

Impacts of Residential-Commercial Land Use Conversion in Ibadan Municipality, Nigeria

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Abstract- This study was conducted in Ibadan Municipality of Oyo State, Nigeria with the aim of analyzing the various impacts of residential-commercial land use conversion within the City. Both primary and secondary sources of data were employed. Basically, a well constructed questionnaire was administered on the occupants of the buildings along fourteen (14) selected roads in the study area. These selected roads entails three categories of roads (Trunk A, B, and C) that has experienced high level of residential-commercial land use conversion in the five Local Government Areas of Ibadan Municipality. Next was the selection of buildings that has been converted from residential use to commercial use. In so doing, seven thousand, three hundred and ninety-one (7,391) existing converted building were identified in the study area, out of which three hundred and sixty-nine (369) buildings were sampled. This was done by selecting every 20th buildings after the first building has been randomly selected. The study revealed that increase in the conversion of residential land use to commercial land use has more positive economic impacts on the people, than social and cultural impacts. As for the physical and environmental impacts, more residential-commercial land use conversion will enhance more positive and negative impacts on the people and the environment of the study area. Also, two patterns of land use conversion detected in the study area were full and partial land use conversion patterns. While, partial land use conversion pattern has the highest proportion of 59.6% of the total land use converted. This study concluded that residential-commercial land use conversion is an unavoidable significant product of urban growth. Hence, the decision makers on land use development matters should involve 'mixed land use' in land use categories when planning for cities and towns.

Indexed Terms- Commercial, Ibadan Municipality, Land Use Conversion, Population Increase, Residential

I. INTRODUCTION

Land is an inestimable resources that all humans rely on. It is a free gift of nature and limited in supply. Its component is not uniform as it varies with locations and in stratas. Basically, its location and attributes helps man in deciding on its best use. Land use can simply be defined as the act of employing land for a particular purpose. It is a way of fixing all human activities on land. Human activities is not fixed, it can change at any point in time. So also, the use in which land is being put into can experience change at any time. Land use change is a term used for a switch in activities on a piece of land. It can also be referred to as an introduction of new use that is of different categories from the existing use of a land (Akinluyi, Oyinloye, and Aladekoyi, 2021). In planning, land use and building use can be used interchangeably in urban areas, as larger proportion of urban land areas has been occupied by buildings. At the same time, land use change can be used in place of land use conversion, they both depicts transformation in land use type or category.

To achieve a conducive, functional and sustainable environment, all activities on land must be planned, either its conversion or development. Where land use planning is considered, it is expected that uses of land are compatible with each other. Otherwise, is the birth of non-conducive and non-functional environment. In land use planning, land is allocated for various uses to ensure that every use is given adequate attention with residential land use given high consideration because shelter is universally accepted as the second most important essential human need after food (Ebube and Emoh, 2022). The idea of introducing another land

use (such as commercial) into a residential area is termed residential land use conversion. The influence of commercial activities in residential areas cannot be overemphasized, either by the complementing aspects or contrarily. Generally, actors in the building sector have divergent views about the conversion of residential properties into commercial uses. Some see it as an avenue for growths, while others refer to it as a starting point for urban land use problems. In any of these ways, the strength of desirability for conversion of a residential land use to commercial use is majorly determined by its location (i.e rural or urban). Urban land use conversion is a phenomenon that will continue to exist in as much there is urban growth.

Urban growth is a major agent shaping and reshaping the economic, social and physical dimensions of urban centres in many large cities of the world, especially in the Sub-Saharan Africa (Ankeli, Nuhu, Sule, Ankeli and Alade, 2019). Urban growth translates to increasing demand for urban land uses and development, particularly in the area of urban housing, commerce, transportation and other various urban land uses (Ankeli, Nuhu, Sule, Ankeli and Bello, 2020). Urban growths characteristics are the attributes of urban areas that leads to increase in population and settlements. This however, results to a functional pattern of land uses that mostly influence or resulted to land use conversions. The studies of Jinadu (2005); Ojikpong, Agbor, and Emri (2021); Ebube and Emoh (2022) confirmed that the conversion of residential land use to commercial uses in urban area has brought about more negative than positive impacts. Among the stated negative impacts were housing scarcity, high level of on-street trading and parking, strain on the existing infrastructure, increase in environmental pollution and low level of privacy. Another impacts that should not be left out is that, it has forced low-income earners to relocate and set-up squatter's settlements inside or outside the urban areas (Agukoronye and Nwankwo, 2002); housing shortage, resulting in overcrowding, high rent, slowing down housing development rate and destruction of city's cultural heritage (Dung-gwon & Mamman, 2005).

On the other hand, residential-commercial land use conversion is of great importance to the estate developers as it gives more income to the property owners through exorbitant rent fee (Agukoronye et.al,

2002). Hence, it can be seen as agent of the country's economic growth and a sign of economic adjustment that seeks to allocate land to its highest and best use. A significant nexus exist between the impacts of land use conversion and land use conversion pattern. This implies that, the significant impact level of land use conversion is a reflex of the pattern (partial or full) that the conversion follows. These impacts may be in form of economic, environmental, institutional, physical or socio-cultural impacts. On this note, this study focused on the analysis of the impacts of residential-commercial land use conversion along some selected Ibadan municipality roads in order to ascertain the current prominent land use conversion impacts in the City. This was done through the evaluation of various residential-commercial land use conversion impacts categories (physical, economic, environmental and socio-cultural impacts); identification of the various patterns of residential-commercial land use conversion; and analysing the relationship between residential-commercial land use conversion pattern and impacts in the study area. Thus, findings from this study could be used as baseline information for future decision making on land use planning and development by policy makers in Nigeria and other developing countries at large.

II. LITERATURE REVIEW

A. Residential Land Use Versus Commercial Land Use

Land use refers to man's various uses which are carried on/over land. It describes how the land is modified (Prakasam, 2010). Its types are residential, commercial, industrial, recreational, agricultural, transportation, public and semi-public uses (Owoeye & Ogunleye, 2015). Residential land use as the name implies refers to a land developed for people to reside. It includes all types of residential dwelling units. This ranges from single family/household dwelling unit to ten or more family dwelling unit (Isola, 2016). It comprises of different types of building such as bungalow, duplex, terrace, courtyard and storied buildings of various designs. Commercial land use on the other hand, is land used for economic purposes. This includes fueling stations, markets, eateries, pharmacy, supermarket, banks, shopping centers, hotels, cinema house, and some vacant land whereby commercial activities are being carried out among

others (Karen, 1994, cited in Isola, 2021). These uses are mostly located along main road, major highways, freeway corridors, etc.

B. Population Increase and Urban Land Use Conversion

Continuous increase in population and land use conversion in urban areas are closely linked. Population growth as an agent of urbanization process affects land use through the changes of land uses from one type to another; and development of open/vacant land for residential, industrial, transportation, commercial, infrastructure, and amenity uses by various human activities inline with their immediate needs (Eric, Helmut & Erika, 2003). This has caused lots of impacts on the environment, society, and the economic at large. One of its types is the conversion of residential land use to commercial uses. Residential-commercial land use conversion is currently more quickly in developing countries than developed countries (World Bank, 2007). For every action there comes reaction, so also, for every land use conversions comes with both positives and negatives impacts on the people and the environment. Precisely, the conversion of residential land use to commercial use enhances more provision of jobs, industrial developments, infrastructural development, housing provision and increase in commercial activities (Owoeye, 2013). As regard to these, urbanization can be seen as an unavoidable country's economy development agent that provides homes, jobs, shopping facilities, professional and community services for the people (Ellis, 2011).

C. Impacts of Land Use Conversion

Impacts of land use conversion have been grouped into environmental, physical, social, economic and cultural categories. Scholars like; Hussien, (2009); Haase and Nuissl, (2010); Adepoju and Adepoju, (2016); Kalu, Alozie, Oti, and Onyenorah (2017) were able to identified some of the physical and environmental impacts of land use conversion to includes chronic shortage of housing, overcrowding, acute crisis in supply of water and electricity, air, water and noise pollution, development of slum and squatter settlement, traffic congestion, shortage of necessary services and poor condition of infrastructural facilities among others. The social problems include; urban poverty, increase in informal sector activities,

smuggling, begging, robbery, drug trafficking, unsecured environment, increase incidence of communicable diseases and lack of privacy (Onyebueke, 2000; Farinmade, 2010). Culturally, land use conversion leads to gradual destruction of the city's cultural heritage (Jinadu, 2005). Also, as a result of displacement of some residents from their building, family ties tends to break, since not all residents displaced can afford rent fee for new accommodation (Isola, 2021).

In economic point of view, as a result of residential-commercial land use conversion, land has become a scarce commodity to the extent that over 70% of the city's population has no access to land (Ayotamuno, 2010). Other economic impacts are, increase in informal activities, increase in price of land, increase in rent fee, among others (Kalu et al., 2017). Of a great interest to this study is to remind us that land use conversion does not only come with negative impacts but also exhibits many benefits. Among them are: it enhances the development and diversification of the commercial activities, opportunity of creating new jobs, increase in business opportunities. It also serves as means of urban beautification, enhancement of increase in income level of the people, increase in sales of goods and increase land value (Junjie, 2008 and Kalu et al., 2017) .

III. MATERIALS AND METHODOLOGY

A. Study Area

The study area is Ibadan Municipality in Ibadan Metropolis, Oyo State, Nigeria . It lies approximately between longitude 3⁰ 5' to 4⁰36' east of the Greenwich Meridian, and latitude 7⁰ 23' to 7⁰ 55' north of the Equator. It occupies an area of approximately 3,200 sq. km , and made up of five Local Government Areas of - Ibadan North, Ibadan Northeast, Ibadan Northwest, Ibadan South and Ibadan Southwest (Figure 1).

Ibadan origin and evolution of land ranges (landform) consists of hills, plains and river valleys (Labinjo, 2002). As a result of the different categories of landforms in Ibadan, not all its land area can be built on; while some areas require lots of work and money to develop than others (such as hilly to plain lands). This thus limits the available and accessible land to be

developed and enhancing conversions of the available developable land area within the city.

The commercial importance that the city exhibits has resulted in land being a key investment, an asset and a status symbol for the people (Balogun, 2011). Ibadan economic activities includes buying and selling, manufacturing, handcrafting, etc. as a result of increasing in population and land use development, the city’s agricultural land has declined, so also farming population.. It was noted by Oluwaseyi (2014) that the city’s economic development majorly depends on the commercial sector activities; which has made over 50% of the economic active population of the city to fall into commercial sector workers.

Ibadan people trade in foodstuffs, textile goods, building materials, motor parts, clothes (including Aso Oke), household utensils, electronics and pharmaceutical products, among others (Labinjo, 2002). Culturally, there exists a very high rated hospitality and receptiveness level of Ibadan people as they throw open arms to visitors, house them, feed them and even tell them about their culture and traditions. This can be seen as one of the major factors that influence increase in population in the city as well as land use conversion. There are three transportation systems within Ibadan: roads, railways and air transport system. The city road transportation system is a major Nigerian transport hub linking many cities in the Southwest. It can be classified through ownership of the roads or function they perform. On the basis of ownership, there are three categories of roads ownerships in Ibadan: Federal, State and Local Government owned roads commonly referred to as Trunk ‘A’, ‘B’ and ‘C’ roads. There exist 4 Trunk ‘A’ roads, 34 Trunk ‘B’ roads and several Trunk ‘C’ roads. There are various roundabouts, intersections and flyovers within the city to facilitate traffic movement, and also to reduce persistent traffic gridlock being experienced as a result of increasing commercial activities through land use conversion. Specifically, this study selected roads from the three categories of roads in the study area as shown in Figure 2.

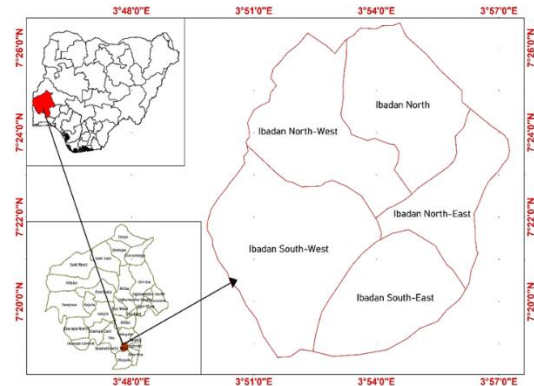


Figure 1: Map of Nigeria showing the study area in the context of Oyo State

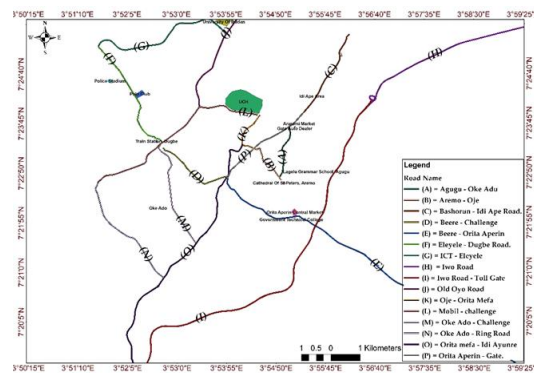


Figure 2: Map Showing selected sampled roads in Ibadan Municipality

B. Research Method

This study analysed the impacts of land use conversion from residential use to commercial use, the pattern of conversions, and the relationship between pattern of land use conversion and the impacts of land use conversion in Ibadan municipality, Nigeria. To achieve these, data were sourced from both primary and secondary sources; primary data were sourced through physical observation of the study area and administration of questionnaire. Questionnaire was administered on the occupants of the selected buildings along selected roads that were sampled in the study area. A multi-stage sampling procedure was employed for this study. The first stage involved the adoption of the 5 existing Local Government Areas (LGAs) in the study area. This comprises of Ibadan North (IBN), Ibadan Northeast (IBNE), Ibadan Northwest (IBNW), Ibadan South (IBS) and Ibadan Southwest (IBSW) LGAs respectively. The second stage involved the identification of the different

categories of the existing roads network in the study area. As presented in Table 1, there existed 3 categories of roads network- Trunk ‘A’, ‘B’ and ‘C’ in the study area. In a segregated manner, there were 4 trunk ‘A’ roads, 34 trunk ‘B’ roads and over 50 trunk ‘C’ roads network. Third stage was the selection of roads network whose buildings located along them has experienced high level of residential-commercial land use conversion in the study area. Purposively for a good representative of all roads categories, in each LGA, 3 roads that cut across the 3 roads categories were selected. That is one of Trunk ‘A’, ‘B’ and ‘C’ roads in each LGA. This was done across the LGAs in Ibadan Municipality except Ibadan Northwest LGA that has no Trunk ‘A’ road that passes through it. In total, the study focused on the buildings along fourteen selected road networks in the City (Table 1).

However, the selections of these roads across both LGAs and roads categories was done to have an in-depth knowledge on the impacts of residential-commercial land use conversion across the City. The last stage involved the use of systematic sampling techniques in selecting buildings that were sampled. A

total number of seven thousand, three hundred and ninety-one (7,391) converted buildings were identified along the selected roads of the study area through physical observation (see Tables 2a and 2b). Subsequently, for the purpose of questionnaire administration, 5% of the converted buildings were sampled. This selection books every 20th buildings after random selection of the first buildings on the selected road networks. This gives a total number of three hundred and sixty-nine (369) buildings that were sampled (Table 2b). Secondary data used for the study were maps and number of the existing road network with their categories. These were retrieved from Cooperative Information Network (COPINE) and Oyo State Ministry of Land, Housing and Urban Development respectively. Descriptive statistical technique was adopted for the data analysis through the use of Statistical Product for the Social Sciences (SPSS) software.

Table 1: Roads Selected Across the Five LGAs in Ibadan Municipality

S/N	LGAs	Road Network Names	Categories
1.	Ibadan North	Old Oyo	Trunk A
		Gate/Orita Aperin	Trunk B
		Orita Mefa /Idi Ayunre	Trunk C
2.	Ibadan Northeast	Iwo Road	Trunk A
		Idi Ape/Basorun	Trunk B
		Oke Adu/Agugu	Trunk C
3.	Ibadan Southeast	Beere/Challenge	Trunk A
		Beere/Orita Aperin	Trunk B
		Orita Aperin/Oja Oba	Trunk C
4.	Ibadan Northwest	Dugbe/Eleyele	Trunk B
		ICT/Eleyele	Trunk C
5.	Ibadan Southwest	Challenge /Mobil	Trunk A
		Oke Ado/Challenge	Trunk B
		Oke Ado/Ring road	Trunk C

Table 2a: Proportion of Residential-Commercial Converted Buildings Sampled

S/N	LGAs	Road Names	No. of Existing Buildings Converted	No. of Selected Buildings for sampling (5%)
1.	Ibadan North	Old Oyo	471	24
		Gate/Orita Aperin	430	22
		Orita Mefa /Idi Ayunre	624	31
2.	Ibadan Northeast	Iwo Road	893	45
		Idi Ape/Bashorun	94	5
		Oke Adu/Agugu	112	5
3.	Ibadan Southeast	Beere/Challenge	473	24
		Beere/Orita Aperin	1312	66
		Orita Aperin/Oja Oba	1085	54
4.	Ibadan Northwest	Dugbe/Eleyele	173	8
		ICT/Eleyele	377	19
5.	Ibadan Southwest	Challenge /Mobil	180	9
		Oke Ado/Challenge	167	8
		Oke Ado/Ring road	982	49
Total			7,391	369

Table 2b: Classification by Road Categories of the Buildings Sampled

Road Categories	No. of residential-commercial converted buildings sampled					Total
	IBN	IBNE	IBSE	IBNW	IBSW	
Trunk A	24	45	24	0	9	102
Trunk B	22	5	66	8	8	109
Trunk C	31	5	54	19	49	158
Total	77	55	144	27	66	369

IV. FINDINGS AND DISCUSSION

This section focus on findings, analysis and discussion of the impacts of residential-commercial land use conversion on the people and the environment of Ibadan Municipality, pattern of land use conversion in the study area, and the relationship between the impacts and pattern of land use conversion in the study area. The impacts of land use conversion was presented in two segments: perception and affirmation

segments. Perception segment dealt with respondents' level of agreement on the identified impacts of residential-commercial land use conversion in the study area. For ease of analysis, these impacts were grouped into three categories: physical & environmental impacts, social & cultural impacts, and economic impact (Tables 3, 4 and 5). Each indicator under different categories was measured using five points Likert ranking scale in the order of 5 - *Strongly*

Agree, 4 - Agree, 3 - Just Agree, 2 - Disagree and 1 - Strongly Disagree.

Second segment (Table 6) was the affirmation segment where the consideration of the effectiveness level of the available infrastructure was considered. This section was also analysed using five point Likert ranking scale as discussed above. For the purpose of discussion, analyses of the data obtained in the two sections evolved into an index called Relative Impact Index (RII) and Respondents Assessment Infrastructure Effectiveness Index (RAIEI). The indices listed in the Tables (3, 4, 5 and 6) were used to classify the various impacts of residential-commercial land use conversion and the available infrastructure into two derivations of positive and negative. Positive deviations indicated that they were the most paramount impacts/more effective (for the infrastructure), therefore has values above the mean index. Negative deviations on the other side were the trivial impacts/less effective infrastructure with values lower than the mean index. However, it is to be noted that twenty-three variables in total were entered for analysis in this section, but the most relevant variables to each impact types (i.e. physical, environmental, economic, social and cultural) were presented in each of the tables.

A. *Physical and Environmental Impacts of Residential-Commercial Land Use Conversion*

Presented in Table 3 is the result on the physical and environmental impact of residential-commercial land use conversion in Ibadan Municipality. From the indices of impacts listed in the Table, there were twelve identified physical and environmental impacts. Ten of the impacts had positive deviation about the mean, while, two has negative deviation around the mean. The ten impacts with the positive deviations were paramount physical and environmental impacts of residential-commercial land use conversion in the study area. These were shortage of parking space (RII - 4.50), high volume of traffic congestion (RII - 4.38), population increase (RII - 4.36), increase in building use intensity (RII - 3.95), and increase in traffic flow (RII - 3.81). Others were shortage of housing unit, frequent noise pollution, increase in construction of new buildings and insufficient proper waste management. Their respective Relative Impact Indices (RII) are 3.77, 3.58, 3.48 and 3.45. However, the two trivial impacts (impacts with negative deviations) of residential-commercial land use conversion identified in the study area were: provision and development of new infrastructures (RII - 2.49) and beautification of the environment (RII - 2.66). This means that residential-commercial land use conversion does not guarantee provision of more infrastructure or beautification of the environment.

Table 3: Physical and Environmental Impacts of Residential-Commercial Land Use Conversion

Impacts	TWV	RII	MD
Shortage of parking space	2,360	4.50	1.08
High volume of traffic congestion	2,296	4.38	0.96
It enhances increase in population	2,284	4.36	0.94
Increase in building use intensity	2,070	3.95	0.53
Increase in traffic flow	1,995	3.81	0.39
Shortage of housing unit within the neighbourhood	1,978	3.77	0.35
Frequent noise pollution	1,874	3.58	0.16
Decrease in length of shopping trip	1,920	3.66	0.15
It enhances construction of new buildings	1,823	3.48	0.06
Insufficient proper waste management	1,810	3.45	0.03
Provision and development of more infrastructure	1,686	2.49	-0.20
It beautifies the environment	1,396	2.66	-0.76

* RII = $\sum RII / N$ * RII = $78.66/23 = 3.42$ *MD= RII- RII

where: MD = Mean Deviation, RII = Relative Impact Index, ΣRII = Summation of Relative Impact Index, RII = Relative Impacts Indices Mean, TWV = Total Weighted Value, N = Total number of impacts (N.B, all these notations also apply to Table 4 &5 respectively).

B. Economic Impacts of Residential-Commercial Land Use Conversion

As presented in Table 4, the Relative Impact Index mean (RII) for economic impacts of residential-commercial land use conversion in the study area was 3.51. However, out of fourteen most rated economic impacts with positive deviations about the mean, two subjects of matter were with the same RII (increase in rent fee and scarcity of land) of 4.27 each. This indicates that, they have the same strength of impact. Others were increase in informal activities (RII - 4.67), increase in sales of goods (RII – 4.44), increase in income level (RII – 4.43), employment opportunity (RII - 4.41), increase in price of land (RII – 4.15), increase in business opportunities (RII – 3.81) and easy access to goods and services (RII – 3.65). This study however supported the opinion of earlier researchers (Agukoronye and Nwankwo, 2002; Obaidullah and Rizwan, 2005; Junjie, 2008 and; Isola-Muyideen and Olugbamila, 2024) that conversion of land use are of more benefits to the people economically than other aspects. Hence, this study serves as an update of the aforementioned scholars.

Land becomes scarce commodity	2,239	4.27	0.76
Increase in price of land	2,173	4.15	0.64
Increase in business opportunity	1,998	3.81	0.30
Easy access to goods and services	1,915	3.65	0.14

* $RII = \Sigma RII / N$ * $RII = 80.76/23 = 3.52$
 *MD= RII- RII

C. Social and Cultural Impacts of Residential-Commercial Land Use Conversion

It was revealed that residential-commercial land use conversion in Ibadan Municipality has not increased the poverty level of the people in the city. This was established when it was rated the highest not important impacts with the least RII of 1.97 among other indices that deviated negatively about the mean (Table 5). This findings is in accordance with Isola-Muyideen et.al (2024) study, which affirmed that land use conversion would rather enhance better standard of living, increase income level and provides more employment for the residents than increasing their poverty level.

Other less important impacts were high level of human trafficking (RII – 2.92) and increase incidence of communicable diseases (RII - 2.40). On the other hand, paramount social and cultural impacts of residential-commercial land use conversion in Ibadan Municipality were: overcrowding (RII – 4.17), high rate of residents’ relocation (RII – 3.76), reduction in privacy & security level (RII – 3.54), increase in theft activities (RII - 3.57), and destruction of the people's tradition & believes (RII – 3.50). Others were high level of crime rate (RII - 3.46), broken of family ties (RII – 3.38) and destruction of the city's cultural heritage (RII – 3.37).

Table 4: Economic Impact of Residential-Commercial Land Use Conversion

Impacts	TWV	RII	M D
Increase in informal activities	2,446	4.67	1.16
Increase in sales of goods	2,329	4.44	0.93
Increase in income level	2,321	4.43	0.92
Provision of employment opportunity	2,311	4.41	0.90
Increase in house rent fee	2,238	4.27	0.76

Table 5: Social and Cultural Impacts of Residential-Commercial Land Use Conversion

Impacts	TWV	RII	MD
Overcrowding	2,184	4.17	1.14
High rate of residents relocation	1,969	3.76	0.73
Increase in accident hazard	1,923	3.67	0.64
Increase in theft activities	1,872	3.57	0.54
Reduction in privacy and security level	1,857	3.54	0.51
Destruction of the people's tradition and believes	1,836	3.50	0.47
High level of crime rate	1,811	3.46	0.43
Broken of family ties	1,773	3.38	0.35
Destruction of the city's cultural heritage	1,766	3.37	0.34
High level of human trafficking	1,530	2.92	-0.11
Increase incidence of communicable diseases	1,259	2.40	-0.63
Collection of illegal rent or toll from the residents and visitors	1,216	2.32	-0.71
Increase in poverty level	1,033	1.97	-1.06

*RII = $\Sigma RII / N$

* RII = $69.71/23 = 3.03$

*MD= RII- RII

D. Impacts of Residential-Commercial Land Use Conversion on the Available Infrastructure

Olugbamila and Isola-Muyideen (2024) asserted that one of the major reasons for land use conversion is demographic changes (i.e increase in population). However, it is also revealed in this study that land use conversion could result to population increase (Table 3). This is so because, ‘population increase’ is a continuous process and a significant elements of urban growth. Therefore, it is expected to have more pressure on the existing infrastructure in an environment where land use conversion has occurred. Presented in Table 6 is the outcome of the findings on the effectiveness level of the available infrastructure in the study area. This was done using five points Likert scale of *Very Effective, Effective, Just Effective, Not Effective and Not at all Effective* for each of these infrastructure on the scale of 5, 4, 3, 2 and 1 respectively. Respondent’s views were measured along the different roads categories through the use of ‘Respondents Assessment Infrastructure Effectiveness

Index’ (RAIEI). The mean index (RAIEI) values for Trunk A, B, and C roads network were 0.89, 0.82 and 1.40 respectively.

Eighteen infrastructure comprises of facilities, utilities and services were observed and the respondents were allowed to rate their levels of effectiveness. Finding showed that communication facility was the most effective while car park was the least effective infrastructure in Ibadan Municipality. In ascending order, among the effective infrastructure in the study area were communication facilities, educational facilities, tarred road, electricity, health facilities and police post. Facilities like prison yard, community hall, drainage system, post office and cemeteries, etc. deviate negatively about the mean. That is, they were less effective infrastructure in the study area. This can be linked to the continuous increase in population against the fixed available infrastructure within the study area.

Table 6: Infrastructure Effectiveness Level Assessment in the Study Area

Infrastructure	Road Categories											
	Trunk A			Trunk B			Trunk C			Total		
	TWV	RAIEI	MD	TWV	RAIEI	MD	TWV	RAIEI	MD	TWV	RAIEI	MD
Communication facilities	1,079	2.06	0.66	500	0.95	0.13	628	1.20	0.31	2,207	4.21	1.09
Educational facilities	979	1.87	0.47	572	1.09	0.28	596	1.14	0.25	2,147	4.10	0.98
Tarred road	936	1.79	0.39	578	1.10	0.28	626	1.19	0.30	2,140	4.08	0.96
Electricity	900	1.72	0.32	498	0.95	0.13	608	1.16	0.27	2,006	3.83	0.71
Health facilities	874	1.67	0.27	562	1.07	0.25	504	0.96	0.07	1,940	3.70	0.58
Police post	880	1.68	0.28	494	0.94	0.12	534	1.02	0.13	1,908	3.60	0.48
Motor park/garage	837	1.60	0.20	452	0.86	0.04	584	1.11	0.22	1,873	3.57	0.45
Games and sport field	788	1.50	0.10	418	0.80	-0.01	464	0.89	0.00	1,670	3.19	0.07
Fire service	689	1.31	-0.09	378	0.72	-0.10	583	1.11	0.22	1,650	3.15	0.03
Prison yard	677	1.29	-0.11	384	0.73	-0.09	556	1.06	0.17	1,617	3.09	-0.03
Community hall	760	1.45	0.05	408	0.78	-0.04	352	0.67	-0.22	1,520	2.90	-0.22
Drainage system	688	1.31	-0.09	416	0.79	-0.03	391	0.75	-0.14	1,495	2.85	-0.27
Post office	577	1.10	-0.30	330	0.63	-0.19	552	1.05	0.16	1,459	2.78	-0.34
Cemeteries	595	1.14	-0.26	368	0.70	-0.11	324	0.62	-0.27	1,287	2.46	-0.66
Water	525	1.00	-0.40	446	0.85	0.03	294	0.56	-0.33	1,265	2.41	-0.71
Tap water	463	0.88	-0.52	432	0.82	0.00	346	0.66	-0.23	1,241	2.37	-0.75
Refuse dump	466	0.89	-0.51	272	0.52	-0.30	343	0.65	-0.24	1,081	2.06	-1.06
Car park	479	0.91	-0.49	284	0.54	-0.28	167	0.32	-0.56	930	1.77	-1.35
Mean Aggregate	$RAIEI_A = 1.40$			$RAIEI_B = 0.82$			$RAIEI_C = 0.89$			$RAIEI_{ST} = 3.12$		

Where:

- *MD = Mean Deviation
- *TWV = Total Weighted Value
- *RAIEI = Respondents Assessment Infrastructure Effectiveness Index

* $RAIEI_A$ = Respondents Assessment Infrastructure Effectiveness Indices mean for Trunk A roads

* $RAIEI_B$ = Respondents Assessment Infrastructure Effectiveness Indices mean for Trunk B roads

* $RAIEI_C$ = Respondents Assessment Infrastructure Effectiveness Indices mean for Trunk C roads

* $RAIEI_{ST}$ = Respondents Assessment Infrastructure Effectiveness Indices mean for the study area

E. Land use Conversion Pattern (LUCP) in Ibadan Municipality

Two land use conversion pattern (LUCP) were documented in literature: full and partial conversion patterns (Farinmade, 2010). Figure 3a is the findings on residential-commercial LUCP based on the LGAs. It was revealed that only two LGAs experienced more of full residential-commercial LUCP. These were Ibadan North and Ibadan Northeast LGAs with 55.8%

and 74.5% respectively. Other three LGAs preferred residential-commercial land use conversion in partial pattern, i.e inform of mixed land use than full conversion pattern. There various proportions were 68.75, 88.9% and 74.2% for Ibadan Southwest, Ibadan Northwest and Ibadan Southwest accordingly.

However, presented in Figure 3b is the analysis of residential-commercial LUCP based on road categories. It can be deduced that Truck A roads occupied more (23.0%) of full residential-commercial LUCP than other road categories. This may be attributed to the hierarchy and location of the roads (trunk A roads). As they are located in the heart of the city, and also serve as primary distributors onto which all other hierarchies of roads were connected. Above all, Table 7 is the overall breakdown of findings on residential-commercial LUCP in the study area, considering both road categories and LGAs in the study area. It can be deduced that the largest proportion of partial residential-commercial LUCP in the study area was located along the Trunk C roads with 37.7% while the least proportion (4.6%) was

discovered along Trunk A roads. In conclusion, major residential-commercial LUCP done in the City of Ibadan was in-form of mixed land uses. This is supported with 59.6% of partial residential-commercial LUCP against 40.4% full residential-commercial land use conversion pattern documented in Table 7.

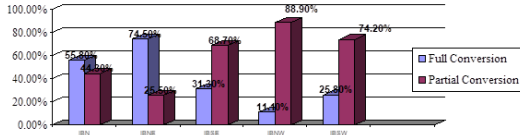


Figure 3a: Residential-Commercial LUCP in the Study Area

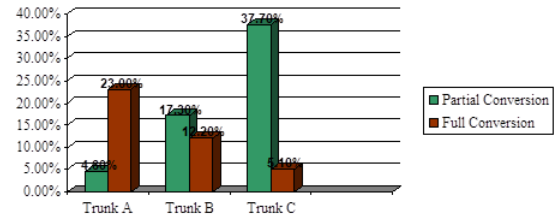


Figure 3b: Summary of Residential-Commercial LUCP by Road Categories

Table 7: Overall Proportion of Residential-Commercial LUCP

LGAs	Road Categories						Total (Based on pattern of conversion)	
	Trunk A		Trunk B		Trunk C		Full	Partial
	Full Freq (%)	Partial Freq (%)	Full Freq(%)	Partial Freq (%)	Full Freq (%)	Partial Freq (%)	Full Freq (%)	Partial Freq (%)
IBN	19 (24.7)	5 (6.5)	15 (19.5)	7 (9.1)	9 (11.6)	22 (28.6)	43 (55.8)	34 (44.2)
IBNE	38 (69.1)	7 (12.7)	2 (3.6)	3 (5.5)	1 (1.8)	4 (7.3)	41 (74.5)	14 (25.5)
IBSE	21 (14.6)	3 (2.1)	21 (14.6)	45 (31.3)	3 (2.1)	51 (35.4)	45 (31.3)	99 (68.7)
IBNW	0 (0)	0 (0)	2 (7.4)	6 (22.2)	1 (3.7)	18 (66.7)	3 (11.1)	24 (88.9)
IBSW	7 (10.6)	2 (3.0)	5 (7.6)	3 (4.5)	5 (7.6)	44 (66.7)	17 (25.8)	49 (74.2)
TOTA	85 (23.0)	17 (4.6)	45 (12.2)	64 (17.3)	19 (5.1)	139 (37.7)	149 (40.4)	220 (59.6)

F. Relationship between Pattern and Impacts of Residential-Commercial Land Use Conversion

Findings in this section has helped in grouping identified impacts of residential-commercial land use conversion into five categories. These are physical, environmental, economic, social and cultural impacts. However, considering the response of the respondents, economic impacts were more accrued to the positive impact of residential-commercial land use conversion in the study area. For example, it was claimed that the land use conversion has encouraged increased sales of goods, easy access to goods and services, more business opportunities, and increase in the residents income level among others (Table 4). This, is in contrary with the residents conclusion on its physical, environmental, social and cultural impacts where such impacts like – shortage of parking space, high level of traffic congestion, increase in building use intensity,

frequent noise pollution, etc were identified (Table 3). Others as presented in Table 5 include overcrowding, high rate of residents relocation, increase in theft activities and destruction of the city’s cultural heritage among others. These impacts categories (Table 3 and 5) were more of negative impacts of land use conversion on the residents and the environment at large.

However, significant proportion (59.6%) of residential-commercial land use conversion falls under partial pattern of land use conversion (Table 7). This implies that most of the land use conversion actors are the residents of the study area who combine their place of work with home or prefer to locate close to their place of work. As observed, the front spaces and front portion of each buildings that were partially converted were the places adopted for the commercial use. This is done either to increase their income level, as a

means of employment or for other reasons identified in Table 4. In summary, findings in this study affirmed that residential-commercial land use conversion in Ibadan Municipality has more positive economic impacts than other land use conversion impacts categories. Hence, it is done for economic enhancement purpose and majorly in partial pattern of conversion. The utmost reason for larger proportion of mixed land use system as observed in the study area.

V. CONCLUSION AND RECOMMENDATION

After an indepth examination of the various categories of residential-commercial land use conversion impacts in the study area, this study concluded that residential-commercial land use conversion is indeed one of the outcomes of urban growth that has come to stay, as it is economically preferable. However, in view of the findings in this research paper, this study recommended that the decision makers on land use development matters should involve ‘mixed land use’ in land use categories when planning for cities and towns. Government and developers should consider rehabilitation and provision of more infrastructural facilities to cater for the population increase. Lastly, enlightenment and encouragement should be done on the need for provision of employment in other sector of the economic as the commercial sector is getting overcrowded.

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