability of green space is, therefore, a potentially important preventive health resource and public access to them needs to be protected (Mitchell and Andpopham, 2007). This is good news for people who live near parks, but less helpful for those in communities with poor access to green space. Inequality is unlikely to come about by random chance since neighborhoods containing greenery are often highly desirable and more costly to buy into (Smith 2010; Conway *et al*., 2010). People on low incomes already shoulder the vast burden of preventable lifestyle-related health conditions. The importance of exploring local green spaces with residents is underlined when it is considered that having nearby green spaces is particularly important for predicting usage of green space. Indeed, research has suggested that the use of green spaces declines dramatically as the distance between green spaces and residences increases (Giles-Corti and Donovan, 2002) and in particular that people may often only be prepared to travel up to five minutes to visit a green space (Coles and Bussey, 2000). Usage patterns of local city centre green spaces were therefore explored in detail in order to build up a picture of how (and indeed if) city centre residents used their local green spaces. Understanding the effect of socio-economic groups could throw light on their design and management (Kaplan & Kaplan, 1989; Purcell, 1992). The influence of social, economic and cultural activity of respondent on the utilization of green infrastructure can affect attitudes towards nature and the desire for contact with it (Ward Thompson, 2002). This research explored the effect of socio-economic characteristics of respondents on the monthly visit and utilization of green infrastructure in Southern Ethiopia.

RESEARCH METHODOLOGY

Description of the Study Area

Three case study areas (Hawassa, Wolayita Sodo and Bodity) were purposively selected. The selection was done in consultation with the Regional Sanitation and Beautification Park Administration and Development Office. The first Case Study area was Hawassa city. It is the capital city of South Nation and Nationalities Peoples (SNNP) Regional State. The city is located between 37^0 52'- 39^0 11' East longitude and 06^0 27'- 07^0 40' North latitude with an elevation of 1708 meters above sea level. It is found at a distance of 275km from Addis Ababa (capital city of Ethiopia) in the Southern part of the country, within the rift valley depression and bordered by Lake Hawassa. According to CSA (2007) report. Hawassa city accommodates 210,676 inhabitants. It covers 50.24 square kilometres, and divided into eight sub-cities. The land use of the study area includes approximately 19.27% for residential area, 20.20% for transportation (road), 7.06% for commercial area, 2.10% for institution, 12.20% allocated for social service area, 5.74% for production and selling area (marketing) area, 16.4% for green infrastructure (trees and forest) area, 4.03% allocated for mixed use service area, 13.10% for other service area (World Bank, 2016).

The study area has a variety of tree and forest resources such as coniferous and broad-leaved (reserved) forest that are distributed according to its environmental condition. Such forest resources have a variety of potential and should be protected and reserved, as they could serve as an important base for development of the Region in general and the urban centres in particular (World Bank, 2016). Wolayita Sodo town was the second case study area. It is the administrative centre of Wolayita Zone of SNNPRS and found at a distance of 390

km from Addis Ababa and 167 km from the regional city Hawassa. The town is located at 6°54′N Latitude and 37°45′E Longitude with an elevation between 1600 to 2100 meters above sea level. According to CSA (2007), the total population of the town was 100,755 and the town has 25.62 square kilometre coverage, three sub-cities and 11 kebeles. The tow is established on a very undulating topography area and mostly exposed to high flood hazards and degradation of land soil erosion. The natural conditions facilitate diverse and fast vegetation growth and nurture a regional landscaping tradition (Wolayita Sodo Town Administration, 2014). Bodity town was also the third Case Study site. It is a small emerging town under Wolayita Zone in SNNPRS. It is situated at 6°58′N latitude and 37°52′E longitude with an elevation of 2050 meters above sea level. The town is at a distance of 366 km from Addis Ababa and 153 km from regional city Hawassa. It is the administrative centre of Damot Gale Woreda. Based on figures from the CSA in 2007, the total population size of the town was 31,973 and the town has its administration and municipality, has 6.16 square kilometre area coverage and divided into two sub-city and four kebeles.

Sampling design and sample size

A questionnaire survey was used to assess the influence of respondent's socio-economic characteristics on the trends of visits of green infrastructure in the study area on a monthly basis. The study employed a combination of case study and cross-sectional research designs to gather the required data. Thecross-sectional approach was used to collect data using the questionnaire survey method. The regional and local urban green development officials were consulted in designing the questionnaire. Thus a total of 400 copies of structured questionnaires were administered to collect both qualitative and quantitative data. Qualitative methods encompass key informant interview, and physical observation using a video camera. While, the quantitative approach evaluated the socioeconomic profile and monthly visit of green infrastructure, including gender, age, marital status, education level, household annual income, occupation, distance to reach the nearest green infrastructure. All questionnaire survey procedures were performed in compliance with relevant laws and institutional guidelines.

Sampling Techniques

Multistage cluster sampling technique was employed to select the specific study area. After clustering the study area, any mature member of the household (age, >18) was selected using simple random sampling technique at each village. A questionnaire was administered based on the population proportion of each case study area. The target sample size of 400 was distributed using the simple random sampling techniquein each case study area. A pilot test (10%) examined the logic, clarity, succinctness of the questions (Thomas *et al*., 2014). Seven undergraduate data collectors were used as research assistants. They were coached in the procedures and etiquette of questionnaire survey and to balance the gender spread (Gobster, 1995). The full survey was completed in August 2016 through face-to-face interviews at each case study area. City/town administration green infrastructure development managers and experts were consulted in site selection. During the survey in each case study area, anymature member of the household (age, >18) was selected using simple random sampling technique at each village. Based on their experience and participation in GI development and management practices, individuals ranging from a total of 7-12 participants in key informant interview were selected at each urban centre.

***Analytical Tools and Models*:** The study employed both descriptive statistics, multiple regression models and chi-square test (cross-tabulation) using SPSS version 21. Multiple linear regression was used to identify the influence of socio-economic characteristics of respondent on the monthly visit of green infrastructure. This was used to determine the effect of socio-economic factors on the monthly visit of green infrastructure. While chi-square test (cross-tabulation) was applied to assess the characteristics of individual socio-economic groups with monthly visit of green infrastructure in each case study area.

Determinant factors to visit green infrastructure: multiple linear regression analysis was used to identify the influencing factor among respondents' socio-economic characteristics in relation to monthly visit of green infrastructure in the study area. The implicit form of the regression equation is: -

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 \ldots \quad (1)$$

Where:

Y = Monthly visit of green infrastructure (N)
βi = Parameter
X_1= Age of respondent (years)
X_2= Education of the of respondent (years)
X_3=Gender of the of respondent (M=1, F=2)
X_4= Annual income (ET Birr)
X_5= Marital Status
X_6= Occupation
X_7= Distance to home (meter)

RESULTS AND DISCUSSION

Response rate and respondent characteristics

The study was conducted in three different size urban centres. In general, the profile of the respondents is denoted by seven socio-economic variables (Table 1). Males (52%) slightly exceeded female (49%). Age, the 31-59 group (53%) outnumbered other groups, followed by 18–30 (35%). The more senior 59 and above age groups only account for 12 percent. For education, 35% hold a University or higher degree, respondents with upper and lower secondary education account for 30% and 15% respectively. The annual income group 10,000-30,000 ET Birr/annual contributes 38%, groups 30,000-50,000 ET Birr/annual accounts 12%.

Whereas >50,000 ET Birr/annual and <10,000ET Birr/annual take 24% and 19% respectively. Among the four groups of occupation, 33% of respondents were self-employed, 27% government employees, followed by 24% and 16% of private company workers and non-employed respondents respectively. The marital status distribution was also single (17%), married (46%), divorced and widowed 14% and 11% respectively. For distance to residence, 41% of the respondents lived at <300m distance from green infrastructure, followed by 500m-1km. However, 16% and 15% of the respondents lived >1km and 300-500m distance from the sounding green infrastructure development respectively.

Table 1. Socio-economic characteristics of the respondents

Demographic characteristics		Number of respondent (N) and percentage in different urban centres							
		Hawassa		W-Sodo		Bodity		Total	
		N	%	N	%	N	%	N	%
Gender	Female	120	49	57	49	17	46	194	49
	Male	126	51	60	51	20	54	206	52
Age	18-30 (Young)	85	35	40	34	16	43	141	35
	31-59 (Adult)	130	53	65	56	16	43	211	53
	>59 (Old)	31	13	12	10	5	14	48	12
Education level	Not Read & Write	11	4	15	13	7	19	33	8
	Primary level	32	13	22	19	7	19	61	15
	Secondary level	23	9	19	16	4	11	46	12
	TVET	77	31	34	29	9	24	120	30
	Graduate and above	103	42	27	23	10	27	140	35
Annual income	<10,000	46	19	22	19	9	24	77	19
	10,000-30,000	116	47	28	24	9	24	153	38
	30,000- 50,000	31	13	24	21	9	24	64	16
	>50,000	53	22	33	28	10	27	96	24
Occupation	Government emp	65	26	34	29	9	24	108	27
	Private Company	62	25	21	18	11	30	94	24
	Self-Employed	85	35	39	33	9	24	133	33
	Non-employed	34	14	23	20	8	22	65	16
Marital status	Not Married	46	19	14	12	7	19	67	17
	Married	120	49	51	44	13	35	184	46
	Divorced	32	13	16	14	7	19	55	14
	Widowed	20	8	19	16	5	14	44	11
	Separated	28	11	17	15	5	14	50	13
Distance to Home	<300meter	116	47	36	31	12	32	164	41
	300-500m	34	14	23	20	3	8	60	15
	500m-1km	63	26	36	31	14	38	113	28
	>1km	33	13	22	19	8	22	63	16

Source: computed by authors based on household survey data (2016), Number (n) and percentage (%)

Table 2. Frequency of visitor to use green infrastructure per month

S/N	Number of Visits	Responses by Urban centres			
		Hawassa	W-Sodo	Bodity	Total
		n (%)	n (%)	n (%)	n (%)
1	No Visit (0)	32(13)	3(3)	4(11)	39 (9.75)
2	Once Per Month (1 times)	43(17)	35(30)	6(16)	84(21)
3	Twice Per Month (2 times)	73(30)	34(29)	8(22)	115(28.8)
4	Three Times Per Month (3 times)	59(24)	28(24)	8(22)	95(23.8)
5	Four Times Per Month (4 times)	27(11)	11(9)	7(19)	45(11.3)
6	More than Five Times Per Month (5 times)	12(5)	6(5)	4(11)	22(5.5)
	Total	246(100)	117(100)	37(100)	400(100)

Source: computed by authors based on household survey data (2016), Number (n) and percentage (%)

Table 3. Multiple Regression Model for Socio Economic Factors Influencing the Respondents Monthly visiting of GI

Predictors	Unstandardised Coefficients					Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	4.743	0.701		6.77	0.000		
Gender	0.49	0.121	0.154	4.048	0.000*	0.940	1.064
age of respondent	-0.125	0.091	-0.051	-1.365	0.173	0.968	1.033
Educational level	0.316	0.317	0.038	0.997	0.319	0.948	1.055
Annual Income	0.940	0.157	0.062	5.987	0.001*	0.955	1.047
Occupation	-0.089	0.057	-0.059	-1.574	0.116	0.972	1.029
Marital Status	-0.098	0.085	-0.043	-1.156	0.248	0.984	1.016
Distance to Home	-0.954	0.131	-0.679	-7.311	0.000*	0.957	1.067
R2= .471, adjusted R2= .460, std.error = 1.174, F (7, 392) = 43.470, p= .000. Durbin-Watson= .561							

Dependent Variable: Monthly visiting of GI*Denotes level of significance at 0.05

Frequency of Visit to Green Infrastructure

The frequency of visits to green infrastructure was analysed using the number of visits of respondents per month. Table 2 shows the monthly frequency and pattern of visitors to use green infrastructure for recreation and other purposes in the study area. Majority of the respondents have relatively good frequency of visits to green infrastructure in the study area. In Hawassa city 30% and 24% of the respondents, respectively visited twice and three times per month. Whereas, 30% and 29% of the respondents, respectively in Wolayita Sodo visited one and two times per month. On the other hand, in Bodity town equal 22% of the respondents visited two and three times per month (Table 2). In general, 28.75% and 23.75% of respondents visited green infrastructure three times a month in the entire study area; while 11.3% and 5.5% respondents, respectively visited four and five times a month. The remaining 21% of respondents visited only one time a month, while 9.7% of respondents reported that they did not visit throughout a month.

Table 4. Gender and respondents visiting frequency of green infrastructure

Urban Centres	Categories	Frequency of Visiting time per month (number (n) percentage (%)			Significant level		
		<3	3-5	>5	X^2	df	p-value
		n (%)	n (%)	n (%)			
Hawassa	Male	20(69)	50(62.5)	56(40.9)	13.596	2	0.001
	Female	9(31)	30(37.5)	81(59.1)			
W-Sodo	Male	15(32)	22(71)	32(59)	12.788	2	0.002
	Female	32(68)	9(29)	16(41)			
Bodity	Male	6(55)	7(58)	7(50)	0.182	2	0.913
	Female	5(45)	5(42)	7(50)			

Source: computed by authors based on household survey data (2016), Number (n) and percentage (%)

Table 5. Age andrespondents visiting frequency of green infrastructure

Urban Centres	Categories	Frequency of Visiting time per month (number (n) percent (%)			Significant level		
		<3	3-5	>5	X^2	df	p-value
		n(%)	n (%)	n(%)			
Hawassa	18-30	6(20.7)	22(27.5)	43(31.4)	1.642	4	0.801
	31-59	19(65.5)	46(57.5)	77(56.2)			
	>59	4(13.8)	12(15)	17(12.4)			
W-Sodo	18-30	3(12.5)	10(26.3)	12(21.8)	4.259	4	0.372
	31-59	14(58.3)	21(55.3)	36(65.5)			
	>59	7(29.2)	7(18.4)	7(12.7)			
Bodity	18-30	3(33.3)	4(27)	4 (32)	1.076	4	0.898
	31-59	3(33.3)	6(40)	3(23.1)			
	>59	3(33.3)	5(33.3)	6(46.1)			

Source: computed by authors based on household survey data (2016, Number (n) and percentage (%)

This indicate the frequency of visitors to access and utilise green infrastructure was very limited in the entire study area. The number of visitors to who visit green infrastructure five times a month is less than from the number of visitors that respond no visits. This is attributed to different socio-economic factors (Table 2). Study conducted by Shanahan *et al.* (2014) in Australian show usuallytourists have been visiting parks near to their home than parks far from their home, which suggests that factors other than distance played a role. Multiple linear regressions were used to test the influence of socio-economic characteristics of visitors and the monthly visit of green infrastructure. Multiple linear regression techniques help to determine the association between socio-economic variables and the frequency of monthly visits to green infrastructure.

The analysis showed that four predictors had a negative correlation coefficient. These include age, occupation, and marital status and distance to home. This indicates there was a weak association between the factors under consideration. The prediction model was statistically significant, F (7, 392) = 43.470, p = 0.000, and accounted for approximately 46% of the variance of monthly visiting of green infrastructure (R^2 = 0.471, Adjusted R^2 = 0.460).

The analysis shows that three of the seven independent variables (predictors) have statistically significant association with monthly visiting of green infrastructure. These include gender (p-value =0.000), annual income (p-value = 0.001), and distance to home (p-value = 0.000) at p <0.05 significance level. The other independent variables (predictors) did not have a statistically significant association with monthly visiting of green infrastructure. These include age (p-value = 0.173), educational level (p-value= 0.319), and occupational background (p-value =0.116) at p <0.05 significance level. When evaluating the standardized beta values, the greatest influences upon the dependent variable are in the following order: distance to home (beta = -0.679), gender (beta = 0.154) and annual income (beta = 0.062).

The Influence of socio-economic characteristics of respondent in the utilisation UGI

Gender and Monthly Visit of Urban Green Infrastructure

The cross-tabulation result showed that there is gender difference in the utilisation of green infrastructure in the study area. Especially in Hawassa and Wolayita Sodo town, the gender distribution has a larger difference on both male and female respondents. In Hawassa city, 40.9% and 59.1% of male and female respondents visited more than five times in a month respectively. Similarly, 62.5% and 37.5% of male and female respondent visited 3-5 times in a month (Table 4). On the other hand, in Wolayita Sodo, 59% and 41% of male and female respondents visited more than five times in a month, while, and 71% and 29% of male and female respondents visited 3-5 times per month.

This indicates that there was a great gender difference in the frequency of monthly visit of green infrastructure. As indicated in Table 4, gender has a statistically significant association in Hawassa and Wolayita Sodo town (χ^2= 13.596, DF = 2, p <0.05) and (χ^2= 12.788, DF = 2, p <0.05) with the frequency of monthly visiting of green infrastructure respectively. However, in Bodity town there was no significant (χ^2= 0.182, DF = 2, p >0.05) association with the frequency of monthly visit of green infrastructure (Table 4). Because equal (50%) number of respondents visited more than five times per month in both male and female categories, while 58% and 42% of male and female respondents also visited <3 times in a month respectively., Studies confirmed that men were more likely to visit the park than women during weekdays. A study in Ankara, Turkey showed that men visit urban green space more often than women, but the study found no gender-related differences in park preferences (Marthe, 2012, Wenzheng, 2013). On the contrary a study conducted by Abdul (2012) concluded that women's chances of visiting parks during the weekends were higher than for men. In Hawassa 69% of male respondents visit green infrastructure less than three times in a month, while 31% of respondent were females.

Similarly, in Wolayita Sodo, 32% and 68% of male and female respondents visited less three times, while in Bodity town, 55% and 45 % of male and of female respondents visited green infrastructure less than three times in a month. Studies showed that the gender disparity may be seen as strange, especially in developing nations that consider female involvement in visiting recreational and sport as something absurd (Bedimo-Rung *et al.,* 2005; Hillsdon *et al*., 2006; Shores and West, 2008; Abdul, 2012). According to Table 4, gender has significant effect on monthly visits of green infrastructure in Hawassa and Wolayita Sodo. The result show that male respondents have an opportunity to recreate in outdoor green infrastructure developments than female respondents. However, research in the United Kingdom, Vietnam and China have shown that younger women are more likely to visit and use green infrastructure for recreation in the urban area than in the countryside for leisure compared to men, especially in the most popular sport, games and physical activities (Neuvonen *et al*., 2007; Schipperijn *et al.,* 2010).

Age and Monthly Visit of Urban Green Infrastructure

Age is one of the social variables in this study, different age groups have different implications on the utilisation of green infrastructure in the study area. Even though, the frequency of visits to green infrastructure in the study area is expected to vary across all age categories, the analysis result showed that, age of the respondent did not have significant effect on the frequency of monthly visit of green infrastructure in all case study areas. As illustrated in Table 5, Hawassa city (χ^2= 1.642, DF = 4, p >0.05), Wolayita Sodo Town (χ^2= 4.259, DF = 4, p >0.05) and Bodity (χ^2= 1.076, DF = 4, p >0.05). The majority (56.2%) of respondents in Hawassa and 36% of respondents in Wolayita Sodo visited green infrastructure more than five times in a month in the age category of 31-59 (Table 5). While in Bodity 40% of respondents in the same age group visited 3-5 times in a month. Conversely, 43%, 21.8% and 32% of the respondents in Hawassa, Wolayita Sodo and Bodity respectively visited more than five times in a month in the age group of 18-30 (Table 5).

On the other hand, respondents (age, >59) show lower records of monthly visits to green infrastructure. About 21.8%, 12.7% and 46.1% of respondents, respectively in Hawassa, Wolayita Sodo and Bodity visited more than five times in a month in the age group of age >59. Respondents age group greater than 59 have better experience in visiting green infrastructure in Bodity town. Studies showed that the oldest age groups have a tendency to attached nature-based options such as taking a break in a quiet and peaceful park and taking a walk in the forests (Hillsdon *et al*., 2006; Zhou and Rana, 2011; Abdul, 2012).The lower level of visit frequency was observed in the age of 18-30 and greater than 59; respondents working activities and school age has influence on the frequent visits of green infrastructure. Similarly, lack of urban parks and availability of good quality green areas have contributed to the infrequent visits of green infrastructure in the study area. However, in all age groups, Hawassa city has more frequent visitors as compared to the other two case study sites. This research result showed that relatively adult people has more interest to access, visit, and spent their time to recreate on urban green infrastructure than younger and old age respondents.

Educational Level and Monthly Visit of Urban Green Infrastructure

Educational level is one of the influencing factors that limits the understanding level of the communities to utilise and visit green infrastructure development in the case study urban centres. Based on the chi-square test result, even though the educational level has a positive correlation, it did not have significant effect on the monthly visit of green infrastructure. Thus, Hawassa city (χ^2= 5.786, DF = 6, p >0.05), Wolayita Sodo Town (χ^2= 3.851, DF = 6, p >0.05), and Bodity (χ^2= 1.653, DF = 6, p >0.05). As indicated in Table 6, 46% of respondents graduate and above in Hawassa, 21.8% of respondents TVET certificate holders in Wolayita Sodo and 33% of respondents, primary school in Bodity visited more than five times a month. Similarly, Hawassa 37% and Wolayita Sodo 21.8% and Bodity 18% of graduate and above respondents visited green infrastructure 3-5 times a month (Table 6).This study showed that there was an understanding difference in the educational level, however, education level did not have significant effect on the monthly visit of green infrastructure (Table 6). About 33%, 20% and 27% of TVET certificate holders, respectively in Hawassa Wolayita Sodo and Bodity visited more than five times in a month. Whereas respondents that had College and University degree have an opportunity to visit green infrastructure frequently, but the visiting time varies throughout the month.

Likewise, in the primary and secondary education level, 18%, 47.3%, and 20% of respondent, respectively in Hawassa, Wolayita Sodo and Bodity visited more than five times in a month. While 27%, 26.3% and 27% of respondents, respectively in Hawassa, Wolayita Sodo and Bodity town visited 3-5 times in a month in this category (Table 6). However, as presented in Table 6, only 4%, 11% and 27% of respondents, respectively in Hawassa, Wolayita Sodo and Bodity town visited more than five times in a month in the category of uneducated (not read and write). This indicates uneducated respondents did not frequently visit green infrastructure as compared to other categories. The analysis result indicated that (Table 6), in all case study area respondent that has college and university degree has higher tendency to visit and use green infrastructure than other educational levels. This indicate when the educational level of respondents become higher, their understanding, use and willingness to manage green infrastructure development will be high. The study also show that people with more education level has higher interest to visit and access green infrastructure (Table 6).

Annual Income and Monthly Visit of Urban Green Infrastructure

It is clear that income has great influence on the utilisation and visits of green infrastructure. Table 7 shows, the relationship between annual income and frequency of monthly visiting of green infrastructure in the study sites. The result show that annual income has a positive correlation and statisticallysignificant effect on the monthly visits of green infrastructure in Hawassa (χ^2= 81.68, DF = 6, p <0.05), Wolayita Sodo (χ^2= 20.573, DF = 6, p <0.05). While, annual income level shows a variation in visits of green infrastructure in Bodity town, but it did not have any significant (χ^2= 2.612, DF = 6, p >0.05) effect on monthly visit of green infrastructure (Table 7).

Table 6. Educational level and respondents visiting frequency of green infrastructure

Urban Centres	Categories	Frequency of Visiting time per month (number (n) percent (%)			Significant level		
		<3	3-5	>5	X^2	df	p-value
		n(%)	n(%)	n(%)			
Hawassa	Not able to Read &Write	2(6)	4(5)	5(4)	5.786	6	0.448
	Primary &Secondary school	10(32)	21(27)	24(18)			
	TVET	7(23)	25(32)	45(33)			
	Graduate and above	12(39)	29(37)	62(46)			
W-Sodo	Not able to Read & Write	4(16.7)	5(13.2)	6(10.9)	3.851	6	0.949
	Primary& Secondary school	5(20.8)	10(26.3)	26(47.3)			
	TVET	8(33.3)	15(39.5)	11(20)			
	Graduate and above	7(29.2)	8(21.8)	12(21.8)			
Bodity	Not able to Read & Write	2(18)	3(27)	3(27)	1.653	6	0.949
	Primary & Secondary school	4(36)	3(27)	3(20)			
	TVET	2(18)	3(27)	4(27)			
	Graduate and above	3(27)	2(18)	5(33)			

Source: computed by authors based on household survey data (2016), Number (n) and percentage (%)

Table 7. Annual income and respondents visiting frequency of green infrastructure

Urban Centres	Categories	Frequency of Visiting time per month (number (n) percentage (%)			Significant level		
		<3	3-5	>5	X^2	d f	p-value
		n(%)	n(%)	n(%)			
Hawassa	<10000	26(33)	15(16)	5(7)	81.68	6	0.000
	10000-30000	44(55)	58(62)	14(19)	1		
	30000-50000	5(6)	4(4)	22(31)			
	>50000	5(6)	17(18)	31(43)			
W-Sodo	<10000	11(39)	7(15)	4(9)	20.57	6	0.002
	10000-30000	6(21)	22(48)	10(23)	3		
	30000-50000	5(18)	5(11)	14(33)			
	>50000	6(21)	12(26)	15(35)			
Bodity	<10000	2(33)	3(33)	4(29)	2.612	6	0.856
	10000-30000	1(17)	6(35)	2(14)			
	30000-50000	1(17)	4(24)	4(24)			
	>50000	2(33)	4(24)	4(24)			

Source: computed by authors based on household survey data (2016), Number (n) and percentage (%)

Table 8. Occupation and respondents visiting frequency of green infrastructure

Urban Centres	Categories	Frequency of Visiting time per month (number (n) & percentage (%)			Significant level		
		<3	3-5	>5	X^2	df	p-value
		n(%)	n(%)	n(%)			
Hawassa	Government emp.	11(37.9)	24(30)	30(21.9)	5.430	6	0.49
	Private company	6(20.7)	21(26.3)	35(25.5)			
	Self-employed	8(27.6)	23(28.8)	54(39.4)			
	Non-employed	4(13.8)	12(15)	18(13.1)			
W-Sodo	Government emp.	3(12.5)	12(31.6)	19(34.5)	12.867	6	0.045
	Private company	1(4.2)	8(21.1)	12(21.8)			
	Self-employed	11(45.8)	13(34.2)	15(27.3)			
	Non-employed	9(37.5)	5(13.2)	9(16.4)			
Bodity	Government emp.	2(22)	3(20)	4(31)	0.915	6	0.988
	Private company	3(33)	27(27)	4(31)			
	Self-employed	2(22)	27(27)	3(23)			
	Non-employed	2(22)	27(27)	2(15)			

Source: computed by authors based on household survey data (2016), Number (n) and percentage (%)

In Hawassa city 43% of respondents in the wealthy (>50,000ET Birr) category were visited more than five times in a month. However, 55% and 62% of respondents in the lower class category visited less than three and 3-5 times in a month respectively. Similarly, 33% and 16% of respondents in poor (<10,000 ET Birr) category visited less than three and 3-5 times in a month respectively (Table 7). Whereas, 39%, 15% and 9% of respondents in the poor economy category visited less than three, 3-5 and more than five times in a month respectively in Wolayita Sodo town. But, 21%, 26% and 35% of respondents in the wealthy (>50,000 ET Birr) category visited less than three, 3-5 and more than five times in a month respectively (Table 7).

In Bodity town, 33% of the respondent in both poor and wealthy income class category visited less than three times in a month. But 35% of respondents in the middle income category visited 3-5 times per month, while 29% of respondents in the wealthy category visited more than five times in a month. Research conducted in the United Kingdom by Neynen *et al*. (2006) indicated that the wealthier households often reside on the suburban periphery where green space is abundant, well-serviced, and well-maintained (Landscape Institute. 2009; Sister *et al*., 2010).Research findings indicated that respondents which earn lower income per year has lower access or visits to public recreational areas (Jonathan *et al*., 2015).

Table 9. Marital status and respondents visiting frequency of green infrastructure

Predictor	Categories	Frequency of Visiting time per month (%)			Significant level		
		<3	3-5	>5	X^2	df	p-value
		Ob(Ex)	Ob(Ex)	Ob(Ex)			
Hawassa	not married	4(5.5)	14(15.3)	29(26.2)	12.079	8	0.148
	married	13(8.4)	19(23.1)	39(39.5)			
	divorced	4(5.9)	23(16.3)	23(27.8)			
	widowed	7(5.9)	17(16.3)	26(27.8)			
	separated	6(5.3)	7(8.1)	15(14.6)			
W-Sodo	not married	6(5.1)	7(8.1)	12(11.8)	2.808	8	.946*
	married	6(7.4)	14(11.7)	16(16.9)			
	divorced	4(4.5)	6(7.1)	12(10.3)			
	widowed	5(4.3)	8(6.8)	8(9.9)			
	separated	3(2.7)	3(4.2)	7(6.1)			
Bodity	not married	1(1.2)	5(5.1)	5(4.8)	10.02	8	0.264*
	married	2(1.2)	2(4.1)	5(3.9)			
	divorced	1(1.1)	7(4.6)	2(4.3)			
	widowed	1(1)	2(1.8)	1(1.7)			
	separated	1(1)	1(1.4)	1(1.3)			

Source: computed by authors based on household survey data (2016), Number (n) and percentage (%)

Table 10 Distance to home and respondents visiting frequency of green infrastructure

Predictor	Categories	Frequency of Visiting time per month (number (n) & percent (%))			Significant level		
		>3	3-5	>5	X^2	df	p-value
		n(%)	n(%)	n(%)			
Hawassa	<300m	15(31)	23(30)	80(66)	35.586	6	.000
	300-500m	9(19)	12(16)	15(12)			
	500m-1km	13(27)	30(39)	16(13)			
	>1km	11(23)	11(14)	11(9)			
W-Sodo	<300m	6(18)	11(29)	19(41)	12.772	6	.047
	300-500m	5(15)	5(13)	13(28)			
	500m-1km	13(39)	15(39)	8(17)			
	>1km	9(27)	7(18)	6(13)			
Bodity	<300m	2(11)	2(22)	9(47)	11.101	6	0.085
	300-500m	2(22)	2(22)	5(33)			
	500m-1km	3(11)	3(33)	4(21)			
	>1km	5(56)	2(22)	1(5)			

Chen and Jim, (2008) and Dahmann *et al.* (2010) also reported that people with low-income typically occupy the urban core where green space is either scarce or poorly maintained. Similarly, other studies confirmed that low-income people have less access to green space, parks, or recreational areas than those who are more affluent (Jennifer *et al.,* 2014).

Occupation and Monthly Visit of Urban Green Infrastructure

The occupational background of respondnets have weak effect on the monthly vistis of green infrastucture in Hawassa and Bodity town, but Wolayita Sodo has better visiting history as compared to others. As illustrated in table 8, occupational background in wolayita sodo has significant (χ^2= 12.867, DF = 6, p <0.05) effect on monthly visits of green infrastructure. But, it did not have significant effect in Hawassa (χ^2= 5.430, DF = 6, p >0.05) and Bodity town (χ^2= 0.915, DF = 6, p >0.05) on the monthly visits of green infrastructure (table 8). This indicates the occupational background of respondents has weak influence on the monthly visit and understanding of green infrastructure in the study area. About 41% and 47% of self-employed respondents respectively in hawassa and Wolayita Sodo visited more than five times per month. similarly, 42% of private company workers in Bodity visited more than five times per month. However, 27.6%, 45.6%, and 22% of self-employed respondents, respectively in Hawassa, Wolayita Sodo and Bodity visited less than three times in a month.

Table 8 revealed that government employees are the second after self-employees in Hawassa and Wolayita Sodo town.

Marital status and Monthly Visit of Urban Green Infrastructure

Marital status has different visiting history across the study area. In this study married respondent has the highest percentage of frequency of visits of green infrastructure. As Table 9 indicate, 40%, 17%, and 3.9% of married respondents, respectively in Hawassa Wolayita Sodo and Bodity of respondent visited more than five times in a month. However, the pattern of visits of response varied among married, divorced, widowed and separated respondents (Table 9). For instance, 26% and 12% and 5% of the married respondents, respectively in Hawassa Wolayita Sodo and Bodity visited more than five times in a month. Even though differences observed between marital status, but it did not have significant effect on the monthly visit of green infrastructure. Thus, Hawassa (χ^2= 12.079, DF = 8, p >0.05), Wolayita Sodo (χ^2= 2.808, DF = 8, p >0.05), and Bodity (χ^2= 10.02, DF = 8, p >0.05). From Table 9, the divorced, widowed and separated respondents lower visiting frequency to green infrastructure when compared to others access the study area. However, as seen in Table 9, in Wolayita Sodo town, the widowed and separated marital status groups frequently visited recreational areas than Hawassa and Bodity town. On the contrary, most single (unmarried) respondents are said to be free and prompt in their decision to recreate at any period of time.

Studies conducted in United Kingdom by Saw *et al*. (2015) show that the patterns of using green space for various marital status significantly affect the use of green spaces. For example, the mean frequency of park visits in Hong Kong was higher for married couples and the elderly compared to other demographic groups (Wong, 2009). Similarly Bedimo-Rung *et al.* (2005), also concluded that the frequency of married respondents in visiting green infrastructure directly proportion with periodic timing, that is, the longer the interval of time for possible recreation, the more participation is observed. However, this seemed logical when one considers the responsibilities that married people assume from time to time (Sanesi and Chiarello, 2006).

Distance to home and Monthly Visit of Urban Green Infrastructure

Distance to green infrastructure is one of the major factors responsible for frequent visits to green infrastructure or spaces. This study also confirmed that distance to home has statistically significant effect on monthly visits of green infrastructure in the study area. In the study result indicates distance to home has significant effect at Hawassa (χ^2= 35.586, DF = 6, p <0.05) and Wolayita Sodo (χ^2= 12.772, DF = 6, p <0.05), but Bodity town did not have significant (χ^2= 11.101, DF = 8, p >0.05) effect on the monthly visit of green infrastructure (Table 10). Studies conducted by Kazmierczak (2013) and Ndubisi, (2016) confirmed that the characteristics of local green infrastructure (spaces) influence the length, frequency and character of visits and even the social ties that may be formed during those visits. Studying the frequency and duration of visits shows that, in terms of physical access to green infrastructure, distance reduces the frequency of visits among various users (Young-Chang and Keun-Ho, 2015). About 66%, 41% and 47%of respondents, respectively in Hawassa, Wolayita Sodo and Bodity town confirmed that peoples are interested to visit green infrastructures in a distance less than 300meter to their home. The availability and accessibility of green infrastructure development were one of the main factors for frequent visits in a month. Thus, most often respondents in Hawassa get involved more recreational activity as compared to other case study area. Despite this, result clearly shows a tendency in using and visiting the nearest green space, but the larger the distance, the lower the frequency of use and visit. Research studies such as Crow *et al.* (2006) and Qureshi *et al.* (2010) also confirmed that residents appreciate the availability of green space close to their homes. Results showed that the reported frequency of green space use declined with increasing distance (Reuben and Jessica, 2014). According to Handy and Niemeier (2011) people living closest to the type of green spaces has an access to exercise physical activity, relaxing and reduces stress and inspire themselves and more likely to achieve the physical activity recommendation and less likely to be overweight.

The pattern of visiting green infrastructure varies in the study area, it depending on the availability of facilities. In Hawassa city majority of the respondents used Lake Hawassa shore and urban parks. While, Wolayita Sodo and Bodity town, communities were willing to spend their time on urban parks, home garden green areas and outdoor sports fields. Various factors were identified in the destruction of urban green spaces. However, expansion of urban centres, population growth, natural hazards (drought), lack of policy that supports the conservation of green space and lack of awareness were the main causes of the change of green space. A narrow approach to handling the depletion of urban green spaces with much emphasis given to urbanisation may worsen the problem since other major challenges may not be attended to. The likely effects of the reduction in the coverage of green spaces in the urban centres can affect society in various forms. The effects on the city and towns as indicated by the respondents are real. In recent times, there had been a complaint with authorities and ordinary citizens about the loss of the green vegetation cover of the city and towns and the likely implications for its parks, garden and natural and semi-natural forest in and around the city and towns. Though climate change and its consequences such as flooding and rainstorm causing disasters in the urban centres Wolayita Sodo town, in particular, was very vulnerable to these problems. Lack of recreational and relaxation areas and poor air quality in the urban centres are some of the effective reduction of green spaces (infrastructure) development. A reliable disaster shelter system can be established by relying on existing urban green spaces. The results of our study provide a new idea for city planning and disaster management policy-makers and policy-implementers. Landscape indices can be used for analysis of green space for disaster shelter as well.

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Author Contributions

Mikias Biazen Molla conceived and designed the methods, selected materials, assembled and analyzed the data, and prepared the article. C.O. Ikporukpo and C.O. Olatubara provided extensive advice on the arrangement and structure of the article as well as its contents.

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