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Impact of Urbanization on Water Quality of the Godavari River in Nashik City (Maharashtra)

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Abstract:

The Godavari River with which Nashik city shares sensitivity as a lifeline has been going through a lot of environmental issues since three decades because of the increasing urbanization. The river that was once so pure and of immense use to the towns people of this city has gradually been experiencing some form of deterioration in its overall health and also water quality. This degradation can be as a result of factors such as the growth of urban centers without appropriate control, people dumping all manner of domestic and industrial waste into rivers without any treatment, and effects resulting from religious activities such as offering and baptisms. As the Godavari River is the lifeline for the entire region in terms of meeting the ecological balance, and its multiple utilization in water needs this study aims to evaluate how far the urbanization has affected the health of this river. The data is collected from both primary and secondary sources and the data of analysis of some of the key physio-chemical parameters of the river to determine the amount of pollution involved. Here, the findings show that two main sources of pollution are domestic sewage, industrial effluents, and the disposal of articles, such as pictures and videos or objects used in religious activities. Also, the research highlights various recommendations to prevent the impact of urban pollution and other practical approaches towards the protection and rehabilitation of this important water source. Based on the findings of the study, the study also focuses on the need to develop another form of urban growth, with concern for the environment and the human resource in the Godavari River for the benefit of the future generation.

Key words: Degradation, Water quality, Urbanization, Godavari River, Physio-chemical

Introduction:

The Godavari River is the second largest in the peninsular India and is an important source of water supply. This river flows through Nashik city which is historically, culturally and economically important city in India. Nashik has religious importance and can also entice visitors all year round. The city has however over the years gone through urbanization and has developed into a fast growing industrial area enhancing the density of the populous. This uncontrolled growth of towns have brought forth the following difficulties to the area.

Now, coming to liberalization Nashik has grown and drastically changed in its landscape. Many people and companies have been congesting the urban places most of the time. New industries have developed their sources on the banks of the river that has made it not to have its natural course and health. Growth has not been gradual; instead, it has been chaotic, and growth without direction has intruded on spaces containing trees and water. About the changes that appear in the environment of Nashik, severe pollution of the Godavari River as for the water it contains has taken place. Pollution in the river has come as a result of factors such as waste disposal, untreated sewage and industrial effluent. water pollution of such type is highly dangerous to the aquatic life that relieves on the river's ecosystem. Contaminants can threaten fish and other water-dwelling organism as contamination conspires to enter water. Other communities in this region who source their drinking, cooking and agriculture water from the river, have a very severe health issue.

This research as an analytical study seeks to investigate how the process of urbanization has affected water quality in the Godavari River. Urbanization entails several human activities most of which are unpleasant towards water bodies. What is more, that also means pollution of the environment with the disruption of natural living spaces and disruption of the regular water flow. Many events and festivals are celebrated in Nashik and therefore millions of people throng to its banks especially during Kumbh Mela. All these aggravate the situation because they create waste and exert pressure on the local assets.

In this paper, the papers would identify the factors that impacting on the quality of water in Godavari River. The paper discusses and analyzes

urbanization as one of the causes not only industrial processes, but also pollution. Therefore, the results will reveal the essence of these times for positive sustainable and more health conditions with restored and preserved states. Knowledge of this relationship contains fundamental measures to the safety of the environment, of the communities dependent on the Godavari River.

Study Area:

This paper considers the stretch of the Godavari River passing through the Maharashtra city of Nashik and the samples were collected at upstream, midstream, and downstream. This stretch is of great importance because it is majorly used for; dwelling, industrial needs and religious activities.

Objectives of the Study

1. In order to measure the current day water quality in the Godavari river concerning Nashik.
2. To examine most of those factors that contribute towards degradation of the water quality and such pollution being related to urbanization.
3. To provide remedial measures that will assist in more improvement and sustaining the quality of the river.

Data Sources and Methodology

A systematic approach of data collection has been selected for this particular research study by using both primary as well as secondary data sources in order to evaluate more effectively and accurately the conditions of water quality prevailing in the Godavari river in Nashik. The primary data was collected by taking water samples from three particular points in the river to compare differences in pollution level between different places and periods. These sampling points were the upstream section nearby Gangapur Dam which can be considered as less polluted reference point, midstream section at Ramkund which is religious site and has large human activities such as bathing washing and immersion of gods and goddesses statues, and downstream section at Tapovan which is situated far away from the city but receives water pollutants form urban and industrial sources. To assess temporal changes in pollution and potential impacts of rainfall, water discharge, and human activities, water samples were collected from the river in three seasons; before monsoon, during monsoon, and after monsoon. Accompanying the primary data collected, secondary data was also gathered using data collected from multiple South Asian authoritative sources such as the Nashik Municipal Corporation (NMC), the Central Pollution Control Board (CPCB) and many others as well as past studies completed on the Godavari River. This secondary data offer clues on long-term trends in pollution, historical records of water quality and previously identified sources of pollution and serve to support the findings from the analysis of the primary data sources.

The study thus concentrated on assessment of a number of important physio-chemical characteristics that influence the health status of the river. These comprised of pH which shows the acidity or alkalinity of water and impacts the aquatic life; DO which enables the determination of the river's capacity to support aquatic life; BOD which shows the amount of organic matter in the river that requires oxygen for breakdown; COD which estimates the amount of pollutants in the river including industrial effluents and chemical soluble deposits. Furthermore, TDS were biased to determine the number of dissolved minerals and salts in the water that are safely consumable by humans and safe for ecosystems to support aquatic lives. The study also looked at Nitrate and Phosphate because high concentrations of these nutrients can cause eutrophication; thereby promoting the growth of algae while limiting oxygen for other animal life. In addition, Lead (Pb), Cadmium (Cd) and Chromium (Cr) concentrations were determined because these metals exert toxic impacts to both water ecosystems and human beings when they reach dangerous levels through industrial effluent discharges and other human activities.

Through comparing the values of these functional characteristics of water in different places and at different moments the authors of the study tried to obtain general idea about the current levels of pollution of the Godavari River, to reveal the major sources of pollution, and to specify the potential directions of its effective management and sustainable development.

Results and Discussion

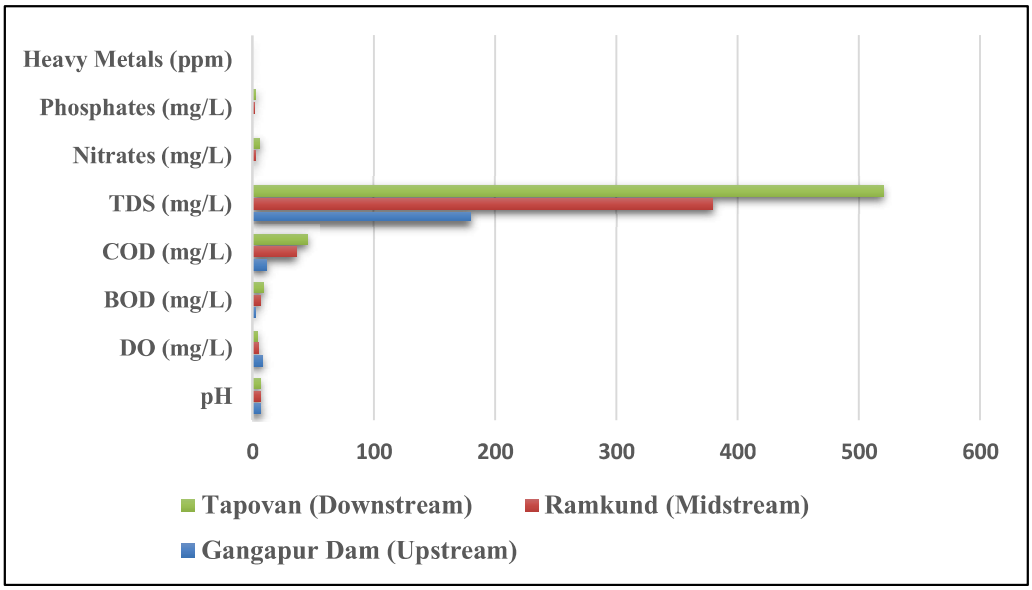
1. Water Quality Analysis:

Table 1 : Water Quality Analysis in Nashik City

Parameter	Gangapur Dam (Upstream)	Ramkund (Midstream)	Tapovan (Downstream)
pH	7.6	6.9	6.5
DO (mg/L)	8.2	5.1	3.8
BOD (mg/L)	2.1	6.5	9.2
COD (mg/L)	12	36	45
TDS (mg/L)	180	380	520
Nitrates (mg/L)	0.8	3.2	5.5
Phosphates (mg/L)	0.3	1.5	2.8
Heavy Metals (ppm)	Trace	0.04	0.09

Source: Primary Data Collection & Value Calculated by Researcher.

Figure 1 : Water Quality Analysis in Nashik City



Everyone might be wondering how the water quality in the Godavari River in the Nashik City looks like as the River passes through Gangapur Dam, midstream in Ramkund and downstream in Tapovan. The pH values change slightly starting from 7.6 which is recorded in Gangapur Dam and decreases to 6.5 in Tapovan due to increment in pollution level. Likewise, DO which is paramount to aquatic life decreases from the up-stream value of 8.2 mg/l to a critical low of 3.8 mg/l downstream indicting organic and industrial pollution leading to oxygen depletion. The parameters of biochemical oxygen demand (BOD) and chemical oxygen demand (COD) which estimate the concentration of organic as well as chemical pollutants dramatically rises at downstream; BOD rising from 2.1 mg/L to 9.2 mg/L at downstream and COD rising from 12 mg/L to 45 mg/L and also increases with a high threshold level of waste and industrial effluents affecting the river system. In addition, the Total Dissolved Solids (TDS), an index of dissolved minerals and pollutants raise from 180 mg/L at Gangapur Dam to 520 mg/L at Tapovan which makes the water ineligible for human consumption and for supporting life in the rivers. In terms of eutrophication and excessive algal grows, there are also remarkable changes in concentration of nitrates and phosphates in which the nitrates from 0.8 mg/L to 5.5 mg/L and phosphates from 0.3 mg/L to 2.8 mg/L this due to contamination from sewage, detergents and agricultural run-off. Heavy metals like Pb, Cd and Cr are detected, though in traces at Gangapur Dam, becomes conspicuous at Ram Kund 0.04 ppm which increases at Tapovan 0.09 ppm and clearly indicates that industrial effluent discharge is adding to the scenario.

The degree of pollution also shows Ramkund as having medium levels of pollution because of religious and domestic purposes while Tapovan is highly polluted that makes its water non potable to humans and inimical to aquatic life. In order to reverse the above deteriorations, stringent standards for disposal of industrial effluents, setting up and operating STPs, educating the public on environmental hazards from religious rituals, water quality analysis and use of Water Recycle & Reuse and Environment Sensitive Urban Development etc should be applied. These measures can go along way in helping to improve the water quality of the Godavari River, in order to be saved for future generations.

2. Urbanization and Pollution Sources:

1. **Domestic Sewage:** Nashik produces around 250 MLD of sewage, of which only 70% is treated effectively. The remaining untreated sewage is directly released into the river, especially during peak flow periods.
2. **Industrial Effluents:** Small-scale industries around Ambad and Satpur industrial areas directly throw partly treated or untreated industrial wastewater into the river. Contained in such effluent are hazardous chemicals and heavy metals.
3. **Religious and Cultural Activities:** Mass bathing and immersion of idols during festivals enhance the turbidity, heavy metal contamination, and nutrient loads. Religious activities mainly include offerings of organic and non-biodegradable materials.

3. Seasonal Variation:

Water quality improves marginally during the monsoon period due to dilution effects but deteriorates significantly during pre-monsoon months due to low flow and higher concentration of pollutants. The post-monsoon periods show intermediate conditions with sedimentation of pollutants playing a critical role.

Ecological and Public Health Impacts The declining water quality has far-reaching implications:

1. **Aquatic Ecosystems:** Decline in DO values and an increase in BOD and COD impacts aquatic fish and other species. The loss of biodiversity occurs at downstream stretches.
2. **Public Health:** The contaminated water risks waterborne diseases like cholera and dysentery. Heavy metals in the water may lead to chronic health conditions in communities that depend on the river for drinking and agriculture.

Recommendations

1. **Infrastructure Development:** Enhance sewage treatment capacity with 100% treatment before discharge. Upgrade the present treatment plants with latest technologies such as activated sludge and membrane bioreactors.
2. **Industrial Regulation:** Implement strict monitoring with imposition of penalties in case of non-compliance with the norms of effluent treatment. Encourage the use of zero-liquid discharge systems by industries.
3. **Community Engagement:** Awareness campaign to be carried out regarding eco-friendly practices at religious events. Use of biodegradable materials during rituals to be encouraged.
4. **Urban Planning:** Incorporate river conservation in urban development policies, emphasizing the minimization of encroachments and the encouragement of green buffers along the riverbank.
5. **Periodical Monitoring:** Install real-time water quality monitoring stations across critical points of the river. Use data analytics for predicting pollution trends and formulating timely interventions.
6. **Policy Interventions:** Strengthen environmental regulations and offer incentives for the adoption of sustainable practices. Engage NGOs and academic institutions for research and advocacy on policy matters.

Conclusion:

Consequently, much harm has been done to the Godavari River flowing in Nashik on account of urbanization. The three major activities linked to the urbanization process have greatly contributed to polluting the river through protraction of industrial waste, poor disposal of sewage and increased littering. Unless prompt countermeasures are taken, the Godavari could degrade both ecologically and culturally to the point at which it cannot be regenerated. The river plays the role of cultures and spirits to the using groups and communities and if lost, it is way too much gone.

This situation calls for sustainable activities and policies in the 'management of the growth of urbanization influence' coupled with the 'healing process of the River. This is why the effective practical measures should be aimed at reducing pollution levels, at the implementation of efficient methods of waste utilization and at increasing the level of conservational measures for the river's natural environment. The achievement of these goals will not be possible unless all the stakeholders come in and do their part. Regarding the cleansing activities, it is suggested that government agencies should enable regulations and provide facilities for the clean-up activities. Businesses need to embrace new ways of doing business in order to cause least harm to the environment. They also include local communities who should participate in clean-up activities and in raising conservation consciousness that can bring about the change.

It is incumbent upon them as a collective future for the Godavari River appears bright. When people have group endeavors, efforts will be made in a bid to rehabilitate this health of this river so that will be of more importance to human beings and for generations to come. Much attention has to be paid to its rehabilitation as soon as possible without it turning into-lifeless and ecology-free landscape or simply cultural landmark. Only thereafter steps for action taken immediately will make sure that there is no more degrading process and the river becomes healthier and cleaner for everybody.

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