www.confluencejournal.com.ngISSN: 1597-5827

RESIDENTS' LEVEL OF SATISFACTION DERIVED FROM USING GREEN INFRASTRUCTURE IN OSOGBO, NIGERIA

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ABSTRACT

This study examined residents' level of satisfaction derived from using green infrastructure in Osogbo, Nigeria. Both primary and secondary data were used for this study. Systematic sampling technique was adopted in selecting one out of every 10 buildings (10%) on the selected streets thus every 10th building was selected. In all, a total number of 212 buildingswere selected including 85, 72 and 56 in the core, transition and suburban zones respectively and this formed the sample size. Both descriptive and inferential statistics were utilized for the study. The result of Chi-square tests (χ^2 = 85.121, p = 0.000) revealed that there was a significant difference in gender distribution across the three residential areas. Findings revealed that green infrastructure that respondents' derived the highest level of satisfaction were parks (RSI_s= 3.55). Other green infrastructures arranged in the order of the satisfaction derived were outdoor sport fields, street trees, allotments, and green roof. . The respectively RSI were 3.37, 3.29, 3.10 and 3.09. [Each of which is higher than the study area index (RSI_s= 3.08)]. The green infrastructure that respondent s' derived satisfaction less than the study area's average were; urban forests, home gardens, green corridors, public green spaces, rain gardens, blue roof, vertical greening, city square and plazas and cemetery& religion yards. The study concluded that basic green infrastructure that are important for promoting public health and providing valuable ecosystem services to urban dwellers are not equitably distributed in the three residential areas of the study area. This study recommends the need for additional green spaces and protection of the existing green infrastructure network to create a climate-resilient development in the study area.

Keywords: Satisfaction, Green Infrastructure, Osogbo, Residents, Maintenance

INTRODUCTION

Rapid urbanization is greatly transforming the spatial pattern of land uses in urban centers worldwide as a result of rapidly growing population and movement to urban areas, especially in the developing countries (Byrne, Lo & Jianjun, 2015; Popoola, Medayese, Olaniyan, Onyemenam & Adeleye, 2016). Consequently, there is a wide range of urban environmental issues (problems) such as urban sprawl, urban slum, decaying city-centre, environmental degradation and losses of urban green space with attendant problems and effects ranging from the local to national and global levels (Calderón-Contreras & Quiroz-Rosas, 2017). Of interest and attention in this study is the problem associated with losses of urban green spaces which can be otherwise known as green infrastructure (Yoade, Onifade and Jimoh, 2021).

Green infrastructure could be described as the network of all green spaces that contribute to biodiversity conservation and benefit people through the maintenance and enhancement of ecosystem services while also playing a vital role in the mitigation of and adaptation to climate change (Berte & Panagopoulos, 2014). Uses of green infrastructure are in different categories. These include: aesthetic and leisure (parks, historical gardens as decoration), functional (health, pedagogical), ecological (habitat for flora and fauna, promote better local climate), technical (coping with stormwater), symbolic (as a symbol of the city); or speculative (as a resource for urban exploitation) (Sandstrom, 2002; Baptiste, Foley & Smardon, 2015). This study focuses on the aesthetic and leisure aspect of green infrastructure which comprise parks, public green space, allotments, green corridors, street trees and urban forests, among others, and the delivery of these green infrastructures.

Green infrastructure delivery has been conceptualised by different authors (Mell 2008; Wright, 2011; Calderón-Contreras & Quiroz-Rosas, 2017). It is a process that involves planning, budgeting, provision, maintenance, monitoring and evaluation of green infrastructure (Wright, 2011; Calderón-Contreras & Quiroz-Rosas, 2017). In the

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words of Mell (2008), it is a way by which green infrastructure needs are identified and planned for, and how the needs are actualised for the concerned stakeholders. In the light of these definitions, green infrastructure is conceptualised in this study as the provision and utilisation of green infrastructure in different areas of our urban centre. Among the importance of green infrastructure delivery are: refuge from intense heat; improved urban air quality; conservation of biodiversity; mitigation of erosion; epitomised architectural beauty of cities and recreation possibilities which contributes to residents' health and well-being (Nowak, Crane & Stevens, 2006; Akpan 2014; Mensah, 2014; Brown, Vanos, Kenny, & Lenzholzer 2015). Besides, Calderon (2009) and Egbetokun (2009) posited that green infrastructure delivery helps to combine the development of various spheres of life such as recreation, agricultural, educational, health and nutrition, thus contributes immensely to human survival on earth.

In spite of the important roles which green infrastructure play in the survival of man, urban green space continues to face serious threats of loss and degradation owing to various human activities (Frazier 1996). Across the globe, urban green spaces are depleting at a faster rate. For example, in 25 European cities, between 7.3 and 41 percent of lands reserved for green spaces have been lost to different land uses such as residential, industrial and commercial (European Environment Agency [EEA], 2002; Schäffler & Swilling, 2013). Several towns in the Republic of South Africa have less than 10 per cent of their total lands occupied by green spaces (Shackleton, Blair, Lacy, Kaoma, Mugwagwa, Dalu & Walton, 2017). In Lagos for instance, Mensah (2014) reported that green spaces now occupy less than 3 percent of the city's landmass. Popoola *et al*,. (2016) also noted that rapid urbanization which has hitherto eaten deep into the city of Ibadan has seriously affected the recreational lands, vacant lands and forest reserves. Studies have revealed the peculiar challenges that make green infrastructure delivery appear unattainable in Nigeria (Ezema, Ediae & Ekhaese, 2015; Popoola *et al.*, 2016; Okorie, 2012). These include increased construction and maintenance costs, absence of government regulation, lack of appropriate government incentive and low level of knowledge and technical expertise on provision of green infrastructure and poor patronage among the residents. In addressing these problems, it is expedient to examine the perception of the residents as stakeholders in the provision and utilization of green infrastructure.

Perception is one of the most important aspects of human behaviour (Walter & Alexander, 2013). It is a process by which individuals organize and interpret their sensory impressions in order to give meaning to their environment (Williams, 2015). It involves deciding which information to notice, how to categorize this information and how to interpret it within the framework of existing knowledge. Perception gives a basic understanding on how people react to uncertainties and problems in their environment, as well as how they would participate in ameliorating the problem eventually (Afon, 1998).

Revealing residents' perceptions regarding green infrastructure has recently become a subject of scientific interest (Krajter Ostoić & Konijnendijk van den Bosch, 2015). In order to cater for the needs of local residents, decision-making on green infrastructure has to take into consideration the needs of citizens in general, and of specific user groups in particular (Iojă, Rozylowicz, Patroescu, Nita, Vanau, 2011). This information on residents' perception will serve as an important input to policy making, planning and management of green infrastructure. Hence this study is focused on the residents' perception of green infrastructure delivery in Osogbo, the capital of Osun State, Nigeria.

METHODOLOGY

Data for the study were from both primary and secondary data sources. Primary data for this study were obtained through field observation and administration of questionnaire. The questionnaire addressed issues on residents' socio-economic characteristics, condition of green infrastructure, level of importance and satisfaction that residents attached to and derived from green infrastructure and factors influencing the perception of residents on green infrastructure. The study population for this study comprised residents in the different residential zones of Osogbo Township.

Multi-stage sampling technique was employed for the study. The first stage is the stratification of residential areas in Osogbo into: the core, the transition and the suburban.

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The second stage involves the identification of selected electoral wards in each residential zone across both Osogbo and Olorunda Local Government Areas. Information obtained from Independent National Electoral Commission [INEC] (2018) revealed that there are 24 electoral wards within Osogbo Township. The third stage is the selection of an electoral ward through purposive sampling in each residential zone of the two local government areas. Through this method, six (6) wards from the residential zones were selected. The target population for information were the household head in the selected electoral wards which formed the sampling frame.

The fourth stage is the identification of streets in each selected electoral wards. Reconnaissance survey revealed that there were 484 streets in the selected electoral wards in the three residential zones. The distribution showed that there were 195, 181 and 108 streets in the core, transition and suburban residential zones respectively. One of every 10 (10%) of the total number of the streets were selected. Thus, 50 streets were selected in all the residential zones.

The next stage is the identification of residential buildings along the selected streets. Information obtained from Google Earth and author's field survey showed that there were 846, 715 and 563 buildingsin the core, transition and suburban residential zones respectively. Systematic sampling technique was adopted in selecting one out of every 10 buildings (10%) on the selected streets thus every 10th building was selected. In all, a total number of 212 buildingswere selected including 85, 72 and 56 in the core, transition and suburban zones respectively and this formed the sample size. In every building selected, an adult resident was selected (mostly household head). Secondary information such as maps, the number and names of political wards and buildings were obtained from the office of the Surveyor General of the Federation, Independent National Electoral Commission Osogbo and Google Earth respectively.Data collected was analyzed based on the objectives of the study.

RESULTS AND DISCUSSION

Residents' Socioeconomic Characteristics

The socioeconomic attributes considered includes gender, age, educational status and monthly income. Others are: marital status, occupation, household size, length of stay and the ethnic background. These variables are being discussed because they are imperative in evaluating people's perception about any subject (Stern & Guangano, 1998; Sadalla et al, 1999; Allan & Philip, 2001; Dunlap and Jones, 2002; Afon, 2011). The analysis was carried out and the results were discussed based on the three residential areas identified for the purpose of the study.

Gender of Respondents

Presented in Table 1 is the gender distribution of residents in the three residential areas. In the core area, 61.2% of the respondents were male while 38.8% were female. This was similar to the case of transition area. Male respondents comprised 59.7% of the respondents while female respondents accounted for 40.3%. Also in the suburban area, the proportion of male respondents (63.3%) was more than that of female respondents (36.4%). In all the residential areas, the proportion of male respondents (61.3%) was higher than the proportion of female respondents (38.7%). The result of Chi-square tests (χ^2 = 85.121, p = 0.000) revealed that there was a significant difference in gender distribution across the three residential areas. It could be inferred from the findings that there were higher responses from male respondents across the three residential areas. This could be because men by tradition are the household heads. This also confers on them the role of getting involved in communal matters. This could be issues of green infrastructure provision, security and safety among others.

Table 1. Gender of Respondents in the study area

Gender	Core		Transition		Suburban		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Male	52	61.2	43	59.7	35	63.6	130	61.3
Female	33	38.8	29	40.3	20	36.4	82	38.7
Total	**85**	**100.0**	**72**	**100.0**	**55**	**100.0**	**212**	**100**

Source: Author's Field Survey (2019)

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Age of respondents

Age of respondents is one of the fundamental socioeconomic attribute that can provide information on residents' perception to green infrastructure. McGehee and Andereck (2004) ascertained this in their study on the development of public infrastructure and perception of the positive or negative attitude of residents' provision of green infrastructure. Summarized in Table 4.2 are the age differences of household heads in the three residential areas of the study area. The age of household head was grouped based on dependency or youth (18-30 years), active population or young adult (31-60 years) and old adults or retired (above 60 years).

From the summary of age distribution of respondents presented in Table 2, it was evident that 52.4% of respondents in Osogbo were young adults. The youth and adult respondents accounted for 11.2% and 36.0% respectively. However, the age distribution of residents within the identified residential areas of Osogbo revealed that young adults were dominant in the three residential areas. This age group constituted 58.8%, 65.1% and 23.6% respectively in the core, transition and suburban areas of Osogbo respectively. Next in descending order were the old adults. This group of respondents accounted for 42.2%, 33.3% and 41.1% in the core, transition and suburban residential areas respectively. The implication of this; according to Akinola (1998) is that the reasoning level of matured adults with respect to disaster assessment of green infrastructure is expected to be high.

Further analysis shows that the minimum age was 26 and the maximum was 68. The mean age and standard deviation for the study area were 44.0 and 10.1 respectively. The mean age of respondents in the high, medium and low residential areas were 42.8 years, 46.9 years and 44.4 years respectively. The standard deviation about the mean age of respondents in the high density area was 9.5 years; it was 10.9 and 9.3 years in the medium and low residential areas respectively. This indicates variation in age distribution of respondents across the three residential zones. The result of Analysis of Variance ($F = 5.761$ and $p = 0.003$) further confirmed the variation. This implies that age plays a significant role in the opinion of residents on green infrastructure in the study area.

Table 2. Age of Respondents in the Study Area

Age	Core		Transition		Suburban		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
18 – 30	-	-	1	1.6	15	27.3	16	11.2
31 – 60	50	58.8	48	65.1	13	23.6	111	52.4
Above 60	35	42.2	24	33.3	27	41.1	78	36.0
Total	**85**	**100**	**72**	**100**	**55**	**100**	**212**	**100**

Source: Author's Field Survey (2019)

Marital Status of Respondents

One other vital trait of respondents that has been established to be significant to how an individual would manage environmental issues is their marital status. The respondents' marital status was classified into two: married and single. Married group consisted of respondents that had at least once been double. The group therefore include: divorcees, separated and widowed among others.

From the summary presented in Table 3, it was established that 58.5% of household heads in the study area were married. Investigation of the same social attribute in the different residential densities revealed that married household heads were the most predominant group. This group constituted 57.7%, 63.9% and 52.7% respectively in the core, transition and suburban residential areas of the Osogbo respectively.Differences in the marital status of household heads across the three residential areas were statistically significant. The Chi-square result of ($\chi^2 = 25.322$ and $p = .000$) confirmed this.

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Table 3. Marital Status of Respondents in the Study Area

Marital status	Core		Transition		Suburban		Total	
	Frequency	(%)	Frequency	(%)	Frequency	(%)	Frequency	(%)
Married	49	57.7	46	63.9	29	52.7	124	58.5
Single	36	42.3	26	36.1	26	47.3	88	41.5
Total	**85**	**100**	**72**	**100**	**70**	**100**	**212**	**100**

Source: Author's Field Survey (2019)

Educational Status of Residents

Another variable considered to influence residents' perception to green infrastructure is education status of respondents which is important to this study. Education is an attribute that could aid resident's perception to green infrastructure. For the purpose of this study, educational backgrounds of respondents are classified into three (3), which are, primary, secondary and tertiary education.

Table 4 presents information on the educational level of respondents across the three residential densities in the study area. It was discovered that respondents that had secondary education and tertiary education in the core area accounted for 43.5% and 47.1% respectively while respondents with primary education accounted for 9.4%. %. In the transition area, respondents with tertiary education dominated the area with 66.6%, while respondents that had at least secondary education accounted for 26.4%. Also, suburban area demonstrates relatively educationally enlightened respondents. This is because 76.4% and 23.6% of the respondents had tertiary and secondary education in the residential area respectively. In all the three residential areas, 61.3% of the respondents had tertiary education, 32.5% had secondary education while 6.2% had primary education.

Specifically, it is shown in the table that there was variation in the educational distribution of respondents across the three strata. This was further corroborated by chi square results (χ^2 28.381= 25.087 and p = 0.000). The chi-square analysis revealed that the difference in education could significantly influence residents' perception on the importance of green infrastructure across the different residential areas of Osogbo.

Table 4. Educational Status of Residents in the Study Area

Education status	Core		Transition		Suburban		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Primary	8	9.4	5	7.0	-	-	13	6.2
Secondary	37	43.5	19	26.4	13	23.6	69	32.5
Tertiary	40	47.1	48	66.6	42	76.4	130	61.3
Total	**85**	**100**	**72**	**100**	**55**	**100**	**212**	**100**

Source: Author's Field Survey (2019)

Occupation of Respondents

Information on the occupation distribution of respondents in the study area is presented on Table 5. This study established that 26.9% of the respondents were traders, 40.1% were casual worker, 9.4% were civil servant, 17.9% were working in the private sector, while others such as artisans of varying occupations accounted for 6.6%. However across the three residential areas, majority of the respondents were casual worker. This accounted for 38.8%, 39.7% and 41.8% in the core, transition and suburban residential areas respectively. The variation in occupational status of respondents in the three residential areas was statistically significant through the Chi-square test computed (χ^2 = 37.396 and p =0.000).

Table 5. Occupation of Respondents

Occupation	Core		Transition		Suburban		Total	
	Freq.	%	Freq	%	Freq	%	Freq	%
Traders	29	40.0	12	15.9	16	28.6	57	26.9
Casual worker	33	38.8	29	39.7	23	41.8	91	40.1
Civil service	10	11.7	2	3.2	08	14.3	20	9.4
Private sector	3	3.5	30	41.3	05	8.2	38	17.9
Others	10	11.7	–	–	04	7.1	14	6.6
Total	**85**	**100**	**72**	**100**	**55**	**100**	**212**	**100**

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Source: Author's Field Survey (2019)

Income Status of the Respondents

The income status of the respondents could influence the act of residents towards the green infrastructure. Thus, in this context it is neces[illegible] the respondents in the study area. Reconnaissance survey carried out on household heads was based on the Osun State Civil Service Salary scale. Household head who are on salary grade levels 01-06 were categorised as low income earners, those on grade levels 07-10 were middle income earners and those on the grade levels 12 and above were high income earners. Therefore, information obtained from Osun State Civil Service Commission showed that the low income earners earned below ₦24,500; while that of middle earner earned between ₦24,501 and ₦54,000 and the high income earner earned above ₦54,000.

As presented in Table 4, below residents that earned below ₦24,500 had a proportion of 48.2%, 8.5%, and 3.2% in the core, transition and suburban residential densities respectively. Residents that earned between ₦24,501-₦54,000 accounted for 32.9%, [illegible] 30.3% in the core, transition and suburban [illegible]. Also, residents that earned above ₦ 54000 represented 82.7%, 15.0% and 2.5% in the three residential densities respectively. Hence, in the study area, it was observed that the middle income earner had the highest proportion with 40.1%, while residents that were high income and low income earners accounted for 24.5% and 38.2% respectively.

Further analysis revealed that variation in income of respondents across the three residential areas was statistically significant (F= 183.484 and p = 0.000). With variation in the average monthly income of household heads, this study hypothesized that perception on green infrastructure will also vary among residents in Osogbo.

Table 6. Income Group of Respondents

Income classification	Core		Transition		Suburban		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Below ₦24, 000 (LI)	41	48.2	6	8.5	5	3.9	52	24.5
₦24501-54000 (MI)	28	32.9	36	48.9	17	30.3	85	40.1
Above ₦54,000 (HI)	16	18.8	31	42.6	34	61.6	81	38.2
Total	**85**	**100**	**72**	**100**	**55**	**100**	**212**	**100**

Source: Author's Field Survey (2019)

Household Size of Respondents

Household sizewas measured by the number of family members living together under one roof and maintaining a unique eating arrangement (National Bureau of Statistics 2009). The variable captures the effect of the size of a household on the condition and distribution patterns of green infrastructure in the study area. For the purpose of this study, Jim and Chen, (2006) household size classification was adopted. Household with 6 members and below, household that contained 7 to 10 members and household with more than 10 members. These were respectively regarded as the small, medium and large sized household size.

From the summary presented in Table 7, low residential density area had the largest proportion of respondents with small sized household. This group accounted for 90.2% of the households within Osogbo area. Households in the medium and high densities with small sized household were 78.7% and 7.4% respectively. Also, the analysis of the household that were medium size revealed that the largest proportion were in the high. This group accounted for 28.4% in the study area. However, 21.3% of the respondents in the medium residential area were of medium sized household.

The average household size for the study area is consistent with the national average reported by National Bureau of Statistics (2006). The average household size for the study area was 5 while it was 6, 5 and 5 respectively in the high, medium and low residential areas.The minimum household sizes for the high and medium residential areas, were 1 while that of the low density was 2. The respective maximum household sizes for the high, medium and low densities were 13, 8, and 8 respectively.

Difference in household size across the three residential areas was significant. The result of the One Way Analysis of variance (F= 4.304;

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p=0.014) confirmed the variation on this demographic attribute of respondents in the study area. It can be concluded that the reduction in average household size from high residential areas towards the low residential area was statistically significant.

Table 7. Household Size in the Different Residential Densities

Household Size	Core		Transition		Suburban		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Small	6	7.4	57	78.7	50	90.2	113	53.3
Medium	24	28.4	15	21.3	5	9.8	44	20.8
Large	55	64.2	–	–	–	–	55	25.9
Total	**85**	**100**	**72**	**100**	**55**	**100**	**212**	**100**

Source: Author's Field Survey (2019)

Residents Length of Stay

It has been noted that length of stay influences residents' awareness and perception of their environment (Jayamala, 2009, Sanni et al 2010). The relevance of length of residence is therefore important to this study. The number of years a household has been living in an area was therefore categorized into four. That is, 1 - 10 years, 11 – 25 years, 26 – 40 years and above 40 years and this is presented in Table 4.8. It was revealed that 71.4%, 68.1% and 56.9% of the respondents respectively in the core, transition and suburban residential areas had been there for 1 to 10 years. The proportion of respondents who had stayed between 11 and 25 years in the three residential areas was respectively 14.3%, 29.2% and 16.7%. Those who had stayed between 26-40 years in the core, transition and suburban areas accounted for 14.3%, 2.8% and 20.8% respectively while those that have spent above 40 years were found in the suburban residential area and this accounted for 5.6%.

The descriptive statistics of the respondents' length of stay in the study area revealed that the minimum length of stay was 2 year, while the maximum was 58 years. The mean and standard deviation of respondents' length of stay in the study area were 6.5 and 6.4 years respectively. The mean length of stay was respectively 7.1, 6.4 and 6.1 years for the core, transition and suburban residential areas. The standard deviations of length of residency for the core, transition and suburban residential areas were 6.6, 5.1 and 4.1 years respectively. Also, variation in residents' length of stay in the different residential densities was significant (F = 3.366 and *p* = .036).

Table 8. Length of Stay

Number of years	Core		Transition		Suburban		Total	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
1 – 10	61	71.4	49	68.1	31	56.9	141	66.5
11 – 25	12	14.3	21	29.2	9	16.7	42	19.8
26 – 40	12	14.3	2	2.8	12	20.8	26	12.3
Above 40	–	–	–	–	3	5.6	3	1.4
Total	**85**	**100**	**72**	**100**	**55**	**100**	**212**	**100**

Source: Author's Field Survey (2019)

Satisfaction Derived from Green Infrastructure in the Study Area.

It is one thing for infrastructure to be available; it is another for residents to derive satisfaction from such infrastructure. It is expected that the higher the importance attached to an infrastructure, the higher the satisfaction respondents would derive from it usage. Therefore, in order to critically examine residents' perception of available green infrastructure, the satisfaction that residents derived from available green infrastructure will be examined. For ease of analysis, the green infrastructures weremeasured through a personally devised index termed *ResidentsSatisfactionIndex*(*RSI*). Residents rated the identified fourteen green infrastructure which were obtained through literature review using one of the five Likert scales of 'Very satisfied' (VS), 'Satisfied' (S), 'Unsure' (US), 'Dissatisfied' (DS), 'Very Dissatisfied' (VDS). The findings are presented in Table 9.

In the study area, the green infrastructure that respondents' derived the highest level of satisfaction were parks (RSI_s= 3.55). Other

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green infrastructures arranged in the order of the satisfaction derived were outdoor sport fields, street trees, allotments, and green roof. The respectively RSI were 3.37, 3.29, 3.10 and 3.09. [Each of which is higher than the study area index (RSI_s= 3.08)]. The green infrastructure that respondent s' derived satisfaction less than the study area's average were; urban forests, home gardens, green corridors, public green spaces, rain gardens, blue roof, vertical greening, city square and plazas and cemetery& religion yards.

In the core area, with an index of 3.97, 3.90, 3.69, 3.37, 3.32, 3.12 and 3.07 respectively (each of which is higher than the core residential area index (RSI_s= 2.94)), the green infrastructure that residents derive the highest satisfaction were: street trees, parks, outdoor sport fields, home gardens, allotments, green roofs, green corridors and urban forests. Similarly, in the transition area, the green infrastructure residents derived the highest satisfaction from were: 'outdoor sport fields', 'parks', 'street trees', 'allotments', 'urban forests' and 'green roofs'. The respectively *RSI* were 3.15, 3.08, 2.86, 2.54, 2.29 and 2.21 (each of which is higher than transition area index (RSI_T = 2.12). Likewise, investigation in the suburban area confirmed that residents derived the highest satisfaction from parks (RSI_{is}= 3.67). Other green infrastructure that residents derive the highest satisfaction arranged in other of significance were: 'green roofs', 'green corridors', 'allotments', 'urban forests', 'home gardens' and 'street trees'. The respectively RSI were 3.50, 3.41, 3.41, 3.28, 3.18 and 3.03.

Table 9:Satisfaction derived from Green Infrastructure in the Study Area

Green Infrastructure	Core RSI	Transition RSI	Suburban RSI	Study Area RSI
Parks	3.90	3.08	3.67	3.55
Street trees	3.97	2.86	3.03	3.29
Outdoor sport fields	3.69	3.15	3.28	3.37
Allotments	3.32	2.54	3.41	3.10
Urban forests	3.07	2.29	3.28	2.88
Green roof	3.31	2.21	3.50	3.09
Home garden	3.37	1.91	3.18	2.82
Green corridors	3.12	1.42	3.41	2.98
Public green space	2.22	2.04	2.80	2.35
Rain gardens	2.81	1.69	2.67	2.39
Blue roof	2.09	1.84	2.62	2.18
Vertical greening	2.64	1.74	1.82	2.07
City square and plazas	2.23	1.80	1.78	1.94
Cemetery& religion yards	1.35	1.09	1.22	1.22
Mean Aggregate	RSIc = 2.94	RSI_T =2.12	RSI_S =2.91	RSIs=3.08

Source: Author's Field Survey (2019)

In order to appreciate the importance of the degree of satisfaction expressed by residents, the 14 green infrastructures were classified into four main groups using multi criteria analysis. This was adopted from Arianoutsou et al (2011). The four main groups were (a) indicators with positive deviation about the mean of GIII but with negative deviation about the mean of RSI (b) indicators with negative deviation about the mean of GIII but with positive deviation about the mean of RSI (c) indicators with positive deviation about the mean of GIII and RSI; and (d) indicators with negative deviation about the mean of GIII and RSI.

Group A: These were indicators considered to be very basic to human existence that is, they were with high importance to residents but the satisfaction derived from them was very low. These variables were public green spaces, rain gardens and green roofs. It can be deduce that the low level of satisfaction that residents derive from these green infrastructures which is very important would strongly influence their perception about the infrastructure in the study area.

Group B: The second group of indicators was those not considered to be of high priority in meeting the needs of residents, but respondents' derived a very high level of satisfaction with them. The indicators in this category were parks, street trees, allotments, outdoor sport fields and urban forests This implies that these indicators would strongly influence respondents perception about the environment despite not seen as a priority.

Group C: This group is made up of indicators considered by respondents to be important in

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satisfying their needs. These indicators were city square and plazas, green corridors, vertical greening and home gardens. These are highly priorities facilities and a very significant influence on the perception about the environment. The absence of these facilities can force respondent to employ self-help.

Group D: In this group are indicators that respondents attached little or no importance to and satisfaction derived from them was also low. This was so as respondents improvised substitutes for themselves. Included among the indicators were cemetery and religion yards and blue roofs. Typical examples of these are people burying their love ones in front of their houses and convert every building available to religion yards in the study area.

Table 10. Deviation about the means of GIII and RSI

Group	Environmental attributes	Deviation about FII	Deviation about RSI
A	Public green space	0.44	-0.71
	Rain gardens	0.39	-0.03
	Green roof	0.34	-0.07
B	Parks	-0.08	0.49
	Street trees	-0.08	0.71
	Allotments	-0.12	0.63
	Outdoor sport fields	-0.16	0.22
	Urban forests	-0.17	0.83
C	City square and plazas	0.35	1.05
	Green corridors	0.32	0.07
	Vertical greening	0.31	0.25
	Home garden	0.29	0.20
D	Cemetery& religion yards	-0.02	-0.54
	Blue roof	-0.53	-0.17

CONCLUSION AND RECOMMENDATIONS

The study examined residents' perception of the available green infrastructure in different residential areas of Osogbo. In achieving this, the socioeconomic background of residents, condition of available green infrastructure, and residents' level of satisfaction with green infrastructure in the study area were examined. Based on the findings from the study, it is concluded that basic green infrastructure that are important for promoting public health and providing valuable ecosystem services to urban dwellers are not equitably distributed in the three residential areas of Osogbo. It was also discovered that residents' levels of satisfaction and importance attached to the available green infrastructure were generally low. This is due to the lack of accessibility, poor state of some green infrastructure, absence of policy instruments that encourage community involvement and unavailability of information to residents about the importance of green infrastructure to their wellbeing in the three residential densities. In addition, this study concluded that infrastructure provision, spatial and socio economic factors play an important role in influencing residents' perception of green infrastructure in the study area.

Based on the conclusion of this study, the following recommendations are proffered as policy guidelines towards the provision and utilization of green infrastructure in the study area.

Through the analysis, it became evident that the existing green spaces were insufficient in number and their distribution was unsatisfactory for over half of the study population. In light of the increasing urban development pressure, this study recommends the need for additional green spaces and protection of the existing green infrastructure network to create a climate-resilient development in the study area.

Government must also be willing to put in place planning framework that is eco-friendly, and master plan that provides for green infrastructure. Such that both public and private development plans include green spaces in their designs which must be rigidly adhered to and those that lack green infrastructure are provided with. This will help complement the already available ones.

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The three tiers of government need to engage in public-private partnership to enhance and bring about adequate green infrastructure delivery in Nigeria communities. For this to be well incorporated there is need for government to involve private organisations and interested individuals in planning, budgeting, provision, maintenance, monitoring and evaluation of green infrastructure. This will bring about development of various spheres of life such as recreation, agricultural, educational, health and nutrition in the country.

Government also need to sensitise the public about the multiple benefits offered by urban green infrastructure. Findings revealed that green infrastructure benefits are not equally understood or appreciated among the residents and this actually affected the residents' level of satisfaction and importance attached to the available green infrastructure in the study area. The use of communication tools, such as information, consultation, and public participation, would be therefore crucial to increase level of awareness among the residents on the importance of green infrastructure to their wellbeing.

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