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To cite this article: O.C. Oloke *et al* 2022 *IOP Conf. Ser.: Earth Environ. Sci.* **993** 012004

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# Assessment of causes and control of fire disaster in Arepo neighbourhood, Ogun State, Nigeria

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**Abstract.** This study examined the occurrence of fire disaster in Arepo community of Obafemi-Owode Local Government Area of Ogun State with emphasis on residential buildings. Questionnaires were administered to 210 adult residents of the neighbourhood while only 150 valid questionnaires are subsequently used for the analysis. Responses were measured on 5-Point Likert scale while the mean score, relative important index as well as frequency and percentages were also used for the analysis. Results were presented with Tables and charts. The study found that residential fire disaster ranked 2<sup>nd</sup> among the six segments/object of fire disaster that had occurred in the community. It was further observed that faulty electrical appliances, carelessness and faulty cooking gadget ranked 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> among the causes of residential fire outbreak in the neighbourhood and that majority of residential housing units are ill-equipped against fire outbreak within the residential neighbourhood in the community. The study therefore concluded by suggesting that government provide firefighting station in the community of Arepo and that the general public has to be enlightened on the importance of providing active firefighting equipment such as fire alarm system, smoke detector, flame detector, heat detector fire extinguisher etc. in their homes.

**Keywords:** fire disaster, extinguisher, residential, community, fire control

## 1. Introduction

Fire is described as the phenomenon that occurs whenever a combustible material comes into contact with oxygen and emits out light, heat and smoke. It is the chemical reaction that occurs when heat stored in a flammable item is released together with light and smoke [1]. Fire is one of man's greatest findings but can also be a source of hazard. The numerous benefit of fire often suppresses the massive destructive ability it possess which threatens a nation's delicate economy. Fire outbreak is one of the worlds' most rampant and damaging disasters and has been a serious and recurring issue especially in the developing countries. This disastrous impact of fire to the environment and economy has attracted attention to strategies to prevent, control or eliminate it when it occurs. In Europe, it was estimated that 8 out of 1,000,000 people are killed annually and more are hospitalized due to fire incidence [2]. The collapse of the world trade centre and death of over 2,000 people was as a result of the fiery fire that engulfed the building [3]. Over the years and in recent times, cases of fatal fire disaster have been reported in different parts of Nigeria. For example, in 2015, there was an outbreak break of fire in a



public all-girls school in Jogana, Kano state which led to the death of seven schoolgirls and injured 21 others [4]. The National Emergency Management Agency (NEMA) reported that the mortality rate in Lagos state from 2009 to 2014 was at a mean percentage of 98.4 [5]. Over the last 5 years, expenses amounting to 6 trillion naira have been spent in the country just to combat this consistent fire disaster experienced in the country [6].

There are numerous causes of fire outbreak, while some are caused by mankind, others are as a result of nature. According to [7], the factors leading to the incessant outbreak of fire are blackouts, irregular discharge of electricity, overvoltage, illegal electrical connection, improper electrical fittings, use of low quality materials, using damaged generators, lack of supervision of infants in the house, keeping contaminated fuel in the domestic property, fire starters and ignorance. [8], also highlighted the causal factors of fire outbreak as dryness of weather, storage of petrol in the house or marketplace, improper discarding of cigarette stub, contaminated fuels, high voltage, abrupt electrical discharge and illegal connection of electricity. In a built up environment, preventing fire accidents totally can be very costly or even unattainable [9]. However, [10] opined that over 75% of fire outbreaks are avoidable. Consequently, necessary measures to prevent the occurrence of fire in the buildings and the neighbourhoods must be engaged to arrest the menace. According to [8], the attitude and vulnerability of the residents, reduction of inflammatory tendencies of products, design/structural safety and quick response of the fire services are vital areas to consider for a building to be fully secured from fire. The rapidly increasing population of many urban and peri-urban settlements in developing countries which has led to an uncontrolled expansion of these neighbourhoods in terms of development of different kinds of properties necessitated the review of the level of exposure to fire disaster and an assessment of the resident's compliance with fire safety requirements in building development. In view of this, this study was carried out to assess the vulnerability of Arepo community, a rapidly urbanizing fringe neighbourhood in Ogun state, to fire disaster as well as the adequacy of firefighting facilities available in residential buildings in the study area. [11] averred that the issues of environmental risk, disaster, exposure and vulnerability of neighbourhoods have gained prominence in recent discourse among policy makers, stakeholders and the public.

## 2. Literature Review

### 2.1 Urban fire risk in Nigeria

Urbanization is a process whereby people move from rural areas or the countryside to cities for permanent residence or temporary business activities. The urban populace initially reached a billion in 1961 and 2 billion in 1985, it was estimated to have surpassed 3 billion in 2002 and was further projected to have reached 4 billion in 2017 and 5 billion in 2031 [12]. Nigeria as a country has consistently been experiencing an increasing shift of her populations from rural to city areas. In the last three decades the number of people living in urban areas in Nigeria, has been growing consistently at the rate of 5.8% per annum, resulting into 48.2% living in the cities [13]. Whereas, urban areas has potentials for socio-economic growth, innovations and employment, the increasing population and movement of people exposed urban residents to the risk of daily hazards and disaster [14]. One of such risks rampant in the communities, towns and cities is the fire risk. Fire risk is described as the likelihood of fire occurrence and the outcome or degree of harm to be expected on the event of fire outbreak. According to [15], a fire event can be viewed from the perspective of harm to a cherished possession, a situation that may cause loss or harm and the probability that a loss or injury will happen. The persistent occurrence of fire disaster in most communities is often as a result of human excesses, carelessness or lack of knowledge and understanding of causes, prevention or fire control measures [16]. Improper or inadequate approach to handling fire outbreak in developing countries, inevitably results in a disaster. [17] observed that developing countries often suffer the burden of disaster due to their abysmal lack of capacity to handle it. In Nigeria, fire disasters are often caused by accidents involving vehicles, fuel laden tankers, as well as through acts of pipeline vandalism and

arson. Neighbourhood fire outbreaks that affect different kinds of properties have often been caused by electrical faults, human error or carelessness and on rare occasion, the natural causes.

## 2.2 Fire hazards in residential buildings

Globally, the constant incidence of fire in residential buildings has resulted to loss of life and properties. For example, according to the National Fire Protection Association (NFPA) in the United States, fire outbreaks attended by the fire department from 2014 to 2018, on an average caused 2,620 casualties, 11,030 injuries and \$7.2 billion monetary losses [18]. In China, the percentage of fire outbreaks in residential buildings from 2007 to 2010 increased by 39% [19]. Also in Canada, the number of residential fire that has occurred from 2010 to 2014 was up to 61,645 and these incidences resulted in 625 losses and 4,759 injuries [20]. Residential building fires do not just affect the building in question, it also affects the surrounding structures and environments and this is why the knowledge of the characteristics of combustible materials, causes of fire and places prone to fire outbreak in residential buildings is important [21]. [22] observed that majority fire outbreak in built-up neighbourhoods is caused by the actions of man while natural fire fiascos such as wildfire occur without the input of man [22]. Furthermore, domestic, industrial and chemical fires and are due to explosions caused by humans or due to machine breakdown [9]. [23] therefore classified the causes of fire in public buildings into natural causes such as lightning, wind; accidental causes such as ignition due to overheating or power surge and combustion triggered by obsessive fire setters, enthusiastic fire setters, fraud fires or acts of vandalism.

## 2.3 Residential fire control system

[23] identified three basic methods for controlling fire hazard in buildings. These are prohibition, isolation and protection. Prohibition, according to the study involves the removal of danger from the building while hazard isolation entails the removal of threats from the remaining part of the building to minimize the effect of fire. Protection involves the reduction of the dangers of fire, offsetting the hazard thereby protecting the building. Fire can also be controlled by the removal of one of the three elements that cause fire. This approach is known as starvation which involves the elimination of fuel from fire, covering to eliminate air supply and quench the oxygen content and finally cooling which ensures the removal of warmth [24]. [25] averred that the systems that need to be installed in structures in order to protect the lives and properties in such buildings are the heating and air conditioning systems, the mechanical smoke exhaust system and the sprinkler system. These facilities, fall under the category of active fire protection systems. Active fire protection is the action taken to put out fire in case of outbreak. It requires the use of fire protection components to control a fire outbreak [26]. Active fire protection systems include among others sprinklers, heat and smoke detectors which are equipped to sense, monitor or put out fire in its early stages. These are more critical in respect to the safety and security of life in any occupied building [27].

## 3. Research Methods

### 3.1 Study Area

Arepo a community in Obafemi-Owode is located in the outskirts of Lagos state and often referred to as the New Lagos. Being a typical migrant settlement, it is mostly made up of residential properties and commercial buildings that include shopping malls, a central market and places of worship. Arepo is a rapidly urbanizing neighbourhood in Obafemi-Owode Local Government Area of Ogun state which caught the attention of real estate developers when a former Governor of the state, Chief Olusegun Osoba founded Journalist Estate Phase 1 in the community. Other residential estates located in the area are Beachland Estate, VOERA Estate (Orange Estate), Journalist Estate Phase 2, Praise Hill Estate, Ya-Wahab Estate amongst others. Arepo community is one of the communities in Obafemi-Owode, located along the ever-busy Lagos-Ibadan Express which occasionally witness fatal fire accidents by the fuel laden tankers and motor vehicles. Also the presence of fuel and gas pipeline in the neighbourhood which is not only susceptible, but have been target of vandalism as well as the obvious lack of firefighting station within the neighbourhood necessitated this study and the choice of

Arepo community. Journalist Estate Phase 1 was adopted as the survey population for this study and the 420 dwelling units in the Estate was adopted as the respondent population. However, according to Nwana (1981), when the population of a research is a few hundreds, a 40% or more samples will be sufficient. Thus, 50% of the 420 housing units was adopted which gave 210 dwelling units. Invariably, questionnaires were administered to adult residents of 210 houses selected at random. A total of 157 were returned, yielding approximately 75% rate of response. However, only 150 questionnaires that were properly completed were eventually used for the analysis. Mean score, relative importance index and ranking were engaged in the analysis. Results were presented in percentages, tables, charts and discussions.

#### 4. Data analysis

##### 4.1 Questionnaire Administration and rate of response

Primary data were collected basically with questionnaires administered to 210 respondents. The response rate achieved is as analysed in Table 1.

Table 1: Questionnaire administration and response rate

Characteristics	Frequency	Percentage
Total Administered	210	100%
Total Retrieved	157	75%
Total properly completed	150	71.4%

A total of 157 questionnaires were completed returned which ordinarily constituted 75% rate of response. However, after careful examination of these questionnaires, it was discovered that only 150 were actually properly completed, which implied that the effective rate of response was 71.4%. The rate of response achieved was considered sufficient for subsequent analysis.

##### 4.2 Demographics profile of respondents

Table 2: Demographic profile of respondents

Category	Attributes	Respondents	Percentage
Gender	Male	127	84.7%
	Female	23	15.3%
	Total	150	100%
Age	31 – 40	46	30.7%
	41 – 50	91	60.7%
	Above 51	13	8.6%
	Total	150	100%
Qualification	OND/NHD	30	20.0%
	B.Sc.	69	46.0%
	M.Sc.	51	34.0%
	Total	150	100%
Occupancy status	Renter	46	30.7%
	Owner	104	69.3%
	Total	150	100%
Accommodation type	Bungalow	46	30.7%
	Flat units	34	22.6%
	Duplex	40	26.7%
	Detached	30	20.0%
	Total	100	100%
Duration of residency	1-5 years	31	20.7%
	6 – 10 years	37	24.7%
	11 – 15years	54	36.0%
	Above 16 years	28	18.6%
	Total	150	100%

The socio-economic characteristics of the respondents are summarily presented in Table 2. The Table revealed among others that 84.7% of respondents are male and the rest are female. Moreover, a total of 137(91.4%) are between 31 and 50 years old, signifying that majority of these respondents are in the prime age of self-actualization, making important decision about life and taking responsibilities. The Table further showed that a total of 120(80%) possess minimum of university's' First degree while others possess either ordinary national diploma or higher national diploma. By implication, the respondents are literate enough to understand and provide relevant responses to the issue raised in the study. The spread of occupancy status indicated that 69.3% of respondents are owners of the housing unit in the study area while 30.7% are renters. The types of property occupied include the occupants of the bungalows have the highest number of responses, followed by 26.7% and 22.7% living in duplexes and flats. Meanwhile, the duration of residency of respondents showed that a total of 82(54.6%) of the respondents have lived in the study area for more than 10years while 68(45.4%) have lived there between 1 and 10years. Thus the data derived in this study will assist to analyse the experience of the people with regards to fire incidence and preparedness of the neighbourhood at large.

#### 4.3 Incidence of fire in the study area

Respondents were requested the frequency of occurrence of fire hazards in the study area. The choice was rated on a 5-Point Likert scale of 5-Very Frequently (VF), 4-Frequently (F), 3-Not Sure (NS), 2-Rarely (R) and 5-Never (N). The mean score of the responses was determined and ranked to indicate how frequent these occur. This presented in Table 3.

Table 3: Order of fire disaster experience in the study area

Fire hazards	Total	Mean Score	RII	Ranking
Residential building fire	544	3.627	0.725	2 <sup>nd</sup>
Commercial building fire	452	3.013	0.603	4 <sup>th</sup>
Industrial building fire	368	2.453	0.491	5 <sup>th</sup>
Fuel pipeline gas	480	3.200	0.640	3 <sup>rd</sup>
Vehicle/tanker accidents	579	3.860	0.772	1 <sup>st</sup>
Educational facility	198	1.320	0.264	6 <sup>th</sup>

The segments of the neighbourhood affected that are vulnerable to fire outbreak and the frequency of incidence were analysed and presented in Table 3. The analysis showed that fire incidence due to accident by motor vehicles and fuel laden truck rank 1<sup>st</sup>, followed by residential building fire and pipeline fire which ranked 2<sup>nd</sup> and 3<sup>rd</sup> respectively. The implication of this is that fire hazards involving these portions occur more frequently when compared to other sectors of the neighbourhood. The result depicts the frequent fire hazards that are caused by vehicular accident and fuel laden tankers within the portion of the Lagos-Ibadan Expressway in the study area. The results further indicate the level of residential fire inferno and activities of pipeline vandalism in the study area.

#### 4.4 Fire control mechanisms of residential buildings in the study area

In order to ascertain the availability of fire safety system in residential buildings in the study area, respondents were requested to indicate the fire control equipment present in the house occupied by the respondents. The results are presented in Figure 1. The results showed that out of the 15 different types of fire fighting equipment listed, one-third of these are present in at least 50% of the respondent housing units and these are fire exit (100%), fire extinguisher (74.7%), flame detector (60.0%), smoke detector (62.7%) and fire alarm (56.7%). Two-third of the equipment are lacking in many houses as indicated by the less than 50% responses that indicated the availability.

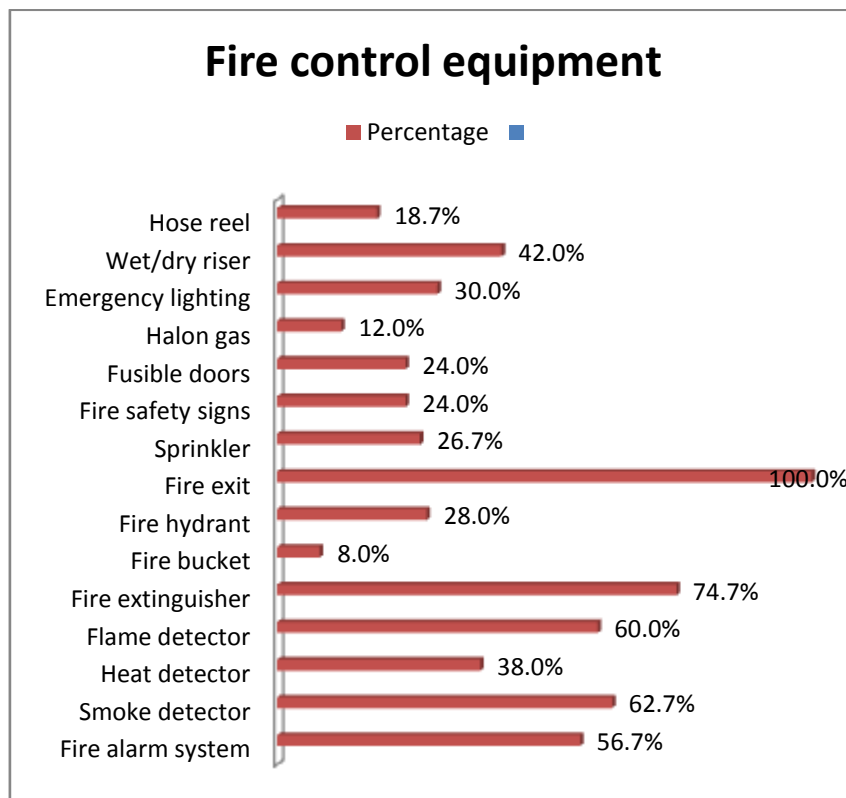


Figure 1: Fire control equipment in residential buildings in the study area

#### 4.5 Causes of residential fire outbreak in the study area

The causes of fire incidence were also investigated in the neighbourhood. Respondents were allowed to select multiple options where applicable. The result is as presented in Figure 2.

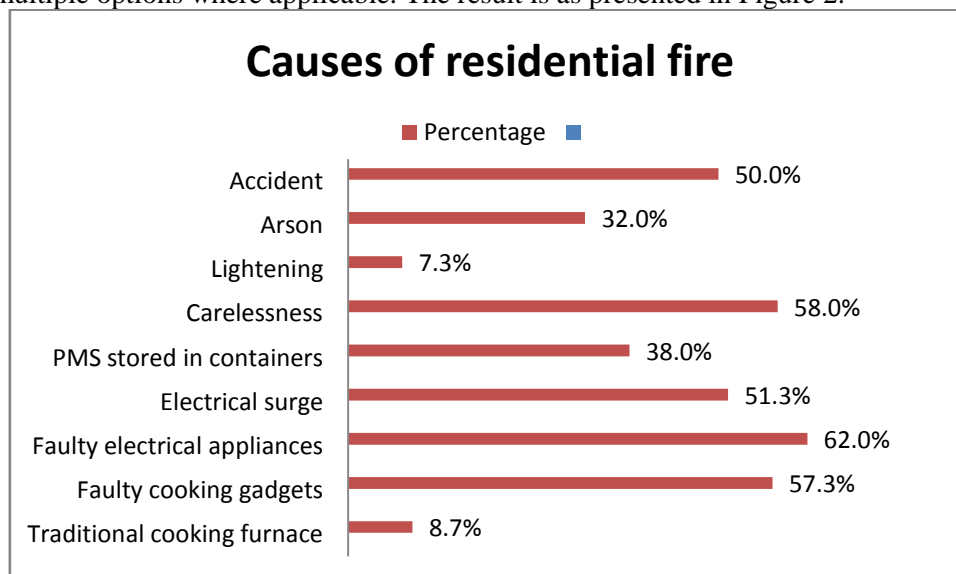


Figure 2: Causes of residential building fire

Result as presented in Figure 2 showed that there is preponderance of human activities related causes of residential building fire in the study area. Prominent among these include faulty cooking gadgets (57.3%), faulty electrical gadgets (62.0%), electrical surge (51.3%), improper fuel storage (38.0%),

carelessness (58.0%) and accident (50.0%). It was also observed that fire outbreak have also resulted from lightening and traditional cooking furnace.

## 5. Discussion

This study has shed light on the imperative for awaking the consciousness of publics and governments at various levels on the need to build capacity against fire hazards in the study area. As observed in the analysis, residential fire incidences ranked second, signifying that the study area witnesses fire outbreak in residential units more often compared to others objects or segments of the neighbourhood except the Lagos-Ibadan highway that border the town of Arepo community. The occurrence of fire hazards along the expressway is often attributed to failure or accident involving fuel laden trucks and motor vehicle. The study went further to level of preparedness of residential buildings in the study area against fire hazards. Analysis further indicated that majority of houses in the neighbourhood are ill-equipped with fire fighting instruments. Only fire exit is common to all houses among the firefighting equipment listed. Fire extinguisher, smoke and flame detectors as well as fire alarm system are among the major equipment available in most residential houses. However, the unavailability of significant number of fire prevention/control in most residences portrays gross lack of adequate firefighting system. Finally, the study revealed that the main causes of fire that affect or consume residential building in the study area are caused by human error or activities.

## 6.0 Conclusion and Recommendations

The study area is a rapidly urbanizing fringe neighbourhood. The study established that the neighbourhoods' housing stock in the study area ranked second in the rate of fire hazard, thereby calling for a proactive approach to arrest the trend and protect life and property. Furthermore, the study observed that most dwelling units are ill-equipped with fire prevention and control system which often results in huge impact in terms of loss of life and properties. The study therefore concluded that there is need for creating public awareness on causes of fire in a residential neighbourhood, fire safety requirements of a residential buildings and how to engage the equipment to combat fire incidence. Governments are equally charged to situate fire fighting station within the vicinity of the area and the surrounding communities.

## Acknowledgement

The authors wish to acknowledge the financial support offered by Covenant University in carrying out this study and the actualization of the research work for publication.

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