

ASSESSING ECOSYSTEM SERVICES USING SPATIAL MAPPING AND RESIDENTS' PERCEPTIONS OF RESIDENTIAL NEIGHBOURHOODS IN ABUJA, NIGERIA

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Abstract

Urban expansion in rapidly growing cities significantly alters residential landscapes, with implications for ecosystem service provision and human well-being. While ecosystem services have been widely studied, limited research integrates spatial assessment with residents' perceptions at the neighbourhood scale in African cities. This study evaluates ecosystem services in residential neighbourhoods of Abuja, Nigeria, by combining geospatial analysis of green infrastructure with residents' perceptions of ecosystem service provision and importance. An integrated quantitative multi-method approach was adopted, involving GIS-based land use/land cover classification derived from Landsat 8 imagery and a structured questionnaire survey of 398 residents across selected neighbourhoods in Abuja Municipal Area Council (AMAC) and Kuje Area Council. Ecosystem services were classified into provisioning, regulating, and cultural categories, and perception data were analysed using descriptive and comparative statistics. The results reveal significant spatial variation in green infrastructure distribution, corresponding with differences in perceived ecosystem service benefits across urban and peri-urban contexts. Regulating services, particularly microclimate regulation and air quality improvement, were rated most important in high-density urban areas, while provisioning services were more prominent in peri-urban neighbourhoods. Cultural services, including recreation and aesthetic value, were highly valued across both contexts. The study demonstrates that integrating spatial and perception-based assessments provides a more comprehensive understanding of ecosystem service provision in residential landscapes. It highlights the need for context-specific planning strategies that enhance multifunctional green infrastructure to support environmental resilience and improve quality of life in rapidly urbanising cities.

Keywords: Ecosystem Services, Green Infrastructure, Residential Landscape, Residents' Perception, Spatial Analysis,

INTRODUCTION

Rapid urbanisation is reshaping cities globally, with particularly significant impacts in the Global South, where urban growth is often rapid, spatially uneven, and insufficiently regulated (Hutchings *et al.*, 2022; Salem & Tsurusaki, 2024). This expansion is characterised by extensive land-use transformation, increasing dominance of impervious surfaces, and the conversion of natural and semi-natural ecosystems into built environments (Follmann *et al.*, 2021; Follmann *et al.*, 2023). These processes disrupt ecological functions and reduce the capacity of urban systems to provide essential ecosystem services, thereby intensifying environmental challenges such as urban heat islands, flooding, biodiversity loss, and

declining resilience (Li *et al.*, 2021; Mukherjee & Bairwa, 2025). Residential neighbourhoods represent a major component of urban land use and serve as a critical interface between human activities and ecological processes. Within these environments, green infrastructure elements—including private gardens, street trees, and communal open spaces—play a vital role in delivering ecosystem services such as climate regulation, recreation, and psychological well-being (Millennium Ecosystem Assessment, 2005; Balvanera *et al.*, 2017; Sung *et al.*, 2025). Despite their importance, residential landscapes remain insufficiently explored in ecosystem service research, particularly at the neighbourhood scale and within rapidly urbanising African cities.

Over the past two decades, ecosystem services research has expanded significantly, supported by global frameworks such as the Millennium Ecosystem Assessment and The Economics of Ecosystems and Biodiversity (MEA, 2005; Balvanera *et al.*, 2017). However, empirical studies have largely focused on macro-scale assessments using remote sensing and land use/land cover analysis (Haase *et al.*, 2014). While these approaches provide valuable insights into the biophysical supply of ecosystem services, they offer limited understanding of how such services are experienced and valued by urban residents. Recent scholarship emphasises the importance of incorporating socio-cultural dimensions into ecosystem service assessments (García-Nieto *et al.*, 2015; Zheng *et al.*, 2025). Residents' perceptions influence how ecosystem services are recognised, utilised, and managed, particularly within residential contexts where daily interactions with green infrastructure occur (van Vliet & Hammond, 2021). However, perception-based studies are often conducted independently of spatial analyses, resulting in fragmented understanding of ecosystem service dynamics (Dhungana, 2025). Green infrastructure has emerged as a key strategy in urban planning for enhancing ecosystem service provision (Gómez-Baggethun & Barton, 2013; Haase *et al.*, 2014). In residential neighbourhoods, it plays a critical role in mitigating environmental challenges while supporting social well-being (Gillner *et al.*, 2015; Coccolo *et al.*, 2018; Brindley *et al.*, 2019). Despite its recognised importance, empirical studies linking the spatial distribution of green infrastructure with residents' perceptions remain limited, particularly in West African contexts (Dipeolu *et al.*, 2021).

In Nigeria, and specifically in Abuja, rapid urban expansion has resulted in heterogeneous residential landscapes with varying levels of green infrastructure and ecosystem service provision (Ayeni *et al.*, 2025). Although Abuja was originally conceived as a planned city (Aliyu, 2016; Bashir *et al.*, 2021), contemporary neighbourhoods exhibit significant variation in density, infrastructure provision, and access to green spaces. Existing studies have largely focused on land-use dynamics and environmental degradation, with limited integration of ecosystem service frameworks and perception-based assessments (Ojobo *et al.*, 2024; Effiong, 2025). This study addresses these gaps by integrating spatial mapping and residents' perceptions to assess ecosystem services in Abuja's residential neighbourhoods. Specifically, it aims to: (i) map the spatial distribution of green infrastructure; (ii) assess residents' perceptions of ecosystem service provision and importance; and (iii) examine the relationship between spatial patterns and perceived ecosystem services across urban and peri-urban contexts. The study contributes to the literature by providing neighbourhood-scale empirical evidence from an African city, advancing methodological integration of spatial and socio-

cultural approaches, and offering insights for sustainable urban planning and residential design.

LITERATURE REVIEW

Ecosystem Services and Green Infrastructure in Urban Neighbourhoods

Ecosystem services represent the benefits that humans derive from ecosystems and provide a critical framework for linking ecological processes with human well-being (Millennium Ecosystem Assessment, 2005). These services are commonly categorised into provisioning, regulating, and cultural services (Balvanera *et al.*, 2017). In urban contexts, ecosystem services are increasingly recognised as essential for enhancing environmental quality, supporting public health, and improving overall urban livability. Green infrastructure plays a central role in the delivery of ecosystem services within cities. It comprises interconnected networks of natural and semi-natural elements, including parks, street trees, wetlands, and residential gardens, designed to provide ecological, social, and economic benefits (Gómez-Baggethun & Barton, 2013). In residential neighbourhoods, green infrastructure is particularly significant due to its proximity to daily human activities. It contributes to regulating services such as temperature moderation, air purification, and stormwater management, while also supporting cultural services including recreation, aesthetics, and psychological well-being (Gillner *et al.*, 2015; Brindley *et al.*, 2019; Coccolo *et al.*, 2018). Despite its importance, the distribution of green infrastructure in urban areas is often uneven, particularly in rapidly urbanising cities, resulting in disparities in ecosystem service provision. Residential landscapes, therefore represent a critical scale for understanding how ecosystem services are generated, accessed, and experienced.

Spatial and Perception-Based Approaches to Ecosystem Service Assessment

Ecosystem service assessment has traditionally been dominated by spatial approaches, particularly through the use of Geographic Information Systems (GIS) and remote sensing techniques. These methods enable the mapping and quantification of ecosystem service supply based on land use and land cover patterns (Haase *et al.*, 2014). While spatial analysis provides valuable insights into the biophysical distribution of ecosystem services, it often relies on proxy indicators and may not fully capture the complexity of ecosystem service delivery or human experience. In contrast, perception-based approaches focus on how individuals experience, interpret, and value ecosystem services within their local environments (García-Nieto *et al.*, 2015). These approaches highlight the socio-cultural dimension of ecosystem services, recognising that their value is not only determined by ecological function but also by human perception and use. Empirical studies show that residents' perceptions vary according to socio-economic characteristics, cultural context, urban density, and landscape quality (Ge *et al.*, 2024). For instance, residents in densely built environments may prioritise regulating services such as temperature reduction, whereas those in less dense areas may place greater emphasis on cultural services such as recreation and aesthetics. However, spatial and perception-based approaches are often applied independently, resulting in fragmented understandings of ecosystem service dynamics. This separation limits

the ability of researchers and practitioners to fully capture the relationship between ecosystem service supply and demand.

Integrating Spatial and Socio-Cultural Dimensions: Evidence and Gaps in African Contexts

Recent scholarship increasingly advocates for integrated approaches that combine spatial and socio-cultural assessments to provide a more comprehensive understanding of ecosystem services (Zheng *et al.*, 2025). Such integration enables the identification of mismatches between ecosystem service supply (biophysical availability) and demand (residents' perceptions and needs), which is essential for effective urban planning and design. Despite these advances, empirical applications of integrated approaches remain limited, particularly in African cities. Existing studies in the region have largely focused on land-use change, environmental degradation, or general green space distribution, with relatively few explicitly addressing ecosystem services and even fewer integrating spatial analysis with residents' perceptions (Dipeolu *et al.*, 2021). In Nigeria, research on urban environments has predominantly examined urban expansion and environmental challenges, with limited attention to neighbourhood-scale ecosystem service assessments. In Abuja, rapid urban growth has resulted in heterogeneous residential landscapes characterised by variations in density, infrastructure provision, and access to green infrastructure (Ayeni *et al.*, 2025). However, there is a lack of empirical studies that comprehensively assess ecosystem services by linking spatial patterns of green infrastructure with residents' perceptions, particularly across urban and peri-urban contexts. This gap constrains the development of context-specific, evidence-based planning and design strategies. Accordingly, this study addresses three key gaps in the literature: (i) the limited focus on neighbourhood-scale ecosystem service assessment, (ii) the underrepresentation of African cities in ecosystem service research, and (iii) the lack of integration between spatial and perception-based approaches. By adopting an integrated framework that combines GIS-based spatial analysis with residents' perception data, the study provides a more holistic understanding of ecosystem services in Abuja's residential neighbourhoods and contributes to advancing sustainable urban planning practices

MATERIALS AND METHODS

Study Area

The study was conducted within the Federal Capital Territory (FCT) (see Figure 1), Nigeria, which covers approximately 7,290 km². The FCT is bordered by Niger State to the west and northwest, Kaduna State to the northeast, Nasarawa State to the east and south, and Kogi State to the southwest. Administratively, it comprises six Area Councils: Abaji, Abuja Municipal Area Council (AMAC), Bwari, Gwagwalada, Kuje, and Kwali. For this study, AMAC and Kuje Area Councils were purposively selected due to their contrasting urban characteristics. AMAC (Figure 2) represents the urban core of Abuja, characterised by high residential density, well-developed infrastructure, and intensive socio-economic activities. In contrast, Kuje (Figure 3) represents a peri-urban context with lower residential density, larger land mass, and ongoing spatial expansion. This contrast provides an appropriate basis for

analysing variations in ecosystem service provision across urban–peri-urban gradients. AMAC consists of twelve administrative wards, including Garki, Wuse, Gwarinpa, Karu, Nyanya, and Gwagwa, while Kuje comprises ten wards, such as Chibiri, Kuje Central, Yenche, Gwargwada, and Rubochi. The selection of these Area Councils enables a comparative assessment of residential landscape characteristics and ecosystem service dynamics within the FCT.

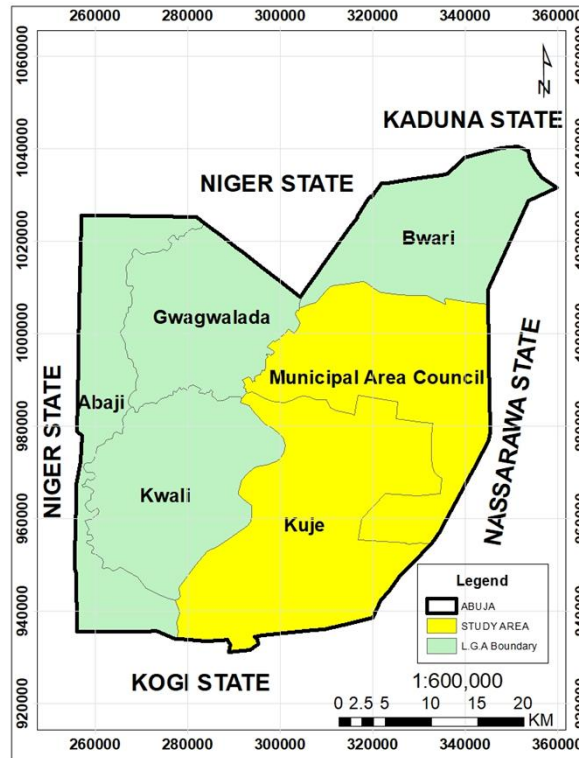


Figure 1: Municipal Area Council and Kuje Area Council in Relationship with the FCT
Source: National Boundary Commission

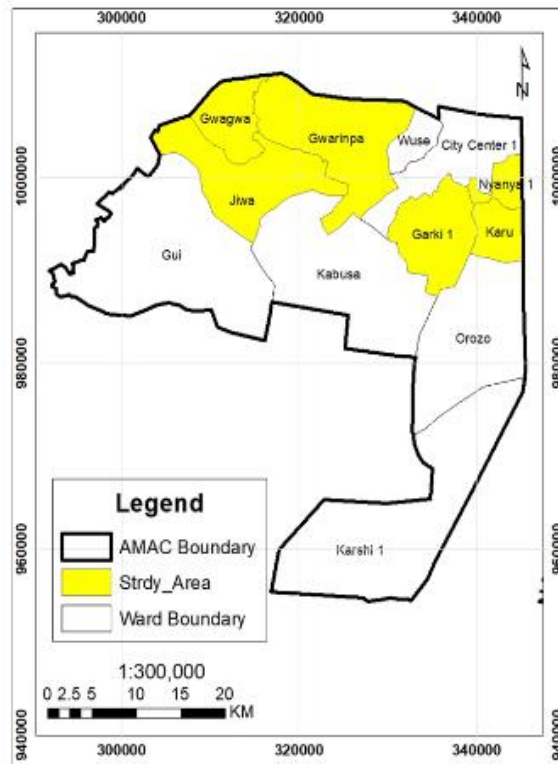


Figure 2 Administrative Ward in Municipal Area Council
Source: National Boundary Commission

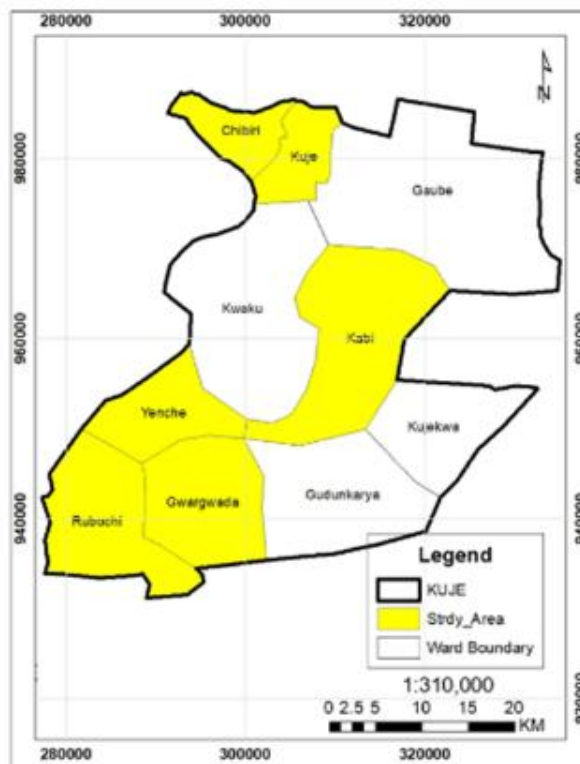


Figure 3: Administrative Ward in Kuje Area Council
Source: National Boundary Commission

Research Design

This study adopted a quantitative multi-method approach to assess ecosystem services in residential neighbourhood landscapes. The approach combines geospatial analysis of land use/land cover (LULC) with quantitative assessment of residents' perceptions, enabling the integration of biophysical and socio-cultural dimensions of ecosystem services. The research design was structured in two complementary phases. Firstly, the spatial analysis phase, which involved mapping and quantifying land use and land cover patterns using remote sensing and Geographic Information Systems (GIS) to infer ecosystem service provision. Secondly, the perception assessment phase that involved a structured questionnaire survey to evaluate residents' awareness, perception, and valuation of ecosystem services within their neighbourhoods. The integration of these two datasets allows for a comprehensive understanding of how spatial landscape characteristics correspond with perceived ecosystem service benefits.

Sampling Procedure and Data Collection

A multi-stage sampling technique was employed to ensure representative coverage of residential neighbourhoods across the selected Area Councils. In the first stage, two Area Councils—Abuja Municipal Area Council (AMAC) and Kuje—were purposively selected from the six Area Councils in the Federal Capital Territory (FCT). The selection was based on key criteria, including residential density, level of infrastructural development, population size, and land mass, in order to capture contrasts between urban and peri-urban contexts. In the second stage, administrative wards were selected using a simple random sampling technique. Six wards were selected from AMAC (out of twelve), while five wards were selected from Kuje (out of ten), ensuring proportional representation across both Area Councils. In the third stage, at least one residential community was selected within each chosen ward. The selection considered variations in residential density and development intensity to ensure inclusion of diverse neighbourhood typologies. In the final stage, respondents were selected within each community using a systematic sampling technique, whereby households were approached at regular intervals along selected streets. This approach ensured randomness and minimized selection bias within each neighbourhood.

Data were collected using a structured questionnaire comprising two main sections. The first section captured respondents' socio-economic characteristics, while the second section assessed residents' awareness, identification, and perception of ecosystem services provided by their residential landscapes. The questionnaire further evaluated the perceived importance of ecosystem services across three categories: provisioning, regulating, and cultural services, using a Likert-scale format. A total of 768 questionnaires were distributed across both Area Councils, with 384 questionnaires allocated to each Area Council to ensure balanced representation. Of these, 398 valid responses were retrieved, representing an overall response rate of 51.8%. AMAC recorded a response rate of 54.1% (208 responses), while Kuje recorded 49.5% (190 responses). The distribution of questionnaires and response rates across selected wards is presented in Table 1.

Table 1: Distribution of Questionnaires and Response Rates

Area Council / Ward	Questionnaires Distributed	Questionnaires Retrieved	Response Rate (%)
AMAC (Total)	384	208	54.1
Garki	64	37	57.8
Gwarinpa	64	35	54.7
Jiwa	64	29	45.3
Karu	64	35	54.6
Nyanya	64	38	59.7
Gwagwa	64	34	53.1
Kuje (Total)	384	190	49.5
Chibiri	78	40	51.3
Kuje Central	78	45	57.6
Yenche	76	44	57.9
Gwargwada	76	47	61.8
Rubochi	76	14	18.4
Total	768	398	51.8

Source: (Fieldwork, 2025)

Spatial Analysis and Ecosystem Service Mapping

Spatial analysis was conducted using Geographic Information Systems (GIS) and remote sensing techniques to assess land use and land cover (LULC) patterns within residential neighbourhoods of the study area. Landsat 8 Operational Land Imager (OLI) satellite imagery with a spatial resolution of 30 metres was utilised for the analysis. Prior to classification, the imagery underwent pre-processing procedures, including layer stacking and image enhancement, to improve classification accuracy and facilitate better visual interpretation. A supervised classification approach was adopted, employing the maximum likelihood algorithm to categorise land cover types relevant to ecosystem service provision. The classification process was guided by spectral signatures and supported by field knowledge of the study area. As a result, the landscape was classified into major land cover categories, namely built-up areas, vegetation (comprising trees and shrubs), grassland and open spaces, bare surfaces, and water bodies. Following the classification, land cover maps were generated for the selected neighbourhoods, and the areal extent and percentage coverage of each land cover category were computed. These spatial outputs provided a basis for analysing the distribution and composition of residential landscapes across the study area. The classified land cover categories were subsequently used as proxy indicators to infer the potential provision of ecosystem services. Vegetated areas were associated with regulating and cultural services, such as microclimate regulation, air quality improvement, and recreational value. Open spaces were linked primarily to cultural services, including recreation and social interaction, while vegetated and peri-urban land areas were indicative of provisioning services, such as food production and access to natural resources. The spatial distribution of these land cover classes enabled a comparative assessment of ecosystem service potential across neighbourhoods within the Abuja Municipal Area Council (AMAC) and Kuje Area Council. All spatial analyses and map production were carried out using ArcGIS software.

Data Analysis

Quantitative data obtained from the questionnaire survey were coded and analysed using statistical software. Descriptive statistical techniques, including frequencies, percentages, mean scores, and standard deviations, were employed to summarise respondents' socio-economic characteristics and to evaluate residents' perceptions of ecosystem service provision and importance across residential neighbourhoods. Ecosystem services were categorised into provisioning, regulating, and cultural groups to enable structured analysis and comparison. Residents' perceptions of ecosystem services were measured using a Likert-scale format, which allowed respondents to rate both the presence and perceived importance of specific ecosystem services within their neighbourhoods. Mean perception scores were computed for each ecosystem service category and used to compare patterns between neighbourhoods in the Abuja Municipal Area Council (AMAC) and Kuje Area Council. This comparative approach facilitated the identification of differences in perceived ecosystem service provision across urban and peri-urban residential contexts. To examine spatial variations in perception, perception scores were aggregated at the ward and Area Council levels and analysed alongside land-cover characteristics derived from the spatial analysis. This enabled a comparative assessment of how variations in residential landscape structure correspond with residents' perceived ecosystem service benefits. Spatial datasets generated from the land use and land cover classification were analysed using GIS tools to determine the areal extent and percentage coverage of land cover classes within each selected neighbourhood. These land cover metrics served as proxy indicators for the potential provision of provisioning, regulating, and cultural ecosystem services. The spatial distribution of ecosystem services was further interpreted through thematic maps, which facilitated visual comparison across the study area. Findings from both the spatial and perception analyses were subsequently integrated and interpreted in the discussion section to provide a comprehensive understanding of ecosystem service dynamics in residential neighbourhood landscapes. This integrative approach enabled the identification of dominant ecosystem services, spatial variations between neighbourhoods, and their implications for sustainable residential planning and design.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Respondents

A total of 398 valid questionnaires were retrieved, representing an overall response rate of 51.8% (AMAC: 54.1%; Kuje: 49.5%). Respondents exhibited diverse socio-economic profiles, reflecting both urban and peri-urban contexts. In AMAC, the majority were employed in formal sectors and resided in medium- to high-density areas, whereas Kuje respondents were predominantly engaged in agriculture, informal trade, and small-scale businesses, indicative of its peri-urban character. Household sizes varied, with larger households observed in Kuje, consistent with typical peri-urban demographics (Adekunle et al., 2019). These socio-economic differences suggest that residential landscape use, interaction with green infrastructure, and awareness of ecosystem services may vary between the urban core and peri-urban areas.

Perceived Ecosystem Services in Residential Neighbourhoods

Residents' perceptions revealed distinct patterns in the valuation of ecosystem services across the two study areas. Cultural services, including recreational spaces, aesthetic appreciation, and relaxation, were highly valued in both AMAC and Kuje. Mean perception scores indicated that residents of AMAC associated green spaces with enhanced mental well-being, opportunities for leisure, and strengthened community cohesion. This finding is consistent with studies highlighting urban green spaces as critical drivers of social interaction and quality of life in cities (Jim & Chen, 2008; Kabisch et al., 2016). In contrast, residents of Kuje placed greater emphasis on provisioning services, such as food cultivation, access to medicinal plants, and micro-climate regulation. This pattern reflects the peri-urban context, where households are more likely to rely directly on residential landscapes for subsistence and livelihood support, underscoring the multifunctional role of green spaces in peri-urban communities. Regulating services, including air purification, urban heat mitigation, and stormwater absorption, were moderately recognized across both councils. Awareness of these services was notably higher in high-density wards of AMAC, suggesting that residents in more developed urban areas may be more exposed to environmental stressors, such as urban heat and air pollution, and therefore more cognizant of the regulating functions of green spaces. Overall, these results underscore the interplay between residential context, socio-economic characteristics, and landscape use in shaping perceptions of ecosystem services. They align with findings from sub-Saharan African cities, where residents' recognition of ecosystem services varies along urbanization gradients and in relation to livelihood dependence on natural resources (Téguia et al., 2013; Adekunle et al., 2019). The study highlights the importance of integrating both social perceptions and ecological functions in the planning and management of residential landscapes to ensure sustainable, context-sensitive outcomes.

Spatial Distribution of Ecosystem Services

Land cover analysis of the selected residential neighbourhoods revealed notable differences in green infrastructure provision between AMAC and Kuje. AMAC neighbourhoods were characterized by a higher proportion of managed green spaces, including parks, gardens, and tree-lined streets, which primarily support cultural and regulating services. In contrast, Kuje exhibited more heterogeneous land cover, with fragmented vegetation patches and a higher proportion of unpaved land, reflecting ongoing peri-urban development and the importance of informal green spaces for provisioning services. Supervised classification of LANDSAT 8 imagery enabled the quantification of land cover types relevant to ecosystem service provision. Forested areas, shrublands, and grasslands were more extensive in Kuje, while built-up surfaces dominated AMAC neighbourhoods. This spatial pattern aligns closely with survey findings, demonstrating a clear link between landscape composition and residents' perceptions of ecosystem services. Overall, the analysis underscores the role of landscape structure in shaping ecosystem service benefits. Well-managed urban green spaces in Figure 4 AMAC enhance recreational opportunities and aesthetic experiences, whereas fragmented and multifunctional green areas in Figure 5 Kuje provide direct material benefits, such as food cultivation and microclimate regulation. These results highlight the need for urban

planning strategies that simultaneously address ecological functionality and social valuation to optimize the design and sustainability of residential landscapes.

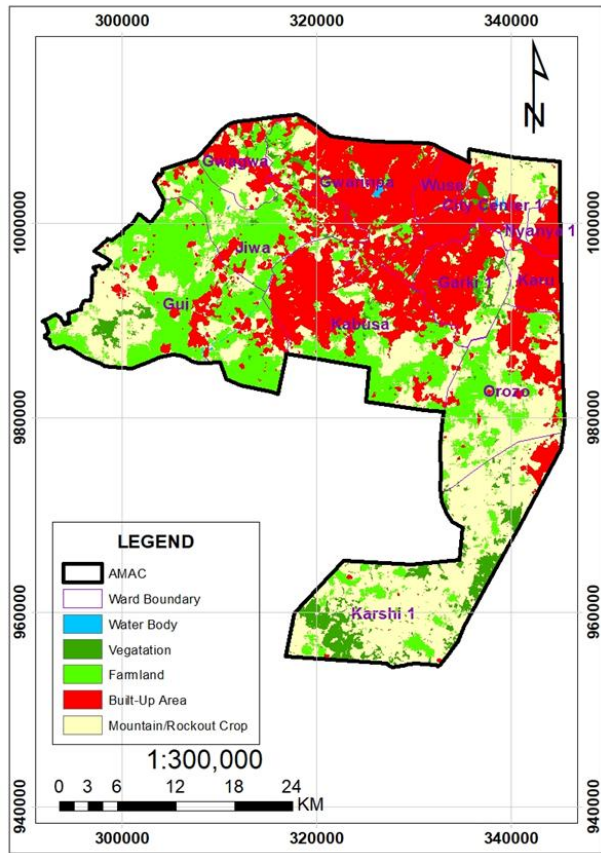


Figure 4. Land-Use Classification of Municipal Area Council
 Source: Fieldwork (2025)

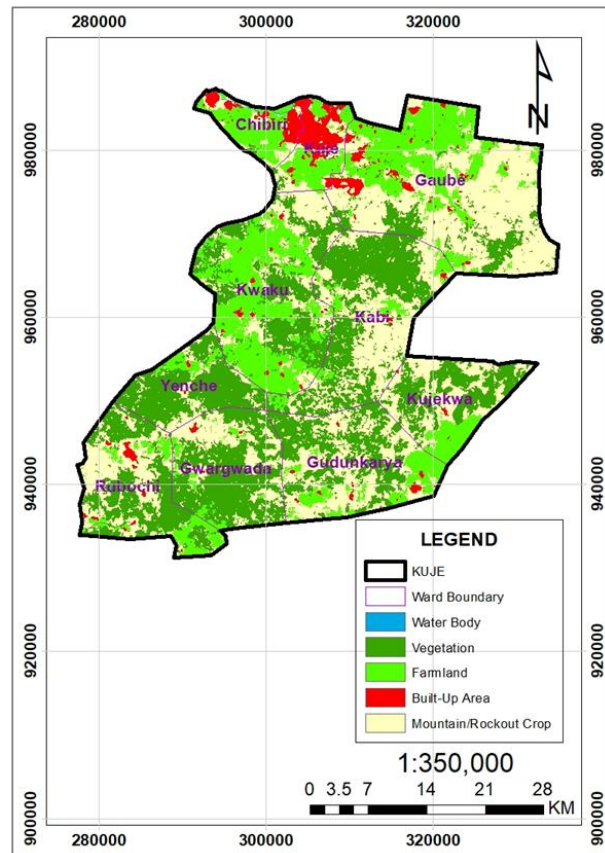


Figure 5, Land-Use Classification of Kuje Area Council
 Source: Fieldwork (2025)

Integrating Perception and Spatial Patterns

Integrating survey and spatial data offers a comprehensive understanding of ecosystem service provision across residential neighbourhoods. In AMAC, characterized by high-density development, formal green infrastructure predominantly delivers cultural and regulating services. Residents (Table 2) highly value these services for enhancing well-being, promoting social interaction, and supporting community life. In contrast, Kuje, with its larger land mass and peri-urban setting, primarily supports provisioning services essential for livelihoods, such as food cultivation and access to natural resources. However, cultural services in Kuje are less accessible due to fragmented landscapes and underdeveloped recreational facilities. These findings indicate that residential landscape planning within the Federal Capital Territory (FCT) should adopt context-specific strategies. In the urban core (AMAC), planning efforts should prioritize multifunctional green spaces that enhance both

cultural and regulating services. In peri-urban areas like Kuje, green infrastructure should be designed to support livelihood needs while gradually improving recreational and aesthetic amenities. This integrated approach aligns with principles of sustainable urban design by promoting equitable access to ecosystem services across diverse residential contexts. It ensures that landscape planning not only addresses ecological functionality but also enhances social well-being, environmental resilience, and quality of life for residents.

Implications for Sustainable Residential Design

The findings of this study indicate that the provision of ecosystem services in residential neighborhoods is strongly influenced by both the composition of the landscape and the socio-economic characteristics of residents. To optimize these services, several design strategies should be prioritized. Firstly, preserving and expanding multifunctional green spaces is essential. These areas not only enhance the visual and aesthetic quality of neighborhoods but also provide critical ecological functions, including microclimate regulation, air purification, and stormwater management. Secondly, increasing public awareness of regulating ecosystem services—such as air and water purification, flood mitigation, and climate regulation—can significantly enhance community resilience to environmental and climate-related challenges. When residents understand the value of these services, they are more likely to actively support and protect their local environment. Thirdly, promoting participatory planning is vital. Engaging residents in the design and management of their neighborhoods ensures that interventions reflect local needs, preferences, and socio-cultural contexts. This participatory approach fosters a sense of ownership and responsibility, which in turn strengthens the effectiveness and sustainability of ecosystem services. By aligning ecosystem service functionality with residents' perceptions and priorities, urban planners and landscape architects can create residential environments that are ecologically robust, socially inclusive, and resilient to rapid urbanization pressures in the Federal Capital Territory. Ultimately, such an approach supports both environmental sustainability and enhanced quality of life for urban and peri-urban communities.

Table 2 Residents' perception of Ecosystem Services in FCT

Primary types of ESs	AMAC Mean	Kuje Area Council Mean	Pooled Mean	Secondary types of ESs	AMAC Mean	Kuje Area Council Mean	Pooled Mean
Provisioning	3.668	3.731	3.701	Community gardens or urban farms	3.835	3.649	3.738
				Residents cultivate Private food gardens	3.809	3.834	3.822
				Nearby Fruit trees or shrubs	3.928	3.986	3.958
				Residents forage for edible plants and wild food	3.314	3.844	3.590
Regulating	3.369	3.204	3.283	Green infrastructure exists	2.603	2.673	2.640
				Natural features reduce noise	3.515	3.336	3.422
				Neighbourhood contains Green spaces	3.825	3.502	3.657
				Neighbourhood features shades areas and green roofs to mitigation temperature	3.747	3.441	3.588
				Neighbour vegetation moderates temperature	3.675	3.611	3.642
Cultural	3.676	3.421	3.543	Available recreational parks, trails and open spaces	3.742	3.152	3.435
				Residents frequently use recreational spaces	3.727	3.166	3.435
				Visual appealing landscape	3.448	3.678	3.568
				Natural environment shapes the neighbourhood's unique identity	3.696	3.455	3.570
				Residents take pride in landscape features	3.552	3.469	3.509
				Natural environment supports residents well-being	3.881	3.692	3.783
				Natural spaces in the neighborhood promote social interaction	4.124	3.711	3.909

Source: (Fieldwork, 2025)

CONCLUSION

This study demonstrates that urban residential landscapes in the FCT provide diverse ecosystem services that are valued differently across socio-economic and spatial contexts. AMAC residents prioritize cultural and regulating services, while Kuje residents rely on provisioning services. Spatial analysis confirms that green infrastructure distribution shapes ecosystem service benefits, emphasizing the importance of landscape structure. Integrating social perception with spatial data offers a robust framework for planning sustainable residential neighborhoods. Urban planners and architects should adopt context-specific strategies to optimize ecosystem services, enhance environmental resilience, and improve residents' quality of life in rapidly urbanizing cities.

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