



## Original Research Article

# An overview of water pollution studies on Gomti river

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### ABSTRACT

Water is very essential for all forms of life. Most of the time our civilizations were generated on the water bank. The Gomati river is located in south of the Himalayan foot hills near Madhogani Tanda village in Pilibhit district in northern Uttar Pradesh. It flows southeastward for almost 940 km through nine districts of Uttar Pradesh. Large amounts of human waste, agricultural and industrial pollutants are discharged in this river as it flows through the highly populated regions of Uttar Pradesh. Lakhimpurkheri, Lucknow, Sultanpur and Jaunpur are major cities located along this river; they are a major source of municipal and domestic waste and sewage water causing pollution in this river. However in recent times, the conditions of water quality are very badly affected. The reasons for this due to increase in population growth, rapid industrialization and agriculture methods resulting deterioration of water quality. The water pollution has many negative consequences such as destruction of marine habitat, development of various fatal human diseases such as cholera, malaria, tuberculosis, etc. Therefore, water pollution is indeed a major and serious global topic of concern. Water Pollution matters because it harms the environment on which we depend. Destroying the environment ultimately reduces the quality of our own lives. Research survey concluded that large number of drains are responsible for pollution in river Gomti that enter directly into the river carrying untreated industrial and domestic waste. In this present article, an attempt is being made to review the various steps should be taken on personal basis to tackle the problem of Gomti river water pollution.

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## 1. Introduction

Water is essential for our existence. Good and adequate water is essential for the comfortable and happy living. The Gomti, an alluvial river of the Ganga plain is considered to originate near Manikot in Madhotanda about 30 km east of the pilibhit down in Uttar Pradesh, at an elevation of 185 m. The river flows through an incised valley before meeting the Ganga river in Kaith, Ghazipur bordering Varanasi. The characteristic of the river is perennial and effluent. The river is characterised by sluggish flow throughout the year, except during monsoon season, when heavy rainfall causes a manifold increase in the run off 75% dependable flow. The total drainage area of the river is 30437 sq.km. Sai

River is its major tributary having drainage of 12900 sq.km approximately 43% of the total catchment area of Gomti basin.



Fig. 1:

On the banks of the river, Sitapur, Lucknow, Sultanpur, Jarnpur are the four major urban settlements. The river, subsequently, receives the untreated wastewater and

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effluents from these occasions in its course through more than 45 major drains carrying the wastewater and industrial effluents from different towns and industrial units. The Gomati river all along its 940 km length traverses through the alluvial plains covering agricultural lands and several small and large urban centers. These regions provide huge quantities of untreated sewage, agricultural runoff that brings pesticides and various chemical fertilizers, along with oil, asphalt, sediment and heavy metals. Primary sources of heavy metals are from industries like tannery, sugar, beverages, paints, chemicals, fertilizers, batteries, automobiles, factories, food processing units, cement, thermal power plants, petroleum refineries and sewage disposal water. Water quality of Gomti river is mainly affected by sewage wastes and industrial wastes disposal in to the river. Apart from there are many cloth colouring units disposing colour dyes etc.in to the river Gomti.<sup>1–12</sup> The washing of cloths and cattle's bathing are also polluting the river water. Use of Plastics and their disposal in the river is creating havoc.

## 2. Present Condition of the River Water

The harmful substances that cause pollution are called pollutants. These pollutants badly effect human life by causing disruptions in human life. These pollutants discharged into water negatively modify the water. The main water pollutants are bacteria, viruses, parasites, fertilizers, pesticides, pharmaceutical products, nitrates, phosphates, plastics etc. In addition to release of microorganisms and various other substances, water pollution can also include release of energy, in the form of heat and radioactivity into water bodies. The Gomati water described here is utilized by people to earn a living by fishing in its highly polluted water. The fishing community uses blue coloured nets in the shallow banks of the river to store the fish they catch and fish caught in the lakes and ponds in the nearby region. They sell their fish to local retail traders and clean and bathe along the banks of the river. The river water here is very polluted; it is of black colour and the nearby river-bank too is polluted with scattered garbage including human and animal feces and all kinds of organic and inorganic waste including plastics.<sup>13</sup> One can only imagine how much rust flows in the river water during the rainy season. The human activities are the main cause of pollution of water bodies like rivers, lakes, marshes, ground water apart from the natural processes. Discharging various wastes in and near a water body causes pollution of that water body.

## 3. Map Showing the Location of Gomti River

In the Indian sub-continent, the Indo-Ganges Plain is one of the largest fluvial sedimentary basins of the world. It is located between the world's most tectonically active regions, the Himalaya in the north and stable Indian croton

in the south. The entire Gomti basin is underlined by thick alluvial sediments of the quaternary age. The alluvial sediments consist of boulders, pebbles, gravels, sand, silt, clay and kankars. The unconsolidated unit may be further subdivided into younger alluvium. The younger alluvium occupies the present day flood plains while the older group occupies elevated points mainly the doab portions the older alluvium is by kankar nodules at depth otherwise it is similar to the younger alluvium. Incision of the Gomti River and its valley has been studied using characteristics of longitudinal profile, escarpment heights, valley morphology. Figure 2 Google Map showing locations of Jaunpur and Kerakat along with the course of the rivers Gomati and Sai (a tributary of Gomati). The white star indicates the location of the confluence of the two rivers. Ever-increasing population and the consequent urbanization and industrialization<sup>14–16</sup> have mounted serious environmental pressures on these ecosystems and have affected them to such an extent that their benefits have declined significantly.



Fig. 2: Google Map showing locations of Gomti river

## 4. Water availability Status of Gomti river

About  $7390 \times 10^6 \text{ m}^3$  water of the Gomti River is annually discharged into the Ganga river.<sup>17</sup> About 80 percent of the discharge flows during the monsoon season. Average annual water yields due to rainfall in the Gomti basin has been found to be 7390 million cubic meter with specific yields of  $244000 \text{ m}^3/\text{km}^2$  and  $234 \text{ m}^3/\text{sec}$ . The run off of the individual basins can be significantly different from the national average for example; the run off in the Gomti basin is 250 mm.

## 5. Water Quality Status of Gomti River

Gomti is facing severe problem of pollution due to discharge of sewage and industrial effluent. The earlier assessment of water quality carried out by department of Irrigation; UP in 2016 and 2019 respectively show high level of pollution in Lucknow and Jaunpur. The central pollution control board (CPCB) monitors the surface water quality of Gomti river and its tributaries – Gomti at Sitapur upstream, at Lucknow upstream and downstream, at Varanasi and Sai at unnao after drain outfall on routine basis. Parameters

measured are physical (temp, pH, ec), bacteriological (total coliform and faecal coliform) and organic pollution (DO, BOD) and COD. In UP, big rivers like Ganga, Sarju, Betawa, Rapti, Gomti, Sai and its tributaries are the main sources of water supply. The stretch of Gomti river from Gaughat to Pipraghat showed decreasing trend of dissolved oxygen. Gaughat showed the maximum DO content whereas Pipraghat showed the minimum. The DO at Gaughat is maximum because the water at this site is least polluted from industrial, sewage and domestic waste. However, when river reaches Pipraghat, it gets heavily polluted due to discharges from various cis and trans drains emptying into the river round the year. Increasing trend of BOD was observed from upstream to downstream sites of Lucknow. Decomposition of organic matter<sup>18,19</sup> is largely an aerobic process, so the demand and requirement of oxygen increases resulting decrease in the dissolved oxygen, thereby increasing BOD and COD. Lower value of BOD at Gaughat was found because of the negligible pollution at the upstream site. Use of detergents leads to increase in the phosphate content in the river water that causes growth of algae. Algal growth in water resulted in lowering of DO due to which the demand of oxygen increases which leads to the decomposition of organic matter incomplete. The content of BOD increases from Nishatganj drain to Pipraghat due to heavy disposal of industrial wastes. The sites of Gomti river from Gaughat to Pipraghat also showed an increasing trend in COD. The demand of oxygen for the decomposition of biodegradable and non biodegradable organic matter increases from upstream to downstream. COD content was to be higher at Upstream barrage and Pipraghat sites. These rivers passes through almost all the big cities of UP. The sewage water, domestic and industrial wastes from the big cities are being disposed in these rivers. Investigation of the physico-chemical and biological parameters helps in assessing the status of water quality.

## 6. Restoration Plan for Gomti River

The above study leads to suggest some important action strategies to be taken up on priority basis for Gomti River. This will be great initiative to restore the river.

1. Demarcate the entire flood-plain, right from the origin to the confluence with the Ganga.
2. Freeze its land-use by buffering. No violation of the land use change.
3. Remove the illegal encroachments in the flood-plain. Declare 500m from river midstream as no construction zone. To be used only for plantation.
4. Declare the origin as well as confluence of all 24 major tributaries as "Eco-fragile areas".
5. Remove the silt deposited in the riverbed along the major settlements.

6. Use decentralized treatment within the zones and uses the water for non-potable purposes.
7. Use standard low cost treatment in the drain itself.
8. Strict monitoring of the 56 sugar factories located around the river in Sitapur and above. They case major pollution load in the river.
9. Proper arrangement of sanitary landfills in Sitapur, Lucknow, Sultanpur and Janupur. In, no situation, solid wastes to be dumped in the river.
10. Water management for the water intensive crops is so poor that farmers use almost two times the water required for irrigation for crops such as paddy, sugarcane, wheat and potato.

## 7. Conclusion

In this paper, an attempt has been made to reclassify the designated best use of water quality based upon river expedition carried out in the entire stretch of Gomti River at 30 different segments. Based on the observation of the river expedition, a restoration plan is also prepared, older satellite pictures were consulted to prepare land use maps in the Gomti basin and compare them with the recent satellite maps. It is observed from the expedition that there is no flow in the initial reach of Gomti in about 60 km length during non monsoon months. This study revealed that water quality of Gomti river was found to be more polluted. Physico-chemical and microbiological quality of Gomti river was poor, unsafe and not acceptable for any purpose. While researching the environmental studies of the Gomati river, heavy metals analyses of the Gomati water, sediments and biological entities that inhabit the river are the prime concern of the researchers. Various industrial waste, agricultural waste and domestic wastes are the main cause of increasing urbanization and population resulted in the increase in generation of waste that is being discharged into the river. It leads to increase in the content of heavy metals that results in pollution of river water. Due to huge amount of organic and inorganic matter, Gomti river lost its self purification nature, resulting higher bacterial growth. That is why it is very necessary to treat the waste coming from industries and other sources before merging into the river so that the aquatic as well as human life may not get affected. Hundreds of crores of rupees must have been spent on cleaning this river projects. After so much efforts and heavy expenditure of money, sadly, Gomati river remains a highly polluted river. Just highlighting the problems and its source or even addressing solutions is not enough. All such efforts must lead to tangible results in cleaning the river and that would require a strong political and administrative will. It is clearly show that most people are ignorant of the severity of the problem they face every day due to river pollution. It is adversely impacting their health and quality of life. Concerned people should take up responsibility in making the common man aware of the problem so that they

are not involved in polluting the river.



**Fig. 3:**

## 8. Source of Funding

None.

## 9. Conflict of Interest

The authors declare that there is no conflict of interest.

## References

1. Kumar S. Heavy metal pollution in Gomti River sediment around Lucknow. *Curr Sci.* 1989;58(10):557–9.
2. Singh M. Heavy metal pollution in freshly deposited sediments of the Yamuna river (the Ganga river tributary): A case study from Delhi and Agra urban centres. *Environ Geol.* 2001;40:664–71.
3. Singh M, Muller G, Singh IB. Geogenic distribution and baseline concentration of heavy metals in sediments of the Ganges river, India. *J Geochem Explor.* 2003;80:1–17.
4. Bhaskaran TR, Chakroaborty RN, Trivedi RC. Studies on the river pollution: 1. Pollution on purification of Gomati River near Lucknow. *J Inst Eng India.* 1963;45(6):39–50.
5. Kumar S, Singh IB. Sedimentological study of Gomti River sediments. *Senckenberg Merit.* 1978;10:145–211.
6. Singh K, Mohan D, Singh VK, Malik A. Studies on distribution and fractionation of heavy metals in Gomti river sediments—a tributary of the Ganges, India. *J Hydrol.* 2005;312(1-4):14–27. doi:10.1016/j.jhydrol.2005.01.021.
7. Mishra SS, Mishra A. Assessment of physic-chemical properties and heavy metal concentration in Gomti River. *Res Environ Life Sci.* 2008;1(2):55–8.
8. BIS, Indian Standard Drinking Water Specification, Bureau of Indian Standard, Indian Standard (10500); 1991.
9. Chatterjee C, Raziuddin M. Determination of water quality index (WQI) of a degraded river in Asanol Industrial area. *Nat Environ Pollut Technol.* 2002;1(2):181–9.
10. Gupta DM, Purohit KM, Dutta J. Assessment of drinking water quality of river Brahmani. *J Environ Pollut.* 2001;8:285–91.
11. Gupta LP, Subramanian V. Geochemical factors controlling the chemical nature of water and sediments in the Gomti River, India. *Environ Geol.* 1998;36(1-2):102–8. doi:10.1007/s002540050325.
12. Sharma JN, Kanakiya RS, Singh SK. Limnological study of water quality parameters of Dal lake. *Int J Innov Res Sci Eng Technol.* 2015;4(2):380–6.
13. Gaur VK, Gupta SK, Pandey SD, Gopal K, Misra V. Distribution of heavy metals in sediment and water of river Gomti. *Environ Monit Assess.* 2005;102(1-3):419–33. doi:10.1007/s10661-005-6395-6.
14. Gupta LP, Subramanian V. Environmental geochemistry of the River Gomti: A tributary of the Ganges River. *Environ Geol.* 1994;24(4):235–43. doi:10.1007/bf00767084.
15. Jigyasu DK, Kuvar K, Srivastava N, Singh S, Singh IB, Singh M. High mobility of aluminium in Gomati River Basin: implications to human health. *Curr Sci.* 2015;108(3):434–8.
16. Kumar S. Heavy metal pollution in Gomati river sediments around Lucknow. *Curr Sci.* 1989;58(10):557–9.
17. Singh VK, Singh KP, Mohan D. Status of Heavy Metals in Water and Bed Sediments of River Gomti – A Tributary of the Ganga River, India. *Environ Monit Assess.* 2005;105(1-3):43–67. doi:10.1007/s10661-005-2816-9.
18. Kumar R, Singh RD, Sharma KD. Water resources of India. *Curr Sci.* 2005;85(5):794–811.
19. Tilwankar V, Nil RS, Bajpai SP. Heavy Metals in Rivers: A Review. *Int J Adv Res Innov Ideas Educ.* 2016;2:785–8.

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