MPRI-EDIR | INTERNATIONAL JOURNAL OF EARTH DESIGN AND INNOVATION RESEARCH
VOL. 02 NO. 1 OCT-2023 ISSN: 1116 - 2759

URBANIZATION AND ITS CONSEQUENCES ON LAND USE IN NIGERIA

GARBA UMAR
Department of Geography, Faculty of Environmental Science, Nasarawa State University, Keffi, Nigeria

Abstract

In the next decade, there will be about 2 billion new city residents, accounting for around 60% of the world's population. Nigeria, a fast developing nation, is already embalmed with the consequent challenges, leading to a more severe damage on the fragile natural resources and the ecosystem. This review paper, is intended to incite Nigerian policy makers, urban planners, environmentalists, developmental economists and sociologists with a view to awakening them towards living up to their responsibilities in curtailing the catastrophes that the country is heading to, as a result of the problem. It was written based on reviews of related literatures, observations and personal experiences of the authors and reviewed current trends of urbanization in Nigeria, various types of major land-uses in the country as well as the major impacts of urbanization as they affect biodiversity, ecosystem, the society, soil and water. The paper traced most of the urban problems in the country to rural inadequacies, compelling the poor and vulnerable who find life intolerable in the rural areas to migrate to the cities to enjoy city life and developments that are being guided by economic, rather than environmental benefits. As a succour to the impacts, the paper recommends the principles of preservation of ecological integrity, efficient and appropriate land-use, healthy living conditions, efficient and effective socio-economic and government institutions, improved welfare and physical structures and adapted landscapes of pleasing designs.

Keywords:
Urbanization,
Consequences,
Land Use,
Degradation,
Environment

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

INTERNATIONAL JOURNAL – EDIR
VOL. 02 NO. 1 OCT-2023 ISSN: 1116 - 2759

Introduction

That the global proportion of urban population has been rising over the last few decades is undisputable. In the mid-1990s, 43% of the world's population lived in urban areas. This figure is projected to become 3/5th of the world's population by 2025 (UN, 1993). Nature Conservation, (2008) suggested that there will be about 2 billion new city residents, accounting for around 60% of the world's population by 2030.

Based on the premise that the global human population is growing and the rural-urban migration is increasing, the urbanization trend will continue at least for the next decades. When cities grow, it require more land and other resources to support such growth. This demand for land will increase land and other natural resources consumption as well as exacerbate the environmental problems already posing threats to the planet earth and costing billions of dollars to the world economy.

The impacts of land-use changes are no longer a local, but global environmental problems (Houghton, 2009).

The concept of Urbanization

Urbanization, as conventionally measured by Demographers, is urban population divided by total population of a region (Glenn et al., 2008).

Hope and Lekorwe, (2009) defined urbanization as the annual rate of change of the percentage of people living in urban areas, or the difference between the growth rate of urban population and that of the total population. It is the process of transformation that affects geographic regions when they become more urban, and that during the processes of urbanization, a growing share of a region's land and people become included in cities (Pivo, 1996). In this respect, urbanization is the process by which population is attracted by and concentrated in selected number of human settlements or urban areas. Urbanization is, therefore, a process by which urban areas increase in size and population density. It is also a process and the rate at which human activities and populations are attracted to a locality or point in space within a relatively short period of time.

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

Urbanization Trends in Nigeria

Nigeria is Africa's most populous country (projected at 140M people) with nearly 40% of the population residing in urban areas (NPC, 2009 and NBS, 2006). Just as the face of the world is changing more rapidly than before, the same is true with Nigeria. The trend primarily responsible for the transformation is the fast growth of the world population. People are moving into cities at a proportion never seen since the industrial revolution when people filled the cities of the developed world more than a century ago (UN-Habitat, 2006).

Nigeria has one of the fastest population flux and is Africa's fastest growing economy coping with socio-economic imbalance, thus, the urbanization trend is very unpredictable and alarming. It currently has other dimensions to causes of urbanization, among them, insurgencies at cities' peripherals; poor rural infrastructural facilities; rural unemployment etc. As towns grew to cities, agricultural lands are being modified to other uses. Dams, highways, industrial areas, residential neighbourhoods and schools are sprouting by the day, typical of an emerging economy.

Urban Land Use

Some of the common land-uses typical to urban areas, among others, include: Settlements, Agriculture, and Forestry, Wildlife and Game Reserves, Mining areas, Wetlands, Fishing lands, Barren lands. Each of these creates a unique impact on the ecosystem, although in the long run they may eventually taper down to environmental degradation.

Impacts on Soils

Marcotullio et al., (2008) reported that urbanization alters the biological, chemical and physical properties of soil, hence, degrading its quality and resulting in loss of vegetation, poor water infiltration, accumulation of heavy metals, excess water runoff and soil erosion.

Land-use changes driven by urbanization, Abuja, for example, have put urban areas on soils that are best suited for other uses such as food/fibre production or forestry (Scheyer and Hipple, 2005). The stability of slopes (natural and artificial)

determine their vulnerability to landslides or slope failures. Encroachment of urban lands into forested or other vegetated areas, expansion of built-up areas and transportation networks into steeper terrains, as is happening in Okene and Lokoja, destabilize slopes leading to slope failures. All of these are happening because, in Nigeria, developments are being guided by economic, rather than environmental benefits.

Increased consumption of agricultural soils. Considering the exponential rising and dynamics of population in the country and even though no empirical data is available on the area converted to urban use in the country, a magnanimous figure must have, in recent years, been consumed by this factor. Physical observations are enough evidences to suggest that large Nigerian towns and cities are expanding by the day, with the consequences of encroaching into farmlands and their conversion to residential lands. Cities such as Lagos, Ibadan, Kano, Enugu, Benin-city, Port Harcourt etc. are thirsty for agricultural lands.

Increasing demand for construction materials. Because development always comes with a cost, development of towns and cities to urban centres through construction of roads, buildings and other infrastructures come with their own costs as well. The uncontrolled demand for sand, gravels, laterite etc. is destructive to soils and results into creation of gullies were none exist, or aggravating the existing ones. Unfortunately, one of the signs that greet a newcomer to many Nigerian towns or cities is excavation/quarry site.

Accelerated erosion. This is a common sight of Nigeria's towns and cities due to anthropogenic activities, but due to lack of accurate and reliable data on the quantum of the losses caused by this event, it is difficult to ascertain the values but must have caused the country a fortune. Global estimates suggested about 24billion tonnes of soils are loss to accelerated erosion annually.

Soil contamination by urban activities. Through improper waste disposal activities and is destructive to soils, particularly agricultural soils (Blackmore and Raddish, 1996). Take the non-biodegradable polythene bags for example, no Nigerian city is free from its litters. This, besides being unsightly, defaces the environment and impair crop yields and development by impeding root growth. An average

traveller to any Nigeria's urban centre is usually welcomed by pyramids of wastes generated via myriad of urban activities.

Impacts on Ecosystem

Man has obscured the existence and significance of ecosystem services in a hurry to celebrate urban fantasy (NRC, 2009). Van der Ryn and Cowan, (2007) express the reality of increasing disconnection of man with nature thus:

'We live in two interpenetrating worlds. The first is the living (natural) world, which has been forged in an evolutionary crucible over a period of 4billion years. The second is the world of roads and cities, farms and artefacts (human-designed) that people have been designing for themselves over the last few millennia'.

The growth and prosperity of the human-designed world came at the expense of the natural world. Thus, a huge gap between these two worlds that has distanced man from nature. To bridge this gap, there's the need for an ecological thinking in urban planning practice.

The designed mess we have made of our cities and ecosystems owes much to the lack of a coherent philosophy, vision and practice of design that is grounded in a rich understanding of ecology (Sim and Cowan, 2009)

For instance, wind direction and buildings alignment must be in congruent for safety and health reasons but, this is not always the case in Nigeria. These climatic factors of temperature, RH and wind are also essential to agriculture.

WHO, (2018) submitted that over 92% of the world's urban residents do not breath safe air. Turbidity resulting from various pollution sources is always high in urban areas.

The influence of cities on micro-climate often comes through heat generated by industrial machines and automobiles, exhalations and other human metabolic activities.

There are no records to buttress this claims from Nigeria's cities, however, records from the outskirts of New York, USA, shows 16 particles of dust/mm^3 of air as against 100 and 4000 particles of dust/mm^3 of air found within the CBD and industrial areas respectively.

Analogous study with any Nigerian city of say Lagos, Kano, Enugu, Ibadan, Aba or Abuja will certainly produce similar results. Dusts and smokes interfere with visibility, imperil machineries and pose a great health hazard to human and livestock.

Impacts on Biodiversity: Through housing, road construction, pavements, vegetation destruction, planting of non-native species, land fragmentation among others poses threats to wild and human life through loss, degradation and fragmentation of habitat (Thoebald et al., 1997).

Habitat alteration from urbanization is so drastic and widespread that it results in the endangerment and extinction of species accompanied by long lasting habitat loss (Mc Kinney, 2012).

Beside reducing the richness of native species, urbanization increases the dominance of non-native species, including invasive alien species, thus, causing biological homogenization.

Total global urban area is expected to triple between 2000-2030, while populations are expected to nearly double from 2.84 to 4.9b in the same period. Thus, urban area is expanding faster than its populations. This will heavily draw on natural resources globally and will consume prime agricultural land, with effects on biodiversity and ecosystem services (Thoebald et al., 1997).

These expansions will occur in areas of low economic and human capacity like Nigeria and will constrain the protection of biodiversity and management of ecosystem services. Calabar, Port Harcourt, Uyo, Lagos, Asaba, Onisha, Abuja, Kaduna, Abeokuta and most other Nigeria's urban centres are a typical example of this scenario.

Materials and Methods

The study area Nigeria (Figure 1) stretches through 923,769 Km2 range of which 13,000 square kilometers is covered by water across 36 states from north to south [5]. With a population of 187 million in 2016 [37], the nation has substantial resources of water bodies [38]. This includes annual water resources potential of 319 billion cubic meters consisting of 272 billion cubic meters (BCM) of surface water and 52 billion cubic meters (BCM) of ground water [39]. While these are

INTERNATIONAL JOURNAL – EDIR
VOL. 02 NO. 1 OCT-2023 ISSN: 1116 - 2759

large water budgets and definitely large volumes of water flowing through the nation's rivers, this water provides resources for fishery, transportation, irrigation, recreation and domestic use. With climate ranging between the semi-arid type in the north to tropical and humid in the south. The availability of surface water resources transcends the river systems and catchment areas made up of River Niger, Lake Chad, the South East and South West regions of Nigeria.



Fig. 1: Map showing Nigeria

The datasets used in this study were mainly derived from Landsat imageries acquired in 1976, 1996 and 2016Theses imageries were sourced from one of the USGS websites; (https://glovis.usgs.gov/). The characteristics of the images are shown in Table 1. The Geo-information software used includes; IDRISI version 18 and ArcGIS, 10.0. The IDRISI Tersest was used in the image processing and analysis, while the ArcGIS was used for visualization of the processed images. Area of Interest (AOI) was extracted from the four (4) Landsat scenes using the "Window" tool in IDRISI. False Colour Composite (RGB) of the three bands for

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

INTERNATIONAL JOURNAL – EDIR
VOL. 02 NO. 1 OCT-2023 ISSN: 1116 - 2759

each of the selected dates was made in order to increase the pictorial quality for easy visual interpretation and identification of features on the images. The images were further subjected to geometric correction using the "Resampling" technique. This is carried out in order to co-register the images as suggested. The images were classified using the Maximum Likelihood algorithm into six classes (settlements, bare surfaces, undisturbed and sparse vegetation, rocky outcrops and farmlands).

Results and Discussions

The obtained result was analyzed using tables and maps. The size and area of the land cover changes were calculated and represented in hectares. The rationale for these was based on the totalsize of the study area.

Sequel to the general objective of this study, it was observed that there was an exponential growthin the city which have led to the quest for land, housing and other facilities/infrastructures that have given rise to changes in land cover, thus, reduction and loss of other land uses.

Figures 1, 2 and 3 present the LULC of the study area during the study period. The statistics of theland use/land cover distribution for each study year as derived from the imageries is presented in Table 2.

Table 1: Land-use/Land Cover Distribution

Land use classes	1976 (hectares)	%	1996 (hectares)	%	2016 (hectares)	%
Undisturbed vegetation	21374.37	23.75	6052.50	6.70	1235.52	**1.37**
Sparse vegetation	33986.25	37.76	18373.77	20.42	8721.90	**9.69**
Settlements	324.45	0.36	978.84	1.09	3615.03	**4.01**
Farmlands	22327.56	24.81	38697.12	43.00	46112.94	**51.24**
Rock outcrops	1962.45	2.18	13916.34	15.46	15286.95	**16.99**
Bare surfaces	10024.92	11.14	11981.43	13.31	15027.66	**16.70**
Total	90,000	100	90,000	100	90,000	100

Source: Field Survey, 2023

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

INTERNATIONAL JOURNAL – EDIR
VOL. 02 NO. 1 OCT-2023 ISSN: 1116 - 2759

The supervised classification system using the maximum likelihood classifier as explained in the methodology was used for the analyses of the imageries. Figures 1, 2 and 3 shows the classified maps adopted in this study.

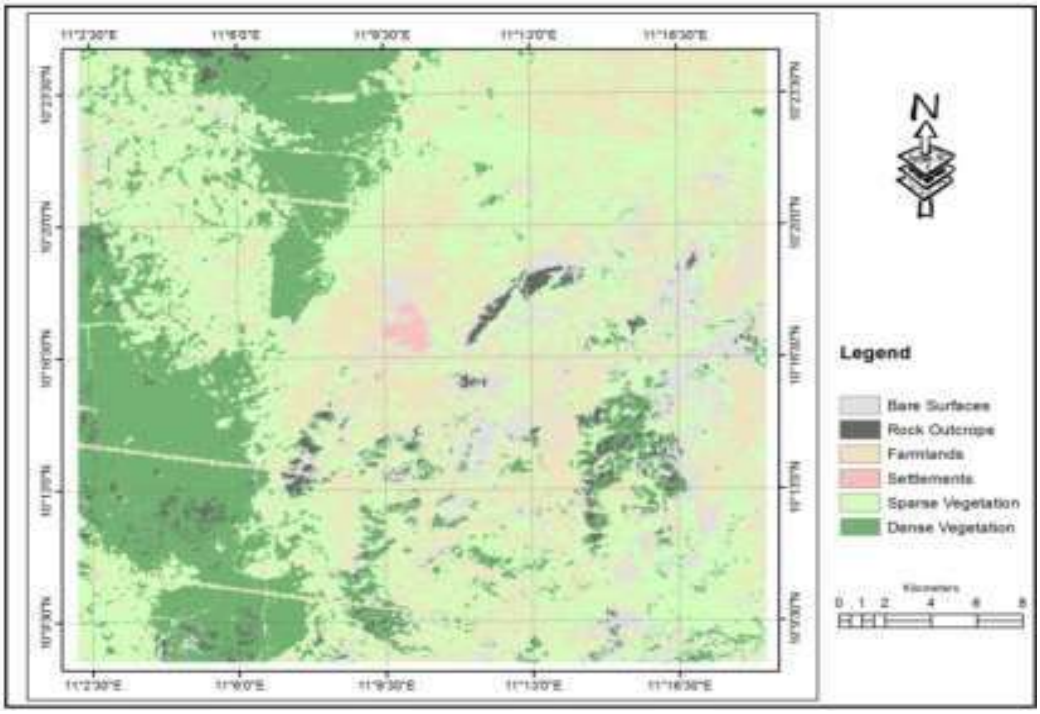

Figure 1: Classified Land Use Land Cover of 1976

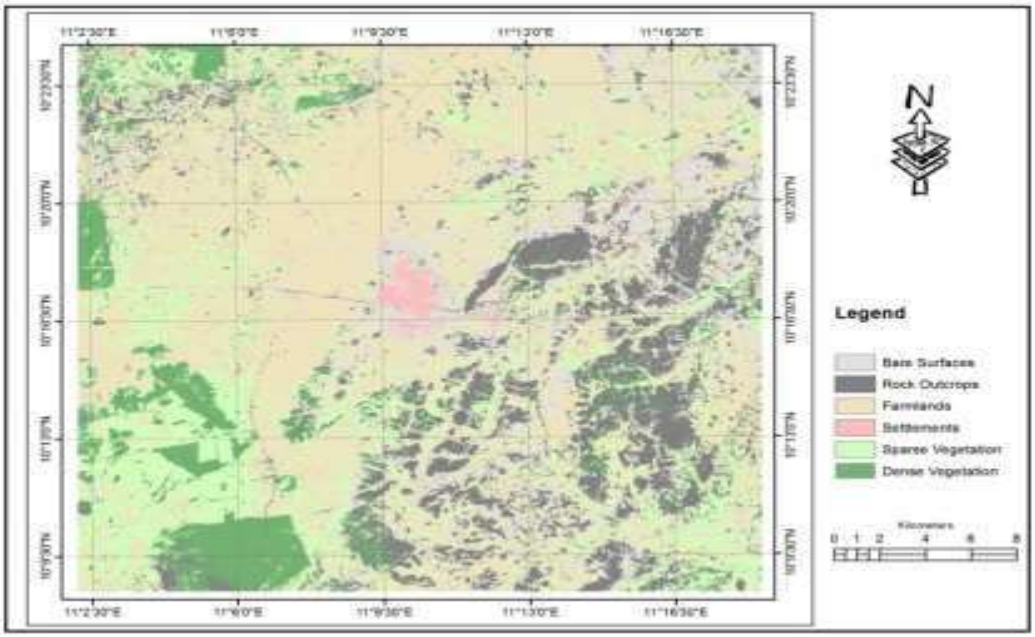

Figure 2: Classified Land Use Land Cover of 1996

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

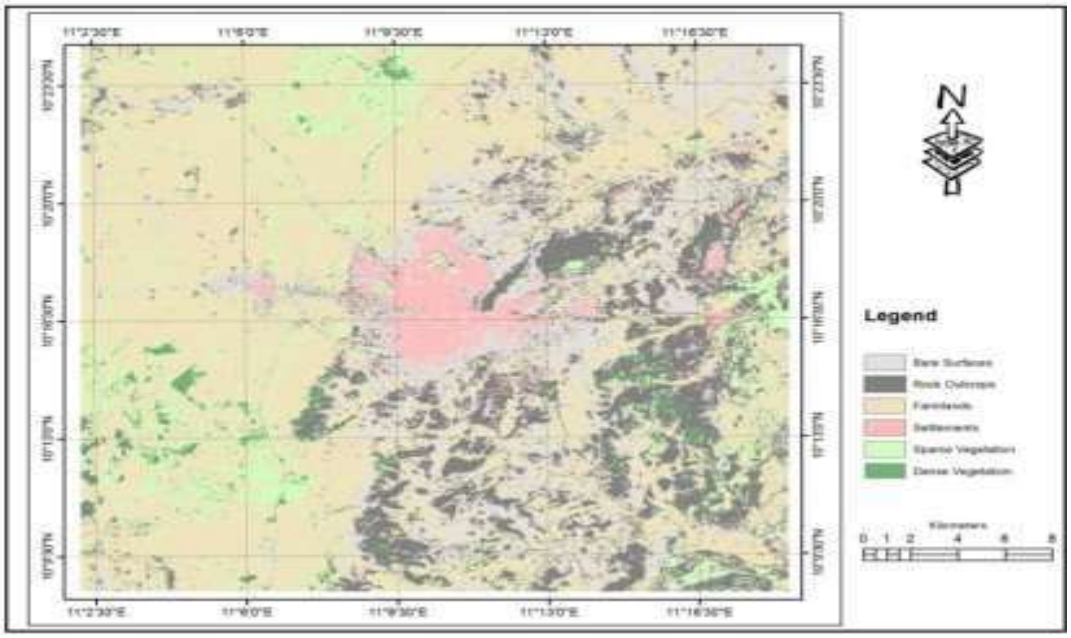

Figure 3: Classified Land Use Land Cover of 2016

As shown in Figure 4.4, the land-use/ land-cover distribution pattern in the year 1976 shows that sparse vegetation occupies 38% of the land-use category in the study area, followed by farmlands and undisturbed vegetation with a percentage of 25% and 24% respectively. This means that the vegetation as at then was readily abundant and there was available farmland with less competitionon land uses. The bare surfaces had about 11% while rock outcrops had only 2%. The least of the land use was settlement which occupies about 0.4%.

The land-use/land-cover distribution for 1996 also shows that farmland occupies over half of the land-use distribution (43%) with almost two times increase from the 1976. This is followed by sparse vegetation 20% a decrease from 1976 land-use distribution, others on the increase are also rock outcrops, bare surfaces and settlements having 15%, 13% and 1% respectively. However, the undisturbed vegetation reduced to about 7% due to increase in settlements and farmlands.

In 2016, the land-use distribution shows increased in settlement which occupies 4%, while the farmlands occupied 51% of the land-use distribution making it the highest land-use/ land-cover category in the study area. Undisturbed vegetation showed a decrease occupying only 1% of the total area. The remaining land-cover categories of rock outcrop (17%) and bare surfaces (17%) showed an increase in

INTERNATIONAL JOURNAL – EDIR
VOL. 02 NO. 1 OCT-2023 ISSN: 1116 - 2759

these areas compared to the previous years except sparse vegetation that also showed a rapid decrease to 10% from 38% of 1976 and this is attributed to land-use conversion for other urban activities and increased population pressure.This conforms to the studies of Chigbu,*et al.,* (2011) who noted a significant disparity and trend in vegetation landcover due to rapid urbanization and socio economic activities. As well as Oluseyi, (2006) that discovered that the land use types that are subject to major changes are vegetal covers and sprawl development.

Conclusion

Systematic Rural Planning: According to Lassey, (1977) most of the urban problems in developing countries can be traced to rural inadequacies. Thus, the poor and illiterates who find life intolerable in the rural areas move en mass to enjoy city life. Agriculture is the principal 'land-user' of the rural land. Where rural industries exist, they often pack to the city areas as a mark of change. As a result, there is frustration in the city life due to overcrowding, pollution, filths, odours, crimes etc. To escape to the country is equally frustrating because the existing rural population and institutions are not prepared to welcome the influx. For this, there's the need for systematic rural planning as a supportive mechanism for 'rural development'.

Past Nigerian governments have concerted their efforts to discover and promote the positive forces that raise the real income per head. They wanted to create more employments and achieve a wider distribution of the gains of 'economic development'. However, economic development does not mean 'total development' of a society, but only a segment of general development. Total or general development include political and economic developments, though we frequently tend to confuse the two. Total development is concerned about how sociocultural and political developments contribute to economic development. It is also important to note that economic development is not synonymous to economic independence, neither is it same as political independence. So also, economic development is not same as industrialization. This is because, economic development is more than mere acquisition of industries.

Total development is 'the upward movement of the entire social system'. It may be interpreted as 'attainment of ideals of modernization'. It is a rise in productivity, social and economic equalization, modern knowledge, improved institutions, attitudes, and a rationally coordinated system of policy measures which can remove most of the undesirable conditions from a social system. Such undesirable

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

conditions must have perpetuated the conditions of state of under development. Therefore, it is more than mere growth, it is growth plus change.

Distributive Justice through maximizing the GNP (raising savings) by allotting more resources for the benefit of everyone within the society; redirecting investments to poverty groups through education, access to credit, public facilities etc.; redistributing income or consumption to poverty groups through fiscal systems or through direct allocation of consumer goods, child nutrition, maternal health etc. and; transfer of existing assets to poverty groups (may be via land reforms). However, there may be political resistance to these and other asset redistribution systems.

Planning must be directed towards identifying the complex factors that will contribute to the creation, change and development of social and physical entities and must involve studying of interrelationships and interactions of such factors in terms of their relative or specific influences. They must determine, as precisely as possible, the degree to which a specified unit of change in any one factor can contribute to a change in another one or more factors. How change in one factor should be made so that future society will not suffer, but achieve improvements without destructions or deteriorations in the environment.

These may only be achievable through:

Preservation of ecological integrity. To provide a continuous supply of life-supporting resources (vegetation, water and air) and further discover what must be done to ensure continued renewal of such essential ecological resources and processes – control of grazing, farming, constructions and pesticide usages.

Efficient and appropriate land-use. Land must not be used according to individuals taste or interest, but in the overall public interest and taking cognizance of topography, natural waters, physical structures, vegetation etc.

Healthy living conditions. Planning must ensure a constructed physical environment that will minimize dangers of diseases and provide comfort. Waste materials must also be easily and safely disposed-off, so as not to constitute health hazards.

Efficient and effective social, economic and government institutions. These must be functional and improved.

Improved human welfare. There must be some acceptable minimum economic and social levels below which no citizen will be allowed to live.

Physical structures and adapted landscape of pleasing designs. This may be feasible through preventing forest-fires and bush-burnings and preventing forests

from being unnecessarily destroyed. Structures should not be unnecessarily erected and there should be no structures erected that are offensive to vision. Ecological integrity must be maintained. \

References

Blackmore, R. and A. Raddish, (1996). Global Environmental Issues. The Open University.

Beek, R. V., E. Cammeraat, V. Andreu and S. B. Mickosvki, (2008). Hillslope Processes: Mass wasting, slope stability and erosion. Eco-technological Solutions. Dordrecht. The Netherlands. Springer. 6:3, 557 – 564.

Cieslewicz, D. J. (2002). Urban Sprawls: Causes, Consequences and Policy Response. The Urban Institute Press. Washington, DC. Pp. 23 – 38.

Glenn, E. P., R. H. Alfredo, P. L. Nagler and S. G. Nelson, (2008). Relationship between Remotely-sensed Vegetation Indices, Canopy Attributes and Plant Physiological Processes: What Vegetation Indices Can and Cannot Tell us About the Landscape. Sensors. 2008, 8:4, 2136 – 2160.

Hope K. R. and M. Lekorwe, (2009). Urbanization and the Environment in Southern Africa: Towards a Managed Framework for the Sustainability of Cities. Journ. Environ. Plann. Mgt. 42:6. 837–59.

Houghton, J. (2009). Global Warming, Climate Change and Sustainability: Challenges to Scientists and Policy Makers. The John Ray Initiative. Briefing Paper 14, 3rd Ed.

Joy, N. E. (2010). Sediment Loads in Runoff: Studies on Agulu/Nanka Erosion Site, Southeast Nigeria. Unpublished PhD Dissertation. Department of Soil Science, University of Nigeria, Nsukka.

Koech, H. K., G. M. Ogendi and J. Kikpemboi, (2012). Status of Slaughter-house Effluent and its Effects on the Physico-chemical Characteristics of Surface Water in Kavuthi Stream, Dagoretti – Kenya. Res. Journ. of Environ. & Earth Sci. 4:8, 789 – 796.

Lassey, W. R. (1977). Planning in Rural Environments. McGrawhill. New York.

Marcotullio, P. J., A. K. Braimoh and T. Onishi, (2008). Land-use and Soil Resources. Springer. Netherlands. Pp. 201 – 250.

Mc Kinney, M. L. (2002). Urbanization, Biodiversity and Conservation. Biosciences. 52:10, 883 – 890.

National Bureau of Statistics, (2006). National Core Welfare Indicators Report, 2006. Federal Republic of Nigeria. Metadata. Abuja – Nigeria.

Nature Conservation, (2008). Global Impacts of Urbanization Threatening World's Biodiversity and Natural Resources. 2007 Annual Report. London, UK.

National Population Commission, (Nigeria) and ICF Macro, (2009). Nigeria Demographic and Health Survey, 2008. NPC and ICF Macro. Abuja, Nigeria.

National Research Council, (2009). Valuing Ecosystem Services: Towards Better Decision Making. National Academy Press. Wasington, DC.

Pivo, G. (1996). Towards Sustainable Urbanization on Main-street Cascadia Cities. Int. Journ. of Urb. Policy and Plan. 13:5, 1314 – 1319.

Scheyer, J. M. and K. W. Hipple, (2005). Urban Soil Primer. Natural Resources Conservation Services. National Soil Survey Center. USDA. Lincoln, Nebraska.

Sim, V. R. and S. Cowan (2009). Ecological Design. Island Press. Washington.

Theobald, D. M., J. R. Miller and N. T. Hobbs, (1997). Estimating the Cumulative Effects of Development on Wildlife Habitat. Landscape and Urb. Plan. 39:1, 25 – 36.

United Nations, (2015). World Population Prospects. Department of Economic and Social Affairs. Working Paper No. ESA/P/WP, 2015, 241.

United Nations, (2006). UN – Habitat, World Urbanization Prospects: 2005 Revision. Population Division. Dept. of Economic and Social Affairs. New York.

EDITOR-IN-CHIEF
Prof. W. F. HILL [MALAWI]

United Nations, (1993). World Urbanization Prospects: 1992 Revision. New York.
Van der Ryn, S. and S. Cowan, (2007). Ecological Design, 10th Anniversary Edition. Island Press. Washington, DC.
World Health Organization, (2018). 2017 World Health Report. WHO. Geneva.