

Influence of Urban Growth on Water Bodies and Environment

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ABSTRACT: *Water is a crucial component of the Earth's ecosystem and for all living things. The river gave them water, which was vital to their survival. Water is still very important and an important component of modern-day development operations. Water is one of the essential necessities of all plants, and life cannot exist without it. New city planning guarantees that a water supply is closed. The water bodies and catchment area will provide enough water for different development and habitation operations. Urban development in India is unplanned and disorderly. Large-scale urbanization and the growth of cities and towns have resulted from the massive rise in population. Better urban amenities prompted people to migrate to town centers in pursuit of jobs, education, and medical care, resulting in the rise and development of new towns and cities. Land and watersheds have been encroached upon as a result of large-scale urbanization and uncontrolled expansion. Soft surfaces have been saved as a result of urban development operations, limiting water penetration into subsurface reservoirs and increasing surface runoff. The purpose of this paper is to investigate the effects of urbanization on water bodies and the environment. The ecology has been transformed and an environmental imbalance has resulted from large-scale deforestation for industrialization and the establishment of new settlements. As a result, unplanned urban growth has had a variety of effects on water bodies, including shrinkage, pollution, and changing the water cycle hence this paper helps to understand the problem and methods to overcome it.*

KEYWORDS: *Deforestation, Environment, Pollution, Urbanization, Water Pollution, Water Cycle.*

1. INTRODUCTION

Water is a crucial component of the Earth's ecosystem and for all living things. It is the bedrock upon which human civilization has been built. Along the river banks, ancient civilizations such as Harappa and Mohenjo-Daro, the Nile Valley, and Mesopotamia grew and prospered. The river water was vital to their survival. Modern urban centers are based on the same principles, with the source of water or catchment region being positioned near to the urban development. Water is a crucial component of modern-day development operations. Water is a vital necessity of all plants and living things, and life cannot exist without it. When planning new cities, make sure that the catchment region or water supply is close by. Water bodies and catchment areas will be provided to guarantee enough water supply for different development and habitation operations. In India, growth is mostly unplanned and uncontrolled. Cities are congested and lack basic utilities. Various environmental challenges have arisen as a result of this imbalance and unplanned growth, which need prompt attention and care. Urbanization has increased population density and built-up regions, which has a direct impact on the environment and water bodies via changes in total runoff, peak flow characteristics, and water quality decrease (Jain and Sharma 2020; Meenu et al. 2019; Nagamanjula and Pethalakshmi 2020; Sharma, Sharma, and Dwivedi 2019).

The social, cultural, economic, and physical growth of cities, as well as the underlying causes of these processes, is referred to as urban development. Depending on the researcher, the phrase "urban development" is employed in a variety of ways. Many scholars concentrate on physical spatial development, such as architecture and city planning, as well as the underlying social and cultural processes. Other scholars begin with social change, such as inequality or gentrification, to explain and examine the changes and their social repercussions. In a city, water bodies serve a variety of purposes. It may be a source of water for irrigation, gardening, fishing, and eco-

tourism, all of which add value to the social advantages. They may also be utilized to reduce urban heat islands and enhance city microclimates. Inland Rivers and canals; reservoirs; tanks and ponds; bays, oxbow lakes, derelict water; and brackish water make up the country's water resources. Surface water bodies are defined as distinct and important pieces of surface water, such as lakes, reservoirs, streams, rivers, or canals; parts of streams, rivers, or canals; transitional water, or a length of coastal water, according to the European Water Framework Directive (Agrawal, Agrawal, and Singh 2019; Choudhary, Dwivedi, and Umang 2019; Gola, Dhingra, and Rathore 2019).

The actions of urban growth have a significant influence on water bodies. Water bodies have shrunk and become polluted as cities expand and development work is carried out to fulfill the growing demand of the urbanized population. The principal cause of water body shrinkage is the vast volume of water extracted to suit the rising population's requirements. Second, as the population grows, the hard cover grows, reducing porosity and boosting the flow of massive amounts of water, creating a flood-like condition.

1.1. Key environmental challenges associated with urban development:

1.1.1. Water Bodies Shrinking

It is clear that human development over the decades has obstructed the water routes that used to access the Aral Sea, limiting the amount of water reaching the sea year after year. People who relied on fishing for a living have lost their food and livelihood as a result of the activities in the water. People who were farming land near the Aral Sea using seawater are no longer working there, and the farmland has dried up completely. The quality of the land and soil has completely altered from that of a farm to that of a desert. The effect of dwindling water bodies on the environment and human existence may be seen in the graph above. In Chennai, India, where a water crisis has gripped the city, washing, and bathing has become a luxury. A lack of rain in 2017 and a failing monsoon in 2018 have resulted in groundwater depletion and the near-drying up of major water bodies/aquifers, forcing inhabitants to rely on water tankers. Several catchment and low-lying regions in Chennai have been turned into residential

complexes. As a result, the catchment regions' rivers and lakes have dried up. Because water cannot find a way to rivers and lakes due to building in low-lying regions, flooding occurs during the rainy season. At the same time, the hard surface prevents water from penetrating into the soil, preventing the water from becoming charged (Abdurakhman and Firdaus 2019; AKBAR 2019; Alfisya 2019; Singh, Singh, and Singh 2018).

1.1.2. Water Bodies That Have Been Polluted:

Pollution of the underground aquifer and pollution of the surface aquifer are the two effects of urban development on water systems. Both of them have been impacted by pollution in two ways. Point sources of pollution fall into the first group, whereas non-point sources of pollution fall into the second. Water sources have become dangerous to use, especially for drinking, as a result of pollution in any of these methods. It also makes it impossible to sustain many of the life forms, ecosystems, aquatic life, marine life, and other organisms that flourish in these bodies of water (Gupta and Kumar 2012; Kumar 2019).

1.1.3. Sewage pollution of aquatic bodies:

There are various factors that contribute to water contamination. The dumping of sewage by metropolitan areas is one of the key reasons. It is a common practice across the globe to discharge sewage into rivers, lakes, or other streams, which are then converted into massive drains over time. Huge rivers, such as the Yamuna, which originates from a Himalayan glacier and is a perennial river that never dries up, have been turned into drains, and its water is unsafe for drinking, despite the fact that the glacier water is clean. Smaller rivers that existed before have dried up and are no longer visible. Gwalior is traversed by a massive nala, which was originally a river known as Swarnkala (Hu and Li 2021; Mustafa and Hayder 2021; Thomes et al. 2019; Vanapalli et al. 2021).

People are no longer aware of this river, and it is no longer traceable, yet the city was formerly situated on its banks. The major cause for this is the expanding population,

which has resulted in the expansion of cities and the establishment of new cities, all of which are largely reliant on water to fulfill their functions. One of the main causes of these water basins diminishing and drying up is excessive water consumption and urbanization. As the world's population grows, so does the amount of trash produced (both residential and industrial), and in the lack of a suitable waste disposal system, we are dumping it into open fields, low-lying regions, and rivers, contaminating them. Chemicals and heavy metals in industrial waste harm aquatic life, infiltrate the food chain, and have an impact on human health. In 1938, a Japanese manufacturer released a large quantity of mercury into Minamata Bay, harming the local fish population. It took a decade for the issue to be discovered. Many locals had eaten the fish by that time, and about 2000 individuals had been poisoned. Hundreds of people were killed or handicapped as a result of the disaster.

1.1.4. *Strange intruders polluting water bodies*

Alien invaders/invasive species are also responsible for water pollution. Animals or plants from one location are brought into a different ecosystem as alien invaders. It is a phenomenon caused by overcrowding or excessive plant or animal growth. Alien invasion species include the following:

- *Canlerpa taxi folia*, alien algae found in the Mediterranean Sea.
- After arriving in ballast water in the Black Sea, an alien jellyfish known as *Mnemiopsis le idefi* destroyed fish numbers by 90%.
- Asian clams known as *Potomocorbula amurensis*, which were also imported by ballast water, have drastically impacted the environment in San Francisco.

A nice example of an alien invasion is the water hyacinth. Rains carry away the surplus fertilizers used in the crops into bodies of water. These water bodies become nitrogen-rich, resulting in the overgrowth of water hyacinth, which covers the whole surface of the water body, blocking sunlight and consuming all of the oxygen contained in the water. As a result of the lack of sunshine and oxygen, aquatic life dies, disrupting the

whole ecosystem. It will eventually expire after eating all of the nutrients and oxygen, and the whole water body will be abandoned and lifeless, devoid of all living forms.

1.1.5. Plastic trash pollution of aquatic bodies

Water pollution is caused by plastic garbage that is dumped or thrown directly into bodies of water. After ingesting these plastic waste products, aquatic creatures get diseased, die, or become paralyzed. Plastic may be absorbed directly or after breakdown, and it returns to the food chain, affecting humans via marine food.

1.1.6. Religious rites pollute water bodies

Submerging idols and worship items directly into water bodies is also one of the sources of water contamination during religious rites. These idols were originally formed of clay/mud and painted with natural/organic hues. The demand for these idols has risen as a result of growing demand from overcrowded cities. The manner of making these idols has also altered in order to fulfill the rising demand. Because of its rapid setting properties, these idols are now made of Plaster of Paris to save manufacturing time and maximize earnings. Furthermore, because to the reduced time and effort necessary to produce the color, organic colors obtained from nature have been substituted by synthetic paints. Using a cast and POP, hundreds of idols may be manufactured in a fraction of the time it would take to dry and make them otherwise. This has enhanced the income of artisans, but it has also led to water contamination.

1.1.7. Oil spills pollute bodies of water

By means of oil spills, oil contributes to water contamination. The shift in our lifestyle has made us increasingly reliant on oil supplies for day-to-day survival. Oils in the process of processing and transportation may spill and pollute the environment. The oil spill on land may render the area unusable for agriculture, as well as poison the whole water supply by coating the water's surface with a film of oil. Birds and other aquatic life forms can't live in water because of the oil coating. There is an imbalance in the ecology and economy as a whole.

1.1.8. *Radioactive waste pollution in aquatic bodies:*

Water contamination is also caused by radioactive waste deposited in water streams by companies. Radioactive water contamination has had a tremendous influence on both human and aquatic life. It causes genetic alterations, illnesses, and infertility in the soil, cell death, and burns.

2. DISCUSSION

The water cycle has been disrupted as a result of urban growth. We're seeing erratic seasonal intervals and rainfall. Rapid urbanization has resulted in widespread deforestation in order to increase the amount of land available for agriculture and industrial growth. Because of the large-scale deforestation, the amount of water available for cloud formation has decreased, resulting in less precipitation in the form of rain and snow.

Rapid urbanization has resulted in a rise in waste creation in the form of rubbish and sewage, which is often deposited in open areas or discharged into waterways. The quality of water in streams has been impacted by waste discharge from metropolitan areas, even if the overall amount of water may stay the same numerically. Because there would be less precipitation on hills and plains as a result of decreased cloud formation, uphill glaciers may not be effectively refilled, and depletion may accelerate. These glaciers provide water to rivers that flow from hills and mountains. These rivers have water accessible throughout the year. The volume of water made accessible by these rivers will be affected by glaciers retreating (due to melting) or disappearing. Less rain means less water for surface streams and groundwater recharge, resulting in a drop in the water. The dilution of sewage in the river and the self-cleaning velocity of the river ecosystem would be affected by reduced rainfall. Deforestation will result in the loss of moisture from the soil, causing desertification over time. The loss of vegetation will raise surface temperatures, resulting in irregular rainfall and glacier melting, rising sea levels.

3. CONCLUSION

Urbanization is a sign of progress in the contemporary world. Increased exploitation of natural resources follows urban development. Land and water are two essential natural resources for any development project to get off the ground. The land is the resource on which development or any physical form, such as roads, buildings, markets, malls, sports stadiums, educational institutions, hospitals, small and heavy businesses, entertainment, museums, parks, and so on, is developed. Water is an essential component of all living things. It's utilized for horticulture, cleaning, and hygiene, as well as attractiveness and adornment. Humans are exploiting excessive ground and surface drinkable water to fulfill the needs of urbanization/development, which when returned to surface streams is tainted and produces pollution, causing ecological imbalance. Changes in land use/land cover, as well as changes in water bodies, have had a significant influence. Its influence on ecology and the environment has been shown in several research. As a result, the cumulative impact of all urban development activities on the environment may be characterized as decreasing of water bodies, pollution, as well as changing the water cycle.

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