The Impact of Urban Land Use Changes on Residential Property Rental Values in Kaduna Metropolis, Nigeria

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Abstract: Changes in urban land use in any society are inevitable irrespective of the genesis and nature of the changes and such changes are part of urban growth. Kaduna Metropolis in Nigeria has experienced changes in its physical form, population and social constituents which have led to land use changes and these changes have affected residential rental values in diverse ways. This study is unique in the sense that it focused on how some factors interdependently influence land use change and the effects of such changes on Residential property rental values in kaduna metropolis. Survey research design was adopted where questionnaires were administered to officials of government agencies and registered estate surveyors and valuers. Structural Equation Modeling (SEM) AMOS was used to analyse data. It was discovered that all the identified factors influencing land use change had significant relationship and cumulatively influenced land use change by 87% with land use planning having the highest influence. Land use change affected residential property rental values at 27%. Town planning authorities, built environment professionals, real estate investors, scholars and policy makers would all find this study useful.

Key words: Urban, land use change, residential property rental values, structural equation modeling

INTRODUCTION

The causes, consequences and control of land use change have become issues of immense importance to the present-day world. The reasons for societal interest in land use and land use change are many. Land use both reflects and defines where economic activity takes place and where and how communities develop (Goetz *et al.*, 2005). Economic conditions, population, other land uses both public and private and the size of the urban area continually change, subjecting the urban land market to forces of perpetual adjustment (Balchin *et al.*, 1995).

As world population surges, there has been a general increase in the demand for land in cities around the globe. Of particular note is the demand for residential land. It has been emphasized that residential land use, among the several contending urban land is the biggest consumer of land in urban centres (Alonso, 1960; Edwards, 2007; Kabba and Li, 2011; Uju and Iyanda, 2012; Joshua, 2014). Under normal situations, increase in population elicits a proportionate increase in the demand for land for residential uses and the occurrence of commercial, industrial, institutional and transportational land uses is spatially linked to residential development. Consequently, any changes in the general use of land affect residential property rental values.

The metropolis of Kaduna in Nigeria has gone through structural changes in its physical form, population, economic and social constituents over the last century largely owing to urban growth. This had engendered changes in land uses in the metropolis (Saleh *et al.*, 2014a, b).

The rapid urban growth and proliferation of human activities in Kaduna metropolis, Nigeria is accompanied by different types of land uses and their conversion from one type to another most often in contravention of land use planning. Incompatible combinations of various types of land use are commonly found adjacent to each other. Intra-urban migration of residents within Kaduna metropolis has resulted in irregular changes in land uses against urban planning regulations and this in turn affects residential property rental values in diverse ways (Ajibuah, 2010; San, 2013).

Research carried out in the area of land use and property value in Nigeria has been quite considerable in recent times, although much of the research studies mainly focused on the determinants of land uses and determinants of property values separately. The crucial issue of properly defining the factors that bring about changes in land uses and meticulously analysing how

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such land use changes influence residential property rental values in a major Nigerian city has not been addressed.

Additionally, most of the research studies on land use and property values in Nigeria were undertaken with the aid of analytical and technical tools that have been found to have some limitations that could affect the quality of results and deductions made from the analysis of data collected for such studies. Examples of such analytical techniques are the Analysis of Variance (ANOVA), Ordinary Least Squares (OLS) regression and Hedonic Price Model based on Multiple Regression Analysis (MRA).

Structural Equation Modeling (SEM), a versatile statistical modelling tool (Lei and Wu, 2007) was employed for data analysis in this study. SEM is a Second generation multivariate analysis technique developed due to some limitations in the traditional Ordinary Least Squares (OLS), especially when dealing with latent constructs (Awang, 2014). This research study will attempt to thoroughly examine the causal factors of land use changes and the consequential impact of land use changes on the rental values of residential property in Kaduna metropolis of Nigeria.

Issues: As people seek to maximise utility in deciding where to live, their relocation within Kaduna metropolis has resulted in irregular changes in land uses against urban planning regulations and this in turn has affected

residential property rental values in diverse ways (Ajibuah, 2010). Their reasons for intra-urban migration are mostly non-monetary considerations such as safety, security, peace and quiet and family ties (Gandu, 2011). Often, households prefer to live alongside others of the same social and cultural background, religion or race.

In Kaduna metropolis, there are visible signs of the ineffectiveness of urban planning regulations and the non-adherence to such regulations by landholders especially on zoning ordinances which is an aftermath of the civil unrests and conflicts that have occurred in the metropolis over time (Gandu, 2011). There is the issue of inadequate land use planning or the land use plans remaining stagnant over time instead of being dynamic. Also, there is non-enforcement of zoning regulations leading to imbalance in land allocation for various uses (Ndabula *et al.*, 2013; Saleh *et al.*, 2014b).

These are also related to shoddy monitoring of the process of land use changes by town planning authorities in the aspect of property development control due to political interference, poor funding, insufficient technical staff, lack of equipment and tools and public resistance (Akinbabijo, 2012).

Related empirical studies: Research works related to this study were reviewed in order to highlight the major areas of such works. The review dwelt on issues, research methods, findings as well as the Researchers comments on them. These are presented in a tabular form in Table 1.

Table 1: Past studies on determinant factors of land use and property values

Author/country	Issues	Methods	Findings	Remarks/ Comments
Larsen and Blair (2014) USA	Effects of surface street traffic externalities on residential property price	Hedonic regression was used	Single-family homes contiguous to an arterial street were sold at a discount while multi-unit properties contiguous to an arterial street were sold at a premium	SEM would have given a better analysis of the variables
McCord *et al.* (2014) UK	Amenity effect of public green spaces on house prices	Ordinary Least Squares (OLS) regression	Urban green space, all things being equal has significant positive effect on residential property values but the values vary according to property type	SEM is more suited to effectively analyse the variables and determine the nature of their relationship
Lee and Sohn (2013) Korea	Impact of elevated railways and underground subways on land prices	Hedonic price model	Land price of places near elevated railways are much lower than those along underground railways	The underlying factors to explain the findings would be better analysed by SEM
Liew and Haron (2013) Malaysia	Factors influencing the rise of house prices and their level of influence	Average indexing, t-test and Pearson correlation	Construction costs; population growth, long term profit of housing growth of GDP, security, public facilities and decline in supply of new housing	Only examined the factors in isolation of land use which is crucial to house price
Monkkonen and Ronconi (2013) Argentina	Relationship between land use regulations, compliance and land prices	Ordinary Least Squares (OLS) regression	Places with stiffer regulation have lower compliance rates with property laws. Lot selling legally in these places have lower land prices	SEM more suited to fashion out the interrelationship between the variables and give better results
He *et al.* (2014) China	Economic growth as driver of land use change	Correlation analysis and Structural equation analysis	A strong association between land use change and GDP expansion. Analysis indicate that economic growth drive land use change	The correlation analysis and structural equations effectively analysed the variables
Koster and Rouwendal (2012) Netherlands	The impact of mixed land use on residential property values	Semi-parametric hedonic house price analysis	Generally, a compatible mix of land uses leads to a rise in residential property values compared to mono- land use area	SEM would have vividly justified the have factors why mixed land use areas higher property values

Table 1: Continue

Author/country	Issues	Methods	Findings	Remarks/comments
Bao et al. (2014) China	The relative pricing behavior for land vis-à-vis land value determination	Hedonic price coefficients under semi-parametric frame-work	Land market prices determined by parcel size, floor space, location, neighbourhood characteristics and planning uses	SEM more suited to effecively determine the factors and analyse their strengths
Kamh et al. (2012) Egypt	Evaluating urban land changes highlighted	GIS, Remote Sensing and Principal component analysis	Population growth, city location and coastal tourist activities were the major factors driving land change and expansion	The interrelation-ships between the factors was not
Appiah et al. (2014) Ghana	Effects of peri-urbanization on land use change patterns	Pearson's Chi-square and step-wise logistic regression modeling	Increasing rate of peri-urbanization caused by rising demand for residential, recreational and commercial land uses to the detriment of agricultural land uses	SEM would have effectively detailed the effects of peri-urbanization on land use change patterns
Amenyah and Fletcher (2013) Ghana	Factors determining rental prices of residential properties	Two-way contingency table, ANOVA and Pearson correlation	Location, number of bedrooms, availability of amenities and facilities determine residential rental prices	SEM would have given a better analysis of the factors
Ong (2013) Malaysia	The relationship between macroeconomic variable and the price of housing	Multiple regression analysis	GDP, population and property gains tax are the key determinants of house prices	SEM would have given a better analysis of the variables
Adegoke (2014) Nigeria	Factors influencing rental value of residential property	Hedonic price model of stepwise regression basis	The most influential factors in all the areas were number of bathrooms, number of living rooms & availability of burglar alarm	SEM would have given a better analysis of the factors
Famuyiwa and Babawale (2014) Nigeria	Inherent values of particular physical infrastructure in rental values	Semi-log (log-linear) hedonic model was adopted	Power supply, good road conditions, street lighting, pedestrian pavements, good drainage systems, neighbourhood security and public waste removal services	SEM would have given an in depth detail of the interrelationships among the factors
Eni and Ukpong, (2014) Nigeria	Impact of population growth on residential land use	Pearson moment correlation	More demand for residential land due to population growth and increase in proportion of land for residence A strong correlation between population growth and land cost	SEM would have detailed the effects of other factors on residential land use
Oruonye (2014) Nigeria	Impact of road construction on land use pattern	ANOVA and simple descriptive statistics	Rise in values of property near newly constructed roads. Complementarity of the new roads attract people to the area and creates new demand for property	SEM would have detailed the contributions of other factors to the land use pattern and property values
Oduwole and Eze (2013) Nigeria	Dynamics influencing rent apartment prices	Stepwise hedonic regression with double log model	Access road, number of rooms, number of bathroom, lot size, electricity, proximity to CBD, the presence of schools and crime rate	SEM would have given a better analysis of the variables
Oloke et al. (2013) Nigeria	Factors affecting residential property values	Tables, percentages and relative importance index	Proximity to the highway, number and size of bedrooms, conveniences, good roads, drainages and security	SEM would have given an in-depth detail of the interrelationships among the factors
Adedeji (2013) Nigeria	Socio-economic attributes of Intra-urban migration and its influence on residents	Correlation analysis and descriptive statistics	Stastistically significant relationship between intra-urban migration pattern and socio-economic attributes	SEM would have detailed the effects of other factors on the intra-urban migration pattern
Oduwaye (2013) Nigeria	Implications of changing land use structure on land use devt	Factor analysis and Principal compnent Analysis (PCA)	Major determinants of residential development are accessibility infrastructure (road) and land value	Did not say much about property value which is important in the study city

Conceptual framework: The concept of this study is hinged on the factors that cause land use changes and the changes in land use subsequently affecting residential property rental values in Kaduna metropolis of Nigeria. The causal factors were gotten from the literature and past studies on land uses in Kaduna metropolis. The factors are population increase, intra-urban migration, security and safety considerations, land use planning regulations and considerations of public utilities and environment.

They are responsible for the continuous changes in land uses which are residential, commercial, industrial and recreational uses.

The effect of the land use changes on residential property values may be positive or negative. Positive effects when there is a rise in residential property values and negative effects when there is a fall in residential property values. The diagram for the conceptual framework is shown in Fig. 1.
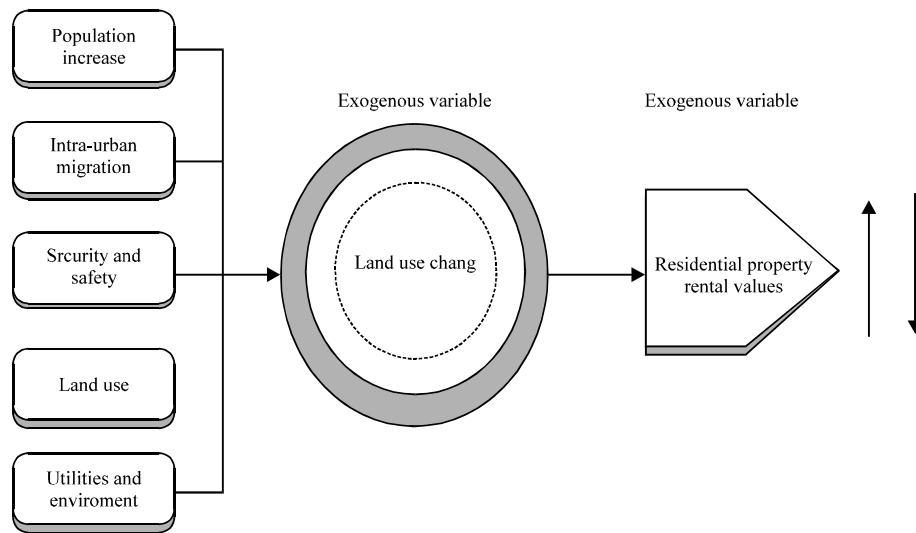
Fig. 1: Conceptual framework for the study; Adapted from Kabba and Li (2011), Kamh *et al.* (2012), Bao *et al.* (2012), Oduwaye (2013), Ndabula *et al.* (2013) and Saleh *et al.* (2014)

MATERIALS AND METHODS

Data and methods: The survey research design under quantitative research was considered the most appropriate to facilitate the realisation of the objectives of this research study. It is the best research design when the research problem involves the identification of factors that affect or influence an outcome, understanding the best predictors of outcome and testing hypotheses and theories (Creswell, 2003).

Sample: Structured questionnaires with close-ended questions were administered face-to-face and handed out to officials of six government agencies in Kaduna metropolis who are involved with land use matters. The agencies are the Kaduna State Urban Planning and Development Authority (KASUPDA), Kaduna State Environmental Protection Agency (KEPA) and the Kaduna State Ministry of Lands, Surveys and Country Planning. Others include the Kaduna State Development and Property Company (KSDPC), the Kaduna State Public Works Agency (KAPWA) and the Federal Surveys Unit, Kaduna.

Questionnaires with mostly close-ended questions were administered face-to-face and handed out to registered Estate Surveyors and Valuers practicing in Kaduna metropolis. The questionnaires were meant to elicit information on trends of residential property rental values and what influenced such values. Rental values were used in this research as against sales prices owing to the fact that property lettings are more generally regular than sales in Nigeria (Ajayi *et al.*, 2013; Oduwole and Eze, 2013).

In developing the instrument for this research, the literature was extensively reviewed, the questions were drafted and tested with individuals similar to the sample frame (Creswell, 2012). This is pilot-testing or field testing to establish the content validity of the scores on the instrument and to improve the questions, format and scales (Creswell, 2003). Simple random sampling technique was adopted to select 180 officials from the 6 government agencies that is, 30 officials per agency. While 90 registered Estate Surveyors and Valuers were purposively selected due to their experience and years of practice in the study area.

A combined total of 270 questionnaires were administered to both government officials and registered estate surveyors and valuers. However, only 207 questionnaires were returned and found valid, depicting a response rate of 77.7%.

RESULTS AND DISCUSSION

Empirical analysis
Hypotheses: Drawing from the conceptual framework, 6 hypotheses were formulated for this study. They are as follows:

- H_1: Increase in population has significant influence on land use changes
- H_2: Intra-urban migration has significant influence on land use changes
- H_3: Security and safety has significant influence on land use changes
- H_4: Public utilities and environment has significant influence on land use changes

Table 2: Fitness indexes of the constructs

Construct	Chisq/df	CFI	TLI	NFI	GFI	RMSEA
Population increase	3.256	0.973	0.918	0.962	0.986	0.105
Intra-urban migration	1.346	0.995	0.988	0.982	0.987	0.041
Security and safety	1.632	0.995	0.988	0.988	0.987	0.055
Land use planning	2.645	0.962	0.928	0.942	0.961	0.089
Utilities and environment	4.726	0.940	0.888	0.926	0.946	0.134
Land use changes	2.504	0.971	0.949	0.953	0.961	0.085
Residential rental values	1.279	0.999	0.996	0.994	0.993	0.037

Table 3: Test results for reliability and convergent validity

Construct	Cronbach's alpha	CR	AVE
Population increase	0.723	0.73	0.415
Intra-urban migration	0.805	0.80	0.418
Security and safety	0.852	0.88	0.608
Land use planning	0.819	0.83	0.427
Utilities and environment	0.829	0.82	0.447
Land use changes	0.857	0.84	0.447
Residential rental values	0.868	0.86	0.574

- H_5: Land use planning regulations has significant influence on land use changes
- H_6: Land use changes have significant effect on residential property rental values

Analysis and results: The collected data was coded and processed by SPSS Version 22. The data was screened for singularity, outliers and normality under this platform. To test the relationships between variables (constructs) of interest in this study, Structural Equation Modeling (SEM) Version 22 was employed.

The AMOS (Analysis of Moment Structures) software is one of the newest software developed for data analysis using SEM (Awang, 2014). The AMOS graphic was used to model and analyse the inter-relationship between and among the latent constructs in this study effectively, accurately and efficiently. The Confirmatory Factor Analysis (CFA) was performed for the measurement model of the latent constructs. The CFA was done for each of the 7 variables in this study.

The CFA addresses the issue of construct validity when the recommended fitness indexes reach the required level. The 3 model fit categories are absolute fit (RMSEA <0.08; GFI>0.90), incremental fit (CFI>0.90; TLI>0.90; NFI >0.90) and parsimonious fit (Chisq/df<5.0) (Awang, 2014). To test for reliability and convergent validity, the Cronbach's alpha coefficient (= 0.70), value of composite reliability (CR = 0.60) and also Average Variance Extracted (AVE = 0.50) are all presented for the 7 constructs as shown in Table 2.

Hair *et al.* (2010) and Holmes *et al.* (2006) recommended the use of at least one Fitness Index from each category of model fit (Table 3). Having substantially achieved the required level for the recommended fitness indexes and the tests results for reliability and convergent validity mostly good for all the constructs, the structural model for the study was then assembled as shown in Fig. 2.

From Fig. 2 which is the initial structural model of the study, it can be seen that 21% of the performance in residential rental values could be estimated by using 1 construct which is land use change. Furthermore, 92% of the performance of land use change could be measured by fusing 5 exogenous constructs (independent variables) into the model namely intra-urban migration, population increase, security and safety, land use planning and public utilities and environment.

This study adopted a benchmark of 0.50 for factor loadings of items as, according to Awang (2014) for newly developed items like the ones for this particular study, the factor loadings of items should be 0.50 or higher. From Fig. 2, the factor loadings are mostly above 0.5 except for 1 item under intra-urban migration construct, 1 item under public utilities and environment construct and 1 item under land use change construct which are 0.49, 0.48 and 0.47, respectively.

It is also recommended that the correlation values between exogenous constructs should be <0.85 to achieve discriminant validity (Awang, 2014). The values for all the correlation between the exogenous constructs are below 0.85 save for the one between land use planning and public utilities and environment constructs which is 0.86. As for the fitness indexes of the structural model, at least 1 fitness index from the various categories of fitness indexes was met. The standings of the Fitness indexes are shown in Table 4.
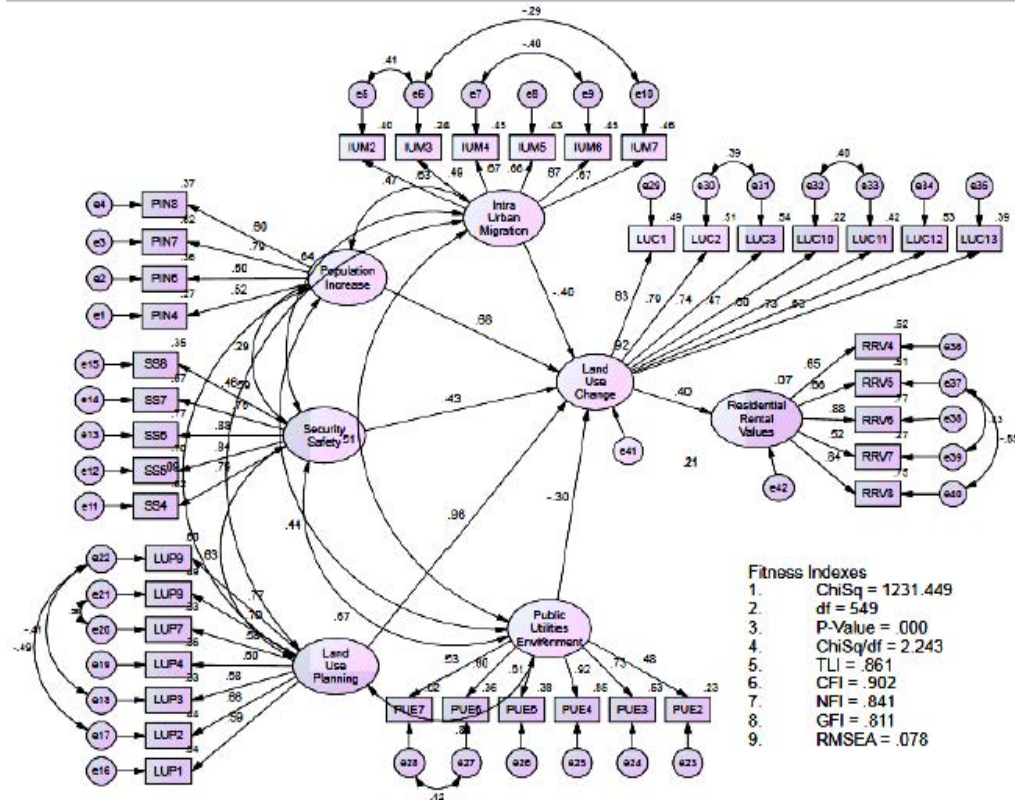
Fig. 2: Initial structural model with standardised estimates

Table 4: Fitness indexes for the initial structural model

Category	Index name	Index value	Comments
Absolute fit	RMSEA	0.078	Required level achieved
Absolute fit	GFI	0.811	Required level not achieved
Incremental fit	CFI	0.902	Required level achieved
Incremental fit	TLI	0.861	Required level not achieved
Incremental fit	NFI	0.841	Required level not achieved
Parsimonious fit	Chisq/df	2.243	Required level achieved

In order to further improve upon the values of the fitness indexes of the structural model so as to have reliable results from the analysis, the items with factor loadings <0.5 were deleted from the model. Some of the pairs of redundant items were also set as free parameters to improve the model. Figure 3 shows the final structural Model.

From the final structural model above, 27% of the performance of residential rental values could be estimated by using the land use change construct. Also, 87% of the performance of land use change could be measured by fusing 5 exogenous constructs into the Model which are still intra-urban migration, population increase, security and safety, land use planning and public utilities and environment. The value of r² for the whole model (27%) is regarded as a large effect (Adams

and Lawrence, 2015) since it could capture 27% of the estimate on endogenous construct (residential rental values) by including certain exogenous constructs into the model. The table below shows the interpretations of effect size (Table 5).

Regarding the factor loadings of the items, all of them are now above this study's benchmark of 0.50. All the correlation values between the exogenous constructs are below 0.85 with only the one between land use planning and public utilities and environment constructs which is on the 0.85 cut-off point thereby achieving discriminant validity with no multi-collinearities. There have also been some improvements in the fitness indexes of the final structural model as depicted in the Table 6.

The construct validity for the final structural model can be said to have been achieved since the requirements for all the categories of the fitness indexes have been met.
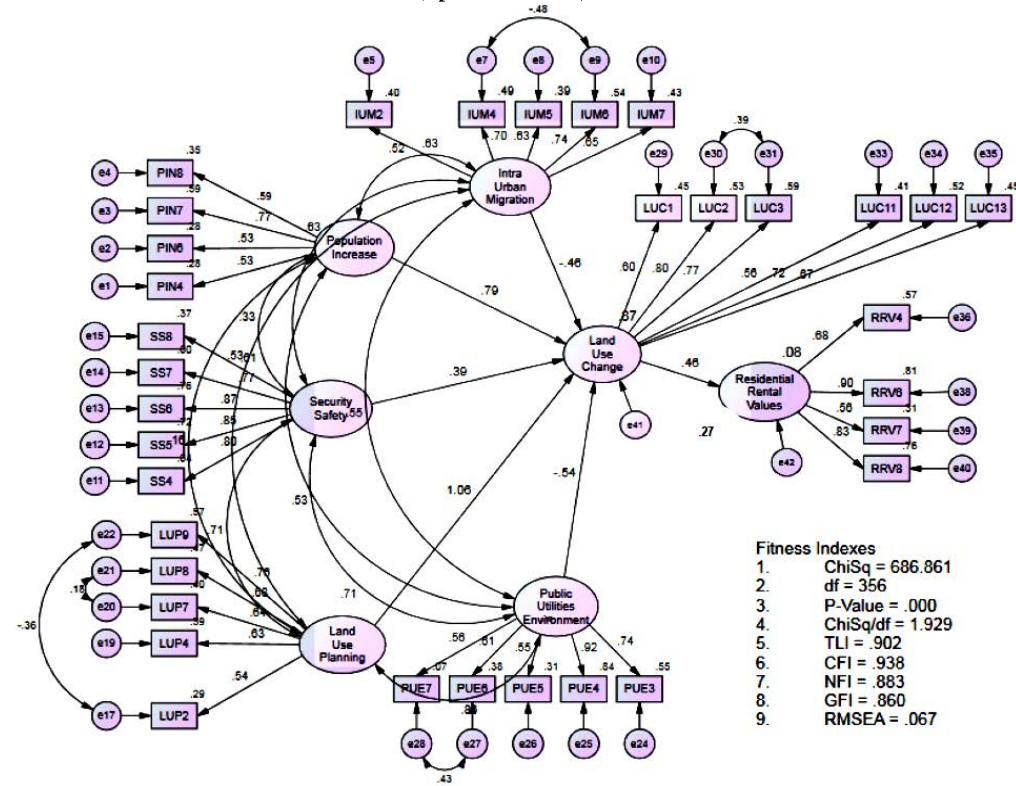
Fig. 3: Final structural model with standardised estimates

Table 5: Interpretations of effect size

Effect size range (%)	Interpretation
1-4	Weak
9-25	Moderate
25-64	Strong

Adams and Lawrence (2015)

Table 6: Fitness indexes for the final structural model

Category	Index name	Index value	Comments
Absolute fit	RMSEA	0.067	Required level achieved
Absolute fit	GFI	0.860	Required level not achieved
Incremental fit	CFI	0.938	Required level achieved
Incremental fit	TLI	0.902	Required level achieved
Incremental fit	NFI	0.883	Required level not achieved
Parsimonious fit	Chisq/df	1.929	Required level achieved

The regression weights indicating the beta coefficient estimates which measure the effects of every exogenous construct on the endogenous construct are presented in Table 7.

The path coefficient of population increase to land use change is 0.942. This value indicates that for every 1 unit increase in population, its effects would contribute 0.942 unit increase in land use change. Also, the effect of population increase to land use change is significant. When intra-urban migration increases by 1 unit, land use change decreases by 0.468 unit. That means intra-urban migration contributes to land use change by 0.532 unit. When security and safety goes up by 1 unit, land use change goes up by 0.335 unit.

When utilities and environment goes up by 1 unit, land use change goes down by 0.577 unit. That means public utilities and environment contributes to land use change by 0.423 unit. When land use planning increases by 1 unit, land use change increases by 1.567 unit. When land use change increases by 1 unit, residential property rental values increase by 0.562 unit. In reference to the regression weights and significance values presented above, Table 8 shows the result of all the hypotheses formulated in this study.

The results have revealed that the hypothesized relationships between and among the various variables are all significant with land use planning having the most influence on land use change in the study area. This is attributable to the expansion of Kaduna metropolis where new layouts for different land uses are being created and in the process redefining the land use structure of the metropolis.

From the degree of influence of the 5 factors influencing land use changes which was 87% and the degree of effect of land use changes on residential property rental values which stood at 27%, it can be seen that the effect sizes are strong (Adams and Lawrence, 2015). The values of 87 and 27% imply that the 5 factors influence land use changes and land use changes affect residential property rental values considerably, respectively.

Table 7: Regression weights and significance value

Construct	Estimate	SE	CR	p-values	Results
Land use change~Population increase	0.942	0.163	5.796	***	Significant
Land use change~Intra-urban migration	-0.468	0.089	-5.268	***	Significant
Land use change~Security and safety	0.335	0.103	3.253	0.001	Significant
Land use change~Utilities and environment	-0.577	0.147	-3.913	***	Significant
Land use change~Land use planning	1.567	0.292	5.365	***	Significant
Res. Rental values~Land use change	0.562	0.104	5.403	***	Significant

Table 8: Results of hypothesis testing

Hypothesis statement of path analysis	Estimate	p-values	Hypothesis result
H_1: Increase in population has significant influence on land use changes	0.942	***	Supported
H_2: Intra-urban migration has significant influence on land use changes	-0.468	***	Supported
H_3: Security and safety has significant influence on land use changes	0.335	0.001	Supported
H_4: Public utilities and environment has significant influence on land use changes	-0.577	***	Supported
H_5: Land use planning regulations has significant influence on land use changes	1.567	***	Supported
H_6: Land use changes have significant effect on residential rental values	0.562	***	Supported

***$p < 0.001$ (given by AMOS to indicate highly significant)

The significance of all the hypothesized relationships between and among the variables depicts that the entire hypotheses for the study have been supported. Therefore, the objective of this study has been achieved and the disposition of the interplay of the various factors established.

CONCLUSION

This study has examined the factors influencing land use changes and the consequential impact of such changes in land use on residential property rental values in kaduna metropolis of Nigeria. The study was limited to the investigation of the interrelationship between land uses changes and residential property rental values without dwelling on the performance of actual rental values over a time period.

The major findings are that population increase, intra-urban migration, security and safety, public utilities and environment and land use planning have a combined influence of 87% on land use changes. While land use changes affect residential property rental values by 27%, meaning that the balance of 73% is accounted for by other factors outside the scope of this study.

The findings of this study have contributed to new knowledge in land use and residential property values. Firstly, the factors that influence changes in land uses were thoroughly examined and the effect of such land use changes on residential property rental values in a major Nigerian city was demonstrated.

Secondly, this study employed SEM for the analysis of data. This data analysis approach by the study is a fresh break from most of the earlier research studies on land uses and property values in Nigeria which were undertaken with the aid of analytical and technical tools that have been found to have some limitations which likely affect the quality of results and deductions made from the analysis of data collected for such studies.

Lastly, the findings of this research have contributed immensely to the body of knowledge of urban economics in general and land use and property values in particular especially as it relates to cities in developing countries which have been grossly under-theorised and frequently under-emphasised in mainstream urban studies.

In understanding the factors that explain land use changes and property values, planners and built environment professionals, financial institutions, property investors, policy makers and researchers can be in a better position to manage urban growth, prudently invest in property, craft policy and refine our understanding of how urban systems and economies function.

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