



Surface Water Quality Assessment of Gomti River Using Index Analysis

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Abstract

This study emphasized on water quality status of River Gomti. Bascaron water quality index were used for finding quality rating of River Gomti. Bascaron water quality index utilized data of pH, Biochemical oxygen demand (BOD), dissolved oxygen (DO), Temperature, Total Coliform, Nitrate and Conductivity of 5 monitoring station along Gomti River from 2008 to 2016. Bascaron WQI represents similar trend over the year but spatial distribution of WQI shows that water quality at Lucknow downstream were very poor. This may be a reason of direct disposal of sewage and anthropogenic activities into river. The river additionally gets industrial effluent load from different ventures in the catchment extend in Lucknow territory the neighbourhood channels. Transfer of household and modern squanders in the waterway Gomti has turned into an intense issue. Although water quality in Sitapur, Varanasi and Jaunpur were remain in acceptable range.

KEY WORDS: *Bascaron WQI, water quality, Gomti River, rating scale*

1. INTRODUCTION

The stream gathers a lot of human and mechanical contaminations as it moves through the exceedingly prevalent territories (18 million approx.) of Uttar Pradesh. High contamination levels in the waterway drastically affect the environment of the River Gomati. It gets agricultural runoff from its immense catchment territory spread more than 10 district straightforwardly or all through its course, gets untreated raw sewage and industrial effluents through more than 40 narrow ditches in Lucknow. The River Gomati starts from Gomat Taal which was officially known as Fulhaar Jheel near Madhoganj Tanda town in Pilibhit region (U.P.). It extends to 940 km through Uttar Pradesh and meets the Ganga River near Saidpur Kaithi in Varanasi. Its water catchment area is around 22,735 Square Km. The urban communities of Lucknow, Lakhimpurkheri, Sultanpur and Jaunpur are situated on the banks of the waterway Gomati and are the most noticeable of the 15 towns situated in its catchment region. Its stream for the most part relies on event of downpour and accordingly the stream in waterway is extremely permissive during rainstorm.

It's five noteworthy tributaries and in excess of 40 drains in Lucknow (UPPCB, 2013). Other contamination sources are washing of garments and creatures in the stream water. The waterway likewise gets industrial contamination load from different industries in the catchment extends in Lucknow region. The amount of household sewage and industrial waste delivered in Lucknow is around 325 million litres for every day



(MLD). At present there is just a single treatment plant situated at Gaughat having capacity of 42 MLD to get the sewage from Sarkata, Pata, and Nagaria just as from Gaughat itself. The water quality can be influenced both by the chemical and biological contaminants. The imprudent transfer of waste effluents may taint the water as a translocation of toxic chemicals and many lead to antagonistic impacts on living beings. The water contamination has direct association with physio-chemical parameters on the off chance that they are found above permissible limit.

Water quality index is a valuable and unique tool which is intended to simplify the quality status of a water body on the basis of physical, chemical and biological parameters. The utilization of water quality index (WQI) improves the introduction of consequences of an examination identified with a water body, as it abridges in one worth or idea a progression of parameters broke down. Thus, the lists are extremely valuable to transmit data concerning water quality to people in general as a rule, giving a smart thought of the advancement inclination of water quality to advance over some period of time, other than permitting the examination between various waterways or various areas along a similar course. The index choice decision relies upon the contamination sources existent at the area and the proposed utilization of the water, and further. The goal of this study is to exhibit a water quality assessment of Gomti River. The Gomti River was picked for this study because it represents an environmental degradation situation that is becoming more and more frequent.

WQI demonstrates the degree of contamination and adequacy of water. A portion of the water quality lists that are oftentimes utilized in open area with the end goal of water quality appraisal incorporate, NSF Water Quality Index (NSFWQI), Canadian Water Quality Index (CWQI), Florida Stream Water Quality Index (FWQI), British Columbia Water Quality Index (BCWQI) and Oregon Water Quality Index (OWQI) (Said et al., 2004). Regardless of the accessibility of water quality information, numerical device and PC learning, endeavours are once in a while made to build up a client intelligent device for water quality examination (Sarkar and Abbasi, 2006) endeavoured advancement of a product device, QUALIDEX to create WQIs.

As WQIs are exceptionally abstract in nature, water quality evaluation is affected by the index used, assigned weight, and adopted arrangement plan. Thus, in perspective on the everyday practice and key water quality checking ventures in India, an endeavour is made to build up a client intuitive and independent apparatus, Surface Water Quality Assessment Tool (SWQAT) more on the likelihood of achieving investigation for the essential parameters.

Since the invention of the first WQI, proposed officially by Horton (1965), a few others have been created. In 1979, Bascaron built up a profoundly adaptable file designated WQI_B. This index permits the presentation or avoidance of parameters in concurrence with the requirements or restrictions for information obtaining (Bascaron, 1979).



2. METHODOLOGY

Dataset of water quality parameter from 2008 to 2016 were acquired from Central Pollution Control Board (CPCB, ENVIS). Total of 6 water quality parameter were used for analysis: pH, biochemical oxygen demand (BOD), dissolved oxygen (DO), electrical conductivity (EC), nitrate, total coliform and temperature. The water quality data gathered from five collecting station along Gomti River. Selected stations are Sitapur (S-1), Lucknow upstream (S-2), Lucknow downstream (S-3), Jaunpur (S-4) and Varanasi (S-5).

Bascaron developed a method for determination of water quality index in 1979. Bascaron water quality index (WQI_B) can be easily calculated by following formula (Abrahamo, 2007):

$$WQI_B = K \frac{\sum C_i P_i}{\sum P_i}$$

Where,

K = adjustment constant on the basis of visual aspect of water body, 1 for clearly visible water with no significant contamination, 0.75 for water having slight colour and turbidity, 0.5 for polluted water with moderate to strong odour and 0.25 adopted for water having dark colour with fermentation and strong odour.

C_i = percentage value of different parameter (Table 1)

P_i = parameter weight of different parameter (Table 1)

parameter	pH	BOD	DO	TEMP	Total Coli.	Nitrate	Conductivity	percentage
Unit		mg/l	mg/l	°C	n°/100m l	mg/l	µmhos/cm	value
weight (P _i)	1	3	4	1	3	2	4	(C _i)
analytical value Of parameter	1	>15	0	>50	>14.000	>100	>16.000	0
	2	12	1	45	10	50	12	10
	3	10	2	40	7	20	8	20
	4	8	3	36	5	15	5	30
	5	6	3.5	32	4	10	3	40
	6	5	4	30	3	8	2.5	50
	6.5	4	5	28	2	6	2	60
	9	3	6	26	1.5	4	1.5	70
	8.5	2	6.5	24	1	2	1.25	80
	8	1	7	22	500	1	1	90
7	<0.5	7.5	21	<50	0	<750	100	

Table 1



The results of index analysis are exhibited quantitatively relating to evaluation from 0 to 100 and qualitative result corresponding to numerical result of water quality index are presented in rating scale as shown in Table 2.

Index Value	Qualitative result
91 - 100	Good
61 - 91	Acceptable
31 - 61	Regular
16 - 31	Bad
0 - 16	Very Bad

Table 2

3. RESULT AND DISCUSSION

Result of Bascaron water quality index obtained from water quality data of different monitoring station along river Gomti from 2008 to 2016 are shown in Table 3.

YEAR	S-1	S-2	S-3	S-4	S-5
2008	95.55	63.33	25.83	74.44	76.66
2009	88.33	61.245	25.555	75	76.66
2010	87.77	64.5825	25.555	75	75
2011	87.77	64.1625	28.055	73.88	76.11
2012	87.22	60	24.44	74.44	75
2013	86.66	59.16	25.83	76.66	78.88
2014	88.33	62.4975	24.72	77.22	78.88
2015	90	60.8325	23.885	75.55	77.77
2016	91.66	61.6665	22.5	74.44	78.33

Table 3

From the outcome it was seen that uncontrolled pollution in Gomti River has brought titanic changes in the water quality of river. Calculated Bascaron index value demonstrate that water quality of Sitapur (S-1) ranges from 86.66 to 91.66 which represent good quality of water. From the graph (Table 4) it was demonstrated that WQI over the year are approximately alike but WQI of Lucknow downstream monitoring station (S-3) indicate bad quality of water. This condition should be treated otherwise water quality get worsen day per day at Lucknow downstream.

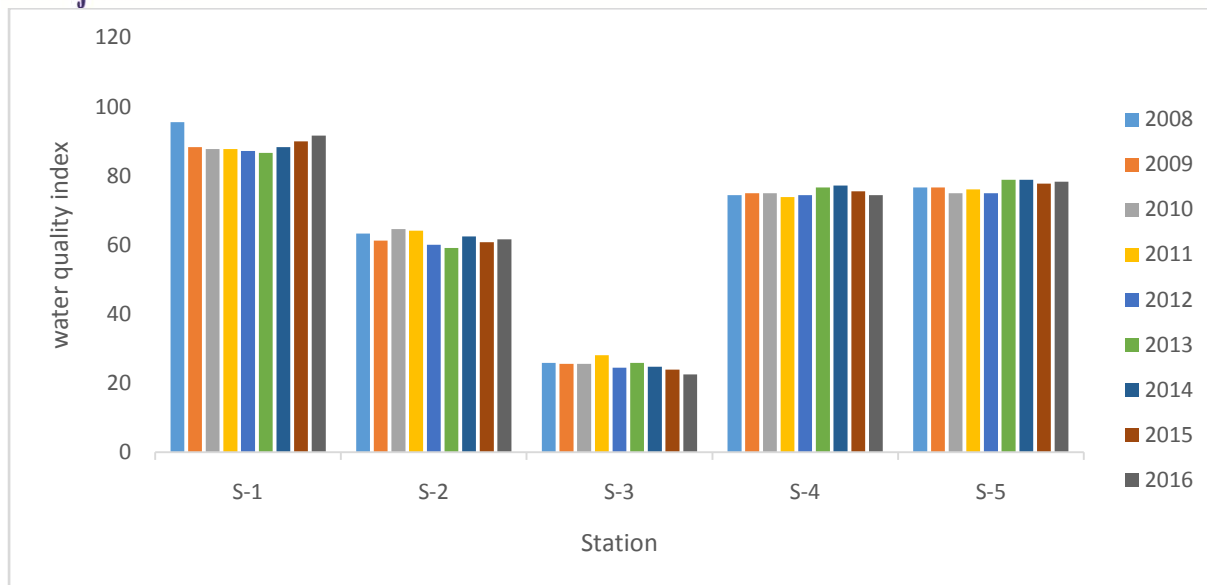


Table 4

At the origin of Gomti River, water quality was good but as river moves through highly populated cities of Uttar Pradesh its water quality deteriorates. At Sitapur monitoring station (S-1) water quality were good having good appearance. As Gomti River enters Lucknow its water quality drops down under acceptable to bad ranges. All river has self-cleansing tendency, organic matter present in water oxidized and DO content of water again increased. Due to this again water regains its quality status.

4. CONCLUSION

Bascaron water quality index is used for determining water quality status of Gomti River. From the result it is concluded that water quality of Lucknow downstream is a matter of concern. Lucknow upstream station having regular water quality which is again not good enough. This may be due to abundantly disposal of untreated sewage into River. Some additional sewage treatment plant should be constructed in Lucknow so that untreated sewage should be treated properly, and load on Gaughat sewage treatment plant could be reduced. In Lucknow downstream station Gomti almost turns into a gutter having dark brown colour and producing highly foul smell. Government and local people should take some initiative to resolve this problem.

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