Research Paper

Volume : 4 | Issue : 5 | May 2015 • ISSN No 2277 - 8179

Study of Pollution Level in Yamuna River Due to Untreated Delhi Drains

Chemistry

KEYWORDS : Physico chemical parameters, Najafgarh, River Yamuna, Drains

Suruchi	Department of Chemistry, Ramjas College, University of Delhi, Delhi
Sonia Ratnani	Department of Chemistry, Ramjas College, University of Delhi, Delhi
Shriniwas Gurjar	Department of Chemistry, Ramjas College, University of Delhi, Delhi
Manish	National Thermal Power Corporation Limited, Badarpur Thermal Power Station, Delhi

ABSTRACT

The aim of this study is to reveal the status of pollution in terms of physico chemical parameters of the water of river Yamuna in Delhi due to untreated drains. The work analyses the effect of the two polluted drains namely Najafgarh and Wazirabad on the water quality of River Yamuna. The study incorporates the measurement of physico chemical parameters of these drains vis a vis water quality downstream of Wazirabad as these drains contributes 58% of the load pollution of the river Yamuna. Six sites including these two drains were chosen along the 22 km stretch of yamuna for assessing the water quality parameters such as pH, conductivity, TDS (Total Dissolved Salts), COD (Chemical Oxygen Demand) and levels of ammonia. Amongst all the locations, Najafgarh drain proved to be the highest contributor of the pollutant as evident from the increased value of pH, TDS and other parameters. Hence the water at these sites without prior necessary treatment cannot be put to use for domestic, irrigation or any other purposes.

Introduction

The increasing pollution of the river Yamuna especially in Delhi due to discharge of untreated waste water is nowadays creating a major concern for environmentalists. [1, 2] Though the 22 km stretch of Yamuna is only 2 per cent of the total length of the river yet it contributes 80 % of the pollution load. [3] River Yamuna after its origination in the Himalayan glaciers from Yamunotri flows through different states of north India like Uttaranchal and Haryana before reaching Delhi. Downstream of Delhi it flows through Uttar Pradesh and finally forms a right bank tributary of Ganga. The water flow of Yamuna in Delhi is controlled at Hatni Kund Barrage where most of the water is diverted into Eastern and Western Yamuna Canal for irrigation. It enters Delhi near Palla village after travelling a distance of about 224 Km. River is again trapped at Wazirabad through a barrage for drinking water supply to Delhi. But nowadays due to high density population and rapid industrialisation river Yamuna has become one of the most polluted rivers in India especially at Delhi which dumps around 58% of its untreated or partially treated wastes into river. [4] This study covers a 22 Km stretch starting from downstream of Wazirabad barrage and extending upto Okhla barrage vis a vis water quality at Wazirabad barrage upstream. Downstream of Wazirabad Barrage the water flow of the river is mostly from drains of various locations of Delhi and some water from Hindon cut canal of Hindon river. The flow of theses drains which consists of untreated sewage, industrial & various other wastes are responsible for chemically degraded and almost dead water body status of Yamuna. Fig1 and Fig 2 depicts the status of two polluted stretch of river Yamuna namely at Wazirabad and ISBT. Waste streams of 22 drains join the river along this stretch including Najafgarh drain which discharges 171.7 tonnes/day of loading (almost 58% of total). Najafagarh drain previously known as Sahibi River with its origination near Najafgarh lake is now one of the most dreaded pollutant source causing death of river Yamuna.

Fig1. Yamuna water flowing through Wazirabad (upstream)

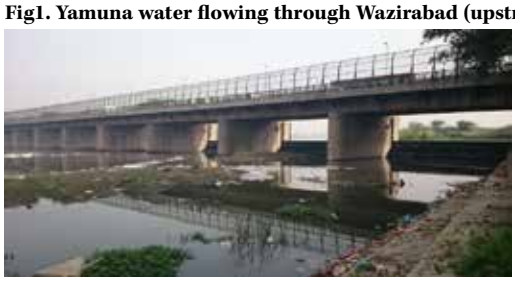


Figure 2. A dirty stretch at ISBT.

Experimental

Materials and methods:

Water samples from river Yamuna were collected in sterilised plastic containers (PVC 1000 mL) from following six different locations in Delhi.

1. Wazirabad (Upstream)
2. Najafgarh Drain
3. Wazirpur drain
4. Yamuna at ISBT Delhi(2 Km downstream of Wazirabad)
5. Yamuna at Sarai Kale Khan(14 Km downstream of Wazirabad)
6. Okhla (22Km downstream of Wazirabad)

Immediately after collection the water samples were brought to the laboratory for analysis of physico-chemical parameters. The various parameters were measured as follows:

The pH was measured by Systonics Digital pH meter standardised with universal buffer solution. Electrical conductivity (EC) was calculated using Elico digital conductometer standardised with KCL solution. Measurement of TDS (Total Dissolved salts) was done on digital TDS meter standardised with sodium chloride solution. Chemical Oxygen Demand (COD) was determined by potassium dichromate oxidation method. The levels of ammonia were measured through spectrophotometer (Hach,DR 5000 at 425nm).

Results and Discussions

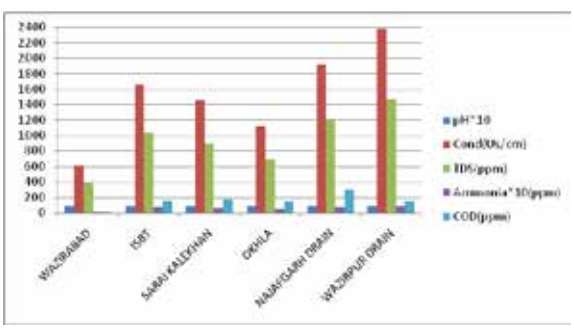
Analysis of the water samples confirms the deterioration of wa-

ter at all the locations. Table 1 summarises the results and comparison with the WHO standards. Variation of all the parameters at all the locations is highlighted in Figure 3.

Table 1. Comparison of various physico-chemical parameters of river Yamuna at different sampling sites with WHO standards.

Parameter Location	pH	Conductivity (Us/cm)	TDS (ppm)	Ammonia (ppm)	COD (ppm)
Upstream of Wazirbad	7.8	612	379.0	1.49	12
Najafgarh Drain	8.07	1924	1194	7.56	300
Wazirpur Drain	7.98	2380	1475	8.05	140
ISBT	7.90	1667	1030	7.25	160
Sarai Kale Khan	7.88	1457	905	6.58	180
Okhla	7.90	1122	696	4.88	140
WHO	6.5-9.2	1000	500	0.4	10 for drinking <50 for other purposes

Figure 3. Variation of physico-parameters of water at Yamuna and Drains



(i) pH

pH indicates the intensity of acidity and alkalinity of water by measuring the concentration of hydronium ions. A increased pH value increases the solubility of toxic chemicals which can prove harmful to aquatic fauna. Most rivers have a neutral pH of 6.5 – 8.5 [5]. The results show a increase in pH value especially for Najafgarh drain which may be due to increase use of alkaline detergents or alkaline waste from industrial areas.

(ii) Electrical Conductivity

Conductivity is the tendency of a substance or solution to conduct electrical current through the water. Electrical conductivity is related to the concentration of salts dissolved in water. EC values were above the normal limits indicating the presence of high amount of dissolved inorganic ions like Ca(II), Mg(II), SO_4^{2-}, Cl^- etc .

(iii) Total Dissolved Salts TDS

TDS indicates the amount of inorganic salts and organic matter dissolved in water. High TDS values are reported in waters of Wazirabad(downstream) and this is due to high density population living in the city and dumping of solid waste into river.

(iv)Ammonia

The results show the concentration of ammonia exceeding the permissible limits which is due to accidental exposure of stream water during recreational activities and direct ingestion of water. Water becomes untreatable when ammonia concentration is not within permissible limit. The measurement of levels of ammonia indicates a high degree of pollution in all the six sites.

(v) Chemical Oxygen Demand COD

Chemical Oxygen Demand determines the amount of oxygen required for chemical oxidation of organic matter present in water with the help of strong oxidant. It is used to measure the pollution level of domestic and industrial wastewater. COD is found to be exceeding the permissible limit at all the sampling locations. Direct discharge of untreated waste through the drains into river is responsible for high organic pollution resulting in high COD values at downstream sites.

Conclusion

The result clearly indicate that till upstream of Wazirabad barrage the water of river Yamuna is almost clean & very little polluted as indicated by values of physico-chemical parameter. Immediately after Wazirabad barrage the river gets huge influx of drain water amongst which Najafgarh drain contributes to the highest pollutant loading and turns the river into a highly chemically polluted sewage.

The water quality of ISBT which is just 2 kms downstream of Wazirabad has deteriorated sharply. This water quality is almost same throughout the Delhi stretch of Yamuna. A small improvement in Okhla water quality is due to water augmentation from Hindon cut canal to Yamuna near Okhla barrage. The study finds that in the whole span of Yamuna in Delhi, Najafgarh Drain along with Wazirpur drain which too forms a part of common drain in last leg contributes huge pollutant which is choking the river and has made it almost a dead water body and makes it unfit for water use in any class as classified by WHO standards.

The present study on six different sampling locations in Delhi shows that pollution in river Yamuna is largely due to untreated drains.

Few steps that can prevent the deterioration of water quality include:

(a) Pollutants discharge to Najafgarh drain specially industrial, chemical & untreated sewage waste should be checked. The industrial areas adjoining the two drains covered in this study should be monitored strictly regarding waste disposal in the drains.
(b) Market areas and other commercial establishments must be monitored for various effluents discharge such as oil and pollutant discharge from small garrage,various chemical activities such as cloth dyeing, oil related activities and other biological and chemical inducing activities.
(c) There should be sewage treatment system for the drain at various locations so that discharge water is almost clean.
(d) Formulation of strict rules and regulations and their effective implementation so that pollution in river Yamuna can be controlled.

Acknowledgements

Authors would like to express their sincere thanks to the staff of NTPC for their help and cooperation.

REFERENCE

1. CPCB Central Pollution Control Board, Report on Status of Water Quality of River Yamuna and Drains adjoining river Yamuna in Delhi, 2004. | 2. CPCB Central Pollution Control Board, Report on Water Quality Status of Yamuna River, 2006. | | 3. CSE, Centre for Science and Environment, Report on State of Pollution in Yamuna, 2009. | 4. Dhillon M.K, George M.P , Mishra S. " Water Quality of River Yamuna- Delhi Stretch", International Journal of Environmental Sciences, 2013 (5), 1416-1423. | 5. Mishra A.K ,"A River about to Die: Yamuna", Journal of Water Resource and Protection. 2010 (2), 489-500. |