WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

GIS Based Spatial Distribution Analysis of Petrol Filling Stations in Awka, Anambra State

Kelechi, O.C[1]. Emengini, E.J[1]., Idhoko, K.E[1]., Obiahu, L

[1]Department of Surveying and Geoinformatics, Nnamdi Azikiwe University Awka, Nigeria

ABSTRACT

This study assessed the spatial distribution of petrol filling stations in Awka metropolis against the physical planning standards set by Nigerian Upstream Petroleum Regulatory Commission (NUPRC) and the Anambra State Government. In a developing urban environment like Awka, petrol filling stations are major contributors to problems like traffic congestion (during scarcity or rush hour, vehicles occupy majority of the road trying to buy petrol from either cheaper or available petrol filling stations), pollution, accidents, noise, air pollution, foul odour, fire and explosion. Names and addresses of the petrol filling stations were obtained and GPS device was used to capture the locations of the petrol filling stations. Questionnaires were also used as a source of data (350 out of 500 was recovered and collated) and mean square statistical technique was used to analyze. The satellite imagery was obtained from the Google earth software and then imported to ArcGIS 10.4.1 software. The study revealed that there are forty-eight (48) Petrol filling stations captured within the study area. It is observed that the filling stations are located along the major roads in the study area and these filling stations are not equally distributed between the roads as can be observed. A buffer query of 15m of Petrol Filling Stations to the road was carried out and the result shows that sixteen (16) stations which make up of (30%) did not meet the criteria of 15m distance from road. Also, it was observed that thirty-two (32) stations which make up of (70%) meet the criteria of 15m distance to the road. Buffer of 400m distance between two petrol filling stations revealed that about 4 petrol filling stations meet up with these criteria of 400m apart as stipulated by NUPRC, the number stood at 10% of the total number of petrol filling stations in the study area. The buffer query for 100m of health facilities to petrol filling stations shows that three (3) petrol filling stations comprises of 10% do not meet with these criteria of 100m to health facilities. While forty-five (45) petrol filling stations comprises of 80% meet up with these criteria of 100m to health facilities. There are minimal environmental and health hazards (only item 3 was above the decision rule with a mean score of 2.57)as a result of sitting of petrol filling station. The research recommends that the regulatory agencies should take appropriate measures to ensure that petrol stations operators comply with the required standards.

Keywords: GIS, Spatial Analysis, Petrol Stations, Awka, Regulation

1. Introduction

Urban development and increase in population has generated various kinds of demands, one of which is FUEL. (Harrison, 1999). Increase in vehicles triggered increase demand for fuel and by extension fuel station, since engines are made to use petroleum products and filling station are the places were fuel are sold. As the economy further experiences an increased level of diversification with the oil and gas sector, accounting for more of the economy, virtually all other sectors of the economy still continue to depend on the oil and gas sector. The improved income and the expansion of the spectrum of the middle-class afforded the propensity for increased use of automobiles, generators and other petroleum demanding plants.

American heritage dictionary of English Language (2011) defines petrol filling station as a place where gasoline and oil are sold and facilities are available for repairing or maintaining automobiles. Nieminen (2005) defines Petrol station as an area including fuel equipment and piping, storage tanks, forecourt and possible building premises for the sale of fuel (inflammable liquids) to customer's vehicles. Petrol filling stations sell petrol or diesel, some carry specialty fuels such as liquefied petroleum gas (LPG), natural gas, hydrogen, biodiesel, kerosene, or butane while the rest add shops to their primary business (Hamid et al., 2009).

The significant roles petroleum products play in any economy are well known. Petroleum is one of the key drivers of industrial activities. Besides the industrial development, the transportation sector is presumed to be the major consumer of fuel to facilitate mankind's movement patterns around the globe. Light (2004) stresses that, retail gasoline is one of the most analyzed products in the world, especially in the United States of America because of people's reliance on cars. However, the price dynamics and its effects on economies of both developed and developing worlds have also been documented (Light, 2004; Chan, T.Y., Padmanabhan, V. and Seetharaman, P.B., 2004). In the case of price dynamics, it has been documented that there are significant ripple effects on most developing economies due to a rise in a barrel of crude oil. Sidaway (1998) stated that, petrol stations are very vulnerable to closures resulting from petrol price competition, regulatory pressure and nonstrategic locations. The suggestion from Sidaway seems to be supported by Mudambi (1994), when he stated that, location affects many aspects of petrol station operation. The dark side of petroleum (especially, fuel for refueling vehicles)

is the environmental effects on the eco-system hence its service location points must be strategically and consciously done to minimize it on both human beings and their immediate environs of their habitation. Also, in the Scandinavian countries particularly in Finland and Sweden, efforts have been made to remedy the effects of pollutants on air, water and soil within abandoned petrol filling sites (Nieminen, 2005).

Awka metropolis has a large number of operational petrol stations. This includes the petrol filling stations and petrol service stations that are located on major roads in the metropolis and also on some minor roads where Oil Marketing Companies (OMC's) like Nigerian National Petroleum Cooperation (NNPC), Total, Oando, and Mobil have established both petrol stations. Some of the petrol stations have been leased out to dealers while others are run by the Oil Marketing Companies themselves. In recent times, there has been a sustained increase in the number of petrol stations in the metropolis. This is due to the population increase in the country and the related increase in the purchase of vehicles. Secondly, the attractive price of petrol both at control price and black-market prices has made more people to go into the petrol retailing business (Uchegbu, 2002). The problems of the distribution, the location and the placement of petrol service stations need careful examination with regard to the control that requires to be exercised; the legislative instruments that may be required to enforce such control and the optimal conditions that should be created from the point of view of service to the general public (Gopalaswamy, 1977). This is because, petrol stations contribute to air pollution and there has also been incidence of fuel station explosions; according to World Health Organization (World Health Organization, 2004), more than 2.3 million lives and properties worth more than US$ 4.5 billion were lost to fire out breaks associated to petroleum products mishandling. Mshelia, Abdullahi, and Dawha (2015), disclosed in their paper, "Environmental Effects of Petrol Stations at Close Proximities to Residential Buildings in Maiduguri and Jere, Borno State ,Nigeria" that, "the perceptions of the residents in the order of severity of dangers affecting them, air pollution is the most severe danger variable. Traffic accidents, traffic congestion and fire outbreak are the next severe dangers. Noise has lesser danger than compared to air pollution, traffic accident, traffic congestion and fire outbreak. While soil pollution and felling of trees are the least danger variables as perceived by the respondents in relation to the distance between the petrol stations and the residential houses. Therefore, it is generally important in the planning process for development particularly in the urban centers, to give much consideration to measures that reduce hazards. Planners should at all times assess possible hazards in planning and promote ways of avoiding or mitigating damage that might cause hazards, risk and vulnerability (Mshelia, et al, 2015).

Geographic Information System (GIS) is a system of hardware, software, and procedures to facilitate the manipulation, analysis, modeling, planning and management of resources. Maps are scales for measuring the property of location. Although maps may show objects with respect to attributes other than location, their principal purpose is to depict object in term of their location property. Location is seen as that property of objects which geographers consider central to their study and problems of understanding objects or phenomena which interest them, (Lewis, 1977). Petroleum station is defined as any land, building or equipment used for the sale or dispensing of petrol or oil for motor vehicles or incidental thereto and includes the whole of the land, building or equipment whether or not the use as a petrol station is the predominant use or is only a part thereof.

The petroleum industry in Nigeria is divided into two main segments, the upstream and the downstream sectors. The upstream refers to activities such as exploration, production and delivery to an export terminal of crude oil or gas. The downstream on the other hand encompasses activities like loading of crude oil at the terminal and its user especially transportation, supply trading, refining distribution and marketing of petroleum, (Asada, 2010). Activities of filling stations or petroleum outlets are part of the downstream sector.

In all parts of the world, cities are exposed to hazards such as traffic congestions, pollution, accidents, fire explosion and environmental problems. These problems are most common in developing nations like Nigeria where there is lack of coordinated planning for development and non-adherence to planning laws. These generally results to illegal conversion, leading to haphazard development and the deliberate location of land uses in unsuitable areas. More than half of a fast-growing world population is living in urban areas, and this is only expected to grow in more coming decades (USAID, 2001).

In a developing urban environment like Awka, petrol filling stations are major contributors to problems like traffic congestion (during scarcity or rush hour, vehicles occupy majority of the road trying to buy petrol from either cheaper or available petrol filling stations), pollution, accidents, noise, air pollution, foul odour, fire and explosion. The extent of these problems depends on the criteria or variables such as the distribution, the location, the positioning and set back from the road etc.

Therefore, there is need to carry out locational analysis of petrol filling stations in Awka metropolis using GIS in order to abate the aforementioned problems. In view of these potential challenges and risks associated with petrol filling stations the following research question evolved.

The aim of this study is to analyze the locational pattern of petrol filling stations in Awka metropolis, Nigeria, using GIS Approach. The objectives of the study are as follows:

i. To determine the pattern(s) of location petrol filling stations.

ii. To determine the proximity of petrol filling stations to residential houses, public and semipublic institutions.

iii. To compare the physical conformity of the petrol filling stations with the physical planning standards of the Nigerian Upstream Petroleum Regulatory Commission (NUPRC).

iv. To examine the environmental hazards of petrol filling stations.

2. Study Area

Awka (Igbo: *Oka*) is the capital city of Anambra State, Nigeria. Awka capital territory is located along latitude 6'12'25'' and longitude 7'04'04''. The city was declared capital on 21 August 1991, after the creation of Anambra and Enugu state, which moved the capital from Enugu to Awka (an administrative center since pre.-colonial times). The city is located at 199.1 kilometres (123.7 mi), by road, directly north of Port Harcourt in the centre of the densely-populated Igbo heartland in South-East Nigeria.

The West-East Federal highway links Lagos, Benin City, Asaba, Onitsha, and Enugu to Awka and several local roads link it to other important towns such as Oko, Ekwulobia, Agulu, Enugwu-Ukwu, Abagana and Nnewi.

Strategically, Awka is located midway between two major cities in Northern Igbo land, Onitsha and Enugu, which has played a significant role in its choice as an administrative center for the colonial authorities and today as a base for the Anambra State government.

3. Methodology

A trip was made to petrol filling stations and coordinates of each petrol filling station was obtained using the Germin 72H Handheld GPS Receivers, oral interview and administration of questionnaire was employed. Name and coordinate data of each station was also obtained.

Sources of Data

The data that was used in this project are divided in two; primary and secondary

Primary Data

These are data that was captured directly in the field. The Data was captured using Handheld GPS receiver. It comprises of coordinates of all the petrol filling stations, name of petrol filling stations and location information of each station. Questionnaire (500 copies) was prepared and administered to buildings around petrol filling stations in the study areas, to assess the environmental and health impact associated with the location of petrol filling station. 350 questionnaires were recovered and Mean Statistical Technique was used to analyze the data.

Secondary Data

The secondary data that was used is the Google Earth map of Awka metropolis. Also, in the process of executing this study, Anambra State Administrative map and Map of Awka metropolis was also used.

4. Results Discussion

Existing Filling Stations Distribution by Road

The study revealed that there are forty-eight (48) Petrol filling stations captured within the study area.

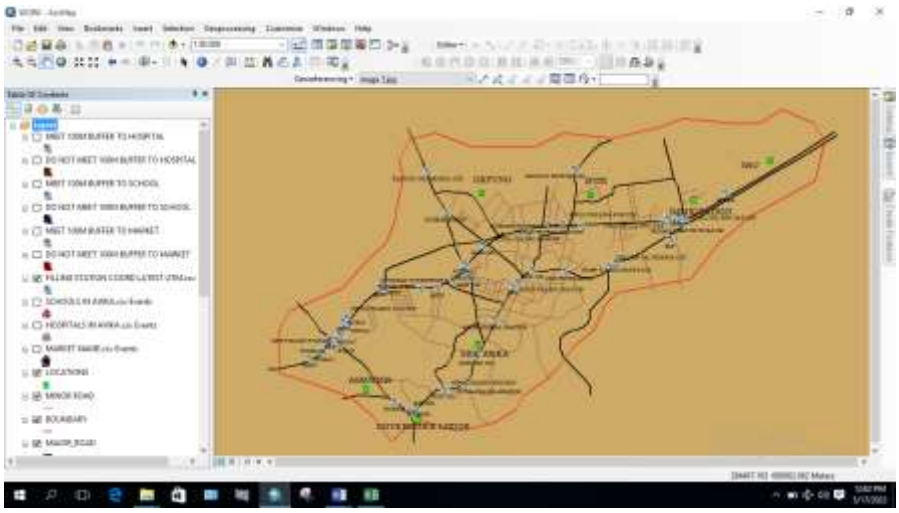

Fig 4.1. Distribution of Filling Station by Road

from fig.4.1 above, it is observed that the filling stations are located along the major roads in the study area and these filling stations are not equally distributed between the roads as can be observed. However, Enugu/Onitsha Express Road has the highest number of station (28) followed b y Zik Avenue Road with (16) and these two roads account for more than one-third of the filling stations in the area. This result is not surprising because the two roads are the major roads in the metropolis.

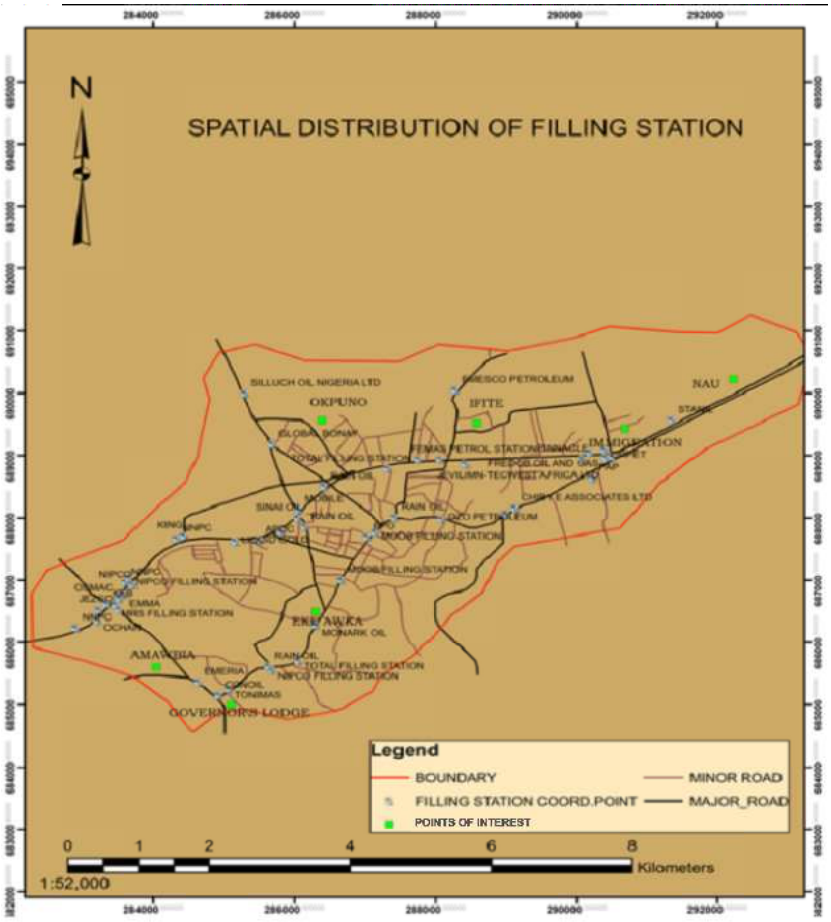

Fig.4.1.1. Distribution of Filling Stations in Awka Metropolis

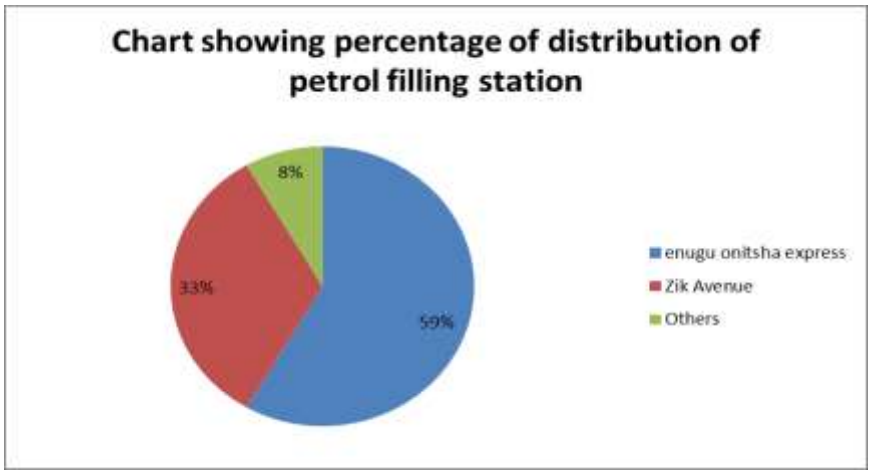

Fig 4.1.2 Result of the distribution of petrol filling station in Awka metropolis

Suitability Analysis

For the purpose of this study, the method of suitability analysis was by the Physical Planning Standards of the Nigerian Upstream Petroleum Regulatory Commission (NUPRC). The standards set by the NUPRC were used to analyze the compliance of filling stations to these physical standards which will limit health and environmental challenges in the society.

Physical Planning Standards

The NUPRC regulates Petrol filling station business in Nigeria and it's a department under the Ministry of Petroleum Resources. This ministry is saddled with the responsibility of registering and regulating the downstream petroleum sector. The Anambra State Ministry of Environment which is responsible for developing and implementing policies, programs and legislation in order to protect and conserve the environment of Anambra State for sustainable development. For a Petrol filling station to be fit for operation in the Awka Metropolis, it has to meet the physical standards set by the NUPRC and the

standards by the Anambra State Ministry of Environment. The study employed these physical planning standards to determine suitable site for filling stations. The suitability analysis was done in ArcGIS environment using Proximity Analysis Tools.

Suitability Analysis by Distance from Road

According to the physical planning Standards set by NUPRC (2007) Procedure guide for grant of approvals to construct and operate of a petrol products retail outlet, the distance from the road to filling station pump should not be less than 15meter. Since filling station were represented as point facilities and road as line feature, a buffer of 15m was created on the road and data query by location was made in ArcMap environment. The query assisted with "selecting all locations that are completely within 15meter road buffer.'' Figure 4.2 below shows the process of carrying out the buffer analysis in ArcGIS environment.

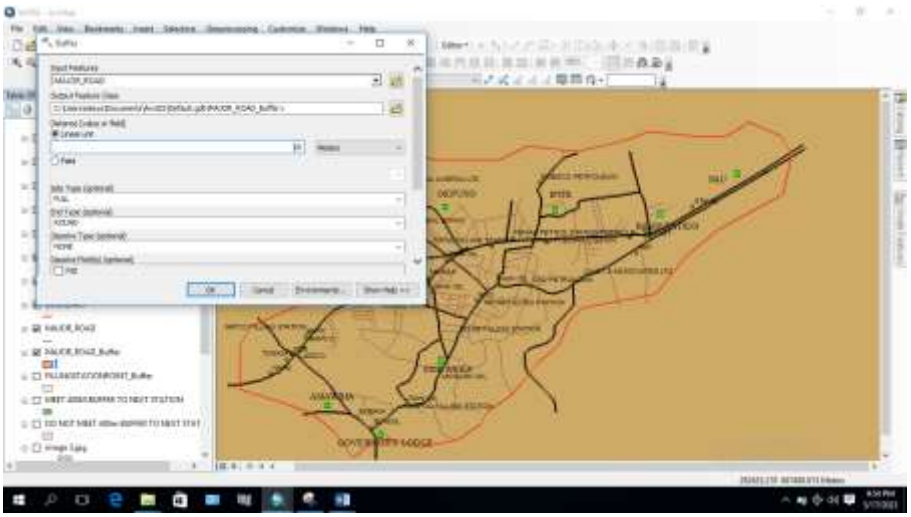

Fig 4.2 Buffer query of 15m from Road in ArcGIS environment

The result of the buffer query of 15m of filling stations to road is presented in figure 4.2.1 below, which shows those filling stations that met the 15m criteria and those that did not meet up with the criteria**.**

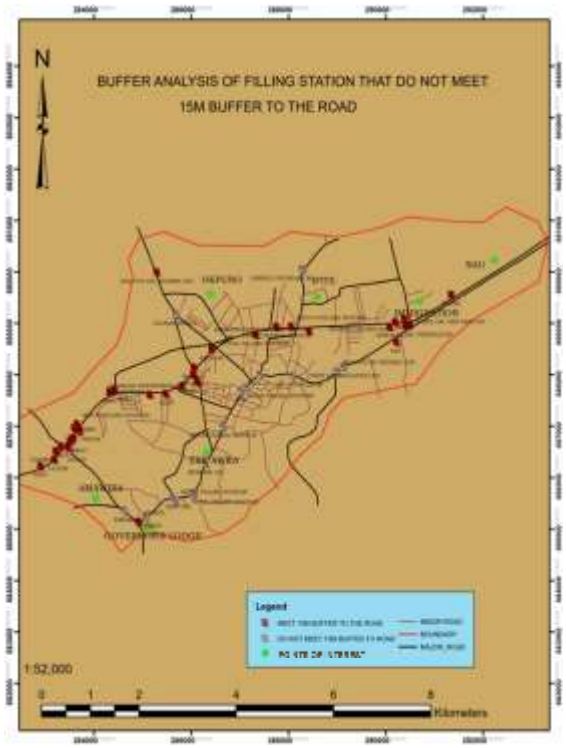

Fig 4.2.1 Buffer Analysis by 15m Distance from Road

From the result, it was observed that sixteen (16) stations which make up of (30%) did not meet the criteria of 15m distance from road. These stations include some stations along the following roads (Zik Avenue, Ifite Road and Isu/Mgbakwu Road). Also it was observed that thirty two (32) stations which make up of (70%) meet the criteria of 15m distance to the road.

This result confirmed that majority of the filling stations meet the standard criteria of locating 15m distance from road.

A buffer distance of 15 meters using the proximity analysis tool in ArcGIS was used to determine those filling stations whose first pump point meet with these criteria.

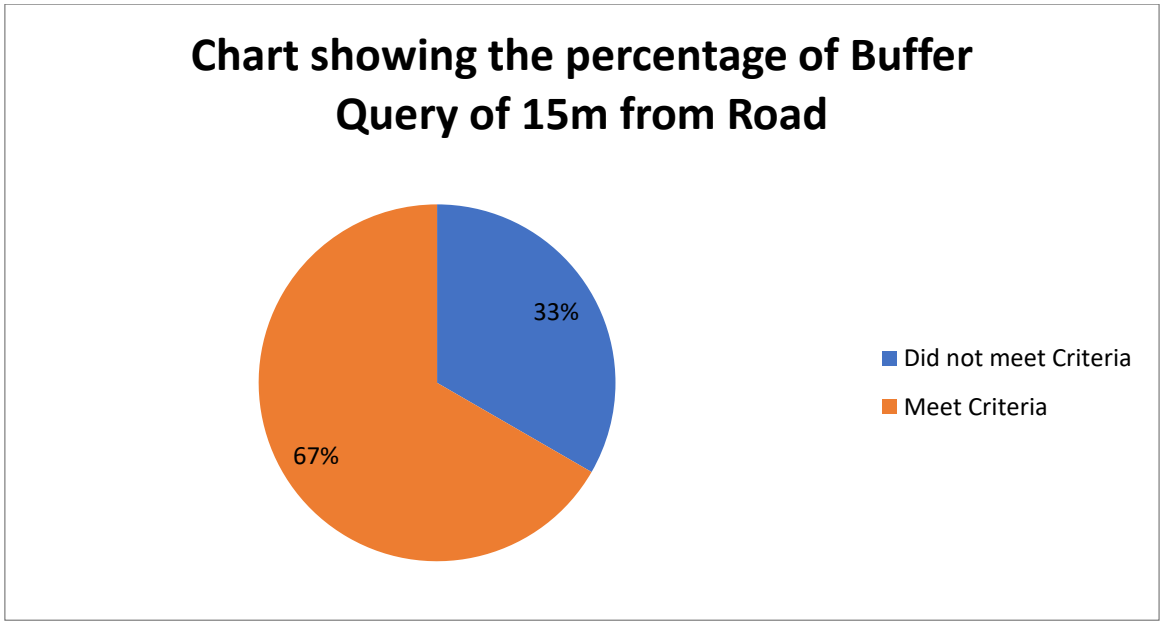

Fig 4.2.2: Result of Query for station that meet and those that did not meet with 15m distance to road in percentages.

Suitability Analysis by Distance between the Location of Filling Stations

Distances between stations in the area were determined in ArcMap environment using proximity operation of the analysis tool. A buffer distance of 400m between filling stations was adopted in ArcGIS environment to determine the filling stations that meet the 400m separation apart. Figure 4.3 shows the procedure of carrying out the buffer analysis in ArcGIS environment.

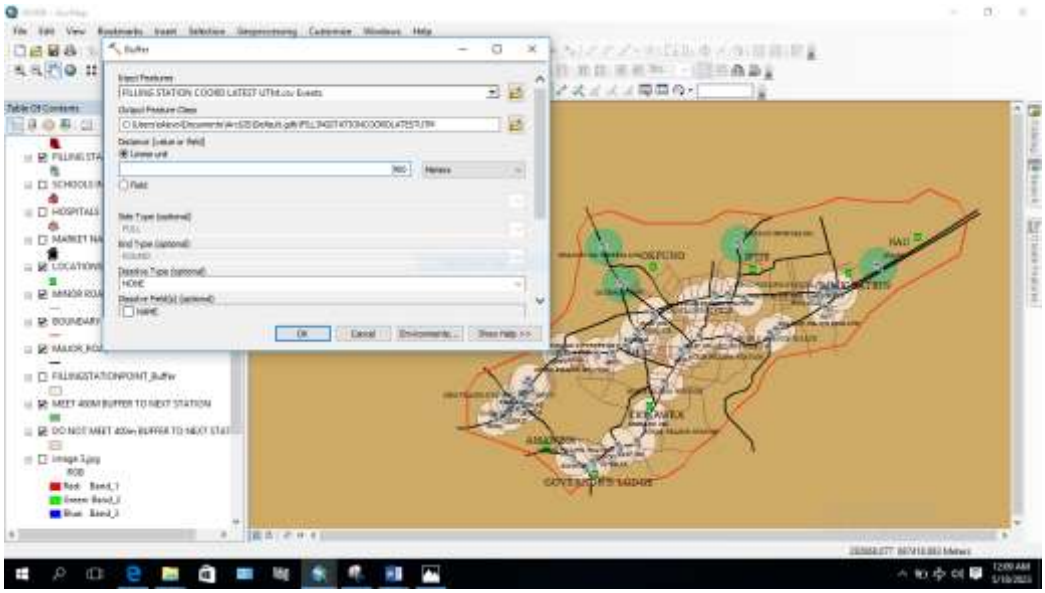

Fig 4.3. Buffer query of 400m between filling stations in ArcGIS environment

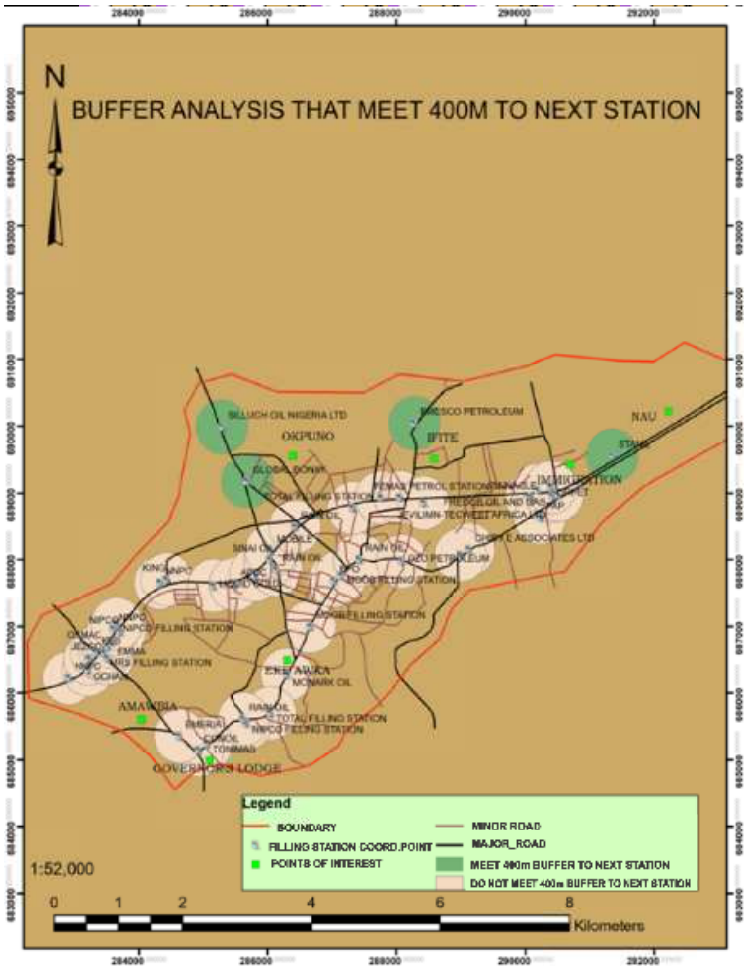

Fig 4.3.1 Analysis by 400m buffer distance between Two Filling Stations

The result of the 400m buffer query is presented in Fig. 4.3.1 showing the filling stations that meet up with the 400m criteria and those that do not meet up with the criteria by DPR.

The findings revealed that about 4 filling stations meet up with these criteria of 400m apart as stipulated by DPR. The number stood at 10% of the total number of filling stations in the study area.

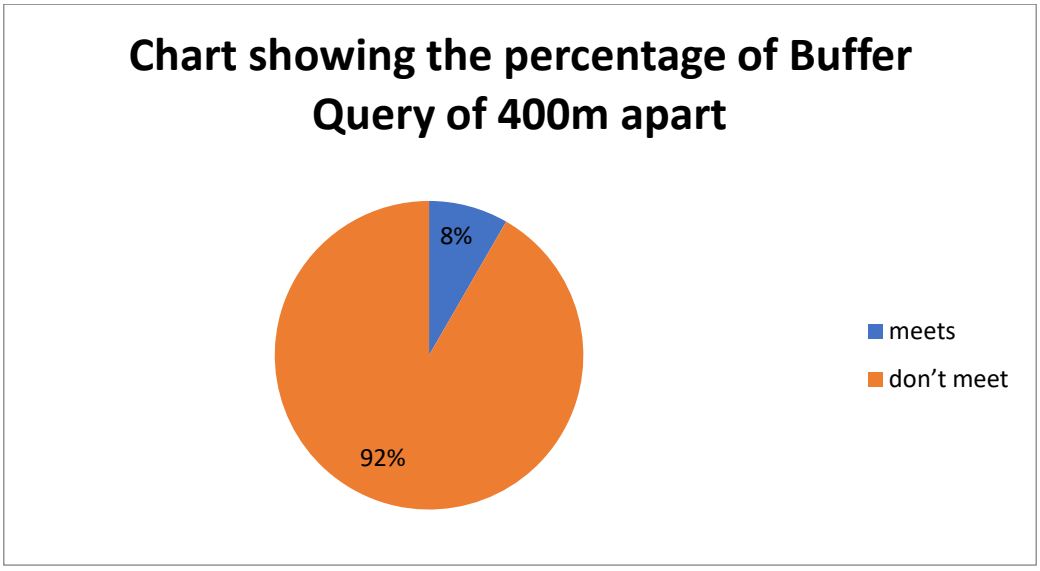

Fig 4.3.2: Result of buffering for stations that complied and those that did not comply with criteria of 400m distance to the next station in percentage.

Distance to Hospitals

According the criteria set by the DPR, filling station are not allow to operate adjacent to public institution like hospitals. In case they are to operate, the minimum distance of 100meters has to be maintained. Thus a comparison was made between the location of filling station and their distance to the hospital. The proximity analysis tool in ArcGIS was used to carry out this analysis using a buffer distance of 100 meters from the location of these filling stations to the health facilities to determine those that meet with these criteria.

The procedure for the buffer analysis in ArcGIS environment is shown in figure 4.4

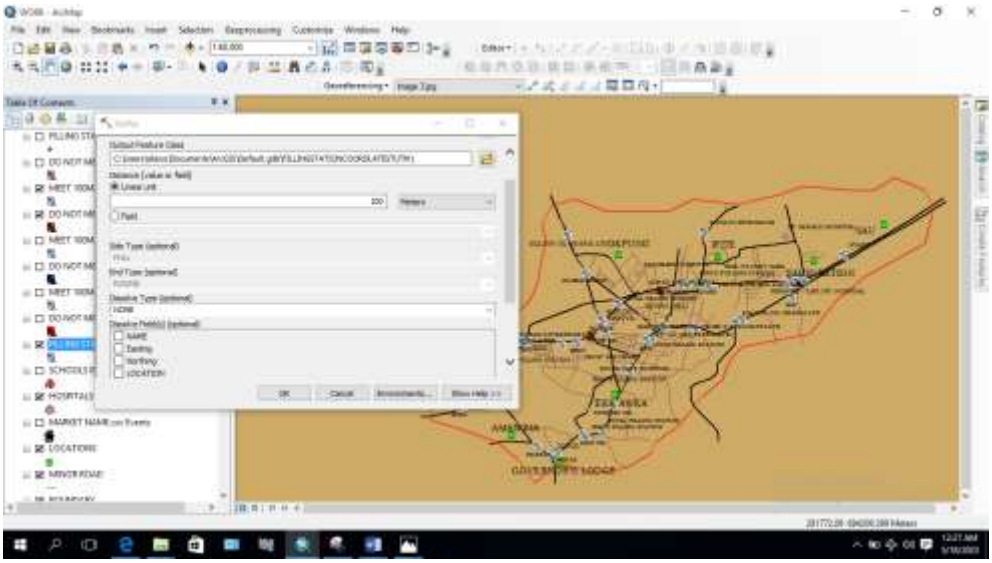

Fig4.4. Buffer query of 100m of Health Facilities to Filling Stations in ArcGIS environment

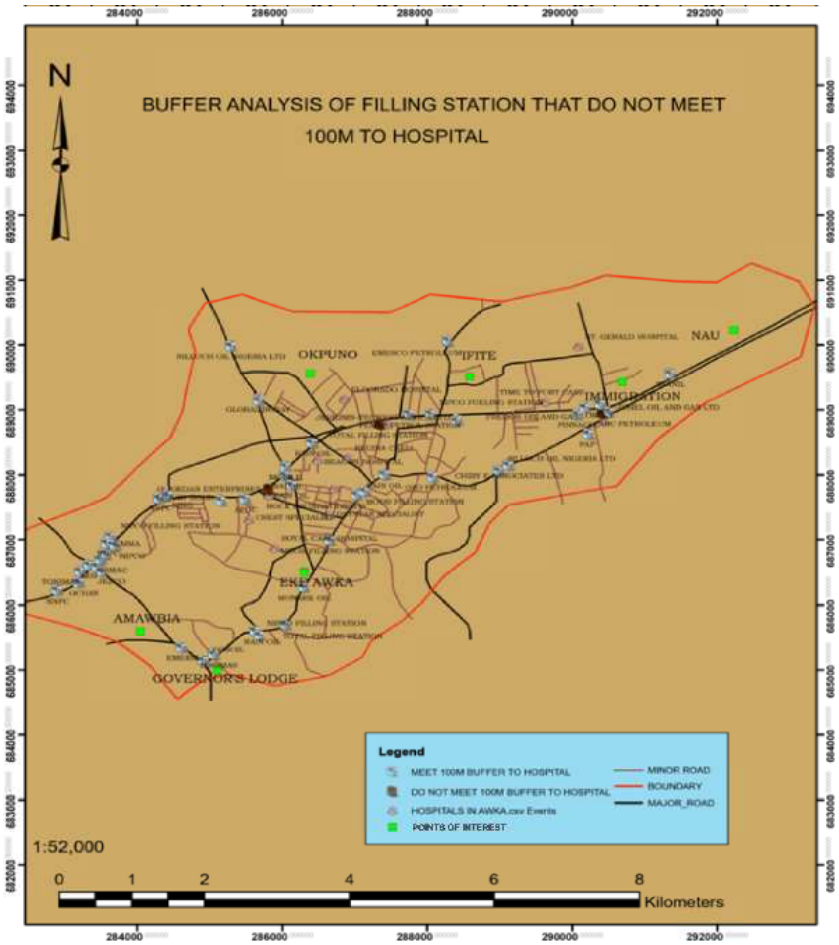

Fig. 4.4.1Analysis by 100m buffer to Hospitals

The result of the buffer query for 100m of health facilities to filling stations are presented in figure 4.4.1

From the result above, it shows that three (3) filling stations comprises of 10% do not meet with these criteria of 100m to health facilities. While forty-five (45) filling stations comprises of 90% meet up with these criteria of 100m to health facilities.

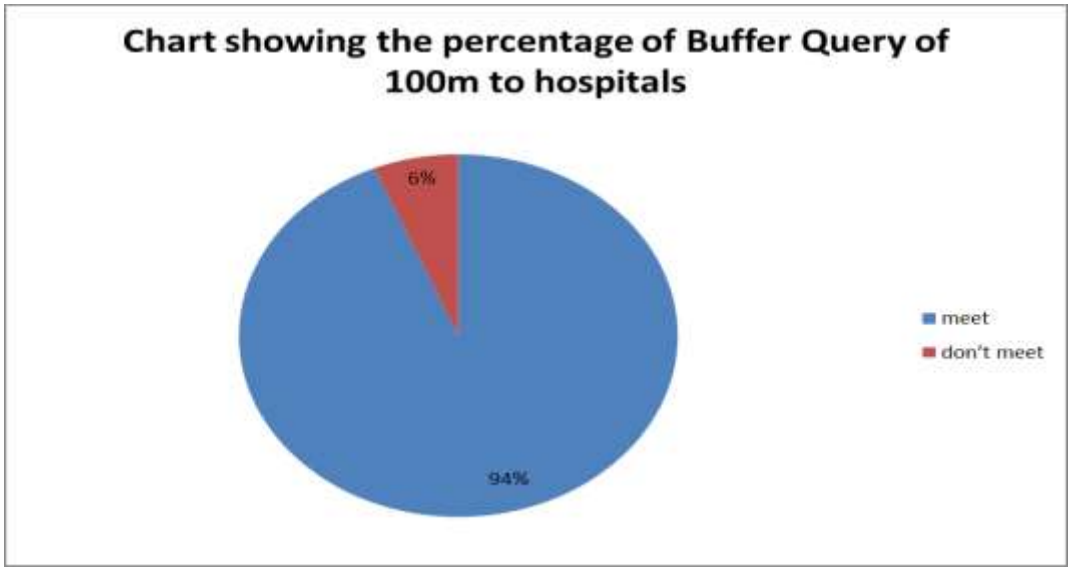

Fig 4.4.2: Result of buffering for stations that complied and those that did not comply with criteria of 100m to hospital in percentage

Suitability Analysis by Distance of Filling Stations to Schools

According to the criteria set by DPR, filling station are not allowed to operate adjacent to public institutions like schools and if they must operate, then a minimum distance of 100meters must be adhered to before sitting such filling station. The proximity analysis tool in ArcGIS was used to carry out this analysis using a buffer distance of 100 meters from the location of these filling stations to the schools to determine those that meet with these criteria. Figure 4.5 shows the procedure of carrying out the buffer analysis in ArcGIS environment.

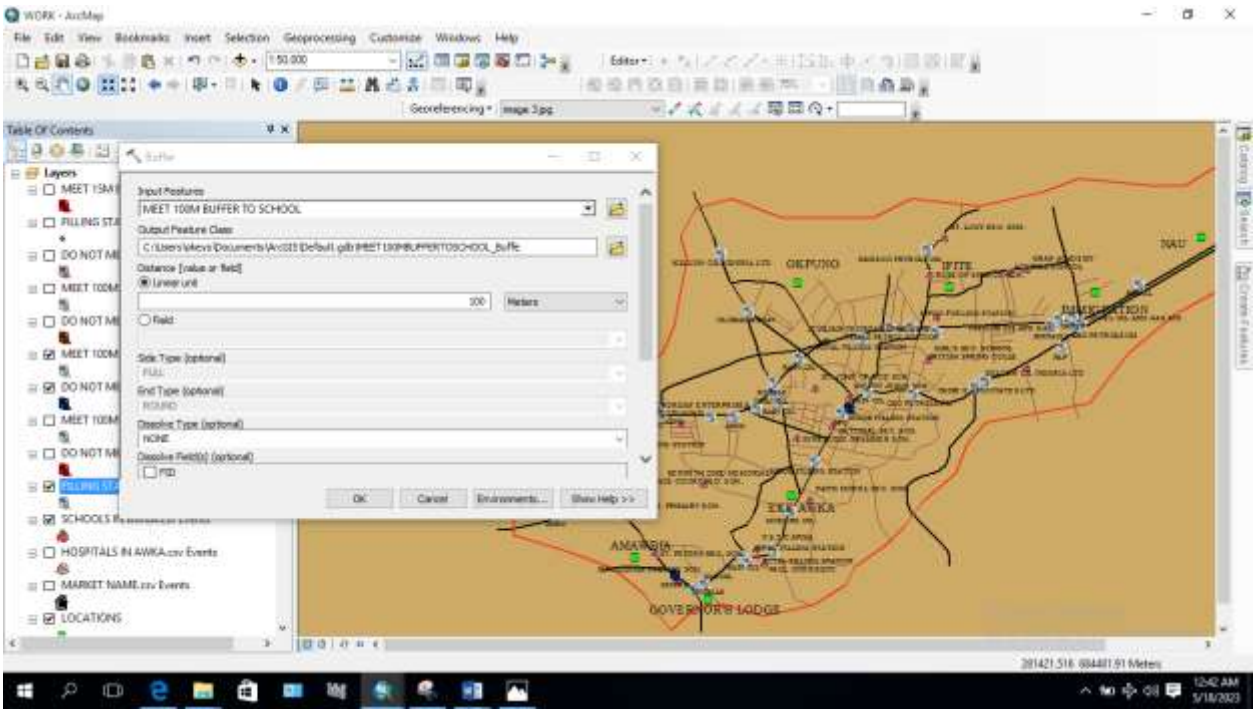

Fig 4.5. Buffer query of 100m of Schools to Filling Stations in ArcGIS environment

The result of the buffer query of 100m of schools to filing stations is presented in figure 4.5.1

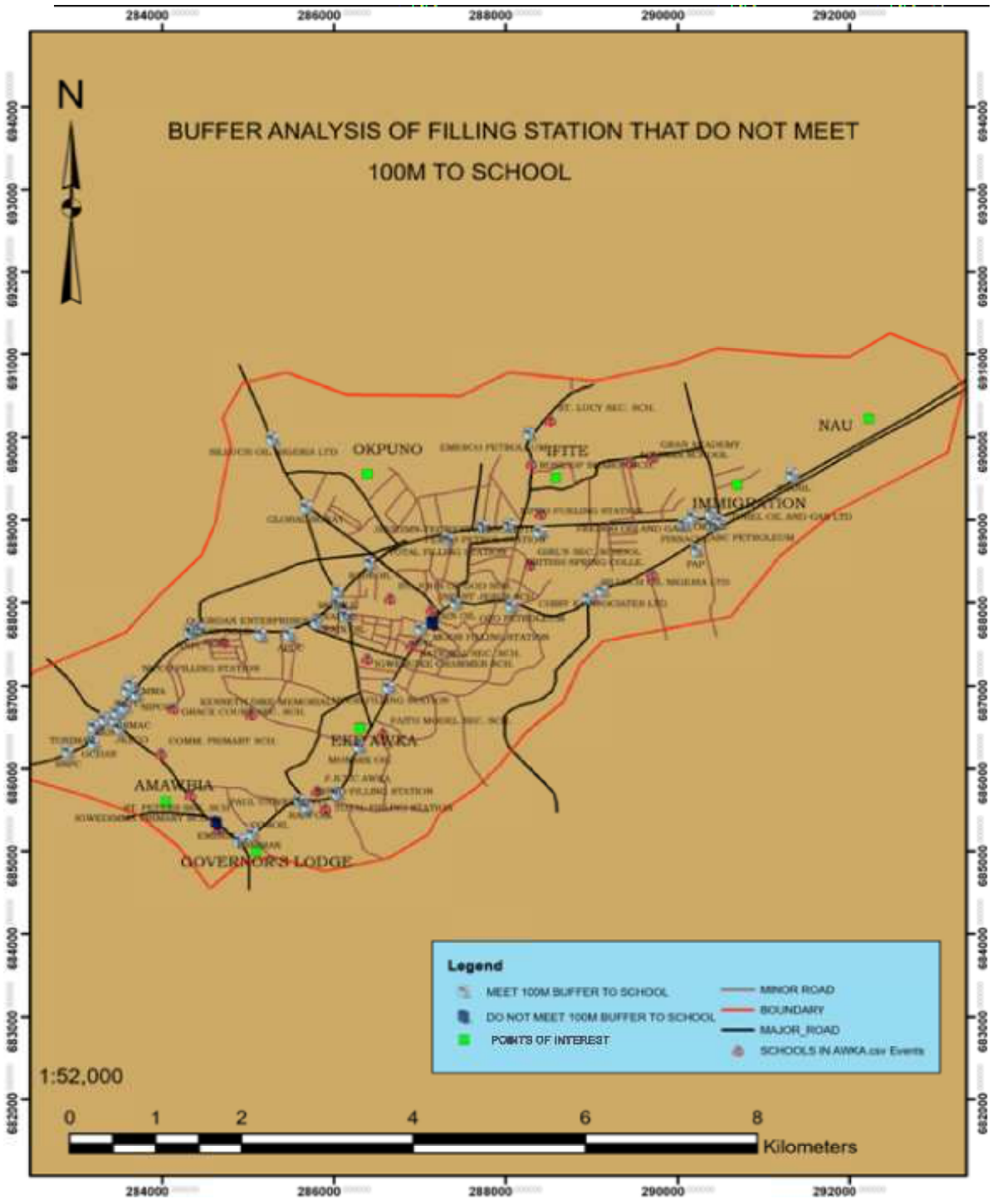

Fig 4.5.1 Analysis by 100m Buffer Distance of Filling Stations to Schools

The result shows that two (2) filling stations comprising of 10% do not meet up with these criteria of 100m to schools. While about forty (46) filling station meet with these criteria which comprises of 90%.

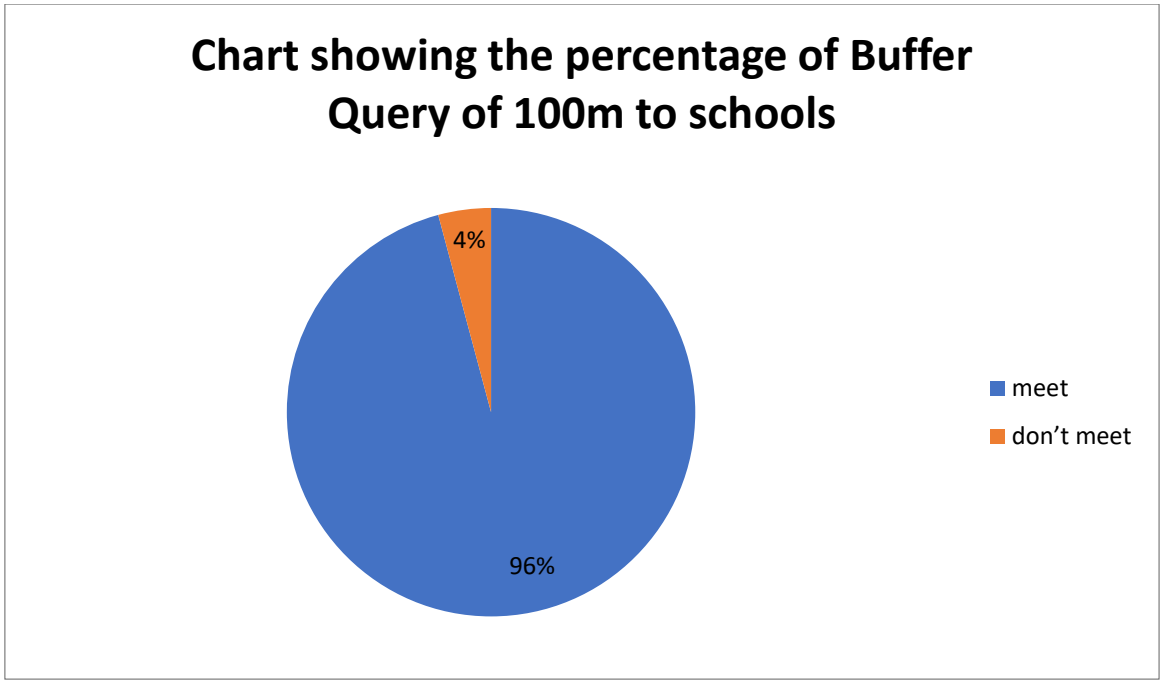

Fig 4.5.2: Result of buffering for stations that complied and those that did not comply with criteria of 100m to schools in percentage

Suitability Analysis by Distance of Filling Stations to Market

According to the criteria set by DPR, filling station are not allowed to operate adjacent to public institutions like markets and if they must operate, then a minimum distance of 100meters must be adhered to before sitting such filling station. The proximity analysis tool in ArcGIS was used to carry out this analysis using a buffer distance of 100 meters from the location of these filling stations to the market to determine those that meet with these criteria. Figure 4.6.shows the procedure of carrying out the buffer analysis in ArcGIS environment.

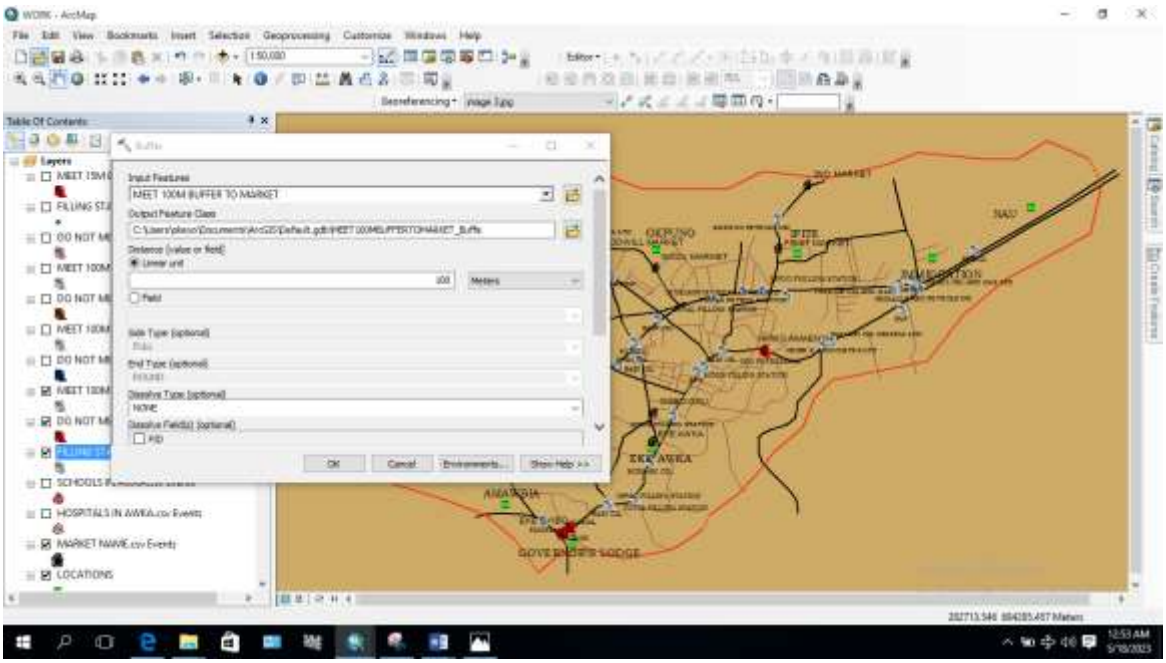

Fig 4.6. Buffer query of 100m of Markets to Filling Stations in ArcGIS environment

The result of the buffer query for 100m of markets to filling stations are presented in figure 4.6.1

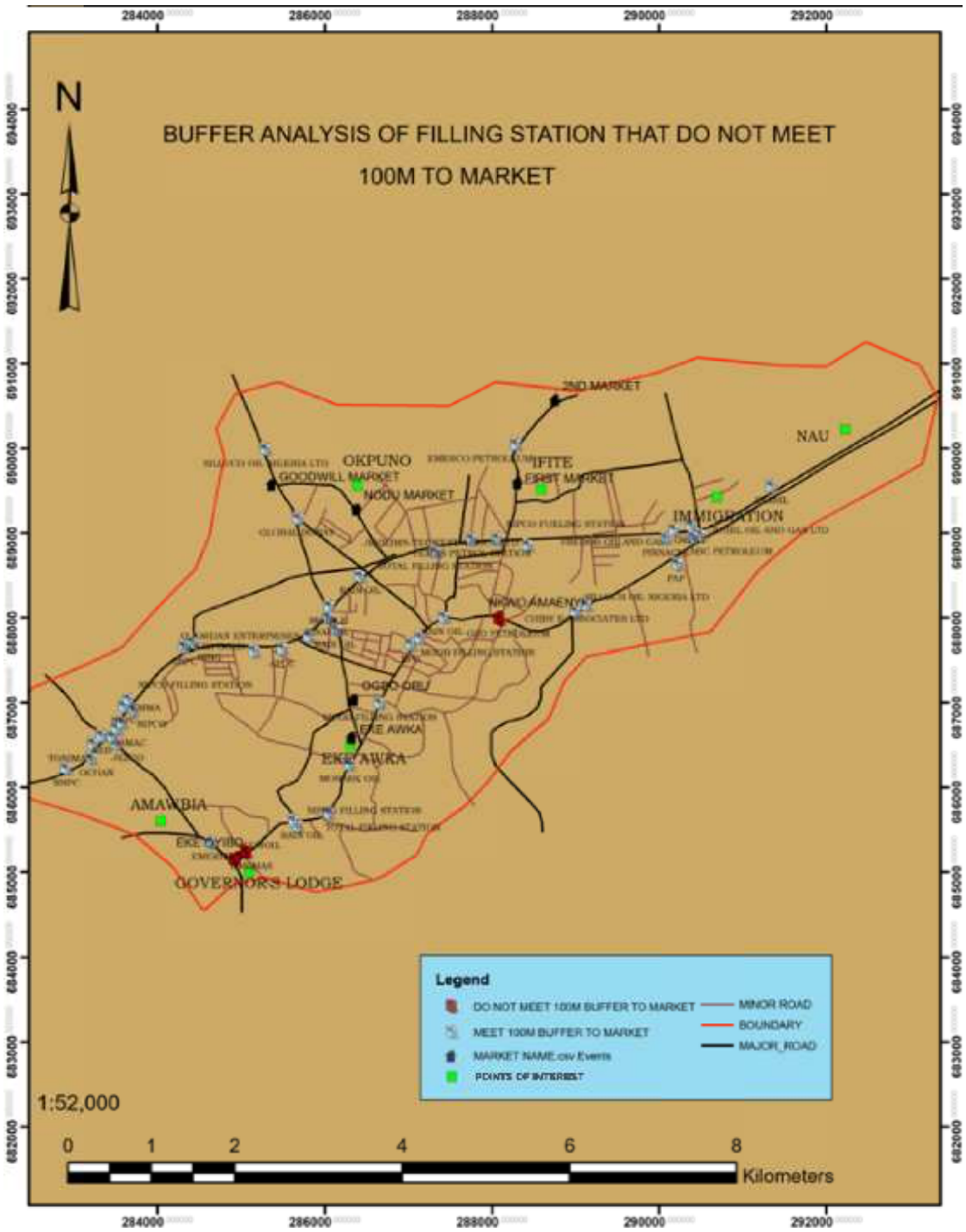

Fig 4.6.1. Analysis by 100m Buffer Distance of Filling Stations to Market

The result shows that two (3) filling stations comprising of 10% do not meet up with these criteria of 100m to market. While about forty (45) filling station meet with these criteria which comprises of 90%.

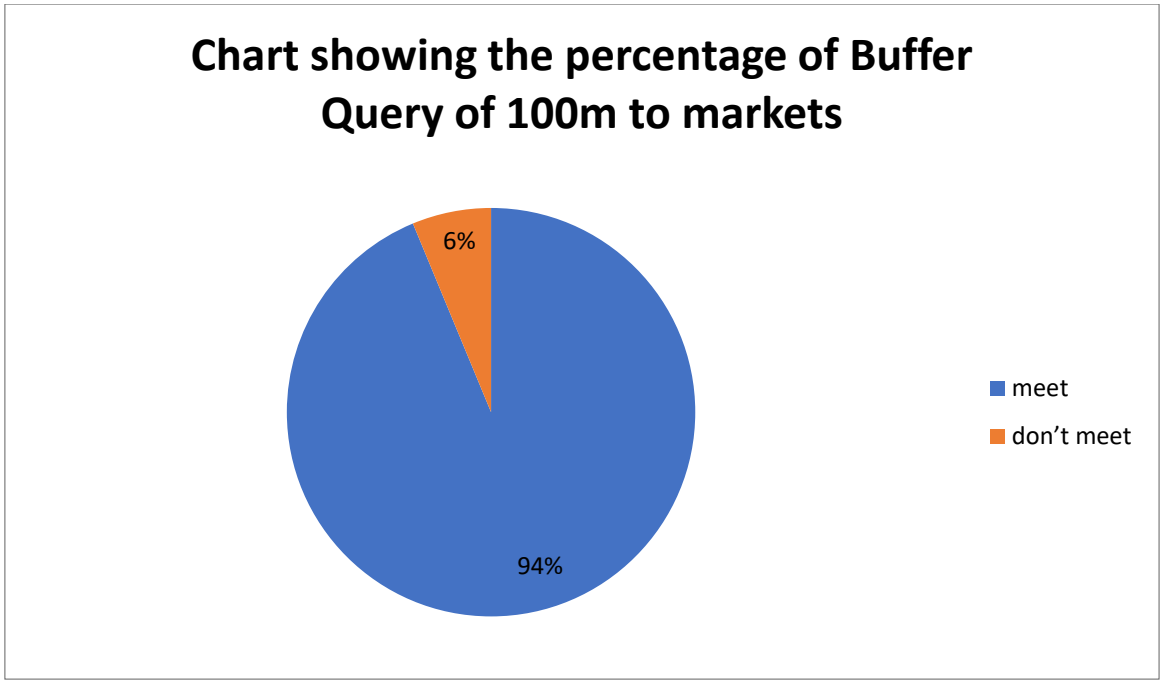

Fig 4.6.1**:** Result of buffering for stations that complied and those that did not comply with criteria of 100m to markets in percentage

Residents' Perception of Environmental Effects of Petrol Filling Stations

This section discusses residents' perceived effects of petrol filling stations on the environment. The parameters considered are noise, fire outbreak, road accidents, traffic congestion, water pollution and air pollution (Table 4.1). For the purpose of this study, 500 copies of structured questionnaires were distributed to the respondents, out of which 350 were fully completed and recovered, and were used for the purpose of data analysis. The research question was highlighted and Mean square statistical technique was used to analyze the data collected.

Research question 3: Are there any environmental hazards associated with the petrol filling stations?

Table 1: Residents' Perception of Environmental Effects of Petrol Filling Stations.

s/n	Items	SA	A	D	SD	∑FX	N	Ẋ	Remarks
1	Fire out-break	61	40	90	159	703	350	2.01	Not accepted
2	Air pollution	100	70	90	90	799	350	2.28	Not accepted
3	Noise pollution	110	70	80	90	900	350	2.57	Accepted
4	Water pollution	60	40	90	160	700	350	2.00	Not accepted
5	Road accidents	60	40	92	158	702	350	2.01	Not accepted
6	Traffic congestion	100	80	80	90	900	350	2.57	Accepted

From the above results, only item 3 with mean score of 2.57 is above the decision rule of 2.50 and was accepted. While, the remaining items were below the decision rule and were not accepted. Analysis of the respondents' responses on this indicates noise pollution as the major problem associated with petrol filling stations in their neighbourhoods (Table 4.1). The noise was reported to have emanated from horns and engines of different automobiles that patronize the petrol filling stations in the area. The intensity of noise pollution from automobiles is particularly high and disturbing during fuel crisis. This is the time intense struggle to buy fuel in the petrol filling stations by motorists lead to unbearable noise in their neighbourhoods. Other source of noise pollution by the petrol filling stations as indicated by the residents include electric generators being used as alternative source of power by the petrol filling stations during public power outage as well as noise associated with petty trading around the petrol filling stations. However, only a very few percentage of the respondents considered the existence of petrol stations as having any significant association with fire outbreak, road accidents, traffic congestion and pollution of surrounding water.

This implies, there are minimal environmental hazards as a result of the sitting of petrol filling station in Awka metropolis.

Mean Square Statistical Technique

Using 4-point value

Strongly Agreed = 4 points

Agreed = 3 points

Strongly Disagreed = 2 points

Disagreed = 1 point

$\frac{\sum FX}{N} = \frac{4+3+2+1}{4} = \frac{10}{4} = 2.50$

It should be noted that the decision values is 2.50, any value above 2.50 is accepted and below 2.50 is unaccepted.

$\dot{X} = \frac{total\ number\ of\ points}{number\ of\ highest\ scale\ points}$

5. Conclusion

The petrol filling stations in Awka metropolis are not evenly distributed, rather they are more concentrated along the major roads especially enugu-onitsha expressway, Also the findings revealed that 30% petrol filling stations did not meet the minimum distance required from road and 10% to other stations. Indeed it is common in the area to see two stations lie back to back. This has been observed in almost all the major roads. In addition, the NUPRC and Awka Capital territory Development Authority (ACTDA) should ensure that petrol filling stations (PFSs) are properly sited in line with their stipulated sitting criteria, as such; the results derived from this study can be adopted to reveal PFSs that contravene standards thus posing problems and possible risks to the people.

6. Recommendations

The study recommends the following:

a) The NUPRC and ACTDA, as the regulatory government agency, should make it compulsory for the filling station operators when submitting their EIA (Environmental Impact Assessment) report to include the geographic location of the site.

This can be helpful in updating the spatial database for the filling stations successfully.

b) The stations that had not met any of the standards should be given deadline to comply or be sealed.

c) The NUPRC and ACTDA need to look into the issue of sitting the stations and take appropriate measures to ensure that only sites which meet their minimum standards were given permission to construct filling stations.

d) The filling stations are mostly located on major roads as found by the study, hence the need to give priority for the roads with less number of filling stations when given approval to operators

References

1. Harrison R. (1999). Understanding our environment, Royal Society Chemistry, UK,
2. American Heritage Dictionary (2011). The American heritage dictionary of the English language Fifth edition. Available at http://www.hmhco.com/shop/books/the-ameriacan-dictionary- of-the -English-language-fifth-edition.
3. Nieminen M. Pasi (2005). Environmental Protection Standards at petrol stations: *A comparative study between Finland and selected European Countries.* Tampere University of Technology. Publication 534
4. Hamid, A. b., Iman. M. H., Suriatini, b. I. and Martin, R. bt., (2009), *Site Potentiality of petrol Stations Based on Traffic Counts*, Malaysia Journal of Real Estate, vol. 4, No.1
5. Light, J. J. (2004), An empirical Investigation of Product Differentiation in Retail Gasoline Industry. United States Naval Academy- Trident Scholar Project Report, Annapolis Mal.
6. Chan, T. Y., Padmanabhan, V. and Seetharaman, P. B. (2004), *A Structural Model of Locational Competition among Gasoline Retailers*: An Empirical Analysis (bschool.nus.edu. retrieved on 8th March 2016)
7. Sidaway, R. (1998), Study of Petrol Stations in Rural Scotland. General Agricultural Policy and Rural Development (16)
8. Mudambi, S. M. (1994), A Topology of Strategic Choice in Retailing, International Journal of Retail & Distribution
9. Uchegbu, S.N. (2002), Environmental Management and Protection, Second Edition, (201 pages) Spotlite Publishers Nigeria.

10. Gopalaswamy, R. (1977), Guide to the Location of Gasoline (Motor Fuel) Filling Stations and Filling-Cum-Serv1ce Stations in Urban Areas. Town and Country Planning Organisation, New Delhi.

11. World Health organization (2004), Safe Piped Water: Managing Microbial Water Quality in Piped Distribution Systems by Richard

12. Mshelia, M., Abdullahi, J. and Dawha, E. (2015),*Environmental Effects of Petrol Stations at Close Proximities to Residential Buildings in Maiduguri and Jere, Borno State*, Nigeria, Vol. 20, No. 4, pp.1-8.

13. Lewis P. (1977).Maps and Statistics. Methuen and Co Ltd London.

14. Asada D. (2010). The petroleum industry in Nigeria: joint operating agreements, memorandum of understandings, compensation and other related issues in perspective. Retrieved from on 02/04/2013.