Yamtara-Wala Journal of Arts, Management and Social Sciences **(YaJAMSS)**
Volume 2, Issue 1. December 2022 ISSN: 2971-5008

ANALYSIS OF THE PREPAREDNESS FOR FIRE OUTBREAK IN THE CENTRAL BUSINESS DISTRICT OF KADUNA METROPOLIS

***Olumide Akinwumi Oluwole[1] Shedrack Palmer Oke[1] Timothy Oyebamiji Ogunbode[2]**
[1]Department of Geography, Nigerian Defence Academy, Kaduna
[2]Environmental Management and Crop Production Unit, Bowen University, Iwo, Osun State
Corresponding Author: **oaoluwole@nda.edu.ng**

Abstract
This study focuses on the preparedness for fire outbreak in the Central Business District of Kaduna metropolis. The study was guided by Precaution Adoption Process Model. Data collected from the field was used to check the level of awareness of building occupants in the Central Business District to fire outbreak and the presence of fire safety installations and level of preparedness to fire outbreak in the District. Data analysis revealed low preparedness for fire emergencies by shop owners and market infrastructure. The study led to the evolvement of Fire Preparedness Model. The Model explains effective ways of been prepared against fire outbreak, and can serve as a prototype in educating people about fire outbreak and also serve as a tool for raising awareness about fire safety measures in buildings. It was also suggested that there should be legislation on the part of Government to enforce provision of fire safety equipment in all the buildings within the Central Business District. The legislation should incorporate insurance of buildings and goods in the market. This will provide succour during fire outbreak. Likewise, there should be regular training of shop owners on how to use the fire safety equipment provided.

Keywords: Fire, Kaduna metropolis, Model, Precaution Adoption Process, Preparedness

Introduction
Fire is the rapid oxidation of a material in the exothermic chemical process of combustion releasing heat, light and various reactive products (Pyne, 2007). Fire starts in three main ways which are accidents (misuse of appliances), deliberate ignition and equipment failure (electrical malfunction) and produce smoke and toxic gases which could be extremely fatal to those exposed to it (Supermedia, 2011). Stages of fire development can be identified as incipient, growth, fully developed and decay (Anowai, 2022). Effective fire safety management requires recognizing all the potential risks associated with the premises and effectively carrying out an assessment of the adequacy of the measures provided or needed to combat the risk (Khan and Abbasi, 1995). A risk analysis indicates the prone to fire outbreak and spread of fire and thus decide what measures must be taken to provide suitable arrangements for protecting people in the premises from fire, and should ensure that the risk of fire occurring is reduced to the barest minimum(Buchanan, 2001; Oladokun and Ishola, 2010).

The frequent occurrence of major fire accidents in commercial buildings, shopping malls, and markets in Nigeria has become a serious threat to the nation's fragile economy (Odogwu, 2021; Daramola and Ibrahim, 2021). This is because fire outbreak results in immeasurable consequences when it happens (StudyCorgi, 2022). Many major markets and commercial buildings have been gutted by market fire destroying lives and properties worth several billions of Naira (National Emergency Management Agency, 2006; 2012; 2015; Abeku *et al.*, 2021). The socio-economic impacts of these accidents are aggravated by the fact that

victims of such fire disasters, mostly small scale traders and artisans, are without adequate insurance cover. Market fire has continued to render many people jobless, damage the environment, disrupt economic activities and worsen the problem of poverty. The effective prevention of these accidents will require enhancing the capacity of the relevant regulatory institutions in evaluating the proneness of any building to fire accidents. Frequent fire disasters in crowded urban business and market structures have also become a source of major concern to Nigerian urban planners. Urban renewal schemes are being initiated to minimize the occurrence of fire accidents and other associated problems by various levels of government in Nigeria (Oladokun and Emmanuel, 2014). Lack of adequate planning in many Nigerian cities and urban areas is creating safety challenges in managing the various centers of activities. The frequent occurrences of fire disasters across various cities in Nigeria have become a major cause for concern for all stakeholders. One of the most vulnerable clusters is the market places and commercial complexes. These disasters commonly referred to as market fire, which continue to destroy valuables worth billions of naira, have become a major burden on the Nigerian fragile economy. Hence, there is need to have a proactive approach to fire safety management integrated into overall management of our built environment (Oladokun and Emmanuel, 2014; Anowai, 2022).

The statistics on fire outbreak for the year ended 2012 from various states in the federation are frightening (Adamu, 2013). In Rivers State, for instance, the government announced that 73 persons suffered different degrees of injuries and that no fewer than 230 persons lost their lives in 222 fire incidents in the state in the year 2012 (Ogunmosunle, 2013). Another statement from the Oyo State Fire Service Department indicated that about one billion naira worth of property were destroyed and a total of 38 people lost their lives in 607 fire incidents that occurred in the year 2012. In just the first two weeks of 2013, the department received 46 distress calls over fire disasters in different parts of the state in which three persons lost their lives to the inferno (Ogunmosunle, 2013).

Several problems about fire outbreaks have been identified by various researchers. Yohannes *et al.* (2010) assessed urban fire risk in the central business district of Dar es Salaam, Tanzania through observation and interviews with building managers, users and key informants. Their study revealed high disaster risk in most buildings of the study area, as 60% of the buildings' users do not know how to operate the facilities, and 40% are not aware of the available escape routes in case of fire outbreak. Notwithstanding, availability of safe escape routes are vital components of building structure (Cvetkovic *et al.*, 2022). Daniel (2011) evaluates fire prevention and control strategies in the design of a Multi-Level Market in Kafanchan, Nigeria. The results obtained showed that the markets in Nigeria are not properly zoned with regards to fire. Also, fire prone areas and the non-fire prone areas were not clearly defined and the devices and strategies provided are inadequate. As a result of lack of a fire plan or map from urban planners for Central Business Districts (CBD) especially market places, agencies responsible for firefighting finds it difficult in providing data for research purposes. For this reason, method of data collection to tackle fire outbreaks are mostly done by questionnaire administration and focused group discussion which cannot provide data that can be used to adequately mitigate and reduce the risks of fire outbreaks. Examples include studies by Afolabi *et al.* (2011), Wahab (2015) and Yohannes *et al*. (2010).

On November, 10, 1997 the Kaduna central market was gutted by inferno. The fire destroyed 90% of the market completely

while 5% were partially damaged and 5% vandalized. After the outbreak, the state government engaged a redevelopment project which was executed and expected to have essential facilities such as refuse disposal points, market office, administrative points, provision of soft landscaping within and outside the market, health facilities, Mosque(s), cafeterias, banks and police post (Ahmad, 2000). Despite the fire incidence that occurred, the government did not set up a fire sub office in the market. Likewise, little or no research has been carried out on fire outbreak in the CBD of Kaduna metropolis. It is for this reason that, this research focused on the analysis of the preparedness for fire outbreak in the Central Business District of Kaduna metropolis.

The Study Area

The study area is located between Latitudes 10^0 $30^{'}$ to 10^0 $31^{'}$ N of the Equator and Longitudes 7^0 $25^{'}$ E and 7^0 $26^{'}$ E of the Greenwich Meridian (Figure 1).It is the hub of commercial activities in Kaduna metropolis. The metropolis was the administrative capital of the defunct northern Nigeria. The Central Business District houses the largest market in the metropolis (Kaduna Central Market) and provides general purpose items such as fabrics, cooking utensils, food items, electronics and lot more. The CBD also has commercial banks, insurance and brokers' firms, eateries, offices of various sorts such as headquarters of different telecommunication firms, individual and corporate organizations' offices (Oluwole, 2017).

Materials and Methods

The materials used for this study are computer system for data processing, analysis, output and storage; Global Positioning System (GPS) for taking coordinates of sampled buildings and location of fire services stations around the study area; The software used are Erdas Imagine, 2014; ArcGIS Version 10.4. The formula for sample size determination by Krejcie and Morgan (1970) was used to determine the sample size for the number of buildings to be drawn for the study. Hence, *306 buildings were available for the study and a sample size of 171 buildings was drawn.*

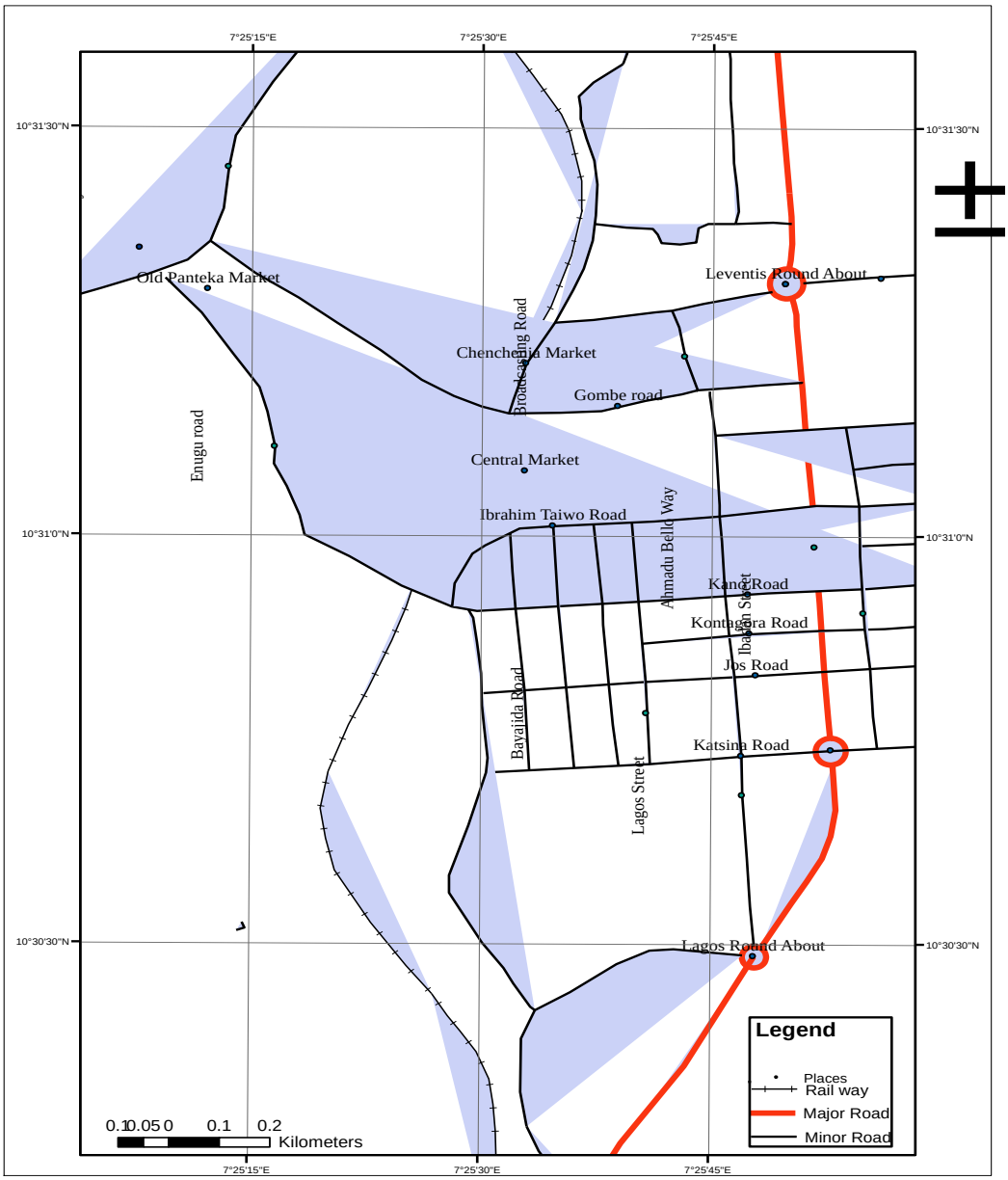

Figure 1: Central Business District, Kaduna Metropolis
Source: Authors Fieldwork, 2018

*Cluster sampling and purposive sampling methods*were used for thisresearch.First hand data were collected from interview with shop owners and firemen in Kaduna state fire service station, direct observation of buildings with respect to fire safety and taking the coordinate of sampled buildings using Global Positioning System (GPS). Data collected from interview was used to check the level of awareness of building occupants in the CBD to fire outbreak, data from direct observation was used to examine the presence of fire safety installations and level of preparedness. Secondary data were collected from National Building Code (2006) and Fire report for the year 2010 – 2017 from the Kaduna state fire service. The data collected were based on the level of fire preparedness (presence of firefighting equipment,

emergency escape routes or exits, distance between building and fuel stations, level of fire safety awareness and presence of fire safety educators such as exit signs),types of goods sold (checking for goods that can act as fuel such as wood or furniture, clothing or fabric, plastics, petroleum products and goods that can trigger fire spread),electrical wiring of buildings (that is, either poor, moderate or good wiring)**,** Type of building materials used, data on previous fire outbreak, number of people, shops and estimated worth of goods.

Results and Discussion

The collected data from the field observation and interview were analyzed. Generally the data reveal low preparedness for fire emergencies by shop owners and market infrastructures. In some buildings, emergency exits were converted into shops constituting great risk during fire outbreak. Most of the shops owners are without fire insurance cover and are unaware of fire safety measures in the buildings. Means of escape route or exits in buildings were converted to shops. Buildings containing over one hundred and fifty people, both customers and traders (Gidan Sarki and LETCO buildings for example) does not have adequate exits and does not have firefighting equipment and are surrounded by naked electrical wires, sub – standard electrical appliances and other factors that can trigger fire outbreak. These factors made these buildings highly vulnerable to fire outbreak. In order to visualize places or areas that are vulnerable to fire outbreak in the CBD, a fire vulnerability map of the CBD was produced (Figure 2).

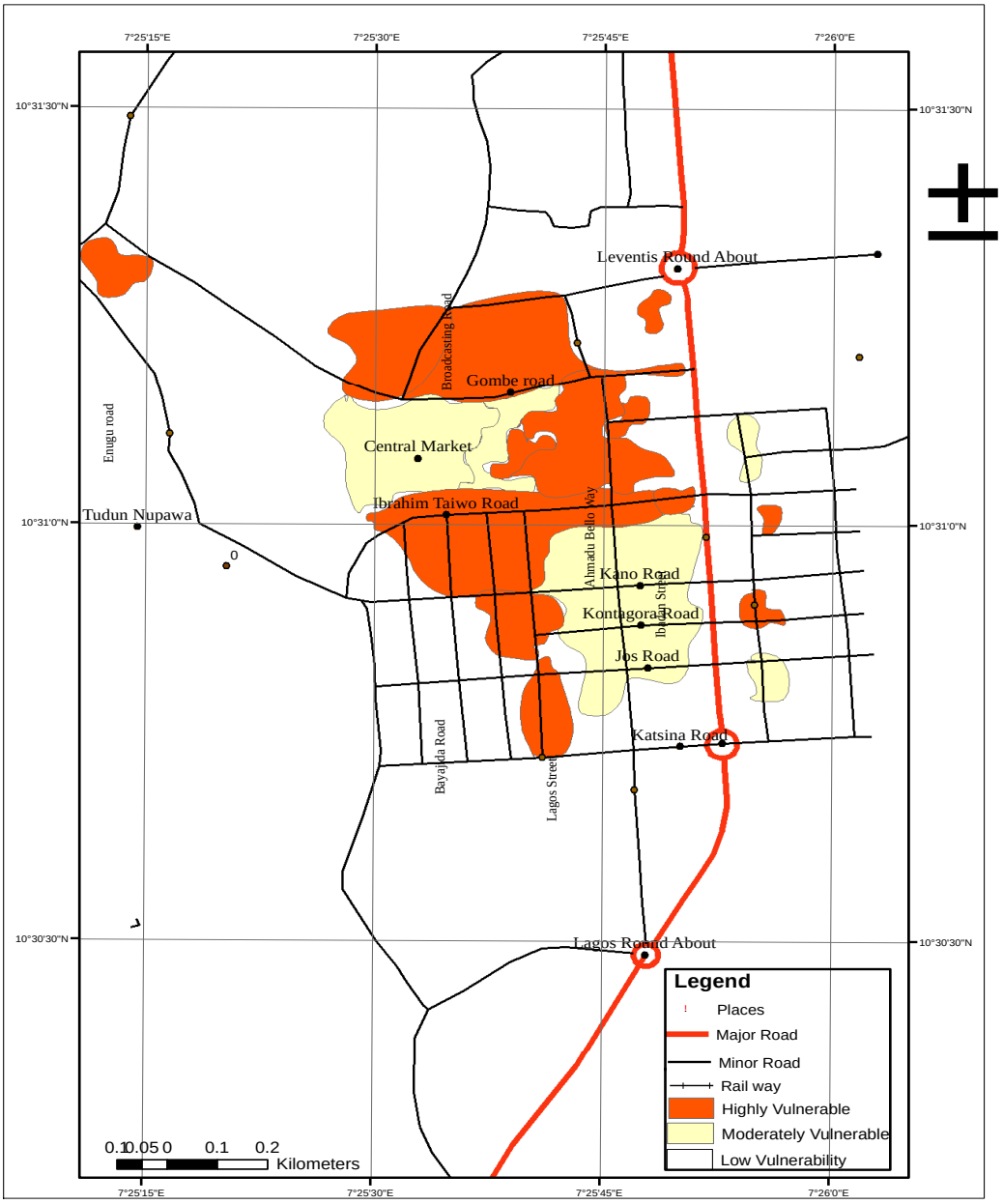

Figure 2: Vulnerability of the CBD to Fire Outbreak
Source: Author's Fieldwork, 2018

This study was guided by Precaution Adoption Process Model (PAPM). The model specifies seven distinct stages in the journey; from lack of awareness to adoption and/or maintenance of a behavior. It is a relatively new model that has been applied to an increasing number of health behaviors, including: osteoporosis prevention, colorectal cancer screening, mammography, hepatitis B vaccination, and home testing for radon gas (Glanz and Rimer, 2005). This model can also be used for fire outbreak studies. In the first stage of the PAPM, an individual may be completely unaware of a hazard. The person may subsequently become aware of the issue but remain unengaged by it (Stage 2). Next, the person faces a decision about acting (Stage 3); may decide not to act (Stage 4), or may decide to act (Stage 5).

The stages of action (Stage 6) and maintenance (Stage 7) follow. According to the PAPM, people pass through each stage of precaution adoption without skipping any of them. It is possible for people to move backwards from some later stages to earlier ones, but once they have completed the first two stages of the model they do not return to them. The level of preparedness of shop owners in the CBD was analyzed from the data contained in appendix 1. From the data, it was noticed that only few people prepared against fire emergency and this is a serious threat to life and property. This led to derivation of a fire preparedness qualitative model for this study (Figure 3).

Fire Preparedness Model (FPM) was adapted from the Precaution Adoption Process Model (PAPM) which explains how people move from the stage of unawareness to the stage of awareness about hazards or disaster (Glanz and Rimer, 2005).The Fire FPM explains effective ways of been prepared against fire outbreak, and can serve as a prototype in educating people about fire outbreak and also serve as a tool for raising awareness about fire safety measures in buildings. FPM was used for this study in order to proffer solution to the problems of low fire preparedness by the people in the Central Business District of Kaduna metropolis. The Fire Preparedness Model (FPM) is an improvement on the Precaution Adoption Process Model (PAPM).

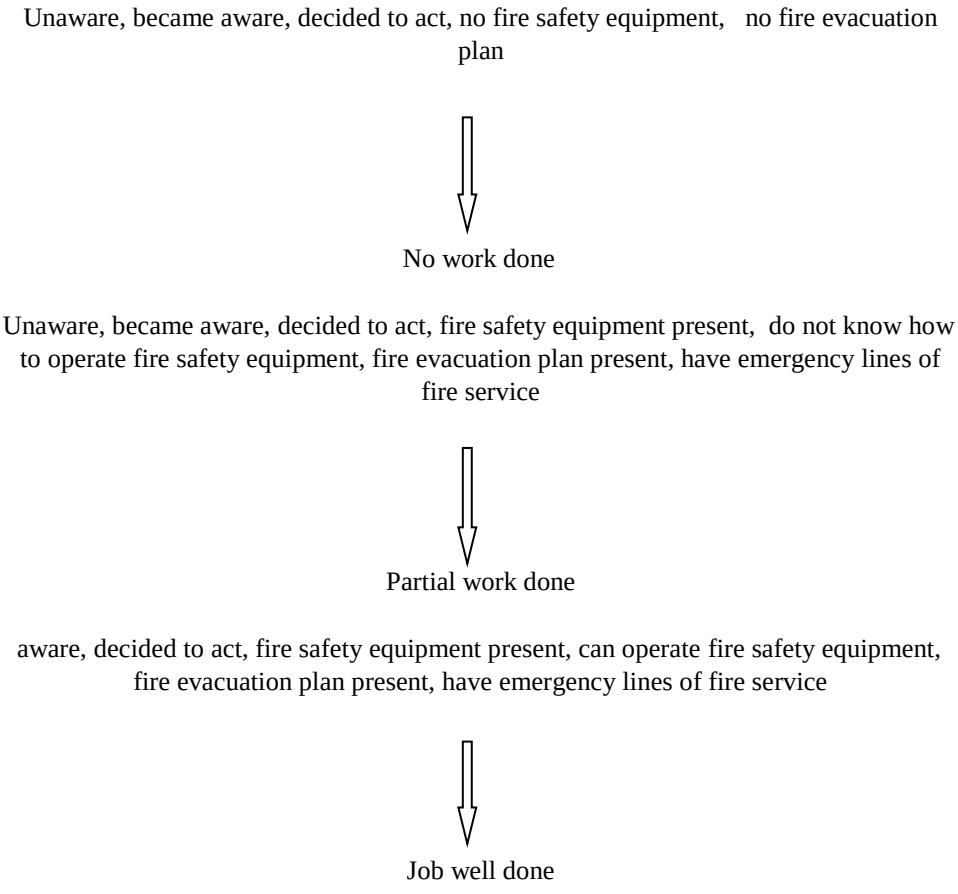

Figure 3: Fire Preparedness Model
Source: Authors Fieldwork, 2018

The Kaduna state fire service station is well situated at a considerable distance to the CBD and could be reached about 4 to 5 minutes of travel on a clear road without obstacles. However, despite the good road network, there were so many obstacles making the CBD partially accessible to fire trucks. For example, Ahmadu Bello way by Kano road is a one way road, surrounded by shops, buses and tricycles and street hawkers, thereby, reducing the width of the road, making it partially accessible by fire trucks. The same applies to Ahmadu Bello way by Jos road. Bayajida road is full of trucks parked by the road side constantly off loading goods serving as obstacles to accessibility. The obstacles on these routes affect arrival time for rescue operations. Out of all the roads in the CBD, the most accessible road free of obstacles is Lagos street and Katsina road.

Conclusion

This study led to the evolvement of fire preparedness model. There is the need for the building engineers to incorporate fire safety devices in all the buildings within the CBD. Also, there should be legislation on the part of Government backed up by the necessary enforcement for the provision of fire safety equipment in all the buildings within the CBD. The legislation should enforce the insurance of buildings and goods in the market. This will provide succour during fire outbreak.

There should be regular training of shop owners on how to use the fire safety equipment provided. Likewise additional fire stations are required for effective coordination in the time of emergencies. There should be water hydrants with uninterrupted water supply located in specific positions within the CBD. Improvement in the awareness on mitigation of fire will culminate in a reduction of fire outbreak in the CBD of Kaduna metropolis.

REFERENCES

Abeku, T., Michael, D., Akpan-Nsoh, I. Udeajah, G., Ogugbuaja, C., Oyewole, R., Gogwin, A. and Agboluaje, R. Losses to market fires hit N41.54 billion in two years, *The Guardian,* September 3, 2021.

Adamu, M. (2013). Fire Disasters, Possible Way Forward, *Managing Emergencies in Nigeria*, Pp.5-7.

Afolabi, T., Olajide, F. O. and Omotayo, S. K. (2011). Assessment of Safety Practices in Filling Stations in Ile-Ife, *Journal of Community Medicine and Primary Health Care,* 23: 40 – 59.

Ahmad, I. (2000). An Appraisal of Kaduna Central Market Redevelopment Scheme, Unpublished M.Sc Dissertation, Ahmadu Bello University, Zaria, Nigeria.

Anowai, H.I. (2022). *Basic Fire Safety Training Manual for Adult: Theory, Evacuation and Practical,* Second Edition, Anowaiyke Company Ltd.

Buchanan, A.H. (2001). *Structural Design for Fire Safety*, John Wiley and Sons, West Sussex, UK, Pp. 86.

Cvetkovic, V.M., Dragasevic, A., Protic, D., Jankovic, B., Nikolic, N. and Milosevic, P. (2022). Fire safety behavior model for residential buildings: Implications for disaster risk reduction, *International Journal of Disaster Risk Reduction*, 6.

Daniel, S. D. (2011).An Evaluation of Fire Prevention and Control Strategies in the Design of a Multi-Level Market, Kafanchan**,** Unpublished M.sc Dissertation, Ahmadu Bello University, Zaria, Nigeria.

Daramola, A.O. and Ibrahim, L. (2021). Analysis of Fire Safety Measures in Residential Buildings in Yaba LCDA, Lagos State, Nigeria, *Journal of Disaster and Risk*, 4 (2): 135-144.

Glanz, K. and Rimer, B.K. (2005). *Theory at a Glance: A Guide to Health*

Promotion Practice, Second Edition, National Cancer Institute, Bethesda.

Khan, F. I. and Abbasi, S. A (1995). Risk Analysis: A Systematic Method for Hazard Identification and Assessment, *Journal of Industrial Pollution Control*, 2: 88-96.

Krejcie, R. V. and Morgan, D. W. (1970). Determining Sample Size for Research Activities, *Educational and Psychological Measurement*, 30: 607 – 610.

National Building Code (2006). *Specifications of Fire in Public Building*, Interpak Books, Pietermaritzburg, Pp. 476.

National Emergency Management Agency (2006). National Plan for Disaster Risk Reduction and Prevention in Nigeria, A Report Prepared Under the Directorship of National Emergency Management Agency, NEMA, Lagos, Nigeria.

National Emergency Management Agency (2012). National Plan for Disaster Risk Reduction and Prevention in Nigeria, A Report Prepared Under the Directorship of National Emergency Management Agency, NEMA, Lagos, Nigeria.

National Emergency Management Agency (2015). National Plan for Disaster Risk Reduction and Prevention in Nigeria, A Report Prepared Under the Directorship of National Emergency Management Agency, NEMA, Lagos, Nigeria.

Odogwu, G. Market fires and the Nigerian economy, *Punch Newspaper*, September 9, 2021

Ogunmosunle, S. Stemming the tide of fire disasters, *Daily Trust Newspapers*, January 30, 2013

Oladokun, V.O. and Emmanuel, C.G. (2014). Urban Market Fire Disasters Management in Nigeria: A Damage Minimization Based Fuzzy Logic Model Approach, *International Journal of Computer Applications*, 106: 1 – 6.

Oladokun, V.O. and Ishola, F.A. (2010). A Risk Analysis Model for Fire Disasters in Commercial Complexes in Nigeria, *The Pacific Journal of Science and Technology*, 11(2): 376 – 386.

Oluwole, O.A. (2017). Analysis of Intra-City Residential Mobility in Kaduna Metropolis, Nigeria, Unpublished PhD Thesis submitted to the Department of Geography, University of Ibadan

Pyne, S. (2007). Problems, Paradoxes and Paradigms Triangulating Fire Research, *International Journal of Wildland Fire*, 16: 271 – 276.

StudyCorgi (2022). Fire growth and spread, Retrieved on 25/9/22 from https://studycorgi.com/fire-growth-and-spread/

Supermedia (2011). TheDangers of Fire and Smoke Damage/Fire and Water Damage, www.superpages.com/Home/supertips/Fire&waterDamage

Wahab, A.B. (2015). Evaluation of Fire Management Practices in Selected Restaurant Buildings In Osogbo, Nigeria, *Journal of Multidisciplinary Engineering Science and Technology*, 2: 56.

Yohannes, K., Jacob, K. and Huba, N. (2010). Assessing Urban Fire Risk in the Central Business District of Dares Salaam, Tanzania, *Journal of Disaster Risk Studies*, 3(1)