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Spatial Clustering and Locational Patterns of Internally Displaced Persons' Camps in Abuja, Nigeria: A GIS-Based Analysis

***Salihu Abdullahi Ekkan; *Nasiru Idris Medugu; & **Dahiru Umar Abubakar**

*Department of Urban and Regional Planning, Nasarawa State University, Keffi. **Department of Urban and Regional Planning, Federal Polytechnic Nasarawa.
Corresponding Author: medugu@gmail.com
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Abstract

Internal displacement is no longer confined to temporary humanitarian camps. In cities, displaced households often settle close to existing communities, markets, transport routes and public services, creating a spatial issue that urban authorities cannot easily separate from broader planning concerns. Nigeria remains one of Africa's major displacement contexts, with more than 3.7 million internally displaced people reported in recent estimates (UNHCR, 2026). Despite this scale, relatively little empirical work has examined how existing IDP camps are arranged within Abuja. This study examines the spatial distribution and clustering of IDP camps in the Federal Capital Territory (FCT) using geographic information system (GIS) techniques. Field reconnaissance, GPS mapping, observation, questionnaires and interviews provided the primary data, complemented by information from government and humanitarian sources. Eighteen camp locations were identified and georeferenced in five Area Councils. Their distribution was examined by Area Council and by distance from nearby urban centres, while the Nearest Neighbour Index (NNI) was used to determine whether the recorded locations were clustered, random or dispersed. Twelve camps, or 66.7%, were located in Abuja Municipal Area Council (AMAC). The calculated NNI of about 0.73 indicates clustering, while camp-to-urban-centre distances ranged from 0.06 to 17 km. The pattern points to the importance of access to roads, services, employment and established urban areas in shaping where camps occur. The study argues that existing IDP settlements should be considered in Abuja's spatial planning and service-provision decisions rather than treated only as temporary humanitarian sites.

Keywords: Internally displaced persons; Spatial clustering; GIS; Nearest Neighbour Analysis; Abuja; Nigeria; Urban displacement; Spatial planning

Introduction

Internal displacement has reached a scale at which its consequences are increasingly visible in the spatial organisation of cities. By the end of 2025, about 82.2 million people were living in internal displacement worldwide (IDMC, 2026). The growing urban dimension of displacement is especially relevant in Africa, where displaced households may settle within towns and cities rather than remain in formally managed camps. Recent research describes urban displacement as a process in which mobility, livelihoods, social networks and access to services become intertwined with the spatial structure of the receiving city (Adzande, 2025; Haile et al., 2025). This shifts part of the displacement question from emergency shelter alone to the longer-term management of land, infrastructure, mobility and urban services.

Nigeria is among the countries most affected by internal displacement in Africa (Okon, 2018; Onifade & Osinowo, 2019;Iloka, 2023;Maple & Ashine, 2026). UNHCR data updated in July 2026 record 3,711,314 internally displaced persons in the country (UNHCR, 2026). The figure is large enough to make displacement a continuing development and planning concern rather than a short-lived humanitarian episode. The urban dimension is particularly relevant. Adzande (2025) found that IDPs in Makurdi were using social networks, agency and informal economic activity to rebuild livelihoods, while recent work on Abuja shows that the spatial location of camps also matters for access to healthcare (Ukpere et al., 2026). Displacement in Nigeria therefore, raises questions not only about protection and assistance but also about where displaced people live and how well those locations connect them to the city.

Location is central to understanding the experience of displacement (Mortimer, Davies, Smith, & Ahmed, 2026). A camp may be physically close to an urban centre without providing easy access to employment or services. GIS makes it possible to examine that relationship by linking camp coordinates with administrative boundaries, roads, settlements and service locations. Nzelibe et al. (2024) used Kernel Density Estimation, Cluster and Outlier Analysis, Nearest Neighbour Analysis and spatial autocorrelation to examine IDP camps in Borno State. In Abuja, Ukpere et al. (2026) similarly used GPS data and nearest-neighbour analysis to examine the spatial distribution and healthcare accessibility of IDP camps, reporting that 87% of the camps in their dataset were located in AMAC. These studies establish a useful Nigerian spatial literature, but they also show the need for further analysis of the wider locational pattern of existing camps in the FCT.

Abuja presents an important case because of its status as Nigeria's federal capital and its combination of metropolitan growth, transportation connectivity, employment opportunities, humanitarian presence and extensive peri-urban development. The attached study identified 18 IDP camp locations within the FCT, with substantial concentration around Abuja's metropolitan area. The evidence indicates that 12 of the 18 identified camps are located within AMAC, while the remaining camps are distributed among Bwari, Gwagwalada, Kuje and Kwali. The concentration of camps in the metropolitan area raises an important spatial question: are IDP settlements in Abuja randomly distributed, or do they exhibit a systematic clustering pattern associated with urban accessibility and proximity?

The concentration of camps does not necessarily mean that their locations are accidental or the result of poor administration. Displaced households make choices within tight constraints. Proximity to jobs, markets, transport, relatives and humanitarian assistance can make an urban or peri-urban location preferable to a remote site. Adzande (2025) illustrates this process in Makurdi, where IDPs developed livelihood opportunities through social networks and an informal market. At the same time, concentration

can increase demand for water, sanitation, housing, transport and other services. Understanding the pattern is therefore useful to both humanitarian agencies and urban planners.

Oloukoi et al. (2025) approached the Abuja problem from another direction. Their GIS-based multi-criteria analysis considered slope, elevation, land cover, proximity to water, towns, schools, hospitals, tourism and major roads in identifying potentially suitable locations. More than 61% of the assessed land in AMAC was classified as having potential suitability for IDP camps. That study is useful for prospective site selection, but it does not establish the pattern of existing settlements. Nzelibe et al. (2024) addressed existing camps in Borno, using several spatial-statistical techniques in a conflict-affected setting. The present study focuses on the observed locations of camps in Abuja and asks a narrower question: how are existing camps distributed across the FCT, and how closely are they associated with the established urban system?

The study analyses the spatial clustering and locational pattern of existing IDP camps in Abuja. It examines their distribution across the Area Councils, determines whether the recorded locations are clustered, and assesses their proximity to established urban centres. These questions are important because recent evidence from Abuja shows that camps are concentrated in AMAC and that proximity to services does not necessarily remove socioeconomic barriers to their use (Ukpere et al., 2026).

Study area

The study was conducted in the Federal Capital Territory (FCT), Abuja, Nigeria. The FCT occupies approximately 8,000 km² and comprises six Area Councils: Abuja Municipal Area Council (AMAC), Bwari, Gwagwalada, Kuje, Kwali and Abaji. Abuja is strategically located in central Nigeria and serves as the country's political and administrative capital. Its metropolitan area has experienced rapid expansion, with development extending into surrounding peri-urban settlements.

Abuja's administrative importance, transport connections, employment opportunities and concentration of public services make it a relevant destination for displaced households. The continued presence of IDPs also places displacement within the city's longer-term governance and development concerns. Research across African cities increasingly links displacement with pressures on urban services and infrastructure. Zhang et al. (2026), using data from 47 African countries, found that internal displacement places additional pressure on sustainable urban development, while the effect is moderated by governance capacity. In Nigeria, Adzande (2025) shows the other side of the process: displaced people also contribute to and reshape urban economies through livelihood strategies and social networks.

Research design and data sources

The study adopted a spatial research design combining field survey and GIS analysis. Primary data were obtained through reconnaissance surveys, GPS mapping, physical observation, questionnaires, and interviews. GPS coordinates of identified IDP camps were captured in the field and subsequently converted into GIS point layers. Satellite imagery was used to support the identification and verification of settlement locations.

Secondary information was obtained from relevant government and humanitarian institutions, published studies, and available demographic and spatial datasets. The resulting spatial database contained the locations of 18 IDP camps distributed across five Area Councils.

Analysis focuses specifically on the spatial component of the broader study. Questionnaire information is therefore used only to interpret factors associated with settlement location, while the principal analytical unit is the IDP camp.

GIS and spatial analysis

The camp coordinates were imported into a GIS environment and overlaid on the administrative map of the FCT. Spatial distribution was examined by calculating the number and percentage of camps located within each Area Council. The proximity of each camp to nearby urban centres was also determined from the spatial database.

The spatial pattern of the camps was assessed using the Nearest Neighbour Index (NNI):

$$NNI = \frac{De}{Do}$$

where Do is the observed mean nearest-neighbour distance and De is the expected mean distance under a random spatial distribution.

The expected mean distance was calculated as:-

$$De = \frac{1}{2\sqrt{n/A}}$$

where n is the number of spatial observations and A is the study-area extent. An NNI below 1 indicates clustering, an NNI approximately equal to 1 suggests randomness, while a value above 1 indicates dispersion.

The analysis used the 18 camp records contained in the field database. The resulting NNI was approximately **0.73**, indicating a clustered configuration. Because two records in the source dataset share the same recorded coordinates, the NNI is interpreted cautiously as an indicator of the concentration of recorded camp locations rather than as an absolute estimate of the underlying settlement process.

Spatial distribution of IDP camps

The GIS inventory identified 18 IDP camps across five Area Councils of the FCT. Their distribution is presented in Table 1.

Table 1. Distribution of identified IDP camps by Area Council

Area Council	Number of camps	Percentage (%)
AMAC	12	66.7
Gwagwalada	2	11.1
Kuje	2	11.1
Bwari	1	5.6
Kwali	1	5.6
Abaji	0	0.0
Total	18	100.0

Source: *Field Survey 2026*

The distribution demonstrates substantial spatial concentration. AMAC contains 66.7% of all identified camps, while Gwagwalada and Kuje each account for 11.1%. Bwari and Kwali contain only one camp each, while no camp was recorded in Abaji. Thus, the distribution is strongly weighted toward the metropolitan part of the FCT.

The concentration is also reflected in the population associated with individual camps. Karmajiji recorded approximately 2,740 displaced persons, Waru 2,688 and Kabusa 2,380. Durumi II contained approximately 2,226 persons, while smaller locations contained substantially fewer residents. The spatial concentration of camps therefore corresponds with a substantial concentration of displaced population.

Spatial clustering

The recorded coordinates indicate that several camps occur in close spatial proximity. The calculated observed mean nearest-neighbour distance was approximately 7.64 km, compared with an expected distance of approximately 10.54 km under a random spatial distribution.

The resulting:

$$NNI \approx 0.73$$

indicates a clustered spatial pattern. The result suggests that the identified camps are located closer to one another than would be expected if their locations were randomly distributed across the FCT.

The clustering is particularly evident around the AMAC metropolitan area, where several camps occur within the same broad urban and peri-urban zone. The pattern suggests that camp location is influenced by spatially structured factors rather than being the product of random settlement.

Proximity to urban centres

The distance of identified camps from nearby urban centres ranged from approximately 0.06 km to 17 km. Several camps were located extremely close to established urban settlements. Durumi I and Durumi II were approximately 0.06 km from an urban centre, while Kuchiyako Kuje was approximately 0.16 km away. Other camps, including Kutunku, Kuduru and EFAB, were also located within approximately 1 km of urban centres.

A second group of camps occurred within approximately 1–5 km of urban centres, while a smaller number were located more than 5 km away. This distribution indicates that most camps maintain some degree of spatial relationship with the existing urban system.

The results therefore reveal three broad locational tendencies: camps embedded within or immediately adjacent to urban settlements; camps located in peri-urban areas; and a smaller number of relatively peripheral settlements.

Accessibility and locational characteristics

The survey evidence supports the interpretation that accessibility contributes to the spatial pattern. Approximately 61.3% of respondents considered road accessibility to their camps fair, 22.6% considered it good and 16.1% considered it poor. However, public transportation remained inadequate: 90.3% of respondents reported inadequate public transportation, while 9.7% reported no public transportation.

The mode of settlement further illustrates the largely spontaneous nature of the spatial pattern. Approximately 93.5% of respondents reported self-settlement, compared with only 6.5% who entered through formal selection. The concentration of camps is therefore not solely the product of a centralised allocation system but appears partly to reflect the cumulative locational decisions of displaced households.

Results and Discussion

Two results stand out. First, 12 of the 18 recorded camps are in AMAC, leaving only six across Bwari, Gwagwalada, Kuje and Kwali. Second, the NNI of about 0.73 is below 1, indicating that the observed locations are closer to one another than expected under a random spatial distribution. This result is consistent with the clustered pattern reported for IDP camps in Borno State by Nzelibe et al. (2024). It is also broadly consistent with Ukpere et al. (2026), who reported that 87% of their Abuja camps were located in AMAC. The convergence is notable even though the two studies use different camp inventories and analytical scopes.

Abuja differs from Borno in an important respect. The camps examined here are located in and around a major metropolitan area rather than within the principal zone from which conflict-driven displacement originates. Several are within 1 km of established urban centres. This gives the locations a close relationship with the urban opportunity structure. Adzande (2025) provides useful Nigerian evidence for interpreting this pattern: in Makurdi, displaced people used social networks and informal economic activity to rebuild livelihoods. The Abuja pattern may similarly reflect the practical value of remaining connected to established urban areas.

Distance to an urban centre is therefore only one part of accessibility. In this study, 90.3% of respondents reported inadequate public transportation, even though many camps were close to established settlements. The finding matters because geographic proximity and practical accessibility are not the same thing. Ukpere et al. (2026) reached a related conclusion in Abuja: although many healthcare facilities were geographically close to IDP camps, socioeconomic and cultural factors still influenced whether displaced people used them. For planning purposes, the implication is that road and transport connections need to be considered alongside simple distance measures.

The high proportion of respondents reporting self-settlement adds another dimension to the spatial pattern. Of the respondents, 93.5% reported that they settled themselves, compared with 6.5% who entered through formal selection. The distribution is therefore unlikely to be explained by official site allocation alone. Household decisions, access to land, social connections and perceived safety may have contributed to where settlements emerged. This interpretation is compatible with Adzande's (2025) finding that urban IDPs in Makurdi actively use social capital and individual and collective agency to establish livelihoods.

These findings are relevant to future site selection. Oloukoi et al. (2025) assessed potential locations in Abuja using physical and service-access criteria, including slope, elevation, land cover, water, schools, hospitals and major roads. The present study provides complementary evidence by examining where camps have actually emerged. The two approaches should be read together: a site may be physically suitable yet poorly connected to the urban services on which displaced households depend. Site selection should therefore combine environmental suitability with accessibility and expected population demand.

The concentration in AMAC presents both an operational advantage and a planning problem. Agencies may be able to reach a large displaced population within a relatively small area, but concentration also increases pressure on local services. The Abuja healthcare evidence already points to differences in service access and utilisation across IDP settlements (Ukpere et al., 2026). Rather than assuming that dispersed sites are automatically better, planning should consider whether existing concentrations can be adequately served. Where new sites are required, transport, healthcare, water, education and other services should form part of the location assessment.

The evidence supports the inclusion of existing IDP settlements in routine urban planning in the FCT. This is consistent with recent work showing that displacement interacts with livelihoods, public services

and the institutional capacity of receiving cities (Adzande, 2025; Manu, 2026; Zhang et al., 2026). The practical requirement for Abuja is better spatial information. Camp locations should be maintained alongside data on roads, health facilities, schools, water infrastructure and population. Such an integrated database would help authorities identify service gaps and assess the likely consequences of relocation or the establishment of new settlements.

Conclusion

This study examined the spatial distribution, clustering and locational characteristics of internally displaced persons' (IDP) camps in the Federal Capital Territory, Abuja, using GIS-based analysis. The evidence shows that existing camps are not randomly distributed across the FCT. Of the 18 identified camp locations, 12 (66.7%) are situated in Abuja Municipal Area Council (AMAC), while the remaining six are distributed across Bwari, Gwagwalada, Kuje and Kwali. The Nearest Neighbour Index of approximately 0.73 further indicates a clustered spatial pattern. The concentration of camps around the metropolitan core, together with the relatively short distances of several camps from established urban centres, points to the importance of accessibility and connection to the existing urban system in shaping settlement locations.

The findings also show that physical proximity alone does not guarantee effective access to urban opportunities. Although some camps are located very close to established settlements, 90.3% of respondents reported inadequate public transportation. At the same time, 93.5% reported self-settlement, suggesting that the observed spatial pattern is influenced not only by formal institutional decisions but also by household-level choices and constraints. Access to employment, markets, social networks, perceived security and available land are therefore plausible factors behind the concentration observed in the study area. These findings reinforce the view that IDP settlements in Abuja should be understood as part of the city's changing urban geography rather than as isolated humanitarian facilities.

Taken together, the results have two implications for urban policy. First, the concentration of camps can make humanitarian and public-service delivery more spatially efficient, but it can also intensify pressure on infrastructure and services in particular locations. Second, future decisions concerning the establishment, relocation or upgrading of IDP settlements should move beyond simple measures of distance and available land. Transport connectivity, access to essential services and the characteristics of surrounding urban areas need to be considered alongside physical site suitability. The study therefore concludes that the spatial management of displacement in Abuja requires closer integration between humanitarian response and mainstream urban planning.

Recommendations

Based on the spatial evidence and the reported conditions of the surveyed IDP population, five practical recommendations are proposed. First, the FCT Administration and relevant Area Councils should incorporate existing IDP camps into routine spatial and infrastructure planning. The concentration of camps in AMAC warrants targeted assessment of water, sanitation, transport, healthcare, education and other essential services in areas where displaced populations are concentrated.

Second, transport access should be treated as a core component of IDP settlement planning. The high proportion of respondents reporting inadequate public transportation indicates that proximity to an urban centre is not sufficient to ensure accessibility. Existing camps should therefore be assessed for road connectivity and public transport availability, while feasible improvements to connecting roads and transport services should be prioritised.

Third, future IDP site selection should combine environmental and physical suitability with accessibility criteria. GIS-based assessments should consider proximity to health facilities, schools, markets, employment areas, roads and public transport, in addition to land suitability, security and environmental constraints. This would reduce the risk of establishing settlements that are physically available but poorly connected to the services on which displaced households depend.

Fourth, the spatial concentration of IDP camps should not automatically be treated as a reason for relocation or dispersal. Where existing settlements are reasonably secure and can be serviced, upgrading may be more appropriate than moving households to peripheral locations. Relocation decisions should be supported by comparative accessibility assessments and meaningful consultation with affected households.

Finally, the FCT should maintain an up-to-date geospatial database of IDP settlements and associated services. Regularly updated coordinates, population estimates, road networks and service locations would support monitoring of settlement growth and provide a stronger evidence base for humanitarian coordination and urban planning. Future research should extend the present analysis by examining temporal changes in camp locations, travel-time accessibility, land-use change and the relationship between camp clustering and socioeconomic conditions.

References

Adzande, P. (2025). Developing pathways for self-reliance: Urban IDPs and the negotiation of livelihood opportunities in Makurdi, Nigeria. Environment & Urbanization, 37(1), 226–243. https://doi.org/10.1177/09562478251317988

Berke, T., & Larsen, L. (2026). The importance of city services to internally displaced persons, returnees, and host residents in Juba, South Sudan. Journal of Urban Affairs.

Clark, P. J., & Evans, F. C. (1954). Distance to nearest neighbor as a measure of spatial relationships in populations. Ecology, 35(4), 445–453. https://doi.org/10.2307/1931034

IDMC. (2025). Global report on internal displacement 2025. Internal Displacement Monitoring Centre.

IDMC. (2026). Global report on internal displacement 2026. Internal Displacement Monitoring Centre.

Iloka, C. P. (2023). Migration, Internal Displacement, Public Disorder and the Role of Crisis Management Framework: A Focus on Women and the Minority Rights in Nigeria. *IRLJ (5)* , 45.

Manu, E. K. (2026). From fragile states to fragile cities: Institutional weakness and urban displacement in Sub-Saharan Africa. Habitat International, 167, 103668. https://doi.org/10.1016/j.habitatint.2025.103668

Maple, N., & Ashine, E. M. (2026). *Internal Displacement in Africa. In The Oxford Handbook of Internal Displacement (pp. 145-154)* . Oxford: Oxford University Press.

Mortimer, A., Davies, K., Smith, G., & Ahmed, I. (2026). How lived experiences of disaster displacement reshape place attachment. *Journal of Environmental Psychology*, 102915.

Nzelibe, T. N., Oyinloye, M. A., Popoola, O. O., & Ilesanmi, F. A. (2024). Spatial analysis of internally displaced persons' camps in Borno State, Nigeria. American Journal of Geospatial Technology, 3(1), 27–34. https://doi.org/10.54536/ajgt.v3i1.2614

Okon, E. O. (2018). Internally displaced persons in Nigeria: Review of empirical studies. *American International Journal of Social Science Research, 2(1)*, 28-38.

Oloukoi, J., Akingbade, A. O., Atureta, O. G., & Enaruvbe, G. O. (2025). GIS-based suitable site selection for internally displaced persons' camps in Abuja, Nigeria. Osun Geographical Review, 5(1).

Onifade, V., & Osinowo, R. (2019). Living conditions of internally displaced persons (IDPS) in Northern Nigeria . *Urbanism and crisis management in Nigeria 5*, 1-9.

Ukpere, V. N., Ajayi, D. D., & Akinfolarin, A. A. (2026). Accessibility and utilization of healthcare facilities among internally displaced persons (IDPs) in Abuja, Nigeria. International Journal of Research and Innovation in Social Science, 10(2), 1110–1132. https://doi.org/10.47772/IJRISS.2026.10200081

UNHCR. (2025). Nigeria: Operational update January–March 2025. United Nations High Commissioner for Refugees.

UNHCR. (2026). Nigeria: Operational data and displacement information. United Nations High Commissioner for Refugees.

Zhang, Y., Ajide, I. N., & Mohammed, A. (2026). Internal displacement, urbanization pressure, and Sustainable Development Goal 11 (Sustainable Cities and Communities) performance in Africa. Sustainable Development. https://doi.org/10.1002/sd.71029