

# Evaluation Of Ganga Water For Drinking Purpose By Water Quality Index At Rishikesh, Uttarakhand, India

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**Abstract:** The present study was intended to calculate water quality index (WQI) for National river (Ganga) of India at Rishikesh for drinking, recreation and other purpose by using eight water quality parameters, turbidity, DO, BOD, COD, Free CO<sub>2</sub>, TS, TSS and TDS. Ganga Action Plan program launched by Government of India in April 1985 in order to reduce the pollution load on the river Ganga, but it failed to decrease the pollution level in the river, after spending more than 9 billion rupees over a period of 15 years. [Report and Opinion 2010;2(9):53-61]. (ISSN: 1553-9873).

**Key words:** WQI, DO, BOD, COD, TS, TSS, TDS

## Introduction:

It is well known that clean water is absolutely essential for several purposes for healthy living (Mandalam et al., 2009). Rivers are the most important natural resource for human development but it is being polluted by indiscriminate disposal of sewage, industrial waste and plethora of human activities, which affects its physicochemical and microbiological quality. Increasing problem of deterioration of river water quality, it is necessary to monitoring of water quality to evaluate the production capacity (Mishra et al., 2009).

The river Ganga is subjected to multiple uses for community water supply, irrigation, bathing, and disposal of sewage and industrial effluents. According to WHO organization, about 80% of all the diseases in human beings are caused by water. Ganga is the National river of India, runs its course of over 2500 kms from Gangotri (Uttarakhand) in the Himalayas to Ganga Sagar in the Bay of Bengal through 29 cities with population over 1,00,000, 23 cities with population between 50,000 and 1,00,000, and about 48 towns. It is a river with which the people of India are attached spiritually and emotionally. Ganga Action Plan or GAP was a program launched by Government of India in April 1985 in order to reduce the pollution load on the Ganga River. The program was launched with much fanfare, but it failed to decrease the pollution level in the river, after spending more than 9 billion rupees over a period of 15 years. The Ganga river basin is one of the most fertile and densely populated areas of

the world and covers an area of 1,000,000 sq. kms. The Ganges River Dolphin is an endangered animal that specifically habitats this river.

The general WQI was developed by Brown et al. (1970) and improved by Deininger for the Scottish Development Department (1975). Horton (1965) suggested that the various water quality data could be aggregated into an overall index. Water quality index is well-known method as well as one of the most effective tools to expressing water quality that offers a simple, stable, reproducible unit of measure and communicate information of water quality to the concerned citizens and policy makers. It, thus, becomes an important parameter for the assessment and management of surface water. WQI is defined as a rating reflecting the composite influence of different water quality parameters. WQI is calculated from the point of view of the suitability of surface water for human consumption (Atulegwu and Njoku, 2004). The objective of the present research is to provide information on the physico-chemical characteristics of River Ganga in order to appreciate the impacts of unregulated waste discharge on the quality of the river as well as to discuss the its suitability for human consumption based on computed water quality index values.

The objective of this research is to represent a water quality evaluation of a river Ganga that receives industrial effluents, through the use of WQI.

**Material and Methods:**

**Study Area:**

The present study has been carried out in Rishikesh to evaluate water quality of river Ganga for drinking purpose, located in newly carved state of Uttarakhand. Rishikesh is extended from latitude  $30^{\circ}07'$  in the north to longitude  $78^{\circ}19'$  in the east. It has an average elevation of 372 meters. Rishikesh had a population of 59,671 as per 2001 census of India. For present study three sites were selected along the river Ganga in Rishikesh namely, Lakshman Jhula,

Pramarth Niketan and Triveni Ghat. Site-1 (Lakshman Jhula) is located at  $30^{\circ} 7' 34''$  N to  $78^{\circ} 19' 49''$  E. Hanging walking bridge with the eastern part of the town, where most of religious ashram are located. Site-2 site was selected at Parmarth Niketa for present study and  $30^{\circ}7' 2''$  N  $78^{\circ}18' 41''$  E. Parmarth Niketan one of the oldest ashram in Rishikesh. Site 3 was selected in Triveni Ghat for present study. This site situated between  $30^{\circ} 6' 10''$  N and  $78^{\circ}17' 57''$  E.

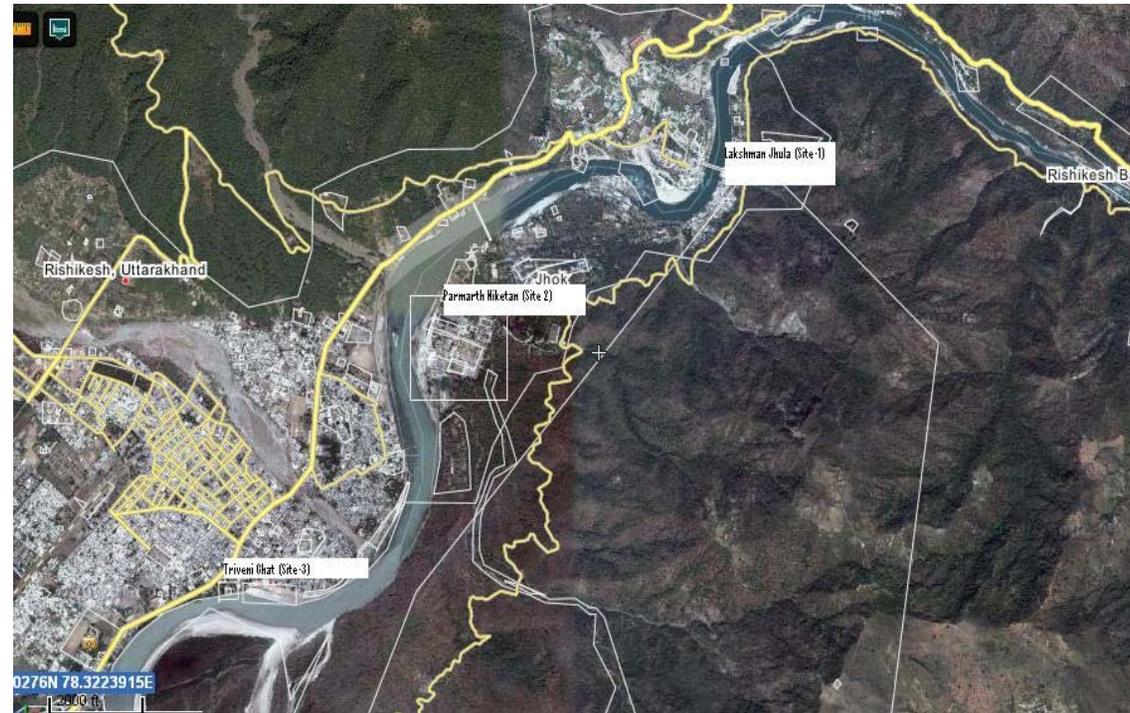


Fig 1 – Showing the selected sampling sites for river Ganga at Rishikesh, Uttarakhand



Fig-2: Site-1 (Lakshman Jhula)



Fig-3: Site-2 (Parmarth Niketa)



Fig-4: Site 3 (Triveni Ghat)

The water samples from river Ganga were collected at interval of 30 days as per the standard method of APHA (2005). In this study, for the calculation of water quality index, eight important parameters were chosen. The WQI has been calculated by using the standard of drinking water quality recommended by the World Health Organization (WHO). The water samples were collected on monthly basis from Jan 2007 to Dec 2008.

Eight water parameter were considered for calculation of water quality index (Harkins, 1974; Tiwari et al., 1986; Tiwari and Manzor, 1988; Mohanta and Patra, 2000, Kesharwani et al., 2004; Padmanabha and Belagalli, 2005)

$$\text{Water Quality Index (WQI)} = \sum q_i w_i$$

$$\text{Where } q_i \text{ (water quality rating)} = 100 \times (V_a - V_i) / (V_s - V_i),$$

When  $V_a$  = actual value present in the water sample

$V_i$  = ideal value (0 for all parameters except pH and DO which are 7.0 and 14.6 mg l<sup>-1</sup> respectively).

$V_s$  = standard value.

If quality rating  $q_i = 0$  means complete absence of pollutants,

While  $0 < q_i < 100$  implies that, the pollutants are within the prescribed standard.

When  $q_i > 100$  implies that, the pollutants are above the standards (Mohanty, 2004).

$$W_i \text{ (unit weight)} = K / S_n$$

Where K (constant) =

$$1/Vs1 + 1/Vs2 + 1/Vs3 + 1/Vs4..... + 1/Vsn$$

$S_n$  = 'n' number of standard values.

According to Sinha *et al.* (2004), if, water quality index (WQI) is less than 50 such water is slightly polluted and fit for human consumption, WQI between 51 - 80 – moderately polluted, WQI between 81 -100-excessively polluted and WQI-Severely polluted.

### **Result and Discussion:**

The result obtained from analysis o water sampled of river Ganga are shown in Table 1, 2, 3, 4, 5 and 6. The turbidity in the river Ganga was lowest during winter season. From summer onwards the water became turbid due to rapid melting of snow and rains. The maximum turbidity 510.07 JTU was observed in monsoon season (July 2007) at site 1 and minimum 0.00 JTU was observed in winter season (January 2008) at site 1. The turbidity value obtained at all selected there sites was found to be above standard permissible limits of WHO. This could be attributed due to presence of organic matter pollution, runoff and heavy rainfall UNESCO/WHO/UNEP, 2001. The Ganga water contained highest dissolved oxygen during winter season, followed by a gradual decrease to its lowest values during monsoon season. The higher concentrations of DO was recorded during winter season mainly due to low turbidity and increased photosynthetic activity of the green algae found on the submerged stones and pebbles (Joshi *et al.*, 2009). The maximum 12.10 mg/L oxygen content of water was recorded in winter season (Jan 2007) at site 3 and minimum 7.14 mg/L at site 2 during monsoon season (July 2008). The BOD ranged from 1.43 mg/L (Nov 2008) at site 3 to 3.79 mg/L (June 2007) at site 3. The COD ranged from 2.71 mg/L (Nov 2007) at site 1 to 9.72 mg/L (July 2008) at site 2. Free carbon dioxide in the Ganga water was invariably present throughout the year. The free carbon dioxide was found to be maximum in monsoon season and minimum during winter season. Water quality index (WQI) is the most effective way to communicate water quality. Water quality index (WQI) = 0 means complete absence of pollutants. When  $0 < 100$ , indicates the water is under consideration and fit for human use and  $WQI > 100$  reflects its unsuitability for human use (Bahera *et al.*, 2004). At site 1, the minimum and maximum value of WQI observed 13.87 (Jan 2008) and 1714.76 (July 2007), While at site 2 minimum and maximum value of WQI observed as 14.59 (Feb. 2008) and 1386.00 (Sept. 2008). However in the case of site 3, minimum and maximum value was observed as 27.29 (Jan 2008) and 1077.90 (Aug. 2008).

Table 1: Physico-chemical status and water quality index of river Ganga at site 1.

Parameters	Turbidity		DO		BOD		COD		Free CO <sub>2</sub>		TS		TSS		TDS		Water Quality Index
Standard Value as per WHO	5.00 NTU		5.00 mg/L		6.00 mg/L		10.00 mg/L		10.00 mg/L		500.00 mg/L		500.00 mg/L		500.00 mg/L		
Wn	0.16533		0.16533		0.13777		0.082666		0.082666		0.00165332		0.00165332		0.00165332		
<b>2007</b>																	
Quality Rating	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	
Jan.	1.20	24.00	11.71	30.10	2.27	37.78	3.82	38.20	0.81	8.10	141.63	28.33	50.73	10.15	4.48	0.89	18.04
Feb.	20.06	401.20	9.24	55.21	2.19	36.50	5.98	39.80	1.57	15.70	174.47	34.88	143.97	28.79	28.45	5.69	85.0
March	60.62	1212.40	9.00	58.33	2.41	40.17	6.62	66.20	1.37	13.70	192.00	38.40	153.89	30.78	19.81	3.96	222.35
April	200.72	4014.40	8.41	64.48	2.52	42.00	5.87	58.70	1.52	15.20	261.02	52.20	252.71	50.54	24.34	4.86	686.43
May	291.30	5826.00	8.99	58.44	3.41	56.83	7.48	74.80	1.40	14.00	341.31	68.26	287.58	57.48	25.79	5.16	988.26
June	496.61	9920.00	8.91	59.27	2.97	49.90	7.89	78.90	2.17	21.70	2001.66	400.33	2694.08	538.82	163.76	32.75	1666.67
July	510.07	10201.40	8.76	60.83	3.48	58.00	8.47	84.70	2.15	21.50	2111.41	422.28	1742.59	348.52	179.59	35.92	1714.6
August	390.65	7813.00	8.21	66.56	3.56	59.33	7.93	79.30	2.30	23.00	1418.00	283.60	1280.27	256.05	124.01	24.80	1320.29
Sep.	109.91	2198.20	7.89	69.90	3.76	62.67	6.91	69.10	2.26	22.60	361.64	72.28	294.75	58.95	33.66	6.73	391.43
Oct.	60.21	1204.20	9.56	52.50	2.22	37.00	4.40	44.00	0.71	7.10	191.427	38.29	219.73	43.95	5.02	1.00	217.23
Nov.	36.53	730.60	10.47	43.02	1.89	31.5	2.71	27.10	0.29	2.90	152.68	30.54	81.17	16.23	6.91	1.38	134.80
Dec.	10.00	200.00	11.94	27.71	1.98	33.00	2.79	27.90	0.57	5.70	186.00	37.20	66.92	13.38	6.47	1.29	45.06

Table 2: Physico-chemical status and water quality index of river Ganga at site 1.

Parameters	Turbidity		DO		BOD		COD		Free CO <sub>2</sub>		TS		TSS		TDS		Water Quality Index
Standard Value as per WHO	5.00 NTU		5.00 mg/L		6.00 mg/L		10.00 mg/L		10.00 mg/L		500.00 mg/L		500.00 mg/L		500.00 mg/L		
Wn	0.16533		0.16533		0.13777		0.082666		0.082666		0.00165332		0.00165332		0.00165332		
<b>2008</b>																	
Quality Rating	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	
Jan.	0.00	0	11.46	32.71	1.72	28.67	4.80	48	0.62	6.2	63.04	12.61	34.89	6.98	8.12	1.62	13.87
Feb.	11.15	223	10.33	44.58	2.23	37.17	7.66	76.6	1.02	10.2	255.00	51	239.16	47.83	18.18	3.64	56.70
March	43.35	867	9.91	48.85	3.01	50.17	8.18	81.8	1.13	11.3	254.00	50.8	221.55	44.31	40.08	8.09	166.20
April	99.16	1983.2	8.82	60.21	2.41	46.17	7.37	73.5	1.00	10	289.50	57.9	271.51	54.30	28.29	5.66	351.3
May	183.85	3677	8.89	59.48	2.84	47.33	7.05	70.5	1.25	12.5	402.96	80.59	339.65	67.93	23.36	4.72	631.39
June	350.40	7008	7.64	72.5	2.88	48	8.28	82.5	1.37	13.7	889.36	177.87	698.99	139.8	110.92	22.18	1185.75
July	388.18	7763.6	8.02	68.73	3.64	60.67	8.98	89.8	1.27	12.7	788.82	157.76	591.56	118.31	144.22	28.84	1312.26
August	287.00	5740	8.07	68.02	3.44	57.33	5.27	52.7	1.10	11	805.00	161	484.64	96.93	180.84	36.17	973.89
Sep.	155.00	300	8.41	64.48	2.48	41.33	6.14	61.4	1.36	13.6	215.00	43	107.78	21.54	30.25	6.05	72.27
Oct.	86.10	1722	10.42	43.54	2.23	37.17	4.36	43.6	0.68	6.8	58.21	11.64	56.16	11.23	41.29	8.26	301.24
Nov.	33.55	671	10.56	42.08	1.43	23.83	3.59	35.9	0.56	5.6	51.36	10.24	51.49	10.30	17.82	3.56	124.65
Dec.	0.00	0	11.16	35.83	1.83	30.5	4.13	41.3	0.51	5.1	47.12	9.42	39.19	7.84	13.06	2.61	13.99

Table 3: Physico-chemical status and water quality index of river Ganga at site 2.

Parameters	Turbidity		DO		BOD		COD		Free CO <sub>2</sub>		TS		TSS		TDS		Water Quality Index
Standard Value as per WHO	5.00 NTU		5.00 mg/L		6.00 mg/L		10.00 mg/L		10.00 mg/L		500.00 mg/L		500.00 mg/L		500.00 mg/L		
Wn	0.16533		0.16533		0.13777		0.082666		0.082666		0.00165332		0.00165332		0.00165332		
<b>2007</b>																	
Quality Rating	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	
Jan.	8.41	168.2	10.54	42.29	1.78	29.67	5.86	58.6	0.88	8.8	65.97	13.19	133.28	26.66	7.93	1.59	44.53
Feb.	1.61	32.2	11.23	35.10	1.89	31.5	4.89	48.9	0.91	9.1	59.19	13.84	125.54	25.11	7.52	1.50	20.33
March	14.68	293.6	11.02	37.29	1.94	32.33	6.36	63.6	1.12	11.2	48.91	9.78	57.81	11.56	9.99	1.99	65.38
April	39.05	781.8	8.62	62.29	2.23	37.17	6.35	63.5	1.02	10.2	68.93	13.79	39.18	17.84	6.79	1.36	150.82
May	78.48	1569.6	8.39	64.69	2.59	43.17	7.01	70.5	1.05	10.5	197.22	39.44	128.78	25.76	33.88	6.78	282.96
June	152.15	3043.0	8.23	66.35	2.71	45.17	8.53	81.3	1.15	11.5	138.84	27.77	159.73	31.95	55.86	11.17	528.08
July	298.49	5969.8	7.46	74.38	2.91	48.5	8.42	89.2	1.27	12.7	273.22	54.64	198.91	39.76	25.72	5.14	1014.55
August	310.62	62.12	7.49	74.06	3.19	53.17	8.48	89.8	1.34	13.4	510.60	102.12	267.17	53.43	45.44	9.09	38.64
Sep.	312.26	6245.2	8.09	66.81	2.93	48.83	8.12	81.2	1.41	14.1	1101.20	220.24	1491.74	298.35	109.96	21.99	1059.06
Oct.	87.58	151.6	8.76	60.83	2.87	47.83	7.42	74.2	1.25	12.5	955.00	191	2209.71	441.94	289.44	57.89	50.02
Nov.	63.54	1270.8	9.31	55.10	2.33	38.83	6.30	63	0.78	7.8	887.12	177.42	1849.37	369.87	216.85	43.37	231.39
Dec.	19.83	396.6	9.96	48.33	1.98	33	4.82	48.2	0.81	8.1	230.11	46.02	211.77	42.35	25.93	5.19	82.92

Table 4: Physico-chemical status and water quality index of river Ganga at site 2.

Parameters	Turbidity		DO		BOD		COD		Free CO <sub>2</sub>		TS		TSS		TDS		Water Quality Index
Standard Value as per WHO	5.00 NTU		5.00 mg/L		6.00 mg/L		10.00 mg/L		10.00 mg/L		500.00 mg/L		500.00 mg/L		500.00 mg/L		
Wn	0.16533		0.16533		0.13777		0.082666		0.082666		0.00165332		0.00165332		0.00165332		
<b>2008</b>																	
Quality Rating	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	
Jan.	0.00	0	11.19	35.52	2.05	34.17	5.14	51.4	0.97	9.7	156.41	31.28	57.15	11.43	36.777	7.36	15.71
Feb.	1.01	.202	11.93	27.81	1.89	31.5	5.58	55.8	1.13	11.3	156.41	31.28	50.87	10.17	23.31	4.66	14.59
March	6.61	1.32	9.55	56.11	2.14	36.8	6.83	68.3	1.56	15.6	68.19	13.64	42.46	8.49	19.46	3.89	21.54
April	46.01	920.2	8.46	63.96	2.13	35.5	6.63	66.3	1.32	13.2	46.81	9.36	62.16	12.43	33.72	6.74	174.22
May	101.75	2035	8.23	67.05	2.16	36	6.43	64.3	1.60	16	161.82	32.36	158.08	31.26	31.74	6.35	359.25
June	156.18	3124	8.27	38.63	2.73	45.5	5.63	66.3	1.78	17.8	181.71	36.34	109.14	21.83	28.13	5.63	536.20
July	310.65	6213	7.14	77.71	2.35	59.17	9.72	97.2	1.93	19.3	219.66	43.93	213.46	42.69	45.86	9.17	1057.98
August	366.60	7332	7.87	70.10	3.32	55.33	8.34	83.4	2.02	20.2	302.03	60.41	462.61	92.52	41.82	8.36	1240.24
Sep.	410.18	8203.6	8.21	66.56	3.44	68.8	7.88	78.8	2.12	21.2	1781.45	356.29	880.41	176.08	210.11	42.02	1386.00
Oct.	93.00	1860	8.19	66.77	2.18	36.33	7.59	75.9	1.54	15.4	2710.11	542.02	849.00	169.8	164.22	32.84	332.34
Nov.	76.41	1528.2	10.17	46.15	1.80	30	5.99	59.9	1.00	10	2010.61	402.12	765.01	153.00	156.54	31.31	271.17
Dec.	32.30	646	10.37	44.06	1.91	31.83	5.84	58.4	1.10	11	251.41	50.28	189.19	37.84	73.85	14.77	134.38

Table 5: Physico-chemical status and water quality index of river Ganga at site 3.

Parameters	Turbidity		DO		BOD		COD		Free CO <sub>2</sub>		TS		TSS		TDS		Water Quality Index
Standard Value as per WHO	5.00 NTU		5.00 mg/L		6.00 mg/L		10.00 mg/L		10.00 mg/L		500.00 mg/L		500.00 mg/L		500.00 mg/L		
Wn	0.16533		0.16533		0.13777		0.082666		0.082666		0.00165332		0.00165332		0.00165332		
<b>2007</b>																	
Quality Rating	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	
Jan.	5.91	118.2	12.10	26.04	1.75	29.17	4.33	43.33	0.98	9.8	58.85	11.77	39.72	7.94	6.28	1.26	32.29
Feb.	12.13	242.6	10.28	45.00	2.48	41.33	8.39	83.99	1.23	12.33	162.15	32.43	140.92	28.18	12.52	2.50	61.30
March	36.61	732.2	10.12	46.67	2.46	41	6.53	65.33	1.35	13.55	193.97	38.79	162.92	32.58	23.87	4.77	141.06
April	89.63	1792.6	9.20	56.25	3.08	51.33	7.59	74.99	1.10	11.00	281.00	56.2	231.73	46.35	33.38	6.68	320.02
May	186.41	3728.2	9.08	57.5	2.69	44.83	7.63	76.39	1.54	15.44	310.94	62.19	738.93	147.79	200.5	40.81	640.11
June	230.10	4602	8.34	65.21	3.79	63.17	8.02	80.22	1.67	16.77	2805.00	561	2707.28	541.46	294.68	58.94	790.26
July	291.67	5833.4	8.08	67.92	3.42	57	9.23	92.33	1.85	18.55	1886.81	377.36	1884.74	376.95	201.44	40.23	993.09
August	285.89	5717.8	8.20	66.67	3.31	55.17	8.33	83.33	2.01	20.15	1461.11	292.2	697.16	139.43	291.71	58.34	973.34
Sep.	87.50	1750	9.10	57.19	2.28	38	8.68	86.88	1.80	18	325.00	65	233.49	46.69	55.76	11.45	312.88
Oct.	62.25	1245	9.80	50.00	2.19	36.5	6.63	66.33	1.05	10.55	261.02	52.20	175.31	35.06	25.95	5.91	225.63
Nov.	10.30	206	10.11	46.77	2.24	37.33	5.69	56.99	0.85	8.55	98.99	19.80	92.82	18.56	16.07	3.21	52.41
Dec.	11.21	224.2	12.06	26.46	1.85	30.28	4.29	42.99	0.66	6.59	79.98	15.99	72.87	14.57	14.32	2.86	49.75

Table 6: Physico-chemical status and water quality index of river Ganga at site 3.

Parameters	Turbidity		DO		BOD		COD		Free CO <sub>2</sub>		TS		TSS		TDS		Water Quality Index
Standard Value as per WHO	5.00 NTU		5.00 mg/L		6.00 mg/L		10.00 mg/L		10.00 mg/L		500.00 mg/L		500.00 mg/L		500.00 mg/L		
Wn	0.16533		0.16533		0.13777		0.082666		0.082666		0.00165332		0.00165332		0.00165332		
<b>2008</b>																	
Quality Rating	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	O. V.	q <sub>n</sub>	
Jan.	3.33	66.66	12.01	26.98	1.92	32.00	7.64	76.40	1.27	12.70	57.43	11.49	50.46	10.09	6.54	1.31	27.29
Feb.	15.15	303.00	10.63	41.35	1.97	32.83	8.99	89.90	1.82	18.20	230.05	46.01	170.17	34.03	83.85	16.77	70.55
March	41.13	822.60	8.56	62.92	2.49	41.50	6.41	64.10	2.50	25.00	254.05	50.81	202.46	40.49	47.15	9.43	159.65
April	89.65	1793.00	8.42	64.38	2.43	40.50	6.17	61.70	1.71	17.10	243.42	48.66	182.64	36.53	28.57	5.71	319.32
May	143.12	2862.40	8.19	66.77	2.64	44.00	5.13	51.30	1.60	16.00	453.50	90.70	506.19	101.24	63.16	12.63	496.24
June	267.54	5350.80	7.62	72.71	2.83	47.17	7.93	79.30	2.80	28.00	1120.54	224.11	1163.12	232.62	123.24	24.65	912.83
July	299.11	5982.20	8.08	66.92	3.73	62.17	6.47	64.70	2.75	27.50	962.33	192.47	694.10	138.82	187.35	37.47	1016.9
August	318.53	6370.60	8.18	66.88	2.54	42.33	6.48	64.80	2.15	21.50	964.21	192.84	814.61	162.92	102.39	20.48	1077.9

<b>Sep.</b>	106.50	2130.00	8.87	59.69	2.26	37.67	6.01	60.10	1.69	16.90	126.41	25.28	102.86	20.57	34.14	6.83	373.66
<b>Oct.</b>	63.63	1272.60	9.28	55.42	2.56	42.67	5.23	52.30	1.58	15.80	67.41	13.48	31.51	6.30	17.49	3.49	321.11
<b>Nov.</b>	21.20	424.00	10.27	45.10	1.85	30.83	5.69	56.90	1.22	12.20	61.56	12.31	18.16	3.63	37.07	7.41	187.55
<b>Dec.</b>	11.00	220.00	11.06	36.88	1.88	31.33	5.53	55.30	1.18	11.80	48.01	9.60	45.11	9.02	5.01	1.00	52.37

### Conclusion:

Analysis of river Ganga water at Rishikesh during study period revealed that the water of dam is not suitable for drinking purpose. These results indicate that water of river Ganga is completely unsuitable for human being, wild animals and cattle.

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