SPATIAL ANALYSIS OF THE LOCATIONAL PATTERN OF FILLING STATIONS IN OYO WEST LOCAL GOVERNMENT AREA.

BY

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Certification

I certify that this original essay was carried out by TAIWO, ADEDEJI ADESOKAN of the Department of Geography, University of Ibadan.

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SUPERVISOR

DR. G.O IKWUYATUM

Dedication

This original essay is dedicated to Almighty Allah, the merciful and the giver of wisdom. I also dedicate this essay to my mother who has been there for me through thick and thin.

Acknowledgment

My utmost gratitude goes to almighty Allah, the most beneficent, the merciful who spared my life and granted me the grace to sail through this chapter of my academic life. I also extend my gratitude to my mother who has shown unwavering and unflinching support right from my day one of admittance into this prestigious department. I pray that Almighty Allah will keep you alive to eat the fruit of your labour.

I will like to appreciate the effort of my amiable supervisor in person of Dr. G.O Ikwuyatum, who has painstakingly supervised my essay. May Allah continue to increase you in knowledge and grant upon you, the bliss of sound health. Also, I will like to appreciate all the teaching staffs of the Department of Geography. You all have been wonderful teachers. May Allah grant you all, your inner-most desires and protect your families from the claws of danger.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Filling Station is defined as any building or equipment used for the sale or dispensing of petrol or oil for motor vehicles or incidental there to 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 (Ayodele 2011). A petrol station is a retail establishment where motor vehicles are refueled, lubricated, serviced, and sometimes repaired (Friedman, 1978).

American heritage dictionary of English Language (2011) defined filling station as a place where gasoline and oil are sold and facilities are available for repairing or maintaining automobiles. Nieminen (2005, p.11) defined 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. 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). Meanwhile, petrol retailer or entrepreneur is any person who carries on a business which sells petrol for direct delivery into the fuel tanks of motor vehicles (Sedgwick, 1969).

According to Ehinomen and Adeleke (2012) the petroleum industry can be classified by type of actors or by sector. The actors in the Nigerian industry consist of both private and public organizations. The public actors are the government agents and functionaries such as the Nigerian National Petroleum Corporation (NNPC) and its subsidiaries, the Department of Petroleum Resources (DPR), the Petroleum Products Pricing Regulatory Authority (PPPRA), among others. The private segment consists of both indigenous and foreign actors. The indigenous actor consist of independent marketers which numbered about 1000 in 1979, a year after formulating the act which established them but increased to 7948 in 2010 and they are competing with the foreign or multinational marketers (referred to as major marketers) like Mobil Oil Nigeria Plc., MRS Nigeria Plc., Total Nigeria Plc., Conoil Plc., Oando Nigeria Plc. and African Petroleum Plc.

Selecting a better site for business enterprise is at mind of every government and entrepreneurs

who invests their capital to earn profit. Some of the variables considered when selecting location for utility are proximity to population centers, distance from neighboring stations, the easements of using existing utility, and the magnitudes of environmental pollution parameters (Alesheikh and Golestani, 2011). Other factors to take into account when making a decision about the location of business, including customers, transport, the neighborhood, finances and the longer term future (Oetomo and Sesulihatien, 2012). Bolen (1988) stated that every location in the earth has its analyzable advantages and disadvantages. According to him the factors can be classified into two physical conditions. These are the real physical and analysis physical. Real physical is a visible condition in relation to area such as land condition, the width, and the distance from the highway. Analysis physical, on the other hand, is physical condition obtained from physical analysis such as population analysis, neighborhood factor, and competitor analysis. Both factors are important while locating business; this is because while the physical condition can affect the nature and type of business to be conducted, analysis physical can affect the business performance. For example, if the distance between one station and the other is too close, then it will lead to decreased turnover on each station (Oetomo and Sesulihatien, 2012).This work focused on the location analysis of filling stations in Oyo west local government area.

The study is triggered by the fact that there are lots of filling stations located in the area, and there is a need to understand why the filling stations are located where they are, what influenced the decision of the operators in sitting their filling station where it is, as it lacks coordination, the filling stations are sited haphazardly. Some of the implications of improper location of the filling station are traffic congestion, fire risk, inconveniences, and so on. In the word of Christaller (1933) in Abler, Adams and Gould (1973), there is some ordering principles unrecognized that governs the distribution of things and phenomena. Only when proper investigation is made that one can explain what is where and why, a question that geography holds since the epoch of Eratosthenes, since the beginning of geography.

1.2 STATEMENT OF THE RESEARCH PROBLEM

Generally, the locational pattern of filling stations in most parts of the country is such that displays an outcome of lack of coordination. This has accounted for the indiscriminate and haphazard location of filling stations in urban space. The locational arrangement of filling stations is such that they are found very close to residential buildings and also along road networks in Oyo west local government. In most part of the world, cities and towns 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. As observed by Ayodele (2011), in highly urbanized areas filling station is a significant contributor to traffic problems such as traffic congestion, pollution, fire and explosion. The extent of these problems depends on the criteria or variable such as location, size and set back from road etc. Some hazards, such as traffic congestion, pollution and many more problems result from un-coordinated development.

From the foregoing discussion, this study sets out to address the following questions:

1. What is the number of filling stations in Oyo West Local Government Area and where are they located?
2. What is the nature and pattern of the location of filling stations in Oyo West Local Government Area?
3. What factors account for the locational pattern of filling stations in Oyo West Local Government Area?
4. What are people's perceptions about the locational pattern of filling stations in their area?
5.

1.3 AIM AND OBJECTIVES OF THE STUDY

The aim of the study is to examine the spatial pattern of location of petrol filling station and the explanatory factors for the location of petrol filling stations in the study area.

The aim of this research will be achieved through the following objectives:

1. To analyse the locational pattern of filling stations in Oyo West local government area.
2. To evaluate the factors responsible for the location of filling stations in the study area.
3. To determine the variation of filling stations in relation to wards.
4. To examine people's perception about the location of filling station in their area.

1.4 JUSTIFICATION OF THE STUDY

The urban space is often a host to a variety of land use. Of all land use to which the urban space has been put to, there has been more emphasis on residential zones and several researches have also been carried out in favour of residential zones. This more or less paints a skewed or lopsided analysis of urban land use in the urban space. There is no gain saying in the fact that land use such as filling station which is a utility industry is fast claiming the urban space as it serves other urban land use zones being a utility industry. Therefore there is the need to study the locational pattern of the existential structures of filling stations that is fast growing in the urban space.

The indiscriminate and haphazard location of filling stations, especially those in residential areas had necessitated the need to empirically observe the distributional pattern of filling stations, the underlying factor influencing the location of the filling stations and people's perception about the location. Hence the geographer is therefore interested in understanding the locational pattern of the filling stations and the factors influencing the choice of location of the phenomenon under study.

1.5 STUDY AREA

1.5.1 OYO WEST LOCAL GOVERNMENT AREA

Oyo West Local Government Area is located within latitude $7^{o}47'$ and $8^{o}8'$, and longitude $3^{o}42'$ and $3^{o}56'$. Oyo west Local Government Area is one of the thirty-three (33) LGAs that constitute Oyo state and also one of the 3 Local Government Areas in Oyo town. It is the largest of the 3 Local Government Areas with an area extent of 526km². The Local Government was created by the Federal Military Government in 1996 alongside 9 other Local Government Area in Oyo State under the leadership of General Sanni Abacha. Oyo West Local Government Area has a total of ten (10) wards, and has its administrative headquarter at Ojongbodu, along Iseyin road, Oyo. It is

bounded in the north by Atiba LGA, in the west by Iseyin LGA, in the east by Oyo East LGA, and in the South by Afijio LGA. According to the 2006 population census exercise, Oyo West Local Government Area is said to be populated with 136,457 residents (NPC, 2006).

Land use in the Local Government can be classified broadly into residential, industrial, Commercial, agricultural, Government acquisition, road networks, recreational, health and educational land use. In terms of commercial land use in the LGA, commercial activities which entails buying and selling of both industrial and agricultural produce takes place mainly at Akesan (Oja Oba), Owode, Irepodun, and Oroki market. Trade and commerce account for the largest economic activities in the Local Government Area.

In terms of Industrial land use, industrial establishment in the local government includes pure water factory, Cassava processing factory, Bread factory, Hotels and recreation centers, and filling stations. Filling station erection takes up a large percentage of industrial land use in the study area; this is due to the increasing demand for petroleum products as new settlements emerge over the years.

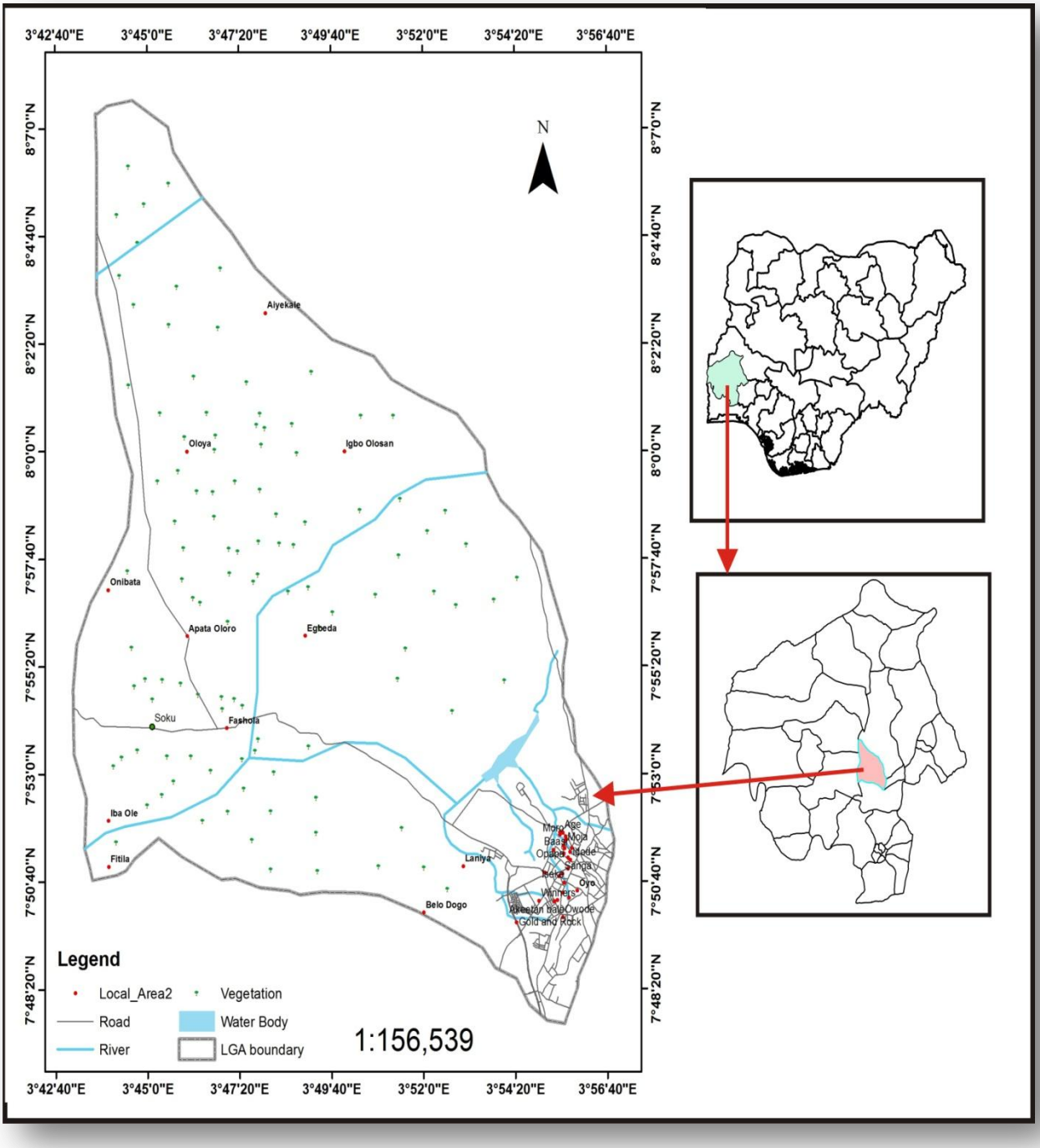


Figure 2:1 OYO WEST LOCAL GOVERNMENT AREA

In terms of agricultural land use, the rural space is involved in extensive cultivation of crops mostly food crops, the areas involved in extensive agricultural production includes villages like Aba Eleja, Iyabeji, Baabo, Fasola, Aladie and Soku. The local government area used to have a government farm at Aladie but it's no longer in operation. Recreational centers in the Local Government Area include Old Oyo National Park, Ojongbodu, and Oyo.

In terms of land use in erecting health facilities, there are a number of health care structures in the Local Government Area. These include Primary health centers such as Kolobo primary health centre, Iyaji primary health centre, Iseke Primary health centre, and Staff Clinic, Ojongbodu. A number of privately owned health structures are also situated in this Local Government Area.

The Local Government Area has numerous public and privately owned primary and secondary Schools. Few Tertiary Institutions are also located in the Local Government Area, some of which are satellite campus for Emmanuel Alayande college of Education at Isokun, Ekiti state University affiliation programme running in the same school. A private University was also recently approved; the name is Atiba University which is located at Gedu area. The location of several educational institutions purveys the educational needs of the residents.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 INTRODUCTION

This chapter reviews literature on locational analysis of filling stations and also discusses the conceptual framework employed in the study. The first section of this chapter, literature review, examines past literature on location analysis of filling stations. The second part of this chapter, discusses extensively the Weber's theory of Industrial location.

2.2 LITERATURE REVIEW

This section focuses on reviewing existing literatures that are relevant to the study.

2.2.1 PATTERN OF PETROL FILLING STATIONS

According to Muritala (2012) who analysed the locational pattern of filling stations in Kano metropolis, the filling station exhibit linear pattern because they are cited mainly on road side where drivers can easily get the product, the overall pattern off distribution is clustered with nearest neighbour value (Rn) of 0.3 (less than 1) and z-value of -15. Olapeju (2015) in his study in Ilaro Ogun state shows that with an Rn value of 0.36, the study amongst others pointedly reveal that the locational pattern of petrol filling station tends towards clustering.

According to a study by S.A Ogunyemi et al, (2017) in Sango Ota metropolis, the nearest neighbor analysis for the spatial pattern of petrol service stations in each region revealed three major spatial distributions. The spatial pattern from Iju to Iyana and Iyana to Ojuore showed dispersed pattern, Abeokuta highway showed random pattern, while Sango Ota showed clustered pattern. Ogundahunsi (2014) in his study of the locational pattern of fuel stations in Ilesa, Osun state, revealed that the computed nearest neighbor index for his study was 0.16 which indicates that the distribution of pattern of the fuel stations was tending towards clustering which is not an ideal situation for such a facility in view of the safety implications. In a study carried out by Oloko-Oba et al (2016) in Ilorin, Kwara state, the result reveals that the spatial pattern of distribution of filling stations in the study area shows a clustered pattern with nearest neighbour ratio of 0.43and z-score of -16.14.

Ayodele (2011) examined the spatial distribution of filling stations in Kaduna North. The study identified the pattern and distribution problem in the area. The study found that there 22 filling

stations in the area and the distribution is uneven as the stations are mostly concentrated along major roads. In addition the study looked at the setbacks and locational situation of the stations and concluded that 69.5% did not conform to the standard. Though GIS was applied for mapping, it was not employed for measuring the standards compliances. Similarly a study was carried out in Agege Local government Area of Lagos State by Abdullahi (2012), the study observed that filling stations are randomly distributed in the area. The study observed due to land shortage people build station wherever the land is available and this creates a pseudo development pattern.

2.2.2 RELEVANCE OF LOCATION

Location is an important concept in geography and depending on the scale of observation, a location could be a point or an area in which human activities takes place (Morril, 1970). The choice of a location is the most crucial decision retailers and service providers must take because it is a basic requirement for business success and growth determinant (Jones, Mothersbaugh and Beatty, 2003; Loof and Nabavi, 2013). It establishes the visibility of business to potential customers, patronage and level of profitability. In the fuel retailing business, location is very important because it determines the turnover (Uba, 2013). Associated with the location decision are consequences which may not be intended or desirable. Several reports have shown the negative consequences of locating fuel stations in residential areas (Adewumi, 2013; Adedeji, 2013; Bello, 2013).

Petrol stations are very vulnerable to closure resulting from petrol price competition, regulatory pressure and non strategic location (Sidaway, 1998). As the classical adage used to advise, "Location, location, location" remain the most important factors when choosing a home or positioning our business (Waters, 2003). George Davies made a strong point in his autobiography that setting a shop in the wrong place is like tying hands behind one's own back (Davies, 1991, as cited in Clarke, 1995). Thus, choice of a location is the single most important decision facing retailers and service providers (Jones et al., 2003). Location is repeatedly stressed in the business press as a requirement for success in retailing (Chan et al., 2005). This is because location can affect business competition and performance, hence, level of profitability.

Theoretically, a firm would choose locations that maximize profits. Location should be considered as a relevant growth determinant (Hoogstra, 2004). It affects many aspects of petrol station operation and can significantly affect the economy of the local community (Mudambi,

1994). Henry (2001) suggested that being an independent business owner or manager, one has to try to maximize benefits by controlling the location of outlets and market threshold. This was supported by Kearny (1998) who stated that it was found in the U.S. that site location (71%) is the primary factor for the drivers to choose a petrol station.

Business profitability of a petrol station is influenced by a number of factors such as property maintenance and management, neighbourhood business potential, grade of street and topography, visibility, compatibility of traffic flow, ease of approach, and special features of location (Friedman,1978). Nieminem (2012) acknowledged that, petroleum is a key driver of industrial activities. For instance, 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 (see Nieminen, 2005). Other factors to take into account when making a decision about the location of business include customers, transport, the neighborhood, finances and the longer term future (Oetomo and Sesulihatien, 2012)

Filling stations were traditionally located in largely uninhabited areas (Isabel, et al., 2010, p.2754). The situation obtaining on the ground proves to be different since many filling stations are being built within urban areas surrounded by residential and public buildings. This trend has been observed regardless of the dangers associated with filling stations. Filling stations come up in newly developed areas only when development reaches a point at which business potential of the areas can be assessed. A delayed demand for Service Site is then created and will culminate in request for permits to use sites which are detrimental to sound development of the area. Preferences for locations on heavily travelled streets so as to obtain the maximum patronage from local area as well as the passing traffic results in serious traffic hazards and traffic congestion (Gopalaswamy, 1977).

2.2.3 EXPLANATORY FACTORS

Entrepreneurial preferential location choices are based on profit maximization (O'Sullivan, 2005). The preferential location choices of an entrepreneur which are profit oriented determine the location of filling stations in Kitwe. According to Iman, et al (2009), entrepreneurial preferential location choices are determined by volume of traffic flows passing the site, proximity to a major travel route, visibility from the road, and distance

of catchment area from residential neighbourhood areas, and within a residential or commercial area.

Accessibility is the ease of entry to and exit from a particular site of residential area. It also measures the ease of entry and exit for motorists on a station's side of the primary street. Petrol sales potentially varies depending on such degree of accessibility, but if a station is to achieve its maximum potential it must be easy for motorists to see it and to enter it (Sedgwick, 1969). Some researchers claim that location decision involves a large fixed investment (Jones, 2003). Accessibility in general terms, describes the degree to which a system is usable by as many people as possible. It is the degree of ease with which to reach certain locations from other locations and viewed as the ability to access functionality and possible benefit (Oni, 2007). Accessibility as a property of location may be grouped into general and special accessibility (Oni, 2007). General accessibility, according to Harvey (1999) refers to nearness to rail termini, bus stations and motorways transport facilities, labour, customers and service facilities such as banks, and post office. Special accessibility on the other hand exists when complimentary uses are in close proximity to each other (Harvey, 1999). In this case, the net economic cost of movement will be lower in terms of distance, time and convenience in addition to greater comparative advantages given greater accessibility of a location (Balchin et al, 2000)

2.2.4 HAZARDS ASSOCIATED WITH LOCATION OF FILLING STATIONS3

Hazards as viewed by Burton et al (1978) are those elements of all the physical environments that are harmful to man and are caused by forces extraneous to him. Hazards also are threat to future source of danger and have the potential to cause harm to people (death, injury, disease and stress); harm to human activities (economic and educational activities); harm to property (property damage and economic loss) and environmental harm (loss of fauna and flora, pollution and loss of amenities). This is in conformity with EFOA, (1999) that safety of people and protection of the environment should at all time be the major concerns at petrol stations because they are potentials for accident especially where the general public has unrestricted access. The necessity therefore for well designed, construction and operation of such facilities should be of paramount importance. Noting that, petrol and other fuel are potentially hazardous at ambient temperature and they give off vapours which when mixed with air in a

proportion and ignited, can burn with explosive force. In addition, all petroleum products are potential pollutants which if released, can cause injury to aquatic life, harmful effects to humans‟ health and environmental damage if incorrectly handled.

According to a study by Mshelia et al (2015), it therefore indicates that, air pollution has the highest percent (74%). This implies that air pollution is the highest danger in relation to the distance between the petrol stations and the residential settlements. That is, the closer the houses are to petrol stations, the more likely the residents will be exposed to air pollution as vehicles move in and out of petrol stations to take fuel and the use of generator to power pumping machines. Traffic accident, traffic congestion and fire outbreak have 45%, 40% and 30% respectively. This means the three variables are less severe compared to air pollution.

From another study carried out in Maiduguri and Jere, Borno State, Nigeria, the workers in the petrol stations and the residents living nearby the petrol stations have in one time or the other suffer various health effects as a result of working in petrol stations or being their close (Mshelia, et al, 2015; Afolabi, et al., 2011). The results from Mshelia et al showed that, respiratory problems (diseases) had the highest percent of 38.05%. This by implication means, it was the most prevalent health problems affecting both the workers and some of the residents as a result of the inhalation of fuel contaminated air. However, skin and sight problems alongside other health complications were also issues of concern. If the situations continue thereafter, such could lead to narcotics effects with symptoms including headache, nausea, dizziness and mental confusion (Mshelia, et al, 2015, p.7).

The issue of location preferences of entrepreneurs also features within the literature (Njoku and Alabge, 2015; Mohammed et al 2014; Afolabi et al., 2011). Njoku and Alagbe stated that, in as much as petrol filling stations should be located where they can be easily accessible, the concern had been that there has been over-provision within one geographical area as well as indiscriminate locations within Oyo town and Nigeria at large (see also Afolabi et al., 2011). The observed trend within the literature is that, some owners prefer to select the optimum location to locate their petrol filling station on the profit maximization principle. Nkoju and Alagbe (2015, p.11), disclosed that, the

Commissioner of Physical Planning and Urban Development stated that, "the Government of the Republic of Nigeria had sometime before the year 2015, imposed a three year ban on major marketers of petroleum products in the State of Oyo due to their nonchalant attitude and failure to comply with national government's call to desist from erecting illegal petrol filling stations". Mulroy (2012) in his presentation at an Environmental Petroleum Seminar in Mitchelstown County Cork disclosed that, petrol filling stations are an environmental liability as they are a potential hazards to the environment hence, site investigation and generic risk assessment need to be undertaken in order to institute a remedial plan for mitigating the significant negative impact that petrol filling station pose on the environment.

2.2.5 REVIEWS

Sule, Shebe, Bichi and Atiyon (2006) studied the spatial distribution of filling station in Kaduna Metropolis using ArcView GIS software. The results of the study showed that there are 193 filling stations in the area, and that independent marketers dominate the business with 68% of the stations. Although the study aimed at inventory and showing the location of the filling stations, it did not show which stations is where or why, and did not examine the spatial pattern of the stations.

Blamah, Vivan, Tagwi and Ezemokwe (2012) looked at the locational impact assessment of gasoline service stations along Abuja-Keffi road and environs in Karu, Abuja, Nigeria. The study examine the location of petroleum filling station using Site Analysis Report (SAR) of the seventeen sampled (out fifty) station in the area, a questionnaire was also administered to solicit people's perception on the effects of the location of filling stations. The findings of the study revealed partiality and disregards of planning criteria in locating filling station, that about 82% of the stations have fallen short in meeting the standards of 450m distance in-between.

As observed by Ayodele (2011), in highly urbanized areas filling station is a significant contributor to traffic problems such as traffic congestion, pollution, fire and explosion. The extent of these problems depends on the criteria or variable such as location, size and set back from road e.t.c. Some hazards, such as traffic congestion, pollution and many more problems result from un-coordinated development. Apart from these hazards, cities are also confronted with other problems like accidents, explosion and fire. Another study by Hamid et al (2009)

discussed site potentiality for petrol station business based on traffic volume counts using a regression and Geographic Information System (GIS) based spatial system. The authors stressed that, site potentiality is an important factor that influences business success of a petrol station which relies on customer visits (p.10). On this note, Kearny (1998) disclosed that, it was empirically found in the United States of America that, site location was the primary factor for drivers to choose a petrol station (see also Hamid et al, 2009, p.11).

2.3 CONCEPTUAL FRAMEWORK

The theory adopted for this study is Weber's theory of Industrial location. This provides a framework for studying the locational pattern of filling stations.

2.3.1 WEBER'S THEORY OF INDUSTRIAL LOCATION

The problems of Industrial location have been studied by number of economists. Alfred Weber a German economist gave for the first time an analytical approach to the problem of industrial location. He tried to give a modern, systematic and scientific approach for that. It was published in 1909 in German language in the year of 1929. Weber's theory of industrial location was concerned with manufacturing location.

He has classified raw materials into two groups (i) ubiquities and (ii) localized. Ubiquities like bricks, clay and water are available everywhere but localized material are like wood, coal, or Iron is available only at certain places. Localised materials are classified into two categories pure materials and gross materials. The materials like cotton, wood etc. add the whole or bulk of weight to the finished product and are called "pure" materials. Others like wood, coal, or Iron, tea and sugarcane that lose their weight in the process of manufacturing are 'gross' materials. Weight losing material attracts the industry to the place where it is available. All localized materials do no attract industries.

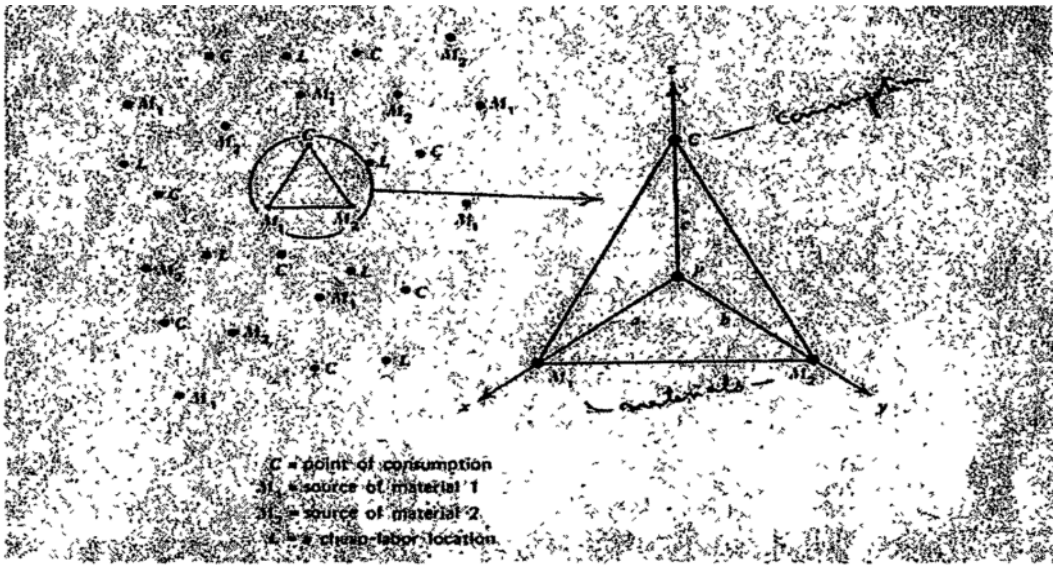
2.3.1.1 FACTORS OF INDUSTRIAL LOCATION

According to Weber's theory, the two factors that are most important in determining the location of an industry are (i) Transport cost and (ii) Labour cost.

The industrial units have to choose that location in such a way that its transport costs are minimal. It is made by two factors, weight of the goods to be transported and distance to be covered. According to him the location of manufacturing industry is determined by the ratio between the weight of localized material and weight of product that is known as a 'material index'. Industries whose material index is not greater than one usually lie at the place of consumption. If the localized material is not used in production and only ubiquitous material is used the material index will be zero; because material index divided by weight of product. The industrial location is influenced by labour cost, transport cost, agglomerative and deglomerative factors. The

transport cost and labour, cost which are called regional factors or primary factors. The agglomerative and deglomerative factors are known as local factor or secondary factor.

The regional factors have the greatest influence on industrial location. In this context were explained the derivation of the least transport cost location by using the same framework as Launhardt that is called location triangle. He takes one point of consumption and the most advantageous deposits of the two necessary materials Mi and M2. The least transport-cost location is the point at which the total ton-miles involved in getting materials to 9 place of production and the finished product to the market is at a minimum. Each corner of the triangle exerts a pull on the point measured by the weight to be transported form or to that corner.



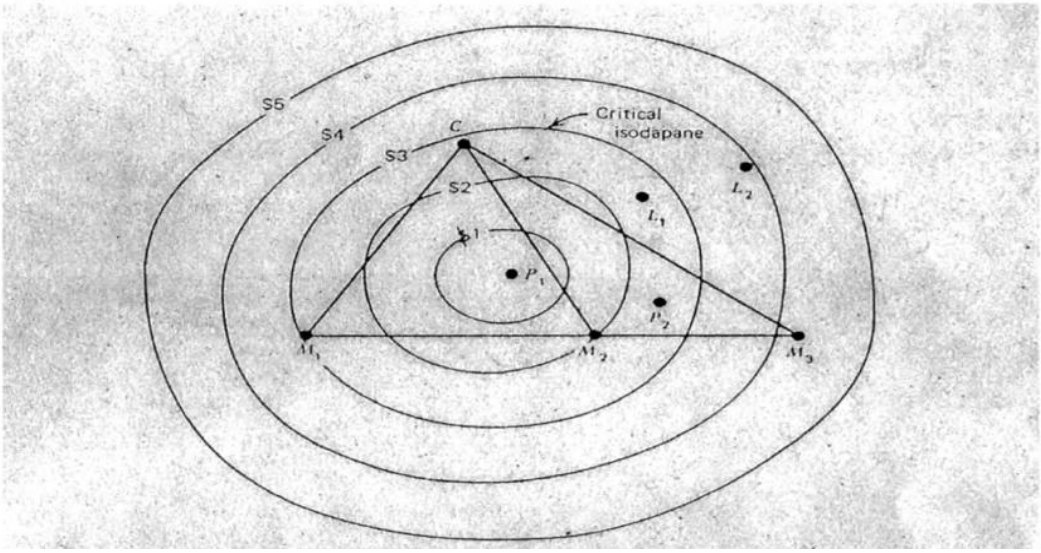
SOURCE: Weber (1929), Translated by Friedrick C., Theory of Location of Industries, University of Chicago.

FIGURE 2.1: LOCATION TRIANGLE

In figure 2.0 the manufacture of one unit of production requires x tons of material Mi and y tons of material M2 with the finished product weighing z tons to be transported to the market c. It is P is the point of production and a, b and c the distance Pmi, Pm^ and PC respectively, the problem is to find that location of P which minimizes xa + yb + zc. The point can be found by geometry and other method. The use of varignon's mechanical model, in which weight of appropriate size attached to the prices of string passing over pulleys are suspended from the earners of the triangle; the three pieces of string are tied together and the position within the triangle where the knot comes to rest indicates the point of compromise between the three force. If the pull of any one corner is greater than the sum of the pulls of the other corner production will be located at

the point or corner of origin of the dominant force. According to Weber's theory the industry may not be necessarily centred at the point of minimum transport cost. This way weber states, "A location can be moved from the point of minimum transport cost. It can be established at the place where labour cost is minimum to transportation cost to a more favorable labour location, only if the saving in cost of labour which this new place make possible is larger than the additional cost of transportation which it involves".

The labour location and its power to attract industries depends on labour cost index and locaitonal weight. The ratio between costs of labour per ton of product has been termed by Weber as the labour cost index and the total weight to be transported during the whole process of production as the locational weight. The extent of deviation caused by the varying labour costs can be determined by its "labour co-efficient" that is the rate of labour costs to the location at weight. The effect of a cheap labour location can be seen in Weber's isodapane framework.

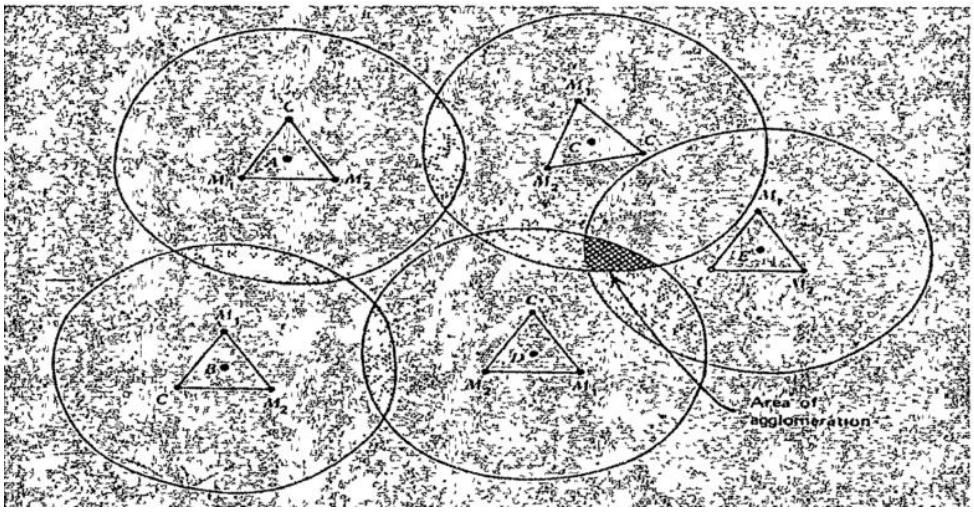


SOURCE:Weber (1929), Translated by Friedrick C., Theory of Location of Industries, University of Chicago.

FIGURE 2.2: ISODAPANE FRAMEWORK

In figure 2.1 is the least-cost location in relation to the market C and material deposits at Mi and M2. The circles centered on Pi are isodapanes, indicating how transport costs rise away from Pt. At Et, there is a source of cheap labour, the use of which world reduce labour costs by Rs. 3 per unit production. Since Li is nearer to Pi than is the Rs.3 isodapane. A movement from Pt to Li would incur less than Rs. 3 of additional transport costs so total costs will be lower at Li. If the cheap labour location is within the critical isodapane, it is more profitable location than the least

transport cost site that is Li in figure, but if it is outside like L2, Pi will be the best location. But movement to a cheap labor location may introduce further complication. It can be seen that figure 2.3 is a deposit of the same material as is found at Mi, and it is obvious that a unit at Li will prefer to use M3. A new locational triangle will be set up (M2 M3c) and a new transport cost point at P2 will emerge, which could be a better location than U. The agglomerative and deglomerative factors are also important for location. These factors are called secondary factors. The total cost of production of industry has also a strong tendency to move toward agglomeration location. If the production cost is less than in increasing transportation cost, the industry will move towards agglomerative location. This way, the weberian theory shows how these factors like transportation cost, labour cost, agglomerative and deglomerative factors affect on industrial location. According to Weber's theory, cost of transportation play predominant role in industrial location.



SOURCE: Weber (1929), Translated by Friedrick C., Theory of Location of Industries, University of Chicago.

FIGURE 2.3: MULTIPLE ISODAPANE FRAMEWORK EXPLAINING AGGLOMERATION

Agglomeration tendencies are treated in much the same way as cheap labour. In figure 2.3 where five firms (A, B, C, D, and E) are in business, each occupying a separate location inside its own locational triangle. The firms find that they could cut their production costs by Rs. 10 per unit if at least three of them operated in the same location, taking advantage of economies of agglomeration, but in order to gain from this a firm must not incur more than Rs 10 of additional transport costs. In figure the circle represent the critical isodapanes for each firm. The shaded

area is the only place where three firms C, D and E can locate together and still each incur less than Rs. 10 & extra transport costs.

2.3.1.2 LIMITATIONS OF WEBER'S THEORY OF INDUSTRIAL LOCATION

There are some limitations of the Weber's theory of location. The theory is based on wrong assumptions about labour supply; he assumed two things fixed labour centres and unlimited supply of labour. It is not correct because a rise of an industry at a place may create new labour centres, and unlimited labour supply at any center is also not correct as rapid development of means of transport and communications is possible, so here alteration is required in weber's assumption regarding labour supply. Transportation cost depending only on distance to be covered and weighs of the material to be carried requires amendment. It depends on the method of transport, nature of goods also. To make it more realistic, the actual freight rate schedules fixed for different means of transport must be taken into account. It would be incorrect to assume fixed points of consumption, it is observed that consumers are spread all over all the country, location and size of markets may vary with change in the economy. Non economic factors also exert important influence on industrial location. The theory ignores the role of capital and entrepreneurship in industrialization. And the classification of material is not proper; Austin Robinson considers this distinction artificial.

2.4 HYPOTHESES TESTED

In other to achieve the stated objectives, the following hypotheses were formulated and tested;

1. The locational pattern of filling stations is Random.
2. There is no significant relationship between number of filling stations and average income per ward.
3. There is no significant relationship between cost of transporting product and distance from Central market
4. There is no significant relationship between type of ownership of filling station and number of employees.
5. There is a significant variation in the number of filling stations across the ten wards in the study area.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter presents the research method used which includes, research design, types and sources of data, sample frame and size, sampling techniques and data collection procedure, and data analysis.

3.2 RESEARCH DESIGN

The research was designed to determine the locational pattern of filling stations in the study area, and to discern explanatory factors responsible for the location pattern observed. Questionnaires were designed for the purpose of the research work, one was designed to get information from filling station owners and the other was designed to get information from households. The questions in the questionnaires were carefully structured in line with the objectives of the study.

3.3 TYPES AND SOURCES OF DATA

The data employed in the study are from both Primary and Secondary sources.

3.3.1 PRIMARY DATA

Primary data are information gotten from questionnaires, interviews, and so on from the sample population. Reconnaissance survey was carried out in the study area to familiarize the researcher with the sample population. In this research, the use of questionnaires was adopted and was divided into two appendixes. Appendix I was distributed to filling station owners or managers in Oyo West LGA. This was divided into various sections, with section A capturing information about the filling stations, and section B capturing the perception of respondents on the location of filling stations with regards to reasons for locating filling stations where they are located. Appendix II was shared to households in Oyo West LGA, this was divided into various sections, with section A capturing information about the Location details of households, section B capturing the socio-economic characteristics of respondents, section C capturing information on petroleum products purchased by households, and section D capturing information on perception of respondents on the location of filling stations.

3.3.2 SECONDARY DATA

Secondary data are information gotten from other sources published or in government/private sectors. Other relevant sources of information such as text materials, archives, thesis, map, online materials, articles, and published journals which will all be used to complement the already obtained primary data.

The secondary data sources that were consulted include, LGA ward classification data, locality data of the LGA from 1991 population census (NPC, 1991), text materials, and published journals.

3.4 SAMPLE FRAME AND SIZE

A sample frame is a complete list of all the members of the population that we wish to study. For appendix I, the totality of all filling stations in the study area constitute the sample frame. Also, for appendix ii, the residents of Oyo West LGA constitute the sample frame.

Sample size determination refers to the act of choosing the number of observations or replicates to include in statistical sample. For the purpose of the study, in choosing the sampling size and securing representative responses, the Taro Yamane sample size method was employed to get the projected population of 2017 from the 1999 population census data for the local government area which gave us a total of 400 questionnaires for households, of which 2 questionnaires got missing. A field survey was carried out to ascertain the total number of filling stations in the LGA, a total of 42 filling stations was documented. As such, one questionnaire was administered to the owner/manager of each filling station to make a total of 42 questionnaires for filling stations.

Below are the formula employed in getting projected population census from 1991 population census data, and Sample Size for the household survey.

Taro Yameni Sample Size formula (n)= $N/(1 + (N \times (e^2))$

Where n= sample size

N= Population under study

e= margin error (0.05)

Projected Population formula (PP) = (1 + GR) ^yr × CP

Where pp= projected population

GR= current growth rate or decrease rate of the population

Yr= interval between the year of the current population and the year of the projected population.

CP= Current population.

The totality of all 42 filling stations was chosen as samples. The table 3.1 below gives an account of the area, name of filling stations and the geographical coordinates of the 42 filling stations in the LGA.

Table 3.1: THE FILLING STATIONS IN OYO WEST LGA AND THEIR NEIGHBORHOODS

	Neighbourhoods	Name of filling stations	Longitudes	Latitudes
1	Odo fufu	Assets Oil and Gas	7.8341	3.9137
2	Winners	Bintinlaye Nig ltd	7.8363	3.9149
3	Jaremily	Olafat	7.8399	3.9182
4	Isokun	Saklaj	7.8458	3.9158
5	Gedu	Silver Touch	7.8494	3.9149
6	Gedu	Adisel	7.8496	3.9086
7	Irepo	Adekaitan	7.85	3.9075
8	Locust	Matbam-Bas	7.8576	3.894
9	Farade	Bovas	7.8428	3.9193

10	Isokun	Assets Oil & Gas	7.8474	3.9175
11	Jaremily	Assets Oil & Gas	7.8421	3.919
12	Jaremily	Zamotun	7.8415	3.919
13	Iseke	Ajenifuja	7.8444	3.9221
14	Ilepo Laisi	Lajimo	7.8374	3.9156
15	Ibadan - Ilorin expresway	Keem-Tee	7.8203	3.9103
16	Awumoro	Lajimo	7.8503	3.918
17	Oroki	Dekem Investment	7.8573	3.9188
18	Fasola	Damarock	7.8994	3.7783
19	Soku	Lateef	7.9002	3.7504
20	Oroki	Ajiga	7.8642	3.9352
21	Ilora road	Ismhas	7.8256	3.9072
22	Ibadan- Ilorin expresway	Mobil	7.8233	3.9095
23	Idi Igba	Molab	7.809	3.9119
24	Sawmill Area	Musalat	7.8085	3.9141
25	Owode	Conoil Oil	7.8301	3.9228
26	Owode	S.Iyaniwura	7.8307	3.9232
27	Owode	S.M Mooras	7.8334	3.9239
28	Alagbon	Olafat	7.8369	3.9218
29	Ladindin	Bovas	7.8418	3.9263

30	Alalubosa	Aybam Oil	7.8431	3.9268
31	Sanga	Gold city Oil	7.8482	3.9269
32	Moja	Molab	7.8594	3.9276
33	Gedu	Total	7.8486	3.9168
34	Dacamca	Track Oil & Gas	7.8243	3.9178
35	Gold & Rock	Aawad Oil	7.8294	3.9056
36	Cele Titun	NNPC	7.8372	3.9032
37	Maradesa	Zamotun	7.847	3.9219
38	Irepo	Oni's	7.8457	3.9033
39	Chief Imam area	Olak	7.831	3.9101
40	Baynikol	Ajisope Oil &Gas	7.8295	3.9101
41	Awumoro	Molab	7.853	3.9192
42	Oroki	Obajel Multi service	7.8608	3.9205

SOURCE: FIELD WORK, 2018

Table 3.2: THE PROJECTED POPULATION ACCORDING TO WARD, AND QUESTIONNAIRES ADMINISTERED TO HOUSEHOLDS PER WARD.

Ward	1991 population	2017 projected population	Questionnaire Administered
Ward 1	578	1379	2
Ward 2 & 7	70657	168535	188
Ward 3	4752	11335	13
Ward 4	632	1508	2
Ward 5	8763	20902	23
Ward 6	2999	7153	8
Ward 8	1188	2834	3
Ward 9	47276	112765	126
Ward 10	13266	31643	35
Total	150111	358054	400

SOURCE: FIELD WORK, 2018

3.5 SAMPLING TECHNIQUE AND DATA COLLECTION PROCEDURE

The study area was selected using purposive sampling technique. Questionnaires in appendix I were distributed to all filling stations in the study area. Questionnaires in appendix ii were administered to residents of Oyo West LGA using proportionate stratified sampling method, in which the questionnaires were divided using population per ward. Simple random sampling was employed in distributing the questionnaires per ward, with an interval of 5 households from each other.

3.6 DATA ANALYSIS

In analyzing the data collected, a series of statistical tools and methods were employed. The data derived from the administered questionnaire were allowed to be defined by appropriate descriptive and inferential statistical methods of analysis. The descriptive statistics involve the use of frequency tables, percentages, pie charts and bar charts. The data derived from the field survey will be converted to measurable data and then coded. The statistical package for social sciences (SPSS) version 20.0 was employed to statistically analyze the data obtained from the field survey. In addition to the descriptive statistics used, inferential statistical techniques were also employed in the course of the analysis.

In terms of hypotheses testing, hypothesis 1 which states that the locational pattern of filling stations is random was tested using the statistical technique of nearest neighbor analysis to determine the spatial pattern of distribution of filling stations in the LGA. This was done via the aid of geographical positioning system (GPS) to collect the geographical coordinate data of the filling stations in the LGA and the use of Arc GIS 10.3 software to run the analysis. The boundary of the study area was also digitized from a geo-referenced map. The coordinate as well as the vector boundary shape files of the study area was projected to UTM Zone 31 N (Projected coordinate) for accurate result of the analysis. Average Nearest Neighbor analysis in spatial analysis extension of ArcGIS 10.3 was used to analyze the data.

The general rule for applying NNA is based on the fact that Nearest Neighbour Statistics (Rn) has a range of values between 0 and 2.15. Table 4.2 shows these values.

TABLE 3.3: NEAREST NEIGHBOUR STATISTICS VALUES

R-VALUE	**INTERPRETATION**
Rn= 1	Implies that the distribution tends towards random
Rn= 0	Implies that the distribution tends towards clustering
Rn= 2.15	Implies that the distribution is regular

Hypothesis 2 which states that there is no significant relationship between number of filling stations and average income per ward was tested using Pearson correlation because of the parametric characteristics of the variables under consideration. Hypothesis 3 which states that there is no significant relationship between cost of transporting product and distance from central market was tested using Pearson correlation because of the parametric characteristics of the variables under consideration. Hypothesis 4 which states that there is no significant relationship between type of ownership of filling station and number of employees was tested using Independent Samples T-test. Hypothesis 5 which states that there is no significant variation in the number of filling stations across the ten wards in the study area was tested using One way analysis of variance (ANOVA).

3.7 PROBLEMS ENCOUNTERED DURING DATA COLECTION

My first visit to the study area was aimed at performing a reconnaissance survey of all the filling stations in Oyo West Local Government Area. The very first difficulty confronted with has to do with capturing the entire filling stations in the LGA. Some filling stations were located in places I am not familiar with and some are located in villages in which I had to travel a long distance to capture them. However with the help of locals and repetitive series of survey, a total of forty-two (42) filling stations were recorded.

In terms of questionnaire administration, the first challenge posed was perhaps the unavailability of managers or filling station owners on getting to the filling stations, and since most are not formally educated, it appeared quite irrational to drop my questionnaires. As a result I had to go back very early around 6:30am and late in the night around 8:00pm to 8:30pm when they will be available, since they will be exercising their managerial duty at the said time. Some manager or filling station owners despite going at the time claim they are busy and instruct me to come back some other days which I did, and some claim they need to inform the owner first before granting me audience. On the part of the respondents to the household survey, majority of them responded enthusiastically to my interview while some displayed apathetic attitudes. Collectively, all these challenges more or less delayed the process of smooth data collection.

CHAPTER FOUR

LOCATIONAL PATTERN AND EXPLANATORY FACTORS OF LOCATION OF PETROL FILLING STATIONS

4.1 INTRODUCTION

This chapter discusses the locational pattern of filling stations, information about filling station, factors of location and the temporal distribution of filling station.

Also, this chapter discusses the social-economic characteristics of household respondents, composition of those using petroleum products, products used, frequency of purchase, reasons for patronizing filling station of choice, perception of the location of filling station, benefit of the location of filling station, and consequences of the location of filling stations in the neighbourhood.

4.2 THE LOCATIONAL PATTERN OF FILLING STATIONS

From figure 4.1, it is crystal clear that the south-eastern axes of the study area have a cluster of filling stations more than any other area in the map. The other areas have no filling station aside from 2 filling stations in the south-western axes. Furthermore, all of the filling stations are located along road networks, (most especially along residential routes and primary routes. Also, most of the filling stations are located in residential areas.

From Table 4.1 in appendix iii, the result of the analysis shows that Rn= 0.535188 (approximated to 0.5) exhibits a clustered distribution (Rn= 0.5), this statistically confirmed that the locational pattern of filling stations in the study area tends towards clustering, this is the obtainable pattern in most study of petrol filling stations pattern. Given the Z-score= -5.762794, it can be concluded that the result of clustering occurs by chance at 0.01 significant level and the verdict was reported to be significantly so. Given this statistical outcome, the null hypothesis is therefore rejected while the alternative hypothesis is accepted. Therefore the locational pattern of filling station is clustered in the study area. From Figure 4.2 in appendix iii, the outcome reveals 19% of the filling station respondents consented to being the owner of the filling station while 81% of the filling station respondents said they are hired managers and not the owner.

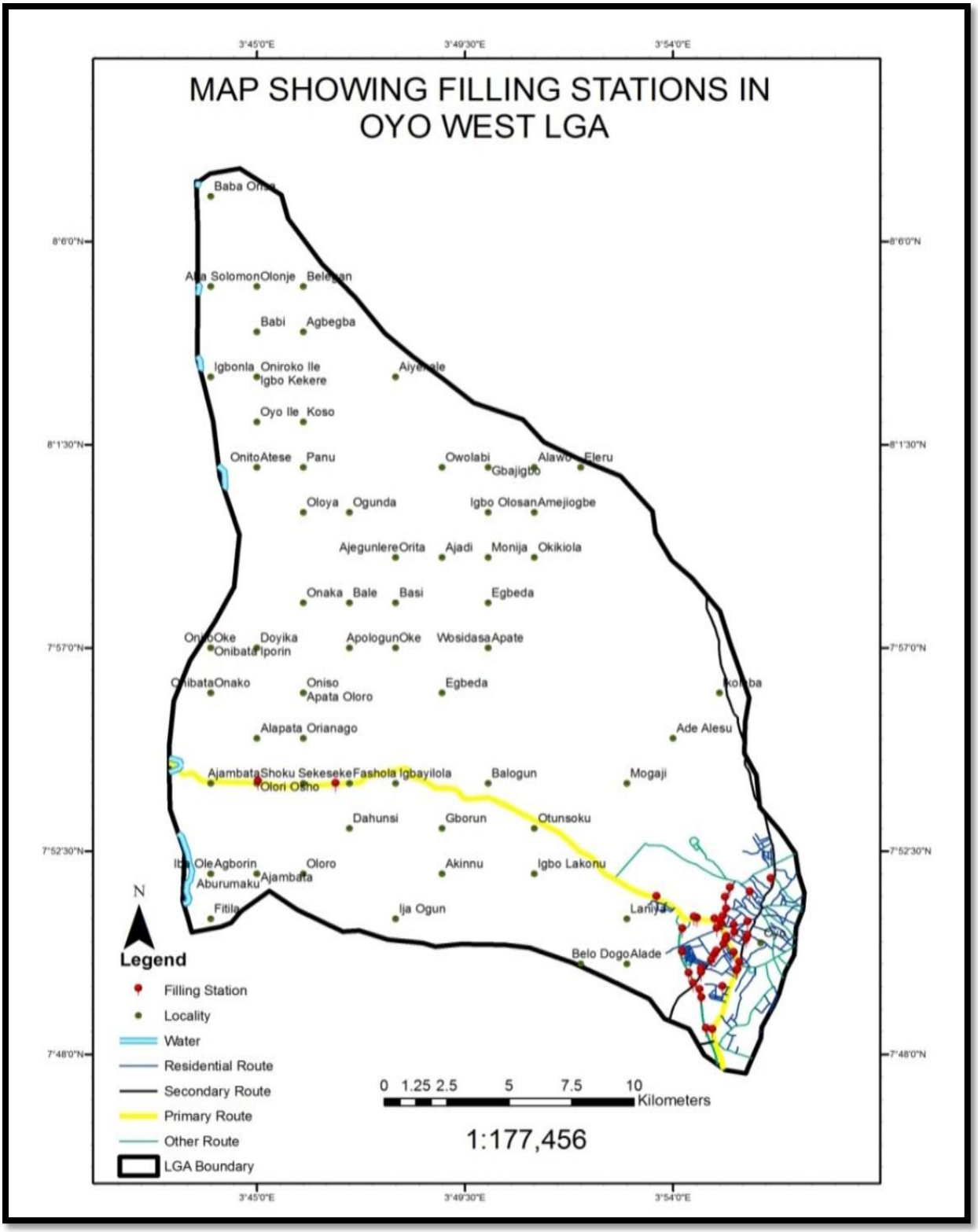


Figure 4.1: THE LOCATIONAL PATTERN OF FILLING STATIONS IN OYO WEST LGA

From table 4.12 in appendix iii, it was observed that the number of filling stations varied significantly across the wards. This means that there is a wide gap between the wards of the study area in terms of number of filling stations located in them. This shows that there is uneven distribution of filling stations across the 10 wards of the study area in which some wards have more filling stations than others. The null hypothesis is hereby accepted as there is a significant variation in the number of filling stations across the ten wards in Oyo West LGA.

From table 4.3 in appendix iii, it can be seen that the LGA has a total of 42 filling stations, of which ward 3 and ward 7 has 2 filling stations (4.8%) each, ward 4 has 9 filling stations (21.4%), ward 5 has 3 filling stations (7.1%), ward 6 has 12 filling stations (28.6%), ward 8 has 6 filling stations (14.3%), ward 9 has 7 filling stations (16.7%), and ward 10 has 1 filling station (2.4%). From the foregoing, we can conclude that ward 6 has the highest concentration of filling station, while ward 10 has the least concentration of filling station.

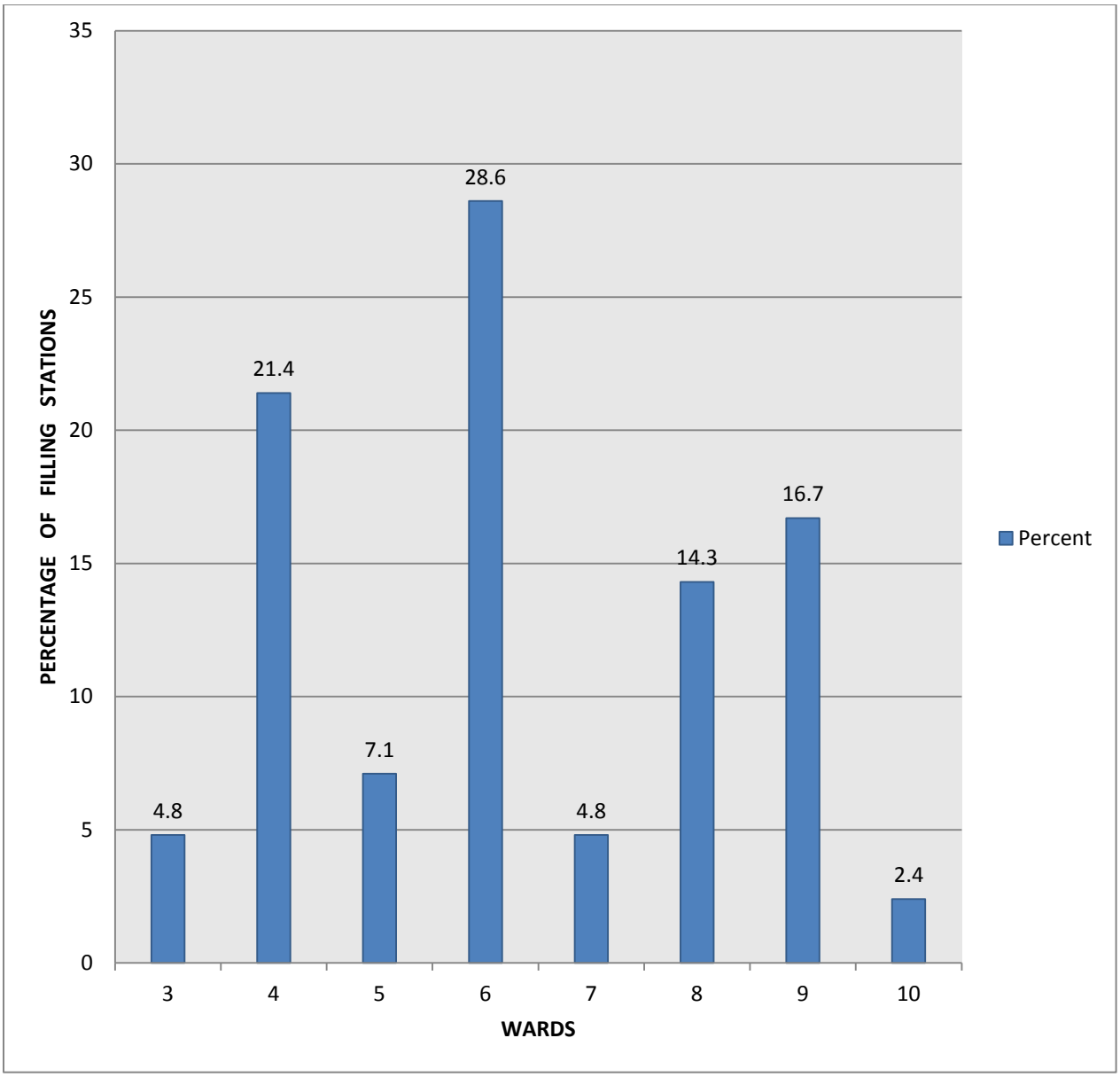


FIGURE 4.2: THE PERCENTAGE OF FILLING STATIONS PER WARD

From table 4.4 in appendix iii, it can be observed that out of the total 42 filling stations in the study area, 27 neighbourhoods have 1 filling station (2.4%) each, 3 neighbourhoods have 2 filling stations each (4.8%), and 3 other neighbourhoods have 3 filling stations (7.1%).

4.3 FILLING STATION OWNERSHIP

Also, from table 4.5 in appendix iii, Awad Oil Nig. Ltd, Adekaitan Company Nig. Ltd, Adisel, Ajenifuja Global Concept, Ajiga, Ajisope, Aybam Oil & Gas, Bintinlaye Energy Res, Conoil Oil, Damarok Nig. Ltd, Dekem, Gold City Oil, Ismhas, Keem-Tee Inv. Res Ltd, Lateef Temitope Ventures, MATBAMBAS, Mobil, Musalat, NNPC, Obajel, Olak Comm. Ent. Nig. Ltd, Onis Global Concepts, S.M Mooras, Saklaj Unique Concept Ltd, Silver Touch Ind. Ltd, Sola Iyaniwura, Total, and Track Oil and Gas have 1 filling station (2.4%) each. Bovas filling station, Olafat, Lajimo, and amotun Ind. Ltd have 2 filling stations (4.8%) each. while Assets Oil & Gas and Molab Nig. Ltd has the highest holding of filling stations in the study area, they have 3 filling stations (7.1%) each.

From table 4.6 in appendix iii, it can be observed that of the 42 filling station in the LGA, 40 filling stations (95.2%) are owned by private individuals, while the remaining 2 filling stations (4.8%) are owned by government and its agencies. Given this vast difference between private ownership of filling stations and public ownership of filling stations, it can be concluded that the filling station industry is dominated by private investors in the LGA.

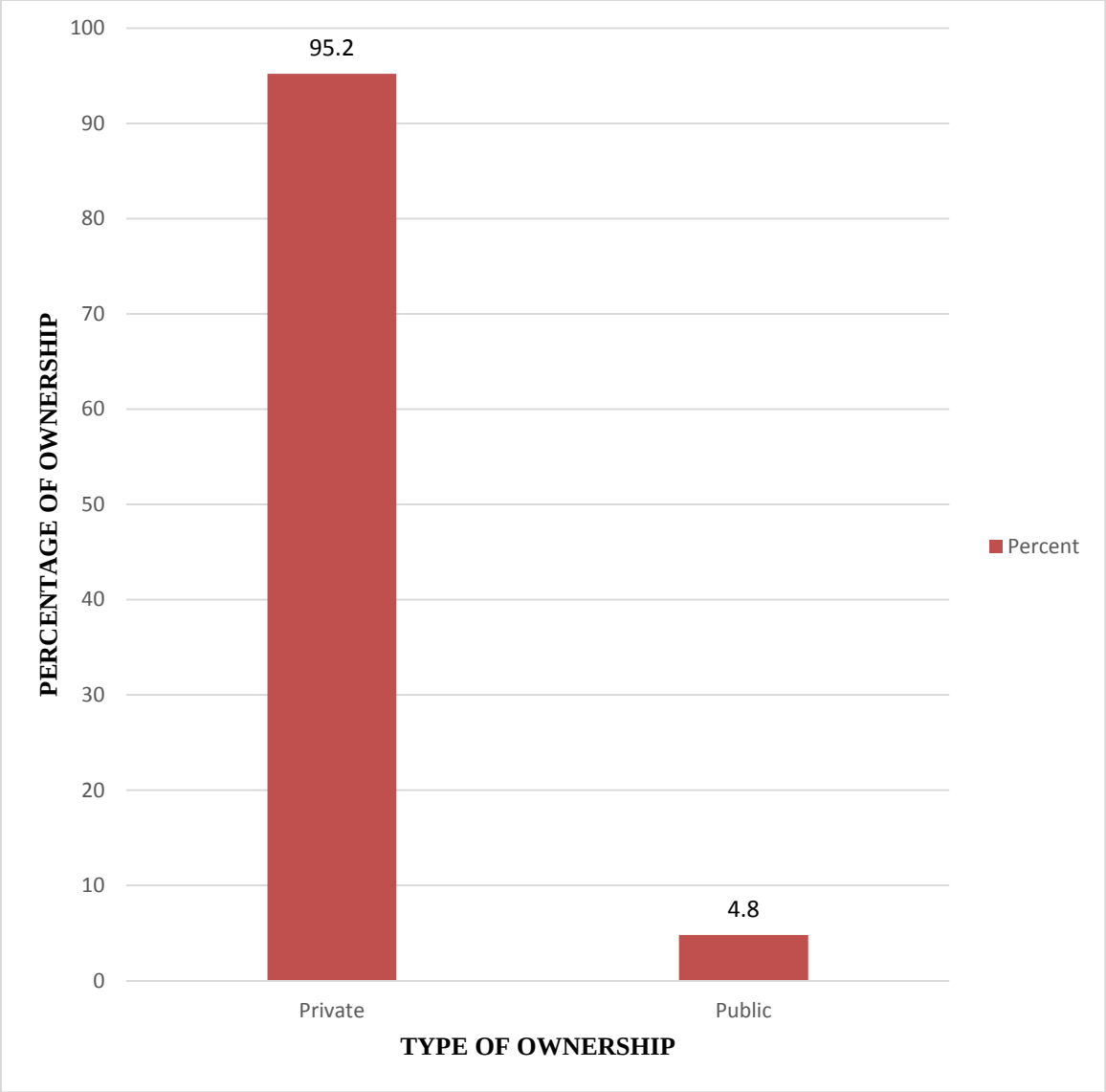


FIGURE 4.3: TYPE OF OWNERSHIP OF FILLING STATIONS

From table 4.11 in appendix iii, it can be observed that there is no significant relationship between the type of ownership and number of employees as reported by filling station owners in Oyo West LGA. This means that the type of ownership of petrol filling stations does not in any way determine the number of employees that is employed by the filling stations in the study area. Thus, the null hypothesis which states that, "There is no significant relationship between type of ownership and number of employees" is hereby accepted.

4.4 TEMPORAL DISTRIBUTION OF FILLING STATIONS

From table 4.7 in appendix iii, it can be observed that there were only 2 filling stations (4.8%) in the year 1965, 1 more filling station (2.4%) was established in the year 1975 to make 3 filling stations, 1 more filling station (2.4%) was established in 1993 to make 4 filling stations, in 1997 1 more filling station (2.4%) was established to make 5 filling stations, 1 filling station (2.4%) each was constructed in the year 1998,2003 and 2004 respectively to make 8 filling stations in total. In 2010, 2 more filling stations (4.8%) were constructed to make 10 filling stations, 5 more filling stations (11.9) were established in 2012 to make 15 filling stations in total. In 2013, 3 more filling stations (7.1%) were established to make 18 filling stations in total, the following year witnessed the establishment of 2 more filling stations (4.8%) to make 20 filling stations. 2015 witnessed a tremendous increase in establishment of filling stations, as 10 filling stations (23.8%) were established to make a total of 30 filling stations. There was also an increase in filling station establishment in 2016, although not as much as that of 2015, 9 filling stations (21.4%) were established to make a total of 39 filling stations. As at the time the survey was carried out, 3 filling stations (7.1%) had been established in the year 2017 to make a total of 42 filling stations. This temporal analysis of filling stations growth shows that the bulk of the filling stations were established between the years 2010 and 2017.

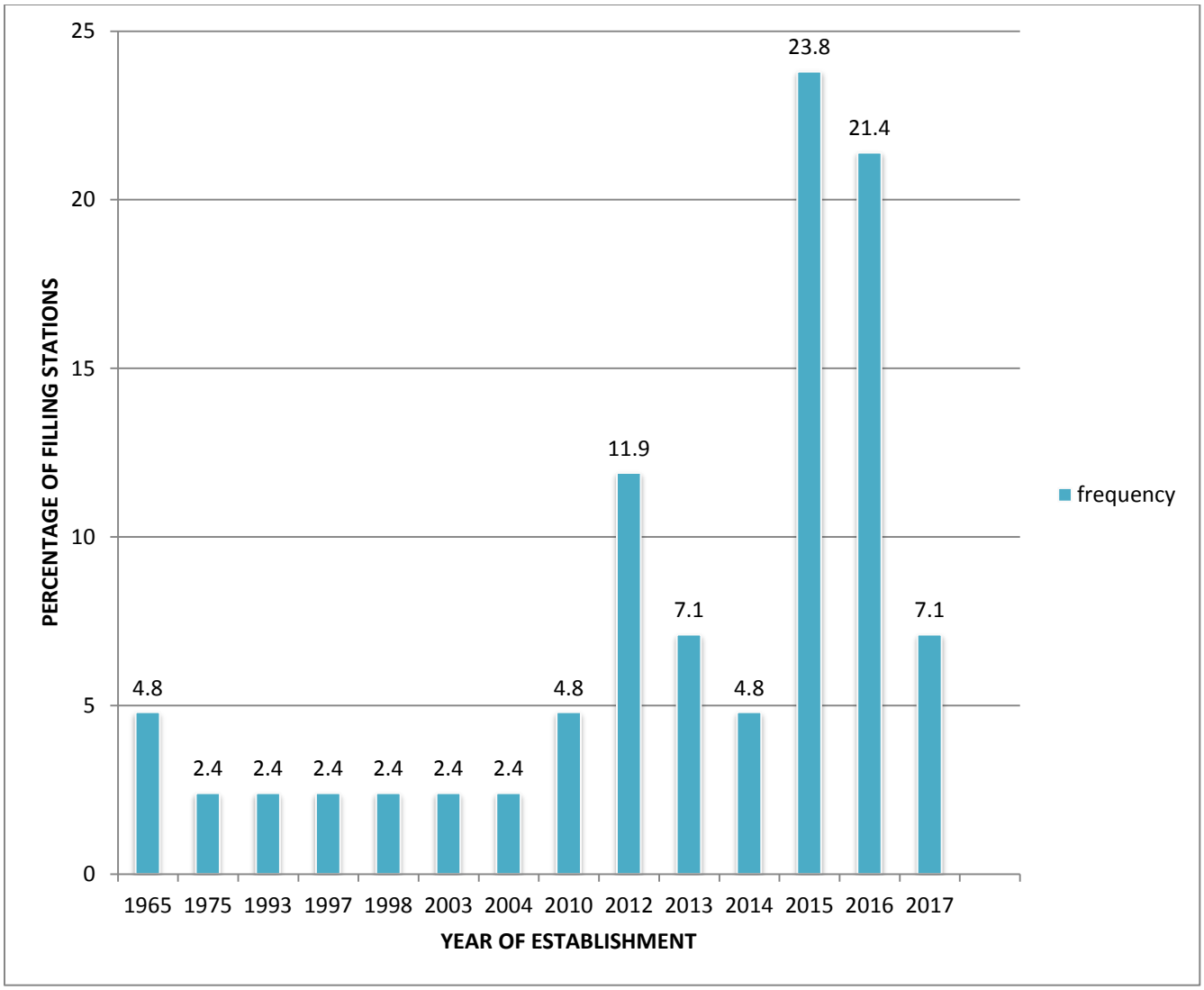


FIGURE 4.4: THE TEMPORAL DISTRIBUTION OF FILLING STATIONS

4.5 EXPLANATORY FACTORS OF LOCATION OF PETROL FILLING STATIONS

As accounted for in figure 4.8 in appendix iii, it can be seen that a total number of 8 filling stations (19.0%) were located primarily because of cheap land value. Also, in similar fashion 11 filling stations (26.2%) located where they because of proximity to market place. And 23 filling stations (54.8%) located where they are because the location is profitable. Given the statistics, it can be concluded that most of the filling stations in Oyo West LGA located where they are because the location is profitable, without considering the health impact.

From the correlation analysis between number of filling stations and average income per ward in table 4.9 in appendix iii, it was observed that there is a significant relationship between the number of filling stations and the average monthly income of respondents in Oyo West LGA, this means that average income per ward is one of the factors that influence the location of filling stations in the study area. That is, wards with a higher average income do have a higher concentration of petrol filling stations than those with lower average income. Thus, the null hypothesis which states that, "there is no significant relationship between number of filling stations and average income per ward" is hereby rejected and the alternative accepted as there is a significant relationship as revealed by the test statistics.

From table 4.10 in appendix iii, it can be observed that there is no significant relationship between the cost of transporting product and distance from central market as reported by filling station owners in Oyo West LGA. This means that the distance of petrol filling stations from central market (Akesan) does not influence the cost of transporting petroleum products from the source of supply. It then means that the distance of petrol filling stations from central market does not increase or decrease the cost of transporting petroleum products from the source of supply. Thus, the null hypothesis which states that, "there is no significant relationship between cost of transporting product and distance from central market" is hereby accepted.

4.6 PRODUCTS SOLD BY FILLING STATIONS

From table 4.13 in appendix iii, it can be observed that 7 filling stations (16.7%) sell only petrol or PMS. Also, only 3 filling stations (7.1%) sell all products (petrol, kerosene, diesel, Gas and lubricants) out of all filling stations in the LGA. It was also revealed that 28 filling stations (66.7%) sell petrol, kerosene and diesel. Also, 4 filling stations (9.5%) sell just petrol and

kerosene in Oyo West LGA. Therefore, it can be concluded from the statistics that majority of the filling station sell just petrol, kerosene and diesel.

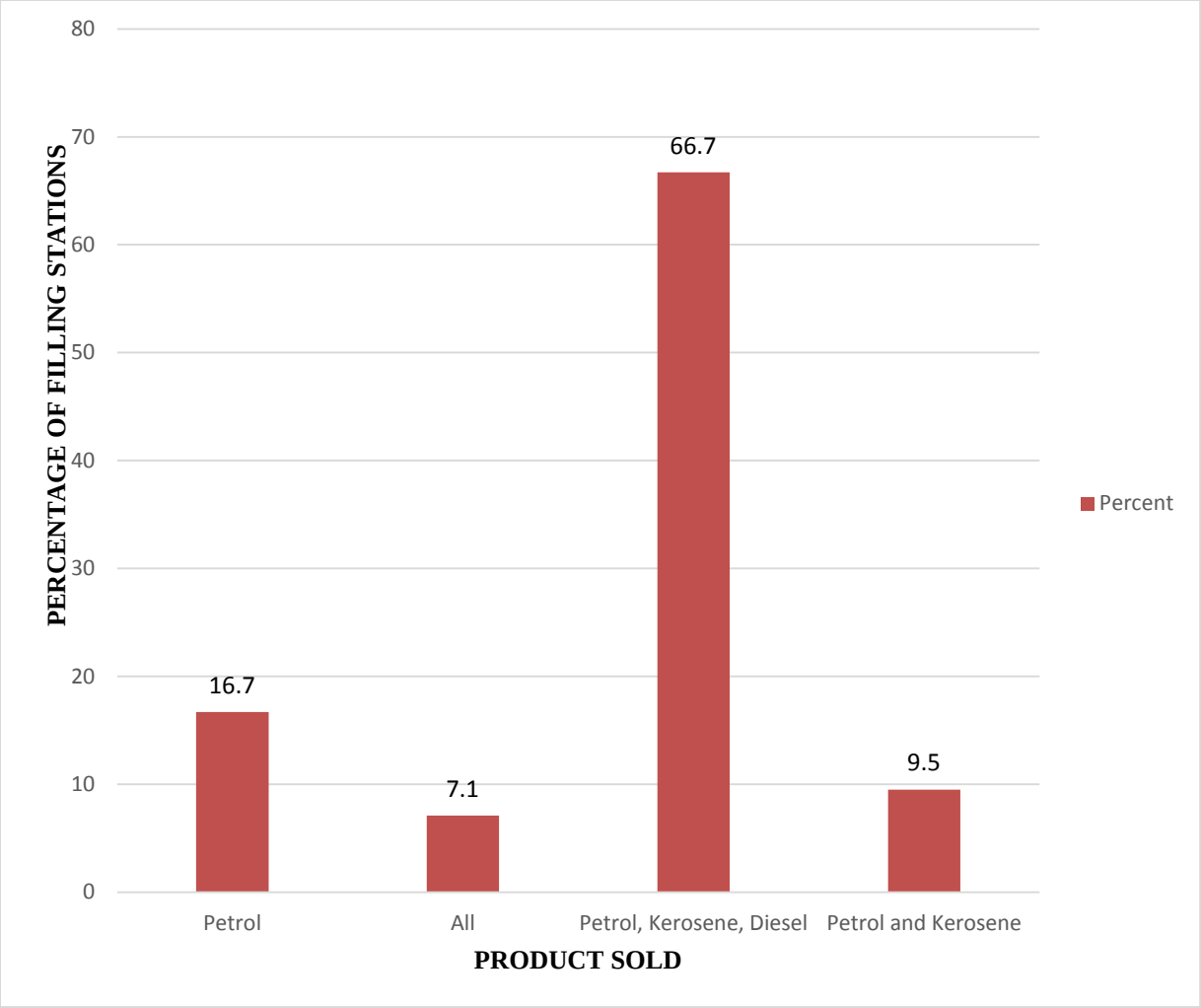


FIGURE 4.5: CATEGORIES OF PRODUCT SOLD BY FILLING STATIONS

4.7 DISTANCE OF FILLING STATIONS TO STRUCTURES

This section discusses the proximity of filling stations to structures such as Central market, central business district, and nearest place of residence in the LGA. Out of the 10 wards of Oyo West LGA, only 8 of the wards have filling stations which are ward 3 to 10, and the distances are explained in relation to each of these wards i.e. from ward 3 to 8 respectively.

4.7.1 DISTANCE OF FILLING STATIONS TO CENTRAL MARKET (AKESAN)

From table 4.14 in appendix iii, it can be seen that out of the total 42 filling stations in Oyo West LGA, 12 filling stations (28.6%) fall within the distance of 500-3900 meters from central market (of which ward 4 has 3 filling stations (7.1%), ward 5, 6, 7, and 9 has 2 filling stations (4.8%) each, and ward 8 has 1 filling station (2.4%). Also 28 filling stations (66.7%) falls within the distance of 4000-9000 meters from central market (of which ward 4 has 6 fillings stations (14.3%), ward 5 and 10 has 1 filling station (2.4%) each, ward 6 has 10 filling stations (23.8%), and ward 8 and 9 has 5 filling stations (11.9%) each.

The table also reveals that only 2 filling stations (4.8%) fall within 10000 meters and above from central market (of which the two filling stations are in ward 2. It can be concluded that ward 3 has all of its filling stations within 10000 meters and above from central market, ward 4 has most of its filling stations within 4000-9000 meters from central market, ward 5 has most of its filling stations within 500-3900 meters from central market, ward 6 has most of its filling stations within 4000-9000 meters from central market, ward 7 has all of its filling stations with 500-3900 meters from central market, ward 8 has most of its filling stations within 4000-9000 meters from central market, ward 9 has most of its filling stations within 4000-9000 meters from central market, and ward 10 has all its filling station within 4000-9000 meters from central market. In all we have most of the filling stations fall within the distance of 4000-9000 meters distance to central market.

4.7.2 DISTANCE OF FILLING STATIONS TO CENTRAL BUSINESS DISTRICT (OWODE)

From table 4.15 in appendix iii, it can be observed that out of the total 42 filling stations in the study area, only 3 filling stations (7.1%) fall within the distance of below 500 meters from CBD

(of which the 3 filling stations are in ward 9). It is also revealed that 10 filling stations (23.8%) fall within 500-3900 meters from CBD (of which ward 4, 5, 7 and 9 has 2 filling station (4.8%) each, ward 6 and 8 has 1 filling station (2.4%) each). Also, 27 filling stations (64.3%) fall within 4000-9000 meters distance from CBD (of which ward 4 has 7 filling stations (16.7%), ward 5 and 10 has 1 filling station (2.4%) each, ward 6 has 11 filling stations (26.2%), ward 8 has 5 filling stations (11.9%), and ward 9 has 2 filling stations (4.8%).

It also revealed that 2 filling stations (4.8%) fall within 10000 meters and above distance from CBD (of which ward 3 has all the filling stations). It can be concluded that all filling stations in ward 3 falls within 10000 meters and above from CBD, ward 4 has most of its filling stations fall within 4000-9000 meters from CBD, ward 5 has most of its filling stations fall within 500-3900 meters from CBD, ward 6 has most of its filling stations fall within 4000-9000 meters from CBD, ward 7 has most of its filling stations fall within 500-3900 meters from CBD, ward 8 has most of its filling stations fall within 4000-9000 meters from CBD, ward 9 has most of its filing stations fall within less than 500 meters from CBD, and ward 10 has its only filling station within 4000-9000 meters from CBD. In all, most of the filling stations in Oyo West LGA fall within 4000-9000 meters distance from CBD.

4.7.3 DISTANCE OF FILLING STATIONS TO THE NEAREST PLACE OF RESIDENCE

From table 4.16 in appendix iii, it can be observed that 4 filling stations (9.5%) falls within less down 5 meters distance from nearest place of residence (of which ward 4 and ward 7 has 1 filling station (2.4%) each, and ward 6 has 2 filling stations (4.8%). Also 21 filling stations (50.0%) fall within 5-10 meters distance from nearest place of residence (of which ward 3, 7 and 10 have 1 filling station (2.4%) each, ward 4 has 5 filling stations (11.9%), ward 5 has 2 filling stations (4.8%), ward 6 and 9 has 4 filling stations (9.5%) each, and ward 8 has 3 filling stations (7.1%). Table 4.5 also reveals that 12 filling stations (28.6%) falls within 11-15 meters distance from the nearest place of residence (of which ward 3, 5,and 9 has 1 filling station (2.4%) each, ward 4 has 2 filing stations (4.8%), ward 6 has 4 filling stations (9.5%), and ward 8 has 3 filling stations (7.1%).

Also 5 filling stations (11.9%) fall within 16 meters and above distance from nearest place of residence (of which ward 4 has 1 filling station (2.4%), ward 6 and 9 have 2 filling stations

(4.8%) each. In conclusion, ward 3 has all its filling stations within 10 meters distance from nearest place of residence, ward 4 has most of its filling stations within 5-10 meters distance from nearest place of residence, ward 5 has most of its filling station within 5-10 meters from nearest place of residence, ward 6 has most of its filling station within 5-15 meters distance from nearest place of residence, ward 7 has all of its filling stations within 10 meters from the nearest place of residence, ward 8 has all of its filling station within 5-15 meters from the nearest place of residence, ward 9 has most of its filling station within 5-10 meters from nearest place of residence, and ward 10 has its only filling station within 5-10 meters from nearest places of residence. In all we could see that most filling station in Oyo West LGA fall within 5-10 meters distance from nearest place of residence.

According to DPR manual (2007), before operating filling station one has to certify some physical planning standards, one of the standard is that "A petrol station should be sited 50 meters away in all angles of the built-up areas to create a buffer zone for the residential house; the buffer zone can be devoted to any non-residential land use". From the DPR guideline stated, we can conclude that all filling stations in Oyo West LGA do not conform to it, and as a result the filling stations pose a danger of fire outbreak for the residence in the LGA, and as such a review should be made by the necessary government bodies to curtail the uncoordinated location of filling stations.

4.8 SOCIO-ECONOMIC CHARACTERISTICS OF HOUSEHOLD RESPONDENTS

This section discusses the socio-economic characteristics of household respondents such as sex, marital status, ethic group, age, education, monthly income, religion, and nationality.

From table 4.17 in appendix iii, it can be observed that out of the 398 persons interviewed in the LGA, there are 197 male respondents (49.5%) in Oyo West LGA, and 201 female respondents (50.5%) in the LGA. We can then conclude that we have more of female residents in Oyo West LGA. Also, from table 4.18, it can be seen that out of the total 398 persons interviewed, 100 respondents (25.1%) are single, 227 respondents (57%) are married, 25 respondents (6.3%) are divorced/separated, and 46 respondents (11.6%) are widow/ widower. It can thus be concluded that the population of Oyo West LGA is dominated by married individuals, followed by individuals that are single. Divorced/ separated and widow/ widower constitute only a small

percentage of residents of Oyo West LGA. According to the result from table 4.19 in appendix iii, it can be observed that out of the 398 respondents, 333 respondents (83.7%) are Yoruba, 29 respondents (7.3%) are Igbo, 24 respondents (6%) are of Hausa ethnic group, and the remaining 12 respondents are of other ethnic groups. It can be concluded that the LGA is largely dominated by the Yoruba ethnic group, and this can be traced back to the historical nature of the region (Oyo town) being the seat of Yoruba empire. Other ethnic groups constitute a very low percentage of the residents of the LGA.

From table 4.20 in appendix 3, it can be observed that only 1 respondent (0.3%) fall within the age range of below 18 years, 220 respondents (55.3%) fall within the age range of 18-36 years, a total number of 153 respondents (38.4%) fall within the age range of 37-56 years, and it can also be seen that a total of 24 respondents (6.0%) fall within 56 years and above. Ward 1 has all of its respondents within age 18-36, ward 2 has most of its residents within age range of 37-56 years, ward 3 has most of its residents between the age of 37-56 and 56 years above, ward 4 has its respondents within age range of below 18 and 18-36, ward 5 has most of its residence within age range of 37-56 years, ward 6 has most of its filling station within age range of 18-36 years, ward 7 has most of its residents within age range of 18-36 years, ward 8 has most of its filling station within the age range of 18-36 years, ward 9 has most of its filling station within the age range of 18-36 years, and ward 10 has most of its filling station within age range of 18-36 years. From the foregoing, it can be concluded that most of the residents in Oyo West LGA fall within the age range of 18-36 years.

Table 4.21 in appendix iii reveals that of all the 398 respondents, a total of 48 respondents (12.1%) responded that they don't have any formal education, 47 respondents (11.8%) said they only attended primary schools, also a total of 144 respondents (36.2%) stated that they are secondary school leavers, and the remaining 159 respondents (39.9%) said they attended tertiary institutions which includes Colleges of education, Polytechnics, and Universities. From the foregoing, it can then be concluded majority of the residents of Oyo West LGA have attained higher educational qualification, as most of them are graduate of tertiary institutions and secondary school leavers. The percentage of persons with no formal education and primary education is very low.

Table 4.22 in appendix iii shows that out of the total 398 respondents, 30 respondents earns monthly income of less than 10000 naira Also a total of 249 respondents (62.6%) earn monthly income within 10000-39000 naira. It is also revealed that a total of 84 respondents earn monthly income of between 40000-69000 naira. Also, a total number of 24 respondents (6.0%) earn a monthly income of between 70000-99000 naira. Finally a total of 10 respondents (2.5%) earn monthly income of 100000 naira and above. It can also be observed that all respondents from ward 1 earn between 10000-39000 naira as monthly income, also most of the respondents in ward 2 earn between 10000-39000 naira monthly, likewise a larger percentage of respondents in ward 3 earn between 10000-39000 naira monthly.

Also, ward 4 has 1 of its respondent earns between 10000-39000 naira and the other respondent earns between 70000-99000 naira. It can also be observed that most of the respondents in ward 5 earn between 10000-39000 naira monthly. Also, most respondents in ward 6 earns between 10000-39000 naira monthly. Likewise in ward 7, a larger percentage of respondents earns between 10000-39000 naira monthly. The trend continues in which most of the respondents in ward 8, 9, and 10 earn between 10000-39000 naira monthly. It can then be concluded that majority of residents in Oyo west LGA earns between 10000-39000 naira monthly as income.

Table 4.23 in appendix iii shows that out of the total 398 respondents, 161 respondents (40.5%) stated that they practice Christianity as their religion (making them the second largest religious group in the study area, 222 respondents (55.8%) declared that they are Muslims i.e. they practice Islam (making them the largest religious group in the study area) and the remaining 15 respondents (3.8%) stated that they are traditional worshipers (making them the religious group with the lowest congregation). These traditional religious groups include Sango, Ifa, and Esu worshippers, etc). From the foregoing, it can be concluded that Oyo West LGA is dominated by Muslims.

4.9 RESPONDENTS' PURCHASING BEHAVIOUR

This section discuss households that does or does not use petroleum products, types of petroleum products used, frequency of purchase, distance to the nearest filling station, and reasons for patronizing filling station of choice.

Figure 4.24 below shows that out of the total 398 respondents, only 3 respondents (0.8%) stated that they don't use any petroleum products, while the remaining 395 respondents (99.2%) stated emphatically that they use petroleum products, this petroleum products include petrol(PMS), GAS, Kerosene, and Lubricants. From the foregoing, it can be concluded that almost all residents of Oyo West LGA depends on petroleum products for their domestic and economic activities. As a result we could then emphasize that in this century, the use of petroleum products still plays a very important role in the daily activities of individual households.

Table 4.25 in appendix iii shows that of the total 398 respondents, 3 respondents (0.8%) stated that they never purchase petroleum products in their household, 54 respondents (13.6%) stated that they use to purchase petroleum products daily in their households. Also, 68 respondents (17.1%) stated that they always buy petroleum products in their households on weekly basis. Also, a total of 22 respondents (5.5%) said that they used to buy petroleum products in their households on monthly basis. The remaining 251 respondents (63.1%) stated that they buy petroleum products in their households as occasion demands i.e. they buy petroleum products as at when there is a need for it.

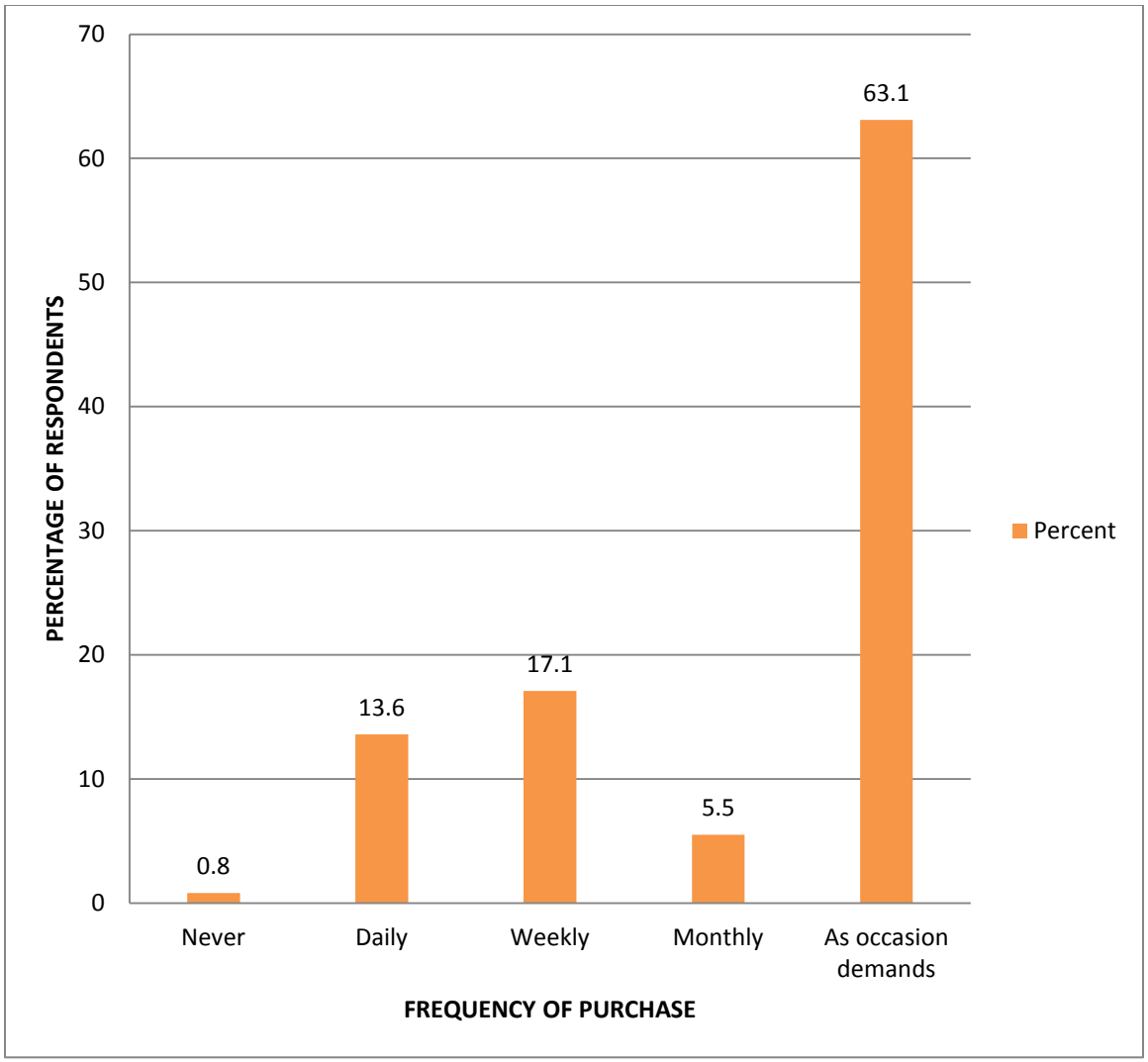


FIGURE 4.6: FREQUENCY OF PURCHASE OF PETROLEUM PRODUCTS

From table 4.26 in appendix iii, it can be observed that out of the total 398 respondents, 122 respondents (30.7%) stated that there households are located within less than 10 minutes walk from the nearest filing station. Also, a total number of 167 respondents (42.0%) have their households located within 10-19 minutes walk from the nearest filling station. Also, it can be seen that 102 respondents (25.6%) have their households located within 20-29 minutes walk from the nearest filling station. And the remaining 7 respondents said they have their households located within 30 minutes walk and above from the nearest filling station. It can be seen from the table that most households are located within 10-19minutes walk from nearest filling station.

Table 4.27 in appendix shows that 158 respondents (40.1%) chose proximity to residence as their reason for patronizing the filling station of choice, also 99 respondents (25.1%) chose good gauge as their reason for patronizing filling station of choice. A total of 57 respondents (14.5%) chose good quality product as their reason for patronizing the filling station of their choice. Also, a total of 24 respondents chose good price as their reason for patronizing the filling station of their choice. 56 respondents (14.2%) in all gave good customer service as their reason for patronizing the filling station of their choice. In all, it can be seen that a larger percentage of respondents gave proximity to residence as their reason for patronizing the filling station of their choice.

4.10 PERCEPTION OF RESPONDENTS ON THE LOCATION OF FILLING STATIONS

This section discusses perception of residence of Oyo West LGA on the location of filling stations in their neighbourhoods, benefits and consequences associated with the location of filling station in their neighbourhoods.

Table 4.28 in appendix reveals that out of the total 398 respondents, 17 respondents (4.3%) said the location of filling stations is not easily accessible. 162 respondents (40.7%) perceived the location of filling stations in their neighbourhood as being too close to residential building. Also, 219 respondents perceived the location of filling stations in their neighbourhood as a good location i.e. it is well located in terms of accessibility. It can be observed that in ward 1 all respondents perceived the location of filling stations to be good. In ward 2 most of the

respondents also perceived the location of filling stations to be good, likewise in ward 3, 4, 5, 6, 7 and 10. But a larger percentage of respondents in ward 8 and 9 perceived the location of filling stations in their neighbourhood as being too close to residential building. From the foregoing, it can be observed that a larger percentage of residents in Oyo West LGA perceives the location of filling stations in the neighbourhood as a good location, this shows that majority of residents are not well informed as regards the danger of locating filling stations close to residential areas.

Figure 4.29 in appendix iii shows that out of the total 398 respondents, 18 respondents (4.5%) said they fetch water from tap water in filling stations, 99 respondents (24.9%) said that the filling stations in their neighbourhoods serve as a place for charging their electrical devices when there is no light, 227 respondents (57%) said that the location of filling stations in their neighbourhoods gives them easy access to petroleum products as at when needed, 10 respondents (2.5%) said that filling stations in their neighbourhood renders religious benefits (such as availability of Mosque to observe their daily prayers), 32 respondents (8%) said that filling stations provide employment opportunities to members of the community (some emphasized that their family members work as managers, and some as attendants in the filling stations), the remaining 12 respondents (3%) said that they enjoy free gifts during festivity period from filling stations in their neighbourhood. It can be observed that majority of the residents in Oyo West LGA see easy access to petroleum products as the main benefit derived.

Table 4.30 in appendix iii reveals that out of the total 398 respondents, only 210 of them responded as regards consequences of location of filling stations in the neighbourhood. 114 respondents (54.3%) said noise pollution is the problem they encounter as a result of the location of filling stations in their neighbourhoods, 67 respondents (31.9%) said air pollution is the problem they encounter as a result of location of filling stations in their neighbourhoods, 11 respondents (5.2%) said oil spillage/land pollution is the consequence they face as a result of location of filling stations in their neighbourhoods, 14 respondents said they encounter busy traffic/ traffic congestion as a result of the location of filling stations in their neighbourhoods, 4 respondents (1.9%) said fire outbreak is the consequence associated with the location of filling stations in their neighbourhood. The remaining 188 respondents did not account for the consequences associated with location of filling stations in their neighbourhoods. From the

foregoing, it can be observed that noise pollution accounts for the largest share of consequences associated with location of filling station in neighbourhoods.

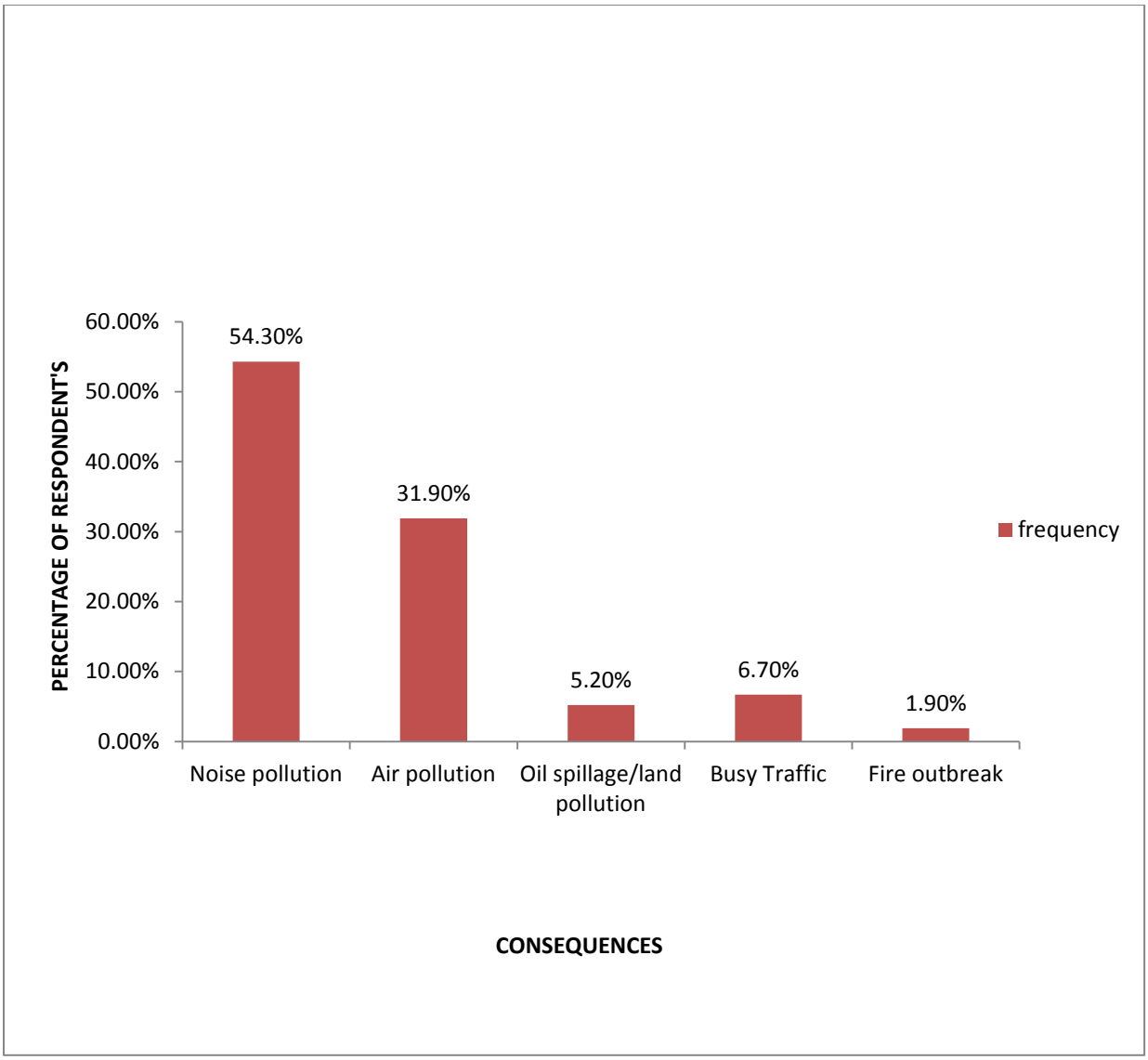


FIGURE 4.7: CONSEQUENCES OF LOCATION OF FILLING STATION IN NEIGHBOURHOODS.

CHAPTER FIVE

SUMMARY OF RESEARCH FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter focuses on the summary of findings and result from the analysis of filling stations in the study area. Also in this chapter, recommendation will be provided, and conclusions will be made.

5.2 SUMMARY OF RESEARCH FINDINGS

This study was designed to look into the locational pattern of filling stations in Oyo West LGA. The result revealed that the locational pattern of filling stations exhibit a cluster. This means that means that every area in the neighbourhoods of the study area does not have equal chance of being selected for the erection of filling stations. The ownership of filling stations in the LGA is between private individuals and public corporations, in which private individuals dominate the scene with ownership of 40 filling stations while public corporation own only 2 filling stations. Also there are filling stations in only 8 wards of the study area out of the total of 10 wards, ward 1 and ward 2 has no filling station. Also, the vast number of filling stations is concentrated in ward 6, 4, 9 and 8, while other wards have pockets of filling stations.

The study also revealed that most of the filling stations (66.7%) in the LGA sell petrol, kerosene, and diesel. Only few (7.1%) sell all petroleum products including lubricants, while others sell either petrol or petrol and kerosene. Also, most of the filling stations (28 filling stations (66.7%) falls within the distance of 4000-9000 meters from central market. The result further revealed that most of the filling stations (27 filling stations (64.3%) fall within 4000-9000 meters distance from CBD (Owode). The result also revealed that most filling stations in the study area (21 filling stations (50.0%) fall within 5-10 meters distance from nearest place of residence. This indicates that most filling stations in the study area do not meet the minimum requirement of buffer zone for residential zone as stipulated by DPR, 2007.

Factors that influence the location of filling stations in Oyo West local government includes cheap land value, proximity to market, and profitable location. Most of the filling stations

(54.8%) locate as a result of profitable location; this is peculiar to all filling stations in most part of the LGA. The temporal distribution of filling stations in the LGA also reveals that the number of filling stations in the LGA is growing tremendously over time with an increasing trend of growth of filling stations witnessed in the year 2010 till date.

The result of the socio-economic characteristics of residents of Oyo West LGA reveals that in terms of sex, most of the respondents were female with 50.5%. Most of the respondents are married with 57%. Majority of residents of the LGA are Yoruba with 83.7%. The respondents were people aged between 18-36 and 37-56 with 55.3% and 38.4% value respectively. A larger percentage of respondents are have finished from secondary school and tertiary institution with 36.2% and 39.9% value respectively. A larger percentage of respondents in the LGA earn between 10,000-39000 naira with 62.6%. Most of the respondents are Muslims with 55.8%, followed by Christians with 40.5%, while the last 3.8 percent are traditional worshippers.

The result further shows that majority of the respondents purchase petroleum products as occasion demands with 63.1%. Also, majority of respondents declared that there houses are located very close to filling stations. Also, the result shows that majority of respondents patronize filling station of choice because of proximity to residence and good gauge with 40.1% and 25.1% respectively.

The result further shows that majority of respondents (55%) perceives the location of filling station in the LGA as a good location, 40.7% of respondents feels the location of the filling stations in the LGA are too close to residential area, while others feel the location of the filling stations are not very accessible. This shows that majority of the residents are not educated on the dangers of filling stations being located too close to residential areas. Also, majority of respondents said ‘easy access to petroleum products’ and ‘charging when there is no light’ are the benefits derived from the location of filling stations in their neighbourhood with 57% and 24.9% respectively. Others said location of filling stations benefitted them in terms of employment, free gift, and religious benefits (mosques). The result also shows that majority of respondents perceive the consequence of location of filling station in their neighbourhood to be noise pollution and air pollution, with 54.3% and 31.9% value. Other consequences given include Oil spillage/ land pollution, busy traffic and fire outbreak.

5.3 CONCLUSION

The study revealed that the locational pattern of filling station in Oyo West Local Government Area exhibits a cluster. The implication of this result may be easily translated to mean that every land in each neighbourhood that makes up the LGA does not have equal chance of being chosen as a location to erect a filling station. The spatial implication is that residents in the LGA do not have equal accessibility to filling station services. The situation is such that there is functional duplicity in which one particular neighbourhood has more filling stations than it needs due to some advantage inherent in the location.

5.4 RECCOMENDATIONS

Overtime, filling stations have been a very important service industry as it provides larger percentage of energy sources consumed in day to day activities of human being. Such activities in which energy is exerted for includes transiting goods and persons, manufacturing, cooking, preparing fields for farming, lightning, etc. As such, construction of filling stations in our neighbourhoods is inevitable. Therefore, in light of my findings, the following recommendations are being proposed.

1. Looking at the result on the perception of residents on location of filling stations in their neighbourhoods, the majority of residents perceived the location of filling stations as being a good location. This shows that the majority of residents of Oyo west LGA are not well informed of the dangers of having filling stations locate very close to their houses, as such there is the need to sensitize the residents of the LGA on the dangers of such actions. As this will prevent or reduce further sale of land by residents to filling stations developers. Ministry of Environment in collaboration with all the petrol stations should constantly mount public enlightenment campaign using posters, bill boards and media houses to educate the public on the hazards associated with petroleum products with respect to human health and the environment so as to discourage residents close to petrol stations.

2. Also, the result revealed that almost all the filling stations does not provide buffer zone of 50 meters for residential buildings as stipulated by DPR (2007) in its guidelines for construction of filling station and other government agencies. As such, the government and its agencies should stiffen its policy execution as regards indiscriminate construction of filling stations in Oyo West LGA and its environs.

3. Government and its agencies should come up with a policy that helps allocate lands for location of filling station in such a way that residents of the LGA have equal accessibility to filling station services, rather than a cluster of this service industry in some particular neighbourhoods such that have more than abundance of filling stations.

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APPENDIX I

SURVEY OF THE SPATIAL ANALYSIS OF THE LOCATIONAL PATTERN OF FILLING STATIONS IN OYO WEST LOCAL GOVERNMENT AREA, OYO STATE.

INTRODUCTION

Sir/Ma,

I am carrying out a survey on the locational pattern of filling stations in Oyo West local Government Area (LGA). This is purely an academic exercise and be assured that any information provided shall be treated as strictly confidential.

QUESTIONNAIRE

SECTION A: INFORMATION ABOUT THE FILLING STATION

1. Ward: _____
2. Neighbourhood: _____
3. GPS location: _____
4. Name of Filling station _____
5. Date of establishment _____
6. Are you the owner of this filling station? (i) Yes [] (ii) No []
7. Type of ownership (i) Private [ ] (ii) Public [ ] (iii) Joint Ownership [ ]
8. Product(s) Sold (i) Petrol [ ] (ii) Kerosene [ ] (iii) Diesel [ ] (iv) Lubrication Oil [ ] (v) Gas [ ]
9. Labour (Number of employees) _____
10. How much does it cost to move 33,000 Liters of product from source to filling station? _____
11. What are the factors that influence the choice of this site for your filling station?

(i) Cheap land value [ ]

(ii) Proximity to Market [ ]

(iii) Labour availability [ ]

(iv) Profitable Location [ ]

12. Distance from central market (Akesan) _____
13. Distance from Central Business District (Owode) _____
14. Distance to the nearest place of residence _____

SECTION B: PERCEPTION OF RESPONDENTS ON THE LOCATION FILLING STATION

15. In your own opinion, (state verbatim) reasons why you located the filling station here.

THANK YOU

APPENDIX II

SURVEY OF THE SPATIAL ANALYSIS OF THE LOCATIONAL PATTERN OF FILLING STATIONS IN OYO WEST LOCAL GOVERNMENT AREA, OYO STATE.

INTRODUCTION

Sir/Ma,

I am carrying out a survey on the locational pattern of filling stations in Oyo West local Government Area (LGA). This is purely an academic exercise and be assured that any information provided shall be treated as strictly confidential.

QUESTIONNAIRE

SECTION A: LOCATION

1. Neighbourhood _____
2. Ward _____
3. Settlement _____

SECTION B: SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

4. Gender (i) Male [ ] (ii) Female [ ]
5. Age _____
6. Marital status (i) Single [ ] (ii) Married [ ] (iii) Divorced/ Separated [ ] (iv) Widow/Widower [ ]
7. Ethnicity: _____
8. Educational qualification (i) No formal education [ ] (ii) Primary [ ] (iii) Secondary [ ] (iv) Tertiary [ ]
9. Monthly Income (average) _____
10. Religion _____
11. Nationality(please specify)_____
12. State of Origin(Nigerians)_____

SECTION C: INFORMATION ABOUT PRODUCTS

13. Do you use any petroleum product in this house? (i) Yes [ ] (ii) No [ ]
14. If Yes in question 13, what type of products do you use? (Tick products used)

(i) Petrol [ ]
(ii) Gas [ ]
(iii) Kerosene [ ]
(iv) Lubricants [ ]
(v) Diesel [ ]

15. How frequently do you purchase these products? (i) Daily [ ] (ii) Weekly [ ] (iii) Monthly [ ] (iv) As occasion demands [ ]
16. Distance to the nearest filling station _____
17. Where do you purchase your products from? /Filling station of your choice (specify) _____
18. What is/are the reasons for patronizing the filling station of your choice? _____

SECTION D: PERCEPTION OFRESPONDENTS ON THE LOCATION OF FILLING STATION

19. In your own opinion, how do you perceive the location of this filling station here in your ward/neighborhood?_____

20. In your own opinion, what are the benefits and consequences of the location of filling stations in this ward/neighborhood?

THANK YOU.

APPENDIX III

TABLE 4.1: NEAREST NEIGHBOUR STATISTICS SUMMARY

Observed Mean Distance:	0.0043 Degrees
Expected Mean Distance:	0.0081 Degrees
Nearest Neighbor Ratio:	0.535188
z-score:	-5.762794
p-value:	0.000000

SOURCE: FIELD WORK, 2018

TABLE 4.2: OWNERSHIP OF FILLING STATIONS

Are you the owner of this Filling station			
Response		Frequency	Percent
Valid	Yes	8	19.0
	No	34	81.0
	Total	42	100.0

TABLE 4.3: FILLING STATIONS PER WARD

Ward		Frequency	Percent
Valid	Ward 3	2	4.8
	Ward 4	9	21.4
	Ward 5	3	7.1
	Ward 6	12	28.6
	Ward 7	2	4.8
	Ward 8	6	14.3
	Ward 9	7	16.7
	Ward 10	1	2.4
	Total	42	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.4: NUMBER OF FILLING STATIONS PER NEIGHBOURHOOD

Neighbourhoods		Frequency	Percent
Valid	Alagbon	1	2.4
	Alalubosa	1	2.4
	Awumoro	2	4.8
	Baynikol	1	2.4
	Cele Tuntun	1	2.4
	Chief Imam area	1	2.4
	Dacanca	1	2.4
	Farade	1	2.4
	Fasola	1	2.4
	Gold and Rock	1	2.4

	Ibadan-Ilorin Expressway	1	2.4
	Id-Gedu	1	2.4
	Idi-Gedu	1	2.4
	Idi-Igba	1	2.4
	Ilepo-Laisi	1	2.4
	Ilora road	1	2.4
	Irepo	2	4.8
	Iseke	1	2.4
	Isokun	2	4.8
	Jaremily	3	7.1
	Ladindon	1	2.4
	Locust, Iseyin Road	1	2.4
	Maradesa	1	2.4
	Moja	1	2.4
	OdoFufu	1	2.4
	Opp. Ojongbadu P/Station	1	2.4
	Oroki	3	7.1
	Owode	3	7.1
	Oyo-Ibadan Expressway	1	2.4
	Sanga	1	2.4
	Saw-Mill	1	2.4
	Soku	1	2.4
	Winners	1	2.4
	Total	42	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.5: FILLING STATION OWNERSHIP PER FIRM

Name of filling stations		Frequency	Percent
Valid	Aawad Oil Nig. Ltd	1	2.4
	Adekaitan Company Nig. Ltd	1	2.4
	Adisel	1	2.4
	Ajenifuja Global Concept	1	2.4
	Ajiga	1	2.4
	Ajisope	1	2.4
	Assets Oil & Gas	3	7.1
	Aybam Oil & Gas	1	2.4
	Bintinlaye Energy Res.	1	2.4
	BOVAS	2	4.8
	Conoil	1	2.4
	Damarok Nig. Ltd	1	2.4
	Dekem	1	2.4
	Gold City	1	2.4
	Ismhas	1	2.4
	Keem-Tee Inv. Res Ltd	1	2.4
	Lajimo Nig. Ltd	2	4.8
	Lateef Temitope Ventures	1	2.4
	MATBAM.BAS	1	2.4
	MOBIL	1	2.4
	Molab	3	7.1
	Musalat	1	2.4

	NNPC	1	2.4
	Obajel	1	2.4
	Olafat Unique Concept Ltd	2	4.8
	Olak Comm. Ent Nig Ltd.	1	2.4
	Onis Global Concepts	1	2.4
	S.MMooras	1	2.4
	Saklaj Unique Concept Ltd	1	2.4
	Silver Touch Ind. Ltd	1	2.4
	Sola Iyaniwura	1	2.4
	TOTAL	1	2.4
	Track Oil and Gas	1	2.4
	Zamotun	2	4.8
	Total	42	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.6: TYPE OF FIRM'S OWNERSHIP

Type of ownership		Frequency	Percent
Valid	Private	40	95.2
	Public	2	4.8
	Total	42	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.7: DATE OF ESTABLISHMENT OF FILLING STATIONS

Date	Frequency	Percent
1965	2	4.8
1975	1	2.4
1993	1	2.4
1997	1	2.4
1998	1	2.4
2003	1	2.4
2004	1	2.4
2010	2	4.8
2012	5	11.9
2013	3	7.1
2014	2	4.8
2015	10	23.8
2016	9	21.4
2017	3	7.1
Total	42	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.8: FACTORS INFLUENCING THE LOCATION OF

Factors		Frequency	Percent
Valid	Cheap Land Value	8	19.0
	Proximity to Market	11	26.2
	Profitable Location	23	54.8
	Total	42	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.9: RELATIONSHIP BETWEEN MONTHLY INCOME AND NUMBER OF FILLING STATIONS

		Monthly Income	**Number of Filling station**
Monthly Income	Pearson Correlation	1	.128
	Sig. (2-tailed)		.011
	N	398	395
Number of Filling station	Pearson Correlation	.128	1
	Sig. (2-tailed)	.011	
	N	395	395

SOURCE: FIELDWORK, 2018

TABLE 4.10: RELATIONSHIP BETWEEN COSTS OF MOVING 33,000 LITRES OF PRODUCTAND DISTANCE FROM CENTRAL MARKET (IN METERS)

		Cost of moving 33,000 litres of product	Distance from central Market (in meters)
Cost of moving 33,000 litres of product	Pearson Correlation	1	.037
	Sig. (2-tailed)		.822
	N	40	40
Distance from central Market (in meters)	Pearson Correlation	.037	1
	Sig. (2-tailed)	.822	
	N	40	42

SOURCE: FIELDWORK, 2018

TABLE 4.11: RELATIONSHIP BETWEEN TYPE OF OWNERSHIP AND NUMBER OF EMPLOYEES

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Type of Ownership - Number of Employees	-1.048	.962	.148	-1.347	-.748	-7.061	41	.000

SOURCE: FIELDWORK, 2018

TABLE 4.12: VARIATION IN THE NUMBER OF FILLING STATIONS ACROSS THE 10 WARDS OF THE LGA

Number of Filling Stations					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16080.632	9	1786.737	45.234	.000
Within Groups	15207.318	385	39.500		
Total	31287.949	394			

SOURCE: FIELDWORK, 2018

TABLE 4.13: PRODUCTS SOLD BY FILLING STATION

Products sold		Frequency	Percent
Valid	Petrol	7	16.7
	All	3	7.1
	Petrol, Kerosene, Diesel	28	66.7
	Petrol and Kerosene	4	9.5
	Total	42	100.0

SOURCE: FIELDWORK, 2018

Table 4.14: DISTANCE OF FILLING STATIONS TO CENTRAL MARKET

	Distance from central Market (in meters)			Total
Ward	500-3900	4000-9000	10000 and above	
Ward 3	0(0.0%)	0(0.0%)	2(4.8%)	2(4.8%)
Ward 4	3(7.1%)	6(14.3%)	0(0.0%)	9(21.4%)
Ward 5	2(4.8%)	1(2.4%)	0(0.0%)	3(7.1%)
Ward 6	2(4.8%)	10(23.8%)	0(0.0%)	12(28.6%)
Ward 7	2(4.8%)	0(0.0%)	0(0.0%)	2(4.8%)
Ward 8	1(2.4%)	5(11.9%)	0(0.0%)	6(14.3%)
Ward 9	2(4.8%)	5(11.9%)	0(0.0%)	7(16.7%)
Ward 10	0(0.0%)	1(2.4%)	0(0.0%)	1(2.4%)
Total	**12(28.6%)**	**28(66.7%)**	**2(4.8%)**	**42(100.0%)**

SOURCE: FIELDWORK, 2018

TABLE 4.15: DISTANCE OF FILLING STATIONS TO CENTRAL BUSINESS DISTRICT

	Distance from central Business District (in meters)				Total
ward	<500	500-3900	4000-9000	10000 and above	
Ward 3	0(0.0%)	0(0.0%)	0(0.0%)	2(4.8%)	2(4.8%)
Ward 4	0(0.0%)	2(4.8%)	7(16.7%)	0(0.0%)	9(21.4%)
Ward 5	0(0.0%)	2(4.8%)	1(2.4%)	0(0.0%)	3(7.1%)
Ward 6	0(0.0%)	1(2.4%)	11(26.2%)	0(0.0%)	12(28.6%)
Ward 7	0(0.0%)	2(4.8%)	0(0.0%)	0(0.0%)	2(4.8%)
Ward 8	0(0.0%)	1(2.4%)	5(11.9%)	0(0.0%)	6(14.3%)
Ward 9	3(7.1%)	2(4.8%)	2(4.8%)	0(0.0%)	7(16.7%)
Ward 10	0(0.0%)	0(0.0%)	1(2.4%)	0(0.0%)	1(2.4%)
Total	**3(7.1%)**	**10(23.8%)**	**27(64.3%)**	**2(4.8%)**	**42(100.0%)**

SOURCE: FIELDWORK, 2018

TABLE 4.16: DISTANCE OF FILLING STATION TO NEAREST PLACE OF RESIDENCE

	Distance to the nearest place of residence (in meters)				Total
Ward	<5	5-10	11-15	16 and above	
Ward 3	0(0.0%)	1(2.4%)	1(2.4%)	0(0.0%)	2(4.8%)
Ward 4	1(2.4%)	5(11.9%)	2(4.8%)	1(2.4%)	9(21.4%)
Ward 5	0(0.0%)	2(4.8%)	1(2.4%)	0(0.0%)	3(7.1%)
Ward 6	2(4.8%)	4(9.5%)	4(9.5%)	2(4.8%)	12(28.6%)
Ward 7	1(2.4%)	1(2.4%)	0(0.0%)	0(0.0%)	2(4.8%)
Ward 8	0(0.0%)	3(7.1%)	3(7.1%)	0(0.0%)	6(14.3%)
Ward 9	0(0.0%)	4(9.5%)	1(2.4%)	2(4.8%)	7(16.7%)
Ward 10	0(0.0%)	1(2.4%)	0(0.0%)	0(0.0%)	1(2.4%)
Total	**4(9.5%)**	**21(50.0%)**	**12(28.6%)**	**5(11.9%)**	**42(100.0%)**

SOURCE: FIELDWORK, 2018

Table 4.17: SEX OF RESPONDENTS

Sex		Frequency	Percent
Valid	Male	197	49.5
	Female	201	50.5
	Total	398	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.18: MARITAL STATUS OF RESPONDENTS

status		Frequency	Percent
Valid	Single	100	25.1
	Married	227	57.0
	Divorced/Separated	25	6.3
	Widow/Widower	46	11.6
	Total	398	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.19: ETHNICITY OF RESPONDENTS

Ethnicity		Frequency	Percent
Valid	Yoruba	333	83.7
	Igbo	29	7.3
	Hausa	24	6.0
	Others	12	3.0
	Total	398	100.0

SOURCE: FIELDWORK, 2018

Table 4.20: AGE COMPOSITION OF RESPONDENTS

	Age				Total
Ward	< 18	18-36	37-56	>56	
Ward 1	0(0.0%)	2(0.5%)	0(0.0%)	0(0.0%)	2(0.5%)
Ward 2	0(0.0%)	36(9.0%)	42(10.6%)	15(3.8%)	93(23.4%)
Ward 3	0(0.0%)	3(0.8%)	5(1.3%)	5(1.3%)	13(3.3%)
Ward 4	0(0.0%)	1(0.3%)	1(0.3%)	0(0.0%)	2(0.5%)
Ward 5	0(0.0%)	10(2.5%)	12(3.0%)	1(0.3%)	23(5.8%)
Ward 6	0(0.0%)	5(1.3%)	3(0.8%)	0(0.0%)	8(2.0%)
Ward 7	0(0.0%)	62(15.6%)	31(7.8%)	0(0.0%)	93(23.4%)
Ward 8	0(0.0%)	2(0.5%)	1(0.3%)	0(0.0%)	3(0.8%)
Ward 9	1(0.3%)	78(19.6%)	45(11.35%)	2(0.5%)	126(31.7%)
Ward 10	0(0.0%)	21(5.3%)	13(3.3%)	1(0.3%)	35(8.8%)
Total	**1(0.3%)**	**220(55.3%)**	**153(38.4%)**	**24(6.0%)**	**398(100.0%)**

SOURCE: FIELDWORK, 2018

TABLE 4.21: EDUCATIONAL STATUS OF RESPONDENTS

Status		Frequency	Percent
Valid	No Formal Education	48	12.1
	Primary	47	11.8
	Secondary	144	36.2
	Tertiary	159	39.9
	Total	398	100.0

SOURCE: FIELDWORK, 2018

Table 4.22: MONTHLY INCOME OF RESPONDENTS

	Monthly Income in Naira					
Ward	<10000	10000-39000	40000-69000	70000-99000	100000 and above	Total
Ward 1	0(0.0%)	2(0.5%)	0(0.0%)	0(0.0%)	0(0.0%)	2(0.5%)
Ward 2	4(1.0%)	71(17.8%)	17(4.3%)	1(0.3%)	0(0.0%)	93(23.4%)
Ward 3	0(0.0%)	8(2.0%)	4(1.0%)	1(0.3%)	0(0.0%)	13(3.3%)
Ward 4	0(0.0%)	1(0.3%)	0(0.0%)	1(0.3%)	0(0.0%)	2(0.5%)
Ward 5	2(0.5%)	11(2.8%)	6(1.5%)	0(0.0%)	4(1.0%)	23(5.8%)
Ward 6	0(0.0%)	4(1.0%)	3(0.8%)	1(0.3%)	0(0.0%)	8(2.0%)
Ward 7	2(0.5%)	62(15.6%)	18(4.5%)	9(2.3%)	2(0.5%)	93(23.4%)
Ward 8	0(0.0%)	2(0.5%)	1(0.3%)	0(0.0%)	0(0.0%)	3(0.8%)
Ward 9	22(5.5%)	64(16.1%)	30(7.5%)	8(2.0%)	2(0.5%)	126(31.7%)
Ward 10	1(0.3%)	24(6.0%)	5(1.3%)	3(0.8%)	2(0.5%)	35(8.8%)
Total	**30(7.8%)**	**249(62.6%)**	**84(21.1%)**	**24(6.0%)**	**10(2.5%)**	**398(100.0%)**

SOURCE: FIELDWORK, 2018

TABLE 4.23: RELIGION PRACTISE OF RESPONDENTS

		Frequency	Percent
Valid	Christianity	161	40.5
	Islam	222	55.8
	Traditional	15	3.8
	Total	398	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.24: PETROLEUM PRODUCT USAGE

		Frequency	Percent
Valid	Yes	395	99.2
	No	3	.8
	Total	398	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.25: FREQUENCY OF PURCHASE

		Frequency	Percent
Valid	Never	3	.8
	Daily	54	13.6
	Weekly	68	17.1
	Monthly	22	5.5
	As occasion demands	251	63.1
	Total	398	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.26: DISTANCE OF HOUSEHOLDS TO THE NEAREST FILLING STATION

	Distance to the nearest Filling Station (time in minutes)				Total
Ward	< 10	10-19	20-29	>30	
Ward 1	1(0.3%)	1(0.3%)	0(0.0%)	0(0.0%)	2(0.5%)
Ward 2	16(4.0%)	37(9.3%)	37(9.3%)	3(0.8%)	93(23.4%)
Ward 3	4(1.0%)	3(0.8%)	4(1.0%)	2(0.5%)	13(3.3%)
Ward 4	1(0.3%)	1(0.3%)	0(0.0%)	0(0.0%)	2(0.5%)
Ward 5	5(1.3%)	12(3.0%)	6(1.5%)	0(0.0%)	23(5.8%)
Ward 6	4(1.0%)	3(0.8%)	1(0.3%)	0(0.0%)	8(2.0%)
Ward 7	35(8.8%)	39(9.8%)	18(4.5%)	1(0.3%)	93(23.4%)
Ward 8	0(0.0%)	3(0.8%)	0(0.0%)	0(0.0%)	3(0.8%)
Ward 9	42(10.6%)	59(14.8%)	25(6.3%)	0(0.0%)	126(31.7%)
Ward 10	14(3.5%)	9(2.3%)	11(2.8%)	1(0.3%)	35(8.8%)
Total	**122(30.7%)**	**167(42.0%)**	**102(25.6%)**	**7(1.8%)**	**398(100.0%)**

SOURCE: FIELDWORK, 2018

TABLE 4.27: REASONS FOR PATRONIZING FILLING STATION OF CHOICE

	Reasons for Patronizing the filling station					Total
Ward	Proximity to residence	Good Gauge	Good quality	Good Price	Good Customer Service	
Ward 1	1(0.3%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	1(0.0%)
Ward 2	29(7.4%)	30(7.6%)	8(2.0%)	0(0.0%)	26(6.6%)	93(23.6%)
Ward 3	12(3.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	12(3.0%)
Ward 4	0(0.0%)	0(0.0%)	0(0.0%)	2(0.5%)	0(0.0%)	2(0.5%)
Ward 5	14(3.6%)	2(0.5%)	0(0.0%)	0(0.0%)	5(1.3%)	21(5.3%)
Ward 6	1(0.3%)	3(0.8%)	1(0.3%)	2(0.5%)	1(0.3%)	8(2.0%)
Ward7	38(9.6%)	19(4.8%)	14(3.6%)	9(2.3%)	13(3.3%)	93(23.6%)
Ward 8	1(0.3%)	2(0.5%)	0(0.0%)	0(0.0%)	0(0.0%)	3(0.8%)
Ward 9	47(11.9%)	39(9.9%)	32(8.1%)	6(1.5%)	2(0.5%)	126(32.0%)
Ward 10	15(3.8%)	4(1.0%)	2(0.5%)	5(1.3%)	9(2.3%)	35(8.9%)
Total	**158(40.1%)**	**99(25.1%)**	**57(14.5%)**	**24(6.1%)**	**56(14.2%)**	**394(100.0%)**

SOURCE: FIELDWORK, 2018

TABLE 4.28: PERCEPTION OF RESPONDENTS ON THE LOCATION OF FILLING STATIONS

	perception of the location of filling stations in neighbourhoods			Total
Ward	Not easily accessible	Too close to residence	Good Location	
Ward 1	0(0.0%)	0(0.0%)	2(0.5%)	2(0.5%)
Ward 2	6(1.5%)	22(5.5%)	65(16.3%)	93(23.4%)
Ward 3	2(0.5%)	0(0.0%)	11(2.8%)	13(3.3%)
Ward 4	0(0.0%)	0(0.0%)	2(0.5%)	2(0.5%)
Ward 5	0(0.0%)	6(1.5%)	17(4.3%)	23(5.8%)
Ward 6	0(0.0%)	1(0.3%)	7(1.8%)	8(2.0%)
Ward 7	0(0.0%)	33(8.3%)	60(15.1%)	93(23.4%)
Ward 8	0(0.0%)	2(0.5%)	1(0.3%)	3(0.8%)
Ward 9	7(1.8%)	93(23.4%)	26(6.5%)	126(31.7%)
Ward 10	2(0.5%)	5(1.3%)	28(7.0%)	35(8.8%)
Total	**17(4.3%)**	**162(40.7%)**	**219(55.0%)**	**398(100.0%)**

SOURCE: FIELDWORK, 2018

TABLE 4.29: BENEFITS OF LOCATION OF FILLING STATION

		Frequency	Percent
Valid	Fetch water from tap	18	4.5
	Charging when there is no light	99	24.9
	Easy access to products	227	57.0
	Religious benefits	10	2.5
	Employment	32	8.0
	Free gift	12	3.0
	Total	398	100.0

SOURCE: FIELDWORK, 2018

TABLE 4.30: CONSEQUENCES OF LOCATION OF FILLING STATIONS

What are the consequences of the location of the filling stations in your neighbourhood					Total
Noise Pollution	Air Pollution	Oil Spillage/Land Pollution	Busy Traffic	Risk of Fire Outbreak	
15(7.1%)	17(8.1%)	0(0.0%)	11(5.2%)	0(0.0%)	43(20.5%)
2(1.0%)	2(1.0%)	0(0.0%)	1(0.5%)	1(0.5%)	6(2.9%)
4(1.9%)	1(0.5%)	0(0.0%)	0(0.0%)	0(0.0%)	5(2.4%)
30(14.3%)	16(7.6%)	4(1.9%)	0(0.0%)	2(1.0%)	52(24.8%)
0(0.0%)	3(1.4%)	0(0.0%)	0(0.0%)	0(0.0%)	3(1.4%)
55(26.2%)	28(13.3%)	7(3.3%)	2(1.0%)	0(0.0%)	92(43.8%)
8(3.8%)	0(0.0%)	0(0.0%)	0(0.0%)	1(0.5%)	9(4.3%)
114(54.3%)	**67(31.9%)**	**11(5.2%)**	**14(6.7%)**	**4(1.9%)**	**210(100.0%)**

SOURCE: FIELDWORK, 2018