International Journal of
Humanity and Social Sciences
(IJHSS)

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CARI Journals

International Journal of Humanity and Social Sciences

ISSN: 3005-5407 (Online)

Vol. 5, Issue No. 5, pp. 14 – 33, 2026

www.carijournals.org

Spatial Patterns of Housing Conditions in Uyo Senatorial District, Nigeria

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Accepted: 29th Oct, 2026, Received in Revised Form: 13th Nov, 2026, Published: 23rd Nov, 2026

Abstract

Purpose: Housing conditions vary spatially because access to infrastructure, environmental services, institutional support, and socio-economic resources is unevenly distributed. This study examined the spatial patterns of housing conditions in Uyo Senatorial District, Nigeria, using Geographic Information Systems (GIS).

Methodology: A descriptive cross-sectional mixed-methods design was adopted, involving 384 households selected through multistage sampling across 18 communities (nine urban and nine rural) in the nine Local Government Areas (LGAs) of the district. Quantitative data were collected using structured household questionnaires, housing observation checklists, and handheld Global Positioning System (GPS) receivers, complemented by qualitative data from Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs). A composite Housing Condition Determinants Index (HCDI) was constructed across five domains: infrastructure, environmental quality, socio-economic conditions, housing density, and institutional support. Data were analysed using descriptive statistics, urban–rural comparisons, and Inverse Distance Weighting (IDW) spatial interpolation in ArcGIS, alongside thematic analysis of qualitative narratives.

Findings: The findings demonstrated a discernible urban–rural gradient, with urban communities recording a higher mean HCDI (70.4%) than rural communities (57.0%), alongside substantial community-level variation ranging from 33.3% in Okwo Nsit to 100.0% in Afaha Offiong. High-performing settlements such as Afaha Offiong (100.0%), Ikot Edibon (93.3%), and Ntak Inyang (86.7%) benefited from stronger infrastructure, organised sanitation, and active community leadership, whereas deprived settlements, including Okwo Nsit (33.3%), Atan (40.0%), Ekim Enen (40.0%), Odoro Ididep (46.7%), and Use Offot (46.7%), experienced compounded deficits in road access, water supply, drainage, and institutional support. Qualitative findings corroborated the quantitative patterns, highlighting rising construction costs, low household incomes, blocked drainage, and weak public intervention as primary drivers of residential deprivation.

Unique Contribution to Theory, Practice and Policy: The study highlights the value of GIS for locating housing deprivation and supporting place-based housing improvement, infrastructure provision, environmental management, and sustainable spatial planning.

Keywords: *Housing Conditions, Geographic Information Systems (GIS), Spatial Patterns, Spatial Hotspots, Housing Determinants, Uyo Senatorial District, Nigeria*

1. Introduction

Housing is an important component of the physical and social environment in which people live. Its condition is influenced by the state of the dwelling, access to basic services, environmental conditions, infrastructure, neighbourhood characteristics, and the institutional and socio-economic context in which households are located (World Health Organization (WHO), 2021; United Nations Human Settlements Programme (UN-Habitat), 2026a). Poor housing conditions are commonly characterised by overcrowding, inadequate sanitation, unsafe water supply, poor drainage, ineffective waste management, and deficient infrastructure. These characteristics highlight the multidimensional nature of housing conditions and the need to examine them beyond individual dwelling attributes. Globally, rapid population growth and urbanisation have intensified pressure on housing and basic infrastructure. In Sub-Saharan Africa, settlement expansion has often outpaced the provision of roads, water supply, sanitation, drainage, waste-management services, and other essential infrastructure (UN-Habitat, 2026b). In Nigeria, the housing deficit is accompanied by substantial variations in the condition of existing housing stock, with many settlements experiencing inadequate infrastructure and environmental services (Adeboye and Akinsiku, 2020; Udoh and Essien, 2025). These challenges are not geographically uniform but often reflect differences in urbanisation, accessibility, infrastructure investment, socio-economic circumstances, and institutional capacity (Udoh, 2023).

Geographic Information Systems (GIS) provide valuable tools for investigating these spatial differences. By linking housing data collected at household and community levels to geographic locations, GIS facilitates the visualisation, comparison, and spatial analysis of housing conditions. Techniques such as spatial interpolation and hotspot analysis can help identify areas where poor housing conditions are concentrated, while spatial assessment of relevant determinants can provide insights into the factors associated with these patterns (Cromley and McLafferty, 2012; Longley *et al.,* 2015). Such analyses are particularly important because district-wide averages may conceal substantial variations between communities, limiting the ability of policymakers to identify areas requiring targeted intervention.

Literature Review and Conceptual Framework

Empirical assessments of housing quality in developing cities have increasingly shifted from single-indicator measures of dwelling structure toward multidimensional frameworks that capture neighbourhood services, environmental hazards, and governance (Aliu *et al*., 2021; Nix *et al.,* 2024; Veeravalli *et al*., 2026). This study is anchored in the UN-Habitat multidimensional housing deprivation framework (UN-Habitat, 2026a, 2026b) and the World Health Organization (WHO) Healthy Housing guidelines (WHO, 2021). Both frameworks conceptualise adequate housing not merely as physical shelter, but as an integrated residential system shaped by five interacting pillars: (1) infrastructure provision (access to roads, electricity, water, and drainage), (2) environmental quality (sanitation, waste management, and absence of flooding or pollution),

(3) socio-economic conditions (household income, livelihood stability, and affordability), (4) housing density (occupancy rates and spatial crowding), and (5) institutional support (urban planning regulation, land administration, and public service delivery).

These issues are particularly relevant to Uyo Senatorial District, Akwa Ibom State, Nigeria, where rapid population growth, peri-urban expansion, and uneven infrastructure investment have created sharp contrasts across residential settlements. Existing empirical studies in Uyo and neighbouring Akwa Ibom communities have documented rapid urban sprawl, inadequate storm-water drainage, uneven access to potable water and sanitation, and residential quality disparities within the Uyo capital territory (for example, Ekong, 2017; Akpan and Atser, 2018; Ukpong, 2019; Udoh and Essien, 2025). However, these prior investigations have largely focused on individual urban neighbourhoods, single infrastructure sectors, or non-spatial household assessments, leaving a critical gap in community-level, district-wide comparative data across all nine Local Government Areas of Uyo Senatorial District. A spatially explicit, multi-domain assessment is therefore necessary to establish an empirical baseline for identifying communities with relatively favourable or deprived housing profiles and informing geographically targeted housing and infrastructure interventions.

In line with the study's focus on housing conditions, this paper examines their spatial distribution, identifies high-priority areas of poor housing conditions based on composite deprivation indices, and evaluates spatial variations in their determinants across communities in Uyo Senatorial District. Specifically, the study seeks to:

1. Examine the spatial distribution of housing conditions across communities in Uyo Senatorial District.
2. Identify high-prioritised areas of poor housing conditions across communities in Uyo Senatorial District.
3. Evaluate the spatial variation in the determinants of housing conditions across communities in the district.

2. Description of the Study Area

a. Location

The study was conducted in Uyo Senatorial District, Akwa Ibom State, Nigeria, located approximately between latitudes $4^{\circ}43'\mathrm{N}$ and $5^{\circ}23'\mathrm{N}$ and longitudes $7^{\circ}48'\mathrm{E}$ and $8^{\circ}10'\mathrm{E}$. The district comprises nine Local Government Areas (LGAs): Uyo, Itu, Ibiono Ibom, Ibesikpo Asutan, Nsit Ibom, Nsit Atai, Nsit Ubium, Etinan, and Uruan. Uyo, the state capital, is the major administrative and commercial centre and has experienced considerable urban expansion. The location and constituent LGAs of the study area are shown in Figure 1.

b. Population

Uyo Senatorial District has experienced substantial demographic growth, increasing from approximately 1.38 million people in the 2006 national census to an estimated projected population of over 2.1 million (National Population Commission (NPC), 2010; National Bureau of Statistics [NBS], 2025). Population growth, urbanisation, and rural–urban migration has increased demand for residential land and housing, particularly around Uyo and adjoining settlements.

c. Settlement Structure

The district comprises urban, peri-urban, and rural settlements with varying levels of population concentration and infrastructure. Uyo and its adjoining areas are characterised by relatively dense and rapidly expanding residential development, while settlements in the more peripheral LGAs are generally less dense and more dispersed. These differences provide an appropriate setting for examining spatial variations in housing conditions.

d. Housing Development

Housing development varies across the district according to settlement type, socio-economic conditions, and access to infrastructure. Planned urban areas generally have better access to roads, electricity, water, drainage, and sanitation facilities, whereas some peri-urban and rural settlements contain less developed housing and limited basic services (Udoh and Essien, 2025). Rapid conversion of agricultural and undeveloped land to residential use has also contributed to uneven housing development (National Bureau of Statistics [NBS], 2025).

e. Environmental Conditions

Uyo Senatorial District has a humid tropical environment characterised by high rainfall, warm temperatures, and generally low to gently undulating terrain. Seasonal heavy rainfall can contribute to surface-water accumulation and flooding in areas with inadequate drainage. Rapid settlement expansion, vegetation clearance, and poor solid-waste disposal can also affect environmental quality in some residential areas (NIMET, 2023; NBS, 2025). These conditions, together with high poverty levels and variations in drainage, sanitation, waste management, and access to basic services, contribute to differences in the residential environment across communities and are relevant to the assessment of housing conditions in the district (Effiong and Essien, 2023).

International Journal of Humanity and Social Sciences

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Vol. 5, Issue No. 5, pp. 14 – 33, 2026 www.carijournals.org

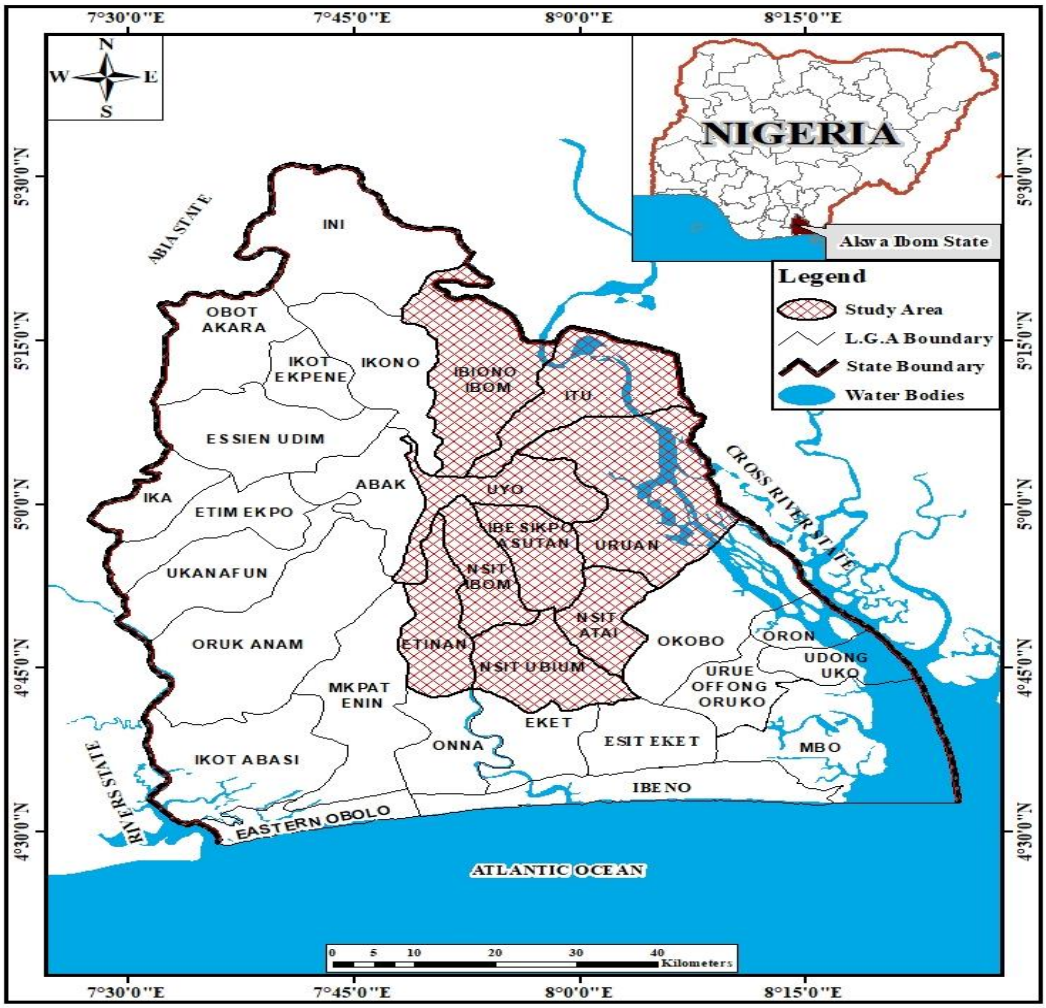


Figure 1: Akwa Ibom State Showing the Study Area

3. Materials and Methods

i. Study Design

A descriptive cross-sectional survey with a convergent mixed-methods design was adopted. Quantitative household survey data were complemented by qualitative information obtained from focus group discussions (FGDs) and key informant interviews (KIIs), which were thematically analysed across the five housing determinant domains to contextualise and triangulate the quantitative community scores. Geographic Information Systems (GIS) techniques were integrated with descriptive and comparative statistical analyses to examine the spatial distribution of housing conditions and variations in their determinants across communities in Uyo Senatorial District.

ii. Sample and Sampling Procedure

The study population comprised households across the nine Local Government Areas (LGAs) of Uyo Senatorial District. The minimum sample size of 384 households was determined using Cochran's (1977) formula for unknown populations:

$$n = \frac{Z^2 pq}{e^2}$$

Where n is the sample size, Z is the Z-score at a 95% confidence level (1.96), p is the assumed maximum population proportion (0.5), q is $1 - p$ (0.5), and e is the margin of error (0.05). Using these parameters ($Z = 1.96, p = 0.5, e = 0.05$), the calculation yielded a target sample size of 384 households. A multistage sampling procedure was then employed to select study locations and distribute the sample. In the first stage, each of the nine LGAs was stratified into urban and rural settlements, and two communities, one urban and one rural were purposively selected from each LGA to capture environmental and infrastructural variations across settlement types, yielding a total of 18 sampled communities: Okwo Nsit, Nung Udoe, Idu, Ikot Edibon, Ikot Uyo Nsit, Ntak Inyang, Atan, Ikot Nseyen, Odoro Ididep, Etinan Urban, Afaha Offiong, Use Offot, Mbiabong Anyanya, Ikot Andem, Ikot Udoh Eyoho, Okoita, Odot, and Ekim Enen. In the second stage, using 1991 National Population Commission (NPC) locality figures projected to 2025 at an annual growth rate of 3.2% (total projected population of 136,675) and an average household size of five persons, the total number of households across the 18 sampled communities was estimated at 27,356. Third, rather than allocating samples based on total LGA populations which would conflict with a fixed two-community-per-LGA design, the sample of 384 households was proportionally allocated directly across the 18 sampled communities based on their estimated household sizes using $\left(\frac{N_i}{N} \times n\right)$, yielding community sample sizes ranging from 2 to 85 households (averaging approximately 21 to 22 households per community) rather than an equal allocation across communities. Hence, households within each community were selected using systematic random sampling at fixed spatial intervals along established transects. Household heads or adult representatives aged 18 years and above participated in the survey.

iii. Construction of Housing Indices

Housing conditions and their contextual determinants were operationalised using two composite indices: the Qualitative Housing Condition Index (QHCI), derived from the household survey, and the Housing Condition Determinants Index (HCDI), derived from Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs).

Qualitative Housing Condition Index (QHCI): To examine physical housing quality across communities in accordance with the operational definition established in the Introduction, the QHCI was constructed using eight household survey indicators adapted from Chu *et al.* (2022):

dwelling type and structural material quality, housing density and room occupancy, ventilation and natural lighting, water supply, waste disposal and environmental sanitation, electricity supply, toilet and sanitation facilities, and access to basic neighbourhood infrastructure. Each indicator was rated on a four-point ordinal scale: Poor (1), Fair (2), Good (3), and Very Good (4), with equal weighting ($w = 1$) assigned across all eight indicators. For each community, indicator scores were summed and normalised into a percentage:

$$\text{QHCI (\%)} = \left(\frac{\sum S}{32}\right) \times 100$$

where $\sum S$ is the sum of the eight indicator scores and 32 is the maximum obtainable score (8×4). Based on standard quartile thresholds, communities were classified as Poor (25.0% to 49.9%), Fair (50.0% to 64.9%), Good (65.0% to 79.9%), and Very Good (80.0% to 100.0%).

Housing Condition Determinants Index (HCDI): To complement the physical dwelling assessment with upstream contextual drivers, qualitative transcripts from the FGDs and KIIs were analysed using thematic content analysis. Five recurring determinant themes emerged: infrastructure provision, environmental conditions, socio economic conditions, housing density and overcrowding, and institutional support. To enable quantitative comparison across the 18 sampled communities, qualitative evidence for each determinant was scored on a three point ordinal scale using explicit thematic rubric criteria: 1 (Poor: widespread community consensus of severe deficit, absent services, or acute environmental hazard), 2 (Fair or Moderate: mixed evidence indicating partial service availability, irregular maintenance, or localised constraints), and 3 (Good: consistent evidence of functional infrastructure, supportive socio economic conditions, and active institutional intervention). Equal weighting ($w = 1$) was assigned across all five determinants, and scores were aggregated into the HCDI:

$$\text{HCDI (\%)} = \left(\frac{\sum S}{15}\right) \times 100$$

where $\sum S$ is the sum of the five determinant scores and 15 is the maximum obtainable score (5×3). Although the raw summed scores span 11 discrete integer values from 5 to 15 (33.3% to 100.0%), normalising to a percentage scale standardises cross community comparison into poor (33.3% to 53.3%), moderate (60.0% to 73.3%), and favourable (80.0% to 100.0%) determinant environments.

Validity and Reliability: Content and face validity for both the survey instrument and the qualitative interview guides were established through review by specialists in medical geography, urban planning, and public health, followed by a pilot study of 30 households outside the sampled communities. Internal consistency reliability of the eight item QHCI scale was confirmed using Cronbach's alpha ($\alpha = 0.82$). For the qualitative HCDI scoring, reliability was ensured through

independent dual coding of FGD and KII transcripts by two researchers, achieving an inter-rater agreement of 88%, with any scoring discrepancies resolved through consensus review against audio transcripts.

iv. Data Collection

Primary data were collected using structured household questionnaires, physical housing observation checklists, handheld Global Positioning System (GPS) receivers, FGDs, and KIIs. The questionnaires and observation checklists captured household socio demographic profiles alongside the physical dwelling, infrastructure, and environmental attributes required for the QHCI, whereas FGDs and KIIs gathered community perspectives across the five HCDI determinant domains. Handheld GPS receivers recorded community geographic coordinates for spatial referencing, while secondary spatial datasets, including administrative boundary shapefiles and satellite imagery, supported base mapping and spatial verification.

v. Data Analysis

Quantitative data were analysed using IBM SPSS Statistics (version 27), while spatial processing and mapping were conducted in ArcGIS 10.7. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise household profiles, QHCI scores, and HCDI determinant scores across the 18 sampled communities. Georeferenced community coordinates were linked to attribute tables to generate choropleth maps of physical housing quality (QHCI) and Inverse Distance Weighted (IDW) interpolated surfaces illustrating the spatial distribution of housing condition determinants (HCDI). The IDW surface was interpreted strictly as a spatial estimate of transitional variation between sampled locations rather than as direct measurements at unsampled sites. Individual determinant scores were also compared across communities to identify the specific structural factors driving unfavourable housing profiles.

vi. Ethical Considerations

Ethical approval was obtained from the appropriate institutional review committee before data collection. Informed consent was obtained from all participants, and participation was voluntary. Confidentiality and anonymity were maintained, and the information collected was used solely for research purposes.

4. Results

i. Spatial Distribution of Housing Conditions

The spatial analysis revealed considerable geographical variation in housing conditions across Uyo Senatorial District. Housing Condition Determinants Index (HCDI) values across the 18 sampled communities averaged 62.6% (median = 60.0%, SD = 18.6%), ranging from a low of 33.3% in Okwo Nsit to a high of 100.0% in Afaha Offiong. While high-scoring conditions were

observed in settlements such as Afaha Offiong (100.0%), Ikot Edibon (93.3%), and Ntak Inyang (86.7%), the lowest scores were recorded in Okwo Nsit (33.3%), Atan (40.0%), and Ekim Enen (40.0%). These findings demonstrate that housing-condition determinants vary substantially across the district rather than exhibiting geographical uniformity.

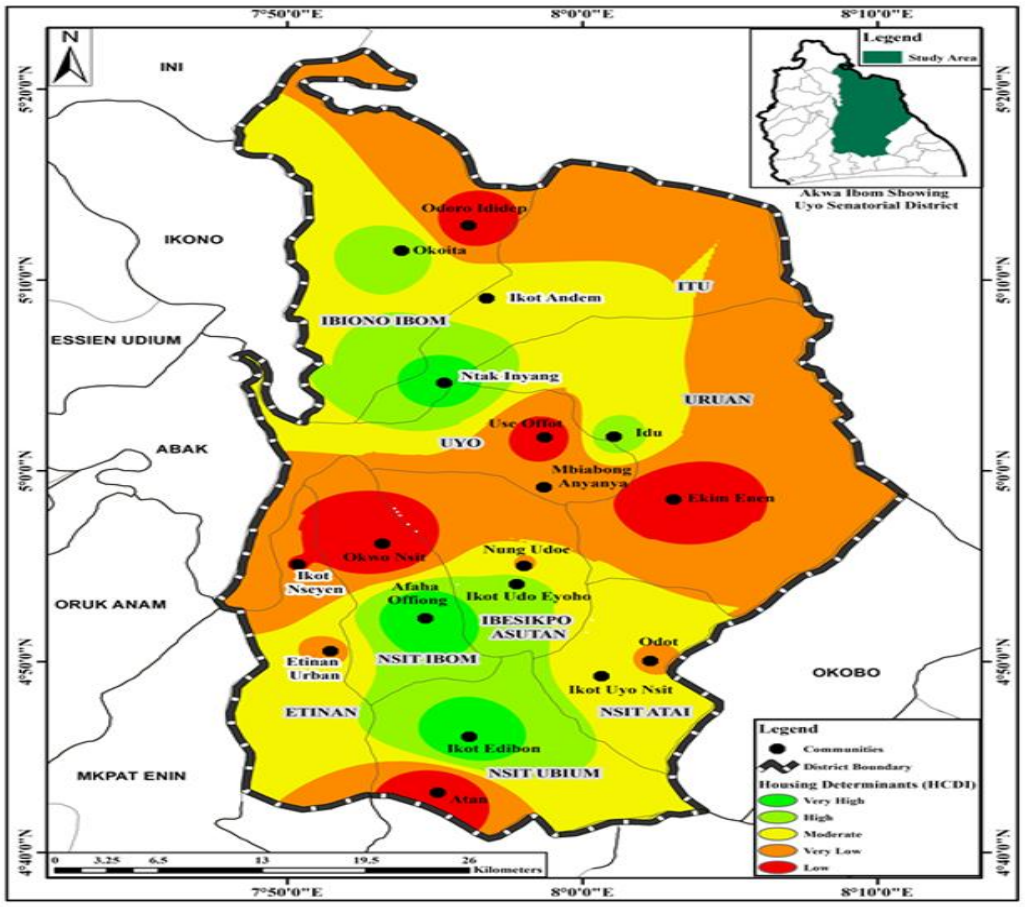


Figure 2. Spatial Distribution of Housing Conditions Across the Sampled Communities

The map illustrates the geographical variation in HCDI values across the sampled communities. By combining scores from five determinant domains into a single index, the HCDI provides a basis for comparing the relative housing-condition profiles of communities and visualising the distribution of comparatively favourable and unfavourable conditions across the study area.

ii High-Risk Areas and Areas of Concern

The HCDI results revealed geographical variations in housing conditions across Uyo Senatorial District. Following the classification framework of Figure 3, housing condition risk levels are categorised into Low Risk / Favourable (green zones), Moderate Risk (yellow zones), and High Risk / Area of Concern (red zones). Okwo Nsit recorded the lowest HCDI value (33.3%),

followed by Atan and Ekim Enen (40.0% each), and Odoro Ididep and Use Offot (46.7% each). Furthermore, Ikot Nseyen and Mbiabong Anyanya recorded HCDI values of 53.3% each, which accounts for the additional high-risk red zones depicted around these settlements in Figure 3. These seven communities represent primary areas of concern with comparatively unfavourable housing-condition profiles, requiring priority attention in housing improvement, infrastructure provision, environmental sanitation, and basic service delivery.

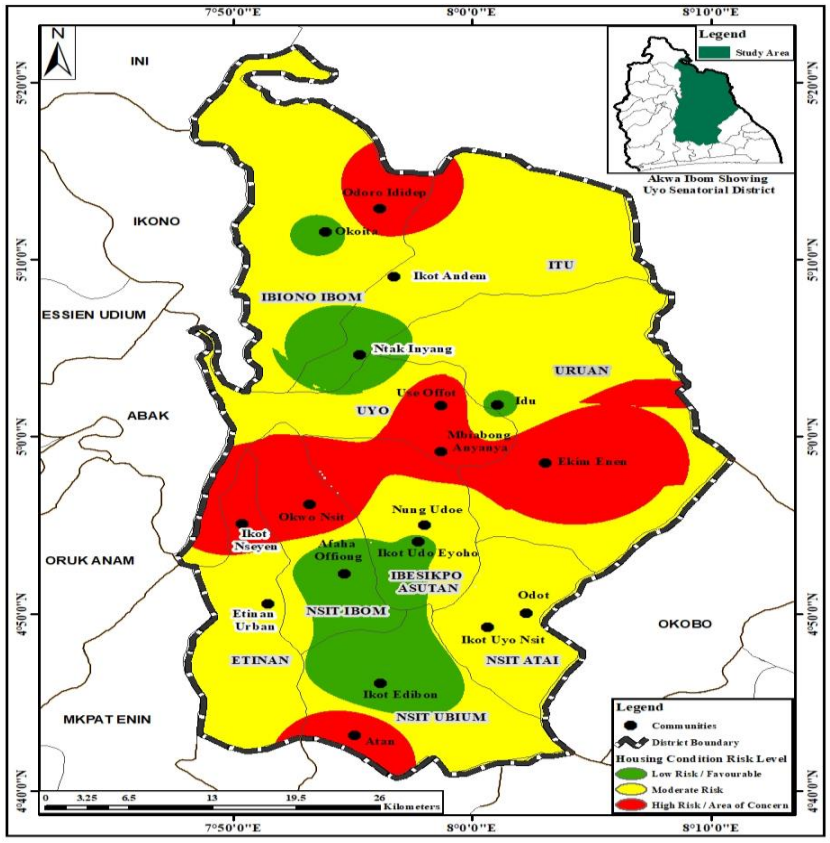


Figure 3. Identification of High-Risk Areas/ Areas of Concern Based on Housing Condition Risk Levels

iii Spatial Variation in Housing-Condition Determinants

Table 1 presents the five determinant-domain scores used to construct the HCDI and illustrates differences in the housing-condition profiles of the sampled communities. Afaha Offiong scored 3 across all five domains and consequently recorded the maximum HCDI value of 100.0%. In contrast, Okwo Nsit scored 1 across all five domains, resulting in the minimum HCDI value of 33.3%. Ikot Edibon also recorded a high HCDI value of 93.3%, with scores of 3 for infrastructure, environmental quality, housing density, and institutional support, and 2 for socio-economic conditions. The results further show that communities with similar or moderate overall HCDI values may have different combinations of strengths and weaknesses across the determinant

domains. Etinan Urban, for example, recorded a socio-economic score of 3 but scores of 1 for environmental quality and housing density, resulting in an HCDI value of 60.0%. Similarly, Ikot Nseyen recorded a housing-density score of 3 but lower scores for infrastructure, environmental quality, and socio-economic conditions, producing an HCDI value of 53.3%. These differences demonstrate the importance of examining the five determinant domains individually alongside the composite index. Although the HCDI facilitates comparisons between communities, the domain-level scores provide additional information about the specific dimensions contributing to their relative housing-condition profiles.

Table 1. Community-Level Scores for the Housing-Condition Determinants and HCDI

Community	Infrastructure	Environmental quality	Socio-economic conditions	Housing density	Institutional support	HCDI (%)
Okwo Nsit	1	1	1	1	1	33.3
Nung Udoe	2	2	2	1	2	60.0
Idu	3	2	2	2	2	73.3
Ikot Edibon	3	3	2	3	3	93.3
Ikot Uyo Nsit	2	2	2	2	2	66.7
Ntak Inyang	3	3	2	2	3	86.7
Atan	1	1	1	2	1	40.0
Ikot Nseyen	1	1	1	3	2	53.3
Odoro Ididep	1	1	1	2	2	46.7
Etinan Urban	2	1	3	1	2	60.0
Afaha Offiong	3	3	3	3	3	100.0
Use Offot	2	1	2	1	1	46.7
Mbiabong Anyanya	2	1	2	1	2	53.3
Ikot Andem	2	1	2	3	2	66.7
Ikot Udoh Eyoho	2	2	2	3	2	73.3
Okoita	2	2	2	3	2	73.3
Odot	1	2	2	2	2	60.0
Ekim Enen	1	1	1	1	2	40.0

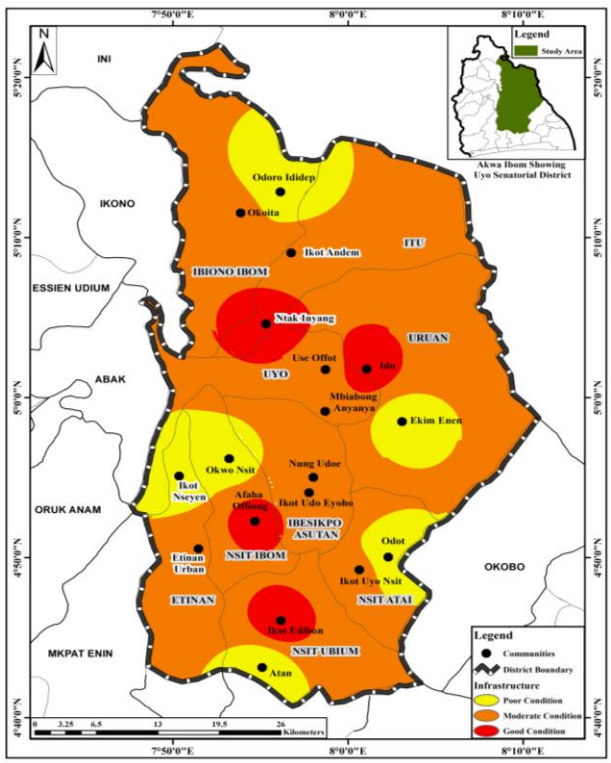
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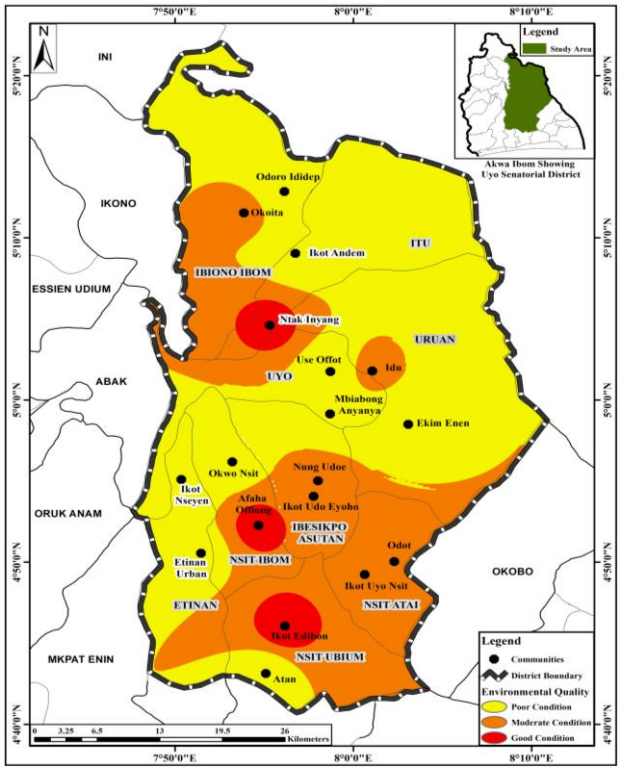
ISSN: 3005-5407 (Online)

Vol. 5, Issue No. 5, pp. 14 – 33, 2026

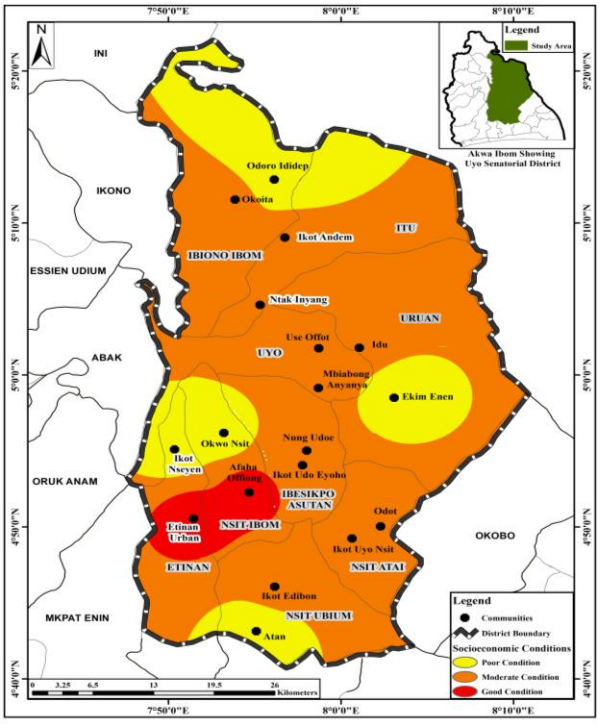
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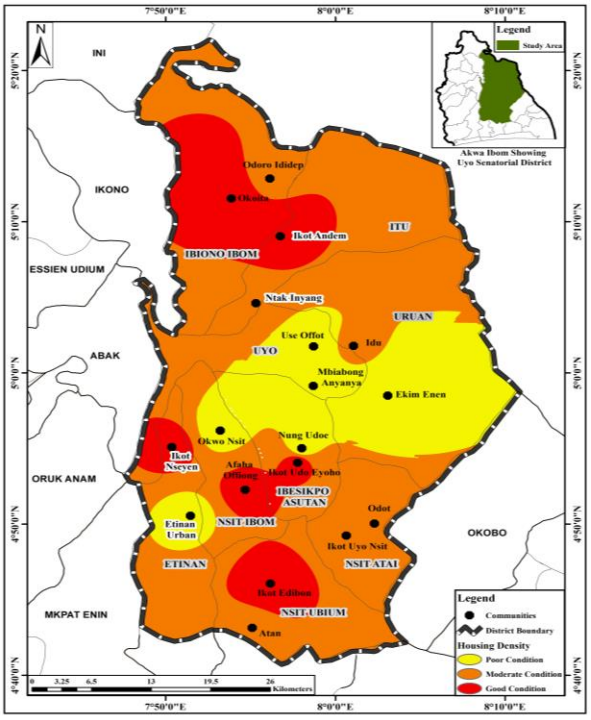
Infrastructure



Environmental Quality



Socioeconomic Conditions



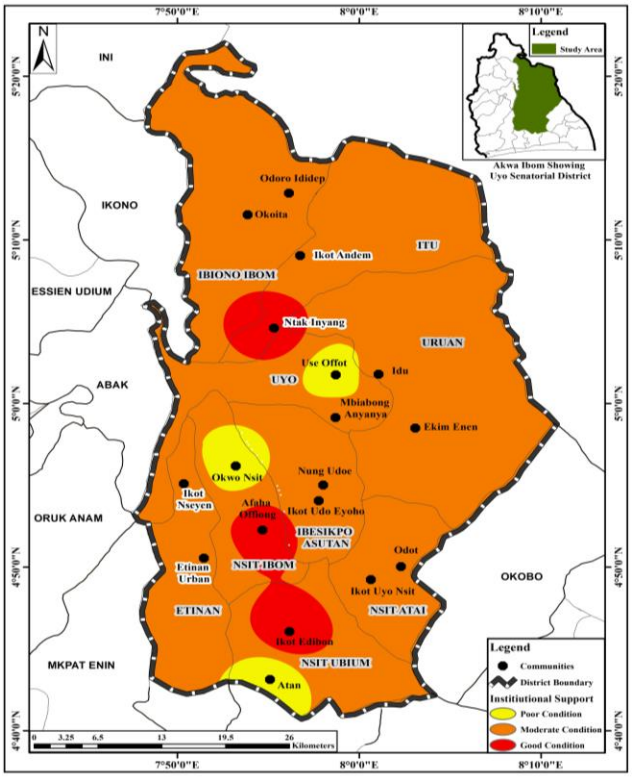
Housing Density

International Journal of Humanity and Social Sciences

ISSN: 3005-5407 (Online)

Vol. 5, Issue No. 5, pp. 14 – 33, 2026

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Institutional Support

Figure 4. **Determinants of Housing Condition.**

4.4 Qualitative Findings on Community Perspectives of Housing Determinants

Thematic analysis of the Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) corroborated the quantitative HCDI patterns across the sampled settlements and provided contextual explanations for the observed spatial disparities (Table 2):

i. **Infrastructure and Dwelling Quality:** Participants in communities with favourable housing conditions (such as Idu, Ikot Edibon, Afaha Offiong, and Ntak Inyang) reported relatively newer cement-block dwellings, functional private and communal boreholes, more reliable electricity supply, and better road connectivity. Conversely, respondents in deprived settlements (such as Okwo Nsit, Ikot Nseyen, Ekim Enen, and Atan) highlighted ageing, less durable housing structures, deteriorated feeder roads, irregular grid electricity, and limited access to potable water.

ii. **Environmental Conditions and Housing Density:** In favourably ranked settlements, community leaders noted detached housing layouts with adequate spacing, lower room occupancy rates, and organised periodic sanitation exercises. In contrast, FGD participants in fair and poor housing clusters emphasised blocked or absent storm-water drains,

seasonal flooding, indiscriminate refuse disposal, inadequate indoor ventilation, and multi-household compound sharing that increased residential crowding.

iii. **Socio-Economic and Institutional Support:** Across all clusters, informants identified rising construction costs and irregular household incomes as major barriers to dwelling upgrades. However, settlements with stronger traditional governance structures, commercial vitality, and closer proximity to administrative centres reported better adherence to building standards and easier access to social amenities, whereas peripheral communities cited minimal public infrastructure investment and weak institutional oversight.

Table 2: Summary of Qualitative Perspectives across Housing Condition Clusters

S/N	Housing Condition Cluster	Housing Determinant Category	Qualitative Summary (Focus Group Discussions and Key Informant Interviews)
1	Good Housing Condition Communities *(Idu, Ikot Edibon, Afaha Offiong, Ntak Inyang)*	Infrastructure Provision	Participants reported relatively better access to potable water through private and community boreholes, more reliable electricity supply, and improved road accessibility compared to other communities.
		Environmental Conditions	Respondents indicated that waste disposal practices were relatively organised, with periodic community sanitation activities and drainage channels that help reduce environmental nuisance and flooding.
		Socio-Economic Conditions	Informants attributed improved housing quality to higher household incomes, stronger commercial activities, and proximity to administrative and market centres that stimulate economic opportunities.
		Housing Density and Overcrowding	Residents described predominantly detached cement-block houses with adequate spacing between buildings, lower occupancy rates, and better ventilation conditions.
		Institutional Support	Evidence from discussions revealed stronger community leadership structures, better compliance with building standards, and relatively easier access to health facilities, schools, and transportation networks.
2	Fair Housing Condition Communities *(Ikot Andem, Ikot Uyo Nsit,*	Infrastructure Provision	Respondents reported moderate access to basic infrastructure. While electricity and water sources were generally available, many households relied on privately owned boreholes and experienced periodic service interruptions.

	Ikot Udoh Eyoho, Okoita, Odoro Ididep, Odot, Nung Udoe, Etinan Urban, Mbiabong Anyanya, Use Offot)		
		Environmental Conditions	Participants noted challenges relating to waste management and drainage maintenance. Open dumping and blocked drainage channels were reported in some neighbourhoods, particularly during the rainy season.
		Socio-Economic Conditions	Informants linked housing challenges to rising construction costs, limited household incomes, and increasing demand for residential accommodation in growing urban and peri-urban areas.
		Housing Density and Overcrowding	Discussions revealed moderate to high residential density in some areas, with multiple households sharing residential compounds and sanitation facilities.
		Institutional Support	Participants reported limited government intervention in housing and environmental management, resulting in greater reliance on community self-help initiatives and periodic sanitation exercises.
3	Poor Housing Condition Communities *(Okwo Nsit, Ikot Nseyen, Ekim Enen, Atan)*	Infrastructure Provision	Informants reported inadequate access to basic infrastructure, including unreliable electricity supply, limited potable water sources, and poor road networks connecting the communities to nearby urban centres.
		Environmental Conditions	Participants highlighted poor environmental sanitation conditions characterised by inadequate waste disposal facilities, poor drainage systems, and seasonal flooding in some locations.
		Socio-Economic Conditions	Discussions indicated that low household incomes and widespread economic constraints limit the ability of residents to improve housing structures and access essential services.
		Housing Density and Overcrowding	Respondents described housing structures that were generally older and less durable, with inadequate

		ventilation and limited space available for household activities.
	Institutional Support	Evidence from FGDs and KIIs pointed to limited public investment in social amenities and infrastructure, contributing to the persistence of poor housing conditions and associated health challenges.

Field Data, 2026

5. Discussion of Findings

The findings revealed substantial spatial variation in housing conditions across the 18 sampled communities in Uyo Senatorial District. The Housing Condition Determinants Index (HCDI) ranged from 33.3% in Okwo Nsit to 100.0% in Afaha Offiong, indicating marked differences in the combined infrastructure, environmental quality, socio-economic conditions, housing density, and institutional support domains across the study area. Afaha Offiong recorded the highest HCDI value (100.0%), followed by Ikot Edibon (93.3%) and Ntak Inyang (86.7%). Conversely, Okwo Nsit recorded the lowest value (33.3%), followed by Atan and Ekim Enen (40.0% each). These differences demonstrate geographical inequalities in housing-condition determinants across the district. Similar spatial disparities in residential and environmental deprivation were reported by Aliu *et al.* (2021), whose GIS-based assessment of informal settlements in Lagos, Nigeria, identified substantial differences in residential conditions, water access, and environmental deprivation across communities. Beyond megacities, empirical studies in medium-sized Nigerian regional centres, including Akure and Abeokuta, similarly demonstrate that residential quality outside primary administrative cores is heavily constrained by uneven municipal infrastructure, uncoordinated peri-urban expansion, and inadequate storm-water drainage (Owoeye and Omole, 2012; Yoade *et al.*, 2015). Within Akwa Ibom State specifically, these spatial patterns corroborate earlier investigations in Uyo and neighbouring settlements showing that rapid urban expansion has outpaced the provision of paved access roads, reticulated water supply, and systematic waste management (Ekong, 2017; Akpan and Atser, 2018; Ukpong, 2019). More recently, Veeravalli *et al*. (2026) demonstrated that living-condition deficits occur across cities of different sizes and that their spatial distribution can be overlooked when assessments focus primarily on major metropolitan areas. The findings from Uyo Senatorial District therefore reinforce the value of community-level GIS assessment for exposing localised housing deficits across urban and rural settlements. Mapping community-level HCDI values provides an empirical basis for comparing multi-domain housing profiles and prioritising deprived settlements, such as Okwo Nsit, Atan, and Ekim Enen, for targeted infrastructure and environmental interventions

The HCDI results identified Okwo Nsit, Atan, Ekim Enen, Odoro Ididep, and Use Offot as communities with comparatively unfavourable housing-condition profiles. Okwo Nsit recorded

the lowest HCDI value (33.3%), while Atan and Ekim Enen each recorded 40.0%, and Odoro Ididep and Use Offot each recorded 46.7%. Based on their composite scores, these communities represent high-priority areas requiring targeted attention in housing improvement and infrastructure planning. These findings align with the value of disaggregated spatial assessments in uncovering communities experiencing overlapping residential and environmental deprivation. Aliu *et al.* (2021), for example, used a deprivation index and spatial mapping to demonstrate that housing and water-related disadvantages varied substantially across settlements in Lagos, underscoring the practical value of identifying disadvantaged communities to guide urban planning and service provision. In the present study, low HCDI values provide an empirical basis for prioritising settlements for closer assessment and intervention across infrastructure, environmental quality, housing density, socio-economic conditions, and institutional support.

The findings also revealed differences across the five assessed domains: infrastructure, environmental quality, socio-economic conditions, housing density, and institutional support. Afaha Offiong recorded the highest possible score across all five domains, resulting in an HCDI of 100.0%. In contrast, Okwo Nsit recorded the lowest possible score across all five domains, resulting in an HCDI of 33.3%. Ikot Edibon recorded favourable scores for infrastructure, environmental quality, housing density, and institutional support, alongside an intermediate socio-economic score, producing an HCDI of 93.3%. The domain-level results further demonstrated that communities can have different combinations of favourable and unfavourable conditions. Etinan Urban, for example, recorded a favourable socio-economic score but less favourable scores for environmental quality and housing density. Similarly, Ikot Nseyen recorded a favourable housing-density score but less favourable scores for infrastructure, environmental quality, and socio-economic conditions. These differences indicate that overall HCDI values may conceal specific strengths and weaknesses within individual determinant domains. This multidimensional pattern is consistent with the broader understanding that adequate housing requires attention to interconnected physical, environmental, infrastructural, and socio-economic dimensions. *Nix et al.* (2024) highlighted the importance of evidence on existing housing conditions, cross-sector collaboration, and effective policy implementation in developing healthy housing policies. Similarly, the World Health Organization (2021) emphasised the role of housing policies, regulations, and legislation in promoting safe and healthy housing. These sources support the importance of considering multiple dimensions of housing conditions when developing improvement strategies, although they do not directly validate the specific scoring system used in the present study. The findings suggest that housing interventions should be tailored to the needs of individual communities. Communities with unfavourable scores across several domains may require broader interventions, whereas communities with stronger overall profiles may benefit from targeted improvements in their weaker domains. The HCDI should therefore be interpreted alongside its component domain scores to support more precise planning and resource allocation.

6. Conclusion

This study examined the spatial distribution of housing conditions, identified potential high-priority deprived areas, and assessed spatial variation in housing-condition determinants across 18 sampled communities in Uyo Senatorial District, Akwa Ibom State, Nigeria. The findings revealed substantial geographical differences in HCDI values, ranging from 33.3% in Okwo Nsit to 100.0% in Afaha Offiong. The results also demonstrated variation across the five assessed domains: infrastructure, environmental quality, socio-economic conditions, housing density, and institutional support. Okwo Nsit, Atan, Ekim Enen, Odoro Ididep, and Use Offot recorded comparatively low HCDI values and warrant priority attention in housing improvement and infrastructure planning. The domain-level findings further demonstrated that communities have different combinations of strengths and weaknesses, highlighting the need for interventions tailored to local conditions. Specifically, severely deprived settlements such as Okwo Nsit (33.3%), Atan (40.0%), and Ekim Enen (40.0%) require comprehensive, multi-sector upgrading across infrastructure, environmental quality, and institutional support, whereas communities with intermediate profiles, such as Etinan Urban (weak in environmental quality and housing density) and Ikot Nseyen (weak in infrastructure, environmental quality, and socio-economic conditions), require targeted interventions in their deficient domains. These findings support the use of community-level assessment and GIS-based mapping to inform housing policy and settlement planning.

Moreover, several methodological limitations should be noted when interpreting these results. First, the spatial interpolation was based on 18 sampled community points, which captures broad regional patterns but may mask localised variations between unsampled neighbourhoods. Second, the study relied on composite HCDI scoring and descriptive Inverse Distance Weighting (IDW) interpolation without inferential spatial autocorrelation or regression testing, meaning the identified spatial patterns reflect descriptive concentrations rather than statistically inferred clusters. Third, data were collected at a single cross-sectional time point, which prevents the assessment of temporal or seasonal changes in housing conditions. Future research incorporating denser sampling, formal spatial statistical modelling, and longitudinal data would address these constraints. Nevertheless, the study highlights the value of integrating composite housing-condition indicators with GIS to identify geographical inequalities and support evidence-informed planning. Targeted improvements in infrastructure, environmental management, basic services, and institutional support, guided by the specific deficiencies identified in each community, may help address disparities in housing conditions across Uyo Senatorial District.

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