

SPATIAL DISTRIBUTION OF SANITARY TOILET FACILITIES IN OYO EAST LOCAL GOVERNMENT AREA, OYO STATE, NIGERIA

By

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Abstract

An ideal public toilet is an “away from home” comfort station that usually provides far more than having access to the toilet for urination and defecation but also incorporated features to cater for the public to amongst others wash their hands, attend to menstrual hygiene needs, use mirrors for grooming or use waste bins. It is synonymously termed as restroom, public convenience, public lavatory or comfort station. But the non-availability of adequate and equitable sanitary toilet facilities in majority of Local Government Authorities (L.G.A.) in Nigeria including Oyo East has made most people to have no option than to defecate in any available space whenever the call of nature arose. The open defecation practice consequently resulted in the spread of cholera, typhoid, intestinal worms, trachoma and the likes as faeces finds its way into the various water supply system commonly natural waterways. This study is aimed at producing a GIS Based Map of Spatial Patterns and Distributions of Public Sanitary Toilet Facilities in the study area. The objectives include ascertaining the total public comfort stations, to identify the factors responsible for open defecation practice and to produce a digital facility map that support spatial and attribute database as a Decision Support System for searching, accessing and utilization of public toilets within the study area. Also, the methodology adopted includes database design, primary and secondary data acquisition using GPS and Scanner respectively, data overlay and as well as creation of spatial and attribute database for the acquired Public Sanitary Toilet Facilities using ArcGIS 10.2.2. Various results were generated that pointed in the direction of uneven distribution of the facilities. It is therefore recommended that it is imperative for various concerned L.G.A to align with World Health Organization standard by providing modern public convenience that are spatially and well distributed within the study area and always ensure to be in good condition for public use.

Keywords: Sanitary, Toilets, Defecation, convenience, facilities, database,

1.0 INTRODUCTION

Issaka *et al.* (2019) reviewed that the existence of open defecation is associated with diseases, under nutrition and poverty, and is usually considered as an affront to personal dignity.

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Those countries where open defecation is most widely practiced have the highest numbers of deaths of children under the age of five, as well as high levels of under nutrition, high levels of poverty, and large disparities between the rich and poor. Even in sub-Saharan Africa, Two Hundred Thousand (200,000) children under the age of five die from diarrhea annually while the numbers dying from cholera within the region are similarly high because of poor sanitation, hygiene practices, and unsafe water supplies.

Abireham *et al.* (2018) opined that majority of Open Defecation (OD) practices referred to in

national surveys as defecating in fields, forests, bushes, bodies of water, or other open spaces, commonly take place in rural areas of low-income countries. Worldwide diarrheal disease is the second leading cause of death in under-five children responsible for 1.7 million morbidities and 760, 000 mortalities every year. In sub-Saharan Africa, it is estimated that 215 million people that is 8% of the urban population and 35% of the rural population continue to engage in OD. For instance, the national OD rate in 2014 was 34.1% and as such, this practice facilitates the transmission of diarrheal diseases, one of the leading causes of mortality in under-five children in sub-Saharan Africa.

As Nigeria heads to the end of year 2019, President Muhammadu Buhari declared war on open defecation with the signing of Executive Order 009 on Wednesday November 20, 2019 which was titled, *'The Open Defecation-Free Nigeria by 2025 and other related matters.'* The order signed by President Muhammadu Buhari is expected to address this menace within five years in order to toeing the same line of action as the United Nations called for an end to open defecation by 2030 since Nigerians cannot live on an island as open defecation is waning worldwide. Report has it that about 25 per cent of the population lack access to toilet facilities, meaning that more than 47 million Nigerians are entangled in this mire (Punch 2019).

Nigeria was ranked second in the world with the highest number of people practicing open defecation, estimated at over 46 million people. Only India ranked worse than Nigeria in open defecation, according to the Water Sanitation and Hygiene [WASH NORM] survey conducted by the United Nations Children's Fund [UNICEF] in conjunction with the Nigerian Ministry of Water Resources and National Bureau of Statistics. The

survey also found that only 11 out of the 774 Local Government Councils in Nigeria are free from the practice of open defecation. (Daily Trust, 2019).

Unfortunately, Nigeria's age-old culture of open defecation has stubbornly refused to go, even in urban areas. For example, it is such a societal problem that teachers and pupils of Ibadan Municipal Primary School, Mokola, Ibadan, Oyo State, abandoned six out of the 13 buildings in the school because of incessant defecation by residents around the school who openly defecate in the classrooms after school hours. This usually occurred because public toilet facilities in Ibadan are mainly built for transient population and places of heavy public activities, but these facilities are heavily relied upon by households within their catchment areas and households without toilets at home have to rely on public toilets (MLGRD and LGS, 2010), and those who cannot access one use the bush or beach for their toilet needs. Osumanu and Kosoe (2013) contended that financial constraints present two challenges. First, it inhibits house owners from the provision of household toilets, and secondly, it causes people's inability to afford fees charged by public toilet operators. This implies that if a household cannot afford the fees for the use of a public toilet and cannot also afford to construct a toilet facility, they will practice open defecation.

The major aim of this study is to assess the spatial distribution of public toilet facilities in Oyo East Local Government Area. The objectives of the study sought to ascertain the total public restrooms in the study area in compliance with WHO standard, to identify the factors responsible for open defecation practice in the study area and produce a digital facility map that support spatial and attribute database as a decision support system for planning, accessing and controlling the utilization of public toilets within the study area.

The presentation is captured in four subsections, beginning with an introduction, followed by a brief description of the study area and a discussion of the methods used in the study. The discussion of the main findings follows in section three while the concluding section looks at some recommendations.

1.1 THE STUDY AREA

Oyo herself is a city in Oyo State and was founded historically as the capital of Oyo Kingdom in the 1830s and known to the people as the new Oyo (Oyo Atiba) in order to distinguish it from the former capital to the north (Old Oyo-Ile) which had been deserted according to the history as a result of rumors of war. Hence, the study area (Oyo East local government) is in Oyo town (see fig. 1) and was among additional ten local government area councils created in Oyo State during military governance in December 1996 having divided the then Oyo Divisional Council into three (Oyo east, Oyo west and Atiba). It is currently classified among the local government councils forming zone four (Oyo areas) based on the distribution of geographical zones and classification in Oyo State. (Oyo State Government, 2018).

Geographically, Oyo East local government is bounded in northern part by Atiba L.G.A, in the southern part by Afijio L.G.A and in the eastern part by Ogo-Oluwa L.G.A. The land mass of the study area covers an area approximated to be 365.5km² in extent and also spread approximately between latitude of 7° 45' 34" N and 7° 58' 56" N and longitude 3° 53' 31" E and 4° 07' 06" E respectively (See fig. 1).

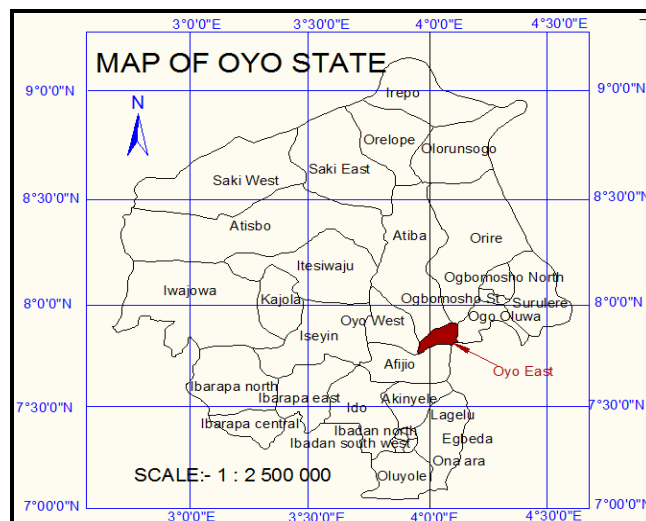


Figure 1. Map of Oyo State Indicating Oyo East L.G.A. in Shaded Portion

1.1 CONCEPTUAL FRAMEWORK:

- i. Data Representation: Conceptually, the real world objects (discrete objects and continuous fields) are represented as either raster or vector in GIS.
- ii. Database: Is a process in GIS ensuring that collected data for a particular area or subject for specific purpose are organized so that information can be easily accessed, managed and updated.
- iii. Networking: This has to do with computer networking (that ensuring online data sharing to have a central pool) and road networking (that entails road connectivity which will ensure movement around the study area to economize cost, time and other mega resources).

2.0 DATA AND METHODS

The methodology section of this paper commonly answers two main questions, namely:

- How was the data collected and generated?
- How was the generated data analyzed?

2.1 DATABASE DESIGN

According to Datanamic (2018), Database Design phase is made of three main stages, namely: Conceptual, Logical and Physical stages (Datanamic, 2018). At the conceptual stage, basic entities were objectively determined, the spatial relationships among the entities and attributes of each entity which supports the process and the application for which the database is designed were considered and interested entities were represented as points, line and polygon which formed the basic data sets. Also, the logical phase translated the conceptual design to reflect the recording of data in computer system. Though there exists hierarchical, network or relational approach but the relational data structure was adopted. A sample of the records is shown in Tables 1,2 and 3.

Table 1: Point Table (Entities and Attributes)

Attribute Name	Description of Attributes
P_E & P_N	Easting and Northing of each Facility
PT_COND	Public Toilet Condition
PTOF	Public Toilet Facility
PT_ADR	Public Toilet Address
PT_TYPE	Public Toilet Type
PT_OVIEW	Public Toilet Overview

Table 2: Road Table

Attribute Name	Description Of Attributes
R_ID	Road Identifier Number
R_Status	Road Status
R_Length	Road Length

Table 3: Polygon Table

Attribute Name	Description Of Attributes
BDR	Boundary
ZN_1 and ZN_2	Zone 1 and Zone 2
ZN_3	Zone 3

2.2 DATA COLLECTION

The datasets required were sourced from both primary and secondary data sources. The primary data were directly collected from the field with the aid of GPS and these include the following:

- a) The locational data of identified Public Sanitary Toilet facilities that were not captured or precisely identified on the downloaded imagery were determined using Hand Held GPS.
- b) Geometric coordinates of roads or streets that were not captured by the imagery as at time downloaded were also fixed by the use of GPS.
- c) Other information (like road names through oral interview) that were taught useful in this study were adequately sourced through social survey.

The secondary datasets were also sourced from various sources:

- a) Scanning and Digitizing of Administrative maps of the study area collected from Local Government Secretariat.
- b) Downloading of Satellite Imagery of Oyo East LGA Administrative maps).

2.3 DATASETS OVERLAY

The georeferenced imagery was overlaid with other two datasets from GPS and digitized administrative boundary of Oyo East LGA respectively using ArcGIS 10.2.2. Also, the shape file of the boundary of Oyo East LGA comprising of zones was carefully traced out in order to overlay it on the downloaded imagery of the study area. This was perceived and considered to be necessary since it enhances the extraction of relevant/update spatial entities like roads, point features or area features from various zones into different layers for further processing.

2.4 DATABASE CREATION

Geodatabase was created for the entities of interest in the study area, they were captured into the database and the imported data for each of the entities were converted to shapefiles. The attribute data of each entity were populated into the database. Also, the shapefiles of the digitized entities from the satellite imagery were integrated into the geodatabase in the Arc Catalog.

The Simulative Database Created for Revenue Generation and Recording

The geodatabase created for the identified informal revenue sources within the study area contains the following:

- (i) **(P_E) & (P_N)** represent the coordinates of each informal economic source.
- (ii) **'Z_N'** that stands for zone in which each revenue source point belongs to.
- (iii) **'PTOF'** represents public toilet facilities.
- (iv) **'PT_ADR'** is the address of the location of each public toilet facilities.
- (v) **'PT_TYPE'** represents the actual type of public toilet (is it water flush or pit latrine).
- (vi) **'PT_COND'** represents the condition of public toilet (active or non-active).
- (vii) **'PT_OVIEW'** is a brief summary or comments based on the gathered information.

3.0 RESULTS AND DISCUSSION

Various analyses were performed that produced results that portrays the spatial distribution of Sanitary Toilet facilities within Oyo East Local Government Area of Oyo State. The composite map of the study area that shows the distribution of the facilities, the three zones in the local government and the road networks is shown in Figure 2.

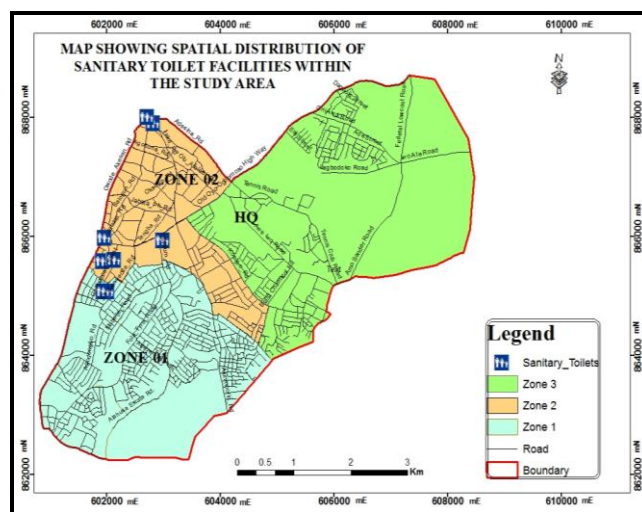


Figure 2. Map of Spatial Distribution of available Public Sanitary Toilets within the Study Area

Discussion:

Figure 2 is a map displaying spatial distribution of available eight (8) public sanitary toilets within the study area. The findings revealed that Two (2) public sanitary toilets are available in Zone 1, six (6) public sanitary toilets are available in Zone 2 while no single one even available in Zone 3 as at the time of capturing the data used for this study.

As shown in Figure 2, the uneven or lump-sided spatial distribution of public sanitary toilets facilities is an indication that public toilets are mainly built for transient population and places of heavy public activities (mostly at garages for travellers' comfort). However, these public facilities are heavily relied upon by households within the vicinity, especially those that are living without toilets at home and those who cannot access anyone. This encourages open defecation since these people prefer using bush or beach or drainage for their toilet needs. No thanks to the uneven distribution of public toilets facilities in Oyo East Local Government Area of Oyo State. Territory is one among the factors identified that encouraged the age-old culture of open defecation.

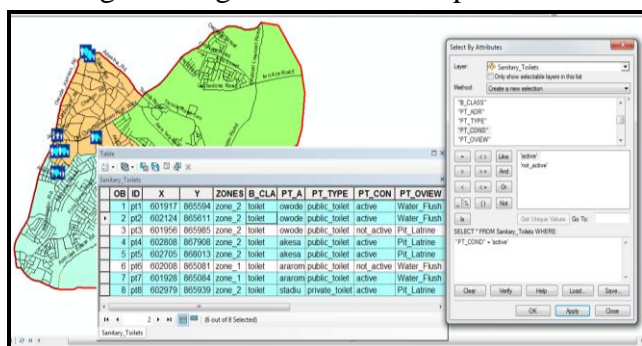


Figure 3. Result of Query Displaying All Active Public Sanitary Toilets within the Study Area

Discussion:

The Six (6) public sanitary toilets highlighted in Figure 3 are the active ones that were fully functioning as at the time of data capturing. Five (5) out of these active toilets are in Zone 2, only

One (1) active toilet is in Zone 1 while no single one is in Zone 3. The result displayed in Figure 3 is a basic source of useful information for the concerned Local Government Authority to:

- i. Understand and visualize the positions of those dress rooms that are active and fully strategize their plan toward improving the health living standard of the govern by distribution of modern toilet facilities at strategic locations within their territory. This will also discourage the practice of open defecation and indirectly reduce the spread of attributed diseases to the barest minimum hence reducing the cost of treatment of diseases.
- ii. Investigate the location of existing old dilapidated toilets, causes of non-compliance by the people and probably put them back in good condition by contracting them out to the hand of reliable people.

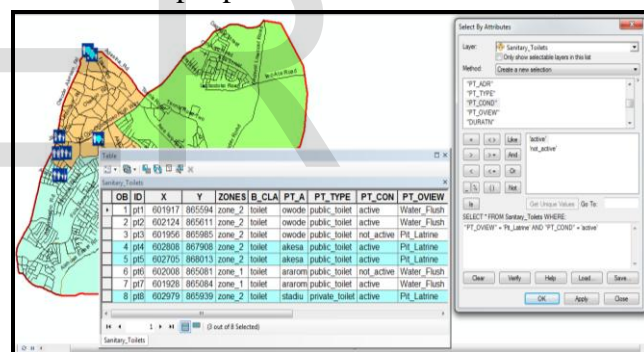


Figure 4. Result of Query Displaying All Active Pit-Latrine within the Study Area

Discussion:

In the result displayed in Figure 4, the highlighted Three (3) out of active Six (6) active public toilets are shared pit latrines while the remaining are water-flush toilets. During the data capturing, the vicinity of the entire three public pit latrines shown in Figure 4 were not in good condition and from the field investigation, majority of people thought it is not hygienic for them at this modern era to be using shared public pit latrine. Instead,

they embarked on the usage of any available open space, forests, bush, beach or waterways.

Figure 5 displays the road network within the study area and the result generated from the route analysis with the spatial location of Oyo East Secretariat taken as the facilities' point while the locations of the newly designed Zonal Offices were taken as points of incidents. The path shown in green indicated the shortest available route to the said Secretariat either from Zonal Office 1 or Zonal Office 2. The direction window indicating the driving directions and the distances is shown in Figure 6. The facility shown in Figure 7 is the one located at the popular Owode Lagos Garage. The closest facility analysis offers the following benefits:

- a) The closest facility solver measures the cost of traveling between public sanitary facilities and determines which are nearest to one other.
- b) One can easily investigate and specify how many public toilet facilities are available along a specific direction of travel and make rightful decisions.

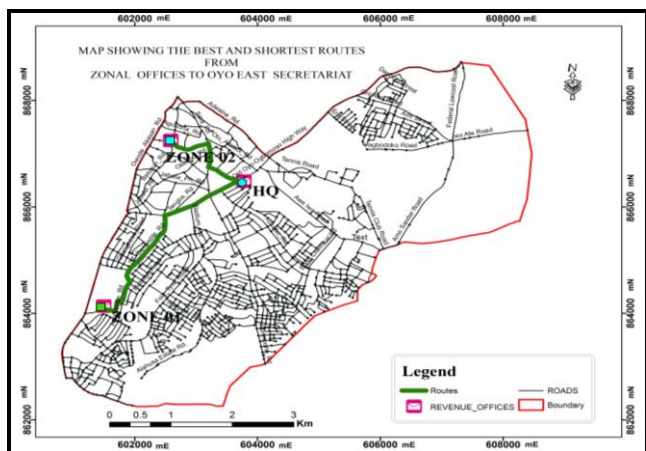


Figure 5. Map of the Best Route from Headquarter to Zonal Revenue Offices

[-] Route: Zonal Office 1 - Oyo East Secretariat		2.3 mi	Map
1:	Start at Zonal Office 1		Map
2:	Go northeast toward Agodongbo_Rd Agodongbo_Rd Agodongbo_Rd	0.3 mi	Map
3:	Turn left on Agodongbo_Rd Agodongbo_Rd Agodongbo_Rd	0.2 mi	Map
4:	Turn left on Araromi_Rd Araromi_Rd Araromi_Rd	0.2 mi	Map
5:	Bear right	< 0.1 mi	Map
6:	Continue on ST_Bennedite_Rd ST_Bennedite_Rd ST_Bennedite_Rd	0.6 mi	Map
7:	Turn right on Old Oyo-Ogbomosho High Way Old Oyo-Ogbomosho High Way Old Oyo-Ogbomosho High Way	0.8 mi	Map
8:	Turn right	< 0.1 mi	Map
9:	Finish at Oyo East Secretariat		Map
Driving distance: 2.3 mi			
[-] Route: Zonal Office 2 - Oyo East Secretariat		1.1 mi	Map
1:	Start at Zonal Office 2		Map
2:	Go south	< 0.1 mi	Map
3:	Turn left	0.4 mi	Map
4:	Turn right on Ilaka_Rd Ilaka_Rd Ilaka_Rd	0.3 mi	Map
5:	Turn left	0.3 mi	Map
6:	Make sharp right on Old Oyo-Ogbomosho High Way Old Oyo-Ogbomosho High Way Old Oyo-Ogbomosho High Way and immediately turn left	< 0.1 mi	Map
7:	Finish at Oyo East Secretariat		Map
Driving distance: 1.1 mi			

Figure 6. Direction window of Best Route from Headquarter to Zonal Revenue Offices.



Figure 7. Sample of Water Flush Public Toilet at Owode Lagos Garage

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 CONCLUSION

The necessary spatial and attribute data acquired were used to develop a geodatabase sanitary facility map that serves as vital tool to understand the factors influencing the effort to reduce open defecation in the study area and to develop effective strategies to minimize these factors. The created geodatabase was tested and has capabilities to search, retrieve, delete and update the information about each and every available public sanitary toilet. Graphically, inadequate public sanitation facilities or lack of access to

proper sanitation are among the factors responsible for the urgent need of government to provide solutions to many problems attributed to the careless spread of disease through open defecation which poses a great threat to human health in the study area. Having carried out these analyses, it was concluded that the aim and objectives of this study were achieved.

4.2 RECOMMENDATIONS

In order to ensure United Nation campaign to end open defecation by 2030, the following recommendations are put forward:

- i) All tiers of governments should look deeper than legislative approach and make necessary provision of basic amenities since any region where there is no adequate housing and pipe borne water, the people have no option than to defecate in any available space which can result into water-borne diseases such as cholera, typhoid and so on.
- ii) Government and goodwill of the individual should disabuse the minds of those who still believe culturally that toilets supposed not to be shared by organizing regular sanitary education especially at grassroots level and provision of modern public toilets for areas massively in need.
- iii) Each Local Government Authority should prioritize good sanitation because the non-availability of sanitation facilities adversely exposes women and girls to various violence including rape and kidnapping when they are forced to go out at night to defecate in the open.

REFERENCES

- Abireham, M.A; Worku, T.M.; Samson,W.A; and Zekele A.M (2018). Assessment of Diarrhea and its Associated Factors in under-five children among Open Defecation –free Rural settings of Dangla District Northwest Ethiopia. *Journal of Environmental and Public Health*. **2018**, article ID 4271915, pp.1. <https://doi.org/10.1155/2018/4271915>.
- Daily Trust Newspaper (2019), UNICEF Report on Open Defecation (EOD) in Nigeria. November 26, 2019
- Issaka, K. O; Enoch, A. K and Frank A (2019). Determinants of Open Defecation in the Wa Municipality of Ghana: Empirical Findings Highlighting Sociocultural and Economic Dynamics among Households. *Journal of Environmental and Public Health*. Volume 2019 Article ID 3075840 | 10 pages <https://doi.org/10.1155/2019/3075840>
- Ministry of Local Government and Rural Development (MLGRD) (2010). *Environmental Sanitation Policy (Revised September 2010)*. Accra: MLGRD.
- Osumanu, I. K. and Kosoe, E. A. (2013) “Where do I answer nature’s call? An assessment of accessibility and utilization of toilet facilities in Wa, Ghana,” *Ghana Journal of Geography*, **5**, 17–31
- Punch Newspaper (2019), Ending Open Defecation (EOD) in Nigeria by year 2025. December 10, 2019.
- SDGs (2015). Press Release on Seventeen Global Goals for Sustainable Development. Retrieved February 22nd 2020 from <https://sustainabledevelopment.un.org>.