Evaluation of Infrastructure in Ibadan Metropolis, Nigeria

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Abstract

The study examined the quantity and quality of infrastructure in Ibadan, Nigeria with a view to using the information to provide policy guidelines for sustainable infrastructural development. Using stratified sampling technique, a total of fifteen wards from the five local government areas in Ibadan metropolis were selected for study. The selection of all the local government areas is based on the fact that all of them cut across all the residential zones in the metropolis and they all topologically converge at the center of the city. Primary data for the study were sourced through the questionnaire administered on 1,035 respondents (2% of household heads in all the residential buildings in the metropolis), using systematic sampling technique. Descriptive and inferential statistics were employed to analyze the data earned. Findings established that 93.14%, 92.27%, 75.07%, 68.99% and 68.02% of the residents had access to nursery/primary school, market, secondary school and mosque respectively. Moreover, while maternity center was accessed by 66.57%, communication facility was used by 58.16%. Although, library was available and accessed by residents, its usage was the least (5.22%) in the study area. The five facilities that residents were very dissatisfied with were waste disposal facilities, nursery/primary school, security/police post, recreational facilities and transport network. The study revealed that facilities such as water supply, restaurant, dispensary, drainage, electricity supply, waste disposal, and fire station, were insufficiently available in the study area. Thus, the study concluded that infrastructure facilities in Ibadan metropolis were poor.

Keywords: Infrastructure, facilities, quality of life, management, environment

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Introduction

The term "infrastructure" can be used to cover all "physical facilities, institutions and organization structures, or the social and economic foundations, for the operation of a society" (United Nations, 2008; Udoka, 2013), and social infrastructure (for example health and education) is usually characterized from economic infrastructure. Infrastructure usually refers to the systems and fundamental facilities needed to assist an area, city or country (UNDP, 2004). Such facilities are typically roads, water supply, electricity, sewers, etc. that enable, sustain or promote the standard of living of people; infrastructure is the enterprise or the products, services and facilities essential for the economy to function appropriately. Providing infrastructural amenities for housing means putting the first basic amenities and services needed by every household in place for numerous schemes and pursuits. However, providing such amenities is one of the numerous complex challenges cities face in developing countries such as Nigeria as they are not able to provide these infrastructures for the filled urban population (Oyesiku, 2010; World Bank, 2012; Gatauwa & Murungi, 2015).

Infrastructural development in many nations is one of the mandatory medium of assessing the achievements of the government and for establishing an excellent control management (Kolawole, 2014). It confirms that whenever people are declined of basic infrastructure, the result is deprivation leading to urban communities with the substantial total of impoverished individuals. Housing provision and housing infrastructure are entwined. Without infrastructure, housing cannot be viable and hence the former should be treated as part to the latter. A model urban community should be supplied with suitable roads, drainage networks, electricity and potable water supply, good waste management system and security (Bovaird & Loffler, 2003; Lucas et al., 2003).

The state of these services in Nigerian urban community contradicts the principle of sustainability in urban housing. A sustainable housing development would not only have environment agreeable and energy efficient buildings, it would also have access to employment, schools, shops, places of entertainment, and primary health care, and it would be accessible by public transport (Kolawole, 2014). Subsequently, the provision of sufficient infrastructural amenities is an important segmentt of housing provision especially in developing countries like Nigeria. There is thus a need for research into the condition of infrastructural supply in mass and public housing developments to reveal the present condition of infrastructural decline, and its causalities and identify ways to attain the right standard of living for people. One important segment of the urban housing challenge is the poor state of

the provided infrastructure (Mabogunje, 1968; Ajanlekoko, 2001; Noll, 2004; Omar, 2009; Veenhoven, 2017).

Findings on housing supply tend to focus on problems of policy, funding, and financial conditions of housing procurement problems, with, infrastructure being dealt with en-passant. However, as interest in quality housing has multiplied, researchers are looking for approaches to present housing from a holistic point of view. The function of infrastructure in housing provision cannot be overstated, nor should it to dealt with as a very little thought (Sirgy & Cornwell, 2002; United State Environmental Protection Agency (USEPA), 2006).

However, the infrastructural base of any country constitutes the backbone of its socio-economic development. Alabi (2010) stated that infrastructural development has in recent time assumed a central importance in Nigeria's effort to attain social and economic stability. Infrastructure is generally referred to as the physical and organizational structures necessary for the functioning of society (Olujimi & Bello, 2009; Orekan, 2015). The United Nations Population Fund (UNPF) (2007) reported that Nigeria's infrastructures are grossly inferior in terms of quality and quantity to those existing in other parts of the world. This was corroborated by Alabi (2010) who observed that infrastructure in Nigeria is in a state of negligence and disrepair.

The infrastructure listed as lacking in Nigeria form the WHO survey 2007 includes insufficient or lack of provision of pipe borne or potable drinking water, poor road network, poor waste management and inefficient electricity supply. Das (2008) reported that these infrastructures are grossly inadequate, inequitably spread, where available and in a state of decay, which point to the inability of the provided infrastructure to meet the needs of the teaming population, itself a result of the influx of people into the cities due to migration and a high birth rate. These phenomenal growths exert a tremendous pressure on the existing infrastructure (Ajibola, Awodiran & Salu-Kosoko, 2013; Asikhia & Uyoyoghene, 2011; United Nations Economic Commission for Africa (UNECA), 2013).

Frischmann's theory of infrastructure and commons established that, the state is generally responsible for the provision of infrastructure through numerous revenue sources including state resources and tax from citizens and organizations. It has been observed that there is a genuine deficit of infrastructure in Nigeria in terms of both quality and quantity (Pacione, 2003; Ventegogt et al., 2003; Flora, 2004; Oluseyi, 2006; Oyesiku, 2009; Ajanlekoko, 2001). There are quite a number of obstacles facing the development of infrastructure in Nigeria including the issues of finance, technology for development, maintenance design, quality and standards, and sustainability. In recent years, Nigeria has administered many significant infrastructural

sector reforms, with obstacles persisting in numerous sectors. Further, Omole (2010) has emphasized that in Nigeria housing is a component of the environment that has great impact on the health, efficiency, social behavior, and general life satisfaction of the community. The researchers concluded that cultural, social and economic worth of the community are the best physical and historical affirmation of the civilization of a country. The studies cited above did not consider the facilities that satisfied the respondents more than others. It is against this background that this study examined infrastructure facilities in Ibadan metropolis, Nigeria.

Research methodology

Study area

Ibadan is located on a hilly terrain; this makes it a defensive site. It has an elevation of about 210 meters above the sea level. It is located between latitude 7° 05N and 7° 25N and longitude 32 °40 E and 32° 55 E and lies approximately at a distance of 145 kilometers north east of Lagos. As a result of its location within the tropics, the city is identified by a fairly uniform temperature, moderate rainfall, high relative humidity as well as the vegetation situated on the derived savannah vegetation zone. The zone is made up of woodland, secondary forests and tropic vegetation communities as well as mixed cropping and farmland (Ajao *et al.* 2002). The vegetation type (i.e. derived savannah) is the result of pressure on land use due to high population density and agriculture. The geographical presentation of the study area within the regional context of Nigeria is shown in Figure 1.

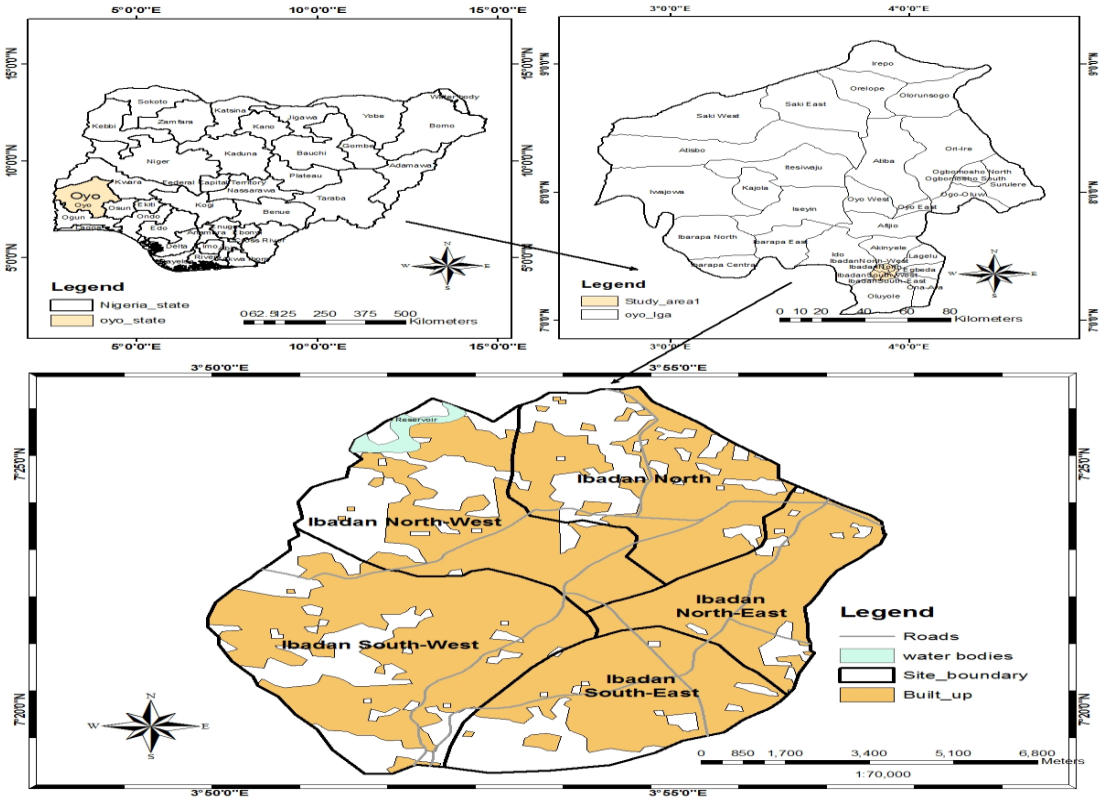

Figure 1. Map of the study area in the Nigerian context

Sampling procedure

A multi-stage sampling technique was employed for data collection. The first stage is the selection of the five Local Government Areas in the metropolis. These are Ibadan North, Ibadan North East, Ibadan North West, Ibadan South East and Ibadan South West. The selection of all the local government areas is established on the fact that all of them cut across all the residential zones in the metropolis and they all spatially converge at the center of the city. The second stage involves the stratification of study areas into residential zones based on the Afon (2000, 2007) scheme: the core, transition and suburban. Furthermore, local government areas in Ibadan metropolis were stratified into the existing political wards, as recognized by the Oyo State Independent Electoral Commission (2012) in the conduct of electoral polls. According to a pilot study, the total number of political wards in Ibadan metropolis was 59. Ibadan North, Ibadan North East, Ibadan South East and Ibadan South West had twelve (12) political wards each while Ibadan North West comprised eleven (11) political wards. The spatial distribution of political wards showed that there were 29, 17 and 23 wards in the core, transition and suburban zones respectively.

In the third stage, a ward in each residential zone of Ibadan North, Ibadan North East, Ibadan North West, Ibadan South East and Ibadan South West was selected randomly without replacement for questionnaire administration. Through this method, a total of fifteen (15) wards were selected for survey consisting of One (1) ward each from the core, transition and suburban zones of the five local government area council of Ibadan metropolis. This selection represents 33.8% of the sampling frame.

The primary and the secondary data which were obtained through the GPS field operations. The quick bird image and existing maps were integrated together in the ArcGIS software from which local queries were performed to produce a GIS database containing the facilities in Ibadan metropolis.

As presented in Table 1, information from the Google Earth and reconnaissance surveys revealed that there were 51, 351 buildings in the selected political wards across the three residential zones of the metropolis. These comprised 26, 427 buildings in the core residential zone, 14,924 buildings in the transition zone and 10,417 buildings in the suburban zone. A systematic sampling technique was employed to identify where households heads would be selected for survey. The first building was chosen randomly. Subsequent units of investigation consisted of every 50^{th} building in each ward, representing 2% of the buildings in the selected wards. Thus, 1,035 buildings were sampled, comprising 528 buildings in the core residential zone, 299 in the transition zone and 208 in the sub-urban zone. A household head was the respondent selected from a sampled building. In cases where the household head was not available, any available adult was sampled. Thus, a total of 1,035 copies of questionnaire were administered for the study.

Table 1: Buildings in the different residential zones where household heads were selected for survey

Residential Areas		Ibadan North	Ibadan NE	Ibadan NW	Ibadan SE	Ibadan SW	Total
Core	Total Buildings	3 556	6 224	4 805	5 433	6 409	26 427
	Sampled Buildings	71	124	96	109	128	528
Transition	Total Buildings	5 673	2 580	1 857	2 238	2 576	14 924
	Sampled Buildings	113	52	37	45	52	299
Sub-urban	Total Buildings	2 315	2 195	2 122	1 792	1 993	10 417
	Sampled Buildings	46	44	42	36	40	208
Total	Total Buildings	11 544	10 999	8 784	9 463	10 561	51 351
	Sampled Buildings	232	220	176	192	212	1035

Source: Author's Field Survey, 2018

Also, residents were made to express their opinion on the condition of the facilities in their locality using a five-point Likert scale of 'Very Good' (VG), Good' (G), 'Neither Poor nor Good' (NPNG), 'Poor' (P) and 'Very Poor'(VP). Therefore, respondents also rated their level of satisfaction on each facility using a five-point Likert scale of 'Very Dissatisfied, 'Dissatisfied', 'Just Satisfied, 'Satisfied and 'Very Satisfied'. The level of satisfaction was measured by an index called Residents' Satisfaction in Infrastructure Index (RSII).

Findings and Discussion

Infrastructure is said to be the systematic framework, which underpins a community's ability to fulfil its mission of providing a base for its citizens to be productive and of nurturing social equity (Eastman & Hong, 2000). It is also seen as a wide range of economic and social facilities key to creating an enabling environment for economic growth and enhancing quality of life (Veenhoven, 2002, 2017; Costanza, 2008). To this end, it is imperative to see whether infrastructural facilities are available and adequate as well as to observe how their quality meets the residents' needs. It is also significant to aware the magnitude to which the facilities are satisfactory and contribute to the residents' quality of life.

Distribution of available infrastructural facilities

The spatial distribution of infrastructural facilities in Ibadan metropolis has been mapped through GIS by this study. Table 2 shows the number of facilities within the localities with the highest number of facilities in Ibadan metropolis while Fig 1 is a graphic representation of the result. It can be observed that more facilities are found around Iwo Road and Bashorun area which feature 12.15% of the total number of facilities mapped. This is followed by Eleyele with 8.05%. Other areas where there are higher numbers of facilities include Onipasan, Old Ife Road, Oke-Adu, Okeofa, Onipasan, GRA Agodi and New Bodija.

Table 2. Localities with the highest number of facilities in Ibadan metropolis

Localities	Number of Facilities	% of Total
Iwo road, Bashorun	86	12.15
Eleyele	57	8.05
Onipasan, Old Ife Road, Oke-Adu, Okeofa, Onipasan	50	7.06
GRA Agodi, Bashorun, Ikolaba, Ashi, New Bodija, Inu-Koko	42	5.93
Ring Road, Abeokuta road, Oke Ayo, Odoona	35	4.94
Odoye, Yemetu, Oritamefa, Agbadagbudu, Oje	30	4.24
Challenge, Passport Office, Oluyole Estate, Ring road	28	3.95
Agugu, Agugu-Oremeji, Koloko, Oluyoro-Okeofa	27	3.81
Iyaganku, Dugbe, Cocoa House, Oke-Bola	20	2.82
Poly, Sango, Samonda, UI	19	2.68
UCH, Ola Bodija, Mokola	19	2.68
Adekile, Gbelekale, Aperin, Ojagbo, Aremo, Koloko	18	2.54
Ibuko, Adelabu, Felele layout, Onibonje, Olorunsogo	17	2.4
Oke-Ado, Cuso, Adeoyo Hospital	17	2.4
Agbowo, Bodija Market, Aponrin	15	2.12
Ring Road, Anfani, Challenge, Molete	15	2.12
Agodi, Kube, Oke-Apon,Itubaba-Ita-Akinloye	12	1.69
Aremo, Alalubosa, Babasale, Ile-Eja, Ode-Aje, Okeofa-Atipe	12	1.69
Beere, Kannike, Oke-Are, Odo-Oye, Isale-Alfa	12	1.69
Ojagbo, Alafara-Olubadan, Aremo, Atipe, Idi Radio, Ojagbo	11	1.55
Oketedo	11	1.55
Oyapidan, Olomi, Eleta, Odinjo, Ile tuntun	11	1.55
Sango, Ijokodo, OkeItunnu, Alaro, Okoro	11	1.55
Sabo	10	1.41
Agbeni, Amunigun, Idikan, Ogunpa, Ayeye, Lanigun	8	1.13
Babasale, Oke Market, Irefin, Oke	8	1.13
Inalende, Oniyanrin, Oke-Iloro, Bola	8	1.13

Source: Author's Fieldwork, 2018

The GIS spatial queries carried out in this work enabled the residents to be provided with a list of social, economic and environmental infrastructure in their locality to indicate whether the facilities were accessible to them.

Through the summary of the map below, it was revealed that facilities were in varying degree of availability in Ibadan metropolis as shown in Figure 2.

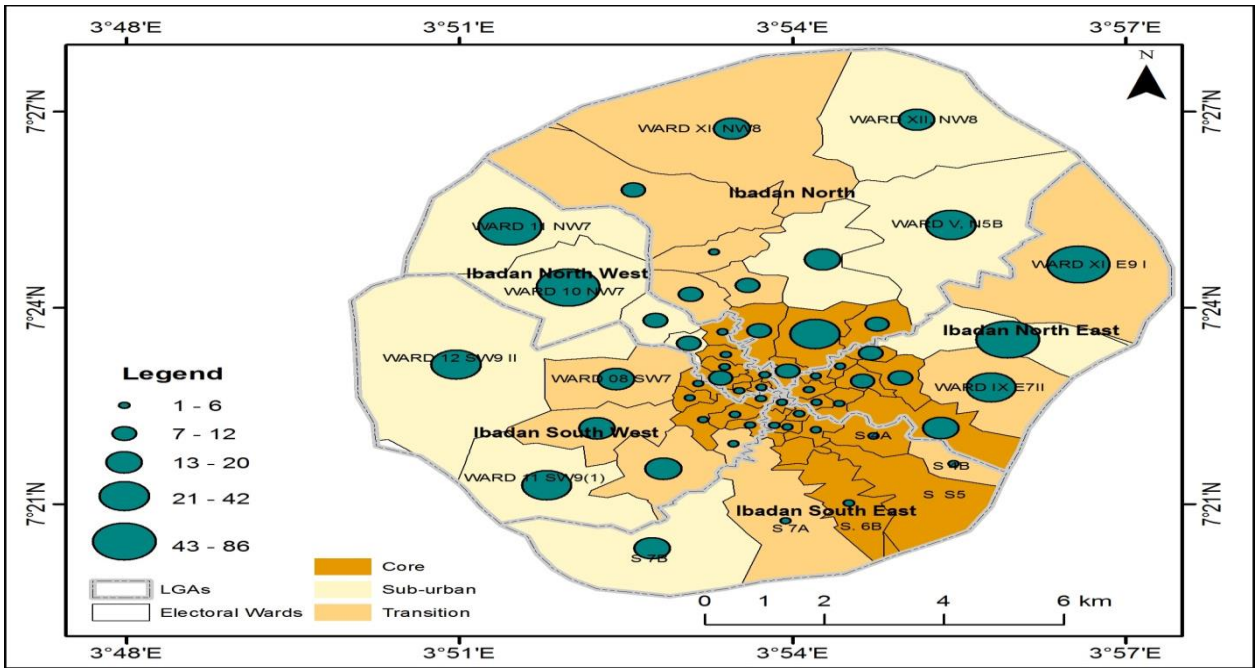

Figure 2. Availability of infrastructure in the residential areas of Ibadan Metropolis

In terms of access, to the facilities in Ibadan metropolis, it is revealed in Table 3 that 93.14%, 92.27%, 75.07%, 68.99% and 68.02% of the residents had access to nursery/primary school, market, secondary school, mosque and church in that order. Moreover, while maternity center was accessed by 66.57%, communication facility was used by 58.16%. Although, library was available and accessed by residents, was the least used (5.22%) in the study area.

Table 3. Access to Facilities

Infrastructure	Frequency				Percentage (Row)			
	Core	Transition	Sub-urban	Ibadan Metropolis	Core	Transition	Sub-urban	Ibadan Metropolis
Nursery/Primary School	506	270	188	964	52.49	28.01	19.50	100.00
Market	488	275	192	955	51.10	28.80	20.10	100.00
Secondary School	379	236	162	777	48.78	30.37	20.85	100.00
Mosque	361	208	145	714	50.56	29.13	20.31	100.00
Church	332	218	154	704	47.16	30.97	21.88	100.00
Maternity Center	350	196	143	689	50.80	28.45	20.75	100.00
Communication facilities	290	186	126	602	48.17	30.90	20.93	100.00
Transportation network	270	177	131	578	46.71	30.62	22.66	100.00
Organized open space	285	130	103	518	55.02	25.10	19.88	100.00
Water supply	237	159	118	514	46.11	30.93	22.96	100.00
Restaurant	220	131	153	504	43.65	25.99	30.36	100.00
Dispensary	322	76	76	474	67.93	16.03	16.03	100.00
Drainage facilities	184	135	117	436	42.20	30.96	26.83	100.00
Electricity Supply	194	138	94	426	45.54	32.39	22.07	100.00
Waste Disposal Facilities	157	149	114	420	37.38	35.48	27.14	100.00
Fire Station	175	132	67	374	46.79	35.29	17.91	100.00
Public toilet	158	119	92	369	42.82	32.25	24.93	100.00
General Hospital	117	105	89	311	37.62	33.76	28.62	100.00
Recreational facilities	99	97	81	277	35.74	35.02	29.24	100.00
Post office/postal service	125	72	54	251	49.80	28.69	21.51	100.00
Convenience stores	110	73	63	246	44.72	29.67	25.61	100.00
Good layout plan	6	19	30	55	10.91	34.55	54.55	100.00
Library	0	54	0	54	0.00	100.00	0.00	100.00
Community Centre	50	55	36	141	35.46	39.01	25.53	100.00

Source: Field Survey, 2018

Variation across the three residential areas revealed that nursery/primary school was relatively higher (95.83%) in core residential areas, as against 90.30% and 90.38% respectively in transition and sub-urban residential areas. Similarly, it was observed that accessibility to library was not adequate/enough except in transition residential area where a proportion (18.06%) of the residents indicated that the facility was available.

Presented in Table 4 is the aggregate residents' view on how adequate each of the identified facilities was in the study area. The nearer the FAI to 5, the more adequate the facilities were considered by residents. The average facility adequacy ($FAI_{Ibadan\text{metropolis}}$) for the study area was 2.64. This implied that facilities in the study area were not adequate as perceived by respondents as the index of 2.64 lay close to 'adequate'.

Table 4. Facility Adequacy Index of the Identified Facilities in Ibadan Metropolis

Infrastructure	Frequency			Percentage (Column)		
	Core	Transition	Sub-urban	Core	Transition	Sub-urban
Nursery/Primary School	506	270	188	9.34	7.92	7.44
Market	488	275	192	9.01	8.06	7.59
Secondary School	379	236	162	7.00	6.92	6.41
Mosque	361	208	145	6.67	3.84	5.74
Church	332	218	154	6.13	4.03	6.09
Maternity Center	350	196	143	6.46	3.62	5.66
Communication facilities	290	186	126	5.36	3.43	4.98
Transportation network	270	177	131	4.99	3.27	5.18
Organized open space	285	130	103	5.26	2.40	4.07
Water supply	237	159	118	4.38	2.94	4.67
Restaurant	220	131	153	4.06	2.42	6.05
Dispensary	322	76	76	5.95	1.40	3.01
Drainage facilities	184	135	117	3.40	2.49	4.63
Electricity Supply	194	138	94	3.58	2.55	3.72
Waste Disposal Facilities	157	149	114	2.90	2.75	4.51
Fire Station	175	132	67	3.23	2.44	2.65
Public toilet	158	119	92	2.92	2.20	3.64
General Hospital	117	105	89	2.16	1.94	3.52
Recreational facilities	99	97	81	1.83	1.79	3.20
Post office/postal service	125	72	54	2.31	1.33	2.14
Convenience stores	110	73	63	2.03	1.35	2.49
Good layout plan	6	19	30	0.11	0.35	1.19
Library	0	54	0	0.00	1.00	0.00
Community Centre	50	55	36	0.92	1.02	1.42
Total	5415	3410	2528	100.00	71.45	100.00

Source: Field Survey, 2018

However, the level of satisfaction derived from these facilities in the study area was 3.18 as presented in Table 5. An index close to 3 (is, 'just satisfied'). The five most adequate facilities to residents and their corresponding satisfaction derived were church (FAI=4.44; RSII=4.16), mosque (FAI=4.44; RSII=2.41), nursery/primary school (FAI=4.18; RSII=2.65), secondary

school (FAI=3.96; RSII=3.15) and market (FAI=3.45; RSII=3.19). On the other hand, facilities such as waste disposal (FAI=1.41; RSII=2.83), recreation (FAI=1.59; RSII=2.84), parking/open space (FAI=1.62; RSII=3.31) and drainage (FAI=1.63; RSII=3.99) were perceived as most inadequate in the study area. Waste disposal facility with an index of 1.41 was perceived to be the least adequate in the study area. This finding supports the claim of Taiwo (2014) who submitted that waste generated by beggars (who were also residents) was indiscriminately disposed wherever they were found. This was due to inadequacy of waste disposal facilities.

Table 5. Residents' Perceived Satisfaction on Facilities in Ibadan Metropolis

Facilities	VD	D	JS	S	VS	SWV	RSII	Deviation about the Mean
	1	2	3	4	5			
Church	9	20	231	2580	1470	4310	4.16	0.98
Drainage facilities	4	4	48	3948	130	4134	3.99	0.81
Dispensary	10	58	75	3764	150	4057	3.92	0.74
Electricity supply	27	90	282	3436	50	3885	3.75	0.57
Fire station	0	8	909	2912	0	3829	3.7	0.52
Public toilet	2	248	543	2912	0	3705	3.58	0.4
Open space	0	0	2157	1264	0	3421	3.31	0.13
Market	0	4	1833	1464	0	3301	3.19	0.01
Secondary School	2	0	2562	700	0	3264	3.15	-0.03
Security/Police Post	0	240	1995	784	0	3019	2.92	-0.26
Waste Disposal Facilities	0	362	2562	0	0	2924	2.83	-0.35
Nursery/Primary school	0	734	2004	0	0	2738	2.65	-0.53
Transport network	2	840	1635	40	30	2547	2.46	-0.72
Recreational facilities	0	4	2931	0	0	2935	2.84	-0.72
Mosque	2	1300	1047	112	30	2491	2.41	-0.77
Water supply	25	1802	273	72	0	2172	2.1	-1.08

$$\overline{\text{RSII}}_{\textit{Ibadan metropolis}} = \frac{\sum RSII}{(N=16)} = \frac{50.96}{16} = 3.18$$ Source: Field Survey, 2018

Adequacy of and satisfaction with facilities in the core residential area

Presented in Tables 6 and 7 were residents' view on how adequate each of the identified facilities was in the core residential area as well as the satisfaction they derived from them. The average FAI for the core (FAI_{core}) was 2.62, and the $RSII_{Core}$ was 3.17. These indices were close to 'adequate' and 'just satisfied'. Facilities that were of significance to this study were those

with indices greater than the average (that is, FAI $_{Ibadan\ metropolis}$ and RSII $_{Ibadan\ metropolis}$) of the study area and those below them. Church and mosque were the facilities considered to be the most adequate with an index of 4.46 each. Their equivalent satisfaction indices were 4.14 and 2.38 respectively.

Table 6. Facility Adequacy Index of the Identified Facilities in Core

Facilities	NAA 1	NA 2	A 3	VA 4	VMA 5	SWV	FAI	Deviation about the Mean
Church	0	0	0	1136	1220	2356	4.46	1.84
Mosque	0	0	0	1136	1220	2356	4.46	1.84
Nursery/Primary school	0	0	111	1368	745	2224	4.21	1.59
Secondary School	0	0	0	2112	0	2112	4	1.38
Market	0	0	900	912	0	1812	3.43	0.81
Dispensary	69	288	222	944	25	1548	2.93	0.31
Communication facilities	162	62	111	1168	30	1533	2.9	0.28
Maternity Center	44	378	225	868	15	1530	2.89	0.27
Fire station	0	568	618	152	0	1338	2.53	-0.09
Security/Police Post	85	832	15	0	110	1042	1.97	-0.65
Public toilet	245	418	162	36	55	916	1.73	-0.89
Library	276	454	24	40	35	829	1.57	-1.05
Parking/open space	279	434	60	28	25	826	1.56	-1.06
Recreational facilities	309	378	21	64	35	807	1.52	-1.1
Drainage facilities	288	446	24	24	15	797	1.5	-1.12
Good layout plan	307	414	24	8	20	773	1.46	-1.16
Waste Disposal Facilities	365	298	0	44	15	722	1.36	-1.26

$$\overline{\text{FAI}}_{core} = \frac{\sum FAI}{(N=17)} = \frac{44.48}{17} = 2.62$$

Source: Field Survey, 2018

The least facility in terms of adequacy with an index of 1.36 was waste disposal. The satisfaction index derived in this facility was 2.83. The facility was close to 'not at all adequate' and 'just satisfied' as perceived by residents. Other facilities that were adequate (above the study area average index) with regards to the satisfaction derived from them included nursery/primary school (FAI=4.21; RSII=2.64), secondary school (FAI=4.00; RSII=3.17), market (FAI=3.43; RSII=3.16) and dispensary (FAI=2.93; RSII=3.91).

Table 7. Residents' Perceived Satisfaction on Facilities in the Core

Facilities	VD	D	JS	S	VS	SWV	RSII	Deviation about the Mean
	1	2	3	4	5			
Church	3	16	138	1312	715	2184	4.14	0.97
Drainage facilities	0	0	3	2108	0	2111	4	0.83
Dispensary	4	38	36	1908	80	2066	3.91	0.74
Electricity supply	17	28	150	1780	10	1985	3.76	0.59
Fire station	0	0	468	1488	0	1956	3.7	0.53
Public toilet	0	116	270	1520	0	1906	3.61	0.44
Open space	0	0	1128	608	0	1736	3.29	0.12
Secondary School	0	0	1314	360	0	1674	3.17	0
Market	0	0	933	736	0	1669	3.16	-0.01
Water supply	15	926	135	20	0	1096	2.08	-0.09
Security/Police Post	0	124	1020	372	0	1516	2.87	-0.3
Waste Disposal Facilities	0	180	1314	0	0	1494	2.83	-0.34
Recreational facilities	0	0	1485	0	0	1485	2.81	-0.36
Nursery/Primary school	0	380	1014	0	0	1394	2.64	-0.53
Transport network	1	432	819	16	10	1278	2.42	-0.75
Mosque	2	678	513	56	10	1259	2.38	-0.79

$$\overline{\text{RSII}}_{Core} = \frac{\sum RSII}{(N = 16)} = \frac{50.77}{16} = 3.17$$

Source: Field Survey, 2018

Adequacy of and satisfaction with facilities in the transition residential area

From the summary presented in Tables 8 and 9, it was established that the mean FAI and RSII in the transition residential area were 2.75 and 3.20 respectively. This implied that on average, the level of facilities' adequacy and the satisfactions derived from them were 'adequate' and 'just satisfied' as the indices were close to 3. Facilities that were very adequate to residents in the transition residential area included market, church, mosque, nursery/primary school, and secondary school. Conversely, those that was low in adequacy included fire station, maternity center, dispensary, communication facilities, security/police post, among others.

Table 8. Facility Adequacy Index of the Identified Facilities in Transition

Facilities	NAA 1	NA 2	A 3	VA 4	VMA 5	SWV	FAI	Deviation about the Mean
Market	0	0	900	612	0	1512	5.05	2.3
Church	0	0	102	440	775	1317	4.4	1.65
Mosque	0	12	84	432	785	1313	4.39	1.64
Nursery/Primary school	0	4	171	552	510	1237	4.13	1.38
Secondary School	0	8	84	1060	10	1162	3.88	1.13
Fire station	0	216	483	120	0	819	2.73	-0.02
Maternity Center	23	264	177	312	35	811	2.71	-0.04
Dispensary	53	188	165	384	5	795	2.65	-0.1
Communication facilities	116	30	156	444	25	771	2.57	-0.18
Security/Police Post	44	424	120	0	15	603	2.01	-0.74
Public toilet	100	272	123	80	10	585	1.95	-0.8
Library	120	274	108	20	5	527	1.76	-0.99
Parking/open spac	129	252	111	24	5	521	1.74	-1.01
Good layout plan	133	246	114	0	25	518	1.73	-1.02
Drainage facilities	123	276	102	16	0	517	1.72	-1.03
Recreational facilities	148	226	75	28	30	507	1.69	-1.06
Waste Disposal Facilities	167	190	96	16	5	474	1.58	-1.17

$$\overline{FAI}_{Transition} = \frac{\sum FAI}{(N=17)} = \frac{46.69}{17} = 2.75$$

Source: Field Survey, 2018

Findings further revealed that residents were satisfied with facilities such as drainage (4.00), electricity (3.74), fire station (3.71) and public toilet (3.54). Others included open space (3.32) and market (3.27). The least five facilities that residents were very dissatisfied with were waste disposal facilities, nursery/primary school, security/police post, recreational facilities and transport network.

Table 9. Residents' Perceived Satisfaction on Quality and Quantity of Facilities in the Transition

Facilities	VD	D	JS	S	VS	SWV	RSII	Deviation about the Mean
	1	2	3	4	5			
Drainage facilities	0	4	27	1104	60	1195	4	0.8
Electricity supply	6	42	54	1016	0	1118	3.74	0.54
Fire station	0	4	246	860	0	1110	3.71	0.51
Public toilet	2	76	165	816	0	1059	3.54	0.34
Open space	0	0	609	384	0	993	3.32	0.12
Market	0	4	519	456	0	979	3.27	0.07
Water supply	8	538	54	16	0	616	2.06	-1.14
Secondary School	2	0	747	192	0	941	3.15	-0.05
Health facility	2	20	30	1076	40	1168	3.91	0.71
Church	4	4	54	736	455	1253	4.19	0.99
Mosque	0	368	315	24	20	727	2.43	-0.77
Transport network	1	252	483	8	0	744	2.49	-0.71
Recreational facilities	0	4	861	0	0	865	2.89	-0.31
Security/Police Post	0	72	573	256	0	901	3.01	-0.19
Nursery/Primary school	0	204	591	0	0	795	2.66	-0.54
Waste Disposal Facilities	0	100	747	0	0	847	2.83	-0.37

$$\overline{\text{RSII}}_{\text{Transition}} = \frac{\sum RSII}{(N = 16)} = \frac{51.20}{16} = 3.20$$

Source: Field Survey, 2018

Adequacy of and satisfaction with facilities in the sub-urban residential area

Findings presented in Tables 10 and 11 are the summary of the adequacy residents placed on infrastructural facilities in the sub-urban residential area and the satisfaction they derived from them. The average FAI for the sub-urban residential area ($FAI_{sub\text{-}urban}$) was 2.66, while that of the RSII for the same area ($\text{RSII}_{Sub\text{-}urban}$) was 3.19. These indices were also close to 'adequate' and 'just satisfied' as in the transition residential area. Church and mosque were the facilities considered to be the most adequate with an index of 4.47 each. The least adequate facility in this residential area was waste disposal with an index of 1.29. However, it was the only facility that tended towards 'not at all adequate' as perceived by residents. Facilities such as security/police post (1.84), public toilet (1.83), drainage (1.80), library (1.80), good layout plan (1.67), parking/open space (1.60), and recreation (1.59) were close to 'not available'.

Table 10. Facility Adequacy Index of the Identified Facilities in the Sub-Urban

Facilities	NAA	NA	A	VA	VMA	SWV	FAI	Deviation about the Mean
	1	2	3	4	5			
Church	0	0	0	436	495	931	4.47	1.81
Mosque	0	0	0	436	495	931	4.47	1.81
Nursery/Primary school	0	0	48	552	270	870	4.18	1.52
Secondary School	0	0	0	832	0	832	4	1.34
Market	0	0	351	364	0	715	3.43	0.77
Maternity Centre	9	156	69	392	0	626	3	0.34
Dispensary	26	110	114	356	0	606	2.91	0.25
Communication facilities	67	34	33	444	10	588	2.82	0.16
Fire station	0	218	246	68	0	532	2.55	-0.11
Security/Police Post	34	344	6	0	0	384	1.84	-0.82
Public toilet	86	158	105	32	0	381	1.83	-0.83
Drainage facilities	87	182	42	64	0	375	1.8	-0.86
Library	89	178	36	72	0	375	1.8	-0.86
Good layout plan	111	142	42	24	30	349	1.67	-0.99
Parking/open space	109	162	36	16	10	333	1.6	-1.06
Recreational facilities	118	144	6	64	0	332	1.59	-1.07
Waste Disposal Facilities	147	122	0	0	0	269	1.29	-1.37

$$\overline{\text{FAI}}_{\text{sub-urban}} = \frac{\sum FAI}{(N = 17)} = \frac{45.25}{17} = 2.66$$

Source: Field Survey, 2018

These facilities had indices below the average FAI computed for the sub-urban residential area. Findings further revealed that what residents perceived to be very adequate among the facilities were viewed with very much dissatisfaction. These facilities included mosque, nursery/primary school, and market.

Table 11. Residents' Perceived Satisfaction on Quality and Quantity of Facilities in the Sub-Urban

Facilities	VD	D	JS	S	VS	SWV	RSII	Deviation about the Mean
	1	2	3	4	5			
Church	2	0	39	532	300	873	4.2	1.01
Drainage facilities	4	0	18	736	70	828	3.98	0.79
Dispensary	4	0	9	780	30	823	3.96	0.77
Electricity supply	4	20	78	640	40	782	3.76	0.57
Fire station	0	4	195	564	0	763	3.67	0.48
Public toilet	0	56	108	576	0	740	3.56	0.37
Open space	0	0	420	272	0	692	3.33	0.14
Secondary School	0	0	501	164	0	665	3.2	0.01
Market	0	0	381	272	0	653	3.14	-0.05
Security/Police Post	0	44	402	156	0	602	2.89	-0.3
Recreational facilities	0	0	585	0	0	585	2.81	-0.38
Waste Disposal Facilities	0	82	501	0	0	583	2.8	-0.39
Nursery/Primary school	0	150	399	0	0	549	2.64	-0.55
Transport network	0	156	333	16	20	525	2.52	-0.67
Mosque	0	254	219	32	0	505	2.43	-0.74
Water supply	2	338	84	36	0	460	2.21	-0.98

$$\overline{RSII}_{\text{Sub-urban}} = \frac{\sum RSII}{(N=16)} = \frac{51.10}{16} = 3.19$$

Source: Field Survey, 2018

The highest level of satisfaction was derived from facilities such as church, drainage, dispensary, electricity and fire station. Others included public toilet, open space and secondary school. All these had positive deviation about the mean and mean values above the average index ($RSII_{Sub\text{-}urban}$).

Conclusion and recommendations

The study has examined infrastructural facilities in Ibadan metropolis. The study revealed that facilities such as water supply, restaurant, dispensary, drainage, electricity supply, waste disposal, and fire station, among others, were insufficiently available in the study area. This finding could hamper the residents' well-being. Thus, the study concluded that infrastructure facilities in Ibadan metropolis were poor.

Based on the findings of this study, it is significant to provide basic and adequate infrastructural facilities at all levels in sequence to enhance the standard of living of those residing in the study

area thereby promoting the growth and development of Nigeria's public housing plans. However, the provision of basic and sufficient infrastructural facilities at all tiers of government and individual participation in infrastructure development should be regarded a criterion in assessing housing provision in Nigeria.

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