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Impact of Urbanization on Rivers, India

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Abstract: ***A Central Pollution Control Board (CPCB) report of 2015 brought out the fact that 61,948 million litres of urban sewage is generated on a daily basis in India. But the cities have an installed sewage treatment capacity of only 38 per cent of this. In reality more than this amount goes untreated into the rivers or water bodies as the treatment capacity of major sewage treatment plants (STPs) in the country is around 66 per cent of the installed capacity as per CPCB findings of 2013. As a result, more than 38,000 million litres of waste water goes into the major rivers, water bodies and even percolates into the ground every day.***

Accelerated transformation of 'urban riverfront development' has been pushed along the riverbanks in the last few decades. The riverfront development has been reduced to just cosmetic 'river beautification' and unaccountable money spent to increase its real estate and commercial value. Increasing urbanization in the river basin is followed by a number of serious Physical, Chemical & Environmental impacts on the health of the river basin system. We are in the country where rivers are considered as mother but it is unfortunate to say that Indian rivers are much more polluted in comparison of other rivers of the world. Through this Dissertation it will be tried to understand the major reason citizens are not sensitive towards river and develop understanding how we can rejuvenate our tributary rivers.

I. AIM

This research aimed to investigate the various factors of urbanization that adversely impact the urban river.

II. OBJECTIVE

The fundamental objectives of the present investigation to study various Physical, Socio-economical & Environmental impacts of urbanization on rivers inside the city which incorporates the follows:

1) Analysis of the various anthropogenic activities that adversely impacts rivers within the city.
2) Analyse present status of urban river in India.
3) Best practices for safeguard the rivers inside the city.

III. INTRODUCTION

Due to movement of people from rural to urban areas, physical growth of the urban areas occurs, which ultimately leads to the urbanization. A land area drained by its rivers and its tributaries is called a river basin. Most of the population throughout the world lives on various river basins.

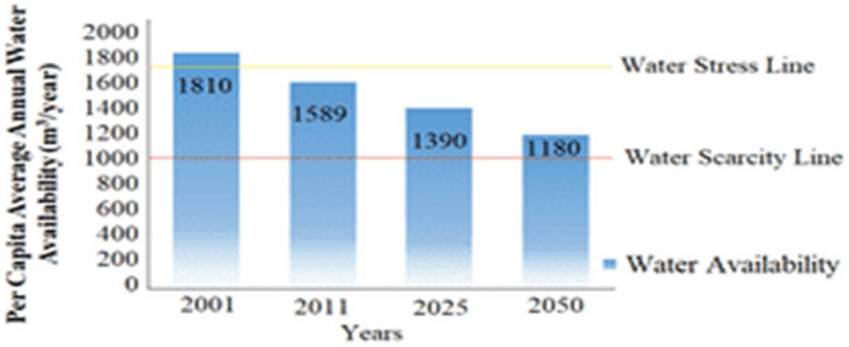
Therefore, changes in river basin due to anthropogenic activities require extensive research. Urban development is associated with the land use transformations, degradation of the water quality of rivers, increased flooding, and disturbance in the natural river basin ecology. Flooding disasters in mega cities like Mumbai floods in 2005 and Delhi floods 2010 left a lesson that the encroachment of a natural drainage system for developmental purposes may result a threat to urban life.

The freshwater resources are depleting fast adding to the growing water crisis. The shrinking and degradation of river ecosystems is the major issue to be tackled on a national level to attain goals related to the conservation of the environment, climate change, and sustainable development. India has 18 percent of the world's population, but only 4 percent of its water resources, making it among the most water-stressed in the world.

The population growth graph of India is going upwards and water availability graph is decreasing day by day, the number of polluted rivers in the country has risen from earlier 121 (2009) to 275 (2019) out of the monitored 445 rivers. India is the country where water is in plenty and we treat rivers as our mother, still fresh water quality index of India is 120 out of 122 countries and fresh water availability index is 133 out of 180 countries.

Through the above statics it can be easily understood that the India is going towards the water scared country, if we not carefully handle our water resources.

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Source: Per capita fresh water availability, future water scarcity and water stress in India (Govt. of India ministry of water resource,2012)

IV. EFFECTS OF URBANIZATION ON RIVER

A. *Physical Effects*

1) *Landscape and change in Landscape:* Built-up regions and open vegetated areas are included in the landscape. The composition of the terrain is quickly changing due to urbanisation. The regional hydrology of a river basin is impacted by changes to the landscape, such as the conversion of open vegetative areas into impervious surface cover (ISC). This causes issues like water shortages and declining water quality.
2) *Land Filling:* Landfilling is done to prepare land for construction, however when landfill is placed along rivers, the width of the river narrows, affecting the flow of water. As a consequence, the river's ability to hold water is diminished, and during the monsoon season, the water level in the rivers rises, resulting in flooding.
3) *Flow Modification:* The modification of stream flow is a key impact of urbanisation. The river basin's ecology needs some base flow to function properly. The Montana technique is employed to determine a river basin's ecological base flow. According to certain research, base-flow can decrease by up to 20% with very minor changes in the soil's porosity.
4) *Over Exploitation:* A basin is closed as a result of over exploitation of its water resources to fulfil rising human water demands
5) Land use changes: The quality of rivers is impacted by changes in land use along the rivers; in recent years, river front projects and river-centric development have both had an impact on rivers in different ways.
6) *Industries:* By immediately dumping hot water from industrial furnaces into rivers or by introducing surface water runoff during the summer, urbanisation raises the temperature of the water. In river water, it has been discovered to stimulate microbial activity. In the spring, the water's warming promotes the growth of algae.
7) *Transportation:* Polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs), BTEXs (benzene, toluene, ethylbenzene, xylene), and heavy metals including cadmium, chromium, iron, nickel, vanadium, lead, aluminium, zinc, and copper are the main pollutants produced by transportation operations. Several of the above-mentioned heavy metals are present in automotive components like brakes and tyres. On average, 1 kilogramme of tyre tread rubber gets worn off throughout the course of a passenger automobile tire's lifetime when it is used for 50,000 km. Rivers get all of these contaminants through surface runoff.

B. *Chemical Effects*

The increasing loading of nutrients, metals, and organic pollutants into river water is what causes urbanization's chemical consequences.

Municipal and industrial runoff change the chemical characteristics of urban waterways. Garbage is dumped directly into rivers.

Urban rivers are marked by the presence of organic pollution, salinity, total suspended solids, heavy metals, nitrate, and organic micro-pollutants. They are also characterised by acidification, eutrophication, and the full extinction of the river's inhabitants owing to high Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD).

Urban rivers are struggling with significant water contamination issues. The recycling of organic waste among communities is one corrective action. Metals like Cu and Zn are markers of anthropogenic contamination in river water. Hg, Ca, Cr, Ni, Co, Mg, Fe, Al, Cu, and Zn are additional metals. These metals could negatively impact the river environment's biogeochemistry.

The extremely harmful organic pollutants, such as polycyclic aromatic hydrocarbons (PAHs) and faecal coliform bacteria, added by runoff from metropolitan areas during rains and floods. The aquatic creatures might die as a result of this.

C. Loss of Bio Diversity

The biological consequences of urbanisation on river basins include changes to the natural habitat of local flora and fauna, biodiversity loss, and degradation of ecosystem processes.

Changes in land use patterns impair ecological stability and species richness.

Indicators of the link between urban growth patterns and ecological conditions in the basins include benthic macroinvertebrates and fish.

V. CASE STUDY

Since Ahmedabad was established in 1411 upon the banks of the Sabarmati River, the river has played a significant role in the city's daily activities. In addition to being a significant water supply, it served as a setting for cultural and recreational pursuits. The riverbed was used for cultivation in the dry seasons.

With time, it also provided a location for a variety of illegal economic activities, and squatter settlements began to appear along the banks of the river. Storm water outfalls allowed untreated sewage to enter the river, and the disposal of industrial waste constituted a serious threat to the environment and public health. The villages around the rivers were severely vulnerable to flooding and lacked even the most basic infrastructure. Along the riverfront, construction slowly began to take shape. Due to these circumstances, the river was rendered impassable and effectively separated the two portions of the city. The metropolis slowly shifted away from the river. The riverfront's potential to be transformed from its unpleasant status into a significant urban asset had long been acknowledged. Since the 1960s, proposals have been made to accomplish the same thing, but it wasn't until 1998 that the city conceived of and began working on this multifaceted project.

The monsoon-fed Sabarmati River divides Ahmedabad into its western and eastern parts as it runs north to south through the city. Since the city of Ahmedabad's founding, it has been an essential component. The river was the city's main supply of water at first. Water is now obtained from a variety of far-off sources. Along the banks, it has created space for cultural and recreational activities. The Salt March started from Mahatma Gandhi's ashram, which was established along the river's banks during the liberation fight. The wide, dry riverbed and its banks were more frequently utilised for textile dyeing and laundering. Farming was done on the river bed during the dry seasons.

It also developed into a location for various illegal commercial ventures including the Sunday flea market known as "Ravivari." Many of the city's destitute and migratory residents eventually moved into unofficial colonies along the banks of the river.

The Sabarmati River became polluted, mistreated, and neglected as a result of all these uses and abuses and unchecked urban expansion. Unimaginative and haphazard construction come to define the riverside. Those property owners who could afford it constructed their own retaining walls to shield their homes from flood erosion. Slum dwellers were very vulnerable to flooding and lacked access to even the most basic infrastructure. Storm water outfalls with sewage contamination and the disposal of industrial waste in the river constituted a serious threat to the environment and human health.

The river itself became inaccessible to the bulk of city dwellers, in addition to the deteriorating ecological health. There were relatively few public access sites to the river because most riverbank land was privately owned and there were many informal settlements. By the 1970s, the city's residents had no other way to take in the expanse of the river that ran through its centre than from the bridges.



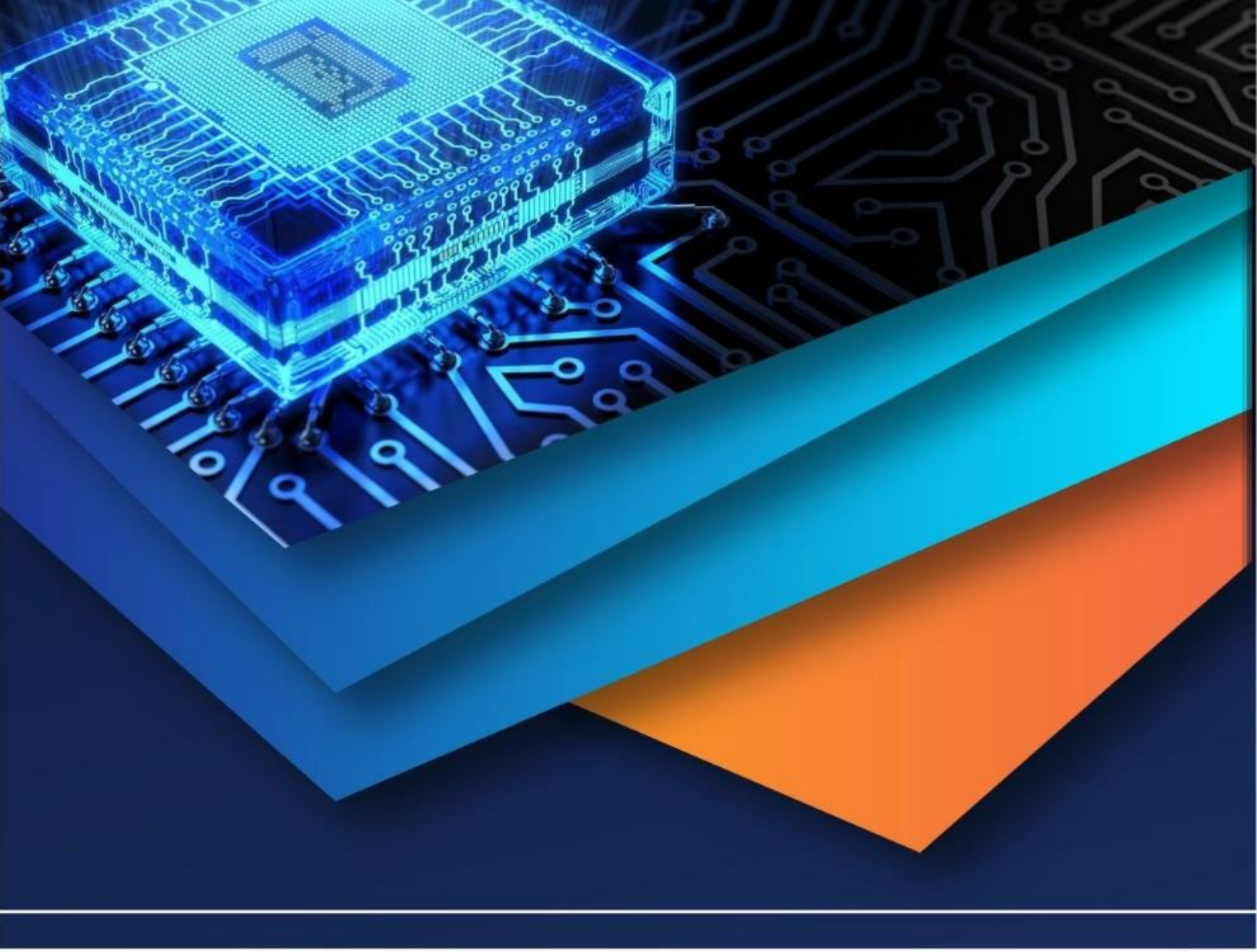
Figure01: Showing the water source in Sabarmati river

Source: Google imagery & Author analysis



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