© MAY 2026 | IRE Journals | Volume 9 Issue 11 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I11-1717610

Assessment Of the City as An Ecosystem to Enhance Land Restoration

EZEA, NNEOMA CHINONYELUM
Department of Architecture, FES, ESUT

Abstract- ***The city is an organized urban area where things should work well and people live a good life. People's choices in life seem to be at variance to the environment in many cases. Rapid urbanization has intensified land degradation, ecosystem loss and environmental stress. This study examines the concept of the city as an ecosystem where the city is likened to the natural environment and its potential to enhance land restoration within. To do this, various areas in the city become minute (sub) system within themselves whereby the city can feed itself, generate its energy use and deal with their waste production thus becoming more sustainable in every aspect. The paper argues that cities can function as regenerative systems when ecological principles are integrated into planning and design. Strategies such as green infrastructure, nature-based solutions, and participatory governance are highlighted as pathways for restoring degraded urban land. An in-depth literature review of key concepts will help in shaping this discussion, showing how a city can actually be called an ecosystem.***

Keyword: City, Ecology, Ecosystem, Green Infrastructure, Land Restoration, Regeneration.

I. INTRODUCTION

Urbanization is occurring at an unprecedented rate, reshaping landscapes and placing significant pressure on natural ecosystems, (UN, 2019). The city is an organized urban area with large population of people living in one defined geographical area, (Pacione, 2009). Cities have experienced rapid expansion, often accompanied by deforestation, soil degradation and loss of biodiversity, (Seto, Güneralp, & Hutyra, 2012). The United Nation (UN) population projection says that there are more people now living in urban areas than rural areas, which means more cities are springing up, (UN, 2018).

Traditionally, cities have been viewed as separate from nature, so, the concept of the city as an ecosystem tries to redefine urban areas as an integrated socio-ecological systems, (Pickett et al., 2011). This perspective recognizes the interactions between human activities and natural processes, enabling the adoption of strategies that promote land restoration and environmental sustainability, (Alberti, 2008). Land restoration is particularly relevant where urban expansion, climate change and poor land management practices have degraded large portions of land, (UNCCD, 2020). By applying ecosystem-based approaches, cities can become drivers of environmental regeneration rather than degradation, (Beatley, 2011).

Therefore, conscious effort is needed to make the city very habitable and sustainable in the long run. This study aims at finding sustainable description of the city, whether it can be likened to an ecosystem, in the real sense of the word, ecosystem.

II. LITERATURE REVIEW

City

A city is a human settlement of a notable size which means different things around the world with respect to size and being densely populated, (Caves, 2004). Urbanization is the major trigger to the growth of a city. Urbanization is the process of society losing its form and acquiring the status of urban way of life, (Tacoli, 2015). Which can also be said to be the gradual increase in the proportion of people living in urban areas. In urbanization people keep moving from rural to urban area in search of work and the good life. In this continuous movement, the urban areas give birth to cities.

Living in cities robs these rural dwellers now urbanites off the village culture and clothes them with urban culture. Village culture is known for common bloodlines, intimate relationships and communal behaviour while urban culture has distant bloodlines, unfamiliar relationships and competitive behaviour,

© MAY 2026 | IRE Journals | Volume 9 Issue 11 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I11-1717610

(Wirth, 1938). In the city there is interaction between people, government and businesses aimed at improving goods and services distribution within the city that sustains urban life, (Pacione, 2009).

The UN projects that by 2050 about 64% population of developing countries will live in cities while 86% population of developed countries and also that cities cover about 3% of earth land surface, (UN, 2018, worldometer, 2024).

Cities are designed with different factors and interests as sprawling cities, compact cities, smart cities and sustainable cities, (Jenks & Burgess, 2000; Batty et al., 2012). All these are in a bid to plan for growth, provide basic services, infrastructure and affordable housing as the needs are on the rise, (UN-Habitat, 2020). In the design of cities, places (spaces) are marked out for proper growth like; the city centre known as central business district (CBD), commercial area, residential, public spaces and so on, (Lynch, 1960). While growing rapidly, some areas of the city are crowded out; like the public spaces (parks, urban greens, etc) giving rise to problems, (Mitchell, 1995, Li & Zhou 2019).

Inner parts of the cities are impacted by urban heat island effect, flooding, etc as a result of urban densification. Cities influence climate change, sustainable development goals (SDGs) especially SDG 11 and all other global issues which informs on the need to reduce the ecological footprint of cities, (Angelo & Wachsmuth, 2020, Bibri, Krogstie & Karrholm, 2020).

Environment

It is said to be the totality of our surroundings circumstances and influences, (Emenike, 2017). Environment affects our behaviour and development and also, we affect the environment through our various activities. The environment has both physical, chemical, biological and social components that cause direct or indirect effects on living beings and human activities due to the interactions that goes on within. Environment can be divided into natural (untouched by human developments), cultural, social and built (modified by humans), (Nyanchama, 2019). There are still other types of environments depending on the field/discipline defining it, like prenatal, postnatal and so on.

There are components of the environment such as; natural, human (cultural and social) and human-made which can be shown as in fig 1.

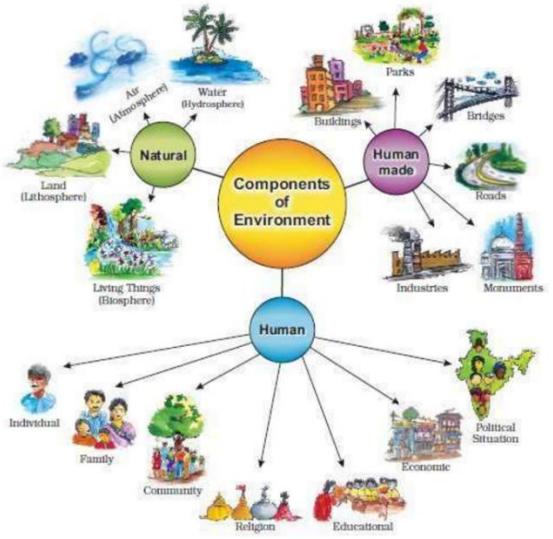

Fig. 1. Components of the environment.

Ecology

Ecology is the study of the habitation of living organisms that deals with relationship of one organism to another within their surroundings, (Hui, 2002, Emenike, 2014). Ecology determines the distribution and abundance of organisms in any setting. It can also be said to be the science of the relationships and interactions of living organisms with their inanimate world and the animate environment, (Daniel & Daniel, 2003). This usually has to do with resources and energy management in any given environment.

There are three main believes in ecology which must be born in mind, they are a times referred to as rules, (Commoner, 1971);

1. Every action has a cost, no matter how small or insignificant. Clearing a forested area for housing development has a lot of ripple actions and reactions such as biodiversity loss, soil erosion, altered hydrological systems, and climate impacts (Odum & Barrett, 2005).

2. Everything is connected to everything else. Of recent there are some research results connecting extraction of water from underground water to the change in the tilt of the earth off the north pole, demonstrating the global consequences of environmental disturbances (Seo et al., 2023).

3. Environmental system has a carrying capacity, a physical limit to the amount of development, pollution and population to support beyond which environmental quality is not sustainable. Taking agriculture for instance, a piece of land that is cultivated overtime has reduced yield and our fore fathers used to practice shifting cultivation by leaving some portions fallow for some time, (Allaby, 2008).

Ecology links together the biological, physical and social sciences, this is seen in the different branches of ecological studies.

Table 1. Branches of Ecological Studies

S/N	Branch of Ecological Study	Description
1	Behavioural Ecology	It explains the patterns of behaviour in animals; such as kinship, parental care, prey predator, etc
2	Physiological Ecology or Eco-Physiology	It deals with how organisms adapt to temperature, maintain water/salt balance, balance level of oxygen/carbon dioxide with other factors of their physical environment.
3	Molecular Ecology	Deals with use of molecular biology to directly tackle ecological problems (molecular clock).
4	Evolutionary Ecology	It emphasizes the impact of evolution on current patterns and human induced changes. Interest is on how form and function adapt organisms to their environment.
5	Ecosystem Ecology	It deals with how organisms obtain energy either through photosynthesis or by consuming other organisms. The issue of interest here is how human activities affect food webs, energy flow and global cycling of nutrients.
6	Population Ecology	It constitutes organisms of the same species living in the same place at the same time and may interact with each other, (predatory and prey, parasite and host).
7	Community Ecology	It is about how population of many different organisms in a particular area are tied to one another by feeding and other interactions. The interest here is on how predation, herbivory and competition influence the numbers and distribution of organisms.
8	Landscape Ecology	This requires the synthesis of several other sub-fields and emphasizes the inter-connections among ecosystems of a region.
9	Conservation Biology	This takes a landscape approach in blending genetics, population and community ecology in maintaining and

		preserving biodiversity and endangered species.
10	Restoration Ecology	It deals with restoring damaged natural systems. The damage was due to human activity.
11	Ecotoxicology	It studies the fate and action of human-made substances (pesticides, detergents) in the natural world.

Source: Adapted from Khedkar D. D. (2020)

Ecosystem

The full name of ecosystem is ecological system which is a system formed by the environments, their organisms and their interactions, (Chapin, 2011). This system is controlled by internal and external forces. Internal forces are decomposition, succession, disturbances, etc influence activities in the system. External forces like climate, soil, topography, etc also have a lot of influence on what happens in the system.

Ecosystem is a dynamic entity that is linked through nutrient cycles, energy flows, and all, (Odum, 1971). Ecosystem provides goods and services of which people depend on. Goods, such as tangible material products and processes (water, food, fuel, medicinal plants, construction materials, etc). While services are improvements on conditions or locations of things of value and its maintenance (hydrological cycles, cleaning air and water, oxygen in the atmosphere, crop pollination). Most times the impact of human activities destroys the ecosystem.

Sustainable city

Sustainable city is a city designed with consideration for social, economic, environmental impacts and resilience for the habitants. Generally, it is said that sustainable city should be able to meet the basic principles of sustainable development (SD) which is satisfying the needs of the present without compromising the ability of the future generation to meet their own needs, ().

Sustainable city provides for the highest quality of life human, natural and financial resources equitably. This is done through; healthy ecosystem, effective governance (citizen participation) and economic security. The bottom line is sustainability in all done with sustainable city.

Concept of urban ecosystem

An urban ecosystem is a dynamic system composed of biotic (plants, animals, humans) and abiotic (soil, water, climate) components interacting within an urban environment. These systems are characterized by energy flows, material cycles, and ecological processes that influence sustainability.

Cities tend to cause significant disruptions to these urban ecosystems that leads to loss of biodiversity and ecosystem services due to land-use changes and infrastructure development, (Adelana, Aiyelari, Are, and Oluwatosin 2023).

There are urban ecosystem strategies that help to restore the city, making cities an ecosystem. Such things as green infrastructure (urban parks, community gardens, etc), natured based solutions (wetland restoration, rainwater harvesting, tree planting), sustainable land use planning and community participation, (Emenike, and Ezugwu, 2006, Adegun, Ikudayisi, Morakinyo, and Olusoga, 2021, Ojerinde, Ochai and Agbelade, 2026)

III. DISCUSSION

The discuss above tried to show what could make a city an ecosystem to be able to enhance land restoration and become more sustainable. A city can be seen as an ecosystem because a city has both biotic components (humans, plants, animals and microorganisms) and abiotic components (water, air, soil, sunlight and buildings). These living (biotic) organisms interact with their non-living (abiotic) components just like in a natural ecosystem.

In this symbiotic relationship, humans relay on plants and animals for food, water and other resources while plants and animals relay on humans for protection and habitat. This is what can be called urban ecosystem which is characterized by high human density, modified environment (less vegetation, more concrete

and asphalt), imported resources (food, energy, water) and waste production (sewage, solid waste and air pollution).

There are a lot of challenges for a city to be seen as ecosystem such as pollution (air, water, soil, etc). This is generally due to the high human density that put pressure on the use of resources and production of waste. Secondly there is loss of habitat, where natural environment is cleared for building and other infrastructure to be put in place for humans' comfort. Thirdly all these lead to modification of climate causing more flooding and aiding droughts in some places.

In the city ecosystem, there are more concrete areas than forested areas. This creates the urban climate characterized by urban heat island, pollution and all, different from the surrounding rural areas.

Seeing cities as ecosystem will help us understand the complex interaction between people and environment, which helps in creating more sustainable cities that are healthy and liveable. This will be done by increasing green spaces (parks, gardens, and green roofs), reducing pollution (investing in public transportation, reducing waste, improving energy efficiency) and conserving resources (recycling and composting waste).

IV. RECOMMENDATIONS

As city has grown to be thought of as a jungle of concrete and steel but has now been seen that it can actually function as an ecosystem. This can be done by leveraging on the city's unique characteristics to restore degraded land, such as;

1. Introducing city habitat: a) making sure of having areas of green infrastructure (green roofs, parks, rain gardens) scatted around the city to provide network of green spaces and corridors for wild life, watershed, encourage return of native spices of plants. Conscious effort is needed to reintroduce nature back into the city, creating forest haven for birds, water shed and habitat for other small wild animals and recreational facilities for the populace. This will also aid water percolation and filtration into the earth for groundwaters, filtering of air from pollution, sun shading and noise masking within the city.
b) inculcating urban agriculture into the vacant plots and roof tops in the cities.

2. Using city as resource managers: a) Turning waste into more useful needs like fertilizers through the use of the 3Rs (reduce, reuse and recycle).
b) water conservation through rainwater harvesting.
c) community engagement through citizens participation (tree planting, cleaning up water ways and so on).
d) education and awareness: educating the people (children, youth and adult) on importance of urban ecosystem and land restoration.

V. CONCLUSION

From the discussions above, a city could actually function as a complex ecosystem. When viewed like this, it can help in land restoration efforts making the cities more sustainable.

REFERENCES

[1] Adegun, O. B., Ikudayisi, A. E., Morakinyo, T. E., and Olusoga, O. O. (2021). Urban green infrastructure in Nigeria: A review. *Scientific African, 14*, e01044. https://doi.org/10.1016/j.sciaf.2021.e01044

[2] Adelana, A. O., Aiyelari, E. A., Are, K. S., and Oluwatosin, G. A. (2023). Influence of urban land use types on ecosystem services in two rapidly urbanizing cities of southwestern Nigeria. *Environmental Monitoring and Assessment*.

[3] Alberti, M. (2008). *Advances in urban ecology: Integrating humans and ecological processes in urban ecosystems.* Springer.

[4] Angelo, H and Wachsmuth, D. (2020) Why does everyone think cities can save the planet. Urban studies. 57(11). 2201-2221

[5] Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., Ouzounis, G., & Portugali, Y. (2012). Smart cities of the future. *The European Physical Journal Special Topics, 214*(1), 481–518. https://doi.org/10.1140/epjst/e2012-01703-3

[6] Beatley, T. (2011). *Biophilic cities: Integrating nature into urban design and planning*. Island Press.

[7] Bibri, S. E., Krogstie S. and Karrholm, M. (2020) Compact city planning and development: emerging practices and strategies for achieving the goals of the sustainability. Date in the Built Environment. 4:1000021

[8] Caves, R. W. (2004) Encyclopedia of the city. Routledge.

[9] Chapin, F. S. (2011) Principles of terrestrial ecosystem ecology. P.A. Maton, P. M. Vitousek & M. C. Chapin (2nd ed) New York: Springer, ISBN 978-1-4419-9504-9. OCLC 755081405

[10] Commoner, B. (1971). *The closing circle: Nature, man, and technology*.

[11] Daniel, T. and Daniel, K. (2003) The environmental planning handbook for sustainable communities and regions. Chicago: planners press.

[12] Emenike, A. I. (2013) Evaluation of environmental and landscape qualities of public open spaces in Enugu metropolis. An unpublished doctoral thesis to ESUT.

[13] Emenike, A. I. (2017) Basic principles of architectural science. Enugu: C. City group printers.

[14] Emenike, A. I. and Ezugwu, J. O. (2006) Rainwater as a Resource: Harvesting, Conservation and Use. *Architecture: Research and Practice. NIA Journal Enugu State Chapter.* 1 (3): 27-28 + 37- 39. ISSN 1597-2747.

[15] Hui, S. C. M. (2002) Sustainable development. http//www.arch.hku.hk/research/BEER/sustain.htm

[16] Jenks, M., & Burgess, R. (2000). *Compact cities: Sustainable urban forms for developing countries*. Spon Press.

[17] Khedkar, (2020) Lecture notes. Paper V- unit V. Shri Shivaji Science College. Amravati

[18] Li, X. & Zhou, W. (2019) Optimizing urban green space spatial pattern to mitigate urban heat island effects: Extending understanding from local to the city scale. Urban forestry and urban greening. 41:255-263

[19] Lynch, K. (1960). *The image of the city*. MIT Press.

[20] Mitchell, D. (1995) The ends of public spaces? Peoples Park: definition of the public and democracy annuals of the association of American geographers 85(1):108-103

[21] Nyanchama, V. (2019) Types of environment. www.Tuko.co.ke

[22] Odum, E. P. (1971) The ecosystem: an evolving concept viewed historically. *Functional ecology* 11(2) 268 – 271

[23] Odum, E. P., & Barrett, G. W. (2005). *Fundamentals of ecology* (5th ed.).

[24] Ojerinde, G. E., Ochai, T., and Agbelade, A. D. (2026). Monitoring urban thermal stress and forest resilience for climate change mitigation in megacities, Northwest Nigeria. *Discover Geoscience*.

[25] Pacione, M. (2009). *Urban geography: A global perspective* (3rd ed.). Routledge.

[26] Pickett, S. T. A., Cadenasso, M. L., & McGrath, B. (2011). *Resilience in ecology and urban design: Linking theory and practice for sustainable cities.* Springer.

[27] Seo, K. W., Kim, S., Ryu, D., Kim, J. Y., & Lee, J. M. (2023). Drift of the Earth's pole confirms groundwater depletion as a significant contributor to global sea level rise. *Geophysical Research Letters, 50*(11). https://doi.org/10.1029/2023GL103509

[28] Seto, K. C., Güneralp, B., & Hutyra, L. R. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. Proceedings of the National Academy of Sciences, 109(40), 16083–16088. https://doi.org/10.1073/pnas.1211658109

[29] Tacoli, C. (2015) Urbanisation, rural-urban migration and poverty. McGranaham, Gordon, Satterthwaite, David. London. International Institute for environment and development.

[30] United Nations. (2018). World urbanization prospects: The 2018 revision. United Nations Department of Economic and Social Affairs.

[31] United Nations. (2019). World urbanization prospects 2019: Highlights. United Nations Department of Economic and Social Affairs.

[32] United Nations Convention to Combat Desertification (UNCCD). (2020). Global land outlook 2.

[33] UN-Habitat. (2020). *World cities report 2020: The value of sustainable urbanization*. United Nations Human Settlements Programme.

[34] Wirth, L. (1938). Urbanism as a way of life. *American Journal of Sociology, 44*(1), 1–24. https://doi.org/10.1086/217913

[35] Worldometer. (2024). *World population and urbanization statistics*. https://www.worldometers.info/world-population/world-population-by-year/