

Accessibility and Geospatial Assessment of Public Secondary School Education in Osun West Senatorial District, Nigeria

Olayode, O., Ogundahunsi, D.S., Gasu, M.B., Olayode, C.A., Ojo, A.O. and Adeyinka, S.A.

Abstract: The study adopts Geographic Information System (GIS) application to analyse the accessibility and spatial configuration of public education at the Secondary Schools (SSs) level in the Osun West Senatorial District (OWSD), Nigeria, in order to provide information and materials to strengthen and promote secondary school education planning. The study also analyses the location of public secondary schools as well as the usage of the allocated space. The data for this study were obtained on the field by using the Global Positioning System (GPS) to determine and analyse the coverage area of OWSD's 116 Public Secondary Schools (PSSs) based on population density. Settlements with public secondary schools (PSSs) were stratified into three different categories: suburb, with less than 10,000 people; semi-urban with 10,000–19,999 people; and urban with 20,000 people and above. Descriptive statistics and GIS were employed to analyse the acquired data. The research findings established that PSSs within 1km radius (Rs) buffer of the study area were clustered, with 81.8% in the urban were clustered while in the semi-urban and suburb settlement categories 20% and 70.0% respectively were dispersed. According to the findings, at a buffer of 2km Rs, 64.8% of the PSSs in urban settlements were clustered, while (21.4%) and the majority (71.4%) were dispersed in semi-urban and suburb settlements, respectively. In addition, results established that at the buffer of 3km, PSSs were clustered at 63.3% in the urban, 23.1% were dispersed in the semi-urban, and 69.2% in the suburb settlements. Moreover, at 4km buffer PSSs, it is apparent from the findings that the majority of the schools at 55.9% in the urban settlements were clustered, while most of the PSSs at 35.7% in the semi-urban settlements and 56.1% in the suburb settlements were dispersed. Conclusively, this research established a high rate of uneven accessibility to PSSs in OWSD. As a result, it is recommended that foreign and private investors, stakeholders, and government need to pool their resources in order to ensure adequate PSSs education availability to all settlement categories.

Keywords: Accessibility, Education, Public Secondary Schools, Settlements and Spatial Planning

I. Introduction

The distribution of educational facilities within the human environment is indeed an integral part of urban planning that has greatly impacted all spheres of socio-economic, physical, human, social, and national growth [1; 2]. The importance and opportunities that

education proffers, are quantifiable by measuring adequacy, availability, effectiveness, and accessibility to these infrastructures by the targeted beneficiaries, which spatial analysis explains their characteristics as a distribution [3; 4].

The threshold population and users' patronage patterns to educational facilities explain the accessibility concept and underscore their level of equitability in the distribution [1]; [5]; [6]. Also, geospatial analysis and distribution of education facilities are not just crucial to land use planning. It could as well be utilized to forecast the expected distance users travelled to school, travel time, and coverage distance (as defined by availability, distribution, location, and accessibility), knowledge, skills,

Olayode, O., Ogundahunsi, D.S., Gasu, M.B. and Olayode, C.A. (Department of Urban and Regional Planning; Osun State University, Osogbo, Osun State, Nigeria)

Ojo, A.O. and Adeyinka, S.A. (Department of Urban and Regional Planning; Obafemi Awolowo University, Ile-Ife, Nigeria)

Corresponding author: olayodeolayiwola80@gmail.com

Phone Number: +2348106596800

Submitted: 08-02-2022

Accepted: 26-03-2022

principles, information, predilection, and many more to fully harness the intrinsic values embedded in education [4]; [7].

Secondary School education plays a significant and germane role among the educational facilities categories. Education at the secondary school stage acts as the link amid primary and tertiary education, as such prepares and grooms individual students for higher or tertiary education [8].

Over the years, the educational system has witnessed several modifications of policies in Nigeria, by improving access to education and utilising the benefits that abound in education both at rural and urban settlements [9]. Therefore, for effective and efficient education planning towards achieving number four (quality education) of the Sustainable Development Goals (SDGs), there is a need to ensure equality in school distribution to adhere to adequate accessibility by the expected or targeted users [8]; [9].

The Inadequate provision of educational facilities has a vast influence on the human and general development of a nation, therefore explaining the significant importance attached to education. This has, however, become the concern globally in the delivery of quality and sound education, which made effort to ensure that the achievement made during the Millennium Development Goals (MGDs) is maintained and leveraged upon, therefore becoming agenda four of the United Nations Sustainable Development Goals (SDGs) [3]; [9]. Considering studies globally, [3]; [10]; [11]; [12]; [13]; [14] reveal the dynamics in the provision and unrelaxed delivery of quality education around the globe.

Accessibility to education facilities and services are constrained by factors including location, proximity, and distance, however, these are not only established in the school distribution [15]. Geospatial distribution of facilities has

observed that equitable distribution is germane to promote access by the patrons/ Studies using Geographic Information System (GIS) revealing the reality of the study is highly exceptional for example, [16] assessed disparity in the spatial location of schools in Cape Town, the study was well defined using GIS). Thus, this research adopts the application of GIS to geographically and spatially examine adequate accessibility to PSSs education in Osun West Senatorial District (OWSD) to provide information that could promote planning and development of secondary school education.

Specific objectives of the study are to identify the location of public secondary schools in OWSD and assess the proportion of the coverage area. These are with the view to providing information that could promote adequate planning and distribution of education facilities.

II. Materials and Methods

A. Study Area

The study area consists of 56 settlements 28 suburb settlements, 11 semi-urban settlements, and 11 urban settlements with less than 10,000 people, 10,000-19,999 people, and 20,000 and above people, across the settlements category respectively. In all, there are 116 PSSs in the study area, 59 in the urban, 16 in the semi-urban, and 41 in the suburb. The OWSD is located in the western part of the state while Osun State is also located in the western region of Nigeria. It is situated between Latitudes $7^{\circ} 30'N$ and $7.5^{\circ}N$, and Longitudes $4^{\circ} 30'E$ and $4.5^{\circ}E$.

A. Methods

Data employed for this research were sourced primarily and secondarily. The primary data were sourced using GPS 72h to acquire the spatial coordinates of both

study area was spatially clustered within the 2km RS and just 24.1% in the study area.

The finding established from Table 1 that, at 3km RS PSSs were clustered within the settlement categories, therefore 96.6% at the urban settlement category, 62.5% at the semi-urban settlement category, and 56.1% at the suburb settlement category. It is also evident from the research that only 4.4% PSSs in the urban category of the settlements were dispersed, just 37.5% in the semi-urban and 43.9% in the suburb. Moreover, the study showed that 77.6% which is the highest proportion of the PSSs in the study was clustered while just a few (22.4%) were dispersedly distributed in OWSD.

In addition, the study showed that PSSs were clustered in the settlements categories within 4km RS as revealed in Table 1, thus, 96.6% in the urban, 68.7% in the semi-urban, and 82.9% in the suburb. Similarly, results revealed that just 4.4% PSSs in the urban, 31.3% PSSs in the semi-urban, and 17.1% PSSs in the suburb settlements were clustered. Likewise, findings showed that the highest proportion (87.9%) of the PSSs in the study area were clustered while few (12.1%) were dispersed.

The study showed that users of PSSs across the settlements category of OWSD travel within 1km and 4km distance from the place of residence to school locations. Also, the study established that between 1km and 2km radius, PSSs were clustered mostly at the urban settlements at the disadvantage of semi-urban and suburb settlements respectively while within 3km and 4km radius, PSSs were vastly clustered at the urban settlements and semi-urban settlement at the decrement and lagging of suburb settlements.

Furthermore, the study established the high level of inequality in the provision, establishment, delivery, and distribution of public secondary schools in the study area

which influenced unequal access to harness benefits that abound educational facilities and services as settlements and communities such as Abebi Anajere, Olufirin, Apeena, Olufirin, Sango, Islamia Area in Ikire; Oke-Odo, Oke-Elenin, Isle-Gbeke, in Gbongan; Idi-Oke, Papa, Olabiwoninu, Ogburo, Obajoko, Koba'ope, Hospital Road, Alaadorun, Agoro in Iwo; Olosinmo, Logun, Aba Ramotu, Isoko, Idi Ape area, Oke – Ola, Ikan, Ado Ori – Oke, Aato, Aponla in Ejigbo; Oke-Osun, Station, Alaaya, Tantoloun, Adenlere, Gbandu in Ayedire Area; include Olota, Idere, Olodo, Idiya, Obamoro, Ololulolu, Owoyalesun, Isero in Ola-oluwa among others, were without walkable proximity and distance to access public secondary school education within their settlement.

Thus, settlers in these settlement categories travel longer distances to access and use PSSs.

A. Buffer Analysis and Operation on PSSs in Osun West Senatorial District

The buffer analysis operates by establishing a new shapefile as data set to create a polygon, leveraging on an established range of distances to buffer specified map objects within the identified layer.

The range of distances can be varied and as well be constant depending on values attributed to the point characteristics. Thus, in an instance where objects as points are of close range, there may be overlapping of buffers. The study carried out by [17] revealed that the maximum walking distance expected of a student in Nigeria setting from place of residence to education location is 4km. Ditto, a study of [18] supports that a walking distance of 2km is enough for students who frequently trek to school. Furthermore, research has revealed the desired and satisfactory distance expected of wards to

commute from place of residence to education facilities or school

Table 1: Distribution of PSS in OWSD

1Km Rs		Settlements			Total
		Urban	Semi-urban	Suburb	
Clustered	Count	54	6	6	66
	% within Clustered	81.8%	9.1%	9.1%	100%
	% within Settlements	91.5%	37.5	14.6%	56.9%
Dispersed	Count	5	10	35	50
	% within Dispersed	10.0%	20.0%	70.0%	100%
	% within Settlements	8.5%	62.5%	85.4%	43.1%
Total	Count	59	16	41	116
	% within Clustered/Dispersed	50.9%	13.8%	35.3%	100%
	% within Settlements	100%	100%	100%	100%
2Km Rs		Settlements			Total
		Urban	Semi-urban	Suburb	
Clustered	Count	57	10	21	88
	% within Clustered	64.8%	11.4%	23.8%	100%
	% within Settlements	91.5%	62.5%	48.8%	75.9%
Dispersed	Count	2	6	20	28
	% within Dispersed	7.1%	21.4%	71.4%	100%
	% within Settlements	8.5%	37.5%	51.2%	24.1%
Total	Count	59	16	41	116
	% within Clustered/Dispersed	50.9%	13.8%	35.3%	100%
	% within Settlements	100%	100%	100%	100%
3Km Rs		Settlements			Total
		Urban	Semi-urban	Suburb	
Clustered	Count	57	10	23	90
	% within Clustered	63.3%	11.1%	25.6	100%
	% within Settlements	96.6%	62.5%	56.1%	77.6%
Dispersed	Count	2	6	18	26
	% within Dispersed	7.7%	23.1%	69.2%	100%
	% within Settlements	4.4%	37.5%	43.9%	22.4%
Total	Count	59	16	41	116
	% within Clustered/Dispersed	50.9%	13.8%	35.3%	100%
	% within Settlements	100%	100%	100%	100%
4Km Rs		Settlements			Total
		Urban	Semi-urban	Suburb	
Clustered	Count	57	11	34	102
	% within Clustered	55.9%	10.8%	33.3%	100%
	% within Settlements	96.6%	68.7%	82.9%	87.9%
Dispersed	Count	2	5	7	14
	% within Dispersed	14.3%	35.7%	50.0%	100%
	% within Settlements	4.4%	31.3%	17.1%	12.1%
Total	Count	59	16	41	116
	% within Clustered/Dispersed	50.9%	13.8%	35.3%	100%
	% within Settlements				
		100%	100%	100%	100%

Source: Author's Field Work, 2021

In Belgian students, walking distances differ given their age class/level/grade which ranges between 1.5km to 2km, for both age 11 to 12 and 17 to 18 respectively [18]; [19]; also, [20]; [21]; [22]; [23] stated that students between the age of 15 and 17 are not expected to walk above 2.4km. Thus, this study adopted, a buffering RS distance of 1km; 2km; 3km; and 4km RS to determine the clustering condition of the available Public Secondary Schools in the study area.

IV. Conclusion

This study analyzed the spatial accessibility of PSS in OWSD which is categorized into Urban, Semi-urban, and Suburb Settlements. The study showed that PSSs in OWSD were unevenly distributed, and as such, there is unequal access to educational facilities by the users across the settlements categories. Findings established that majority (50.9%) of the PSS were in the urban, while just 13.8% were in the semi-urban and 35.3% in the suburb. From the findings, it can therefore be inferred that Semi-urban and Suburb were highly underserved as against urban settlements. Furthermore, findings affirmed that, PSSs at 1km radius, 2km radius, 3km radius and 4km radius clustered in the urban (81.8%, 64.8%, 63.3% and 55.9%) and dispersed in the suburb (70.0%, 71.4%, 69.2% and 50.0%). This implies that there is a longer threshold distance for secondary school users to access education in semi-urban and suburbs as compared to urban areas where people can easily access education.

In view of the findings, the study, thus, recommends that government, stakeholders, and private organisations should come together to make PSSs education available to all categories of settlements. In addition to making available transportation means for school users living at a far distance to the school location for easy accessibility to secondary school education.

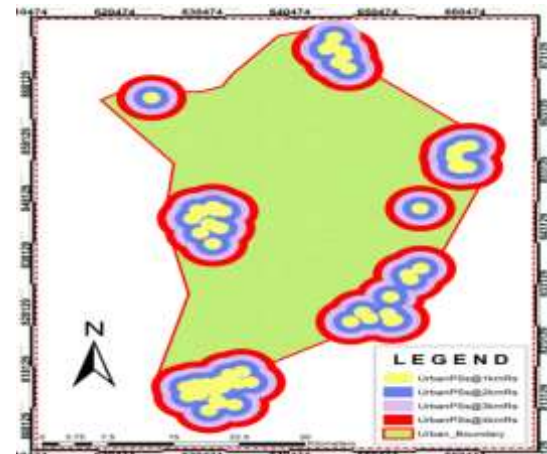


Figure 1: Spatial Buffer of PSSs at Urban Settlements

Source: Authors fieldwork, 2021

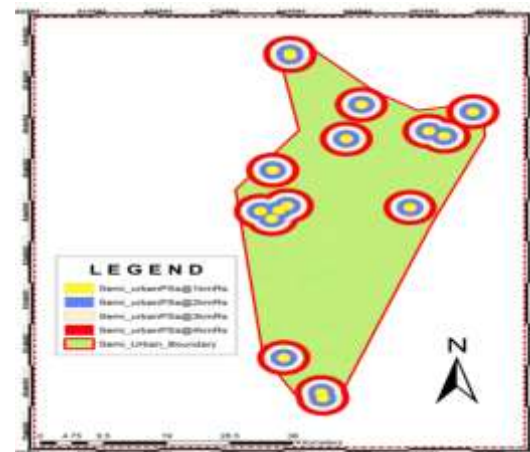


Figure 2: Spatial Buffer of PSSs at Semi-Urban Settlements

Source: Authors fieldwork, 2021

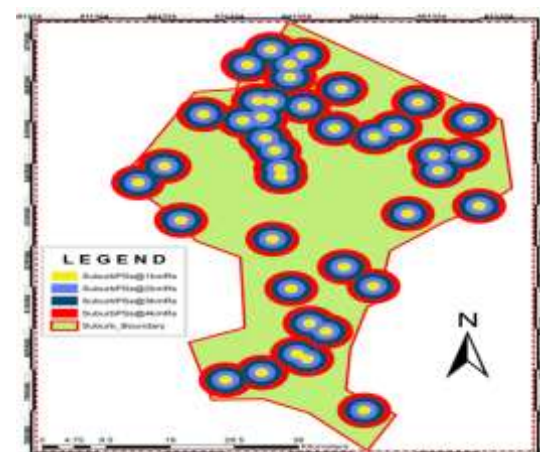


Figure 3: Spatial Buffer of PSSs at Suburb Settlement

Source: Authors fieldwork, 2021

References

- [1] Agrawal, S. and Gupta, R.D. "School Mapping and Geospatial Analysis of the Schools in Jasra Development Block of India", *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, vol. XLI-B2, 2016, pp. 1-12, Prague, Czech Republic.
- [2]. Fabiyi, O.O. and Ogunyemi, S.A. "Spatial Distribution and Accessibility to Post Primary Educational Institution in Ogun State, Southwestern Nigeria: Case Study of Yewa South Local Government Area, Nigeria", *Journal of Scientific Research and Reports*, vol. 5, no. 7, 2015, pp. 542-552.
- [3] Ojo, A.O. "A Study of Accessibility to Secondary School Facility in Lagos Metropolis, Nigeria," *A PhD. Thesis, Submitted to the Department of Urban and Regional Planning, Obafemi Awolowo University, Ile-Ife, Nigeria*, Unpublished, 2018.
- [4] Onuka, A.O. and Arowojolu, A.F. "An Evaluation of Parents' Patronage of Private Primary Schools in Abeokuta, Nigeria", *International Journal of African and African American Studies*, vol. 2, 2008, pp. 58-70.
- [5] Khalid, A., Hamdy, I. and El-Gamily. "GIS as an Efficient Tool to Manage Educational Services and Infrastructure in Kuwait", *Journal of Geographic Information System*, 2013, vol. 5, 2013, pp. 75-86.
- [6] Ogundahunsi, D.S. "Locational Analysis of Fuel Stations, in Ilesa, Osun State, Nigeria", *International Journal of Development and Strategies in Humanities, Management and Social Sciences*, vol. 2, 2014. pp. 249 and 252-254.
- [7] Ikoya, P.O. and Onoyase, D. "Universal Basic Education in Nigeria: Availability of Infrastructures for Effective Programme Implementation. Educational Studies", vol. 34, 2008, pp. 11-24.
- [8] Ojede, P. and Ilusanya, G. "Planning and Policy of Higher Education in Nigeria: In Babalola, J.B., Ayeni, A.O., Adedeji, S.O., Suleiman, A.A. and Arikewuyo, M.O. (eds)", *Educational management: thoughts and practice*, Ibadan, Codat Publications, 2006.
- [9] Ogundahunsi, D.S. and Olayode, O. "An Assessment of Public Secondary School Infrastructure in Osogbo, Osun State, Nigeria", *Journal of Geography and Planning Sciences*, vol. 3, no. 1, 2018, pp. 112-124.
- [10] Allard, S.W. "Out of Reach: Place, Poverty, and the New American Welfare State", *New Haven: Yale University Press*, 2008.
- [11] Amsterdam, C. "School Infrastructure in South Africa: Views and Experiences of Educators and Learners", 2010.
- [12] Aliyu, A., Shahisah, M.A. and Aliyu, R.M. "Mapping and Spatial Distribution of Post Primary Schools in Yola North Local Government Area of Adamawa State, Nigeria", *International Journal of Science and Technology*, vol. 2, no. 5, 2013, pp. 405-422.
- [13] Maangi, E.N. "Factors Influencing Parental Patronage of Private Primary Schools in Kenya Despite Free Primary Education (FPE) in Public Schools", *Journal of Education and Practice*, vol. 5, no. 26, 2014, pp. 119-128. Retrieved from www.iiste.org
- [14] Mustapha, O.O., Akintunde, O.S., Alaga, A.T., Badru, R.A., Ogbole, J.O., Popoola, O.S. and Samuel, S.A. "Spatial Distribution of Primary Schools in Ilorin West Local Government Area, Kwara State, Nigeria", *Journal of Scientific Research and Report*, vol. 9, no. 6, 2016, pp. 1-10.
- [15] Meskarian, R., Penn, M.L., Williams, S. and Monks, T.A. "Facility Location Model for Analysis of Current and Future Demand of Sexual Health Service", *Journal Plos.org.*, vol. 12, no. 8, 2017, e0183942. <https://doi.org/10.1371/journal.pone.0183942>
- [16] Naidoo, A.G.V., Van, E. and Munch, Z. "Spatial Variation in sShool Performance, a Local Analysis of Socio-economic Factors in Cape Town", *South African Journal of Geomatics*, vol. 3, no. 1, 2014, pp. 78-94.
- [17] Vagale, L.R. "Manual of Space Standards for Urban Development. Ibadan, Nigeria", Ministry of Lands and Survey, 1971.
- [18] Giles-Corti, B., Wood, G., Pikora, T., Learnihan, V., Bulsara, M., Van Niel, K. et al.

“School Site and the Potential to Walk to School: The Impact of Street Connectivity and Traffic Exposure in School Neighborhoods”, *Health and Place*, vol. 17, no. 2, 2011.

[19] D’Haese, S., De Meester, F., De Bourdeaudhuij, I., Deforche, B. and Cardon, G. “Criterion Distances and Environmental Correlates of Active Commuting to School in Children”, *International Journal of Behavioural, Nutrition Physical Activity*, vol. 8, 2011, pp. 88.

[20] Nelson, N.M., Foley, E., O’Gorman, D.J., Moyna, N.M. and Woods, C.B. “Active Commuting to School”, *International Journal of Behavioural, Nutrition Physical Activity*, vol. 5, 2008, pp. 1.

[21] Olubadewo, O.O., Abdulkarim, I.A. and Ahmed, M. “The Use of Gis as Educational Decision Support System (Edss) for Primary Schools in Fagge Local Government Area of Kano State, Nigeria”, ISSN-L: 2223-9553, ISSN: 2223-9944, vol. 4, no. 6, 2013.

[22] Van Dyck, D., De Bourdeaudhuij, I., Cardon, G. and Deforche, B. “Criterion Distances and Correlates of Active Transportation to School in Belgian Older Adolescents”, *International Journal of Behavioural, Nutrition Physical Activity*, vol. 7, 2010, pp. 87

[23] World Bank: *World Development Report 2006: Equity and Development*. New York: Oxford University Press, 2005.