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A Study Of The Effectiveness Of Sewage Treatment Plants In Koshi River (Barrage) In Ramnagar, Nainital (Uttarakhand)

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Abstract

This kind of monitor exploration is common. The purpose of the study was to estimate and monitor the physico-chemical properties of drain water at the input and output of the stps as well as the stps themselves the average concentrations of the parameters at the intake are pH 6.8, TSS 149.6 DO 0.50, COD 185, BOD 82.6 , Temperature 24.2 ,NH4N 18.25,TN 7.3 and phosphorus 0.52 .The following outlet values were determined based on the wastewaters acceptability Temperature 19.0,NH4N 0.416, TN 0.48, pH 7.6, TSS 5.60, DO 0.208, COD 34.3, BOD 5.64 and Phosphorus 19.0. Lastly agglomerative hierarchical clustering techniques were used to examine the similarities among the sewage treatment plants the results show that after treatment at koshi river ramnagar effluent quality has considerably improved.

Keywords: Sewage treatment plant, Wastewater, Water quality, Pollution, Monitoring, Ramnagar

Introduction

In numerous nations, it’s not unexpected practice to release untreated sewage water into water ways; in India, in any case, there is a critical defer between the development of homegrown wastewater and its treatment. Sewage or wastewater is the normal term used to depict the wastewater let out of homegrown offices like homes, establishments, and business tasks. Normally, homegrown and public wastewater is comprised of 99.9% water and 0.1% suspended, colloidal, and disintegrated solids. These solids are principally natural in nature since they contain the most noteworthy convergence of carbon compounds, including human waste, paper, vegetable matter, and so forth Introduction .They additionally contain microbes that drain the oxygen in water bodies. Moreover, the contamination of water bodies and land that is inundated by wastewater is expanded when modern emanating is joined with metropolitan rubbish. The emanating isn't straightforwardly used for drinking since it contains particles, metals, and microorganisms that, assuming their focuses or numbers surpass as far as possible, could be perilous to people. Accordingly, groundwater is ceaselessly

separated from the beginning fulfill the rising need for crisp drinking water as well concerning different purposes like washing, planting, and different purposes. In this manner, groundwater is ceaselessly separated from the beginning fulfill the rising need for crisp drinking water as well with respect to different purposes like washing, cultivating, and different purposes. This causes various ecological and cultural issues nearby. For certain reasons, the treated wastewater might be utilized rather than groundwater. Physical, synthetic, and natural strategies are required for sewage water treatment. Various prior research have exhibited that after sewage water has been dealt with, sewage slime frames that actually contain more prominent measures of natural contaminations are applied to agrarian soils (Singh *et al.* 2004; Blunt Laturnus *et al.* 2007). Anaerobic cycles are helpful as the principal method for feasible home wastewater treatment, as indicated by a concentrate by Foresti *et al.* (2006). Since the beginning of homegrown sewage treatment (DST), anaerobic digesters have been liable for the evacuation of a huge part of natural matter (mineralization of waste muck) in ordinary oxygen consuming sewage treatment plants. Starting with the primary family sewage treatment (DST) frameworks.

Study Area:-

Ramnagar is arranged at scope 29.390904 and Longitude 79.131741. Right now, 3.500 Million liters of sewage are created every day (mld).While Ramnagar's sewage treatment offices have a consolidated limit of 7 (mld). The principal channels in Ramnagar are where the leftover 40% of untreated sewage tracks down its direction into the Koshi Stream. Which transports sewage, the nature of the stream water is declining and it is right now unsuitable for drinking and agrarian use. Around 75% of the populace is adjusted by sewage offices. Enormous parts of the Ramnagar region come up short on sewage framework. Both authentic and illegal settlements, including resettlement camps. The commonplace strategy for assessing wastewater age depends on 80% of the water input. Unrealistic in a spot like Ramnagar. Fundamental channels moving sewage from the Ramnagar district are situated at a few places. The Koshi Stream's aggregated contamination has been attempted to be contained. Alongside the channels, the making of these open channels brings about awful scent, unfortunate bed quality, and ground water contamination. The Koshi Stream gets the inbound waste water.

Fig.1; Sewage treatment plant (STPs) is located at Ramnagar, Nainital

Materials and Methods- - In 2023, a sum of 9 examples were accumulated for the examination. These nine examples related to similar STP's seven bays and seven outlets. From tests of unfiltered water, the pH and not entirely set in stone. Utilizing a Rachho pH Meter (model number 123), the pH was estimated. TDS and conductivity were estimated utilizing a Systronics conductivity meter. The American General Wellbeing Affiliation (APHA, 1995) potentiometric titration strategy was utilized to decide the bicarbonate content. Nitrate was determined utilizing the brucine technique. The response among nitrate and brucine brings about a yellow tone, whose force can be checked at 410 nm. The method works with tests that reach in saltiness from incredibly low to extremely high. Utilizing turbid metric examination, still up in the air. The assurance of sulfate could be hampered by suspended particles and the example's regular tone. Filtration is a strategy for eliminating suspended material. The fruitful precipitation of barium sulfate might be hampered by the presence of silica more than 500 mg/l and huge measures of natural garbage.

Result-According to the results, the sources of ammonia concentration in inlet and outlet wastewater samples ranged from 63.4 to 54.3 mld with an average of 5.10 to 4.52 mld, phosphorus sources ranged from 6.3 to 7.8 mld with an average of 0.5 to 0.65 mld, nitrogen sources ranged from 88 to 5.6 mld with an average of 7.3 to 0.416 mld, and sources of BOD inlet and outlet 99 to 67.7 mld with an average of 82.6to 5.64 mld, source of COD in inlet and outlet 220 to 412mld with an average of 184 to 34.3mld, source of DO in inlet and outlet 6.1 to 2.5 with an average of 0.50 to 0.20mld, source of TSS in inlet and outlet 146.6 to 67.3mld with an average

5.60 to 149.6 and source of pH in inlet and outlet 81.36 to 92.38mld with an average 6.81 to 7.6 mld. The statistical correlation between different Inlet hydrological parameters are shown in table (3) PH is positively correlated with water TSS (r=0.07054, P<0.05), COD (r=0.4505, P<0.05), DO(r= 0.027, P<0.05), Temperature (r=0.781, P<0.05). PH is negatively correlated with TN(r=-0.558, P<0.05), NH4N(r=-0.524, P<0.05) Phosphorus (r=-0.510, P<0.05).TSS positively correlation with COD(r=0.055,P<0.05),BOD(r=0.106,P<0.05)), Temperature (r=0.441,P<0.05) and Phosphorus (r=0.290,P<0.05).Negatively correlated with NH4N (r=-0.126,P<0.05),TSS (r=-0.141,P<0.05). DO positively correlated with COD (r=0.426,P<0.05),TN(r=0.061,P<0.05) and Phosphorus (r=0.384,P<0.05).Negatively correlated with BOD(r=-0.074,P<0.05) ,Tem.(-0.296,P<0.05).COD positively correlation with BOD(r=0.322,P<0.05),Tem.(r=0.056,P<0.05)and TN(r=0.137,P<0.05)Negatively correlation with NH4N(r=-0.120,P<0.05)Phosphorus(r=-0.578,P<0.05) .BOD positively correlation with TN(r=0.481,P<0.05) and Tem.(r=0.303,P<0.05) Negatively correlation with Phosphorus(r=-0.396,P<0.05),NH4N(r=-0.120,P<0.05). Temperature positively correlation with NH4N(r=0.481, P<0.05), negatively correlation with Phosphors (r=-0.120, P<0.05).NH4N positively correlation with TN (r=0.993, P<0.05) Phosphorus(r=0.452, P<0.05). TN positively correlation with Phosphorus (r=0.464, P<0.05). The statistical correlation between different outlet hydrological parameters are shown in table (4) PH positively correlation with DO (r=0.638,P<0.05)COD(r=0.386, P<0.05),NH4N(r=0.253, P<0.05) and TN(r=0.338, P<0.05).Negatively correlation with TSS(r=-0.075,P<0.05),Temperature(r=-0.067,P<0.05)and Phosphorus(r=-0.355,P<0.05). TSS positively correlation with COD (r= 0.174, P<0.05), BOD (r=0.633, P<0.05), Temperature(r= 0.662, P<0.05) and NH4N (r=0.069, P<0.05).Negatively correlated with DO (r=-0.072, P<0.05), Phosphorus (r=-0.163, P<0.05). DO positively correlation with COD(r=0.434, P<0.05), TN(r=0.022, P<0.05). Negatively correlated with BOD(r=-0.375, P<0.05), Temperature(r=-0.039, P<0.05), NH4N(r=0.253, P<0.05) and Phosphorus (r=-0.052, P<0.05). COD positively correlation with BOD(r= 0.214, P<0.05), NH4N(r=0.058, P<0.05) and TN(r=0.483, P<0.05). Negatively correlated with Temperature (r=-0.041, P<0.05), Phosphorus (r=-0.179, P<0.05). BOD positively correlation with Temperature (r= 0.361, P<0.05), NH4N(r=0.572, P<0.05) and TN(r=0.410, P<0.05). Negatively correlated with Phosphorus (r=-0.159, P<0.05). Temperature positively correlation with TN (r= 0.437, P<0.05),). Negatively correlated with NH4N (r= -0.025 P<0.05), Phosphorus (r=-0.363, P<0.05). NH4N positively correlation with TN(r= 0.032, p<0.05).Negatively correlated with Phosphorus (r=-0.450, P<0.05). TN Negatively correlated with Phosphorus (r= -0.300, P<0.05).

Table: 1 – Inlet water values in STP Plant

Months	pH	TSS	DO	COD	BOD	TEM.	NH4N	TN	PHOSPHORUS
January	6.7	138	0.3	180	85	24.3	15.2	6.2	0.6
February	6.2	141	0.3	170	75	20.09	19.9	8.0	0.6
March	6.32	116	0.8	178	82	19.3	27.6	11.3	0.6
April	6.9	124	0.7	180	81	24.3	12.2	4.9	0.5
May	6.8	128	0.8	184	83	25.3	14.8	5.9	0.4
June	6.97	178	0.7	222	84	24.6	19.6	7.8	0.5
July	7.2	181	0.5	202	86	23.8	16.4	6.6	0.3
August	7.04	170	0.6	192	82	24.4	16.3	6.7	0.5
September	7.06	174	0.3	176	84	27.1	20.7	8.3	0.6
October	7.09	164	0.4	172	75	26.8	16.8	6.7	0.6
November	6.95	146	0.3	180	95	26.3	18.2	6.8	0.5
December	6.6	136	0.4	172	80	25.1	21.3	8.8	0.6

Table: 2 – Outlet water values in STP Plant

	pH	TSS	DO	COD	BOD	TEM.	NH4N	TN	PHOSPHORUS
January	7.73	4.9	0.2	36	4.9	17.7	0.3	0.4	0.7
February	7.70	5.4	0.2	32	5.4	17.7	0.3	0.4	0.7
March	7.67	5.7	0.3	40	5.5	17.7	0.3	0.5	0.8
April	7.74	5.8	0.2	28	5.8	19.0	0.4	0.5	0.8
May	7.44	5.6	0.1	28	5.9	19.5	0.4	0.4	0.8
June	7.65	5.7	0.3	36	5.7	20.1	0.3	0.6	0.6
July	7.78	6.2	0.2	40	5.7	22.0	0.4	0.6	0.6
August	7.54	5.8	0.1	28	5.8	20.3	0.4	0.5	0.5
September	7.76	5.5	0.3	36	5.6	19.6	0.5	0.4	0.6
October	7.79	5.2	0.2	32	5.8	18.3	0.6	0.4	0.6
November	7.95	5.7	0.3	36	5.6	18.9	0.5	0.5	0.5
December	7.63	5.8	0.1	40	6.0	17.9	0.6	0.6	0.6

Table.3; Showing correlation between different inlet physico-chemical parameters for Sewage treatment plant in Koshi River (Barrage) Ramnagar, Nainital

	pH	TSS	DO	COD	BOD	TEM.	NH4N	TN	PHOSPHORUS
pH	1								
TSS	0.705455	1							
DO	-0.02733	-0.28075	1						
COD	0.45058	0.558688	0.426839	1					
BOD	0.358859	0.106982	-0.07458	0.322985	1				
TEM.	0.781709	0.441999	-0.29678	0.056283	0.30354	1			
NH4N	-0.52475	-0.12622	0.03107	-0.12051	-0.06332	-0.48192	1		
TN	-0.54568	-0.14188	0.061374	-0.12795	-0.13152	-0.51294	0.993743	1	
PHOSPHORUS	-0.51034	-0.2904	-0.38449	-0.5789	-0.39629	-0.12051	0.45292	0.464786	1

Table.4; Showing correlation between different Outlet physico-chemical parameters for Sewage treatment plant in Koshi River (Barrage) Ramnagar, Nainital

	pH	TSS	DO	COD	BOD	TEM.	NH4N	TN	PHOSPHORUS
pH	1								
TSS	-0.07585	1							
DO	0.638722	-0.07204	1						
COD	0.38672	0.174634	0.434821	1					
BOD	-0.308	0.635039	-0.37551	-0.21497	1				
TEM.	-0.06729	0.662077	-0.03972	-0.0418	0.361151	1			
NH4N	0.253955	0.069698	-0.22285	0.058365	0.572112	-0.02569	1		
TN	0.030824	0.760882	0.022887	0.483138	0.410334	0.437653	0.032564	1	
PHOSPHORUS	-0.35507	-0.16395	-0.05273	-0.17953	-0.15998	-0.36349	-0.45014	-0.3005	1

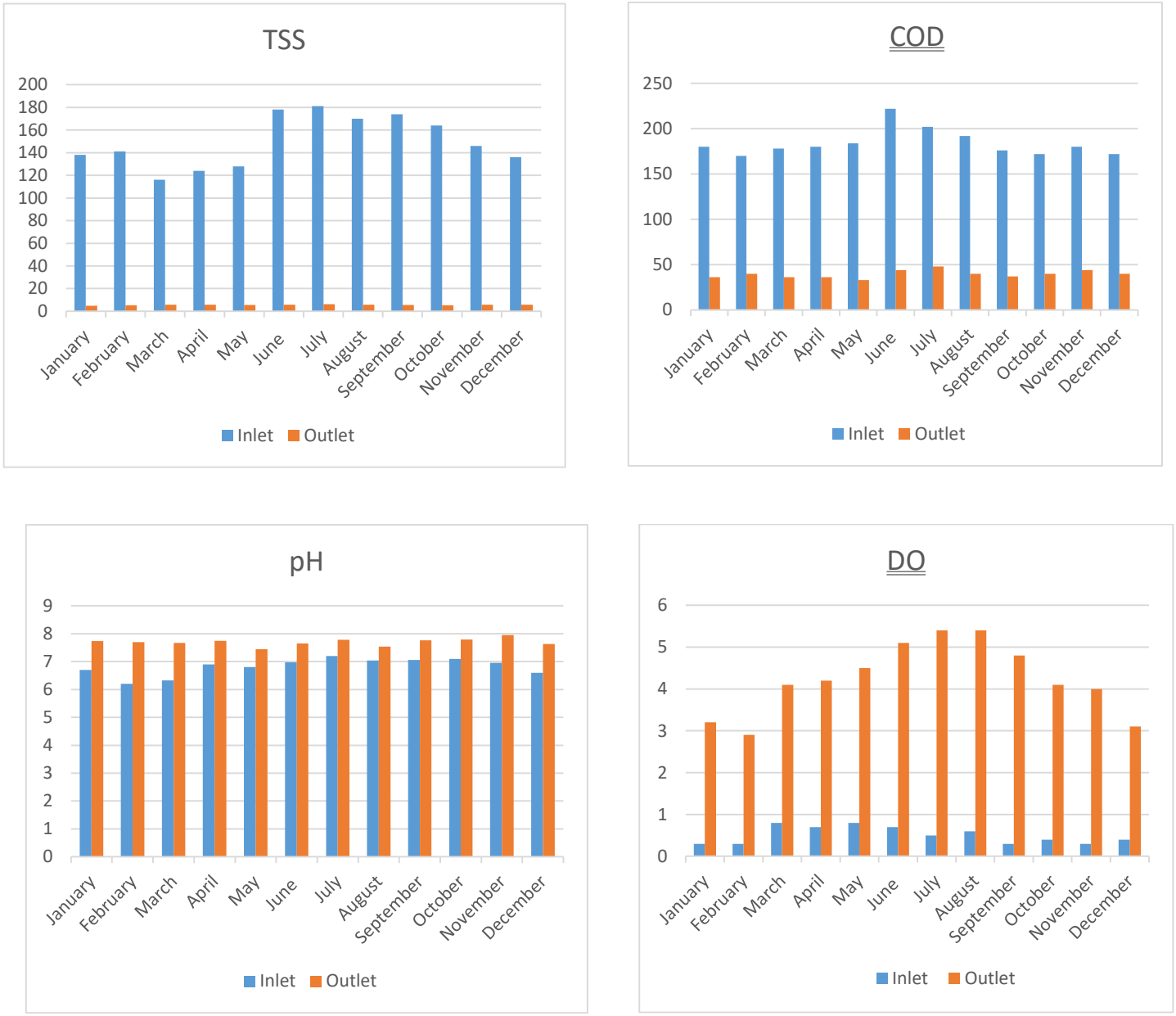
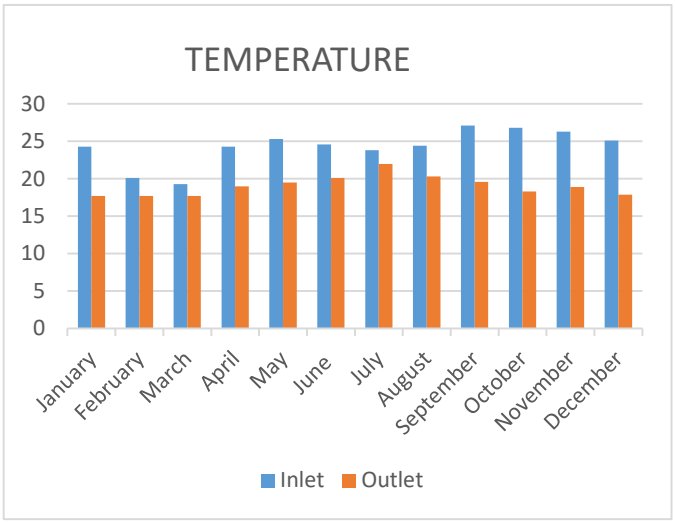
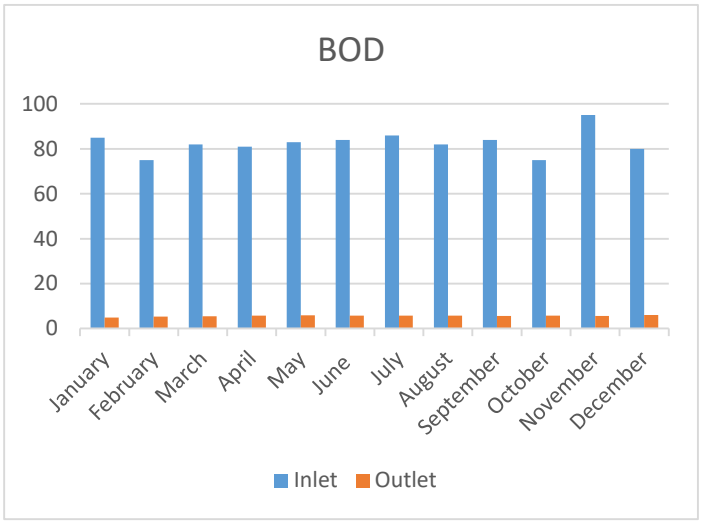
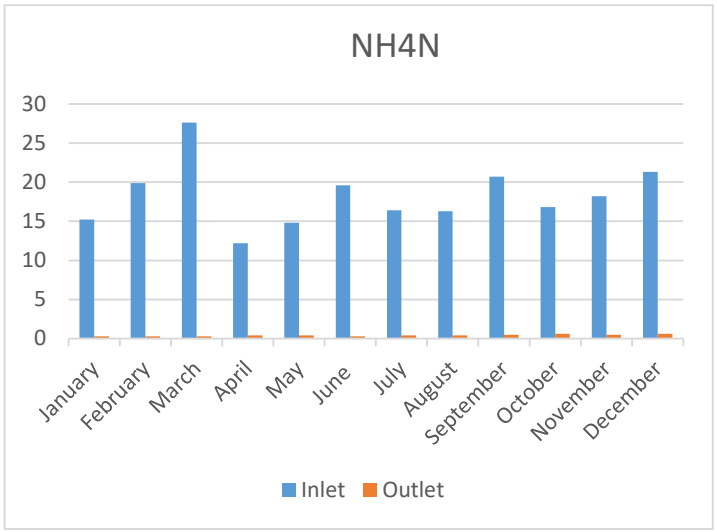
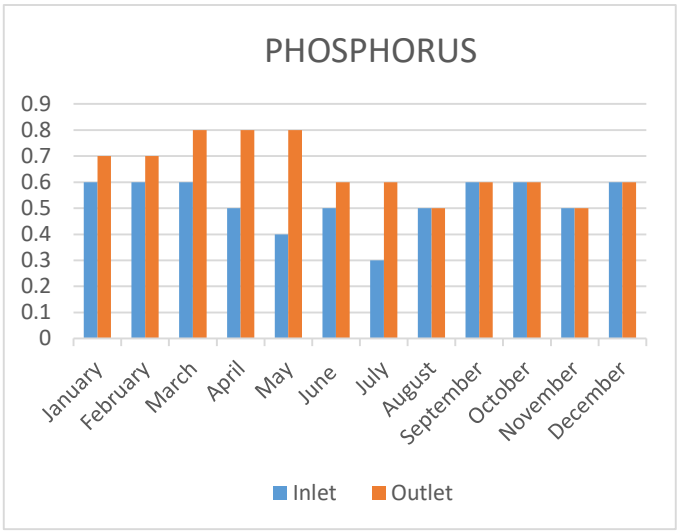


Fig. Inlet and outlet water values in STP plant









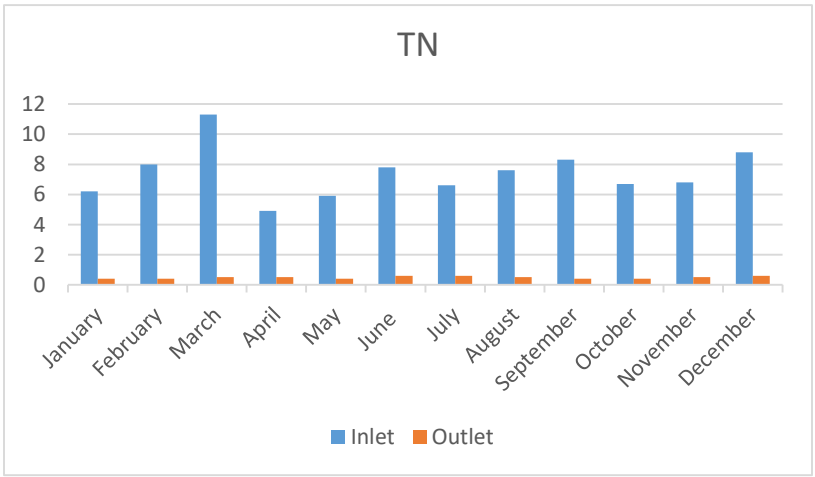


Fig.3; Inlet and outlet water values in STP plant

Conclusion

For many years, the Koshi River was contaminated by the debris from this city's drains. These drains are currently protecting the Koshi River from pollution, thanks to the facility. The future water needs will be greatly aided by this plant, which will also alleviate the current clean water deficit.

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