



**Research Article**

**THE EFFECT OF URBANIZATION ON ENVIRONMENT IN BANGALORE**

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**ABSTRACT**

This paper has made an attempt on study on the effects of urbanization on environment in Bangalore urban district. There is a close relationship between the environment and the health of the persons living in an area. The geographical expansion and demographic growth of urban areas have exerted an adverse impact on the urban environment. The large scale of agricultural land in the urban area converted into industries, housing, infrastructure development like road, rail etc. has resulted not only in loss of greenery but in creation of urban heat island. The urban areas have big share in the present day environmental problems from solid waste, automobiles, increase in motor vehicular traffic in cities has contributed to air and water pollution which in turn has an adverse effect on the health of people. The present day environment degradation increases due to rapid urbanization in cities like Bangalore. This paper mainly examines the environmental problems due to urbanization and identify the environmental related health problems in Bangalore city. The data for the paper would be collected only by the secondary sources.

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**INTRODUCTION**

Bangalore is the capital city of Karnataka state and is one of the fastest growing cities in India. The only metropolitan city of Karnataka with a total population of 96,21,551 (2011 census) is the most populous district in the state, which accounts for 15.8 percent of total population of the state. The total area of the district is 2196 sq.km and 4381 people living in one sq.km. It is the smallest district in the Karnataka state in terms of area and biggest district in terms of population. Bangalore is the most urbanized district with 90.94 percent of its population residing in urban areas.

In simple terms urbanization is the increase in the proportion of people living in towns and cities. United Nation defined urbanization is the movement of people from the rural areas to the urban areas with population growth equating to urban population. As per 2011 census total population of Karnataka state was 6.11 crores out of which 38.6 percent of population lives in urban areas. The absolute increase in population is been more in urban areas than in rural areas. The Percentage of urban population in Karnataka was 22.95 percent in 1951 which was increased to 38.57 percent in 2011; the percentage of urban population in India was increased from 17.29 percent to 31.16 percent in India in the same period. Karnataka state is the seventh most urbanized state in India.

**Objective of the study**

The important objectives of the study are

2. To identify the environmental related health problems in Bangalore city
3. To give suitable suggestion for controlling measures of environmental degradation in Bangalore

**Study area**

Bengaluru is located on the Deccan Plateau, in the south eastern part of Karnataka state. The district lies between 12° 58' to 13° 0' North Latitude and 77° 37' to 78° 18' East Longitude. The average elevation of the district is around 900 to 1000 meters above the mean sea level which endows it with a salubrious climate. The district has four taluks they are Bengaluru North, Bengaluru South, Bengaluru East, and Anekal. The famous IT and BT Electronic City situated in Anekal taluk.

The relationship between urbanization and environment are complex in nature. Where the more urbanization, creates more opportunities for jobs, education, health facilities, modern life style etc., but the urbanization also degrade the environment especially in water and Air quality.

There is a close relationship between the environment and the health of the persons living in an area. The geographical expansion and demographic growth of urban areas have exerted an adverse impact on the urban environment. The large scale of agricultural land in the urban area converted into industries, housing, infrastructure development like road, rail etc. has resulted not only in loss of greenery but in creation of urban heat island. The urban areas have big share in the present day environmental problems from solid waste, automobiles, increase in motor vehicular traffic in cities has contributed to air and water pollution which in turn has an

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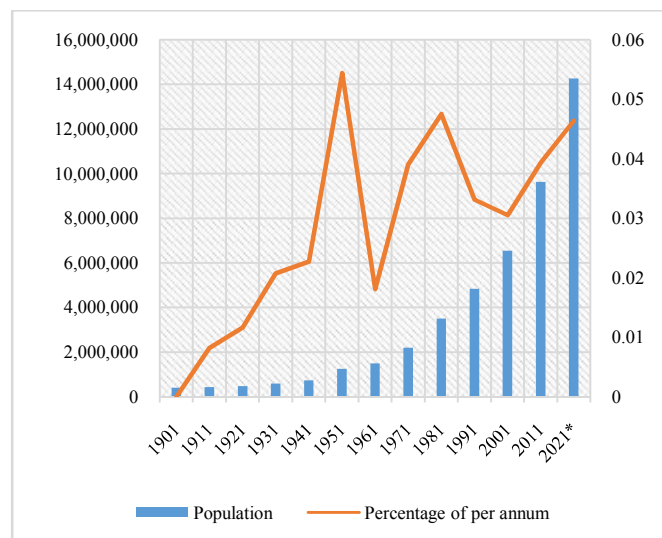
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adverse effect on the health of people. The present day environment degradation increases due to rapid urbanization in cities like Bangalore. This paper mainly examines the environmental problems due to urbanization and identify the environmental related health problems in Bangalore city. The data for the paper would be collected only by the secondary sources. To make this study qualitative in nature, simple and adequate tools have been used for analyzing.

### Urban growth in Bangalore District

Bangalore is the most urbanized district with 90.94 percent of its population residing in urban areas. As per the 2011 census the total population of Bangalore district is 96.21 lakhs. From 2001 to 2011, population has increased in the district by 47.5 percent touching almost a crore. The expected population of Bangalore district was 142.70 lakhs by 2021. Bangalore district population growth may be faster increasing in the forthcoming decades. Bangalore is booming with information technology and biotechnology, growth of the private service sector, well developed infrastructure facilities with industrialization.

### Population growth in Bangalore



### Environmental problems due to urbanization in Bangalore Urban District

The environmental pollution is one of the most burning problems before mankind. The rapid growth of Bangalore in past decades has resulted in significant decrease in the quality of the environment. The increase in urban population area and growth in economic activity has led to environmental degradation in Bangalore. There has been the highly unplanned development of industries, factories, drainage, and unsystematic disposal of solid waste, motor vehicular traffic etc., are responsible for environmental degradation in Bangalore.

In Bangalore identifies several types of environmental problems such as decreased land and deforestation, slum development, global warming, soil erosion and pollution, water pollution, air pollution and solid waste management etc. This type of environmental problems in the urban center have resulted to many health problems in Bangalore.

### Water pollution due to urbanization

"Water is an important natural resource to touch all aspects of human civilization from agricultural and industrial development to the cultural and religious values embedded in society." (Koichiro Matsuura, 2008). The major sources of water supply in Bangalore district are municipal pipes connection through Cauvery river water and bore wells. But supply of water started falling short of demand as rapidly growing in size and number in the district. The inequitable distribution of water, some sections of the population get less water than the average per capita requirement. Some sections of the population especially in new layouts depend on private bore well water as well as bought out water. Water losses estimated between 30-50 percent a serious problem in the Bangalore district. Source of surface and ground water have become increasingly contaminated due to increased industrial effluents, domestic wastage, and modern agricultural techniques. It causes the damages to the human being and sustainable environment.

Bangalore city is also known as Land of lakes where a large number of lakes were constructed to store water during the regime of Kings and British period. In Bangalore there are three forms of watersheds, i) Kormangala chalagatta valley, ii) Vrishbhavati Valley and iii) Hebba Nagavara valley. The number of lakes in Bangalore has reduced from nearly 285 to 194 due to unplanned and irresponsible urbanization during the nineties, witnessed large scale unrealistic, uncontrolled developmental activities in the neighborhood of lakes, which led to decline in ground water, native species of lake ecosystem, dumping of solid waste construction debris etc. in storm water drains, lake catchment, polluting existing surface and subsurface water resources, reduced water holding capacity to accumulation of silt etc. (ENVIS technical report, 2016). Aarti Kelkar (2016) study found that more than 90% of Bangalore lakes are polluted or encroached by mafia, 90 percent of lakes were sewage fed due to sustained flow of untreated sewage and industrial effluents, dumping of solid wastes and building debris in to lakes. And water quality analysis of 80 lakes found that almost half of the lakes were highly polluted.

### Air pollution due to urbanization

"The presence in air of substances put there by acts of man in concentrations sufficient to interfere with the comfort, safety or health of man or with the full use or enjoyment of his property. The presence of contaminants in atmosphere is considered to be in sufficient quantities and duration, to cause them to be injurious to human health, animal and plant life and reduce welfare in general" defined by WHO.

One of the major sources of air pollution in Bangalore is ever-increasing traffic with increasing private vehicles registration, use of non-environmental friendly fuel sources and industrial development degrading air quality. The vehicles, industries, factories release smoke, carbon dioxide, nitrogen oxide, hydrocarbon, aldehydes and leadoxide, etc. are causing serious environmental pollution affecting the health of the people.

The number of vehicles increased drastically due to globalization, economic development, and rapid urbanization today. Due to increase in vehicles on the road today we experience higher levels of air pollution than before. At present the transportation is a major source of air pollution in

the Bangalore city, it is estimated for nearly all of carbon monoxide, more than 80 percent of nitrogen oxides, 40 percent of volatile organic compounds, 20 percent of sulfur dioxide and 35 percent of PM10 in 1998.

**Registered vehicles and their forecast in Bangalore**

Type of vehicle	2000	2010	2020	2030
Two wheelers	1067430	2951520	4835610	6719700
Three wheelers	61424	115401	169378	223355
Cars	201052	697745	1194438	1691131
Jeeps	6827	9104	11381	13658
Taxi	6299	32818	59337	85856
Buses	20656	35723	50790	65857
Trucks	41887	139573	237259	334945
Tractors	6158	20555	34952	49349
Trailers	5544	12487	19430	26373
Maxi cab	4238	23153	42068	60983
Others	16542	84018	151494	218970
Total	1438057	4122097	6806137	9490177

The above data shows that the number of registered and share of different modes of vehicles in Bangalore city. It's clearly depicts that the two wheelers account for about 72 percent of the total vehicular population and it contribute the 65 percent if hydrocarbons and nearly 50 percent if carbon monoxide in Bangalore. Three wheelers, cars, jeeps, trucks, taxi and other vehicle contribute 28 percent of vehicular population in Bangalore.

**Major sources of air pollution in Bengaluru City**

Source	Source PM10 (TPD)	% Contribution
Transport	22.4	42
Road dust	10.9	20
Domestic	1.8	3
DG Set	3.6	7
Industry	7.8	14
Hotel	0.1	-
Construction	7.7	14
Total	54.3	100

Source: Department of Planning, Programme Monitoring & Statistics, Government of Karnataka (2016a)

The table clearly depicts that the contribution of road dust to air pollution is 20%, industry and construction contribute 14 percent, DG set and domestic contribute only 7 percent and 6 percent compared to 42% of contribution from Transport sector.

**Impact of Solid waste on Environment**

One of the most important challenges in Bangalore district is solid waste that is generated in today's urban areas due to rapid urbanization and drastic change in the culture and practice of people. The waste that would be generated would consist of not only household waste but also many other forms of waste including those from hotels, hospitals, construction and industries etc.

Zone	Zonal average weight/per day (MT)
Bommanhalli	324.1
Dsarahalli	131.6
East zone	904.2
Mahadevapura	401.4
R R Nagar	155.4
South Zone	719.4
West zone	870.9
Yelahandka	92.6
Total waste for all zone	3599.7

It is estimated that in Bangalore, total solid waste generated in zonal wise comes around 3599.7 metric tons per day (2014). Roughly 60% is organic waste and 40% dry waste. The average weight of waste generated per day per ward is 17.07

metric tons and the average weight of waste generated per day per person comes out to be 400.2 grams. Around 23.5 percent of the waste generated does not get collected. This clearly indicates the lack of disposal facilities and public awareness, the unscientific manner of disposal of solid waste, dumping into the open places constitutes a serious problem in public health issues.

**E waste**

Wastes generated from electrical and electronic equipment's are regarded as e-waste. The changing in lifestyle patters of urbanized people and growth of the IT and BT companies has resulted in huge e-waste generation in Bangalore urban district. Among the metropolitan cities of India, Bangalore ranks third in e-waste generation. Around 8000 tones e-waste generated in Bangalore urban district in one year. It is essential to dispose of the e waste in an environmentally sustainable manner.

**Environmental degradation and Health Impact**

Due to Rapid increase in urban population there is environmental degradation especially in the quality of water and air. Some unlawful factories and houses which have poor infrastructure, the waste from building and industries wastes dumped directly nearby water sources, degrade the water quality. One of the major sources of air pollution in Bangalore is ever-increasing traffic with increasing private vehicles registration, use of non-environmental friendly fuel sources and industrial development degrading air quality. The vehicles, industries, factories release smoke, carbon dioxide, nitrogen oxide, hydrocarbon, aldehydes and leadoxide, etc. are causing serious environmental pollution affecting the health of the people. More people in the cities there is great demand for basic facilities.

There is a close relationship between the environment and the health of the persons living in an area. Pollution of air and water and undisposed waste has an adverse impact on health of citizens. People in Bangalore urban district do highly suffering from Air related diseases such as allergy, sneezing, skin rashes, Asthma, Bronchitis and Nausea etc. and water borne diseases such as Gastroenteritis, Dysentery, Diarrhea and Hepatitis and vector borne diseases such as dengue, chickungunya and malaria.

**Environment related health problems**

Air related disorders	Water borne diseases
Allergy 36.1 %	Gastroenteritis, 6.9 %
Asthma 13.8%	Dysentery, 9.2%
Bronchitis 3.4%	Diarrhea 7.5%
Nausea 3.7%	Hepatitis 1.0%

Source: Centre for Sustainable Development, 2012

In Bangalore urban district around 57 percent of people suffering from air related diseases and 25 percent of people suffering from water borne diseases. More than one third of people are suffering from allergies causing throat irritation, skin rashes and sneezing.

**CONCLUSION**

The present day environment degradation increases due to rapid urbanization in cities like Bangalore. This paper mainly examines the environmental problems due to urbanization and identify the environmental related health problems in Bangalore city.

There should be well set plan and sustainable balance for maintaining the culture and heritage along with the modern trend of industrialization and urbanization. The only way out of this situation would be increase awareness among the residents on the various issues and environmental problems in Bangalore urban district.

Based on the above study the strategic steps should be taken by the authorities and residents in Bangalore to living back reminences of its glory, history and heritage. The important suggestions of the study are as follows

1. Rainwater harvesting should be made compulsory for all residents. It helps to increase sufficient water supply and recharge and improve the groundwater level.
2. Create a stable policy frame work for sustainable urban development
3. Solid Waste management is the concern for any urban city with respect to its safe disposal recycling of waste products and also generating energy from wastes.
4. To ensure environmental sustainability in cities, planting of trees is imperative and encourage citizens to plant trees by providing free seedlings for the citizens.
5. To reduce the air pollution level in Bangalore city, the transport department is making it mandatory for auto rickshaws, to use LPG fuel
6. To strengthen the public transportation system and to discourage the use of personalized modes of transport.
7. To adopt the various traffic management measures to reduce the number of personalized vehicles on the roads.
8. Natural gas is a very promising fuel for lower vehicular pollution. The use of CNG as a fuel reduces the emissions of carbon monoxide and hydrocarbons significantly.
9. The citizens should have participate and commitment for the society as it helps in solving the environmental problems related to pollution and the human health in Bangalore.

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