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Pollution Assessment and Abatement of Ban-Ganga River at Katra Town-J&K

Sunjay Raina[1], and Sandeep Singla[2]

M.Tech Scholar, Department of Civil Engineering, RIMT University, Gobindgarh, Punjab, India
[2]Professor & Head, Department, Department of Civil Engineering, RIMT University, Gobindgarh, Punjab, India

Correspondence should be addressed to Sunjay Raina; skraina2011@gmail.com

ABSTRACT- The Ban Ganga is an important tributary of river Chenab and flows thru the Katra metropolis of Jammu and Kashmir. Katra town is a prime commercial centre for Mata Vaishno Devi and additionally the main source of pollutants for Ban Ganga River & Tawi River. The river has non secular significance for Hindu Vaishnava and different devotees. more than 10 million site visitors make the pilgrimage each yr, and many bathes within the river to cleanse earlier than they go away on the whole journey. Holy Ban Ganga River, which is revered via the devotees and locals as sacred, has been definitely became a nallah where trash is flowing. The Ban Ganga River has been decreased to a -metre huge drain, full of sludge, plastic and litter of pilgrims a few pilgrims also raised worries over ecological degradation on the Trikuta mountain variety due to massive influx of Vaishno Devi pilgrims and alleged felling of trees, which immediately impacts the Ban Ganga River. Locals alleged that brisk developmental activities on the thirteen-km track from the Katra base camp to the cave shrine have been posing an ecological chance to the Trikuta hills and the largest assignment before the Board turned into to hold the ecological balance. They appealed Shrine Board as well as the Governor to take essential initiative to smooth Ban Ganga and feared that if emergency measures are not taken, the river would be dead soon. since the past few decades, Katra metropolis have skilled good-sized increase. the agricultural areas but, tormented by inadequate infrastructure facilities, were unable to address this swelling growth of the city regions a chief physical infrastructure issue that desires to be addressed within the Notified area is the inappropriate and unhygienic disposal of waste water & sewerage via open drains that follow the natural slope of land and its discharge, with none remedy. family who doesn't have septic tank disposes their wastewater directly into drains which reveals its ultimate way into Ban-Ganga or herbal streams placed in the east and south east course of the town. The sewerage is being handled manually by using sweepers in a traditional manner and being thrown in open rain- water drains and herbal nallahs there via growing lot of pollution in town.PHE branch at Jammu is responsible for the distribution of water to the town and all the villages in the Notified region, extracts water from the Ban-Ganga Rivers, chlorinates it and then distributes it to all the city and villages. The great of this water is frequently inferior because of the infection of floor and surface water that consequences from the absence of a STP (Sewage treatment Plant) in the Notified place. the two water treatment plants have insufficient capacity to address the growing demand for water for the horizon 12 months. there is an absence of door-to-door waste collection practices inside the metropolis. most effective road sweeping is being practiced in the metropolis as a number one series of waste. there's a scarcity of scientific waste disposal practices within the town. stable wastes generated from households and accommodations get disposed off alongside Katra - Reasi road without proper treatment. This has created nuisance in surrounding regions and makes difficult to skip from this avenue.

KEYWORDS- Water Quality, Water Quality Analysis, katra, Jammu & Kashmir

I. INTRODUCTION

Water is the most essential requirement for all organisms, and changes in water can cause problems for these organisms to survive. Good water quality is essential for organisms. Water quality can be evaluated by examining its physical and chemical properties. Due to thelarge population and the negligence of people, the water quality of is deteriorating every day [1]. The demand for water for all life, from microorganisms to humans, is increasing day by day, but the unplanned urbanization and industrialization of threatens all water resources, making safe. Providing good drinking water is a serious problem [2]. In recent decades, growth of the world's tremendous industry of has occurred to meet the increasing demand for human civilization,
causing overfishing of available resources and pollution of water, land and air.

As a result, rapid industrialization, urbanization, and anthropogenic activities have caused water pollution, which has led to the fluctuating water crisis. Environmental pollutants from the anthropogenic source can synergistically affect aquatic ecosystems. The measurement of such environmental pollutants can be evaluated physiochemically. Almost 70% of India's water is polluted by discharging domestic and industrial wastewater into natural water resources such as rivers, streams and lakes [3]. Water resource is most often polluted by industrial effluents. When waste from different industry is discharged without proper treatment in to the water. The physical, chemical and biological characteristics of water are altered in such a way that they are not useful for the purpose for which they are intended [4]. From the hydrological cycle, the provision of water both inside the ecosystem, oceans, seas, lakes, and ground water paperwork a huge percentage of the earth's

composition [5]. however, not all water available either in all fore referred to places may be appropriate for human consumption as well as human sports like irrigation of plants, fish farming, or maybe all agricultural sports in totality because of water pollutants [6,7]. it's miles therefore vital that water quality research or evaluation can be achieved to find out whether or not the to be had water from the termed dependable assets is secure for drinking [8, 9] and other makes use of. According to WHO estimates approximately 80% of water pollutants in India is due to home waste. The wrong management of water structures might also motive severe troubles in availability of drinking water [10].

II. SOURCE OF WATER POLLUTION

Usually, the pollutants come from three distinguished sources-

- Excrement discharged into the river,
- Commercial effluents discharged into the river without any pre-treatment and,
- floor run off from agricultural land, where chemical fertilizer, insecticides and manures are used.

This makes the river water risky for consuming and bathing. about 1500 substances had been listed as pollution in freshwater ecosystems and a generalised listing of pollutants consists of acids and alkalies, anions (e.g. sulphide, sulphite, cyanide), detergents, home sewage and farm manure, food processing water, gases chlorine, ammonia), warmness, metals (cadmium, zinc, lead), vitamins (phosphates, nitrates), oil and oil dispersants, organic toxic wastes (formaldehydes, phenols) pathogens, insecticides, polychlorinated biphenyls and radionuclides, similarly to oxidizable substances, home sewage contains detergents, vitamins, metals, pathogens and a spread of other compounds [11].

III. SOLID WASTE MANAGEMENT

There's a scarcity of door-to-door waste collection practices within the metropolis best road sweeping is being practiced in the town as a number one collection of waste. there may be an absence of clinical waste disposal practices within the town. stable wastes generated from families and accommodations get disposed of along Katra - Reasi avenue without proper remedy. This has created nuisance in surrounding areas and makes difficult to skip from this avenue. It is found that villages positioned in proximity to Katra areas have appreciably higher stable waste control structures compared to the ones in addition away.

IV. PARAMETERS OF WATER QUALITY

From all the purposes of water quality evaluation, various parameters must be considered to make pure water is exceptional. Water quality parameters can be categorized into three special categories; physical, chemical, and organic parameters. Physical parameters consist of temperature, pH, colour, flavour, odour, salinity, hardness, turbidity, conductivity (C), total suspended solids (TSS), and overall dissolved solids (TDS). Chemical parameters of water encompass fluorides, irons, organics, vitamins, alkalinity, insecticides, dissolved oxygen (DO), biological oxygen call for (BOD), chemical parameters consist of COD, and disinfection by-products (DBP). Biological parameters of water include micro-organisms, viruses, protozoa, and helminths. These types of three parameters of water exceptional need to be measured in step with the same for water. Normally, state pollution control boards help in sampling and analysis of water best information, whilst the CPCB undertakes scrutiny, processing, and storage of facts, along with the evaluation of statistics for interpretation and preparation of action plans. The tracking is undertaken either on monthly or every year basis.

V. WATER QUALITY INDEX

To begin with, WQI become advanced by using Horton (1965) in united states of America with the aid of selecting 10 maxima normally used water best variables like dissolved oxygen (DO), pH, coliforms, specific conductance, alkalinity and chloride and so on has been extensively applied in European, African and Asian international locations. The assigned weight reflected significance of a parameter for a precise use and has vast impact at the index. Moreover, a new WQI just like Horton's index has also been developed through the institution of Brown in 1970 which changed into based on weights to individual parameter. lately, many modifications have been taken into consideration for WQI concept through various scientists and specialists [12].

WQI is defined as, a rating reflecting the composite influence of distinct water quality parameters. It is one of the only gears to speak information on the quality of water to the involved residents and coverage maker [13].

A Water quality Index (WQI) is a means with the aid of which water first-rate statistics is summarized for reporting to the general public in a regular manner. it's miles similar to the UV index or an air Quality index, and it tells us, in easy terms, what the first-class of ingesting water is from a consuming water deliver. Generally, from literature evaluations it's far pertinent that a 100-point water quality index scale may be divided into numerous stages

Table 1: Water quality and environmental impact assessment

Concentration	Quality	E.I.A
90-100	Excellent	Excellent
80-90	Good	Healthy
50-80	Medium	Alarming
25-50	Bad	Badly Affected
0-25	Very Bad	Very Badly Affected

The WQI measures the scope, frequency, and amplitude of water satisfactory exceedances after which combines the three measures into one rating. This calculation produces a rating among 0 and 100. The better the rating the better the fine of water

VI. USE OF GIS IN TOWN PLANNING

Mapping and GIS packages allow to seize, keep, manipulate, examine, manage, and present all styles of geographically referenced statistics [14]. GIS generation combines database, mapping and statistical strategies to combine georeferenced records into visual shows wherein the relationships, styles and tendencies within the statistics may be more effortlessly recognized [15]. although Mapping and GIS programs do now not rely on GNSS as

sole way for data capture, the widespread of the GNSS technology has allowed for low-price facts acquisition approaches that made GIS technologies to be greater normally used.

VII. RESULTS AND DISCUSSION

Table 1: Calculations for Dissolved Oxygen Content

Concentration	Quality	E. I. A
90-100	Excellent	Excellent
80-90	Good	Healthy
50-80	Medium	Alarming
25-50	Bad	Badly Affected
0-25	Very Bad	Very Badly Affected

Table 2: Calculations for dissolved Oxygen

S. No.	Volume of Sample	Burette readings		Conc. of water sample	Average Conc. of water sample(V1)
		Initial	Final		
1	50 ml	0.0	1.1	1.1	0.96
2	50 ml	0.0	1.0	1.0	
3	50 ml	0.0	1.0	1.0	

Calculations:
N1V1= N2V2
N/40 ×0.96=N2 ×50
N2= 1/40 ×0.96/50×8
N2= 0.025×0.0192×8
N2 =0.0384×10^3=3.84 ppm or 3.84 mg/l
DO= 3.84 mg/l or 3.84 ppm
Where
N1=Normality of NA_2SO_3
N2= Dissolved oxygen content
V1= Conc of Sample
V2= Volume of sample

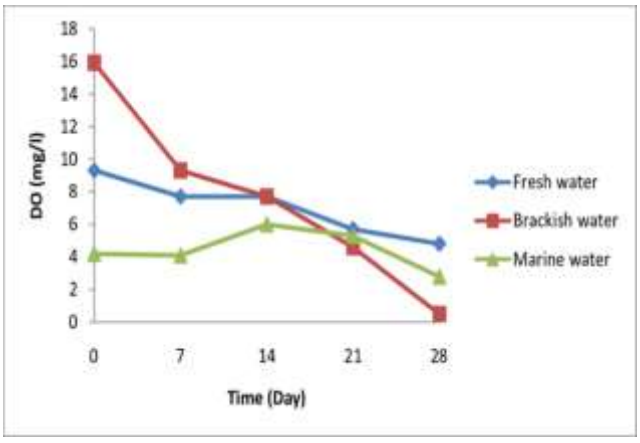

Figure 1: Graph of Dissolved Oxygen

A. Calculations for Chemical Oxygen Demand

Normality of FAS= 0.25 N
Volume of Sample= 10 ml
Initial Blank Reading= 4.5
Final Blank Reading= 4.1
Average mL FAS used for Blank=4.05
Initial Sample reading= 3.0
Final Sample reading =2.9
Average mL FAS used for Sample= 2.95

$$\text{COD mg/l} = \frac{(a-b)\times N\times \text{Milli eq. wt of } O_2 \times 8000}{\text{Volume of Sample}}$$

$$\text{COD mg/l} = \frac{(4.5-2.95)\times N\times 0.25\times 8000}{10}$$

COD mg/l= 310 mg/l
Where,
a = mL FAS used for blank
b = mL FAS used for sample
N = normality of FAS
8 = Milieq wt of O_2

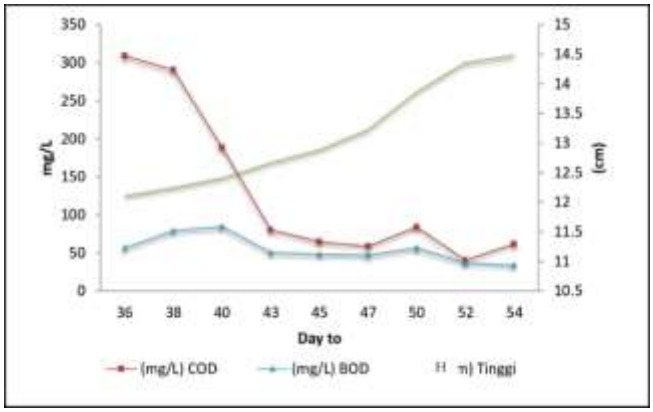

Figure 2: Chemical Oxygen Demand (COD) graph

B. Calculations for Biological Oxygen Demand

DO of Blank before incubation = 95 ml
DO of Sample before incubation = 90 ml
Average Final Value of Blank, (5th day) = 8.9 ml
Average Final Value of Sample (5th Day) = 4.38ml

BOD O2 mg/L = $\frac{(DO_{IS} - DO_{FS}) - (DO_{IB} - DO_{FB} \times 100}{\text{\% Dilution}}$

BOD O2 mg/L = $\frac{(90 - 4.38) - (95 - 8.90) \times 100}{0.042}$ = **159.9mg/l**

where,
DO_{IB}=DO of blank (seeded dilution water) before incubation, mg/L
DO_{IS}=DO of sample immediately after preparation, mg/L
DO_{FB}=DO of blank (seeded dilution water) after incubation, mg/L
DO_{FS}=DO of sample after incubation period, mg/L

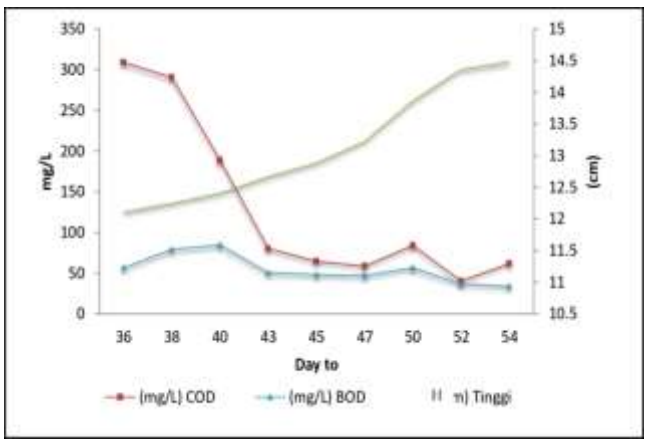

Figure 3: Biological Oxygen Demand (BOD) graph

C. Calculations for Alkalinity

Calculate phenolphthalein (P) alkalinity as follows:

Table 3: Calculations of Alkalinity

S.no	Volume of Sample (ml)	Burette Readings		Volume of H_2So_4 (ml)
		Initial	Final	
1	30	0.0	0.5	0.39
2	30	0.0	0.6	
3	30	0.0	0.3	

alkalinity, as mg CaCO3/L = $\mathrm{P} - \mathrm{Q} = \mathrm{A} \times \mathrm{N} \times 50 \times \frac{1000}{\text{volume of samplee}}$

P-alkalinity, as mg CaCO3/L= $0.39 \times 0.025 \times \frac{1000}{30}$

P-alkalinity, as mg CaCO3/L=6.79 mg/L as $CaCO_3$ eq.

Calculate total (T) alkalinity as follows:

Table 4: Calculations of Total Alkalinity

S. no	Volume of Sample (ml)	Burette Readings		Volume of H_2SO_4 (ml)
		Initial	Final	
1	50	0.0	12	11.5
2	50	0.0	11.1	
3	50	0.0	12.0	

T-alkalinity, as mg CaCO3/L = $\boldsymbol{B \times N \times 50 \times \frac{1000}{Volume\ of\ Sample}}$

T-alkalinity, as mg CaCO3/L = $11.5 \times 0.025 \times 50 \times \frac{1000}{30}$

T-alkalinity, as mg CaCO3/L = 285 mg/l as $CaCO_3$ eq.

where,

A = mL of H2SO4 required to bring the pH to 8.3

B = mL of H2SO4 required to bring the pH to 4.5

N = normality of H2SO4

Type of alkalinity

Three types of alkalinities, i.e., hydroxide, carbonate and bicarbonate are easily calculated from the table given as under:

Table 5: Types of Alkalinities

Values of P and T	Type of Alkalinity		
	OH^-	$CO3^-$	$HCO3^-$
P=0	0	0	T
P<1/2T	0	2P	T-2P
P=1/2T	0	2P	0
P>1/2T	2P-T	2(T-P)	0
P=T	T	0	0

Interpretation of Result:

Since, P<1/2T= 6.6<110.33.

Alkalinity due to OH^- is 0, due to $CO3^-$ is 13 and due to $HCO3^-$

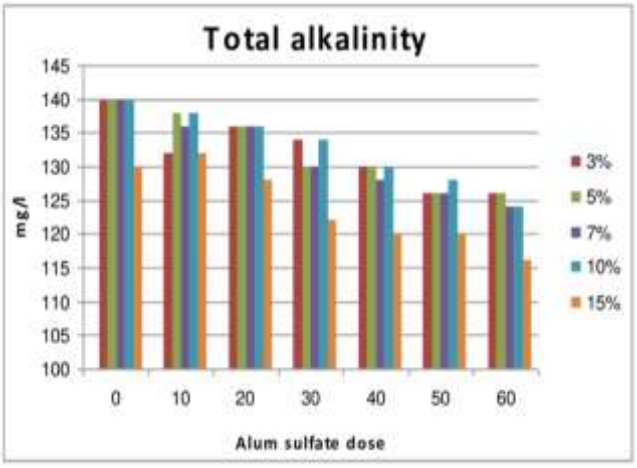

Figure 5: Simple Titration Curve

D. Calculations for Conductivity

Conductivity Measure: 295 kmho/cm

Conduction Correction= Measure Value × Cell Constant × Temperature correction factor

=295×0.96×1.05

Conduction Correction=296.3 kmho/cm

Total Dissolved Solids= Conduction Correction ×average factor

=296.3×0.75

Total Dissolved Solids= 222.2 mg/l Approx

VIII. CONCLUSION

Government ought to make notion for compulsory for every house keep to connect to the sewerage net paintings with their septic tank so that no untreated sewer needs to drift immediately into the close by nallah, for you to lead to cleanliness of Holy River Ban-Ganga, in addition greater utmost pride for the spiritual activities, rituals festivals, etc in the end overall socio-financial system improvement of the town. Station wise composition, distribution and numerical abundance of microbenthic invertebrates which simply mirror that the pollution load on this stream has elevated to an extra volume that's the direct final results of elevated pilgrimage load, waste water/ sewerage coming from the households, commercial setup, the horse excreta, night time soil, etc find its way into sacred River Ban Ganga. for this reason, the tourism activities and the waste management must be regulated for the recuperation and conservation of this religiously celebrated flow. It's miles hardly ever possible to assess the gain of offering proper sewerage gadget and waste disposal arrangements at the health of network, thru the significance is clearly identified. in which the waste water management is improper, the cost of fitness care associated with water borne sicknesses is an added drain at the economic sources of the community. maintaining the area clean through imparting normal sewerage machine with powerful treatment works becomes all of the greater essential to guide tourism. There may be no planned sewerage gadget within the vicinity. At many locations septic tanks are not functioning properly and effluent from septic tanks are discharged without delay into the nearby nallah or open discipline. during the survey it turned into discovered that trees mendacity enroute have gone lifeless. Nallah sporting the undigested sewage float ultimately locate its way into the streams and pollute major supply of water, which is distinctly

objectionable. The environments of the region are getting polluted. excellent court has also surpassed an order that no production hobby shall be allowed until ecological balance is restored. the present device could be very unsatisfactory, unhygienic and most obnoxious from aesthetic factor of view. The above grave situation fully justifies and establishes the instantaneous want of offering the sewerage machine and powerful sewage remedy plant.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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