

A STUDY OF THE ENVIRONMENTAL IMPACTS OF URBAN GROWTH IN HYDERABAD, TELANGANA

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Abstract

Rapid urbanization of the cities is a new phenomenon for the Indian subcontinent. Rapid urban growth has significant impact on the environment of the cities. The local authorities of the growing city like Hyderabad lack the proper vision, planning and the knowledge database for sustainable management practices for urban growth. Urbanization refers to general increase in population and the amount of industrialization of a settlement. It includes increase in the number and extent of cities. It symbolizes the movement of people from rural to urban areas. Urbanization happens because of the increase in the extent and density of urban areas.

Introduction

The conversion of Earth's land surface to urban uses is one of the most irreversible human impacts on the global biosphere. It hastens the loss of highly productive farmland, affects energy demand, alters the climate, modifies hydrologic and biogeochemical cycles, fragments habitats, and reduces biodiversity. We see these effects on multiple levels. Future urbanization will, for example, pose direct threats to high-value ecosystems: the highest rates of land conversion over the next few decades will likely take place in biodiversity hotspots that were relatively undisturbed by urban development in 2000. Within cities, the nature of urban growth is also an important determinant of urban dwellers' vulnerability to environmental stress. It has been recognized that actions by humans are modifying and altering the energy and mass exchanges that occur between atmosphere, oceans and biota, and researchers now understand that these changes could be beyond the resilience of natural systems to absorb. As well, the growth of cities is causing increasing stress on many aspects of the urban environment. Sustainable development has been proposed for many years as a means of ensuring that human impacts are within the capacity of the Earth's environment to cope with changes. The UN Economic and Social Council reported in 2017 (United-Nations that 54% of world's population lives in cities; urban population that lives in developing country slums fell from 39% in 2000 to 30% in 2014; cities are becoming less dense; urban sprawl is challenging more sustainable patterns of urban development; from 2000 to 2015 the expansion of urban land outpaced the growth of urban populations; and in 2014, 9 of 10 people who live in cities were breathing air not compliant with World Health Organization (WHO) safety standards. There are various ways to identify patterns of settlement in cities around the world. (Yang et al. Citation2019), who studied trends in social media in a number of cities in USA and also elsewhere, found similarities in social media responses for regions at similar levels of urban hierarchy. An Inverse S-shape Rule to analyze urban land density in four towns in North Eastern Thailand in two periods, and compared them with pixel-based classifications. All cities increased in density over time, but the patterns of change varied between the cities. The paper demonstrated that urban density function is useful for studying variations in land densities. It is studied the urban dynamic impact of rainfall and runoff changes over the whole of the urban hydrological environment

in Wuhan, China and demonstrated that run-off increases for increasing permeability, leading to significant levels of run-off for high levels of urbanization.

This paper aims to determine the changes in land uses due to urbanization in two cities, Wuhan in China and western Sydney in Australia, by classifying Landsat images over a 30-year period in terms of buildings, vegetation, water and soil and then determine the extent of fragmentation in land uses over the period. A review will be given in of methods used for the analysis of urban land cover which involves a large proportion of impervious surfaces, using Landsat medium-resolution remote sensing images. The methods of classification of medium resolution images for urban areas include Spectral Mixture Analysis (SMA) leading to the method used in this paper, Multiple Endmember Spectral Mixture Analysis (MESMA), together with the implementation of Super-Resolution Mapping (SRM) based on Artificial Neural Network (ANN) predicted Wavelet method will review issues of sustainability of urban areas and the importance of green space for the health and well-being of residents and provide recommendations for minimum levels of green spaces in urban areas will introduce the two cities for consideration of the impacts of urbanization over a 30-year period, Wuhan in China, and western Sydney in Australia, the Landsat data used and describe the implementation of MESMA and SRM methods in detail for the classifications in terms of buildings, vegetation, water and soil. Since urbanization causes fragmentation in vegetation areas, the classified images are analyzed using *IndiFrag* software to determine the level of fragmentation of land covers in the two cities will compare the indices extracted from the classified Landsat images by *IndiFrag* software for the two cities, while suggestions are made in that Ecosystem Service Values (ESV) could be used to assess the impacts of urbanization in the two cities. The paper concludes that more studies are required to determine how cities can be sustainable in the future, which is proposed to be addressed in the UN Sustainable Development Goals and Agenda 2030 (United-Nations).

The environmental impacts of urban expansion reach far beyond urban areas themselves. In rapidly urbanizing areas, agriculture intensifies on remaining undeveloped land and is likely to expand to new areas, putting pressure on land resources. Furthermore, urban areas change precipitation patterns at scales of hundreds of square kilometres. Urban expansion will affect global climate as well. Direct loss in vegetation biomass from areas with high probability of urban expansion is predicted to contribute about 5% of total emissions from tropical deforestation and land-use change. The scope and scale of these impacts is yet to be fully researched. Although many studies have described how urbanization affects CO₂ emissions and heat budgets, effects on the circulation of water, aerosols, and nitrogen in the climate system are only beginning to be understood. Urbanization is a process that leads to the growth of cities due to industrialization and economic development, and that leads to urban-specific changes in specialization, labor division and human behaviors. The population is growing at the rate of about 17 million annually which means a staggering 45,000 births per day and 31 births per minutes. If the current trend continues, by the year 2050, India would have 1620 million populations. Due to uncontrolled urbanization in India, environmental degradation has been occurring very rapidly and causing many problems like shortages of housing, worsening water quality, excessive air pollution, noise, dust and heat, and the problems of disposal of solid wastes and hazardous wastes. Urbanization refers to general increase in population and the amount of industrialization of a

settlement. It includes increase in the number and extent of cities. It symbolizes the movement of people from rural to urban areas. Urbanization happens because of the increase in the extent and density of urban areas. Due to uncontrolled urbanization in India, environmental degradation has been occurring very rapidly and causing many problems like land insecurity, worsening water quality, excessive air pollution, noise and the problems of waste disposal. This paper emphasizes on the effect of urbanization on environmental components mainly climate, biosphere, land and water resources. A case study of urbanization in India and metropolitan cities have been carried out leading to conclude on the existing causes of damage to the environment due to urbanization and preventive measures to keep a check on them. Although it is impossible to restrict urbanization it has to be ensured that urbanization proceeds in the right path causing minimum impact on environment. Environmental pollution is defined as “the contamination of the physical and biological components of the earth or atmospheric systems to such an extent that normal environmental processes are adversely affected.” Environmental pollution is a global crisis, is common to both developed as well as developing countries such as India and presents the threat of persistent long-term consequences.

The decline in environmental quality as a result of pollution is evidenced by a decline in agricultural yield, a loss of biological diversity and excessive amounts of toxic and recalcitrant contaminants in the atmosphere, water reservoirs and in food supplies. It is commonly agreed that pollution is the outcome of industrial and technological activities, and the exploitation of natural resources. Pollution becomes problematic when the use or contamination of natural resources occurs at a higher rate than nature's capacity to restore itself.

In Hyderabad, this practice is all too common. Lakes are contaminated with industrial effluents and domestic sewage, among other things. Air is polluted by vehicular and industrial emissions. Soil, similarly, is contaminated by leachates in municipal wastes and other toxic substances. To Hyderabad, pollution should be a matter of grave concern.

Positive and Negative Effects of Urbanization: The positive effects of urbanization include economic growth and education. However, crime, prostitution, drug abuse, and street children are all negative effects of urbanization. Urbanization emphasizes existing social services and infrastructure. It is the process through which cities grow, and a higher and higher percentage of the population comes to live in the city.

Positive and Negative Effects of Urbanization

Urbanization results in a **reduction in the proportion of people living in rural areas and the way society adapts to this change**. Following are the positive and negative effects of urbanization.

Positive Effects of Urbanization

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The Positive Effects of Urbanization include:

- Urbanization creates convenience
- It provides **better education and employment opportunities**
- Better economy
- Citizens get a better social life
- Better health services
- Round-the-clock security and police are available

Negative Effects of Urbanization

The Negative Effects of Urbanization are:

- Overcrowding results in the development of slums
- Waste disposal problem
- Poor air and water quality with insufficient water availability
- **High energy consumption**
- Urbanization causes housing problems
- Sanitation problem
- Unemployment, which sometimes leads to urban crime
- Traffic congestion

Major sources of air pollution in Hyderabad are road dust, vehicular emissions, open burning: Study

Effects of Air Pollution

Air pollution affects all things. It is harmful to our health, and it impacts the environment by reducing visibility and blocking sunlight, causing acid rain, and harming forests, wildlife, and agriculture. Greenhouse gas pollution, the cause of climate change, affects the entire planet.

Harming Human Health

According to the World Health Organization, an estimated seven million people die each year from air pollution. More than 4,000 people died in just a few months due to a severe smog event that occurred in London in 1952. Ground-level ozone causes muscles in the lungs to contract, making it difficult to breathe. Exposure to high ozone levels can cause sore throat, coughing, lung inflammation, and permanent lung damage.

Symptoms from short-term exposure typically resolve quickly, but long term exposure is linked to serious illness and disease in multiple body systems. Children, the elderly, and people with ongoing illnesses are more vulnerable to air pollution than other groups. Urban populations are also at greater risk due to high concentrations of pollution within cities. Check the current air quality in your area to determine if you should take precautions such as reducing or avoiding outdoor activity.

| Short-term exposure to air pollution can cause: | Long-term exposure to air pollution can cause: |
|--|--|
| <ul style="list-style-type: none">• Coughing• Wheezing/difficulty breathing• Irritation to eyes, nose, and throat• Headache• Dizziness• Fatigue | <ul style="list-style-type: none">• Respiratory diseases (asthma, emphysema)• Cardiovascular damage• Harm to liver, spleen, and blood• Nervous system damage• Cancer• Birth defects• Death |

Harming Animals and Plants

Wildlife can experience many of the same negative health effects of air pollution that humans do. Damage to respiratory systems is the most common effect on animals, but neurological problems and skin irritations are also common. Plants and crops grow less when exposed to long-term air pollution. Ozone pollution harms plants by damaging structures called stomata, which are tiny pores on the underside of leaves that allow the plant to "breathe." Some types of plants can protect themselves by temporarily closing their stomata or producing antioxidants, but others are particularly sensitive to damage. Between 1980 and 2011, nine billion dollars-worth of soybeans and corn were lost in the US as a result of ozone pollution. When acid rain, lead toxicity, and exposure to nitrogen oxides change the chemical nature of the soil, plants are robbed of the nutrients that they need to grow and survive. This impacts agriculture, forests, and grasslands.

There are many other ways that air pollution affects living things, such as damaging the habitat, water, and food sources that plants and animals need to survive.

Burning fossil fuels releases sulfur and nitrogen oxides into the atmosphere. Acid rain forms when sulfur dioxide and nitrogen dioxide mix with water droplets in the atmosphere to make sulfuric acid and nitric acid. Winds can carry these pollutants for thousands of miles, until they fall to the Earth's surface as acid rain, which damages the leaves of vegetation, increases the acidity of soils and water, and is linked to over 500 deaths each year. Buildings and other structures are also impacted by acid rain, which causes an estimated five billion dollars of property damage each year. Acid rain dissolves mortar between bricks, causes stone foundations to become unstable, and is destroying ancient buildings and statues carved from marble and limestone.

Reducing Sunlight

High levels of particulate pollution from all types of burning reduces the amount of sunlight that reaches the surface and even changes the appearance of the sky. When less sunlight is available for photosynthesis, forests grow at a slower rate and crops are less productive. Hazy skies not only reduce visibility, but also impact the weather and even the climate.

Making a Hole in the Ozone Layer

In 2019 the ozone hole over Antarctica (shown in blue) was the smallest it has been since the hole was discovered. Since the banning of CFCs, the ozone hole continues to shrink, but scientists warn that complete recovery is still uncertain.

NASA

The hole in the ozone layer is caused by air pollutants. Chemicals used as refrigerants, such as chlorofluorocarbons (CFCs), contain chlorine atoms. Releasing chlorine atoms into the atmosphere destroys ozone. A single chlorine atom can destroy thousands of ozone molecules. The ozone layer blocks harmful ultraviolet-B (UVB) radiation from the Sun — it protects us in a way that is similar to putting sunscreen on your skin to prevent sunburn. The ozone hole puts all living things at risk by increasing the amount of UVB that reaches the surface. Exposure to UVB increases the risk of skin cancer in humans, restricts growth and development in plants, slows the development of fish and amphibians, and reduces the number of phytoplankton in marine ecosystems. UVB also causes natural and synthetic materials to breakdown at an accelerated rate.

Adding Too Much Nitrogen to the Land

Gaseous ammonia (NH₃) from agriculture and nitrogen dioxide (NO₂) from car, truck, and airplane emissions increase the amount of nitrogen in soils. Plants need nitrogen to grow, but too much nitrogen can limit the growth of some plants and increase the growth of others, disrupting the balance of species within an ecosystem. This disruption is negatively impacting grasslands and other fragile environments around the world.

Effects of Greenhouse Gas Pollution

Greenhouse gas pollution is causing climate change. As a result, ecosystems are changing faster than plants and animals can adapt, and many species are going extinct. Marine ecosystems are vulnerable to ocean acidification caused when carbon dioxide emitted into the atmosphere is dissolved in seawater. Ocean acidification makes it difficult for many marine species to grow shells and skeletons.

Melting ice sheets, warming oceans, and extreme weather conditions are examples of how climate changes caused by greenhouse gas pollution threaten ecosystems across the Earth. In many cases, the decline of one or a few species due to air pollution can topple the balance of entire ecosystems.

Towards A Green India

- *Although the past decade of rapid economic growth has brought many benefits to India, the environment has suffered, exposing the population serious air and water pollution.*

- *A new report finds that environmental degradation costs India \$80 billion per year or 5.7% of its economy.*
- *Green growth strategies are needed promote sustainable growth and to break the pattern of environmental degradation and natural resource depletion. Emission reductions can be achieved with minimal cost to GDP.*

Findings

First, Environmental sustainability could become the next major challenge as India surges along its projected growth trajectory

Second, A low-emission, resource-efficient greening of the economy should be possible at a very low cost in terms of GDP growth. While a more aggressive low-emission strategy comes at a slightly higher price tag for the economy it promises to deliver greater benefits.

Third, For an environmentally sustainable future, India needs to value its natural resources, and ecosystem services to better inform policy and decision-making

Key Findings

Green growth is necessary. With cost of environmental degradation at US \$80 billion annually, or equivalent to 5.7% of GDP in 2009, environment could become a major constraint in sustaining future economic growth. Further, it may be impossible or prohibitively expensive to clean up later.

Green growth is affordable. Model simulations suggest that policy interventions such as environmental taxes could potentially be used to yield positive net environmental and health benefits with minimal economic costs for India.

Green growth is desirable. For an environmentally sustainable future, India needs to value its natural resources, and ecosystem services to better inform policy and decision-making especially since India is a hotspot of unique biodiversity and ecosystems.

Green growth is measurable. Conventional measures of growth do not adequately capture the environmental costs, Therefore, it is imperative to calculate green Gross Domestic Product (green GDP) as an index of economic growth with the environmental consequences factored in.

What can be done?

A low-emission, resource-efficient greening of the economy should be possible at a very low cost in terms of GDP growth. A more aggressive low-emission strategy comes at a slightly higher price tag for the economy while delivering greater benefits

Emissions reduction would have a minimal impact on GDP which would be offset by savings through improving health while substantially reducing carbon emissions.

- A 10% particulate emission reduction will lower GDP only modestly. GDP will be about \$46 billion lower in 2030 due to interventions, representing a loss of 0.3 % compared to business as usual.
- A 30% particulate emission on the other hand reduction will lower GDP by about \$97 billion, or 0.7 %.
- GDP growth rate will be negligibly reduced by about 0.02 to 0.04% in both scenarios. There will be significant health benefits under both scenarios which will compensate for the projected GDP loss.
- The savings from reduced health damages will range from \$105 billion in the 30% case and by \$24 billion with a 10% reduction.
- Under the scenarios, another important benefit would be a substantial reduction in CO₂ as a co-benefit which has a potential of being monetized.

Lakes are a vital part of urban ecosystems which perform important ecological and environmental functions to safeguard local climate, groundwater and habitat. The incessant population growth coupled with low urban planning is causing severe damage to urban ecosystems throughout the world. Hyderabad is one of the largest growing metropolitan cities of India covering an area of 65000 ha situated on the banks of Musi River in the northern part of the Deccan Plateau. The city had a population of 1.25 million in 1961 which increased to 6.8 million in 2011 with a metropolitan population of 7.75 million, making it India's fourth most populous city and sixth most populous urban agglomeration. Hyderabad is popularly known as 'City of Lakes' which occupies the top position in India in terms of Urban Lakes. In 20th century, the number of lakes were around 925 which are now reduced to 521 and most of these lakes are facing extinction. The water spread area of these lakes has been considerably reduced due to steady urban growth and the carrying capacity and ecological status of these urban lakes are in real danger. Many of these lakes have shrunk in size while the waters of several lakes got polluted with the discharge of untreated domestic and industrial effluents. Taking into consideration the environmental degradation of urban lakes, an attempt was made to study the current status, loss of water bodies and water spread using remote sensing and GIS techniques. Time-series satellite images of MSS, IRS and RESOURCESAT and Survey of India maps of 1:50,000 and 1:25,000 were used for this study. Analysis of these together with other data sets was accomplished through integrated use of ERDAS Imagine Arc view and ArcGIS software packages. It is estimated that there were 925 lakes in 1982 in erstwhile Hyderabad Urban Development Authority (HUDA) area which came down to 521 in 2012. A total number of 404 lakes disappeared during the last 30 years period. Consequently the water spread area of these lakes got reduced from 14005 ha. to 11066 ha. The area covered under water bodies has come down from 21.53 per cent of the geographical area in 1982 to 17.02 per cent in 2012. The decline during 2002-2012 period was severe which can be directly related to the highest urban growth (87.2%) during the same period. The study indicates that, immediate attention be drawn towards conservation and

management of these lakes for the protection of urban systems. Urban areas can grow from increases in human populations or from migration into urban areas. Urbanization often results in deforestation, habitat loss, and the extraction of freshwater from the environment, which can decrease biodiversity and alter species ranges and interactions.

Conclusion

Urbanization is a sign of contemporary growth. The utilisation of natural resources increases after urban development. Two fundamental natural resources—land and water—are needed to begin any development endeavour. Land is the resource on which development activity or any built form such as roads, buildings, market, malls, sports stadiums, educational institutes, hospitals, small and heavy industries, entertainment, museums, parks etc. are built. Water is basic ingredient of all life forms. It is used in horticulture, washing and hygiene, beautification and ornamentation purpose. In order to meet the need of urbanization/development human beings are exploiting excessive ground and surface potable water which when returned to surface stream is contaminated and causes pollution which creates imbalance in ecosystem. Significant impact has been seen in form of change in Land use/Land cover and change in water bodies. Various studies have shown its impact on ecology and environment. Thus combined effect of all Urban Development activity bearing Impact on Environment can be summarized as (a) shrinking of water bodies (b) pollution (c) Altering water cycle.

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