

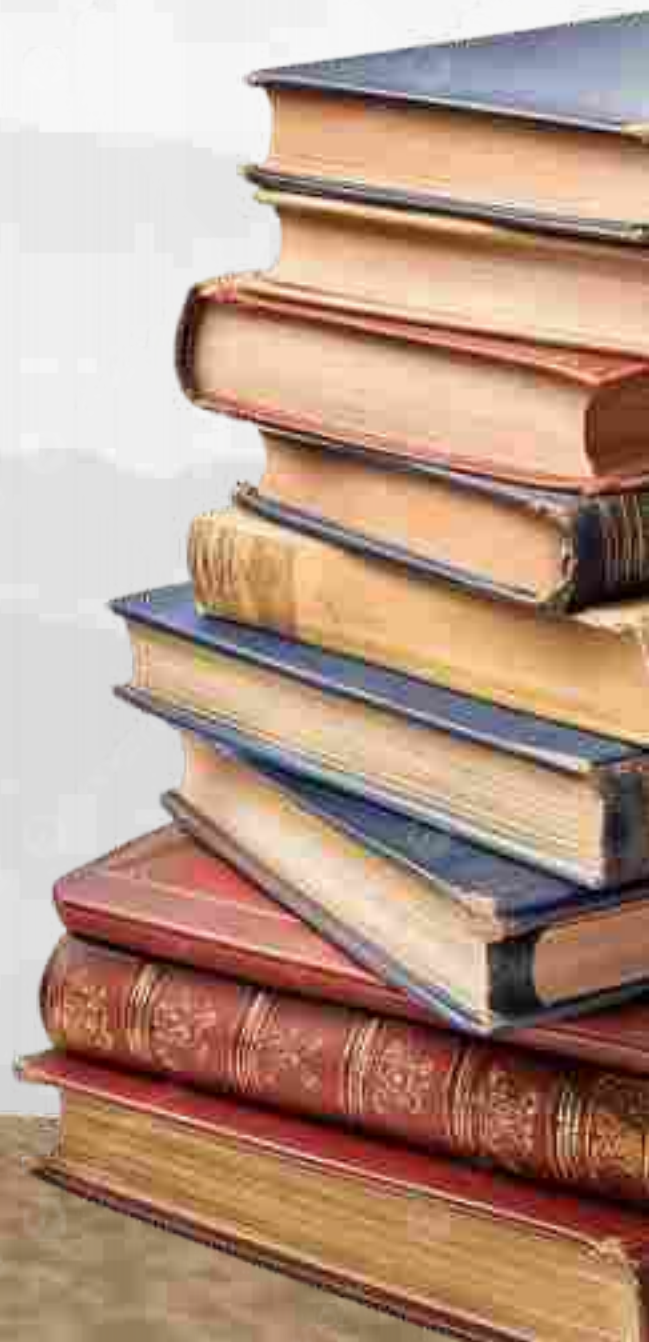


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PERSPECTIVE ON EDUCATION IN NIGERIA

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CHAPTER EIGHTEEN

**AN ASSESSMENT OF THE IMPACT OF URBANIZATION
ON LOCAL BIODIVERSITY****By****Ronald, Abhulimen Winifred**Department of Biological Sciences, Faculty of Biosciences,
Federal University Wukari.**Orchid-id:** 0009-0006-3670-4079. **Email:** Ronaldwinifred@gmail.com**ABSTRACT**

Urbanization is transforming landscapes worldwide, reshaping ecosystems and profoundly impacting local biodiversity. This chapter investigates how urban growth leads to habitat destruction and fragmentation, pollution, invasive species, climatic alterations, and overexploitation of natural resources. It also explores practical mitigation strategies such as green infrastructure, ecological zoning, sustainable transport systems, environmental impact assessments, native plant restoration, and community stewardship. The findings reveal that while urbanization imposes serious threats to biodiversity, there are multiple opportunities to balance development with conservation. By integrating ecological considerations into urban planning, engaging local stakeholders, and restoring degraded habitats, cities can become places that support both human well-being and biological diversity. This balanced approach is essential for sustaining resilient ecosystems in urban settings.

Keywords: urbanization, local biodiversity, habitat fragmentation, green infrastructure, ecological zoning, sustainable urban planning, Nigeria

18.1. Introduction

urbanization is a rapidly growing global phenomenon characterized by the expansion of human populations into urban areas and the transformation of natural landscapes into built environments.

As cities expand to accommodate increasing human populations, natural habitats such as forests, wetlands, and grasslands are often replaced by infrastructure, including roads, buildings, and industrial zones. This transformation has profound ecological consequences, particularly for local biodiversity.

Local biodiversity — the variety of plant, animal, and microbial life within a specific geographic area — is highly sensitive to changes in land use and environmental conditions. Urbanization can lead to habitat fragmentation, pollution, and the introduction of invasive species, all of which threaten native species and disrupt ecological balance. While some species may adapt to urban settings, many are unable to survive in altered or degraded habitats, resulting in population declines or local extinctions.

The chapter helps us to understanding the relationship between urban development and biodiversity is crucial for developing sustainable urban planning strategies that minimize ecological damage. This research explores the multifaceted impacts of urbanization on local biodiversity, examining both the threats it poses and potential mitigation approaches to preserve ecological integrity in urban landscapes.

18.2. Clarification of concepts

i. Concept of Urbanization

What is Urbanization?

Urbanization is the process by which an increasing proportion of a population comes to live in urban areas, such as towns and cities, rather than rural areas. It involves the growth and expansion of cities due to population movement from rural to urban regions, as well as the physical development of urban infrastructure like housing, roads, industry, and public services. Urbanization is the process of the growth and expansion of cities and urban areas. It involves the migration of people from rural to urban areas, leading to a concentration of the population and economic activities in a particular location. This trend has been ongoing for centuries and has significantly impacted society, economy, and the environment. The process of urbanization is closely linked to industrialization and modernization, as urban areas offer better opportunities for employment, education, and access to resources. However, it also presents challenges such as overcrowding, pollution, and strain on infrastructure and resources. Urbanization is an ongoing global phenomenon that continues to shape our world and the way we live (Femi, 2019).

Key Features of urbanization includes:

Population Growth in Cities: More people move to cities in search of better job opportunities, education, healthcare, and living standards.

Land Use Change: Natural landscapes like forests, grasslands, and wetlands are often cleared or modified to make room for urban development.

Economic Transformation: Urbanisation is typically linked to industrialisation and a shift from agriculture-based economies to service and industry-based ones.

Infrastructure Development: Increased construction of buildings, transportation networks, and utilities such as water and electricity supply.

The causes of Urbanisation include:

Rural-to-Urban Migration: People migrate to cities for better employment, education, and healthcare.

Natural Population Growth: High birth rates in cities contribute to urban expansion.

Government Policies and Industrialisation: Development policies and the growth of industries attract people to urban areas.

The types of Urbanisation includes:

Planned Urbanisation: Guided by urban planning, with regulated development and infrastructure.

Unplanned (or Rapid) Urbanisation: Often leads to overcrowding, slums, traffic congestion, and inadequate public services.

ii. Concept of Local Biodiversity

Local biodiversity refers to the variety of living organisms—plants, animals, fungi, and microorganisms—that exist within a specific area or ecosystem, such as a forest, wetland, park, or even an urban neighborhood. It includes: number of species present (species richness), the genetic variation within those species, the diversity of ecosystems or habitats in the area, and the interactions between different organisms and their environment. Local biodiversity refers to the variety of living organisms that are present in a specific geographic area. This includes all plants, animals, and microorganisms that inhabit an environment, as well as the interactions between these species. Local biodiversity is important for the health and functioning of ecosystems, as well as for providing ecosystem services such as pollination, nutrient cycling, and pest regulation. Understanding and preserving local biodiversity is crucial for maintaining the balance of nature and promoting sustainable development. The term "local biodiversity" refers to the variety of living organisms found in a specific geographical area. This includes the diversity of species, genes, and ecosystems within that area. Local biodiversity is important as it supports and maintains the health and balance of an ecosystem, providing essential services such as clean water, air, and soil. It also plays a crucial role in our daily lives, as it provides food, medicine, and materials for various industries. Understanding and protecting local biodiversity is crucial for maintaining the overall health and sustainability of our planet (Niyi, 2018).

a) Components of Local Biodiversity:

- **Species Diversity** – The range of different species living in the area.
- **Genetic Diversity** – The genetic differences within a species, which help populations adapt to environmental changes.
- **Ecosystem Diversity** – The variety of habitats (e.g., ponds, woodlands, grasslands) in a local region.
- **Functional Diversity** – The roles species play in the ecosystem (e.g., pollinators, decomposers, predators).
- **Examples of Local Biodiversity:**
 - A **pond** may host frogs, fish, aquatic plants, algae, and insects.
 - An **urban park** could contain native trees, birds, insects, fungi, and even small mammals.
 - A **tropical forest** may support hundreds of species of plants, birds, reptiles, and microorganisms within a small area (Niyi, 2018).

18.3. Threats of Urbanization on local biodiversity

Urbanisation affects biodiversity in complex and often interrelated ways. These impacts can be direct—such as the destruction of habitats—or indirect, like changes in climate, pollution, and species interactions. Below is an examination of the key dimensions through which urbanisation influences local biodiversity according to Kingsley, (2020):

i. Habitat destruction (e.g., due to urbanisation or agriculture)

Habitat destruction is the primary cause of loss of biodiversity in local ecosystems. It occurs when natural habitats, such as forests and wetlands, are destroyed or altered by human activities. This can include deforestation, land conversion for agricultural purposes, and urban development. When habitats are destroyed, the species that rely on them for food, shelter, and reproduction are also affected. This disruption can lead to a decline in local biodiversity, as species may be forced to move or adapt to new environments. In addition, habitat destruction can also disrupt the delicate balance of an ecosystem, leading to further impacts on biodiversity. Without intervention and conservation efforts, habitat destruction will continue to be a major threat to local biodiversity.

One of the most immediate and significant effects of urbanisation is the conversion of natural habitats into urban infrastructure. Forests, wetlands, grasslands, and other ecosystems are cleared to make way for buildings, roads, and industrial development. This has led to loss of habitat reduces the space available for native species to live and reproduce. Even when patches of habitat remain, they are often **isolated**, limiting gene flow and species movement. This can lead to reduced genetic diversity and increased vulnerability to extinction (Abimbola, Adewumi & Abubakar, 2025).

ii. Pollution (air, water, soil)

Pollution poses a serious threat to local biodiversity. It can harm the delicate balance of ecosystems, introducing chemicals and toxins that can harm plants and animals. Additionally,

pollution can also disrupt food webs, leading to declines in certain species and upsetting the natural balance of an ecosystem. In aquatic environments, pollution can lead to decreased water quality and oxygen levels, resulting in the death of many aquatic species. Furthermore, pollution can also have indirect effects on biodiversity, such as altering reproductive patterns and weakening the immune systems of animals. Urban areas are major sources of air, water, noise, and light pollution, all of which can negatively affect biodiversity.

Air Pollution: Impairs respiratory function in animals and damages sensitive plant species.

Water Pollution: Runoff from cities carries heavy metals, oils, and chemicals into nearby water bodies, affecting aquatic life.

Noise Pollution: Disrupts animal communication, breeding, and navigation.

Light Pollution: Affects nocturnal species' behaviors such as feeding, migration, and reproduction. It is crucial to address pollution in order to protect our local biodiversity and maintain healthy ecosystems.

iii. Invasive species

The presence of invasive species is a major threat to local biodiversity. These species are non-native and often have no natural predators in their new environment, allowing them to grow and spread rapidly. This leads to a decrease in the population and diversity of native species, as invasive species compete for resources and sometimes even prey on them. Additionally, invasive species can alter ecosystem processes and disrupt the balance of the local ecosystem. This can have cascading effects on the entire food web, leading to further declines in native species. Invasive species also have the potential to introduce new diseases to the local ecosystem, further deteriorating the health and resilience of native species. Overall, invasive species pose a significant threat to local biodiversity and require immediate attention and management to prevent further harm. Urban areas often become gateways for **invasive alien species**, which outcompete native flora and fauna. It increased movement of people, goods, and materials introduces non-native species to local ecosystems. Invasive species can alter habitat structure, spread disease, or displace native species, leading to biodiversity loss (Odafivwotu & Abotutu, 2015).

iv. Climate change

Climate change poses a significant threat to local biodiversity. Rising temperatures, changes in precipitation patterns, and extreme weather events are all impacts of climate change that can have serious consequences for the delicate ecosystems that support diverse species of plants and animals. As the climate becomes warmer, many species may be unable to adapt and migrate to more suitable habitats, leading to declines in population sizes and even extinction. In addition, changes in precipitation patterns can cause droughts or floods, affecting the availability of food and water for many species. Extreme weather events such as hurricanes and wildfires can also

have devastating impacts on local biodiversity, destroying habitats and displacing or killing many species. These threats on local biodiversity are not only detrimental to the health of individual species, but can also have cascading effects on entire ecosystems and the services they provide to humans. It is crucial that we address and mitigate the effects of climate change in order to protect local biodiversity and the delicate balance of life on our planet. Urbanisation contributes to localized warming due to the Urban Heat Island (UHI) effect, where cities become significantly warmer than surrounding rural areas. It has leads to changes in local microclimates can affect temperature-sensitive species, leading to shifts in distribution, altered migration patterns, or mortality.

v. Overexploitation (e.g., overfishing, deforestation)

Overexploitation is a serious threat to local biodiversity. This refers to the excessive use or extraction of natural resources, such as plants and animals, beyond their sustainable levels. When this occurs, it can lead to the decline or extinction of certain species, disrupting the delicate balance of the ecosystem. This is because overexploitation can lead to the depletion of important resources, including food and shelter, for many species. Additionally, overexploitation can also disrupt the natural processes that are necessary for these species to thrive, such as pollination or seed dispersal. As a result, this can have a cascading effect on the entire ecosystem, causing further declines in biodiversity. This issue is particularly prominent in local areas where the resources are limited and the pressure for their use is high. Therefore, it is crucial to address overexploitation in order to protect and preserve the local biodiversity. This can be done through implementing sustainable management practices and regulations, as well as educating the local communities about the importance of maintaining a balanced and healthy ecosystem.

18.4. Potential mitigation approaches to preserve ecological integrity in urban landscapes.

The potential mitigation approaches to preserve ecological integrity in urban landscapes according to Abel, (2016) and Ogunde, (2017):

i. Green Infrastructure Development

Incorporate parks, green roofs, rain gardens, and urban forests into city planning to support biodiversity, improve air quality, and manage stormwater naturally. Green infrastructure development is an essential approach to mitigating the impacts of urbanization on ecological integrity in urban landscapes. By implementing green infrastructure, cities and urban areas can effectively manage stormwater runoff, reduce urban heat island effect, and improve air and water quality. This is achieved through the use of natural systems and approaches, such as rain gardens, green roofs, and urban forests, that mimic the natural functions of the environment. These green infrastructure practices help to preserve and restore ecological integrity in urban landscapes by providing habitat and promoting biodiversity, reducing erosion and flooding, and improving soil health. Additionally, green infrastructure can also provide multiple co-benefits, such as

recreational spaces and attractive urban amenities, further enhancing the livability of urban areas. Overall, green infrastructure development is a crucial tool for mitigating the negative impacts of urbanization on ecological integrity and promoting sustainable development in cities.

ii. Urban Planning with Ecological Zoning

Designate and protect ecological zones (e.g., wetlands, riverbanks, green corridors) within cities. Limiting development in these areas helps preserve native habitats and species. Urban planning with ecological zoning helps to mitigate urban development's negative impact on the environment by designating specific zones for different levels of land use intensity and ecological protection. By using ecological zoning, urban planners can prioritize areas for ecological preservation and limit development in those areas to maintain the integrity of the natural ecosystems. This approach allows for the coexistence of urban development and ecological conservation, preventing urbanization from completely overtaking and destroying natural habitats. It also promotes sustainable development by identifying areas suitable for urban expansion while also preserving critical ecological areas. Ultimately, this helps to maintain ecological balance and protect the biodiversity of urban landscapes, ensuring the long-term health and resilience of both the environment and the communities living within it.

iii. Sustainable Transportation Systems

Promote public transport, cycling, and walking over car-dependent infrastructure. This reduces emissions, limits habitat fragmentation, and improves overall environmental health. Sustainable transportation systems help to mitigate approaches to preserve ecological integrity in urban landscapes by reducing carbon emissions and air pollution. These systems promote the use of alternative modes of transportation such as public transportation, cycling, and walking, which reduces the reliance on private vehicles. This reduces the overall carbon footprint of the city and helps to preserve the quality of air and water in the urban environment. Furthermore, sustainable transportation systems often incorporate green infrastructure, such as green roofs and rain gardens, which can help to mitigate the effects of urbanization on the natural landscape. These systems also prioritize the use of renewable energy sources, such as electric buses and trains, to further reduce the impact on the environment. By promoting sustainable transportation, cities can reduce their contribution to climate change and support the preservation of ecological integrity in urban landscapes.

iv. Environmental Impact Assessments (EIAs)

Mandate EIAs before any major urban development. This ensures ecological concerns are identified early and mitigated through design adjustments or conservation offsets. The use of Environmental Impact Assessments (EIAs) play an essential role in preserving the ecological integrity of urban landscapes by providing comprehensive analyses of potential environmental impacts of proposed projects. Through this process, potential negative impacts can be identified

and mitigated before any development takes place. This helps to ensure that urban landscapes maintain their natural balance and prevent harm to the surrounding ecosystems. Additionally, EIAs also help to promote sustainable development practices by considering alternative approaches and recommending mitigation measures that minimize environmental impact. This not only preserves the ecological integrity of urban landscapes but also promotes the long-term sustainability of these areas.

v. Native Plant Landscaping and Restoration

Encourage the use of native vegetation in landscaping and rehabilitate degraded urban areas. This supports local wildlife and reduces the need for irrigation and pesticides. Native Plant Landscaping and Restoration play a crucial role in mitigating the negative impacts of urbanization on ecological integrity. By using native plant species in urban landscapes, we can help restore the natural balance and diversity of local ecosystems. These plants have evolved to thrive in their local environment and are better equipped to withstand the challenges of urban living. One of the main ways Native Plant Landscaping and Restoration help preserve ecological integrity is by providing habitat for native wildlife. As urbanization continues to encroach on natural habitats, many species are forced to adapt or disappear altogether. By incorporating native plants into urban landscapes, we can create a more suitable habitat for these species, which in turn helps maintain the overall ecological balance. Native plants are also more resilient to local climate conditions and require less maintenance compared to non-native plants. This reduces the need for watering, fertilizing, and other maintenance practices that can have harmful effects on the environment. This also leads to a reduction in the use of chemicals and pesticides, which can have detrimental effects on both the environment and human health. In addition to providing habitat and reducing maintenance needs, Native Plant Landscaping and Restoration also help to mitigate stormwater runoff. Native plants have deep root systems that can absorb and filter water, which helps to prevent erosion and flooding. This not only helps to preserve the ecological integrity of the surrounding environment, but also helps to prevent damage to urban infrastructure. Native Plant Landscaping and Restoration are essential tools in preserving ecological integrity in urban landscapes. By incorporating native plants into our urban environments, we can promote biodiversity, reduce maintenance needs, and mitigate the negative impacts of urbanization. This not only benefits the environment but also helps to create a more sustainable and healthier city for all inhabitants.

vi. Community-Based Environmental Stewardship

Engage local communities in urban greening projects, environmental education, and conservation efforts. When people feel ownership, they help protect and maintain ecological spaces. Community-Based Environmental Stewardship (CBES) is a vital approach to preserving ecological integrity in urban landscapes by engaging local communities and empowering them to take care of and protect their local environment. By involving the community in stewardship activities such as litter cleanups, tree plantings, and restoration projects, CBES promotes a strong

sense of ownership and responsibility for the environment, leading to more sustainable and long-term preservation efforts. Moreover, CBES also fosters a sense of community and promotes understanding and appreciation of the local ecosystem, which can help mitigate potential conflicts between development and conservation in urban areas. With the support and involvement of the community, CBES can effectively address environmental issues and implement effective mitigation approaches, such as implementing green infrastructure, promoting sustainable development practices, and creating green spaces in urban areas.

Conclusion

Urbanization is an increasingly dominant force shaping natural landscapes and ecosystems across the globe. While it offers numerous social and economic benefits, its environmental costs—particularly to local biodiversity—are significant. The expansion of urban areas leads to habitat loss, fragmentation, pollution, and the introduction of invasive species, all of which place immense pressure on native flora and fauna. Additionally, urban heat islands and disrupted ecological interactions further threaten the stability of local ecosystems.

However, the negative impacts of urbanization are not inevitable. With strategic urban planning, the integration of green infrastructure, and community involvement in conservation, it is possible to mitigate biodiversity loss and even enhance ecological resilience within cities. Preserving local biodiversity is not only vital for maintaining ecosystem services and ecological balance but also for promoting healthier and more sustainable urban environments for future generations.

In summary, understanding and addressing the ecological consequences of urbanization is essential. Through collaborative efforts between governments, scientists, urban planners, and local communities, cities can evolve into spaces that support both human development and biological diversity.

Revise Questions

1. What is Urbanization?
2. Define local Biodiversity
3. Discuss five threats of Urbanization on local biodiversity
4. Highlight five potential mitigation approaches to preserve ecological integrity in urban landscapes.

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CHAPTER ONE:

AN ASSESSMENT OF THE CONTRIBUTIONS OF WEST AFRICA TERTIARY INSTITUTIONS TO THE DEVELOPMENT OF WEST AFRICA COUNTRIES

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CHAPTER FOUR:

FACTORS THAT WILL ENHANCE DEVELOPMENT OF CAREER SERVICE CENTRES IN NIGERIAN TERTIARY INSTITUTIONS

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