

Quantitative and qualitative estimation of waste water discharge from Ghazipur city

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Abstract: Ghazipur a sub-urban area situated on the bank of river Ganga is affected by water pollution by municipal raw waste water discharge; few small scale industries & two industrial sources. The significant sewage water pollution taking place through five major drains are Badamahadeva, Peernagar, Collectorghat, Navapura and Dadrihat. The experiment was carried out during March to May 2009; in the P.G. College, Ghazipur laboratory, the quantity of waste water discharged from the city is 3,70,000,00 l/day, qualitatively; except chloride most of the parameters have the higher value obtained than prescribed for sewage water quality standard, sites like Bada Mahadeva and Dadri Ghat are mostly affected by organic wastes and remaining three are inorganic as well as organic river water pollution, sewage treatment plant is required to reduce the load of the river Ganga to curb the impacts.

[Sandeep K. Pandey, Suman Yadav. **Quantitative and qualitative estimation of waste water discharge from Ghazipur city.** *World Rural Observ* 2016;8(1):52-56]. ISSN: 1944-6543 (Print); ISSN: 1944-6551 (Online). <http://www.sciencepub.net/rural>. 8. doi:[10.7537/marswro08011608](https://doi.org/10.7537/marswro08011608).

Keywords: Waste Water, MLD, C.O.D., D.O., River Water Quality

Introduction:

Water is the most poorly managed resource in the world (Fakayode, 2005). In urban areas careless disposal of industrial effluent, domestic waste water discharge and the untreated municipal waste water discharge contribute greatly to poor quality of surface water. The great rivers in developing countries are the carrier of the waste loads. (Rai, 2007, 2010; Sharma et al., 2007; Rai and Tripathi, 2007b; Rai and Tripathi, 2008; Rai, 2009; Zhuang et al., 2009) The Ghazipur is not exception in this regard. Ghazipur is developing town with 80,000 (2001, Census), and projected to become 10, 5243 no. of individuals in city (2011, Census). City situated along the bank of river Ganga. The city Ghazipur is divided in to cis and trans rail line sections. The waste water discharge points are four major ponds and several small ponds at Trans position of the railway line. At cis position densely populated area's waste water disposal takes place into the river Ganga by five major drains and several small drains. The constituents of the waste water are domestic waste, small scale industrial waste (canneries), waste water from opium factory and Nandganj distillery. Up to this time several studies have been carried out by different workers related to its quality but there is no authentic work is present about the quantitative estimation of waste water discharge from Ghazipur city.

Materials and Methods:

Ghazipur city is sub-urban area and district head quarters located in the eastern Gangetic plain of the Indian sub-continent at 25°19' N and 25°54' N

latitude, 83°4' E and 83°58' E longitude 76.50 meter above sea level. Ghazipur has a humid sub-tropical climate. The experiment was carried out between March to May 2009, this period characterized by max. Temperature between 32^oC to 46^oC; where humidity varied between 25% to 70%. The five major drain sites were selected for the analysis of waste water are Badamahadeva, Peernagar, Collectorghat, Navapura and Dadrihat. Analysis work has been carried out in Post Graduate College, Ghazipur, laboratory. Parameters like pH was measured with the help of pH meter (Model no. 101 E) of Electronic India, standardized with pH buffer 4, 7 and 9.2., T.D.S. was estimated by evaporation method at 180^oC, Alkalinity, Hardness, D.O., Chloride, CO₂ and all parameters were analyzed by standard procedure mentioned in APHA (1995). The elemental analysis carried out by digital flame photometer. The quantitative estimation has been carried out by measuring the flow of water and by calculating the volume of the liquid on hour basis for 24 hours for individual site and by average calculation of one site and multiplied by the no. of drainage discharging from the city. In trans area population of the studied area multiplied by 135 liter/capita/day waste water discharge.

Result & Discussion:

The amount of municipal waste water discharge from Ghazipur city is ~37.62477 MLD in year 2009, (3, 70, 000, 00 L/day) while the opium factory releases about ~4000 l/day and distillery releases~1600 KL/day (1600000 L/day). In comparison to drinking water supply in Ghazipur. In

comparison of discharge of waste water, Capacity of installed drinking water supply *viz.* water head tanks, pumps, and mini pump houses is 40,000 KL*.

* Personal communication to supervisor of the MCG, chemist of GOAW and distillery effluent on the basis of per day production of alcohol.

Municipal corporation water supply works with 70% efficiency, so the municipal corporation supply water quantity is 2, 80, 000, 00 L/day and the waste water discharge was 3,70,000,00 remaining 90,000,00 L/day water coming from ancillary sources of water like hand pump, jet pumps, tube well etc. the final quantity of waste water discharge is 3,86,040,00 L/day. Various physical, chemical and biological parameters have been testified related to water quality standard. Where physical parameters are Temperature, Colour, Odour, and Turbidity. Temperature of the waste water discharge varies from 28.4°C to 32°C. Where the highest temperature was reported at Badamahadeva site 32°C. The colour of city discharge was different at all sites depends on waste water discharge composition. The odour was pungent, rotten and specific. The value of Total Solid (T.S.), Total Dissolved Solid (T.D.S.) and Total Suspended Solid, of Bada Mahadeva site is nearly three times higher than the value which is prescribed for "typical constituents of untreated domestic sewage." The value of chemical oxygen demand (COD) of Bada Mahadeva site is seven times higher than the value which is prescribed for sewage water quality standard. The value of total solid (T.S.), Total Dissolved Solid (T.D.S.) and Total Suspended Solid, Chloride and Total Hardness is minimum at Dadarighat site. The value of Total Solid of such site is 21.3% lower than the value which is prescribed for "Untreated domestic sewage". The value of T.D.S. in Dadrighat site is 6.82% and T.S.S. is 53.2% lower than the value which is prescribed for untreated domestic waste water.

The value of COD of Peernagar site and Dadrighat site is within the prescribed limit, where as the value of Chemical Oxygen Demand (COD) of Navapura site and Collector Ghat site is slightly higher than the value which is prescribed for sewage water quality standard.

The value of alkalinity of all the sites is observed between the ranges of 580-809 mg/l, whereas higher alkalinity is observed at Navapura site and lower at Peernagar site.

The value of calcium hardness is found between the ranges of 154-175.2 mg/l for all the sites. Highest calcium hardness is observed at Dadarighat site where as calcium hardness lowest amount was observed at

peernagar site. The value of magnesium hardness for the entire site is observed between the ranges of 72.2 to 130 mg/l. The value of calcium and magnesium of all the sites is observed between the range of 63.24-77.6 mg/l and 16-31.72 mg/l respectively. The value of Dissolve Oxygen (D.O.) of all the sites is found between the ranges of 2.7 - 5.5 from site I to site V. Dissolve Oxygen observed at Badamahadeva site is nil here the organic pollution load is higher than other sites.

The value of total solid of Navapura site and Peernagar site is slightly higher than the value which is prescribed for "untreated domestic sewage."

The value of chloride (Cl⁻) is found within the range of 218.112-417.40 mg/l, whereas higher chloride value is observed at Collectorghat site and lower chloride value is observed at Dararighat site. Minimum C.O.D is observed at Peernagar site and Dadarighat site having values 107.93 mg/l and 140.15 mg/l which is nearly half of compared to "sewage water quality standard" whereas C.O.D value of Collectorghat site and Navapura site is slightly higher than the value which is prescribed for sewage water quality standard.

The value of electrical conductivity is observed between the range of 0.10 to 0.72, Maximum conductivity is observed at Badamahadeva site whereas minimum conductivity is observed at Collectorghat site whereas the value of E.C. prescribed is for drinking water is 0.4 - 0.85 μ mhos/cm.

The maximum probable Number (MPN) of E.Coli is found between the ranges of 40,000-78,000 per 100 ml.

The value of Total hardness, Calcium hardness, Magnesium, Calcium, Dissolved oxygen and Chloride is beyond the detection limit at Bada mahadeva site.

The quantity of waste water discharge from Ghazipur city is 3, 70, 000, 00 L/day, the quality of waste water releasing from the city having high organic load, high soluble and suspended load, the biological analysis indicates that the waste water discharge having high number of E-coli, means it having fecal content is higher in the municipal waste water the similar reports has been from Mo EF and results from GAP. The quantity and quality of waste water discharge shows that the city is in immediate requirement of sewage treatment plant to curb the pollution load on the major suburbs drainage adjoining river Ganga.

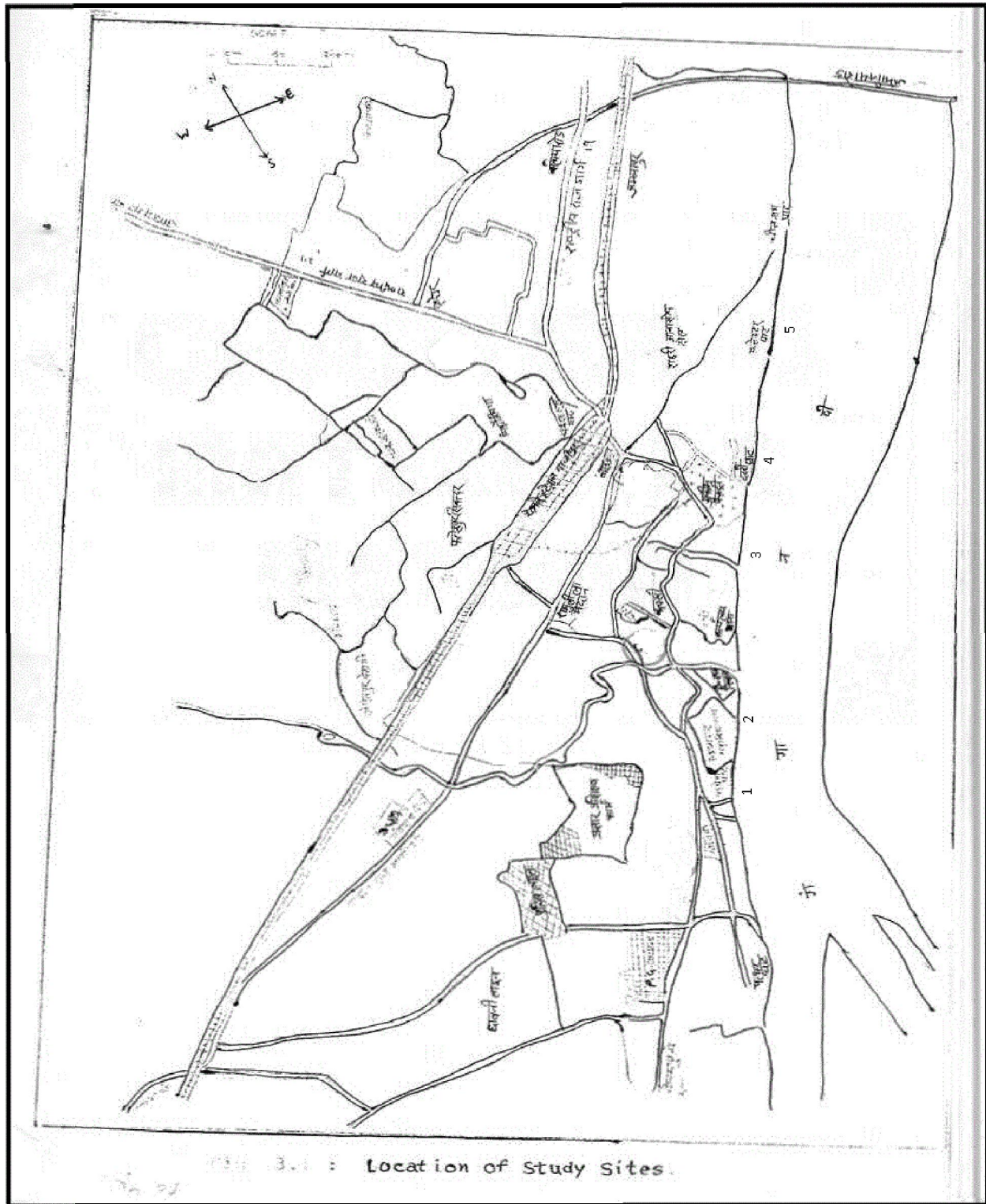


Figure. 1: A map view of study sites depicted as 1.Badamahadeva, 2. Peernagar, 3. Navapura 4. Dadrightat, 5. Collectorghat.
1to 5 as downstream.

S.No	Parameters	Study Sites						
Physical parameters		Badamahadeva 1	Peernagar 2	Navapura 3	Dadright 4	Collectorghat5	Sewage Water Quality Standard	Typical Constituent Of Untreated Domestic Waste
1	Colour	Dark Brown	Yellow	Brown	Yellow	Greenish Black		-
2	Odour	Specific	Specific	Specific	Specific	Specific		
3	Temperature in degree celcius	32.0±0.4	29.8±0.3	29.7±0.4	29.4±0.4	30.8±0.3	Shall not exceed 5 ⁰ C about receiving water temp.	
Chemical Parameters								
1	pH	8.67±0.4	8.09±0.5	7.81±0.4	7.89±0.3	7.83±0.4	5.5-9.0	
2	Total Hardness	-	259.2±1.5	295.2±1.6	239.6±1.5	243.6± 1.4	-	
3	Calcium Hardness	-	154.0±2.0	165.2±6.0	175.2±6.5	168.4±4.0	-	
4	Magnisium Hardness	-	105.2±1.5	130.0±3.0	65.5±4.5	75.5±3.2	-	
5	Calcium	-	63.24±1.2	77.6±1.2	70.08±3.1	67.36±3.7	-	
6	Magnesium	-	25.66±0.5	31.72±0.4	16.0±0.7	18.34±0.7	-	
7	Dissolved Oxygen	-	5.5±0.8	3.1±0.2	4.2±0.3	2.7±0.7	-	
8	Total Solid	4104±2.8	1227.2±3.2	1238.4±3.5	944±3.8	984±2.8	-	
9	Total Dissolve solids	3270.4±4.5	992.8±6.4	903.2±4.9	792.0±3.0	872.0± 2.9	-	
10	Total Suspended Solids	833.6±5.4	234.4±6.9	335.2±6.3	192.0±4.8	152.0±7.4	600	350
11	Chloride	-	475.60±1.5	242.82±1.8	218.12±1.4	417.40±2.2	-	-
12	C.O.D.	1834.88±5.3	107.93±3.8	316.65±6.4	140.15±2.9	356.00±4.2	250	-
13	Alkalinity	640±4.0	580±5.0	809±3.4	631±3.7	628±7.5	-	-
14	Electrical Conductivity in µmhos/cm	0.72±0.7	0.18±0.3	0.32±0.2	0.68±0.5	0.10±0.4	-	-
Biological Parameter								
16	E.Coli/100ml	78,000±4.2	70,000±4.7	40,000±7.8	75,000±3.6	70,000±7.9	1000/100 m*	-

*WHO standard.

Conclusion:

The population expansion is the cause of refuse pressure increase, it is the slower rate of planning which unwillingly causing a threat of environment, health and several social challenges, the above mentioned parameters are the indicators of non-compliance of the norms, that should be follow for the sake of better environment, good ecosystem and public health.

Acknowledgement:

Author's are thankful to Head, Department of Environmental Sciences, P.G. College, Ghazipur for providing necessary facilities.

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3/25/2016