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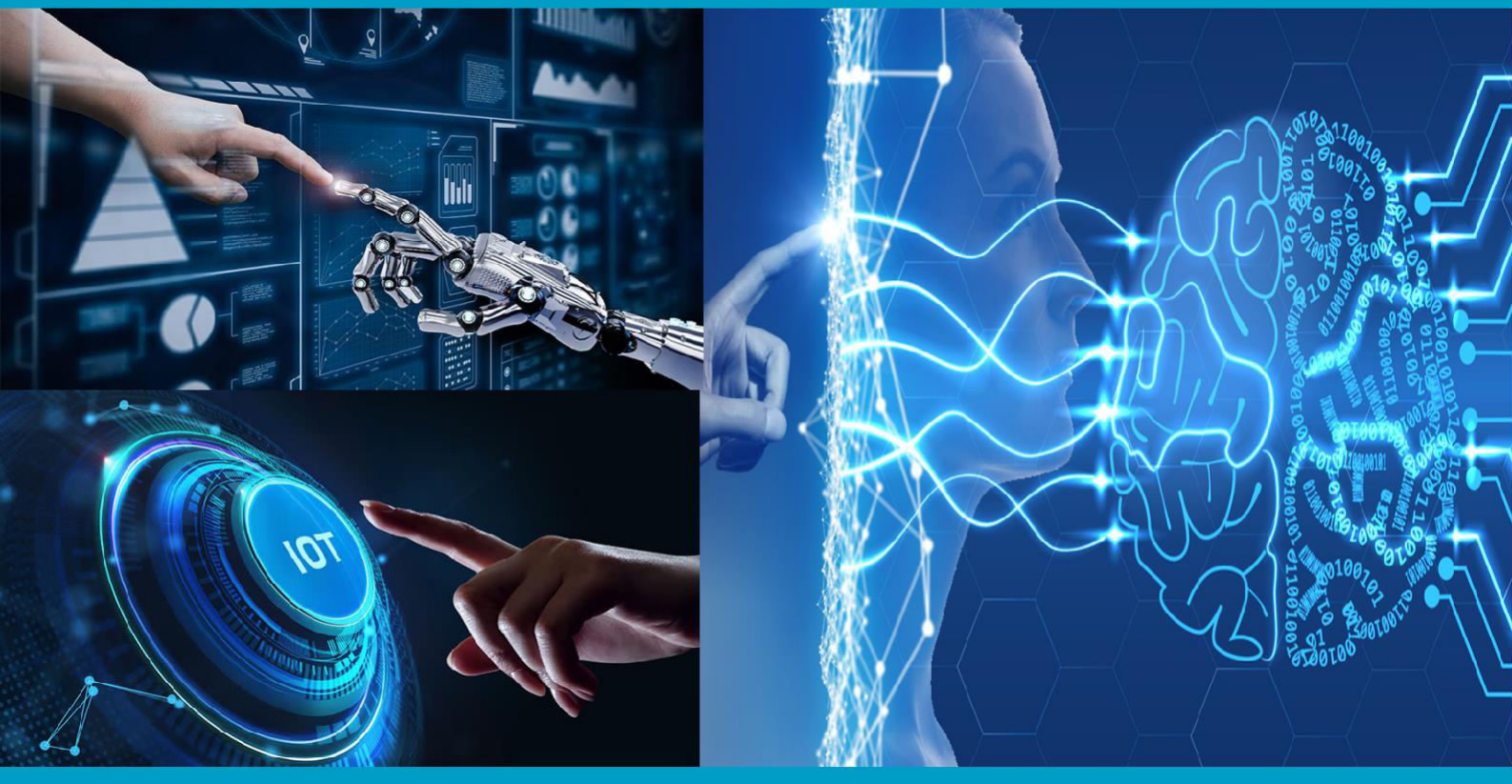

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Water Quality Assessment of River Gomti in Lucknow City

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ABSTRACT: Rivers are the most important surface fresh water resource not only in India but also in the world. The total volume in world's rivers is about 2,115 km3 Rivers play a vital role in shaping up the natural, cultural, and economic aspects of any country. In Indian mythology, rivers have been always worshiped as goddesses or gods and all the civilizations, since ancient times till date, have thrived along major rivers of the world. Rivers are easily accessible, and are used for multiple facets but with the passage of time due to rapid development, urbanization and industrialization have led to deterioration of the environment. Since the advent of industrial revolution, the people of earth have alternatively sinned against the environment. Unplanned urbanization and industrialization have resulted in over use of environment in particular of water resource. In the capital city of Lucknow in Uttar Pradesh, the Gomti River, a tributary of the Ganga, was worshipped like a divine and was known as Adi Ganga Gomti, but with rapid modernization and urbanization the water of river Gomti has become impure and the status of river water has degraded rapidly. Hence assessment of water quality and determination of pollution level has become an enormous necessity today. While physical, chemical, and biological compositions determine the quality, climate change, anthropogenic factors, . In order to examine water quality of river Gomti, water samples were collected from 5 different locations of Lucknow. The present study is meant to investigate the recent status of River Gomti in the entire stretch of Lucknow City. Results of the study indicated the water quality of river Gomti is not even appropriate for recreational purpose, let alone drinking and agricultural use. As Gomti river is unfit for consumption, which is also evidenced in the adverse impacts on its biodiversity. The presence of Solariella, a marine species of molluscs that can survive in water rich in high ph value, reveals that use of fertilizers like urea in adjacent regions for agriculture has further deteriorated the water quality of the Gomti. This paper argues that immediate action plans in terms of bio-mapping of Gomti, establishment of oxidation ponds at critical points to treat industrial waste and sewerage, ban on rampant groundwater extraction in river area, ban on highly water-consuming cultivation of *satha dhaan*, fool-proof riverfront development are needed to save river Gomti or else the river's rapid deterioration will sooner doom it to be categorized into a dead river.

KEYWORDS: Adi Ganga Gomti, Gomti, Gomti River**,** Assessment of water quality, Determination of pollution level

I. INTRODUCTION

Freshwater is not only precious and scarce but also a finite resource which is unevenly distributed. Water plays an important role in our life and our daily activities. Rivers always were worshipped as Goddess as mentioned in our religious books but with technological enhancement, rapid development and industrialization rivers became only a medium for progress without caring about
its quality and piousness. As a result, the entire rivers presently not only in India but in the whole world are on the verge of dying. Same is the case with the river Gomti which flows in about 14 kms in Lucknow City. The Gomti, also known as the Gumti or Gomati River, is a Ganga tributary. An alluvial river, Gomti is fed by rain and groundwater and has been an important source of water supply to the city of Lucknow and several urban and rural areas in its journey to join the Ganga near Varanasi as a tributary river.

According to Hindu mythology, the river is the Hindu sage Vashishtha's daughter. The Gomti is one of India's transcendental rivers, according to the *Bhagavata Purana*, one of Hinduism's major sacred works. In present study, an attempt has been made to assess the deterioration of water quality of river Gomti. The present paper is an attempt to analyse the physiochemical parameters of water of river Gomti at different locations so that present situation of the river quality could be assessed and one can find solutions so as to revive river Gomti in to live river.

Origin of Gomti River

River Gomti, one of the foremost prosperous of river Ganga triggers from a reservoir positioned close to Madho-Tanda (Miankot) with an altitude of two hundred meters. Gomti river flows from the swampy area of Madho Tanda in Pilibhit

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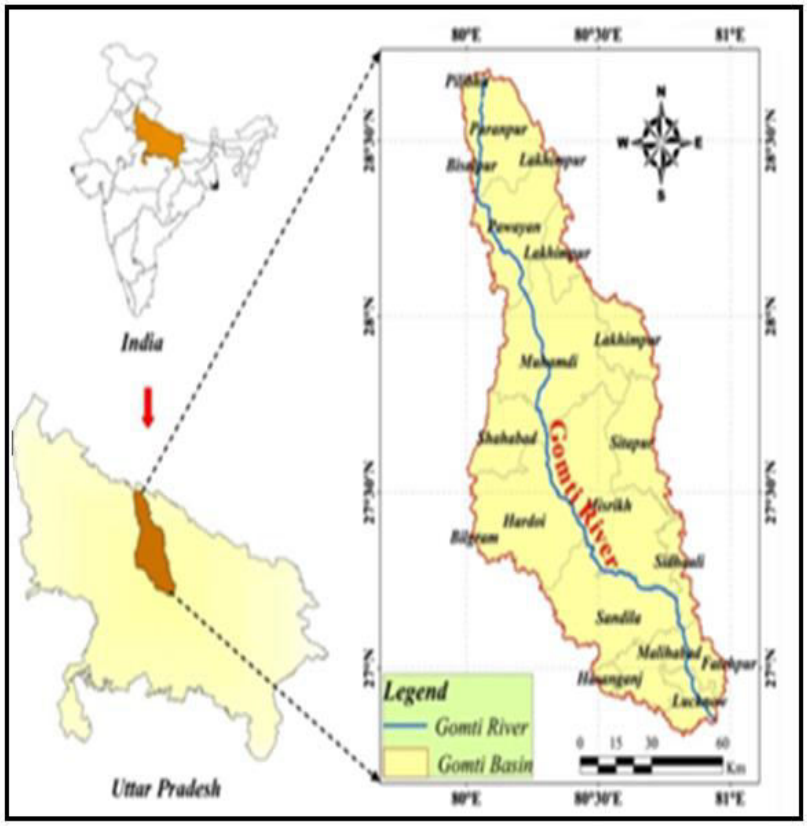
district $28^0$34' North latitude - 80^0 07'E longitudes in the north western part of U.P. The place is located about 50 kms of Himalayan foot hills. Gomti River is a tributary of Ganga River which came into existence during the late Pleistocene. There are many ponds and rivulets in the river, which during rainy season becomes an extensive swampy area. Gomti River covers about 750 kms and flows through the district of Pilibhit, Shahjahapur, Sultanpur, Jaunpur district about 30 kms. North of Varanasi (map1). It enters Lucknow City near Ghailla Saurura and leaves the city near Pipraghat The river Gomti is the life line of Lucknow city. It is the heart of Lucknow. It is the synonym of Lucknow's Nawabi culture. Presently what we breathe, eat, drink and think is actually Gomti.

Figure 1: Location Map of Gomti River Basin and Study Area



II.PRESENT STATUS OF RIVER GOMTI

Earlier the river Gomti used to be the main source of life for drinking, communication and irrigation. But with the Post-World War II in general and post-independence in particular. Lucknow witnessed massive decline in the water quality of Gomti. The river Gomti covers approximately 14 kms path in Lucknow city. When the River enters the city near Ghaila the river water is pure and safe for drinking but after that the river water starts declining drastically as all together as untreated sewage is drained through 33 drains directly 675 mld sewage per day into river Gomti as a result organic pollutants and pathogens in waste water makes approximately 75% to 80% of the river pollution load, while most of the other pollution comes from industrial discharges, dropping of dead bodies, religious activities, agricultural run of etc.

Lucknow's population, which stood at 25,98,000 in 2003, rose to **3,590,000 in 2018 whereas in 2022 rose to** 3,854,000. Whereas the water demand in 2003 was approximately 447MLD. which rose to 664 MLD by 2018 and presently the demand is 710 mld approximately. Gomti is a major source of 55% of Lucknow's water supply but if the population continued to be increasing there would be scarcity of water in Lucknow City (Table 1).

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Table1: POPULATION AND WATER DEMAND STATUS IN LUCKNOW CITY

S.NO.	YEAR	POPULATION	WATER DEMAND(MLD)
1.	2003	25,98,000	447
2.	2018	**3,590,000**	664
3.	2022	3,854,000	710

(Source: Jal Nigam, Lucknow, UP, India)

III.LATEST RESEARCH TRENDS

Some present literatures or studies papers are discussed. These literatures may prove very beneficial to understand the present condition of River Gomti.

A 2017 study [1] has mentioned about the pathetic water quality condition of the river which in turned had contaminated the underground water resources. As an end result women and children particularly, young girls have to travel every day for about 2-2.5 kms normal to fetch easy ingesting water for his or her families. Around eighty percentage of ocean pollutants enters our seas from the land. Virtually any human interest will have an impact on the quality of our water environment. When farmers fertilize the fields, the chemical compounds they use are progressively washed with the aid of using rain into the groundwater or floor waters nearby. Sometimes the reasons of water pollutants are pretty surprising. Chemicals launched with the aid of using smokestacks (chimneys) can input the ecosystem after which fall lower back to earth as rain, getting into seas, rivers, and lakes and inflicting water pollutants.

[2] studied various physical-chemical parameters, heavy metals, level of organic matter, sewage pollution and their variation from the upstream Gomti River to downstream of River Gomti in Lucknow City to analyse the status of river Gomti. The samples were taken from upstream of Gomti River to downstream of the river. DO, BOD, COD, pH, Conductivity, Total Suspended Solids, Total Solids, Total Dissolved Solids were analysed in the entire study. The study revealed that due to the drains draining in the river Gomti carry untreated domestic and industrial waste into the river Gomti and many other causes have deteriorated water quality of the river Gomti from Gaughat to Pipraghat. At Gaughat Dissolved Oxygen is high whereas the BOD is low on contrary Pipraghat DO is minimum while BOD is high.

Sampling Sites

River Gomti in Lucknow City is selected for the present study. Selection of sampling stations along its stretch is based on the degree of exposure to human impact. Water samples were collected from the various sites at random, at selected 5 stations i.e., Gaughat, Mohan Meakins, Nishatgaj, Gomti Barrage and Pipraghat, during May 2022. Water samples were collected at regular intervals and were analysed by the Irrigation Department Laboratory, Lucknow.

IV.METHODOLOGY

Water Samples were collected from the five staions and then it was sent to the State Level Water Analysis Laboratory, U.P. Jal Nigam, 6, Rana Pratap Marg, Lucknow for testing the ph, turbidity, DO, BOD, Coliform, TDS, Total Hardness and Alkalinity of the river Gomti so as to analyze the present tatus of river Gomti. The tested value is shown in the Table-2., besides the value of the water quality index has been compared with the standard values of WQI, which is shown in Table 3. The water quality rating is divided into five categories. The range from 0 to 25 is coming under (A) grading with excellent water quality, the range from 26 to 50 is for grading (B) with good water quality, and respectively, (C), (D), and (E) gradings are categorized for different WQI values [3].

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Table 2 WATER QUALITY OF GOMTI RIVER IN LUCKNOW CITY (May,2022)

Sample No:-	Area	pH	Turbi-dity	DO	BOD	Coliform	TDS	Total Hardness	Alkalinity
			(NTU)	(mg/L)	(mg/L)	(MPN/100ML	(mg/L)	(mg/L)	(mg/L)
		6.5-8.5	**1.0-5.00**				**500-2000**	**200-600**	**200-600**
1	**Gaughat**	7.47	7.6	7.2	2.1	2,400	264	170	200
2	**Mohan meakins**	7.39	7.10	5.7	4.4	50,000	248	255	325
3	**Nishatgaj**	7.34	40.6	4.0	6.0	60,000	254	245	345
4	**Gomti Barrage**	7.30	16.32	3.6	6.2	80,000	560	250	380
5	**Pipraghat**	7.22	11.96	2.4	6.6	1,00,000	542	245	345

Source: State Level Water Analysis Laboratory, U.P. Jal Nigam, 6, Rana Pratap Marg, Lucknow

V.RESULTS & DISCUSSION

Various parameters required for water evaluation of the Gomti river at Lucknow, are indexed in Table 2. The facts accumulated via way of means of sampling at diverse places are analysed, and the consequences are discussed.

pH

The hydrogen ion concentration in water is expressed in terms of pH. It is defined as the logarithm of inverse of hydrogen ion concentration in moles/L. The pH value of natural waters mostly depends on free carbon dioxide, bicarbonates and carbonate ions. The equilibrium condition may be changed by the intensity of photosynthetic process (which consumes carbon dioxide) and the biochemical oxidation of organic substances (which produces carbon dioxide), as well as chemical conversions of some mineral substances, such as reduction-oxidation reactions of ammonia, sulphur containing minerals, iron, etc. The pH value is also affected by the presence of various acids and alkalis, which may be discharged into the body of water through wastes. The pH value is a significant parameter for evaluating the quality of water and the quantity of the pollutants in the river water. In the Study, it is found that the pH ranged from 7.22 to 7.47. The highest pH was observed in the waters of Ghaila. This indicates that water is alkaline here. This is possible because before this area, no major drains are directly poured into river. The lowest pH value was observed in Pipraghat area where most of the water is stagnated and due to most of the drains loaded in the river water.

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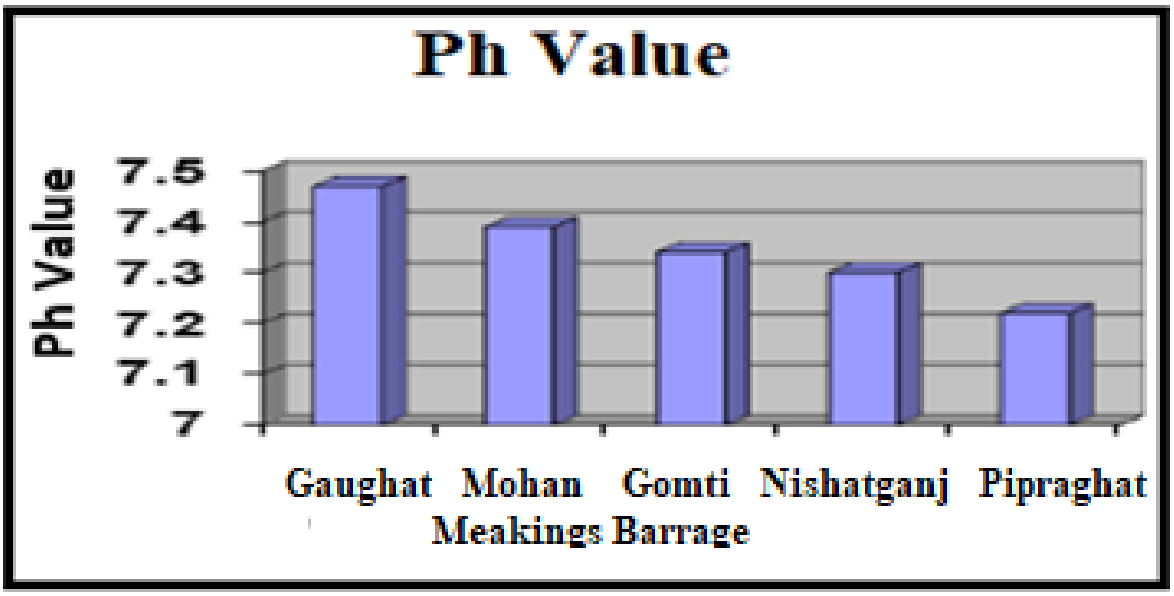
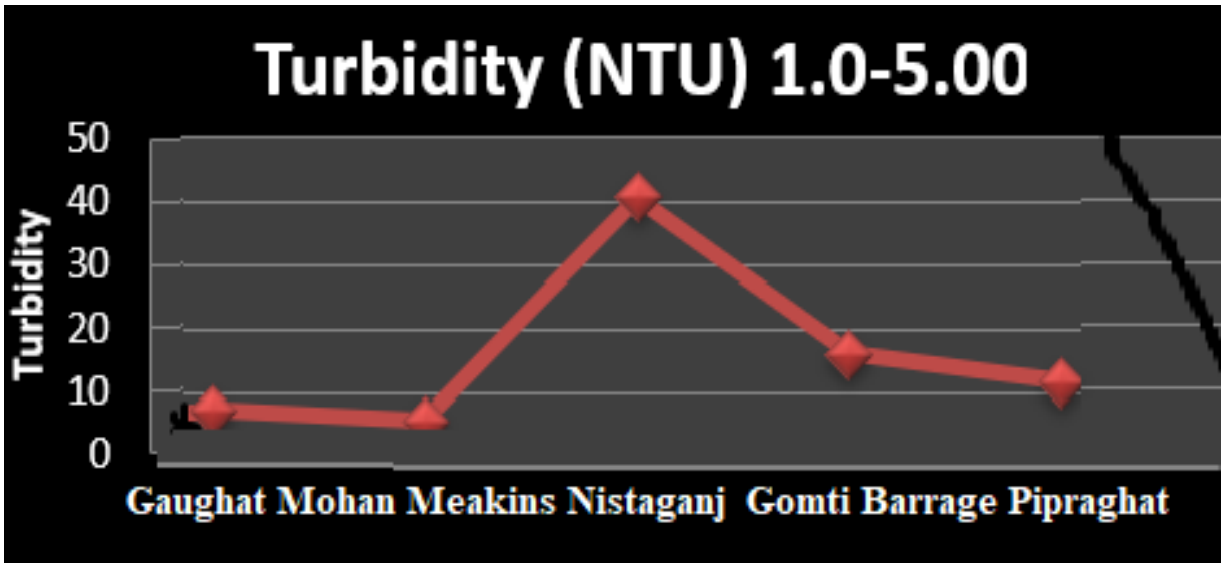


(**Figure 2:** pH value in water discovered)

Turbidity

Turbidity, which is a related parameter, is interference to the passage of light or scattering of light by suspended particles in a column of water. Turbidity at different sites is more than from the permissible limit of turbidity i.e. 1 – 5 NTU. The turbidity level is between 7.1-40.6. Lowest turbidity is seen near the water of Ghaila whereas highest turbidity was observed near Nishatganj. The increased turbidity level is due to different types of pollution such as drains, waste from temple, various impurities in the river water etc.



(**Figure 3:** Turbidity in water discovered)

Dissolved Oxygen (DO)

In river water oxygen is dissolved in varying concentrations. DO is an index which helps to understand the physical and biological processes going on in water and is also water quality parameter. Water pollution can be easily controlled if the analysis of DO is carried. The guideline value for DO is >5 mg/L. DO, much less than three to five mg/L, is crucial for the survival of aquatic life whereas generates a favorable condition for bacteria and other pathogens, which are

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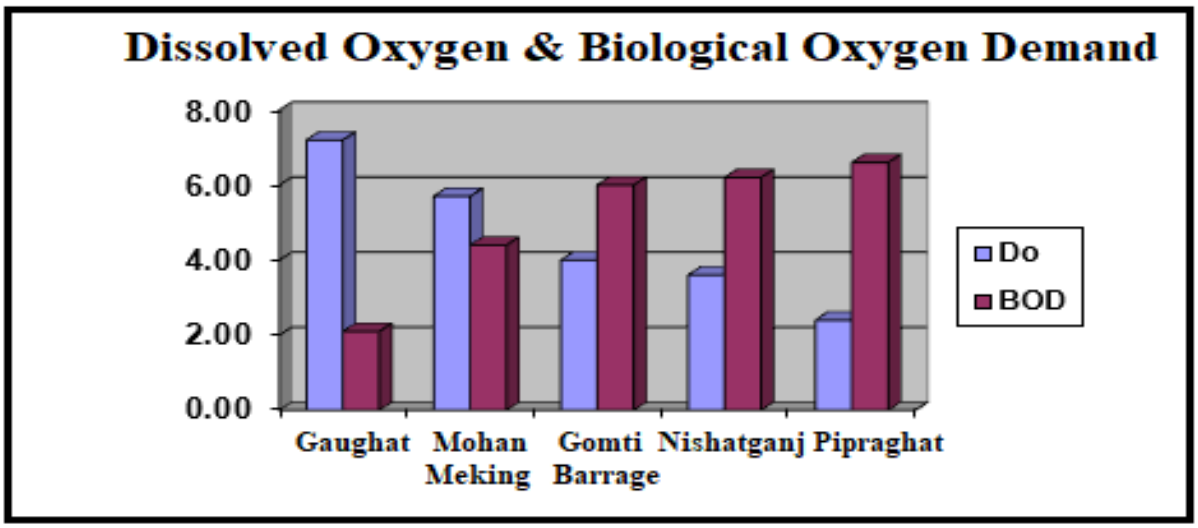
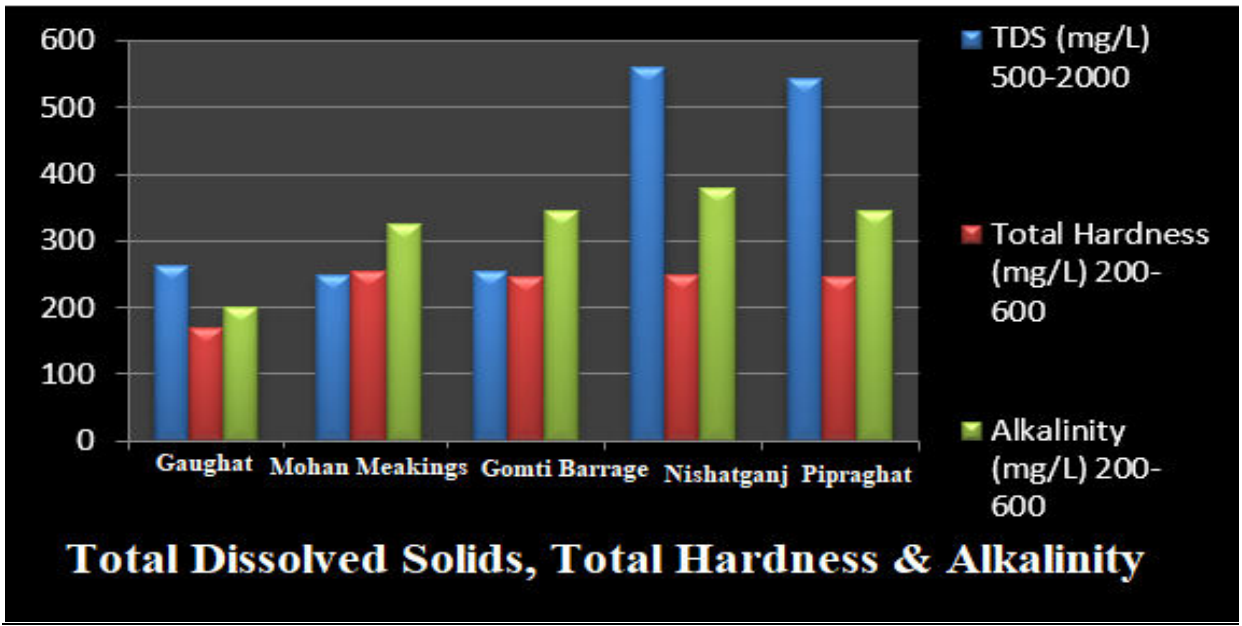
anaerobic and injurious to human health [4]. Dissolved oxygen concentration is a most important Indicator of water pollution [5]. Similar observation is also found by in Gomti River water [6] and in the Ganga River water values ranged between 9.50-11.0 mg/lit [7]. From table 2 it is clearly visible that at Ghailla the water DO is 7.2 and at Mohan Meakings it is 5.7 but after that there is a drastic decline from 4 the DO falls to 2.4 which is harmful for the survival of aquatic life and good for anaerobic activities.

BOD

Due to biodegradation of organic materials biological oxygen demand (BOD) increases and exerts oxygen tension in a water body. BOD has been used to detect the amount of organic materials in water which supports the growth of microorganism. In the present study, the average value found was 4.6mg/l is higher than the value obtained in Yamuna River and in Ganga River correspondingly.



(**Figure 4:** DO and BOD discovered in water)



(**Figure 5:** Total dissolved solids, total hardness and alkalinity discovered in water)

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TDS

Total dissolved solids (TDS) refer to the residue left after evaporation of a known volume of water at 105°C, which has been filtered through a standard filter. It is approximately equal to the total content of dissolved substances in a water sample since approximately half of the bicarbonate ion, which is one of the dominant ions in waters, is lost as CO2 during evaporation process. The TDS value for river waters depends largely on the ratio of the contribution of the overland flow to the subsoil flow. It may vary from less than 50 mg/L to a few thousand mg/L.

Total dissolved solids (TDS) were highest seen in waters near downstream of the river. This is obvious because downstream area is the largest Hindu Cremation Ground in the City. Lots of ashes, flowers, worshipping materials are directly thrown in the river. The Concrete Diaphragm of the Riverfront has resulted in stagnation of water which helps in increasing the TDS levels. On the other hand, Gomti on entering the city experiences the lowest values of TDS.

Total Hardness

The hardness of natural waters depends mainly on the presence of dissolved calcium and magnesium salts [8] and permanent hardness is mainly caused by chlorides and sulphates present in water [9]. The higher value of total hardness at different sites may be due to use of soaps and detergents by washer men and also discharge of the domestic wastes through drains. Total hardness has no adverse health effects except for imparting taste [10, 11]. Total hardness is again observed highest between Mohan Meakings and Pipraghat due to washing of chicken clothes and pouring of a number of untreated drains which carry detergents and untreated waste from households and other points into the river.

Total Alkanity

Alkalinity is a measure of a river's "buffering capacity" or its ability to neutralize acids. Alkaline compounds in the water such as bicarbonates (baking soda is one type), carbonates, and hydroxides remove H+ ions and lower the acidity of the water (which means increased pH). They do this usually by combining with the H+ ions to make new compounds. Without this acid neutralizing capacity, any acid added to a river would cause an immediate change in the pH and as shown in table 2 as the river passes through Mohan Meakings area the alkalinity level increases drastically.

Total Coliform

Presence of coliforms is an indicator of the presence of organism of faecal in the river water as well as it is also the indicator of purity of drinking water whether suitable or not as if coliform is more than the permissible limit it indicates the presence of bacterial contamination. This test is performed sequentially in 3 stages: Presumptive coliform test, confirmed coliforms test and Completed coliforms test. The presence of these microorganisms can cause sensory defects (odor, color, taste), it causes various health related problems due to contaminated waters are diarrhea, abdominal cramps and vomiting due to salmonella, cholera is due to vibro cholerae, infection of lungs due to mycobacterium.
From the table 2 it is clearly evident that the coliform level in the water is above permissible limit which is neither fit for drinking bathing or cleaning.

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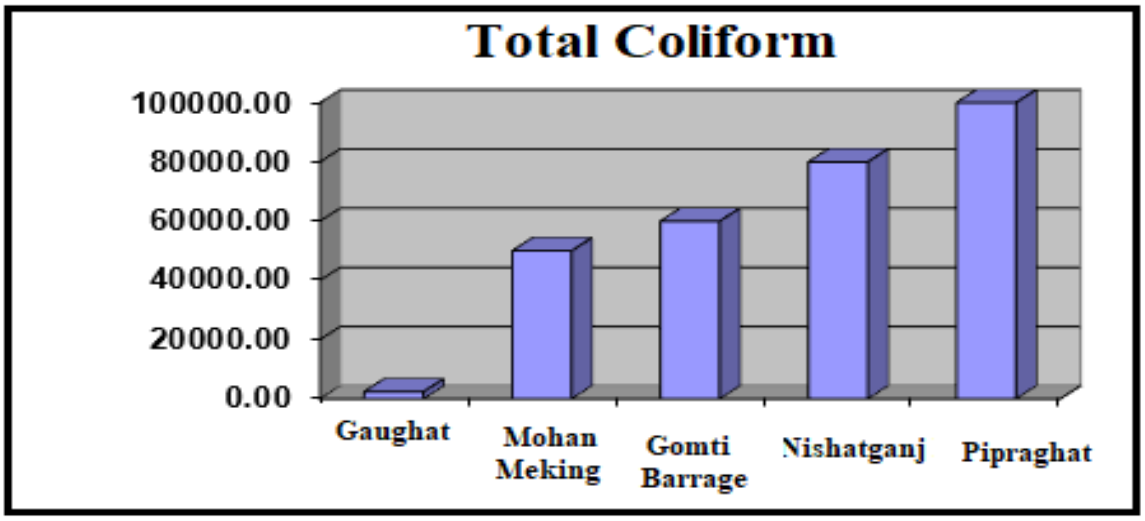

(**Figure 6:** Total coliform discovered in water)

Recommendations to save River Gomti

From the above result and discussion, it is clearly evident that the river Gomti is presently receiving huge amount of organic waste when it passes through the entire city. The main cause besides this is increasing population, untreated sewage waste, direct waste disposable at the site. So one can only minimize pollution in river Gomti when people of Lucknow City will have regard for the river and will understand that Gomti River is nature's gift and their life line.

Following measures need to be adopted to control pollution in Gomti River:

- People must feel initiated, involved and should participate in the implementation and the working of pollution control plan
- Improve flow pattern and remove siltation so that river could be charged
- Dry sanitation must be adopted where almost no water for the waste disposal is used.
- Proper sewerage system on both the banks of the river so that the sewage is collected and treated.
- Plan for establishing more septic tanks and soak pits and for sewage disposal.
- Proper garbage collection system on both banks of the river avoid open defaecation and made and use lavatories.
- NGO's and citizen groups be empowered for mobilizing public opinion and participation in development activities.
- People have to change their attitude and become active to save the river.

VI.CONCLUSION

Hence from the above results, it can be concluded that all the physio-chemical parameters like DO, hardness, alkalinity, pH were above the WHO acceptable limits. Water sample test has clearly proved that the river water of Gomti is highly contaminated and is unsatisfactory for drinking purpose and the water quality is not in safe limit for human, flora and fauna. So, there is an urgent need of making people aware about the grave situation that presently river Gomti is highly polluted and if people are not made aware and try to save the river from further decay. The union government of India, the provincial government of Uttar Pradesh and people at large must be actively involved in restoring health to River Gomti or else the river will soon become a dead river.

As per the NRDC (1999) result says, "While much tap water is indeed risky,

REFERENCES

[1] M K Singh, Mukesh Ruhela, Vishal Kumar and V K Bhatnagar (June 2017) To Study of Water Quality from River of Lucknow and Effect on Human Health. *Int. Arch. App. Sci. Technol*; Vol 8 [2]. 51-55.

[2] Nuzhat Parveen and S.K.Singh," Physico-Chemical Characteristics of Gomti River at Lucknow Stretch, India." *International Journal of Advanced Research* (2016), Volume 4, Issue 7, 749-759.

| |ISSN: 2395-7639 | www.ijmrsetm.com | Impact Factor: 7.580|

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[3] Chauhan, A., and Singh, S. (2010). Evaluation of Ganga water for drinking purpose by water quality index at Rishikesh, Uttarakhand, India. *Rep. Opin.* 2, 53–61.

[4] Radha Krishnan R., Dharmaraj, K., and Ranjitha Kumari, B. D., (2007), A comparative study on the physicochemical and bacterial analysis of drinking, borewell and sewage water in the three different places of Sivakasi, Journal of Environmental Biology, 28(1), 105-108.

[5] Basavaraddi, B.S., Kousar, H., and Puttaiah, E.T., (2012), Dissolved Oxygen Concentration a Remarkable Indicator of Ground Water Pollution, Bull. Env. Phar and Lif.1, 3: 48 – 54.

[6] Dhananjay Kumar, Anjali Verma, Namita Dhusia and Nandkishor More. Water Quality Assessment of River Gomti in Lucknow. Universal Journal of Environmental Research and Technology. Volume 3, Issue 3: 337-344. Available at: https://www.environmentaljournal.org/3-3/ujert-3-3-1.pdf.

[7] Bhutani, R., Khanna, D.R., Kulkarni Dipali Bhaskar and Ruhela Mukesh, (2014), Assessment of Ganga River ecosystem at Haridwar, Uttarakhand, India with reference to water quality indices. Appl waterSci (6):14-20.

[8] Ikomi, R. B., and Emuh, C. T., (2000), The Status of the physicochemical Hydrology of Upper Warri River Nigeria. Journal of Science and Environment, 2: 75-86.

[9] Roy, Y., and Kumar, R. A., (2002), A study of water quality of the Rivers of Ranchi district, Ind. J. Environ. Protec, 21(5), 398-402.

[10] World Health Organization (1996), Guidelines for drinking water quality, Volume 2 Recommendations, 2 Edition Geneva.

[11] WHO. Guidelines for drinking-water quality: fourth edition incorporating the first and second addenda. Geneva: World Health Organization; 2022.

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