

Water Quality Assessment of Yamuna in Baghpat Region

Ajay Roy^{1*} Vashwati Ghosh²

¹ M. Tech Scholar, Civil Engineering, Greater Noida Institute of Technology, Greater Noida, U.P., India

² Assistant Professor, Civil Engineering, Greater Noida Institute of Technology, Greater Noida, U.P., India

Abstract – Here we are studying the quality analysis of Yamuna river in different location in India. Here testing the different parameters of water that is pH, Dissolved Oxygen (as O₂) Min, Biological Oxygen Demand (Max.) BOD, Chemical Oxygen Demand (COD), Total Dissolved Solid, Total Hardness (as CaCO₃), Calcium (as Ca), Magnesium (as Mg), Alkalinity, Conductivity, Turbidity, Total Suspended Solid and Temperature .this analysis we are doing collecting the water in different location in Yamuna rivers testing the all parameters, we are selecting some location of Yamuna river that is Goripur Yamuna , Baghpat District Magistrate, Palla Village, katha village, Sonia Vihar and Wazirabad Mandiwala Barrage. Finally, we are finding the water quality index. Water quality index must be less than 100 is more suitable in Drinking if is greater than 100it is unsuitable in drinking.

Keywords: Water Quality, Parameters, Water Quality Index, Villages.

-----X-----

INTRODUCTION

Water quality from streams is of extensive significance on the grounds that these water assets are commonly utilized in an assortment of ways, for example, household and private water supplies, farming (water system), hydroelectric force plants, transport and framework, the travel industry, diversion, and different methods for utilizing water for human or monetary purposes [1]. Atmosphere attributes significantly affect the variety of surface water quality in spatio-transient terms. Breaking down water quality represents a major issue for the water security of numerous zones in different climatic classes. The geospatial inconstancy of water assets and socio-financial weights present complex difficulties to reasonable water asset the board to meet household, farming and mechanical water requests [2].

At present, the commonly used methods of water quality assessment include index method [1], the analytical hierarchy process. fuzzy method, gray evaluation method and artificial neural networks. As the complexity of water systems, water quality impacted by many factors, there is certain limitation in these methods [3]. Now, grey system theory has been rapidly developed and is being used in many areas, such as in the society, economy, agriculture, industry, traffic, ecology and so on. A number of edge disciplines such as grey hydrology, grey geology, grey breeding, regional economic analysis

of grey, and grey philosophy came into being [4]. Significance of organic observing in stream quality appraisal was surely known, and different frameworks were created in the twentieth century. Be that as it may, a large portion of them depended on the scoring framework, and in River Quality Assessment, consequent utilization of Artificial Intelligence (AI) was started. AI has wide scope in the issue of river quality assessment and few systems have been developed to model human ways of reasoning and find the quality of river water from ecological data[5].

Water quality assessment is an evaluation means that, through a certain degree of mathematical methods and means, the regional water environmental factors are described quantitatively[6]. The differences between these approaches result from the systems and charging mechanisms applied to limit discharge. These distinctions, nonetheless, are likewise reflected in the procedures received for peril appraisal and observing of releases to water, for example regardless of whether it is centered around the effluents or the accepting water; both have their points of interest and burdens A consolidated methodology can utilize the advantages. The whole bowl is separated by the positioning rule and field examination as 22 observing areas and 10 contamination pointers. Utilizing SPSS delicate, paper investigation on the fundamental contamination markers and the significant

contamination commitment segments are utilized in the principle segment examination strategy. The outcome shows that four primary segments extricated reflect 91.81 percent of data on crude variables[8]. Evaluating changes in surface water quality in various occasions through the span of one year is a significant perspective for surveying the fleeting variety of waterway contamination because of the common or anthropogenic contribution of point and nonpoint sources into the step by step disintegrating water environment[9]. A River Quality Monitoring Program (RQMP) could be considered based on existing water quality data, benchmarks, anthropological impacts and the supposed use criteria. The information checked assistance the organizers create different natural projects at both national and worldwide level[10].

EXPERIMENTAL SECTION

Study area

The Baghpat region is situated on the banks of the Yamuna River, at 28° 57' N Latitude and 77° 13' E Longitude. The current study was planned by selecting those towns located in the district of Baghpat. The samples were collected in Goripur, Baghpat Distt Megistrate, Palla Village, Katta Village, Sonia vihar, Wazirabad Mandiwala Barrage from the Six locations. The literature survey showed that the hand pumps did not make any studies on Surface Water. Therefore the present study has been undertaken.

a fridge for assurance of both physical substance and natural parameters, and brought to the research facility. The examples were kept in the cooler at 40 ° C preceding investigation. Twofold refined water was utilized to make all the arrangements and reagents. China's have been cleaned with Thomas Baker Thromaklin's fluid cleanser followed by refined water and dries into the stove before examination.

Water sample analysis

The pH and electrical conductivity were measured using a Systronic digital pH meter (model 335) with a precision of ± 0.01 and a Systronic digital conductivity meter (model 304) with a precision of ± 0.01. Century TDS meter used to determine TDS or Graviometric Method. Total hardness was measured using the method of titration with EDTA. Total Alkalinity was measured by method of titration. Chloride was determined using the silver nitrate method using potassium Di-chromate Method Used as for COD and was calculated in mg / L terms. Gravimetric Methods also used . DO was estimated utilizing the titration technique utilized by Winkler Azide. BOD is measured using an incubation method of 3 days. The physico-chemical analysis was performed using standard methods.

WQI METHOD:-

The WQI method is a powerful method tool that enables water quality to be easily communicated to the public especially in policy makers. It is an unambiguous instrument that permits the combination of water parameters that are viewed as essential to water quality as needs be. Right now, WQI, determined utilizing the weighted number juggling record technique, is utilized to decide the impact of waste dumping on the prompt ground and surface water bodies to the dumpsite.

The WQI is given as;

$$WQI = \frac{\sum_{i=1}^n q_i w_i}{\sum_{i=1}^n w_i}$$

Where

q_i = quality rating of the I the water quality parameter.

W_i = unit wait of the I the water quality parameter

$$\sum_{i=1}^n w_i = 1$$

$$q_i = 100 \left(\frac{v_i - v_{io}}{s_i - v_{io}} \right)$$

V_i = estimated value of the i the parameter

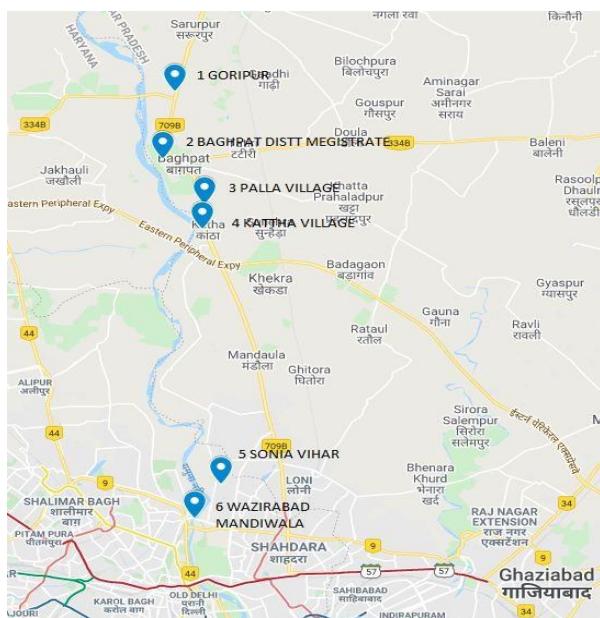


Fig 1: Samples locations in a Google Yamuna Map

Collection of water samples

During a three-month post-monsoon period, water samples from various zones were collected and analysed. The gathered examples were put away in

Vi0 = ideal value of the I the parameter

Si = standard permissible value of the paraments

In most cases vi0 =0 Except for PH=7 and D0=14.6

The unit weight (wi)

$$W_i = \frac{K}{s_i}$$

Where $k = \frac{1}{\sum_{i=1}^n \frac{1}{s_i}}$

Observation and result: -

The WQP provides various input parameters on the form including location, site, sampling and date parameters to filter and customize the returned results. Restrained values of the WQP and WHO guidelines are expressed below. The parameters pH, dissolve oxygen(DO), BOD, COD, TDS, TSS, Calcium Magnesium, Alkalinity, Conductivity, Turbidity, Temperature were calculated. The detailed of the results are expressed in Table 1.

Table 1: restrained values of the WQP and WHO guidelines

MEASURED VALUES RESULTS										TOLERANCE LIMITS AS PER IS-2296			
PARAM ETERS	TEST METH	S W 1	S W 2	S W 3	S W 4	S W 5	S W 6	U N I T	CL ASS -A	CL ASS -B	CL ASS -D	CL ASS -E	
PH	IS-3025	7.33	8.13	7.96	6.97	7.95	7.52	-	(6.5-8.5)	(6.5-8.5)	(6.5-8.5)	(6.5-8.5)	
DISSOLV E OXYGEN (O2)	IS-3025	7.9	7.8	7.6	7.8	7.4	7.2	m g/ L	6.0	5.0	4.0	-	
BOD	IS-3025	8.1	8.2	10.20	8.7	9.0	12.0	m g/ L	2.0	3.0	-	-	
COD	IS-3025	32	32	40	36	44	56	m g/ L	-	-	-	-	
TOTAL DISSOLVE SOLIDS	IS-3025	504	474	432	468	594	657	m g/ L	500	-	-	2100	
TOTAL HARDNE SS AS (CaCO3)	IS-3025	244	224	220	252	248	256	m g/ L	300	-	-	-	
CALCIU AS (Ca)	IS-3025	84.8	60.8	48	54.4	81.6	86.4	m g/ L	80	-	-	-	
MAGNESI UM AS (Mg)	IS-3025	7.77	17.49	24.3	24.18	10.69	6.80	m g/ L	24	-	-	-	
ALKALINITY	IS-3025	208	200	184	184	200	200	m g/ L	-	-	-	-	
CONDUC	IS-3025	801.5	753.3	687.3	745.3	844.0	1043.7	µS/cm	-	-	1000	2250	
Turbidity	IS-3025	5.8	3.7	7.6	13.8	9.7	18.6	NTU	-	-	-	-	
TSS	IS-3025	16	12	18	30	38	66	Mg/L	-	-	-	-	
Temperature	IS-3025	17.4	17	17.8	17.5	14	13	°C	-	-	-	-	

Calculated values of QI guidelines are expressed below. The parameters ph, dissolve oxygen (DO), BOD, COD, TDS, TSS, Calcium Magnesium, Alkalinity, Conductivity, Turbidity, Temperature were calculated. The detailed of the results are expressed in Table 2.

PARAM ETERS	si	1/si	UNIT WEIG HT (Wi=K/si)	SW1(qi)	SW2 (qi)	SW3 (qi)	SW4 (qi)	SW5 (qi)	SW6 (qi)
PH	8.5	0.117	0.174	22	75.33	64	2	63.33	34.66
DO	6.0	0.166	0.247	77.90	79.06	81.39	79.06	83.72	86.04
BOD	3.0	0.333	0.495	270	273.33	340	290	300	400
TDS	2100	0.000476	0.0007	24	22.57	20.57	22.28	28.28	31.28
HARDNE SS AS CaCO3	300	0.00333	0.004	81.33	74.66	73.33	84	82.66	85.33
CALCIU M	80	0.0125	0.018	106	76	60	68	102	108
MAGNESI UM	24	0.0416	0.061	32.37	72.87	101.25	100.75	44.54	28.33
CONDUC TIVITY	2250	0.000444	0.0006	35.62	33.48	30.54	33.12	41.95	46.38
		1/si=0.673	Wi=1						
		K=1/1/Si							
		F=1.485							

Calculated values of Water quality Index (WQI) were analyzed. Here the different parameters value in different location, the parameters i.e., pH, Dissolved Oxygen (as O2) Min, Biological Oxygen Demand (Max.) BOD, Chemical Oxygen Demand (COD), Total Dissolved Solid, Total Hardness (as CaCO3), Calcium (as Ca), Magnesium (as Mg), Alkalinity, Conductivity, Turbidity, Total Suspended Solid and Temperature were analyzed for SW1, SW2, SW3, SW4, SW5 and SW6. Total WQI was high in SW6 is 229.342 and Lowest in SW1 is 160.963. (Table 3).

Table No 3: CALCULATED VALUES OF WQI (Qiw)

Parameters	SW1	SW2	SW3	SW4	SW5	SW6
PH	3.828	13.107	11.136	0.348	11.019	6.03
DO	19.241	19.527	20.103	19.527	20.678	21.251
BOD	133.65	135.298	168.3	143.55	148.5	198
TDS	0.0168	0.0157	0.0143	0.0155	0.0197	0.0218
Total hardness	0.325	0.298	0.293	0.336	0.330	0.341
Ca	1.908	1.368	1.08	1.224	1.836	1.944
Mg	1.974	4.445	6.176	6.145	2.716	1.728
Conductivity	0.021	0.020	0.018	0.019	0.025	0.027
Total WQI=	160.963	174.078	207.120	171.164	185.123	229.342

Average WQI

$$= \frac{SW1 + SW2 + SW3 + SW4 + SW5 + SW6}{\text{Total no of samples}}$$

$$= \frac{160.963 + 174.078 + 207.120 + 171.164 + 185.123 + 229.342}{6}$$

$$= \frac{1127.79}{6}$$

=187.965

=188>100 As we comparing this value with table 4.1 Which is unsuitable.

The above table we can see the different parameters value in different location, the parameters ARE pH, Dissolved Oxygen (as O2) Min, Biological Oxygen Demand (Max.) BOD, Chemical Oxygen Demand (COD), Total Dissolved Solid, Total Hardness (as CaCO3), Calcium (as Ca), Magnesium (as Mg), Alkalinity, Conductivity, Turbidity, Total Suspended Solid and Temperature

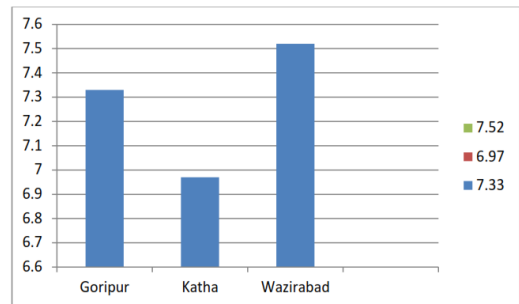


Figure 1: Graph diagram of PH

The figure 1 shows the Graph diagram of PH, here we are comparing the PH value of three sampling

location and it is Goripur Yamuna, Katha Village and Wazirabad Barrage. Here we can see high PH value is in Wazirabad location and low PH value in Katha Village location, the PH value is good in Katha location and the value is 6.97.

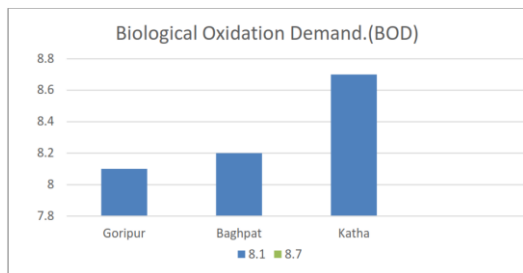


Figure 2: Graph diagram of biological oxygen demand

The figure 2 shows the Graph diagram of biological oxygen demand, here we are comparing the biological oxygen demand value of three sampling location and it is Goripur Yamuna, Baghpat and Katha Village. Here biological oxygen demand high in Katha village and low in Goripur Yamuna biological oxygen demand comparatively better in Goripur Yamuna location.

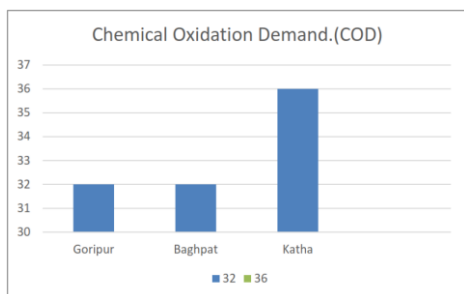


Figure 3: Graph diagram of chemical oxygen demand

The figure 3 shows the Graph diagram of chemical oxygen demand, here we are comparing the chemical oxygen demand value of three sampling location and it is Goripur Yamuna, Baghpat District and baghpat Katha Village. Here chemical oxygen demand high in Katha Village and low in Both baghpat district and also in a Goripur Yamuna. chemical oxygen demand comparatively better in two location.

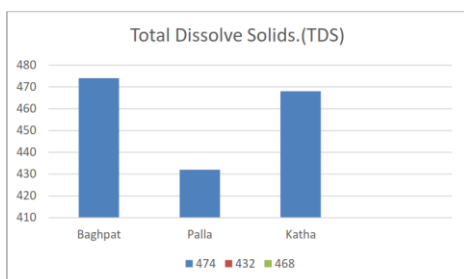


Figure 4: Graph diagram of total Dissolve Solids

The figure 4 shows the Graph diagram of total dissolve solids, here we are comparing the total TDS value of three sampling location and it is Baghpat, Unique vision Palla and Katha Village. Here total Dissolve solids high in Baghpat and low in Palla village. total dissolve solids comparatively better in Unique vision Palla Village location.

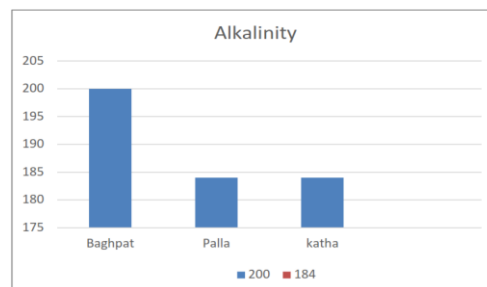


Figure 5: Graph diagram of alkalinity

The figure 5 shows the Graph diagram of alkalinity, here we are comparing the alkalinity value of three sampling location and it is Baghpat District, Palla Village and Katha Village. Here alkalinity high in baghpat District and low in Both Palla and Katha Village alkalinity comparatively better in This Two location. Alkalinity water should be in 20-200mg/L.

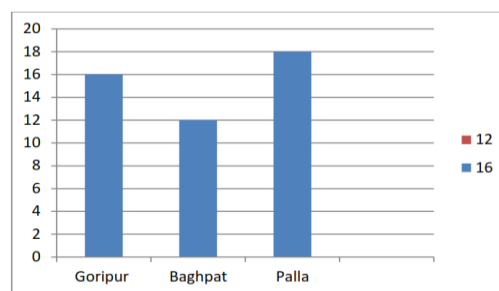


Figure 6: Graph diagram of total suspended solid

The figure 6 shows the Graph diagram of total suspended solid, here we are comparing the total suspended solid value of three sampling location and it is Goripur Yamuna, Baghpat District and Palla village. Here total suspended solid high in Palla Village and low in Baghpat District.

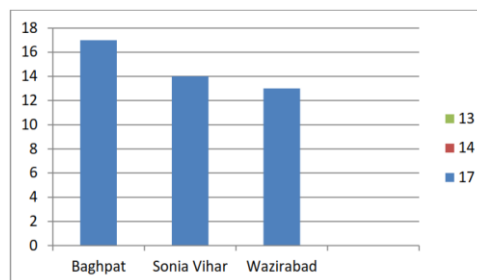


Figure 7: Graph diagram of temperature

The figure 7 shows the Graph diagram of temperature, here we are comparing the temperature value of three sampling location and it

is wazirabad , Sonia vihar and baghpat. Here temperature high in baghpat and low in wazirabad barrage temperature comparatively better in Wazirabad Barrage location.

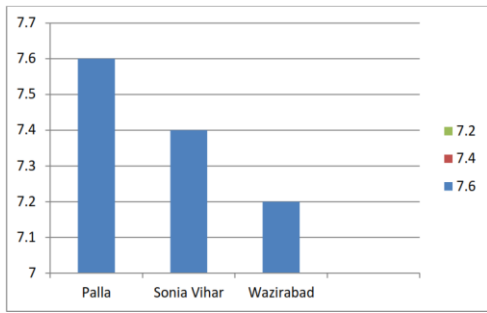


Figure 8: Graph diagram of dissolved oxygen

The figure 8 shows the Graph diagram of liquefied oxygen, here we are comparing the dissolved oxygen value of three sampling location and it is wazirabad barrage, Sonia vihar and Palla village. Here dissolved oxygen high in Palla Village and low in Wazirabad.

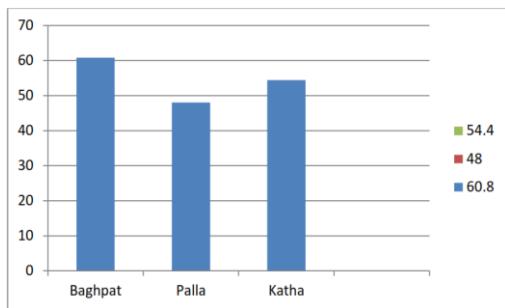


Figure 9: Graph diagram of calcium

The figure 9 shows the Graph diagram of calcium, here we are comparing the calcium value of three sampling location and it is Palla Village, Katha Village and baghpat District. Here calcium high in baghpat and low in Palla village.

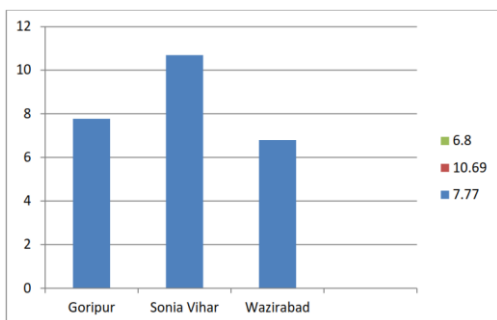


Figure 10: Graph diagram of magnesium

The figure 10 shows the Graph diagram of magnesium, here we are comparing the magnesium value of three sampling location and it is wazirabad barrage, Sonia vihar and Goripur Yamuna. Here magnesium high in Sonia Vihar and low in

Wazirabad. magnesium comparatively better in Wazirabad Location.

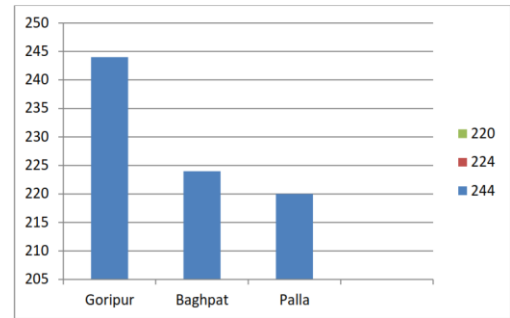


Figure 11: Graph diagram of Total Hardness as Caco₃

The figure 11 shows the Graph diagram of conductivity, here we are comparing the conductivity value of three sampling location and it is Palla Village, Goripur Yamuna and baghpat District. Here Total Hardness high in Goripur and low in Palla Village.

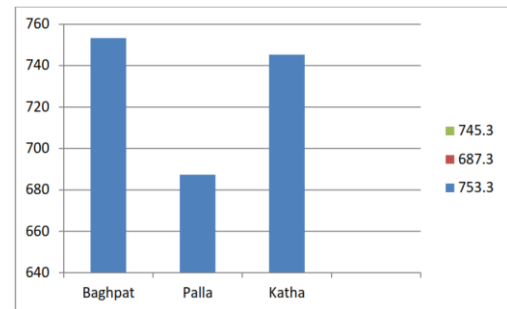


Figure 12: Graph diagram of conductivity

The figure 12 shows the Graph diagram of conductivity, here we are comparing the conductivity value of three sampling location and it is Palla Village, Katha Village and baghpat District. Here conductivity high in Baghpat and low in Palla Village.

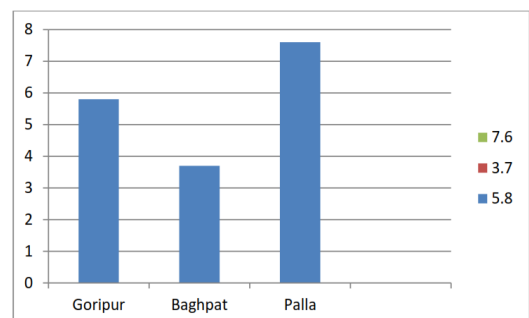


Figure 13: Graph diagram of turbidity

The figure 13 shows the Graph diagram of turbidity, here we are comparing the turbidity value of three sampling location and it is Goripur Yamuna, Palla

Village and baghpat District. Here turbidity high in Palla Village and low in baghpat.

CONCLUSION:

Hence here we are studied the quality analysis of Yamuna river in different location in India. Here we are selecting some location of Yamuna river. The locations are Goripur Yamuna, Baghpat District, Palla Villagel, katha village, Sonia Vihar and Wazirabad Mandiwala Barrage. Here we are finding the different parameters that is pH, Dissolved Oxygen (as O₂) Min, Biological Oxygen Demand (Max.) BOD, Chemical Oxygen Demand (COD), Total Dissolved Solid, Total Hardness (as CaCO₃), Calcium (as Ca), Magnesium (as Mg), Alkalinity, Conductivity, Turbidity, Total Suspended Solid and Temperature. finally we are finding WQI using equation when the WQI is less 100 it is good for drinking and it is greater than 100 it is not good for drinking, here we are getting the WQI in Yamuna river is 188 so it is greater than the 100 that mean this is not good for drinking. Treatment process should be done there.

SOLUTION:

The current research issues parameters of water quality that yield conservative outcomes. Every pollution stress should be tracked for comprehensive river status. As we see, the Yamuna has become almost extinct in the distinct place in the Baghpat region span and is not appropriate for any kind of specified uses. There should be immediate restauration and treatment process should be done. It takes enough time and flow to self-purify the stretch. Pollution load input should be minimized. One recommendation for this is to channel all point source inlets after Baghpat Region to the width. The keyword is "Control, not prohibition." In future government should take the decision to band garbage waste dubbing in Yamuna river. And treatment this water using different technology after we can use this water for drinking or other use. This water we can use by using some purification or recycling this water that was helpful in future.

REFERENCES:

1. Andreea-Mihaela Dunca et. al. (2018). "Water Pollution and Water Quality Assessment of Major Transboundary Rivers from Banat" Revised 23 January 2018; Accepted 6 February 2018; Published 5 March 2018.
2. Muhammad Mazhar Iqbal et. al. (2018). "Assessment of Water Quality Profile Using Numerical Modeling Approach in Major Climate Classes of Asia" 12 October 2018; Published: 15 October 2018
3. LiuLu et. al. (2011). "Study on Water Quality Assessment of Urban River".
4. Junfei Chen et. al. (2009). "Research on River Water Quality Assessment of Eastern Route of South-to-North Water Transfers Based on Grey Cluster Evaluation Model" November 10-12, Nanjing, China
5. Raza Hasan et. al. (2011). "Artificial Intelligence in River Quality Assessment".
6. Miao Qun et. al. (2009). "Application of Comprehensive Water Quality Identification Index in Water Quality Assessment of River" DOI 10.1109/GCIS.2009.166
7. R. Meza et. al. (2006). "An Intelligent System for Rivers Water Quality Assessment, based on Pollutants Propagation Modeling and Simulation" 1-4244-0361-8/06/\$20.00 ©2006 IEE
8. Pierre Accorsi et. al. (2014). "Hydraulics: Visual Analysis of River Water Quality" 978-1-4799-6227-3/14/\$31.00 ©2014 IEEE
9. Zhang Liping et. al. (2010). "SPSS For Water Quality Assessment Of Beijing Typical River Based On Principal Component Analysis".
10. Wang Jucui et. al. (2011). "Assessment of surface water quality using PCA and FA in Jinghe River of Shaanxi Province, China" 2011 IEEE
11. Olayiwola Oni et. al. (2016). "The Use of water Quality Index method to determine the Potability of surface water and Groundwater in the Vicinity of a Municipal Solid Waste dumpsite in Nigeria".

Corresponding Author

Ajay Roy*

M. Tech Scholar, Civil Engineering, Greater Noida Institute of Technology, Greater Noida, UP, India

royajay785@gmail.com