ASSESSMENT OF WATER QUALITY IN MUSI RIVER: CHEMICAL ANALYSIS AND ENVIRONMENTAL IMPACT

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ABSTRACT

This study aimed to determine the water quality of the Musi river and the content of heavy metals in water, sediment and mussels as well as to predict the water quality of the Musi river in the next five years. The water samples were taken from 18 stations (sampling points) from upstream to downstream to be checked physically, chemically and biologically. The cause of this study is to investigate the broad Contaminants Index (CCI) of the study area vicinity with a view to investigate the water pollution level of the four hundred-year-antique Musi River located in Hyderabad Telangana. The study is done in view of sustainable development. Water pollution in rivers is still a crucial problem for the countries that use river water as the primary water source. The present study focused on the MUSI River contamination and its impacts on health of downstream villages of MUSI in Hyderabad city. These pollutants are responsible for the degradation of aquatic ecosystems and groundwater resources. A composite sampling technique is used to collect samples from sampling locations following a standard way to obtain a representative sample. At the start of the have a look at place, CPI suggests excessive eutrophication hazard. This look at can be an alternative for determining the level of pollution, indicating pollutants, and decision making of the use of water.

Keywords: *Musi river, water quality, water pollution, groundwater, aquatic ecosystems.*

INTRODUCTION

However, the quality of global water has rapidly declined for decades due to the impact of both natural and anthropogenic factors. Assessing water quality for different water use purposes, such as domestic use, irrigation, conservation and industrial usage, are an important strategy for food safety and human health. Rivers are one of the primary sources of fresh water for the survival of humans and other living things. In its utilization, large rivers also function as transportation routes, and even some industries are located on the banks of the river. Transportation activities affect vegetation arrangement, which can have implications for erosion and abrasion that form sediments upstream, middle and downstream rivers. This can lead to siltation and concentration of pollutants. Activities in the river also have a severe impact on the dissolved oxygen depletion. Water quality evaluation aims to identify the sources of water pollution and develop a strategy for sustainable water source management, maintaining and promoting human health and other social and economic growth. Surface water quality indexes have been developed and introduced worldwide by researchers with various applications of the nation Sanitation Foundation Water Quality Index (nSFWQI) the Water Quality Index (WQI). The decrease in water quality will reduce the usability, productivity, carrying

capacity and capacity of water resources, reducing the wealth of natural resources. The addition of large quantities of waste material from upstream to downstream of the river will continuously result in the river being unable to recover. Several industries along the Musi River are rubber processing, wood processing, fertilizers, ceramics, detergents, oil, gas, cold storage, electroplating, soft drinks, and fabric dyeing. In addition to these industries, there are also stockpiles and ship barges. Most industries do not have an optimal Wastewater Treatment Plant (WWTP). In addition, the Musi River is also a shipping lane for various types of ships. The topography of the Palembang City area shows that the people who live on the banks of the Musi River are still dense. This contributes to the generation of domestic waste into the waters of the Musi River.

LITERATURE REVIEW

Pankaj Kumar Gupta (2023) Use of wastewater for irrigation remains a disagreement among policymakers and researchers. However, it is fact that wastewater may contains many contaminants including heavy metals that can negatively impact ecosystem health. The present study is an attempt to assess the impact of wastewater use on soil, crop, and water and associated health risks based on exposure risk model where wastewater irrigation is more prominent in Hyderabad city, South India by analyzing physical (pH, EC, turbidity, oil and grease, TSS), chemical (Zn, Cr, Pb, Mn, Cu and Ni) and biological (BOD, COD, DO) parameters. The results indicated that biological contamination and the presence of heavy metals with the rising groundwater salinity. Low to moderate cancer risks are also inferred if humans are exposed to these waters for a long time. However, the study suggests continuous monitoring of the water and soil quality in wastewater irrigated areas to take remedial actions for sustainable agriculture development and protect ecosystems.

Jeevan Rao (2020) Irrigation using Musi sewage water in the Nalgonda and Rangareddy districts of Telangana, India, has been studied to determine its impact on heavy metal concentrations in riverbed water. Prior to the 2012 and 2013 planting seasons, soil samples were taken at several locations along the Musi riverbed. The soil samples were analyzed using a number of standards. Soil samples taken from the Musi river area showed that sewage-irrigated soils had higher levels of every characteristic compared to the control soils. Furthermore, the value of the Rabi season was higher than that of the Kharif season. Lead, cadmium, nickel, and chromium levels were below acceptable limits, but copper, iron, manganese, potassium, and nitrogen were abundant.

Managing Dian Mariadi's (2020) works one of the objectives of the Palembang city administration is the restoration of the Sekanak River. The Sekanak, one of Palembang's oldest rivers, is quite dirty because it carries so much trash from the city's homes and businesses. More people using the riverbanks have degraded the water quality of the Sekanak River. Alterations in color and odor are qualitative indicators of declining river water quality. The watershed continues to be an essential resource for the local population. In order to foretell the consequences of environmental

contamination, chemical and physical research are required to address the present issue of declining river water quality in Sekanak. In order to conduct their experiment, researchers collected water samples from the Sekanak River in two populated areas. Although one of the samples taken from the stream region exhibited many metrics that were considered to be over the quality level, the other sample was found to be in an acceptable state.

Fazil Qureshi (2018) Heavy metal pollution in urban areas of India is very severe and complex. This study has been conducted to assess the health risk of inhabitants by heavy metals (Cd, Mn, Fe, Cu, Pb, Zn, Ni, and Cr) through the groundwater intake of Mathura city of Uttar Pradesh, India. The HPI mean value has been found to be 66.61 indicating the groundwater quality is in poor condition. A total of 65 groundwater samples were collected, and these samples were analyzed for the presence of heavy metals (Cd, Mn, Fe, Cu, Pb, Zn, Ni, and Cr). The Igeo results confirm the certain extent of heavy metals contamination in the groundwater of Mathura city with respect to Pb, Cd, Ni, Fe, and Cr. The correlation matrix of the heavy metals in the groundwater has also been evaluated. No significant correlations have been observed among most of these heavy metals, indicating different anthropogenic and natural sources of contamination.

Cecilia Saldías (2017) a lot of towns in poor countries don't pick up their trash. People who live further down the stream use dirty water to water their plants. This puts the farmer, the buyer, and the land in danger. This water source can also make money for farms further down the value chain. There might be a better way for everyone to clean up and get rid of trash. Things would stay on the fields, and everyone would be safer. Farmer who are poor don't know if they can pay for water now that prices are going up. It's also really tough to clean. What do farmers think of the different ways to handle waste water? How much are they ready to pay for each? This study uses a choice experiment to show that. The case study is the Indian city of Hyderabad. People who farm would gladly pay more to have their water cleaned.

Chemical analysis of water samples

In addition to making up 65% of human bodies, water also supports a wide variety of aquatic life in our world's lakes, rivers, and seas. Because of human need on water, notable ancient communities have emerged around water features such as rivers and lakes. The demand for water has skyrocketed while its quality has plummeted due to industrialization and the development of agriculture. Due to its high solubility, water is quickly contaminated. Particles are a component of rain before it reaches the earth. As soon as it touches down, it starts to swiftly take up any contaminants. Water contamination in India has been on the rise in recent years, with the country's rivers being the primary culprits. These rivers are known to be very polluted and endanger aquatic life as well as human health. Wastewater irrigation may be a health issue for both agricultural workers and customers due to the presence of harmful bacteria, viruses, and parasites. This happens especially if the food isn't cooked thoroughly before eating it. One of

the most abundant and valuable resources on Earth is groundwater.

Musi River Groundwater Quality in Rural and Urban Areas

Water is essential for all forms of life on Earth; without it, studies on the subject would be incomplete. Since it makes up around two-thirds of the human body and is home to a multitude of aquatic life in rivers, lakes, and oceans, water is a very valuable resource.1 As a result of increased industrialization and globalization, surface and subsurface water sources have become more polluted. Contamination may affect any body of water, even groundwater. The fundamental features of water are removed by mixing dirty and clean water. Groundwater supplies, which may be accessible by a piped system or a hand pump, determine the availability of drinkable water. Underground water sources are used by various water distribution networks in both urban and rural areas. Human activities, such as the disposal of industrial effluents and domestic sewage into rivers, lead to a gradual degradation of groundwater quality.

Urban Pollution in Musi river water

In the Indian state of Telangana, between the Deccan Plateau towns of Hyderabad and Nalgonda, the MUSI River empties into the Krishna River. Muchukunda is another name for it. The basin of the Musi River is located between about 17°58′ and 16°38′N, with longitudes of 77°46′ and 79°48′E. Both the old and modern parts of Hyderabad are physically separated by the Musi River. Hyderabad gets its water from two reservoirs on the banks of the Musi River: Himayatsagar and Osmansagar. The source of the river is located in the Vikarabad district's Anthagiri Hills, which are about 90 km west of Hyderabad. From that point on, the Musi River mostly flows eastward. Forty kilometers downstream from the Nagarjuna Sagar Dam, it reaches the Krishna River at Wadapally, Nalgonda district, after winding its way for around 256 km across Telangana. In order to dispose of sewage from both residential and commercial sources, Hyderabad has transformed it into a huge sewer system.

Water Pollution of Musi River

Hyderabad, an Indian city, is situated on the banks of the Musi River. It separates the ancient city from the modern city and runs across a large section of Hyderabad. Starting 90 km west of Hyderabad in the Anantagiri Hills, the river flows into the Krishna River close to Wazirabad in the Nalgonda District. The nearby Musi River runs about 70 kilometers upstream before it reaches Hyderabad, and for 186 kilometers downstream till it meets the Krishna River. As soon as it leaves Hyderabad, the river goes from being pure to being the dirtiest and most poisonous it has ever been.

A River Named Musi and Its Effects on In Hyderabad, a city in India

The rapid urbanization and population growth in India have made the nation no stranger to modern-day urban floods. Bangalore, Chennai, Delhi, Hyderabad, and Mumbai are among the most populated cities in the country that have seen the consequences. In every way imaginable, Hyderabad has grown in the last half-century. New roads, shops, and buildings are continuously springing up. As cities have grown in size and population, housing colonies have sprung up. The architecture of towns constructed

after the turn of the century is drastically different from that of older communities. Minor roadways have the potential to transform into major rivers when storms, cloud bursts, and depressions provide substantial precipitation. As a background, Hyderabad is situated on rather high terrain. The Musi River is situated in the city's lowest point, and the elevation varies as you walk down from higher to lower. Looking down from above, the assumed direction of flow is downward. Given the short duration and extensive coverage of the monsoons, the likelihood of flooding in Hyderabad is minimal.

RESEARCH METHODOLOGY

Musi River water samples were collected in a sterile 5 litre plastic container and stored in a dark light and analyzed within 4 weeks of collection. In the area, under investigation the parameters like pH, Electrical Conductivity, Total dissolved solids, Alkalies, Next, the sample bottle was put into a cool box that was filled with ice cubes. Water sampling and analysis referred to the Indonesian national standard (SNI) and followed the work. Sampling of water, sediment and mussels in the Musi River, Palembang was divided into 18 stations. Total Hardness, Calcium, Magnesium, Chlorides, Nitrates, Sulphates, Carbonates, Bi-Carbonates and Fluorides are studied to know the quality of Musi River water as well as underground water through bore wells. The Musi River, with a length of 21.35 km from upstream (Pulo Kerto) to downstream (Sei Lais), is divided into 17 segments resulting in 18 sampling stations. At each station, the water samples were taken to measure temperature and tested for levels of total suspended solids (TSS), total dissolve solid (TDS), dissolved oxygen (DO), pH, biochemical oxygen demand (BOD), chemical oxygen demand (COD), phosphate, nitrate, ammonium, and Escherichia coli levels. The results of the sample analysis were then compared with the quality standards that have been set for each parameter. The data from the analysis became the basis for predicting the water quality of the Musi River. Moreover, the content of heavy metals in water, sediment and mussels was analyzed.

RESULTS AND DISCUSSIONS

The 6th largest city agglomeration in India has been built at Hyderabad. The Fusion County comprises twelve districts from the regions of Rangareddy and Medak as well as Secunderabad near the University of Osmania and others known as the Greater Hyderabad Municipal Corporation (GHMC). Physically structured, this touch is a tapestry from the Krishna River in the Musi Sub-basin (11,000 km2). Rapid growth and fiscal change have drawn people from any part of the country and the development of urban agriculture in the city to about 7.7 million is seen as a general addition to greenery and food safety.

Sample Households villages Under Musi River

The table reveals that 15% of respondents won under Rs. 10,000/. In Enkiryal, given the absence of fish, and the problems related to the sullying of fish that are more evident in comparison to others, the rate below Rs 10, thousand/-level was higher than that of the Rs 40 000/-respondents. In addition the rates below are greater than that of the Rs 40, 000/-. Next, everyone falls together in the subway Rs. 10,000/-set surapally.

Table 1: Distribution of Households in Selected Communities along the Musi River

Sample	Pratapasingaram		Enkryal		Sura Pally		Aroor		On the Whole	
Education	T.H.H	S.H.H	T.H.H	S.H.H	T.H.H	S.H.H	T.H.H	S.H.H	T.H.H	S.H.H
PG	11	2	109	10	21	1	36	6	177	19
G	321	31	499	49	72	9	409	40	1236	129
UG	104	10	301	31	131	14	99	8	505	63
M	11	2	11	1	249	24	5	1	276	29
TOTAL	447	45	920	91	473	48	549	55	2194	244

The accompanying graph clearly shows that many individuals are quitting their jobs to provide water to low-income households. People value water more than their jobs, which is why this is happening. Pratapa singaram is no longer home to many nuclear families due to the prevalence of Krishna's basic water. To receive the water they need for drinking and other uses, inhabitants of Enkiryala town have to drive long distances since the town's water facility can't keep up with demand.

Table 2: the Distribution of Respondents' Incomes in the Villages under Study

Sample Location	Under 10,000	10,000-20,000	10,000-20,000	10,000-20,000	10,000-20,000	60,000 above	Total
Pratapasingaram	2(4.45)	12(28.7)	11(24.4)	6(13.2)	5(11.2)	5(11.2)	42(100)
Enkryal	18(19.55)	21(22.83)	17(18.46)	19(20.64)	1(1.85)	6(6.52)	83(100)
Sura Pally	9(19.15)	10(21.26)	13(30.96)	6(14.27)	4(9.51)	2(4.75)	44(100)
Aroor	7(12.4)	11(19.64)	16(28.4)	7(12.4)	5(9)	6(10.7)	52(100)
Total	36(55.	54(92.43	57(102.22)	38(60.51	15(31.56	19(33.17	221(1

	55)	)		)	)	)	0)

Every home has to take turns supplying water because of this unpleasant rule—People's budgets are taking a major hit, and their families are seeing substantial weight gain, as 83 of them were tested for drinking little amounts of water all at once. Water collection is made more challenging by the fact that the surapally viallge plant is located two km outside of town. Because 43 people are already struggling to get little quantities of water, this is making their situation worse.

Table 3: the Total Number of People Working to Extract Water from Different Locations in Selected Villages

Name of the village	Fetching of water (<18 year)	Fetching of water (>18 year)	Total No. Persons Engaged in Fetching of water
Pratapasingaram	1	2	3
Enkiryala	35	48	83
Surapally	15	26	41
Aroor	11	36	47
Total	62	112	174

Due to its six-kilometer distance from the running area, Aroor Village has limited access to water. An individual with access to the water may sell twenty-liter bottles for two rupees, but the manufacturer charges five rupees every bottle. People were watched by collecting water from different parts of their neighbourhood.

CONCLUSION

Water is indispensable part of our lives as well as other animals and environment. It plays very significant role for all living organisms. Our research indicates that the Musi River has hazardous levels of several chemical contaminants. The presence of pollutants, including heavy metals, fertilisers, and suspended particles, must be addressed immediately. Certainly, it has an impact on the river's ecosystem. Both the unpredictability of dissolved oxygen levels and the threat that contaminants represent to biodiversity are major issues for aquatic life. The river's natural balance is in a perilous state. Aside from environmental concerns, the declining water quality endangers human health and means of subsistence. Locals risk injury or death every time they utilise the Musi River for domestic or agricultural purposes. This study's findings stress the significance of acting quickly and in concert. Just standing on the sidelines won't cut it anymore. The establishment of mitigation strategies, including both short-term solutions and long-term sustainable practices, must be done without delay. The actual assessment of the Musi River is classified as lightly polluted based on the sampling station. Several parameters, such as TSS and DO have exceeded the specified quality standard values. The Musi River water also contains the heavy metals that have passed the threshold values, namely Pb and Cr. Meanwhile, high Fe, Mn, and Zn contents were found in the sediments.

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