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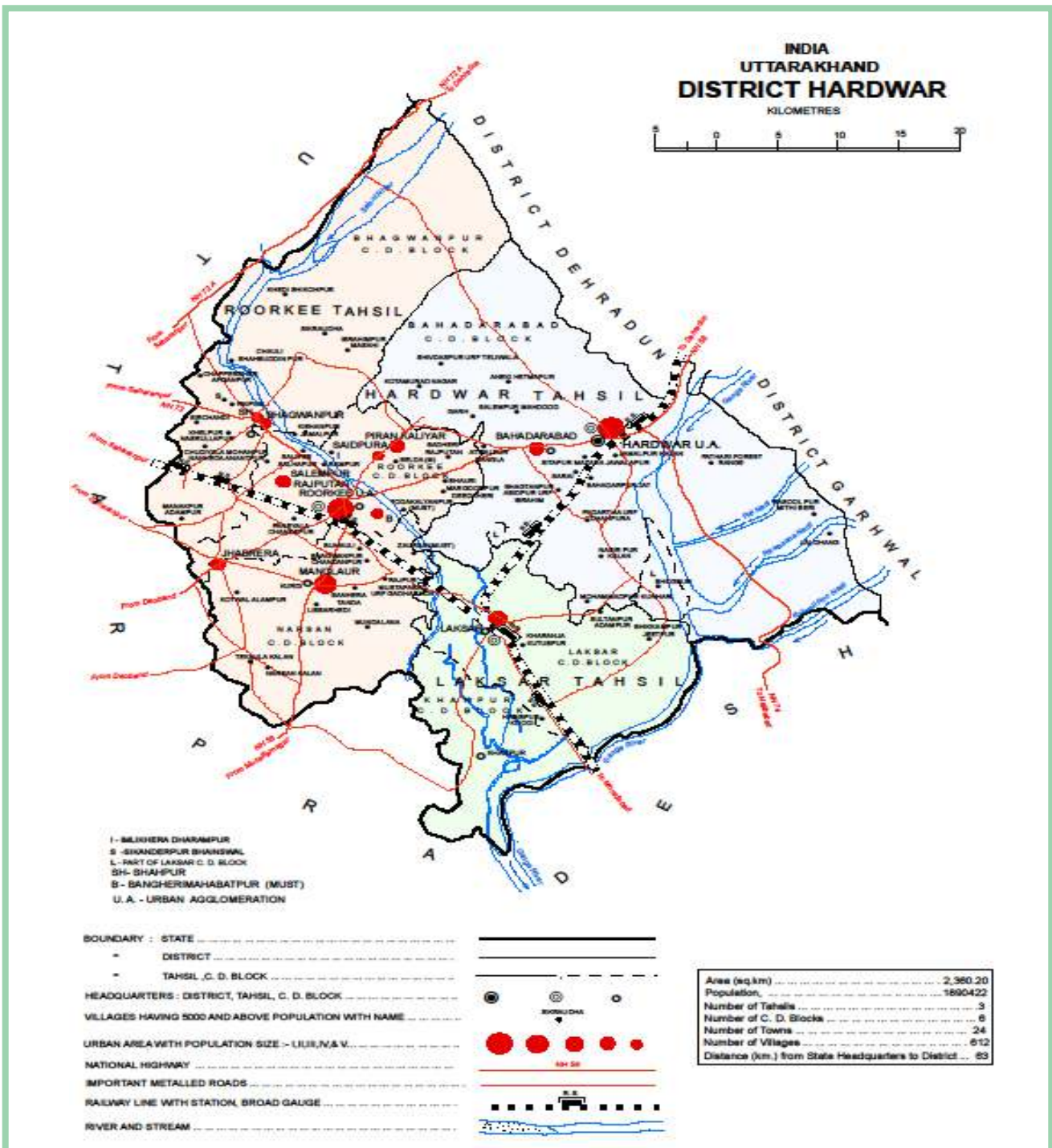
WATER QUALITY CHARACTERISTICS TREND

AT
DOWNSTREAM OF HARIDWAR
TOWN FROM 2015 TO 2021

INTRODUCTION

District Haridwar is bounded in the north by Dehradun, the state capital of Uttarakhand and in the east by the district of Garhwal. Districts Muzaffarnagar and Bijnor of Uttar Pradesh make its boundary in the south and Saharanpur district in the west. Total area of the district is 2360sqkms. Topographically the district presents much more variety of features than any other district of the Gangetic plain. In the north, there are steep hills of the Siwalik chain and below the hills, the submontane and then tarai tract. The greater portion of the district is open and highly cultivated. The hilly tract of Siwalik range from northern borders stretching in south east direction having a breadth of 10.16 km. The ridges one after another at places.

Holy Ganga is the main river of the district. It flows in the eastern part of the district. Ganga river first touches the district Haridwar, about 288 km. from its source at Gaumukh in upper Himalayas and runs southward forming the eastern boundary of the district.



Water Quality Characteristics of River Ganga

The Water quality characteristics of river Ganga at downstream of Haridwar (Balkumari Mandir) for the parameters prescribed in designed best use criteria (pH, BOD, DO and Total Coliform) for the year 2011 to 2021. The year wise observed value for the deferent parameter as follows:

pH Value

S.N.	Year	Minimum	Maximum	Std. Dev	Mean	DBU Class
1	2011	6.74	8.5	0.53	7.62	A
2	2012	5.94	8.78	0.75	7.64	A
3	2013	7.5	8.32	0.26	7.84	A
4	2014	6.3	8.1	0.47	7.55	A
5	2015	7.36	8.45	0.32	7.97	A
6	2016	7.46	7.82	0.14	7.68	A
7	2017	6.85	7.9	0.29	7.52	A
8	2018	7.67	8.29	0.22	7.88	A
9	2019	7.18	8.02	0.25	7.65	A
10	2020	7.1	8.02	0.33	7.67	A
11	2021	6.5	8.37	0.49	7.62	A
DBU Criteria					6.5-8.5	

Dissolved Oxygen (DO) Value (mg/l)

S.N.	Year	Minimum	Maximum	Std. Dev	Mean	DBU Class
1	2011	4.2	8.8	1.24	6.53	A
2	2012	6	8.6	0.73	7.17	A
3	2013	5.6	7.8	0.63	6.45	A
4	2014	4	6.4	0.91	5.52	A
5	2015	7.8	11.6	1.20	9.35	A
6	2016	8.2	10.6	0.77	9.27	A
7	2017	6.4	9.6	0.88	8.76	A
8	2018	8.6	10.6	0.55	9.20	A
9	2019	8.6	9.4	0.28	8.95	A
10	2020	8.4	10.6	0.67	9.25	A
11	2021	8.2	10.4	0.63	8.99	A
DBU Criteria					5 or more	

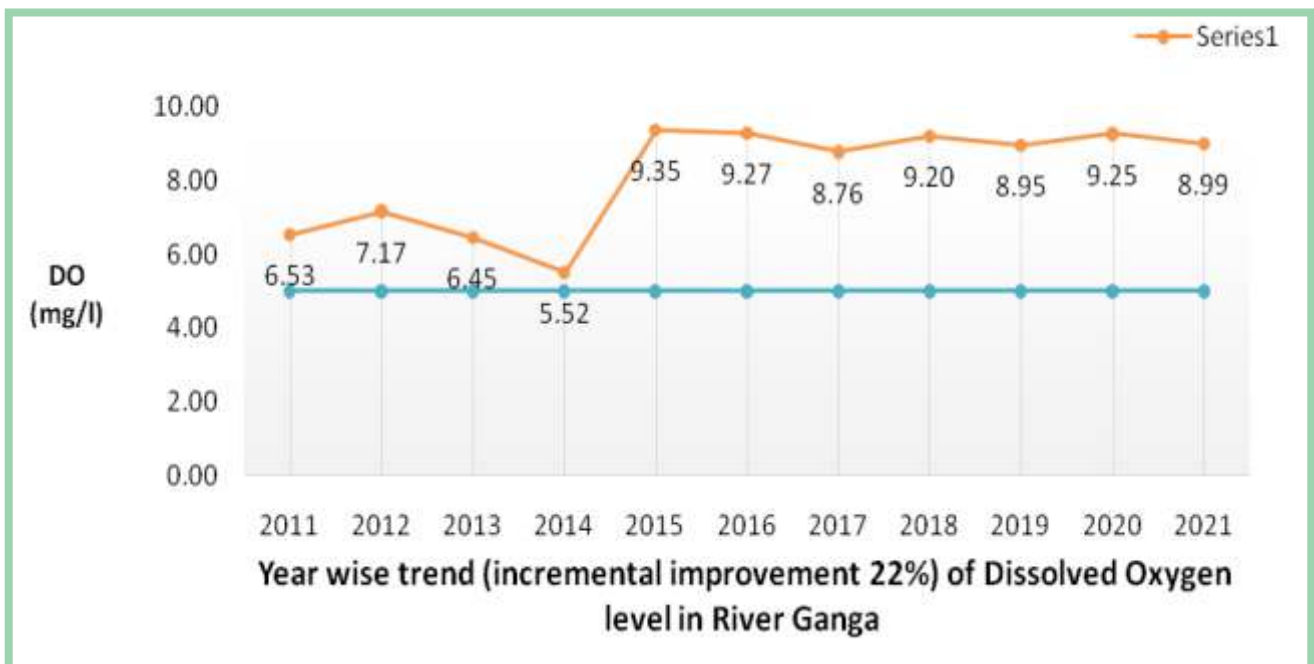
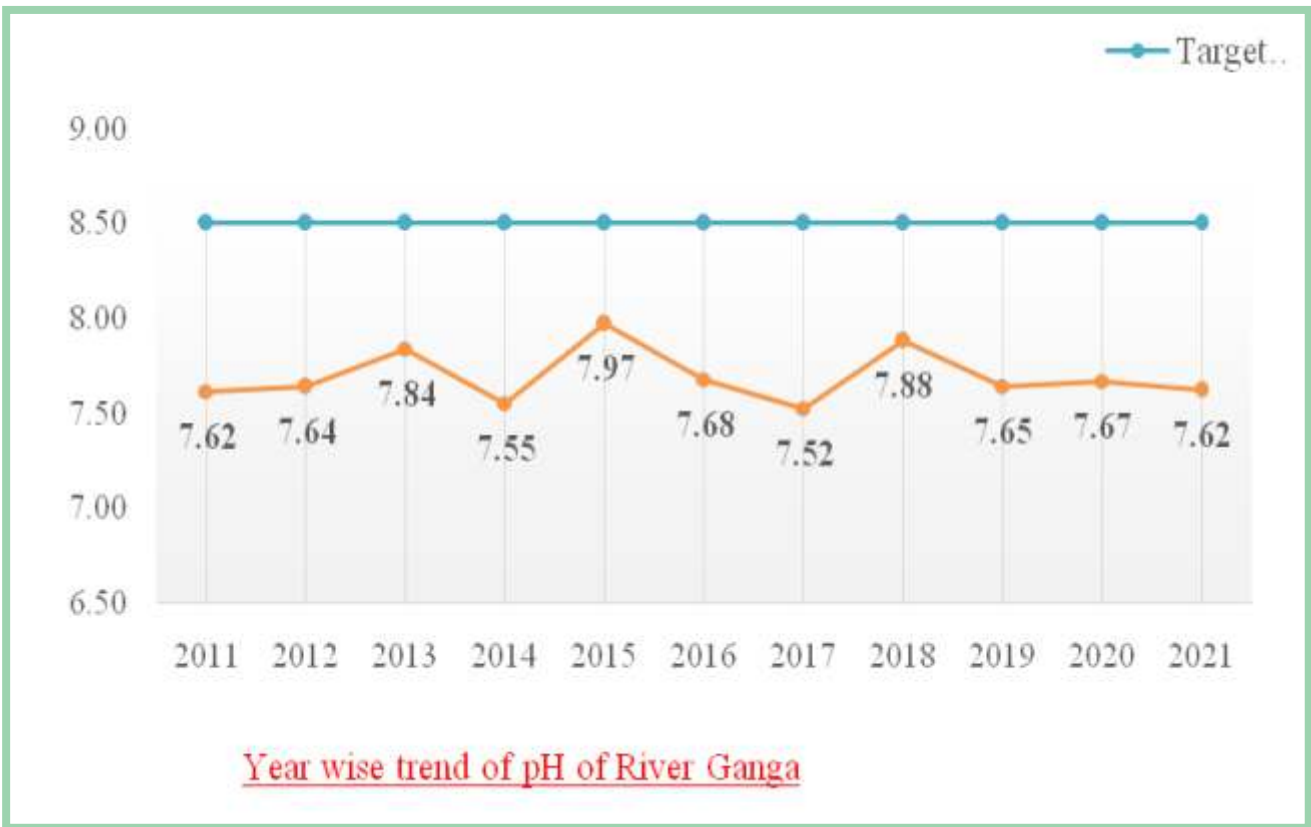
Biochemical Oxygen Demand (BOD) Value (mg/l)

S.N.	Year	Minimum	Maximum	Std.Dev	Mean	DBU Class
1	2011	2.8	12	3.16	6.87	A
2	2012	2.4	15	3.35	6.63	A
3	2013	2.2	7.8	1.99	5.15	A
4	2014	3.2	7.2	1.36	5.20	A
5	2015	1	1.8	0.24	1.33	A
6	2016	1	1.4	0.13	1.10	A
7	2017	1	1.6	0.19	1.10	A
8	2018	1	1.2	0.09	1.05	A
9	2019	1	2	0.30	1.18	A
10	2020	1	1.6	0.20	1.22	A
11	2021	1	2.6	0.48	1.58	A
DBU Criteria					3 or <(less)	

Total Coliform (TC) Value (MPN/100ml)

S.N.	Year	Minimum	Maximum	Std.Dev	Mean	DBU Class
1	2011	1600.00	10000.00	3026.67	2945.45	C
2	2012	600.00	1600.00	336.99	1458.33	C
3	2013	500.00	1600.00	422.76	1245.45	C
4	2014	1600.00	1600.00	0.00	1600.00	C
5	2015	300.00	900.00	244.95	600.00	B
6	2016	90.00	500.00	117.28	245.83	B
7	2017	140.00	480.00	100.46	237.50	B
8	2018	220.00	350.00	41.00	260.83	B
9	2019	130.00	350.00	62.44	269.17	B
10	2020	60.00	140.00	27.91	108.33	B
11	2021	80	150.00	17.11	124.91	B
DBU Criteria					500 MPN/100 ml	

The graphical representation of all water quality parameters (pH, DO, BOD and Total Coliform) from the year 2011 to 2021 is elaborated as follows





Year wise trend (incremental improvement 78%) of Biochemical Oxygen Demand of River Ganga



Year wise trend (incremental improvement 85%) of Total Coliforms in River Ganga

Conclusion

The analytical report of water quality at downstream of Haridwar indicates that, the quality of water from the year 2011 to 2021 has drastically improved in terms of Dissolved Oxygen, Biological Oxygen demand and Total coliform.

The environmental parameter wise summary of gradual improvement of the water quality is as follows:

1. pH Value:-

The pH value of the river water quality in the year 2011 to 2014 was observed from 7.55 to 8.97, while the value observed from the year 2015 to 2021 is between 7.52 to 7.88. The recorded values of pH are within the norms.

2. Dissolved Oxygen:-

The dissolved oxygen value from 2011 to 2014 was observed from 7.55 mg/l to 7.84 mg/l, while the dissolved oxygen value recorded from 2015 to 2021 is between 7.52 mg/l to 9.35 mg/l. The incremental improved is by 22 %.

3. Biological Oxygen Demand:-

The BOD value from the 2011 to 2014 was recorded from 1.33 mg/l to 6.87 mg/l, while BOD value observed from 2015 to 2021 is 1.05 mg/l to 1.58 mg/l. This indicates reduction in BOD value is by 78%.

4. Total Coliform:-

The total coliform values observed from 2011 to 2014 was 1600 MPN/100ml. to 2945 MPN/100 ml, while total coliform value observed from 2015 to 2021 is from 108 MPN/100 ml to 600 MPN/100 ml. This indicates reduction in total coliform value by 85%.

The present water quality in comparison to designated best use criteria is as follows:

S.No.	Parameters as per DBU	Prescribe norms	Value as per 2020 data
1	pH	6.5-8.5	7.67
2	Dissolved Oxygen	5 or more	9.25
3	Biological Oxygen Demand	3 or < (less)	1.22
4	Total Coliform	500 MPN/100 ml	108

The above tables indicate that the water quality of the river Ganga at downstream is falls under 'B' category (outdoor bathing organised).

Haridwar to Sulatnapur Stretch achieved the category "B" (outdoor bathing organized) due to following reasons:-

1. Treatment of the all sewage generated from the Haridwar City.
2. All drains in Haridwar towns earlier carrying untreated sewage to the river Ganga now has been tapped.
3. There is no interferences of industrial discharge in to this stretch.
4. The designated solid waste disposal facility has been developed in the town and being used for disposal of solid waste generated from the towns.



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