Spatial Distribution of Telecommunication Base Station and Its Compliance in Federal Capital City (FCC), Abuja.

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Abstract

The rapid growth of the Global System for Mobile Communication (GSM) in Nigeria has led to a significant increase in the number of telecommunication base stations deployed across urban areas, particularly in the Federal Capital City (FCC), Abuja. This research examines the spatial distribution of these telecommunication masts and evaluates their compliance with the Nigerian Communications Commission (NCC) regulations. Using Geographic Information Systems (GIS), spatial and statistical analyses were conducted on 92 base stations identified through a combination of secondary data from the NCC and Mobile Network Operators, and verified through field surveys using GPS coordinates. The findings indicate a clustered distribution pattern, with the highest base station concentrations in the Wuse and Garki districts. Nearest Neighbourhood Analysis confirmed a significant level of clustering (Rn = 0.01, Z-score = -12.74), suggesting that deploying these masts is not random. Despite NCC guidelines mandating a minimum spacing of 1 km between masts, only 24 installations adhered to this requirement, highlighting widespread non-compliance among major service providers such as MTN and Glo. The study concludes inconsistent adherence to planning standards undermines urban sustainability and livability. To address these issues, the research recommends stricter enforcement of NCC regulations, streamlined permit processes, and increased collaboration among stakeholders. These measures would promote the efficient and environmentally responsible distribution of telecommunication infrastructure in Abuja. This research provides valuable insights for urban planners, policymakers, and telecom operators who aim to balance technological progress with sustainable urban development.

Keywords: Telecommunication Base Station, Spatial Distribution, GIS analysis, Regulatory Compliance, Sustainable Development, Abuja.

1.0 Introduction

Global System for Mobile Communications (GSM) dominates the Nigerian telecom industry, accounting for almost 98% share of the market (NCC, 2025). Also, GSM is one of the quickest growing and most demanding telecommunication applications in the world now and in Nigeria (Enahoro, 2021). It presents a constantly growing telephone subscriptions around the globe. Nigeria is one of the major consumers of GSM for communication in Africa; over 60% of the population in Nigeria depends on GSM as the fastest means of communication (Omoruyi, 2025). Ever since the launch of mobile phone service in Nigeria in the early 2001, it has played a crucial role in the dissemination of information (communication, SMS, and Data for internet usage). The sector had recorded an excessive growth from 2.27 million subscribers in 2002, when the first

mobile permit was issued, to 186 million in January 2025 (NCC, 2025). According to the Nigerian Communications Commission (NCC), the number of structured transceiver base stations (BTSs) or mast sites by the four service operators grew from zero in 2001 to about 127,294,000 in May 2023 (NCC, 2023).

The mast is a free-standing structure that supports antennas at a height where they can transmit and receive radio waves (Aboshio, 2024). A mast is usually 15m high and plays no part in the transmission of radio waves. The base stations are sites that enable mobile phones to work (Osodeke,2012). They can be big or small and have transmitters and receivers in a cabin or cabinet attached to antennas. They can be mounted on a substantial pole or tower, an existing building rooftop, or street furniture such as street lamps. Thus, without the base station, the mobile phone will not work.

Despite existing guidelines from the Nigerian Communications Commission (NCC) for the siting of telecommunication masts, many operators have indiscriminately installed base stations, often without due consideration for urban planning standards (Adetoso, 2023). The absence of environmental impact assessments (EIAs) underscores the need for a spatially conscious and regulatory-compliant telecom infrastructure deployment (IFC, 2007; Iortile et al., 2013; Aderoju et al., 2014). The Abuja Master Plan was designed to guide the physical development of Nigeria's capital city. However, the growing disregard for this plan through unregulated mast installations poses significant risks to urban livability and sustainability. A spatial analysis of the base stations is, therefore, essential to identify patterns of clustering, infrastructural gaps, and service operators' compliance with the NCC regulations and planning standards in the FCC. The specific objectives are to:

- Identify and locate the telecommunication base stations within the Federal Capital City.
- Assess the spatial pattern of distribution of telecommunication masts in different neighbourhoods in FCC
- Assess the compliance level to the NCC guidelines by the service providers in FCC.

This study is justified as it bridges the gap between technological expansion and sustainable urban management. It seeks to assess the spatial distribution of base stations in the FCC using spatial analytical tools like ArGIS as there is limited geospatial compliance studies in Nigerian cities, evaluate the degree of compliance with NCC guidelines, and provide critical insight for policy makers, urban planners, and telecom operators on optimizing telecommunication infrastructure while

safeguarding environmental and public health. By identifying non-compliance hotspots, the study can prompt better enforcement mechanisms and contribute to more equitable and sustainable urban growth.

2.0 Literature Review

2.1 Classical Location Theory

In classical location theory, the spatial pattern of economic activities is explained mainly in terms of transfer costs which include both freight charges (Transport cost) and the cost of insurance on materials and goods; route and losses incurred by deterioration of or damage to materials and the route. The expense and inconvenience of shipping finished products to distant customers and procuring raw materials from distant sources induce producers to locate near their markets or raw materials (Tien, 2019). Which of the market or source of raw material eventually attracts an activity depends on the comparative price of meeting materials and distributing finished products. Many industrialists, therefore, are given to locate where aggregate transfer costs are at a minimum (Gbakeji, 2014).

Transport prices are normally cut by bringing manufacturers and consumers closer together on the tape drive and communications network (Crawford, 2009). Consequently, profit-oriented enterprises respond to transfer costs by seeking to subdue them. Transfer costs, in core, operate to choose a concentration of economic activities at strategic points on the tape drive and communications network, and all types of production find favourable locations at trans-shipment and junction points on the conveyance net (Yeung, 2006). The notion of transfer costs has strong implications for the spatial distribution/location of public facilities. Public facilities have many important characteristics, two of which are particularly relevant for our present purpose: The services they produce are mostly for final consumption,

Public services generally require personal contact between producers and consumers. As a result of these two characteristics, public facilities are generally located primarily with an eye to distribution, and are thus oriented towards the consumer market. Location theory also makes important points about the spatial distribution of producers and consumers. The locational relation between producers competing for markets is usually one of mutual repulsion. This is largely because producers search for markets where competition is at a minimum (Campbell, 2011). If the good supplied is standardized, affording no grounds for consumer preference apart from cheapness, each market point will buy from whatever production centre can supply it most cheaply. The delivered price of any good or product in any market is equal to its cost at the factory plus

distribution costs. Consequently, the spatial pattern of producers and consumers is a function of competition between producers and is largely resolved by the structure of transfer costs.

2.1.1 Locational Objectives and Spatial Efficiency

In locating private and public facilities, the common objective of policy-makers is either to maximize utility or to minimize costs. However, public and private decision-makers differ in their definition of utility and cost. Since the major goal of shareholders or owners of private facilities is to maximize their profits, private location decisions are necessarily profit-oriented. For all private enterprises, the ultimate basis of choice of location is the rate of earnings (wages, profits, or interests) obtainable at different locations (Banwo, 2017). Regularity and security of earnings are also important. Consequently, communities with stable economies are generally more attractive to entrepreneurs seeking to locate enterprises. Equally important is the expected trend in earnings. Thus, from the point of view of private locational decisions, the important factors are stability and security of returns and bright prospects.

While private enterprises mainly seek monetary profits for a comparatively small group of individuals, public decision-makers aim at maximizing social utility or minimizing the social costs for those who use the services provided. In such situations, the definition of utility and cost for the user in human terms takes the place of variables, structured solely in terms of monetary returns to the producer (Moscati, 2019). The goal of public location decisions could, for instance, be to minimize aggregate travel for a given population while simultaneously ensuring that all consumers have access to facilities. The smaller the whole travel, the more effective the set of facility locations and the more accessible the services to the user population. Public and private decision-makers differ in their locational objectives, especially as their locational decisions are made within different frameworks.

Monetary measures are the basis of most private location decisions. Therefore, concerning public facilities, non-monetary criteria become especially evident (Moscati, 2019). Hence, one of the primary objectives of public locational decisions is the maximization of accessibility to facilities. It is against this background that the spatial pattern or distribution of health-care facilities was examined to identify the locational characteristics of this category of public facilities.

2.2 NCC Regulations on the Location of Telecommunication Mast

According to the Nigerian Communication Commission Act of 2009 on the siting of telecommunications towers and masts is stated as follows:

- The siting of masts and towers shall take cognizance of the provisions of the Act and be guided by the provisions of the collocation and infrastructure sharing in such a way as to minimize their number, protect and promote public safety, and mitigate visual impact on the community.
- Telecommunication towers above 25 metres in height would not be permitted within districts delineated as residential.
- Where towers above 25 metres in height are permitted, they should be placed at a minimum setback of 5 metres distance to the nearest demised property, excluding the fence.
- The minimum spacing between two or more towers above 55 metres in height shall be 1 (one) kilometre.

2.2.1 Challenges and Issues in NCC Guidelines Implementation

1. Lack of Enforcement and Compliance: One of the most significant challenges in the implementation of the NCC's guidelines is the lack of effective enforcement. Many operators do not adhere to the minimum spacing requirements, and masts are often sited in areas not compliant with the NCC's regulations. A study by Iortile et al. (2013) highlighted that despite the existence of regulations, many cities in Nigeria, including Abuja, experience poor enforcement, resulting in the indiscriminate placement of base stations.

2. Urban Planning Conflicts: The rapid expansion of telecommunication infrastructure often conflicts with urban planning efforts, particularly in fast-growing cities like Abuja. The Abuja Master Plan was designed to ensure orderly growth, but the siting of telecommunication masts without proper adherence to zoning laws has led to irregularities in land use. Masts are frequently installed in residential and commercial zones without considering the long-term urban development plan (Aderoju et al., 2014).

3. Public Health and Safety Concerns: There are concerns about the health risks of electromagnetic radiation from telecommunication masts. While the NCC sets guidelines to mitigate these risks, such as ensuring that masts are located at safe distances from populated areas, some studies have raised concerns about the long-term health effects on residents

living close to these structures (Ihunwo, 2019). The lack of proper monitoring and follow-up on radiation levels in many locations further exacerbates public concerns.

2.3 Spatial Analysis and the Role of GIS in Compliance Monitoring

1. Geospatial Tools in Mast Siting and Compliance Monitoring: The use of Geographic Information Systems (GIS) has been recognized as an effective tool for monitoring the compliance of mast siting with NCC regulations. GIS allows for the mapping and spatial analysis of base station locations, facilitating the identification of areas where towers violate minimum spacing or setback requirements. According to Nwachukwu et al. (2021), GIS tools have been successfully used to assess the distribution patterns of base stations and identify hotspots where regulatory violations are frequent.

2. Urban Sustainability and the Need for Strategic Planning: Strategic planning, supported by spatial data and GIS tools, is essential for balancing the expansion of telecommunication infrastructure with urban sustainability. Planning efforts must account for the socio-economic, environmental, and aesthetic impact of telecommunication masts, ensuring that their installation does not compromise the livability of urban spaces.

3.0 Methodology

3.1 Study Area

Abuja, the Federal Capital City of Nigeria, officially became the capital on December 12, 1991, replacing Lagos due to increasing congestion, overpopulation, and administrative challenges in the former capital (Mabogunje, 1977; Ede, 2014). The move aimed to ensure a more neutral, centrally located capital to promote national unity and balanced development (Salau, 2005). The Federal Capital Territory (FCT), where Abuja is located, was established in 1976 by Decree No. 6 under the administration of General Murtala Mohammed. The FCT covers approximately 8,000 square kilometers and was chosen for its centrality, low population density at the time, and limited dominance by any ethnic or religious group (Federal Capital Development Authority [FCDA], 1990).

The city's physical and structural development was guided by a comprehensive Master Plan prepared by the International Planning Associates (IPA); a consortium of American urban planning firms (IPA, 1979). The plan organized the city into functional sectors, including residential, administrative, commercial, and recreational zones. Prominent

districts include the Central Business District, Garki, Asokoro, and Maitama.

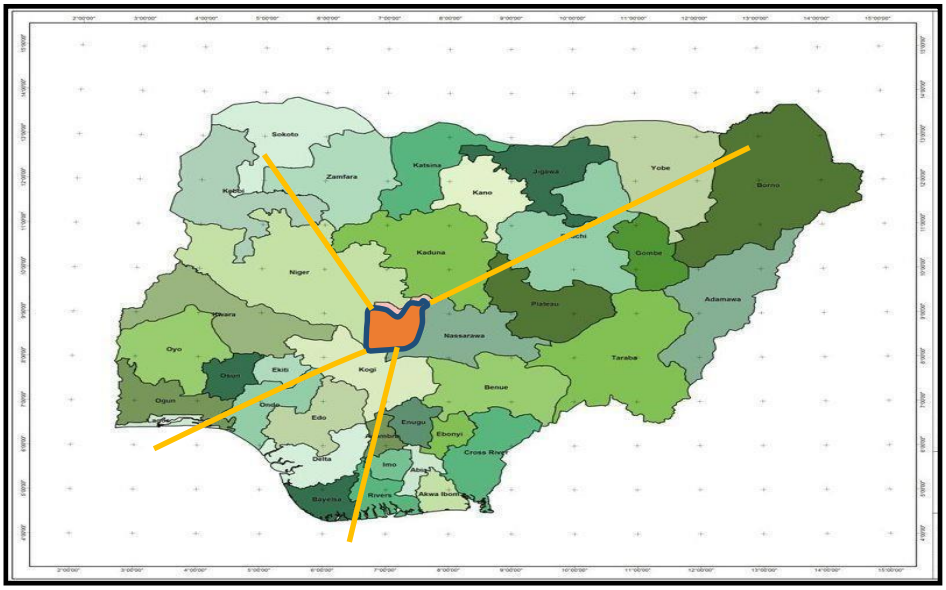
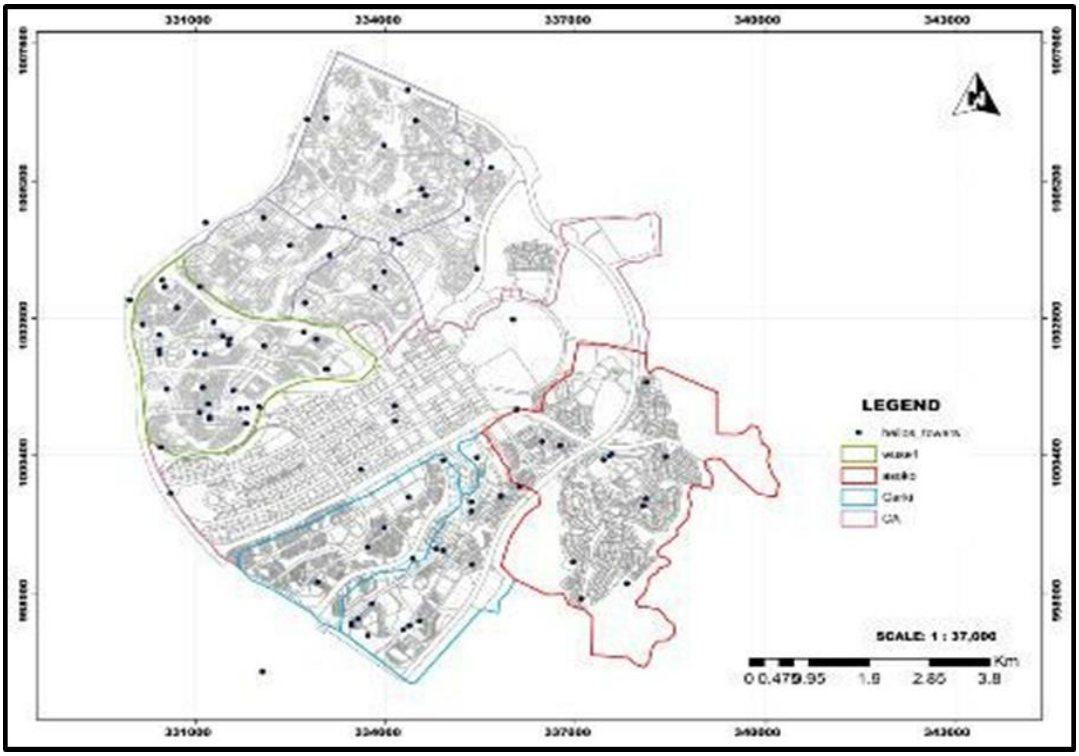


Figure 1.1 is mapped of Nigeria showing Abuja, Figure
Source: Abuja Geographic Information Systems (AGIS) (2025).



Source: Authors' Fieldwork, 2025

3.2 Research Design

This study adopts a descriptive and spatial analytical research design. The approach is suitable for examining the geographical distribution of telecommunication base stations and assessing their compliance with relevant regulatory standards in Abuja. It combines quantitative spatial data analysis with qualitative assessment of policy and regulatory frameworks.

3.3 Methods of Data Collection

Data for this study were collected through both primary and secondary sources. The primary data involved direct observation through personal visits to 92 out of 137 telecommunication base stations identified in the mast deployment records of Mobile Network Providers. During these visits, the geographical coordinates of the masts were captured using a handheld GPS device to determine their location, mast type, height, surrounding land use, and compliance with setback standards. This field survey ensured accuracy and ground-truthing of each infrastructure's actual location and condition. The selection of 92 out of 137 base stations was purposive, based on spatial representation across the Federal Capital City (FCC), accessibility, operational status, and the availability of reliable location data. This sample size, constituting approximately 67% of the total base stations, provided adequate coverage for analyzing spatial distribution and compliance levels while also reflecting practical constraints such as time, terrain, and security considerations.

Secondary data sources included records from the Nigerian Communications Commission (NCC) for licensed base stations, and infrastructure deployment data obtained from Mobile Network Operators such as MTN, Airtel, and Glo. Additionally, consultations with the Abuja Geographical Information System (AGIS) provided access to satellite imagery and base maps, which were used within a GIS environment to support spatial analyses and mapping.

3.4 Method of Data Analysis and Presentation

The spatial data collected were processed and analyzed using ArcGIS software to produce maps showing the geographic distribution of telecommunication base stations within the Federal Capital City (FCC). To assess spatial patterns, tools such as Nearest Neighbor Analysis and Hotspot Mapping were employed to identify the degree of clustering or dispersion of the base stations.

A 1 km buffer zone was created around each telecommunication mast to assess the coverage area and determine the level of compliance or violation of spatial deployment regulations. The

1 km radius was adopted in line with the Nigerian Communications Commission (NCC) guidelines, which recommend a minimum distance of 1 km between co-located base stations in urban areas to avoid signal interference, ensure optimal network performance, and reduce the concentration of infrastructure in densely populated areas. This distance also reflects general urban planning standards regarding the equitable spatial distribution of urban infrastructure and services.

The results were presented using thematic maps, tables, and descriptive statistics, providing a comprehensive understanding of the spatial configuration and regulatory compliance of base station deployment across the study area.

3.5 Validation of Data and Analysis

To ensure the accuracy and reliability of both the data collected and the spatial analysis performed, multiple validation strategies were employed. Firstly, ground-truthing was conducted through direct field visits to 92 base stations, during which a handheld GPS device was used to capture the geographic coordinates and assess physical characteristics such as mast height, type, and compliance with land use and setback standards. These observations were compared with deployment records from Mobile Network Operators and the Nigerian Communications Commission (NCC) to confirm consistency.

Secondly, triangulation of data sources was applied. This involved cross-verifying the primary data obtained during field surveys with secondary data from the NCC, Mobile Network Operators (MTN, Airtel, Glo), and the Abuja Geographic Information System (AGIS), including base maps and satellite imagery. Agreement across these multiple data sources served to enhance the credibility of the findings.

4.0 Results and Discussion

4.1 Telecommunication Base Stations within the Federal Capital City, Abuja

This study considers the number of telecommunication mast in the Federal Capital City, Abuja; the spatial location of telecommunication masts and telecommunication service operators.

4.1.1 Telecommunication Service Operators in Federal Capital City, Abuja

There are several telecommunication service operators in the Federal Capital City, Abuja namely; MTN, Glo, Etisalat, Airtel respectively. Each of these service operators have different number of telecommunication subscribers spatially distributed within the four district of the Federal Capital City, Abuja as shown in Table 4.1.

Table 4.1: Telecommunication Service Operators

Service Operators	Year of Establishment	Subscription Base @ 2025
Airtel	2001	29,291,114
Etisalat	2008	22,444,198
Globacom	2003	30,040,119
MTN	2001	61,218,803
Visafone	2008	55,244
Multilinks	1994	4,637

Source: Authors Fieldwork, 2025

4.1.2 Types of Telecommunication Masts by each Operators in Federal Capital City, Abuja

There are basically two types of telecommunication masts used by service operators in the Federal Capital City, Abuja which are the Single and multiple telecommunication masts in the study area. The multiple service operators are, Visafone and Multilinks.

4.1.3 Number of Telecommunication Masts per Operator in the Federal Capital City, Abuja

There are total number of 35 masts from MTN; 29 from Glo; Etisalat has 5 masts; 15 mast from Airtel, while the multiple operators have 8 telecommunication masts. Furthermore, Wuse I and II has 41 masts, 22 masts in Garki I and II, Maitama has 15 masts, Asokoro has 14 base stations as shown in Table 4.2.

Table 4.2: Summary of Telecommunication Service Operators

District(s)	Telecommunication Service Operators Single operators				
	MTN	Glo	Etisalat	Airtel	**Multiple Operators**
Wuse I and II	14	13	3	7	4
Garki I and II	8	8	1	3	2
Maitama	5	5	1	2	2
Asokoro	8	3	-	3	-
Total	**35**	**29**	**5**	**15**	**8**

Source: Authors Fieldwork, 2025

4.2.1 Spatial Distribution Pattern of Telecommunication Masts in Federal Capital City Abuja.

Each district was divided into cadastral zones and the number of the telecommunication base stations as shown in Table 4.3. In overall, the Federal Capital City, Abuja which have a total number of 92 telecommunication masts. Wuse I and II districts has 41 base stations, Garki I and II has 22 base stations, Maitama 15 stations, while Asokoro has 14 base stations.

Table 4.3: Inventory of Telecom Masts per Operators in Federal Capital City

District(s)	Cad. Zone	MTN	Glo	Etisalat	Airtel	Multiple Operators	Grand Total
Wuse	AO2	10	8	3	6	4	31
	A07	2	2	-	1	-	5
	A08	2	3	-	-	-	5
Garki	A01	7	5	1	2	-	15
	A03	1	3	-	1	2	7
Maitama	A05/06	5	5	1	2	2	15
Asokoro	A04	8	3	-	3	-	14
	Total	**35**	**29**	**5**	**15**	**8**	**92**

Source: Authors Fieldwork, 2025

4.2.2 Telecommunication Masts Location in Federal Capital City, Abuja

The study indicates that there are four GSM operators within the study area, which is shown in Figure 4.1 as a composite of the total mast in the study area. Since there are four zones in the study area.

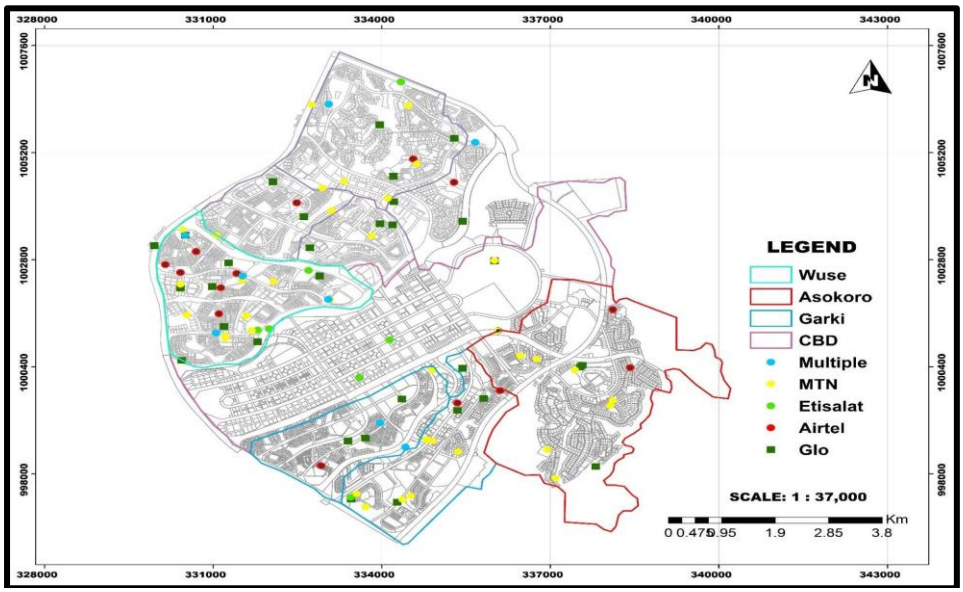


Figure 4.1: Composite Spatial Distribution of Base Stations in F.C.C, Abuja
Source: Authors Fieldwork, 2025

4.3 Near Neighbourhood Analysis of Telecommunication Masts in Federal Capital City, Abuja

The spatial distribution pattern analysis of telecommunication masts in the Federal Capital City, Abuja was found that the best model to use is the Average Nearest Neighbourhood Analysis which is shown in Figure 4.2.

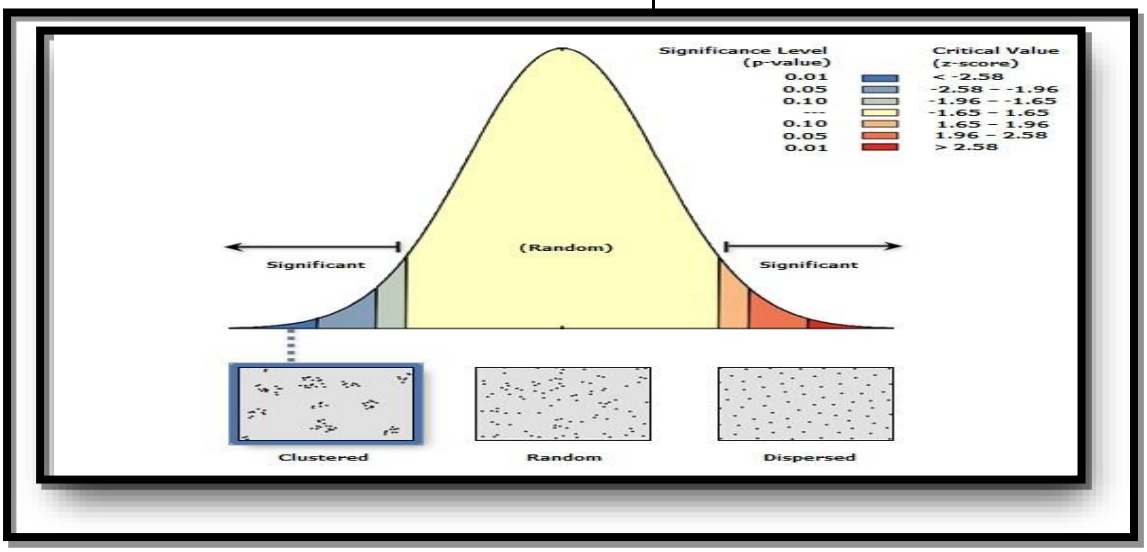


Figure 4.2: Average nearest Neighbourhood Analysis of Telecommunication Masts in the Federal Capital City, Abuja.
Source: Author's Fieldwork, 2025.

The Nearest Neighbourhood Analysis on the distribution of Telecommunication Masts in the Federal Capital City, Abuja. Indicates that Rn = 0.01 with a critical value of <-2.58, N = 92, study area of 9539.0678 metres, average nearest neighbourhood ratio = 0.413662, and test significant: P – value = 0.000000, Z – score = -12.740124. The result of the breakdown therefore indicates that the pattern of spatial distribution of telecommunication mast in the federal capital city, Abuja are clustered.

4.4 Compliance and Violation of Telecommunication mast to Planning Regulations in the Federal Capital City, Abuja

The Nigerian Communications Commission (NCC) stipulates a minimum distance of 1 kilometer between telecommunication towers. This analysis evaluates the level of compliance and violations of this requirement using a geospatial map that illustrates the distribution and service coverage of mobile network towers in the study area. A 1km buffer zone was created around each mast to show the level of compliance and violation of the NCC regulations.

4.4.1 Telecommunication Service Operators' Compliance with NCC Regulations in Federal Capital City, Abuja.

The telecommunication service operator's violation in respect to the compliance with NCC and town planning regulation in terms of 1km (100m) radius of tower to tower spacing and network coverage when siting of telecommunication masts in the Federal Capital City, Abuja shown in Appendix A.

4.4.2 Telecommunication Service Operators Violation of NCC Regulations

From the analysis carried out, there is a high level of violation in regards to NCC regulations on tower-to-tower spacing. Out of the total number of 92 telecommunication base stations owned by various service operators identified in the study, only 24 of those complied. Figure 4.3 shows the typically illustration of the service operators non-compliance to NCC regulation. While others operators as shown in Figure 4.4.4.5 and 4.6.

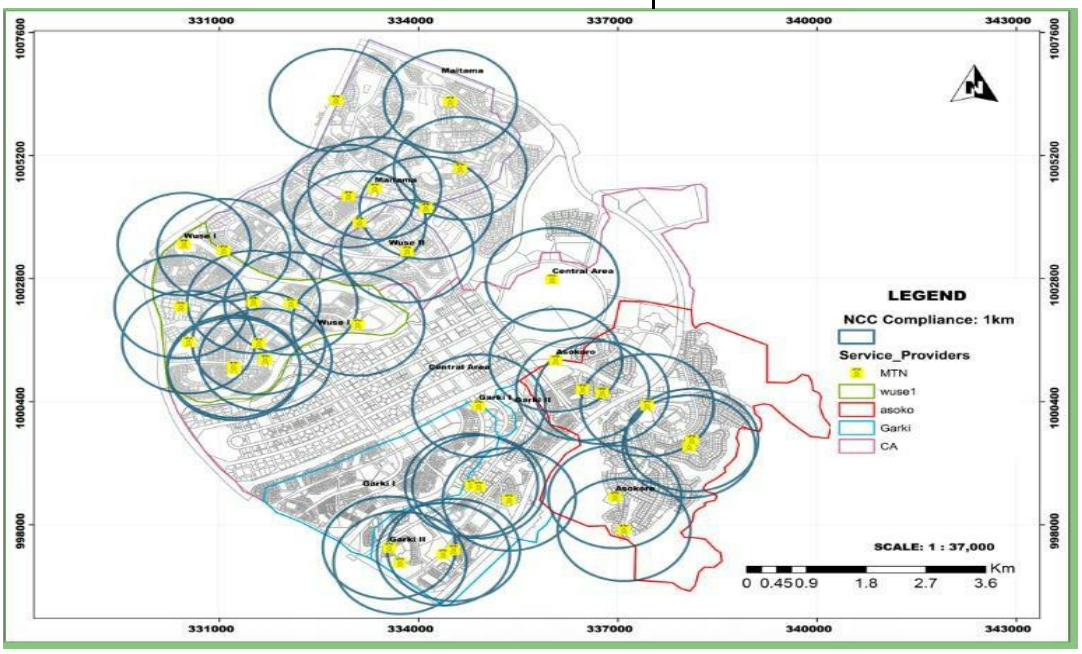


Figure 4.3: MTN Violation to NCC Regulations on Tower- to-Tower spacing
Source: Authors Fieldwork, 2025

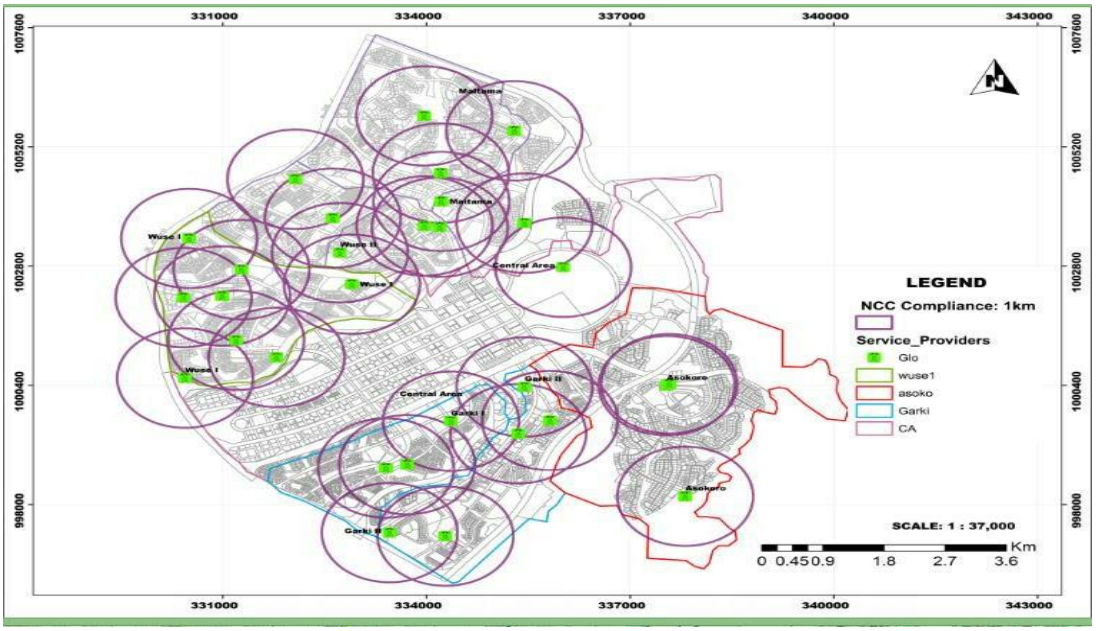


Fig 4.4: Globacom Violation to NCC Regulations to NCC Regulations to Tower to Tower Spacing
Source: Authors Fieldwork, 2025

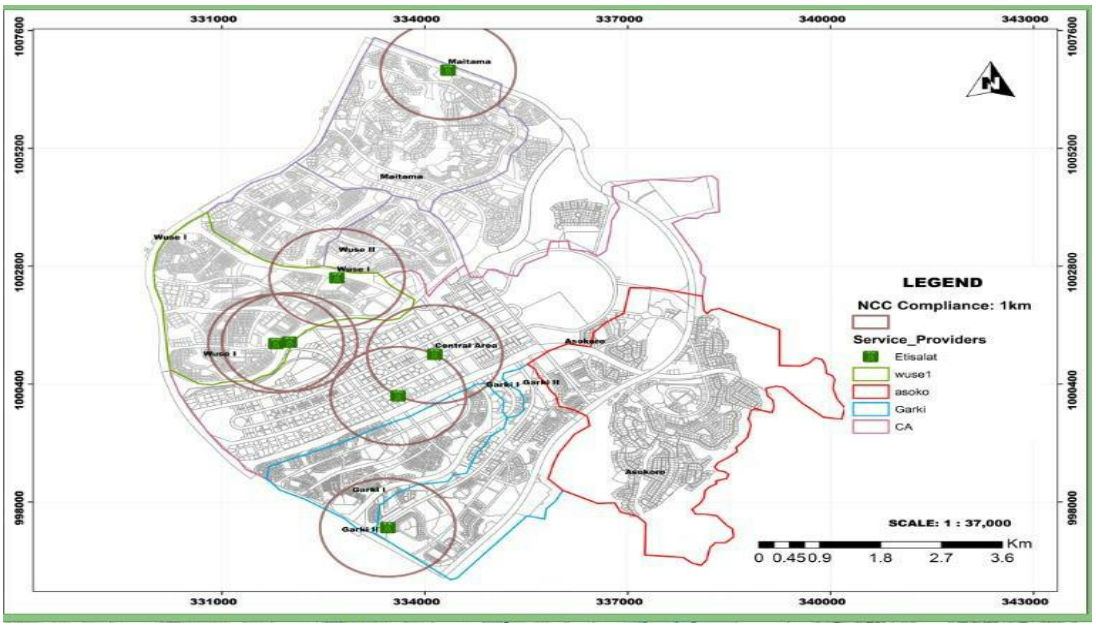


Fig 4.5: Etisalat Violation to NCC Regulations to NCC Regulations to Tower to Tower Spacing
Source: Authors Fieldwork, 2025

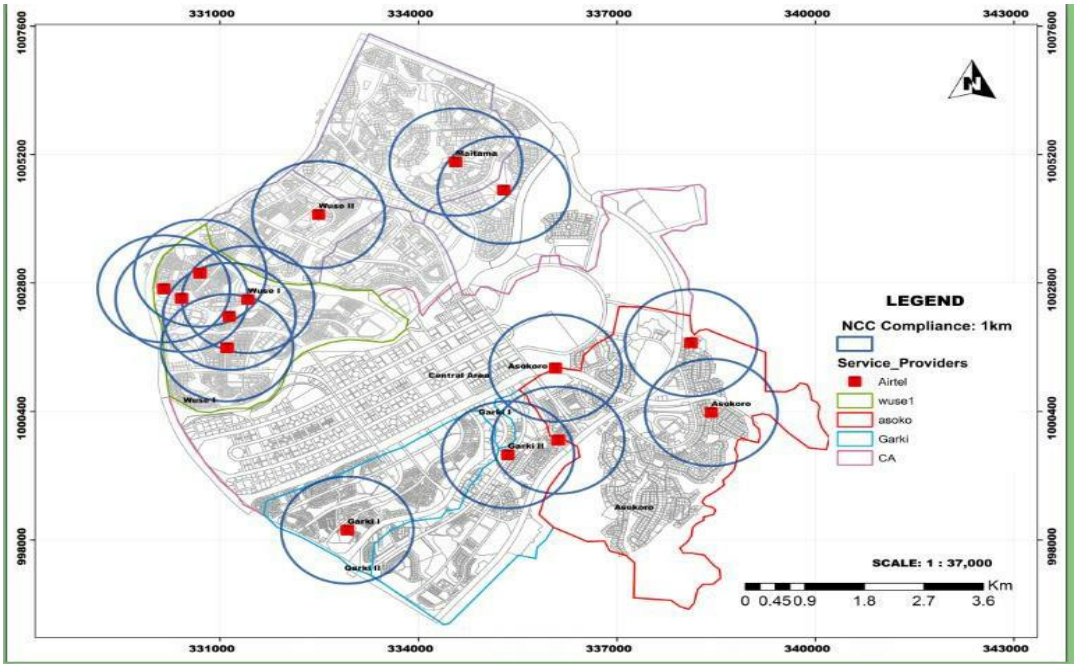


Fig 4.6: Airtel Violation to NCC Regulations to NCC Regulations to Tower to Tower Spacing
Source: Authors Fieldwork, 2025.

4.5 Summary of Findings

From the study carried out in Federal Capital City, Abuja which have a total number of 92 telecommunication masts. Wuse I and II districts has 41 base stations, Garki I and II has 22 base stations, Maitama 15 stations, Central Business District has 4 stations while Asokoro has 14 base stations. The spatial distribution pattern of the telecommunication masts within Federal Capital City, Abuja is an uneven pattern that clusters. There are total number of 92 telecommunication masts in the city and 22 of those base stations need is to be shut down as shown in table 4.12. For instance, in Wuse district, MTN need to shut down 4 of their masts, 2 masts from Glo, 1 mast from Etisalat and 2 masts from Airtel making it a total number of 9 base station to be shut down in Wuse district. Also in Garki district; MTN need to shut down 3 of the masts and Glo to close down 2 of the base station, respectively. Furthermore, in Maitama district; MTN to shutdown 2 base station and a base station from Glo and in Asokoro district; MTN to close down 2 base stations and a base station from Glo, in order avoid land use conflict and restore orderliness in the physical planning of the city.

The result of the breakdown indicates that the pattern of spatial distribution of telecommunication mast in the federal capital city, Abuja is clustered. The catchment analysis which is a 1km radius revealed that there is an overlapping of various telecommunication masts service radius across another. While only 24 masts comply with regulation of siting of

telecommunication masts. 8.3% compliance by MTN, 23.3% from Glo, 71.4% compliance from Etisalat while 40.0% from Airtel.

From the analysis shown; most base stations are closer to one another signifying non-adherence to the minimum standard of mast which is 1km of tower to tower spacing as stated by the Nigerian communication commission and National Environmental Standard and Regulations Enforcement agency (NESREA).

5.0 Conclusion and Recommendations

5.1 Conclusion

The study revealed a significant level of non-compliance by telecommunication service providers in the siting of base stations within the Federal Capital City, Abuja. To enhance the effectiveness of physical planning and support sustainable urban development, there is a pressing need to review existing development planning permits and approval procedures. These processes, in their current form, may contribute to system inefficiencies and perceived delays, which can discourage compliance among service providers. By streamlining and improving transparency in approval workflows, trust can be built between regulatory bodies and stakeholders. Such reforms would not only reduce the likelihood of informal development practices but also promote a shared sense of responsibility among residents and service operators toward maintaining a healthy and well-organised urban environment.

5.2 Recommendations

Based on the findings of this research, recommendations were made that will help bridge that gap in physical planning and urban development in the Federal Capital City. The recommendations will also help to sustain the observed achievements in physical planning and urban development renaissance in Abuja.

a) The current minimum setback of 10 meters from adjacent properties for telecommunication towers may be insufficient, particularly in residential areas where mast heights often exceed 36 meters. International safety guidelines suggest that the setback distance should be proportional to the tower's height to mitigate risks associated with structural failures. For instance, the International Finance Corporation (IFC) advises that "the setback distance between a tower and the nearest residential property should be at least equal to the height of the tower" to ensure safety in the event of a collapse. Similarly, the Nigerian Communications Commission (NCC) mandates that "the open space available at the site of a proposed mast or tower installation must be at least three times the space required by the base of the structure". These guidelines underscore the importance of adequate setbacks to protect public safety. Therefore, increasing the

minimum setback to at least 20 meters would align with international best practices and enhance safety for residents and properties near telecommunication towers.

b) Regarding tower-to-tower spacing, maintaining a minimum distance of 1 kilometre between towers can help prevent signal interference and promote efficient network coverage. This spacing also aligns with urban planning principles aimed at reducing visual clutter and ensuring equitable distribution of telecommunication infrastructure.

c) To improve environmental compliance and infrastructure efficiency, the Nigerian Communications Commission (NCC), in partnership with the Federal Ministry of Environment, should strengthen the enforcement of Environmental Impact Assessments (EIAs) for telecommunication base stations. This can be achieved by mandating the submission and approval of comprehensive EIA reports before mast installation, followed by post-installation environmental monitoring to ensure continued compliance. Additionally, a centralised digital platform should be introduced to streamline permit applications, monitor EIA submissions, and reduce bureaucratic delays. To further promote sustainability and reduce the proliferation of masts, the NCC should enforce co-location policies, encouraging multiple operators to share infrastructure. This approach will minimise environmental degradation, lower operational costs, and enhance urban planning efficiency in line with national development goals.

d) Technical and structural requirement for installation and construction of masts must conform to the stipulated guidelines to avoid collapse, the ministry of environment and the Nigeria Communication Commission should collaborate in order to enact planning law bidding on all the service operators in carrying out effective environmental impact assessment before and after the erection of the telecommunication tower.

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