

Landscape Architecture as Means of Passive Fire Control Measures in Markets in the Federal Capital Territory of Nigeria

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Abstract

Incidences of fire at market places in Nigeria are always connected to the issues from electrical appliances usage like fans and air conditioning systems. To address these issues, Garki model market, Wuse market and Maitama farmers market in Abuja of the Federal Capital Territory (FCT) of Nigeria were comparatively studied with the aim of overviewing their landscape architecture with regards to passive fire control measures, so as to provide guidelines to enhance the use of planted trees against fire outbreaks at the stages of design of markets in Nigeria. The data of this research were gathered by means of desktop study. Then, contents analyses technique was employed to analysed the data and to checked their results, in order to ensure validities. Among the research findings are: there is no landscape architecture with regards to planted trees in Garki model market and the cross section of Wuse market for moderating temperatures during the hot season and for reducing energy usage, and the use of planted trees was given a consideration in Maitama farmers market but it is not adequate. Among the provided guidelines are: Architects should ensure that landscape architecture with regards to planted trees should be considered at the design stages of markets, and landscape architecture with regards to the use of planted trees during the design stages of Nigerian markets should not be given partial considerations by the Architects, in order to ensure adequacy of trees.

Keywords: Fire Control, Guidelines, Landscape Architecture, Markets, Nigeria.

INTRODUCTION

Landscape architecture is a means of development and decoration in the planting of gardens, yards, ground covers, parks and other planned green outdoor spaces (Shiny, Shini, Ramachandran, Sivaji and Selvam, 2022) [22]. It is used for enhancing nature plus the creation of a non-artificial setting for buildings, towns or cities. It is among the arts with regards to decorations as related to architecture, urban and regional planning plus horticulture. To change or bring to an existence a pleasing non-artificial setting, Shiny *et al.*, (2022) [22] additionally made it known that the features to be used are

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water (cascades, lakes, ponds plus streams), hedges, shrubs, trees, grasses, flowers, and bushes plus rocks. Other features that can also be used are artificial devices such as fences, fountains, pavement, gazebos, decks, plazas plus terraces (Shiny, 2022) [22]. The importance of components that are man-made as related to non-artificial components varies according to the designer, site purpose and the prevailing culture and fashion.

Garden and landscape designs can conceptually vary between classical/symmetrical and non-

artificial/romantic, informality plus formality, utility plus pleasure and private plus public. An enclosed patio garden having tubs, plant baskets and contrasts of paving and also having the large non-artificial garden popular in 18th-century England where artificial elements were visible in lesser dimension. The beauty part of landscape revolves size, scent, plants, form, colour, function plus climate. Continual maintenance of gardens is a necessity, so as to keep weeds plus other unwanted non-artificial phenomena from asserting themselves. The changeability of garden is with seasons plus climate and with the cycle of growth and decay of plants (Shiny *et al.*, 2022) [22].

The importance of plants in landscape architecture cannot be over emphasized. Based on the information obtained from the Centre for Biological Diversity (2023), [3] plants are the formation from life kingdom having inclusion of common organisms like grasses, herbs, bushes, vines, ferns, mosses plus trees; via photosynthesis, these plants transform water and carbon dioxide into sugars plus oxygen that give the main fuel for life, and by means of the fixation of nitrogen, they provide proteins which is known as the fundamental life building blocks. Plants are crucial to the wellbeing of the rest of living creatures on earth via the services of sustained systemic life-support plus drugs, food and the rest of material resources from them. The totality of described plant species hovers about 250,000. Plant cells are made of rigid cell walls that consist cellulose, chloroplasts, a nucleus and large vacuoles filled with water (Ducksters Education Site, 2019) [6]. According to Daniel and Chris (2017), [5] plants reduce energy usage, extend roof lives and moderate temperatures during the hot season. It was further explained that plants make indoor spaces healthier for the occupants, both in terms of physical and mental health. Therefore, this has made it known that plants have many significances in markets.

According to Academy of Urbanism (2022), markets are important spaces for economic activities where people can find business spaces and the finance networks obtainable in markets are enormous. As more markets are established in Nigeria, different problems arise from their establishments, and these include fire outbreaks, bomb blasts, stealing, fraud, human congestions, quarrels and disputes, inadequate supply of water and electricity, inadequate toilet facilities, dilapidated market structures, substandard buildings, and the activities of hawkers and open space traders that do not conform with the standard market operations (Achumba *et al.*, 2013; [2] Federal Fire Service of Nigeria [FFSN], 2016; [9] Gidipoint, 2015; [15] National Association of Nigerian Traders [NANT], 2014 and 2016; [14, 15] Olayinka, 2016; [19] Terkula *et al.*, 2016) [25]. Furthermore, the FFSN (2016) and NANT (2016) [11] revealed that fire outbreaks in markets in Nigeria are significantly rated high and in most cases they were attributed to the problems from the use of electrical appliances such as fans and air conditioning systems for artificial cooling and ventilation. Gidi Point (2015) [12]. This is because emphasis have not been given to the use of plants for natural cooling and ventilation. It was additionally made it known by the FFSN (2016) and NANT (2016) [11] that in most cases of outbreak of market fire, lives plus properties that worth millions of Naira are lost.

To this end, this study aimed at overviewing landscape architecture with regards to passive fire control measures in markets in the Federal Capital Territory of Nigeria, in order to provide guidelines to enhance the use of planted trees against fire outbreaks at the design stages of Nigerian markets. The Federal Capital Territory (FCT) of Nigeria is located in the central part of Nigeria and its capital city is Abuja. (Figure 1) shows the Nigerian map revealing the FCT location in the central part of Nigeria; it also shows the locations of other states in Nigeria.

METHODS AND PROCEDURES

Qualitative data were generated by this research by using descriptive survey method. According to the National Population Commission (2022) [16] and Nigeria High Commission (2022), [17] it was opined that Nigeria is made up of 36 states and the Federal Capital Territory (FCT). The research overviewed landscape architecture as means of passive fire control measures in markets in the FCT of

Nigeria because of the previous cases of market fire outbreaks in this territory (Abuja Markets Management Limited [AMML], 2018; [1] FFSN, 2003, 2013, 2014 and 2015) [8–10].

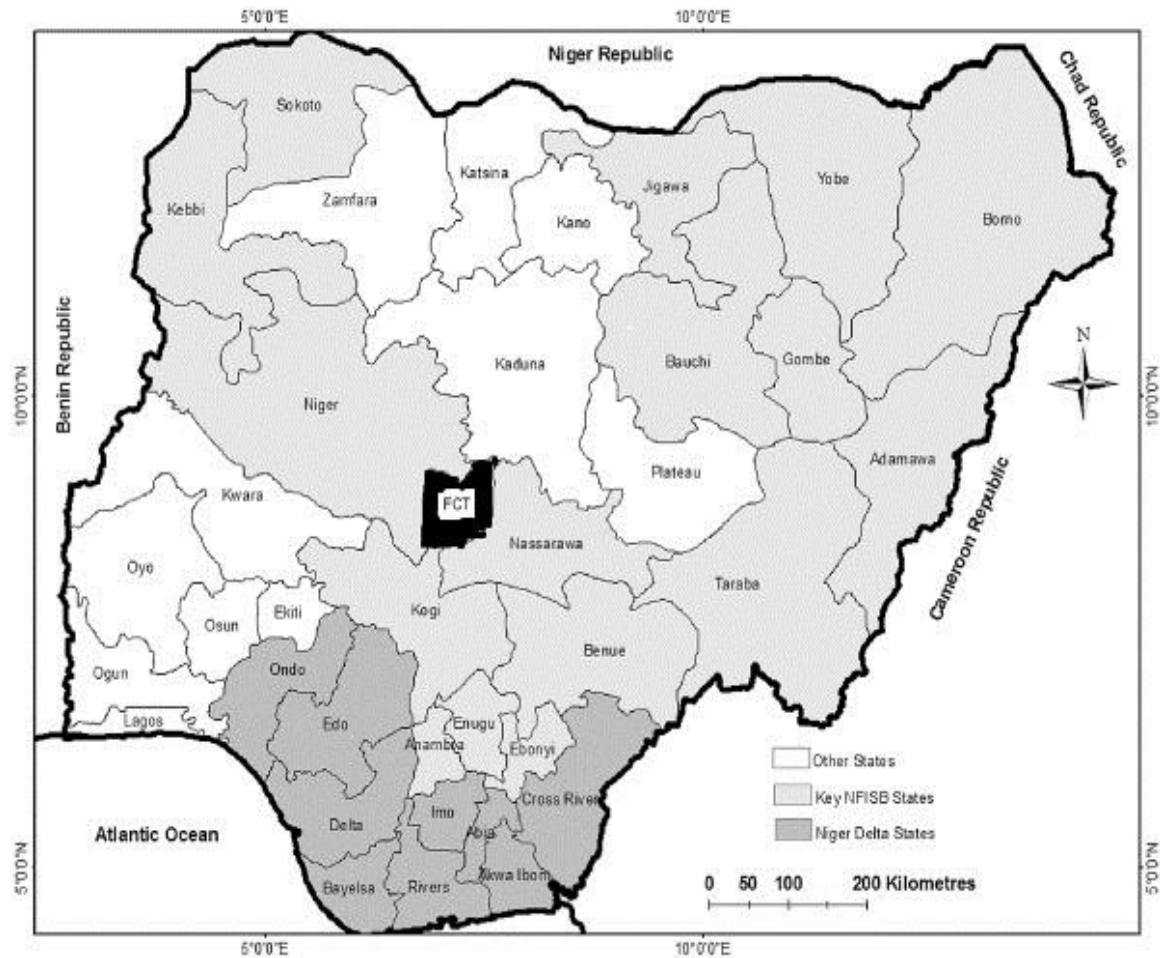


Figure 1. Nigeria showing 36 States with FCT highlighted [Source: Research Gate, 2016 (https://www.researchgate.net/figure/260672838_fig5_Figure-1-Map-of-Nigeria-showing-the-Nigerian-Frontier-Inland-Sedimentary-Basins-NFISB)].

According to Federal Capital Development Authority (2016), [7] there are seven regional built-up markets that are under the control of Markets Management Committee of the FCT; they are:

1. Maitama farmers market.
2. Dei-dei building material and regional market.
3. Kado market.
4. Gudu market.
5. Nyanya informal market.
6. Garki model market.
7. Wuse market.

Based on the information obtained from Prashant and Supriya (2010), [20] Steve (2011); [23] Suresh and Chandrashekar (2012), [24] in every research, 20% sample size of a population is an appropriate suggested sample size. Owing to this, out of the seven available regional built-up markets in the FCT, three were purposively selected and studied; they are:

1. Garki model market.
2. Wuse market.
3. Maitama farmers market.

The three selected markets for this study are more than 20% of the sample size and these in turn have made the sample size to be acceptable. The research data were collected via desktop study; reviewed different literature and information from reports, journals, blogs, tags, official Facebook website, magazine, doctorate degree thesis and hand book. Research data were analyzed and their checking were made by means of the technique of contents analyses via the comparison of the extracted data with the original desktop data from the main sources, in order to validate the results. The results of the analyses were employed in providing the guidelines to enhance the use of plants against fire outbreaks at the design stages of Nigerian markets.

RESULTS AND DISCUSSION

Garki model market, Wuse market, Maitama farmers market were studied with respect to their landscape architecture as means of passive fire control measures in the markets. (Table 1) shows the three markets that were studied with their related issues of causes of fire and landscape architecture. It reveals that the issues of landscape architecture exist in all the three markets that were studied but the issues of the causes of fire were only found in Garki model market and Wuse market.

Table 1. Distribution of Markets with their Related Issues of Causes of Fire and Landscape Architecture.

S.N.	Market	Related Issue
1	Garki Model Market	No Landscape Architecture with Regards to the Planted Trees; Power Surge and Electricity Generators in the Shops are the Cause of Fire Outbreaks in the Market
2	Wuse Market	No Landscape Architecture with Regards to the Planted Trees at the Cross Section of the Market; the Main Cause of Fire Outbreaks in the Market is Electrical Equipment and Wiring from Electric Power Generators
3	Maitama Farmers Market	Use of Planted Trees to Moderate Temperatures and to Reduce Energy Usage was Inadequately Considered; Haphazard Use of Electricity Generators to Moderate Temperatures was not Found

Source: Reviewed Work, 2023.

Garki Model Market

Plants reduce energy usage, extend roof lives and moderate temperatures during the hot season (Daniel and Chris, 2017) [5]. However, observation revealed that there is no landscape architecture with regards to planted trees to moderate temperatures during the hot season, in order to reduce the use of electricity generators for powering appliances for artificial cooling and ventilation which is one of the causes of fire outbreaks in Garki model market as fire outbreaks from generators in this market have been previously reported by the Guardian (2016) [13]. (Figure 2) shows a shop building in the market without planted trees for landscape architecture.



Figure 2. Shop Building in Garki Model Market without Planted Trees for Landscape Architecture [Source: TVC News, 2017 (<https://www.tvcnews.tv/2017/01/traders-from-garki-model-market-protest-in-abuja/>); Retrieved on 06/04/2022].

According to the Guardian (2016), [13] there was fire outbreak on 24th April, 2016 and it shares similarities with the one that occurred on 29th March, 2014 and goods worth millions of Naira were lost. Majority of the time, power surge plus electricity generators in shops are the causes of these fires and petrol storages are their catalysts for very intensive fires. (Figure 3) shows burnt shops in the market as a result of the use of electricity generator. Based on the information obtained from the Guardian (2016), [13] there were either empty or expired fire extinguishers in Garki model market when there was fire outbreak on 29th March, 2014 in the market.



Figure 3. Burnt Shops in Garki Model market as a Result of the Use of Electricity Generator (Source: Guardian, 2016 (<https://guardian.ng/sunday-magazine/more-market-fires-than-meet-the-eye/>); Retrieved on 06/04/2023].

Wuse Market

Observation showed that at the cross section of Wuse market, there is no landscape architecture with regards to planted trees to moderate temperatures during the hot season, in order to reduce the use of electricity generators for powering appliances for artificial cooling and ventilation which is one of the causes of fire outbreaks in Wuse market as fire outbreaks from generators have been previously revealed by Odaudu (2021) [18]. (Figure 4) shows shop buildings at the cross section of the market without planted trees for landscape architecture.



Figure 4. Shop Buildings at the Cross Section of the Market without Planted Trees for Landscape Architecture [Source: Shutterstock, 2023 (<https://www.shutterstock.com/image-photo/abuja-federal-capital-territory-nigeria-december-1278322417>); Retrieved on 06/04/2023].

According to Odaudu (2021), [18] the main cause of fire outbreaks in Wuse market is electrical equipment and wiring from electric power generators. Similarly, the study of Ramamurthy (2004); [21] Chukwu and Kalu (2015) [4] revealed that indiscriminate use of electric power generators causes outbreaks of fire. Odaudu (2021) [18] further revealed that indiscriminate use of electric power generators are very common in the old section of Wuse market due to unstable supply of public electric power. This is also owing to the necessity of the power appliances for non-natural cooling plus ventilation amidst the rest of the needs. The researcher additionally revealed that there is a location around part of the north of the market new section where different sales people gathered many small size electric power generators in a general power house. This power house is considered to be a centre of fire outbreaks from electric power generators in the market. (Figure 5) shows a power house with indiscriminate arrangement of small size electric power generators in the market.



Figure 5. Power House with Indiscriminate Arrangement of Small Size Electric Power Generators in Wuse market [Source: Odaudu, 2021 in the Repository of the Federal University of Technology, Minna, Nigeria (<http://repository.futminna.edu.ng:8080/jspui/bitstream/123456789/12657/1/ODAUDU%2C%20Ugbede%20Sunday-%20PhD-SET-2015-665.pdf>); Retrieved on 06/04/2023].



Figure 6. Open Stalls with Planted Trees around them at Maitama Farmers Market [Source: Info About Companies of Nigeria, 2023 (<https://ng.infoaboutcompanies.com/Catalog/Federal-Capital-Territory/Abuja/Butcher-Shop/Maitama-Farmers-Market-Abuja.>); Retrieved on 23-02-2023].

Maitama Farmers Market

From the information obtained from Daniel and Chris (2017), [5] plants reduce energy usage, extend roof lives and moderate temperatures during the hot season. It was observed in Maitama

farmers market that the use of planted trees to moderate temperatures during the hot season and to reduce energy usage was given a consideration. However, planted trees were not adequate; nevertheless, the haphazard use of electricity generators to moderate temperatures were not found in this market. (Figures 6 and 7) show shop buildings with planted trees around them.



Figure 7. Open Stalls with Planted Trees around them at Maitama Farmers Market [Source: Info About Companies of Nigeria, 2023 (<https://ng.infoaboutcompanies.com/Catalog/Federal-Capital-Territory/Abuja/Market/Maitama-Farmers-Market-Abuja.>); Retrieved on 23-02-2023].

CONCLUSION AND RECOMMENDATIONS

Landscape architecture with regards to passive fire control measures in markets in the Federal Capital Territory of Nigeria was overviewed, in order to provide guidelines to enhance the use of planted trees against fire outbreaks at the design stages of Nigerian markets. The research findings showed that: there is no landscape architecture with regards to planted trees in Garki model market and the cross section of Wuse market for moderating temperatures during the hot season and to reduce energy usage; the use of planted trees to moderate temperatures during the hot season and to reduce energy usage was given a consideration in Maitama farmers market but it is not adequate; power surge, electrical equipment and wiring from electric power generators are the causes of fire outbreaks in the market due to haphazard use of electricity generators to moderate temperatures.

Therefore, the following guidelines are provided to enhance the use of planted trees at the design stages of markets, in order to reduce fire outbreaks in Nigeria:

- i. Architects should ensure that landscape architecture with regards to planted trees for moderating temperatures during the hot season and for reducing energy usage should be considered at the design stages.
- ii. Landscape architecture with regards to the use of planted trees to moderate temperatures during the hot season and to reduce energy usage should not be given partial considerations by the Architects, in order to ensure adequacy of trees.
- iii. Upon achieving adequate landscape architecture in market design, there must be central generator's house in the market for general use in complementing the natural ventilation from planted trees, in order to reduce fire outbreaks from electrical equipment and wiring from personal or private electric power generators.
- iv. Upon having the central generator's house, the management authorities of Nigerian markets should ban the use of personal or private electricity generators to power appliances for artificial cooling and ventilation in the markets, so as to reduce fire outbreaks.

RESEARCH GAP

Different types of plants and their standard spacing around the buildings in the markets to ensure sufficient natural ventilation and cooling were not considered in this research, and this is a research gap. Thus, in subsequent research of this type, it is important that this gap is filled.

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