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Literature Review

Environmental Modification and Anthropogenic Impacts on Urban Environment

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Abstract

The paper focuses on environmental modification resulting from urban hazardous ecological impact induced by humans who are the most potent and fundamental agents of environmental alteration, exponential population growth, industrialization, poor sanitary conditions and general environmental depletion activities, thereby contributing to the decline of environmental quality. Thus, advancing mitigation and adaptation strategies to ameliorate environmental degradation. To provide an in- depth analysis of the subject matter, literature was reviewed while situating the research on a conceptual framework based on environmental possibilism, determinism and carrying capacity. Human activities which are the major ecological transformation agent in the urban area, can also be measured in terms of the biologically productive natural resources (land, water, air soils and the biologically active sphere). The study therefore recommends that social impact assessment, as well as environmental impact assessment, must be carried out to regulate man's activities to mitigate environmental decline. These measures will safeguard, protect and conserve the environment and improve its quality to forestall indiscriminate damage.

Keywords: Environmental, Modification, Anthropogenic, Impacts, Urban Environment.

1. Introduction

Man has continually modified the environment to suit his own taste and preferences in the process of this environmental modification, man inflicts diverse environmental damages on the planet Earth, where the urban environment exists. This is the justification of the "theory of environmental possibilism", which explicitly states by Peet (1985) that man can manipulate nature to suit his own demands at the expense of nature (Bennett, 2013).

As urban centres, continue to spring up across the world, the physical changes that emerge as a result of urbanization, and landscape transformation include deforestation, and environmental pollution (water, land noise, and others) (Khairunnisa et al., 2022; Zipperer et al., 2020). All these anthropogenic disturbances generate immediate environmental impacts on urban ecology. This, in turn, leads to a reduction in environmental quality.

Edewor (2021) asserts that to achieve a sustainable environment, all stakeholders in the environment must be responsive to environmental ethics, which is one of the modest ways to avert environmental crisis, and also to create awareness of environmental protection consciousness.

While the wheel of economic activities will continue to spin in the cityscape, the challenges of environmental problems will continue to multiply if the trend of this unsustainable trajectory is not stemmed. The urban environment has always borne the full

brunt of anthropogenic activities resulting from human impact. The term environment depicts the total of all conditions that affect an organism. In other words, the domain of human existence is the natural environment.

Lövei (2013) summarized the human impacts on the environment using the IPAT equations, as follows:

I = Impact on the human environment
P = Population
A = Affluence (measured by per capita income
T = Technology

From the IPAT equation, it is obvious that population growth and scaling up of the standard of living results in higher demand for the use of ecosystem resources and a greater dimension of waste generation both on domestic and industrial scales. Alberti (2008) mentioned that the consequences of the concentration of population in urban areas are always negative because as low-income earners contribute to the decay of the urban environment through filthy sanitary habits, the upper echelon of society also contributes to environmental degeneration through pollution by use of vehicles that depend on fossil fuels and at the cooperate level through industrialization. The impact of humans on the environment through anthropogenic activities has generated the concept of sustainable development, which is an organizing concept of meeting human needs while also sustaining the capacity of the natural environment and the resources contained thereof for the present generation without hindering the potential of posterity in meeting their needs. This also brings to the fore the effects of human activity on the cityscape at different levels (Edewor, 2024). Figure 1 is a typical example of the geographic scale of Environmental impacts.

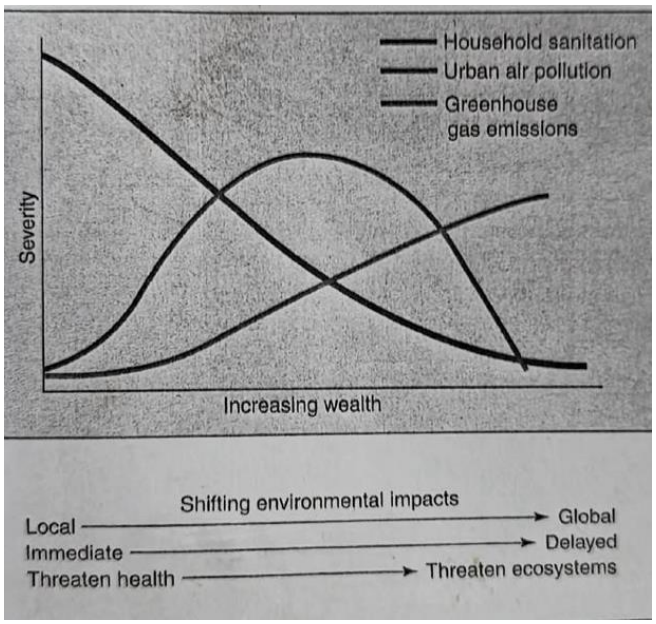

Figure 1. The Geographic Scale of Environmental Impact
Source: Graph from World Energy Assessment, UNDP, 2022

1.1. Urban Ecology and Environmental Modification

Urban ecology entails the systematic and scientific study of the inter-relationship of the biotic and abiotic components of the ecosystem with each other in their surroundings, within the context of an urban environment (Edewor, 2021). Cohen (1995) stated that more than 50% of the world's population in recent times inhabit urban areas, the import of this outcome is

that urban areas will continue to experience urban decay with very minimal urban renewal possibilities, since Environmental Impact Assessment, had received little or no attention in the policies that regulate human activities in urban areas. Specifically, the Nigerian urban areas are inhabited largely by densely urbanized populations, either because the cities themselves are just being transformed from "agroviles" through anthropogenic activities to urban centres or a majority of the inhabitants are migrants from the rural countryside which is usually the consequence of rural-urban migration. This eventually inundates the urban landscape.

These attributes of urban centres have at least two major salient implications. In the first instance, the urban settlers are bound to adapt themselves to systems of urbanism required to maintain a decent environment or adjust to the use of urban sanitary facilities which may not be readily available in adequate quantity and accuracy and precision in handling such facilities. Secondly, there is likely the tendency for a large number of individuals to have low productivity and low-income capacity to maintain a healthy urban environment due to the scarcity of sanitary facilities and standard housing facilities. UNO (2015) noted that this is a major cause of urban sprawl and the decline in the environmental quality of urban ecology and urban areas in general.

2. Methods

This study adopts a qualitative research design that focuses on analyzing secondary data sources to examine the impacts of anthropogenic activities on urban environments with particular emphasis on the concept of carrying capacity. The research is hinged on the theoretical framework of the man-environment relationship, drawing heavily from environmental determinism, possibilism, and particularly, carrying capacity theory.

The study utilizes a descriptive analytical approach that reviews scholarly literature, policy documents, institutional reports, and empirical case studies to interpret the environmental consequences of urbanization and human activities. The method focuses on interpreting environmental trends in relation to population growth, urban sprawl, and the degradation of ecological systems.

3. Results and Discussion

This article is hinged on the theory of man-environmental relationship which encompasses the concept of environmental possibilism, determinism and carrying capacity. The focus in respect of this research is on "carrying capacity" Monte-Luna et al. (2004) defined carrying capacity in human geography as the population of humans in a location such as a town, city, country or the entire globe that can conveniently carter for or support based on the available resources. We live in a world today where the human population is experiencing exponential growth. Fekadu (2014) also used the concept of environmental determinism, possibilism and carrying capacity to analyze human impacts on the environment and remarked that humans and human interference affect the biosphere and these influences when continuing unabated, the resultant effect is usually drastic degradation of the global ecosphere, carrying capacity (CC) which involves the maximum population level which a specific environment can support amid finite and infinite environmental resources, (food, space, water jobs, sanitary facilities etc. All these encompass the basic needs of various human settlements, but the demands are in higher intensity in towns, cities and urban areas due to their sprawling population densities. This high demand for resources in urban areas is a major

hindrance to environmental sustainability in the urban areas as the environment is always on the brink of the reality of environmental damage through massive anthropogenic activities, natural ecological hazards, transportation bodies and domestic and individual action.

The World Population Commission pontificated that the earth's human population has rapidly increased over the last couple hundred years. "From 1 billion in 1804 to 8 billion in 2022", with a projection of 9.2 billion by 2030, the exponential population growth worldwide, especially with a concentration of population in urban areas, the concept of carrying capacity is therefore of utmost importance to this article (United Nations Department of Economic and Social Affairs Population Division, 2022). The justification is that renewable resources and the entire planet Earth have their limits. If the resources must be harnessed sustainably, the earth's carrying capacity must be taken into cognizance so that the planet Earth and other immediate environment will not be pressured beyond its limits. In this wise, the earth would be shielded from exceeding the earth's carrying capacity.

The mitigation and adaptation factors therefore point to the concept of environmental sustainability which relates to the type of development that takes place without endangering the ability of posterity to meet their own needs (Edewor, 2024).

Though there is the general allusion that technology, can improve carrying capacity, the same technology remains the "bane of environmental assault as well as environmental decline or degradation through anthropogenic activities, and man's impact on the environment.

3.1. Urban Environment and Human Impacts

Mosley (2023) pointed out that the cityscape and world environment have been under assault since the era of the Industrial Revolution as a result of anthropogenic activities which have continued unrestrained, especially in urban areas where the population is concentrated in large areas, with relatively insufficient facilities to accommodate the population size.

A. Environmental modification

Humans and their distorting impacts through their insatiable quest for development are constantly involved in the creation of new towns, and expansion of new cities, this is usually referred to as environmental transformation or modification through urban renewal and expansion. Deforestation, overgrazing, and ill-considered large- scale agriculture can convert a former green and luxurious ecosystem into sterile and impoverished landscapes (Danilov-Danil'yan & Reyf, 2018). As pointed out by Edewor (2021) and Edewor (2022), environmental modification can result in environmental assault, as in the case of urban growth, this term will negatively improve the urban ecosystem which in turn reduces environmental quality with dual consequences for human health and environmental decline.

Industrialization: A mosaic of manufacturing and production industries and factories, dominates the cityscapes, all these are sources of anthropogenic disturbances in the environment. The functional complexity of the urban areas attract a myriad of environmental pollutants. Urbanized areas are usually defined by the continuous increase in population density. The toxic fumes and effluents from industrial activities are constantly discharged into the atmosphere, lithosphere, biosphere and hydrosphere. The issue of climate change is already garnering global attention, as the permanent regions of the earth which are known as the cryosphere are experiencing the melting of ice, the recent October 2022 flooding situation in Nigeria which affected over nineteen states can be partly attributed to anthropogenic factors, resulting from reckless anthropogenic activities such as indiscriminate waste disposal in drainage channels results to imperfect drainage in urban areas, this also results to the bandwagon effect of flooding.

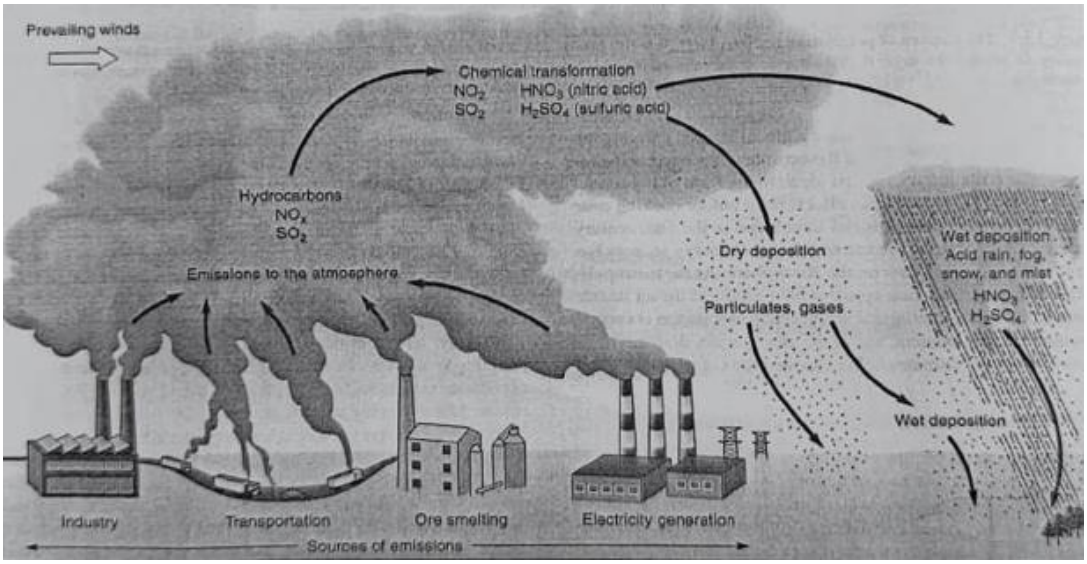

Figure 2. The Formation of Acid Precipitation
Source: Human Geography: Landscapes of Human Activities

Pollution and urban growth UNFPA, (2002): The United Nations Population Fund, remarked that population growth is the bane of environmental degradation in both urban areas and suburbs. The anthropogenic activities generated by humans are usually in most cases antagonistic to the safety of both the physical environment and the populace, the expansion of cities and towns globally, and the exponential rise in the population of humans, remain a major threat to man and biodiversity the ecological impact of urbanization cannot be underscored. All these anthropogenic activities and their human impacts have compounded environmental issues and climate change at various scales (locally, nationally and globally). Especially in the aspect of global climate change and ozone layer depletion, coupled with little or no recover to environmental or social impact assessment.

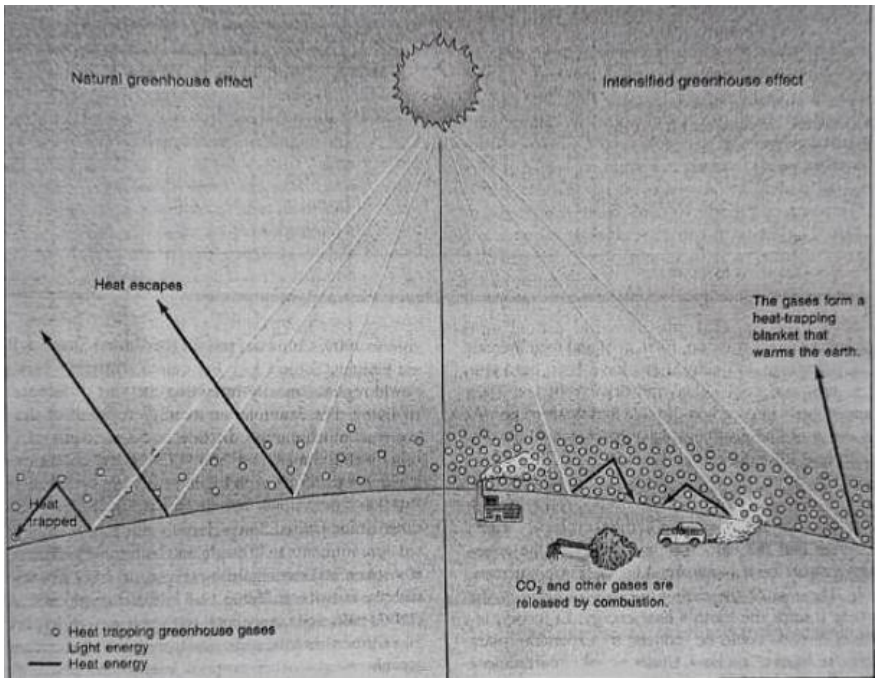

Figure 3. Intensified Greenhouse Effect
Source: Human Geography: Landscapes of Human Activities

As the population increases, cities and urban areas continue to expand, this expansion brings about land cover transformation, and microclimatic conditions such as urban heat islands; which is a distortion of the urban climatic condition due to population pressure arising from the concentration of population.

The World Bank reported that urban population growth in Nigeria was at 4.0254%, further statistics indicated that Nigeria at (25%) has the highest population growth rate of all the top 10 most populous countries in the world. The current population in Nigeria is 218, 541, 212. The National Population Commission posited that the total population of Nigeria in urban areas is 52.75%

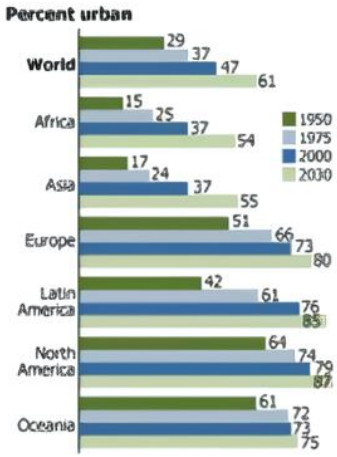

Figure 4. Population Living in urban areas.
Source: UN, World Urbanization Prospects

MacEachern (1990) opined that, like the plants' community ecosystem, the urban ecosystem also possesses a system and structure, therefore, when the urban environment is drenched beyond its carrying capacity, there is bound to be an environmental decline, which especially based on the anthropogenic disturbance from humans and human impacts.

Inadequate environmental sanitation facilities are yet another uphill task and challenging urban conditions that assume almost an insurmountable status. It is an urbanization phenomenon that results in the decline of environmental quality with adverse effects on human health. Urban areas generate a lot of solid waste and liquid waste, ranging from domestic waste to industrial effluents. Domestic waste increases with income Horizon 2020 noted that cities generate a tremendous amount of waste, in urban areas of developing countries, an estimated 20-50% of the solid waste generated remains uncollected. The result in most cases is disposed of indiscriminately in metropolitan regions. In urban sprawl conditions, where urban poverty exists, refuse is in most cases mixed with human excrement as a result of the nonavailability of access to sanitary facilities such as decent toilets or where toilets are available, there would be the problem of water supply.

When solid waste is not collected and disposed of effectively, it brings about poor sanitary conditions which pollutes and degrades lands, water resources, air quality and other components of the environment. Also, organisms such as flies, and worms that breed in low sanitary conditions are vectors of harmful diseases that lead to ill health.

3.2. Mitigation/ Remediation Strategy

Having identified some of the primordial causes of environmental assaults and their effects on the environment, it is expedient to advance some mitigation/adaptation remedies

that would safeguard the urban ecosystem. Edewor (2022), opined that the environment, both physical and human, has a limited ability to cope with prevailing environmental pressure and erosive tolerance. Therefore, the standard and ethical environmental sustainability index must be accorded adequate attention in the form of environmental and social impact assessment, to mitigate man's negative impact on the environment from both domestic and industrial waste.

Also, routine environmental sanitation should be embarked upon at all levels, locally, nationally and globally. These are all ethical practices that will improve environmental decline. Edewor (2021), opined that one of the major contributors to low environmental dualities in Nigerian urban areas is the resistance of the populace to planning bylaws alongside with lack of planning and control. It is also important for cities to scale up their refuse disposal and collection techniques to avert environmental deterioration 21st century refuse disposal facilities should also be explored such as incinerators, pulverization equipment and others.

3.3. Policy Implication of the Study Recommendation

From this discussion, it is quite glaring that urban areas and urban ecology are experiencing environmental deterioration and a decline in environmental modification resulting from anthropogenic disturbances, thus resulting in environmental assaults that put species on the brink of extinction. The research article has also established that exponential population growth, poor environmental sanitation and industrialization, and improper refuse disposal systems affect the environment and also constitute health hazards to humans.

Anthropogenic disturbances are mainly responsible for environmental assaults. Therefore, environmental impact and environmental sanitation activities should be upheld. One of the major indicators of a low-quality environment is poverty therefore, urban slums and shanty towns should be eliminated to restore the aesthetics and general environmental quality in urban areas. Coordinated policy of environment and protection is paramount to safeguarding the urban environment.

4. Conclusion

This paper documents environmental modification and anthropogenic impacts on urban environments. The exploding urbanization has outstripped the carrying capacity of the urban areas in Nigeria through indiscriminate anthropogenic disturbances that degrade the environment.

Poor environmental sanitation also aggravates substandard environmental quality in the urban areas, other principal factors inducing environmental assaults include industrialization, urban sprawl and exponential urban growth. From the foregoing discourse, the problem of urban areas in Nigeria includes poor sanitation facilities especially indiscriminate disposal of refuse. It is also obvious that urban poverty results in environmental decline, due to their poor sanitary habits. Therefore, environmental policies and laws that safeguard the environment from sudden decline should be enacted and strictly adhered.

5. References

Bennett, D. E. (2013). Geography and the emergence of sustainability science: missed opportunities and enduring possibilities. *THe Geographical Bulletin*, *54*.

Cohen, J. E. (1995). How many people can the earth support? *The Sciences*, *35*(6), 18–23.

Danilov-Danil'yan, V. I., & Reyf, I. E. (2018). The biosphere and civilization: In the throes of a global crisis. In *The Biosphere and Civilization: In the Throes of a Global Crisis*.

https://doi.org/10.1007/978-3-319-67193-2

Del Monte-Luna, P., Brook, B. W., Zetina-Rejón, M. J., & Cruz-Escalona, V. H. (2004). The carrying capacity of ecosystems. *Global Ecology and Biogeography*, *13*(6), 485–495.

Edewor, A. O. (2021). Perspectives On Environmental And Social Justice: The Sdgs In Focus Through A Geographer's Lens. *Environmental Review*, *8*(2).

Edewor, A. O. (2022). Environmental degradation and sustainability in Isoko north and south, Delta state, Nigeria: the deforestation factors. *Innovations*, *69*. https://journal-innovations.com/assets/uploads/doc/98c02-265-274.23860.pdf

Edewor, A. O. (2024). Environmental Impacts Of Arable Crop Production:An Evaluation Of Nitrogen And Phosphorous Availability In Cultivated Farmlands Of Isoko Area Of Delta State. *Contemporary Journal of Environmental Sciences (CJES)*.

Fekadu, K. (2014). The paradox in environmental determinism and possibilism: A literature review. *Journal of Geography and Regional Planning*, *7*(7), 132–139.

Khairunnisa, S. A., Rukmi, W. I., & Kurniawan, E. B. (2022). Arrangement of Pedestrian Paths Based on Walkability Aspects in Jakarta Kota Tua Area. *INTERNATIONAL JOURNAL ON ADVANCED TECHNOLOGY, ENGINEERING, AND INFORMATION SYSTEM (IJATEIS)*, *1*(2). https://doi.org/10.55047/ijateis.v1i2.227

Lövei, G. L. (2013). Urban ecology. Patterns, processes and applications. *Bulletin of Insectology*, *66*(2), 308.

MacEachern, D. (1990). *Save Our Planet--750 Everyday Ways You Can Help Clean Up the Earth*. ERIC.

Mosley, S. (2023). *The environment in world history*. Routledge.

Peet, R. (1985). The social origins of environmental determinism. *Annals of the Association of American Geographers*, *75*(3), 309–333.

United Nations Department of Economic and Social Affairs Population Division. (2022). *World Population Prospects 2022*. United Nations. https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022_summary_of_results.pdf

Zipperer, W. C., Northrop, R., & Andreu, M. (2020). Urban Development and Environmental Degradation. In *Oxford Research Encyclopedia of Environmental Science*. https://doi.org/10.1093/acrefore/9780199389414.013.97