ISSN: 2315-5701

OSCOTECH JOURNAL OF ARTS AND SOCIAL SCIENCES (OJASS)
A BI-ANNUAL ACADEMIC JOURNAL OF THE FACULTY OF MANAGEMENT SCIENCES,
OSUN STATE COLLEGE OF TECHNOLOGY, ESA OKE
SEPTEMBER, 2016 EDITION
http://ojass.oscotechesaoke.edu.ng/en/
Vol. 3 No. 1
Page 229 - 246

GEOSPATIAL ASSESSMENT OF SOLID WASTE MANAGEMENT IN ESA-OKE, OBOKUN LOCAL GOVERNMENT, OSUN STATE

Adewoye, Olugbenga Adewale & Oyewole, Oluwarantimi Damilola
Osun State College Of Technology, Esa – Oke.

ABSTRACT

The problem of solid waste disposal, especially in our cities has become one of the most intractable environmental problems facing us today. To manage this problem, geographic information system (GIS) has been a unique integration of computer hardware, software, peripheral, procedural techniques, organizational structure, people and institution for capturing manipulating, storing, analyzing, modulating, modeling and displaying geographically referenced data for solving complex human related problems. Relevant literatures were reviewed to discuss the conceptual framework of the paper. Data for the job were obtained from the primary source. Data obtained, were from the direct interview of the inhabitants and the coordinating of the waste disposal sites using a hand held global positioning system (GPS).From the locational and attribute data obtained, a relational database was designed and created. Series of (GIS) analyses like spatial querry and buffering were carried out on the database and the result were displayed to show the geospatial assessment of solid waste management in Esa-Oke. Recommendations were made on how to improve on solid waste management so as to reduce its effect on the people and the environment.

Keywords: *Geographic Information System (GIS) Geospatial, Solid Waste*.

INTRODUCTION

The environment is heading towards a potential risk due to unsustainable waste disposal. It is a sensitive issue which concerns about serious environmental problems in today's world. The present situation of direct dumping of the waste without proper inspection and separation leaves a serious impact of environmental pollution causing a tremendous growth in health related problems. "Domestic, industrial and other wastes, whether they are of low or medium level wastes, cause environmental pollution and have become perennial problems for mankind.(Abioye 2014). If this situation is not handled properly within time then it would lead to worse consequences on a global level.

There has been awareness regarding waste management amongst many countries. There has been development of new technologies for improving the waste management systems. GIS is one of the new technologies which have contributed a lot in very less time span to the waste management society. "The Geographic Information System (GIS) helps to manipulate data in the computer to simulate alternatives and to take the most effective decisions."(Fadahunsi, 2009). Solid waste is a bit complex to summaries, in a wider term waste can be said as, the items which are no more in use and are not expected to be used in future either. The only solution to these items is to destroy them. There are also some technical descriptions to the term solid waste which are; "Solid waste is the term used to describe non-liquid waste materials arising from domestic, trade, commercial, agricultural, industrial activities and from public services." (Onosemoke, 2015)Though the definition of the term will remain same in all times but it changes its features in different times. There is a large variation in solid waste from country to country. The type of solid waste depends on the commodity usage and lifestyle of the people.

Geographic Information Systems (GIS) can be described as general-purpose computer-based technologies for handling geographical data in digital form in order to capture, store, manipulate, analyse and display diverse sets of spatial or geo-referenced data (Burrough and McDonnell, 1996). In essence, GIS are spatial databases of digital maps which store information on various phenomena and their locations.

STATEMENT OF THE PROBLEM

Solid waste management is one of the major problems that city planners face all over the world. The problem is especially severe in most developing country cities where increased urbanization, poor planning and lack of adequate resources contribute to the poor state of municipal solid waste management there is a considerable amount of disposal of waste without proper segregation, leading to both economic and environment loss. There is a tremendous amount of loss in terms of environmental degradation, health hazards and economic descend due to direct disposal of waste. It is better to segregate the waste at the initial stages of generation rather than going for a later option, which is inconvenient and expensive. There has to be appropriate planning for proper waste management by means of analysis of the waste situation of the area.

The environment is heading towards a potential risk due to unsustainable waste disposal. It is a sensitive issue, which concerns about serious environmental problems in today's world. The present situation of direct dumping of the waste without proper inspection and separation leaves a serious impact of environmental pollution causing a tremendous growth in health related problems. Domestic, industrial and other wastes, whether they are low or medium level wastes, they are causing environmental pollution and have become perennial problems for mankind .The work focused on the geospatial assessment of solid waste management techniques in Esa-oke, Obokun Local Government Area, of Osun State.

THE STUDY AREA

The site is Esa- Oke, Town in Obokun Local Government Area of Osun State. It is bounded in the East by Efon Alaye, West by Esa Odo, South by Ijebu Jesa and North by Oke Imesi. The inhabitants are farmer. It falls approximately within the geographical location of latitude 07˚ 41' 32"N and longitude 04˚ 27' 56" E, latitude 07˚ 41' 44"N and longitude 04˚ 28' 04" E.

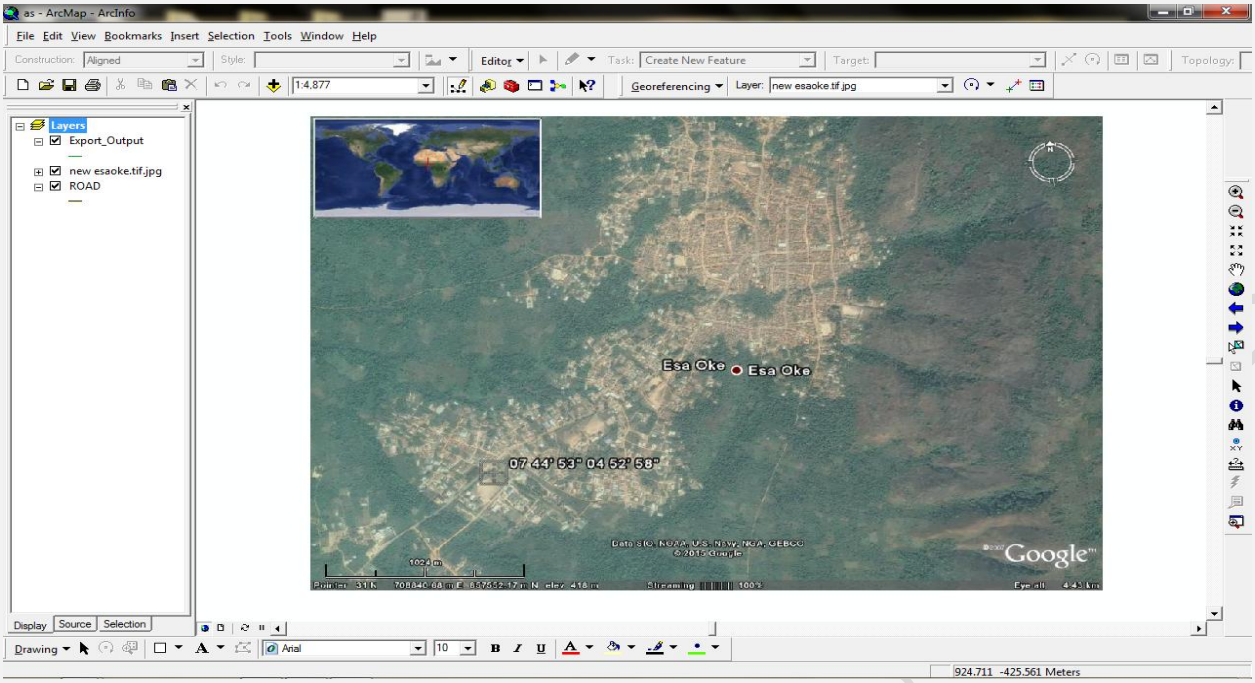


FIG 1.0 Satellite Imagery of Esa-Oke, Osun State (Source: Google Earth)

GEOGRAPHIC INFORMATION SYSTEM

Geographic Information System (GIS) is a computer system that records, stores, and analyzes information about the features that make up the Earth's surface. A GIS can generate 2- or 3-dimensional images of an area, showing such natural features as hills and rivers along with artificial features such as roads and power lines. Scientists use GIS images as models, making precise measurements, gathering data, and testing ideas with the help of the computer. A GIS is designed to accept geographic data from a variety of sources, including maps, satellite imageries, photographs, and printed text and statistics. The applications of a GIS are vast and continue to grow. By using GIS, scientists can research changes in the environment; engineers can design road systems; electrical companies can manage their complex networks of power lines, governments can track the uses of land; and fire and police departments can plan emergency routes. Many private businesses have begun to use a GIS to plan and improve their services. A typical GIS supports the management of spatially referenced resources. This is why it is defined as a decision support system involving the integration of spatially referenced data for decision making in a problem-solving environment. By this, it can be inferred that GIS is seen as a decision support tool, which has hardware, software, spatial database and procedure and expertise as its components. Using GIS as decision-making tool, it is possible for resources managers to

perform queries and analysis on complex and large volume of spatial and non-spatial data. These operations are usually more cost effective, accurate and faster than manual analysis, especially in situations where large volume of diverse data is involved.

The amount of data captured, stored and displayed determines the levels of awareness of the tourist attractions. The information can only be generated, well-packaged and presented by an information system which is known to be computerized system for creating, storing, manipulating and communicating information that are spatially referenced .

A data input subsystem allows the user to capture, collect, and transform spatial and thematic data into digital form. The data inputs are usually derived from a combination of hard copy maps, aerial photographs, remotely sensed images, reports, survey documents, etc.

The data storage and retrieval subsystem organizes the data, spatial and attribute, in a form which permits it to be quickly retrieved by the user for analysis, and permits rapid and accurate updates to be made to the database. This component usually involves use of a database management system (DBMS) for maintaining attribute data. Spatial data is usually encoded and maintained in a proprietary file format.

The data manipulation and analysis subsystem allows the user to define and execute spatial and attribute procedures to generate derived information. This subsystem is commonly thought of as the heart of a GIS, and usually distinguishes it from other database information systems and computer-aided drafting (CAD) systems.

The data output subsystem allows the user to generate graphic displays, normally maps, and tabular reports representing derived information products. The critical function for a GIS is, by design, the analysis of spatial data. It is important to understand that the GIS is not a new invention. In fact, geographic information processing has a rich history in a variety of disciplines. In particular, natural resource specialists and environmental scientists have been actively processing geographic data and promoting their techniques since the 1960's. Today's generic, geographic information system, is distinguished from the geo-processing of the past by the use of computer automation to integrate geographic data processing tools in a friendly and comprehensive environment.

An operational GIS also has a series of components that combine to make the system work. These components are critical to a successful GIS. A working GIS integrates five key components:

Hardware is the computer system on which a GIS operates. Today, GIS software runs on a wide range of hardware types, from centralized computer servers to desktop computers used in stand-alone or networked configurations.

GIS software provides the functions and tools needed to store, analyze, and display geographic Information.

Perhaps the most important component of a GIS is the data. Geographic data and related tabular data can be collected in-house, compiled to specifications and requirements, or occasionally purchased from a commercial data provider.

GIS technology is of limited value without the people who manage the system and develop plans for applying it to real world problems. GIS users, range from technical specialists, who design and maintain the system to those who use it to help them perform their everyday work.

A successful GIS operates according to a well-designed implementation plan and business rules which are the models and operating practices unique to each organization. As in all organizations dealing with sophisticated technology, new tools can only be used effectively if they are properly integrated into the entire business strategy.

SOLID WASTE MANAGEMENT

It is a bit complex to summaries the total meaning of the term solid waste in a single definition. In a wider term waste can be said as, the items which are no more in use and are not expected to be used in future either. The only solution to these items is to destroy them. There are also some technical descriptions to the term solid waste which are; “Solid waste is the term used to describe non-liquid waste materials arising from domestic, trade, commercial, agricultural, industrial activities and from public services.” (Ahmed, 2006). “The ‘Municipal Solid Waste’ includes commercial and residential wastes generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes. Though the definition of the term will remain same in all times but it changes its features in different times. There is a large variation in solid waste from country to country. The type of solid waste depends on the commodity usage and lifestyle of the people. Disposal is the final stage in the solid waste management, and all the wastes whether they are residential commercial or from any other sources are collected and transported to a disposal site. It may be a landfill site or an incinerator or some other mode of

disposal. In most of the third world countries solid wastes are disposed around cities and towns along the roads, which gave rise to several problems like pollution due to smoke, water pollution blockage of drains and sewers due to plastics and health hazards to workers and rag pickers and humans living nearby areas(Ahmed, 2006). Due to these reasons safe disposal of solid waste is important for safeguarding the public health, environment and wildlife as well. An efficient waste management system is the one that provides ecologically sound disposal option for waste that cannot be reduced, recycled, composted, combusted or processed further. Safe disposal is possible only when we understand the reasons for inefficient practices. As the amount of waste generation is enormous, the municipalities struggle to collect the waste and give less importance to disposal. They may not be having sufficient funds to pay the salaries of the staff and most of the municipal corporations are inefficient in managing the waste due to various reasons. It may be due to corruption at all levels, or due to lack of political will to fund for the practice of solid waste management. Many government authorities give less priority to waste management and do not reserve any funds. A wide range of options are available for the safe waste disposal. They are listed as follows.

1. Open dumping 2. Sanitary dumping
3. Composting 4. Incineration
5. Gasification 6. Refuse derived fuel

CONTRIBUTION OF GIS IN SOLID WASTE MANAGEMENT

There are several phases in solid waste management, right from the stage where it is generated till it reaches its final destination or at a stage where it is no more a threat to the environment. It is observed that solid waste management can be bifurcated into mainly two phases. One is the waste management in the area where it is generated and second is the management of waste at dumping grounds. .

The waste is generated in all areas but there is large variation in its type and quantity. According to (Olawepo, 2000), the quantity and nature of the waste generated vary with the activities and with the level of technological development in a country. “The issue of waste is not only because of the increasing quantities but also largely because of an inadequate management system.” (Uchegbu 2002). The analysis of this variation would give the information which could make it easy to understand the area’s waste generation nature and trend. This trend can help to propose a proper waste management system that could

recognise this variation. The suggestions made after considering these variations would maintain a balance in this variation by considering the areas which generate more or a different category of waste. Also there is some general categorization in the waste generation which also helps to analyse the waste generation trends. These trends are useful while planning waste management. An analysis done in this systematic way can bring out the appropriate remedies for the solid waste management applications. GIS could help in dealing with several factors simultaneously which needs to be considered while planning waste management. “GIS is a system of computer hardware and software, designed to allow users to collect, manage, analyse and retrieve large volume of spatially referenced data and associated attribute data collected from a variety of sources.”(Michael, 2013).

There are planning aspects in waste management. A good planning would support proper management policies. There are several problems which need to be treated with decisions taken considering all the related factors. Often the order and the amount of preferences given to these factors, decides the decision’s credibility. Manual methods adopted for analysis of many factors would be a lengthy and tedious work. Also there are possibilities of errors while merging the spatial and non spatial data. But in GIS, as the work is carried in layers, there are least chances of confusion or error and the system is capable enough to coordinate between spatial and non-spatial data. “The spatial operation is normally performed in conjunction with GIS functionality found in most GIS software. (Michael, 2013).

METHODOLOGY

The methodology included the collection of information about the waste management techniques in Esa-Oke town, especially on how to accomplish the aim. These include data sources, map scanning, map georefrencing, map digitizing and attribute data acquisition, geodatabase design, and creation and information presentation. The methodology of this study covers some sequential steps. Spatial feature extraction or classification is one of the GIS capabilities for searching suitable site.

DATABASE CREATION

Database is an organized integrated collection of data stored so as to be capable of use by relevant application with data being accessed by different logical part.(Kufoniyi 1998). This was the construction phase where database was created. This is the security measure used the protection of the database security is very important since it is vital for data integrity.

The strategic measure used included controlling access to database by use of password. This ensures that data in the database is accurate and that cases of violation of integrity are detected automatically by the system. Here, care was taken while entering data into the system, such that, accurate data were entered and updating could be done accurately without tampering with existing data. Backups are provided to cater for any loss of data through system failure. Having created the database, proper maintenance practice was made to meet its stated objectives. The ability to include more data and remove irrelevant data was possible by way of maintenance.

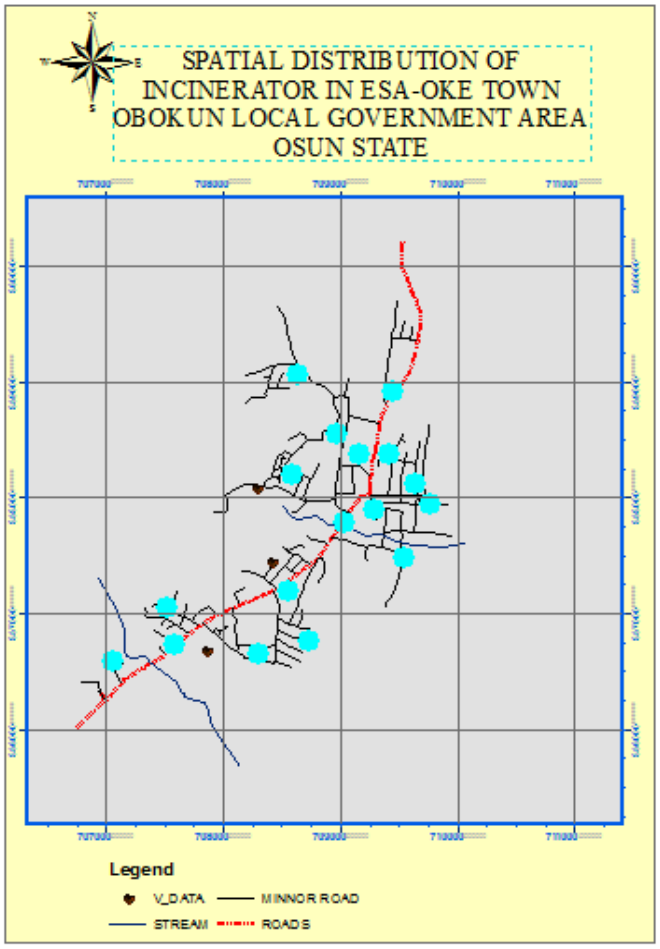
SPATIAL ANALYSIS AND INFORMATION PRESENTATION

This dealt with the analysis and presentation derived from the database created. Spatial Analyses undertaken here include overlay operation, query (single criteria), buffering etc. Finally, the application areas of these analyses were highlighted to show the relevance of these applications to other spatial problems. The quality and integrity of data input in the database were tested before any of the analyses were performed to ensure reliability of information derived The database was tested by designing a simple query and running the query to see if the desired result is achieved. The query ran, hence the database was confirmed fit for analysis.

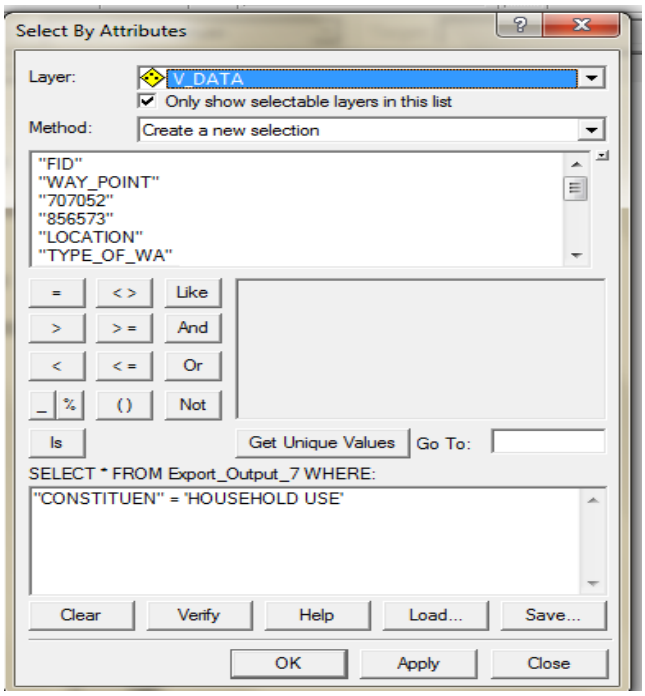
Queries were designed for the purpose of retrieving information from the database. The queries performed in this project gave answers to certain generic questions asked from the database was made possible as a result of the implicit link of both the spatial and attributes data. The queries were based on the products from the analysis carried out on the database. The result of the queries were displayed in the graphics.

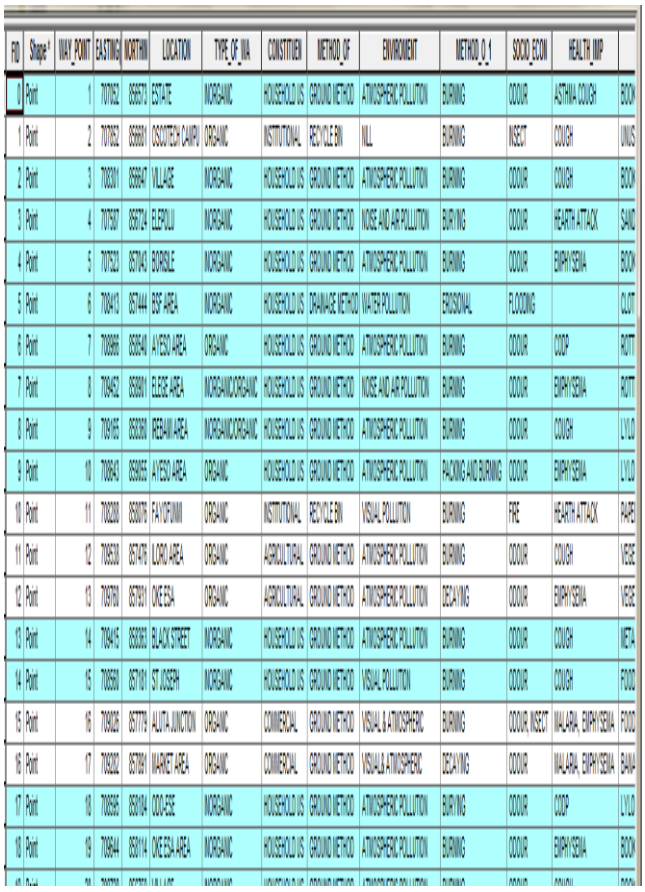
Attributes of V_DATA

FID	Shape	WAY_POINT	EASTING	NORTHING	LOCATION	TYPE_OF_WA	CONSTITUEN	METHOD_OF	ENVIRONMENT	METHOD_O_1	SOCIO_ECON	HEALTH_IMP	
0	Point	1	707152	868573	ESTATE	NORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	ASTHMA COUGH	BOD
1	Point	2	707152	868691	OSOTECH CAMPU	ORGANIC	INSTITUTIONAL	RECYCLE BIN	NILL	BURNING	INSECT	COUGH	UNG
2	Point	3	708301	868647	VILLAGE	NORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	BOD
3	Point	4	707597	869724	ELEROLU	NORGANIC	HOUSEHOLD US	GROUND METHOD	NOISE AND AIR POLLUTION	BURYING	ODOUR	HEARTH ATTACK	SAND
4	Point	5	707523	857843	BARBLE	NORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	EMPHYSEMA	BOD
5	Point	6	708413	857444	BSF AREA	NORGANIC	HOUSEHOLD US	DRAINAGE METHOD	WATER POLLUTION	EROSIONAL	FLOODING		DUST
6	Point	7	708868	868548	AYESO AREA	ORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COOP	ROTT
7	Point	8	708452	868691	ELESE AREA	NORGANIC/ORGANIC	HOUSEHOLD US	GROUND METHOD	NOISE AND AIR POLLUTION	BURNING	ODOUR	EMPHYSEMA	ROTT
8	Point	9	708195	868368	IREBAM AREA	NORGANIC/ORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	LYLO
9	Point	10	708643	858955	AYESO AREA	ORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	PACKING AND BURNING	ODOUR	EMPHYSEMA	LYLO
10	Point	11	708208	858078	FAYOFUNMI	ORGANIC	INSTITUTIONAL	RECYCLE BIN	VISUAL POLLUTION	BURNING	FIRE	HEARTH ATTACK	PAPE
11	Point	12	708538	857476	LORD AREA	ORGANIC	AGRICULTURAL	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	VERE
12	Point	13	708788	857831	ONE ESA	ORGANIC	AGRICULTURAL	GROUND METHOD	ATMOSPHERIC POLLUTION	DECAYING	ODOUR	EMPHYSEMA	VERE
13	Point	14	708415	858083	BLACK STREET	NORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	META
14	Point	15	708588	857101	ST JOSEPH	NORGANIC	HOUSEHOLD US	GROUND METHOD	VISUAL POLLUTION	BURNING	ODOUR	COUGH	FOOD
15	Point	16	708826	857778	ALUTA JUNCTION	ORGANIC	COMMERCIAL	GROUND METHOD	VISUAL & ATMOSPHERIC	BURNING	ODOUR INSECT	MALARIA EMPHYSEMA	FOOD
16	Point	17	709202	857981	MARKET AREA	ORGANIC	COMMERCIAL	GROUND METHOD	VISUAL& ATMOSPHERIC	DECAYING	ODOUR	MALARIA EMPHYSEMA	BANA
17	Point	18	709395	858094	OOO-ESE	NORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURYING	ODOUR	COOP	LYLO
18	Point	19	708644	858114	ONE ESA AREA	NORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	EMPHYSEMA	BOD
19	Point	20	709728	858758	VILLAGE	NORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	BOD



2.0 SPATIAL DISTRIBUTION OF INCINERATORS IN ESA-OKE.





FID	Shape *	WAY_POINT	EASTING	NORTHIN	LOCATION	TYPE_OF_WA	CONSTITUEN	METHOD_OF	ENVIRONMENT	METHOD_O_1	SOOD_EEON	HEALTH_IMP	
0	Point	1	707052	856573	ESTATE	MORBAMIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	ASTHMA COUGH	BOOK
1	Point	2	707052	856581	OSCOTECH CAMPU	ORGANIC	INSTITUTIONAL	RECYCLE EN	NILL	BURNING	INSECT	COUGH	UNIVS
2	Point	3	706931	856647	VILLAGE	MORBAMIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	BOOK
3	Point	4	707037	856724	ELEKOLU	MORBAMIC	HOUSEHOLD US	GROUND METHOD	NOISE AND AIR POLLUTION	BURNING	ODOUR	HEARTH ATTACK	SAND
4	Point	5	707023	857043	BORELE	MORBAMIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	BIRTH DEFA	BOOK
5	Point	6	706913	857144	ESF AREA	MORBAMIC	HOUSEHOLD US	DRAINAGE METHOD	WATER POLLUTION	EROSIONAL	FLOODING		CLOT
6	Point	7	706999	856944	A ESU AREA	ORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	KOTT
7	Point	8	706952	856991	ELEGE AREA	MORBAMIC/ORGANIC	HOUSEHOLD US	GROUND METHOD	NOISE AND AIR POLLUTION	BURNING	ODOUR	BIRTH DEFA	KOTT
8	Point	9	706995	856939	IREMAJA AREA	MORBAMIC/ORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	LYLO
9	Point	10	706943	856995	A ESU AREA	ORGANIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	PLOUGHING AND BURNING	ODOUR	BIRTH DEFA	LYLO
10	Point	11	706938	856978	FAYOYINMI	ORGANIC	INSTITUTIONAL	RECYCLE EN	VISUAL POLLUTION	BURNING	FIRE	HEARTH ATTACK	AARE
11	Point	12	706938	857478	LUSO AREA	ORGANIC	AGRICULTURAL	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	YESS
12	Point	13	706789	857351	OKE ESA	ORGANIC	AGRICULTURAL	GROUND METHOD	ATMOSPHERIC POLLUTION	BULLYING	ODOUR	BIRTH DEFA	YESS
13	Point	14	706845	856939	BLACK STREET	MORBAMIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	KETA
14	Point	15	706999	857101	ST JOSEPH	MORBAMIC	HOUSEHOLD US	GROUND METHOD	VISUAL POLLUTION	BURNING	ODOUR	COUGH	FOOD
15	Point	16	706925	857773	ALAFIA JUNCTION	ORGANIC	COMMERCIAL	GROUND METHOD	VISUAL & ATMOSPHERIC	BURNING	ODOUR INSECT	MALARIA BIRTH DEFA	FOOD
16	Point	17	706932	857351	MARKET AREA	ORGANIC	COMMERCIAL	GROUND METHOD	VISUAL & ATMOSPHERIC	BULLYING	ODOUR	MALARIA BIRTH DEFA	BAKA
17	Point	18	706995	856784	OLD ESE	MORBAMIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	COUGH	LYLO
18	Point	19	706944	856714	OKE ESA AREA	MORBAMIC	HOUSEHOLD US	GROUND METHOD	ATMOSPHERIC POLLUTION	BURNING	ODOUR	BIRTH DEFA	BOOK

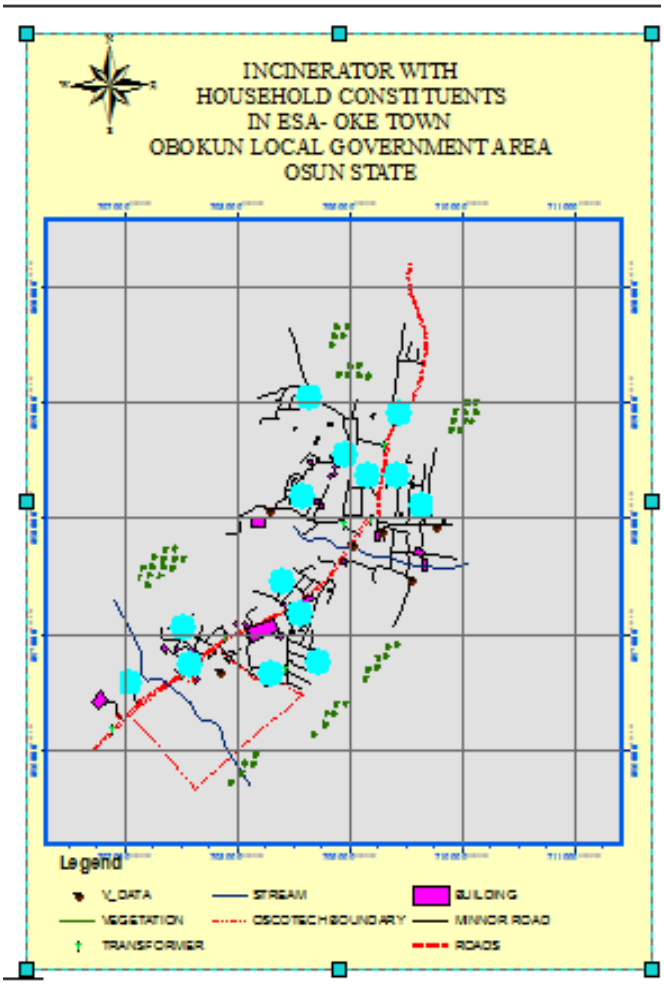


FIG 3.0; INCINERATOR WITH HOUSEHOLD CONSTITUENTS IN ESA-OKE.

BUFFERING OPERATION

Based on the criteria that waste collection points should not be more than 50 meters away from the household, buffering operation was used to determined places that are within the distance between 0 and < 50 meters from the waste collection points.

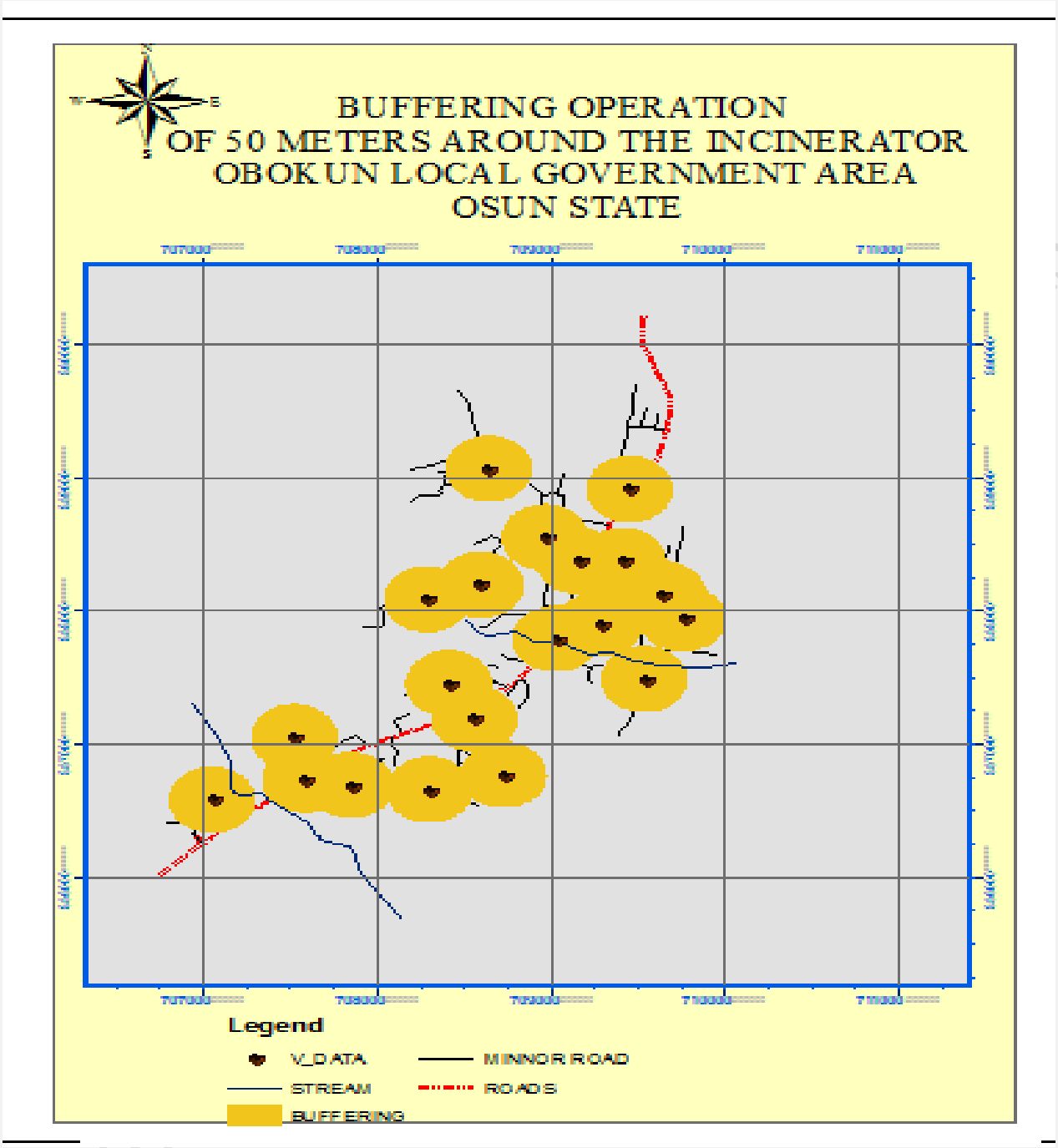


FIG 4.0: BUFFERING OPERATION, 50m AROUND INCINERATOR IN ESA-OKE

NETWORK ANALYSIS

The network analysis was modeled in this work to determine the route linking the existing waste collection points in order to show the accessibility to these waste collection

point for evacuation, this is very important especially for the waste Management Board in determining the best route to take in evacuating waste in the study area.

This was done by building a network datasets from the arc catalog for the road that have been vectorized, the network was built along with the waste collection points. The result of the analysis is shown

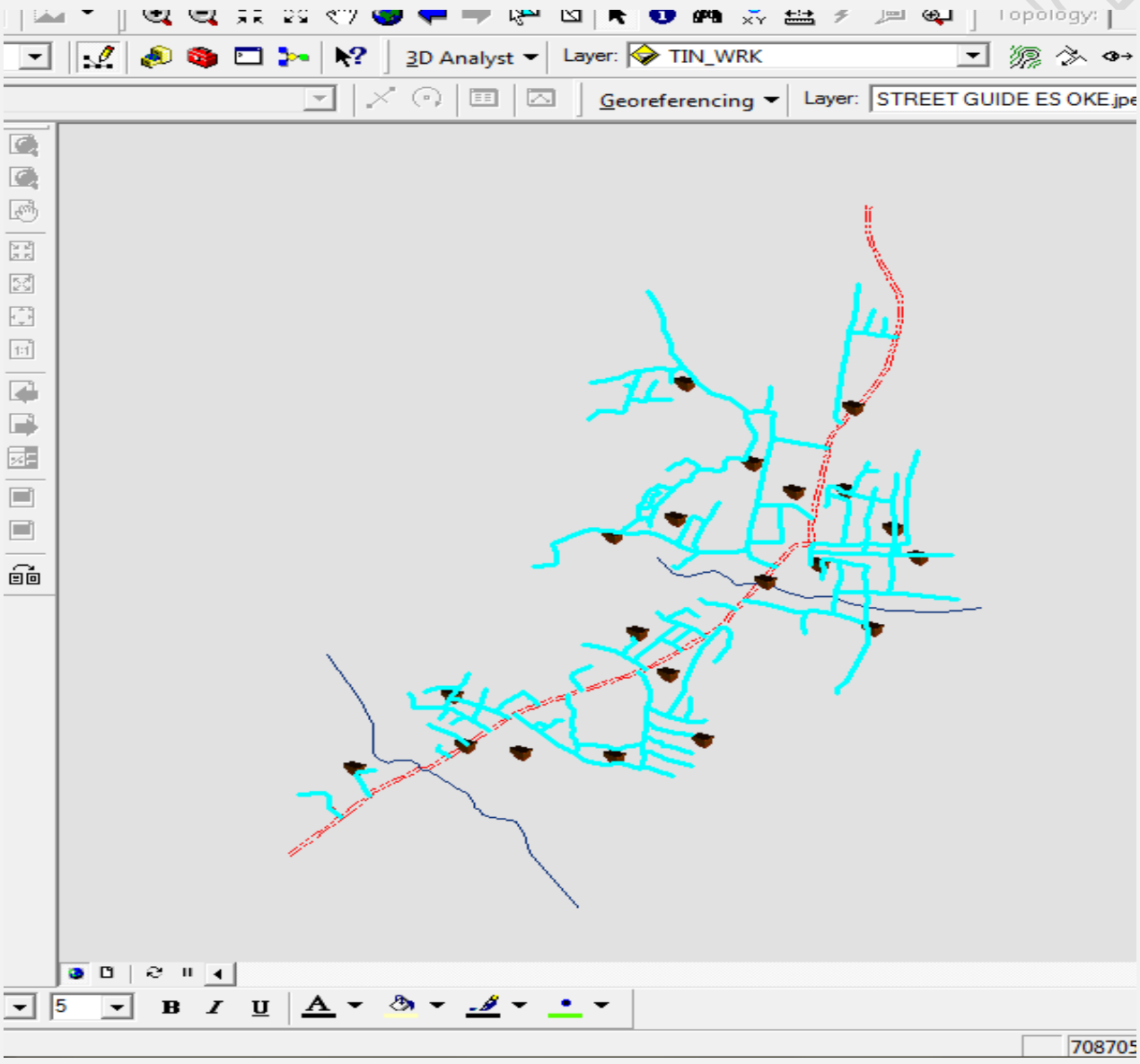


FIG 5.0 Map showing the route linking the waste collection point.

CONCLUSION

Throughout this paper we have raised a number of issues that we believe must be faced in any country to develop and implement its information systems, namely GIS programs. The implementation of GIS technology should carefully consider the nature of the developing countries with respect to its socio-economic priorities and cultural character, thus preventing any conflicts with the inherited values. On the other hand, GIS vendors are requested not only to introduce GIS technology but also to share the responsibilities of educating society and to play a major role in making GIS a useful for tool social development.

Business environments no longer operate on a comparative advantage basis but also on competitive advantage. Therefore, the professionals in the construction industry and their decision makers should be prepared and equipped to be able to compete in the new economic environment. Thus, these professionals must brace up to the fact that the era of planning or decision making by intuition has passed and that the 21st Century the professionals in the construction industry require automated and scientifically based plans. One of the ways of achieving this is to be GIS compliant. However, it must be known that there is no single key to being GIS compliant. Many factors come into play and must all be addressed.

It is believe that the development and application of GIS technologies in Nigeria does not succeed the way it should be because of the absence of a firm political stand on the side of government.

One problem which needs to be addressed urgently is the need for policy makers in Nigeria to be aware and recognize the relevance and impressiveness of GIS technology. Such “awareness” led to a deliberate policy of professional consultation on syllabus content and relevance of the technology for sustainable development in Nigeria.

RECOMMENDATIONS

Gatekeepers cannot afford not to move with the technology of the age, hence the following recommendations are put forward in order to achieve sustainability that preempts poverty:

As a matter of urgency, databases that are in hard copies in files gathering dusts should be converted to digital format in order to have intact historical knowledge of previous decisions that may impact on future benefits;

• Training and retaining opportunities should be embedded in the scheme of service of those involved in the built environment especially in the area of decision making;

• Development agencies should encourage networking of their facilities to enable decisions that bear in mind area-side and inter-generational consequences;

• Computer building companies should be encouraged (their production line subsidized) so that acquisition would be easier to sustain interest in its use for a better society.

• Though implementing Geographic Information Systems may be expensive as noted earlier, governments and the professionals should look beyond the cost and focus on the benefits by doing more through a follow up to the launch of Nigeria-Sat-1. Governments at all levels should set machineries in motion for the implementation of Geographic Information Systems.

• Professional bodies (such as Nigerian Institution of Surveyors and Nigerian Institution of Town Planners) have a role of play here. They need to create awareness and put pressure on various Governments to implement Geographic Information System.

• The hindrance of funds can also be removed if states come together and pool resources together for the purpose of implementing Geographic Information Systems. We can have a regional implementation, if the states get their priorities right and all the funds wasted on money laundering and extravagance ventures are channeled towards implementing Geographic Information System.

• Organizational and managerial issues are as important as technical ones. Thus, there is need for more Geographic Information System research-based guidance on GIS management issues. This research will lead to the development of a GIS implementation plan and process.

REFERENCES

Abioye O. J. (2014) *Digital Surface modelling of Federal School of surveying, Oyo East Local Government Area, Oyo State*. Higher National Diploma Project, Osun State College of Technology, Esa Oke Nigeria

Ahmed S. M. (2006). *Using GIS in solid waste planning: A case Study of Aurangabad, India*. Final Master's Thesis Linkoping University, Sweden.

Burrough D.A.(1996) *Principles of Geographical Information system for land Resources Assessment*. Oxford: Claredon press

Fadahunsi J. T (2009). *Application of Geographical Information System (GIS) Technology to Tourism management in Ile-Ife, Osun State, Nigeria*

Kufoniyi O.(1998). Database design and creation. In C.U Ezeigbo (Ed.), *Principles and application of Geographic information system*. Lagos: Heinemann.

Michael A.O (2013). GIS and Remote Sensing in Urban waste Disposal and Management. Focus on Owo L.G.A, Ondo State Nigeria. Dept of Urban and Regional Planning, School of Environmental Technology, FUTA. Akure, Nigeria.

Olawepo (2000). Waste Generation and Management in Jimoh H.I and Fabiyi I.P (Eds) *Contemporary Issues on Environmental studies* Ilorin: Unilorin press

Onosemode A.O. (2015). Spatial assessment of Waste collection points using GIS approach. *Nigeria Journal of cartography and GIS* 8(1)

Uchegbu S.N (2002). *Issues and Strategies in environment planning and management in Nigeria*. Hilton, Enugu, Nigeria.