Perception of fire safety in properties adjoining filling stations in Lagos State

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Abstract

Purpose -. Following recorded fatalities in and around Petrol Filling Stations (PFS) in Nigeria, this research explores the perception of fire safety among users of properties adjoining PFS in Lagos State towards understanding their preparedness for, or adaptability to possible disasters.

Design / Methodology / Approach

Qualitative and quantitative techniques were adopted, choosing the identified 17 PFS in the study area. Total of 154 properties around these locations were also purposively sampled for primary data collection. Secondary data were obtained from relevant town planning sources and official documents of the DPR.

Findings *– The respondents had co-existed with adjoining PFS for upwards of 7 years. Location of PFS did not fit into the cityscape plan. Most PFS did not comply with minimum locational requirements. Threats to life and properties had been continuous while property users are not well informed about hazard insurance.*

Research Limitations *– The study collected data from PFS operators, and user sides. DPR was not heard out, regarding operational procedures. The level of fire insurance policy required by the occupiers of adjoining properties was also not addressed.*

Theoretical / Social / Practical Implications*- PFS locations did not conform with the city landscape plan. The perception of fire safety was also significantly different between the two respondent-groups. The study recommended proper monitoring of siting of PFS by the DPR and mandatory compliance to Town Planning laws by operators.*

Originality / Value *– The dangers being perennially anticipated by users of premises adjoining filling stations were highlighted. Measures are required to ameliorate the hazards.*

Keywords: Fire hazards, Hazardous gas, Petroleum stations, Planning regulations, Respondents' perception,

1.0 Introduction

Efficient land use planning plays a vital role in ensuring public safety in the midst of natural and artificial risks in the human environment (Smith, 2004). In recent times, the impacts of human activities on the environment have intensified so much due to increasing population and accompanying industrial activities. Among the list of facilities for driving the industrial activities is that of fueling. At the core of the need for mobility and running the wheels of urban living and livability is the petroleum service station. Afolabi et al (2011) sees petroleum service station as a facility where fuel and automobile lubricants are dispensed. The fuels sold at these stations include premium motor spirt (PMS) or petrol, liquefied natural gas (LNG), automotive gas oil (AGO) or diesel, and dual-purpose kerosene (DPK). These, as mixtures of many organic substances could present fire explosion, health and environmental hazards when they are mishandled. Owusu-Sekyere et al (2021) posited that petroleum station is a key driver of economic growth. They are

not only indispensable in modern technological society, but are also the lifeblood of modern appliances.

Taylor et al (2016) had detailed consequences of unbridled siting of petrol stations on the ecosystem and adjoining properties because of the volatility of chemical constituents of the products. The possible risks of fire and/or explosion had been given prominence in this case. Thus, the occurrence of petroleum filling stations in close proximity to residential and other properties in many parts of Lagos State (Akaninyene & Ogunbanwo, 2023) and the attendant risks, among others, raised some research questions. Foremost is querying the factors which influence the location of petroleum stations as well as the level of compliance of these to established planning standards in the study area. Further, the environmental hazards posed by such stations and the perception of these by occupiers of properties adjoining these stations deserve an enquiry.

While some works (including Afolabi et al 2011; Mshelia et al 2015) had been done on petroleum stations in the study area, the core of the emphasis was on their effects on property values. Even Ilechukwu and Adesiyan (2022) on hazards of location of PFS focused more on oil leakage and possible environmental diseases, treating fire as only an offshoot of oil leakage. A direct measurement of the respondents' perception of fire safety and implications on properties adjoining petroleum stations have been left out. Elsewhere across Nigeria, hazards including fire and attendant loss of life and property have been the natural consequence of explosions in petroleum stations. Occurrences include those of fatalities reported by Rivers, Oyo as well as Osun States Fire Service Departments over recent years past (Ogunmosunle, 2013).

This research answers questions relating to the level of compliance of petroleum stations with policy standards, their impacts on health, safety and especially the perception of the respondents about petroleum-based fires. The paper is structured into sections including introduction, literature review and methodology. The others were those of presentation and analysis of research data, as discussions, perception test and recommendations were subsequently taken.

2.0 Literature review

A petroleum station is one where petroleum products directly consumed by internal combustion mechanical devices operated by man in his operational processes are stored and dispensed to buyers. Among the common products dispensed by these stations are Premium motor spirit (PMS) popularly called petrol, Automotive gas oil (AGO), diesel and Dual Purpose Kerosine (DPK), Kerosine.

While the development of filling stations had started in Nigeria before independence, Udoh (2013) confirmed that the rate at which they came up only became amplified in the late 1960s across the country and Africa in general. The spiral increase in population of African cities, according to Owusu-Sekyere et al (2021), necessitated a corresponding rise in the rate of ownership of machines requiring fueling which in turn called for a rise in the need for fuel services. Thus, the continued increase in the use of such mechanical devises tremendously impacted the rate at which relevant petroleum products and services are consumed. This in turn, necessitated the availability of these products at convenient locations within the landscape of human settlement. The need for such availability coupled with the supporting business motives in rendering such services, often led to

what Afolabi et al (2011) had seen as a trade-off and compromise in the considerations of the minimum safety requirements for location of the service stations.

All the products involved here are regarded as flammable just as every work process around them generates its own hazards (Ahmed et al, 2012). It thus, becomes pertinent that locations and operations at these stations should follow guidelines provided by relevant regulating bodies (Oloko-Oba et al, 2016). However, Ogunyemi et al (2017) opined that the optimisation of locational requirements for stations and some other public facilities had remained a task for town planning as a result of which some urban dwellers are exposed to hazards. In fact, the speed of urbanization in some African communities was faster than planning schemes could respond to (Owusu-Sekyere et al, 2021).

Odipe et al (2018) confirmed the observation of many other authors regarding the increasing preponderance of filling stations across city cityscape as mostly fraught with irregularities in locations near residential and similar infrastructures. In the same vein, Abdullahi (2012) observed that, resulting from space constraints, many filling stations in Lagos State, for example, were built without conforming to any statewide master plan but just where land was considered available. Thus, scarcely had the usually prescribed guidelines been strictly followed in most cases of filling station development therein. It is therefore not unexpected that the stations would constitute potential dangers to properties of various uses around their locations (Mshelia et al, 2015).

The Department of Petroleum Resources (DPR) is a Nigerian Government arm vested with the statutory powers to ensure that the laws, regulations and relevant guidelines in the operations of the oil and gas operations, including those of retail stations, are complied with. The DPR has monitoring, supervisory and controlling authority over all operators across the petroleum value chain in Nigeria (https://www.petrolplaza.com/organisations/2397). This is in addition to ensuring conformity of the operations to prescribed health and safety standards. It also stands, among other things, to advise the Government of the Federation on matters impacting the public on petroleum matters. The operations of DPR are premised on the risks posed by the volatility and flammability of hydrocarbons especially when subjected to the harsh environment of handlings at the stations (DPR, 2020). This, according to DPR was to highlight the attendant operational risk as well as statutorily obligate the operators to minimise accidents to “as low as reasonably practicable”. The Department highlighted the purpose of safety, its important features as well as types of safety cases in petroleum facilities life cycle in its operations.

The commonest hazard in the filling stations is fire or explosion. According to Akaninyene & Ogunbanwo (2023) fire results from exposure of combustible substance to heat above its flash point. The outcome is usually a disruption on business, a harm to human lives as well as the environment. Furthermore, Ogbonna & Nwaogazie (2015), as mentioned by this source saw fire as a major work place hazard which results mostly from faulty appreciation of safety preparedness. The major fault here is usually a leakage of oil vapour occurring mostly in the processes of unloading, gauging, oil filling and tank cleaning (Zhang, 2014). This source further clarified that petroleum products are very susceptible to kindling fire as they easily produce static electricity in the course of transportation and mixing. In this process, the accumulation of static energy could be exacerbated, explaining why fire accidents occur during transportation to, and discharge at the

stations. In the prevention of fire occurrences, Zhang supported the consistency of locations with planning rules as well as environmental protection policy among other things.

3.0 Research Methodology

This research is a cross-sectional survey in which qualitative and quantitative techniques were adopted. Yaba Lagos was the focus of the study. Located as a subdivision of the old Mainland Local Government area, it is a very populous and central area of Lagos state. It contains many public institutions, market sites, and large residential contents as well as interspersed petroleum stations typical of the state. The Yaba-zone houses 17 filling stations, some of which were captured in the Geographical Information System (GIS) -generated map below, attached as Figure 1 below.

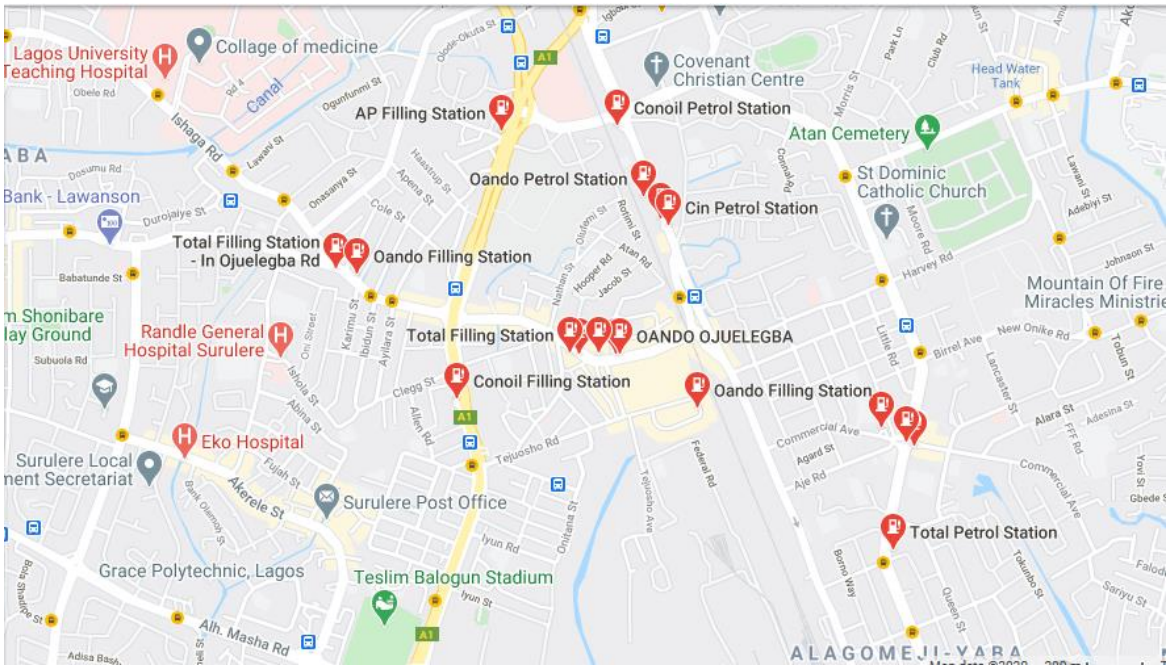

Figure 1: GIS-generated map of the study area

All the 17 petroleum stations identified in the study area were chosen for the study. A total of 154 properties around these locations were purposively sampled for administration of questionnaire and follow-up interviews as the respective situations demanded. The purposive sampling approach became necessary because of the sensitive nature of the study and the usual Lagos residents' suspicion of research enquiries. Close ended questions were asked in the questionnaire while open-ended interview guides were utilised to elicit information on the opinion of respondents regarding apprehensions in the occupation of properties around the service stations. The required primary data as collected with the questionnaires and follow-up interviews included those in respect demographic details of respondents, operational or/and strategic mechanisms in the stations, as well as fire prevention and mitigation measures thereon. Others concern the reactions and perception of occupiers around the stations regarding fire safety. The questionnaires were in two (2) formats, each made respondent-group specific. One was for the PFS operators and the other for users of adjoining properties. These, however, contained areas of similarities in respect of demographic details and fire safety perceptions. Secondary data about locational compliance of the stations were obtained from relevant town planning sources and official documents of the

Department of Petroleum Resources (DPR) regarding siting and supervision of petroleum stations. The data collected were coded and inputted to computer-aided SPSS Version 23.00 for descriptive and inferential analysis using frequency, ranking, percentage and means. Independent-samples t-test was utilised in the comparison of perspectives of fire safety by the two respondent-groups (Petroleum Station Operators and the Occupiers of Adjoining Properties)

4.0 Analysis and discussions

The data collected for this study were analysed with the Statistical Package for Social Sciences (SPSS) Version 23.00, using descriptive and inferential tools. A composite total of 171 copies of questionnaire were administered on respondents. The breakdown comes to 17 petroleum stations and 154 on residents of their adjoining properties. Only 16 out of the 17 questionnaires served on the petroleum stations were received as well completed for coding and analysis. This represents 94.12% response rate. The adjoining properties returned 119 out of 154 representing a response rate of 77.3%. In respective cases, the responses were adjudged high and adequate for the study.

4.1 Demographic details

The demographic details of the respondents were as herein following presented. The respondents were in two groups namely the Operators of the Petroleum Filling Stations and the Residents/occupiers of adjoining properties. For the sake of uniqueness, only respective station managers were chosen for service of questionnaires. Also, householders in the adjoining properties were approached for purpose of filling their questionnaire.

4.1.1 Age and Education of respondents

The details of age and education of the respondent groups were as summarised in Table 1A and B below.

TABLE 1A: Respondents' demographic details (Petroleum Station Operators)

Research Parameters	**Frequency**	**Percentage (%)**
A. Age (in years)		
20 - 30	2	12.5
31 - 40	8	50
41 -50	5	31.15
51 - 60	1	6.25
Above 60	0	0
Total	**16**	**100**
B. Education level		
Below HND/BSc	7	43.75
HND/BSc	8	50
Above HND/BSc	1	6.25
Total	**16**	**100**

In the table above, the ages of respondent-group I (Operators of the Petroleum filling Stations) were given in ranges. In terms of educational qualifications, HND/BSc being an equivalence of college degree, had been taken as a standard of measurement. The table revealed that on this side of the divide, the frequencies in age-grouping range vary between 2 (12.5%) in the bracket of 20-30 years and 1(6.25%) within that of 51-60 years. This shows that mostly people in the active working age bracket are involved in management operations of petroleum filling stations in the study area. Going by the Chapter 2, Section 8, subsection 10(i) [i.e. 020810(i)] of Nigerian Federal Government Public Service Rules (2008) at page 23, the formal retirement age from public services in the country is 60 years. Among these petroleum station operators, the recorded education level in the varying duty categories showed that those with education levels below HND/BSc were 7(43.75%) with 8(50%) having a standard HND/BSc. Only 1(6.25%) had above HND/BSc formal educational status.

The summary of demographics on the side of the respondents from adjoining properties was as shown in Table 1B below.

TABLE 1B: Respondents' demographic details II (Residents/Occupiers of Adjoining Properties)

Research Parameters	**Frequency**	**Percentage (%)**
A. Age (in years)		
20 - 30	8	6.72
31 - 40	19	15.97
41 -50	31	26.05
51 - 60	49	41.17
Above 60	12	10.08
Total	**119**	**100**
B. Education level		
Below HND/BSc	54	45.4
HND/BSc	45	37.8
Above HND/BSc	20	16.8
Total	**119**	**100**

The Table 1B above showed that different number of persons belonged to the various age grades. While 8 out of the 119 respondents (6.72%) belonged to the 20-30 years age bracket, 31 (26.05%) were in age range 41-50years just as 12(10.08%) were above 60 years of age. They were either house residents, commercial-centre operators or occupiers of mixed-use properties. Only one person, in the respective cases, was picked for the survey. Respondents of these age ratings were expected to understand the subject of study and offer reasonable response to enquiries. The recorded educational status in the adjoining properties featured more frequencies at the various levels than at the filling stations as shown in the table. As many as 54(45.4%) had below the

BSc/HND mark while 20 (16.8%) had educational qualifications above it. With the recorded formal educational levels in both cases, the respondents are deemed well-learned and informed enough to understand safety from the perspectives of policy provisions, compliance and mitigations.

4.2 Length of occupational experience

The respondents were asked how long they have operated in, or occupied the studied locations on a scale of four options: 0-3years, 4-6years, 7-10 years and above 10 years. The outcome of the quest of the occupational experience by both petroleum station operations and the occupiers of adjoining properties, was as contained in Table 2 below.

TABLE 2: Occupational experience of respondents

Parameter	Frequency	Percentage
A. Years of operation (Stations)		
0 - 3 years	0	0
4 - 6 years	0	0
7 - 10 years	2	12.5
Above 10years	14	87.5
Total	**16**	**100**
B. Years of engagement (Operators)		
0 - 3 years	1	16.67
4 - 6 years	3	18.75
7 - 10 years	9	56.25
Above 10 years	3	18.75
Total	**16**	**100**
C. Residents' length of stay in the area		
0 - 3 years	18	15.1
4-6 years	30	25.2
7 - 10 years	31	26.1
Above 10 years	40	33.6
Total	**119**	**100**

From the Table, all the stations have been corporately operating at the respective locations for upward of 7 years. In fact, the bulk of them (14 representing 87.5% of 16) had been there for more than 10 years. The operators at the stations, however, showed a somewhat recent experience. One of them (16.67%) had only been engaged at the location for between 0-3 years while 9 (56.25%) had been there for not more than 10 years. Similarly, 3 (18.75%) had been engaged at their respective stations for above 10 years. Generally, therefore, most of the operators had been engaged at the respective study area for a period long enough to accord them the experience of operational conditions and possibly hazards thereon. Meanwhile, 18 (15.1%) of the occupiers of adjoining properties had been around for between 0-3 years just as 30 (25.2%) had spent between 4-6 years there. A bulk of 40 (33.6%) agreed to having been there for above 10years. These residents have been on ground for substantial number of years to be able to have some cumulative impressions about the petroleum stations.

4.3 Characteristics of stations relative to the adjoining properties

The summary of land use types and spacing between properties and the stations are as contained in Table 3 below.

TABLE 3: Land use and spacing of station from adjoining properties

Parameter		Frequency	Percentage
A. Land Use			
	Residential	49	41.18
	Commercial	34	28.57
	Mixed use	39	32.77
	Total	**119**	**100**
B. Distance of adjoining properties to filling Stations			
	Below 50 m	85	71.43
	51 - 100m	21	17.65
	Above 100m	13	10.92
.	**Total**	**119**	**100**
C. Setback from road intersection			
	Below 30m	110	92.43
	31 - 60m	8	6.72
	Above 60m	1	0.84
	Total	**119**	**100**

From the Table above, the properties adjoining the petroleum stations were of varying types. Of the studied 119 properties, 49(41.8%) were residential while 34(28.57%) were commercial units. However, the remaining 39 (32.77%) were of mixed uses. The implications of these concern continuous use of these properties at most parts of the day, even when operations of the stations were on. The distances of the filling stations were seen, in the table to be less than 50m away from 85(71.43%) of the 119 properties. They were within 51-100m of 21(17.65%) of the properties. Also, 13 (10.92%) of the properties were found to be within 101-150m distance away from their adjacent filling stations. Furthermore, 110 (92.4%) of the adjoining properties had setbacks of less than 30m from road intersections while the remaining `8 (6.72%) had between 31-60m setback. Looking at these distances became imperative in order to see the level of compliance with safe distances specified in planning proposals. From these figures, however, the level of contraventions appeared abysmal.

4.4 Compliance level of filling stations with established principles

The Department of Petroleum Resources (DPR) had had in place, some established requirements for setting up filling stations. The overall consensus of the respondents confirmed the levels at which these provisions were complied with by the studied filling stations. The assessment of compliance level with some ten (10) critical stipulations of the DPR was as captured in Table 4 below.

TABLE 4: Compliance level of stations with established guidelines

Criteria	Mean	Ranking
LEVEL OF SIGNIFICANT COMPLIANCE:		
Stations should be located within a growth centre or an urban area except in circumstances where it can be shown through appropriate studies that the need exists otherwise	4.89	1st
Stations should be erected on level rather than sloping site to prevent rolling or discarded materials such as cans, drums, etc.	4.76	2nd
Canopies and supports over pumps and service equipment when located less than 6m from interior residential plot lines or building should be constructed of non-combustible materials	4.66	3rd
Buildings are to be located a minimum of 12m from road property boundaries to provide adequate area for maneuvering of vehicles in the area	4.34	4th
Filling stations will not be allowed in any are where the traffic situation is such that it will cause obstructions in entering or leaving a station or on tight curves where visibility is not adequate	4.21	5th
LEVEL OF MODERATE COMPLIANCE:		
No fuel pumps or other mechanical equipment shall be installed so as to permit servicing of motor vehicles standing in a public street or highway	3.38	6th
When sited in shopping centres, stations should be located in an isolated area of the development as long as planning criteria are met, example, set back	3.30	7th
LEVEL OF NON-COMPLIANCE:		
Stations should be located at a minimum of 100m from any public institution such as schools, churches, public libraries, auditoriums, hospitals, public playgrounds etc.	1.89	8th
Petrol pumps shall be located a minimum of 30m from any residential building	1.42	9th
Distance between one petrol station and another is a minimum of 150m. Area of land to be developed should be sufficient to tallow maneuvering of vehicles within its curtilage but should not be less than 1100m2 with a minimum frontage of 9m on the primary street.	1.34	10th

The Table above highlighted three levels of compliance with the requirements. These could be seen as those of significant, moderate and non-compliance levels. In the first level of significant compliance are those requirements which elicited means ranging top-down from 4.89 to 4.21 which were ranked on the table from first (1^{st}) to fifth (5^{th}). At the second level (moderate compliance) are those with means ranging, as before, from 3.38 to 3.30 in the sixth (6^{th}) and seventh (7^{th}) positions. The level of non-compliance featured means ranging from 1.89 to 1.34 in the 8^{th} to 10^{th} positions.

4.5 Appraisal of fire safety measure expectations at stations

The respondents were requested to appraise some key measures in fire prevention at the stations which could affect the adjoining properties. The measures include those of tactical, preventive as well as reactive approaches. A summary of appraisal of such measures recorded the means and rankings given in Table 5 below.

TABLE 5: Appraisal of fire prevention measure expectations at the stations

Criteria	Mean	Ranking
Safety training of workers prior to engagement and in employment	4.76	1st
Periodic maintenance of plant and pumps	4.51	2nd
Checks on underground tanks	**3.76**	**3rd**
Fire alarm and detection	3.23	4th
Sufficient firefighting equipment	2.13	5th
Sufficient first aid equipment	**1.45**	**6th**
Workers' use of personal protective equipment	**1.21**	**7th**
Allocation of protective equipment to workers	**1.08**	**8th**

The table shows various means and ranking of the fire safety measures expected at the stations. As seen by the respondents, the training of the workers on causes, prevention and management of fire was ranked first with a mean response average of 4.76 on a scale of 5. The provision of fire alarm and facilities for detection of fire recorded a mean figure of 3.23 at the fourth (4^{th}) position while the allocation of fire protective equipment was rated least with a mean figure of 1.08 at 8^{th} position. It would be seen here that the stations had been tactically prepared for possible fire outbreak. The efficacy of these preparations, however, becomes a test or/and evaluation upon any occurrence of hazard.

4.6 Respondents' reactions to locational closeness to petroleum stations

Various opinions were expressed by the respondents regarding the general feelings and reactions to living, working or engaging in related occupation of sites adjacent to filling stations. A summary of the means of opinions is contained in Table 6 below.

TABLE 6: Respondents reactions to spatial locations adjacent to Petroleum Stations

Opinion	Mean	Ranking
I don't feel safe living close to a petroleum station	4.87	1st
Stations should not be cited close to residential environments	4.75	2nd

Opinion	Mean	Ranking
Periodic inspection of stations by DPR should ensure strict compliance	**4.71**	**3rd**
Petroleum stations should be designed to forestall fire outbreak	**4.34**	**4th**
Fire outbreak at petroleum stations will greatly affect adjoining residents	**4.14**	**5th**
There is usually dearth of adequate firefighting equipment in petroleum stations	**2.45**	**6th**
Petroleum stations should only be sited at the suburbs	**1.32**	**7th**

From the table above, the biggest concern of the respondents was the fear of fire safety at the locations close to petroleum stations. This recorded a means figure 4.87 as was ranked 1st among the other responses. Ranked at the second position with a means value of 4.75 was the expression of prohibition of stations locating close to residential environments. The wish that DPR carried out periodic inspection of stations to ensure compliance with safety measures came up at the third position, with a means figure of 4.71. At the fourth place with a mean figure of 4.34 was the notion that the design of petroleum stations should forestall fire outbreak. Similarly, at the bottom of the mean figures was 1.32 recorded in the opinion that petroleum stations should only be sited at the suburbs where human close contact would be sparse. The only measure standing in the gap here to stem the apprehensions are perhaps the tactical measures put in place by the PFS operations.

4.7 Group perceptions of fire safety

In the bid to compare the perception levels of fire safety by 'Petroleum Station Operators' and the 'Occupiers of Adjoining Properties', an independent-samples t-test was carried out. The report is as summarised in Tables 7A and B below. The Table 7A shows the group statistics while the counterpart displays those of Independent Samples Test.

TABLE 7A: Group Statistics

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Overall Perception of Fire Safety	Petrol station operators	16	2.94	.772	.193
	Adjoining ppty occupiers	119	3.68	.503	.046

From the above table the group statistics showed the mean and standard deviation of the groups, as well as confirmed the respective number of respondents in each case (16 and 119 respectively). The mean and standards deviation figure in respective cases were 2.94 and .772 (Petrol Station Operators) while those of Occupiers of adjoining properties stood at 3.68 and .503. The standard

error Mean figures were also shown for the respective groups. There were no missing values for any of the groups.

The table 7B below shows the outcome of independent-samples test. From the Table, two segments stand displayed namely the Levene's Test for Equality of Variances and t-test for Equality of Means. The result of Levene's test for Equality of Variances is the determinant of the applicable t-values. In this test, the first line (Equal variances assumed) was applicable, according to Pallant (2020), as the test returned a value of .053, which is greater than the stipulated threshold of .05. The use implies that the assumption of equal variances was not violated.

TABLE 7B: Independent-Samples Test
Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Difference	
									Lower	Upper
Overall Perception of Fire Safety	Equal variances assumed	3.818	.053	-5.167	133	.000	-.743	.144	-1.028	-.459
	Equal variances not assumed			-3.746	16.755	.002	-.743	.198	-1.162	-.324

Thus, the t-test for Equality of Means returned a sig.(2-tailed) value of .000 indicating that there is a significant difference in the mean scores on the dependent variable (Overall perception of fire safety) for the groups (Petroleum Station Operators and Occupiers of Adjoining Properties). The table additionally indicates the mean difference between the groups along with 5% margin of error ($p < 0.05$) showing both the upper and lower values. There was therefore, significant difference in mean scores of perceptions for 'Petroleum Station Operators' (M 2.94, SD= .772) and 'Occupiers of Adjoining Properties (M= 3.68, SD=.503).

5.0 Conclusion and recommendations

The study found that majority of the sampled residents have occupied the study area for between 4-6years while some had even been there for upwards of 10 years. The stations on the other hand, had been operating at the respective locations for not less than seven (7) years. Similarly, the location of the stations did not demonstrate a fit into any particular city landscape plan but simple identification of 'suitable' parcel of land in search of investment opportunity. Thus, the dangers and perceptions expressed by the respondents are not new developments. Rather, the respondents had helplessly learnt to cope with them rightly or otherwise. The properties within the catchment

areas of these stations have been such that occupancy was of perennial nature without the possibility of any seasonal risk-free moment gaps. This shows that the threats to lives and properties had been continuously under hazardous anticipations, even in an atmosphere where property owners are not well informed about hazard insurance.

Further findings from the study revealed that the perceptions of fire safety differ between the operators of the petroleum stations and the occupiers of adjoining properties. Similarly, an estimated bulk (total of 89.08%) of the filling stations did not comply with setback standard to adjoining land use. As many as 92.43% of the identified filling stations maintained a setback of only 30meters from the road intersection as against the prescribed minimum standard of 100 meters. It was, however, found that the management of these stations, being aware of the implications of their contraventions, had engaged in tactical activities of training their workers prior to engagement and during active employment as well as carrying out periodic maintenance of plants and pumps, underground tanks check and providing fire alarm and detection systems. Fire-fighting equipment systems were also found to have been installed in significant numbers in the sampled stations to combat fire outbreak.

There is need for government and its agency saddled with the responsibility of issuing license and supervising the operation and compliance of filling station operations to do its utmost best to prevent the manifestation of the hazards already envisaged by respondents. Issuing certificate of compliance should be a minimum irreducible requirement for operation of filling stations. The involved filling stations need to re-strategise towards correcting the present anomalies as much as possible. The DPR should keep existing developments under constant monitoring while future planning and developments should be subjected to the primary provisions of the requisite laws. Among other things, the extent to which adjoining properties are insured against hazards could constitute an area of further research from this work.

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