Rapid Urban Growth And Land Use Change In Kano Metropolis Nigeria

Hashim Abdullahi, Gobi Krishna Sinniah, Ho Chin Siong,

Abstract: The study employed four (400) structured questionnaires and Geographical Information System (GIS) was used for the study which covers 35 years (1984 to 2019) and it employed Remote sensing technology and the Landsat images of 1984 , 1998 together with 2019 were classified into four major categories. Aim of the study is to assess environmental impact of rapid urban growth in Kano metropolis. The result depicts that changes trend in farm land/open fields within 1984-1998 indicates significantly cut down by (-49.94%), in 1998-2019, it deeply dropped by (-84.90). On the other hand, built up area growth as reveals more obvious trends within 1984-1998 (23.59) positive growth also within 1998-2019 (5.18). Annual Changes records are 1984-1998 (1.67) and 1998-2019 (0.25). The trend of changes in built up areas is 5,563.816 Ha in 1984 but tripled in 1998 with 15,594.642 Ha. Ordinary least square (OLS) explains that coefficient of determination (R2) (0.947663) shows that about 94% of the changes in the dependent variables (environmental impact of urban growth) was accommodated for the changes in the explanatory variables (Number of households per house (NHH), number of people per house hold (NPH) , number of rooms per house(NRH) , materials used for constructions (MTC), number of rooms rented (NRR) and Monthly rent per room (MRR). The study indicated significant environmental impacts of pre-construction and post constructions activities together with locations, sizes of plots and ages of buildings with the study area. Recommendation is drawn based on the identified spatial planning principles.

Keywords: Urban Growth, Land Use Changes, Kano Metropolis, environmental impacts

1 INTRODUCTION

Urban expansion is among the most crucial environmental challenges attraction national and international scholarly research works. [1], urban expansion in relation to land uses changes has been receiving international attention and discussion with in the land use policies. Land use policies should covers; geographical indicators, Spatial-temporal of urban structure, spatially population consideration, Measurement of accessibility in suburban settings polycentric. [2], challenges of urbanization environmentally could be minimize using green space technology and it will positively improve the wellbeing of cities dwellers. [3] In addition, crop land is anticipated and projected to reach 18%. When this happen, it will eventually posed great challenges to environment through: conversion of agricultural land into buildings and clearance of forest for agricultural purpose. The author added that comment with regards to the dramatic increase in agricultural activities will have significant effects on non-agricultural terrestrial and aquatic eco-system globally. Recent increase in food production in the last four (4) decades resulted to: 6.87 fold raising of Nitrogen fertilizer, 3.48 fold raising of Phosphorous, 1.68 fold raising of irrigated cropland and 1.1 fold raising in crop cultivation. [4] Social buildings environmental impacts is obvious very significant yet with regards to life cycle thinking is yet to be intensively studied and established.

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Potentials (GWP), Human Health, Ecosystem Quality, Climate Change and Resources Saito and Freites (2011) stated that developing nations are more prone the climate change risks. Climate change vulnerability is very obvious to the water resources through the reductions in river flows and decreases in water quality. Fesselmeyer, Seah and Kwok (2018), United Nation unveiled that in 2014 relatively 54% of the World population dwells in urban areas which is far greater than 30% of the 1050. This is therefore explained; urbanization is seen as the focal points of discursion for many years in this context of this great global issue. [it is projected that by the year 2030 , world demographic figure will approximately reached five billion , yet very little is known about urban expansion , its future locations , magnitude and precisely rate of its growth. Theprojected global Urban expansion and growth will be intensified within the African continents on: Nile River in Egypt, The coast of West Africa on the Gulf of Guinea, Northern Lake Victoria in Kenya and Uganda extending to Rwanda and Brundi, Kano Northern Nigeria and Greater Addis Abba Ethiopia

1.1 URBAN GROWTH ENVIRONMENTAL CHALLENGES

[6] urban growth and expansion has been receiving research efforts with variety of professional approaches but emphasis to the multiple perspectives of both morphological and functional approaches. Economic recession plays vital roles in altering the urban growth and expansion distorts building cycle together with the functions of real estate market. [7] Chinses economy experienced significant and rapid development which results to massive energy use and its growth trends posed heavy burden on both fossil resources together with the environmental ecology. [8] The study shows an annual mean temperature, frequent extreme weather together with mean sea level is raising slightly while the result indicates also that variability in rain fall as an impact of climate change. [9] United Nation comment that 2.8 billion of the world population rely solely on wood-fuel together with rustic stoves for domestic heating and cooking. Many research on this issues has been conducting particularly in Africa and Asia with results of wood-fuel is linked with the following determine factors; fuel prices, seasonal influence, wood fuel availability and the nature and

cooking practice of a community. Fuelwood production in Brazil could be traced to its energy balance productions and consumption and contains: fuels, natural gas, fire wood, liquid petroleum gas (LPG), kerosene, gas-worker, electricity and charcoal. About 11 million household use fuel wood for heating, cooling and cooking for domestic purposes.

1.2 URBAN GROWTH CHALLENGES CONSTRUCTION PROCESSES

Kumar and Katoch (2016) explained that construction operations that deviate from sustainability usually posed significant environmental challenges. Primary data handles intangibles impacts, while secondary data deals with tangibles. [10], challenges and predicaments in mass housing estate in Famagusta is quiet important that requires intensive urban and regional planning with effective policies intervention for several years. [11] explained the factors that impede Permanent Housing Reconstructions which include; skill manpower, effective management, communication, supplies and logistics, financial Involvement, safety and health management, control and monitoring.[12] approximately 60 million M^2 covers by present existing buildings in China and annual newly constructed buildings in China accounts to 2 billion. Life Cycle embodied environmental (LCEE) impacts; this is the sum total impacts of buildings energy and materials consumption as result of it materialization consumption phases which include raw materials transportation , in situ constructions and end-of-life (EOL) phases activities. Environmental impacts caused by permanents material and material belong to this category an example of concrete and rebar and have more environmental impact on the natural eco-ecosystem. In Addition, temporary buildings materials equipment like scaffolds has less environmental impacts. However, heavy building machines have tremendous environmental impacts Life Cycle operational environmental (LCOE) impacts; this covers all related buildings energy consumptions within and during building operations which include energy consumed for heating, cooling and cooking, lighting, water use and energy for domestic appliances. Greater part of the world population dwells in cities by 2050 as projected will relatively reached 70% but the developing countries urbanization will maintain 95% [13]. Malaysia urbanization as an economic development indicator significantly nearly tripled its initials 25% of 1960 to 65% in 2005. Urbanization in China anticipated to 55% by 2020 while by 2030 60% expected [14]. Urban centers are significant source environment challenges.

1.3 LAND COVER CHANGES CHALLENGES AND ITS PROTECTION STRATEGIES

Urban housing expansion affect the environment resources particularly the vegetation resources. When assessing the land cover changes these are to be considered (1) Quality of forest farm land (2) Use of spatial data to asses both forestry and farming viability (3) How land use influenced quality of life (4) Estimate total land cost development [15].Sprawl is usually developed in an urban area as a result of very high population increase and shortfall of housing together with high rental value, Urban sprawl is characterized with these environmental impacts as; (1) It pollutes environments (2) It reduces reserve land (3) It consumes high energy (4) It alters aesthetics of the environment (5) It affects eco system diversity (6) It in increases water runs off (7) It destroys vegetation cover (Jean, 2006). Building life cycle structure stages include; (1) Procurement (2) Design (3) Production (4) Operation (5) Maintenance (6) Refurbishment (7) Demolition [16]. [17] Construction processes affect the environment. It degrades the environment through; Environmental pollution, Eco-system distortion and habitat destruction, Afforestation and desertification, Soil erosion, Solid waste Statistics inventory carried out in 2005 unveiled land use change with these figures ; Farming account to 22.1%, 1.7 % and 16.4% are for industries and energy sectors. In 1994 up to 2006, agricultural land use remained unchanged, while industrial land use rose speedily to 26%. Government attention was minimizing emission and amazon deforestation [18]. [19] [20] the study evaluates new technology with the aids of hybrid Models used to assess carbon. Reduction technologies potentials. This is to make an action plans for the DE carbonization of Bangkok Metropolitan Area (BMA).

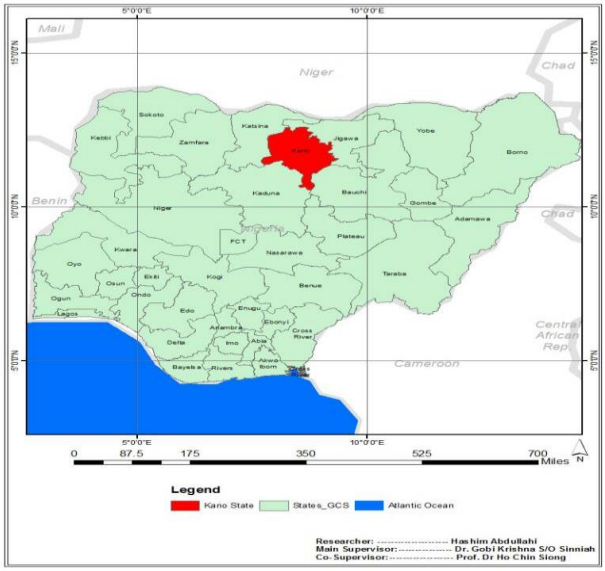
1.4 ENVIRONMENTAL PROTECTION STRATEGIES

These are techniques used in mitigating the urbanization in relation to housing construction process, maintenance process and renewal process as. Another scholar comment that 3 phases of urban growth and found models to appraise the impact of urban growth (1) Land use, (2) Air quality (3) Energy [21].These policies of sprawl could be effective in solving housing environmental predicament (a) Green belt development with cities and (b) Effective development control of urban growth [22] Urban sprawl measuring strategies are another environmental impact mitigating measures (a) Direct physical measurement, (b) Base line measurement (c) Aggregate measurement (d) Environmental impact measurement and (e) Models measurement [23].Cities are living organism because it possesses birth stage, youthful stage, Maturity state, old age and rejuvenation just similar to the living organism and are machines and activities in the cities determines its activities [24] [25] EIA covers generally landscape , cultural heritage and nature. It also evaluates socio-economic impacts of the said projects. 2 major approaches of environmental impact assessment (E.I.A). (a) Political and (b) Administrative; Steps of Administrative; application to concern authority, public hearing, EIA drafting, Second public hearing, Final Draft and Complaining strategies. Steps of Political; (1) EIA steps formation (2) Observation and comment (3) Handling statements (4) Evaluating comments and (5) Supplementary statement. The pilot survey conducted before the main study reveals the respondents' responses as; vegetation cover is rapidly decreasing in Kano has total of 92% of responses when strongly and agree combined together. In addition, responses on housing sector is rapidly increasing is strongly agreed by (90%), population is rapidly growing maintains 90% strongly agreed while domestic energy usage is supported by 65% but temperature increases in Kano records 53% responses. Generators usage promotes air pollution has 100% agreed responses. Wood fuel and charcoal production affects the environment records 85% while few buildings have trees depicts 79% while over dependent on petrol to power generates pollute the environment 66%. Haphazard and rapid urban and population growths and high rate of urbanization in Kano metropolis required to ascertain its environmental challenges with regards to its proliferation in the urbanization processes. The in depth study could help in the control which may lead to the total conservation of the natural environment and it will protect the

environmental quality for human habitation and safeguard the natural ecosystem. There is needs to mitigate the environmental impacts of housing urban growth in Kano Metropolis Nigeria.

2.0 STUDY AREA

[26] tated that the traditional fortified Kano establishment reflected 10Th Century and it served as the major and prominent Tran-Sahara routes for trades. Kano city is more than 1000 years and started within Dala Hill [27] Kano Metropolis is geographically located within Latitudes 12 ^{o} 25 ^{l} N to 12 ^{o} 40 ^{l} N and Longitude 8^{o} 35^{l} E to 8^{o} 45^{l} E. It is the most developing and urbanizing cities and commercial center of the Northern Nigeria. Kano metropolis population is projected to reach 5,724,000 people by 2025. Major cities of Kano and Lagos together with other major cities has an annual urbanization of 3.61% within 2015 and 2018. It is highly crowded with 1000 people per Square kilometer (KM^2) and its climate is wet and dry base on Koppen's classifications [28][29] [30] In addition, it is the Commercial center of 19 Northern states of Nigerian. Kano Metropolis is the most commercialized and industrialized metropolis in the Northern Nigeria that attract influx of migrants from and outside the region. There is huge gap therefore and calls for in-depth studies of housing growth and its environmental impacts in the Kano Metropolis as demonstrated by the Pilot studies conducted.



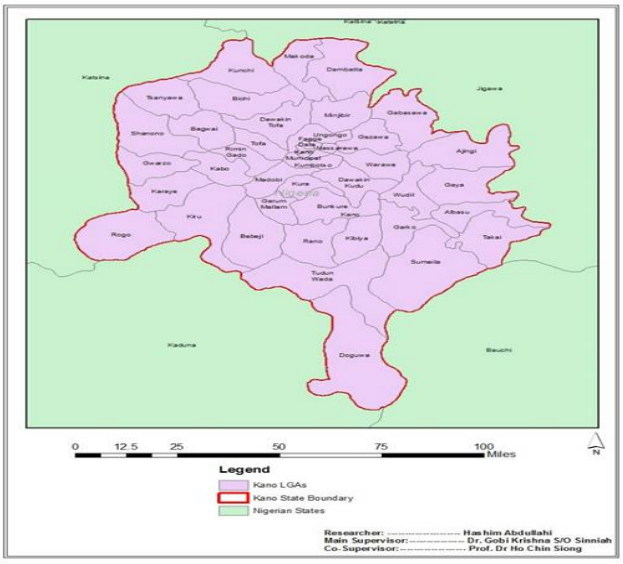


Figure 1a. *Showing Nigeria and its 36 states and FCT Figure1b. Showing Kano State and its LGAs*

3.0 AIM

Aim of the study is to assess environmental impact of rapid urban growth in Kano metropolis, with reference to migrations of urban settings from traditional to modern Urban Planning, Land Uses Changes Challenges towards sustainable built environment.

4.0 MATERIALS AND METHODOLOGY

The study employed Geographical Information System (GIS) which covers 35 years (1984 to 2019) and it employed Remote sensing technology and the Landsat images of 1984 , 1998 together with 2019 were classified into four major categories as (a) Farm land / open fields (b) Trans cape / Irrigated field (c) Built up areas and (d) Water bodies but built up area is only considered for this study for built up areas changes determination. Four hundred (400) structured questionnaires was also administered. E View 8 version was adopted for the analysis, while photographing and oral interview was conducted. Descriptive statistics was employed for the data results interpretations with the support of photographs obtained during the site survey.

5.0 DATA ANALYSIS

S/N	Land covers	1984		1998		2019	
		Area (Ha)	Area (%)	Area (Ha)	Area (%)	Area (Ha)	Area (%)
1	Built up areas	5,563.,816	3	15,594.642	9	22,423.44	36

Table 1*. Indicating trend of rate of increase of built up areas from 1984, 1998 and 2019*

The trend of changes in built up areas is 5,563.816 Ha in 1984, 15,594.642 Ha in 1998 but it tripled the valued of 1984 in 2019 rose to 22,423.44 Ha. It is inferred that built up area is the only major converter of farmland/open fields in the metropolis. The built up area has positive growth throughout the study period. Built up Areas growth as reveals by the study

is more obvious trends within 1984-1998 (23.59). The study shows positive growth also within 1998-2019 (5.18). Annual changes records are 1984-1998 (1.67) and 1998-2019 (0.25).

Incomplete New Estate Complete Buildings

***Figure 2a** and 2b. Indicating rapid urban growth pictures in the metropolis*

Lay- out Development in Kano Metropolis is at high increase. The study indicates that the states government in its efforts to provide decent and affordable housing for its people. The state government from the last 3 decades is making great efforts in the construction of massive housing in the form of cities.

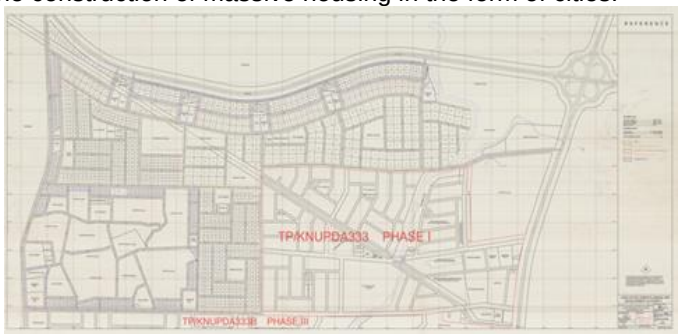


***Figure 3**. Showing proposed residential commercial lay –out Kwankwasiya City Phase II along Western Bye Pass*

Proposed Residential Commercial Lay–out Kwankwasiya City Phase II along Western Bye Pass. Digitally designed and with plots sizes for residential 60m by 60m for Low density. The medium density plots sizes is 45m by 45m while high density plot sizes is 45m by 30m. Plot sizes for commercial is 30m by 30m and the sum total plots is 929. This is an indicator of the state government in housing delivery which has significant implications.

***Table 2**. Showing trend of rate of decrease of land-uses (Farmland/ open fields) for 1984, 1998 and 2019*

S/N	Land covers	1984		1998		2019	
		Area (Ha)	Area (%)	Area (Ha)	Area (%)	Area (Ha)	Area (%)
1	Farmland /open fields	163,383.558	91	142,148.164	79	-30,333.824	49

Sources: Field Survey, 2019

Changes trend in farm land/open fields within 1984-1998, the study indicates significantly cut down by (-49.94%), 1998-2019 it deeply dropped by (-84.90) while annual Changes 1984-1998 (-3.57%) and 1998-2019 (4.04). This experienced rapid reduction within the study period. The study unveiled that Rapid Land Use Changes (Reduction of farmland/open fields) in Kano Metropolis is because of the following factors. Farm land /Open Fields is converted into Built up areas expansions for residential, circulation, commercial and for irrigation farming. The study also indicates that vegetation cover is affected by Wood fuel and Charcoal productions Timber production for building construction (Roof members, doors, windows and related interior decoration furniture)

***Figure 4a,** 4b, and 4c. Illustrating farm land/open fields farmers manually harvesting rice*

***Table 3**. Revealing respondent who owned personal houses within the metropolis*

Dependent Variable: OHS
Method: Least Squares
Date: 08/07/19 Time: 15:24
Sample: 1 215
Included observations: 215

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.984147	0.038623	51.37162	0.0000
NHH	-0.011568	0.015667	-0.738324	0.4611
NPH	-0.004257	0.005988	-0.710922	0.4779
NRH	-0.001274	0.007784	-0.163656	0.8702
MTC	-0.909402	0.026090	-34.85646	0.0000
NRR	0.002325	0.007094	0.327780	0.7434
MRR	-1.93E-05	5.10E-06	-3.781209	0.0002

R-squared	0.947663	Mean dependent var	0.395349
Adjusted R-squared	0.946153	S.D. dependent var	0.490067
S.E. of regression	0.113719	Akaike info criterion	-1.478149
Sum squared resid	2.689879	Schwarz criterion	-1.368407
Log likelihood	165.9010	Hannan-Quinn criter.	-1.433808
F-statistic	627.7072	Durbin-Watson stat	0.687837
Prob(F-statistic)	0.000000		

Source: Field Survey, 2019

Looking at the findings of the study, it can be observed that, each of the Slope Coefficient gives the rate of changes in the probability of Environmental Impact (Buildings ownership) occurring for a given unit change in the value of explanatory variables. Number of households per house (NHH), number of people per house hold (NPH), number of rooms per house (NRH), materials used for constructions (MTC), and number of rooms rented (NRR) and Monthly rent per room (MRR). The regression coefficient of the variables number of households per house (NHH), number of people per house hold (NPH) -0.011568 and -0.004257 which implies that, holding all other variables constant, a one increase in number of households per house (NHH), number of people per house hold (NPH) on an average, the probability of Environmental Impact will increase lower by about (-1.1%) and (-0.4%). The regression coefficient of the variables number of households per house (NHH), number of people per house hold (NPH) -0.001274 and -0.909402 which implies that, holding all other variables constant, a one increase in number of rooms per house (NRH), materials used for constructions (MTC), on an average, the probability of Environmental Impact will increase lower by about (-0.1%) and increase higher by (90%). The regression coefficient of the variables number of rooms rented (NRR) and Monthly rent per room (MRR) 0.002325 and -1.93E-05 which implies that, holding all other variables constant, a one increase in number of rooms rented (NRR) and Monthly rent per room (MRR) on an average, the probability of Environmental Impact will increase lower by about (0.2%) and increase higher by (1.9%). The coefficient of

determination (R2) (0.947663) shows that about 94% of the changes in the dependent variables (Environmental impact of rapid urban growth) was accommodated for the changes in the explanatory variables (Number of households per house (NHH), number of people per house hold (NPH), number of rooms per house (NRH), materials used for constructions (MTC), number of rooms rented (NRR) and Monthly rent per room (MRR). The coefficient of determination (R2) (0.947663) shows that about 94% of the changes in the dependent variables (Modern Houses) was accommodated for the changes in the explanatory variables (Number of households per house (NHH), number of people per house hold (NPH), number of rooms per house (NRH), materials used for constructions (MTC), number of rooms rented (NRR) and Monthly rent per room (MRR).

Figure 5a, *5b and 5c. Showing historic growth of Kano Metropolis 1955 to 2019*

Table 4; *Buildings environment descriptive analysis of those who owned houses*

	AGE	LOC	SZE	TNR	TREE	TYP
Mean	10.65946	1.627027	1.827027	1.772973	0.583784	1.837838
Median	11.00000	2.000000	1.000000	1.000000	1.000000	2.000000
Maximum	22.00000	2.000000	3.000000	3.000000	1.000000	3.000000
Minimum	1.000000	1.000000	1.000000	1.000000	0.000000	1.000000
Std. Dev.	6.102185	0.484907	0.898262	0.854861	0.494268	0.734015
Skewness	0.055161	-0.525345	0.345856	0.451389	-0.339942	0.262049
Kurtosis	1.714021	1.275987	1.334579	1.523694	1.115560	1.893071
Jarque-Bera	12.84142	31.42047	25.06821	23.08252	30.93627	11.56227
Probability	0.001628	0.000000	0.000004	0.000010	0.000000	0.003085
Sum	1972.000	301.0000	338.0000	328.0000	108.0000	340.0000
Sum Sq. Dev.	6851.546	43.26486	148.4649	134.4649	44.95135	99.13514
Observations	185	185	185	185	185	185

Source: Field Survey, 2019

Table provides descriptive statistics of respondents that owned houses of their own. It covers age of building (AGE), location of building (LOC) , plot sizes (SZE), types of tenure system (TRN), tree within houses (TREE) and types of houses respondents owed (TPY). This category covers one hundred and eighty-five (185) respondents that personally either built, purchased, inherited, mortgage loaned, government housing program or respondents were given houses. Age of building (AGE) indicates both minimum and maximum values as 1.000000 and 22.00000 together with 10.65946 and 6.102185 as its values for means and standard deviation. Location of building (LOC) shows equal of 2.000000 for both its minimum and maximum value and its means and standards deviations records as 1.627027, 0.484907. Plot sizes (SZE) depicts on the other hand also slightly different records with the location of building (LOC) if carefully observed. Its minimum and maximum values are 1.000000 and 3.000000, but its values of mean and standard deviation include 1.827027 and 0.898262. Besides, types of tenure system (TRN) which covers customary certificates of occupancy, statutory certificates of occupancy demonstrate exact minimum and maximum value with plot sizes (SZE) 1.000000 and 3.000000 but with closely values of mean and standard deviations 1.772973, 0.854861. In addition, houses with tree within its premise (TREE) reveals unique minimum value of 0.000000 but with 1.000000 for its standard deviation. Mean and standard deviation of 0.583784 and 0.494268 respectively. Types of houses respondents owed (TPY) portrays 1.000000 and 3.000000 and mean and standard deviations of 1.837838 and 0.734015. It can be inferred that, there is significant environmental impact in Kano metropolis in-term of pre- constructions environmental impacts of site clearance, transportation of building materials, energy used for constructions as well as conversion of tress into timber for construction process.

In addition, the regressions coefficient of the variables location of building (LOC), tree within houses (TREE) are -0.156628 and 0.004486. This implies that, holding all other variables constant, a one increase in each of location of building (LOC) , tree within houses (TREE) on an average, the probability of Environmental Impact will increase lower by about (-15%) and (0. 4%). In addition, the coefficient of determination (R^2) reveals that relatively 0.94% of the changes in the dependent variable (DV) environmental impact was fully captured therefore the changes within the explanatory variables number of households per house (NHH), number of people per house hold(NPH) , number of rooms per house(NRH) , materials used for constructions (MTC), types of houses respondents owed (TPY), plots sizes (SZE), Age of building (AGE), types of tenure system (TRN), location of building (LOC).

Figure 6*. Revealing Tradition and modern houses in the study area*

Table 5.
Showing Correlation analysis of respondents that owned houses

	AGE	LOC	SZE	TNR	TREE	TYP
AGE	1.000000	0.799887	0.883531	0.890458	-0.802252	0.827253
LOC	0.799887	1.000000	0.712015	0.699264	-0.651222	0.852191
SZE	0.883531	0.712015	1.000000	0.967752	-0.909738	0.814477
TNR	0.890458	0.699264	0.967752	1.000000	-0.880836	0.841782
TREE	-0.802252	-0.651222	-0.909738	-0.880836	1.000000	-0.741313
TYP	0.827253	0.852191	0.814477	0.841782	-0.741313	1.000000

Source: Field Survey, 2019

Building Environment (respondents that owned houses of their own). Age of building (AGE) shows with location of building (LOC), plot sizes (SZE), types of tenure system (TRN),) and types of houses respondents owed (TPY). It shows negative correlation with tree within houses (TREE). Location of

building (LOC) reveals correlation positively with Age of building (AGE) shows plot sizes (SZE), types of tenure system (TRN), and types of houses respondents owed (TPY) except tree within houses (TREE) that indicates negative correlation. Finally, the table demonstrates that all variable in this category depicts positive correlations within all variables excepts except tree within houses (TREE) that indicates negative correlation with other variable and the variable also indicated same trend. This can be inferred that, there are less trees (Vegetation) within buildings especially Old Town residential areas and commercial buildings within the entire Kano metropolis. This therefore affects the air quality of the metropolis which has environmental impacts implication.

***Figure 7a** and 7b. Indicating lay-out and complete and incomplete building in Kano Metropolis*

5.0 RESULTS AND DISCURSIONS

The result unveiled that, as the farm land/open fields dramatically reducing with the study area, on the other hand built up area speedily and rapidly increasing. The study indicates significantly cut down in farm land/open fields by (-49.94%), 1998-2019 it deeply dropped by (-84.90) while annual Changes 1984-1998 (-3.57%) and 1998-2019 (4.04). This has positive growth throughout the study period. In contrary, built up Areas growth as reveals by the study is key player of farm land converter in the metropolis. This is very obvious trends within 1984-1998 the built up area rose by 23.59%. The study shows positive growth also within 1998-2019 5.18%. Annual change records of built up area are stated as 1984-1998 1.67% and 1998-2019 0.25% respectively. The trend of changes in built up areas at a glance is 5,563.816 Ha in 1984 but this tripled it initial value of 1998 with 15,594.642 Ha. The Built up Area in 2019 rose to 22,423.44 Ha. It is inferred that built up area is the major converter of agricultural land into various physical land use especially residential and commercial land uses in the metropolis. This required in depth control in order to have sustainable development that will allow future generations enjoy the abundance natural resources within the study.

7.0 RECOMMENDATIONS

The study uncovers the strong need of urban and regional intervention with regards to the rapid and dramatic urban growth that has serious environmental implications. Some of the obvious environmental challenges include vegetation cover reductions as part distortion of eco-system. This through site clearance and charcoal and wood fuel production. It is strongly recommended that spatial urban planning frame work to be developed with emphasis urban growth management frame work in the metropolis. It could be used as guide for adoption by Kano State Urban Planning Development Authority (KANUPDA), Ministry of Environment, and Ministry of Housing. The urban growth management frame work could also be used in other Nigerians major cities and in African countries as well. Globally, it could also be used especially in developing countries. This survey results call for strong recommendations for in-depth research to be conducted on urban growth management frame work to mitigate the environmental impacts of rapid urban growth in Kano metropolis. This may improve the environmental sustainability through the frame work implementation together with socio-economies of the study area. It could help in the preservation of natural resources and the ecosystem, aesthetic could be attained in the study area.

Finally, Haphazard and rapid urban growth and significant population increase which lead to high rate of urbanization in Kano required elaborative study which will support and control properly the environmental impact of the rapid urban growth with the metropolis. The study if conducted will lead to the total preservation and conservation of the natural environment and its available resources for sustainability. The study if conducted will also promote the environmental quality for human habitation and it will mitigate and minimize damage to natural ecosystem. There is needs to mitigate the environmental impacts of urban growth in Kano Metropolis Nigeria.

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