

Landscape Perception of Urban Greenery in Residential Areas in Enugu Metropolis

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Abstract: Landscape perception in urban greenery focuses on how people perceive and evaluate spaces and these perception relates to benefits experienced. Natural landscapes are perceived as more visually appealing, more calming and restorative, and more conducive to relaxation and leisure activities. The contrasting urban greenery of Enugu metropolis is a result of complex interplay of residential area densities and social systems and continues to be depleted. This study aimed at assessing landscape perception in urban greenery in residential areas in Enugu metropolis as categorised into high, medium and low densities. This was achieved by determining how local residents value urban greenery and examining local residents preference of urban greenery as a development initiative. A total of 389 respondents in all three densities were interviewed using a structured questionnaire. The results showed that urban greenery received higher residents' prioritization ranking in low density areas than in medium and high densities. Notwithstanding, most of the surveyed respondents 84% knew of the benefits of trees while 11% thinks it is of no value and as low as 5% are ignorant of it's benefits. The study recommends that indiscriminate falling of trees by the Enugu Electricity Distribution company should be checkmated, the few available open spaces in high density areas should be procured for afforestation, baseline data on urban greenery at community level should be captured.

Keywords: Urban greenery, Landscape perception, Landscape value

I. Introduction

In recent times, the natural landscape is constantly diminishing and agricultural land use changes are increasing as a result of industrialization, global trade development, improved utilities and infrastructure, and a rapidly advancing process of urbanisation (Mottet et al., 2006). A lot of literature has concentrated on society's visual preferences for different landscapes. Some research specially discussed people's preferences for wild (natural) contrasting managed landscape and the related influential factors. Research on landscape perception in urban green spaces has focused on understanding how people perceive and evaluate these spaces, and how these perceptions and evaluations are related to the benefits that are experienced. Özgüner and Kendle (2006) examined the public perception on naturalism in contrast to more formally designed urban green spaces; and they compared the experienced values and sensory benefits of the two landscape styles and respondents' preferences for them. Van den Berg and Koole (2006) found that the variables of place of residence, age, socio-economic status, farming background, preference for green political parties and recreational motives were correlated with relative preferences for wild versus managed nature scenes.

There have been studies particularly into investigating the preferences for different residential landscape styles in relation to individual factors. Larsen and Harlan (2006) found that residents' preference for front yard landscape type of lawn, desert and oasis was related to income level. Acar and Sakıcı (2008) concluded that the demographic and expertise status of the participants were correlated with the preferences for types of urban rocky habitat scene and management options. Van den Berg and Van Winsum-Westra (2010) explored residents' preference for three allotment gardens styles related to the personality trait personal needs structure: manicured, romantic and wild. The study of Zheng et al. (2011) explored students' preferences for natural and wild, versus clean and neat residential landscapes correlated with the variables including the engaged disciplines, place of residence, environmental attitudes and their parents' education levels.

One key finding from this research is that people generally prefer natural landscapes to more built-up, urban environments. Natural landscapes are perceived as more visually appealing, more calming and restorative, and more conducive to relaxation and leisure activities. People also tend to perceive natural landscapes as being more healthy and environmentally friendly, and as providing more opportunities for physical activity. Amidst all these researches, there is no study whatsoever as to the residents' perception on urban greenery in Enugu state and Nigeria at large. Also, research has also shown that people's perceptions of urban green spaces can be affected by their personal characteristics and experiences, such as their age, gender, cultural background, and previous exposure to natural environments. Notwithstanding, there is no research on landscape perception in urban green spaces of Enugu metropolis and the value residents place on them to collaborate this information. Thus, there is a need for this research in order to design and manage these spaces in ways that enhance their perceived and actual benefits.

This study firstly pursues the investigation into the value residents place on urban greenery and desire to be in close proximity to urban green space (recreation needs). Numerous literature has suggested that there is an increasing desire for human contact with nature but there is a lack of research with quantitative data in Enugu and Nigeria at large. This study attempts to quantify the value residents' place on urban greenery within their community based on generalised demands on outdoor natural environment, and disparity of urban greenery in different respondent communities. Secondly, preference rating of urban greenery as a key development initiative, which could generate more visits and/or greater physical activities (Velarde et al., 2007), and might in turn amount to health benefits (Park et al., 2011). This study discusses the issues of lack of provision of urban green spaces, and to a certain extent affords insight into ways to meet people's needs for better recreation

II. Methodology

Explaining the sensory function of greenery on people can be challenging. Various methods can be applied for measuring people's opinions, values, attitudes and perceptions of urban greenery and they include surveys, interview methods and audits. This study employed primary sources of data collection via interviews, semi-structured questionnaires, field observation, drawing upon the strengths of these different methods to improve the quality or validity of the data. Descriptive data collection technique for text data which displayed individual opinions of respondents. The importance of the study was made known to the respondents before data was collated.

The research utilised stratified random sampling method in selecting respondents from the three residential densities interviewed in Enugu metropolis. 389 respondents representing 97.25% of the sample population in the selected residential classes were interviewed. The questionnaire was sub-divided into three components namely; respondents socio-economic characteristics, residential environmental conditions and respondent's judgement which comprises recognition, value, prioritisation and willingness was collated to form primary data for the research.

Research area

Enugu State is located in the South-Eastern geopolitical area of Nigeria, between 06^o21^oN and 06^o30^oN and between longitude 07^o26^o E and 07^o37^oE. The land area of the city is estimated at about 72.8 square kilometres. Enugu metropolis is bounded in the East by Nkanu East Local Government Area, in the West by Udi Local Government Area, in the North by Enugu East Local Government Area and in the South by Nkanu West Local Government Area. The metropolitan territory is generally characterised by hilly land with a few rivulets, plain and valleys. The mean daily temperature is 26.7^oC (80.1^oF). The weather periods that occur in the city are the rainy season and the dry season.

Issues of Urban greenery

Urban greenery remains a subject of global discussion and encompasses all trees in the urban landscape, whether privately or communally owned. Nowak et al. (2001) concedes that urban greenery includes road signage and furniture and private or public green parks. Thus, by definition, urban green entails all trees, forest resources, open spaces and green landscapes in the urban area. Miller (1988) suggests that urban green is a management strategy to plan trees and manage forest within and around cities for environmental benefit. This entails the conscious planting, financing, regulations, mandates and operational management in order to be effective. Therefore, urban greenery blends with the city population and the built environment and its benefits are economic, social, environmental and recreational (McPherson, 2006). Numerous literature concedes to the importance of urban greenery close to the people but these researches are centred on trees, rather than the beneficial population (Carter, 1992). Thus an inquiry into people's perception of urban greenery and the value residents ascribe to urban greenery is the primary aim of this research.

Landscape Perception

Landscape perception refers to the way in which people perceive, interpret, and evaluate the natural and built environments around them. It involves both cognitive processes (such as attention, memory, and categorization) and emotional responses (such as pleasure, stress, and awe). Landscape perception is influenced by both intrinsic and extrinsic factors, such as an individual's personal characteristics and experiences, as well as the physical characteristics of the landscape itself.

Characteristics of Landscape Perception

According to Zhang et al., (2013) some of the key characteristics of landscape perception include:

- Visual appeal: People tend to prefer landscapes that are visually appealing, with a balanced composition of elements such as colour, form, and texture.

- **Attention:** People's attention is drawn to certain aspects of the landscape, such as focal points or points of interest, and these aspects can influence their overall perception of the landscape.
- **Memory:** People's memories of past experiences in a landscape can influence their current perception of the landscape.
- **Personal relevance:** People's perceptions of a landscape can be influenced by its relevance to their personal interests, values, and needs.
- **Cultural context:** People's perceptions of a landscape can be shaped by the cultural and social context in which they experience the landscape.
- **Emotional response:** People's emotional responses to a landscape, such as feelings of pleasure, relaxation, or stress, can influence their overall perception of the landscape.

It is imperative to note that these key characteristics are perceived individually. Consequently, the feedback from the respondents depends to a great degree on the awareness level of the observer.

Cognitive and Emotional Responses to Urban Greenery

According to Van den Berg et al., (2014) how people respond to the various elements of urban greenery can be categorised; cognitive and emotional response. Cognitive responses pertain to the way individuals process and make sense of sensory input. This includes visual or mental imagery, or individual understanding of experience. Both visual and mental imagery are closely linked to memory and the senses. This means that the way people respond to visual elements of the landscape and the use of sensory materials in design can create a certain feeling or mental response. Urban green spaces are often designed to elicit particular responses, such as creating a space for relaxation, contemplation, or play. For example, the use of water elements is often used as a way of creating a calming response. Additionally, visual elements, such as artwork or signage, can be used to create a certain message or feeling within a space, such as promoting social justice.

Physical Characteristics of Urban Green Spaces

A significant portion of the perceived environment is based on the physical characteristics of urban green spaces, such as the amount of light, noise, and vegetation. The varying levels of light and shadow can create different moods that, in turn, will influence the way people respond to the space. There are many ways in which the level and type of light in urban green spaces can be manipulated to create a certain mood or effect. For example, in areas where there is a lot of foot traffic, such as parks and sidewalks, it is important to use light in order to provide a safe environment. On the other hand, in places where there is less foot traffic, such as cemeteries, darkness can be used as a way of creating an eerie and interesting setting. Zhang et al., (2015) suggested that there are several factors that can influence landscape perception in urban green spaces, including:

Naturalness: People generally prefer natural landscapes to more built-up, urban environments. Natural landscapes are perceived as more visually appealing, more calming and restorative, and more conducive to relaxation and leisure activities.

Water: The presence of water, such as a pond, river, or fountain, can enhance the visual appeal and restorative qualities of an urban green space.

Amenities and facilities: The availability of amenities and facilities, such as seating, playgrounds, and recreational facilities, can affect people's perceptions of an urban green space.

Vegetation and wildlife: The presence of vegetation and wildlife can enhance the naturalness and biodiversity of an urban green space, and can be perceived as more visually appealing and restorative.

Design and layout: The overall design and layout of an urban green space, including the arrangement of paths, plantings, and other elements, can affect people's perceptions of the space.

Personal characteristics and experiences: People's perceptions of urban green spaces can be affected by their personal characteristics and experiences, such as their age, gender, cultural background, and previous exposure to natural environments.

Effects of different design and management strategies on perception

Different designs and management strategies for urban green spaces can have a variety of effects on landscape perception. Some strategies that may enhance landscape perception include:

Maximising naturalness: Designing and managing urban green spaces to maximise their naturalness, such as by incorporating a diverse range of vegetation and wildlife, can enhance their perceived visual appeal, restorative qualities, and biodiversity.

Incorporating amenities and facilities: Providing amenities and facilities, such as seating, playgrounds, and recreational facilities, can make urban green spaces more attractive and functional for a wider range of people.

Enhancing visual appeal: Using design elements such as colour, form, and texture to enhance the visual appeal of an urban green space can improve people's perceptions of the space.

Creating a sense of enclosure: Designing urban green spaces to create a sense of enclosure, such as through the use of trees, hedges, or other plantings, can enhance the perceived intimacy and privacy of the space.

Incorporating natural features: Incorporating natural features such as water bodies, rock formations, and other topographic elements can enhance the perceived naturalness and visual appeal of an urban green space.

Promoting biodiversity: Designing and managing urban green spaces to promote biodiversity can enhance their perceived ecological value and contribute to the overall health and well-being of the space.

Overall, it is important to consider the specific goals and context of an urban green space when designing and managing it, in order to enhance its perceived and actual benefits for people and the environment.

Description of the study location and sample population

The residential urban space of Enugu metropolis is not a continuous zone but arbitrarily defined, circumscribing about twenty neighbourhoods and some inner open space. The urban residential space in Enugu is categorised into low, medium and high density areas. The low density areas account for about 5% of the residential areas in Enugu and includes neighbourhoods like G.R.A, Independence layout, and parts of Trans-Ekulu. Plot sizes range from 900 - 3600 sqm and a density of 18 - 60 persons per hectare. Medium density neighbourhood accounts for about 28% of the residential areas of Enugu and includes; Achara layout, Idaw-River, New haven, Uwani, parts of Trans-Ekulu and Maryland. The average density is about 350 to 400 persons per hectare with an average plot size of about 600 - 900 sqm. The high density residential areas in Enugu account for about 67% of the entire residential neighbourhood in Enugu (Enugu master plan, 1978). These areas include Coal camp, Ogui-Nike, Ogui new layout, Abakpa and Emene. These areas are dominated by tenement buildings and the population density in these areas is about 700 persons per hectare and the plot sizes range from 300 - 600 sqm. Some of these areas have grown into slums, creating health hazards due to overcrowding of habitable rooms and over use of available infrastructure.

For the purpose of this research, six neighbourhoods were selected from eighteen residential densities in Enugu Metropolis. Table 1 shows the sampled neighbourhoods according to their densities.

Table 1: Selected Neighbourhood and Residential densities.

S/N	NEIGHBOURHOOD	DENSITY
1	Independent Layout	Low
2	GRA	“
3	Trans Ekulu	Medium
4	Maryland	“
5	Uwani	High
6	Abakpa	“

Source: Researcher’s survey (2022).

Research Design

Based on the 1991 census, the selected neighbourhoods had a population of 146,960. According to United Nations (2015) Nigeria has an annual growth rate of 2.83%; the population of the selected neighbourhoods was projected to 1,103,773 in 2022. The number of households for each of the selected neighbourhoods was obtained by dividing the projected population of the respective neighbourhoods by six (6) which is the average household size in Nigeria. Table 2: shows the household population and number of questionnaires that will be administered.

Table 2: The sampled neighbourhoods and sample sizes

NEIGHBOURHOODS	2022 PROJECTED POPULATION	HOUSEHOLD POPULATION	SAMPLE SIZE
Abakpa	197,959	32,992	198
Uwani	69,630	11,605	70
Trans Ekulu	25,064	4,177	25
Maryland	10,192	1,699	10
Independent Layout	53,445	8,907	54
GRA	42,816	7,136	43
Total	321,032	66,516	400

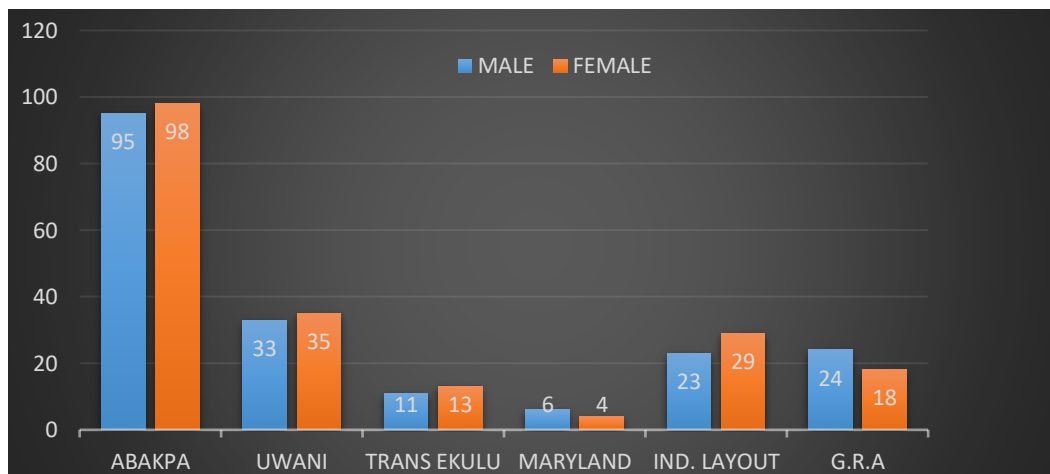
Source: Researcher’s Survey, (2022).

This research utilised home-based interviews in soliciting for respondents’ comments. The selected respondents were required to live in the sample community and experience the environmental conditions on a regular basis. The investigative interviews of 389 respondents was conducted between 8th September to 29th November, 2022 during weekday evenings and weekend mornings when residents are more available for conversations. For ease of data manipulation and increase of face-to-face interviews numbers, 70% of the questions for the interview were pre-coded with 30% left open-ended. In addition, respondents during prioritisation of street furniture, indicated five development project initiatives which they will like in their community in their order of preference (namely; drains, roads, tree planting, alley paving and street lights). This order of preference method supported weight ranking of the development projects which assisted in understanding the comparative value residents place on urban greenery in the community. Personal respondent’s questions included; perception on recognition and adequacy of urban trees and benefit and value of urban trees and greenery within their home and immediate environment.

III. Presentation of the study findings, including any statistical analyses

A total of 400 questionnaires were administered to the residents in the six selected neighbourhoods. 389 (which represents 97.25%) were recovered and 11 were not. Accordingly, Fig. 1 shows gender distribution of the sample population, with more female respondents sampled in each neighbourhood except from Maryland and G.R.A

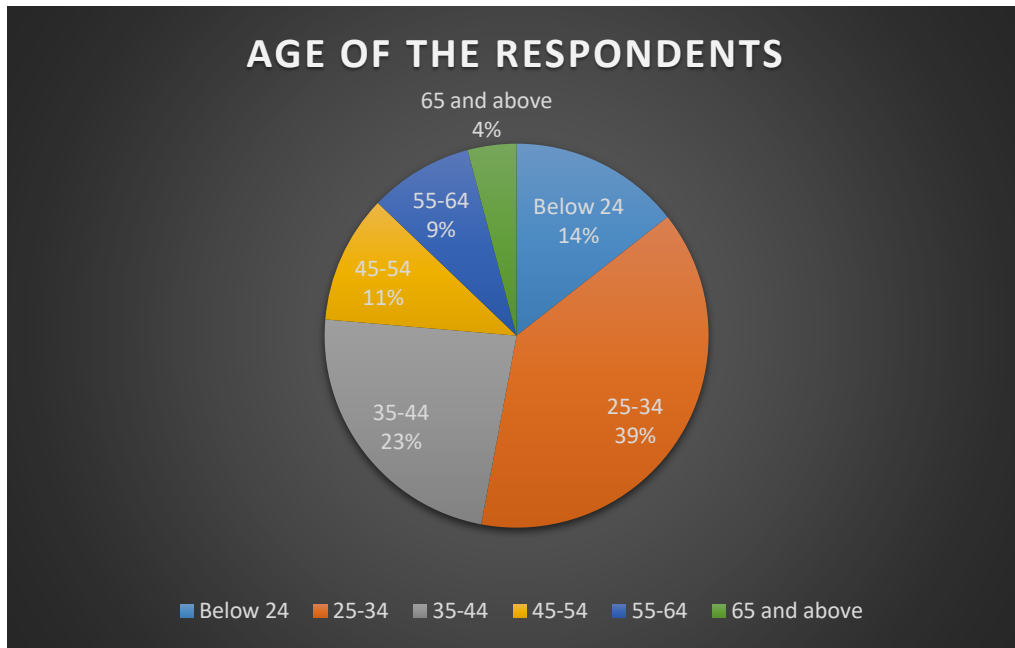
Figure 1: Sex of the respondents



Source: Field Work, 2022

The sample population is characterised by varying age limits ranging from 18 years to above 65 years. Figure 2 shows a chart of the age limits of the respondents with the highest sampled age limit being 25-34 years.

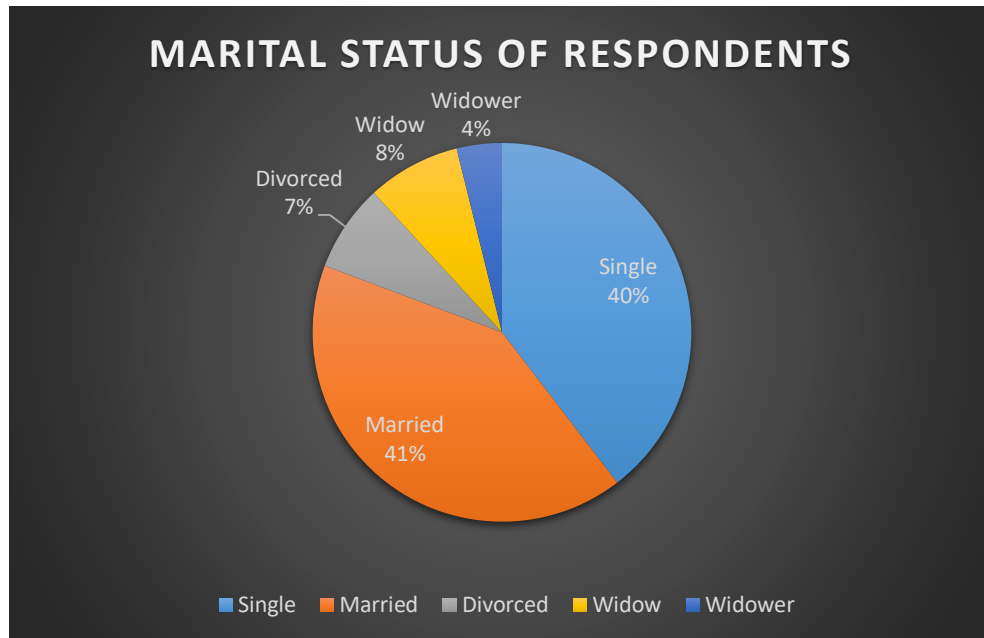
Figure 2: Age of the respondents



Source: Field Work, 2022

Figure 3 captured the marital status of the respondents, with 41% and 40% of the sample population Married and Single respectively. Other status captured were Divorced, Widow and Widower.

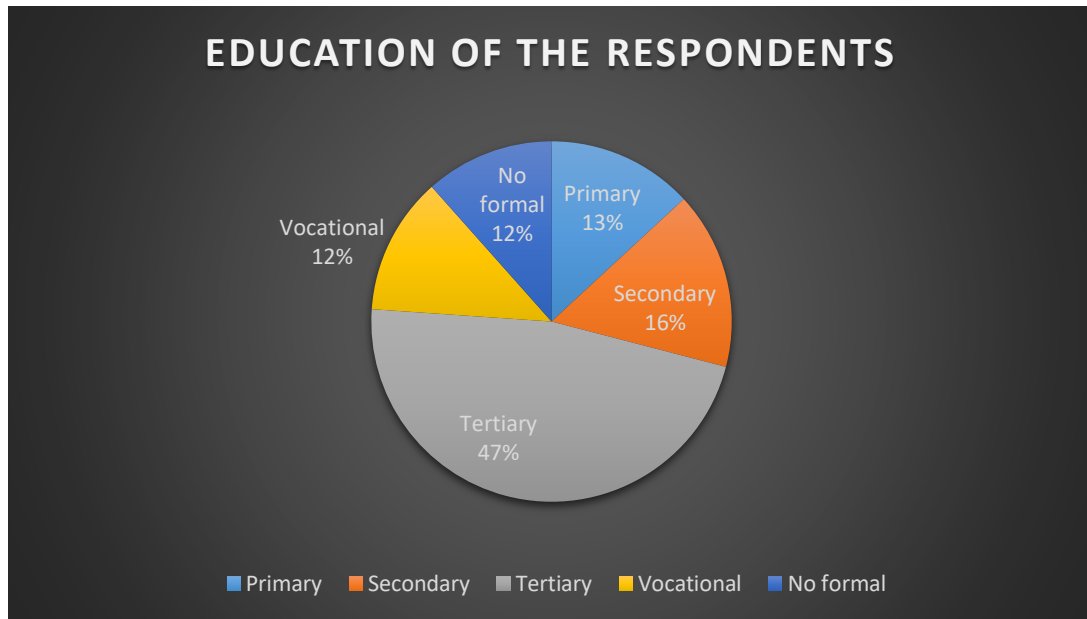
Figure 3: Marital Status of Respondents



Source: Field Work, 2022

The education level of the respondents captures the literacy level of the sample population. Fig 4 shows the education level of the respondents with as high as 47% of the sample population attaining tertiary education and as low as 12% with no formal education.

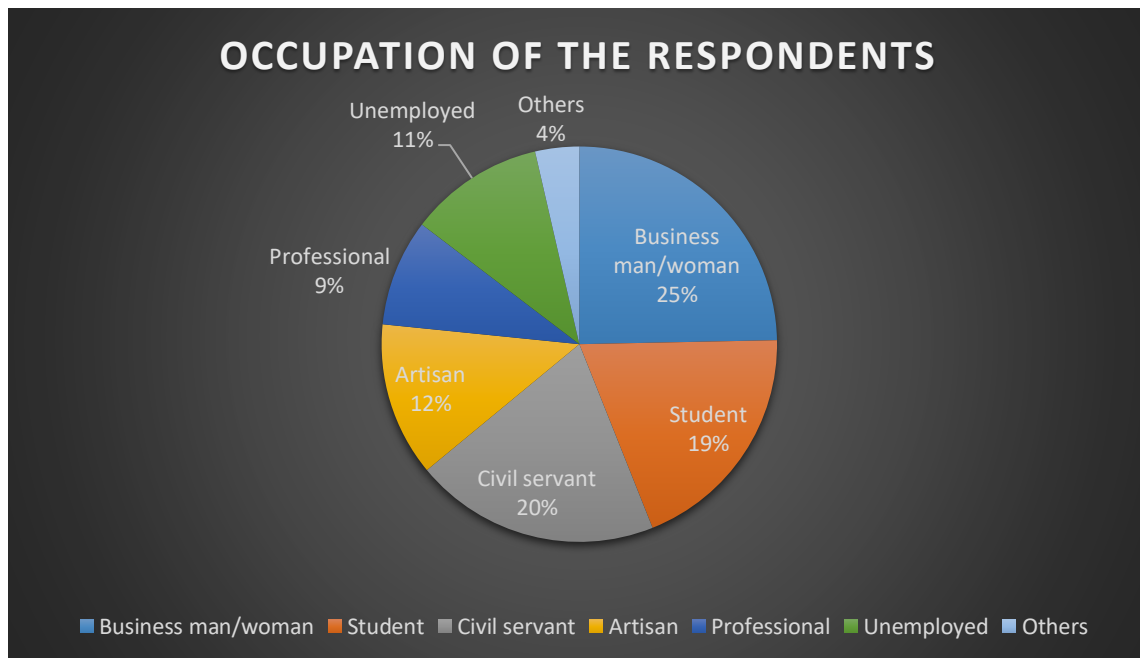
Figure 4: Education of the respondents.



Source: Field Work, 2022

The occupation of the respondents provides information on the availability of the respondents and empirical data on the income level. Figure 5 shows the occupation of respondents which includes; Business, Civil service, students, Artisans etc.

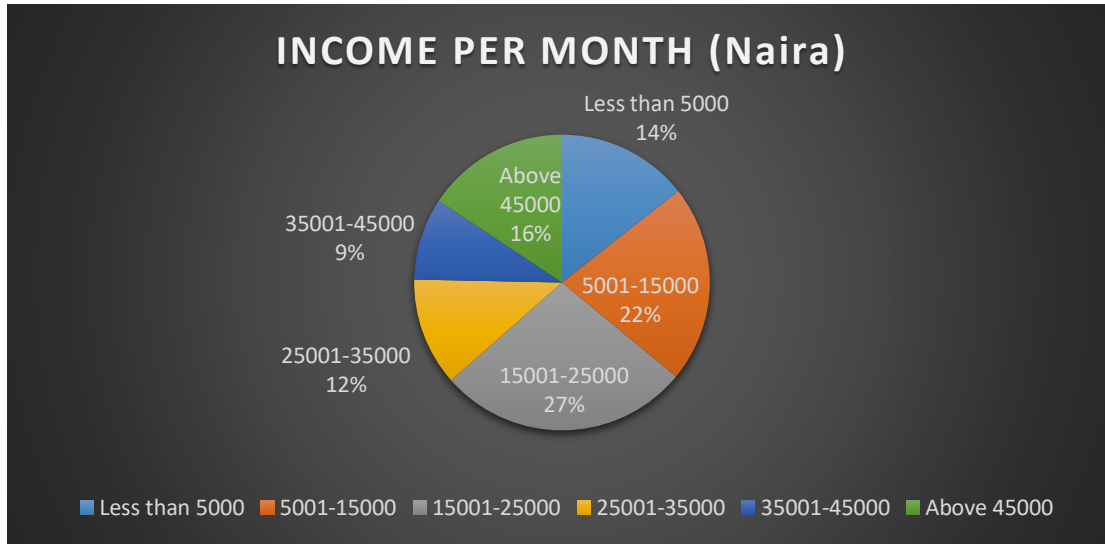
Figure 5: Occupation of the respondents



Source: Field Work, 2022

The three density types in Enugu can also be classified into income types; Low income, Medium income and High income areas. Fig 6 is a pie chart showing the income level of the respondents of which 27% of respondents earning between ₦15,001 - ₦25,000 per month were the highest sampled income.

Figure 6: Income per month of the respondents



Source: Field Work, 2022

Respondents' value of urban greenery within their community

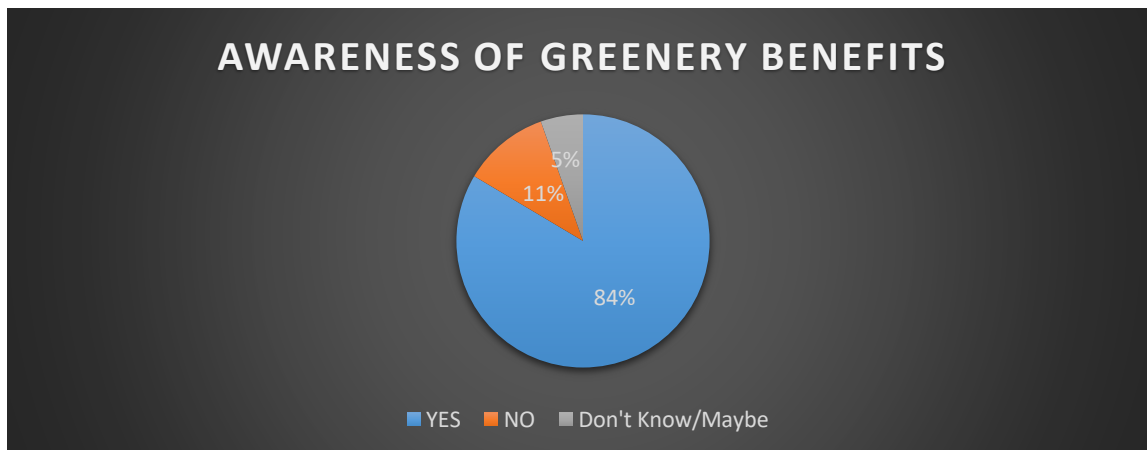
Empirical data retrieved will address the value respondents put on the urban greenery and its benefits. 389 respondents were interviewed to know the values they ascribe to urban greenery. The interview started with inquiring about the tree dominance in their area. 36 people representing 9.3% of the 389 respondents thought that the trees in their community were too many whereas 165 people representing 42.4% wanted more trees to be planted as they were very few in their community. However, 188 of the respondents which represents 48.3% were pleased with the amount of trees in their vicinity neither wanting more trees or wanting some to be felled.

Respondents' awareness on the benefits of urban greenery

Some of the benefits of urban greenery noted by respondent are; provides aesthetics for the area it is located, primary source of food, carbon sequester and provides oxygen, purifies and freshens the air, shade provision, venue for social gatherings, primary source of fuel-wood, protects buildings and the urban population from wind-storms, primary source of herbs. According to the respondents, provision of fresh air was the prevalent benefit of greenery in communities as 72% of the respondents (280) mentioned it.

Furthermore, the respondents were questioned on their level of awareness of the benefits of urban greenery. As high as 84% of the respondents were aware of the benefits of greenery while 11% were not aware and as low as 5% were indifferent, as shown in fig 7.

Figure 7: Residents' opinion on Greenery benefit

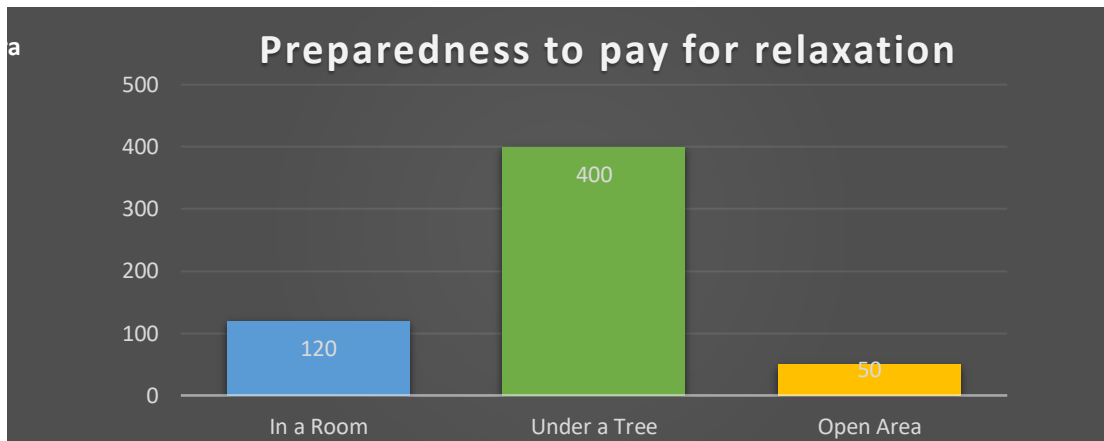


Source: Field Work, 2022

Prioritising relaxation location and willingness to pay

The respondents were required to prioritise the preferred choice of location - inside a building, open paved area, on a greenery (under a trees) - for resting on a sunny day and how much they were ready to pay for utilising this location. Recreating under a tree scored the highest rank at 71%. Recreating in a room was second with 24%, and in an open area was of least priority at 5%. This corresponds with their willingness to pay per hour for relaxation. Each respondent was asked to utilise five hundred naira ₦ 500 (or \$1.39 USD) in each location, figure 8 shows the collative mean of how much they were prepared to pay

Figure 8: Preparedness to pay for relaxation (collative).

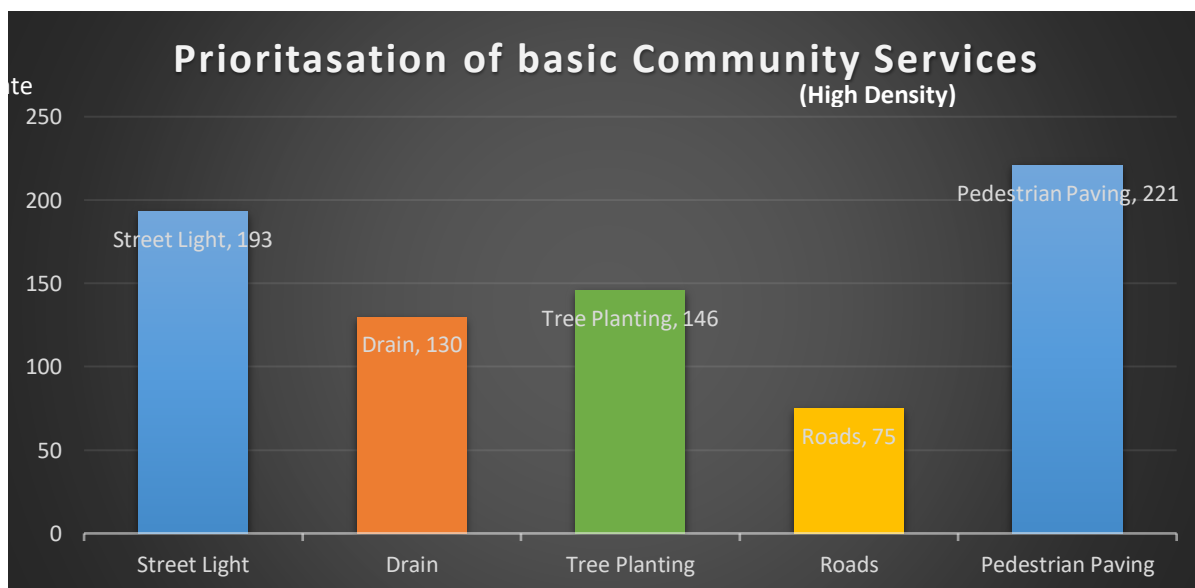


Source: Field Work 2022

Perception on urban greenery as development initiative

The respondents were asked to prioritise some basic public amenities. The prioritisation revealed different scenarios in the three residential densities. Five community amenities were indicated and the respondents were required to tick in order of preference. The prioritisation scenario in the three (3) different residential densities were different as evidenced by the aggregated number of points from the public amenities and street furniture. In the high density areas (low class) pedestrian paving received the most priority while roads were of least priority as shown by Fig.9. It is understood that Pedestrian paving eases walking and increases accessibility within the community.

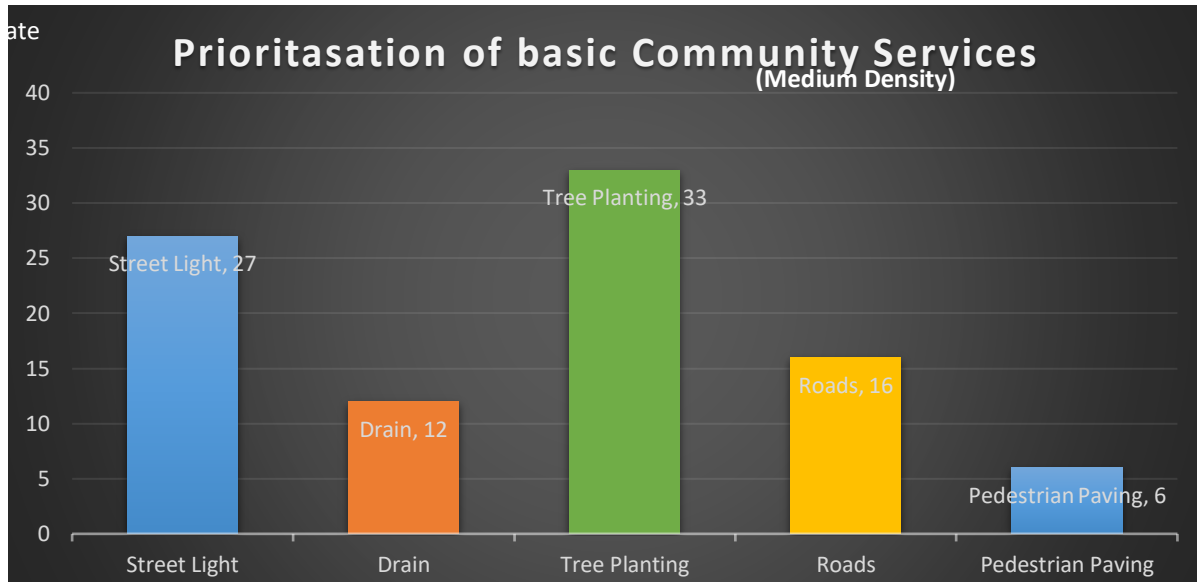
Figure 9: Prioritisation of basic community service in High Density areas.



Source: Field Work 2022

In the medium density areas, tree planting was mostly preferred while pedestrian paving was the least preferred development initiative as shown in Fig 10. This emphasises that walking is greatly reduced in the area and there is less need for pedestrian paving.

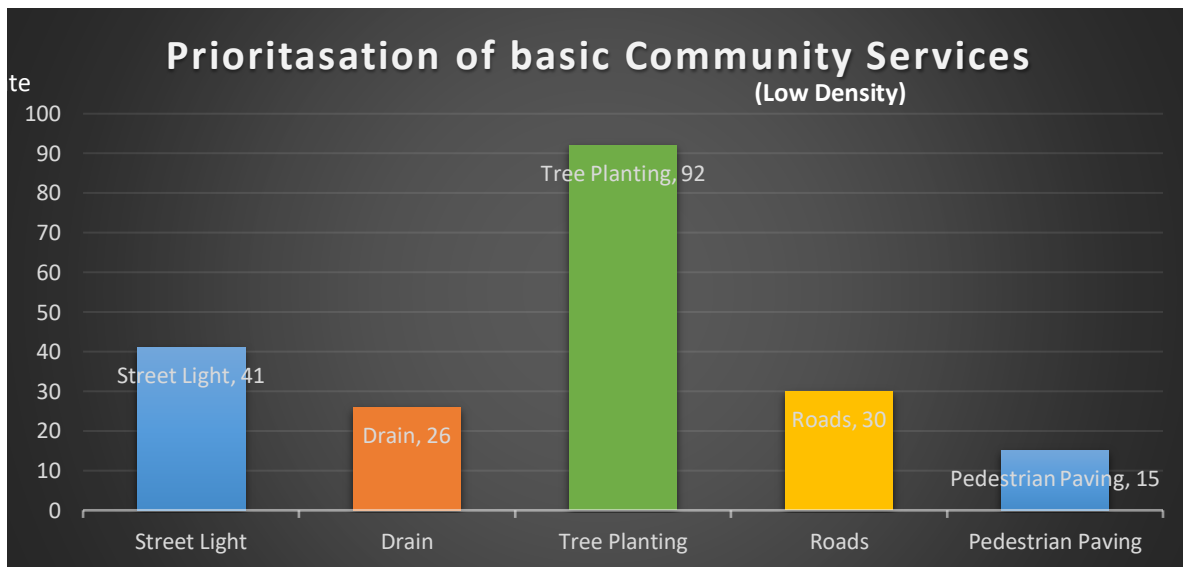
Figure 10: Prioritisation of basic community service in Medium Density



Source: Field Work 2022

In the low density area, pedestrian paving was also the least preferred development initiative followed by drains and roads respectively. Tree planting was the most preferred option followed by the introduction of street lights as shown in Fig 11.

Figure 11 : Prioritisation of basic community service in Low Density Area.

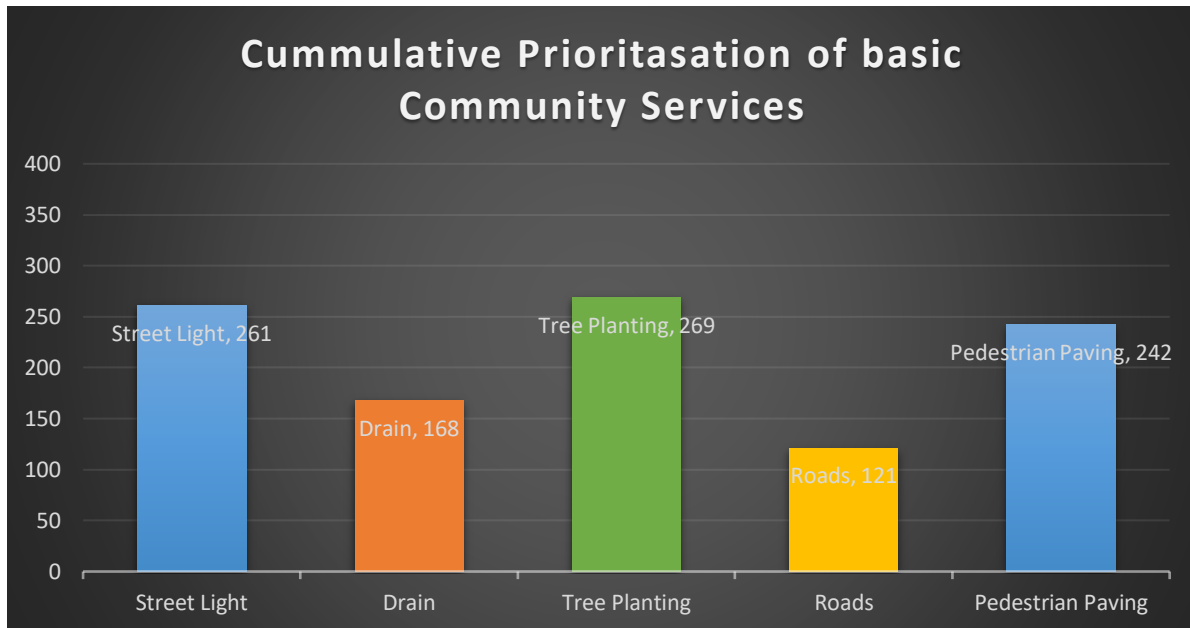


Source: Field Work 2022

The result of the prioritisation from the different residential classes suggests that low density (high class) areas will have more greenery than high density (low class) areas. The cumulative data suggests that Tree planting is the most preferred basic community service in view of the sample population.

Subsequently, as shown in fig. 12, cumulative response shows that tree planting is the most preferred amenity .

Figure 12: Cumulative prioritisation of basic community service in the residential area densities



Source: Field Work 2022

IV. Discussion

Residents' value of urban greenery in the Enugu metropolis

The results showed that respondents' value of urban greenery relates to dominance, awareness of the potential benefit and preparedness to pay. This also conforms with Woodall et al (2010) research findings that the respondent relationship with greenery and trees relate to value benefits they derive. 42% of the respondents had fewer trees in their community landscape. This indicates their awareness of and potential benefits of trees in their communities. Respondents from high density-low income areas, believed that the "just right" or adequate amount of trees were present in the landscape and lack of space for planting additional trees. Topfer (2001) observed that population increase and increase in housing demand limits space for tree planting. In urban areas hard landscape allows for vehicular parking which is preferred to planting trees for economic reasons. High rise building developments clears the entire site with no recognition of urban trees. The few soft landscapes are covered with flowers, shrubs and lawns.

84% of the respondents are aware that urban trees are beneficial, which indicates that Enugu residents value and will support urban greenery initiative. Thus, this validates that *Residents' perception on the value of urban greenery within their residential area densities do not significantly differ in Enugu metropolis*. Notwithstanding, the response on urban tree benefits shows that communities members are aware of the functions of urban trees as the lungs of the city as first used by Gil (2009).

The respondents' result shows that they are motivated to pay while relaxing under a tree. Consequently, rate imposts for property taxation in denser urban greenery areas (Independence layout / GRA) are higher when compared to less dense urban greenery areas (Abakpa / Uwani) by the ECTDA.

Prioritisation of urban greenery as a public community development initiative.

Greenery based community initiative relied heavily on land ownership (tenure) system in place for the said property. In most areas, especially high density areas, the traditional and compound houses indicate a high rate of tenants occupiers as opposed to flats and detached bungalows which were mostly owner occupied. Hence, respondents (tenants) involvement in tree planting is highly limited and is similar to Moyer's (2006) findings and Clark et al. (1997) findings which predicts that features of urban greenery is dominant in privately owned buildings and properties. This also accounts for the preference of pedestrian paving in the high density areas and urban greenery in low density areas and meaningful amount of urban greenery is also preferred in the medium density areas. Subsequently, it was also observed that street furniture prioritisation depended on space availability and the prevalent need of the respondents. The result of cumulative prioritisation indicated a growing interest and consciousness surrounding urban greenery in Enugu metropolis.

V. Recommendations

The activities of the EEDC - Enugu Electricity Distribution Company was identified as one of the primary contributors to the loss of urban greenery. The activities of EEDC should be checked by introducing new and improved ways of situating electrical power lines. The indiscriminate depletion of urban greenery will persist so long as the culture of hanging power lines in poles continues.

It is of paramount importance that the government act quickly in procuring and securing the few places available now in high density areas for the sole purpose of planting trees especially drought resistant and fast growing species. Furthermore, the government should embark on public education, promotion and community patronage campaigns. It is necessary to consider the concerns and problems identified by the respondents - excessive littering by trees - when selecting species for tree planting.

Baseline data on urban greenery at the community level should be captured and monitored regularly by government agencies. Findings from this research should form a good basis for future inventory studies on tree-residents ratio, plot size-greenery ratio, green public open spaces-sealed land ratio, among others, to ascertain their status.

VI. Conclusion

The results obtained from this research work suggests that the quality of vegetation cover in residential areas negatively correlates with residential density of the community. Greenery in low density areas are predominantly consciously planted along streets, driveways, parks, squares and open spaces and private homes. Whereas, greenery in high density areas are mainly accidental and less consciously planted and incidentally located on boundary lands, and within compound houses as food crops. With substantial and continuous increase in population and urbanisation - intense development of land - trees in low density areas continue to dwindle. Although the high density areas have lower urban greenery cover, the trees continue to be depleted.

The findings thus indicate that urban greenery influences the density status in residential geography to a great extent. The research suggests that high residential density areas have very little urban green cover than medium density areas in that order up to low density. Undeniably, spatial planning - regional and master plans - contributes to the urban greenery cover, well structured low density areas make spaces available for urban greenery whereas unplanned "slum ridden" high density areas lack planned spaces and have fewer incidental trees on marginal lands.

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