LAND USE CONVERSION AND URBAN MOBILITY IN KANO METROPOLIS, KANO STATE, NIGERIA

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ABSTRACT
This study investigates the impact of land use conversion on urban mobility in Kano metropolis, recognizing that the accelerating rate of urbanization is a globally acknowledged primary cause of residential land use change. This growth fuels a constant demand for land, leading to land conversion which carries significant environmental and developmental implications. The rapid urbanization, particularly in developing world cities like Kano, severely impacts the existing land use system, and unchecked conversion creates the potential for severe mobility problems when urban transport planning fails to keep pace. The study addresses a critical research gap by systematically analyzing the complex interplay of influencing factors at a local level. A cross-sectional survey design was employed to collect primary data using a structured interview schedule. The study area included eight Local Government Areas (LGAs) selected using purposive sampling: Municipal, Nassarawa, Fagge, Gwale, Tarauni, Dala, Ungogo, and Kumbotso. Data were analyzed using descriptive statistics and the Logit Regression Model. The results showed a statistically significant relationship between the independent variables and the dependent, with the model explaining 84% of the variation in the dependent variable. Specifically, the findings revealed that Land Area, Land Use Guide Plan, Road Functions, and Land Use in the Surrounding have a positive and significant effect on land use conversion in Kano Metropolis. The study concludes that these four variables are the main factors influencing land use conversion. It recommends enhancing community stakeholder engagement, integrating land use and transport planning, and strengthening and enforcing the land use guide plan.

Keyword: Land Use Conversion, Land Area, Land Use Guide Plan, Road Functions, Urban Mobility

INTRODUCTION

One of the most profound socio-spatial challenges of the 21st century is the accelerating rate of urbanization, which is globally recognized as a primary cause of residential land use change (Enisan and Agbaje, 2022). The massive population growth and the multi-various functions inherent in urban centers render cities as major generators and attractors of human movement and traffic (Ogunbodede, 2020). This growth fuels a constant and rising demand for land, leading to the incidence of land conversion which is defined as a shift in the function of a land area from its original use to another, carrying significant environmental and developmental implications (Harewan et al., 2023). Fundamentally, land use change is determined by the special and temporal interaction between biophysical factors (e.g., soil, climate, topography) and a wide array of anthropogenic factors (e.g., population size, economic conditions, applied land use strategy, and technology levels) (Owoeye & Ogunleye, 2015).

The rapid rate of urbanization, particularly in developing world cities like Kano, Nigeria, severely impacts the existing land use system (Asuquo, 1981). The resulting pressure necessitates the optimization of restricted land to meet the escalating demands of the people; an element of population requirement that drives land conversion due to its potential impact on socio-cultural and economic aspects of society (Akinbabijo, 2019). The consequences of this unchecked conversion are two-fold: first, the potential for severe mobility problems when urban transport planning fails to keep pace (Ogunbodede, 2020); and second, the systemic risk posed by converting Other Purpose Areas (OPA) crucial for sustaining life support systems (Abdurashid & Muhammadbek, 2020). These shifts, often promoted through local government policies designed to attract investment and facilitate structural economic transformation (Yusuf et al., 2025) ultimately create a spatial pattern of location segregation dictated by household agglomeration along economic and social classes (Asuquo, 1981).

While the global dimension of urbanization-related land use change is acknowledged by policymakers and researchers worldwide, there remains a critical gap in local, empirical studies that systematically decompose the complex interplay of influencing factor. Current literature identifies the dual influence of general factors (biophysical vs. anthropogenic); however, there is a lack of research quantifying how local policy decisions aimed at promoting economic growth and attracting investment specifically override or amplify these traditional drivers in a large West African metropolis. The absence of this targeted analysis makes it difficult to ascertain the precise degree to which these policy strategies

are responsible for the observed rate and pattern of residential land use conversion, hindering the development of truly effective and sustainable urban management strategies for cities like Kano. Therefore, this study aims to investigate the impact of land use conversion on urban mobility in Kano metropolis

LITERATURE REVIEW
Determinants of Land Use Change
Globally, land is use for different purposes. These are not only limited to residential, but commercial, religious, recreational, industrial, transport etc. The proportion of land allocated to various use in different parts of the world vary tremendously depending on the level of development, compliance with the planning regulations and the purpose to which the land is to be put (United Nations Environment Programme Annual Report, 2010). One of the major causes of residential land use change or change in the pattern of residential land use is urbanization (Enisan & Agbaje, 2022). According to Veldkamp and Fresco (2021), land use change is determined by special and temporal interaction between biophysical factors (e.g. soil, climate, vegetation and topography) and anthropogenic factors (e.g. population size and density, technology levels, economic conditions, the applied land use strategy, and social attitude and values). Owoeye and Ogunleye (2015) in their analysis of structure and pattern of the changes and the causative factors of residential land use around the Ekiti State University (EKSU), Ado-Ekiti, discovered that there is one special characteristic of the changes where most of the actors are academicians of who majority are students tenants with few staffs of the institution living among the host community which seems to be a motivating factor that speeds up the rate of development and changing land use pattern around the university community.

Theoretical Review
This study is guided by the principles of Integrated Transportation and Land Use Planning Model (ITLUP) and bid-rent theory

Integrated Transportation and Land Use Planning Model (ITLUP)
According to Sebastian, Anju and Sangeeth (2021) ITLUP is based on the principle that the ultimate goal of transportation is to connect people with goods, services and people rather than improve mobility by supply enhancement. Integrated Transportation and Land Use Package is composed of a residential allocation model, employment allocation model and a travel demand model. The model aims to reduce the travel option by integrating land use and transportation, thus decreasing the traffic congestion. It focuses on high speed mobility mainly in urban areas. The well planned settlements avoid the need for unnecessary trips. Future development could be based on the principle of ITLUP Model to recreate livable cities. By coupling land use and transportation in the planning process, we

essentially create urban spaces for people and not for automobiles, which is the core philosophy behind the Model.

Bid-rent theory

Chidi, (2019) defined bid-rent theory is as the maximum amount that households or firms are willing to offer for a unit of land, given a level of services or benefits. All have their own hypothetical bid rent for each urban site. If the land market is permitted to function so that the highest bidder occupies the site, then both the allocation of the land to a particular use and the intensity of that use are determined by the market. Thus bid-rent theory gives emphasis on the direct relation between transport cost and land use intensity which is not exactly applicable in all urban spatial pattern. Other aspects like physical, resources, accessibility, multiple service centers are the determining factor of urban land use. So, the exact concentric pattern is rarely found. Bid rent theory does not directly lead to an operational model for land use and land prices. It relies strongly on an analysis of the market, market prices and bids actors which are valuable information for sustainable land use planning and management.

Empirical Review

Peng, et al. (2021), using logistic regression model analyze the differences between the factors influencing changes in land use for both emerging and traditional industry in Shenzhen city China. The study found that the distance from public roads, the distance from highways, and the distance from railway freight stations, the proportion of secondary industry, and the proportion of tertiary industry are important explanatory variables for the two types of land use change. Traditional industrial land use is also affected by the land slope, the distance from ports, the population, and fixed asset investment. Emerging industry land use is also affected by the distance from the airport, the number of railway stations, the quality of the population, and innovation-driving forces. The study recommends that government to rationally plan emerging industry land and differentiated management of this, in order to fill the current research gap in the field of land use change, and to contribute to research revealing the mechanisms driving changes in emerging industrial land.

Purwanto et al. (2017), identify the factors that affecting land use conversion from settlement area into commercial area at Ir. Soekarno Street/MERR, RungkutMadya Street, and MedokanAyu Street in Indonesia. The study employed descriptive and Multiple regression techniques for the data analyses. From the result, the study showed that the factors that affecting land use conversion are land's value, average income of the land owner, and land use in the surrounding area. It recommends that the existing commercial activities are to be maintained and encouraged to provide a parking area on the lot.

Saheed and Obianuju (2021), examined the effect of socio-economic infrastructure of the rural areas on the rural economy in Kaduna State. The study adopts a

correlation analysis, a Multicollinearity and Cronbach Alpha Reliability tests as well as regression analysis on primary data. Findings of the study reveal that there is a positive relationship between socioeconomic infrastructure and rural economy, while the multicollinearity test shows absence of high correlation among the independent variables and the Cronbach Alpha confirms internal consistency of the variables. Furthermore, the regression analysis indicates that socio-economic infrastructure, particularly road, electricity supply, market and telecommunication infrastructure all have positive and statistically significant effects on the rural economy. The paper recommends that governments should increase efforts towards developing the infrastructure in the rural areas in order to facilitate the growth of the economy in the rural sectors.

Owoeye and Ogunleye (2015) in their analysis of structure and pattern of the changes and the causative factors of residential land use around the Ekiti State University (EKSU), Ado-Ekiti, it was discovered that there is one special characteristic of the changes where most of the actors are academicians of who majority are students tenants with few staffs of the institution living among the host community which seems to be a motivating factor that speeds up the rate of development and changing land use pattern around the university community.

Abubakar and Akinola (2020) examined the effects of rural roads network on access to rural markets in Kudan Local Government Area of Kaduna State. A total of 360 questionnaires were administered across the ten (10) wards. Findings in the study include poor road network and bad surface condition of roads, high cost of transport and overloading which compelled market patrons to make use of motorcycle as their major means of transport. A large numbers of market centres and even towns were found unconnected by Direct Motorable Routes (DMR). The study therefore recommends provision of adequate funds for construction of good tarred roads and rehabilitation, community-oriented approach to rural road development interventions that will improve the provision rural transport services and ensuring regular maintenance of the roads from time to time to influence the patronage of rural markets in Kudan LGA.

Despite the robust findings on drivers, a critical research gap remains, particularly relevant to the study of Kano Metropolis. This study aims to address this critical gap by specifically analyzing the interaction between local government investment policies and land conversion in Kano, thereby shedding light on the resulting impact on urban mobility and access

METHODOLOGY
Study Area

Kano city is state capital of Kano state established in 1967. It is largest city in northern Nigeria and second largest town in Nigeria. It is located between latitudes 10^030'N and 13^0 N and between longitudes 7^040'and 10^035'E, and is 1549feet

above sea level. The master plan of 19631983 established the spatial dimension of Kano metropolis. The areas of coverage include urban Kano and the district of Ungogo and Kumbotso. Today metropolis has expanded beyond that and covers six Local Government Areas (Municipal, Nassarawa,Fagge, Gwale, Tarauni, Dala) and Part of Tofa Local Government Area, Dawaki Kudu, Gezawa and Minjibir.

Generally, the climate of the study area is that of tropical continental type. This type of climate has clear wet and dry seasons with more dry than wet months (Mortimore, 1989), which is categorized under Aw in Koffen's climatic classification. Consequently, allow mean annual rainfall of 880mm is a typically occurrence. The area is characterized by four months of wet season and eight months of dry season. The temperature is characterized by warm to hot throughout the year, although cool periods occur around October to February. It has been observed the mean annual temperature of about 26^oC, but the monthly values of coldest months range between 21^oC and that of hottest months have the mean value of 31^oC. Evapo-transpiration (ET) is generally higher than the precipitation with estimate of 2,538mm. Per annum the climate is very much influenced by two air masses namely; tropical maritime and tropical continental air masses. The study area is normally divided into four climatic periods annually; the warm raining season (June -September), the cool dry season (November-February), the hot dry season (march-may) and warm dry season (October- November).

The study area form part of the plains of the Hausa land and it is generally plain with elevation not higher than 600 metres above sea level. The general relief of the study area is between 485 metres and 570 metres. The area is characterized by basement complex rocks and granite materials. The materials consist of metamorphic and igneous rock types of Precambrian origin. The soil is matured on the plain, but seriously altered due to human settlement. The influence of topography, wind drift materials, and climate are what shaped the aggregate of the soil. The matured soil is said to be latosols of ferruginous type. The soil is however well drained, brown to reddish in color.
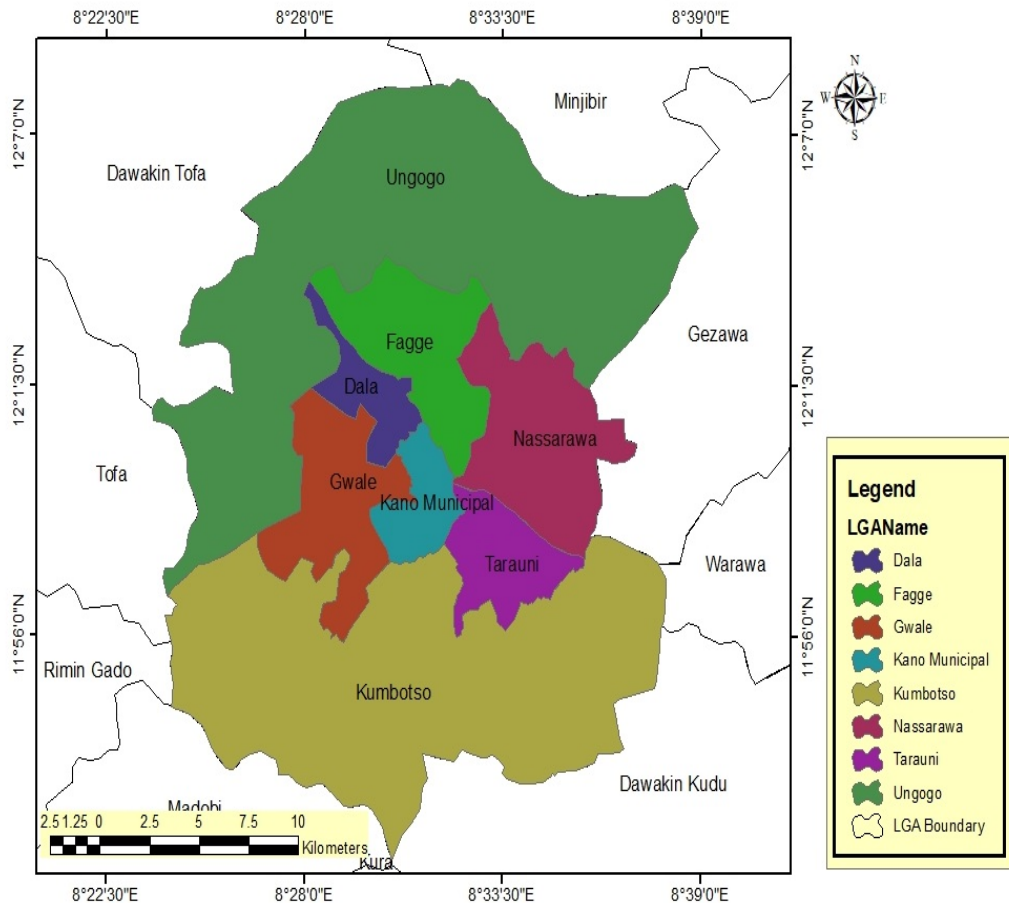
Research Design

The current study used a cross sectional survey design to analyses the factors that influence land use conversion on social development in Kano Metropolitan. The data was collected using structured interview schedule. The study used percentage, frequency and logit regression techniques for the data analyses.

Population of the Study

Based on the above, the target population of this study consists of the total number of registered house in the study area with ministry of land in Kano state which is 74,878.

Sampling Procedure and Sample Size

For the purpose of this study, the researcher used purposive sampling procedure in selecting eight local governments in Kano state metropolitan area. These include, Municipal, Nassarawa, Fagge, Gwale, Tarauni, Dala, Ungogo, Kumbotso. This could be as a result of intensity of combating residential land to commercial purposes. The sample has been chosen from the total population of 74,878 to

represents the sample size of the study so as to make reasonable generalization to the whole population.

Summary Data Collection Procedure

Primary method of data was used to collect data from the respondents. This was achieved using structured questionnaire. The data was collected from the sampled respondents.

Technique of Data Analysis

Data was analyzed using both descriptive and inferential statistics. Descriptive involved the measures of central tendency; frequency distribution, percentage. For inferential statistics logit regression model was used to achieve the objective of the study. Descriptive statistics was used to describe the socio-economic characteristics of the respondents in the study area. Logistic regression model is useful where the dependent variable is dichotomous. It can then be assumed that Y i is the random variable (dichotomous) that takes on the value 1 or 0, where 0 denotes non- occurrence of the event in question and 1 denotes the occurrence if x 1, - xn are characteristics to be related to occurrence of this outcome then the logistic model specifies that the conditional probability of event (i.e. that Y=1) given the value X i … X n is as follows:

$P(Y) = 1/[1 + \exp - (\alpha - \sum \beta_i X_i)]$ ……………………………… (1)

In order to linearise the right hand side a logit transformation was applied by taking logarithm of both sides therefore we have;

$\text{Logit} P(Y) = \alpha + \sum \beta_i X_i$ ……..………. ……………………... (2)

Where $Y_i = 1$ if Land conversion or 0 if otherwise.

β = Logistic coefficient for independent variables

α = constant term

X_i = vector of independent variables specified as factors that influence land conversion or otherwise.

Where;

X_1 = Land Area

X_2 = Land Value

X_3 = Land Owner Earning

X_4 = Land Use Guide Plan

X_5 = Motor Pack

X_6 = Road Functions

X_7 = Land Use in the Surrounding.

e = error terms

RESULTS AND DISCUSSION

Reliability Test

The Reliability of this instrument was analyzed through Cronbach's alpha which measures internal consistency. If α is greater than 0.7, it means that it has high

reliability, 0.5 is sufficient, and if α is smaller than 0.3, then it implies that there is low reliability (Hair, et al., (2006). The Cronbach's alpha results which are higher than the minimum alpha value of 0.70 suggested that the questionnaire was reliable (Nunnally, 1978). Table 1 presented Cronbach's alpha results of each item used in the questionnaire is presented as:

Table 1:ReliabilityCheck

Reliability Statistics

Variables	Cronbach's Alpha	No of Items
Land Area	0.617	4
Land Value	0.865	3
Land Owner Earning	0.735	4
Land Use Guide Plan	0.823	5
Motor Pack	0.785	5
Road Functions	0.712	3
Land Use in the Surrounding	0.632	3

Source: Field Work, 2025

Demographic Characteristics of the Respondents

Table 2 presented the demographic characteristics of the respondents of the study. From the table, the demographic distribution of the sex of the respondents showed that 72% were male and 28% female. This indicates that the majority of the respondents were male. Based on age distribution of the respondents, majority of the respondents fall within 41-50 age brackets which accounted for 38.4%. This showed that most of the respondents were active population. The educational level of the respondents shows that 43.7% of them had diploma/NCE certificate, this implies that the most of the respondents had tertiary education. From the distribution of the occupation showed that 59.7% of the respondents engaged in Business/trading. This indicated that majority of the respondents were business men and women.

Table 2: Profile of the Respondents

Respondents Gender	Frequency	Percent
Age of Respondents		
>20	11	4.2
21-30	46	17.3
31-40	83	31.6
41-50	101	38.4
51>	22	8.4
Level of Education		
Post graduate	7	2.7
Degree	63	24
Diploma / NCE	115	43.7
Certificate	54	20.5
Others	24	91

Occupation		
Civil Servant	72	27.4
Business / trading	157	59.7
Farming	2	8
Hand Craft	22	8.4
Others	10	3.8
Gender		
Male	189	71.9
Female	74	28.1

Source: Field Work, 2024

Correlation Matrix Results

Table 3 presents matrix correlation which shows the extent of relationship between the variables; the correlation matrix shows the magnitude and direction of the relationship between dependent and independents variables in the model. It excavated that the nearer the correlation coefficient to one the stronger the strength of the relationship; a negative correlation shows that there is an inverse relationship between the variables. The correlation matrix is symmetric about the diagonal and the values of the diagonal are 1.0000, since there is a perfect correlation of the variables with itself (Helwig, 2017). From the results all the variables under the study except land owner earning conjugate a positive relationship with acceptability dependent variable. Therefore, it can be concluded that Land Area, Land Value, Land Use Guide Plan, Road Functions, Land Use in the Surrounding have a conjugal and blissful agreement with acceptability as expected. This means that these variables have positive relationship with land use conversion in metropolis, Kano state, Nigeria.

Table 3: Correlation Matrix

	LUC	LA	LV	LOE	LUGP	MP	RF	LUS
LUC	1.000							
LA	0.721	1.000						
LV	0.747	0.110	1.000	`				
LOE	-0.911	0.514	0.029	1.000				
LUGP	0.130	0.646	0.157	0.304	1.000			
MP	-0.469	0.110	0.110	0.574	0.220	1.000		
RF	0.163	0.514	0.514	0.612	0.613	0.241	1.000	
LUS	0.553	0.646	0.231	-0.202	0.398	0.397	-0.071	1.000

Source: Computed and Compiled by the Researcher using STATA 14

Factors Influencing Land Use Conversion in Kano Metropolis

The diagnostic statistics showed the improvement in explanatory variable that is included in the logistic model in table 4.2 as shown by the chi-squire statistics of 0.002 which is statistically significant at 1% implying that independent variables

have significant relationship with the dependent variable. The strength of association between the dependent and independent variables are captured by the R^2 estimated value of 0.084; it means that the independents variables explain the variation in dependent variation by 84%. From the result also the estimated slope coefficient of coefficient land use, land use guide plan, road functions, land use in the surrounding (0.214, 0.121, 0.041 and 0.043) with probability value (0.009, 0.014, 0.016 and0.046) is positive and significance effect on land use conversion. This means that land use, land use guide plan, road functions, land use in the surrounding have influence effect on land use conversion in Kano metropolis, Kano State, Nigeria. The findings of this study is consistent with the finding of Purwanto et al. (2017) and that of Peng, et al. (2021).

Table 4:Regression Results

Variables	Coefficient	Standard error	P value	Exp(B)
Land Area	0.214	0.081	0.009	0.808
Land Value	0.003	0.042	0.937	0.997
Land Owner Earning	-0.163	0.079	0.040	0.850
Land Use Guide Plan	0.121	0.082	0.014	1.128
Motor Pack	-0.853	0.021	0.800	0.064
Road Functions	0.041	0.015	0.016	0.028
Land Use in the Surrounding	0.043	0.018	0.046	-0.007
Constant	3.443	1.416	0.015	31.278
R2 = 0.84	Chi Square (sig.) = 0.002			

Source: Computed and Compiled by the Researcher using SPSS 16 (2025)

Conclusion and Recommendations
The current study investigated the factors influencing land use conversion in Kano metropolis, Kano state, Nigeria using land use guide plan, road functions, land use in the surrounding, Land Owner Earning, land value, land owner value, and motor park as the independent variables that can influence of land use conversion. Structured questionnaire was administered and collect data from sampled respondents on the socio economic characteristics of the respondents, factors influencing land use conversion and analyzed using logit regression model. Based on the result, it revealed that the estimated slope coefficient of coefficient land use, land use guide plan, road functions, land use in the surrounding (0.214, 0.121, 0.041 and 0.043) with probability value (0.009, 0.014, 0.016 and0.046) is positive and significance effect on land use conversion. This means that land use, land use guide plan, road functions, land use in the surrounding have influence effect on land use conversion in Kano metropolis, Kano State, Nigeria. The finding of this study is consistent with the finding of Purwanto et al. (2017) and that of Peng, et al. (2021).From the results, it can be concluded land use, land use guide plan, road functions, land use in the surrounding are the main factors

impacting land use conversion on urban mobility in Kano metropolis, Kano state, Nigeria. Based on the findings, the current study recommends enhancing community stakeholder engagement where communities' leaders such as traditional rules, should be engaged in the process of land conversion. There should be integration of land use and transport planning i.e road functions, Also the land use guide plan strengthened and enforced.

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