

# Urbanization and Environmental Stress: A Review of Impacts of Urban Development on the Environment in Kenya



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## Abstract

Urbanization has been considered a development process which is beneficial both to individuals and the country at large. People move from rural to urban areas in search of better services like education, jobs, and recreational services among others. Urbanization draws various activities like industrialization, tourism, educational and health facilities which not only contribute revenue to the government but also create employment opportunities for the jobless which in turn reduces crime rates associated with joblessness. Despite the benefits that accrue from urbanization, it has been characterized by loss of vegetation cover, degradation of surface water quality, land degradation, more generation of waste, air pollution, poor infiltration, noise among other impacts. These impacts if left unmonitored, generally degrades the quality of the environment. The study was informed from such argument to examine the impacts of urbanization on the environment. It relied on document analysis as a method of data gathering.

**Keywords:** Urbanization; Impacts; Environment; Stress; Kenya

## Introduction

Human development activities are beneficial to him but have a lot of impacts on the environment. As has been mentioned by previous scholars, environment means a lot to humanity together with other life forms. Environment support various human activities such as agriculture, settlement, industrial and other forms of development activities. Sustainable use of environmental resources has been an issue of debate globally [1]. Every individual on earth wants to develop. Human development in most cases has not integrated the environmental concerns. This has led to degradation of environmental resources which are meant to cater for both present and future generations. The value of environment has been slighted and hence man undertake development activities without giving attention to the impacts of his activities. This paper examine urbanization as a development activity together with the impacts it has on the environment.

## Discussion

Urbanization has been viewed as a development activity which is associated with transformation and growth of urban areas into cities. It involves migration of people from the rural into urban areas. Urbanization draws and comes with various activities that support human's life in different ways. People get moved and attracted with better health, education, recreational

services in the urban areas [2]. Similarly, they move to urban centres in search of job. Growth of urban population comes with consequences such as increased demand for housing facilities, more educational and health facilities together with other facilities which support human's life [3]. It also calls for more resources such water, land and energy to be subjected into use.

## Impacts of Urbanization of Water Resources

Urban development has considerably affected water resources especially the surface water bodies. Urbanization is associated with industrial development and some of them came up as a result of establishment of industries. Availability of water supply is one of the factors that influence the establishment of industries. Apart from the direct impacts which might come from the industries such as discharge of effluents into water bodies and over withdrawal of water for industrial use, development of urban centres impact negatively on surface water [4]. As urban centre draws people from every corner of the country, increase of its population translates to increased waste product which sometimes deposited into water body. A good example is Nairobi River which some people settling adjacent to the river have turned it into dump site. River Migori also suffers the same problem as a result of development of Migori town. A number of rivers including Sare, Ewaso Nyiro among others experience similar challenges.

In most cases, water has been considered life. Human beings together with other organisms need fresh water. Once contaminated, water becomes unhealthy and unsafe for consumption. The waste deposited into the rivers as a result of urban development degrades the quality of the water and make it unsafe even for the aquatic organisms supported by such rivers [1]. These aquatic organisms suffer from the contaminants of the waste and may end up dying. If this happens, we realize loss of biodiversity. Through urbanization, pavements are constructed to enable easy movement and save people from muddy areas. These pavements interferes with water infiltration into the soil. This not only affect the soil moisture and micro-organisms but also impacts on the ground water recharge. Sustainably, there should be constant flow of water in the cycle [2]. If one stage of water cycle is impaired, the whole system/process is impacted on. The water that fails to infiltrate the soil as a result of pavements created may end up contributing to flooding.

Urban development also leads to over-extraction of ground water resources. Having contaminated the surface water declared it unsafe for consumption, man starts exploring the ground water. Several boreholes are drilled to support the ever-increasing urban population whose demand for water also increases. This leaves the government together with private developers with no alternatives other than drilling boreholes. They pump underground water and supply it through pipes. This interferes with the normal water cycle especially if over-withdrawn.

The other impact of urbanization on water resources come due to the establishment of the drainage systems like the sewer lines. This might not have frequent impact but when they bust or have leakages, may cause a significant impact on water quality [4]. The sewage may contaminate the ground water as well as the surface water as it flows down-stream. Such an impact on water quality may be compared with the impacts of improperly treated industrial effluent on water. It may contain heavy metal that might be very harmful to the aquatic ecosystem.

**Loss of Land Cover**

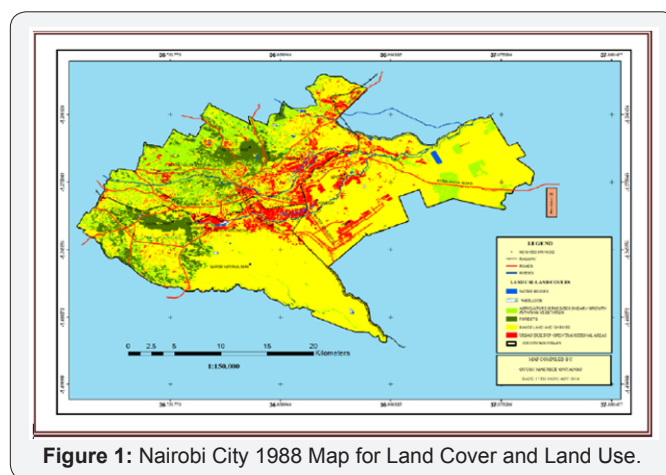
Urban development and expansion involve clearance of vegetation to pave way for settlements. This subjects land to agents of erosion. Vegetation cover normally controls soil erosion and infiltration rates. They lower the speed of flowing water (run-off) making it infiltrate the soil. Other roles performed by vegetation include contribution to hydrological cycle through evapo-transpiration, acting as carbon sinks, addition of aesthetic value among other roles [1]. These roles are compromised when vegetation is cleared. The sad news is that urban population continues to increase and more houses are needed to cater for the increasing population. This means that more vegetation will continue to be cleared. Vegetation also act as habitat for animals like birds among other life-forms. Destruction of vegetation implies loss of habitats. The animals are displaced and might migrate to other areas which might also be unsafe for them.

Oyugi et al. [5] established the high rate of land cover loss especially in Nairobi. More settlements are created to help cater for urban population. Some areas serve as communication lines e.g. roads that also contribute to loss of vegetation cover. Figures 1 & 2 show the differences experienced between 1988 and 2015 in terms of loss of land cover as was established by Oyugi et al. [5]. Significant land cover changes have been realized in Nairobi City since 1988. The city has expanded, a lot of settlement have come up together with industrial activities which have negatively impacted on land cover. Aesthetic value of the land cover has been lost. Structures have replaced vegetation. The quality of air continually goes down in that air purification reduces with reduction in vegetation cover. Need for food by urban dwellers also cause pressure in other regions such as the peri-urban and rural areas. Urban centres create ready market for food produce. People in the rural areas subject land to agricultural activities that involves clearance of vegetation to pave way for farming activities. Through such activities, land cover is lost hence compromising their ecological roles. This is also accompanied by soil degradation due to application of inorganic fertilizers which not only infers with the soil pH but also impact on the soil micro-organisms meant for soil aeration. It is through such agricultural activities where we realize eutrophication.

**Land-Use Changes**

Urbanization has led to changes in land use. Open spaces serving as recreational areas are being turned into built up environment being occupied by settlements. Open grass, range and shrub-lands supporting various biodiversity are also turned into built environment leading to loss of biodiversity. A good example was established when Nairobi city was subjected to a study in 2017 to determine how fast urban development lead to land use and land cover changes. The following results were established.

Source: Oyugi et al. [5]



From Figure 1, it is evidenced that the range lands and shrubs marked yellow was wide spread in the year 1988. The urban built up environment as indicated by red was also not intensive.

The forests marked green was still dominating and could be seen distributed in the city. As urban population increased together with other urban activities, the range lands and shrubs together with forest started depreciating. More land cover was lost as the urban built up areas increased as depicted in Figure 2.

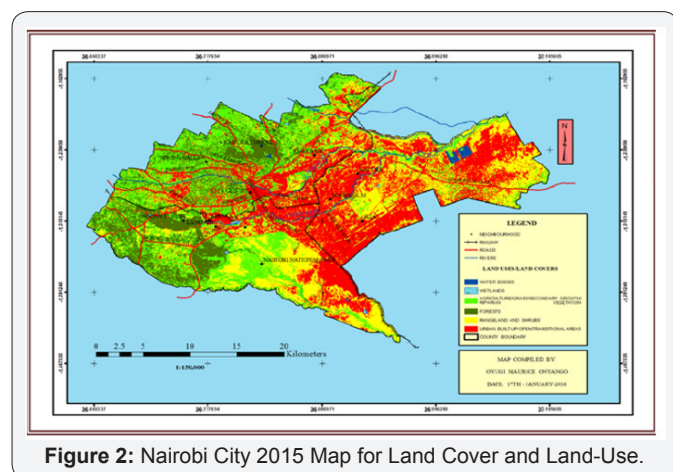


Figure 2: Nairobi City 2015 Map for Land Cover and Land-Use.

Source: Source: Odenyo et al. [5]

Nairobi city as an example of urban development has now been characterized by intense loss of vegetation cover and increased coverage of the built-up areas which serve various purposes such as business enterprises, industries, road networks, residential structures together with other forms of settlements. The city has subjected Nairobi river to a lot of challenges of waste assimilation until the river has been overwhelmed and turned into a sewage like system. It has been overburdened by waste that is deposited in it. The areas that were formally occupied by vegetation have also been replaced with structures. The range and shrub lands have been lost Oyugi et al. [5]. The percentage losses are as indicated in Table 1. It might not reflect the current situation on the since the data reaches 2015 but going by the trends, it is on the constant increase. From Table 1, it is clear that the built up environment increases yearly. This implies that more land under range and shrub lands are being converted into built up lands. Man has taken the initiative of finding how to live comfortably without integrating environmental concerns in his plans.

Table 1: Nairobi City Land-Use and Land Cover Changes (1988-2015).

| Classes of Land-Use and Land Cover |  | Years      |            |            |            |            |            |            |            |            |            |            |            |
|------------------------------------|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                                    |  | 1988       |            | 1995       |            | 2000       |            | 2005       |            | 2010       |            | 2015       |            |
|                                    |  | Area (Km2) | Percentage | Area (Km2) | Percentage | Area (Km2) | Percentage | Area (Km2) | Percentage | Area (Km2) | Percentage | Area (Km2) | Percentage |
| i                                  | Growth/Riparian Vegetation             | 126.82     | 17.71      | 101.12     | 14.12      | 176.76     | 24.68      | 143.03     | 19.97      | 190.75     | 26.63      | 189.73     | 26.49      |
| ii                                 | Water Bodies                           | 2.70       | 0.38       | 4.72       | 0.66       | 4.84       | 0.68       | 3.62       | 0.51       | 3.04       | 0.42       | 4.09       | 0.57       |
| iii                                | Urban Built-Up/Open/Transitional Areas | 73.08      | 10.20      | 124.36     | 17.36      | 155.20     | 21.67      | 175.19     | 24.46      | 183.97     | 25.69      | 228.65     | 31.93      |
| iv                                 | Forests                                | 59.63      | 8.33       | 122.41     | 17.09      | 63.63      | 8.88       | 79.14      | 11.05      | 83.19      | 11.62      | 93.44      | 13.05      |
| v                                  | Rangeland and Shrubs                   | 453.99     | 63.39      | 363.61     | 50.77      | 315.79     | 44.09      | 315.23     | 44.01      | 255.25     | 35.64      | 200.30     | 27.97      |
| TOTAL                              |  | 716.22     | 100.00     | 716.22     | 100.00     | 716.22     | 100.00     | 716.22     | 100.00     | 716.22     | 100.00     | 716.22     | 100.00     |

The environment get degraded at a faster rate as depicted by this table. The natural environment is turned into built environment and the ecological performed by these environmental resources end up being compromised at the expense of human well-being [2]. What might have not known is that we cannot talk about our well-being and development if we leave environment behind. All that we do to realize well-being takes place in the environment. Our developments are also supported by what the environment provides [6]. It is needless to emphasize the importance that accrue from these resources that we degrade and deplete because the impact of degrading and depleting them is realized basically on us. Every individual aim's at having a better future. This cannot be achieved without

environmental resources that we don't care for at the moment. Urbanization should be controlled and planned so as to minimize its negative impact on the environmental resources.

Proper environmental management should be encouraged by embracing development control systems and adhering to the provisions of the Kenyan Physical Planning Act and the Environmental Management and Coordination Act which advocate for subjection of new projects to environmental Impact Assessment to help anticipate the potential impacts a project might have on the environment thereby proposing mitigation measures for environmental protection. Lack of follow up and enforcement of these policies and other institutional frameworks

have made private developers to take advantage and manage the environmental resources as if they are individual properties [7,8]. Figure 3 shows how range and shrub-lands are constantly being lost in urban areas like Nairobi. The built up is on the rise and will continue to go up as urban population continues to go up [1]. Rise of forest cover was experienced between 1988 and 1995 after which it started declining and has not risen to the level it was in 1995. More pressure is caused by urban population that majorly use charcoal as a source of energy for cooking in the developing countries like Kenya.

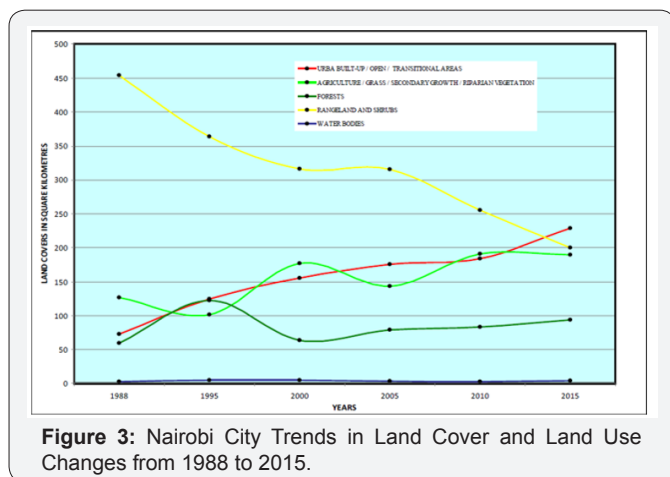


Figure 3: Nairobi City Trends in Land Cover and Land Use Changes from 1988 to 2015.

Source: Odenyo et al. [5]

Most of the changes in land use are triggered by urban population which not only needs food but also other better and quality services like housing [2]. Planning issues also come with their consequences. For example, planning of urban centres provides for zoning to ensure conforming and compliance like the type of enterprises to be found within the central business district and other transitional zones. This might also be affected by the differences in social structures and status. The urban rich people with tend to acquire land far from the city centre. As they move farther urban centre expands as more services also move to where they occupy [6]. The increase in urban population as had been mentioned calls for a number of activities and service. The World Bank established in 2016 under their report on Kenyan urbanization review that the Kenyan Urban population continues to rise and they also projected this to continue as depicted by Figure 4.

Source: Republic of Kenya (2016)

As indicated in Figure 4, the rural population continues to go down while the urban population rises. More people as was noted by the World Bank [3] continually migrate to urban areas. Urban environment becomes overwhelmed with waste generated together with the pressure on the available resources to meet the demand of the urban population. The constant growth of urban population was also affirmed by Oyugi in 2017 whose study was based on Nairobi City and revealed a constant positive rise in urban population as reflected in Table 2. The

World Bank estimate of the Kenyan urban population puts it at slightly above 14million of which it is expected that by 2030, the urban population will rise to 22 million and to 40 million by the year 2050 [3]. This signifies the pressure the urban environment will have in terms of providing for this population. Going with these estimates, very little natural environments will be found. More areas will be turned into built environment [7-9]. The country will keep on experiencing land use and land cover changes. This calls for adoption of better environmental management strategies that will counter the negative impacts that will be associated with these changes that will come as a result of urbanization. Increase in urban population is not only estimated to rise in Kenya but globally as depicted in Figure 5. This means that the impacts of urbanization on the environment is a global agenda.

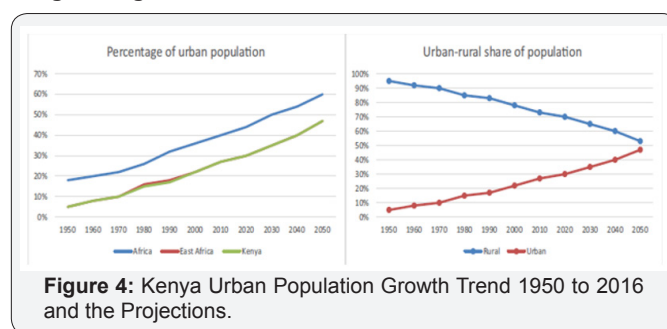


Figure 4: Kenya Urban Population Growth Trend 1950 to 2016 and the Projections.

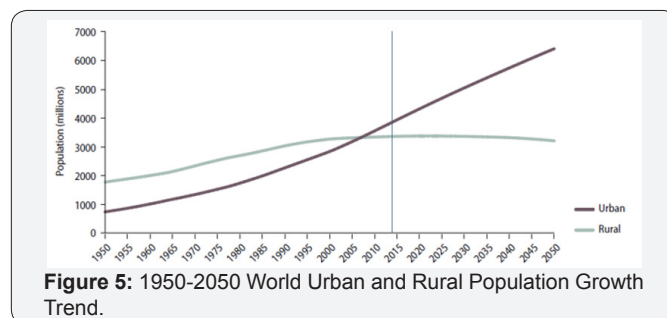


Figure 5: 1950-2050 World Urban and Rural Population Growth Trend.

Table 2: Population Growth Trend in Nairobi City (1988-2015).

| Year | Total area Under Built up, Open and Transitional Lands (Km2) | Total Population | Land Consumption Rate |
|------|--|------------------|-----------------------|
| 1988 | 73.08  | 1,265,110        | 0.0058                |
| 1995 | 124.36   | 1,724,935        | 0.0072                |
| 2000 | 155.20   | 2,239,701        | 0.0069                |
| 2005 | 175.19   | 2,791,075        | 0.0063                |
| 2010 | 183.97   | 3,273,319        | 0.0056                |
| 2015 | 228.65   | 3,979,827        | 0.0057                |

Source: United Nations [9]

Kenyan urbanization has been seen to grow steadily. According to Figure 6, it is indicated that 26.49% of the Kenya's population (total) already lived in cities and urban areas in the year 2017. This is expected to have risen in 2018 considering the trend in growth of urban centres [10]. The only question

that is still left unanswered is whether countries will put up the right strategies in dealing with the environmental impacts associated with this high rate of urbanization. It is clearly indicated from Figure 6 that each year there is an increase in urbanization. Some of the trading centres grown into urban centre and transform the natural environment into built up environment. The consequences of such kind of transformation has been discussed above including loss of vegetation cover, increased land degradation, changes in land use which impact negatively on the environment. Others also include degradation of air quality as vegetation which aid in purification is cleared thus such a role they perform is compromised.

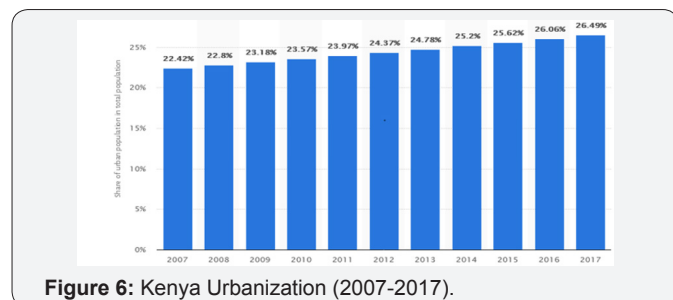


Figure 6: Kenya Urbanization (2007-2017).

<https://www.statista.com/statistics/455860/urbanization-in-kenya/>

### Pollution

Most industries are found in urban areas. Among these industries, some have not taken the initiative of being environmentally friendly. They have installed carbon filters which help monitor the amount of carbon dioxide and other gases getting into the atmosphere. Consequently, the air get polluted with these gases emitted from industries [4]. Some of the industries also deal with processing of poisonous items which if not well managed affect the surroundings. The exhaust fumes from vehicles whose number continue to rise in the urban areas is also a threat to the environment as they pollute the system. Urban areas are also characterized by noise pollution which comes from industries and moving vehicles.


### Conclusion

The impacts of urbanization on the environment cannot be overemphasized. A lot of land cover has been lost through

urbanization, land use changes have been realized and more air pollution have also been experienced. A number of rivers have lost their quality due to urban development. The only challenge that still persist is constant increase in urban population that continues to put pressure on available resources like water. More land is subjected to development. Land fragmentation and settlements created which cannot perform the ecological roles performed by the vegetation they substitute. There is therefore need for controlled and urban development. Environmental concerns need to be integrated in the development plans as provided by the Physical planning act and the Environmental management and Coordination act to help ensure environmental protection and conservation of natural resources.

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