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Research Article

Measurement of Accessibility to Job Locations in the Socially Excluded Areas of Calabar Metropolis, South-South Nigeria

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Abstract

This paper examined the level of access to urban jobs by the socially excluded poor neighbourhoods of Anantigha and Nyangasang with a view to addressing the job-residence balance in Calabar. It estimated the number of accessible jobs by commute distances and number of daily trips. A questionnaire and travel diary survey was used to obtain primary data from residents using the stratified sampling technique. The data was analysed using kernel density estimation (KDE) which adopts a non-parametric approach in estimating probability density function of random variables, in this case the number of jobs located per 1000m2. The study observed that the average commute distance to low-paying neighbourhood jobs is 2km. Furthermore, the location of low paying informal jobs is determined largely by accessibility options in the city. However, the reality of this available transport options and indeed the land use pattern does not favour the low-income group and thus become a constraint to their access to jobs. The unavailability of population data in GIS format at enumeration resolution, in the study area, remains a challenge for future urban studies of this nature. The location of employment for the socially excluded communities can become a factor in the planning of public transportation that is reliable, safe and accessible to these urban residents.

Keywords

Accessibility, Job Location, Modal Split, Urban Poor, Socially Excluded, Kernel Density Estimation

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Introduction

The degree of mobility and socioeconomic engagement in any given community is highly dependent on the critical role of transport. Urban transportation planning practices are not known to accommodate this integral role of transport as a driver of activities, rather, there is an undue focus on efficiency of the transport network itself. The difficult to measure socioeconomic implications of transport therefore, become neglected. However, recent findings in sustainable urban transport revealed the impact of transport policies on social exclusion, which is a result of the lack of opportunities caused by poor access to transport systems (Wati, 2009; Preston, 2007; Litman, 2003; Church et al, 2000).A plethora of recent researches (Sari, 2015; El-Geneidy et al., 2016; Policy Brief, 2016; Fransen et al., 2019; Grisé, et al., 2019; Tomasiello, et al., 2019) recognised the relevance of the application of accessibility in research domains that links disadvantaged or socially excluded individuals to job opportunities in cities. Some of these studies applying geographic information system technology. Most researches on job accessibility continue to employ aggregate measures to link active group populations, and employed persons to pre-existing job locations which often lead to failure to reflect person-specific labour-market opportunities for the socially excluded in the society.

Geographical engagement with social justice dates back to three decades or more (Smith, 2000). Social justice requires among other things, social inclusion which represents the participation of people in society. Painter and Philo (1995) likened social exclusion to a situation whereby some members of society either due to socioeconomic characteristics or environmental conditions become separated from the central activities in a society. In the opinion of Hine & Mitchell (2001), social exclusion deals with a wide spectrum of non-participation in life-shaping socioeconomic and leisure activities. There is no consensus on the meaning of social exclusion as many researchers are of the view that it is contextual. For example, Philip and Shucksmith (1970), pointed out that participation or the lack of it is usually affected the impacts that such activity conveys. Therefore, the argument has always been the fact that as much as a society is desires to grant all members equal opportunities to participate in socioeconomic activities, the reality is not always the case. This is often due to sociodemographic characteristics, and the available opportunities themselves. Therefore, the quality of a society can be determined partly by the number of opportunities that can be accessed by the general public in that society. This opportunity to participate defines the availability of livelihood sustenance which in turn defines the quality of that society.

Calabar has witnessed rapid population growth from 98,346 in 1963, 320,862 in 1991, 381,022 in 2006, to approximately 450,000 in 2020. This is based on the 2006 National Population Commission (NPC) estimates and a growth rate of 2.5% (NPC, 2006). This causes urban sprawl with its attendant implications on serviceability of existing urban infrastructure and thus, social exclusion of most communities. Low income-dwellers in Calabar and environs are mostly socially-excluded from major activity centres in the metropolis. They spend a long commute time to-and-from work, school, shopping, and leisure on mostly inefficient urban transport system. This is true of low-income groups residing at the fringes of Anantigha, 8-Mile, Nyangasang, Atimbo, Akpabuyo and so on, with a limited access to activity centres like markets, central business district, and other areas of low-income job locations. Successive administrations in Cross River State had focused on beautification of the city, in their urban renewal efforts. The aim of this is the enhancement of their tourism programs, rather than on deliberate intervention in the social wellbeing of the low-income group. This exacerbates the problem of individual accessibility to job locations in the study area. The aim of this study was to examine the critical factor of the job-housing balance in the study area and by extension many cities in the developing countries. The findings provided insights into realistic choices that planning experts and city administrators can make for an increasing access to job locations for the socially-excluded residents of Calabar. This can serve as an effective strategy in addressing urban poverty through sustainable access to livelihood opportunities.

Study Area Description

Calabar is the capital of Cross River State which is located in the southern part of Nigeria. The city has been inhabited by the Quas, Efiks and the Efuts since the 15th Century. The European sailors navigated the southern coastlines through the Atlantic Ocean into Calabar as early as the 16th Century where they established a seaport for international trade. Although, access to the hinterland was constrained by the rainforest, from the 17th to 19th Centuries, the city served as a major slave trade port. By 1885 to 1906, Calabar became the headquarters of the Niger Coast Protectorate, Southern Protectorate and later, the Oil River Protectorate. The city is located on longitudes $8^0\ 19^1\ 30^{11}$ and $8^0\ 25^1\ 30^{11}$ east of the Greenwich Meridian, and latitudes $4^0\ 57^1\ 55^{11}$ and $5^0\ 40^1\ 30^{11}$ north of the Equator (figure 1). The city comprises of Calabar South Local Government Area and Calabar Municipality. In terms of area, it is approximately 406 kilometers. Intra-urban movement in the study area is mostly undertaken on road transport

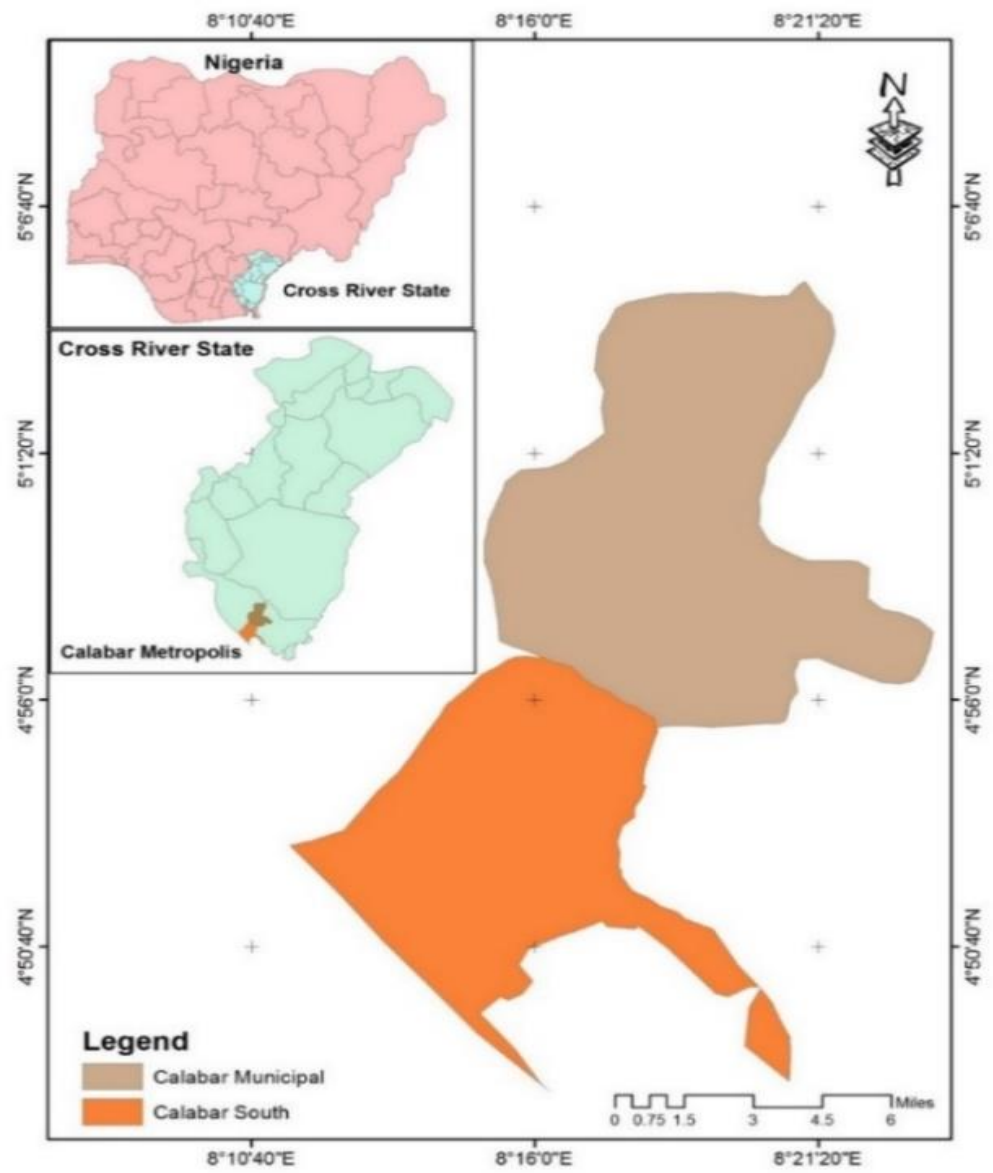

Figure 1. Calabar metropolis showing Nigeria and Cross River State (inserts) (GIS Unit of the Department of Geography and Environmental Science, University of Calabar)

Infrastructure, prominent amongst which is the private automobile, private taxi, buses, mini-buses and tricycles. There operate on different road categories. For example, tricycles are not allowed to operate on highways, while others, such as private taxi, buses, mini-buses can operate on every road category provided there are transport needs. The Murtala Mohamed Highway divides the city into two halves providing the only land access to other parts of the country (figure 2). The Margaret Ekpo International Airport provide access to other parts of the world by air transport, while the Kwa River and Calabar Rivers both provide access to the Atlantic Ocean.

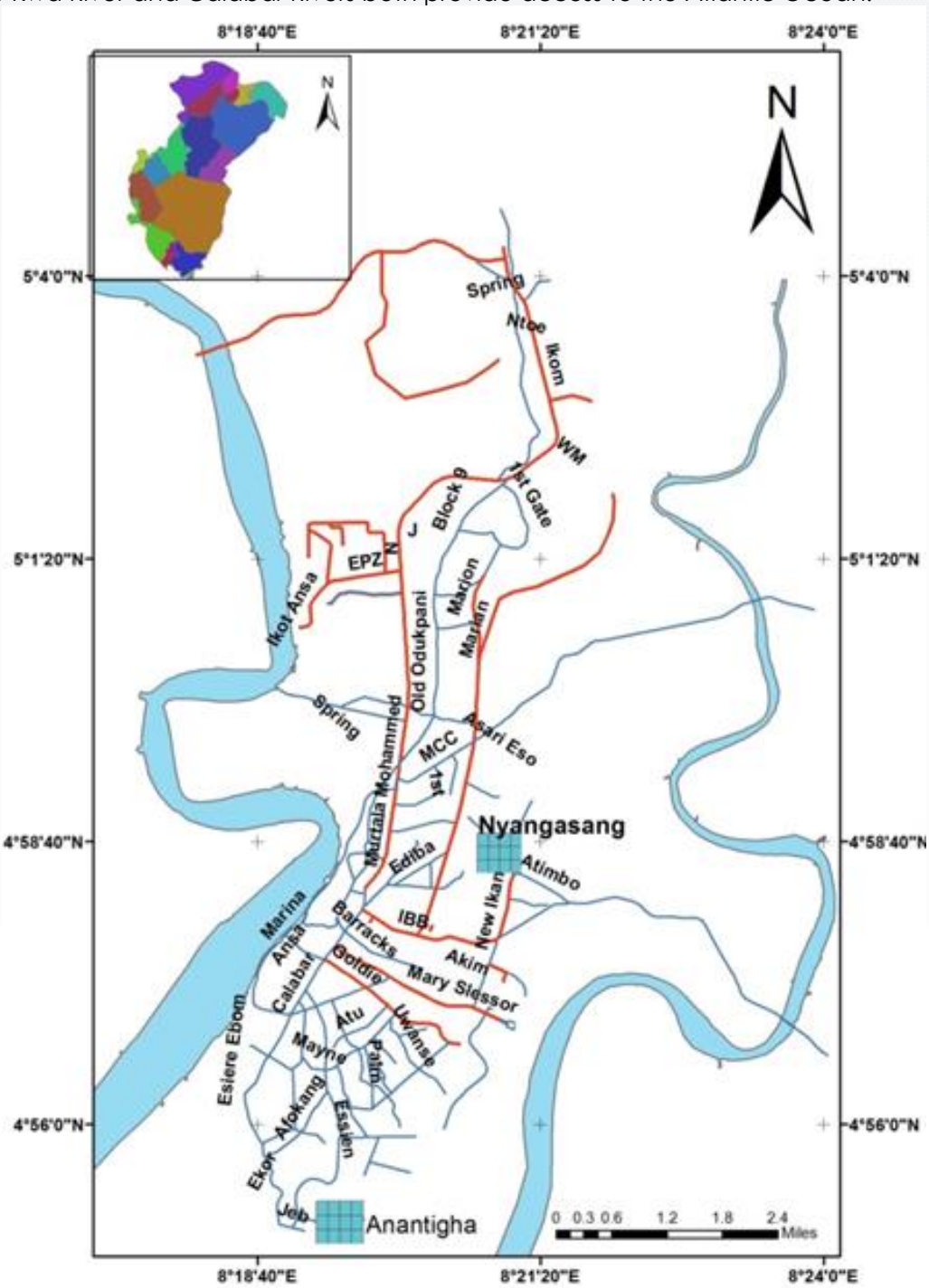

Figure 2. Calabar metropolis showing Nyangasang and Anangtigha locations (GIS Unit of the Department of Geography and Environmental Science, University of Calabar)

There is an obvious sprawl process taking place in Calabar. For example, the city is fast expanding northwards to 8 Mile, eastwards to Akpabuyo and Odukpani. This is due to physical limitations of the Atlantic Ocean in the south and the Calabar River in the western part of the city. While this is often debated by stakeholders, development experts often conclude that such natural water fronts present the highest land value in most cities of with high socioeconomic activities. Therefore, the opinion of this school of thought is that socioeconomic rather than physical factors offer a better explanation to the internal spatial structure of Calabar. This makes it difficult to predict the direction of physical development of Calabar in the future.The scope of this study is limited to two socially excluded neighborhoods of Calabar. First, Anantigha in Calabar South Local Government Area and second, Nyangasang in Calabar Municipality (figure 2). Both neighbourhoods are characterized by majority of low-income earners and are located in the urban fringes, having serious environmental challenges such as steep slopes, erosion, flooding and so on. Cost of housing in both locations is cheap while population density remains very high compared to other parts of the city. Living conditions in these communities satisfy slum characteristics.

The Problem

The urban fabric of Calabar Metropolis is made up of two extremes of urban development. This includes, first, a piecemeal urban development structure lacking in balanced development which correspond to, Ikot Eneobong, Atimbo-Akpabuyo axis, Nyangasang, Anantigha and other pockets of sprawl developments along transport lines. Second, an orderly, pedestrian-friendly urban design, with coordinated land use mix. Examples of these locations in the city includes, State and Federal Housing Estates, Ekorinim, City Gate, Lemna, and International Conference Centre. The spatial pattern is characterized by an uneven and heterogeneous development whose housing density ranges between 1,470 and 80-200 persons per hectare in the aboriginal areas and high-income housing estates, respectively. Compared to most cities in Nigeria such as Lagos, Kano, Port Harcourt, Enugu, Kaduna, and so on, Calabar still has a poor urban population. For example, Okon, Ogba & Adejumo (2012) revealed that, about 45 per cent of the total urban population, especially in central and southern parts, resides in housing conditions adjudged to be poor. Mean trip lengths are low in Calabar, in contrast with other Nigerian cities like Lagos, Port Harcourt, Abuja, Kaduna, Enugu and so on. Rapid sprawl and rise in motorization however, remains a challenge for the city administrators. Public transport system in un-organized, poor and often tilted to the advantage of the high-income earners with private automobiles.

The establishment of the Department of Public Transportation (DoPT) to regulate the public transport sector in Calabar, is still met with several challenges. Operators of the privately-operated public transport often exploit weak regulation to engage in many forms of criminality. Fares are increased arbitrarily, and comfort levels of passengers is often low. In terms of operational challenges, the enabling road infrastructure is poorly designed for public transportation, lacking bus-stops and other basic complimentary road infrastructure. Regulatory staff exhibits attitudes that often exposes their low level of training. High operational fees charged on operators and restriction to the time of operation are among the numerous challenges faced by operators. Urban renewal efforts of government in terms of road construction notwithstanding, there has not been any specific program that supports several urban housing or slum improvement like essential services to urban poor or socially and economically weaker section of housing. The critical question remains as anticipated impacts of investing in sustainable transport initiatives like bus rapid transit and monorail to the accessibility of the urban poor in Calabar and environs. This informed the need for this study, to examine the level of deprivation occasioned by lack of transport services in Calabar.

Literature Review

Globally, employment is considered as an essential component of everyday life and livelihood support system, which continues to draw substantial attention in research and policy that is interdisciplinary in nature. The inability to reach or easily access good-paying job locations in cities constitute severe consequences on the economic security and quality of life of individuals as well as the general level of welfare of any society. This often constitutes a dispute between the accessibility of employment and transport in geography in one hand, and the planning of transport infrastructure, on the other hand.Social exclusion is a multifaceted concept, which spans across, economic, political and social dimensions. According to the Social Exclusion Unit (2001), it deals with weak socioeconomic and livelihood support necessary for individual or family wellbeing. This includes, but not limited to, poor health, high crime environments, unemployment, poor skills, low incomes, poor housing family breakdown which prevent people from participating fully in society. Bhalla and Lapeyre (1997) opined that it is a basic standard of living that protects the right of individuals to participate in major social, economic and political activities such as, health care, employment, and education that usually form the basis for its measurement. Mackett and Thoreau (2015) observed how lack of transportation contributes to social exclusion by providing barriers to access, thus affecting the daily lifestyles of urban residents.

While researches on job-housing balance and social exclusion exist in many developed countries, the same cannot be said of developing countries. Furthermore, the link between population demographics and transportation for decades, also has been investigated. For example, the spatial mismatch theory showed how low-income American workers live far from and encounter accessibility challenges to job-rich suburbs (Kain, 1968). The findings in the United States context posit that there is a strong correlation between poor accessibility and low-income black households (Grengs, 2001). This definition is not broad enough to accommodate situations where many low-wage workers residing near the central business district (CBD) could access high access to jobs in downtown due to employment densities and efficient transport system (Blumenberg & Hess, 2003; Hess, 2005). In addition, Glaeser et al. (2006) observed that many older cities like Chicago and New York, have many of their low-income group reside disproportionately in the CBD due largely to efficient public transportation. Nevertheless, they posited further that decentralization of jobs will influence relocation to the suburbs.

In Toronto's census metropolitan area, Moos and Skaburskis, (2009) found out how middle and senior managers commute from the suburbs. In the contrary, professionals, clerical workers, intermediate service, clerks, and sales workers commutes from places near the city centre. Wachs and Kumagai (1973) on their part, found out different access levels to job locations based on income class of workers. Delbosc and Currie (2011) observed very clear differences in mobility and car reliance across different geographic locations. Their result further revealed that car reliance peaked in fringe Melbourne, while that in other regional areas, there was slight less car reliance. However, the study also found out that mobility and distance travelled increased with location away from central Melbourne, leading to a greater sensitivity to fuel price increases.

Elsewhere in Brussels, van Meeteren et al. (2016) identified how the central labour market core supplied the majority of specialized jobs covering the axis Antwerp-Brussels while the rest of Flanders is marked by higher concentrations of generic and industrial jobs. Hernandez (2017) concluded that 'mobility defines the difficulty to access a destination' and thus remain a critical requirement for participation in "modern life". Bok and Kwon (2016) identified the essential role of public transportation in improving sustainability and quality of urban life using environmental and economic indicators of selected cities. The ability of public transport to provide "Door to door mobility" makes it more attractive, leading to the enhancement of the social quality of life of urban dwellers in Jackiva (Yatskiv et al., 2017). Since social exclusion is often the result of lack of transportation (Saghapour et al., 2016; van Wee, 2016), the focus of most polices direction has

been on accessibility that facilitates movement to primary trip locations or destinations at reasonable cost/time. In the same vein, Pons Rotger and Nielsen (2015) established that 'transport-based job accessibility has a positive and indefinite effect on individual incomes. In Tao, et al., (2020) study of the public transport impacts on job accessibility in Shenzhen, China, it was established that there exist significant job accessibility disadvantages for low-income or migrant workers who depend on public transport. The study, therefore, illustrated procedures and methods to quantify and visualize such accessibility hotspots.

Transportation inequality offer a better explanation for the difficulty of disadvantaged neighbourhoods in accessing job locations than the physical home-work distances (Kawabata, 2003; Ong & Miller, 2005). Modal mismatch or inequality has been used in literature to refer to the difficulty of reaching desired destinations without a car since the last decade (Blumenberg & Manville, 2004; Grengs, 2010; Adeel et al., 2016; Kamruzzaman et al., 2016; Wang et al., 2020). Passengers relying on public transit may have difficulty connecting certain areas of the city due to accessibility disparity which continue to have remarkable effects for the choices non-car owners make in the city. Boshmann (2011) interviews of poor urban residents, revealed that the choices individuals make is subject to the available transport options and not job locations. This according to the interviewees, the ability to reach job locations is dependent on available transportation. They want a better transit, and not necessarily car ownership assistance. Kawabata (2003) observed that the chances of workers employed on full-time hours become increased with better transit to jobs.

The United Kingdom index of multiple deprivation (IMD) consists of six dimensions measured at the UK census ward level, including 25 per cent income, and employment, 15 per cent health deprivation and disability, education, skills and training, 10 per cent housing, and geographical access to services (Solomon 2000; Williams 2002). Fransen et al., (2015) and Titheridge et al., (2014) both observed that the emphasis of literature on social exclusion is more on the outcomes of transport deprivation, instead of, on the processes leading to it. They further categorized exclusion in transport as ranging from physical and spatial to socioeconomic factors. Foth, Manaugh and El-Geneidy (2013) developed a methodology using a social indicator that is based on the census tract level of sociodemographic parameters. This enabled them measure the effect of accessibility to jobs and transit travel time on the socially disadvantaged in Toronto region. They further observed the three levels of transit equity in the region, to include, spatial, temporal and job type. The range in accessibility and transit travel time over a 10-year period narrows down, according to them. Furthermore, the most socially disadvantaged census tracts were statistically observed to have lower travel times and better accessibility, than the rest of the region in 1996 and 2006. This showed that Toronto operates an equitable transit system that is beneficial to those in social need, and may gain the most from transit. Eurostat, (2016) considered the proportion of the working age population in unemployment as a critical development social indicator in labour markets in its report on European Union employment statistics. Statistics Belgium (2016) showed considerable sociodemographic differences by sex, age and educational level for individuals aged 20–64 instead of transport access to employment opportunities.

The study of Venter, et al (2007) established most significant influence of locality on gender mobility experiences. This influence is greatest in more distant rural communities with specific informal work, walking access to social services and small-scale agriculture characteristics, which usually alleviate their inequitable travel burdens. The smallest differences between men and women's travel habits are displayed by centrally located localities. According to them, this supports the notion accessibility of centrally located houses promote women's satisfaction of daily needs and strategic empowerment (Venter, et al, 2007). Ojoko and Okon (2018) study of housing-related urban poverty in Calabar Metropolis revealed that residential mobility is significantly related to socioeconomic variables such as household size, marital status, gender, education, annual income and job type, $F(6, 402) = 8.903$, $p < .001$. These variables, to a large extent, are in turn affected by access to sustainable and good-paying jobs. The study recommended a suitable jobs-housing balance that serves the peculiar needs of the city. In another study by Okon and

Ojoko (2018), kernel density analysis (KDA) was employed to estimate the number of jobs located per 1000m^2. This confirmed the significant influence of transport mode to job locations on available transport options for residents of Calabar, $F(1, 431) = 18.181$, $p < .005$.
Thus, the findings of these studies reviewed above revealed an existing knowledge gap in the job-housing balance scenarios in many developing countries vis-a-vis the overwhelming importance of sustainable transport system in creating job accessibility for socially disadvantaged workers in urban centres. The strategies to reduce work-related commute and a jobs-housing balance depends to, a large extent, on the choices that residents make. Better job accessibility by transit for low-income workers enhances regional economic development and effectively addresses equity concerns for the socially excluded in the society. The paper supports the argument that sustainable urban transportation that connects significant land uses, and deliberately connects the fringes to activity centres hold a veritable key to socially-inclusive and prosperous cities.

Materials And Methods

This study used both primary and secondary data. The primary data included research instruments, personal interviews, travel diary and field observations. The questionnaire provided data on residents' income sources, house-type, family assets, employment, and so on. The travel diary on the other hand, was used to examine the travel behaviour of respondents. Review of literature from journals and other periodicals constituted secondary data. Types of data used in the study included discrete and continuous data. Geo-locations of sampled housing units and job locations formed part of several data layers that was used in this study. Others are, the spatial data layer of research participants, their housing quality, and travel behaviour.
The topographic map of the study area was used to carry out the initial identification and listing of houses. This was undertaken using the stratified sampling method. The hand-held GPS was used to aid ground-truthing during field exercises. The study sampled only residential buildings based on reconnaissance survey of initial listing and geo-location of transects. When listed houses are non-residential, the next residential was immediately substituted. Only heads of households were interviewed.
Landsat imagery of the study area for 2015 was acquired where the geographic coordinates of the potential sampled residential buildings were collected. This aided way-pointing to the actual potential sample to facilitate questionnaire administration by field assistants through the use of a hand-held GPS. This is also called site-specific sampling, often considered as more straightforward method than random sampling, offering a better coverage of the study area. It informed initial choice of samples considered during field visits. To be able to delineate transects for un-biased sampling, a 50*50m grid was superimposed on the topographic map of the study area (figure 3). Research participants indicated their travel behaviour for a whole weekday. This included their transport mode, travel time and distance covered, transport cost per trip, trip purpose and so on. Complementary geo-locations of respondents was carried out using the hand-held GPS. A
Purposive sampling technique was used to identify derelict housing conditions that qualify for very low-income habitation in these fringes. The study identified employment opportunities across the research locations and mapped them at an appropriate spatial scale. Different scenarios were adopted for the analysis. This includes, job types, job locations, and their densities. These variables were aggregated to determine socially-excluded accessibility to job locations using kernel density analysis in a GIS environment.

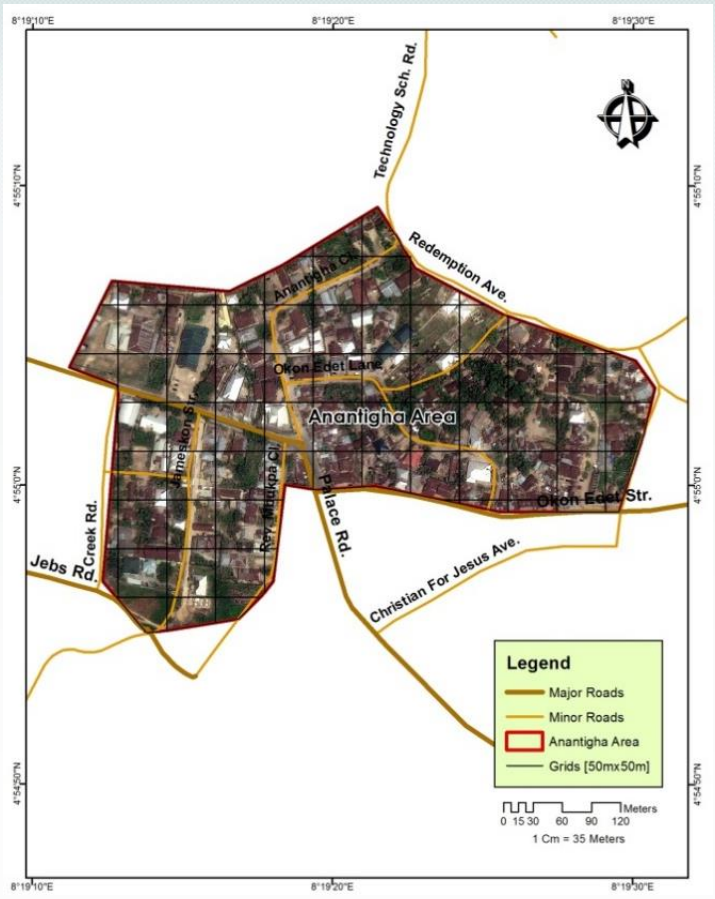

Figure 3. A 50 by 50m grid for Anantigha study location (Authors' field survey, 2021)

Results and Discussion of Findings

The study area is composed of two neighbourhoods in Calabar. The first is Nyangasang in Calabar Municipality which constitutes 52.1 per cent of responses. This is equivalent to 93.6 per cent overall success rate. The second, Anantigha in Calabar South Local Government Area, constitute 47.9 per cent of total responses, representing an 86 per cent overall success rate. Gender distribution of respondents indicates 60.6 and 39.4 per cent for male and female respondents, respectively. Their age distribution ranges between 26-35 years (38.1 per cent), 36-45 years (28.3 per cent), and 18-25 years of age (12 per cent). Others such as between 46-55 years, and 56 years or above accounts for 13.6 per cent and 8 per cent, respectively. This distribution is quite at variance with the 2006 census projected population of 121, 462 (50.7 per cent) and 118,195 (49.3 per cent) for females and males, respectively, in Calabar Municipality. In contrast, projected female population for 2020 in Calabar South Local Government was 126,471 (50.6 per cent), while for males, it was 123,408 (49.4 per cent) (Table 1).

Table 1
Socio-Demographic Characteristics: Gender and Age Distribution (Author's field survey, 2021)

Socio-demographic variable	Per cent
Location	
Anantigha	47.9
Nyangasang	52.1
Gender	
Male	60.6
Female	39.4
Age	
18-25years	12.0
26-35years	38.1
36-45years	28.3
46-55years	13.6
56years and above	8.0

Distances covered to job locations in Calabar

The research examined the daily work-based commute distances as covered by respondents. This showed that 38.4 per cent of respondents cover >2 km on work-based trips. Furthermore, about 28.1 per cent and 33.5 per cent of residents cover <1 km and 1-2 km respectively (figure 4). Short work-based trips to mostly low-paying jobs were undertaken by most respondents. Commute distances of 1-2 km by 57 per cent of study participants was revealed in the Anantigha area of the metropolis. Similarly, 34.1 per cent cover >2 km, while 8.8 per cent of the respondents cover <1 km distance to work. Job locations based on distance (kilometres) of commute by respondents was modeled in figure 5, where, about 26 jobs are located per 1000 m^2. The planning implication of this result is that there is a significant influence of distance on prediction of job locations in Anantigha than in Nyangasang, where only 15 jobs per 1000 m^2 were observed. The reason is that, in Nyangasang, 53.5 per cent of respondents commutes <1 km to work. Others, such as, 20.5 per cent and 26 per cent commutes 1-2 km and >2 km respectively. There is therefore a robust relationship between distance and job locations in Anantigha than in Nyangasang.

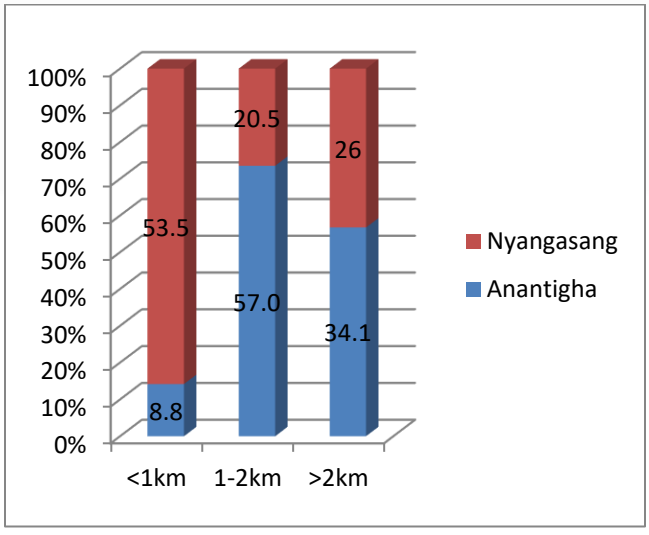

Figure 4. Daily commute distances (km) to and from job locations in the study area (Authors' field survey, 2021)

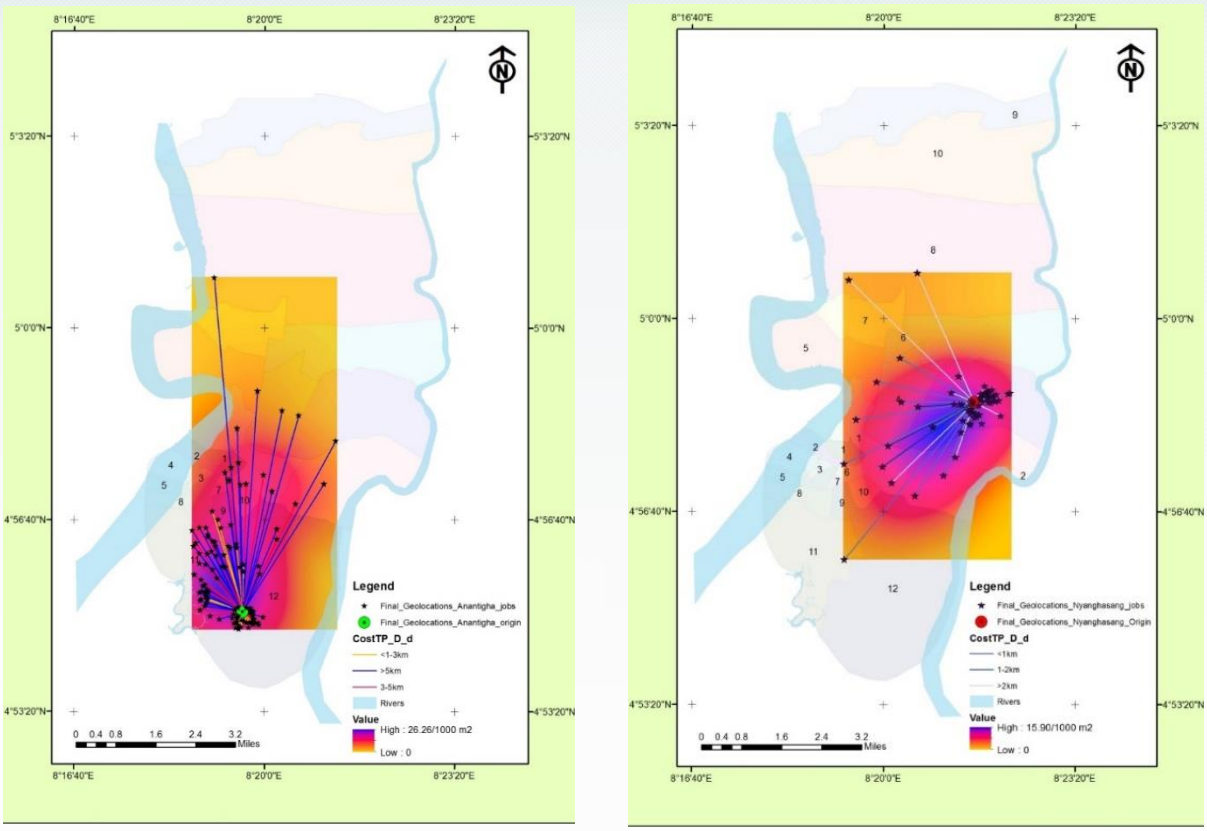

Figure 5. The location of jobs according to daily work-based commute distances (km) in Anantigha and Nyangasang neighbourhoods (Authors' field survey, 2021)

Urban transport options and the impacts on job locations in Calabar

Individual choices pertaining to transport was observed to have a strong relationship with available transport options within any geographical space and time. Poorly developed public transport system in the study area characterized by inaccessibility to most economic activities was observed. Most geographical locations cannot support any form of transport. In some other cases, only walking, or tricycles. This reflects the social exclusiveness or otherwise of most residential communities in the study area. Our results that are based on the travel diary indicated an overwhelming dependence on public transport. For example, 70.2 per cent indicated public transport for intra-urban commuting. In contrast, only 29.8 per cent uses private automobiles to meet their urban mobility needs. Individual distribution across the two study locations do not differ substantially as revealed in figure 6. This informed the modeling of job locations in the study area. The model in figure 7, shows that few jobs are located per 1000 m^2. In other words, the disposition to public or private transport mode is not a strong predictor of job locations in the study area. Up to 15 jobs and 11 jobs per 1000 m^2 can be observed in Anantigh and Nyangasang, respectively (figure 7). Deductions from this result can be indicative of a low car ownership ratio or weak socioeconomic status of residents.

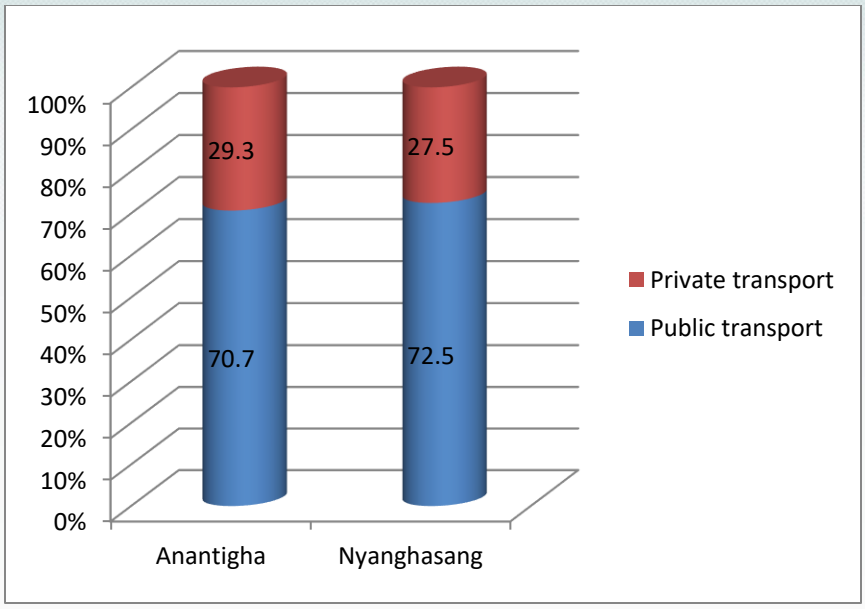

Figure 6. Private and public intra-urban mobility in Calabar (Authors' field survey, 2021)

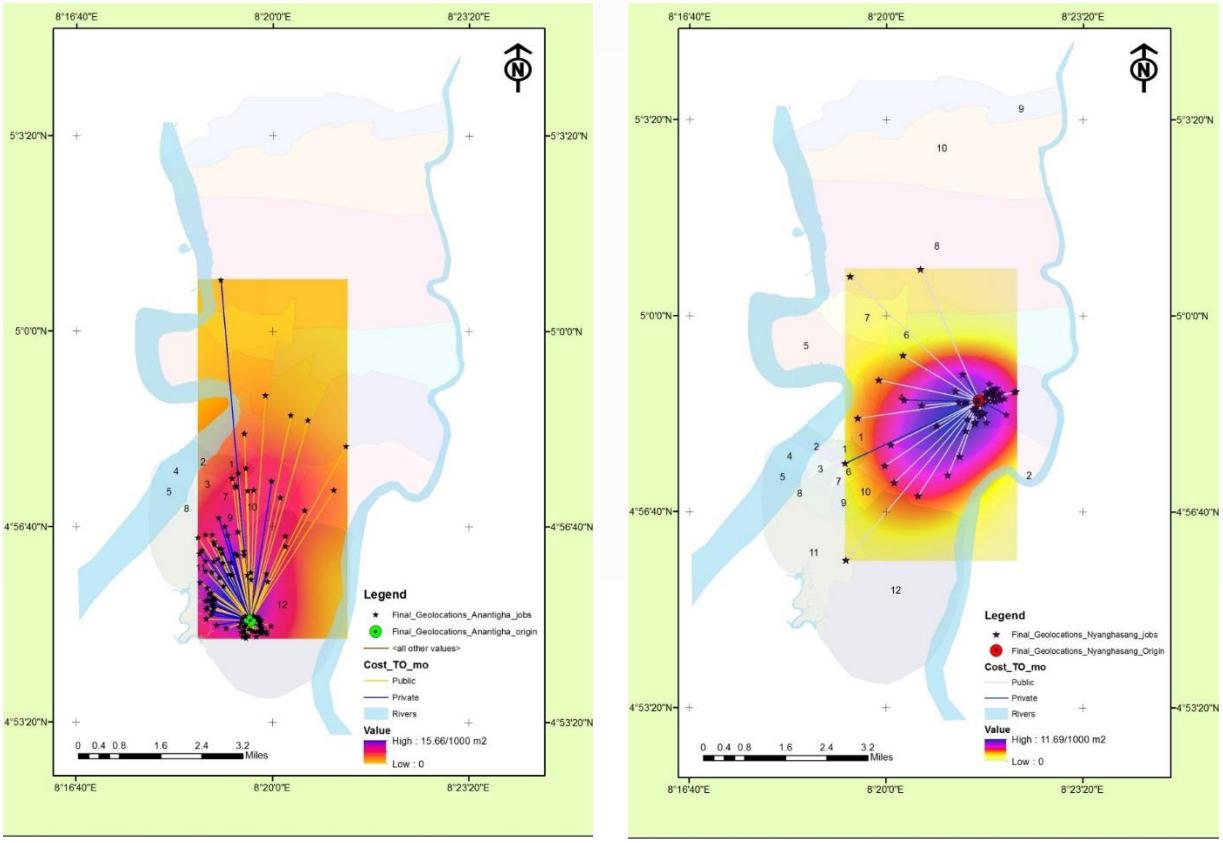

Figure 7. Distribution of private and public intra-urban mobility options in Anantigha and Nyangasang (Authors' field survey, 2021)

Building characteristics of work-end trips in Calabar

Specific building characteristics of work-end trips was examined. This enabled the study to examine the concentration of jobs in specific locations in Calabar. The results in figure 8 revealed that there is a strong relationship between job locations and the pattern of trips in both locations. For instance, hospital related trips and ministry employments, respectively account for 10 and 30 per cent of total trips of respondents in both communities. In terms of home/house end trips, 26 per cent was recorded, while school-based trips accounts for 15 per cent for both study locations. However, market-based trips also do not differ substantially across the two locations. While, 17.2 trips were recorded in Nyangasang, 17.3 per cent trips were recorded in Anantigha.
Independent models in figure 9, showed a very high job-locations concentration in Anantigha, (36 jobs per 1000m^2), remarkably different from that of Nyangasang (25 jobs per 1000m^2). The implication is that, destinations of trips is a better predictor of job-location model in both study locations. The land-use characteristics of a building thus indicates clearly how many of these jobs-related trips can be produced. This can be a clear indication of which employment categories dominate in the study area and thus become a very important tool for planning inclusive urban development.

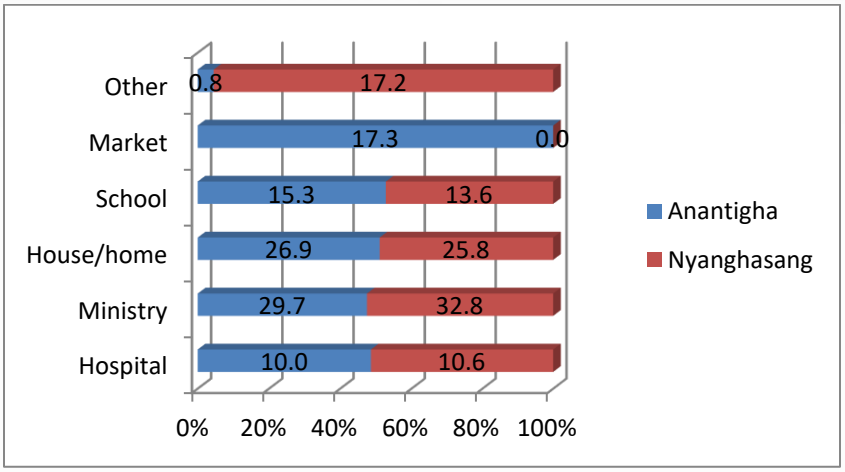

Figure 8. Employment locations as trip attractors in the study area (Authors' field survey, 2021)

Main trip purpose and their impacts on job locations in Calabar

The main trip purpose to school, work, or shopping was examined to identify their significance in job locations in the study area. This was possible since respondents provided information on their main purpose of trip was in the travel diary survey. This section focuses on the travel behaviour of residents with a view to providing basic data for efficient urban planning. Figure 10 shows similar pattern of primary trips in both Anantigha and Nyangasang. The majority of primary trips undertaken by residents is work-related trips. In Anantigha, primary work-trips accounts for 61 per cent, while, in Nyangasang, there are 65.3 per cent of total trips. A mean value of 9 per cent was recorded for shopping, family, and school-related trips in both locations. A similar pattern of primary trips between both study locations was observed in Anantigha area, with 23 jobs per 1000 m^2, while in Nyangasang, 25 jobs per 1000 m^2 were estimated. This is a confirmatory result that the parameters used are good predictors of job locations (figure 11). The fact that 6 out of every 10 trips undertaken in the study area are work-related also allude to the validity of our estimations.

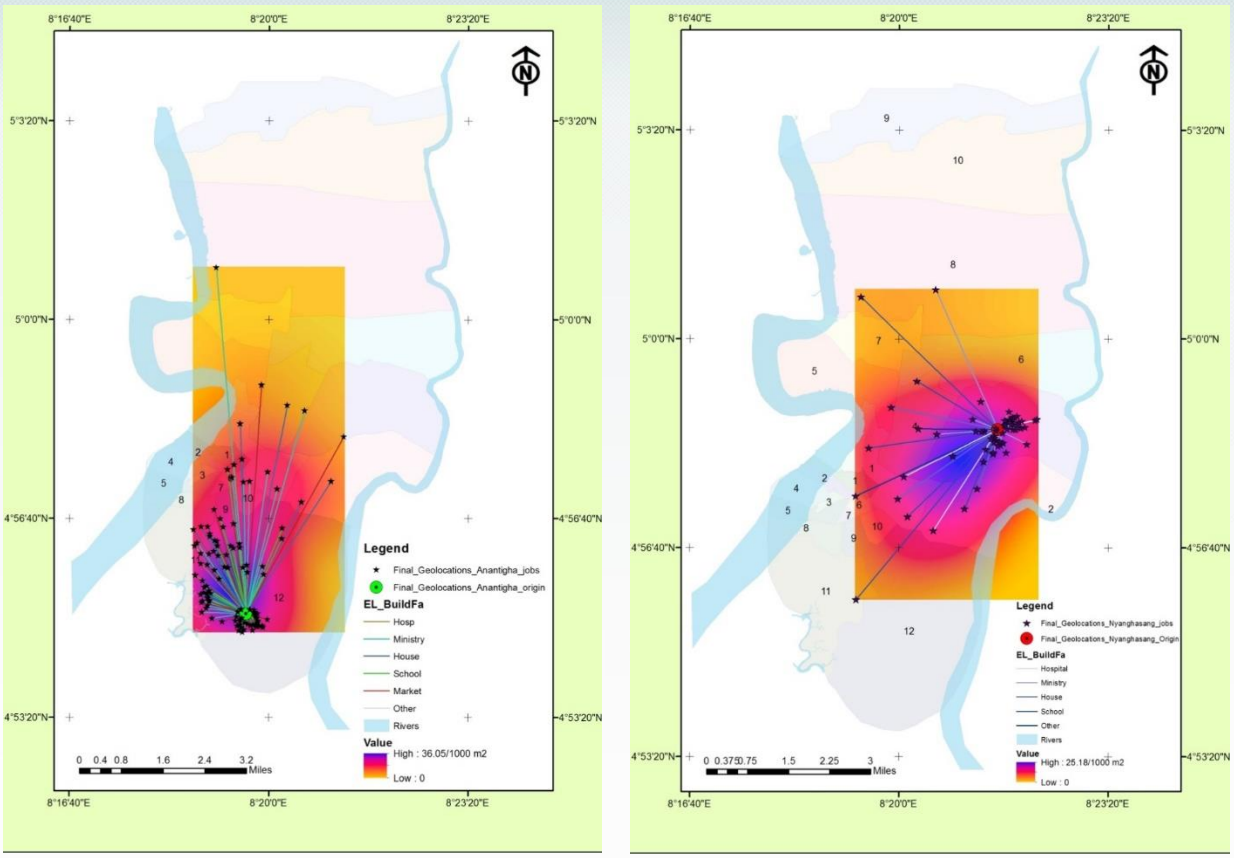

Figure 9. Distribution of building characteristics of work-end trips in Anantigha and Nyangasang (Authors' field survey, 2021)

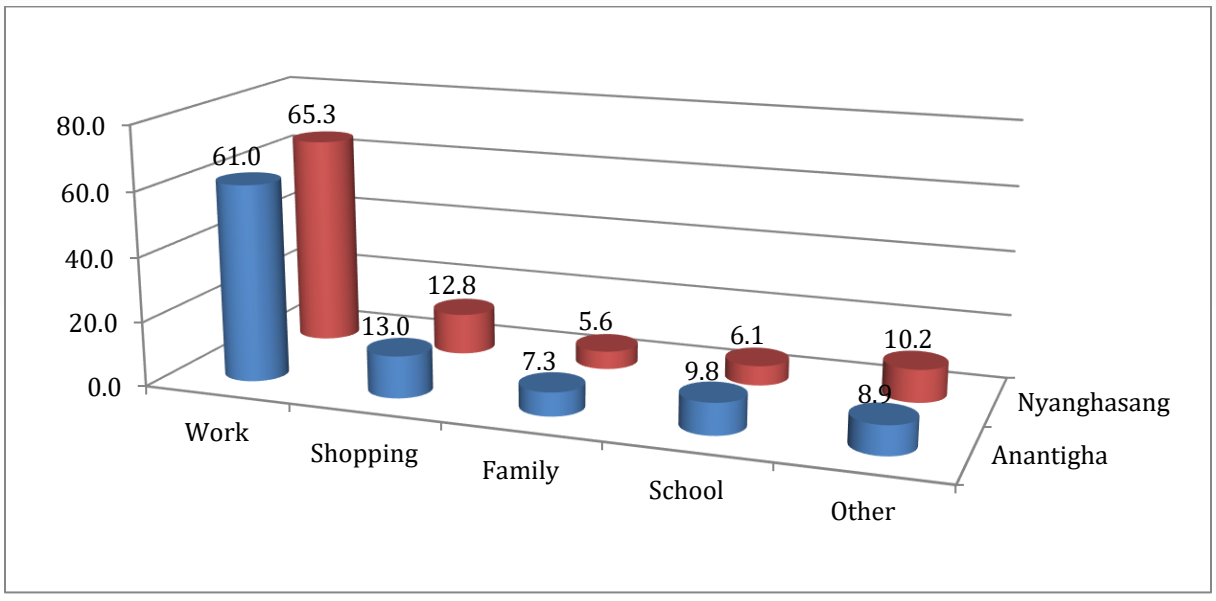

Figure 10. Daily primary trips in Anantigha and Nyangasang (Authors' field survey, 2021)

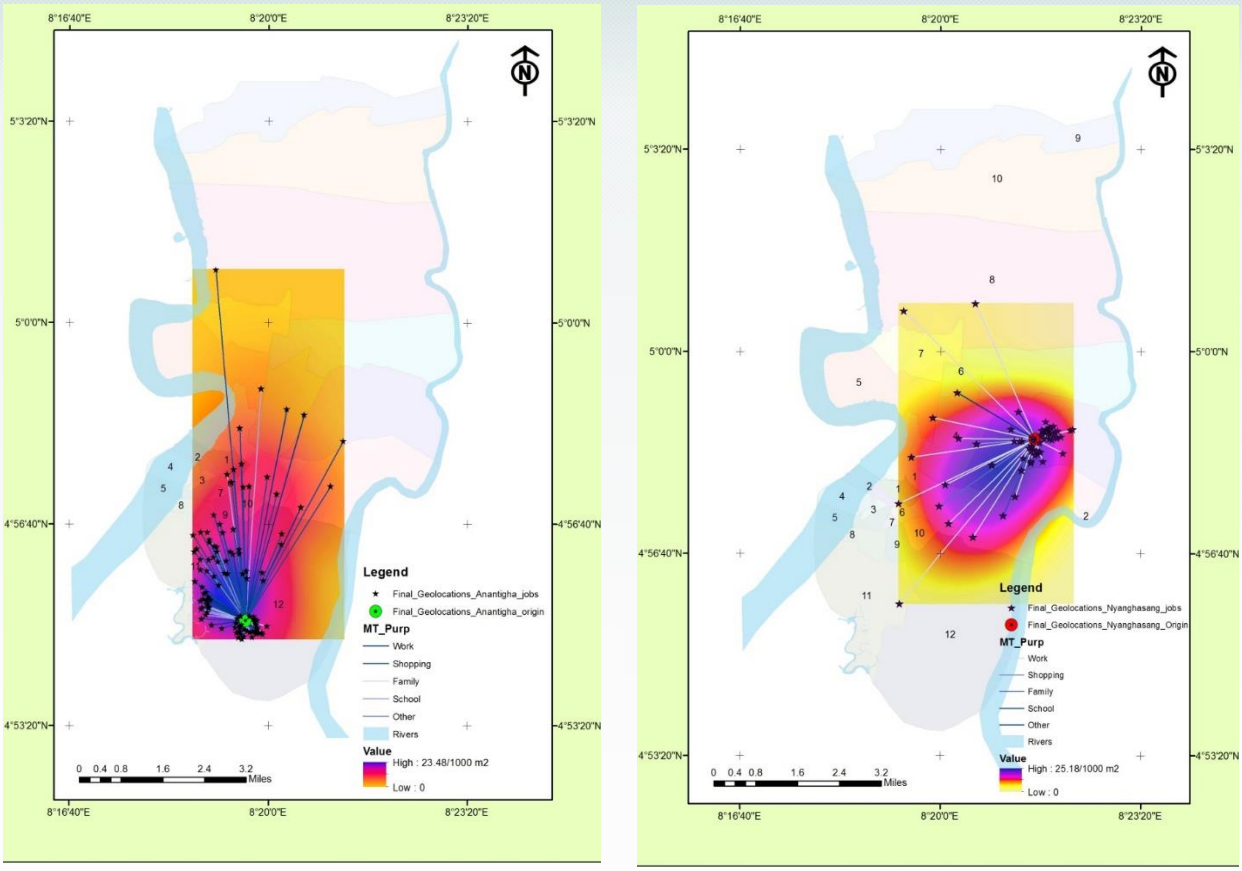

Figure 11. Distribution of job locations based on daily primary trip purposes in Anantigha and Nyangasang (Authors' field survey, 2021)

Conclusion and Recommendations

The findings of this research demonstrated the applicability of geographical information system to critical assessment of urban challenges such as accessibility to basic services in cities of the Third World. While questions of who the poor are and their location within Calabar have been raised, the use of GIS to implement urban planning policies that promote social inclusion became evident. However, lack of reliable data is a major challenge to the implementation of this methodology. Th paper concluded that accessibility to job locations in the study area is poor and explains the degree of social exclusion of Nyangasang and Anantigha residents in Calabar. While these residents are engaged in low-paying, informal socioeconomic activities, poor accessibility to job locations is what socially exclude them from the major scheme of things in Calabar metropolis. This indicates the disparity in levels of accessibility for different groups within the urban centre.

The study advocates a deliberate policy for social inclusion of this group of residents within the metropolis. Such policy may include urban renewal, or deliberate urbanization of the fringes that focuses on how residents can easily access well-located, good-paying jobs, to enhance the quality of their wellbeing. It is further recommended that the incorporation of needs, rights, wants, and desires into accessibility be given priority attention, as it offers a valuable understanding of the dimensions and implications of accessibility to livelihood. While the difficulty of providing accessibility in specific cases, is acknowledged, the need for the provision of adequate housing for the low and medium-income groups is strongly advocated.

This study in Calabar and indeed Nigeria, is one of a very few studies that focuses on practical

assessment of how many jobs can be located per unit space using geographical information systems methodology. The data quality which remained a fundamental challenge, notwithstanding, the study has generated a demonstration database for students and urban planning professionals in Calabar and Nigeria in general. While, the study has the tendency to stimulate a robust methodological debate, it has however, provided a background to literature in the often-neglected urban planning for the poor. Specific data layers needed for geo-spatial analysis, such as, origin-destination data, census shapefile data at enumeration area resolution, is lacking in the study area. The unwillingness of residents to participate in the survey remained a fundamental challenge to the study. This notwithstanding, the study has provided a demonstration-database for students and professionals of urban planning in Calabar and that has created the foundation for further research on accessibility to jobs for the urban poor in Nigerian cities.

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