



Implications of Present Land Use Plan on Urban Growth and Environmental Sustainability in a Sub Saharan Africa City

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History:

Received: 15 February 2017

Accepted: 30 March 2017

Available Online: 30 May 2017

Keywords:

Land use, Urban Development, Urban Growth, Environmental Sustainability.

DOI:

10.11113/ijbes.v4.n2.181

ABSTRACT

Land use, urban development and environmental sustainability have become an interesting research arena as urban development would change the city landscape as well as generate environmental degradation. This paper looks at the missing link between land use planning and urban growth, and its implications for environmental sustainability in a selected sub Saharan Africa city of Kaduna, Nigeria. We assessed urban growth from historical GIS data of the city to evaluate the urban expansion. At the same time, regression analysis was used to establish a relationship between carbon emission and traffic volume in the city. A city characterized by weak land use planning has created a gap leading to uncoordinated land use planning and uncontrolled physical growth. A steady increase of built up area of 8,400.31 hectares in 1982 to an area of 17,120.5 hectares in 2015 can be a reflection of the presence of uncontrolled urban expansion. The lack of coordination between land use planning and urban growth has resulted in environmental ills within the city. One among the ills, is ubiquitous traffic congestion within the city leading to high carbon (CO₂) emission. Findings show a strong connection between emission and volume of traffic. In addition to findings, the decline of green areas in the city. By these findings, it is suggested that the modern concept of land use planning which embraces flexibility, public participation and integration of environmental issues should be entrenched and allow to take the lead in the process of urban growth.

1. Introduction

Inability of the land use planning to cope with the dynamics of urban growth that harms the environmental sustainability has led to the growth of detrimental cities in the sub Saharan region. The complication calls for immediate attention from urban authorities and stakeholders. Over the years, the concept of urban land use planning in third world countries of Sub Saharan Africa was committed to what was earlier obtainable in the Western Countries. The present planning system itself was the reflection of colonialism. For example, the land use planning system of Ghana was fashioned to pursue her colonial master agenda (Njoh, 2009; Rakodi, 2006). Similarly, in Nigeria the planning system is cruelled and outdated. It was anchored on the 1946 act which was a product of 1932 Town and Country Planning act in the United Kingdom (Aribigbola, 2008). This was common to many countries in the region. The most prevalent characteristic of urban land use planning in the region is confined within a rigid system of top-down approach instead of a participatory bottom-up approach. The approach commonly entails the allocation of land to various designated urban activities over a long period of time, without due consideration of urban dynamism and participatory. On the other hand land use planning at the local level is considered upon as a guide by stakeholders towards neighborhood future

land use pattern (Philip, David, Edward, & Daniel, 2006). As a result, land use plan has been implemented in the absence of sufficient participation from the citizens as the primary stakeholders. In the meantime, Agenda 21 has addressed that land use planning should be a collective decision making process that guide and aid allocation of urban land to activity that provides the many benefits to the citizens in a sustainable manner. Towards this sustainability, the land use planning should be able to accommodate many sustainable values as showed in Figure 1.

The need for effective land use planning amid rapid urban growth in sub Saharan African Cities remains paramount. Globally, projected urban population by 2050 will account for 70 percent of world population (Seto & Shephard, 2009). About 90 percent of the urban population increase will occur in Africa and Asia (UN, 2014), with sub Saharan African region leading across the Continent. As growth of urban areas remain unabated in the coming years, it is expected that more pressure will be on land at both the urban Centers and suburbs. Therefore effective land management system that will guide and direct human activities remains very dominant. Land remains the basic natural resource upon which all developmental activities depend. Considering the interacting and conflicting nature of activities on this vital urban

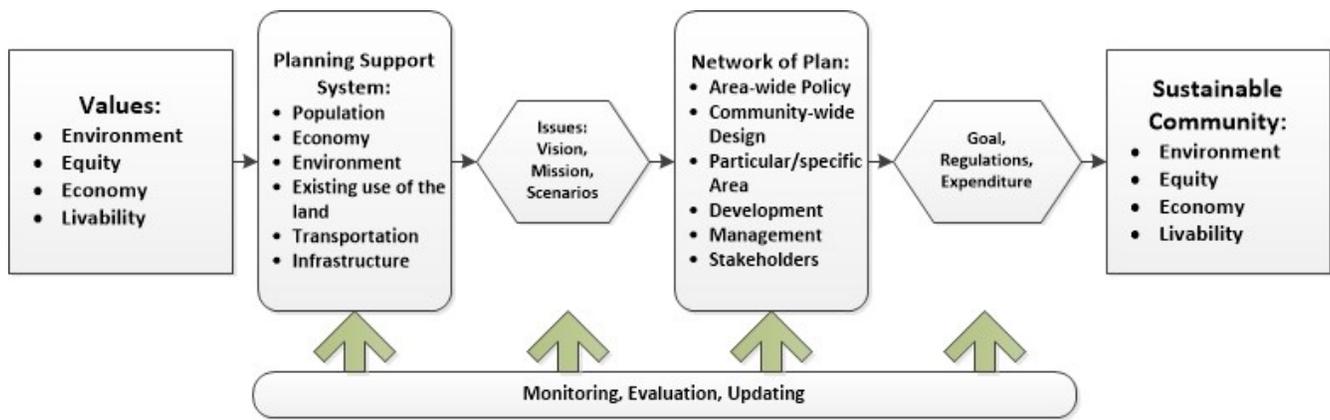


Figure 1: Conceptual Framework of Land Use Planning (adopted from Philip et al., 2006)

resource, it is essential, to design a detail proposal on effective allocation and management of land in a coordinated manner (FEPA, 1998). Land is regarded as limited in supply, but a fundamental natural resource that sustained urban growth and transformation. Without sufficient land, the urban growth cannot be accommodated appropriately. The ability to guide land use changes is critical to control and regulating expansion and connectivity in urban areas. Therefore adequate land management through compatible land use system promotes efficient and resilient urban development geared towards Sustainability (World Bank, 2013). Consensus shows that urban land use planning remains the appropriate tool that can be used by urban stakeholders for effective and proper management of urban growth in the 21st century (UN-Habitat, 2009).

The inability of land use planning to cater for the rapid urban growth and attain the goal of environmental sustainability has remained a major setback to the development of urban Centers in the study. This inefficacy has resulted in the illegal acquiring of land which, in the long run creates urban squatters, slums and shanties as well as substandard informal development in urban areas. For instance, according to the study of (Amao, 2012; Aribigbola, 2007; Eko, Ayama, Eni, Eja, & Esien, 2012; Yadau, 2012). Some of the urban ills associated with informal growth include: uncontrolled development or loose development control, weak economic basis, destruction of urban natural resources, and above all the violation of development regulations. Rapid urban growth without a strong guide of land use planning as a tool for land allocation and regulation, may gradually lead to a degenerated and deplorable condition of the physical environment. In this case, the urban areas in sub Saharan are mostly characterized by concentric urban form with radial expansion growth which is particularly dictated by economic motives and population pressures.

In many countries, the land use plan has been a veritable tool in urban planning and the development of urban areas over the years. Land use planning systems in the developed world of Western Europe and Northern America can be described as very pragmatic and have continued to respond to urban dynamism sharply. In contrast, loose urban development control present in the study area despite the existing urban plan. The contemporary issue in land use planning today is flexibility and shift to embrace more participatory, democratic involvement and integrated process. A link between land use planning and environmental issues which is already a new frontier in the developed world is very much lacked in sub Saharan countries. Watson (2009), argued that the old way of land use planning in urban planning and development gives little attention to poverty and sustainability amid

rapid urban growth. Indeed, the old approach tends to limit its effectiveness and efficiency. This has given rise to the assertion that land use planning systems in sub Saharan region is fragile (Dowell & Ellis, 2009). The application of land use planning system in urban planning for the sub Saharan region has over the years been criticized in studies by Egbu (2007), Kironda (2006), Njoh (2009) and Watson (2009). The basis of criticism was the inability of the system to monitor urban growth and enhance urban welfare. The lack of harmony between urban growth and key environmental sustainability indicators can say to be a reason for the indictment of the land use planning system over the years. This negative trend has limited the role of land use planning as a drive to efficient urban growth that promotes environmental sustainability in sub Saharan African cities.

This paper is aimed at assessing the efficacy of land use planning system on urban growth and to ascertain its consequences on environmental sustainability in a sub Saharan city of Kaduna. The old land use system couple with the lack of will power from urban authority in the control of urban development may have resulted in the current urban form which has created harm to the sustainability of the city. Finally, the objectives of this study can be outline as follow: to established evident and trend of growth for the city over the years, to trace the existing gap between the planning system and growth in the city, to established the environmental ills that has affected the attainment of environment sustainability target for Kaduna urban area over the years and finally put forward policy recommendations.

2. Study Area

Kaduna is a colonial town founded in 1907 by the British colonist. It became the capital of northern Nigeria region in 1917. Geographically, Kaduna is located between latitude 10 degrees, 27'N to 10 degrees 38'N and between longitude 7 degrees, 20'E to 7 degrees 35'E. Figure 2 shows the outline map of Kaduna urban area. Kaduna is divided into almost two equal parts by a seasonal Kaduna River. The city is ranked third with respect to population size after Kano and Abuja in Northern Nigeria and considered as a strong political, economic and military base in Nigeria. It is made of four administrative councils namely: Kaduna North, Kaduna South, Chikun and Igabi. A focus on Kaduna is motivated by the structural changes in the physical forms, population, economic and social composition of the city due to rapid growth through the year. It is pertinent to note that, Kaduna urban area like many sub Saharan Africa cities is characterized by the following:



Figure 2: An outline map of Kaduna urban area (Masterplan, 2010)

- A concentric growth pattern that expands away from the central area of the city to form a mono centric land use pattern.
- High concentration of population density amid shortage and poor condition of existing infrastructure
- Development of informal ribbon settlements along the major routes in the city.
- High traffic congestion along the major routes in the city during peak hours of the day.
- Rapid land use conversion that is detrimental to rich natural vegetation and organized open spaces and
- Lack of greenbelt area to demarcate the urban boundary from adjoining regional areas.

3. Material and Approach

The study employed both primary and secondary data, and information materials in this work. We also carried out an in-depth review of relevant literature materials and extracted them in line with the area of interest. We retrieved Kaduna Urban area Landsat imageries showing Land cover/Land use trend for the years 1982 through 2015. Parah Urban Konsult supplied the digital data in ArcGIS format. We carried out the analysis on the satellite imageries by using ArcGIS 10.2 software. Finally, we undertook the counting of traffic flow manually by using a tally sheet at selected points along selected routes in the city. Higher National Diploma students in their second year of study were trained and utilized for this purpose.

4. The Concept of “Sustainable Development” and “Environmental Sustainability”

The concept of sustainable development is basically to balance between economic prosperity, environmental quality and social welfare for the

benefit of human wellbeing. Sustainable development is to address the need of the present without jeopardizing ability of the future generations to meet their needs (WCED, 1987). This definition shows that, the baseline for sustainable development is the need for proper integration of environmental management in the quest for efficient economic development across all sectors. The environmental component of sustainable development is a major concern for urban stakeholders’ amid rapid urbanization trend in third world countries of sub Saharan Africa. “Environmental sustainability” as a concept is defined as a condition of stability, resilience and linkages that enables human society to meet its needs.

Based on the objectives set out in this paper, environmental sustainability can be assessed using different indicators. However, table 1 above shows an array of indicators that are related to the environmental component of sustainable development. On the global perspective, CO₂ emission from Africa countries is very low (MDG Report, 2013) however, Concentration of CO₂ at the local level of city like Kaduna may be very high. Similarly, environmental sustainability under different themes can be assessed based on the listed indicators on the table. The emergent of environmental sustainability concept buttresses the importance of the environmental component in

Table 1: Sustainability Indicators

No	Theme	Relevant Indicators	Source
1.	Protection of the atmosphere.	<ul style="list-style-type: none"> • Emission of Greenhouse gases e.g. CO₂ • Consumption of ozone depleting substance • Ambient concentration of air pollutants in urban areas • Emission of Nitrogen Oxides, Sulphur Oxides and Carbon Monoxide. 	Jackson & Roberts, 2000; UN, 2007a; EIS, 2005.
2.	Land	<ul style="list-style-type: none"> • Fertile and available cropland area for agriculture. • Land area covered by Natural Vegetation e.g. Forest. • Land use change 	UN, 2007a; S.I.A, No Year.
3.	Urban Environmental Quality	Public green area, neighborhood green area, Green-belt area, Green playground.	EURO-STAT, 2001.
4.	Reducing Human Vulnerability	<ul style="list-style-type: none"> • Natural disaster exposure e.g. Flooding, earthquake • Percentage of people living in hazard prone areas. 	ESI, 2005; UN, 2007a.
5.	Biodiversity	<ul style="list-style-type: none"> • Terrestrial coverage under protection • Threat to available Species, and Native Vegetation 	UN, 2007a, S.I.A, No Year.
6.	Human Settlement development	Urban Population density Formal and Informal Urban Settlements.	Jackson & Robert, 2000.
7.	Water	Water quality, underground Water Reserves and dissolved Oxygen in Water.	ESI, 2005; UN, 2007a
8.	Human consumption and Production Pattern	<ul style="list-style-type: none"> • Yearly energy Consumption, • Amount of Energy Used, Waste Reuse and Recycle • Modal Split and Urban Transportation. 	UN, 2007a; EURO-STAT, 2001.

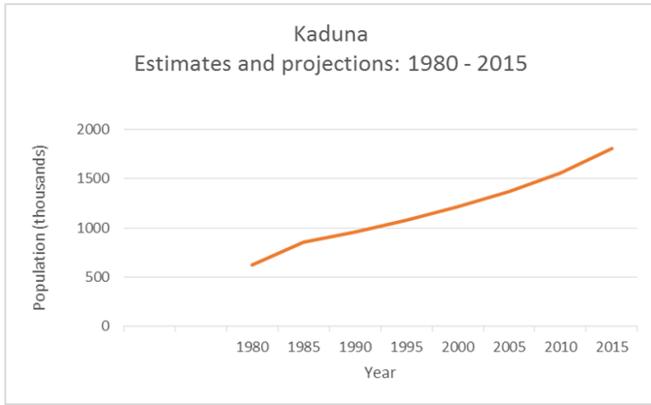


Figure 3: Kaduna Population Estimate (UN, 2007)

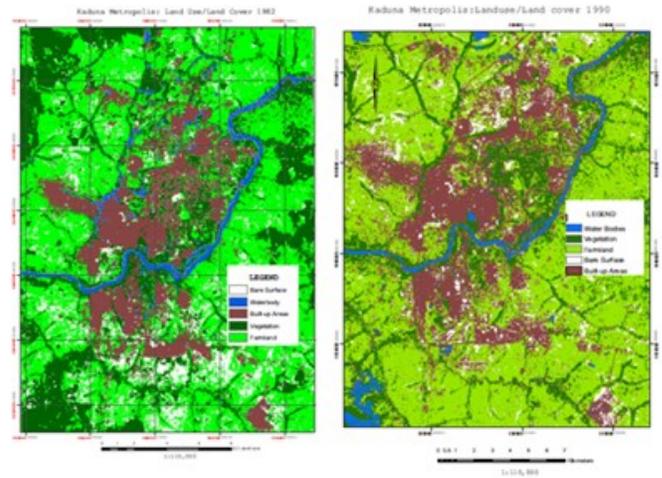


Figure 4 and 5: Land Use of Kaduna 1982 and 1990

sustainable development and reaffirmed the importance attached to environmental issues in the 21st century.

5. Evidence and Trend of Growth in Kaduna Urban Area

Transitional growth of Kaduna over the years can be ascribed to both demographic and physical increase. The population composition of the city has continued to grow steadily. Increase in population can be related to natural increase through birth rate and the influx of people from within and outside the country. Furthermore, the growth of Kaduna can also be assigned to its proximity to Nigeria Federal capital territory, Abuja (Abbas, 2010). A city with a population base of 628,000 people in 1980 has an estimated population of 1,807,000 in 2015 based on projection (UN, 2007). At the national level, Kaduna is ranked fifth. Figure 3 shows evidence of steady population increase from 1980 to 2015. The population is expected to grow steadily and is projected to reach 2,083,000 million by the year 2020.

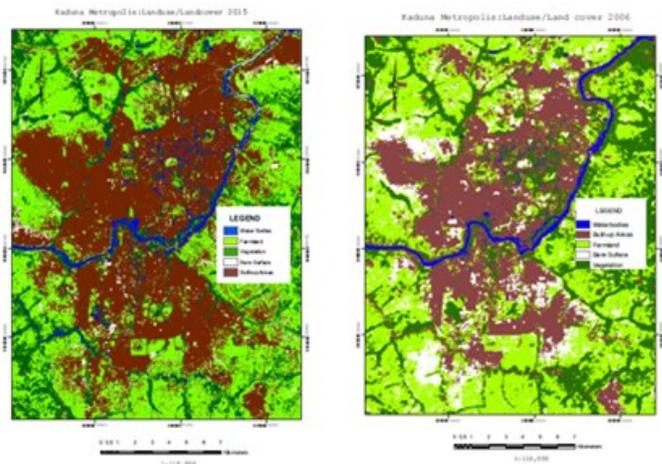


Figure 6 and 7: Land Use of Kaduna 2015 and 2006

Evidence of physical growth can be observed in changes in Land use and Land covers in the city. The initial development plan for Kaduna urban area was to cover a radius of 15km from the central area. However, the city has far exceeded its boundary limit to about 20km to 25km radius from the center. Figure 4, 5, 6, 7 shows steady increase in built-up area from 1982 to 2015 respectively. A transitional expansion of the city over this period is established. A breakdown of Table 2, shows a steady increase of built-up areas of 8440.31 hectares in 1982 to an area of 17,120.5 in 2015, is a clear indication of urban expansion and urban sprawl. A general trend of growth in the city as

seen in Figure 8, shows a gradual increase in built-up area, while the natural areas of the city depicted in farmlands, vegetation's, bare surfaces and water bodies keep declining. A look at the land uses within the built up area in 2015 shows predominant residential use. It has an area of 15,695.16 hectares. The organized open green space is the least within the category of land use with 154.03 hectares. Empirically, Kaduna has witnessed growth in terms of population increase and expansion of built-up areas over the years, without proper development control by the authority.

Table 2: Land Use in Kaduna

No	Land Cover	Land Area (Ha) 1982	% of Land Area (1982)	Land Area (Ha) 1990	% of Land Area (1990)	Land Area (Ha) 2006	% of Land Area (2006)	Land Area (Ha) 2015	% of Land Area (2015)
1.	Built-Up Area	8,440.31	18.7	9,110.36	20.3	10,920.90	24.4	17,120.50	38.2
2.	Farmland	23,175.12	51.5	22,704.80	50.6	19,465.30	43.2	18,256.00	39.7
3.	Vegetation	10,019.60	22.7	9,919.60	22.1	9,373.00	20.7	8,391.15	17.6
4.	Bare Surface	2,159.30	4.8	2,059.30	4.6	4,347.39	9.4	1,214.82	2.5
5.	Water bodies	1,040.33	2.3	1,040.33	2.3	1,012.03	2.3	920.55	2.0
Total		44,834.39	100.0	44,834.39	100.0	44,834.39	100.0	44,834.39	100.0

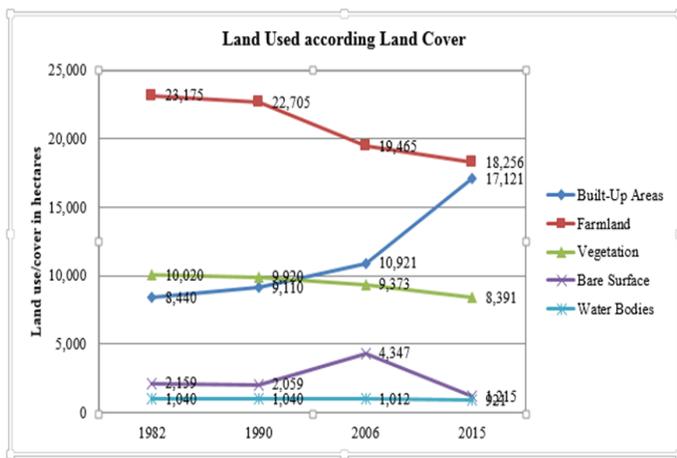


Figure 8: Trend of Land use/Land cover 1982-2015

The spatial growth of Kaduna like other cities of sub Saharan Africa region are characterized by the following:

- Sprawling along the major route of the city and the conversion of rich natural land to built-up area.
- Urban growth is guided by disjointed land sub division plan that has no regard for environmental issues.
- Depending on old and outdated land use plan which does not consider the contemporary dynamism of urban growth.
- Weak planning mechanism in form of development control trailing urban growth from behind.

6. The missing link between land use planning and urban growth.

Land use planning activities in Kaduna urban area were initially the mandate of Kaduna Capital Development Board (KCDB) established in 1967. KCDB was subsequently transformed to be Kaduna State Urban Planning and Development Authority (KASUPDA). Currently, KASUPDA is the statutory organ in charge of land use planning in the city. As an authority, KASUPDA is legally empowered for the planning, implementation, monitoring and control of development activities in Kaduna urban area as enshrined in the Nigerian Urban and Regional Planning Law, 1992 Decree No.88,1992 and Decree No.18,1999 (as amended).

The following institutions are participated in the KASUPDA membership: the former Kaduna State Ministry of Lands, Survey and Country Planning, Kaduna State Development and Property Company, the four local government Councils that constituted Kaduna urban area, private developers and land speculators. The tenet of land use planning has been reduced and limited to what this paper considers as “territorial land subdivision” by the listed institutions above. The involvement of multiple organs in land use planning activities within the city poses a major challenge for proper urban planning. The current situation results in lack of coordination and effective monitoring process. Similarly, overlapping of function and lack of a common focus for the city are major lapses. KASUPDA, the legal organ mandated for land use planning has been weakened and incapacitated to a large extent. Some of the current challenges facing

urban planning activities in Kaduna are the lack of coordinated plans that will guide growth in the city. The last and only approved plan for guiding physical development in the city was the 1967 master plan (i.e. The Great Kaduna Master Plan 1967-2020). The plan was prepared base on the rigid top-down approach and span through a very long period of time. Therefore, neglecting due consideration of urban dynamism over time. The urban dynamics exist every day, thus a city plan must be flexible to respond to the urban dynamics. The core elements of flexibility, participatory, democratization and integration were lacked. An attempt to review the 1967 plan in 2010 only received bureaucratic bottom neck. However, the reviewed Master plan was formally endorsed and approved as a working document in 2016 without functional organ for implementation. Empirical evidence has shown that, the growth of the city has exceeded the 1967 master plan provision by far. The scenario has resulted in poor growth been guided by uncoordinated land subdivision and weak planning mechanism in form of development control trailing from behind.

Land use planning has been unable to measure up with the rate of urban growth of the city. The pace of land use planning intervention in land acquisition, preparation of plans, implementation, monitoring and projection of future growth does not correspond to the current reality in the city and has created a gap. This gap has led to a large scale proliferation of illegal layouts, emergent of sprawling settlements, distortion and overlapping on existing layouts (Hussaini, 2012). The peripheral growth of the city along major routes is characterized by informal settlements. The concept of land use planning has been reduced to “land subdivision” and control by illegal multiple organs. The lack of coordination and proper monitoring of growth have affected the infrastructure base of the city. This has buttressed the

Table 3: Traffic Volume Generated in the Two Peak-hours of Day.

No	Location	Traffic Volume at 7:00-9:00am PCE	Traffic Volume 4:00-6:30pm in PCE
1.	Kawo	5,083	4,985
2.	Kasuwa(Market)	4,683	6,227
3.	Station Roundabout	10,474	10,347
4.	Sabon Tasha	8,521	6,030

Table 4: CO₂ Concentration in selected location in Kaduna

No	Location	Geography Coordinates of Locations	Average CO ₂ Content at 7:00 -9:30am in ppm	Average CO ₂ content 4:00-6:30pm in ppm
1.	Kawo	N 10°34'39.4" E 7°26'41.1"	1,457	1,730
2.	Kasuwa (Market)	N 10°31'11.8" E 7°25'50.9"	1,169	1,855
3.	Station Roundabout	N 10°29'44.5" E 7°25'10.8"	1,850	1,884
4.	Sabon Tasha	N 10°34'39.4" E 7°27'31.4"	1,555	1,755
5.	Standard Limit		350	350

(Source: KEPA, 2015)

World Bank study on African infrastructure, which pointed out that sprawl in African cities will increase the cost of infrastructure delivery (World Bank, 2010) and may also retard cost recovery ability. Above all, the land use planning approach for the city is old and does not consider the contemporary dynamism of urban growth.

7. The current trend and implications for environmental sustainability.

Urban growth is part of the transitional trend associated with the urbanization process. The expansion of the urban area may not be a problem considering the strategic role of urban areas as the Center of human attraction and places of habitation and work in order to improve the standard of living (Fagbohun, 2007). However, the nature, pattern, direction and rate of urban growth have become the issue of contention over the years. A missing link between land use planning and uncoordinated urban growth poses a major threat to environmental sustainability in any city. The implications of this trend in Kaduna can be considered upon from the following environmental indicators: CO₂ emission resulting from high traffic volume, air quality and decline in natural green areas. The lapses in land use planning for the city have resulted to mono centric land use pattern. This pattern has impacted negatively on the transportation system. The uncontrolled expansion has continued to increase the distance between adjoining settlements and the city center. Increase distance between the origin and destination may discourage trekking or the use of a bicycle. Therefore, may result in auto-dependence (Kockelman, 1997; Permana, Perera, Aziz & Ho, 2015).

The regression analysis between CO₂ and Traffic volume at Morning Peak Hour (7:00-9:00am) was conducted. The result showed that F-test =10.006, p-value <0.05, means there is a significant positive association between traffic volume and CO₂ at morning peak hours along the points. The result of R-square=0.833, indicating a strong connection between traffic volume and CO₂ at morning peak hours (Table 5).

The regression analysis between CO₂ and Traffic volume at Evening Peak Hour (4:00-6:30pm). Shown that F-test =3.580, p-value <0.05,

Table 5: Relationship Between carbon emission CO₂ and Traffic Load at Morning Peak Hour (7:00-9:30am)

Pairs	Beta (β)	t	Sig.	F-test	p-value	R-Square
(Constant)	845.880	3.833	.001	10.006	0.000	0.833
Traffic Load (7-9.30am)	0.092	3.163	.000			

Table 6: Relationship Between carbon emission CO₂ and Traffic volume at Evening Peak Hour (4:00-6:30pm)

Pairs	Beta (β)	t	Sig.	F-test	p-value	R-Square
(Constant)	1630.759	16.880	0.003	3.580	0.020	0.642
Traffic Load (4:00-6:30pm)	0.025	1.892	0.020			

this figure means there is significant positive association between traffic volume and CO₂ at evening peak hours along selected points in the city. The result of R-square=0.642 and it indicated a strong connection between traffic volume and CO₂ at evening peak hour (Table 6).

Table 3, shows the average traffic load in the morning peak period of 7:00am to 9:30am heading to the city center along major routes from the adjoining settlements on working days and the average traffic load in the evening peak period of 4:00pm to 6:30pm moving out of the city center to adjourn settlements. The high traffic load which comprises different model splits usually leads to traffic congestion in the city during the morning and evening peak period. The implication of traffic congestion, is considered in extreme concentration of carbon emission emanating from the combustion of fossil fuel. Table 4, shows carbon emission concentration in selected points along traffic routes in the city of Kaduna. The results of the R-square 0.833 and 0.642 for the morning and evening peak period indicate a strong connection between traffic volume and CO₂. The data show a very high disparity between acceptable standard limit of 350 parts per million (ppm) and average values measured at all points. Carbon is not directly harmful to human health (ATPS, 2013) but remain very significant among the Greenhouse gases (GHGS). The effect of greenhouse gases like carbon in global climate change is regarded as the greatest environmental threat currently facing the world. Similarly, based on previous studies on air quality, it is proved that conventional air pollutants and Greenhouse gases are both generated by fossil fuel combustion (Smith, 2013) The emission of harmful air pollutants such as: Carbon monoxide, Nitrogen oxides, Sulphur dioxide and particulate matters has also been established. Air pollution related diseases in three hospitals in the city revealed that 3,073 cases of Asthma, Cardiovascular and Bronchitis disease between the years 2006-2011 were reported (Ezra, Dyaji, & Nwokedirioha, 2013). This revelation is a clear indictment on the air quality index for the city.

The poor and weak land use planning system has resulted in uncoordinated and unguided physical growth of the city. A gradual decline in green vegetation cover and the encroachment of built-up areas into the flood plain of river Kaduna poses a threat to environmental sustainability. The inability to reconcile between urban growth and greenery may likely result to Urban Heat Island (UHI) effect and may also affect the carbon sequestration ability in the city. The gradual increase in surface temperature due to conversion of vegetative surface to a hard and non-porous surface affects the urban environment. This trend affects solar radiation, evaporation rate and above all, may likely increase the energy need for the city.

The steady decline in farmland in the city increase more concern about the sustainability of urban and peri-urban Agriculture production. Agreed on the assertion that urbanization impact on land and water, puts urban food production at risk (Eaton & Hilhorst, 2003; FAO, 2000). This may likely affect food security and the livelihood of urban population that depend on this farmlands. The drop in agricultural activity may likely increase the poverty index for the city. Furthermore, the encroachment of built up areas along the flood plain of River Kaduna has attracted severe consequences to victims and urban authority over the years. Between 1976 and 2010 a total of 3,350 hectares of the floodplain was taken over as built-up areas for physical development (Opatoyinbo, Adepetu, & Abdullahi, 2015). It was believed that over 2000 residential houses along the plain of the River Kaduna were submerged, and thousands of people were displaced following excessive night rainfall in September, 2015 (News, 2015). This scenario is consistent with the United Nation report that 62% of

urban population in Sub Saharan Africa lives in life threatening condition, affected by environmental disasters such as flooding (UN-Habitat, 2009). Kaduna urban area is also bedeviled with the problem of solid waste management. The waste management path to environmental sustainability in it three “Rs” slogan of reduce, reuse, and recycle is not being practice. In 2015, questionnaires administered in the city show that 30.2% of respondents representing the highest, admitted that indiscriminate dumping of waste is the major environmental problem confronting them.

8. Conclusion and Policy Implications

As rate of urbanization and pace of growth in urban areas keeps escalating in sub Saharan Africa. The inability to harmonize between the land use plan and growth has created a widespread challenge for Kaduna urban area. Notable ills identified in this study are the large scale proliferation of illegal development along major routes of the city which has led the emergent of a sprawling settlement pattern far from the city nub of activities. Similarly, uncoordinated growth has remained a major predator of the urban rich natural areas such as farmland, vegetation and bare surface, and water bodies. The implications of this negative trend in environmental sustainability of Kaduna have manifested in the high traffic congestion resulting in high concentration of CO₂ above the acceptable limit. Air pollution related diseases identified for the city over the years are a pointer towards poor air quality due to pollutants. The encroachment of settlements along the Plain of Kaduna River which has resulted in annual flooding impact negatively to sustainability in the city. Finally, in order to promote resilient and environmental sustainability the restructuring and repositioning of land use planning institutional body to meet up with current challenges of urban transition is necessary. Then, the old and rigid approach to land use planning systems should be discarded and the new concept of flexibility, public participation and integration of environmental issues should be entrenched. An effective coordination by urban stakeholders in order to create linkage between land use planning practice and urban growth for environmental sustainability should also be promoted.

References

- Abbas, I., Adama, Y. and Ukoje, J. A. (2010). Street mapping using remotely sense data and GIS Technique. *Research Journal of Applied Sciences, Engineering and Technology*, 2(2), 191-197.
- Amao, F. L. (2012). Housing Quality in Informal Settlement and Urban Upgrading in Ibadan, Nigeria. *Developing Country Studies*, 2(10), 68-80.
- Aribigbola, A. (2007). Urban Land Use Planning, Policies and Management in Sub Saharan Africa Countries: Empirical Evidence from Akure, Nigeria. *4th World Bank Urban Research Symposium*. Washington D.C.
- Aribigbola, A. (2008). Improving Urban Land Use Planning and Management in Nigeria: The Case of Akure. (9).
- ATPS. (2013) African Technology Policy Studies Network (ATPS): Vehicle Carbon Emission Concentration Level in Minna, Nigeria: the Environment Cum Climate change Implication. *Working Paper*: (Okelola Olumayokun Francis, Okhimamhe Apollonial)
- Dowell, D.E., & Ellis, P.D. (2009). Urban Land and Housing Markets in the Punjab, Pakistan. *Urban Studies*, 46(11), 2277-2300.
- Eaton, D., & Hilhorst, T. (2003). Opportunities for Managing Solid Waste Flows in the Peri Urban interface of Bamako and Ouagadougou. *Environment and Urbanization*, 15(1), 53-64.
- Egbu, A.U. (2007). *Impact of Land Use Planning on Urban Housing Development in Nigeria*. (PhD Thesis), University of Wolverhampton, UK.
- EIS. (2005). Environmental Sustainability Index: Benchmarking National Environmental Stewardship. earth.columbia.edu/News/2005/images/ESI2005 policysummary.pdf
- Eko, A.J., Ayama, O.R., Ani, D.I., Eja, E.I., & Esien, O.E. (2012). The Effect of Urban Sprawl on Peripheral Agricultural Land in Calabar, Nigeria. *International Review of Social Science and Humanities*, 2(2), 68-76.
- EUROSTAT. (2001). Environmental Sustainability indicators in urban areas: An Italian Experience.: National Statistical Institute of Italy.
- Ezra, V., Dyaji, L., & Nwokedirioha, O. (2013). Public Health Effects from Vehicular Emission in Kaduna Metropolis. *International Journal of Environmental Science and Development Research*, 1(1), 1-8.
- Fagbohun, P.O. (2007). *Population and Urbanization in Nigeria*. Lagos-Nigeria: Bluesign Publication.
- FAO. (2000). *Feeding Asians Cities. Proceedings of Regional Seminar organized by: The Regional Network of Local Authorities for the Management of Human Settlements (City Net) and the Association of Food Market Agencies in Asia and Pacific (AFMA), With the technical Support of the Food and Agriculture Organisation of United Nations (FAO). November, 27-30, Bangkok, Thailand.*
- FEPA. (1998). Federal Environmental Protection Agency Decree No.58. Lagos -Nigeria.
- Hussaini, I. G. (2012). *Land Acquisition and Compensation as a key to Urban Planning: "A Case Study of Northern Nigeria Cities"*. Paper presented at the 2012 NITP Kaduna Chapter, Kaduna Nigeria.
- Jackson, & Roberts. (2000). A Review of Indicators of Sustainable Development: A Report for Scottish Enterprise Tayside: University of Dundee.
- Kironda, J.M.L. (2006). The Regulatory Framework, Unplanned Development and Urban Poverty: Findings from Dares Salaam, Tanzania. *Land Use Policy*, 23, 460-472.
- Kockelman, K. (1997). Travel Behavior as Function of Accessibility, Land Use Mixing, and Land Use Balance: Evidence from San Francisco Bay Area. *Journal of the Transportation Research Board* 1607., 10.3141/1607-16, 116-125.
- MDG Report. (2013). Assessing progress in Africa toward the Millennium Development Goals Food Security in Africa: Issues, Challenges and Lessons.
- News. (2015). This Day News(2015). Over 2000 Houses Submerged by Flood in Kaduna (Article). Retrieved 9/02/2016 <http://www.thisdaylive.com/articles/over-2000-house-submerged-by-flood-in-kaduna/220813>
- Njoh, A.J. (2009). Urban Planning as a tool of Power and Special Control in Colonial Africa. *Planning Perspective*, 24(3), 301-317.
- Opatoyinbo, O.O., Adepetu, A.A., & Abdullahi, M.L. (2015). *Population Growth and Urban Land Use Change along River Kaduna Floodplain*. Paper presented at the FIG Working Week 2015: From the Wisdom of the Ages to the Challenges of the Modern World. 17-21, May 2015, Sofia, Bulgaria.
- Permana, A.S., R. Perera., Norsiah, A.A., & HO, C. S. (2015). Creating the Snergy of Land Use, Transport, Energy and Environment Element towards Climate change Co-benefits. *International Journal of Built Environment and sustainability*, 2(1), 17-28

Philip, R.B., David, R.G., Edward, J.K., & Daniel, A.R. (2006). *Urban Land Use Planning*. Chicago: University of Illinois.

Policy, Science for Environmental. (2015). Indicators for sustainable cities. in-depth Report 12. Produce for the European Commission DG Environment by the Science Communication Unit, UWE. <http://ec.europa.eu/science-environment-policy>

Rakodi, C. (2006). Relationships of power and place: the social construction of African cities (Editorial). *Geoforum*, 37, 312-317.

S.I.A, Sustainable Indicators for Australia. (No Year). Australia Government, Department of the Environment, Sustainable Indicators of Australia. Retrieved 17/03/2016 <http://www.environment.gov.au/topics/sustainable-communities/measuring-sustainability/sustainability-indicators>

Seto, K.C., & Shephard, M. (2009). Global Urban Land use trends and Climate impacts current opinion in Environmental Sustainability. *Urbanization and Global Change*, 1(1), 89-95.

Smith, A. (2013). *The Climate Bonus: Co-benefits of Climate Policy*. New York, NY.: Routledge.

UN-Habitat. (2009). Planning Sustainable Cities *United Nation Human Settlements Programme*. London.

UN. (2007). United Nation Department of Economic and Social Affairs/ Population Division. World Urbanization Prospects: 2007 Revision. Retrieved 22/01/2016 <http://esa.un.org/unup>.

UN. (2007a). United Nations Indicators of Sustainable Development: Guidelines and Methodologies. In Third Edition (Ed.). New York.

UN. (2014). World Urbanization Prospects. Highlights. *The 2014 Revision*. New York: Department of Economic and social Affairs.

Watson, V. (2009). The planned City sweeps the poor away: Urban Planning and 21st century. *Urbanization*, 72, 151-193.

WCED. (1987). Our Common Future: The Bruntland Report. New York.
World Bank. (2010). Africa 's Infrastructure. A time for Transformation 2010. Washington DC.

World Bank. (2013). *Planning, Connecting and Financing Cities-Now priorities for City Leaders*. Washington DC.

Yadua, O. (2012). Determinants of Urban Poor Housing in Makoko Area, Lagos. *Journal of Sustainable Development in Africa*, 14(6), 1520-1539.