



Research Article

Assessment of 2021 Sokoto Central Market Fire Disaster: Geographical Perspective

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ABSTRACT

Fire has been a source of energy for the human population throughout the history. With the growing urban population in Nigeria, city infrastructures are under pressure. Markets particularly in most Nigerian cities are over congested due to poor planning and illegal allocation of space for shops. Previous experience reveals that whenever there is a fire outbreak in the market it becomes very difficult for firefighters to get access to quench as a result lives are lost and properties are destroyed. Data for this paper were collected from the Sokoto Central Market Management record containing nine major fire incidents since 1980. A sample of 134 purposively sampled respondents were collected and interviewed using a structured questionnaire. Data collected were subjected to simple descriptive statistics and inferential statistics specifically cross-tabulation. Major findings revealed that the careless attitude of shop owners (62.7%) was the main cause of the fire disaster while 55.2% attested to the fact that the magnitude of damages was the result of the distortion of the market's master plan and 22% attributed it's to the lack of functional fire service facilities and inadequate manpower in the market. The major challenge faced by 56% of traders was the loss of customers who could not find them due to their temporary relocation. The study recommended that traders should be incorporated into the post-fire reconstruction of the damaged area so that the required number of shops will be adequately captured in the distribution process. Since the human factor is the cause of most fire disasters, the study further recommended that the Fire Service Department should organize regular sensitization, seminars on the causes, and emergency prevention measures for future recurrence.

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INTRODUCTION

Fire disasters are accompanied by devastating impacts affecting both lives and properties worth billions of Naira (Kihila, 2017). In recent years the incidence of disasters has been increasing drastically in number as well as in terms of people affected and in magnitude of material losses (Modh, 2015). Generally, the increase in population in the last two decades has placed more people at risk whenever an extreme event such as a fire occurs. Globally fire contributes to the rising number of deaths and disability in the population of human beings. In Africa, the frequent occurrence of major fire accidents in commercial buildings, shopping malls, and markets has become a serious threat to the fragile economy of most countries (Philip, 2015). Markets are public places where people meet for business transactions; where almost all the basic needs of people are sold in retail and wholesale (Mubita *et al.*, 2020; Sunday, 2017). Nigeria is not exceptional where many major markets and commercial buildings, lives, and properties worth several billions of naira were destroyed by fire (NEMA, 2006). A significant increase in human settlement particularly in the urban areas had put many people vulnerable to fire-related disasters. According to Adamu *et al.* (2020), many disasters are occasioned by the rapid population growth rate, urbanization, and socio-political issues occasioned by ethnic plurality, which all, in turn, create fierce competition for national resources, that result in deteriorating livelihoods, social marginalization, crime, and general insecurity. Another opinion by Yunus (2021), that population growth and urbanization have led to over-stretching of the land and existing infrastructures as a result of an increase in human activities (social, economic, and political), demand for land, services, and

basic amenities, and market places are not exceptional.

Different population behaviours and lifestyles such as smoking and alcohol consumption can have different levels of fire risk-associated hazards (Taylor *et al.*, 2021), while Corcoran *et al.* (2013) asserted that lifestyle characteristics of localities can be used to analyse and understand fire risk levels and to identify the types of areas that are relatively more vulnerable to fire incidence than others. In urban centers due to congestion, high-density population areas are prone to fire disasters as a result of pressure, lack of planning, and nonchalant dangerous actions of residents (Popoola, 2018). The growing level of urban population negatively affects the infrastructure systems of many cities in Africa (Gernay *et al.*, 2016). Among the human and natural disasters, fire is a serious threat to the functionality of the built environment and can severely damage infrastructure. The effects of fire disaster seriously hindered long-term strategist development and caused governments to substantially modify their economic development priorities and programme by channeling the budget to the affected area (Modh, 2015). A study by investigated the influence of population density on the burnt area by exploring its spatial variability using Geographically Weighted Regression to detect the existence of critical thresholds in population density for fire behaviour using quartile regression. Another study in Gombe State Nigeria, Abdullahi *et al.* (2020) confirmed the inverse relationship between the increase in population and housing with fire service provision in the state. Understanding the progression of population behavior during a disaster can therefore improve the efficiency and appropriateness of institutional efforts aimed at population preservation after a large-scale fire disaster

(Rudenstine and Galea, 2014), while *Isa et al.* (2016) observed that simultaneous increase in population and settlement expansion of the town has a direct effect on the need to increase in emergency services.

On the classical model of density, Simmel (1971) claimed that high density causes emotional stress and that this stress produces negative social effects and attitudes toward other people. In A development (M I R Winandari *et al.*, 2021), opined that as population density increases, some environmental resources diminish which include space for activity, easy movement, privacy, quiet neighborhoods; property control, and predictability of local events decrease. On the other hand, positive aspects of the increase in density include local social resources increase, and more opportunities for informal contact and assistance because people are more easily accessible. According to Modh (2015), disaster and development are closely linked, that, disasters can destroy development initiatives, but they also create development opportunities. O'Mathúna *et al.* (2018), viewed it, as an overwhelmingly negative event. However, a more thorough analysis reveals that they do not always have exclusively negative consequences. They pointed out that disasters can provide the impetus for change that brings positive outcomes, such as changes in building practices or regulations when previous ones are shown to be inadequate and expose injustice that stimulates reform.

Trans-Saharan trade in the 15th century enabled the market to develop rapidly and also increased the population as new creativity developed. This is likely the reason behind the presence of talented migrants who migrated from other places to settle in the Sokoto Caliphate. The increase in population paved the opening of more markets. Some of the markets are satellite and temporary while

others are permanent. The central market came into being as a result of the large influx of people from different sources and urbanization, and witnessed several relocations. The first movement was carried out in 1908 during the reign of Sultan Attahiru II (Shitu 2009). Following the conquest of Sokoto in 1903. Several factors accounted for the movement of the market to its second location. The major reason was that it was located near the Sultan's palace which was visited on the market days (Fridays and Mondays) by the Europeans every week and on their way to the market, who had to pass through the palace which the sultan's palace officials did not like. The market had to be relocated to a second location place in 1909 west of the Sultan Palace and near Shehu's Mosque and Hubbare (Shehu's Tomb) called Yardole meaning forceful market Muhammad (1983). This was a piece of land belonging to the Sultan, but some traders were not interested in leaving the former marker place for the new location as it was very far from the town. There were other prominent mini markets such as Kofar Rini, Kofar Atiku, Kofar Marke, and Marina markets. These mini-markets later developed into full-flagged markets within the Sokoto metropolis. Sokoto Central market has witnessed several fire disasters since its inception on 15th March 1980 by the Late President Alhaji Shehu Shagari. The available record revealed that eight fire incidents occurred in 2002, 2004, 2005, 2006, 2012, 2016, 2020, and recent 2021. The incessant occurrence of these disasters poses a challenge to the government of Sokoto State, in particular, the people and by extension the federal government.

In recent times, the frequency of fire outbreaks in urban cities of Nigeria is alarming as there is barely a day without the occurrence of one incidence or the other

leaving in its wake the destruction of properties worth millions of naira, sometimes loss of lives, devastating impacts on human means of livelihoods and infrastructural development such as market. A high population growth rate often requires increased social expansion of social services such as fire service stations, hospitals, and markets because of increased pressure on the available land resources.

Sokoto metropolis has been experiencing very astronomical population growth, since the creation of the state in 1967. There have been very rapid increases in residential, commercial, industrial, and institutional land uses leading to the city's sprawling (Dantuni, 2012). The simultaneous increase in population and settlement expansion of the metropolis should be expected to have direct and indirect effects on the occurrence of disasters such as fire outbreaks. A survey carried out in 2021 revealed that the perimeter of the market is characterized by unplanned structures, several temporary Shops (TS), and heaps of garbage. In Africa, Nigeria is not excluded and Sokoto is inclusive the level of underemployment is very high; the majority of the urban population considers markets as an alternative place to earn a means of living. This has resulted in the uncontrolled development of a market where the traders

build on occupy any available space to display their goods and resulted in incessant fire disasters since 1980. Several studies on market fire (Sunday, 2017; Yunus, 2021) neglected to link disaster with population pressure on the existent facilities of the various market informer in Nigeria. Against this background, this study seeks to investigate the influence of the high population with respect to the 2021 Sokoto Central Market fire disaster.

Study Area

The study area is located at Latitude 13° 3' 43.2" N and Longitude 5° 13' 26.4" E with a total size of 227572.73897 square meters. The construction of the Sokoto Central Market was started by one of the military governors of Sokoto Umaru Abubakar about 45 years ago and it was completed during the time of Governor Shehu Kangiwa (Wikipedia 2021).

Record available and confirmed by the Director Sokoto Central Market. "There are about 14, 000 shops, and its location is so strategic because of its proximity to two major motor parks in the state, thus easing the movement of traders and customers, but currently with rapid construction of temporary shops is approximately 25000 shops "Figure 1 show the study area.

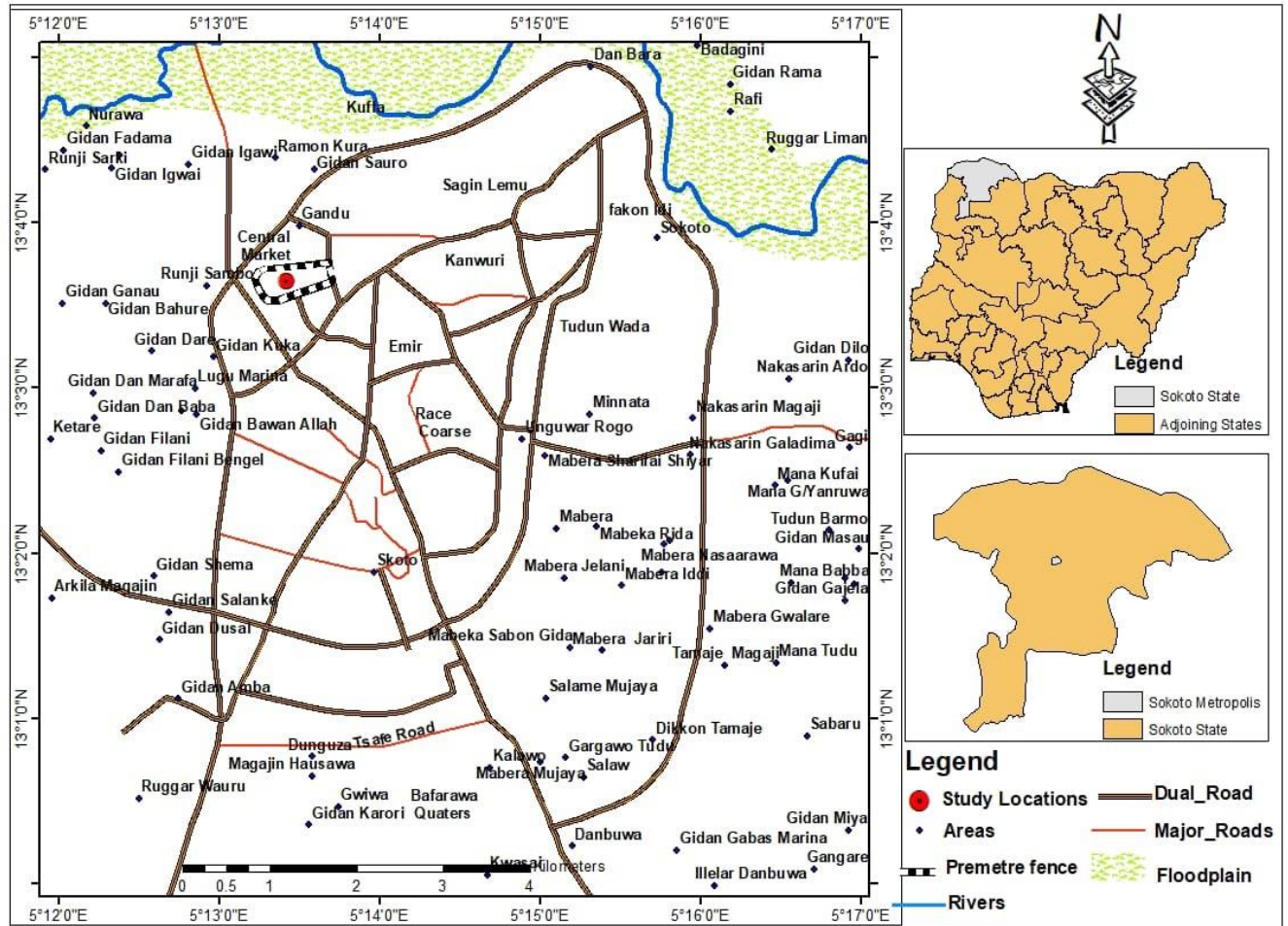


Figure 1: Study Area

METHODOLOGY

Primary and secondary data were used. The target population was the traders with an emphasis on the victims of fire disasters. A total of 4335 victims of the Sokoto Central Market fire disaster were collated from the market management committee. From which 134 respondents (victims) were purposively selected and interviewed. In administering the

questionnaires, the market was first structured into Lines A to Z, and the affected line was considered. The sampling was based on the level of damage caused by the inferno with 58 people selected from section B of the market being the most affected, 30 were selected from A section, 26 from line C, 20 from line D, and interviewed. The details are presented in Table 1.

Table 1: Affected Area and Number of Victims Interviewed

Affected Line	Respondents
A	30
B	58
C	26
D	20
Total	134

Source: Fieldwork 2021

Data collected from the field were processed and analyzed with the use of the SPSS software version 20. Simple descriptive statistics and inferential statistics (cross-tabulation for relationships were generated). The observation method was used to link the population and the nature of the fire Disaster at Sokoto Central Market. Observation is a way of gathering data by watching behavior, and events, or noting physical characteristics in their natural setting. This research technique is primarily used for qualitative

research to gather data about people, objects, events, and behaviours (Kumar, 2022). Observations can also be either direct or indirect. Direct observation was applied during the 2021 fire disaster in Sokoto Central Market. This was done through watching interactions with people processes, recording and snapping pictures, and critically looking at the behaviors of fire as they occur. Results obtained were displayed in the form of tables, and figures such as graphs pie charts, and bar graphs.

RESULT AND DISCUSSION

The gender distribution and marital status of the sample are presented in Table 2. This data shows that 107 of the total respondents were men while females constitute 27 of the respondents. For Married men and women, it shows as 82 and 3 respectively. This representation was expected since men tend to engage more in trading activities than

females in the study area. This is due to the cultural and religious beliefs of the environment where females do not engage in most business activities in the market except those from outside the region who mostly are non-muslim Furthermore; Table 2 shows that only 2 women were divorced. All these imply that the number of women with shops in the market women is few.

Table 2: Marital Status and Gender

Marital Status	Gender		Total
	Male	Female	
Married	82	03	85
Single	22	05	28
Widow	00	02	02
Divorce	00	19	19
Total	104	29	134

Source: Authors Field Work 2021

Education plays a vital role in the smooth and efficient running of every community. A low level of literacy skills may significantly limit the ability to understand and respond to fire safety messages (Philip, 2015; Comolotti, 2004). Figure 2 shows those victims who attained tertiary education accounted for

50%; thus indicating that the majority of the respondents obtained post-secondary qualifications and 7.5% Islamiyyah qualifications. A good number of the respondents have higher comparative advantages in terms of literacy level.

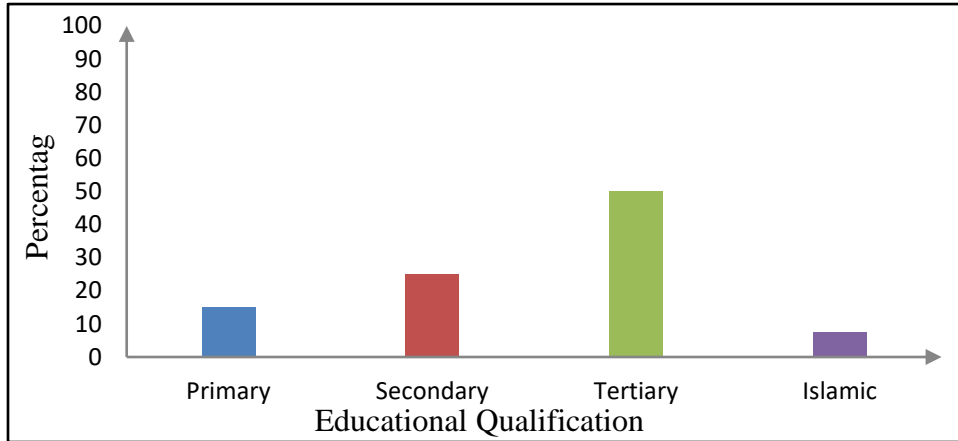


Figure 2: Educational Qualification Attained

Figure 3 shows that 44.8% and 33% of the respondents reside within the Sokoto metropolis constituting of Sokoto South, and Sokoto North LGAs respectively. Only, 22% are from another local government area with low business patronage. This is not surprising given the fact that about 70% of rural people are directly engaged in farming activities.

The findings reveals that the majority of respondent reside within the Sokoto metropolis which them more advantage of saving their properties in the event fire disaster than those that live faraway. Many of the traders during 2021were able to escape with their properties before the fire razed their shops.

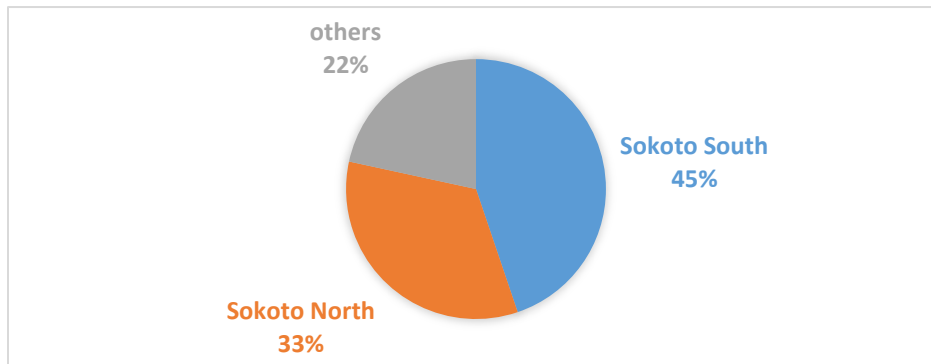


Figure 3: Local Government of Residence

Table 3, reveals that the majority of the market traders about 60 use mobile phones as

a means of passing information among themselves. Data analysis further reveals that

a total of 127 respondents heard about the fire outbreak through their GSM phones, television, market association friends, and radio broadcasting in the morning, while they were at home. This shows that the inferno

happened when the respondents were at home. Thus suggesting that a lot or complete destruction of their goods must have taken place as they were not within close vicinity of the market.

Table 3: Sources of Information of the Fire Incidence and Places

Sources of information	Place of Hearing		
	At home	Office	Total
Radio	45	00	45
Television	04	00	01
Mobile phones	60	04	64
Market association	11	01	12
Friends	07	02	09
Total	127	07	134

Source: Authors Field Work 2021

Table 4 shows that 43 of the respondents reside close to the market between the ranges of 1-5km from the market and must have come from within the Sokoto metropolis. While 49 out of the 134 came from 21 and above kilometers. A critical analysis

revealed those closer to the market suffered minimum damages compared to the people who reside far away from the market. This is because they were able to save their properties from the inferno.

Table 4: Approximated Distance of Victims' Residence from the Market and Estimated Damages

Distance from the market	Estimated damages in Naira					Total
	N100,000- N300,000	N300,000- N500,000	N700,000- N900,000	N900,000- N1,100,000	N1,100,000 and above	
Less than 1km	0	0	3	0	3	06
1-5km	1	1	0	3	38	43
6-10km	1	0	3	3	16	23
11-20km	1	3	0	0	9	13
21 km and above	0	1	1	3	44	49
Total	3	5	7	9	110	134

Source: Field Work 2021

Responding to the cause of the fire incident Table 5 shows that 62.7% attributed to the

carelessness by marketers such as failure to switch off the electrical appliance and

improper burning of incinerators. These agree with (Adamu & Yunus, 2010; Ismaila & Dankani, 2020) that human factors contribute to a higher number of fire incidents in Nigeria. This could also be related to higher number of the population having little knowledge about fire safety measures as

reported by research conducted by the Fire Disaster Precaution and Safety Awareness Association (FDPSAAS, 2010) shows a very low level of awareness of fire safety in Nigeria; less than 2% out of 140 million inhabitants of the country's population have acquired the basic fire safety knowledge.

Table 5 Major Causes of Fire Incidence

Causes	Frequency	Percentage (%)
Electrical Fault	36	26
Carelessness	84	62.7
Intentionally	05	3.7
Others	09	6.7

Source: Authors Fieldwork 2021

On the major challenge in trying to quench the fire incident was the difficulty faced by firefighters due to the very high wind velocity associated with harmattan (Table 6). This finding is in tandem with Patric (2006) that very high wind speed facilitates the rapid spread offering another location. This is also

in conformity with Agbola & Falola (2021), and Ismaila, (2014) that high frequency of fire incidents occurs during the dry season, a festive period when there is high energy usage especially fuel wood which if not well taken care of could result in a fire outbreak.

Table 6: Reasons for High Record of Damages

Reason	Frequency	Percentage (%)
High wind velocity	119	88.8
Hammatan season	15	11.2
Total	134	100

Source: Authors Field Work 2021

Water is required to put out any fire incidents availability within proximity to the sight of a fire outbreak is very important. Table 7, shows that 74.6% of the respondents said water vendors were sort for to quench the

fire. This indicates that there was no functional fire-fighting vehicle with the required water to quench the fire in the market. Thus those at the sight of the incident resulted in the use of fire extinguishers and

water vendors to quench the fire in the market. Other people around used sand to put off the fire in the market.

Table 7: Facilities Available for Quenching Fires in the Market

Facility Available	Frequency	Percentage (%)
Water Vendor	100	74.6
Fire Service	07	5.2
Fire Extinguisher	01	0.7
Others	26	19.4
Total	134	100

Source; Authors Field Work 2021

Table 8 shows that 89 victims said that they reported the incident within 10-30 minutes and 22 said 10-30 minutes to the Fire Services Department. However, a majority of the respondents affirmed that firefighters responded within 21-30 minutes, and 31 minutes respectively. A critical analysis of the responses shows there was a delay in reporting and the time taken for firefighters to respond. This could be attributed to challenges in communication that could have reduced the magnitude of damages

Table 8: Estimated Time Taken to Report and respond by Fire personnel

Respond Time	Reported Time of Fire fighters					Total
	Less than 10 minute	10-30 minutes	31-45 minutes	46- 1hour	Hour and above	
5-10 minutes	00	01	00	00	00	01
11-20 minutes	00	01	01	01	00	03
21-30 minutes	01	22	07	00	00	30
31 minute and above	00	65	32	01	02	100
Total	01	89	40	02	02	134

Source: Authors Field Work 2021

Table 9 shows that 123 of them reported that it took the firefighters up to 5hours and above before they could put off the fire and bring it under control. Furthermore, only nine (9) subscribe to the fact that it took the firefighter less than 4-5 hours before the fire could be quenched. This indicates that it took the firefighters long before they brought the fire under control. It resulted in the destruction of properties worth billions of Naira.

Table 9: Respond Time and Duration Fire Control

Reported Time	Control Time				Total
	Less than 1 hour	2-3 hours	4-5 hours	5 hours above	
Less than 10 minute	00	00	01	00	01
10-30 minutes	01	00	06	82	89
31-45 minutes	00	00	01	39	40
46- 1hour	00	00	01	01	02
Hour and above	00	01	00	01	02
Total	01	01	09	123	134

Source; Authors Field Work 2021

Figure 4 indicate that 63.4% of the victims affirmed that the performance of the firefighter personnel was satisfactory as they professionally handled the fire. As such the damages or losses caused were not due to the poor performance of the fire personnel, but

that they were not well equipped, with the required facilities such as Carbon dioxide extinguishers, emergency communication system, Halo vaporizing extinguisher, and life detectors.

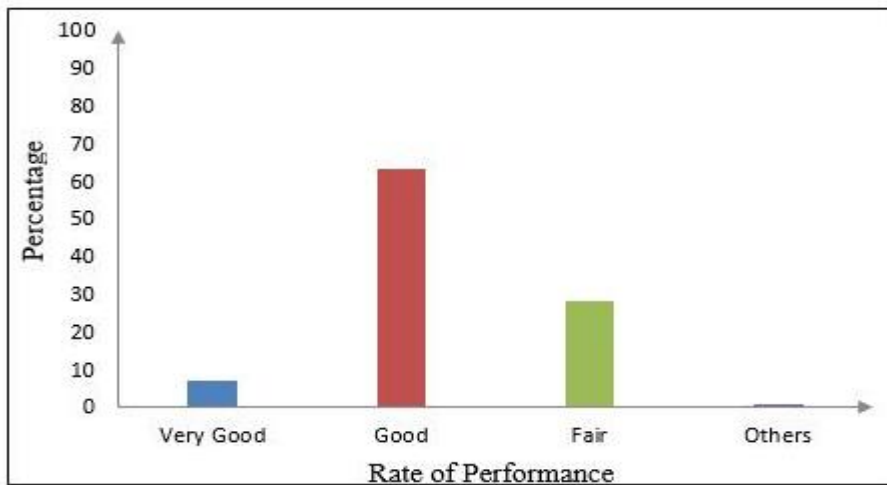


Figure 4: Performance of Fire Fighter Personnel

Table 10 shows that 55.2% of the respondents thought that the main reason why the firefighters spent much time was that the market’s master plan was distorted and as such did not allow them free movement with

their vehicles. Only 3.7% of respondents opined that the delay was because people were in-patient trying to save their properties. These are in line with Corcoran *et al.* (2013) that lifestyle characteristics of localities can

be used to analyses and understand fire risk levels. Other important findings are the congestion of shops especially temporary

shops that were not part of the initial part of the master plan which did not allow the free movement of vehicles to put off the fire.

Table 10: Possible Factors that Prolonged the Fire to be controlled

Reason/Opinion	Frequency	Percentage (%)
People are in-patient in trying to save their properties	05	3.7
Distortion of the master plan that disallowed the free flow of fire vehicle	74	55.2
A large number of people trooped into the market just to see what was happening	25	18.7
Inadequate manpower of fire personnel	30	22.3
Total	134	100

Source: Field Work 2021

Figure 5 shows that 77.6% of the respondents attested to the fact that there was no loss of life while 22.4% reported that there were cases of human lives lost during the inferno.

The loss of life could be attributed to the stamped where traders are rushing inside the market to save their properties.

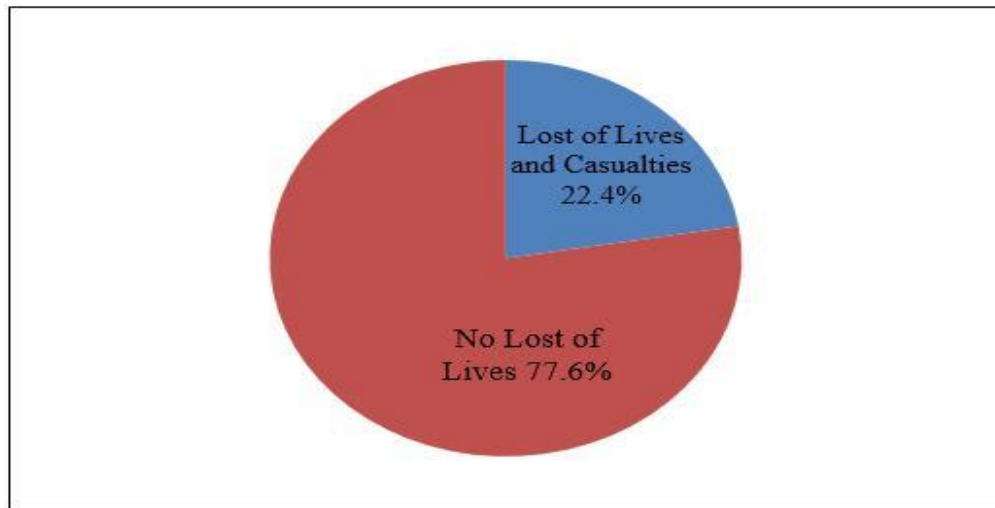


Figure 5: Record of Lost Human Lives or Livestock

Table 11 shows that 60.5% of the victims reported that they lost their shops and goods to the fire, some 2.2% said that they were able to secure shops and goods. The latter were people close to the market who were

able to save their properties before the fire spread to their line. Overall a majority of victims lost their means of livelihood. The implication is that the fire incident will affect the number of people who depend on them.

Table 11: Nature of Destruction Experienced

Nature of Destruction	Frequency	Percentage (%)
Both the shop and goods were burnt to ashes	81	60.5
Only shop was burnt and properties Secured	39	29.1
Both the shop and goods were secured	03	2.2
Goods were carried away by the hoodlums	11	8.2
Total	134	100

Source: Authors Field Work 2021

Table 12 reveals that 88% estimated their damages to be the sum of one million one hundred thousand (₦1, 100,000.00) and above. This no doubt shows that the inferno caused severe damage to properties worth millions of naira. However, 0, 37% of respondents estimated their damages ranged

from ₦700, 000.00 to ₦900, 000.00 naira; this indicates that a few victims have damages of less than million Naira. This is agreed with several studies among them are (Abdullahi *et al.* (2020), Adamu & Yunus, (2010); and Sunday (2017) that most market fire outbreak victims lose millions of Naira.

Table 12: Estimated Damages by the Fire Incident

Estimated Damages (₦)	Frequency	Percentage (%)
₦100,000.00 - ₦300,000.00	03	2.3
₦300,000.00 - ₦500,000.00	03	2.3
₦700,000.00 - ₦900,000.00	01	0.7
₦900,000.00 - ₦1,100,000.00	09	6.7
₦1,100,000.00 and above	118	88.0
Total	134	100

Source: Field Work 2021

Table 13 shows that the majority of the victims 127 reported receiving assistance. However, the record shows that (120 out of 134) respondents received cash as a means of palliative care and only 7 people did not

receive any form of assistance. Most of the victims were pleased with a donation made as it is the best option since money is the medium exchange that can be used to address the victim's immediate pressing needs.

Table 13: Form of Assistance Received

Did you Received Assistant	Forms of Assistants				Total
	Food stuffs	Building materials	Cash	Others specify	
Yes	01	02	120	04	127
No	01	01	02	03	07
Total	02	03	122	07	134

Source: Authors Field Work 2021

Table 13 shows that 91.1% of victims received assistant from their friends and relatives to cushion the effect of a fire disaster. This attests to the fact that the people's culture encourages assistance to friends, relatives, and neighbors affected by any type of misfortune. Other assistance came from the Sokoto State Emergency

Management Agency (SEMA) and Non-Governmental Organisations (NGOs). The result indicates that post-disaster management specifically relief material and compensation to the victims needs to be improved by government agencies considering the larger percentage comes from relatives and friends.

Table 14: Sources of Donation

Source of Assistance	Frequency	Percentage (%)
National Emergency Management Agency (NEMA)	02	1.6
Sokoto State Emergency Management Agency (SEMA)	03	2.2
Local Government Emergency Management Agency (LEMA)	03	2.2
Non-Governmental Organisation (NGO)	01	0.7
Friends and Relative	122	91.1
Others	03	2.2
Total	134	100

Source: Field Work 2021

Table 14 reveals that 56% of victims 56% attributed their major challenge to the loss of customers due to temporary location as most of their customers end up going

elsewhere thus affecting their sales. In general, temporary relocation caused as a result of a fire disaster had serious economic implications for the victims who heavily

relied on the market as a means of livelihood. The environmental effect can be seen in the pictures below. This has been corroborated by Olorunfemi & Adebimpe (2008) confirmed that disasters possess

anthropogenic origins and their consequences are felt in both human and physical environments. They conclude that human tolls have been significant

Table 14: Major Challenges

Major Problem	Frequency	Percentage (%)
Inadequate Capital	02	1.5
Daily Movement of my Goods	12	9.0
Security Challenges	01	0.7
Loss of Customers due to temporary Location	75	56.0
Temporary location allocated not adequate	33	24.6
Others	11	8.2
Total	134	100

Source: Authors Field Work 2021.

Some of the notable areas affected by the fire disaster were presented on number plates A to J.



A: Transformer site reported to be the genesis of outbreak



B: Vegetation shelter destroyed by fire



C: People scavenging for un-burnt items



D: Plastics groups line



E: Central mosque



F: Traders Looking for un-burnt items



G: Fire after a week of the disaster in some shops



H: Overhead water system damaged by the fire incide



I: Scavengers looking for irons and other Relatives. destruction destroyed materials.



J: Eyewitness observing the nature of

CONCLUSION AND RECOMMENDATIONS

The study concluded that the behavior of the traders and management factors contributed to the level of fire disaster in the study area and very few cases of loss of life were reported but properties worth billions of naira were destroyed. The 2021 Sokoto Central Market Fire Disaster was devastating and in worst in the history of market fire in Sokoto State. It affected the means of livelihood of many traders; the study revealed that fire outbreaks affected people can be attributed to an increase in the human population, human-related activities have exacerbated the frequency of occurrence. The study

recommended that the fire Service department organize regular educational seminars on the causes and emergency prevention measures of fire outbreaks in the market so that the traders can be more careful about their actions and consequences in the markets. The original market's master plan should be maintained and expanded to guide the professionals will allow the free movement of fire service vehicles in the event of a disaster and reduce the level of damages. Finally, the government should reconstruct the affected areas within the shortest possible time so that the victims will go back to their normal lives.

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