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## **BRIEF REPORT ON IMPACT OF LOCKDOWN DUE TO COVID-19 PANDEMIC ON SURFACE WATER QUALITY IN RAJASTHAN**

In order to combat with the threatening spread of COVID-19 pandemic, lockdown in the state of Rajasthan was imposed by the Hon'ble Chief Minister of Rajasthan, Sh. Ashok Gehlot from 22<sup>nd</sup> March, 2020 onwards. The major sectors contributing to surface water pollution are industries, domestic sewage, activities at Ghats i.e. community bathing and washing, pilgrim activities, tourism, boating, agriculture runoff and other residential activities. Most of the water bodies are used for domestic water supply, irrigation, industrial, fisheries, boating/tourism and community bathing/washing.

Rajasthan State Pollution Control Board has a network of sixty monitoring stations for surface water (river, canal, lake and dam) under National Water Monitoring Programme in the state from where regular water sampling is carried out to know the water quality. As a result of stringent restrictions and shutting down of all non-essential activities, improvement in quality of the surface water was expected in surface water bodies of the State.

Accordingly, to know the impact of lockdown on surface water quality in the state, sampling and analysis of water quality has been carried out in last week of April, 2020 at 45 locations out of which fourteen stations are on rivers, four stations on canals, sixteen stations are on lakes and eleven stations are on dams across the State. List of sampling stations and point of sample collection are shown at Table 1.1

The analysis results of the samples collected were compared with the analysis results of the samples collected in last year April, 2019. The parameters under study have been compared as per CPCB Water Quality Criteria for Designated Best Use and the trends have been analysed with the concentration observed in April, 2019 and April, 2020. CPCB Water Quality Criteria for "Designated Best Use" is shown in Table 1.2.

The study has been categorized into two part as per flowing surface water and stored surface water bodies: Impact of lockdown on water quality of Rivers/ Canals of Rajasthan and Impact of lockdown on water quality of lakes/ dams of Rajasthan.



# RAJASTHAN STATE POLLUTION CONTROL BOARD

Table-1.1: List of sampling stations and point of sample collection

S. No.	Type	Station Code	Name of Location/ Station Identifier
1	River	1232	River Mahi Banswara (D/S At Confluence With River Chap Under Sagwara- Sirohi Road Bridge)
2		1288	River Chambal At Akelgarh, Kota U/S Kota Bairage At Intake Point Of PHED
3		1289	River Chambal At Rangpur, Kota D/S (2 km. from city)
4		1413	River Chambal At Rameshwar Ghat Near Sawaimadhopur
5		2953	River Kali Sindh At Anicut of M/S CFCL Gadepan, (Nearest Approachable Point)
6		2954	River Parvati Before Meeting River Chambal At Khatoli
7		2955	River Chambal Entering In Rajasthan At Gandhi Sagar Dam (Nearest Approachable Point)
8		2956	River Kali Sindh At Barod Road Bridge (Nearest Approachable Point)
9		4174	Gambhiri River Near Old Bus Stand, Chittorgarh
10		4175	River Berech, Near Hotel Padmini, Chittorgarh
11		4769	River Chambal, Near Chambal Bridge Dholpur To Murena Road, NH-3
12		4804	Berach River Near Village-Nagari, Chittorgarh
13		10029	Rever Chambal At Keshoraipatan Up- Stream Near Raj Rajeshwar Mahedev Temple, District- Bundi
14		10030	Rever Chambal At Keshoraipatan Down- Stream Near Ambedkar Nagar, District- Bundi
15	Canal	2932	River Narmada Main Canal (Before Entering In Rajasthan State) Tehsil Sanchore
16		2933	Gang Canal At Khakha Head Near Hindumal Kot
17		2934	Masitawala Head, IGNP, Hanumangarh
18		4773	Indira Gandhi Feeder At Rajasthan Border, Tehsil-Tibi
19	Lake	1285	Pichola Lake, Udaipur (At Water Intake Point Of PHED)
20		1286	Udaisagar Lake, Udaipur ( At Intake Point Of HZL Zinc Smelter Debari Udaipur)
21		1414	Pushkar Lake, Ajmer
22		1481	Fateh Sagar Lake, Udaipur At Intake Point of PHED, Rajasthan
23		1714	Kaylana Jheel Jodhpur, Rajasthan
24		1716	Nakki lake Mount. Abu
25		2935	Lake Jet Sagar (Nearest Approachable Point)
26		2937	Lake Siliserh, Alwar
27		2940	Gape- Sagar Lake, Dungarpur
28		2941	Lake Jaisamand, Salumber, Udaipur; Point No 1
29		2942	Lake Jaisamand, Salumber, Udaipur; Point No 2
30		2943	Lodha Talab, Banswara-Dungarpur Road, Banswara
31		4177	Swaroop Sagar, Udaipur
32		4178	Goverdhan Sagar, Udaipur
33		4179	Badi Ka Talab, Udaipur
34		4795	Nela Talab, Sector-14, Hiran Marg, Udaipur
35	Dam	1717	Kodar Dam Mount Abu
36		2945	Up Stream Of Chhapi Dam (Nearest Approachable Point)
37		2946	Up Stream Of Bhim Sagar Dam (Nearest Approachable Point)
38		2949	Ranakpur Dam, Ranakpur,River Luni
39		2951	Bisulpur Dam
40		2952	Near Newta Dam, Jaipur
41		4172	Ghosunda Dam, Chittorgarh
42		4173	Gambhiri Dam, Nimbahera- Tehsil, Chittorgarh
43		4781	Kanota Dam Village Sumel, Tehsil-Bassi
44		4790	Piplaz Dam, Bhawani Mandi
45	4805	Bhanwar Semla Dam Near Village-Dhopal	



Table 1.2 CPCB Water Quality Criteria

CPCB Water Quality Criteria for Designated Best Use		
Designated-Best-Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be 50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20C 2mg/l or less
Outdoor bathing (Organised)	B	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between 6.0 to 8.5 Electrical Conductivity at 25C micro mhos/cm Max.2250 Sodium absorption Ratio Max. 26 Boron Max. 2mg/l

## I. Impact of Lockdown on Water Quality of Rivers and Canals in Rajasthan:

Fourteen stations of rivers and four stations of canals were included for analysis. To study the impact of lockdown on water quality; data of April, 2019 and April, 2020 were compared for the five parameters i.e. BOD, COD, DO, Total Coliform and Conductivity. A comparative statement of eighteen Water Quality Monitoring Stations of rivers and canals in the state are shown in Table 1.3 and percent fluctuation w.r.t. April, 2019 are shown in Table 1.4

It has been observed that water quality of the rivers and canals in terms of all the above parameters has improved in Gang Canal at Khakha Head (2933), Masitawala Head (2934) and Indira Gandhi Feeder at Rajasthan border (4773). In terms of only BOD, COD and DO improvement in water quality has been observed at River Chambal at Akelgarh, Kota (1288), River Kali Sindh near M/s CFCL, Kota (2953), River Gambhari near old bus stand (4174) and River Berach, Near Hotel Padmani, Chittorgarh (4175).



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Table-1.3: Comparative Statement of Water Quality Monitoring Stations of River and Canal in Rajasthan

S. No.	Name of Location/ Station Identifier	Type	Station Code	Parameters									
				Biochemical Oxygen Demand (mg/l)		Chemical Oxygen Demand (mg/l)		Dissolved Oxygen (mg/l)		Total Coliforms (MNP/100 ml)		Conductivity (µmho/cm )	
				April, 2019	April, 2020	April, 2019	April, 2020	April, 2019	April, 2020	April, 2019	April, 2020	April, 2019	April, 2020
1	River Mahi Banswara (D/S At Confluence With River Chap Under Sagwara- Sirohi Road Bridge)	River	1232	1.85	1.08	21.60	8.28	5.87	4.97	28	120	510	520
2	River Chambal At Akelgarh, Kota U/S Kota Bairage At Intake Point Of PHED	River	1288	1.65	1.51	20.85	9.60	5.36	6.37	7	20	300	280
3	River Chambal At Rangpur, Kota D/S (2 km. from city)	River	1289	2.47	3.13	30.86	33.60	3.91	3.78	120	210	670	610
4	River Chambal At Rameshwar Ghat Near Sawaimadhapur	River	1413	1.85	2.70	18.86	23.40	4.32	4.10	75	120	640	570
5	River Narmada Main Canal (Before Entering In Rajasthan State) Tehsil Sanchore	Canal	2932	1.55	1.73	14.76	9.60	4.74	6.59	75	28	380	280
6	Gang Canal At Khakha Head Near Hindumal Kot	Canal	2933	2.27	1.51	22.52	9.60	4.64	5.08	75	28	390	270
7	Masitawala Head, IGNP, Hanumangarh	Canal	2934	2.78	1.51	25.02	11.20	4.33	5.40	75	28	310	230
8	River Kali Sindh At Anicut of M/S CFCL Gadepan, (Nearest Approachable Point)	River	2953	2.27	1.51	21.68	11.88	3.81	4.97	39	64	480	520
9	River Parvati Before Meeting River Chambal At Khatoli	River	2954	2.58	2.16	36.00	16.56	5.15	4.97	75	39	650	570
10	River Chambal Entering In Rajasthan At Gandhi Sagar Dam (Nearest Approachable Point)	River	2955	1.24	1.51	28.80	16.20	4.84	5.72	28	75	380	270
11	River Kali Sindh At Barod Road Bridge (Nearest Approachable Point)	River	2956	1.44	2.48	14.18	20.40	4.64	3.78	28	28	570	550
12	Gambhiri River Near Old Bus Stand, Chittorgarh	River	4174	2.68	1.94	40.80	23.40	3.09	5.62	75	120	600	650
13	River Berech, Near Hotel Padmini, Chittorgarh	River	4175	2.88	2.70	37.60	27.72	4.84	7.02	75	120	1190	1250
14	River Chambal, Near Chambal Bridge Dholpur To Murena Road, NH-3	River	4769	2.06	2.81	13.94	29.88	5.87	4.64	28	150	2100	600
15	Indira Gandhi Feeder At Rajasthan Border, Tehsil-Tibi	Canal	4773	2.47	1.73	29.19	11.60	3.91	5.40	75	39	440	280
16	Berach River Near Village-Nagari, Chittorgarh	River	4804	1.96	2.48	24.00	23.04	6.39	4.86	28	120	600	1140
17	Rever Chambal At Keshoraipatan Up- Stream Near Raj Rajeshwar Mahedev Temple, District- Bundi	River	10029	2.37	3.24	39.20	36.40	4.64	3.35	75	210	690	620
18	Rever Chambal At Keshoraipatan Down- Stream Near Ambedkar Nagar, District- Bundi	River	10030	5.56	4.32	70.89	41.20	3.09	2.59	210	210	730	640
<b>Minimum</b>				<b>1.24</b>	<b>1.08</b>	<b>13.94</b>	<b>8.28</b>	<b>3.09</b>	<b>2.59</b>	<b>7</b>	<b>20</b>	<b>300</b>	<b>230</b>
<b>Maximum</b>				<b>5.56</b>	<b>4.32</b>	<b>70.89</b>	<b>41.20</b>	<b>6.39</b>	<b>7.02</b>	<b>210</b>	<b>210</b>	<b>2100</b>	<b>1250</b>



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Table 1.4: Percent fluctuation between April 2019 and April 2020

S. No.	Name of Location/ Station Identifier	Type	Station Code	Parameters (% Decrease/ Increase)				
				BOD	COD	DO	Total Coliforms	Conductivity
1	River Mahi Banswara (D/S At Confluence With River Chap Under Sagwara- Sirohi Road Bridge)	River	1232	-42%	-62%	-15%	329%	2%
2	River Chambal At Akelgarh, Kota U/S Kota Bairage At Intake Point Of PHED	River	1288	-8%	-54%	19%	186%	-7%
3	River Chambal At Rangpur, Kota D/S (2 km. from city)	River	1289	27%	9%	-3%	75%	-9%
4	River Chambal At Rameshwar Ghat Near Sawaimadhopur	River	1413	46%	24%	-5%	60%	-11%
5	River Narmada Main Canal (Before Entering In Rajasthan State) Tehsil Sanchore	Canal	2932	12%	-35%	39%	-63%	-26%
6	Gang Canal At Khakha Head Near Hindumal Kot	Canal	2933	-33%	-57%	10%	-63%	-31%
7	Masitawala Head, IGNP, Hanumangarh	Canal	2934	-46%	-55%	25%	-63%	-26%
8	River Kali Sindh At Anicut of M/S CFCL Gadepan, (Nearest Approachable Point)	River	2953	-33%	-45%	30%	64%	8%
9	River Parvati Before Meeting River Chambal At Khatoli	River	2954	-16%	-54%	-3%	-48%	-12%
10	River Chambal Entering In Rajasthan At Gandhi Sagar Dam (Nearest Approachable Point)	River	2955	22%	-44%	18%	168%	-29%
11	River Kali Sindh At Barod Road Bridge (Nearest Approachable Point)	River	2956	72%	44%	-19%	0%	-4%
12	Gambhiri River Near Old Bus Stand, Chittorgarh	River	4174	-28%	-43%	82%	60%	8%
13	River Berech, Near Hotel Padmini, Chittorgarh	River	4175	-6%	-26%	45%	60%	5%
14	River Chambal, Near Chambal Bridge Dholpur To Murena Road, NH-3	River	4769	36%	114%	-21%	436%	-71%
15	Indira Gandhi Feeder At Rajasthan Border, Tehsil-Tibi	Canal	4773	-30%	-60%	38%	-48%	-36%
16	Berach River Near Village-Nagari, Chittorgarh	River	4804	27%	-4%	-24%	329%	90%
17	Rever Chambal At Keshoraipatan Up-Stream Near Raj Rajeshwar Mahedev Temple, District- Bundi	River	10029	37%	-7%	-28%	180%	-10%
18	Rever Chambal At Keshoraipatan Down-Stream Near Ambedkar Nagar, District- Bundi	River	10030	-22%	-42%	-16%	0%	-12%



Attempt has also been made to analyse the water quality in terms of each parameters. Parameter wise analysis is presented below graphically in Figures 1.1 to 1.5.

## i. Biochemical Oxygen Demand (BOD):

The concentration of BOD in rivers and canals of Rajasthan has ranged between 1.24 to 5.56 mg/l in April, 2019, whereas the same has ranged between 1.08 to 4.32 mg/l in April, 2020. Most of the rivers and canals monitored are within desirable limits of BOD set by CPCB under “Designated Best Use” criteria except at River Chambal at Rangpur (1289), River Chambal at Keshoraipatan Up- Stream near Raj Rajeshwar Mahedev Temple (10029) and River Chambal at Keshoraipatan Down- Stream Near Ambedkar Nagar (10030). There is a slightly decreasing trend with respect to BOD in almost all rivers and canals monitored except at eight stations i.e. River Chambal At Rangpur (1289), (River Chambal at Rameshwar Ghat (1413), River Narmada Main Canal (2932), River Chambal Entering In Rajasthan At Gandhi Sagar Dam (2955), River Kali Sindh at Barod Road Bridge (2956), River Chambal, Near Chambal Bridge Dholpur To Murena Road (4769), Berach River Near Village-Nagari(4804) and River Chambal at Keshoraipatan Up- Stream Near Raj Rajeshwar Mahedev Temple (10029)

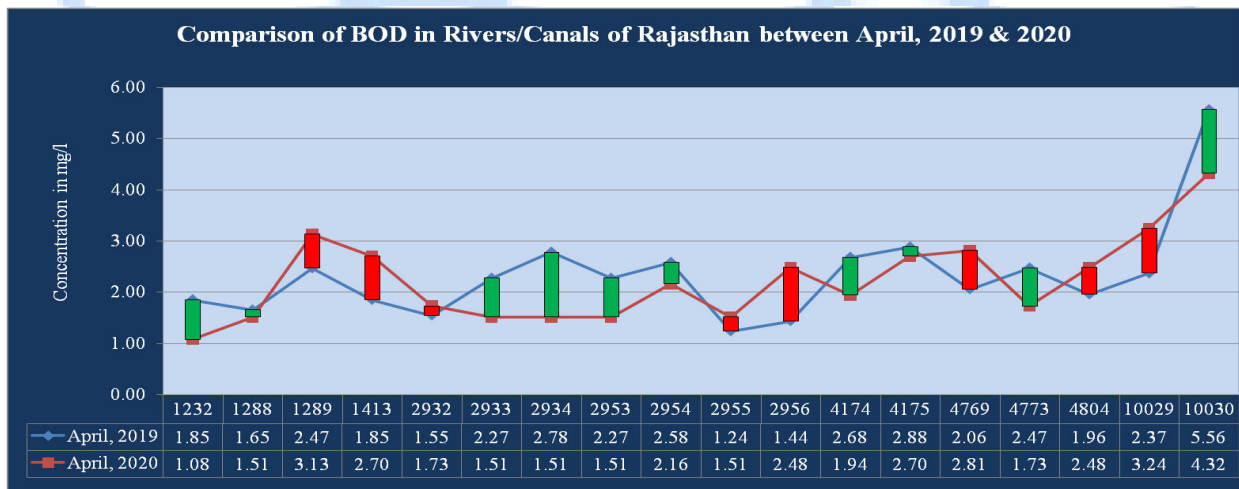


Fig. 1.1 Comparison of BOD in river and canals of Rajasthan between April, 2019 and April, 2020

## ii. Chemical Oxygen Demand(COD):

The concentration of COD in rivers and canals of Rajasthan has ranged between 13.94 to 70.89 mg/l in April, 2019, whereas the same has ranged between 8.28 to 41.20 mg/l in April, 2020. COD values are showing decreasing trends in all the





rivers and canals except at four locations i.e. River Chambal at Rangpur (1289), River Chambal at Rameshwar Ghat (1413), River Kali Sindh at Barod Road Bridge (2956) and River Chambal, Near Chambal Bridge Dholpur To Murena Road (4769). This could be due to lockdown of industrial activities, almost nil community bathing and washing activities.

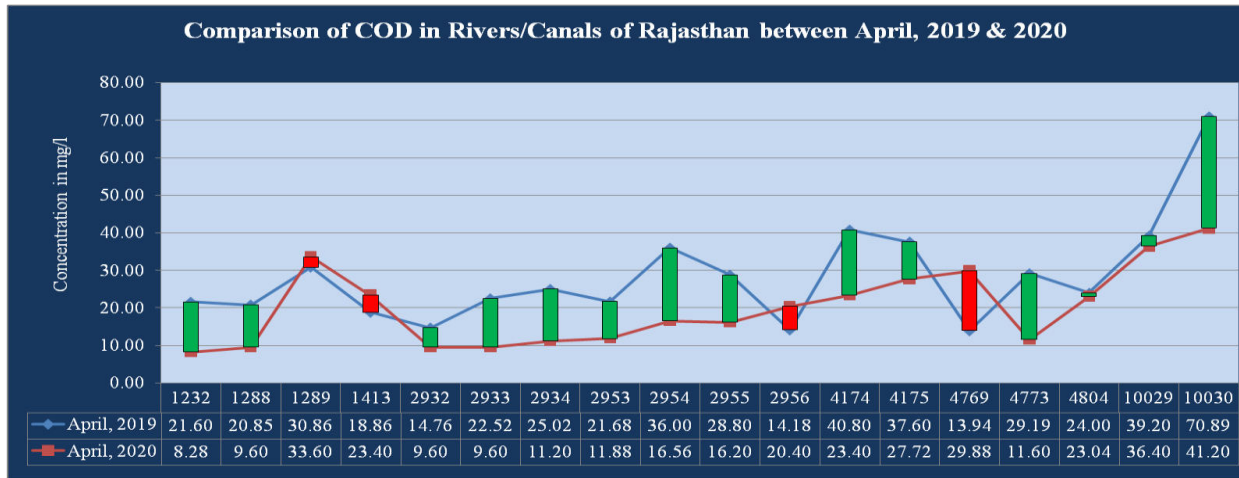


Fig. 1.2 Comparison of COD in river and canals of Rajasthan between April, 2019 and April, 2020

### iii. Dissolved Oxygen (DO):

The concentration of DO in rivers and canals of Rajasthan has ranged between 3.09 to 6.39 mg/l in April, 2019, whereas the same has ranged between 2.59 to 7.02 mg/l in April, 2020. The water quality of most of the rivers monitored with respect to DO meets the stipulated water quality criteria at thirteen locations in 2019 which increases to fourteen locations in April, 2020. Increasing trend has been observed for concentration of DO at nine locations i.e. River Chambal at Akelgarh, Kota (1288), River Narmada Main Canal (2932), Gang Canal at Khakha Head (2933), Masitawala Head, IGNP, Hanumangarh (2934), River Kali Sindh at Anicut of M/S CFCL Gadepan (2953), River Chambal Entering In Rajasthan at Gandhi Sagar Dam (2955), Gambhiri River Near Old Bus Stand, Chittorgarh (4174), River Berech, Near Hotel Padmini, Chittorgarh (4175) and (Indira Gandhi Feeder At Rajasthan Border (4773). At the remaining places, reduction in DO level was observed as compared to DO levels in April, 2019.

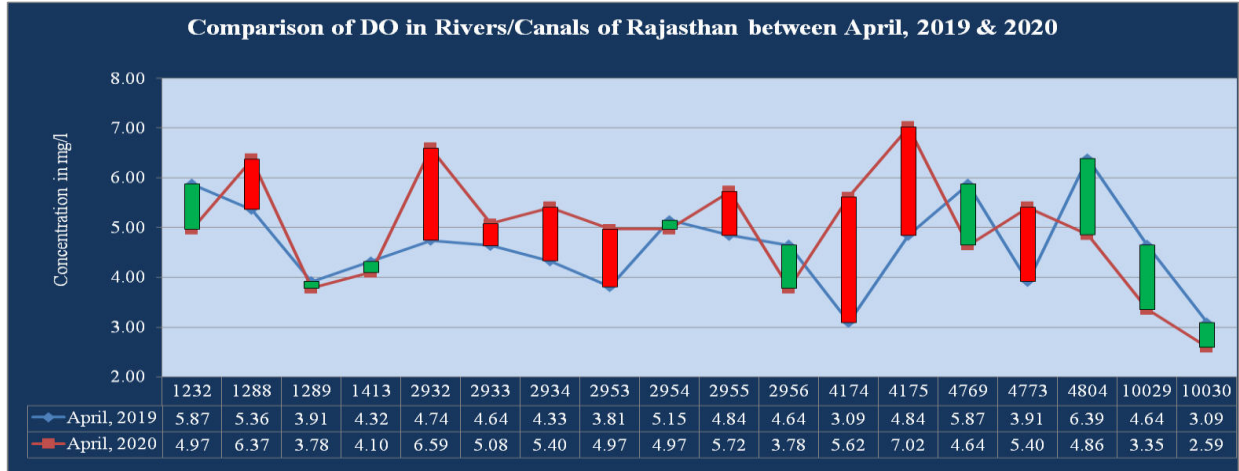


Fig. 1.3 Comparison of DO in river and canals of Rajasthan between April, 2019 and April, 2020

**iv. Total Coliform:**

The concentration of total coliform in rivers and canals of Rajasthan has ranged from 7 to 210 MPN/100ml in April, 2019, whereas the same has ranged between 20 to 210 MPN/100ml in April, 2020. The water quality of the rivers and canals monitored with respect to total coliform meets stipulated water quality criteria at all stations. Total coliform values are showing the increasing trends in all the rivers except at station 2954 (River Parvati before meeting River Chambal at Khatoli) while decreasing trends observed in all the canals. This could be attributed to decrease in industrial effluent discharged in the river which resulted into availability of less dilution in these rivers.

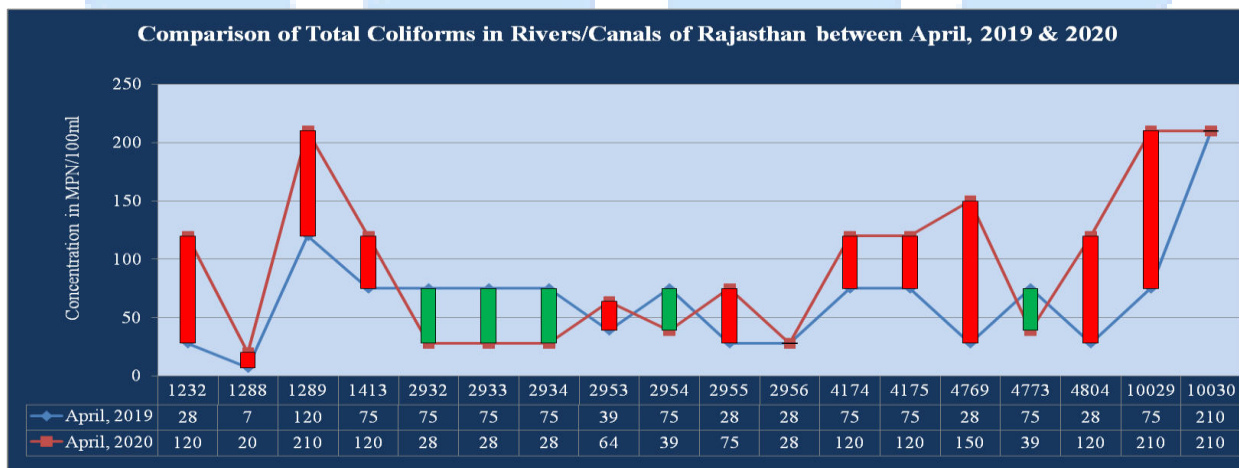


Fig. 1.4 Comparison of Total Coliform in river and canals of Rajasthan between April, 2019 and 2020



**v. Conductivity:**

On analysis of data, it has been observed that the conductivity in rivers and canals of Rajasthan has ranged between 300 to 2100µmho/cmin April, 2019, whereas the same has ranged between 230 to 1250µmho/cm in April, 2020. The water quality of the rivers and canals monitored with respect to conductivity meets stipulated water quality criteria at all stations. Values of conductivity are showing decreasing trends in all the rivers and canals except at following stations i.e. River Mahi Banswara (1232), (River Kali Sindh at Anicut of M/S CFCL Gadepan (2953), (Gambhiri River Near Old Bus Stand, Chittorgarh (4174), River Berech, Near Hotel Padmini, Chittorgarh (4175)and Berach River Near Village-Nagari, Chittorgarh (4804)

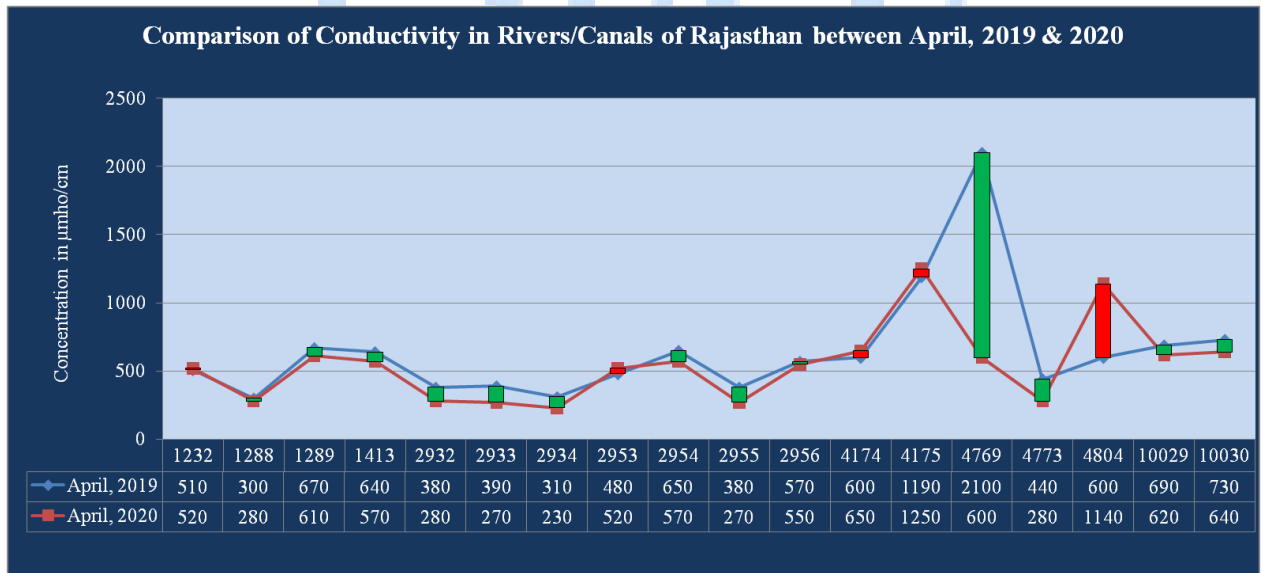


Fig. 1.5 Comparison of Conductivity river and canals of Rajasthan between April, 2019 and April, 2020



## II. Impact of Lockdown on Water Quality of Lakes and Dams of Rajasthan:

Sixteen stations on lakes and eleven stations on dams across the state were included in the study. To study the impact of lockdown on water quality, data of April, 2019 and April, 2020 were analysed for the parameters i.e. BOD, COD, DO, Total Coliform and Conductivity. A comparative statement of twenty seven Water Quality Monitoring Stations of Lakes and Dams in Rajasthan State are shown in Table 2.1 and percent fluctuation w.r.t. April, 2019 are shown in Table-2.2

It has been observed that water quality of the lakes and dams in terms of all the above parameters has been improved in Pushkar Lake, Ajmer (1414), Up Stream of Chhapi Dam (2945) and Piplaz Dam, Bhawani Mandi (4790). In terms of only BOD, COD and DO, improvement in water quality has been observed at Pichola Lake, Udaipur (1285), Kaylana Jheel Jodhpur (1714), Kodar Dam Mount Abu (1717), Lake Jet Sagar (2935), Gambhiri Dam, Nimbahera- Tehsil, Chittorgarh (4173), Swaroop Sagar, Udaipur (4177) and Badi Ka Talab, Udaipur (4179).



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Table-2.1: Comparative Statement of Water Quality Monitoring Stations of Lakes and Dams in Rajasthan

S. No.	Name of Location/ Station Identifier	Type	Station Code	Parameters									
				Biochemical Oxygen Demand (mg/l)		Chemical Oxygen Demand (mg/l)		Dissolved Oxygen (mg/l)		Total Coliforms (MNP/100 ml)		Conductivity (µmho/cm)	
				April, 2019	April, 2020	April, 2019	April, 2020	April, 2019	April, 2020	April, 2019	April, 2020	April, 2019	April, 2020
1	Pichola Lake, Udaipur (At Water Intake Point Of PHED)	Lake	1285	2.88	2.38	26.40	17.28	6.00	8.60	75	120	690	610
2	Udaisagar Lake, Udaipur ( At Intake Point Of HZL Zinc Smelter Debari Udaipur)	Lake	1286	3.09	3.67	22.40	30.60	5.50	6.80	120	150	1580	1190
3	Pushkar Lake, Ajmer	Lake	1414	12.36	3.56	94.40	35.20	1.24	5.40	150	28	460	300
4	Fateh Sagar Lake, Udaipur At Intake Point of PHED, Rajasthan	Lake	1481	1.96	3.24	20.80	29.52	5.60	8.80	75	120	830	620
5	Kaylana Jheel Jodhpur, Rajasthan	Lake	1714	1.24	0.76	10.89	6.12	5.30	7.90	28	28	260	270
6	Nakki lake Mount. Abu	Lake	1716	3.61	2.48	44.80	21.96	4.53	4.43	75	120	340	320
7	Kodar Dam Mount Abu	Dam	1717	2.88	1.30	42.40	11.88	3.91	7.34	64	120	220	160
8	Lake Jet Sagar (Nearest Approachable Point)	Lake	2935	3.30	2.05	27.52	13.20	4.12	5.40	28	75	400	350
9	Lake Siliserh, Alwar	Lake	2937	2.99	3.13	37.53	32.76	6.30	5.20	28	39	220	250
10	Gape- Sagar Lake, Dungarpur	Lake	2940	0.23	0.21	42.40	48.24	4.60	7.60	75	120	800	660
11	Lake Jaisamand, Salumber, Udaipur; Point No 1	Lake	2941	1.44	2.38	30.40	24.84	7.20	9.00	75	64	580	520
12	Lake Jaisamand, Salumber, Udaipur; Point No 2	Lake	2942	1.24	2.27	25.60	23.04	7.20	8.80	75	75	570	510
13	Lodha Talab, Banswara-Dungarpur Road, Banswara	Lake	2943	4.12	4.32	32.00	28.80	4.94	2.81	150	150	850	560
14	Up Stream Of Chhapi Dam (Nearest Approachable Point)	Dam	2945	1.75	1.30	31.82	11.52	4.64	5.40	28	28	350	330
15	Up Stream Of Bhim Sagar Dam (Nearest Approachable Point)	Dam	2946	2.06	1.94	32.56	17.28	4.64	4.64	28	28	320	300
16	Ranakpur Dam, Ranakpur, River Luni	Dam	2949	2.58	2.81	28.80	33.48	5.67	4.54	28	120	470	400
17	Bisulpur Dam	Dam	2951	0.82	1.19	20.80	20.40	6.08	4.54	21	39	450	400
18	Near Newta Dam, Jaipur	Dam	2952	10.30	12.96	96.94	132.00	0.21	0.00	210	210	2000	1530
19	Ghosunda Dam, Chittorgarh	Dam	4172	2.37	2.70	32.00	21.20	4.53	2.81	75	120	410	770
20	Gambhiri Dam, Nimbahera- Tehsil, Chittorgarh	Dam	4173	3.53	2.27	77.60	16.00	2.88	4.54	120	75	410	530
21	Swaroop Sagar, Udaipur	Lake	4177	2.78	1.94	33.60	15.12	4.60	7.60	75	120	650	500
22	Goverdhan Sagar, Udaipur	Lake	4178	3.71	4.10	48.80	42.84	4.00	6.40	120	120	1190	790
23	Badi Ka Talab, Udaipur	Lake	4179	2.99	2.38	43.20	19.08	6.60	8.80	75	120	440	410
24	Kanota Dam Village Sumel, Tehsil-Bassi	Dam	4781	7.68	9.29	109.37	104.00	2.88	2.59	210	150	2200	1590
25	Piplaz Dam, Bhawani Mandi	Dam	4790	2.68	1.84	37.00	14.04	5.77	5.83	75	64	560	400
26	Nela Talab, Sector-14, Hiran Marg, Udaipur	Lake	4795	2.16	4.43	19.20	48.60	4.00	4.50	75	150	1460	770
27	Bhanwar Semla Dam Near Village-Dhopal	Dam	4805	1.75	0.86	24.00	6.48	5.77	5.18	28	120	450	480
<b>Minimum</b>				<b>0.23</b>	<b>0.21</b>	<b>10.89</b>	<b>6.12</b>	<b>0.21</b>	<b>0.00</b>	<b>21</b>	<b>28</b>	<b>220</b>	<b>160</b>
<b>Maximum</b>				<b>12.36</b>	<b>12.96</b>	<b>109.37</b>	<b>132.00</b>	<b>7.20</b>	<b>9.00</b>	<b>210</b>	<b>210</b>	<b>2200</b>	<b>1590</b>



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Table 2.2: Percent fluctuation between April 2019 and April 2020

S. No.	Name of Location/ Station Identifier	Type	Station Code	Parameters (% Decrease/ Increase)				
				BOD	COD	DO	Total Coliforms	Conductivity
1	Pichola Lake, Udaipur (At Water Intake Point Of PHED)	Lake	1285	-17%	-35%	43%	60%	-12%
2	Udaisagar Lake, Udaipur ( At Intake Point Of HZL Zinc Smelter Debari Udaipur)	Lake	1286	19%	37%	24%	25%	-25%
3	Pushkar Lake, Ajmer	Lake	1414	-71%	-63%	335%	-81%	-35%
4	Fateh Sagar Lake, Udaipur At Intake Point of PHED, Rajasthan	Lake	1481	65%	42%	57%	60%	-25%
5	Kaylana Jheel Jodhpur, Rajasthan	Lake	1714	-39%	-44%	49%	0%	4%
6	Nakki lake Mount. Abu	Lake	1716	-31%	-51%	-2%	60%	-6%
7	Kodar Dam Mount Abu	Dam	1717	-55%	-72%	88%	88%	-27%
8	Lake Jet Sagar (Nearest Approachable Point)	Lake	2935	-38%	-52%	31%	168%	-13%
9	Lake Siliserh, Alwar	Lake	2937	5%	-13%	-17%	39%	14%
10	Gape- Sagar Lake, Dungarpur	Lake	2940	-9%	14%	65%	60%	-18%
11	Lake Jaisamand, Salumber, Udaipur; Point No 1	Lake	2941	65%	-18%	25%	-15%	-10%
12	Lake Jaisamand, Salumber, Udaipur; Point No 2	Lake	2942	83%	-10%	22%	0%	-11%
13	Lodha Talab, Banswara-Dungarpur Road, Banswara	Lake	2943	5%	-10%	-43%	0%	-34%
14	Up Stream Of Chhapi Dam (Nearest Approachable Point)	Dam	2945	-26%	-64%	16%	0%	-6%
15	Up Stream Of Bhim Sagar Dam (Nearest Approachable Point)	Dam	2946	-6%	-47%	0%	0%	-6%
16	Ranakpur Dam, Ranakpur, River Luni	Dam	2949	9%	16%	-20%	329%	-15%
17	Bisulpur Dam	Dam	2951	45%	-2%	-25%	86%	-11%
18	Near Newta Dam, Jaipur	Dam	2952	26%	36%	-100%	0%	-24%
19	Ghosunda Dam, Chittorgarh	Dam	4172	14%	-34%	-38%	60%	88%
20	Gambhiri Dam, Nimbahera- Tehsil, Chittorgarh	Dam	4173	-36%	-79%	58%	-38%	29%
21	Swaroop Sagar, Udaipur	Lake	4177	-30%	-55%	65%	60%	-23%
22	Goverdhan Sagar, Udaipur	Lake	4178	11%	-12%	60%	0%	-34%
23	Badi Ka Talab, Udaipur	Lake	4179	-20%	-56%	33%	60%	-7%
24	Kanota Dam Village Sumel, Tehsil-Bassi	Dam	4781	21%	-5%	-10%	-29%	-28%
25	Piplaz Dam, Bhawani Mandi	Dam	4790	-31%	-62%	1%	-15%	-29%
26	Nela Talab, Sector-14, Hiran Marg, Udaipur	Lake	4795	105%	153%	13%	100%	-47%
27	Bhanwar Semla Dam Near Village-Dhopal	Dam	4805	-51%	-73%	-10%	329%	7%

Attempt has also been made to analyse the water quality in terms of each parameters. Parameter wise analysis is presented below graphically in Figures 2.1 to 2.5.



## i. Biochemical Oxygen Demand (BOD):

The concentration of BOD in lakes and dams of Rajasthan has ranged between 0.23 to 12.36 mg/l in April, 2019, whereas the same has ranged between 0.21 to 12.96 mg/l in April, 2020. Most of the lakes and dams monitored are within desirable limits set by CPCB under “Designated Best Use” criteria except at following stations with respect to BOD in April, 2020 i.e. Udaisagar Lake, Udaipur (1286), Pushkar Lake, Ajmer (1414), Fateh Sagar Lake, Udaipur (1481), Lake Siliserh, Alwar (2937), Lodha Talab, Banswara (2943), Near Newta Dam, Jaipur (2952), Goverdhan Sagar, Udaipur (4178), Kanota Dam Village Sumel, Tehsil-Bassi (4781) and Nela Talab, Sector-14, Hiran Marg, Udaipur (4795)

There is a slightly decreasing trend observed with respect to BOD in lakes and dams monitored except at Udaisagar Lake, Udaipur (1286), Fateh Sagar Lake, Udaipur (1481), Lake Siliserh, Alwar (2937), Lake Jaisamand, Salumber, Udaipur; Point No 1 (2941), Lake Jaisamand, Salumber, Udaipur; Point No 2 (2942), Lodha Talab, Banswara (2943), Ranakpur Dam, Ranakpur, River Luni (2949), Bisulpur Dam (2951), Near Newta Dam, Jaipur (2952), Ghosunda Dam, Chittorgarh (4172), Goverdhan Sagar, Udaipur (4178), Kanota Dam Village Sumel, Tehsil-Bassi (4781) and Nela Talab, Sector-14, Hiran Marg, Udaipur (4795).

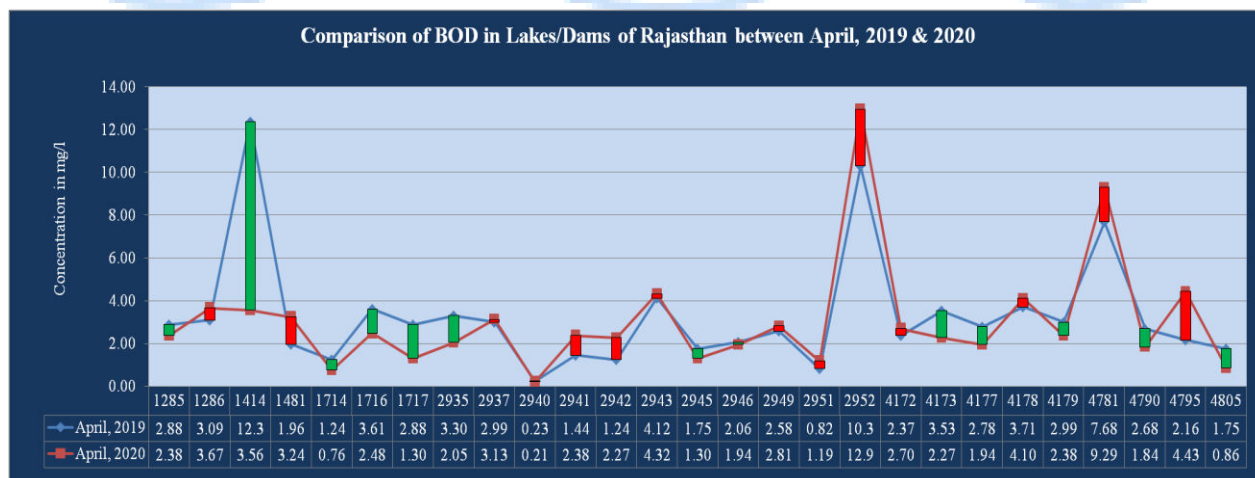


Fig. 2.1 Comparison of BOD in Lakes and Dams of Rajasthan between April, 2019 and April, 2020

## ii. Chemical Oxygen Demand (COD):

The concentration of COD in lakes and dams of Rajasthan has ranged between 10.89 to 109.37 mg/l in April, 2019, whereas the same has ranged between 6.12 to 132.0 mg/l in April, 2020. COD values are showing decreasing trends in all the



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lakes and dams except at Udaisagar Lake, Udaipur (1286), FatehSagar Lake, Udaipur (1481), Gape-Sagar Lake, Dungarpur (2940), Ranakpur Dam, Ranakpur, River Luni (2949), Near Newta Dam, Jaipur (2952), and Nela Talab, Sector-14, Hiran Marg, Udaipur (4795). This could be due to lockdown of industrial activities and minimized anthropogenic activities.

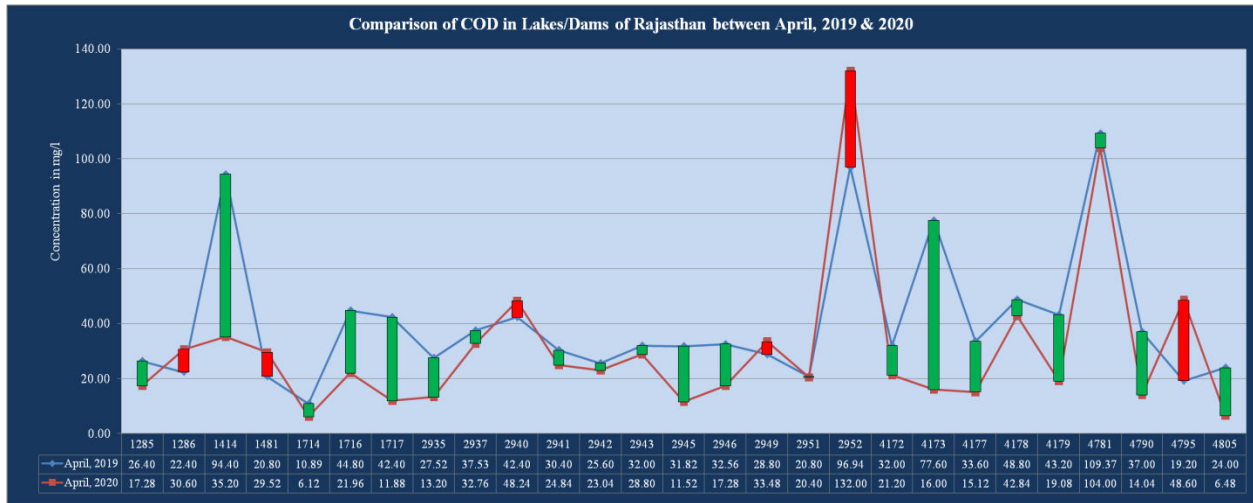


Fig. 2.2 Comparison of COD in Lakes and Dams of Rajasthan between April, 2019 and April, 2020

### iii. Dissolved Oxygen (DO):

The concentration of DO in lakes and dams in the state has ranged between 0.21 to 7.20 mg/l in April, 2019, whereas the same has ranged between 0.0 to 9.0 mg/l in April, 2020. Values of DO are showing increasing trends in most of the lakes and dams across the state except at Nakki lake Mount. Abu (1716), Lake Siliserh, Alwar (2937), Lodha Talab, Banswara (2943), Ranakpur Dam, Ranakpur, River Luni (2949), Bisulpur Dam (2951), Near Newta Dam, Jaipur (2952), Ghosunda Dam, Chittorgarh (4172), Kanota Dam Village Sumel, Tehsil-Bassi (4781) and (Bhanwar Semla Dam Near Village-Dhopal (4805)). The water quality of most of the lakes and dams monitored with respect to DO meets the stipulated water quality criteria at twenty two locations in 2019 which increases to twenty four locations in April, 2020.



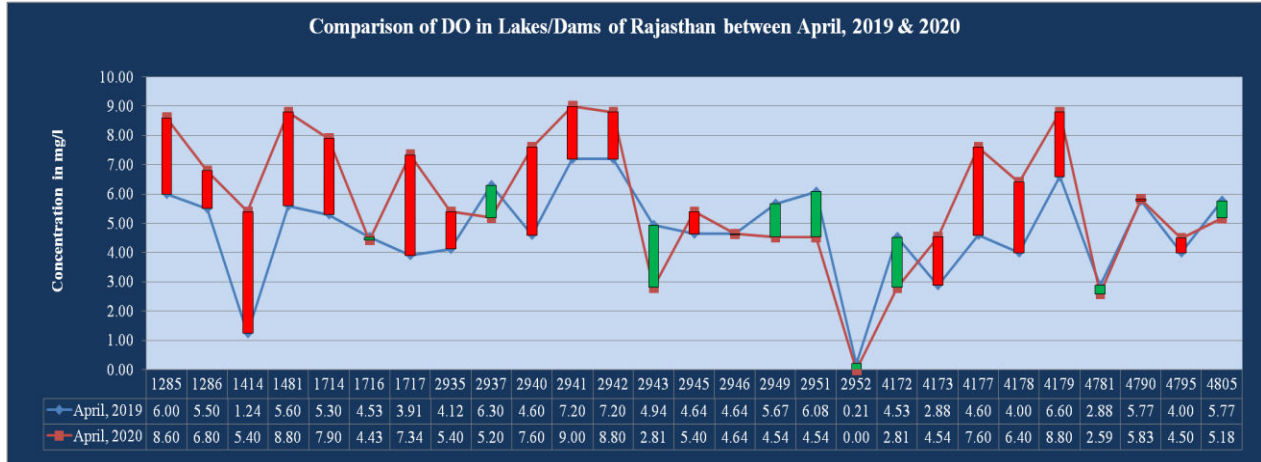


Fig. 2.3 Comparison of DO in Lakes and Dams of Rajasthan between April, 2019 and April, 2020

**iv. Total Coliform:**

The concentration of total coliform in lakes and dams in the state has ranged between 21 to 210 MPN/100ml in April, 2019, whereas the same has ranged between 28 to 210 MPN/100ml in April, 2020. The water quality of the lakes and dams monitored with respect to total coliform meets stipulated water quality criteria at all stations. Values of Total Coliforms are showing increasing trends in most of the lakes and dams across the state except at Pushkar Lake, Ajmer (1414), Lake Jaisamand, Salumber, Udaipur; Point No 1 (2941), Gambhiri Dam, Nimbahera-Tehsil, Chittorgarh (4173), Kanota Dam Village Sumel, Tehsil-Bassi (4781) and Piplaz Dam, Bhawani Mandi (4790).

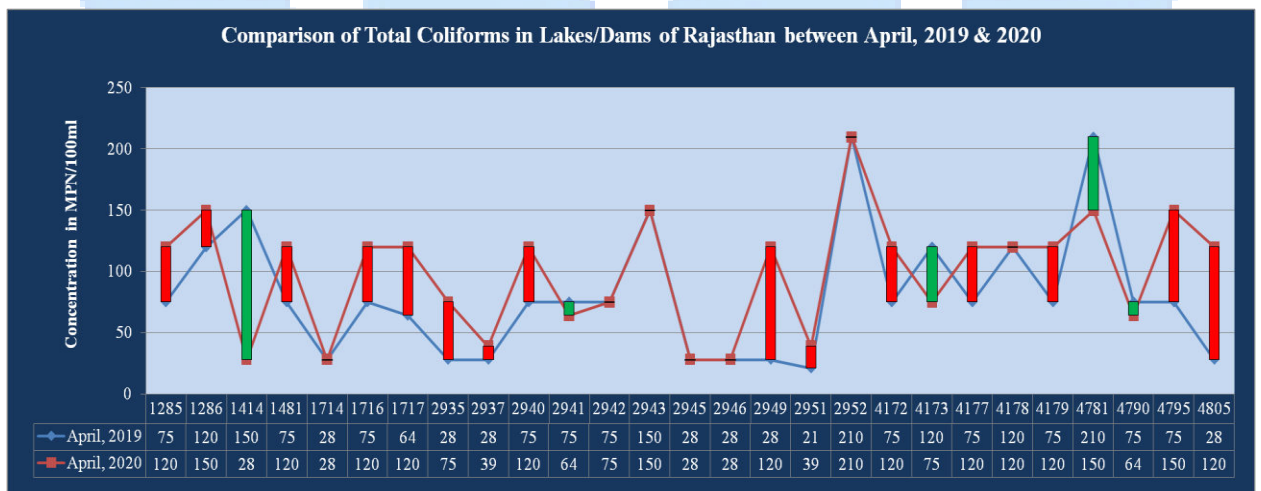


Fig. 2.4 Comparison of Total Coliform in Lakes and Dams of Rajasthan between April, 2019 and April, 2020



**v. Conductivity:**

On analysis of data, it has been observed that the concentration of conductivity in lakes and dams of Rajasthan has ranged between 220 to 2200  $\mu\text{mho}/\text{cm}$  April, 2019, whereas the same has ranged between 160 to 1590  $\mu\text{mho}/\text{cm}$  April, 2020. The water quality of the lakes and dams monitored with respect to conductivity meets stipulated water quality criteria at all stations. Values of conductivity are showing decreasing trends in all the lakes and dams except at following stations i.e. Kaylana Jheel Jodhpur, Rajasthan (1714), Lake Siliserh, Alwar (2937), Ghosunda Dam, Chittorgarh (4172), Gambhiri Dam, Nimbahera- Tehsil, Chittorgarh (4173), and Bhanwar Semla Dam Near Village-Dhopal (4805).

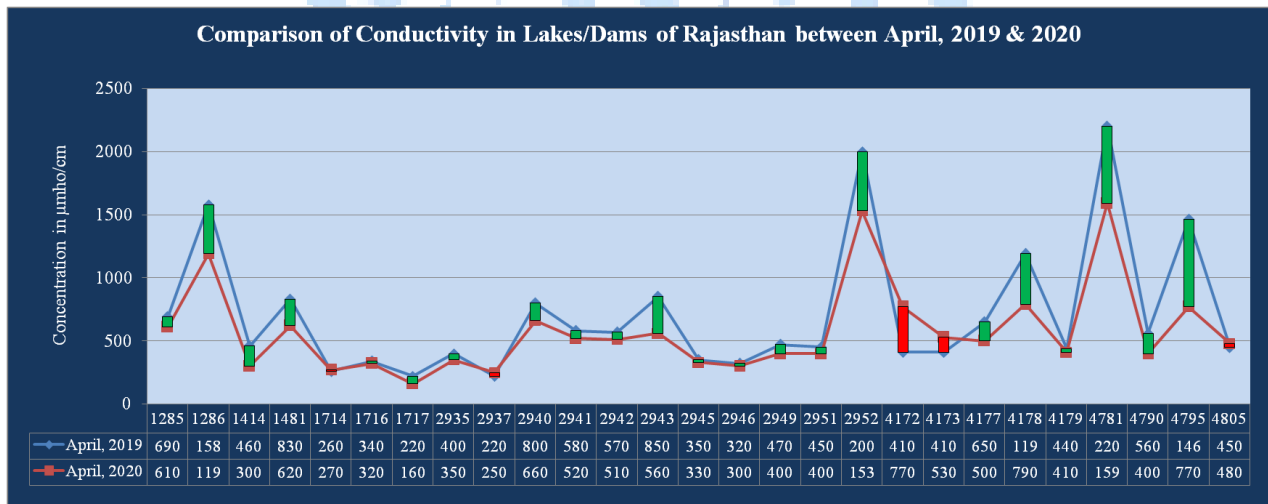


Fig. 2.5 Comparison of Conductivity in Lakes and Dams of Rajasthan between April, 2019 and 2020

**III. Conclusions and Highlights:**

- I. The overall water quality of the canals i.e. Main Canal of River Narmada, IGNP and Gang Canal has improved. Likewise, water quality of River Chambal at Akelgarh, Kota, River Kali Sindh near M/s CFCL, Kota, River Gambhari near old bus stand and River Berach, near Hotel Padmani, Chittorgarh has also improved in terms of major parameters. It may be due to lockdown of industrial activities, almost nil community bathing and washing activities around these respective canals/ rivers.
- II. Water quality of the major lakes like Pichola, Udaisagar, Swaroop Sagar, Goverdhan Sagar and Badi Ka Talab in Udaipur, Nakki lake at Mount Abu,



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Pushkar Lake, at Ajmer, Kaylana Jheel at Jodhpur and Gape- Sagar Lake at Dungarpur has also improved in the period of lockdown.

- III. Improvement of water quality of the lakes located in Udaipur and Mount Abu may be due to minimal tourist inflow in lockdown period. Similarly, the water quality of the Pushkar Lake is due to minimal pilgrims and almost nil community bathing and washing activities at the ghats.
- IV. The water quality of the up-stream of Chhapi Dam, Piplaz, Dam at Bhawani Mandi, Kodar Dam at Mount Abu and Gambhiri Dam at Nimbahera has improved as compared to April, 2019. Improvement of water quality of these dams may be due to minimal human interventions at the dam and there catchment area during the lockdown period.

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