

Study and Evaluation of Water Quality of River Gomti in Lucknow City

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Abstract— The River Gomti is called the life line of the city Lucknow. The source of domestic water in Lucknow city is river Gomti. About 66% population of Lucknow city is depends upon the water of River Gomti. Aishbagh and Balaganj are the two Water Treatment Plant which are treating the water of River Gomti and after that it is supplied to the city. This paper presents the analysis the physicochemical parameters of water of River Gomti at different locations and in different season (Pre Monsoon, Monsoon and Post Monsoon) and Study of trend of change of physicochemical properties of the water with time. In this research paper evaluate different parameters of gomti river water. The samples are taken from nine different locations of the river Gomti ie. Gaughat, Hardng Bridge, Daliganj Bridge, Hanuman Setu, Nishatganj Bridge, Gomti Brrage, Shaheed path, Bharwara STP and Indira Canal Aquaduct. Laboratory tests are conducted of these samples and they are compared with standard parameters and also compared to each other with time. Parameters like pH, TDS, TSS, DO, BOD, COD and Total Hardness were determined. The parameters showed that the quality of water is not now in safe limit and not good for flora and fauna, but the situation is alarming and degradation is in continuous process, therefore to improve the quality of water. Since, the water of River Gomti is used for drinking purpose in Lucknow city, the continuous monitoring of the pollution level is necessary and immediate action is required for its better management.

Key words: Gomti River, Water Quality, Physico-Chemical Parameters, Level of Pollution

I. INTRODUCTION

The River Gomti is an alluvial plain river which originates from Gomat Taal which formally known as Fulhaar jheel, in Madho Tanda (Near Mainkot around 30 Km east of Pilibhit district in Uttar Pradesh). It is lies between latitudes 25°-26.9°N and 28°-9.1°N, longitudes 80°E - 83°-9.6°N and at an elevation of 200 masl. After flowing through districts Pilibhit, Shahjahanpur, Lakhimpur Kheri, Sitapur, Hardoi, Lucknow, Barabanki, Amethi, Faizabad, Sultanpur, Jaunpur, Ghazipur and Varanasi, it ultimately confluences with River Ganga near Saidpur Kaithi in Ghazipur district near Varanasi at an elevation of 62 masl. The total length of the river is about 940 kilometres. River Gomti has 22 tributaries in which Sai river is its major tributary having drainage area of 12,900 Sqkm covering approximately 43% of the total catchment area of the Gomti River Basin. (Thakur-2008)

Lucknow, Sultanpur and Jaunpur are three major cities are situated on the banks of the river and are the most prominent of the 15 towns in its catchment area. An average flow rate of Gomti river is 1500 MLD, however, during the monsoon season it reaches up to 45000 MLD while in summer it falls down to 500 MLD. Its water coverage is about 22,735 square km. Its flow mainly depends upon occurrence of rain and therefore the flow in river is very lenient during monsoon.

A. River Gomti in Lucknow

Lucknow, the city of nawabs and the capital of Uttar Pradesh, is located on both banks of the Gomti River. After 340 Km, the Gomti enters in Lucknow, where it travels 16 km. In the Lucknow area, the Gomti River exhibits meandering characteristics, which are highly distorted indicating neo tectonics activity in this region.

The Lucknow is situated on the both bank of the river, right side of the river is old Lucknow and it called sis gomti area and the left side area is newly establishment and is called trans gomti area. A Pumping station had installed at Gaughat for lifting the raw water from the River Gomti and it is supplied to Aishbagh and Balaganj Water Treatment Plant.



Fig. 1: Screenshot

II. OBJECTIVES OF THE STUDY

- 1) Analysis the physicochemical parameters of water of River Gomti at different locations and in different season (Pre Monsoon, Monsoon and Post Monsoon).
- 2) Study of trend of change of physicochemical properties of the water with time.

III. METHODOLOGY

The analysis of physic-chemical parameters started with sample collection. The sampling was done in Pre Monsoon, Monsoon and Post Monsoon 2015. Before a sampling program is undertaken, a detailed sampling protocol must be developed and as a minimum the following item must be specified.

- 1) Sampling plan
- 2) Sample labelling
- 3) Sample storage
- 4) Sample testing

The Sample was collected from the above mentioned locations in the closed lid plastic bottle at and period, and store in Environmental Engineering lab refrigerator. The water sample were subjected to analysis within 24hr of collection for the physical-chemical parameter like pH, BOD, COD, DO, TDS, TSS, Total hardness, etc. in this project the various parameter of water of river Gomti will be evaluated.

A. Location of the Sampling Sites:

The present study thus evaluates the effect of water quality of River Gomti in Lucknow city. 7 necessary physico-chemical parameters are estimated as per standard methods and evaluated statistically. These samples are collected from 9 locations of entire length of the river in lucknow city (From Gaughat to Indira canal Aquaduct). The water samples are collected throughout the study period ie Pre Mansoon, Mansoon and Post Mansoon 2015. The samples are collected at the sites with the help of fisherman and boat. All the physic chemical parameters are analyzed in the laboratory.

Water sample collected from the following sites

- Sample 1: From River Gomti at Gaughat Pumping Station
- Sample 2: From River Gomti at Harding Bridge
- Sample 3: From River Gomti at Daliganj Bridge
- Sample 4: From River Gomti at Hanuman Setu
- Sample 5: From River Gomti at Nishatganj Bridge
- Sample 6: From River Gomti at Gomti Barrage
- Sample 7: From River Gomti at Amar Shaheed Path Bridge
- Sample 8: From River Gomti at Bharwara Sewage Treatment Plant
- Sample 9: From River Gomti at Indira Canal Aquaduct

1) Physicochemical Data of River Gomti in Lucknow (Pre Monsoon period 2015)

S. No	Sampling Sites	pH	TDS (mg/l)	TSS (mg/l)	DO (mg/l)	BOD (mg/l)	COD (mg/l)	Hardness (mg/l)
1.	Gaughat	8.12	278	26	6.21	3.20	12.20	210
2.	Harding Bridge	7.90	292	27	6.41	6.58	15.50	200
3.	Daliganj	8.17	308	18	2.90	11.40	19.81	325
4.	Hanuman Setu	7.80	328	42	2.80	10.00	18.92	328
5.	Nishatganj bridge	8.01	352	52	4.21	10.40	20.21	275
6.	Gomti Barrage	7.62	382	40	2.92	12.50	23.52	262
7.	Shaheed Path	8.18	340	26	4.90	15.40	24.60	271
8.	Bharwara STP	8.00	328	32	5.00	10.21	18.52	282
9.	Indira Canal Aquaduct	8.13	262	22	4.60	9.61	18.20	192
	Average Value	7.99	319	32	4.44	9.92	19.05	261

Table 1: Physicochemical Data of River Gomti in Lucknow (Pre Monsoon period 2015)

2) Physicochemical Data of River Gomti in Lucknow (Monsoon period 2015)

S. No	Sampling Sites	pH	TDS (mg/l)	TSS (mg/l)	DO (mg/l)	BOD (mg/l)	COD (mg/l)	Hard ness (mg/l)
1.	Gaughat	7.80	312	42	6.82	4.04	12.61	242
2.	Harding Bridge	7.85	368	32	7.10	5.81	13.22	262
3.	Daliganj	8.10	412	46	4.82	9.22	16.61	292
4.	Hanuman Setu	7.62	480	72	5.21	8.62	17.21	248
5.	Nishatganj bridge	7.81	462	82	5.15	9.61	19.21	260
6.	Gomti Barrage	8.02	518	110	4.21	10.21	22.22	298
7.	Shaheed Path	8.10	541	90	5.62	12.16	23.25	248
8.	Bharwara STP	7.65	482	104	6.21	14.21	17.62	292
9.	Indira Canal Aquaduct	8.21	492	82	6.02	7.52	15.12	245
	Average Value	7.91	452	73	5.68	9.04	16.61	265

Table 2: Physicochemical Data of River Gomti in Lucknow (Monsoon period 2015)

3) Physicochemical Data of River Gomti in Lucknow (Post Monsoon period 2015)

S. No	Sampling Sites	pH	TDS (mg/l)	TSS (mg/l)	DO (mg/l)	BOD (mg/l)	COD (mg/l)	Hard ness (mg/l)
1.	Gaughat	8.63	360	52	3.72	3.52	14.81	280
2.	Harding Bridge	7.32	378	42	8.01	4.16	18.21	175
3.	Daliganj	8.58	382	44	2.50	11.20	20.60	182
4.	Hanuman Setu	7.80	339	36	7.68	11.51	15.21	192
5.	Nishatganj bridge	7.48	392	54	7.32	10.61	18.61	218
6.	Gomti Barrage	7.68	412	41	2.14	10.52	18.60	340
7.	Shaheed Path	8.60	390	48	7.12	11.20	21.20	200
8.	Bharwara STP	7.72	382	52	6.10	8.18	21.50	218

9.	Indira Canal Aquaduct	8.51	410	62	2.90	11.10	20.00	215
	Average Value	8.04	383	48	5.28	9.11	18.75	224

Table 3: Physicochemical Data of River Gomti in Lucknow (Post Monsoon period 2015)

IV. RESULT & CONCLUSION

The water samples were analyzed for physicochemical characteristics. Total of seven physicochemical parameters were analyzed namely pH, TDS, TSS, DO, BOD, COD and Total Hardness (TH), in the present study. Physicochemical properties of River Gomti variation in different months and at different sites were recorded as follows.

A. pH:

In Pre Monsoon period the highest value 8.18 at Shaheed Path and lowest value 7.62 at Gomti Barrage. In Monsoon period the highest value 8.21 at Indira canal Aquaduct and lowest value 7.62 at Hanuman Setu. In Post Monsoon period the highest value 8.63 at Gaughat and lowest value 7.32 at Harding bridge. If it is analysed by site wise the highest value 8.63 was found at Gaughat and lowest value 7.32 was found at Harding Bridge.

B. Total Dissolved Solids (TDS):

In Pre Monsoon period the highest value 382 mg/l at Gomti Barrage and lowest value 262 mg/l at Indira canal Aqueduct. In Monsoon period the highest value 541 mg/l at Shaheed Path and lowest value 312mg/l at Gaughat. In Post Monsoon period the highest value 412 mg/l at Gomti Barrage and lowest value 339 mg/l at Hanuman Setu. If it is analysed by site wise the highest value 541 mg/l was found at Shaheed Path and lowest value 262 mg/l was found at Gaughat.

C. Total Suspended Solids (TSS):

In Pre Monsoon period the highest value 52 mg/l at Nishatganj Bridge and lowest value 18 mg/l at Daliganj Bridge. In Monsoon period the highest value 110 mg/l at Gomti Barrage and lowest value 32 mg/l at Harding bridge. In Post Monsoon period the highest value 62 mg/l at Indira canal Aquaduct and lowest value 36 mg/l at Hanuman Setu. If it is analysed by site wise the highest value 110 mg/l was found at Gomti Barrage and Lowest value 18 mg/l was found at Daliganj Bridge.

D. Dissolved Oxygen (DO):

In Pre Monsoon period the highest value 6.41 mg/l at Harding bridge and lowest value 2.80 mg/l at Hanuman Setu. In Monsoon period the highest value 7.10 mg/l at Harding bridge and lowest value 4.21 mg/l at Gomti Barrage. In Post Monsoon period the highest value 7.68 mg/l at Hanuman Setu and lowest value 2.14 mg/l at Gomti Barrage. If it is analysed by site wise the highest value 7.68 mg/l was found at Hanuman Setu and Lowest value 2.14 mg/l was found at Gomti Barrage.

E. Biochemical Oxygen Demand:

In Pre Monsoon period the highest value 15.40 mg/l at Shaheed Path and lowest value 3.20 mg/l at Gaughat. In Monsoon period the highest value 14.21 mg/l at Bharwara STP and lowest value 4.04 mg/l at Gaughat. In Post Monsoon period the highest value 11.51 mg/l at Hanuman Setu and lowest value 3.52 mg/l at Gaughat. If it is analysed by site wise the highest value 15.40 mg/l was found at

Shaheed Path and lowest value 3.20 mg/l was found at Gaughat.

F. Chemical Oxygen Demand:

In Pre Monsoon period the highest value 24.60 mg/l at Shaheed Path and lowest value 12.20 mg/l at Gaughat. In Monsoon period the highest value 23.25 mg/l at Shaheed Path STP and lowest value 12.61 mg/l at Gaughat. In Post Monsoon period the highest value 21.50 mg/l at Bharwara STP and lowest value 14.81 mg/l at Gaughat. If it is analysed by site wise the highest value 24.60 mg/l was found at Shaheed Path and lowest value 12.20 mg/l was found at Gaughat.

G. Total Hardness:

In Pre Monsoon period the highest value 328 mg/l at Hanuman Setu and lowest value 192 mg/l at Indira canal Aquaduct. In Monsoon period the highest value 298 mg/l at Gomti Barrage and lowest value 242 mg/l at Gaughat. In Post Monsoon period the highest value 340 mg/l at Gomti Barrage and lowest value 175 mg/l at Harding Bridge. If it is analysed by site wise the highest value 340 mg/l was found at Gomti Barrage and lowest value 175 mg/l was also found at Gomti Barrage.

V. CONCLUSION

After the analysis of physicochemical parameters of the water of river gomti in my opinion to save the River Gomti, it is necessary that the river always have ample water in its water way. The sufficient amount of the water and its flow is the major factor to save the river. Releasing water into the River Gomti from outside is must to rejuvenate the drying river, which is also threatened by pollution from industrial and domestic waste. Gomti is a ground water fed river. Besides, various tributaries that meet the river at different points all along its length reinforce and revitalize the river. But now the ground water level fast going down, more than half of Gomti's tributaries are dry, filled with sewage and sludge.

Following suggestions are recommended for the betterment and survival of the river:

1) To provide the ample water in the river by taking water from other sources like river

It is suggested that the releasing the sufficient water in Gomti from any nearby river to maintain minimum flow. If the river gets ample water, pollution will not be that big a threat for the river. Continuous flow with ample water helpful for the revival of the river

2) All the incoming waste water through drains should be diverted from the river

The waste water of the Lucknow city is untreated discharged in River Gomti up to few years ago. At present these drains are tapped at its discharge point and all the waste water is diverted to the Sewage Treatment Plant at Bharwara. But still some waste water discharged into the river especially in peak hours and rainy season. If all Domestic waste, industrial waste, hospital waste are diverted, the river will become pollution free.

3) *Disilting of River Gomti and its tributaries*

Desilting of the river to increase its depth is an urgent requirement because with slight increase in rainfall every season, Gomti gets flooded. To conserve water and to redirect it into Gomti in the lean season, there is a need to construct reservoirs, dams and revive old tributaries. Ponds, which existed along the course of the river, can be dug again for storing the excess water.

4) *Forestation of Gomti River Basin*

Apart from releasing water from any river, diverting of waste water drains from river and disilting of the river, the forestation of Gomti river basin is also helpful to restore Gomti and its tributaries. At present the deforestation is major cause of short rain fall. The deforestation is a major cause of climate change, and due to climate change the rain is also affected. To increase the rain fall forestation is also a better option.

5) *Shifting of Barrage of River Gomti*

Barrage was constructed in 1980 at Ballo Adda to impounding the water in River Gomti so that a minimum level of water could be maintained in the river for pumping station at Gaughat.

The 12km stretch from barrage to Gaughat has stagnant water because gates of the barrage block the flow. Sludge and sewage gets blocked at barrage due to stagnant water. The gate of the barrage are closed almost fulltime.

6) *Revival of Gomti will beneficial for Ganga too because River Gomti is an important tributary of River Ganga.*

ACKNOWLEDGEMENTS

The authors acknowledge the head, department of civil engg. of Integral University Lucknow and Rajiv Banerjee Associates Professor of department of civil engg of Integral University Lucknow for providing facilities to this work.

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