



# **Biodiversity Spectrum of Urban Landscape: A Tool for Evaluation of Environmental Degradation and Climate Change**

<sup>1</sup>Amadi, Confidence Harrison & <sup>2</sup>Okodudu, Ezinneka Eunice

<sup>1</sup>Department of Geography and Environmental Studies

Faculty of Social Sciences

Ignatius Ajuru University of Education

Port Harcourt, Rivers State, Nigeria

Email: [harrisonamadi39@gmail.com](mailto:harrisonamadi39@gmail.com)

<sup>2</sup>Department of Geography and Environmental Management

Faculty of Social Sciences

University of Port Harcourt, Choba, Rivers State, Nigeria

Email: [nneokodudu@yahoo.com](mailto:nneokodudu@yahoo.com)

## **ABSTRACT**

The effect of declining urban biodiversity on the environment have been very glaring in terms of its negativity effect on not only on ecological interaction but also on the general global system of the world. Urban areas and its ineffective biological interdependency have over the decades inadvertently impacted disastrously on the ecosystem relationship and their characterization with other dependent organisms of an interdependent ecosystem. The creation of cities in various regions of the world is currently and massively threatening the effective interaction and interdependent natural ecological systems of the world; hence, the entire livelihood and survival of not only organisms but also that of plant becomes a major challenge to man in his quest to urban development. This invariably is responsible for the continued unabated climate change and environmental degradation virtually experienced all over world. In response to various pressures arising from activities of urbanization on the environment and its associated loss of free natural services to ecosystem interaction and interdependent environmental relationships. Landscape designers have begun to realize the need for the integration of scientific application model in cities. This encourages the application of scientific land use practice in the urban areas of the world. To this end, this paper studied exploratively the extent to which the development of urbans and urbanization have bridge the natural flow of matter and free flow of ecological energy interaction and supply in cities: as such, the work identify the need to not only improve urban biodiversity but also the involvement of effective planning, scientific design and management of urban landscape as a tool of not only developing urban landscape but protecting and properly managing both the created and natural biodiversity in other that an improved urban environmental sustainability can be effectively achieved. The paper concludes that the integration of various environmental spectrums and the applicability of scientific scheme will to a large extent reduce the social, economic and the decline of both vegetal and biological organism in the urban areas of the world. The paper therefore recommend among others that urban areas and new cities should first and foremost be scientifically planned and designed for effective biological interaction for the benefit of present and future generations.

**Keywords:** Biodiversity, Urban Landscape, Evaluation, Environmental Degradation and Climate Change.

## INTRODUCTION

Virtually all cities of various nations are the focal points of interaction between urbanization and nature. In the time past, the biological diversity of most landscape has existed and functioned as coherent interdependent relationships among each other and as such their coherent interdependency increased their functional interaction and interconnectedness on the environment (Anyeluslu et al, 2013). This mode of interaction by any landscape seem to be gradually distorted by increase in population growth and its associated activities (man's influence), especially in new city development where technological and all form of scientific application are test-run; these and the utilization of available landscape for the erection of varying building structures which in one way or the other intercept the national flow of ecological interaction has been identified as major issues distorting urban environment. Nowadays there seem to be more to the impact of urban areas on the environment, thus, the density of building and other hard materials tends to not only defacing the surface of urban landscape but also bridging effective urban biodiversity spectrum, and this have dramatically increased in recent years due to population growth and increase in the use of volatile substance and material in urban area.

The world population appear to be growing in a geometric formation causing more people to live in cities thereby posing and pushing high level threat and pressure on the available urban landscape and resource which varied from cities to another. The distribution of people across the Earth surface is not an equal one; and as such, the pressure of population growth on the available land-space put conservation under threat, thus leading to increase in the use of natural and land resources, the presence of these land and natural resources varies and differs in quantity and quality; yet, they perform functional role of ecological stability (Kohsaka, 2010).

Tratalos et al (2007) claimed that more than half of the world's population lives in cities which are increasing by time; and as such there is an indication that by 2030, 1.75 million new urban residents are expected in urban area (McDonald *et al* 2008).

Again, there is the prediction that by 2050 more than two-third of the significantly larger world will be living in urban area (Muller et al, 2010). This assertion is yet to be disproved, by implication, this will mean that the landscape and many other organisms including microorganisms, will be under pressure and may gradually face serious extension, which imply doom for effective and interdependent co-existence between biological diversity, ecosystem, biosphere, hydrosphere and the Tropospheric coordination and interaction of the global system.

The intended conduct and ways of life planned and designed for city dwellers were predicated on land use criteria; yet many urban landscapes continue to face one form of degradation and another; because urban landscape has continued to undergo constant modification of its ecological features which affects and disconnect its environment from effective interaction. This ineffective interaction of urban environment arises from fragmentation of open and natural areas emanating from degradation of water resources, loss of trees and free natural services; all these are some of the ecological impacts of urbanization on the environment (Benedict & Macmahon, 2002). Effectively, the alteration of habitat, loss of natural ecosystem interaction and dismemberment of natural habitat types result to ineffective biodiversity interaction which in turn changes the bio characterization and its natural forms. These rapid changes cause concerns about the future of life in cities, and call for sustainable approach towards the use of space and earth natural resources for the enhancement of biodiversity in urban areas of both developed and developing nations of the world.

Throughout the world, urban areas possesses multiple influence and as such moderate and regulate climate elements. For this reason Nberti et al (2003) claimed that cities are both complex ecological entities which have their own unique internal rules of behaviour, growth and development, this unique rules can be used for the evaluation of important roles played by cities on the global ecological functions. In the view of broadest form of life-centered theory, all forms of life have an inherent right to exists; these forms of life provide to the environment and the earth at large the required interdependent influence and function which do not only maintain the continuous regeneration of environmental resources for man but that which also moderate, regulate and help in constantly re-enforcing the global system stability. Because

of these broad roles of organism on the environment, some bio centric thinkers have given species a hierarchy of values. Some for example, believe that we have greater responsibility to protect and conserve animal species than plant species; hence, many more see these species and environmental resources according to their importance and contributions to humans; as such see nothing wrong in killing pest species such as rats or mosquitoes. For the benefit of biodiversity, ecological interaction, environmental interdependency and man's future generation, every organism including resources of any environment has a natural right to live and function in order to continue to play the role of interconnectivity and interdependence influence on the ecological system in order to maintain continuity and sustain both rural and urban areas of the world (Amadi, 2018).

Over the past six decades the species of biological diversity of urban cities in the world have consistently experience decline, scholars such as Muller and Warner (2010) maintains that the number of vascular plant species decreases from more than 400 species for km<sup>2</sup> at urban fringe to less than 50 species per km<sup>2</sup> in city centre, in central European cities. Approximately 10-15% habitat lost occurs in virtually all the cities of the world. These figures will increase as anthropogenic activities of man increases including that of pollution, climate change and other environmental problems caused by urbanization (Zitkovic, 2008). Generally urban biodiversity is a component of urban ecology and as such urbanization, land use and land cover are the main factors threatening biodiversity by way of direct habitat conversion or indirect effect of human population growth on local, regional and global scales (Clergeau et al, 1998, Blair, 1999, Mckinney 2002; Ricketts and Imhoff, 2003).

This situation of ineffective urban biodiversity spectrum is almost peculiar with varying cities of the world as it is now creating generational awareness; that could be one reason why urbanization and its impacts on environment is becoming global issue for human future. This situation currently is becoming worrisome; there is however, a glimmer of hope for preserving the urban biodiversity and its ecological interaction on the environment. These days, there is a growing awareness that the health of planets biological diversity is essential for determination of human own destiny. This means more protection of ecosystem is required for biodiversity than what has occurred in the past (Connery, 2010).

In this case, environmental managers, urban planners, landscape architects, bio geographers and biotechnologists have significant roles in not only managing and conserving space for various usage but also effectively planning urban environment suitable for a landmark architectural design that encourages the conservation of biological diversity spectrum of urban landscape for effective ecological and global system interaction.

Towards these objectives, this paper looks at various conceptual explications surrounding urban biodiversity landscape spectrum. These concepts include but not limited to urban biodiversity definitions, environmental degradation, urban climate and climate change. The concepts shall be x-rayed in order to understand the implication of declining biological diversity on the urban area and the environment at large. In achieving this goal, it requires an urban environmental strategy that repairs past urban environmental damage on vegetation, resources and climate; so as to help us shift from ordinary urban development to systematic urban planning, design and development.

### **Conceptual Explications**

Sequel to the clarification and understanding of the identified conceptual explication for this work; arising from their terms and meaning, the following four key concepts shall be employed to diagonalized urban biodiversity landscape spectrum: urban biodiversity definitions, Environmental degradation, urban climate, and climate change.

#### **Urban biodiversity Definitions**

The concept of biodiversity is a term used to convey the degree of nature's variety and variability including the number and frequency of genes, species and ecosystems in their totality (Soule and Wilcox, 1980). It is used to describe the variety of life forms in nature as they occur in huge variety of organism including animals, plants and micro-organisms on the earth's surface. This definition by implication is a general term that can be used to express the occurrence of living organism at any levels of life. Savard et al (2000) explained that life is structured in a hierarchical manner which starts with cells that constitute

individuals, and then form the populations, which regroup into species and as a result and as vegetation communities.

In virtually all the cities of the world, there seem to be a gap between the ecological complexes in which variety of life forms exist and form an intricate and interdependent relationships that occur among co-existing organisms in the urban landscape and the various processes that are going on continuously in the natural ecosystem whether terrestrial or aquatic environment (Amadi, et al, 2019). This means that the loss of any one or more species in the development of cities and urban areas may threaten the existing ecological balance of nature and this invariably leading to a great direct or potential loss to not only humans but also to both intricate ecological interactions and a change in climatic characterization.

The concept of urban biodiversity is a specific part of living diversity of nature. In the view of Zitkovic (2008), he describes urban biodiversity as plants and animals that are living in the built environment. Such environment consists of patches of land that have survived during city development and expansion, and as such these patches represent the nature of the area before dense human settlement. Muller et al (2010) share the same view and contained that urban biodiversity can also be explained from “the variety and richness of living organisms including genetic variation and habitat diversity found in and on the edges of human settlement.

One notable implication of biodiversity spectrum of urban landscape is that since the industrial revolution, urban landscape and urban climate have gradually metamorphosed into different complex stages arising from varying degree of biological-diversity distortion and other man’s influence. Today urban climate and its environmental influence is not only becoming of a great interest in many European cities such as Paris, Frankfurt, London Madrid and Barcelona but also other developing cities of the world (Dettwiler, 1970, Hanal et al, 1990, Lee, 1992, Lopez et al 1993 and Moreno-carcia, 1994). This is because since the development of human life and cities a lot of factors affected biodiversity. Permanent settlement agriculture revolution, man-made structural features (buildings and roads) affluent and chemical discharge, pollution, population increase and waste dumps as well as other socio-economic and cultural dynamics etc affected urban biodiversity and distortion its functions (Olivera et al, 2011).

Arising from the varying factors militating against biodiversity from rural borders to urban core together with their different habitats Muller et al (2010) categorize urban landscape and habitat levels as follows

- a. Ruminants’ of pristine natural landscape (e.g. leftovers of primeval forests rock faces).
- b. Agricultural landscapes (e.g. meadows, areas of arable land),
- c. Urban-industrial landscape (e.g. city centres, residential areas, industrial parks, railways areas, formal parks and gardens, brown fields).

The ideological perspective of various scholars view point on urban landscape and biodiversity point to the fact that the modification of urban environment constitute serious ecological bridging which hinders free flow of ecological interaction and interdependent; this notwithstanding, the lack of interdependent between natural and distorted urban landscape result to change in urban climate characterization which affect global general circulation causing not only shortage in the release of oxygen but also increases the supply of carbon-dioxide on the atmosphere and as such within the environment this constitute not only threat to the environment but to man and other organisms.

### **Environmental Degradation**

In this context and as a concept, it is used to explain a situation of declining natural and environmental resources. In general, the environment particularly with its vegetation provides all life support system of every human society including that of climate elements such as moderating temperature intensity, supply of evapotranspiration, breaking and diverging of pressure winds as well as regulating climate condition and enhancing easy percolation of run-off. Frankly speaking, these life support systems are sustained by the natural resources found in both land, air and water of the environment.

More, significantly, Freedom (2008) has categorized these resources to include fresh/safe water, fisheries, arable lands plants, animals, minerals resources, air and marine resources amongst others. These resources often occur in variable quantity and quality. The environment and particularly human beings exploit and make use of these resources for sustenance and survival of life and maintenance of existence.

The implication here is that the misuses or over use of these natural environmental resource spells doom and as such affects not only its quality but also is quantity in terms of its pristine supply on the environment.

Obviously, the issue of environmental degradation becomes a major concern when the use and misuse of these resources increases in quantity without regard to their role, value and function to both man and the environment. This view is in line with Miller contention; that environmental degradation refers to the down ward trend in the environmental resources such that their level of use in the human societies equally decreases than increasing rate (Miller cited in Jimoh, 2006: 276).

Many other body and scholars have equally define environmental degradation from other valued and perceptual consideration, free online encyclopedia, for instance Wikipedia, defines environmental degradation as the deterioration of the environment both in terms of quantity and extinction of some wildlife species and quality life, air, water or land pollution (<https://en.wikipedia.org/wiki/environmentaldegredatio>).

The effects of deterioration of the environment by man's activities and other environmentally threatening substances in cities and other rural environment gradually break down or wear down the physical, chemical and biological components of the natural environment; although the environment can sometimes undergo deterioration through natural processes such as heat or rise in surface temperature glaciations pressure winds, running water etc. It became more sever and continuous with the application of anthropogenic processes involving man's inept land use activities such as habitat distortion, deforestation, lumbering, land or forest clearing for cultivation, roads and residential construction as well as bridges, dredging and coastline/shoreline construction work. This include also crude oil spill or continuous discharge of sewage, use of agrochemical, mineral mining activities and excavation as well as solid wastes and effluents into water bodies or land; Yet both natural processes and the inept man's anthropogenic activities put together aggravate environmental degradation in urban area.

The environment seem to be more deteriorated when contaminants are allowed to stay in the environment and tend to constitute threat, danger and hazard when there is an increase in their occurrence leading to pollution of the environment through land, air and water; this will be worst in cities devoid of effective biodiversity because certain substances like sulfur dioxide (SO<sub>2</sub>) has an inadvertent effect on urban environment where other substances are more reactive under reducing quality atmosphere, while others are more reactive in oxidizing atmosphere. This imply that in urban environment, the atmospheric contaminants can graduate to become a pollution under certain conditions even at a trace level concentration (Naratama, 2011).

One notable implication of environmental degradation for both the environment and social existence is its adverse effect on both atmosphere and the stratospheric structure of the earth. This affects not only the atmospheric air quality but also the climate behaviour; it also disrupts socio-economic life of the immediate human population that do not only depend on natural resource for sustenance but also on good air quality, water quality, and seafood for survival.

Therefore, this paper considers environmental degradation to mean the gradual or state of depreciation of environment and its resources in terms of quantity and quality in air, water, land vegetation, flora and fauna, wildlife mineral, amongst others whose deterioration arises from the multiple influence of man's activities on the environment.

### **Urban Climate**

One of the most important concepts upon which this paper is anchored, is the concept of urban climate. Generally, all over the world, urban climate occurs from the modification of the environment through the creation of cities and its structures. The building of cities with their constructed mass of buildings and movements systematically changes the natural landscape into a city's cape. In city landscape, deferent materials and structural made constructions form the eddy-face of cities; these materials and structures are mostly had. This means that the thermal conductivities and heat capacities will become greater in urban area then in areas where biodiversity are greater and concentrated such that the available net radiation could be used for evaporation or evapotranspiration (Ojo, 1977).

The type of materials, structures and activities that constitute urban landscape greatly varies in shapes and orientations and as such most of them absorbs fast part of the energy received and even direct parts to the other absorbing surface within the city. The implication here is that, the whole city absorbs or store most of the energy available to the city environment. This also means that air within the city will quickly be heated or cooled by contact with the surface of the city landscape and provides warmer surface that constitutes a more efficient warming air (Ojo, 1977); affirming further, that the general activity of man affects the climates of a city. The influence of these activities manifest in form of heat so that the city is made into heat generators arising from steam engines, factories, vehicles, flaring of gases and hot air from air conditioners.

Oliver (1979) observed the impact of new buildings and new city development, noting that building and structures cause more damage on the microclimate and as such alter its characterization. These makes the urban climate to be distinctly different from the surrounding rural climate, hence, the urban environment is warmer, cloudy, foggier and Wetter (Ayoade, 1993).

The most significant effect of these additional distortions of the urban ecological system is urban heat Island arising from anthropogenic climate modification-phenomenon; hence the modification of land cover in urban areas results in the triggering of local air and surface temperatures to rise several degrees higher than the simultaneous temperatures of the surrounding rural areas. Several causes account for UHI night-Ture warming, these include but not limited to building blockage, changes in the rural properties for surface materials, lack of vegetation and lack of evapotranspiration in urban areas (Oka, 1982).

In attempting to resolve the implication of biodiversity spectrum of urban landscape, several scholars have applied the concept of urban heat Island to urban climate change research in different part of the world, Buechley et al, 1972; Oke, 1987, Adebayo, 1991a; Myrup et al, 1993; Camilloni and Barros, 1997, Emmanuel, 1997a; Botkin and Keller 1998. Okeh (1987) for instance in utilizing this concept, apply it to his study on boundary layer climates in Methnen, London; and discovered that little vegetation in the city's hinders quick evaporation and as such cause city to remain warmer than the surrounding countryside. While Emmanuel (1997a) applied the concept of urban heat Island to the study of urban vegetation change as an indicator of demographic trends in cities of Detroit.

Base on the findings of scholars on varying causes of urban heat Island, Voogt (2004) outline different types of urban heat Island as follows:

- a. Canopy Layer Heat Island (CLHI)
- b. Boundary Layer Heat Island (BLHI)
- c. The Surface Heat Island (SHI)

The first two refer to a warming of urban atmosphere the last which refer to the relative warmth of urban landscape surface. This imply that urban areas should be systematically planned and be followed up with a consistent environmental management for effective biological diversity interaction and interdependent relationships; hence, areas in urban landscape should be reserved to enhance biodiversity, building should be spaced and materials that are eco-friendly should be introduced with cities to allow free flow of interactions and interdependent relationship.

### **The concept of climate change**

This concept "climate change" is used to refer to any change in climate overtime, arising from anthropogenic or both natural variability and anthropogenic influence on the environment. Base on the occurrence and alteration of climate characteristics and behaviour. thus, change overtime due to the influence of both the natural variability and anthropogenic activities. The United Nations Framework convention on "climate change" (UNFCCC, 1992) in its Article 1, defines "climate change" as a change in climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. This by implication means the long-time average weather conditions of a region, thus including the frequency with heat intensity, weather patterns, the frequency and intensity of storms, hot weather and cold spills.

In the view of Ayoade, (2004) climate change is also seen as a long-term shift, alteration or change in the type of climate prevailing over specific location, region or the entire planet. It is obvious from both

definitions that change is an inherent attribute of climate which is caused by both human activities (anthropogenic) and natural processes (sudden event). As such, the human factors that cause climate change have been identified as industrialization, technological development, urbanization, deforestation and burning of fossil among others, while the natural factors include solar radiation quality and quantity, astronomical position of the earth among others (Odjiugo, 2009).

The increasing rate with which the globe experience warming, thus influence climate change this have been traced to unsustainable industrialization occasion by the release of green house gasses, and deforestation, these have been viewed as the main causes of climate change (Clerk, 2002, Buba, 2004, Nwafor, 2007). In the same vein NEST, 2003, Odjugo and Ikhuoria, 2003, Odjugo, 2005, and De Weadt, 2007, outline deforestation, urbanization burning of fossil fuel and water pollution as an additional contributing factor of climate change.

The inadvertent effect of urbanization and its associated activity influence on the climate, exposes the entire world to vulnerability of risk in varying degree of environmental hazard. For this reason, the intergovernmental panel on climate change (IPCC). Third Assessment Report (TAR) describes Vulnerability as “the degree to which a system is susceptible to, or unable to cope with adverse effects of climate change, including climate variability and extremes. Vulnerability therefore is a function of the character, magnitude, and rate of climate variation to which a system is exposed to its sensitivity, and its adaptive capacity (IPCC, 2001a, P. 995) (IPCC Def. 1).

The combination of the effects of urban influence on climate change and its risks on the growing cities and its increasing population puts both environment and human at a high-level danger of threat. This thinking obviously may have propelled the climate change impact studies to typically examine factors such as increase in the number of people at risk of flooding based on projections of sea level rise (Nicholls et al, 1999). The combination of the effects of urban influence on climate change and its risk on the growing cities together with increasing population puts both environment and human at a high-level danger of threat. This thinking, obviously may have propel the climate change impact studies to typically examine factors such as increase in the number of people at the risk of flooding, and cities likely to be stormed by sever winds; this was based on certain environmental indicators (Nicholls et al, 1999).

This paper, having x-ray the “concept of climate change “arising from urban development, contained that climate change has far reaching effect on human exposure to hazard; therefore, the ability of urban planners, architecture, geographers, environmental managers, bio-technologist, Ecologists, and other earth scientist together with government policy on the applicability of urban scientific planning and development; would enhance the ability of people to cope with hazards once they occur. This conceptual framework therefore is relevant to the problem under-consideration because it strongly links the effects of urban landscape spectrum to climatic vagaries base on its influence on both the environment and human in the society.

### **Causes of Biodiversity loss in urban Area**

Scientists, particularly environmental scientists, urban planners, Biographers, ecologist and architectural designers actively work to understand past and future environmental status by using observations and theoretical models, with that record of environmental status extending various complex transformation mode on the landscape of the earth involving floral and faunal; the relationship between urban development and biodiversity loss can be traced, based on the degree of various alteration of vegetation, particularly with the total clearing of the surface vegetation of urban areas of the world for urban development. This basically helps to expose the various interplay involved in the distortion of ecological system, thus, creating avenue for a solution seeking planning and execution that encourages afforestation of urban environment.

The word vegetation can be described as the renewable gold (Odeyemi, 1998) on which the long-term sustainability of life on earth rests; because vegetation support not only the ecological organism but also provide respiratory process on the environment. This is why “the world conservation strategy (WCS) outline the various ways of conserving environmental species as its major objectives:

- a. Maintenance of essential ecological process and life support systems.

- b. Preservation of genetic diversity and sustainable development of species and the ecosystems revolve around land and vegetation.

Vegetation generally is the single source of primary biological production that sustains the human population and animal species. This is why “the world conservation strategy (WCS) outline the various ways of conserving environmental species as its major objectives:

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b. Preservation of genetic diversity and sustainable development of species and the ecosystems revolve around land and vegetation.

One inadvertent and important feature associated with urban development is change in vegetation. The urban area experience almost complete absence of primary forest. This extensively is not far from multiple human activities ranging from the construction of varying degree of building, materials, various road construction, urbanization affluence discharge; pollution and discharge of chemical dumps and varying toxic waste, as well as population pressure on the cities are some of the associated causes amongst others.

The consequences of urban vegetation loss and other activities of man invariably hinder the degree of biodiversity relationship which proportionally cause certain degree of change on climate behaviour. Now this change in climate behaviour is felt inform of chemical precipitation, urban heat Island, warm temperature, harsh weather, toxic particulates and degradation of environmental quality within urban and country side; this in recent time have attracted public concern and the need to consider a scientific urban development for adequate resource sustainability, and environmental conservation becomes absolute. This is in line with Heino view point, contending that the influence of the activities of man on climate in different scales has attracted much attention during the recent years (Helno, 1980).

The inapplicability of these conservation strategy in urban areas of the world have led to urban land cover change, and as such this have cause the most significant regional anthropogenic impact to urban environment and beyond.

### **The Benefits of Urban Biodiversity**

The existence of urban spatial biodiversity will provide an explicit generation of a healthy ecological urban environment. This is because urban environment is ecologically highly dynamic (Angold et al, 2006) and as such can enhance the provision of an ample opportunities for free exchanges of mater and energy in a healthy physical urban environment. By implication, the elements of climate together with its associated healthy mineral compounds in urban soil, together with the influence of groundwater and the relative atmospheric condition provides life supporting element and compounds which helps to establish natural vegetation (Amadi and Pedro, 2019).

An improvement in urban biodiversity can have positive and potential impact on quality of life of urban dweller as well as improve complex interaction among varying ecological interdependent relationship between human and nature.

A good urban plan and design should make use of a well land use pattern; such that enriches its green areas like parks and provide avenue for variety of species associated with urbanization and its landscape; of which many scholars have affirm that there is a variety of species living in urban area that are well-adapted to the urban life (Oliveira et al, 2011). These benefits associated with urban species have triggered more research and as such scholars have produced substantial evidence indicating that biodiversity in urban area can be more than rural areas surrounding (Qureshi and Breauste, 2010). By implication, this means that there will be lots of habitat concentrating in an intricate complexity within urban ecological niche; hence, there are some unique physical and ecological conditions within urban areas, which include mixed and small-scale habitat mosaic, different form of landscape and land uses, vary influence of people given rise to habitat types.

Additionally, Muller (2007) justified the reasons for high biodiversity in cities as follows:

- Cities often include relies of natural habitats forest and rivers.
- Cities often include relies of semi-natural habitats meadows, arable fields.



- The variety and distinctness of urban habitats-residential areas, gardens, parks, industrial areas, railway areas, Brownfield.
- Cities are centers of immigration
- Cities are centres of importation naturalization, and spread of exotic species

Urban environment should be one of the most significant area that provide ecological conservation of biodiversity for persistence climate moderation and regulation of certain, deleterious gases such as carbon dioxide (CO<sub>2</sub>) and Nitrogen (N<sub>2</sub>) that enters the biological world through the process of photosynthesis and the process of nitrogen fixing to enhance the process that release oxygen from vegetation to the atmosphere. This is why conservation of urban biodiversity is an important global issue because urban environment has significant role it plays in preserving the local species and maintaining a stable platform for not only the environment, but also providing the needed resource assistant for urban citizens in order to understand the natural process of a biological community on the environment.

## CONCLUSION

This paper has presented a picture of urban landscape spectrum which is a critical influencing factor of climate and climatic changes in urban areas of the world. Virtually all urban areas of the world recorded deficit in, “in and out flow” of urban atmospheric air mass. The paper finds out that the major causes of this is as a result of the pattern of urban design, building plan, structure and materials used in the urban areas of the world.

The paper recommended that the application of World Conservation Strategy (WCS) in both urban and country side should be adopted in all urban planning and design. It also recommended a scientific and systematic approach in the development of a mega-urban-city. These should be the primary and major concern of all government policy in the world.

Finally, the paper suggests that although the effect of inappropriate urban development is already been felt by the entire-world through global warming and global changing effect. The paper, conclusively maintained that since global change causes are no respecter of internal and international borders, there is the need now for all countries with urban areas in the world to respect the various treaties and conventions aim at reducing the triggering influence of global change. This will propel the needed systematic urban development and steam the enhancement of a targeted sustainable urban world for future generations.

## REFERENCES

- Adebayo, Y.R. (1991a) “Heat Island” in a Humid Tropical city and its Relationship with potential Evaporation. *Journal of Theoretical and applied climatology* 43 (3); 137-147.
- Adjugo Pao (2009) Qualifying the cost of climate change impact in Nigeria: *Emphasis on wind and rainstorm*. *J. Hummenecol.* 28 (2) 93-101.
- Alberti, M. Narzluff, J.M., Shulenberger, E; Bradley, G; Ryan, C. Zumbrunnen, C. (2003). Integrating Humans into Ecology; *Opportunities and Challenges for studying urban Ecosystems Vio Science, Vol. 53, No. 12 (Dec. 2003) Pp. 1169-1179.*
- Amadi, C. Harriuson and Pedro, T. Deekor (2019), *Essentials of Biography and soil studies (Geography of interdependent Relationships among organisms and the Environment)*. Emmanest Ventures and Data communication, Port Harcourt.
- Amadi, C., Harrison (2018) Issues in Environmental Management: *Planning and supervision*. Emmanest Ventures and Data Communication Port Harcourt.
- Angold, P.G., Sadler, J.P. Hill, M.O., Pullin, A., Rushton, S, Austin, K., Small, E., Wood, B., Wadworth, R. Sanderson, R., Thompson, K. (2006), Biodiversity in urban habitat patches: *Science of the Total Environment* 360 (2006) 196-204.
- Ayoade, J.O. (2004) *Introduction to Climatology for the Tropics (2<sup>nd</sup> Edition)*. Spectrum books limited, Ibadan Nigeria.
- Ayoade; J.O (1993) *Introduction to Climates for the Tropics*. Spectrum Books Limited, Ibadan, Nigeria.
- AyselNslu and Nasim Shakouri (2013). Urban landscape Design and Biodiversity: *Advances in landscape Architecture*, Murat Ozyavuz, Intechopen, doi:10.5772/55761. (accessed 20 September, 2019).

- Benedict, M.A. & Macmahom, E.T (2002) Green infrastructure: *Smart Conservation for the 21<sup>st</sup> century, Renewable Resources Journal, Volume 20, Numbers, Autumn 2002*. Pages 12-17 Maryland, USA.
- Botkin, D. and Keller, E.A (1998) Environmental Science: *Earth as a living planet (2<sup>nd</sup> Edition)*. John Wiley & Sons, New York.
- Buba, A. D. (2004) "Climate change and water problems in Chad Republic" *J. Arid Environ*, 3 (2): 42-50
- Buchley, R.W. Bruggen, van and Trippi, L.E. (1972) Heat Island Death Island? *Environmental Research*. 5 :85-92.
- Camilloni, I and Barros, V. (1997), *On the urban Heat Island effect Dependence on temperature Trends. Climatic Change*, 37:665-681.
- Clerk C. R. (2002) "Climate change of climate Fluctuation". *Arid Environ*; 1 (1): 18-33.
- Connery, K. (2009) Biodiversity and urban Design: *Seeking an integrated solution. Journal of Green Building*. Spring 2009. Vol 4, No 2. Pp 23-38.
- De Weerd, S. (2007) Climate Change coming home: *Global Warning effect on population. World Watch*, 2 (3) 6-13.
- Dettwiller, J. (1970) *Evolution Secularize du climate de Paris (influence de l'urbansime)*. *Men meteorolo Natt Paris*, 52-83.
- Emmanuel, R. (1997a) urban Vegetation change as an indicator of demographic Trends in cities: *the case of Detroit*. *Environment and planning* 24 (B)s: 415-426.
- Freedom, C. Onuoha (2008) Oil exploitation, Environmental degradation and climate change: *Assessing the vulnerability of the Niger Delta, Environment; Conference proceedings*.
- Hanal, G., Weidert, D. & Busen, R. (1990) *Absorption of solar Radiation in an urban Atmospheric Environment*, 24 (B). 83-292.
- Intergovernmental Panel on Climate Change (IPCC) (2001). The report of working group 1 of the intergovernmental Panel on climate (IPCC), 2007: *climate change 2007 Synthesis report*. Summary for policy makers available at: <http://www.IPCC.wgi-ucar.edu/wgi/wgi-report.htm>, (accessed 23 September, 2019).
- Jimoh, I.H. (2006) Pattern of environmental degradation and development efforts. In H.A Saliu, A.A. Ogunsanya, J.O. Olujide and J.O. Olaniyi (eds) *Democracy and Development in Nigeria: Economic and environmental issues vol. 2*. Lagos: Concept Publication.
- Kohsaka, R. (2010) Economics and the convention on biodiversity: *financial incentives for encouraging biodiversity in Nigeria*. Urban biodiversity and design 1<sup>st</sup> edition. Edited by N. Muller p. Warner and John.
- Lee, D.O. (1992). *Urban warming? An analysis of Recent Trends in London's heat Island Weather*, 47:50-56.
- Lopez Gomez, A. Fennadez, F. Arroyo, F., Matinvide, J. And Guardrat, J.M. (1993) *El Climate de las ciudadsespariolas*, Madrid cathedra. 268.
- Mcdonald, R. Karveive, P. Forman, R.T.T. (2008). *The implications of current and future urbanization for global protected areas and biodiversity conservation*. *Biological conservation*, 141.
- Moreno-Garcia, M.C. (1994). Intensity and form of the urban Heat Island in Barcelona. *International Journal of Climatology* 8. 14:705-710.
- Muller, N. Werner, P., Kelcey, J.G. (2010) *Urban biodiversity and design*. John Wiley & Sons, Mar 5, 2010-468 pages.
- Murap, L.O. McGinn, C.E. and Flocchini, R.G. (1993) *An analysis of Microclimatic Variation in suburban Environment*, *Atmospheric Environment*, 27; (B): 129-156.
- Narayana: P. (2011). *Environmental pollution principles analysis and control*. New Delhi: CBS: Ltd. In perspectives on the Niger Delta Environment.
- Nicholls, R.J. Hoozemans, F.M.J. and Marchland, M. (1999) increasing flood risk and wetland losses due to global sea-level rise: *regional and global analysis*, *global Environmental Change*, 9. 569-587.
- Nigerian Environmental Study/Action Team (NEST), (2003), *Climate change in Nigeria: A Communication guide for reporters and educators*. NEST Ibadan.

- Nwafor J.C. (2007) "Global climate change: *The driver of multiple causes of flood intensity in sub-Saharan Africa*" paper presented at the international conference on climate change and economic sustainability held at Nanamdi Azikwe University, Enugu, Nigeria, 12-14 June, 2007.
- Odeyemi, S.O. (1998) Plant: *The Renewable Green Gold*, Inaugural Lecture Service University of Lagos Press.
- Odjugo PAO (2005) "An analysis of rainfall pattern in Nigeria", *Global J. Environ Sci.*, 4 (2): 139-145.
- Odjugo PAO (2009) quantifying the cost of climate change impact in Nigeria; *Emphasis on Wind and Rainstorm*. *J. Uman Ecol.* 28 (2): 93-101
- Odjugo PAO, Okhuoria A.I (2003). "The impact of climate change and anthropogenic factors on desertification in the Semi-Arid region of Nigeria", *Global J. Emminon* 5012 (2): 118-126.
- Ojo, S.O (1977) *The climate of West African*. Heinemann Publisher. London.
- Oke, T.R. (1987) *Boundary Layer Climates (2<sup>nd</sup> Edition)*. Methuen co; London/ New York, 435.
- Oke; T.R. (1982), The Energetic Basis of the urban Heat Island. *Quartly Journal of Royal Meteorological Society*, 108:1-24.
- Olivera, J.A. Balaban, O. Doll, C.N.H., Penaranda, R.M., Ciasparatos, A., Lossifova, D. Suwa, A. (2011) Cities and biodiversity; *Perspectives and governance challenges for implementing the convention on biological diversity (CBD) at the city level*. *Biological conservation* 144 (2011) 1302-1313.
- Qureshi, S. & Breuste, Jurgen, H. (2010) Prospects of Biodiversity in Mega city of Karachi, Pakistan: *Potentials, constraints and implications*. *Urban biodiversity and design* 1<sup>st</sup> edition. Edited by N. Muller, P. Warner and John G. Lelcey. Blackwell Publishing Ltd.
- Ricketts, T. And M. Imoff (2003) Biodiversity: *urban areas and agriculture; locating priority ecoregion for conservation*. *Conservation Ecology* 8 (2):1 (online) URL: <http://www.consecol.org/vol8/iss2/art1>
- Roberts, D.A., Bastista, G.T., Pereira, S.I.G, Waller, E.K. & Nelson, B.W. (1998) Change Identification using multi-temporal Spectral Mixture Analysis: *Applications in eastern Amazonia*, in Lunetta, R. & Elvilge, C.D., (eds) *Remote Sensing and change Detection Environmental Monitoring Methods and Applications*. Sleeping Bear press, Inc. Michigan.
- Savard L., Clergeaub, Ph. Mennechz (2000) *Biodiversity concepts and Urban ecosystems landscape and urban planning* 48(2000) 131-142.
- Soule G, and Wilcox (1980) *Applied Biography's urban climate*. Technical note for urban growth.
- Tratalos , J. Fuller, R.A Warren, Ph H. Davies R.G Gaston, K.J. (2007) *urban form biodiversity potential and ecosystem services landscape and urban planning* 83 2007.
- "United Nations Framework convention on Climate change". (1992) Retrieved from <http://unfccc.int/resourceve/docs/convkp/convpdf>(Accessed 11september, 2019).
- Voogt, J.A (2004) urban Heat Islands: *Hotter cities, Environment, Overpopulation impacts*, November 2004, from <http://www.actenbioscience.org/environment/voogt.html>
- Wikipedia, *Environmental Degradation*; <https://en.wikipedia.org/wiki/environmentaldegredation> Accessed 20 September, 2019.
- Zitkovic, M. (2008). *Managing green spaces for urban biodiversity: local and regional authorities for biodiversity 2010*.