



## Impact of socio-biological activities on Gomti River flowing through Lucknow

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Received: 08-03-2009

Accepted: 15-08-2009

### Abstract

Gomti River is the lifeline for Lucknow and is a major source of water for domestic use. Over the years extensive urbanization in Lucknow city has changed the characteristics of Gomti River due to disposal of untreated wastes, which mainly include sewage, solid sludge and hospital wastes. This has caused the degradation of Gomti River resulting in aquatic pollution. The river water is extensively used for washing, bathing, recreational and religious activities. In the present paper we are presenting the findings pertaining to different physico-chemical and microbiological parameters, which have been assessed to determine the impact of socio-biological activities on the quality of river water. For this sampling of water has been done from six different sites at three points of every site, in the month of June, 2006 from Gomti River. Hardness of water samples ranged from 315.00-643.00 mg/l. the pH values of water ranged from 8.60- 8.90. The total dissolved solids varied from 230.40-530.50 mg/l and the dissolved oxygen of water varied between 0.00-4.80 mg/l. The chloride concentration varied between 99.30- 224.30 mg/l and the alkalinity of water samples ranged between 307.70-480.00 mg/l, the nitrate of water samples varied from 11.8- 18.6 mg/l. The fluoride concentration water sample was 0.58- 1.15 mg/l. The bacteriological examination of water yielded the results that >1600/100 ml of coliform 1600-> 1600/ 100 ml of fecal coliform were present in the water samples. These results have been clearly shown that the water of Gomti River is severely affected by various socio-biological activities around sampling site.

**Keywords:-** *Physico-chemical parameters, Urbanization, Sociobiological, Microbiological parameters, Gomti River*

### Introduction

Water is the most essential and prime necessities of life. No one can live without water (Kesre *et al.*, 2007; Khanna, 2007). Although about 73 percent of world's surface area is covered by water i.e. mainly in ocean, lakes, river and on the land. The quantity of fresh water in comparison to marine is quite less. Fortunately, India is a land which has been blessed with a large number of big and small rivers. The Gomti River also known as the Gumti or Goamti is a tributary of the Ganga. The Indian city Lucknow is located on the bank of Gomti River. About 90% pollution load in river is due to human activities. Water pollution occurs as a result of the presence of any objectionable or waste material capable of damaging the water quality. (FEPA, 1991). Gomti water in the Lucknow city is severely polluted by

industrial effluent, domestic waste and socio-biological activities such as mass bathing, washing of clothes, animal bathing and disposal of industrial effluent and by the discharge of untreated sewage from residential area. An attempt has been made to evaluate the quality of Gomti water by microbiological and physico chemical analysis of water samples collected from different points having socio-biological importance.

### Materials and Method

The water samples collected from six different sites, owing to having sociobiological activities like bathing, washing, recreational and religious gathering at Gomti River flowing through Lucknow city were designated as S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub>, S<sub>4</sub>, S<sub>5</sub> and S<sub>6</sub> (Fig.1). The water samples were collected in plastic cans for physico-chemical analysis, for microbiological study water samples were collected in sterilized glass bottles. Sampling was done in the month of June (2006) and the samples were

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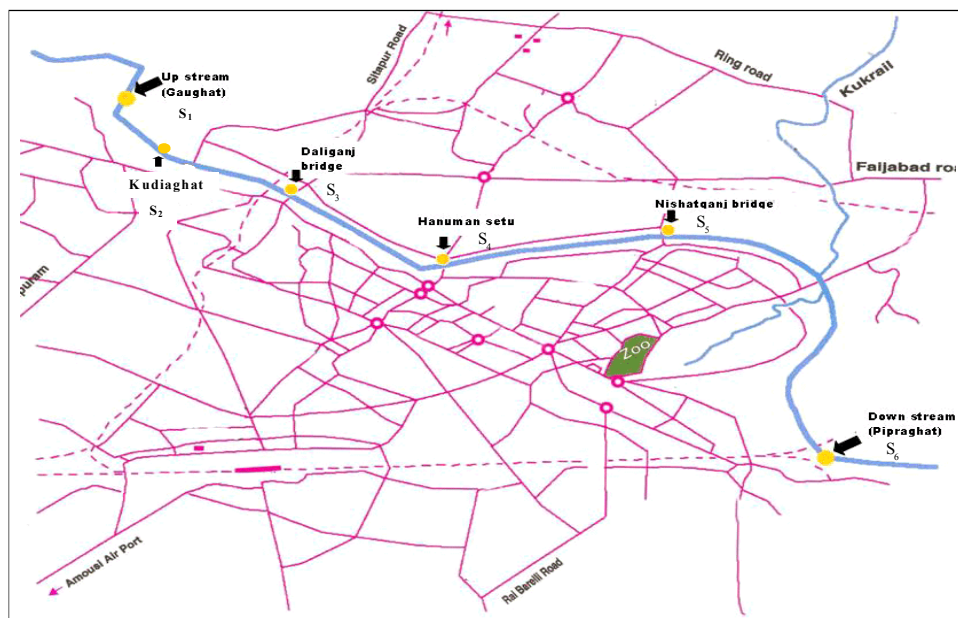


Fig. 1: Map showing location of different sampling sites in Gomti River

analyzed using standard methods (APHA, 2005; Khanna and Bhutiani, 2004).

### Results and Discussion

The data presented in Table-1 shows that the temperature recorded was 34.00°C at all the sampling sites. The pH of water samples was found between 8.60- 8.90, crossing the desirable limits. pH has no direct adverse effect on the human health. Total hardness ranged between 315.00- 643.00 mg/l. Although hardness has no known adverse effect on human health; however some evidence has indicated its role in cardiac disorders. The hard water is also not suitable for domestic use in washing, cleaning and laundering (Trivedi and Goel, 1986). The total alkalinity of water samples ranged between 307.70-480.00 mg/l. A number of bases i.e. carbonate bicarbonate, hydroxides, phosphate and nitrates, silicates and borates *etc.* contributed to alkalinity (Garg *et al.*, 1998; Sakhare and Joshi, 2002). A higher

value of alkalinity was observed at site S<sub>6</sub>. Dissolved oxygen of water ranged from 0.00-4.80 ppm. In any aquatic ecosystem the level of dissolved oxygen depends on the factors like the concentration of dissolved solids and biological activities of all life. (Khatavakar *et al.*, 2004). Depletion of dissolved oxygen may be due to disposal of sewage and industrial effluent into natural water bodies and resulting into an increase of BOD in the water (Kriubauathy *et al.*, 2005).

The desirable limit of total dissolved solids is 500.00 mg/l, in this study the concentration of total dissolved solid (TDS) ranged from 230.40-530.50 mg/l. Higher concentration of total dissolved solid may be attributed to the presence of colloidal or finely suspended matter, which does not settle in the water. The presence of colloidal or fine matter may be due to the direct discharge of solid wastes (Rajurkar *et al.*, 2003). Total dissolved solid values exceeding may cause gastrointestinal irritation (Kaushik *et al.*, 2004).



Chloride concentration ranged between 99.30-224.30 mg/l. Chloride have been found to be associated with pollution and its higher value is attributed to the sewage contamination and organic pollutants (Mishra *et al.*, 2003). Higher concentration of chloride in drinking water may cause disease of heart and kidneys. Sulphate concentration varied between 316.70- 640.00 mg/l. It is maximum at S<sub>4</sub>, S<sub>5</sub> and S<sub>6</sub> stations. Nitrate concentration varied between 11.80-18.60 mg/l. Nitrate is the oxidized form of nitrogen in water. It is most important source of biological oxidation of nitrogenous organic matter origin which includes domestic sewage, agricultural runoff and effluent from residential or industrial areas (Saxena, 1998).

Fluoride concentration varied between 0.58-1.15 mg/l. It was higher at S<sub>4</sub> and S<sub>6</sub> stations. Total organic carbon in water samples varied between 44.51 to 68.74 ppm. Organic contaminants (natural organic substance, insecticides, herbicides and other

agricultural chemical) enter water ways in rainfall runoff. Domestic and industrial waste water also contribute organic contamination in various amounts. A high organic content means an increase in the growth of microorganisms which contributed to the depletion of oxygen supplies. Coliform present in water is >1600/100ml. Fecal Coliform in water is 1600->1600/100ml. Fecal contamination of natural drinking water source is a most serious danger to human health by causing various water born diseases. Coliform and Fecal Coliform are established indicators of fecal contamination in aquatic environment. According to WHO guidelines for drinking water, there should be <10 Coliform and no fecal coliform or fecal streptococci in 100 ml of any potable water samples (WHO, 2004).

### Conclusion

The findings of this study have proved that Gomti River water is indeed polluted through various socio-biological activities. We have also been able to show that bacterial population has contributed to the contamination of Gomti water. All physico-chemical parameter were found to cross the desirable limits and some of them crossed the maximum permissible limit according to Bureau of Indian Standard. The results of different physicochemical parameters have shown that the water of Gomti River is severely affected by various socio-biological activities at different sampling sites. The implication of these findings may be that people dependent on this water for domestic use including cooking, drinking and washing may be exposed to some of these hazards.

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**Table-1: Physico-chemical parameter of Gomti River at different sites in Lucknow City**

Parameter	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>
pH	8.60	8.60	8.60	8.70	8.60	8.90
Temperature (°C)	34.00	34.00	34.00	34.00	34.00	34.00
DO (ppm)	0.00	2.00	2.00	1.00	3.00	4.80
TDS (mg/l)	230.40	274.10	300.10	392.00	443.70	530.50
Hardness (mg/l)	315.00	383.00	445.00	481.00	509.00	643.00
Alkalinity (mg/l)	307.70	346.30	353.00	363.30	387.00	480.00
Chloride (mg/l)	99.30	124.70	146.00	164.30	183.70	224.30
Sulphate (mg/l)	316.70	340.00	376.60	426.70	503.30	640.00
Nitrate (mg/l)	11.80	12.50	13.70	14.80	17.50	18.60
Fluoride (mg/l)	0.58	0.67	0.74	0.94	0.87	1.150
Total organic carbon (ppm)	44.51	54.84	56.97	60.63	63.22	68.74
Coliform(/100ml)	>1600	>1600	>1600	>1600	>1600	>1600
Fecal Coliform(/100ml)	1600	1600	>1600	1600	1600	>1600



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