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Building Urban Fire Resilience in Sub-Saharan African Cities: Evaluating Institutional and Planning Responses to Fire Disasters in Ikeja, Lagos, Nigeria

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Abstract

The rising frequency of urban fire disasters poses critical challenges to resilience and sustainable development in rapidly urbanising regions. This study assesses fire disaster management in Ikeja, Lagos, by examining the operational capacity of fire service agencies and the integration of urban planning regulations in mitigating risks. Grounded in a resilience framework, a mixed-methods approach was applied, drawing on fire incident records, structured questionnaires, and interviews with planning and fire service officials. A total of 105 households from fire-prone districts were surveyed using multi-stage sampling. Quantitative data were analysed with descriptive statistics and mean-score ranking, while qualitative insights were explored through thematic analysis. Findings reveal that 60% of fire outbreaks were linked to candle use and 25.7% to electrical faults, with incidents concentrated in high-density areas such as Opebi, Ogba, and GRA. Despite a reported 10-minute response time, the fire service faces severe operational constraints, including water shortages, poor vehicle maintenance, inadequate safety equipment, and manpower gaps. These weaknesses reflect limited adaptive capacity and a reactive institutional culture. Moreover, urban planning agencies play a marginal role in fire mitigation, often restricted to issuing safety certificates, while enforcement of building codes remains weak. Comparative evidence from Nairobi, Accra, and Ibadan underscores the regional pattern of under-resourced, response-focused fire management. The study concludes that building fire resilience in Lagos requires a shift from fragmented, reactive measures toward proactive planning, public education, and strategic infrastructure investment. Policy reforms and stronger.

Keywords: Disaster Management, Fire Disaster, Fire Services, Lagos, Urban Planning, Urban Resilience.

Introduction

Disasters, both natural and anthropogenic, increasingly threaten human lives and livelihoods globally, as underscored by the United Nations Office for Disaster Risk Reduction (DRR) (1). This global challenge is exacerbated by inadequate emergency preparedness among local populations, rendering them passive and ill-equipped in times of crisis. The persistence of this problem in rapidly urbanising regions, especially in Sub-Saharan Africa, underscores the need for integrated and proactive disaster risk management strategies. Natural disasters have increased in frequency and intensity over the past few decades, negatively impacting social, political, and economic systems (2). The effects of disasters may manifest both directly and indirectly, with tangible and intangible consequences.

Urban regions in emerging economies, particularly in Sub-Saharan Africa, are experiencing a convergence of risks due to ongoing urbanisation, which stretches existing infrastructure and introduces new vulnerabilities through unregulated land use changes (3, 4). This complexity is mirrored in cities like Ikeja, Lagos,

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which was selected as a case study because it represents a highly industrialised and commercialised urban district where fire-related risks intersect with residential, industrial, and informal settlement vulnerabilities. By focusing on Ikeja, the study provides context-specific findings that can be generalised to other African cities undergoing similar urbanisation pressures. This justification also strengthens the broader relevance of the study in resilience and disaster risk management discourse. Comparable urbanisation trends and fire vulnerabilities have also been documented in Nairobi, Accra, and Johannesburg (5-7), suggesting broader regional applicability.

Africa's rapid urbanisation has spurred the expansion of informal settlements lacking basic infrastructure, thereby increasing the risk and frequency of fire disasters (8). These vulnerabilities are compounded by inaccessible settlement layouts that hamper firefighting efforts (9) and the recurrence of market fires in dense Central Business Districts (CBDs), which reflect similar governance and planning challenges in Accra and Nairobi, underscoring the need for comparative urban fire management approaches (5, 10). Furthermore, many African countries lack coherent fire disaster management frameworks (11), limiting their capacity for effective preparedness and response.

Fire disasters impact not only physical structures but also disrupt economic systems, social organisation, and cultural continuity (12). Both human and natural causes, such as illegal power connections, fuel explosions, and bushfires, necessitate diverse mitigation approaches. Reducing the risk of urban fires thus calls for integrated urban planning and institutional readiness. The vulnerability of human populations during fire events was emphasised, reinforcing the need for robust, preemptive strategies (13). Even though the total elimination of fire risks is impractical, framing fire management within resilience theory strengthens the analytical foundation of this study, as it focuses on the capacity of communities and institutions to absorb shocks and adapt to long-term risks rather than solely on reactive measures (14).

While natural fire events are infrequent in Nigeria, the prevalence of human-induced fire disasters is substantial. Between 1998 and 2013, Nigeria recorded over 5,000 fire-related deaths, with property losses estimated at ₦50 billion annually (15, 16). In Lagos State, the Lagos State Fire Service and the Lagos State Emergency Management Agency (LASEMA) play central roles in fire response. However, their operational limitations, mirrored in many African urban centres, highlight the need for institutional strengthening and community-based risk reduction strategies. In 2017 alone, the fire service responded to 1,273 fire calls (17).

It has been noted that total fire prevention in built environments is economically unfeasible (18). This study, therefore, adopts a resilience framework to assess preparedness, prevention, and institutional coordination (19), consistent with best practices in urban risk governance. Preparedness, as a key phase in the disaster management cycle, encompasses public awareness, early warning, and capacity for response and recovery (20). Understanding institutional and community preparedness levels is crucial in formulating adaptive planning measures. The absence of fire safety mechanisms in buildings and poor enforcement of fire regulations reflect a systemic gap in urban planning policies in Nigeria and other Sub-Saharan African countries (21).

This research aims to examine the institutional and urban planning dimensions of fire disaster management in Lagos, focusing on Ikeja Local Government Area (LGA). By drawing parallels with other African cities, the study highlights both unique local conditions and shared regional vulnerabilities, offering comparative lessons for Sub-Saharan Africa. It adopts resilience as both a conceptual lens and analytical tool to assess the strengths and gaps in current disaster risk management policies and practices.

Fire disasters, both globally and locally, have resulted in significant human and economic losses. Incidents such as the 2001 World Trade Centre collapse, the 2017 Grenfell Tower fire in London, the Kamala Mills fire in Mumbai, and the Sweden disco fire in 1998 underscore the catastrophic potential of fire hazards. Although these cases vary contextually, they collectively highlight the global relevance of fire preparedness, response coordination, and institutional capacity in mitigating urban disasters.

Sub-Saharan African cities face unique challenges that elevate fire risk, including poor enforcement

of building codes, unplanned urban expansion, and limited access to emergency services (22). In Nigeria, these issues are exacerbated by administrative bottlenecks, infrastructure deficits, and limited disaster awareness. The National Emergency Management Agency documents a range of disasters affecting Nigerians, including fires, floods, building collapses, and oil spills, among others, that reflect both natural and human-induced vulnerabilities (23).

Agencies responsible for disaster response often perform poorly due to inadequate coordination, delayed response times, and underutilisation of resources (24). This mirrors findings in Ghana, Tanzania, and Kenya, suggesting a regional pattern of institutional deficiency in fire disaster management. A study has attributed this to systemic weaknesses in national disaster governance structures, resulting in widespread urban risk exposure (25, 26). This comparison underscores that the challenges identified in Ikeja are not isolated but rather symptomatic of broader African urban governance gaps in disaster management.

The rural–urban knowledge gap in fire safety also contributes to rising urban risk. It has been noted that rural populations often retain deeper cultural awareness and practical knowledge about fire behaviour and risk mitigation, unlike urban dwellers who are more detached from environmental signals (27). This contrast highlights the necessity of embedding community-based resilience training in urban environments like Ikeja, where social detachment from traditional practices weakens adaptive capacity.

Despite the rising urban risks, DRR remains poorly embedded in urban development policies in Nigeria and many sub-Saharan countries (28). The Hyogo Framework for Action (2005-2015) and its successor, the Sendai Framework (2015-2030), underscore the need for DRR integration into planning systems. However, practical implementation often falls short due to fragmented governance and limited local capacity. This gap between international policy commitments and domestic practice illustrates the need to critically compare what exists in Nigeria's policy frameworks with what is implemented, thereby sharpening the governance critique of fire disaster management.

Previous studies have examined various dimensions of fire safety and risk, including urban vulnerability (29), seasonal risk patterns (30), fire safety in construction (31), and awareness in public buildings (32). However, few have focused explicitly on the role of urban planning and institutional resilience in fire disaster management, particularly in a comparative Sub-Saharan African context. This study contributes to filling this scholarly gap by integrating resilience theory, policy analysis, and comparative urban perspectives into its examination of fire disaster management in Ikeja, Lagos.

Rationale of the study

Lagos State's increasing exposure to urban fire disasters, particularly in industrialised and high-density areas like Ikeja, highlights a broader challenge shared by many Sub-Saharan African cities, including Nairobi, Accra, and Johannesburg. The convergence of climate variability, inadequate infrastructure, and unregulated urban growth has intensified vulnerabilities across these cities (33, 34). Ikeja is especially relevant because it combines features of a commercial hub, industrial zone, and residential district, thereby allowing for an assessment of differentiated risks across urban sectors, a perspective that enriches resilience-based planning.

This study contributes to regional discourse by contextualising findings from Ikeja within a comparative Sub-Saharan African framework.

The research is guided by the need to substantively apply the concept of resilience to urban fire disaster management. Resilience here refers to the capacity of urban systems, including governance, infrastructure, and communities, to absorb, adapt, and recover from fire-related shocks (35). Unlike studies that only mention resilience as a background term, this work integrates resilience theory into its methodology and discussion, ensuring that findings are grounded in an analytical framework that bridges theory and practice.

Moreover, the study addresses a clear gap in scholarly and policy-oriented discourse by identifying context-specific challenges and operational inefficiencies in Lagos State's fire management architecture. By evaluating how urban planning processes intersect with emergency services and community risk perceptions, the research develops implementable

strategies for enhancing fire resilience in Sub-Saharan African cities. This focus on planning responses directly answers calls for a more explicit exploration of how governance and urban design affect risk management.

The findings are intended to inform both academic debates and practical policy formulation, offering critical insights into institutional preparedness, regulatory shortcomings, and planning responses to urban fire hazards. In doing so, the study aligns with international best practices in urban risk reduction while remaining grounded in local realities.

Methodology

Concept of Resilience

Resilience refers to the capacity of a system, community, or individual to withstand, adapt to, and recover from adverse events while maintaining or quickly resuming essential functions. This study adopts resilience as a guiding analytical framework, rather than merely a nominal reference, to assess the institutional capacity and planning responses to urban fire disasters in Sub-Saharan Africa.

Originally conceptualised in ecological sciences during the 1970s, resilience has evolved into a multidisciplinary framework applicable to DRR, urban planning, and institutional policy (36). A previous study defines resilience as the goal of a system to continue functioning under disruption (37). Often juxtaposed with the concept of vulnerability, resilience is its inverse, focusing on a system's strength, flexibility, and recovery rather than its susceptibility to harm (38).

Vulnerability has been described as a function of exposure to a hazard combined with the capacity to anticipate, cope with, resist, and recover from its impacts (37). In urban settings, resilience must therefore be considered through a human-centric lens, recognising the intersectionality of class, age, ethnicity, gender, and other social identities that shape how risk and recovery are experienced (39). This intersectional perspective is particularly important in the case of Ikeja, where commercial districts, industrial areas, and informal settlements exhibit differentiated risks, reflecting how socio-economic and spatial disparities amplify fire disaster impacts (Figure 1).

Figure 1: Relationship between Resilience and Hazard (40)

This framework, which defines resilience deterministically (i.e., what is resilient to what), is consistent with traditional hazard-specific risk models, such as those related to flooding, heatwaves, or fire (36). However, the present study goes beyond this static model by employing a systems-based view of resilience, focusing on adaptability, continuity, and recovery as key components of institutional and community readiness.

Unlike the traditional "predict and prevent" model that characterises classical DRR, resilience promotes a holistic, integrated response to uncertainty. This approach is central to this study, as it enables a dynamic analysis of how institutions like the Lagos State Fire Service interact with community systems, physical infrastructure, and socio-economic structures during and after fire disasters.

Resilience also encompasses behavioural and systemic dimensions. This study explores how resilience is affected by human behaviour, such as illegal power connections and unsafe energy sources, as well as by systemic failures in planning and emergency response. For instance, institutional fragmentation between agencies, weak enforcement of building codes, and resource shortages in firefighting services illustrate systemic weaknesses that reduce resilience capacity. The application of resilience helps assess the effectiveness of institutional coordination, community-level awareness, and resource availability in urban fire disaster management.

Ikeja LGA presents a prototypical urban fire risk zone due to its high building and population density, administrative significance, and infrastructural strain. The use of substandard materials, noncompliance with fire codes, and

reliance on flammable backup energy solutions due to erratic power supply increase vulnerability. By explicitly situating Ikeja within this resilience framework and comparing it with contexts such as Nairobi, Addis Ababa, and Accra, the study underscores both local and regional lessons in African fire disaster risk governance. Through integrating resilience and vulnerability analyses, the research identifies high-risk zones, systemic gaps, and practical opportunities for reform in urban fire disaster preparedness in Lagos and other African cities.

Study Area

Ikeja, the capital of Lagos State, holds a strategic administrative and economic role within Nigeria's urban hierarchy. Geographically, Ikeja LGA lies between 3°30' North and 7°30' East (Figure 2).

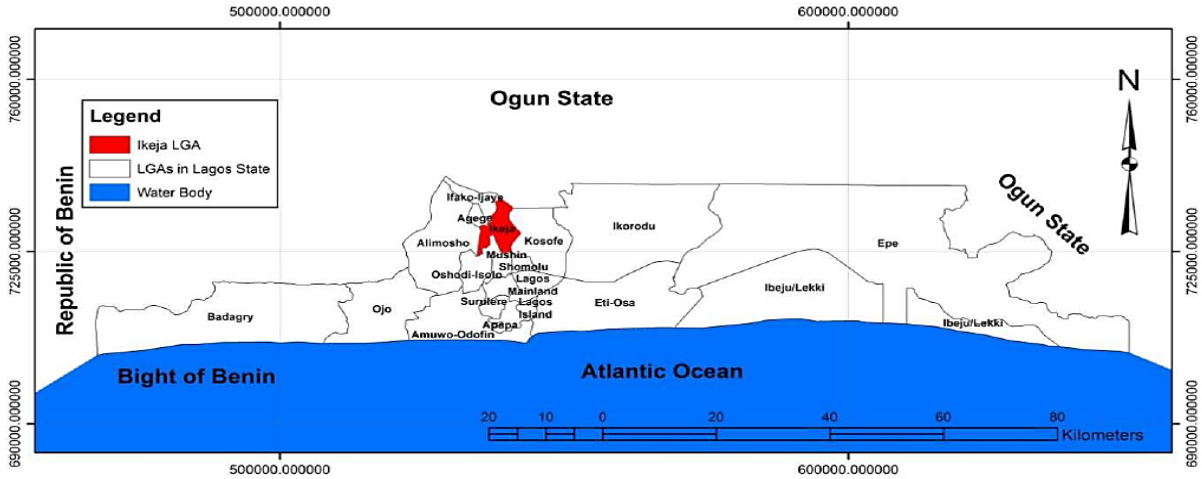

Figure 2: Map of Ikeja LGA in its Regional Settings (41)

It is located inland and bordered by Agege, Alimosho, and Ifako-Ijaiye LGAs to the west, Kosofe LGA to the east, Mushin and Oshodi/Isolo LGAs to the south, and Ogun State to the north. Ikeja was designated the capital of Lagos State following Nigeria's 1976 state reorganisation (42), and since then, it has developed into a dense administrative, industrial, and commercial urban hub.

The urbanisation and infrastructure strain in Ikeja reflect similar trends in rapidly expanding Sub-Saharan African cities such as Nairobi, Accra, and Dar es Salaam, where institutional preparedness often lags population growth and land-use intensification. Positioning Ikeja as a case study, therefore, provides insights that are both context-specific and transferable, reinforcing the comparative African urban resilience discourse. Ikeja serves as a microcosm for analysing the resilience of urban systems under increasing fire risk pressures.

Ikeja has experienced frequent and devastating fire incidents over the years, causing significant loss of life and economic damage. One of the most catastrophic events was the 2002 bomb explosion at the Ikeja Military Cantonment, resulting in approximately 800 deaths and mass displacement. Between 1998 and 2020, over 10,127 fire-related fatalities were recorded in Nigeria, with Lagos State and Ikeja LGA contributing substantially to that number (15). The Nigerian Minister of Interior, Abba Moro, estimated annual property losses due to fires at ₦50 billion, with a sizable portion occurring in Lagos (16).

More recent incidents further demonstrate the persistent vulnerability of Ikeja to fire disasters. For instance, the 2013 fire at Ikeja City Mall severely damaged retail facilities, while the 2021 fire at Computer Village destroyed numerous shops and digital infrastructure (43). These events reflect recurring failures in fire prevention, building code enforcement, and electrical safety. Comparing these incidents with recurring fire outbreaks in Nairobi's Gikomba Market and Accra's Makola Market highlights common urban fire governance gaps across Sub-Saharan Africa. According to the Public Relations Officer of the Lagos State Fire Service, "there is hardly a week without news of a fire outbreak in some part of Ikeja LGA." Despite these recurring events, data scarcity severely limits the ability to conduct temporal and spatial fire risk analysis, making it difficult to implement targeted interventions.

The only reliable fire incident data available for this study came from 2014, when the Lagos State

Fire Service responded to 92 fire incidents in Ikeja. These incidents were categorised by district to identify risk clusters, revealing both frequency and location-based vulnerability patterns. Contributing factors included population growth, unregulated electrical connections, use of flammable backup energy sources, and urban congestion. This reliance on a single-year dataset highlights the systemic weakness of fire data management in Nigeria, underscoring the need for institutional reforms in data collection and sharing.

Research Design

This study adopted a mixed-methods approach, utilising both quantitative and qualitative techniques to gather robust and triangulated insights into urban fire resilience and institutional performance in Ikeja.

Data Sources

Primary data were obtained through structured questionnaires and interviews. Secondary data included fire incident records, response protocols, planning policies, and legal frameworks provided by the Lagos State Fire Service and the Ministry of Physical Planning and Urban Development.

Three distinct questionnaire sets were designed:

- Household Questionnaire: Targeted at residents who had experienced fire incidents, exploring their socioeconomic characteristics, incident experiences, preparedness measures, and awareness of planning regulations.
- Planning Agency Questionnaire: Targeted officers from the Ministry of Physical Planning and Urban Development, focusing on institutional planning roles, regulatory enforcement, and mitigation policies.
- Fire Service Questionnaire: Focused on operational responses, logistics, and challenges encountered by the Lagos State Fire Service.

To complement the questionnaires, semi-structured interviews were conducted with selected personnel from the fire service and planning agency. These interviews were audio-recorded, transcribed, and coded thematically to enrich the dataset.

Sampling Strategy

A multi-stage sampling technique was employed. In the first stage, nine districts within Ikeja LGA with known fire incidents were identified: Alausa, Agidingbin, Government Reserved Area (GRA), Oregun, Opebi, Ogba, Maryland, Ojodu, and Magodo (42). These formed clusters for spatial sampling. Table 1 presents the distribution of fire incidents in these districts based on 2014 records.

Table 1: Cases of Fire Disasters in Ikeja, LGA by Cluster (15)

Districts	Total Number Of Cases
1. Alausa	20
2. Agidingbin	6
3. GRA	26
4. Oregun	7
5. Opebi	16
6. Ogba	11
7. Maryland	5
8. Ojodu	1
9. Magodo	Nil
Total	**92**

This cluster-based method aligns with comparative approaches used in urban disaster research in Sub-Saharan Africa, providing a framework for spatially disaggregated resilience assessment.

Using fire codes from the National Fire Protection Association (NFPA), the incident radius was set at 250 metres. The number of buildings within the incident radius was identified as 130. However, going by a similar study, which suggests smaller sampling ratios for larger populations, a 10% sample yielded 13 buildings (44).

The total sample size thus included the 92 incident buildings and 13 nearby buildings, resulting in a sample of 105 buildings. One household representative per building was surveyed, bringing the final questionnaire count to 105. This structured approach ensured proportional representation of different urban land uses,

commercial, residential, and industrial, thereby allowing risk comparisons across districts in Ikeja.

Data Analysis

Quantitative data were analysed using Descriptive statistics (frequency tables, percentages, bar graphs, pie charts) and Likert scale evaluation for institutional role assessments.

A mean score ranking technique was used for institutional performance indicators. The formula used:

MS=∑(f·X) NMS = \frac {\sum (f \cdot X)}{N}MS=N∑(f·X)……..[1]

Where:

- MS = Mean Score
- f = frequency of responses
- X = assigned value per response
- N = total number of responses

This approach allows for prioritising response factors and identifying key institutional gaps in urban fire resilience. Qualitative data from interviews were thematically coded to complement statistical findings, ensuring a triangulated analysis that highlights both institutional weaknesses and community-level experiences.

Results and Discussion

Socio-Economic Characteristics of Respondents

The study targeted individuals who had directly witnessed fire incidents. This was confirmed before administering the questionnaires.

Gender Distribution

Among the 105 respondents, 83 (79.0%) were male, while 22 (21.0%) were female (Table 2). This suggests that men were more likely to report and share their experiences with fire incidents. This disparity might be influenced by social or emotional factors, as women are often perceived to be more reserved in discussing traumatic events.

Household Role of Respondents

Most of the respondents (79%) were heads of their households, while the remaining 21% were adult members (Table 3). All respondents were adults who had witnessed fire incidents and were considered capable of providing detailed accounts of fire damage and emergency responses.

Table 2: Sex of Respondents

Sex	Frequency	Percent
Male	83	79.0
Female	22	21.0
Total	**105**	**100**

Table 3: Status of Respondents

Age Bracket	Frequency	Percent
Family head	83	79.0
Adult member	22	21.0
Total	**105**	**100**

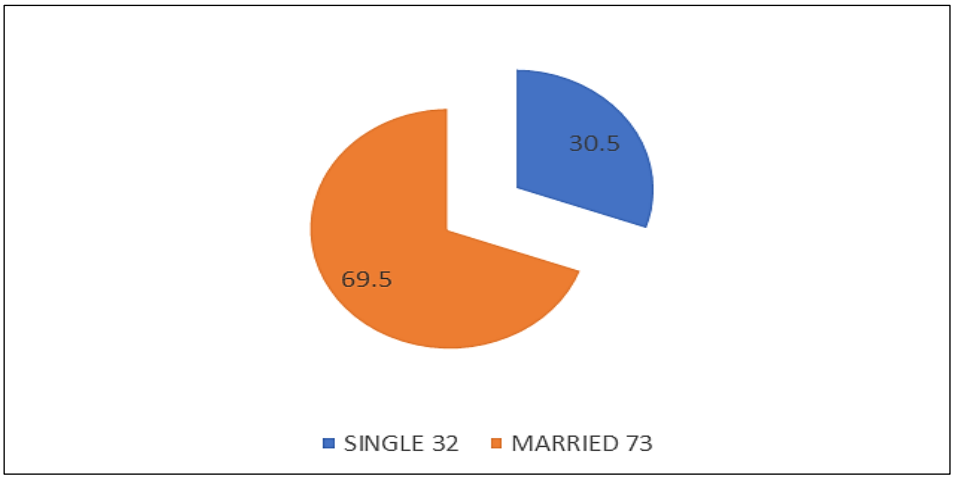

Figure 3: Marital Status of Respondents

Marital Status

At the time of the survey, 69.5% of respondents were married, and 30.5% were unmarried (Figure 3). This demographic detail reinforces the reliability of responses, as most participants were long-term resident's familiar with the area's fire risk dynamics.

Educational Attainment

Educational levels among respondents were relatively high: 40.0% had a tertiary education, another 40.0% completed secondary school, 12.4% had primary education, and only 7.6% had no formal education (Table 4). These results indicate a population generally capable of understanding fire safety protocols and regulations.

Employment Status

Employment distribution showed that 44.8% of respondents were government employees, 29.5% worked in the private sector, and 25.7% were self-employed. This reflects high socio-economic engagement across the study area as presented in Figure 4.

Table 4: Educational Attainment of Respondents

Level of Education	Frequency	Percentage
Primary Education	13	12.4
Secondary Education	42	40.0
Tertiary Education	42	40.0
No Formal Education	8	7.6
Total	**105**	**100**

Causes and Effects of Fire Incidents

Respondents cited multiple causes of fire outbreaks (Table 5). Candle lighting was the most frequently reported cause (60.0%), followed by electrical malfunctions (25.7%) and chemical or gas-related issues (14.3%). This indicates that a significant number of respondents have either been victims or witnesses of fire incidents.

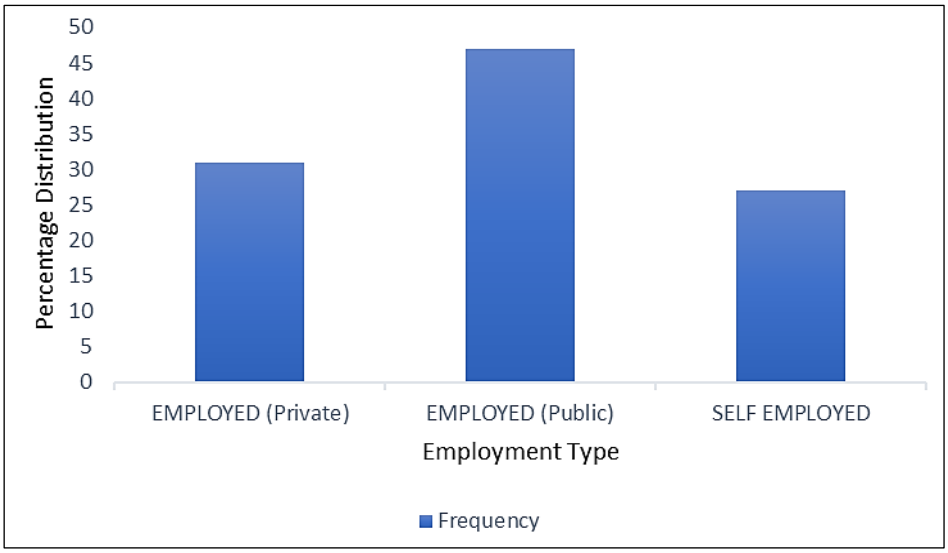

Figure 4: Employment Status of Respondents

Table 5: Causes and Effects of Fire Incidence

Fire incidence cause	**Frequency**	**Percentage (%)**
1. Candle lighting	63	60.0
2. Electrical systems and devices	27	25.7
3. Chemicals and gases	15	14.3
Total	**105**	**100.0**
Effects of fire incidence	**Frequency**	**Percentage**
1. Partial damage to properties	66	62.9
2. Total damage to properties with loss of life	30	28..6
3. Displacement	9	8.5
Total	**105**	**100.0**

The extent of fire damage was considerable. Partial property damage accounted for 62.9%, while 28.6% experienced destruction with fatalities. Only 8.5% reported displacement due to fire damage. This displacement occurred primarily because of the extent of damage to the affected properties and the people living in them.

These findings mirror studies in Accra (Ghana) and Dar es Salaam (Tanzania), where domestic fire sources such as candles, faulty wiring, and kerosene stoves dominate incident causation, particularly in low- and middle-income settlements (39, 41). The persistence of such causes underscores the role of inadequate planning, poor electrical regulation, and weak enforcement of safety standards.

Fire Outbreak Trends and Land Use

Many respondents (61.0%) observed an increasing trend in fire occurrences over time (Table 6). Furthermore, fire outbreaks were reported to occur predominantly in residential zones (64.8%), followed by commercial areas (16.2%) and other land uses (19.0%). This data, presented in Figure 5, suggests that residential areas in the study region are more vulnerable to fire disasters than other types of land use.

Table 6: Trend in Fire Outbreak Occurrence

Rate	**Frequency**	**Percent**
1. Increasing	64	61.0
2. Decreasing	28	26.7
3. Constant	13	12.4
Total	**105**	**100**

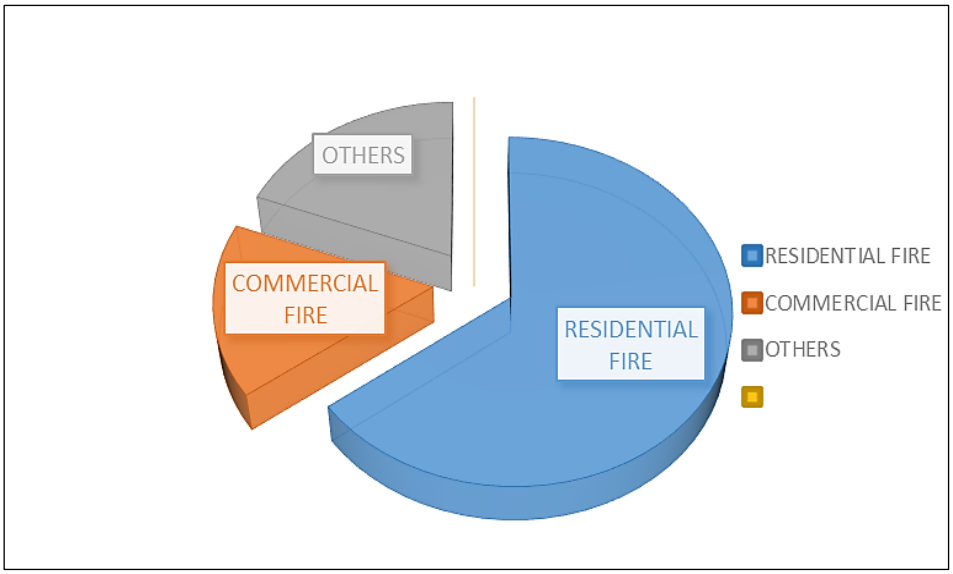

Figure 5: Land Use Zone of Fire Incidence

The predominance of residential fire outbreaks resonates with findings from Nairobi and Kampala, where dense informal settlements and mixed land use present high vulnerability. In Ikeja, this is compounded by congested housing layouts, unregulated electrical connections, and reliance on flammable energy alternatives such as candles and generators.

Resident Response and Control Measures

Residents employed various fire control strategies. The most common method was the use of fire extinguishers (63.8%), followed by traditional means such as soap and water (22.9%), and public calls for help (9.5%). A small fraction (3.8%) was unsure of what methods were used (Table 7).

Table 7: Control Measures Adopted by Residents

Method	Frequency	Percentage
1. Fire extinguisher	67	63.8
2. Soap and water	24	22.9
3. Public call for help	10	9.5
4. Unaware	4	3.8
Total	**105**	**100.0**

The high reliance on fire extinguishers suggests some level of preparedness among urban residents, possibly reflecting exposure to workplace safety regulations in commercial hubs such as Computer Village. However, the continued use of rudimentary methods such as soap and water indicate gaps in awareness and affordability of appropriate firefighting tools. Comparative studies in Ghana and Kenya reveal similar dual patterns, where pockets of preparedness coexist with low-capacity responses.

Fire Service Response and Community Involvement

Fire service response was generally slow. According to 70.5% of respondents, there was a significant delay in response time, while 29.5% cited operational hindrances (Table 8). This delay may be attributed to the distance of the fire station from various land use zones. Therefore, there is a pressing need for planning authorities to ensure that fire stations are strategically located near different land use areas before approving development plans. Regarding who helped extinguish fires (Figure 6), 52.4% said the community alone responded, 29.5% noted joint efforts with the fire service, and 18.1% said only the fire service was involved.

Only 5.7% rated fire service performance as effective. Most rated it average (56.2%) or ineffective (38.1%), particularly those directly affected (Figure 7). Therefore, there is a need for immediate improvement for an effective service.

Table 8: Timing of Response of the Fire Service in the Area

Response	Frequency	Percent
1. Delayed	74	70.5
2. Hindered	31	29.5
Total	**105**	**100.0**

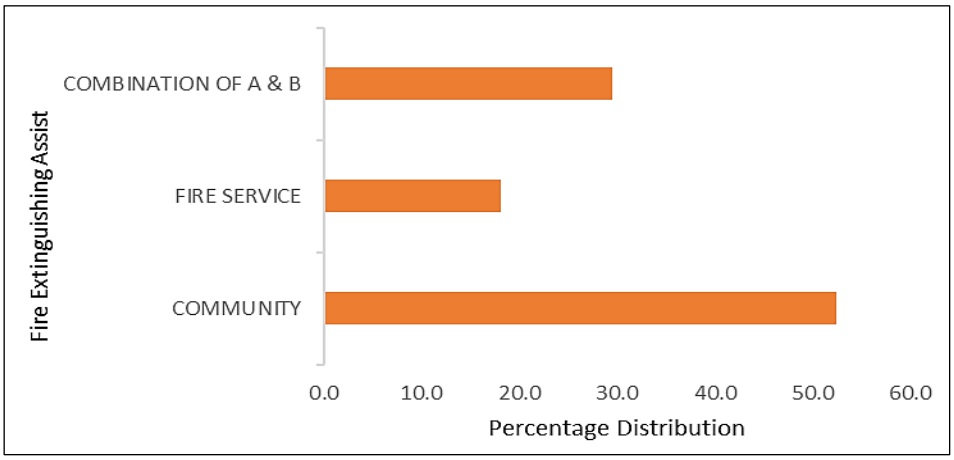

Figure 6: Effort for Incident Arrest

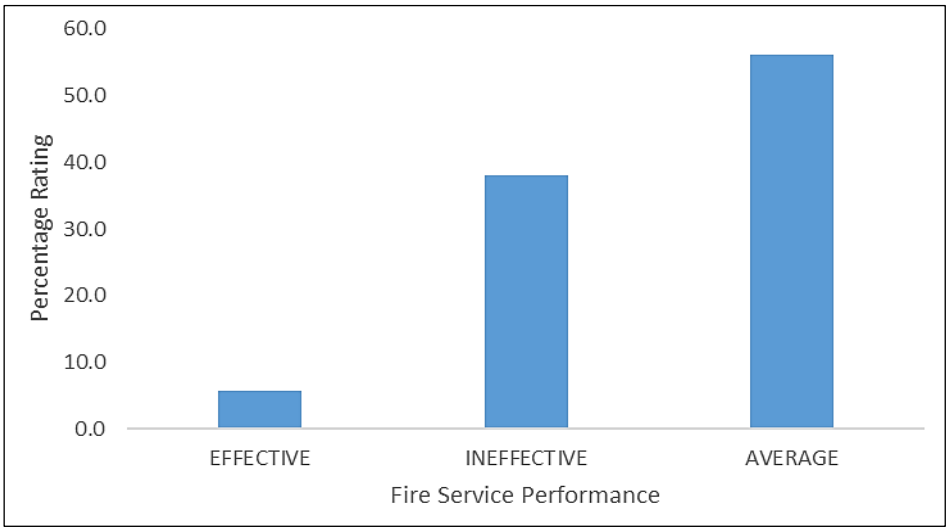

Figure 7: Assessment of the Fire Service Performance Rating

These findings echo broader sub-Saharan trends that fire services are frequently underfunded, poorly equipped, and unable to meet urban demands. In Nairobi, Accra, and Lagos alike, communities often constitute the first line of defence, highlighting the centrality of community-based disaster risk reduction (CBDRR). The persistence of delayed response times in Ikeja reflects both logistical gaps (station location, equipment deficits) and systemic governance weaknesses (bureaucratic bottlenecks, fragmented institutional mandates).

Urban Planning Role in Fire Mitigation

Interviews with officers from the Ministry of Physical Planning and Urban Development revealed that fire safety certificates are required for premises used as residences, workplaces, entertainment facilities, health institutions, and industrial or educational establishments. Despite this regulatory mandate, the Ministry has made limited contributions to the spatial planning of fire stations, even as Ikeja experiences rapid urban growth. This gap underscores the disconnect between statutory planning processes and disaster risk reduction (DRR).

Using a framework from an earlier study (9), 10 urban planners rated the extent to which fire-risk indicators are considered in planning practice and the result is presented in Table 9. Human/vehicular accessibility (mean = 3.9) was the most considered factor, followed by house

density (3.6). Cooking space design scored lowest (2.2), reflecting the neglect of fire-safe building design in regulatory enforcement.

These findings align with broader trends in Nairobi and Accra, where urban planning frameworks acknowledge accessibility but fail to integrate fire-specific design standards into residential development. Such omissions allow domestic-level vulnerabilities (e.g., poorly ventilated kitchens, inadequate spacing) to persist despite formal regulation.

Table 9: Urban Planning Indicators in Fire Mitigation

Indicators	1	2	3	4	5	Total	Weighted mean
1. House density and closeness	1	1	2	3	3	10	3.6
2. Occupancy rate	1	1	2	4	2	10	3.5
3. Appropriate and continuous planning strategies	2	2	1	3	2	10	3.1
4. Accessibility (Human/Vehicular)	1	1	0	4	4	10	3.9
5. Cooking space design	4	3	1	1	1	10	2.2

Table 10: Public Awareness of Fire-related Planning Regulations

Item	Frequency	Percentage
1. Aware of fire-related planning regulations	18	17.0
2. Not aware of fire-related planning regulations	87	83.0
Total	**105**	**100.00**

Awareness of Fire-Related Planning Regulations

Table 10 shows that 83% of respondents were unaware of planning regulations related to fire safety, with only 17% reporting some knowledge. This highlights weak public engagement and a lack of effective awareness campaigns by planning authorities.

This reflects findings from Ghana and Tanzania, where limited regulatory awareness among residents correlates with poor compliance and high urban fire risk. The absence of proactive community education perpetuates reliance on reactive interventions rather than preventive planning.

Fire Service Operations and Challenges

Despite two fire stations and a reported 10-minute average response time, the fire service struggles with multiple operational challenges. Interviews with fire officers (Table 11) identified poor vehicle maintenance, water shortages, and lack of safety equipment as major impediments (mean = 2.9 for each). Other issues included inadequate training, poor communication, and manpower shortages.

On average, the fire service responds to emergencies in about 10 minutes using equipment such as fire engines, ladder trucks, hoses, personal protective equipment, and communication devices (Figures 8 and 9). However, respondents consistently cited delays and limited efficiency.

Table 11: Operational Challenges Faced by Fire Agency

Challenges	1	2	3	4	5	Total	Weighted Mean
1. Inadequate fire station distribution	2	4	1	2	1	10	2.6
2. Communication gaps	1	2	5	1	1	10	2.4
3. Shortage of water	4	3	2	1	1	10	2.9
4. Poor training	4	1	2	1	2	10	2.6
5. Lack of safety equipment	3	2	1	1	3	10	2.9
6. Manpower shortage	4	3	1	1	1	10	2.2
7. Poor vehicle maintenance	2	1	4	2	1	10	2.9

Figure 8: Fire Hydrant within the Study Area

Figure 9: Fire Service Response During a Fire Outbreak Within the Study Area

The weighted mean analysis (Table 11) shows that water shortage, poor vehicle maintenance, and inadequate safety equipment represent the most critical impediments, all scoring 2.9. These challenges directly undermine resilience capacity by reducing the fire service's ability to absorb, adapt, and recover from shocks. In resilience terms, the service demonstrates limited "adaptive capacity" and "redundancy," both essential indicators in disaster risk management frameworks (36, 38).

The Lagos State Fire Service is mandated not only to respond to fires but also to undertake public education and preventive activities. Despite this, it has not effectively educated the public about fire safety. Interviews revealed that the only information residents receive occurs during fire incidents, when safety "dos and don'ts" are shared. Beyond these ad hoc interventions, ongoing educational programs are absent.

This gap between policy and practice is striking. The Lagos State Urban and Regional Planning Law (2010) and the Fire Service Act mandate proactive engagement in fire prevention, yet in Ikeja, the service operates reactively. The limited integration of fire safety considerations into urban planning further compounds this, as fire stations are not strategically located relative to high-density risk zones. This reflects a divergence between formal policy frameworks and institutional practice, a weakness also noted in other African cities (45-48).

The interviews with 10 officers further underscored systemic limitations. All identified the lack of safety equipment, unreliable water supply, and poor vehicles as the most pressing issues. In

addition, communication breakdowns and inadequate training reduce response effectiveness, while manpower shortages exacerbate delays.

Comparative evidence reinforces these findings. In Nairobi, residents of informal settlements frequently rely on community self-help due to delayed institutional response (45). In Accra, logistical failures and lack of hydrant infrastructure mirror Ikeja's challenges (46). Similarly, studies in Ibadan describe disaster management as fragmented and reactive, with overlapping roles and weak enforcement (47). These regional parallels indicate that the challenges in Ikeja are not isolated but part of a broader Sub-Saharan African pattern of under-resourced, response-focused fire management.

The identified challenges highlight the need for a resilience-oriented reform of fire service operations in Ikeja. Strategic investments in infrastructure, capacity-building for personnel, and the institutionalisation of preventive education are essential. Furthermore, integrating fire risk assessments into urban planning processes, particularly in high-density residential and commercial districts, would strengthen both institutional and community resilience.

Challenges and Limitations

The study faced notable challenges, particularly the reliance on secondary data (e.g., 2014 records) and the limited availability of updated fire service documentation. These constraints, which are common in Nigerian research contexts, may have influenced the accuracy of trend analysis and the assessment of recent institutional changes. Nevertheless, the establishment of the National Fire Data Repository Centre (NFDRC) represents a positive development that can help address these systemic data gaps and strengthen future disaster-related research.

Comparative Context of the Findings with Sub-Saharan Africa

Fire disasters in Ikeja LGA remain a major concern, with recurrent outbreaks across residential and commercial areas. Field survey results showed that the leading causes of fire incidents include electrical faults, negligence (such as unattended cooking), candle use, and illegal electrical connections. Respondents further identified high-density residential zones, such as Opebi, Ogba, and GRA, as particularly vulnerable. The frequency and severity of these fires highlight weaknesses in physical planning, infrastructure provision, and public awareness.

Lagos State Fire Service data corroborates these findings, with 92 incidents recorded in Ikeja in 2014 alone, unevenly distributed across districts. GRA, Alausa, and Opebi recorded the highest numbers, suggesting a strong link between population concentration, commercial intensity, and fire outbreak frequency. Fire officers interviewed cited poor urban planning, unstable electricity supply, and low levels of fire safety education as key aggravating factors.

Community members frequently act as first responders before the arrival of fire services, reflecting resilience at the grassroots level. However, this resilience stems more from necessity than from institutional support, underscoring the inadequacy of formal response mechanisms.

These observations align with wider regional evidence. In Nairobi's informal settlements, residents often mobilise themselves to suppress fires in the absence of a prompt institutional response (45). Similarly, in Accra, Ghana, fire risk is heightened by flammable building materials, informal electrical systems, and delays in fire service arrival (46).

Institutional and regulatory weaknesses identified in Ikeja mirror findings elsewhere in Sub-Saharan Africa. For instance, Ibadan's fire disaster governance has been described as fragmented, reactive, and underfunded, with overlapping institutional roles and poor enforcement of safety standards (47). In Ikeja, few buildings hold valid fire safety certificates, and updated risk assessments are rare. Fire officers also confirmed persistent operational challenges such as outdated equipment, inadequate staffing, and the absence of predictive data systems.

This reactive approach to fire management is consistent with evidence from Kenya, where institutional strategies largely priorities response over prevention (48). A broader regional review further notes that limited funding, weak institutional coordination, and low levels of public risk awareness remain major barriers to building fire-resilient cities across Africa (44).

The study's mean score analysis of fire control measures across Ikeja's districts also revealed disparities. While districts like GRA and Alausa had relatively better access to fire extinguishers and

closer proximity to fire stations, others, such as Ojodu and Agidingbin, lagged. Despite these differences, delayed response times and inadequate awareness were common challenges across all areas.

In summary, the causes, vulnerabilities, and institutional deficiencies identified in Ikeja are not isolated but rather reflect broader urban risk dynamics across Sub-Saharan Africa. This reinforces the urgent need for proactive urban planning, improved community education, and substantial investment in disaster resilience infrastructure.

Recommendations

To reduce fire risks and strengthen resilience in Ikeja and similar urban contexts, the following actions are recommended:

Short-term Measures: Conduct widespread educational programs to raise public awareness of fire safety practices and planning regulations.

Foster partnerships between urban planners, fire services, and community groups to promote fire safety at the neighbourhood level.

Medium-term Measures: Strengthen enforcement of building codes, ensuring that fire risk assessments are integrated into the planning approval process.

Install functional fire hydrants across residential, commercial, and industrial zones, and ensure a consistent water supply through collaboration with the Lagos State Water Corporation (LSWC).

Long-term Measures: Establish additional, strategically located fire stations in high-risk districts to reduce response times.

Invest in the training, equipping, and continuous professional development of fire service personnel, supported by modern data and communication systems.

Conclusion

Fire remains one of the most destructive urban hazards, capable of causing extensive losses within minutes. Unlike seasonal disasters such as floods, fires often arise from human negligence or system failures and can occur at any time. A single safety lapse can therefore escalate into a catastrophic event.

Preparedness is central to fire disaster management. Proactive measures ranging from effective urban planning and rapid institutional response to strong community engagement are essential to reducing vulnerability. In Ikeja, delayed fire service response has emerged as a critical driver of fire-related losses. Establishing additional, well-equipped fire stations in at least four key districts would significantly improve emergency coverage and reduce fatalities.

Urban congestion further compounds delays, making the strategic siting of fire stations and hydrants vital. Equally, hospitals and health centres should be formally integrated into fire disaster planning, with staff trained and emergency roles clearly defined. Periodic drills and updates to disaster plans would enhance readiness.

Beyond operational improvements, urban planners have a pivotal role to play. They can embed fire risk assessments into development control processes, guide infrastructure investments, and ensure that fire resilience is integrated into broader urban development strategies. Supporting this requires adequate funding, institutional reforms, and research investments in geospatial and social data for risk prediction.

Ultimately, building fire-resilient cities demands a multi-stakeholder approach, uniting government agencies, planners, communities, and the private sector. The findings from Ikeja not only reveal systemic local gaps but also mirror regional urban challenges across Sub-Saharan Africa. Addressing these challenges is vital to advancing both disaster risk reduction and sustainable urban resilience.

Abbreviations

CBD: Central Business District, DRR: Disaster Risk Reduction, f: frequency of responses, GRA: Government Reserved Area, LASEMA: Lagos State Emergency Management Agency, LGA: Local Government Area, LSWC: Lagos State Water Corporation, MS: Mean Score, N: total number of responses, NFDRC: National Fire Data Repository Centre, NFPA: National Fire Protection Association, X: the value assigned to each response.

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Author Contributions

Odekunle Folasade Jokotade: conceived the research idea, prepared the original draft, Fadeyi Ayomipo Akintunde: providing critical review, editorial input, Osalusi Moyosore Joy: data collection, Alabi Oluwadamilola Ajoke: literature sourcing, manuscript review, Alabi Adewale Segun: literature sourcing, manuscript review, Adebayo Oluwatoyin Abiodun: literature sourcing, manuscript review, Faturoti Toyin Funmilayo: literature sourcing, manuscript review, Akande Ifeoluwa: literature sourcing, manuscript review, Akinde Oluwabunmi Precillia: literature sourcing, manuscript review, Kilasho Omotunde Musilludeen: literature sourcing, manuscript review, Jinadu Idris Olawale: literature sourcing, manuscript review, Adebayo Gabriel Olabisi: literature sourcing, manuscript review, Adewole Hakeem: data collection. All authors read and approved the final manuscript.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this work. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy, have been completely witnessed by the authors.

Ethics Approval

Not applicable.

Declaration of Artificial Intelligence (AI) Assistance

AI-assisted technology was used solely for proofreading and correcting grammatical errors in the preparation of this manuscript. The authors remain fully responsible for the content, accuracy, and integrity of the manuscript.

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