The Influence of Land Use Planning on Land Use Changes

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Abstract: The proper functioning of an urban area and the harmonious coexistence of different land uses is guided and made possible by urban planning policies and regulations. The strategic location of Kaduna metropolis in Nigeria has made it to undergo structural changes geographically, population-wise, economically and socially with time due to the proliferation of human activities on land, though the use of land has not been in conformity with urban planning. There was the need to carry out a proper research study on the magnitude of influence of land use planning on land use changes in a metropolis of a developing country. Simple random sampling technique was employed to select 240 officials from 6 Government agencieswho were administered questionnaires. Structural Equation Modeling (SEM) AMOS was used for data analysis. Findings showed that land use planning has a significant influencing relationship to land use change at the level of 64%. The study's findings will serve as invaluable reference points to public and private stakeholders who are all involved in one way or another with the situation and growth pattern of land uses.

Key words: Influence, urban, land use planning, land use change, structural equation modeling

INTRODUCTION

Cities in developing countries have been grossly under-theorised and frequently under-emphasised in mainstream urban studies (Kim and Short, 2008). As a result, many urban scholars and developing countries' urbanists in particular have called for serious scholarships on them. While the vast majority of urban dwellers are found in developing countries' cities, their urban experiences remain almost invisible in key theories or concepts in urban studies which instead show a clear bias toward the cities of developed countries (Kim and Short, 2007).

Being a scarce resource, it is imperative for land to have an administrative system to ensure that it is used properly in line with the legal planning requirements and the attendant contractual land grant conditions and that the appropriation of land is well-organised (Lam and Man, 2013). It has been proven by Boamah *et al.* (2012) and Boamah (2014) that the proper functioning of an urban area and the harmonious coexistence of different land uses is guided and made possible by urban planning policies and regulations. No nation can optimise the benefits of its stock of land if the land is used in a disorganized manner (Kim, 2011; Boamah *et al.*, 2012).

Nigeria is a developing country and Kaduna metropolis is the 5th largest urban centre in Nigeria with a total population estimated to be about 1.4 million people in 2014 and a total land mass of 343,612.97 ha. The metropolis is intersected by River Kaduna and is a major hub for transportation and trade in Northern Nigeria. The strategic location of Kaduna metropolis in Nigeria has made it to undergo structural changes geographically, population-wise, economically and socially with time due to the proliferation of human activities on land (Saleh *et al.*, 2014).

However, the spate of land uses in the metropolis has not been in tandem with laid down town planning and this has resulted in the in discriminate change of land use from one type to another and disharmony in land uses are commonly experienced. This is attributed to inadequate and in effective urban planning, non-compliance and non-enforcement of planning regulations (Gandu, 2011; Ndabula *et al.*, 2013). Also responsible for disorderly land uses in the metropolis is poor development control efforts caused by insufficient funding, administrative bottleneck, and inadequate technical staff (Akinbabijo, 2012).

In the light of the foregoing, there was the need to carry out a proper research study on the magnitude of influence of land use planning on land use changes in a metropolis of a developing country. Based on information from previous studies and the researchers' experience from living and working in Kaduna metropolis for several years, the metropolis was found suitable to be studied to find out the nature of interplay between land use planning and land use changes.

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Literature review: The population concentration in an urban area can be redistributed by a variety of land use regulations with the regulations also having the capacity to sway the density of developed lands vis-a-vis the general land area of the city. Some land use guidelines have the in fluence of decreasing the inclusive density of land usein a city (Jaeger, 2013; Hilber and Nicoud, 2013).

Urban land use problems such as slum evolution, incompatible land uses, polluted living environment, congestion and overcrowding and socially adverse land uses are significantly addressed by proper and purposeful urban planning. Land use planning, specifically development control, facilitates the realization of sustainable urban areasand assists in enhancing living standards and dwelling environment. It equally helps to improve the well-being of urban inhabitants as well as preventing spatial disorder and inconveniences ensuing from incompatible uses of land (Boamah *et al.*, 2012).

Development controlresults in enhanced living environment; public welfarevia matching population growth with infrastructural facilities and eradication of undesirable externalities; more efficient use of land; improved transport network; equal rights to use urban land and better neighbour hood featu resincluding communal welfare (Michael and Palmquist, 2009). Similarly, planning controls bear on the structure of the urban built-up areasand functions in revitalizing derelict buildings in the urban landscape. It weighs on the housing provisionscheme performance and the broader urban economy (Mohammed *et al.*, 2009).

Nevertheless, land use regulations that are not effective could result in disorderly urban spatial structure. Vermeulen and Ommeren (2009) and Kim (2011) have noted the possibility of ill-considered planning controls in triggering haphazard urban growth and consequently negatively affecting the welfare of urban dwellers.

Glaeser and Ward (2009) and Boamah *et al.*, (2012) have argued that if any urban environment has a disorganised development, it is in part the manifestation ofinad equate and futile land use planning process. The capacity of land use control to achieve its anticipated goal is largely dependent on the officialsystem put in place to manage the development control; the planning monitoring and evaluation process; developers' assurance in the development control scheme and awareness and involvement of the general public in the planning procedure.

It has also been shown that tight land use controls stifle property development, all things being equal and that owing to interruptions, higherbuilding codes and the constraintin supply elasticityenforced by the guidelines, the housing built in such areas tends to be more costly (Saiz, 2010; Monkkonen and Ronconi, 2013).

The political climate impacts the nature of regulation and extent to which growth management policies are implemented to affect land conversion processes. In addition to leadership at the regional and state levels, a robust economy and an educated population are key correlates of planning and development management influencing land conversions (Wilson and Song, 2010). More literature on the relationship between land use planning and land use changes is reviewed in Table 1 as follows.

Table 1:Previous studies on the influence of land use planning on land use changes

Author/country	Issues	Methods	Findings	Remarks/comments
Kim (2011) USA	Effects of land use planning and regulations on regional economic development	Comprehen-sive literature review	Planning has positive and negative effects on urban devt. Positive effects: are removal of unwanted externalities, protection of public goods, execution of facility enhancements, inspiring efficient devt and revising transportation decisions. Negative effects are: a more incompatible pattern of devt. if restrictive land use guidelines are used to interfere with market activities, decline of site obtainability for urban uses, resultant rise in the prices of land for construction, dwellings, business locations and hindering municipalities from meeting the growing demands for housing in good time	It has been shown that land use planning and regulations is a powerful tool which can be used by the government as a regulatory tool on land uses and controlling the tempo of the property market
McLaugh-lin, 2012 Australia	The shift of land use regulations from positive development control to negative constraints	Review of contempo-rary research	Land use controls that are complicated and constricting on the expanse and magnitude of intended developments have effects that are potentially negative on property markets, societal justice, environmental feasibility and provincial economic buoyancy	In as much as land use controls aredesirableforproperfunctioning of land uses, they tend to be inimical to new developments and the property market when they are too restrictive and complex,resultingtotheopposite outcomes of dynamic urban planning and land uses

Table 1: Continue

Author/country	Issues	Methods	Findings	Remarks/comments
Hilber and Robert-Nicoud (2013) USA	Effects of land use regulations on the part of owners of developed residential land and owners of undeveloped land	GIS satellite images, land use regulation index. OLS used for data analysis	Additional land use restrictions are desired by owners of developed residential land as these increases the value of their lands while undeveloped land owners resist such constraints since it raises the cost of developing their lands. Areas with required facilities have more inhabitants and land there is more developed with stricter land use controls	More planned areas with desired facilities tend to attract more people because they are more conducive to live in. Less planned areas witness more land use changes due to the high number of low-income earners and less stringent regulations.
Lam and Man (2013) Hong Kong	Illegal changes of use in residential and aged industrial buildings	Qualitative study Multiple court cases were analysed. The analysis was based on documentary court proceedings	Illegal land use change and conversion was hinged on some factors. Obsolete and economically unsustainable lease restrictions, resulting in illegal conversion of the premises for commercial use; ambiguous user clauses in land leases leading to illegal changes of use; scarce government resources for achieving effective lease enforcement. Generally, economic highest and best use of property caused illegal Land use change and conversion	Out-dated and equivocal aspects of planning regulations coupled with inadequate resources to monitor land use conversions gives room for illegal and detrimental changes in land use.
Monkkonen and Ronconi (2013) Argentina	Relationship between land use regulations, compliance and land prices	Data on land prices, house development and land use regulations OLS regression used in data analysis	Places with stiffer regulation have lower compliance rates with property laws. Lot selling legally in these places have lower land prices	This is applicable to growing urban centres in developing countries where there is keen competition for land uses due to the limited supply of land. Even with the tight land use controls, pockets of land use conversions are found
Zhou *et al.* (2015) China	Effect of land use spatial control policy on urban development and farmland conversion	GIS, remote sensing and landscape metrics	The conversion of farmlands was more intense in the non-planned areas than the planned areas. Similarly, farmland patterns were more fragmented in the non-planned areas compared to the planned areas	Effective and purposeful land use planning curtails indiscriminate land use conversion and fragmentation. The study established that changes in land uses are regulated by land use planning
Boamah (2014) Ghana	The system and challenges of development control	Question-naires to 120 respondents through purposive sampling. Regression analysis was used to analyse data.	Factors accountable for the widespread Factors accountable for the widespread Xl factors, delays in the planning approval process, negative public views about the planning process and planning officials, absence of official support to developers in rectifying identified defects in their proposed devts and unreasonable building regulations	Urban planning is meant to ensure order and harmony in land uses but this cannot be realised when there are violations of the regulations which amount to indiscriminate changes in land use
Ayotamuno *et al.* (2010) Nigeria	The rapid incursion of commercial activities into what was wholly a residential district	Observa-tions, interviews and question-naires to inhabitants of the area. descriptive statistics used	Mostly, open areas located near residential buildings had disappeared, as hotels and other commercial enterprises took over, reducing the space for community interaction, children's play and recreation. The quality of the living environment in the area had deteriorated with loss of open space and gardens	Ineffective land management and non-enforcement of land use regulations were the primary factors responsible for the land use changes
Adedokun (2011) Nigeria	Urban activities and their spatial patterns	Data from question-naire to 500 respondents. Descriptive statistics and probability transition analysis	There is no clear coordination of urban activities and land uses. Several cases of conflicting and incompatible land uses with negative effects on residents and the environment	Evidently, land use planning is not effective in this situation as shown by the land use conflicts. This implies that land use conversions are done arbitrarily with irregular land use changes as aftermath
Ajibola *et al.* (2012) Nigeria	The effects of land use planning on values of residential property	Data gathered from real estate experts and residents Descriptive statistics and linear regression	Properties located in well-planned areas had higher values than those located in less planed areas	The land uses in well-planned areas exist in harmony and land use conversions and The environment there is orderly, functional and aesthetically pleasing which is the reason why property values are higher

Table 1: Continue

Author/country	Issues	Methods	Findings	Remarks/comments
Yahaya and Ishiak (2013) Nigeria	Impediment to effective land use planning	Examined national land use and urban planning laws. Literature review of past studies	People are not willing to observe the land use and planning ordinances. Also, there are lapses on the part of the constituted authorities in implementing and enforcing the laws	Disregard for the land use and planning laws impacts negatively on land use order. The problem is further compounded by the ineffective enforcement of the laws
Aliu and Ajala (2014) Nigeria	Influence of neighbour-hood and dwelling attributes on residential housing choice	Question-naires to household heads in 3 residential density areas Descriptive statistics and multinomial logit analysis	The high density areas are characterised by multifamily housing units with less quality dwellings compared to low and medium density areas. The quality of dwelling influences housing choices in the areas	Due to inadequate housing provision for the teeming population, people resort to poor quality dwellings for shelter and also engage in land fragmentation to build houses. These have negative impacts on nearby land uses
Bello and Arowo-segbe (2014) Nigeria	Factors influencing changes in land use	Extensive literature review of past studies and government reports	The ambiguous stipulations and administrative bottlenecks of the Land Use. Act coupled with non-adherence to planning regulations have resulted in illegal and disjointed land uses	Parcels of land are fragmented and land uses are converted indiscriminately due to lapses in the laws. All these bring about illegal land use changes

MATERIALS AND METHODS

In seeking to achieve the objective of this study, survey research design was adopted. Survey researchers collect quantitative, numbered data using question naires or interviews and statistically analyse the data to describe trends about responses to questions and to test research questions or hypotheses (Creswell, 2012). All these are in line with the direction of this study which justifies the adoption of this research design for the study.

Sample: The study employed simple random sampling technique to select 240 officials from 6 government agencies in Kaduna metropolis who are directly involved with issues of land use. These agencies include the Kaduna State Ministry of Lands, Surveys and Country Planning, Kaduna State Urban Planning and Development Authority (KASUPDA) and Kaduna State Environmental Protection Agency (KEPA). The others are the Kaduna State Public Works Agency (KAPWA), Kaduna State Development and Property Company (KSDPC) and the Federal Surveys Unit, Kaduna.

Structured questionnaires were administered to 40 experienced Officials from each of the Government agencies mentioned.Before the actual field survey, the questionnaires were pilot-tested to establish the content validity of the scores on the instrument and to improve the questions, format and scales. Out of the 240 questionnaires administered, only 204 questionnaires were returned and found valid for analysis, portraying a response rate of 85%.

Additionally, as part of primary data collection, direct observation of land activities in the study area was also done so as to understand the patterns and changes in land uses as well as the field involvement of the specified Government agencies. Direct observation can be used to capture certain information on some major attributes of the issues at hand in a research study.

Empirical analysis

Hypothesis: The hypothesis formulated for this study is:

- H_1: Land use planning has significant influence on land use changes

RESULTS AND DISCUSSION

Structural Equation Modeling (SEM), one of the most prominent and advanced statistical analytical tools today (Hair *et al.*, 2013), was used to examine the relationship between the variables in this study. The AMOS (Analysis Of Moment Structures) software (Version 22) is one of the newest software developed for data analysis using SEM. The AMOS graphic was employed to model and analyse the relationship between the latent constructs (land use planning and land use change) in this study efficiently and effectively. The confirmatory Factor Analysis (CFA) was performed for each of the 2 latent constructs in the study.

The concern of construct validity is resolved by the CFA when the recommended fitness indexes of the measurement models meet the accepted level. The 3 model fitness 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, 2015). The results are presented in Table 2. 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 2 constructs as shown in Table 3.
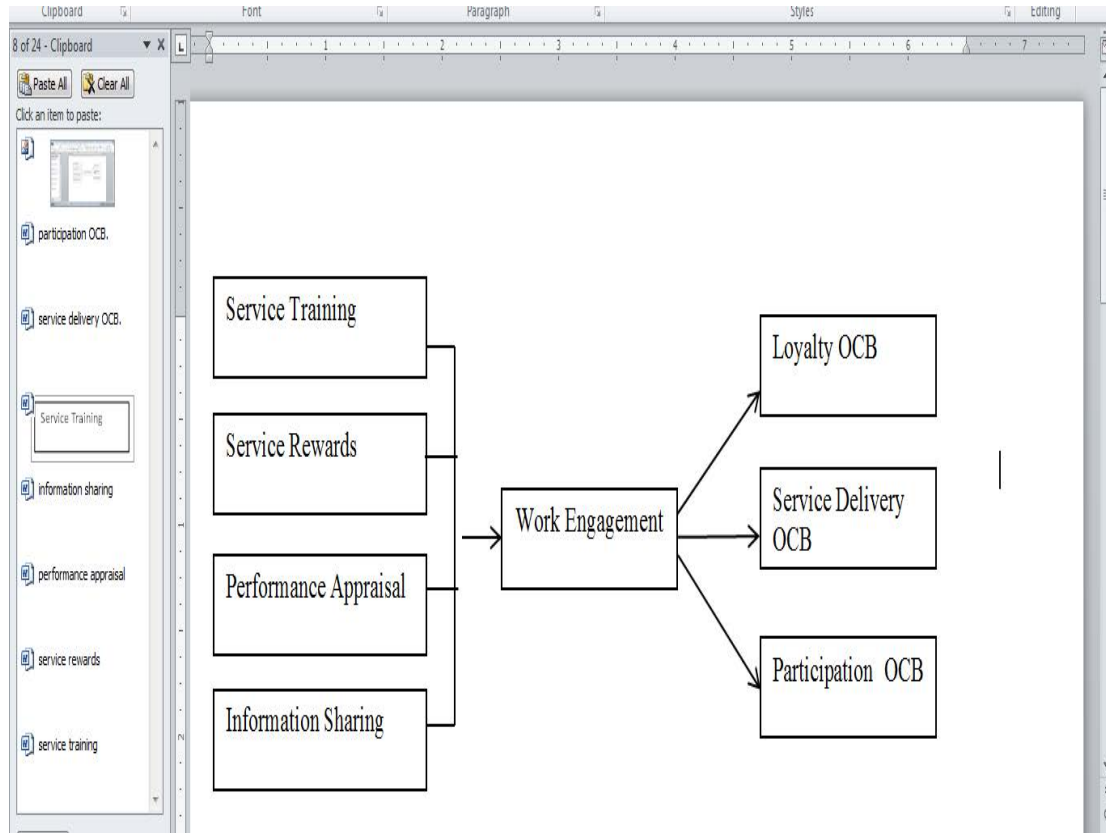
Fig. 1: Structural model with standardised estimates

Table 2: Fitness indexes of the constructs after CFA

Construct	χ^2/df	CFI	TLI	NFI	GFI	RMSEA
Land use planning	2.645	0.962	0.928	0.942	0.961	0.089
Land use change	2.504	0.971	0.949	0.953	0.961	0.085

Table 3: Test results for reliability and convergent validity

Construct	Cronbach's alpha	CR	AVE
Land use planning	0.819	0.83	0.427
Land use change	0.857	0.84	0.447

Table 4: Fitness indexes for the structural model

Categories	Index name	Index value	Comments
Absolute fit	RMSEA	0.082	Required level not achieved
Absolute fit	GFI	0.930	Required level achieved
Incremental fit	CFI	0.946	Required level achieved
Incremental fit	TLI	0.910	Required level achieved
Incremental fit	NFI	0.913	Required level achieved
Parsimonious fit	χ^2/df	2.381	Required level achieved

The use of at least one Fitness Index from each category of model fit has been recommended by Hair *et al.* (2013) and Smith *et al.* (2006).

The accepted level for the recommended fitness indexes have been substantially met as well as the tests results for reliability and convergent validity which have turned out to be mostly good. The structural model for the study was next assembled as shown in Fig. 1.

The construct validity for the Structural Model has been achieved since the requirements for all the categories of the Fitness indexes have been met as shown in Table 4. This study, adopted a benchmark of 0.50 for items' factor loadings, since, according to Awang, newly developed items like the ones for this study should have 0.50 or higher as benchmark for factor loadings of items. As can be seen from the structural model above, the factor loadings of the items in the 2 latent constructs are all above 0.50 thereby achieving unidimensionality.

From the structural model, it is clear that 64% of the performance in Land Use Change could be estimated by the Land Use Planning construct. In other words, Land Use Planning influences Land Use Change at the 64% level. The value of R^2 for the whole model (64%) is regarded as a large effect (Adams and Lawrence, 2015) since it could capture 64% of the estimate on endogenous construct (land use change) by the exogenous construct (land use planning). Table 5 shows the interpretations of effect size.

Table 5: Interpretations of effect size; Adams and Lawrence, 2015

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

Table 6: Regression weight and significance value

Construct	Construct	Estimate	SE	C.R	p-value	Results
Land Use Change	Land Use Planning	0.957	0.130	7.366	***	Significant

Table 7: Result of hypothesis testing

Hypothesis statement of path analysis	Estimate	p-value	Hypothesis result
H_1: Land use planning has significantin fluence on land use changes	0.957	***	Supported

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

The regression weight indicating the beta coefficient estimate which measures the influence of the exogenous construct on the endogenous construct is presented Table 6. The path coefficient of land use planning to land use change is 0.957. This value indicates that for every 1 unit increase in land use planning; its effects would contribute 0.957 unit increase in land use change. Also, the effect of land use planning to land use change is significant.

In reference to the regression Weight and significance value presented above, Table 7 shows the result the hypothesis formulated in this study

The results have shown that the influencing relationship between land use planning and land use change is significant and therefore, the study's hypothesis is supported. The magnitude of influence that land use planning exerts on land use change was measured at 64% revealing a strong effect size (Adams and Lawrence, 2014). Land use planning influences land use change considerably by the value of 64%.

The strong influencing relationship of the variables in Kaduna metropolis is ascribed to the evolving developmental pattern of the metropolis where any activity on land either conforms or does not conform to urban land use planning. The multiple communal sectarian violence in the metropolis in recent past and the palpable tensions during political elections have had the effect of changing settlement patterns and promoting the expansion of the city in rapid unplanned residential development in the south (Christians) and the west and north (Muslims). The factors that promoted these settlement patterns were safety and security considerations manifested in people relocating and taking residency in areas where their ethno-religious groups were dominant.

These dynamics of land uses and settlement patterns have come with attendant problems such as fragmentation of land plots which distorts urban planning, congested and uncontrolled development, indiscriminate conversion of buildings to multiple uses, traffic congestion, over stretching of existing infrastructure and increase in land and air pollution.

CONCLUSION

The magnitude of influence of land use planning on land use change in kaduna metropolis of Nigeria has been examined accurately and effectively in this study, by the use of AMOS SEM. It was discovered that land use planning has influence on land use changes at 64% level, indicating that other factors are responsible for the remaining 36% of the effects on land use changes. This calls for further research in this direction.

The objective of this study, has been achieved and the findings of this study have contributed empirically to academic literature on land use planning and land use changes especially in cities of developing countries like Nigeria where there is dearth of such literature.

The metropolis of Kaduna is still growing in terms of its population, land uses and land area coverage and it is projected to grow into one of the foremost urban centres in Nigeria in particular and Africa in general. To ensure that it develops in the right direction with harmony in land uses and as a conducive urban setting that enhances living and working for its inhabitants, there needs to be investment in local economic development and the regeneration of neighbour hoods, in frastructure and buildings that have suffered neglect including renewal where original functions have been lost or decline has progressed to the point of no return.

There is also the need to be upgrade low income neighbourhoods with the insertion of physical and social infrastructure to low-income, informal areas to bring them up to a basic living standard. Planned extensions are vital to control and direct the expansion of the city at and beyond its current borders. It is imperative for town planning authorities to appreciate the fact that a growing urban centre becomes more complex creating more demand for land resource and its utilization and must therefore make adequate land use plans and properly monitor the process of land use changes to forestall negative effects on the environment and other land uses.

The study will serve as a veritable reference material to town planning authorities, built environment professionals and policy makers who are all involved in one way or another with the situation and growth pattern of land uses.

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