

ASSESSMENT OF THE CAUSES OF FIRE INCIDENTS IN GARKI MODEL MARKET OF ABUJA AND PREVENTION MEASURES AGAINST RECURRENCE

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Abstract

Nigerian markets have been facing the calamities of frequent fire incidents which have led to loss of valuable goods, properties and human lives. Garki model market in Abuja was studied with the aim of assessing the causes of fire incidents, in order to provide guidelines to reduce the calamities of fire incidences for a sustainable trades in Nigeria. 287 trading points were studied from the available 1,430 trading points in the market by using systematic sampling method at every 5th interval. The primary research data were obtained from the managing company of Garki model market, National Association of Nigerian Traders, and the traders in the market by the use of questionnaires, interview questions, discussions, and direct observation schedule. The secondary research data were sourced from the reviews of literature. Among the research findings are: electrical equipment and wiring have the highest number of the factors responsible for the causes of fire incidents in the market with 241 respondents testified to them out of 287 respondents of the questionnaires. In addition, the use of fire wood for cooking and preparation of meats are the factors responsible for the causes of fire incidents in the market. Having found the causes of fire incidents in the market, among the recommended guidelines to reduce the recurrences of fire incidents is that the management authorities of markets in Nigeria should make it a law for all the traders to put off electrical equipment at the close of businesses at night, in order to reduce their overheating or any other factor that can lead to fire incidences in markets.

Key Words: *Calamities, Fire Incidents, Guidelines, Markets, Nigeria*

Introduction

Markets are very crucial in the economy of every country; they have been contributing to the economy of nations through trades (Baah-Ennumh and Adom-Asamoah, 2012). Nigeria, like other countries in the world has many markets for different kinds of trades. Some of them are major markets, while others are minor ones which are relevant in the country.

Therefore, fire safety in markets is very important for the traders in Nigerian markets and the entire country. According to Leo (2014), trading started when the first settlers arrived in the country; like many countries of Africa, the main method of trading was through the barter system. In this case, people used to exchange goods and services for commodities and other services that were

believed to be equal to the things that were offered. This later transformed to the use of different local currencies such as Naira that is currently in use in Nigeria.

Many developing nations do not have strategies to protect their citizens that work in public buildings of which markets are inclusive, and they are exposed to several calamities that generate from fires among others without insurance cover of any kind (Leo, 2014). As a result of this, whenever any unforeseen calamity such as fire strikes the people who are above the poverty line, they sink into the poverty trap (Guha-Khasnobis and Ahuja, 2004). One of the major calamities in Nigeria is fire outbreak in the market places. According to the Federal Fire Service of Nigeria (2016), frequent fire outbreaks in Nigerian markets is a problem, and they have led to the loss of valuable goods, properties and lives of people. In addition to these negative effects of fire outbreaks in Nigerian markets, the indirect fiscal loses; health and environmental implications that are connected to them are incalculable.

Thus, the aim of this study is to assess the causes of fire incidents in Garki model market in Abuja, in order to provide guidelines to reduce the calamities of fire incidences for a sustainable trades in Nigeria. The objectives of the study are: to ascertain the causes of fire incidents from the traders with respect to Garki model market; to determine the rationales for the causes of fire incidents from the market management authority with respect to Garki model market; to investigate the things responsible for fire incidents from the National Association of Nigerian Traders (NANT) in the Federal Capital Territory (FCT) of Nigeria with respect to Garki model market, and to evaluate the

reasons for fire incidents in Garki model market by observations.

Study Area

The scope of this research is the whole buildings in Garki model market of the FCT of Nigeria. The FCT of Nigeria is located in the central part of Nigeria (Nnodim, 2011). Figure 1 shows the map of Nigeria revealing the location of the FCT in Nigeria; it also shows the locations of other states in Nigeria. Abuja is the Capital City of Nigeria and it is located in the FCT. Figure 2 shows that the FCT of Nigeria has boundaries with Kogi State of Nigeria to the south west of the FCT, and Nasarawa State of Nigeria to the east and south of the FCT; also, it has boundaries with Kaduna State of Nigeria to the north east of the FCT, and Niger State of Nigeria to the West and North of the FCT. The landmass of the FCT of Nigeria is 7,753.85 kilometres square (National Population Commission of Nigeria, 2010).

Garki model market is located in the Abuja Municipal Area Councils of FCT of Nigeria. Figure 3 shows the map of Abuja Municipal Area Councils of the Federal Capital Territory (FCT) of Nigeria revealing Garki District and other Districts. The market is located in Garki District of the Abuja Municipal Area Council. According to Satellite Google Map Data (2016), Garki model market is located along Mustajad Street (off Karaye Street and Samuel Ladoke Akintola Boulevard). Figure 4 shows the street map of Garki district, revealing Garki model market which is located along Samuel Ladoke Akintola Boulevard (off Karaye Street). The climate of the FCT of Nigeria is the tropical, humid and hot type (Agbelade, *et al.*, 2017). Its main elements have regimes that are different from climates of the northern and southern parts

of Nigeria (Abdulkadir *et al.*, 2015). Abuja (FCT) has average annual normal temperature of 25.7 °C (Climate Data, 2018) with the range of minimum temperatures of 19.3°C to 34.7°C in December and the range of maximum temperatures of 24.5°C to 37.1°C in March (Norwegian Meteorological Institute, 2018).

The nature of the vegetation of the Federal Capital Territory (FCT) of Nigeria is not uniform and the shrub savannah vegetation type dominates the northern part of the FCT of Nigeria (Ishaya *et al.*, 2014). The southern part of the FCT is dominated by the gallery vegetation and foothills in most areas of the mountains (Ishaya *et al.*, 2014). The vegetation is known for deciduous trees that are scattered among grasses. However, there are forest in some of the areas of the FCT of Nigeria because they have not suffered too much deforestation (Mallo and Mgbanyi, 2013). The Federal Capital Territory (FCT) of Nigeria has an undulating terrain and the high altitude which act as a modulating influence that make the weather clement almost at all times (Federal Capital Development Authority, 2016). The natural endowments of the FCT like its isolated highlands, rolling hills and other endearing features make it a bliss (Abuja Galleria, 2015).

Methodology

Primary and secondary research data were generated through the use of descriptive survey method; quantitative and qualitative data were generated. The primary research data are the data that were gotten from the managing company of Garki model market, NANT in the FCT of Nigeria, and the sales people in Garki model market. The company that manages

Garki model market is Abuja Markets Management Limited. According to the Abuja Markets Management Limited (2016), there are 1,430 trading points in Garki model market. Hence, by using systematic sampling method at every 5th interval, 287 trading points were selected out of the total number of the trading points for this research.

Questionnaires, interview questions, discussions and direct observation schedule are the four research instruments that were used for the collection of the primary research data. Questionnaires and focus group discussions were used to collect the data from the traders in the market. In this case, 287 questionnaires were distributed to the traders through the help of research assistants. Similarly, by employing the research assistants, 20 numbers of focus group discussions that are made up of five traders were organised in the market. Discussions and a set of interview questions were used to collect data from the staff of the NANT and the managing company of the market. Direct observation schedule was used to assess the causes of fire incidents in the market. The secondary research data are the data that were sourced from the reviews of relevant literature to this research.

Results and Discussion

Electrical problems, use of fire wood and highly combustible materials are the causes of fire incidents in Garki model market. Table 1 shows the distribution of the causes of fire incidents with their numbers of observations, and common locations in the market.

Fire Incidents from the Electrical Problems in the Market

The interview questions administered to the National Association of Nigerian Traders (NANT) showed that most of the

fire incidents in the market are caused by power surge. Also, the discussion with the staff of the managing company of Garki model market revealed that fire incidents mostly start from the cold rooms at night in the central part of the formal section of the market as a result of power surge because the traders in the cold rooms do not put off their electrical appliances at the close of businesses for the day.

Fire Incidents from the Use of Fire Wood in the Market

The focus group discussion with the traders in Garki model market revealed that one of the reasons for the causes of fire incidents in the market is the use of fire wood for cooking and preparation of meats. It was seen that the traders are still indiscriminately cooking in the premises of the illegal restaurant and also preparing meats with the use of fire wood around the open stall in the western part of the informal section of the market, in order to minimise the costs of using other alternative means. When there is strong wind that can blow the charcoal fire from the point of using the fire wood to any material that can easily burn, the entire market can be set on fire if appropriate control measures are not employed immediately.

Fire Incidents from the Use of Highly Combustible Materials in the Market

In order to manage spaces for sales, it was seen in the central part of the formal section of the market that the traders partitioned two different single shops into two spaces with non-fire resistant wood for commercial activities due to high costs of the shops. These are also as a result of inadequate numbers of the sales points in the market in relation to high demands for sales points; they are considered as unlawful architectural interior design. Building materials for

designing buildings against fire outbreaks should be able to resist surface flame spread (Building and Construction Authority, 2017; Neufert and Neufert, 2000; Quarles, 2013). Also, non-fire resistant wood can easily burn and increase the rate of spread of fire when there is fire outbreak in buildings (Chen *et al.*, 2015; Civil Engineering Home, 2017; Iwami *et al.*, 2004; Zurich Company, 2015).

Similarly, shelves were not incorporated into the interior design of the lock-up shops of the market; as a result of this problem, the construction and use of non-fire resistant wooden shelves by the traders in 135 shops in the formal section of the market were found and they are also considered as unlawful architectural interior design. These cause the fast spread of fire when there is fire outbreak. Moreover, bases for keeping goods were not incorporated into the interior design of the open stalls of the market; as a result of this problem, the construction and use of non-fire resistant wooden bases by the traders in 73 open stalls in the informal section of the market were observed. They are also considered as unlawful architectural interior design; these non-fire resistant wooden bases cause the fast spread of fire when there is fire incident.

In addition, it was noticed that the design of most of the buildings in the market have no verandas or corridors where the traders can stay for relaxation when there are no customers to sell goods. As a result of this problem, on 14 buildings in the market, the traders fixed canopies in between the roofs of two or more buildings as sun shading devices, so that they can stay under them to relax and receive fresh air in the afternoon when there are no customers for them to conduct business transactions, especially during

the intense sunshine. These are considered as illegal additional designs and building attachments. Combustibility of building materials is a prime factor to consider when designing buildings against fires (National Fire Academy, 2000; Neufert and Neufert, 2000; Sikazwe; 2015; Tan, 2007). These illegal additional designs and attachments to buildings cause the fast spread of fire from one building to another building when there are fire incidents. Table 2 shows the distribution of the causes of fire incidents from the use of highly combustible materials with their numbers of observations, and common locations in the market.

Data from the Traders with Respect to the Causes of Fire Incidents in the Market

Out of 287 traders that received the questionnaires, 241 (84.0%) of them responded that the main cause of fire incidents in Garki model market is electrical equipment/wiring, and 20 (7.0%) of them responded that arson (intentional fires) is the main cause of fire incidents in the market. Five (1.7%) traders responded that smoking (fire from cigarette end) is the main cause of fire incidents in the market, and 18 (6.3%) traders responded that they do not know the main cause of fire incidents in the market. Three (1.0%) traders responded that other causes of fire incidents in the market are cooking with gas cookers and other naked fires. Figure 5 shows the main causes of fire incidents in Garki model market. In this subsection, the majority of the traders responded that the main cause of fire incidents in the market is electricity/wiring. Therefore, it became important that emphasis was given to the fire incidents from electricity/wiring for the guidelines to reduce fire incidences.

Conclusion

The importance of markets were overviewed as they are very crucial in the economy of every country; the issues of calamities associated with the causes of frequent fire incidents in Nigerian markets were also overviewed. The research aimed to assess the causes of fire incidents in Garki model market in Abuja, in order to provide guidelines to reduce the calamities of fire incidences for a sustainable trades in Nigeria.

The research data that were obtained from the traders in the market revealed that electrical equipment and wiring have the highest number of the causes of fire incidents, followed by arson (intentional fires) and smoking (fire from cigar rete end), while other causes of fire incidents such as cooking with gas cookers and other naked fires have the lowest number. Other research findings showed that the causes of fire incidents in Garki model market are: the use of fire wood for cooking and preparation of meats; partitioning of single shops into two spaces with non-fire resistant wood for different commercial activities; the use of non-fire resistant wooden shelves in the lock-up shops; the use of non-fire resistant wooden bases for keeping goods in the open stalls, and fixing of canopies in between roofs of two or more buildings as sun shading devices by the traders.

Recommendations

Having found the causes of fire incidents in the market, the following guidelines are therefore recommended to reduce the calamities of fire incidences in Nigerian markets:

- i. The management authorities of markets in Nigeria should make it a law for all the traders to put off electrical equipment at the close of

- businesses at night, in order to reduce their overheating or any other factor that can lead to the fire incidences in markets. Alternatively, there should be provision for central or general control switches for all the market buildings in Nigeria, in order to make all electrical power supply of market buildings to be off from them by market management personnel at night, while living all the external lighting to be on at night for security reasons. Thus, there will be reduction of overheating of electrical appliances that can lead to fire incidences at night.
- ii. There should be provision of adequate number of standard fire resistant restaurants on the market sites at the design and construction stages to reduce the indiscriminate use of fire wood around the illegal restaurants in market places. Also, the management authorities of markets in Nigeria should ban the use of fire wood or cooking with fire wood, and there must be appropriate actions to that effect, in order to reduce fire outbreaks as a result of the use of the naked fires.
 - iii. Government of Nigeria should provide more markets with bigger numbers of trading points in different locations in Nigeria, so that many people can get spaces for trade to reduce the rate at which the traders partition single lock-up shop with non-fire resistant wood for two different trading spaces due to high demands for the lock-up shops.
 - iv. The management authorities of markets in Nigeria should ensure to disallow the traders in markets from demarcating single lock-up shop into two shops with non-fire resistant wood, in order to reduce the spread of fires through them.
 - v. Shelves must be incorporated into the design of the lock-up shops in markets to stop the illegal construction of non-fire resistant wooden shelves in the lock-up shops. The design specifications for the shelves should be non-combustible metal plates, in order to reduce the rate at which fires spread from them or through them to other interior building materials or properties in case of fire outbreaks.
 - vi. Bases for keeping goods must be incorporated into the design of the open stalls in markets to stop the illegal construction of non-fire resistant wooden bases for keeping goods. The design specifications for the bases for keeping goods should be non-combustible metal plates, in order to reduce the rate at which fires spread from them or through them to other interior building materials or properties in case of fire outbreaks.
 - vii. Floors of the lock-up shops in markets must be designed to have front verandas/corridors, in order to reduce the use of canopies as roof sun shading devices for the sit out areas which in turn cause the fast spread of fire in markets.
- This study did not consider the damages from fire incidents in the study area, and this is a gap in knowledge. Therefore, it is finally recommended that in subsequent research of this kind, this gap should be filled.

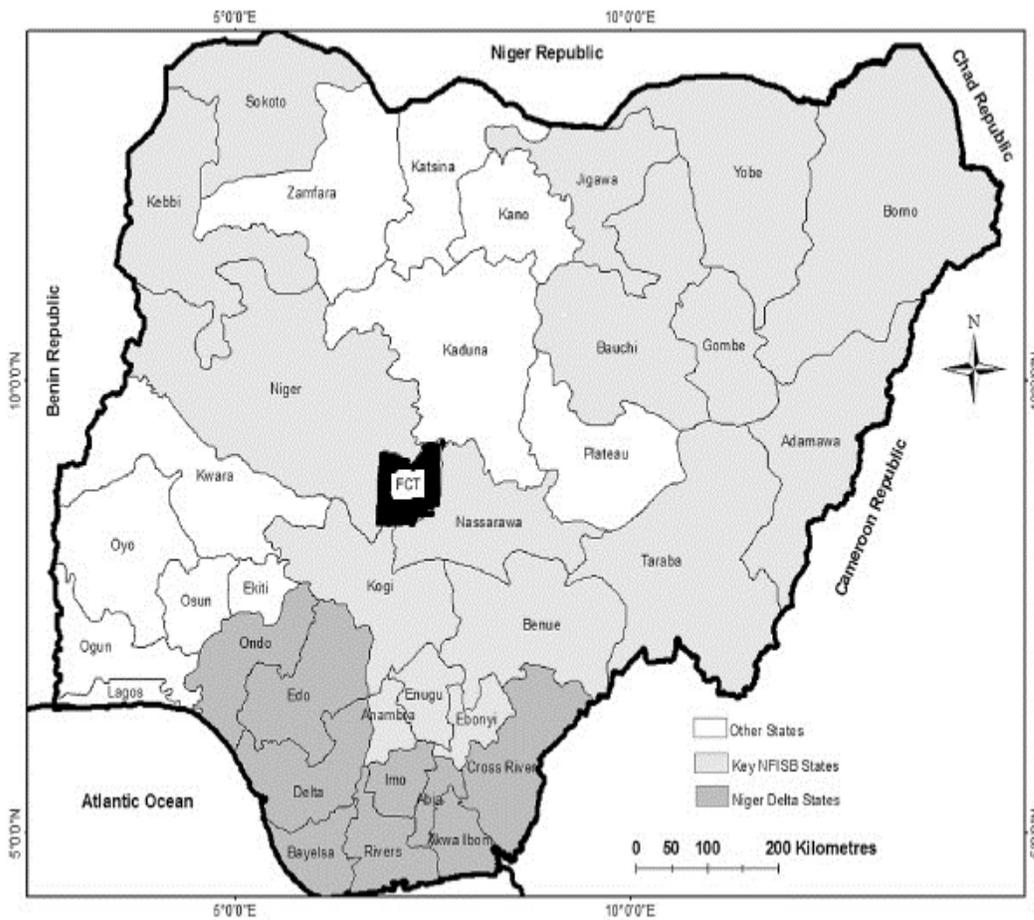


Fig. 1: Nigeria Showing 36 States with FCT Highlighted

Source: Researchgate, 2016(https://www.researchgate.net/figure/260672838_fig5_Figure-1-Map-of-Nigeria-showing-the-Nigerian-Frontier-Inland-Sedimentary-Basins-NFISB)

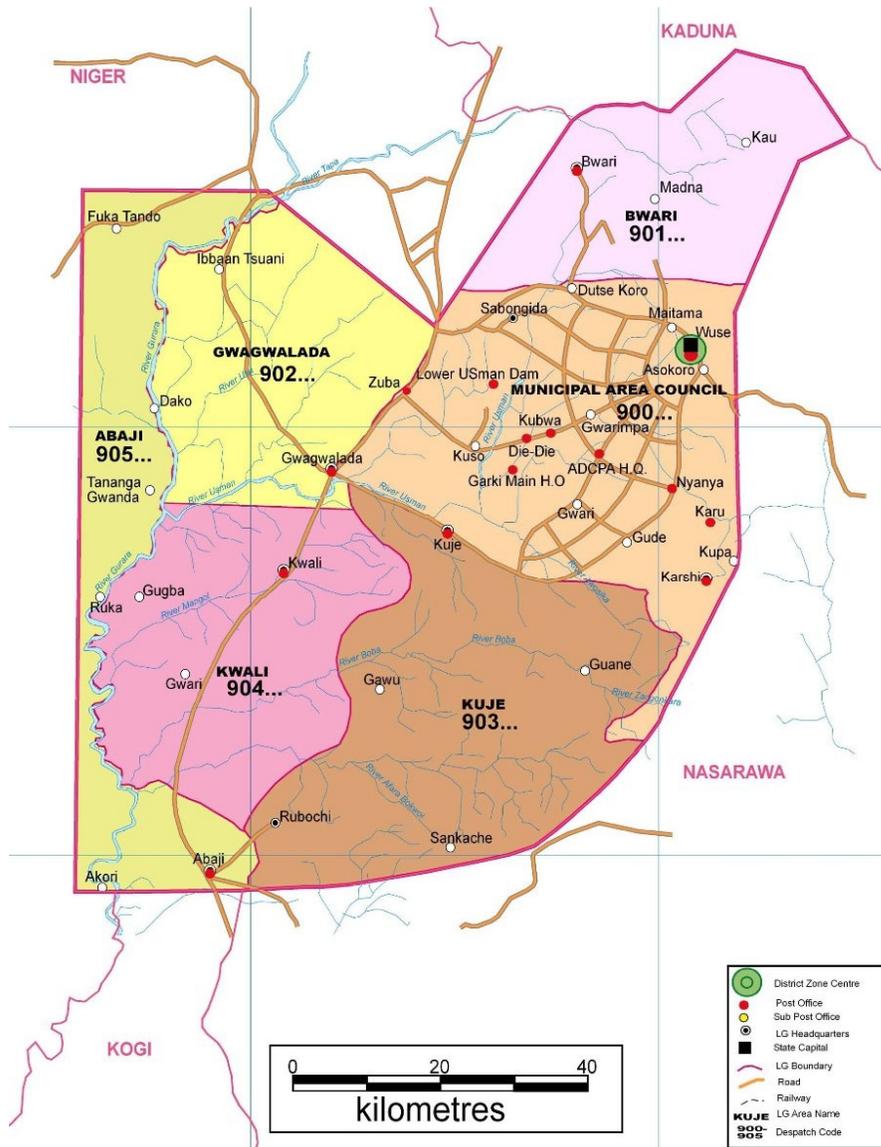


Fig. 2: Federal Capital Territory of Nigeria
 Source: Satellite City Google Maps, 2016 (<http://naijatellit.blogspot.com.ng/2016/01/list-of-6-local-councils-in-abuja.html>)

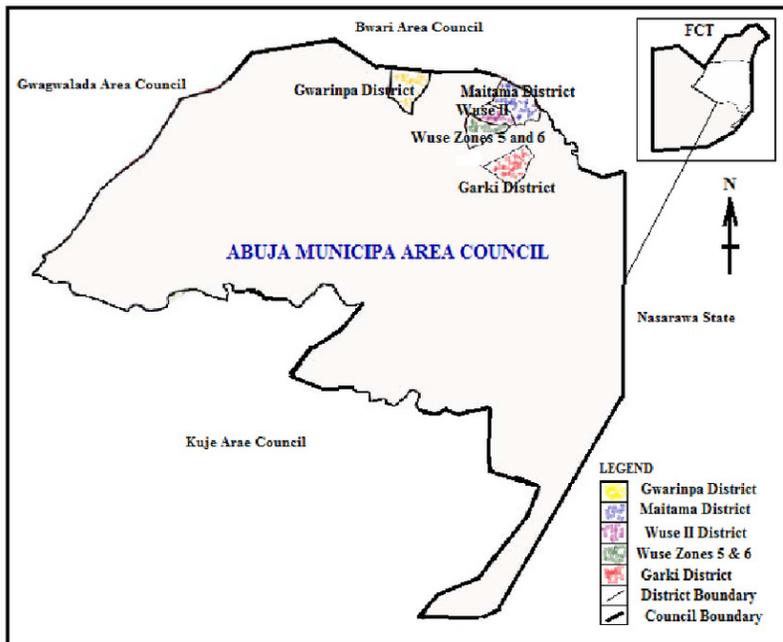


Fig. 3: Abuja Municipal Area Councils of the Federal Capital Territory of Nigeria showing Study Area

Source: Research Gate, 2015

(https://www.researchgate.net/publication/276278580_Carbon_Monoxide_Its_impacts_on_human_health_in_Abuja_Nigeria)

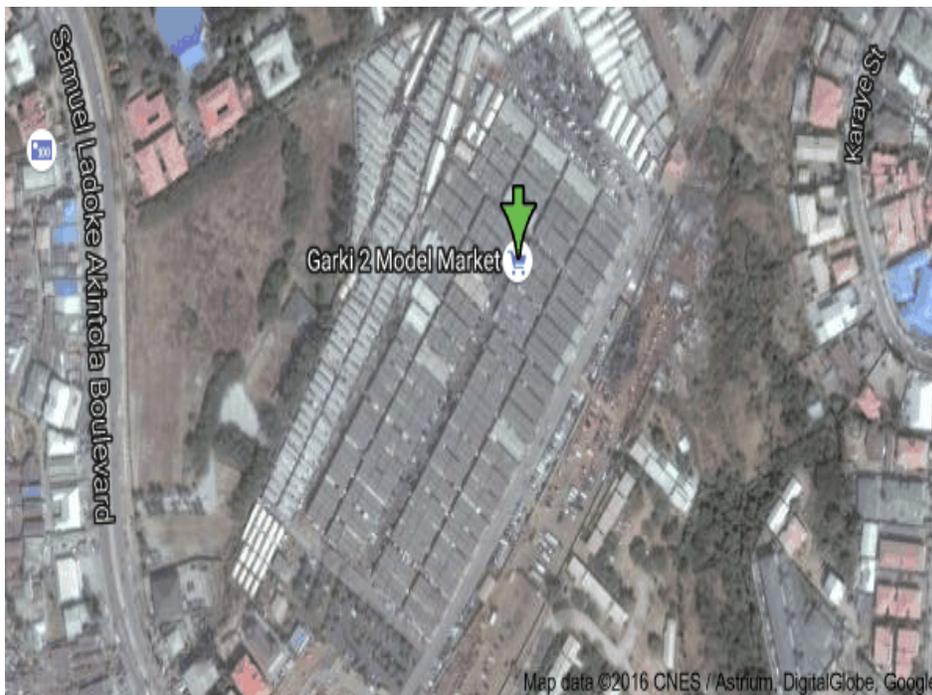


Fig. 4: Garki Model Market

Source: Satellite Google Map Data, 2016 (<https://www.google.com/maps/@9.0220938,7.4905048,452m/data=!3m1!1e3>)

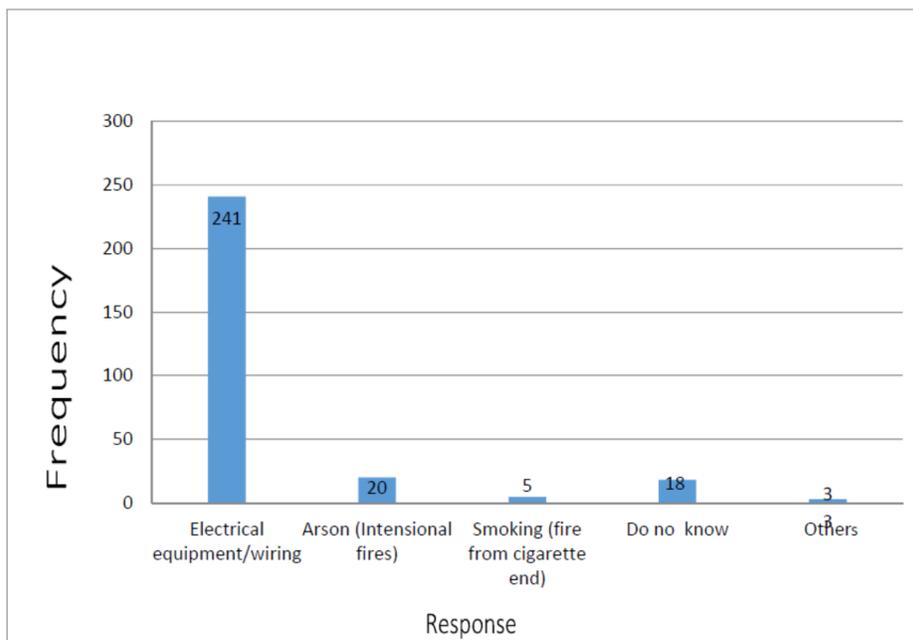


Fig. 5: Main Causes of Fire Incidents in Garki Model Market

Table 1: Distribution of the Causes of Fire Incidents in the Market

S/N	CAUSE OF FIRE INCIDENT	NUMBER OF OBSERVATION / COMMON LOCATION
1	Electrical Problems	Central Part of the Formal Section
2	Fire Wood	Around 1 Restaurant and 1 Open Stall in the Western Part of the Informal Section
3	Highly Combustible Materials	224 Sales Places in the Formal and Informal Sections

Table 2: Distribution of the Causes of Fire Incidents from the Use of Highly Combustible Materials in the Market

S/N	CAUSE OF FIRE INCIDENTS	NUMBER OF OBSERVATION / COMMON LOCATION
1	Partitioning of Single Shops with Non-fire Resistant Wood	2 Lock-up Shops in the Central Part of the Formal Section
2	Use of Non-fire Resistant Wooden Shelves	135 Shops in the Formal Section
3	Use of Non-fire Resistant Wooden Bases for Keeping Goods	73 Open Stalls in the Informal Section
4	Fixing of Canopies in between the Roofs of Buildings	14 Buildings in the Market

References

AbdulKadir, A., Usman, M.T. and Shaba, A.H. (2015). An Integrated Approach to Delineation of the Eco-climatic Zones in Northern Nigeria.

Journal of Ecology and the Natural Environment, 7(9): 247-255.

Abuja Galleria (2015). About Abuja. Abuja Business Directory. <https://www.abujagalleria.com/Abuja>

- ja/about-abuja.html. Retrieved on 20-05-2016.
- Abuja Markets Management Limited (2016). Our Facilities. A Report of Facilities of Abuja Markets Management Limited. <http://www.abujamarketsmanagement.com/our-facilities/>. Retrieved on 06-06-2016.
- Agbelade, A.D., Onyekwelu, J.C. and Oyun, M.B. (2017). Tree Species Richness, Diversity and Vegetation Index for Federal Capital Territory, Abuja, Nigeria. *International Journal of Forestry Research*, 1: 12.
- Baah-Ennumh, T.Y. and Adom-Asamoah, G. (2012). The Role of Market Women in the Informal Urban Economy in Kumasi. *Journal of Science and Technology, Ghana*, 32(2): 56-67.
- Building and Construction Authority (2017). Sustainable Construction. A Guide on Fire Protection and Performance-based Fire Engineering. Building and Construction Authority (BCS) Sustainable Construction Series 2.
- Chen, C., Chien, S. and Ho, M. (2015). *A Study on Fire Spreading Model for the Safety Distance between the Neighbourhood Occupancies and Historical Buildings in Taiwan*. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XL-5/W7, 25th International CIPA Symposium 2015, 31 August – 04 September 2015, Taipei, Taiwan.
- Civil Engineering Home (2017). Fire Resistant Buildings Requirements. A Building Technology and Construction Guide. The Contractor, Civil Engineering Home. <https://theconstructor.org/building/fire-resistant-buildings-requirements/8553/>. Retrieved on 01-06-2017.
- Climate Data (2018). Climate: Abuja. A Climate Report. <https://en.climate-data.org/location/703/>. Retrieved on 06-06-2018.
- Federal Capital Development Authority of Nigeria (2016). The Geography of Abuja. http://www.fcda.gov.ng/index.php?option=com_content&view=article&id=20&Itemid=56. Retrieved on 30-12-2016.
- Federal Fire Service of Nigeria (2016). Market Fires Killed 600 in 15 Months. The Controller General (Joseph Anebi), Federal Fire Service of Nigeria. <http://punchng.com/market-fire-killed-600-in-15-months-cg/>. Retrieved on 02-01-2017.
- Guha-Khasnobis, B. and Ahuja, R. (2004). Extending Formal Insurance to the Informal Economy Workers in India. EGDI and UNU-WIDER Conference, Parallel Session 3.2.
- Iwami, T., Ohmiya, Y., Hayashi Y., Kagiya, K., Takahashi, W. and Naruse, T. (2004). Simulation of City Fire. *Fire Science and Technology*, 23(2): 132-140.
- Ishaya, S., Hassan, S.M., and James, S.E. (2014). Post-Adaptation Vulnerability of Cereals to Rainfall and Temperature Variability in the Federal Capital Territory of Nigeria. *Ethiopian Journal of Environmental Studies & Management*, 7(5): 532 – 547.
- Leo, M.T. (2014). An Assessment of the Awareness of Fire Insurance in the Informal Sector: A Case Study of Kumasi Central Market in Ghana. *International Journal of Humanities*

- Social Sciences and Education (IJHSSE)*, 1(8): 41-47.
- Mallo, I.Y.Y. and Mgbanyi, L.L.O. (2013). Assessment of Soil Wash and Soil Erodibility Indices on Miniature Badlands at Gada Biyu, Abuja, Federal Capital Territory, Nigeria. *Ethiopian Journal of Environmental Studies and Management*, 6(2): 135-142.
- National Fire Academy (2000). Principles of Building Construction: Non-combustible. 2nd Edition of Students Manual. Federal Emergency Management Agency United States Fire Administration, National Fire Academy.
- National Population Commission of Nigeria (2010). *Population Distribution by Sex, State, Local Government Area and Senatorial District*. Priority Table, Volume III. The Result of 2006 Population and Housing Census of the Federal Republic of Nigeria.
- Neufert, E. and Neufert, P. (2000). *Architects' Data*. ISBN-10: 0632037768, ISBN-13: 978-0632037766, Third Edition, 12th September, 2000, Pp. 72 - 76, 126 – 130, & 137. Oxford Brookes University: Wiley-Blackwell.
- Nnodim, N.J. (2011). Centre for Performing Arts, Abuja: A Study of the Methods for Improving Accessibility and Increasing Participation of People with Disabilities. A Master Degree Thesis, Department of Architecture Faculty of Environmental Studies University of Nigeria, Nsukka, Enugu State, Nigeria.
- Norwegian Meteorological Institute (2018). Weather Statistics for Abuja (Nigeria). A Weather Report. <https://www.yr.no/place/Nigeria/Abuja/Abuja/statistics.html>. Retrieved on 06-06-2018.
- Quarles, S.L. (2013). Fire Ratings for Construction Materials. An Article on Fire. Insurance Institute for Business and Home Safety, Richburg, South Carolina. <http://articles.extension.org/pages/31039/fire-ratings-for-construction-materials>. Retrieved on 25-05-2017.
- Satellite Google Map Data (2016). Garki Model Market. A Map Showing the Location of Garki Model Market in the Federal Capital Territory of Nigeria. <https://www.google.com/maps/@9.0220938,7.4905048,452m/data=!3m1!1e3>. Retrieved on 18-07-2016.
- Sikazwe, H.C. (2015). Design Considerations for Fire Resistance in Buildings. Safety Report. Apex Business and Management Consultants, United Kingdom. <https://www.linkedin.com/pulse/design-considerations-fire-resistance-buildings-hector-chapa-sikazwe>. Retrieved on 24-05-2017.
- Tan, M.B. (2007). Sustainable Construction Materials for Buildings. A Building Construction Guide. Building and Construction Authority, Singapore.
- Zurich Company (2015). Building Combustibility. Zurich Risk Feature. Zurich Risk's Engineers, Australia. https://www.zurich.com.au/content/risk_features_home/property/fire/construction/building_combustibility.html#. Retrieved on 01-06-2017.