BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL,
Principal Bench, New Delhi
In
Original Application No. 593/2017
With
Original Application No. 148/2016

In the Matter of: -

Paryavaran Suraksha Samiti & Anr. **Applicant(s)**

Vs.

Union of India & Ors. **Respondent(s)**

With

Mahesh Chandra Saxena **Applicant**

Vs.

South Delhi Municipal Corporation & Ors. **Respondent(s)**

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Parivesh Bhawan, East Arjun Nagar
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Place: Delhi
Date: 16th September, 2020

Status Report in the matter of Hon'ble NGT order dated 21st May, 2020 in Original Application No. 593/2017 (Paryavaran Suraksha Samiti & Anr. v/s Union of India & Ors.)

with

Original Application No. 148/2016 (Mahesh Chandra Saxena v/s South Delhi Municipal Corporation & Ors.)

15th Septemer, 2020

CENTRAL POLLUTION CONTROL BOARD
"Parivesh Bhawan", East Arjun Nagar,
Delhi-110032

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1.0 Background

The last hearing by the Hon'ble NGT in the matter of OA No. 593/2017 (Paryavaran Suraksha Samiti & Anr. v/s Union of India & Ors.) was held on 21.05.2020, wherein NGT reviewed the compliance report dated 15.05.2020, submitted by CPCB, regarding status of ETPs, CETPs & STPs in the country. Subsequently, the Tribunal passed the following directions:

i. *All States/UTs through their concerned departments such as Urban/Rural Development, Irrigation & Public Health, Local Bodies, Environment, etc. may ensure formulation and execution of plans for sewage treatment and utilization of treated sewage effluent with respect to each city, town and village, adhering to the timeline as directed by Hon'ble Supreme Court. STPs must meet the prescribed standards, including faecal coliform.*

CPCB may further continue efforts on compilation of River Basin-wise data. Action plans be firmed up with Budgets/Financial tie up. Such plans be overseen by Chief Secretary and forwarded to CPCB before 30.6.2020. CPCB may consolidate all action plans and file a report accordingly.

Ministry of Jal Shakti and Ministry of Housing and Urban Affairs may facilitate States/UTs for ensuring that water quality of rivers, lakes, water bodies and ground water is maintained.

100% treatment of sewage/effluent must be ensured and strict coercive action taken for any violation to enforce rule of law. Any party is free to move the Hon'ble Supreme Court for continued violation of its order after the deadline of 31.3.2018. This order is without prejudice to the said remedy as direction of the Hon'ble Supreme Court cannot be diluted or relaxed by this Tribunal in the course of execution. PCBs/PCCs are free to realise compensation for violations but from 1.7.2020, such compensation must be realised as per direction of this Tribunal failing which the erring State PCBs/PCCs will be accountable.

ii. *The CPCB may study and analyse the extent of reduction of industrial and sewage pollution load on the environment, including industrial areas and rivers and other water bodies and submit its detailed report to the Tribunal.*

iii. *During the lockdown period there are reports that the water quality of river has improved, the reasons for the same may be got studied and analysed by the CPCB and report submitted to this Tribunal. If the activities reopen, the compliance to standards must be maintained by ensuring full compliance of law by authorities statutorily responsible for the same.*

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iv. *Accordingly, we direct that States which have not addressed all the action points with regard to the utilisation of sewage treated water may do so promptly latest before 30.06.2020, reducing the time lines in the action plans. The timelines must coincide with the timelines for setting up of STPs since both are interconnected. The CPCB may compile further information on the subject accordingly.*

v. *Needless to say that since the issue of sources of funding has already been dealt with in the orders of the Hon'ble Supreme Court, the States may not put up any excuse on this pretext in violation of the judgment of the Hon'ble Supreme Court.*

2.0 Compliance Status of ETPs, CETPs & STPs reported by SPCBs/PCCs

In compliance of the directions of Hon'ble NGT issued vide order dated 03.08.2018 and 14.08.2019, CPCB has been collecting the monthly compliance status report with regard to ETPs, CETPs & STPs from all the SPCBs/PCCs and examining the same for shortcomiongs and required corrective measures. The shortcomings/actions pending at the end of SPCBs/PCCs are communicated on monthly basis.

As on 31.08.2020, all SPCBs/PCCs have responded to the communication of CPCB and provided the compliance status reports. However, Uttar Pradesh Pollution Control Board has not submitted the status report for ETPs, till date. Arunachal Pradesh, Assam, and Manipur have not furnished the updated compliance status for the last few months.

The state-wise details of the compliance status as reported by SPCBs/PCCs are given at **Annexure-I (Table No. 1 to 9)**. However, the summary of the compliance status is as follow:

i. As per the data received from SPCBs/PCCs, out of total 64,484 number of industries requiring ETPs, 62,653 industries are operating with functional ETPs and 1,831 industries are operating without ETPs. Show-cause notices and closure directions have been issued to 856 and 824 industries, respectively for operating without ETPs. Legal cases have been filed against 6 industries and action is under process for 145 industries. Out of 62,653 operational industries, 61,530 industries are complying with environmental standards and 1,123 industries are non-complying. Show-cause notices and closure directions have been issued to 613 and 135 industries, respectively, for non-compliance. Legal cases have been filed against 13 industries and action is under process for 362 industries.

ii. As per the data received from SPCBs/PCCs, there are total 191 CETPs, out of which 129 CETPs are complying with environmental standards and 62 CETPs are non-complying. Show-cause notices and closure directions have been issued to 20 and 5 CETPs, respectively for non-compliance. Legal cases have been filed against 8 CETPs and action is under process for 29 CETPs.

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iii. As per the data received from SPCBs/PCCs, there are total 15,730 STPs (including municipal and other than municipal (non-municipal/stand-alone) STPs), out of which, 15,200 STPs are complying with environmental standards and 530 STPs are non-complying. Show-cause notices and closure directions have been issued to 262 and 28 STPs, respectively, for non-compliance. Legal cases have been filed against 17 STPs and action is under process for 223 STPs.

iv. As per the data received from SPCBs/PCCs, there are 84 CETPs in construction/proposal stage, whereas, for STPs, 1,081 projects (municipal and non-municipal) are under construction/proposal stage.

v. As per the data received from SPCBs/PCCs, 15 SPCBs/PCCs (namely- Andhra Pradesh, Assam, Bihar, Goa, Haryana, Himachal Pradesh, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Odisha, Puducherry, Tamil Nadu, Telangana and West Bengal) are displaying OCEMS data in public domain. The links provided by Gujarat and Uttarakhand SPCBs are password protected and data is not available in public domain. The 4 SPCBs (namely, Chhattisgarh, Jammu & Kashmir, Punjab and Sikkim) have not provided appropriate web links. Further, Chandigarh PCC has clarified that OCEMS data will be displayed after upgradation of STPs. Karnataka SPCB has requested for time till 30.09.2020 to make the system operational. Mizoram SPCB has informed that there is no industry requiring OCEMS connectivity. Lakshadweep PCC informed that there is no industry in the Union Territory of Lakshadweep.

OCEMS data of 11 SPCBs/PCCs (Andaman & Nicobar, Arunachal Pradesh, Daman & Diu, Dadra Nagar Haveli, Delhi, Manipur, Meghalaya, Nagaland, Rajasthan, Tripura and Uttar Pradesh) is not available in public domain.

3.0 Steps taken by CPCB in compliance of the Hon'ble NGT directions dated 21.05.2020

3.1 Sewage Management

Hon'ble NGT vide order dated 21.05.2020 passed directions regarding sewage management under Para 24, 26 (i) & 26 (v). The point-wise reply is as follow:

3.1.1 Compliance status w.r.t. the directions under Para 24 and 26 (iv)

i. CPCB requested all States/UTs vide email/letter dated 03.06.2020, 24.06.2020 and 24.08.2020 to submit action plans as per the format and compliance reports. Further, CPCB has also provided link of the report submitted to the Hon'ble NGT indicating observations/ shortcomings on action plans of reuse of treated sewage, to the SPCBs/PCCs. A copy of the correspondances is attached at **Annexure-II.**

ii. Accordingly, action plan was received from the State of Punjab and revised action plans were received from Jammu and Kashmir (UT), Lakshadweep, Rajasthan (specific to Ajmer district), and Sikkim. Information is awaited from other States. The gap analysis of action plans is attached as **Annexure-III**.

iv. 4 States/UTs (Arunachal Pradesh, Manipur, Uttar Pradesh, Uttarakhand) have not submitted any information till date.

3.1.2 Compliance w.r.t. directions under Para 26 (i)

i. CPCB communicated to all SPCBs/PCCs to provide information on STPs inventory as per the format, vide letter dated 15/07/2020. A copy of letter is attached as **Annexure-IV.** Based on continuous follow-up, all SPCBs/PCCs have provided information on STPs and same is attached as **Annexure-V.**

ii. CPCB vide letter dated 24.08.2020 has requested all States/UTs to submit action plans through online portal of CPCB.

3.2 River basin-wise macro picture of ETPs, CETPs, STPs, MSW Facilities and Legacy Waste Sites

The Hon'ble NGT, in the matter of OA No. 593 of 2017, vide order 28.08.2019, directed CPCB to collect the data of ETPs, CETPs, STPs, MSW facilities and legacy waste sites and prepare a river-basin-wise macro picture in terms of gaps.

In compliance of the Hon'ble NGT's directions, CPCB has developed an online portal for the collection of river-basin wise information. The details of the river basins associated with the concerned states, as adopted from River Basin Classification, 2019 of Central Water Commission, is given at **Annexure-VI**. The portal, with modules for ETPs, CETPs and STPs, is operational and SPCBs/PCCs are in the process of using the same for submission of information.

3.2.1 Status of ETPs:

CPCB has been collecting the industry specific information related to river basin, locational coordinates (lattitude & longitude), disposal point for trade effluent, treatment capacity & actual treatment, environmental compliance status, action taken by concerned authority in case of non-compliace, etc. Further, provision for capturing information regarding pollution load of four major water quality parameters i.e. pH, BOD, COD and TSS are being also incorporated. SPCBs/PCCs have been reminded to expedite the work for data submission, vide letter dated 12.05.2020, 30.07.2020 and 25.08.2020 (email). Copy of the correspondences is given at **Annexure-VII (a to c)**.

So far, information from 6 SPCBs/PCCs (namely; Delhi, Haryana, Daman & Diu, Mizoram, Odisha and Tripura) have been received through CPCB portal. Rest of the SPCBs/PCCs are under the process of compilation and submission of data. The data submitted by Haryana, Daman & Diu, Delhi and Odisha SPCB/PCC has some shortcomings, which were communicated vide letter dated 07.09.2020 & 09.09.2020. A Copy of the correspondences to concerned SPCBs/PCCs is given at **Annexure-VIII (a to d).**

Although, to have the complete and clear picture, data from all the States/UTs is required, however, preliminary analysis based on the information recived from 04 SPCBs/PCCs, is as follows:

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a. River basin-wise disposal point of industrial units for the discharge of trade effluent:

As per the river basin-wise information received from 04 SPCBs/PCCs (Delhi, Daman & Diu, Mizoram and Tripura), there are total 1,544 industrial units in these States/UTs. The river basin-wise number of units with respect to their effluent discharge points is summarized in the following table:

Table No. 1: River basin-wise status of trade effluent generating units and their disposal points

Sl. No.	River Basin	State/ UT	Number of units w.r.t. their effluent disposal points									Total
			CETP	Canal	Drain	Land/ Irrigation	River	Sewer	STP	ZLD	Others	
1	Ganga	Delhi	817	1	571	0	0	26	1	3	0	**1419**
2	West flowing rivers from Tapi to Tadri	Daman & Diu	0	0	0	2	1	0	0	20	21	**44**
3	Minor river basins drainage to Bangladesh & Burma	Mizoram	0	0	61	0	0	0	0	0	0	**61**
		Tripura	4	0	2	1	2	0	0	0	11	**20**
Total			**821**	**1**	**634**	**3**	**3**	**26**	**1**	**23**	**32**	**1544**

b. **River basin-wise discharge of treated/partially treated effluents**

Based on the information received from Delhi, Daman & Diu, Mizoram and Tripura SPCB/PCC, river basin-wise quantum of treated/partially treated industrial effluents, is summarized in the following table:

Table No. 2: River basin-wise status of discharge of treated/partially treated effluent at various dispoal points

Sl. No.	River Basin	State/UT	Discharge Volume at the particular discharge point(KLD)									Total
			CETP	Canal	Drain	Land/ Irrigation	River	Sewer	STP	ZLD	Others	
1	Ganga	Delhi	6178	0	6721	0	0	177	195	6	0	**13277**
2	West flowing rivers fromTapi to Tadri	Daman & Diu	0	0	0	24	400	0	0	1210	233	**1867**
3	Minor river basins drainage to Bangladesh & Burma	Mizoram	0	0	43	0	0	0	0	0	0	**43**
		Tripura	545	0	2	18	1320	0	0	0	470	**2355**
Total			**6723**	**0**	**6766**	**42**	**1720**	**177**	**195**	**1216**	**703**	**17542**

c. River basin-wise discharge of untreated/partially treated industrial trade effluent

As per the available information for the 04 States/UTs, the Table No. 3 summarizes the river basin-wise status of the designed capacity of ETPs, daily average volume of effleuent generation and Discharge of untreated/partially treated effluent (KLD).

Table No. 3 River-basin wise industrial effluent generatio and treatment

Sl. No.	River Basin	State/UT	Designed capacity of ETPs (KLD)	Daily Average Volume of Effluent Genration (KLD)	Daily average volume of treated effluent (KLD)	Discharge of untreated/partially treated effluent (KLD)
			(i)	(ii)	(iii)	(iv) = (ii) – (iii)
1	Ganga	Delhi	32358	13417	13338	79
2	West flowing rivers from Tapi to Tadri	Daman & Diu	4351	1867	1867	0
3	Minor river basins drainage to Bangladesh & Burma	Mizoram	95	44	43	1
		Tripura	13869	2359	2355	4
Total			**50673**	**17687**	**17603**	**84**

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3.2.2 River basin-wise status of CETPs:

So far, river basin-wise information of CETPs have been received from 6 SPCBs/PCCs (namely Chandigarh, Delhi, Mizoram and Tripura, Daman & Diu and Dadra Nagar Haveli). The Chandigarh, Mizoram Daman & Diu and Dadra Nagar Haveli, have informed that there is no CETP in their State/UT. The information from other SPCBs/PCCs is awaited.

3.2.3 River basin-wise status of STPs:

CPCB has developed a portal to facilitate submission of river basin-wise data for STPs. CPCB vide letter dated 24.08.2020 has requested all States/UTs to submit action plans and river basin-wise data through portal. The information from SPCBs/PCCs is awaited.

3.2.4 River basin-wise status of MSW Facilities and Legacy Waste Sites:

CPCB developed the formats for collection of information regarding Municipal solid Waste (MSW) processing facilities, landfill sites and dumpsites from all the States/UTs, to ensure compliance with Hon'ble NGT Directions. The formats circulated to all States/UTs vide letter dated July 31, 2020 **Annexure-IX.** Information has been received from 10 States/UTs (namely; Kerala, Maharashtra, Jammu & Kashmir, Himachal Pradesh, Mizoram, Tamil Nadu, Delhi, West Bengal, Meghalaya & Pondicherry). Out of the 10 states, Tamil Nadu has provided information for only dumpsites. On the basis of information, as submitted by States/UTs, the status is as follow:

3.2.4.1 Status of MSW facilities and legacy waste sites

a) State wise distribution of the SWM facilities is given in Table No. 4. River basin-wise distribution of the SWM facilities is given in Table No. 5.

Table No. 4: State-wise Distribution of Solid Waste Management Facilities

Sl. No.	Name of the State	Waste Processing facilities	Landfill Sites	Dumpsite
1.	Delhi	40	2	3
2.	Himachal Pradesh	52	0	15
3.	Jammu & Kashmir	3	7	53
4.	Kerala	20	-	39
5.	Maharashtra	103	19	62
6.	Meghalaya	2	1	5
7.	Mizoram	26	1	5
8.	Puducherry	4	3	3
9.	Tamil Nadu	Not Provided	Not Provided	136
10.	West Bengal	9	2	107
TOTAL		**259**	**35**	**428**

Table No. 5: River basin-wise Distribution of Solid Waste Management Facilities

Sl. No.	River basin	Name of the State	Waste Processing	Landfill	Dumpsite
1.	Alur	Kerala	0	0	1
2.	Amravati	Maharashtra	0	0	1
3.	Anchar	Jammu & Kashmir	1	1	1
4.	Beas	Himachal Pradesh	5	0	3
5.	Bharthpuza	Kerala	0	0	1
6.	Bhatsa	Maharashtra	0	0	1

Sl. No.	River basin	Name of the State	Waste Processing	Landfill	Dumpsite
7.	Bhawani	Tamil Nadu	0	0	1
8.	Bindusar	Maharashtra	1	0	1
9.	Binwa Khud	Himachal Pradesh	0	0	1
10.	Bori	Maharashtra	1	0	1
11.	Cauvery	Tamil Nadu	0	0	3
12.	Chalakudy Puzha	Kerala	1	0	0
13.	Chandrabhaga	Maharashtra	1	1	1
14.	Chitra Puzha	Kerala	1	0	2
15.	Darna	Maharashtra	1	0	1
16.	Devanathi	Tamil Nadu	0	0	1
17.	Gandhari	Maharashtra	1	1	0
18.	Ganga	West Bengal	4	0	0
19.	Ghodnadi	Maharashtra	1	0	1
20.	Girnna	Maharashtra	1	0	2
21.	Godavari	Maharashtra	5	1	5
22.	Gomai	Maharashtra	1	0	1
23.	Grad	Jammu & Kashmir	0	0	1
24.	Haldi	West Bengal	2	2	0
25.	Hatheli Khud	Himachal Pradesh	1	0	1
26.	Hiwara	Maharashtra	1	0	1
27.	Indrayani	Maharashtra	2	1	2
28.	Jhelum	Jammu & Kashmir	0	2	2
29.	Kadalundi River	Kerala	1	0	2
30.	Kalam Khad Nala	Himachal Pradesh	1	0	0
31.	Kalyan creek	Maharashtra	3	1	1
32.	Kan	Maharashtra	0	0	1
33.	Kanhan	Maharashtra	3	0	2
34.	Karamana	Kerala	0	0	1
35.	Karuvannoor	Kerala	0	0	1
36.	Khir Ganga	Himachal Pradesh	1	0	0
37.	Kolar	Maharashtra	1	0	1
38.	Kora Puzha	Kerala	1	0	1
39.	Koringa	Puducherry	0	0	1
40.	Koyana	Maharashtra	1	1	1
41.	Krishna	Maharashtra	6	2	6
42.	Kundalika	Maharashtra	1	1	1
43.	Maharaza Samuthi ram	Tamil Nadu	0	0	1
44.	Manjara	Maharashtra	1	1	1
45.	Markanda River	Himachal Pradesh	1	0	0
46.	Marna	Maharashtra	0	0	1
47.	Meenachil	Kerala	0	0	1
48.	Minkjai	Meghalaya	0	0	1
49.	Mithi	Maharashtra	0	0	1
50.	Mula	Maharashtra	38	0	1
51.	Nallathanni	Kerala	0	0	1
52.	Nira	Maharashtra	1	1	1
53.	Pabbar river	Himachal Pradesh	2	0	0
54.	Panchganga	Maharashtra	2	1	2
55.	Panzara	Maharashtra	1	0	1
56.	Patalganga	Maharashtra	2	0	2
57.	Pedhi	Maharashtra	0	0	1
58.	Pelhar	Maharashtra	1	0	1
59.	Penganga	Maharashtra	2	0	2
60.	Puzhakal	Kerala	0	0	1
61.	Rangavali	Maharashtra	1	0	1
62.	Ravi	Himachal Pradesh	1	0	1
63.	Ringre	Meghalaya	1	0	1
64.	Satluj	Himachal Pradesh	4	0	1
65.	Savitri	Maharashtra	0	0	1

Sl. No.	River basin	Name of the State	Waste Processing	Landfill	Dumpsite
66.	SEER KHAD	Himachal Pradesh	1	0	0
67.	Sina	Maharashtra	1	0	1
68.	Sirsa	Himachal Pradesh	0	0	1
69.	Suketi Khad	Himachal Pradesh	1	0	0
70.	Swan river	Himachal Pradesh	1	0	0
71.	Tapi	Maharashtra	2	1	2
72.	Tawi	Jammu & Kashmir	0	0	1
73.	Tirur	Kerala	0	0	1
74.	Titur	Maharashtra	1	0	1
75.	Tuirial	Mizoram	1	1	0
76.	Ulhas	Maharashtra	3	0	3
77.	Umiam	Meghalaya	1	1	1
78.	Una Khad	Himachal Pradesh	1	0	0
79.	Uppanaru	Tamil Nadu	0	0	1
80.	Valapattanam	Kerala	0	0	1
81.	Wainganga	Maharashtra	5	3	5
82.	Wardha	Maharashtra	3	2	2
83.	Wena	Maharashtra	1	0	1
84.	Yamuna	Delhi	41	2	3
85.	NA	Break-up given in Table No. 6	88	8	325
		TOTAL	**259**	**35**	**428**

b) The SWM facilities located in the ten states are spread over 84 river basins, a majority of them are significantly small.

c) The information, regarding river basin in which a particular solid waste management facility is falling, has not been reported for 34% of the waste processing facilities, 22% of the landfills and 75% of the dumpsites. State wise number of states for which the river basin in which the waste management facility has not been provided is given in the Table No. 6.

Table No. 6: SWM facilities for which river basin has not been indicated

State/UT	Waste processing facilities	Landfills	Dumpsites
Himachal Pradesh	31	No sanitary landfill site	7
Jammu & Kashmir	2	4	48
Kerala	16	Not provided	25
Maharashtra	7	1	1
Meghalaya	0	0	2
Mizoram	25	0	5
Puducherry	4	3	2
Tamil Nadu	Not provided	Not provided	128
West Bengal	3	0	107
Total	**88**	**8**	**325**

d) The number of dumpsites (428) is substantially higher than the number of scientifically designed landfills (35). As no arrangement for collection and treatment of leachate is provided in these dumpsites, there is a high potential of contamination of surface and groundwater resources at these dumpsite.

e) Capacity of one landfill site in Maharashtra is exhausted.

f) Fresh waste is reported to be dumped at 224 out of 428 dumpsites.

g) Disposal of legacy waste is not under consideration in 46 out of 428 dumpsites.

h) Bio-remediation in 72 out of 428 dumpsites is not being done in accordance with CPCB guidelines.

i) Ground water analysis report is not available for 215 out of the 259 waste processing sites, 26 out of 35 landfill sites, 222 of the 428 dumpsites.

j) 174 out of the 259 waste processing facilities, 16 out of 35 landfill sites and 422 out of 428 dumpsites have not provided leachate treatment facilities.

k) Only 22 out of the 259 waste processing facilities, 14 out 35 landfill sites and 109 out of 428 dumpsites have confirmed that the leachate complies with the stipulated norms.

l) Locational coordinates for waste processing facilities have not been provided for 60 out of 259 facilities and point of disposal for 214 out of 259 facilities; 8 out of 35 landfill sites and 20 out of 35 point of disposal of leacheates; 80 out of 428 dumpsites and 376 out of 428 point of disposal of leachates.

3.3 Assessment of Impact of Lockdown on Water Quality of Major Rivers

A nationwide lockdown was being imposed by Government of India (GoI) since midnight of 24th March 2020 as a preventive measure to restrict the spread of Coronavirus (COVID-19) infections and thereafter extended further. During the lockdown period, human activities were restricted and most of the activities came to stand still including industrial operations.

The Central Pollution Control Board (CPCB) has requested State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) to assess water quality of 19 major rivers (viz., river Beas, Brahmaputra, Baitarni & Brahmani, Cauvery, Chambal, Ganga, Ghaggar, Godavari, Krishna, Mahanadi, Mahi, Narmada, Pennar, Sabarmati, Sutlej, Swarnarekha, Tapi, Yamuna) at the existing monitoring locations under National Water Quality Monitoring Programme (NWMP) vide letter dated 09.04.2020 with a view to (i) study the impact of lockdown on water quality of major rivers due to restriction of activities in the country, (ii) compare the water quality of major Rivers during pre-lockdown (March 2020) and lockdown period (April 2020), and (iii) assess water quality of major rivers for compliance to the parameters prescribed under Primary Water Quality Criteria for Outdoor Bathing. Accordingly, 20 State Pollution Control Boards (SPCBs) have participated in the assessment and collected water samples from 19 major rivers and analysed collected water samples for the parameters viz. pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Fecal Coliform (FC) and the results were compared with the Primary Water Quality Criteria for Outdoor Bathing notified under Environment (Protection) Rules, 1986.

During the pre-lockdown period (March 2020), SPCBs have collected samples from 388 locations whereas 366 number of samples from the monitoring locations during lockdown (April 2020) from afore-said 19 major rivers and collected samples were analysed for Primary Water Quality Criteria for Bathing Water Quality Criteria notified under the Environment (Protection) Rules, 1986. The assessment report prepared by CPCB is given as **Annexure-X** and is submitted before Hon'ble NGT for consideration.

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Annexure I

Table No. 1: Compliance Status of all Industries Generating Trade Effluent and Requiring ETPs

Sl. No.	Name of the SPCBs/PCCs	Total No. of Industries which require ETPs	No. of industries having functional ETPs	No. of industries operating without ETPs	Action taken against industries operating without ETPs				Details of Industries having functional ETPs		Action taken against industries having ETPs but Non-complying with the Effluent Standards				Month of the Information
					No. of industries against which show cause notice/directions issued	No. of industries against which closure directions issued	No. of industries against which legal cases filed	No. of industries against which action is under process	No. of industries complying with Effluent Standards	No. of industries Non-complying with Effluent Standards	No. of industries against which show cause notice/directions issued	No. of industries against which closure directions issued	No. of industries against which legal cases filed	No. of industries against which action is under process	
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Andaman & Nicobar	22	17	5	4	1	0	0	17	0	0	0	0	0	Jan-20
2	Andhra Pradesh	1091	1074	17	17	0	0	0	1053	21	21	0	0	0	Jun-20
3	Arunachal Pradesh	2	2	0	0	0	0	0	2	0	0	0	0	0	Dec-18
4	Assam	2472	1677	795	399	312	0	84	1440	237	3	0	0	234	May-19
5	Bihar	213	211	2	0	1	1	0	210	1	1	0	0	0	Jul-20
6	Chandigarh	222	222	0	0	0	0	0	222	0	0	0	0	0	Jul-20
7	Chhattisgarh	1005	896	109	0	109	0	0	896	0	0	0	0	0	Jul-20
8	Daman & Diu	95	95	0	0	0	0	0	95	0	0	0	0	0	Jul-20
9	Dadra Nagar Haveli	159	154	5	0	5	0	0	143	11	11	0	0	0	May-19
10	Delhi	38	35	3	1	2	0	0	31	4	4	0	0	0	Jun-20
11	Goa	209	209	0	0	0	0	0	209	0	0	0	0	0	Jun-20

Annexure-I

Sl. No.	Name of the SPCBs/PCCs	Total No. of Industries which require ETPs	No. of industries having functional ETPs	No. of industries operating without ETPs	Action taken against industries operating without ETPs				Details of Industries having functional ETPs		Action taken against industries having ETPs but Non-complying with the Effluent Standards				Month of the Information
					No. of industries against which show cause notice/directions issued	No. of industries against which closure directions issued	No. of industries against which legal cases filed	No. of industries against which action is under process	No. of industries complying with Effluent Standards	No. of industries Non-complying with Effluent Standards	No. of industries against which show cause notice/directions issued	No. of industries against which closure directions issued	No. of industries against which legal cases filed	No. of industries against which action is under process	
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
12	Gujarat	8268	8157	111	36	69	0	6	8014	143	74	36	0	33	Jun-20
13	Haryana	3613	3535	78	4	69	0	5	3504	31	2	17	3	9	Jun-20
14	Himachal Pradesh	1003	1000	3	3	0	0	0	992	8	8	0	0	0	Jun-20
15	Jammu and Kashmir	440	228	212	180	18	0	14	201	27	19	3	1	4	Jun-20
16	Jharkhand	213	213	0	0	0	0	0	212	1	0	0	0	1	Jun-20
17	Karnataka	3326	3167	159	90	57	2	10	3123	44	39	3	2	0	Jul-20
18	Kerala	5166	5146	20	20	0	0	0	5114	32	13	0	2	17	Dec-19
19	Lakshadweep	0	0	0	0	0	0	0	0	0	0	0	0	0	Jul-20
20	Madhya Pradesh	1177	1177	0	0	0	0	0	1172	5	2	0	3	0	Jun-20
21	Maharashtra	16597	16597	0	0	0	0	0	16434	163	110	18	0	35	Jul-20
22	Manipur	0	0	0	0	0	0	0	0	0	0	0	0	0	Feb-19
23	Meghalaya	231	190	41	12	20	2	7	190	0	0	0	0	0	Aug-19
24	Mizoram	56	53	3	0	0	0	3	53	0	0	0	0	0	Jul-20
25	Nagaland	29	25	4	0	0	0	4	25	0	0	0	0	0	Dec-19
26	Odisha	1179	1133	46	13	29	1	3	1085	48	39	6	0	3	Jul-20
27	Puducherry	94	91	3	3	0	0	0	83	8	4	1	0	3	Feb-20
28	Punjab	1796	1717	79	43	31	0	5	1574	143	118	3	0	22	May-20
29	Rajasthan	1369	1257	112	25	84	0	3	1137	120	107	10	2	1	Oct-19

Sl. No.	Name of the SPCBs/PCCs	Total No. of Industries which require ETPs	No. of industries having functional ETPs	No. of industries operating without ETPs	Action taken against industries operating without ETPs				Details of Industries having functional ETPs		Action taken against industries having ETPs but Non-complying with the Effluent Standards				Month of the Information
					No. of industries against which show cause notice/directions issued	No. of industries against which closure directions issued	No. of industries against which legal cases filed	No. of industries against which action is under process	No. of industries complying with Effluent Standards	No. of industries Non-complying with Effluent Standards	No. of industries against which show cause notice/directions issued	No. of industries against which closure directions issued	No. of industries against which legal cases filed	No. of industries against which action is under process	
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
30	Sikkim	64	64	0	0	0	0	0	64	0	0	0	0	0	Jul-20
31	Tamil Nadu	11279	11272	7	0	7	0	0	11251	21	8	13	0	0	Jul-20
32	Telangana	2178	2167	11	1	10	0	0	2119	48	23	25	0	0	Jul-20
33	Tripura	18	12	6	5	0	0	1	6	6	6	0	0	0	Jul-20
34	Uttar Pradesh	**Data not provided**													
35	Uttarakhand	843	843	0	0	0	0	0	843	0	0	0	0	0	Jul-20
36	West Bengal	17	17	0	0	0	0	0	16	1	1	0	0	0	Jun-20
TOTAL		**64484**	**62653**	**1831**	**856**	**824**	**6**	**145**	**61530**	**1123**	**613**	**135**	**13**	**362**	

Table No. 2 : Number of Water Polluting Industries Inspected for Compliance Verification								
Sl. No.	SPCB/PCC	Month of Inspection						
		Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20
1	Andaman & Nicobar	12	–	–	–	–	–	–
2	Andhra Pradesh	54	71	38	11	–	38	–
3	Arunachal Pradesh	–	–	–	–	–	–	–
4	Assam	–	–	–	–	–	–	–
5	Bihar	10	12	0	0	5	13	1
6	Chandigarh	23	–	0	–	–	4	26
7	Chhattisgarh	71	94	52	8	–	93	126
8	Daman & diu	12	–	–	–	–	9	0
9	Dadra Nagar Haveli	–	–	–	–	–	–	–
10	Delhi	383	197	–	0	0	4	–
11	Goa	15	11	5	0	0	3	–
12	Gujarat	2363	2529	1867	657	–	2211	–
13	Haryana	143	139	79	7	136	220	369
14	Himachal Pradesh	237	258	148	59	–	364	328
15	Jammu and Kashmir	174	173	129	0	84	117	121
16	Jharkhand	19	23	12	2	7	14	–
17	Karnataka	540	610	480	174	–	520	539
18	Kerala	–	–	–	–	–	–	–
19	Lakshadweep	0	0	0	0	0	0	0
20	Madhya Pradesh	121	97	54	15	34	75	–
21	Maharashtra	1216	1020	557	17	32	30	47
22	Manipur	–	–	–	–	–	–	–
23	Meghalaya	–	–	–	–	–	–	–
24	Mizoram	0	0	0	0	–	0	0
25	Nagaland	–	–	–	–	–	–	–
26	Odisha	49	161	87	4	42	49	43
27	Puducherry	–	12	–	–	–	–	–
28	Punjab	235	205	150	0	42	–	–
29	Rajasthan	–	104	92	–	–	–	–
30	Sikkim	47	50	–	0	0	–	16
31	Tamil Nadu	1230	1472	1023	64	761	1246	1261
32	Telangana	–	110	94	68	–	58	53
33	Tripura	21	21	20	8	14	17	18
34	Uttar Pradesh	–	–	–	–	–	–	–
35	Uttarakhand	161	145	151	0	–	153	112
36	West Bengal	30	19	21	–	–	17	–
	TOTAL	**7166**	**7462**	**5021**	**1083**	**1157**	**5265**	**3060**

– Data not provided by SPCB/PCC

Table No. 3: Compliance Status of all Existing Common Effluent Treatment Plants									
Sl. NO.	Name of the SPCBs/PCCs	Total No. of CETPs in the State/UT	No. of CETPs complying	No. of CETPs Non-complying	Action taken against Non-complying CETPs				Month of the Information
					No. of CETPs against which show cause notice/directions issued	No. of CETPs against which closure directions issued	No. of CETPs against which legal cases filed in the court (s)	No. of CETPs against which action is under process	
A	B	C	D	E	F	G	H	I	J
1	Andaman & Nicobar	0	0	0	0	0	0	0	Jan-20
2	Andhra Pradesh	6	6	0	0	0	0	0	Apr-20
3	Arunachal Pradesh	0	0	0	0	0	0	0	Oct-19
4	Assam	0	0	0	0	0	0	0	May-19
5	Bihar	0	0	0	0	0	0	0	Jul-20
6	Chandigarh	0	0	0	0	0	0	0	Jul-20
7	Chhattisgarh	0	0	0	0	0	0	0	Jul-20
8	Daman & Diu	0	0	0	0	0	0	0	Jul-20
9	Dadra Nagar Haveli	0	0	0	0	0	0	0	Aug-19
10	Delhi	13	4	9	0	0	0	9	Jul-20
11	Goa	0	0	0	0	0	0	0	Jun-20
12	Gujarat	35	20	15	2	0	0	13	Jun-20
13	Haryana	19	14	5	1	0	1	3	Jul-20
14	Himachal Pradesh	1	0	1	1	0	0	0	Jul-20
15	Jammu and Kashmir	2	0	2	2	0	0	0	Jul-20
16	Jharkhand	1	1	0	0	0	0	0	Jun-20
17	Karnataka	10	9	1	1	0	0	0	Jul-20
18	Kerala	6	4	2	2	0	0	0	Dec-19
19	Lakshadweep	0	0	0	0	0	0	0	Jul-20
20	Madhya Pradesh	2	2	0	0	0	0	0	Jun-20
21	Maharashtra	26	23	3	1	1	1	0	Jul-20

Sl. No.	Name of the SPCBs/PCCs	Total No. of CETPs in the State/UT	No. of CETPs complying	No. of CETPs Non-complying	Action taken against Non-complying CETPs				Month of the Information
					No. of CETPs against which show cause notice/directions issued	No. of CETPs against which closure directions issued	No. of CETPs against which legal cases filed in the court (s)	No. of CETPs against which action is under process	
A	B	C	D	E	F	G	H	I	J
22	Manipur	0	0	0	0	0	0	0	Feb-19
23	Meghalaya	0	0	0	0	0	0	0	Jun-20
24	Mizoram	0	0	0	0	0	0	0	Jul-20
25	Nagaland	0	0	0	0	0	0	0	Dec-19
26	Odisha	0	0	0	0	0	0	0	Jul-20
27	Puducherry	0	0	0	0	0	0	0	Sep-19
28	Punjab	3	2	1	0	0	1	0	May-20
29	Rajasthan	13	4	9	1	0	5	3	May-20
30	Sikkim	0	0	0	0	0	0	0	Jul-20
31	Tamil Nadu	36	27	9	7	1	0	1	Jul-20
32	Telangana	7	4	3	0	3	0	0	Jul-20
33	Tripura	1	0	1	1	0	0	0	Jul-20
34	Uttar Pradesh	6	6	0	0	0	0	0	Jul-20
35	Uttarakhand	3	3	0	0	0	0	0	Jul-20
36	West Bengal	1	0	1	1	0	0	0	Jun-20
TOTAL		**191**	**129**	**62**	**20**	**5**	**8**	**29**	

Table No. 4 : Number of CETPs Inspected for Compliance Verification								
Sl. No.	SPCB/PCC	Month of Information						
		Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20
1	Andaman & Nicobar	0	0	–	–	–	–	–
2	Andhra Pradesh	3	4	3	0	–	–	–
3	Arunachal Pradesh	–	–	–	–	–	–	–
4	Assam	–	–	–	–	–	–	–
5	Bihar	0	0	0	0	0	0	0
6	Chandigarh	0	0	0	0	0	0	0
7	Chhattisgarh	0	0	0	0	0	0	0
8	Daman & Diu	0	–	–	–	0	–	0
9	Dadra Nagar Haveli	–	–	–	–	–	–	–
10	Delhi	0	0	0	0	0	13	13
11	Goa	0	0	0	0	0	0	–
12	Gujarat	32	31	28	18	32	30	–
13	Haryana	3	5	0	0	15	12	14
14	Himachal Pradesh	1	1	1	1	1	1	1
15	Jammu and Kashmir	1	1	1	0	1	1	1
16	Jharkhand	0	0	0	0	0	1	–
17	Karnataka	5	5	5	0	0	0	5
18	Kerala	–	–	–	–	–	–	–
19	Lakshadweep	0	0	0	0	0	0	0
20	Madhya Pradesh	2	2	2	2	2	2	–
21	Maharashtra	25	25	25	25	25	25	25
22	Manipur	–	–	–	–	–	–	–
23	Meghalaya	–	–	–	–	–	0	–
24	Mizoram	0	0	0	0	0	0	0
25	Nagaland	0	–	–	–	–	–	–
26	Odisha	0	0	0	0	0	0	0
27	Puducherry	–	–	–	–	–	–	–
28	Punjab	3	3	3	0	2	–	–
29	Rajasthan	–	6	5	0	9	–	–
30	Sikkim	0	0	0	0	0	0	0
31	Tamil Nadu	25	23	26	4	14	22	20
32	Telangana	4	5	4	4	4	4	4
33	Tripura	1	1	1	1	1	1	1
34	Uttar Pradesh	5	5	–	–	7	5	6
35	Uttarakhand	3	3	3	3	–	3	3
36	West Bengal	1	1	1	–	–	1	–
	TOTAL	**114**	**121**	**108**	**58**	**113**	**121**	**93**
– Data not provided by SPCB/PCC								

Table No. 5: Compliance Status of all Existing Sewage Treatment Plants (Municipal and Non-municipal)									
Sl. NO.	Name of the SPCBs/PCCs	Total No. of STPs in the State/UT	No. of STPs complying	No. of STPs Non-complying	Action taken against Non-complying STPs				Month of the information
					No. of STPs against which show cause notice/directions issued	No. of STPs against which closure directions issued	No. of STPs against which legal cases filed in the court (s)	No. of STPs against which action is under process	
A	B	C	D	E	F	G	H	I	J
1	Andaman & Nicobar	91	89	2	2	0	0	0	Jan-20
2	Andhra Pradesh	369	355	14	14	0	0	0	Apr-20
3	Arunachal Pradesh	1	1	0	0	0	0	0	Jul-19
4	Assam	3	3	0	0	0	0	0	May-19
5	Bihar	11	11	0	0	0	0	0	Jul-20
6	Chandigarh	61	59	2	0	0	0	2	Jul-20
7	Chhattisgarh	85	85	0	0	0	0	0	Jul-20
8	Daman & Diu	2	2	0	0	0	0	0	May-20
9	Dadra Nagar Haveli	39	39	0	0	0	0	0	Aug-19
10	Delhi	34	1	33	0	0	0	33	Jun-20
11	Goa	399	399	0	0	0	0	0	Jun-20
12	Gujarat	216	181	35	18	0	0	17	Jun-20
13	Haryana	1498	1471	27	8	6	3	10	Jul-20
14	Himachal Pradesh	513	506	7	7	0	0	0	Jul-20
15	Jammu and Kashmir	436	368	68	57	4	0	7	Jul-20
16	Jharkhand	44	44	0	0	0	0	0	Jun-19
17	Karnataka	2810	2748	62	62	0	0	0	Jul-20
18	Kerala	2777	2765	12	6	0	0	6	Nov-19
19	Lakshadweep	0	0	0	0	0	0	0	Jul-20
20	Madhya Pradesh	619	609	10	7	0	3	0	Jun-20
21	Maharashtra	1514	1512	2	2	0	0	0	Jul-20
22	Manipur	0	0	0	0	0	0	0	Feb-19

Sl. NO.	Name of the SPCBs/PCCs	Total No. of STPs in the State/UT	No. of STPs complying	No. of STPs Non-complying	Action taken against Non-complying STPs				Month of the information
					No. of STPs against which show cause notice/directions issued	No. of STPs against which closure directions issued	No. of STPs against which legal cases filed in the court (s)	No. of STPs against which action is under process	
23	Meghalaya	10	10	0	0	0	0	0	Jun-20
24	Mizoram	2	2	0	0	0	0	0	Jul-20
25	Nagaland	0	0	0	0	0	0	0	Oct-19
26	Odisha	457	380	77	47	18	0	12	Jul-20
27	Puducherry	77	71	6	1	0	0	5	Feb-20
28	Punjab	662	608	54	7	0	7	40	May-20
29	Rajasthan	631	589	42	16	0	4	22	May-20
30	Sikkim	7	7	0	0	0	0	0	Jul-20
31	Tamil Nadu	1401	1396	5	5	0	0	0	Jul-20
32	Telangana	374	374	0	0	0	0	0	Jul-20
33	Tripura	19	17	2	2	0	0	0	Jul-20
34	Uttar Pradesh	93	68	25	1	0	0	24	Jul-20
35	Uttarakhand	431	428	3	0	0	0	3	Jul-20
36	West Bengal	44	2	42	0	0	0	42	Jun-20
TOTAL		**15730**	**15200**	**530**	**262**	**28**	**17**	**223**	

Table No. 6 : Number of STPs Inspected for Compliance Verification (municipal and non-municipal)								
Sl. No.	SPCB/PCC	Month of Information						
		Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20
1	Andaman & Nicobar	12	–	–	–	–	–	–
2	Andhra Pradesh	30	30	23	1	–	–	–
3	Arunachal Pradesh	–	–	–	–	–	–	–
4	Assam	–	–	–	–	–	–	–
5	Bihar	2	1	0	1	4	4	0
6	Chandigarh	6	6	–	6	6	6	6
7	Chhattisgarh	12	15	11	5	–	18	18
8	Daman & Diu	0	0	0	0	2	–	–
9	Dadra Nagar Haveli	–	–	–	–	–	–	–
10	Delhi	0	1	1	0	–	34	–
11	Goa	31	11	8	0	1	5	–
12	Gujarat	70	72	57	42	–	68	–
13	Haryana	60	80	45	5	141	144	175
14	Himachal Pradesh	189	185	142	55	–	164	154
15	Jammu and Kashmir	75	98	93	13	41	59	60
16	Jharkhand	7	8	3	1	3	6	–
17	Karnataka	417	202	143	104	189	189	183
18	Kerala	–	–	–	–	–	–	–
19	Lakshadweep	0	–	–	0	–	0	0
20	Madhya Pradesh	62	64	46	15	–	63	–
21	Maharashtra	307	292	242	0	15	13	17
22	Manipur	–	–	–	–	–	–	–
23	Meghalaya	–	–	–	–	–	10	–
24	Mizoram	0	0	0	0	–	0	0
25	Nagaland	–	–	–	–	–	–	–
26	Odisha	32	48	32	3	11	16	10
27	Puducherry	11	11	–	–	–	–	–
28	Punjab	94	96	94	15	57	–	–
29	Rajasthan	–	38	16	–	–	–	–
30	Sikkim	0	0	0	0	0	0	0
31	Tamil Nadu	315	387	240	31	240	282	346
32	Telangana	27	0	0	0	30	30	30
33	Tripura	27	27	27	7	12	15	19
34	Uttar Pradesh	85	84	89	91	26	94	93
35	Uttarakhand	36	19	12	7	–	17	17
36	West Bengal	13	19	11	16	2	26	–
	TOTAL	**1920**	**1764**	**1312**	**417**	**780**	**1263**	**1128**
– Data not provided by SPCB/PCC								

Table No. 7: Number of under Construction/ Proposed CETPs			
Sl. No.	**Name of the SPCB/PCC**	**No. of Under Construction/Proposed CETPs**	**Target date**
1	Andaman & Nicobar	0	–
2	Andhra Pradesh	3	Mar, 2019- Jun 2020
3	Arunachal Pradesh	0	–
4	Assam	0	–
5	Bihar	5	Jan,2021
6	Chandigarh	0	–
7	Chhattisgarh	0	–
8	Daman & diu	0	–
9	Dadra Nagar Haveli	0	–
10	Delhi	0	–
11	Goa	0	–
12	Gujarat	17	Dec, 2019- July, 2021
13	Haryana	12	Jun, 2020- July, 2023
14	Himachal Pradesh	4	Mar, 2021- Mar, 2023
15	Jammu and Kashmir	5	Sept, 2020
16	Jharkhand	1	No date provided
17	Karnataka	4	Mar, 2024
18	Kerala	1	Jan, 2020
19	Lakshadweep	0	–
20	Madhya Pradesh	1	Jun, 2020
21	Maharashtra	4	Mar, 2020- Dec, 2020
22	Manipur	0	–
23	Meghalaya	0	–
24	Mizoram	0	–
25	Nagaland	0	–
26	Odisha	0	–
27	Puducherry	0	–
28	Punjab	4	June, 2019 - Dec, 2020
29	Rajasthan	9	June, 2021
30	Sikkim	0	–
31	Tamil Nadu	11	Dec,2020- Mar,2022
32	Telangana	1	Oct, 2020
33	Tripura	1	Dec, 2020
34	Uttar Pradesh	0	–
35	Uttarakhand	0	–
36	West Bengal	1	Jun, 2020
TOTAL		**84**	

Table No. 8: Details of under Construction/ Proposed STPs (Municipal and other than municipal)			
Sl. No.	**Name of the SPCB/PCC**	**No. of Under Construction/Proposed STPs**	**Target date**
1	Andaman & Nicobar	1	–
2	Andhra Pradesh	3	Mar,2019 - Jun, 2020
3	Arunachal Pradesh	0	–
4	Assam	1	Target date not provided
5	Bihar	33	Dec,2020 - Dec,2021
6	Chandigarh	1	Nov,2021
7	Chhattisgarh	11	Dec,2020 - June,2021
8	Daman & Diu	0	–
9	Dadra Nagar Haveli	0	–
10	Delhi	0	–
11	Goa	8	Dec, 2020
12	Gujarat	75	Oct, 2019 - Jan, 2022
13	Haryana	264	Sept, 2020 - Feb, 2027
14	Himachal Pradesh	32	Mar, 2020 - Dec, 2024
15	Jammu and Kashmir	10	Dec, 2020
16	Jharkhand	6	Dec, 2021 - Oct, 2022
17	Karnataka	152	Dec, 2020 - Mar, 2024
18	Kerala	105	Jan, 2019 - Dec, 2024
19	Lakshadweep	0	–
20	Madhya Pradesh	54	Apr, 2020 - Oct, 2021
21	Maharashtra	72	Dec, 2018 - Dec, 2024
22	Manipur	0	–
23	Meghalaya	0	–
24	Mizoram	1	01-Oct-19
25	Nagaland	1	30-Jun-21
26	Odisha	18	Oct, 2017 - Dec, 2019
27	Puducherry	0	–
28	Punjab	115	July, 2019 - June, 2022
29	Rajasthan	62	Aug, 2019 - Dec, 2021
30	Sikkim	0	–
31	Tamil Nadu	30	Mar, 2020 - Mar, 2024
32	Telangana	20	Dec, 2020 - Dec,2021
33	Tripura	1	Oct, 2018
34	Uttar Pradesh	0	–
35	Uttarakhand	1	Target date not provided
36	West Bengal	4	May,2020
Total		**1081**	

Table No. 9: Display of "Online real time, continuous monitoring system" (OCEMS) data in public domain

Sl. No.	Name of SPCBs/PCCs	Display of OCEMS data on SPCB/PCC website (Yes/No)	If Yes: Web-link of the webpage	If No: Likely date by which data will be displayed on the website	Remarks
1	Andaman & Nicobar	No	–	–	Link not working
2	Andhra Pradesh	Yes	http://aprtpms.ap.gov.in/publicview.html	–	–
3	Arunachal Pradesh	No	–	–	There is no industry requiring OCEMS
4	Assam	Yes	https://pcba.rtdas.in/	–	–
5	Bihar	Yes	bpcbcems.nic.in	–	–
6	Chandigarh	No	–	Data will be displayed after upgradation of STPs.	Requested for time till 30-Nov-2020
7	Chhattisgarh	No	–	–	Proper link not provided
8	Daman & Diu	No	–	–	–
9	Dadra Nagar Haveli	No	–	–	–
10	Delhi	No	–	–	–
11	Goa	Yes	http://gspcb.glensserver.com/GSPCB_ONLINE/index.html	–	–
12	Gujarat	Yes	https://gpcb.gujarat.gov.in/webcontroller/viewpage/online-monitoring-system-dashboard	–	–
13	Haryana	No	www.hspcbcems.nic.in	–	Link not working
14	Himachal Pradesh	Yes	http://envirologiciq.com/public/dashboard/industries		-
15	Jammu and Kashmir	No	www.cpcb.nic.in	–	–
16	Jharkhand	No	–	–	–

Sl. No.	Name of SPCBs/PCCs	Display of OCEMS data on SPCB/PCC website (Yes/No)	If Yes: Web-link of the webpage	If No: Likely date by which data will be displayed on the website	Remarks
17	Karnataka	No	https://kspcb.gov.in/onlinemonitoring.html	—	Requested for time till 30-Sept-2020
18	Kerala	Yes	https://keralapcb.glensserver.com/public/graph.html	—	—
19	Lakshadweep	No	—	—	—
20	Madhya Pradesh	Yes	https://esc.mp.gov.in/online/	—	—
21	Maharashtra	Yes	http://www.mpcb.gov.in/Online_CEMS.php	No data provided	—
22	Manipur	No	—	—	—
23	Meghalaya	No	—	—	—
24	Mizoram	No	—	Link not required	—
25	Nagaland	No	—	—	—
26	Odisha	Yes	http://ospcbrtdas.com	—	—
27	Puducherry	Yes	http://ppcc.glensserver.com/PPCC_ONLINE/index.html	—	—
28	Punjab	No	https://app.cpcbccr.com/AQI_India/ and cpcbrtdms.nic.in User Id : computer.section.ppcb@gmail.com Password : ppcb@1234	—	Link not working
29	Rajasthan	No	—	—	—
30	Sikkim	No	115.114.10.198:8080/enviroconnect/servlet/com.aipl.pls.web.admin.AdminServlet	—	—
31	Tamil Nadu	Yes	1) http://117.232.97.121/RealTime_tnpcb_cac/index.html (2)http://117.232.97.121/RealTime_tnpcb_cac_new/index.html	—	—
32	Telangana	Yes	http://183.82.41.227:8080/enviroconnect/aqms	—	—
33	Tripura	No	—	—	—
34	Uttar Pradesh	No	—	—	—
35	Uttarakhand	No	http://zylem.cpcb.com/ https://hitech.glensserver.com	—	Link not working
36	West Bengal	Yes	http://www.wbpcb.gov.in/cmsdata.php	—	—

ANNEXURE - II

Email **upc1.cpcb@gov.in**

E-mail from CPCB: Original Application No. 593/2017 (arising from W.P. (Civil) No. 375/2012 on the file of the Hon'ble Supreme Court) (With Report dated 13.02.2020 and 14.05.2020) WITH Original Application No. 148/2016 (With Report dated 15.05.2020) titled as Paryavaran Suraksha Samiti & Anr. Vs. Union of India & Ors. With Mahesh Chandra Saxena Vs. South Delhi Municipal Corporation & Ors.

From : UPC 1 Division, CPCB <upc1.cpcb@gov.in> Wed, Jun 03, 2020 06:28 PM

Subject : E-mail from CPCB: Original Application No. 593/2017 (arising from W.P. (Civil) No. 375/2012 on the file of the Hon'ble Supreme Court) (With Report dated 13.02.2020 and 14.05.2020) WITH Original Application No. 148/2016 (With Report dated 15.05.2020) titled as Paryavaran Suraksha Samiti & Anr. Vs. Union of India & Ors. With Mahesh Chandra Saxena Vs. South Delhi Municipal Corporation & Ors. 2 attachments

To : Member Secretary APPCB <membersecy@appcb.gov.in>, arunachalspcb@gmail.com, membersecretary@pcbassam.org, mscellbspcb@gmail.com, hocecb@gmail.com, Member Secretary GSPCB <ms-gspcb.goa@nic.in>, goapcb@rediffmail.com, membersecretarygpcb@gmail.com, ms-gpcb@gujarat.gov.in, mshspcb@gmail.com, mspcb-hp <mspcb-hp@nic.in>, membersecretaryjkspcb@gmail.com, ranchijspcb@gmail.com, Member Secretary Karnataka State Pollution Control Board <memsecy@kspcb.gov.in>, Head office Karnataka State Pollution Control Board <ho@kspcb.gov.in>, Sreekala S <ms.kspcb@gov.in>, It mppcb <It_mppcb@rediffmail.com>, ms@mpcb.gov.in, Pollution Control Board <pcb-man@nic.in>, megspcb@rediffmail.com, duhawma15@yahoo.com, rusoviljohn@yahoo.co.in, membersecretary@ospcboard.org, Member Secretary <msppcb@punjab.gov.in>, membersecretary@rpcb.nic.in, drgopalpradhan@gmail.com, spcbsikkim@gmail.com, tnpcbmembersecretary@yahoo.com, ts ms <ts_ms@pcb.ap.gov.in>, mukherjee manas <mukherjee_manas@rediffmail.com>, ms@uppcb.com, msukpcb@gmail.com, ms@wbpcb.gov.in, dstandamans@gmail.com, Chandigarh Pollution Control Committee <cpcc-chd@nic.in>, mspcc dmn <mspcc_dmn@pccdaman.info>, Member Secretary <msdpcc@nic.in>, Director, S&T <lk-dst@nic.in>, Pondicherry Pollution Control Committee Pondicherry <ppcc.pon@nic.in>, Member Secretary <member-secretary@rpcb.nic.in>, hspcbho@gmail.com, spsubudhi@gmail.com

Cc : vishalcpcb <vishalcpcb@gmail.com>, divsinha <divsinha@yahoo.com>, DIVYA SINHA <divyasinha.cpcb@nic.in>

Sir,

Hon'ble NGT vide directions dated 21.05.2020 directed all States / UTs to comply the directions mentioned in Para 24 and 26 (i), (iv) and submit the status to CPCB by 30.06.2020. Copy of directions are attached.

Report submitted by CPCB indicating observations / shortcomings in action plan is available on NGT's website and can be downloaded using link https://greentribunal.gov.in/sites/default/files/news_updates/Status%20Report%20in%20OA%20NO.%20148%20of%202016.pdf.

In this regard, it is requested to submit the action plan as per NGT's directions and format enclosed.

With Regards,

UPC-I Division,
CPCB, "Parivesh Bhawan"
East Arjun Nagar
Delhi - 110032

Format for Sewage Treatment Plants and Utilization of Sewage.docx
14 KB

orderlist (1) (1).pdf
1 MB

Gmail

Vishal Gandhi <vishalcpcb@gmail.com>

E-mail from CPCB: Original Application No. 593/2017 (arising from W.P. (Civil) No. 375/2012 on the file of the Hon'ble Supreme Court) (With Report dated 13.02.2020 and 14.05.2020) WITH Original Application No. 148/2016 (With Report dated 15.05.2020) titled as Paryavaran Suraksha Samiti & Anr. Vs. Union of India & Ors. With Mahesh Chandra Saxena Vs. South Delhi Municipal Corporation & Ors.

UPC 1 Division, CPCB <upc1.cpcb@gov.in> Wed, Jun 24, 2020 at 6:08 PM
To: CS AP <cs@ap.gov.in>, csarunachal@nic.in, Kumar Sanjay Krishna IAS <cs-assam@nic.in>, Chief Secretary Bihar <cs-bihar@nic.in>, Chief Secretary Office <csoffice.cg@gov.in>, vivekdhand@nic.in, chiefsecretary@gujarat.gov.in, Chief Secretary <cs-goa@nic.in>, KESHNI ANAND ARORA <cs@hry.nic.in>, Anil Khachi <cs-hp@nic.in>, cs-jandk <cs-jandk@nic.in>, csjharkhand@nic.in, cs@karnataka.gov.in, "Chief Secretary, Government of Kerala" <chiefsecy@kerala.gov.in>, Iqbal Singh Bains <cs@mp.nic.in>, csmadhyapradesh@nic.in, cs@maharashtra.gov.in, cs-manipur <cs-manipur@nic.in>, Mr TALI TOY <csngl@nic.in>, Asit Kumar Tripathy <csori@nic.in>, "Chief Secretary, Punjab" <cs@punjabmail.gov.in>, csrajasthan@nic.in, csskm@hub.nic.in, csuttaranchal@nic.in, chiefsecyuk@gmail.com, cs@tn.gov.in, Somesh Kumar IAS <cs@telangana.gov.in>, cs-tripura <cs-tripura@nic.in>, CHIEF SECRETARY GoUP <csup@nic.in>, chiefsec@wb.gov.in, Shri Vijay Kumar Dev <csdelhi@nic.in>, "Shri. Dineshwar Sharma IPS" <lk-admin@nic.in>, Administratordd@gov.in, csandaman@nic.in, "Chief Secretary CS, Puducherry" <cs.pon@nic.in>, MSRao <raoms@gov.in>, cs miz <cs_miz@rediffmail.com>
Cc: vishalcpcb <vishalcpcb@gmail.com>, Nalin Gupta <nkgupta.cpcb@nic.in>

Sir,

Hon'ble NGT vide directions dated 21.05.2020 directed all States / UTs to comply the directions mentioned in Para 24 and 26 (i), (iv) and submit the status to CPCB by 30.06.2020. Copy of directions are attached.

Report submitted by CPCB indicating observations / shortcomings in action plan is available on NGT's website and can be downloaded using link https://greentribunal.gov.in/sites/default/files/news_updates/Status%20Report%20in%20OA%20NO.%20148%20of%202016.pdf.

In this regard, it is requested to submit the action plan as per NGT's directions and format enclosed.

With Regards,

UPC-I Division,
CPCB, "Parivesh Bhawan"
East Arjun Nagar
Delhi - 110032

2 attachments

Format for Sewage Treatment Plants and Utilization of Sewage.docx
15K

orderlist (1) (1).pdf
1146K

27

OFFICE COPY

File No: A-14011/1/20120-Mon 5310-5344

Dated: 24/08/2020

To,

The Member Secretary, SPCBs/PCCs
All States/UTs

Subject: Compliance of directions dated 21/05/2020 of Hon'ble NGT in the matter of O.A No 593/2017 with Original Application No. 148/2016 titled as Paryavaran Suraksha Samiti & Anr. Vs. Union of India & Ors. With Mahesh Chandra Saxena Vs. South Delhi Municipal Corporation & Ors.

Reference: CPCB emails dated 03.06.2020 and 23.06.2020.

Sir,

Kindly refer to our earlier emails dated 03/03/2020 and 23/06/2020, wherein it is requested to submit the compliance report as per NGT directions dated 21/05/2020 as referred above and mentioned in Para 24 and 26 (i) and (iv) and submit status report by 30/06/2020. However, reply and compliance report are still awaited.

It is to further informed that CPCB has also developed web portal for compilation of information on STPs as per direction Para 26 (i) and same is available at India E track portal. It is requested to use existing login credentials for India E track portal already available with SPCBs for updating information in respect of sewage treatment plants.

It is also requested to submit updated action plan as per observations/shortcoming indicated by CPCB. These observations and shortcomings indicated by CPCB can be access using link:

https://greentribunal.gov.in/sites/default/files/news_updates/Status%20Report%20in%20OA%20NO.%20148%20of%202016.pdf

This may please be treated as urgent and updated reports and action plan may be provided by 07/09/2020.

Encl.: As above

Yours faithfully

[N K Gupta]
Divisional Head (IPC-I

Copy to:

Chief Secretaries
All States/UTs : **Request to ensure compliance of Hon'ble NGT directions**

[N K Gupta]

3744/UPC-I
26/09/2020

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
निर्गत..... N 8 .....
दिनांक..... 27.8.20 .....

Annexure III

S. No	State	Estimate Present and Projected Sewage Generation and Treatment Capacity	Identification of Bulk Users and Quantification of Re-use	Time line	Gaps
1	Punjab	Sewage Generation: 2606.5 MLD Sewage Treatment Capacity: 1723.5 MLD Projected Treatment Capacity: 2605.5 MLD (1723.5 + 883) MLD	Sector: Quantity Agriculture: 243.3 MLD Construction: 0.5 MLD Total: 243.8 MLD	Industrial Re-use (1.5 MLD): 31.03.2022 Urban Landscaping, green Belts (52 MLD): 31.12.2023 Irrigation (1519.3 MLD): 31.10.2025	i. Projected Sewage Treatment capacity can treat only present quantity of sewage generated. It may also have considered future growth. ii. At present, 9.3 % of re-use of treated sewage has been carried
2	Jammu and Kashmir	Sewage Generation: 60.25 MLD Projected Sewage Generation (for next five years): 199.23 MLD Sewage Treatment Capacity: 127.04.5 MLD Projected Treatment Capacity: 98.036 MLD	Not mentioned	July, 2021	Additional data received from UT of Jammu and Kashmir whereas data is ambiguous. No information provided on bulk user identification.
3	Rajasthan	Additional information received only for Ajmer District and shortcoming in action plan still exists.			
4	Lakshad weep	Presently, septic tanks are installed in all households, Private and Government establishments. Bio toilets developed by DRDE installed for management. Department of Environment & Forest is proposing a pilot project on Faecal Sludge and Septage Treatment plant at Kavarati Island.			

Annexure - III

S. No	State	Estimate Present and Projected Sewage Generation and Treatment Capacity		Identification of Bulk Users and Quantification of Re-use	Time line	Gaps
5	Sikkim	Sewage Generation	- MLD	No bulk users identified	No Time line	Gaps not addressed in revised action plan.
		Projected Sewage Generation (2021)	42.55 MLD			
		Sewage Treatment Capacity	20.12 MLD			
		Projected Treatment Capacity	24.17			

Annexure IV

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

Office Copy

No. A-14011/1/2020-UPC-I

July 15, 2020

To,

The Member Secretary
All the SPCBs / PCCs (List Enclosed)

Subject: Preparation of National Inventory of Sewage Treatment Plants.

Sir,

An inventory of Sewage Treatment Plants was prepared during 2017-18 with the help of SPCBs/PCCs and State Urban Bodies (enclosed for ready reference). The same needs to be updated for reviewing current status of Sewage Management.

In this context, a standard format is devised and attached herewith. It is requested that updatedinformation as of 30.06.2020 as per the format may please be forwarded to this office by 31.07.2020. Soft copy may also be sent to email-ids : nkgupta.cpcb@nic.in, upc1.cpcb@gov.in to facilitate compilation.

This may please be treated as urgent.

Encl : As above

Yours faithfully

[Prashant Gargava]
Member Secretary

Copy for kind information to :

1. The Principle Secretary,
   State Urban Departments (List Enclosed)
2. PS to CCB
3. The Regional Director, CPCB : to follow up with States / UTs under their jurisdiction.

[Prashant Gargava]

3656/UPC-I
16/07/2020

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

Annexure V

NATIONAL INVENTAORY OF SEWAGE TREATMENT PLANTs (STPs)

Sl. No	State	Number of STPs	Installed Treatment Capacity (In MLD)	Number of STPs-Operational	Operational Treatment Capacity (In MLD)	Actual Utilized Capacity (In MLD)
1	Andhra Pradesh	67	853.05	40	444.85	309.56
2	Bihar	25	631.05	0	0	0
3	Chandigarh	6	242.63	6	242.63	235.12
4	Chhattisgarh	3	73.1	3	73.1	5.65
5	Daman, Diu & Dadra Nagar Haveli	3	24.21	2	17.21	4.2
6	Goa	13	104.85	9	44.35	25.05
7	Gujarat	69	3378.06	68	3357.56	2686.92
8	Haryana	157	1875.2	155	1837.2	1284.35
9	Himachal Pradesh	86	152.79	59	99.3	51.37
10	Jammu & Kashmir	26	221.82	12	93.226	49
11	Jharkhand	12	638.5	2	22	15
12	Karnataka	148	2816.31	100	1987.5	1738.8
13	Kerala	14	1159	5	115.48	76.42
14	Madhya Pradesh	142	1911.5	45	684.32	536.45
15	Maharashtra	195	10014.94	130	6396.26	4242.02
16	Manipur	0	0	0	0	0
17	Mizoram	1	10	0	0	0
18	Meghalaya	0	0	0	0	0
19	NCT Delhi	40	2984.78	35	2800.18	2411.89
20	Nagaland	0	0	0	0	0
21	Odisha	14	378.5	4	55	50
22	Puducherry	4	59	3	30	30
23	Punjab	119	1781.65	96	1604.15	387.93
24	Rajasthan	140	1215.75	56	768	478.9
25	Sikkim	6	19.02	6	19.02	16.06
26	Telangana	37	901.55	27	842.05	706.2
27	Tamil Nadu	63	1492.428	63	1525.728	892.3

Sl. No	State	Number of STPs	Installed Treatment Capacity (In MLD)	Number of STPs- Operational	Operational Treatment Capacity (In MLD)	Actual Utilized Capacity (In MLD)
28	**Tripura**	1	8	1	8	1.5
29	**Uttar Pradesh**	102	3259.99	92	3091.57	2510.15
30	**Uttarakhand**	81	515.86	52	344.85	187.66
31	**West Bengal**	67	1197.88	24	337.3	213.66
Total		**1641**	**37921.42**	**1095**	**26840.83**	**18439.96**

Annexure VI

Sl. No.	State/UT	River Basin
1	Andhra Pradesh	East flowing rivers between Mahanadi and Pennar
		East flowing rivers between Pennar and Kanyakumari
		Godavari
		Krishna
		Pennar
2	Arunachal Pradesh	Brahmaputra
3	Assam	Barak and others
		Brahmaputra
4	Bihar	Ganga
5	Chandigarh	Indus(Upto Border)
6	Chhattisgarh	Brahmani and Baitrani
		Godavari
		Ganga
		Mahanadi
7	Daman & Diu	West flowing rivers from Tapi to Tadri
8	Dadra and Nagar Haveli	West flowing rivers from Tapi to Tadri
9	Delhi	Ganga
10	Goa	West flowing rivers from Tapi to Tadri
11	Gujarat	Mahi
		Narmada
		Sabarmati
		Tapi
		West flowing rivers of Kutch and Saurashtra including Luni
		West flowing rivers from Tapi to Tadri
12	Haryana	Area of inland drainage of Rajasthan
		Ganga
		Indus(Upto Border)
13	Himachal Pradesh	Area of inland drainage of Rajasthan
		Ganga
		Indus(Upto Border)
14	Jammu and Kashmir	Indus(Upto Border)
15	Jharkhand	Brahmani and Baitrani
		Ganga
		Mahanadi
		Subarnarekha
16	Karnataka	Cauvery
		Godavari
		Krishna
		Pennar
		East flowing rivers between Pennar and Kanyakumari
		West flowing rivers from Tapi to Tadri
		West flowing rivers from Tadri to Kanyakumari

Sl. No.	State/UT	River Basin
17	Kerala	Cauvery
		East flowing rivers between Pennar and Kanyakumari
		West flowing rivers from Tadri to Kanyakumari
18	Madhya Pradesh	Godavari
		Ganga
		Mahanadi
		Mahi
		Narmada
		Tapi
19	Maharashtra	Godavari
		Krishna
		Mahanadi
		Narmada
		Tapi
		West flowing rivers from Tapi to Tadri
20	Manipur	Barak and others
		Minor rivers draining into Myanmar and Bangladesh
21	Meghalaya	Barak and others
		Brahmaputra
22	Mizoram	Barak and others
		Minor rivers draining into Myanmar and Bangladesh
23	Nagaland	Barak and others
		Brahmaputra
		Minor rivers draining into Myanmar and Bangladesh
24	Odisha	Brahmani and Baitrani
		Godavari
		East flowing rivers between Mahanadi and Pennar
		Mahanadi
		Subarnarekha
25	Puducherry	East flowing rivers between Pennar and Kanyakumari
		West flowing rivers from Tadri to Kanyakumari
26	Punjab	Area of inland drainage of Rajasthan
		West flowing rivers of Kutch and Saurashtra including Luni
		Indus(Upto Border)
27	Rajasthan	Ganga
		Mahi
		Sabarmati
		West flowing rivers of Kutch and Saurashtra including Luni
		Area of inland drainage of Rajasthan
		Indus(Upto Border)

Sl. No.	State/UT	River Basin
28	Sikkim	Brahmaputra
29	Tamil Nadu	Cauvery
		East flowing rivers between Pennar and Kanyakumari
		West flowing rivers from Tadri to Kanyakumari
30	Telangana	East flowing rivers between Mahanadi and Pennar
		East flowing rivers between Pennar and Kanyakumari
		Godavari
		Krishna
		Pennar
31	Tripura	Minor rivers draining into Myanmar and Bangladesh
		Barak and others
32	Uttar Pradesh	Ganga
33	Uttarakhand	Ganga
34	West Bengal	Brahmaputra
		Ganga
		Subarnarekha
35	Andaman and Nicobar Islands	Others
36	Lakshadweep	Others

Annexure VII (a)

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

SPEED-POST

Hon'ble NGT Matter

F. No. B-29012/IPC-VI/2020-21/ 12.05.2020

To,

The Member Secretaries
All SPCBs/PCCs

Sub: River-basin wise status of ETPs and CETPs- reg.

Sir/Madam,

This has reference to the Hon'ble NGT order dated 28.08.201, in the matter of OA No. 593/2017 (Paryavaran Suraksha Samiti and Anr. v/s Union of India & Ors.), wherein, Hon'ble NGT has directed CPCB to prepare a river basin wise macro picture in terms of gaps and needed interventions, with regard to ETPs, CETPs, STPs, MSW facilities and Legacy Waste Sites.

In order to collect the information, CPCB has developed a web portal, including modules for ETPs and CETPs. The modules for STPs, MSW facilities and Legacy Waste Sites are under development stage. The web portal can be accessed through following web-link : http://125.19.52.219/gpi/riverbasin/. The login credentials for this portal are same as India-E-Track portal. Further, details are given in the instruction sheets, available on the respective modules of the web-portal.

It is requested to kindly submit the information for ETPs and CETPs by 31st May, 2020.

Yours faithfully,

(P. K Gupta)
Divisional Head, IPC-VI

Copy to:

1. All RDs, CPCB : *With a request to follow-up the matter with SPCBs/PCCs.*

(P. K Gupta)

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

Annexure VII (b)

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

SPEED POST

Hon'ble NGT Matter

F. No. B-29012/IPCVI/2020-21

Date: 30.07.2020

To,

The Member Secretary
33 SPCBs/ PCCs
(as per the list)

Sub : River-basin wise status of industrial Effluent Treatment Plants (ETPs) - reg.

Sir/Madam,

This has reference to CPCB letter no. F. No. B-29012/IPCVI/2019-20, dated 12.05.2020 regarding submission of information related to river-basin wise status of industrial Effluent Treatment Plants (ETPs), in the matter of OA No. 593/2017 (Paryavaran Suraksha Samiti and Anr. v/s Union of India & Ors). The desired information is still awaited.

It is requested to kindly submit the information through online portal, by 10.08.2020. The web portal can be accessed through the web-link: **http://125.19.52.219/gpi/riverbasin/**. The login credentials for this portal are same as India-E- Track portal.

Yours faithfully,

(Ajay Aggarwal)
AD & Div. Head, IPC-VI

Copy to:-

The Regional Director
CPCB
(as per the list)

: *With a request to follow-up the matter with concerned SPCBs/PCC for ensuring timely submission of information.*

O/C

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

Annexure VII (c)

Email **ipc6.cpcb@gov.in**

River-basin wise status of ETPs, CETPs & STPs-reg.

Tue, Aug 25, 2020 04:44 PM

From : CPCB IPC VI DIV <ipc6.cpcb@gov.in>

Subject : River-basin wise status of ETPs, CETPs & STPs-reg.

To : MS Andaman and Nicobar <dstandamans@gmail.com>, MS Assam <membersecretary@pcbassam.org>, MS Arunachal Pradesh <arunachalspcb@gmail.com>, Member Secretary APPCB <membersecy@appcb.gov.in>, MS Bihar <bspcb@yahoo.com>, MS Chattishgarh <hocecb@gmail.com>, MS Chandigarh <bchoudharyifs@yahoo.co.in>, MS Dadra and Nagar Haveli <collectordnh@gmail.com>, MS Goa <goapcb@gspcb.in>, MS Gujarat <membersecretarygpcb@gmail.com>, mspcb-hp <mspcb-hp@nic.in>, MS Jammu and Kashmir <membersecretaryjkspcb@gmail.com>, MS Jharkhand <ranchijspcb@gmail.com>, Head office Karnataka State Pollution Control Board <ho@kspcb.gov.in>, Sreekala S <ms.kspcb@gov.in>, MS Madhya Pradesh <it_mppcb@rediffmail.com>, MS Maharashtra <ast@mpcb.gov.in>, Pollution Control Board <pcb-man@nic.in>, MS Meghalaya <megspcb@rediffmail.com>, MS Nagaland <npcb2@yahoo.com>, MS Orissa <membersecretary@ospcboard.org>, Pondicherry Pollution Control Committee Pondicherry <ppcc.pon@nic.in>, MS Punjab <msppcb@gmail.com>, Member Secretary <member-secretary@rpcb.nic.in>, MS Sikkim <csraoifs@gmail.com>, Neetu Kumari Prasad <ms-tspcb@telangana.gov.in>, MS Tamil Nadu <tnpcbmembersecretary@gmail.com>, Manas <trp@envis.nic.in>, MS Uttar Pradesh <ms@uppcb.com>, MS Uttarakhand <msukpcb@yahoo.com>, MS West Bengal <ms@wbpcb.gov.in>

Cc : Murali Sanku <murali.sss@appcb.gov.in>, bhuyangokul@gmail.com, rhythm aggarwal87 <rhythm.aggarwal87@gmail.com>, sharmajva@gmail.com, ranchijspcb@gmail.com, neia@kspcb.gov.in, Pollution Control Board <pcb-man@nic.in>, aghaliswu@yahoo.co.in, bibekanandabhol@gmail.com, spcbsikkim@gmail.com, rasika ragu <rasika_ragu@yahoo.co.in>, trippcb@sancharnet.in, csrawat65@yahoo.co.in

To

The Member Secretary,
SPCBs/PCCs
(as per the list)

Sir/Madam,

This has reference to CPCB letter no. F. No. B-29012/IPCVI/2019-20, dated 12.05.2020 & 30.07.2020, regarding submission of information related to river-basin wise status of ETPs (effluent treatment plants), in the matter of OA No. 593/2017 (Paryavaran Suraksha Samiti and Anr. v/s Union of India & Ors).

In this regard, it is to inform that the desired information is still awaited. Further, this issue will be reviewed by the Chairman, CPCB, during the meeting with SPCBs/PCCs, to be held on 01.09.2020, through video conferencing.

It is requested to submit the information about, river-basin wise status of ETPs, CETPs & STPs, through online portal, by 30.08.2020. The web portal can be accessed through the web-link: **http://125.19.52.219/gpi/riverbasin/**. The login credentials for this portal are same as India-E- Track portal.

Yours faithfully,
Ajay Aggarwal
AD & Div. Head IPC-VI
Central Pollution Control Board
Parivesh Bhawan, New Delhi

Annexure VIII(a)

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

SPEED-POST

Hon'ble NGT Matter

Date: 07.09.2020

B-29012/IPCVI/2020-21

To,

The Member Secretary
Delhi Pollution Control Committee
4th floor, ISBT Building,
Kashmeri Gate,
Delhi - 110006.

Sub: Shortcomings in river-basin wise status of ETPs- reg.

Sir,

This has reference to the information provided by DPCC on CPCB's online portal regarding river basin-wise status of ETPs for the quarter Apr-June, 2020, in the Hon'ble NGT matter of OA No. 593/2017 (Paryavaran Suraksha Samiti and Anr. v/s Union of India & Ors.).

It is observed that data provided by DPCC has some shortcomings, which are pointed out in the enclosure.

It is requested to submit correct information on the web portal. The web portal can be accessed through following web-link: **http://125.19.52.219/gpi/riverbasin/.** The login credentials for this portal are same as India-E- Track portal.

Yours faithfully,

A Aggwl

(Ajay Aggarwal)
AD & Div. Head IPC-VI

Encl: as above

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

Shortcomings observed in the river basin-wise status of ETPs, provided by DPCC

- As per the latest information provided by DPCC (Apr-Jun, 2020) regarding Grossly Polluting Industries (GPIs), there are **03** GPIs in Delhi, however, no. of GPIs mentioned in river basin wise information is **305**, which is contradictory.
- DPCC has mentioned that Dtc Netaji Subhash Place, Subhash Place Depot, Delhi, - 110035 lies in Brahmaputra river basin, which is incorrect as Delhi comes under Ganga river basin.
- DPCC has mentioned that PUNJAB PRINTING PRESS, C-92, Ph-I, Okhla Industrial Area, New Delhi - 110020 lies in Indus river basin, which is incorrect as Delhi comes under Ganga basin.
- DPCC has provided the incorrect co-ordinates of some of the industries, which are mentioned as below:

Sl. No.	Name and Address of Industry	Co-ordinates provided	Location according to the co-ordinates
1.	Nandi Greens (a Unit Of Nandi Caterers Pvt. Ltd.), Kh. No. 43, 46 And 48, Village-sultanpur, Near Ghitorny Metro Station, Mg Road, New Delhi – 110030	Lat: 26.258537 Long: 82.065985	Sultanpur, Uttar Pradesh
2.	Mapple Emerald, Kh No 41/2/2, 1, 3, 41/3,41/9, Min 37/23//2, 37/24/2 34/24/2 Samalkha Kh. No.450. Rajkori Samlkha Village Rajokri,Nh-8 - 110037	Lat: 29.240527 Long: 77.011764	Samalkha, Haryana
3.	Swami Gutta Factory, Plot No. 20, Gali No. 7, Jawahar Nagar Redevelopment Area - 110094	Lat: 28.949911 Long: 77.673073	Meerut, Uttar Pradesh
4.	Darsh Industries,Plot No-10, Kh.No-3/24/1, 3/24/2, Jawahar Nagar Industrial Area, Delhi- 110094	Lat: 28.946255 Long: 77.674558	Meerut, Uttar Pradesh
5.	Fashion Flare International Private Limited, A-189, Okhla Industrial Area, Phase -I	Lat: 28.887464 Long: 77.596944	Fakhrabad, Uttar Pradesh
6.	K.P. Engineering Works (Regd.), D-1627, Dsidc, Narela Industrial Area - 110040	Lat: 28.949911 Long: 77.673073	Meerut, Uttar Pradesh

******

Annexure VIII (b)

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

SPEED-POST

Hon'ble NGT Matter

B-29012/IPCVI/2020-21

Date: 07.09.2020

To,

The Member Secretary
Haryana Pollution Control Board
C-11, Sector 6, Panchkula,
Haryana 134109

Sub: Shortcomings in river-basin wise status of ETPs- reg.

Sir,

This has reference to the information provided by SPCB, Haryana on CPCB's online portal regarding river basin-wise status of ETPs for the quarter Apr-June, 2020, in the Hon'ble NGT matter of OA No. 593/2017 (Paryavaran Suraksha Samiti and Anr. v/s Union of India & Ors.).

It is observed that in the earlier information, submitted on India E-Track portal, Haryana, SPCB has mentioned that total 3613 units in the State are generating trade effluent and requires ETPs, however in river basin wise information it is mentioned that there is no trade effluent generating unit in Haryana.

It is requested to provide river basin wise information for all the trade effluent generating units. The web portal can be accessed through following web-link: **http://125.19.52.219/gpi/riverbasin/.** The login credentials for this portal are same as India-E-Track portal.

Yours faithfully,

(Ajay Aggarwal)
AD & Div. Head IPC-VI

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

Annexure VIII (c)

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

SPEED-POST

Hon'ble NGT Matter

B-29012/IPCVI/2020-21/

Date: 07.09.2020

To,

The Member Secretary
Daman and Diu Pollution Control Committee
Office of the Deputy Conservator of Forests
Moti Daman,
Daman – 396220.

Sub: Shortcomings in river-basin wise status of ETPs- reg.

Sir,

This has reference to the information provided by PCC, Daman & Diu on CPCB's online portal regarding river basin-wise status of ETPs for the quarter Jan-Mar, 2020, in the Hon'ble NGT matter of OA No. 593/2017 (Paryavaran Suraksha Samiti and Anr. v/s Union of India & Ors.).

It is observed that in the earlier information, submitted on India E-Track portal, Daman & Diu, PCC has mentioned that total 98 units in the Union Territory are generating trade effluent and requires ETPs, however, river basin wise information for only 44 industries has been provided.

It is requested to provide river basin wise information for all the trade effluent generating units. The web portal can be accessed through following web-link: **http://125.19.52.219/gpi/riverbasin/.** The login credentials for this portal are same as India-E-Track portal.

Yours faithfully,

(Ajay Aggarwal)
AD & Div. Head IPC-VI

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

Annexure VIII (d)

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

SPEED-POST

Hon'ble NGT Matter

B-29012/IPCVI/2020-21/

Date: 09.09.2020

To,

The Member Secretary
Odisha State Pollution Control Board
Paribesh Bhawan
A-118, Nilakanta Nagar, Unit –VIII,
Bhubaneshwar – 751012.

Sub: Shortcomings in river-basin wise status of ETPs- reg.

Sir,

This has reference to the information provided by Odisha SPCB, on CPCB's online portal regarding river basin-wise status of ETPs for the quarter Apr-June, 2020, in the Hon'ble NGT matter of OA No. 593/2017 (Paryavaran Suraksha Samiti and Anr. v/s Union of India & Ors.).

It is observed that data provided by Odisha SPCB has some shortcomings, which are pointed out in the enclosure.

It is requested to kindly look into the matter and provide correct and complete information at the earliest.

Yours faithfully,

(Ajay Aggarwal)
AD & Div. Head IPC-VI

Encl: as above

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

Shortcomings observed in the river basin-wise status of ETPs, provided by Odisha SPCB

- As per the latest information provided by OSPCB (Apr-Jun, 2020) regarding Grossly Polluting Industries (GPIs), there are **06** GPIs in Odisha, however, number of GPIs mentioned in river basin wise information is **16**, which is different.
- It is observed that in the earlier information, submitted on India E-Track portal, Odisha, SPCB has mentioned that total 1179 units in the State, are generating trade effluent and requires ETPs, however, river basin wise information for only 149 industries has been provided.
- The latitudes and longitudes of 107 industries are mentioned as 0.0, which is incorrect as state of Odisha extends from 17.31° N latitude to 22.31° N latitude and from 81.31° E longitude to 87.29° E longitude.
- In the portal, for units having zero discharge, ZLD option is provided, however, Odisha SPCB has mentioned discharge point as "No discharge, Nil (ETP treated waste reused and recycled) etc.", for 31 industries. Odisha SPCB should adhere to the options provided in the portal.
- For all the units, designed capacity of ETP, average volume of Effluent Generation, daily average volume of treated effluent and treatment capacity gap is mentioned as Zero. Odisha SPCB needs to provide the actual figures.

Annexure IX

SPEED-POST / E-mail केन्द्रीय प्रदूषण नियंत्रण बोर्ड
CENTRAL POLLUTION CONTROL BOARD
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE GOVT. OF INDIA

F. No. B-11011/UPC-II/MSW/2020-21

Dated: 31.07.2020

To,

The Member Secretary,
(All SPCBs/PCCs)

Sub: Information on MSW facilities and Legacy Waste sites in the matter of Paryavaran Suraksha Samiti & Anr. v/s Union of India & Ors. (OA No. 593/2017) before Hon'ble NGT-reg

Sir/ Madam,

Vide Order dated 28-8-2019 in the matter of Paryavaran Suraksha Samiti & Anr. v/s Union of India & Ors. (OA No. 593/2017), Hon'ble NGT directed as follows: -

"The CPCB needs to collate the available date base with regard to ETPs, CETPs, STPs, MSW facilities, Legacy Waste sites and prepare a river basin wise macro picture in terms of gaps and needed interventions."

In view of above, CPCB has prepared following 3 formats **(enclosed)** for collecting information:

Format 1. MSW processing facilities
Format 2. MSW Landfill Sites.
Format 3. MSW Dumpsites (Legacy Waste)

It is requested to provide information on MSW facilities and Legacy Waste sites in given formats in Excel Sheet format through email to divyasinha.cpcb@nic.in by **15th August, 2020** so that consolidated report may be filed in Hon'ble NGT within stipulated time frame. It may be noted that next date of hearing in the matter is on 21st Sept.2020, and the compiled report has to be submitted to Hon'ble NGT by 15th September 2020. by CPCB.

Yours faithfully

(Divya Sinha)
Additional Director & I/c, UPC-II

Encl: As above

'परिवेश भवन' पूर्वी अर्जुन नगर, दिल्ली-110032
Parivesh Bhawan, East Arjun Nagar, Delhi-110032
दूरभाष/Tel : 43102030, 22305792, वेबसाईट/Website : www.cpcb.nic.in

Format 1: MSW Processing Facilities

Name of the State	MSW (1)	MSW facility Location (2)	Waste Processing Capacity (TPD) (3)	Technology adopted [Bio-methanation+cmposting+WtE+RDF +any other (Specify)] (4)	Date since MSW facility is in operation (5)	Quality of waste being processed at MSW facility [mixed/segregated/RDF/ pre-treated/other (please specify)] (6)	Ground Water Analysis Report (Please Annex Detailed Report) (7)	Has effective treatment system been installed (Y/N) (8)	If '8' is 'Y' – please provide details of treatment (9)	Point of Disposal of Treated Leachate (River, Drain, Creek, Any other surface water body – please specify name of the water body) (10)	Does the treated leachate comply with characteristics of treated leachate as specified in Schedule II B of SWM Rules, 2016? (11)	GPS Coordinates of MSW facility (12)	GPS Coordinates of point of disposal of treated leachate (13)	River basin in which the MSW faciliy3 s is located (14)

44

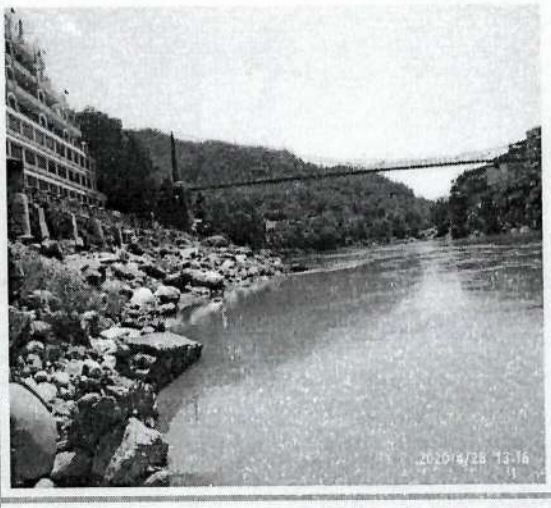
Format 2: MSW Landfill Sites

Name of the State	Landfill (1)	Scientific landfill location (2)	Capacity of landfill (3)	% capacity of landfill exhausted (4)	Waste Disposed at Landfill (TPA) (5)	Date since landfill is in operation (6)	Quality of waste being disposed at Landfill (segregated inerts/mixed) (7)	Ground Water Analysis Report (Please Annex Detailed Report) (8)	Has Leachate Management System been provided (Y/N) (9)	If '9' is 'Y' – please provide details of treatment (10)	Point of Disposal of Treated Leachate (River, Drain, Creek, Any other surface water body – please specify name of the water body) (11)	Does the treated leachate comply with characteristics of treated leachate as specified in Schedule II B of SWM Rules, 2016? (12)	GPS Coordinates of Landfill (13)	GPS Coordinates of point of disposal of treated leachate (14)	River basin in which the Landfill is located (15)

Format 3: MSW Dumpsites (Legacy Waste)																		
Name of the State	Dumpsite location (2)	Area covered (m2) (3)	Height of Dumpsite (4)	Quantity of waste at dumpsite (TPA) (5)	Date since the dumpsite is in operation (6)	Is fresh waste still being dumped at the dump site ? (7)	If '7' is yes- then quantity of waste being dumped (TPD) (8)	Ground Water Analysis Report (Please Annex Detailed Report) (9)	Has disposal of Legacy waste been done (Y/N/under consideration) (10)	If '10' is Y/under consideration- please provide details (11)	Has disposal of Legacy Waste been planned in accordance with CPCB Guidelines (Y/N) (12)	Has Leachate Management System been provided (Y/N) (13)	If '13' is 'Y' – please provide details of treatment (14)	Point of Disposal of Treated Leachate (River, Drain, Creek, Any other surface water body – please specify name of the water body) (15)	Does the treated leachate comply with characteristics of treated leachate as specified in Schedule II B of SWM Rules, 2016? (16)	GPS Coordinates of Dumpsite (17)	GPS Coordinates of point of disposal of treated leachate (18)	River basin in which the Dumpsite is located (19)

Annexure - X

Assessment of Impact of Lockdown on Water Quality of Major Rivers

CENTRAL POLLUTION CONTROL BOARD
(Ministry of Environment, Forest & Climate Change)
Parivesh Bhawan, East Arjun Nagar
DELHI-110032

Septemeber 14, 2020

ABBREVIATIONS

BOD	-	Biochemical Oxygen Demand
COD	-	Chemical Oxygen Demand
CPCB	-	Central Pollution Control Board
CWC	-	Central Water Commission
DO	-	Dissolved Oxygen
FC	-	Fecal Coliform
GoI	-	Government of India
GPI	-	Grossly Polluting Industries
Km	-	Kilometre
MoEF & CC	-	Ministry of Environment, Forest and Climate Change
NABL	-	National Accreditation Board for Testing and Calibration Laboratories
NWMP	-	National Water Quality Monitoring Programme
PCCs	-	Pollution Control Committees
RTWQMS	-	Real Time Water Quality Monitoring Station
SPCBs	-	State Pollution Control Boards
WHO	-	World Health Organisation

EXECUTIVE SUMMARY

Government of India (GoI) had imposed a nationwide lockdown since midnight of 24th March 2020 as a preventive measure to restrict contagion's spread against the Coronavirus (COVID-19) infections and therafter extended further. During the lockdown period, human activities were restricted and most of the activities came to stand still. In view of the restrictions on industrial operations, industrial discharges reduced to minimum in most of the areas, Central Pollution Control Board (CPCB) requested SPCBs/PCCs to assess the water quality of 19 major rivers (viz., river Beas, Brahmaputra, Baitarni & Brahmani, Cauvery, Chambal, Ganga, Ghaggar, Godavari, Krishna, Mahanadi, Mahi, Narmada, Pennar, Sabarmati, Sutlej, Swarnarekha, Tapi, Yamuna) at the existing monitoring locations under National Water Quality Monitoring Programme (NWMP), vide letter dated 09.04.2020 with a view to (i) study the impact of lockdown on water quality of major rivers due to restriction of activities in the country, (ii) compare the water quality of major Rivers during pre-lockdown (March 2020) and lockdown period (April 2020), and (iii) assess water quality of major rivers for compliance to the parameters prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Accordingly, 20 State Pollution Control Boards (SPCBs) have participated in the assessment and collected water samples from 19 major rivers and analysed collected water samples for the parameters viz. pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Fecal Coliform (FC) and the results were compared with the Primary Water Quality Criteria for Outdoor Bathing notified under Environment (Protection) Rules, 1986. *Major constrains while carrying out sampling by the SPCBs/PCCs is that all the existing monitoring locations under NWMP could not be monitored due to movement restrictions during lockdown.*

During the pre-lockdown period (March 2020), SPCBs have collected samples from 387 monitoring locations and 365 number of samples from the monitoring locations during lockdown (April 2020) and collected samples were analysed for the critical parameters. *During pre-lockdown (March 2020),* the analysis results revealed that 351 out of 387 monitored locations for DO, 375 monitored locations for pH, 315 monitored locations for BOD and 324 monitored locations for FC complied with Primary Water Quality Criteria for Outdoor Bathing. In summary, 299 out of 387 monitored locations complied (77.26 %) with criteria parameters listed under the Primary Water Quality Criteria for Outdoor Bathing. *During lockdown (April 2020),* The analysis of results showed that 331 out of 365 monitored locations for DO, 355 monitored locations for pH, 298 monitored locations for BOD and 299 monitored locations for FC are complying with the outdoor bathing water quality criteria. It was observed that 277 out of 365 monitored locations in April 2020 complied (75.89 %) complied with Primary Water Quality Criteria for Outdoor Bathing, which implies that there is no significant improvement in water quality of major rivers monitored in the country, during the lockdown period

Overall Observations on 19 Major Rivers Monitored during Pre-lockdown (March 2020) and Lockdown Period (April 2020): -

- Four rivers viz., Baitarni, Mahanadi, Narmada and Pennar showed 100 % compliance with the Primary Water Quality Criteria for Outdoor Bathing during Pre-lockdown and lockdown period.

- River Ghaggar failed to comply with the Primary Water Quality Criteria for Outdoor Bathing during Pre-lockdown and lockdown period.

- Water quality of two rivers viz., Sabarmati (55.6 %) and Mahi (92.9 %) remains unchanged in terms of compliance to Primary Water Quality Criteria for Outdoor Bathing during pre-lockdown and lockdown.

- Improvement in water quality w.r.t Primary Water Quality Criteria for Outdoor Bathing was noticed in case of 7 rivers viz., Brahmani (increase in compliance to the bathing criteria limits from 85 % to 100%), Brahmaputra (enhancement in compliance to the criteria limits from 87.5 % to 100 %), Cauvery (marginal improvement from 90.5 % to 96.97 %) , Godavari (increase in compliance from 65.8 % to 78.4 %), Krishna (improvement in compliance from 84.6 % to 94.4 %), Tapi (improved compliance from 77.8 % to 87.5 %) and Yamuna (increase in compliance from 42.8 % to 66.67 %) which may be attributed to (i) Minimal industrial effluent discharges in view of closure of almost all industries. (ii) No human activities involving disposal of worshipped pooja materials and garbage. (iii) No anthropogenic activities such as outdoor bathing, washing of clothes, vehicle washing and cattle washing, no pilgrimage activities etc. during lockdown phase and (iv) The cattle movement was also reduced considerably reducing biological contamination of surface water bodies.

- Water quality was deteriorated during the lock down period in case of five rivers viz., Beas (reduced from 100 % to 95.45 %), Chambal (reduced compliance to the criteria limits from 75 % to 46.15 %), Ganga (reduced compliance to the criteria limits from 64.6 % to 46.2 %), Sutlej (reduction in % compliance from 87.1 to 78.3%) and Swarnarekha (reduction in % compliance from 80 % to 53.33 %) which may be attributed to (i) discharge of untreated or partially treated sewage; (ii) pollutant concentrations are usually at their highest levels due to negligible dry season flow; and (iii) no fresh water discharges from the upstream.

- Cent percentage compliance was observed during lockdown w.r.t Primary Water Quality Criteria for Outdoor Bathing in case of 6 rivers (viz., river Baitarni, Brahmani , Brahmaputra, Mananadi, Narmada and Pennar) which may be attributed to availability of adequate infrastructure for management of sewage in the catchment of the respective river bodies and might had adequate dilution.

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1.0. INTRODUCTION

1.1 Background

The COVID-19 global pandemic, caused by the Novel Coronavirus, is considered to be one of the most virulent diseases to have afflicted humankind. According to World Health Organisation (WHO), SARS-CoV-2 virus cases were first detected in December 2019, in China's Hubei province, subsequently declared as a Public Health Emergency of International Concern. With infections rising swiftly and no vaccine/treatment formulated, most nations had called for immediate and widespread lockdowns to curb the virus transmission. Government of India (GoI) had similarly imposed a nationwide lockdown since midnight of 24th March 2020 as a preventive measure to restrict contagion's spread against the Coronavirus (COVID-19) infections after a Janata Curfew on March 22, 2020 in the country. Initial period of lockdown was declared during the period 25th March 2020 to 14th April 2020 and therafter extended further. During the lockdown period, human activities were restricted and most of the activities came to stand still. In view of the restrictions on industrial operations, industrial discharges reduced to minimum in most of the areas. Also, the lockdown period offered a unique situation to carryout assessment of water quality of surface water bodies including major rivers in the Country as it provides an opportunity to re-comprehend and redesign exsiting frameworks and put in place robust mechanism to cleanse indentified polluted river stretches. Therefore, Central Pollution Control Board (CPCB) in association with the State Pollution Control Boards (SPCBs)/Pollution Control Committees (PCCs) conducted assessment of impact of lockdown on water quality of water bodies specially on major rivers in the Country.

1.2 Objective

Main objectives of the study are (i) to study the impact of lockdown on water quality of major rivers due to restriction of activities in the country, (ii) to compare the water quality of major Rivers during pre-lockdown (March 2020) and lockdown period (April 2020), and (iii) to assess water quality of major rivers for compliance to the parameters prescribed under Primary Water Quality Criteria for Outdoor Bathing.

1.3 Methodology and the Constraints

Central Pollution Control Board (CPCB) in association with SPCBs/PCCs has established a Water Quality Monitoring Network across the country [called National Water Quality Monitoring Programme (NWMP)] in order to

prepare strategies including plans and requisite policies for prevention and control of water pollution. Present water quality monitoring network comprises 4111 locations which include surface and groundwater in 28 States and 8 Union Territories. Among these, 2021 locations are monitored on rivers under NWMP in the country. Under, NWMP, monitoring is carried out with a frequency of monthly, quarterly, half yearly and yearly basis for some high altitude locations depending on the type of water body, seasons and the locations. State-wise and water body- wise water quality monitoring locations under NWMP is given at **Annexure - I.**

In order to assess impact on water quality of major rivers due to lockdown since midnight of 24 th March 2020, Central Pollution Control Board (CPCB) vide letter dated 09.04.2020 requested concerned State Pollution Control Boards (SPCBs)/ Pollution Control Committees (PCCs) to carryout water quality of all major rivers preferably river Beas, Brahmaputra, Baitarni & Brahmani, Cauvery, Chambal, Ganga, Ghaggar, Godavari, Krishna, Mahanadi, Mahi, Narmada, Pennar, Sabarmati, Sutlej, Swarnarekha, Tapi, Yamuna at the existing monitoring locations under National Water Quality Monitoring Programme (NWMP) and for further analysis of the collected samples in accordance with the Guidelines for Water Quality Monitoring, 2017 (GWQM, 2017) issued by Ministry of Environment, Forest and Climate Change (MoEF&CC). Accordingly, SPCBs/PCCs have carried out analysis of collected water samples at laboratories of respective SPCBs/PCCs or National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited or laboratories approved under the Environment (Protection) Act, 1986. Analysis results received from SPCBs/PCCs till first week of June 2020 have been considered and prepared this report. Analysis results of March 2020 data (Pre-lockdown) are compared with April 2020 (lockdown) water quality data of all the monitored rivers. The critical water quality parameters viz. pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Fecal Coliform (FC) and the results were compared with the Primary Water Quality Criteria for Outdoor Bathing notified under Environment (Protection) Rules, 1986 (**Annexure - II**).

Major constrains while carrying out sampling by the SPCBs/PCCs is that all the existing monitoring locations under NWMP could not be monitored due to movement restrictions during lockdown. Also, SPCBs/PCCs, generally do not monitor flow details under NWMP, therefore, this study is confined to comparison of water quality during the lockdown period (April 2020)with the pre-lockdown period (March 2020) to assess percent variation or increasing trend or decreasing trend in water quality only for bathing criteria parameters such as pH, DO, BOD and FC and also to assess compliance

status with the Primary Water Quality Criteria for Outdoor Bathing notified under Environment (Protection) Amendment Rules, 2000.

River-wise samples collected, water quality observed during pre-lockdown (March 2020) and lockdown period (April 2020), number of sampling locations complying with the Primary Water Quality Criteria for Outdoor Bathing, location-wise and parameter-wise variation or increasing or decreasing trend in water quality and other related details are given in subsequent paras of the report.

2.0 IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER BEAS

2.1 About Beas River

The River Beas originates from Beas Kund, near Rohtang Pass, on the southern end of the Pir Panjal Range of District Kullu in Himachal Pradesh (HP) and flows a distance of about 245 km in HP and merge with the river Sutlej at Harike Pattan, south of Amritsar, Punjab after traversing a total distance of 470 km. Major towns on the banks of River Beas are Manali, Kullu, Shamshi, Bhunter in HP & Amritsar in Punjab. Major tributaries of the river Beas are river Bain, Banganga, Luni and Uhal, Banner, Chakki, Gaj, Harla, Mamuni, Parvati, Patlikuhlal, Sainj, Suketi and Tirthan. Major industrial establishments on the banks of river Beas within Punjab jurisdiction are Brewery, Distillery, Sugar, Paper Board, Gluten, Thermal Power Plant and few screening plants. In Punjab State, there are 16 local bodies and 75 villages which are discharging wastewater directly or indirectly into river Beas, 12 water polluting industries mainly located at Pathankot, Gurdaspur, Mukerian and Dasuya are the major concern.

2.2 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water Quality of river Beas is monitored at 31 locations by Central Pollution Control Board (CPCB) in association with H.P. State Pollution Control Boards (HPSPCB) and Punjab Pollution Conrol Board (PPCB) under National Water Quality Monitoring Programme (NWMP). State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Beas is depicted in **Figure 2.1.**

2.3 Analytical Results:-

Water quality of river Beas was carried out at 22 locations during pre-lockdown (March 2020) and 22 locations during lockdown period (April 2020) to assess the impact of lock-down on water quality of river Beas. Water quality of river Beas for the Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented in **Table – 2.1**. Based on the monitoring & analysis of collected samples, the water quality trend of river Beas with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are depicted in **Figure 2.2 to Figure 2.9.**

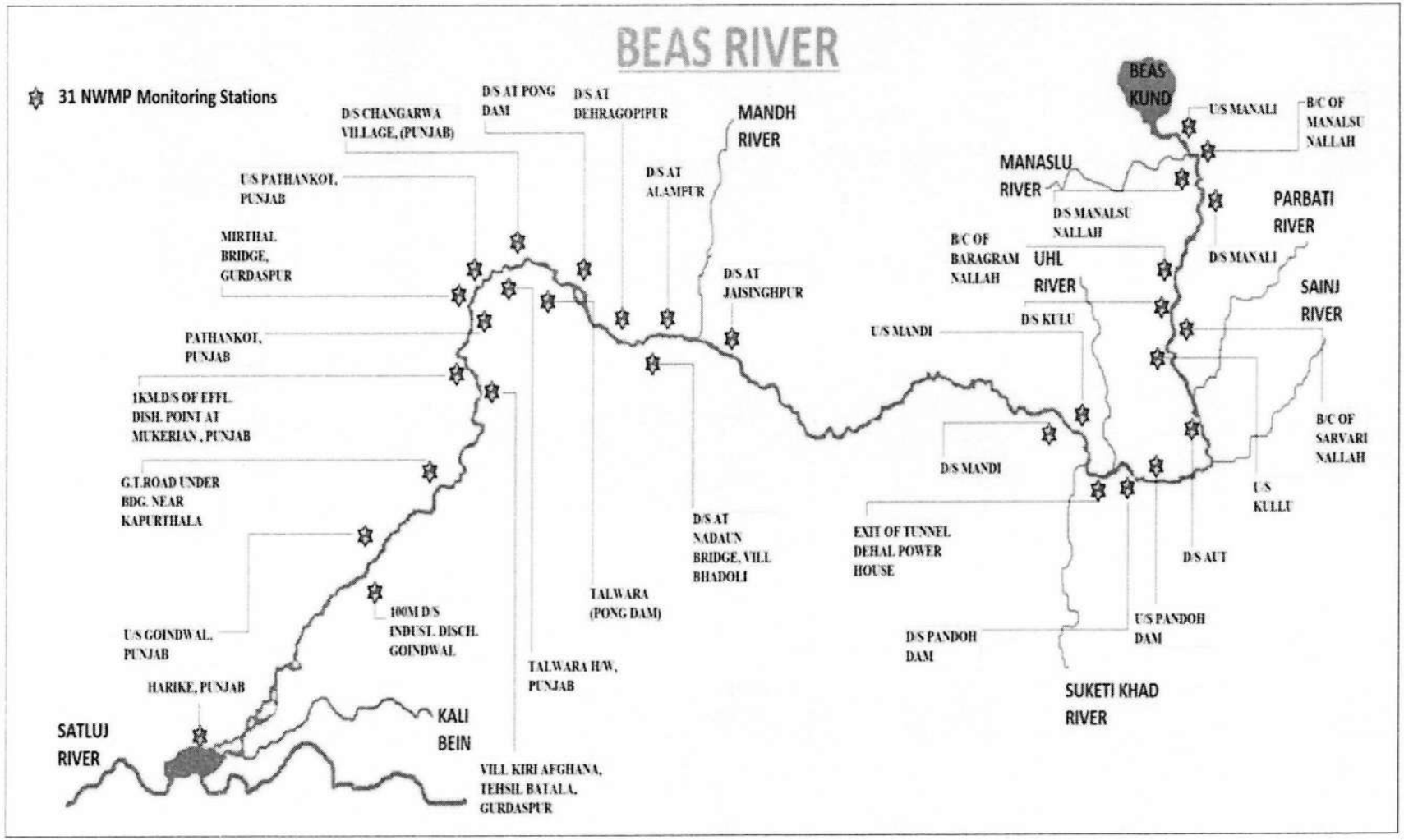

Figure 2.1: State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Beas

Table - 2.1: Water Quality of River Beas during Pre (March 2020) and Lockdown Period (April 2020)

Details of Monitoring Locations on River Beas	Dissolved Oxygen (mg/L)			pH		BOD (mg/L)*			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
HIMACHAL PRADESH												
U/S Manali	9.4	9.8	4.26%	7.5	7.6	BDL	BDL	0.00%	11	11	0.00%	Complying
D/S Manali	9.2	10	8.70%	7.4	7.6	BDL	BDL	0.00%	23	23	0.00%	Complying
D/S Manalsu Nallah	9.3	10	7.53%	6.5	7.6	BDL	BDL	0.00%	13	13	0.00%	Complying
U/S Kullu	9.3	9.9	6.45%	7.7	8	BDL	BDL	0.00%	33	23	-30.30%	Complying
D/S Kulu	9.1	9.5	4.40%	7.6	7.5	BDL	BDL	0.00%	17	33	94.12%	Complying
D/S Aut	8.4	9.8	16.67%	7.5	7.5	BDL	BDL	0.00%	23	33	43.48%	Complying
U/S Pandon Dam	8.9	8.7	-2.25%	7.8	7.8	BDL	BDL	0.00%	23	23	0.00%	Complying
At Exit of Tunnel Dehal Power House	9.4	9.2	-2.13%	7.6	7.8	BDL	BDL	0.00%	33	23	-30.30%	Complying
U/S Mandi	9.7	9.2	-5.15%	7.9	7.9	BDL	BDL	0.00%	33	23	-30.30%	Complying
D/S Mandi	9.4	9.3	-1.06%	7.7	8.2	BDL	BDL	0.00%	70	49	-30.00%	Complying
D/S Alampur	8.7	-	-	7.8	-	BDL	-	-	2	-	-	Complying
D/S Dehragopipur	9.0	8.6	-4.44%	7.6	7.4	BDL	BDL	0.00%	2	8	300.00%	Complying
D/S Pong Dam	8.6	-	-	6.8	-	BDL	-	-	2	-	-	Complying
D/S Pandoh Dam	9.2	8.9	-3.26%	7.6	7.9	BDL	BDL	0.00%	33	Not reported	-	Complying
D/S Jaisinghpur	9.0	-	-	7.8	-	BDL	-	-	2	-	-	Complying
Nadaun Bridge, Bhadoli	9.3	-	-	7.8	-	BDL	-	-	2	-	-	Complying
No. of locations monitored in HP	16 locations in March 2020 and 12 locations in April 2020 (FC not reported for one location in April 2020)											

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Details of Monitoring Locations on River Beas	Dissolved Oxygen (mg/L)			pH		BOD (mg/L)*			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
No. of monitoring locations monitored results available	16	12	-	16	12	16	12	0.00%	16	11/12 (FC not reported for one location)	0.00%	
No. of locations complying to Criteria	16	12	-	16	12	16	12	0.00%	16	11/11	0.00%	
Range	8.4 to 9.7	8.6 to 10	% Increase (4.26 to 16.67 %) at 6 location s and % Decrease (1.06 to 5.15 %) at 6 locations	6.5 to 7.9	7.4 to 8.2	BDL	BDL	Stable at all 12 monitored locations (No variation observed at 12 monitored locations)	2 to 70	8 to 49	% Increase (43.48 to 300 %) at 3 locations, % Decrease (30 to 30.3 %) at 4 locations and 'No' variation at 4 locations	
PUNJAB												
At Mirthal Bridge,GDPur	-	7.5		-	7.5	-	1.1	-	-	45		Complying
At G.T.Road Under Bdg. Near Kapurthala	8.2	7.8	-4.90%	7.9	8	1.5	1.3	-13.30%	140	82	-41.40%	Complying
At 100m D/S Indust. Disch. Goindwal	8.1	7.7	-4.90%	7.8	7.8	1.3	1.1	-15.40%	210	110	-47.60%	Complying
At 1km D/s of Effl. Disch. At Mukerian ,	7.2	7.1	-1.40%	7.6	7.7	1.6	1.3	-18.80%	210	170	-19.00%	Complying
At Talwara H/W, Punjab	-	7.8	-	-	7.6	-	1.1	-	-	40		Complying
At U/S Pathankot	-	7.5	-	-	7.5	-	1.1	-	-	36		Complying
D/S Pathankot, Punjab	-	7.3	-	-	7.8	-	1.3	-	-	92		Complying
U/S Goindwal, Punjab	8.3	7.9	-4.80%	8	8.1	1.3	1.1	-15.40%	170	93	-45.30%	Complying
At Harike, Punjab	8.2	8	-2.40%	8	7.7	1.2	1.1	-16.70%	140	110	-21.40%	Complying

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Details of Monitoring Locations on River Beas	Dissolved Oxygen (mg/L)			pH		BOD (mg/L)*			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
Nr Village Kiri Afghana, Tehsil Batala	7.4	7.5	1.40%	7.8	7.6	1.4	1.1	-21.40%	170	140	-17.06 %	Complying
No. of locations monitored in Punjab	06 locations in March 2020 and 10 locations in April 2020											
No. of monitoring locations monitored results available in Punjab	6	10	-	6	10	6	10	-	6	10	-	
No. of locations complying to Criteria	6	10	-	6	10	6	10	-	6	10	-	
Range	7.2 – 8.3	7.1 - 8	% Increase (1.4 %) at 1 location % Decrease (1.4 to 4.90 %) at 5 locations	7.6 - 8	7.5- 8.1	1.2 – 1.6	1.1 – 1.3	% Decrease (13.30 to 21.40 %) at 6 locations	140 - 210	36 - 170	% Decrease (17.60 to 47.60 %) at 6 locations	
Overall Water Quality Status of River Beas (HP and Punjab) during Pre-lockdown (March 2020) and Lockdown Period (April 2020)												
No. of locations monitored	22 locations in March 2020 and 22 locations in April 2020											
No. of monitoring locations results available	22	22	-	22	22	22	22	-	22	21/21	-	
Range	7.2 – 9.7	7.1 - 10	% Increase (1.4 to 16.67 %) at 7 locations and % Decrease (1.06 to 5.15 %) at 11 locations	6.5 - 8	7.4- 8.2	BDL -1.6	BDL – 1.3	% Decrease (13.3 to 21.4 %) at 6 locations and stable at 12 locations	2 - 210	8 - 170	% Increase (43.48 -300 %) at 3 locations, % Decrease (17.6 to 47.6 %) at 10 locations and 'No' variation at 4 locations	

Note:- * Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

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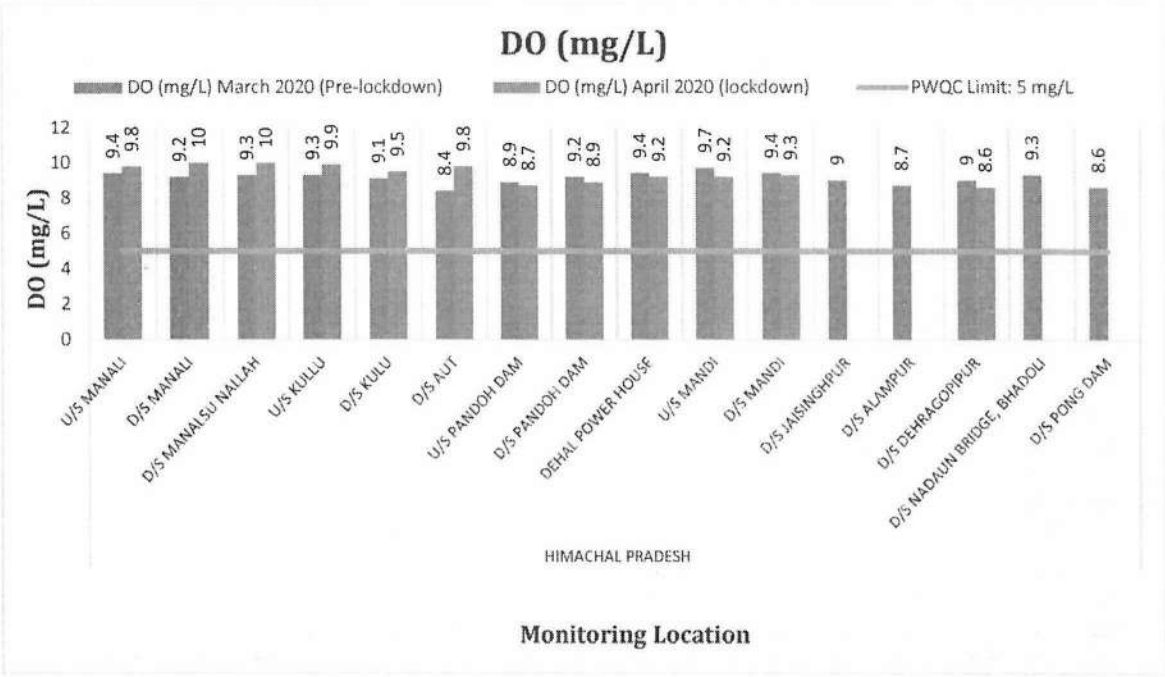

Figure 2.2: Water Quality of river Beas for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in HP

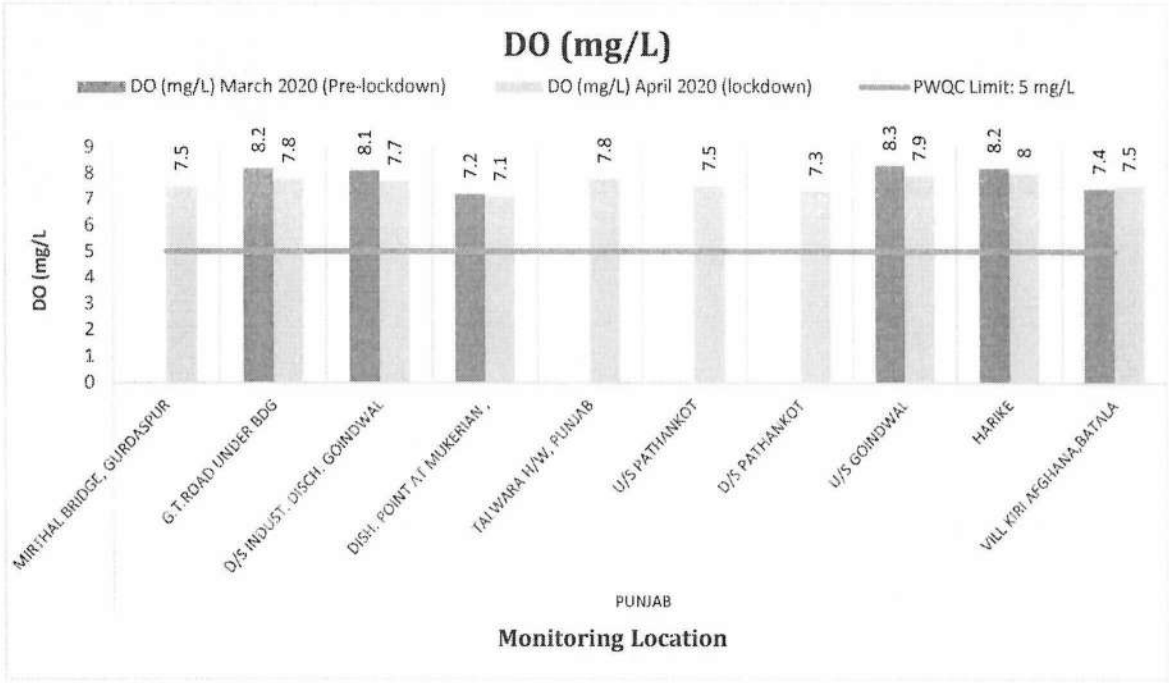

Figure 2.3: Water Quality of river Beas for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Punjab

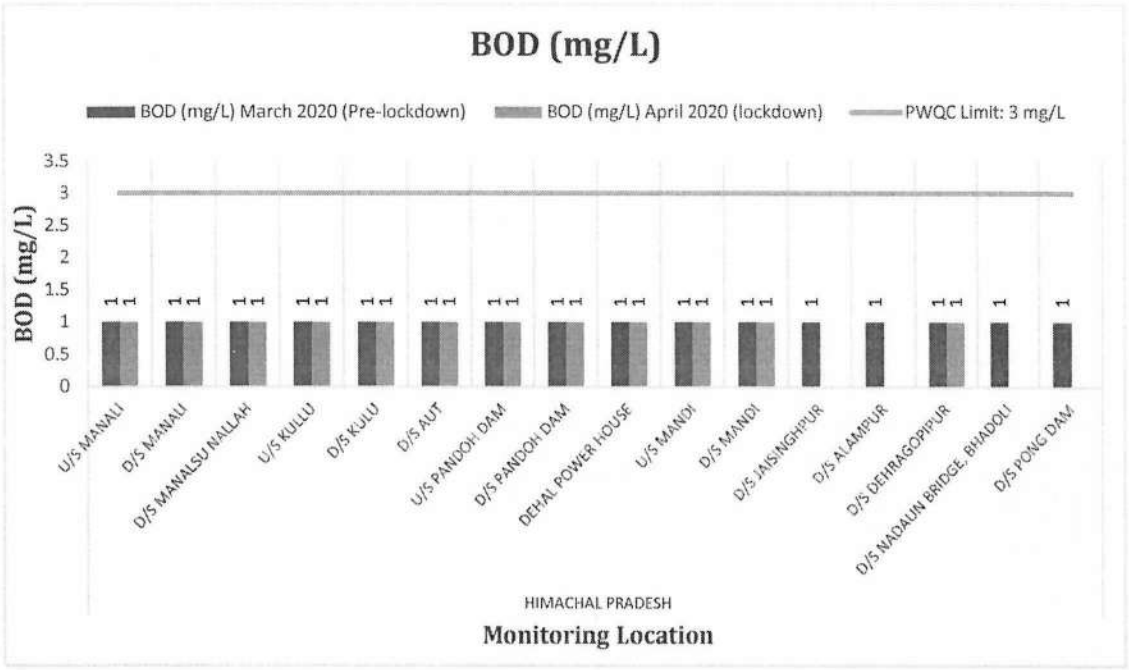

Figure 2.4: Water Quality of river Beas for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in HP

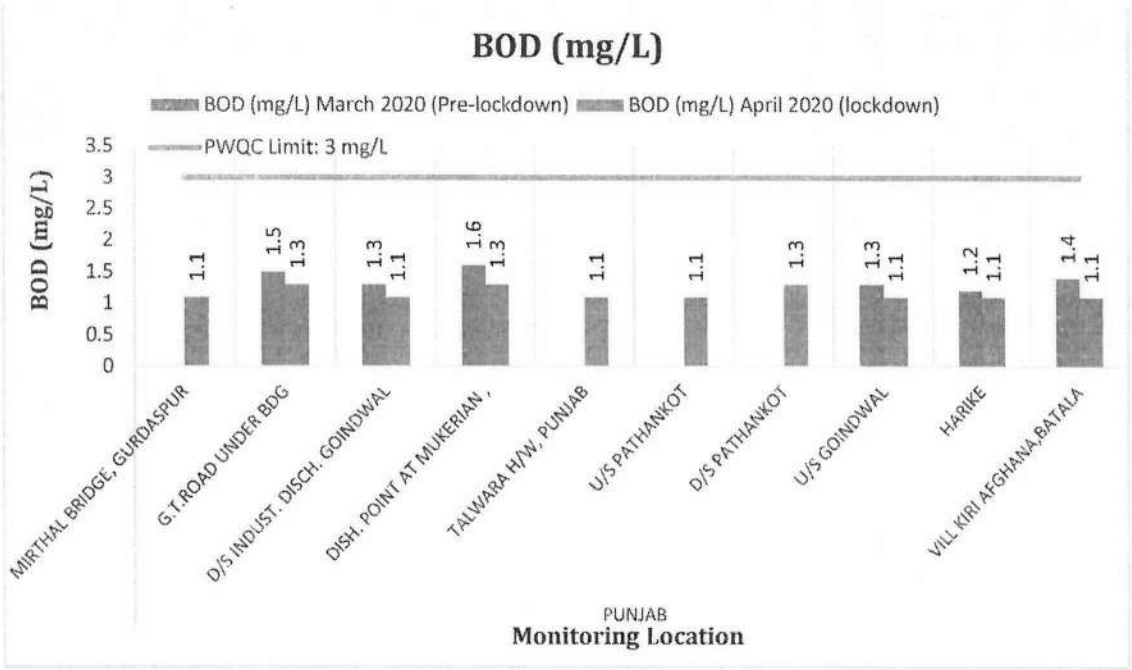

Figure 2.5: Water Quality of river Beas for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Punjab

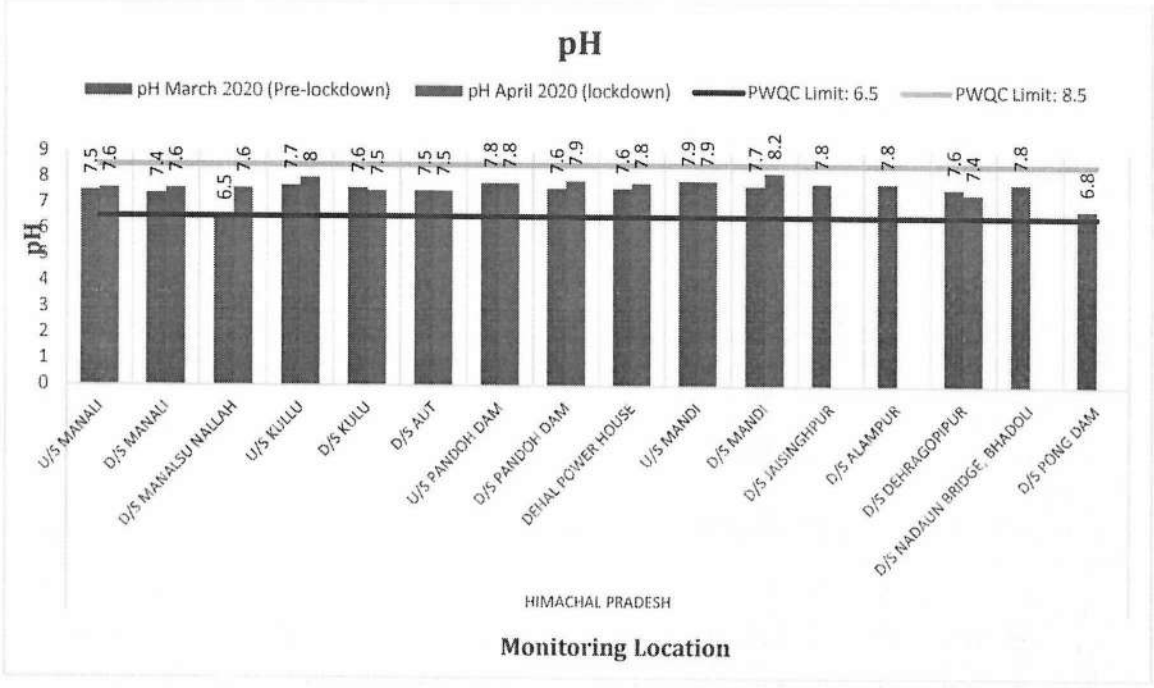

Figure 2.6: Water Quality of river Beas for pH during pre-lockdown (March 2020) and lockdown (April 2020) in HP

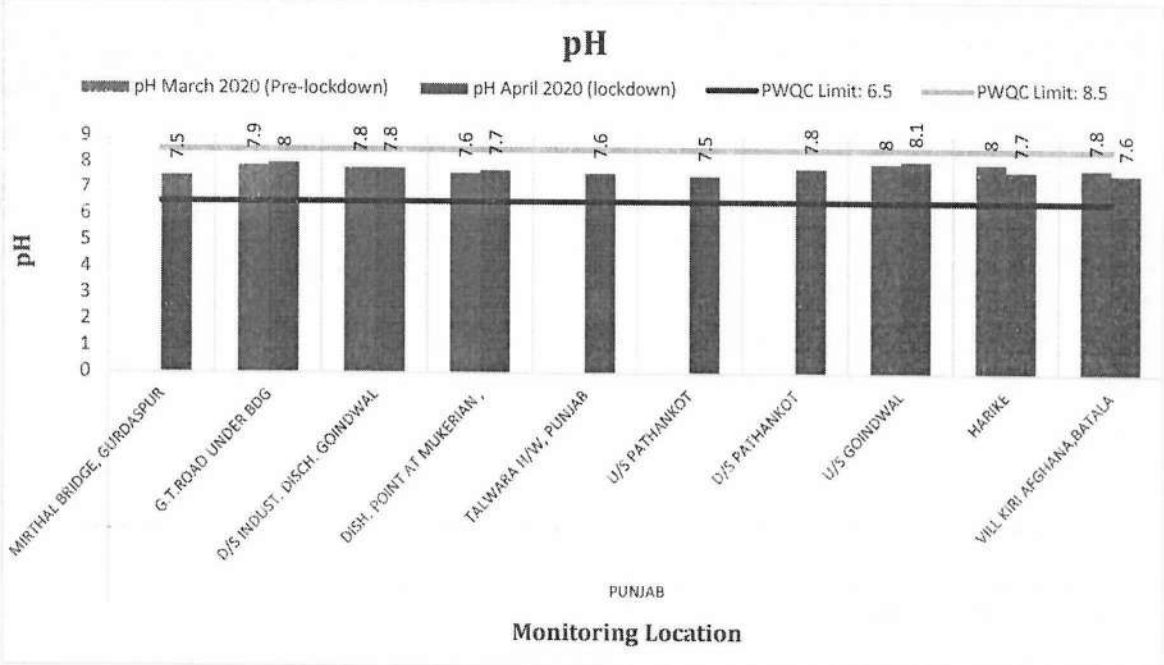

Figure 2.7: Water Quality of river Beas for pH during pre-lockdown (March 2020) and lockdown (April 2020) in Punjab

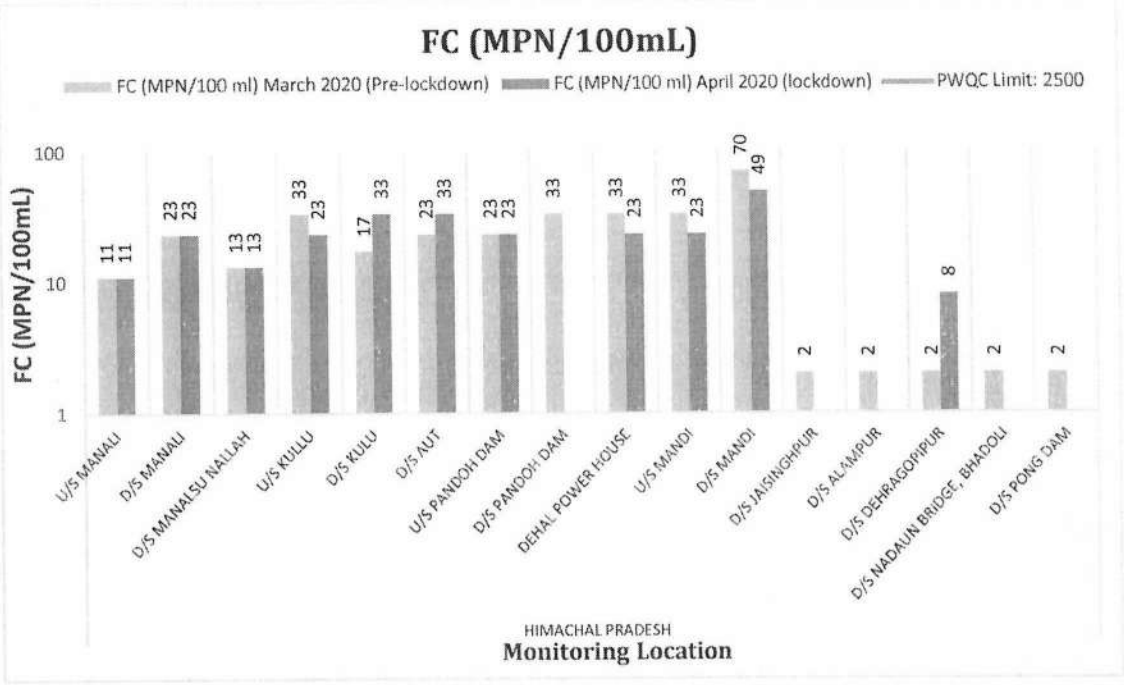

Figure 2.8: Water Quality of river Beas for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) in HP

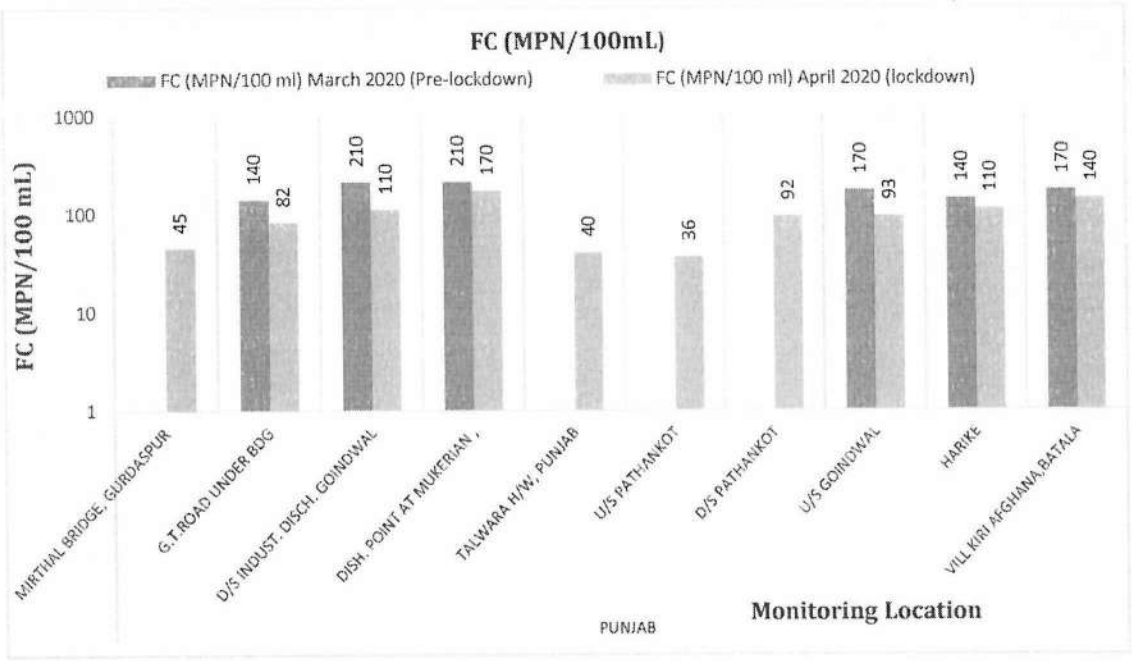

Figure 2.9: Water Quality of river Beas for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) in Punjab.

2.4. Observations

Based on the analytical results of the samples collecte from river Beas, following findings/observations are made:

Himachal Pradesh

During the pre-lock down period (March 2020): -

- The analysis results for four critical parameters were found to be in the range of pH (6.5 – 7.9), DO (8.4 – 9.7 mg/L), BOD (BDL mg/L) and FC (2 – 70 MPN/ 100mL) at all the 16 monitored locations.

- Maximum Dissolved Oxygen (9.7 mg/L) was observed at U/s Mandi and minimum value of DO (i.e. 8.4 mg/L) at D/s Aut.

- BOD was observed as (BDL) at all the 16 monitored locations whereas maximum Faecal Coliform count was observed as 70 MPN/ 100 mL at D/s Mandi and minimum value (2 MPN/ 100 mL) was observed at 5 monitored locations (viz, D/s Alampur, D/s Dehragopipur, D/s Pong Dam, D/s Jaisinghpur and D/s Nadaun Bridge, Vill Bhadoli).

- All 16 monitored locations were observed to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020): -

- The analysis results for four critical parameters were found to be in the order of pH (7.4 – 8.2), DO (8.6 – 10 mg/L), BOD (BDL mg/L) and FC (8-49 MPN/ 100mL) at all the 16 monitored locations.

- Minimum DO (8.6 mg/L) was observed at D/s Dehragopipur and maximum value of DO (10.0 mg/L) was observed at D/s Manali, whereas BOD was observed as 'BDL' at all the 12 monitored locations.

- Minimum Faecal Coliform (FC) count of 8 MPN/ 100 mL was observed at D/s Dehragopipur and maximum value of FC (49 MPN/ 100 mL) was observed at D/s Mandi.

Overall observations (Himachal Pradesh Stretch): -

- The analysis results revealed increasing trend for DO (4.2 -16.67 %) at 6 locations, FC (43.48-300 %) at 3 locations and BOD as 'BDL' at 12 monitored locations.

- The analysis results shown decreasing trend for DO (1.06 -5.15 %) at 6 locations, FC (30 - 30.3 %) at 4 locations and 'no' variation was observed at 4 monitored locations.

- It can be concluded that water quality of river Beas in Himachal Pradesh conforms to the desired bathing water quality criteria during pre-lockdown and lockdown period at all the monitored locations.

Punjab

During the pre-lock down period (March 2020): -

- The analysis results for four critical parameters were found to be in the range of pH (7.6 – 8), DO (7.2 – 8.3 mg/L), BOD (1.2 – 1.6 mg/L) and FC (140 – 210 MPN/ 100mL) at the 6 monitored locations.

- Minimum DO (7.2 mg/L) was observed at 1 km D/s of Effluent Discharge Point at Mukerian and maximum DO (8.3 mg/L) was observed at U/s Goindwal, Punjab whereas minimum BOD (1.2 mg/L) was observed at Harike, Punjab and maximum BOD (1.6 mg/L) was observed at 1 km D/s of Effllluent Discharge Point at Mukerian.

- Minimum Faecal Coliform count (140 MPN/ 100 mL) was observed at G.T.Road Under Bridge, Near Kapurtala and maximum FC (210 MPN/ 100 mL) was observed at two locations viz, 100 m D/S Industrial Discharge, Goindwal and 1km D/s of Effluent Discharge Point at Mukerian.

- All 6 monitored locations were complying to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020): -

- The analysis results for four critical parameters were observed to be in the order of pH (7.5 – 8.1), DO (7.1 – 8 mg/L), BOD (1.1 –1.3 mg/L) and FC (36 - 170 MPN/ 100mL) at the 10 monitored locations.

- Minimum Dissolved Oxygen (7.1 mg/ L) was observed at 1km.D/s of Effluent Discharge Point at Mukerian and Maximum DO (8.0 mg/L) was observed at Harike, Punjab. Minimum BOD (1.1 mg/L) was observed at 7 locations and maximum BOD (1.3 mg/L) was observed at 1km.D/s Effluent Discharge Point at Mukerian and D/s Pathankot.

- Minimum Faecal Coliform (36 MPN/ 100 mL) was observed at U/s Pathankot and maximum FC (170 MPN/ 100 mL) was observed at 1km D/s of Effluent Discharge Point at Mukerian.

- All 10 monitored locations were found to be within the desirable limits for the criterial parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on river Beas (Punjab State): -

- The analysis results revealed increasing trend for the parameter DO (1.4 %) at 1 location. Also, decreasing trend for DO (1.4 – 4.90 %) at 5 locations, BOD (13.3 -21.40 %) at 6 locations and FC (17.6 -47.6 %) at 6 locations.

Overall observations on water quality of river Beas (covering HP & Punjab): -

The analysis results reveal that

- During pre-lockdown (March 2020), analysed critical parameters were noticed in the order of pH (6.5 - 8), DO (7.2 – 9.7mg/L), BOD (BDL to 1.6 mg/L) and FC (2-210 MPN/100 mL) at the 22 monitored locations. Also, all the 22 monitored locations were found to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- During lockdown (April 2020), critical parameters were observed to be in the range of pH (7.4 - 8.2), DO (7.1– 10 mg/L), BOD (BDL - 1.3 mg/L) and FC (8-170 MPN/100 mL) of the monitored locations. Also, 21 monitored and analysed samples were found to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- During lockdown, the analysis resuits of river Beas revealed maximum DO (10 mg/L) was observed at D/s Manali and minimum DO (7.1 mg/L) at Mukerian.

- Maximum BOD was observed at 03 locations near Kapurthala, Mukerian & D/s Pathankot as (1.3 mg/L) and minimum BOD as 'BDL' at 12 locations while maximum FC count was observed at Mukerian (170 MPN/100 mL) and minimum at Dehragopipur (08 MPN/100 mL).

- Overall, decreasing trend was observed for DO (1.06 - 5.15 %) at 11 locations, BOD (13.3 - 21.4 %) at 6 locations and FC (17.6 - 47.6 %) at 10 locations whereas 'consistent BOD' at 12 locations and 'no' variation in FC at 4 locations. Similarly, increasing trend was observed for DO (1.4 - 16.67 %) at 7 locations and FC (43.48 - 300 %) at 3 monitored locations.

2.5 Conclusion

All the 22 monitored locations during Pre-lockdown and 21 out of 22 monitored locations during lockdown on river Beas were observed to be complying with the Primary Water Quality Criteria for Outdoor Bathing. During lockdown, 95.45 % compliance was observed in terms of monitored locations for the paramters prescribed under Primary Water Quality Criteria for Outdoor Bathing.

3.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER SUTLEJ

3.1 Sutlej River

The River Sutlej rises from beyond Indian borders in the Kailash mountain near Mansarover lake from Rakas lake (as Longcchen Khabab river in Tibet). River Sutlej enters India near Mansarover and flows North Westwards. It enters Himachal at Shipkila and flows in the South-Westerly direction and it leaves Himachal Pradesh State to enter the plains of Punjab State at Bhakhra. About 14 km (kilometre) downstream of Bhakra Dam, Nangal, the river takes southern direction. After flowing for another about 50 km, it enters the plains near Ropar in Punjab. The river Sutlej finally reaches Harike where it meets river Beas. During the monsoon period, the river leaves Punjab plains near Ferozepur and finally drains into the river Indus. The tributaries of River Sutlej are river Baspa, Spiti, and Beas. In Himachal Pradesh, river Sutlej passes through Kinnaur, Shimla, Kullu, Solan, Mandi and Bilaspur districts. Its coarse in Himachal Pradesh is 320 km from Rakastal, with the tributaries viz. the river Spiti, Ropa, Taiti, Kashang, Mulgaon, Yula, Wanger, Throng and the Rupi as right bank tributaries, whereas the river Tirung, Gayathing, Baspa, Duling and the Soldang are left bank tributaries. In Punjab, main cities and towns along the river Sutlej are Nangal, Anandpur Sahib, Kiratpur Sahib, Ropar, Kurali, Machhiwara, Ludhiana, Phillaur, Phagwara, Jalandhar, Cantonment Jalandhar, Nawanshahar, Banga and Hoshiarpur. There are two major drains i.e. Buddha Nallah and East Bein, which carry domestic as well as industrial effluents of Ludhiana, Jalandhar, Phagwara, Phillaur, Nawanshahar etc. and merge with river Sutlej at village Wallipur and near village Malsian, respectively. The Buddha Nallah is a non-perennial natural drain of about 51 km length, which traverses about 14 km across Ludhiana city from East to West and finally meets river Sutlej near village Wallipur in district Ludhiana. The total waste water of Ludhiana city discharged into river Sutlej is estimated about 700 MLD which include industrial effluent. East Bein passes through Nawanshahar, Kapurthala and Jalandhar. It is a natural storm water drain which originates near village Bhairon Mazra, District Nawanshahar. After travelling through a length of around 40 km, it passes

through Jalandhar district near village Phadrana. As East Bein traverses through Jalandhar district, number of drains out fall into it. East Bein falls into river Sutlej at Village Mundi Kalan few kilometres upstream of Harike lake.

3.2. Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water Quality of river Sutlej is measured at 42 locations by Central Pollution Control Board (CPCB) in association with H.P. State Pollution Control Board (HPPCB) and Punjab Pollution Control Board (PPCB) under National Water Quality Monitoring Programme (NWMP). State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Sutlej is depicted in **Figure 3.1**.

3.3. Analytical Results

Water quality monitoring of river Sutlej was carried out at 32 locations during pre-lockdown (March 2020) and 23 locations during lockdown period (April 2020) to assess the impact of lock-down on water quality of river Sutlej. Water quality of river Sutlej for Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented in **Table-3.1**.

Based on the monitoring & analysis of collected water samples from river Sutlej, the graphical presentation of water quality of river Sutlej with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are presented in **Figure 3.2 to Figure 3.9**.

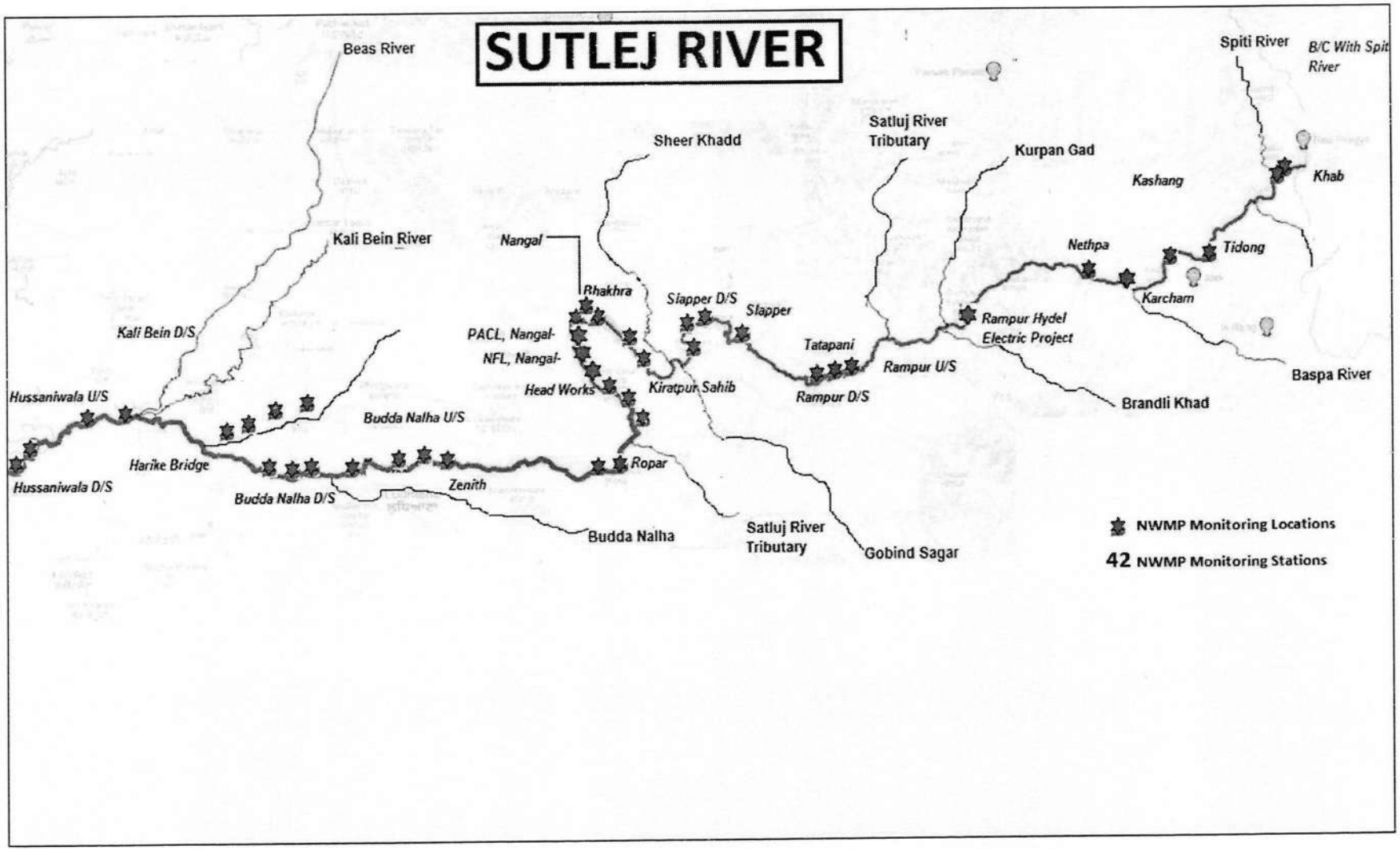

Figure 3.1: State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Sutlej (HP & Punjab)

Table-3.1: Water Quality of River Sutlej during Pre (March 2020) and Lockdown Period (April 2020)

Monitoring Locations on River Sutlej	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
HIMACHAL PRADESH												
U/S Khairian SW Dumping Site Bilaspur	9.1	8.2	-9.90%	8	7.8	BDL	BDL	0.00%	94	110	+17.00%	Complying
D/S Khairian SW Dumping Site Bilaspur	9.7	8.4	-13.40%	8	7.8	BDL	BDL	0.00%	120	140	+16.70%	Complying
At Khab	9.2	-	-	8.4	-	BDL	-	-	210	-	-	Complying
At D/S Bhakhra	7.7	9.5	+23.40%	7.5	8.2	BDL	BDL	0.00%	34	31	-8.80%	Complying
At U/S Slapper	8.9	8.7	-2.20%	7.9	7.8	BDL	BDL	0.00%	94	110	+17.00%	Complying
At D/S Slapper	8.8	8.9	+1.10%	7.8	8	BDL	BDL	0.00%	94	94	0.00%	Complying
At U/S Tatapani	8.0	-	-	7.7	-	BDL	-	-	540	-	-	Complying
At U/S Rampur	8.6	-	-	7.9	-	BDL	-	-	280	-	-	Complying
At D/S Rampur	8.5	-	-	7.1	-	BDL	-	-	540	-	-	Complying
At Neptha Zakhai	8.5	-	-	8.2	-	BDL	-	-	250	-	-	Complying
D/S Rampur Hydel Electric Project	8.7	-	-	7.3	-	BDL	-	-	180	-	-	Complying
Karcham Drain	8.7	-	-	7.8	-	BDL	-	-	350	-	-	Complying
D/S Power House Kashang HEP	9.0	-	-	8.4	-	BDL	-	-	220	-	-	Complying
D/S Tidong HEP	9.4	-	-	7.8	-	BDL	-	-	210	-	-	Complying
No. locations monitored in Himachal Pradesh	14 locations in March 2020 and 5 locations in April 2020											
No. of monitoring locations monitored results available in Himachal Pradesh	14	5	-	14	5	14	5	-	14	5	-	

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Monitoring Locations on River Sutlej	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
No. of locations complying to Criteria	14	5	-	14	5	14	5	-	14	5	-	
Range	7.7-9.7	8.2-9.5	Decrease in percent variation (2.2 to 13.40%) at 3 locations and increase in percent variation (1.10% - 23.40%) at 2 locations	7.1-8.4	7.8-8.2	BDL	BDL	Consistent at all 5 monitored locations ('No' variation at 5 monitore locations)	34-540	31-140	Decrease in percent variation (8.80 %) at 1 location, increase in percent variation (16.7% - 17%) at 3 locations and 'No' variation at 1 location	
PUNJAB												
At U/S Nangal	8.2	9.3	+13.4%	8.3	7.4	BDL	BDL	0.00%	78	45	-42.3%	Complying
At D/s Nangal	7.9	9.1	+15.2%	8.5	8.5	BDL	BDL	0.00%	93	91	-2.2%	Complying
At Ropar Head-Works	7.8	10.2	+30.8%	7.4	7.6	BDL	BDL	0.00%	330	210	-36.4%	Complying
At 100 mts D/s after Budha Nallah confluence, Ludhiana	2.8	3	+7.1%	7.2	7	14	16	+14.3%	230000	70000	-69.6%	Non-complying
At Boat Bridge, Dharamkot Nakodar Road	4.2	4	-4.8%	7.5	7.1	4	4.3	+7.5%	220000	31000	+40.9%	Non-complying
At Harike	6	5.9	-1.7%	8.1	7.8	2.4	2.6	+8.3%	1300	1700	+30.8%	Complying
D/S of Rishab- Paper Mills	-	9.8	-	-	7.6	-	BDL	-	-	310	-	Complying
At D/S NFL	9.2	8.9	-3.3%	8.5	8.4	NA	NA	-	78	68	-12.8%	Complying

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Monitoring Locations on River Sutlej	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
At D/s East Bein	3	2.8	-6.7%	7.4	7.5	5.2	5.8	+11.5%	33000	70000	+112.1%	Non-complying
U/S Buddha Nallah	8.4	6.7	-20.2%	7.6	7.6	2.6	2.2	-15.4%	170	340	+100.0%	Complying
U/S Hussainiwala H/W Ferozepur	7.2	9.2	+27.8%	8	8	1.2	BDL	-16.7%	230	210	-8.7%	Complying
D/S Hussainiwala H/W Ferozepur	7.3	9	+23.3%	7.9	8	1.4	BDL	-28.6%	230	210	-8.7%	Complying
River Sutlej at Kiratpur Sahib	9	10.6	+17.8%	8.1	7.6	BDL	BDL	0.00%	170	92	-45.9%	Complying
At 100m D/s PACL Nangal	9.2	8.8	-4.3%	8.5	8.2	BDL	BDL	0.00%	68	68	0.00%	Complying
At Anandpur Sahib	8.9	9.2	+3.4%	8.4	8.5	BDL	BDL	0.00%	170	100	-41.2%	Complying
At Bunga Sahib	8.9	10.5	+18.0%	7.7	7.6	BDL	BDL	0.00%	210	110	-47.6%	Complying
At Ludhiana U/s	8.4	7.4	-11.9%	7.7	7.8	1.2	BDL	-16.7%	230	260	+13.0%	Complying
At Ludhiana D/s	3	3.9	+30.0%	7.2	6.9	9	6	-33.3%	170000	43000	-74.7%	Non-complying
No. locations monitored in Punjab	17 locations in March 2020 and 18 locations in April 2020											
No. of monitoring locations monitored results available in Punjab	17	18	-	17	18	16	18	-	17	18	-	-
No. of locations complying to Criteria	13/17	14/18	-	17/17	18/18	13 /16	13/18	-	13 /17	14 /18	-	-
Range	2.8-9.2	2.8-10.6	Decrease in percent variation (1.7 - 20.2 %) at 7 locations and	7.2-8.5	6.9-8.5	BDL -14	BDL - 16	Decrease In percent Variation (15.4-33.3%) at 5 locations and Increase in Percent	68 - 230000	45 - 70000	Decrease in Percent variation (2.2. - 74.7%) at 11 locations and	

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Monitoring Locations on River Sutlej	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
			Increase in % variation (3.4 – 30.8%) at 10 locations					Variation (7.5 – 14.3%) at 4 locations and 'consistent at 7 locations			Increase in percent variation (13 – 112.1%) at 5 locations. and 'No' variation at 1 location	
Overall Water Quality Status of River Sutlej (HP and Punjab) during Pre-lockdown (March 2020) and Lockdown (April 2020)												
No. of locations monitored	31 locations during March 2020 and 23 locations during April 2020											
No. of monitoring locations results available	31	23		31	23	30	23		31	23		
Overall Range	2.8-9.7	2.8-10.6	Decrease in percent variation (1.7 - 20.2 %) at 10 locations and increase in percent variation (1.1 - 30.8 %) at 12 locations	7.1-8.5	6.9-8.5	BDL -14	BDL - 16	Decrease in % variation (15.4 - 50 %) at 5 locations and increase in % variation (7.5 - 14.3 %) at 4 locations and 'No' variation at 12 locations	34-230000	31-70000	Decrease in percent variation (2.2 - 74.7 %) at 12 locations and increase in percent variation (13 – 112.1 %) at 8 locations and 'No' variation at 2 locations	

Note:- * Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL), NA- Sample Not Analysed

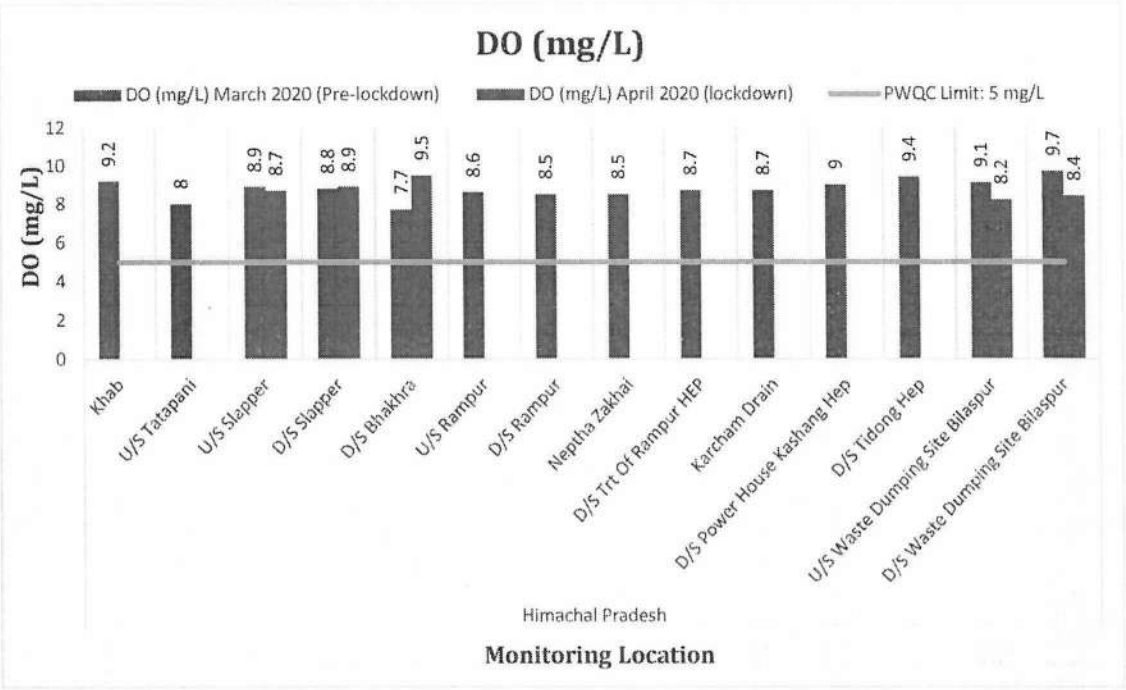

Figure 3.2: Water Quality of river Sutlej for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in H.P. State

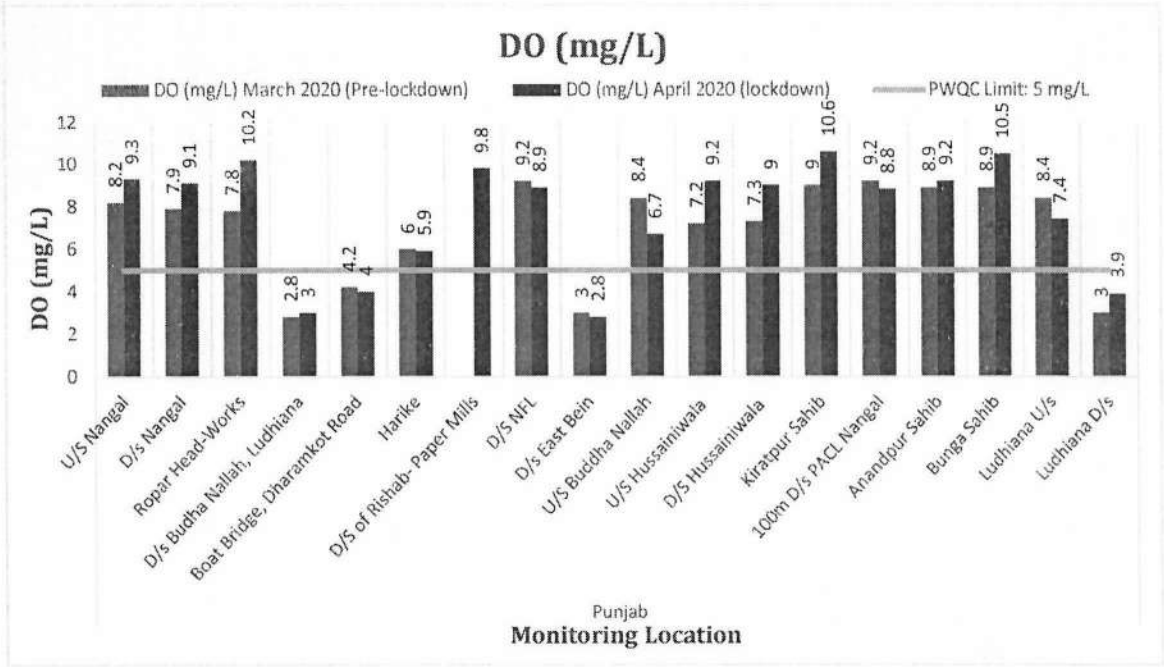

Figure 3.3: Water Quality of river Sutlej for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Punjab

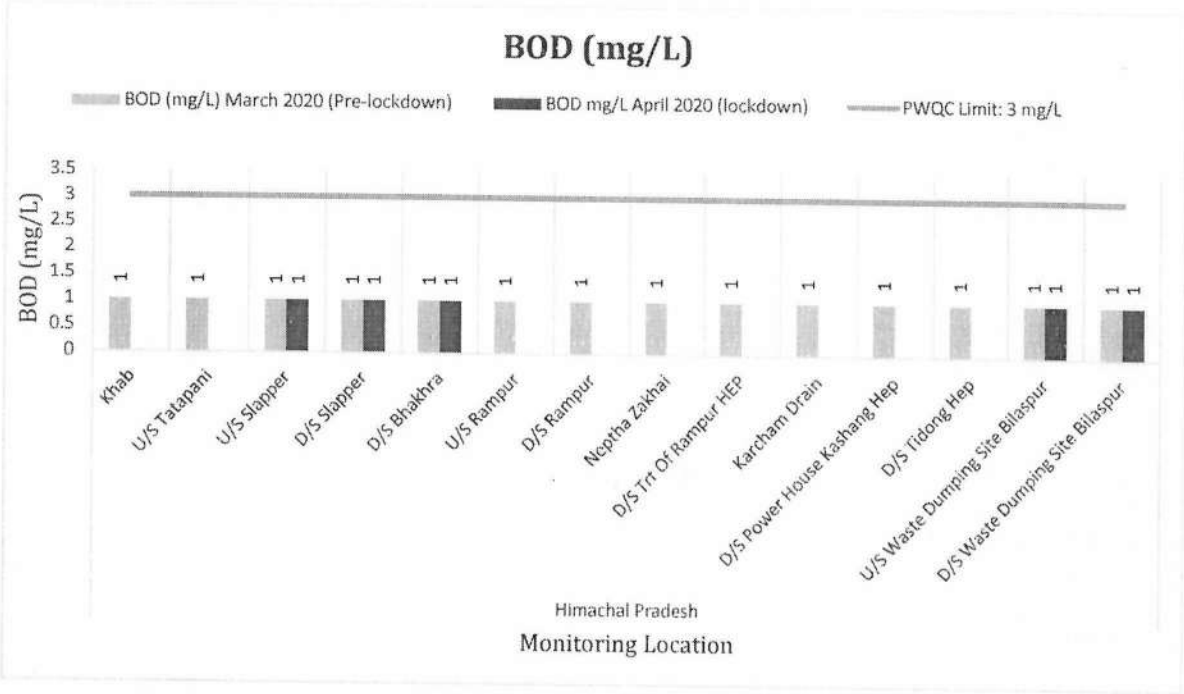

Figure 3.4: Water Quality of river Sutlej for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in H.P. State

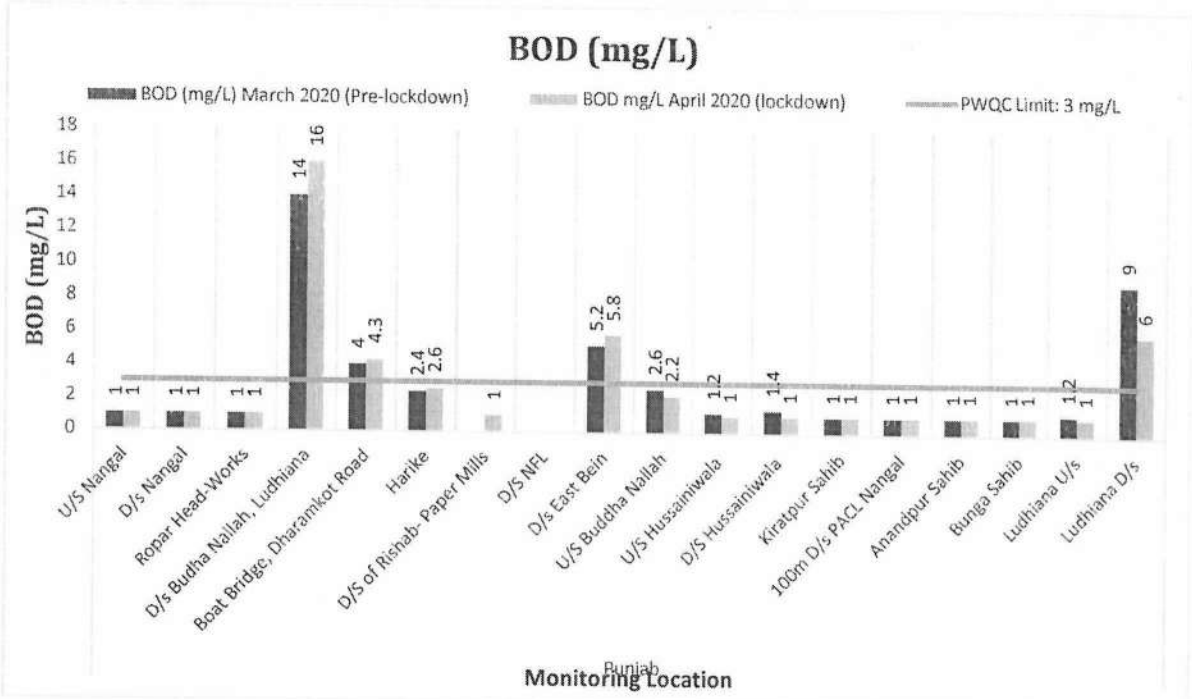

Figure 3.5: Water Quality of river Sutlej for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Punjab

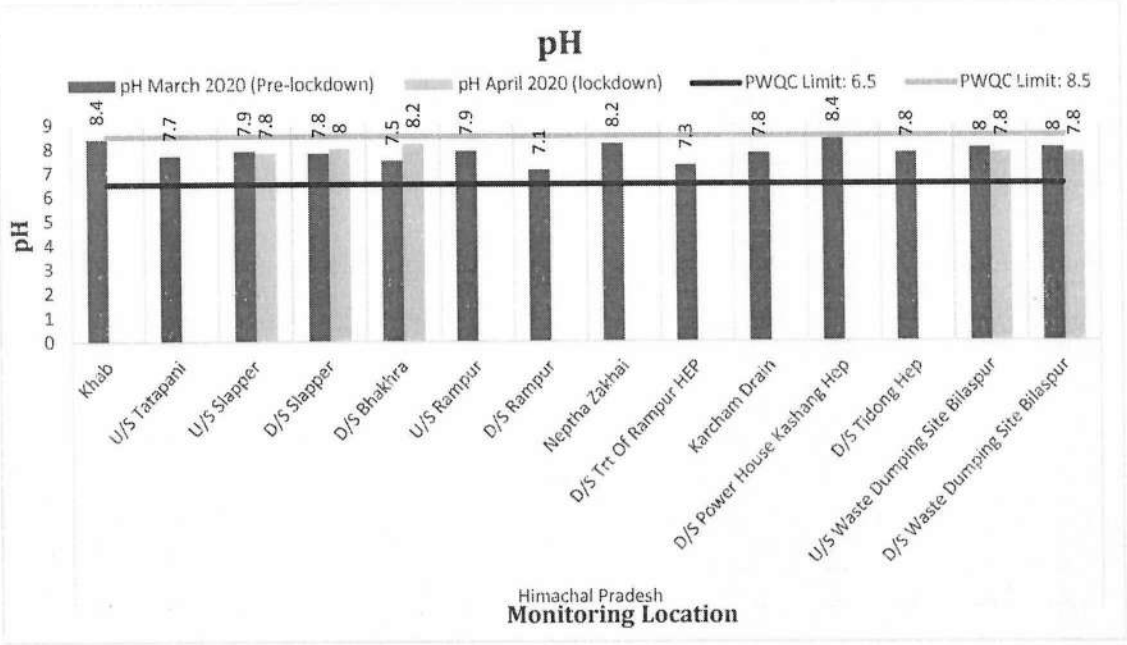

Figure 3.6: Water Quality of river Sutlej for pH during pre-lockdown (March 2020) and lockdown (April 2020) in Himachal Pradesh

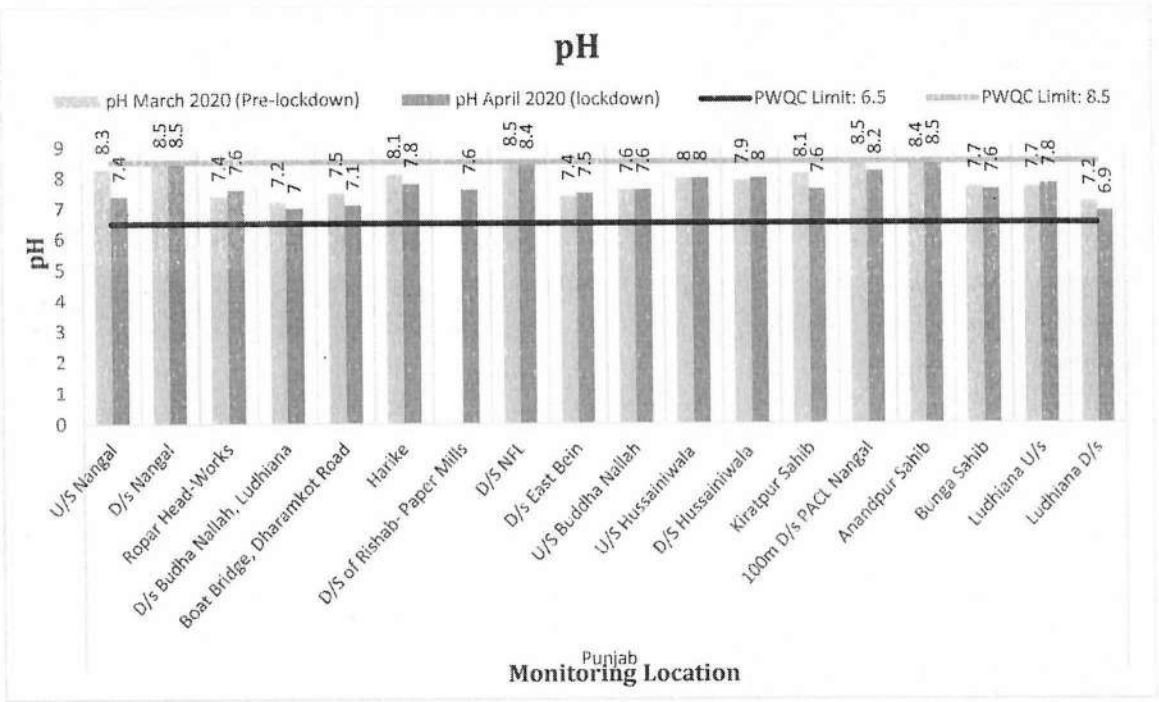

Figure 3.7: Water Quality of river Sutlej for pH during pre-lockdown (March 2020) and lockdown (April 2020) in Punjab

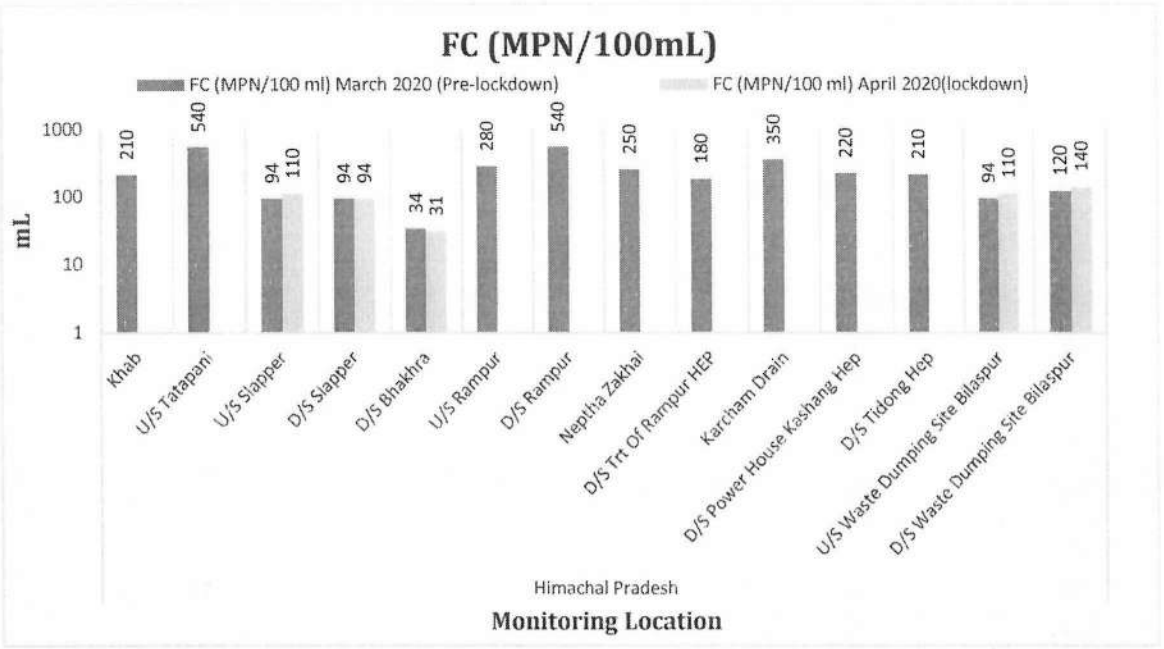

Figure 3.8: Water Quality of river Sutlej for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) in Himachal Pradesh

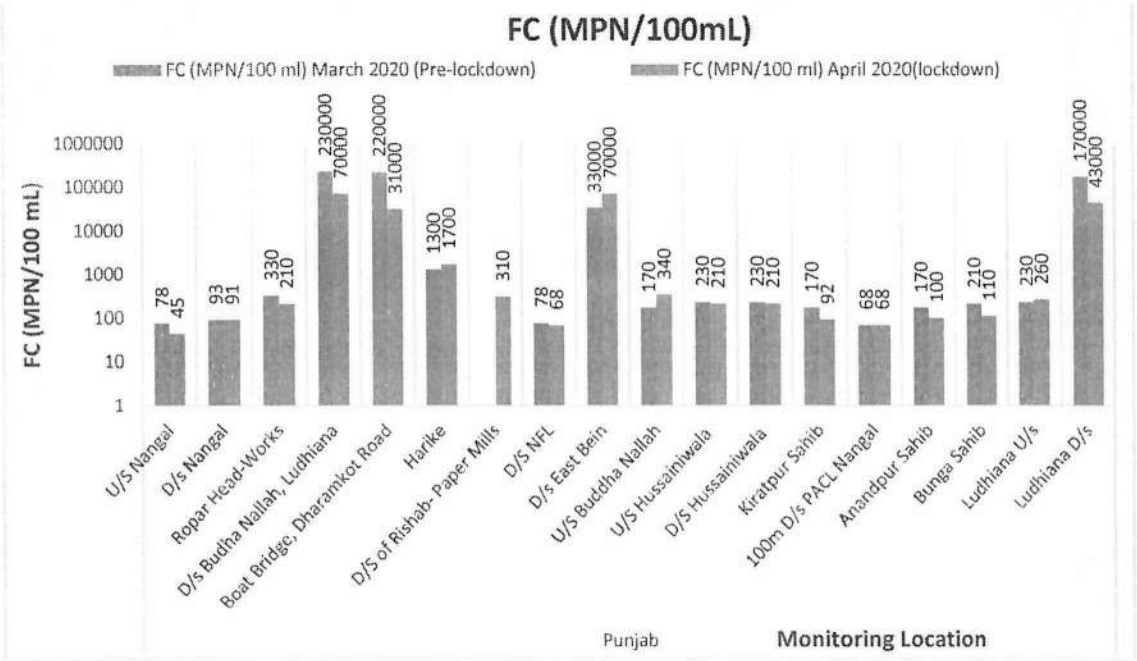

Figure 3.9: Water Quality of river Sutlej for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) in Punjab

3.4. Observations

Based on the analytical results of the samples collected from river Sutlej, following findings/observations are made:

Himachal Pradesh

During the pre-lock down period (March 2020): -

- The analysis results revealed four critical parameters are in the order of pH (7.1 – 8.4), DO (7.7 – 9.7 mg/L), BOD (BDL mg/L) and FC (34 – 540 MPN/ 100mL) at the 14 monitored locations.

- Maximum Dissolved Oxygen (9.7 mg/L) was observed at D/s Khairian Solid Waste Dumping Site Bilaspur and minimum DO (7.7 mg/L) was at D/s Bhakra and BOD (BDL) was consistatnt at all the 14 monitored locations whereas minium Faecal Coliform count was observed (34 MPN/ 100 mL) at D/s Bhakra and maximum FC (540 MPN/100 mL) observed at U/s Tatapani and D/s Rampur.

- All the 14 monitored locations were observed to be within desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):-

- The analysis results of four critical parameters indicates pH (7.8 – 8.2), DO (8.2 – 9.5 mg/L), BOD (BDL mg/L) and FC (31-140 MPN/ 100mL) at the 5 monitored locations.

- Maximum DO (9.5 mg/L) was observed at D/s Bhakra and minimum DO (8.2 mg/L) was observed at U/s Khairian Solid Waste Dumping Site Bilaspur whereas BOD (BDL mg/L) was observed at all the 5 monitored locations.

- Minimum FC (31 MPN/100 mL) was observed at D/s Bhakra and maximum FC (140 MPN/100 mL) was observed at D/s Khairian Solid Waste Dumping Site Bilaspur.

- All the 5 monitored locations were found to be complying to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall Observations (Himachal Pradesh):-

- The analysis results revealed decreasing trend for the parameters i.e., DO (2.2 -13.40 %) at 3 locations, FC (8.8 %) at 1 location while increasing trend were shown for the parameters i.e., DO (1.1-23.40 %) at 2 locations, FC (16.7-17 %) at 3 locations

- 'No' variation in FC at one location and consistent 'BOD' at all the 5 monitored locations were noticed.

Punjab

During the pre-lock down period (March 2020):-

- The analysis results for four critical parameters were found to be in the order of pH (7.2 – 8.5), DO (2.8 – 9.2 mg/L), BOD (BDL – 14 mg/L) and FC (68- 230000 MPN/ 100mL) at the 18 monitored locations.

- Minimum Dissolved Oxygen (2.8 mg/L) was observed at 100 m D/s after Budha Nallah confluence (clearly confirms main source of pollution from Budha Nallah carrying untreated/partially treated wastewater from Ludhiana) and maximum DO (9.2 mg/L) was observed at 100m D/s PACL Nangal which indicates no discharge from the industry).

- Minimum BOD (BDL mg/L) was observed at 7 monitored locations (viz, U/s Nangal, D/s Nangal, Ropar Head-Works, D/s NFL, Kiratpur Sahib, 100m D/s PACL Nangal & Anandpur Sahib) and maximum BOD (14.0 mg/L) was observed at 100 m D/s after Budha Nallah confluence, Ludhiana, which is the main source of pollution in river Sutlej.

- Minimum Faecal Coliform count (68 MPN/ 100 mL), was observed at 100 m D/s PACL Nangal and maximum FC (230000 MPN/100 mL) was observed at 100 m D/s after Budha Nallah confluence, Ludhiana, which indicates untreated sewage discharge through Budha Nallah generated from Ludhiana.

- 13 monitored locations were found to be within the desirable limits for the parameters prescribed under Primary Water Quality Criteria for Outdoor Bathing whereas pH was complying at all the 17 monitored locations.

During the lock down period (April 2020):-

- The analysis results for four critical parameters found to be in the order of pH (6.9 – 8.5), DO (2.8 – 10.6 mg/L), BOD (BDL – 16 mg/L) and FC (45 - 70000 MPN/ 100mL) at the 18 monitored locations. 13 out of 18 monitored locations were complying to the parameters (i.e. DO, BOD and FC).

- Minimum DO (2.8 mg/L) was observed at 100 m D/s after E.Bein and maximum DO (10.6 mg/L) was observed at Kiratpur Sahib whereas BOD (BDL mg/L) was observed at 11 locations (viz, U/s Nangal, D/s Nangal, Ropar Head-Works, D/s of Rishab- Paper Mills, U/s and U/s Hussainiwala Head Works, Ferozepur, Kiratpur Sahib, 100m D/s PACL Nangal, Anandpur Sahib, Bunga Sahib & at Ludhiana U/s) and maximum BOD (16.0 mg/L) was observed at 100 mts D/s after Budha Nallah confluence, Ludhiana, which is the main source of pollution.

- Minimum FC (45 MPN/100 mL) was observed at U/s Nangal and maximum FC (70000 MPN/100 mL) was observed at 100 m D/s after Budha Nallah confluence, Ludhiana, which indicates contamination due to municipal sewage from Ludhiana through Budha Nallah.

Overall Observations (Punjab): -

- The analysis results of the monitored locations shown decreasing trend for the parameters i.e., DO (1.7 -20.2 %) at 7 locations, BOD (15.4 - 33.33 %) at 7 locations and FC (2.2 -74.7 %) at 11 locations whereas increasing trend were shown for the parameters i.e., DO (3.4-30.78 %) at 10 locations, BOD (7.5 -14.3 %) at 4 locations, FC (13-112.1 %) at 5 locations.

- 'No' variation was observed in FC at one location and consistent 'BOD was observed at 7 locations.

Overall Observations on River Sutlej (covering Himachal Pradesh and Punjab):-

➢ During Pre-lockdown period (March 2020), the analysis results of four critical parameters were observed to be in the order of pH (7.1 - 8.5), DO (2.8 – 9.7 mg/L), BOD (BDL – 14 mg/L) and FC (34 - 230000 MPN/ 100mL) at the 31 monitored locations. 27 monitored locations were found to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- During lockdown period (April 2020), the analysis results of four critical parameters were observed to be in the order of pH (6.9 - 8.5), DO (2.8 – 10.6mg/L), BOD (BDL – 16 mg/L) and FC (31-70000 MPN/ 100mL) at 23 monitored locations. 18 monitored locations were observed to be complying with the Outdoor Bathing Primary Water Quality Criteria.

- During lockdown, on rver Sutlej, maximum DO was observed at Kiratpur Sahib (10.6 mg/L)) and minimum at D/s East Bein (2.8 mg/L). Maximum BOD was observed at D/s Budha Nallah (16.0 mg/L) and minimum as 'BDL' at 16 locations while maximum FC count was observed at two (02) locations i.e., D/s Budha Nallah and D/s East Bein (70000 MPN/100 mL) and minimum FC (31 MPN/100 mL) at D/s Bhakra.

- Decreasing trend were shown for DO (1.7 - 20.2 %) at 10 monitored locations, BOD (15.4 - 50 %) at 7 locations and FC (2.2 - 74.7 %) at 12 monitored locations.

- Increasing trend was observed for DO (1.1 - 30.8 %) at 12 locations, BOD (7.5 - 14.3 %) at 4 locations and FC (13 – 112.1 %) at 8 locations.

- 'No' variation in FC at 2 locations and consistent 'BOD' at 12 monitored locations were observed.

3.5 Conclusion

27 out of 31 monitored locations during pre-lockdown (March 2020) and 18 out of 23 monitored locations during lockdown (April 2020) were found to be within desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Water Quality of river Sutlej marginally deteriorated during the lockdown period which may be due to inadequate infrastructure for treatment of generated municipal sewage in the catchment of river Sutlej.

Also, 78.3 % of compliance in terms of monitored locations for the paramters prescribed under Primary Water Quality Criteria for Outdoor Bathing was observed during lockdown.

4.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER GANGA

4.1 About Ganga River

The Ganga river rises in the northern most part of Uttarakhand, flows through Uttar Pradesh, Bihar, Jharkhand and West Bengal and finally falls into the Bay of Bengal. Total length of River Ganga (within India) is 2,525 km before it discharges into the Bay of Bengal. Major tributaries of River Ganga are river Yamuna, Gandak, Ghaghra, Gomati, Ramganga, Kosi and Sone etc.. Large clusters of industrial cities established on its banks like Haridwar in Uttarakhand; Kannauj, Farukhabad, Kanpur, Allahabad and Varanasi in UP; Patna, Bhagalpur and Munger in Bihar; Beharampur and Kolkata in WB State. Various categories of industries discharging wastewater into Ganga river includes Sugar, Distilleries, Pulp & Paper, Textiles, Tanneries, Chemicals, Pharmaceuticals, Thermal Power Plants and Food & Dairy Industries (1072 Grossly Polluting Industries (GPIs) in 5 main Ganga States. Major hotspots responsible for pollution in River Ganga, are in the State of UP and WB. In UP stretch, 16 out of 56 major drain out fall (from Kanpur) discharging 2213 MLD of sewage (BOD load of 107 TPD). Similarly, there are 58 major drains in WB stretch from which 7375 MLD of sewage (BOD load of 241 TPD) is discharged into River Ganga, and this is the root cause for high BOD in entire WB stretch.

4.2 Water Quality Monitoring Locations on river Ganga under National Water Quality Monitoring Programme (NWMP)

Water Quality of River Ganga is monitored at 97 locations by Central Pollution Control Board in association with the State Pollution Control Boards of Uttarakhand (16), UP (30), Bihar (33), Jharkhand (04) and WB (14) under National Water Monitoring Programme (NWMP) apart from 36 Real Time Water Quality Monitoring Stations (RTWQMS). State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Ganga is depicted in **Figure 4.1**.

4.3 Analytical Results

Water quality of river Ganga was examined at 65 locations [UK (6), UP (27), Bihar (17), Jharkhand (04), WB (11)] during Pre-lockdown (March 2020) and 54 locations [UK (5), UP (14), Bihar (17), Jharkhand (04), WB (14)] during lockdown (April 2020) to assess impact of lock-down. Water quality of river Ganga analysed for the Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. DO, pH, BOD and Fecal Coliform (FC) are tabulated and presented in **Table-4.1.** Based on water quality analysis done by the 5 SPCBs, water quality trend of river Ganga w.r.t to outdoor bathing crieteria parameters as observed are depicted in **Figure 4.2 to Figure 4.20**.

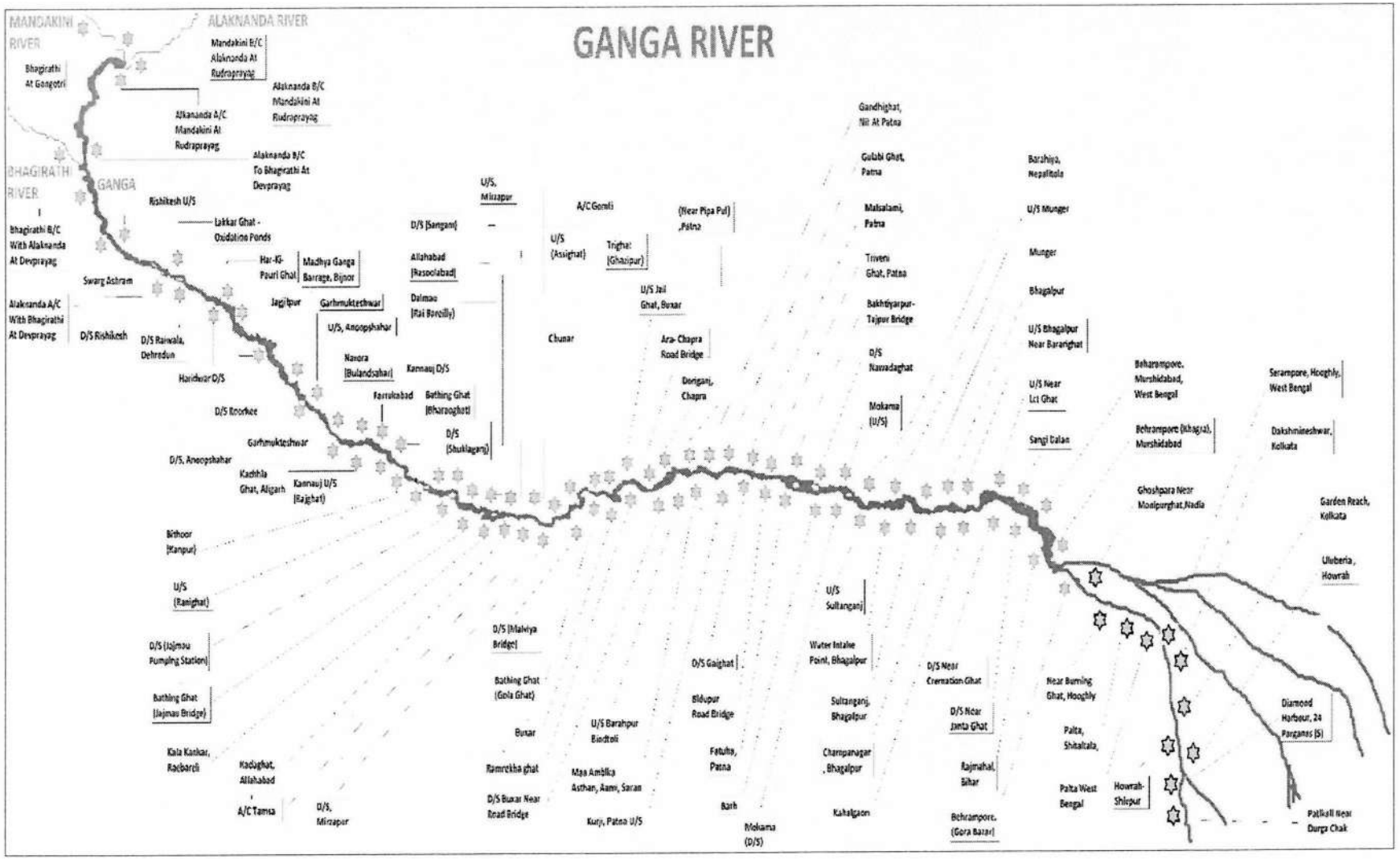

Figure 4.1: State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Ganga

Table-4.1: Water Quality of River Ganga during Pre (March, 2020) and lockdown period (April, 2020) (5 States- Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal)

Monitoring locations on River Ganga	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
UTTARAKHAND												
U/s Rishikesh	11.6	10.6	-9%	7.7	7.8	1	0.6	-40%	17	12	-29%	Complying
D/s Rishikesh	10.4	9.8	-6%	7.5	7.5	1	0.8	-20%	26	17	-35%	Complying
AC of river Song	10.8	10.6	-2%	7.9	8.2	1.2	1.2	0%	30	40	33%	Complying
Har-ki-Pauri Ghat	9.8	10.2	4%	7.5	7.6	1	0.6	-40%	26	26	0%	Complying
Haridwar D/s, Upper Ganga Canal D/s Balku	9.6	10	4%	7.6	7.7	1.2	1	-17%	60	60	0%	Complying
D/s Roorkee, Haridwar	10	-	-	6.6	-	1	-	-	40	-	-	Complying
No. of locations monitored	06 locations in March 2020 and 05 locations monitored in April 2020											
No. of monitoring locations results available	6	5	-	6	5	6	5	-	6	5	-	- -
No. of locations complying to Criteria	6	5	-	6	5	6	5	-	6	5	-	-
Range	9.6-11.6	9.8-10.6	Increase in % variation (4 %) at 2 locations and Decrease in % variation (2 - 9%) at 3 locations	6.6-7.9	7.5-8.2	1.0-1.2	BDL (0.6)-1.2	Decrease in % variation (17 - 40 %) at 4 locations and 'No' variation at 1 location	17-60	12-60	Increase in % variation (33 %) at 1 location. Decrease in % variation (29 - 35 %) at 2 locations and 'No' variation at 2 locations	

Monitoring locations on River Ganga	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
UTTAR PRADESH												
Madhya Ganga Barrage-Bijnor	9.9	9	-9%	7.8	7.7	1	1.1	10%	-	-	-	Complying
Garhmukteshwar, U.P	9.2	8.9	-3%	7.5	8	2.6	2.2	-15%	170	-	-	Complying
At Gharmukteshwar	9.3	9.6	3%	7.4	8.1	2	1.6	-20%	-	130	-	Complying
Kachhla Ghat, Aligarh	10.6	10.7	1%	7.5	7.4	1	0.9	-10%	170	140	-	Complying
Farrukabaad	9.9	-	-	8.1	-	1.6	-	-	1500	-	-	Complying
Kannauj U/s (Rajghat)	9.6	-	-	8.4	-	2.6	-	-	1700	-	-	Complying
Kannauj D/s	9.2	-	-	8.4	-	2.9	-	-	2400	-	-	Complying
Bithoor (Kanpur)	8.7	-	-	8.4	-	3.2	-	-	1800	-	-	Non-complying
Kanpur U/s (Ranighat)	9	-	-	8.4	-	3.1	-	-	2200	-	-	Non-complying
At Bathing Ghat (Bharaoghat)	8.8	-	-	8.5	-	3.4	-	-	2100	-	-	Non-complying
D/s (Shuklaganj)	8.7	-	-	8.3	-	3.3	-	-	2500	-	-	Non-complying
At Kanpur D/s Jajmau pumping station	8	-	-	8.6	-	4.6	-	-	31000	-	-	Non-complying
At Bathing Ghat (Rajmau Bridge)	8.2	-	-	8.2	-	4.4	-	-	26000	-	-	Non-complying
At Dalmau (Rai Bareilly)	10.3	-	-	8	-	4	-	-	3100	-	-	Non-complying
At Kala Kankar, Raibereli]	10.4	-	-	7.9	-	3.9	-	-	3000	-	-	Non-complying
At Allahabad (U.P)	9.4	8.6	-9%	8.1	8	2.7	2.5	-7%	1700	830	-51%	Complying
At Kadaghat, Allahabad	8.8	-	-	8.1	-	2.6	-	-	2100	-	-	Complying
At Allahabad D/s (U.P.	8.6	8.7	1%	8.2	8.2	2.7	2.4	-11%	1700	820	-52%	Complying

Monitoring locations on River Ganga	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
River Ganga A/c Tamsa River, Sirsa	8.9	9.1	2%	8	8.2	2.4	2.2	-8%	1700	790	-54%	Complying
U/s, Vindhyachal, Mirzapur	9.4	8.8	-6%	8.1	8.3	2.1	2.8	33%	1300	600	-54%	Complying
D/s, Mirzapur	8.5	8.1	-5%	8.4	8.5	3.6	3.1	-14%	8000	5400	-33%	Non-complying
At Chunar	8.8	8.6	-2%	3.3	8.4	3.2	3.1	-3%	5000	3300	-34%	Non-complying
At Varanasi U/s (Assighat), U.P	9.3	10.4	12%	8.1	8.5	2.6	2.6	0%	1100	700	-36%	Complying
At Varanasi D/s (Malviya Bridge), U.P.	8.4	9.5	13%	8.3	8.7	3.7	4	8%	14000	9400	-33%	Non-complying
A/c Gomti River, Bhusaula	9	9.9	10%	8.4	8.6	3	3.2	7%	4000	2100	-48%	Non-complying
At Bathing Ghat (Gola Ghat)	8.3	-	-	8.5	-	4.2	-	-	5400	-	-	Non-complying
At Trighat (Gghazipur)	8.9	9	1%	8.5	8.6	3.5	3.4	-3%	13000	4300	-67%	Non-complying
No. Locations monitored in UP	27 locations in March 2020 and 14 locations in April 2020											
No. of monitoring locations results available in UP	27	14	-	27	14	27	14	-	25	12	-	-
No. of locations complying to Criteria	27	14	-	25/27	11/14	14/27	9/14	-	15/25	8/12	-	-
Range	8-10.6	8.1-10.7	Increase in % variation (1 - 13 %) at 8 locations and Decrease in % variation (2 - 9 %) at 6 locations	3.3-8.6	7.4-8.7	1.0-4.6	0.9-4.0	Increase in % variation (7 - 33 %) at 4 locations, Decrease in % variation (3 - 20 %) at 9 locations and 'No' variation at 1 location	170-31000	130-9400	Decrease in % variation (33 - 67 %) at 10 locations	

Monitoring locations on River Ganga	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
BIHAR												
Ganga at Buxar	9.8	9.7	-1%	8.3	8.1	1.4	1.4	0%	11000	2200	-80%	Non-complying
U/s Jail Ghat, Buxar	9.5	9.4	-1%	8.4	8.1	1.4	1.6	14%	4000	3300	-18%	Non-complying
At Buxar, Ramrekhaghat	9.3	9.5	2%	7.8	8.3	1.4	1.9	36%	35000	2600	-93%	Non-complying
At D/s Buxar Near Road Bridge	9.2	8.9	-3%	8.2	8.4	1.7	2	18%	11000	14000	27%	Non-complying
At Ara-chapra Road Bridge (Koilwer Banura-c	8.6	-	-	8.9	-	1.6	-	-	2700	-	-	Non-complying
At the confluence of Sone river Doriganj,	7.4	8.6	16%	8.5	8.4	1.7	1.6	-6%	14000	2700	-81%	Non-complying
At Maa Ambika Asthan, Aami, Saran	8	8.6	8%	8.4	8.4	1.4	1.6	14%	11000	2700	-75%	Non-complying
Near Danapur (near Pipa Patna	8.3	8.6	4%	8.3	8	1.6	1.4	-13%	2600	680	-74%	Non-complying
AT Kurji, Patna	10	8.5	-15%	8.4	8	1.4	1.6	14%	11000	2200	-80%	Non-complying
At Gandhighat, at Patna	8.2	8.6	5%	8.1	8.2	1.9	1.9	0%	17000	9400	-45%	Non-complying
At Gulabi Ghat, Patna	7.5	7.6	1%	8.3	8.3	2	2.1	5%	160000	14000	-91%	Non-complying
AT Patna, D/s (Ganga Bridge), Gaighat	9	8.4	-7%	7.9	8	1.6	1.8	13%	28000	11000	-61%	Non-complying
At Malsalami, Patna	9	8.5	-6%	8.2	8	1.6	1.7	6%	11000	2700	-75%	Non-complying
Kachchi-Dargah-Bidupur Ppatna	9.5	8.6	-9%	8.3	8.3	1.5	1.6	7%	17000	1100	-94%	Non-complying
River Ganga at Triveni Ghat, Patna	7.4	8.5	15%	8.2	8.4	2.4	2	-17%	4000	2600	-35%	Non-complying
At Kewala Ghat,Fatuha	6.3	8.7	38%	8	8.3	2.6	1.9	-27%	35000	3300	-91%	Non-complying
Bakhtiyarpur-Tajpur Bridge Athmalgola	-	8.7	-	-	8.3	-	1.5	-	-	1400	-	Complying
AT Mokama (U/s), Mahadeo Asthan, Patna	-	8.8	-	-	8.4	-	1.5	-	-	1100	-	Complying

Monitoring locations on River Ganga	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
AT Mokama (D/s)	7.2	-	-	8.5	-	1.7	-	-	7900	-	-	Non-complying
No. of locations monitored in Bihar	17 locations in March 2020 and 17 locations in April 2020											
No. of monitoring locations results available in Bihar	17	17		17	17	17	17		17	17		
No. of locations complying to Criteria	17	17		17	17	17	17		17	6/17		
Range	6.3-10.0	7.6-9.7	Increase in Variation (1 - 38 %) at 8 locations and Decrease in variation (1 -15 %) at 7 locations	7.8-8.9	8.0-8.4	1.4-2.6	1.4-2.1	Increase in % Variation (5 - 36 %) at 9 locations, Decrease in % variation (6 - 27 %) at 4 locations and No variation at 2 locations	2600-160000	680-14000	Increase in % variation 27 % at 1 locations and decrease in % variation (18 - 94 %) at 14 locations	
JHARKHAND												
River Ganga U/s near LCT Ghat	8.6	9.5	10%	8.2	7.2	2.6	1.8	-31%	-	--		Complying
D/s near Janta Ghat	8.6	9.2	7%	8.2	7.2	2.6	1.8	-31%	-	-		Complying
River Ganga at Sangi Dalan	8.6	9.6	12%	8.4	7.1	2.6	1.6	-38%	-	-		Complying
At Rajmahal	8.6	9.5	10%	8.2	7.1	2.6	1.5	-42%	-	-		Complying
No. of Locations monitored in Jharkhand	04 Locations monitored in March 2020 and April 2020 (FC not monitored)											

Monitoring locations on River Ganga	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
No. of monitoring locations results available	4	4	-	4	4	4	4	-	-	-	FC not monitored)	-
No. of locations complying to Criteria	4	4	-	4	4	4	4	-	-	-	FC not monitored	-
Range	8.6	9.2-9.6	Increase in % variation (7 - 12%) at 4 locations	8.2-8.4	7.1-7.2	2.6	1.5-1.8	Decrease in % variation (31 - 42 %) at 4 locations	-	-	-	-
WEST BENGAL												
At Baharampore, WB	9.1	6.8	-25%	8.6	8.5	4.1	3.7	-10%	11000	2400	-78%	Non-complying
At khagra	9	9.6	7%	8.5	8.5	3.3	5.5	67%	140000	7000	-95%	Non-complying
At Gorabazar	8.2	7.6	-7%	8.5	8.5	2.9	4	38%	30000	6000	-80%	Non-complying
At Nabadip Ghoshpara near Monipurghat	7.2	7.7	7%	8.5	8.5	3	2.8	-7%	4000	17000	325%	Non-complying
At Tribeni near Burning Ghat	-	7.9	-	-	8.2	-	3	-	-	92000	-	Non-complying
At Palta Shitalatala	-	8.5	-	-	8.5	-	3.9	-	-	140000	-	Non-complying
At Palta, WB	7.4	7.9	7%	8.4	8.4	3.5	3.6	4%	110000	26000	-76%	Non-complying
At Durgachak near Pathikhali, W.B.	6.8	4.6	-32%	7.8	6.8	2.5	3.33	33%	900	ND	-	Complying
At Serampore, WB	-	6.4	-	-	7.9	-	2.8	-	-	33000	-	Non-complying
At Dakshmineswar,WB	6.9	5.8	-16%	6.9	7.8	4.5	4	-11%	130000	110000	-15%	Non-complying
At Howrah-Shivpur	6.5	3.9	-40%	6.8	7.1	4.3	1.25	-71%	80000	33000	-59%	Non-complying
At Garden WB	6.5	5	-23%	8.0	7.7	2.9	4	38%	80000	140000	75%	Non-complying
At Uluberia, WB	5.7	4	-30%	8.0	7.0	3.2	1.05	-67%	50000	17000	-66%	Non-complying
At Diamond Harbour,	5	6.1	22%	7.7	7.8	1.75	2.7	54%	11000	790	-93%	Complying
No. of locations monitored in W.B	11 locations in March 2020 and 14 locations in April 2020											
No. of monitoring locations results available in WB	11	14	-	11	14	11	14	-	11	14	-	

Monitoring locations on River Ganga	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
No. of locations complying to Criteria	11	11	-	10	14	5	6	-	1	2	-	
Range	5-9.1	3.9-9.6	Increase in % variation (7 to 22 %) at 4 locations and decrease in % variation (7 - 40 %) at 7 locations	6.8-8.6	6.8-8.5	1.75-4.5	1.05-5.5	Increase in % variation (4 - 67 %) at 6 locations and decrease in % variation (7 - 71 % 5 locations	900-140000	790-140000	Increase in % variation (75 - 325 %) at 2 locations and decrease in % variation (15 - 95%) at 8 locations	
Overall River Observations on River Ganga (Uttarakhand, UP, Bihar, Jharkhand and WB) during Pre (March 2020) and Lockdown Period (April 2020)												
No. of locations monitored	65 locations during Pre-lockdown and 54 locations during lockdown											
No. of monitoring locations results available	65	54	-	65	54	65	54	-	65	52	-	
Overall Range	5.0-11.6	3.9-10.7	Increase in % variation 1% - 38% at 26 locations and decrease in % variation 1% - 40% at 23 locations	3.3-8.9	6.8-8.7	1.0-4.6	BDL (0.6)-5.5	Increase in % variation 4% - 67% at 19 locations, Decrease in % variation 3% - 71 % at 26 locations and 'No' variation at 4 locations	17-160000	12-140000	Increase in % variation 27% - 325 % at 4 locations. Decrease in % variation 15% -95 % at 34 locations and 'No' variation at 2 locations	

Note:- * Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL), ND-Not Done

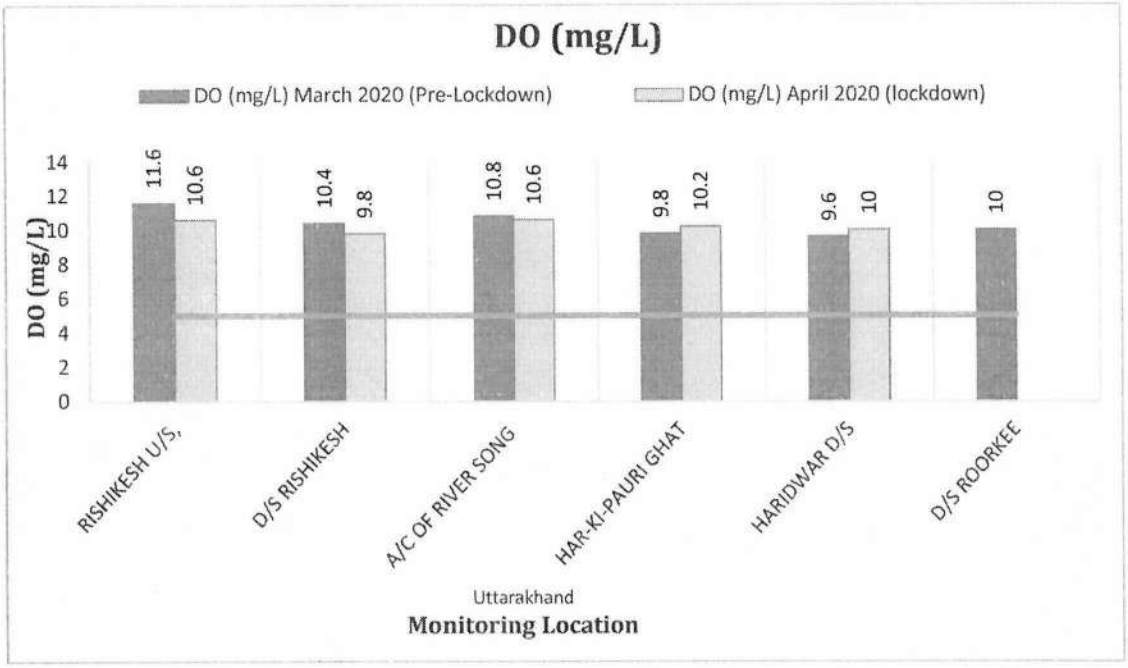

Figure 4.2: Water Quality of river Ganga for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Uttarakhand

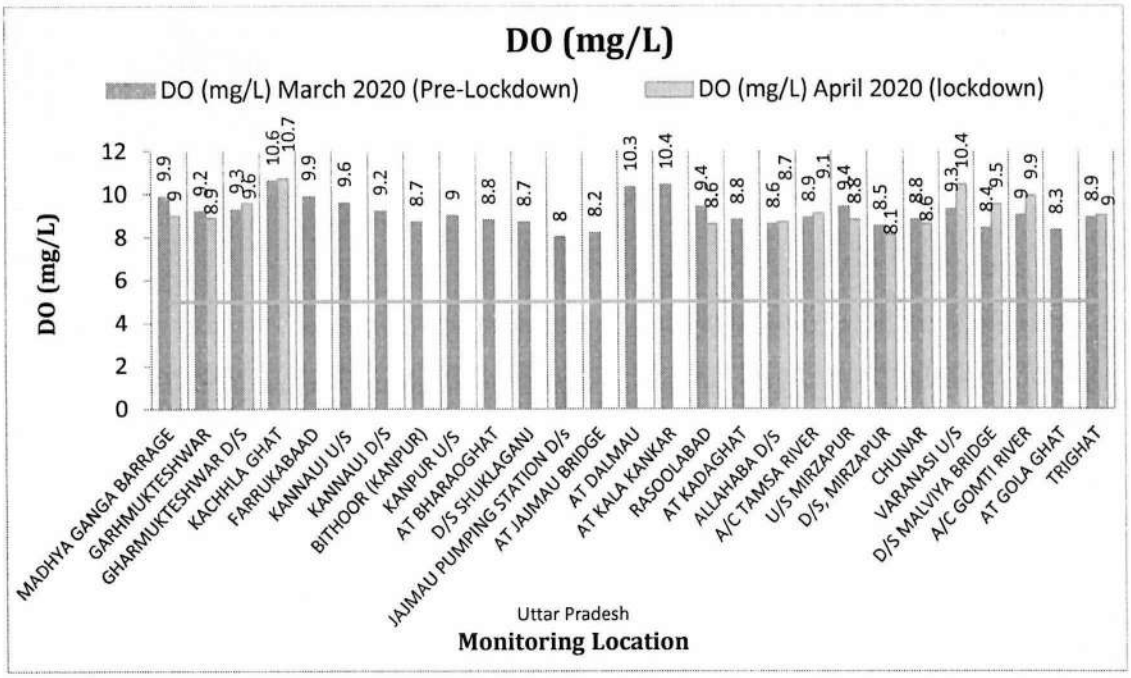

Figure 4.3: Water Quality of river Ganga for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Uttar Pradesh

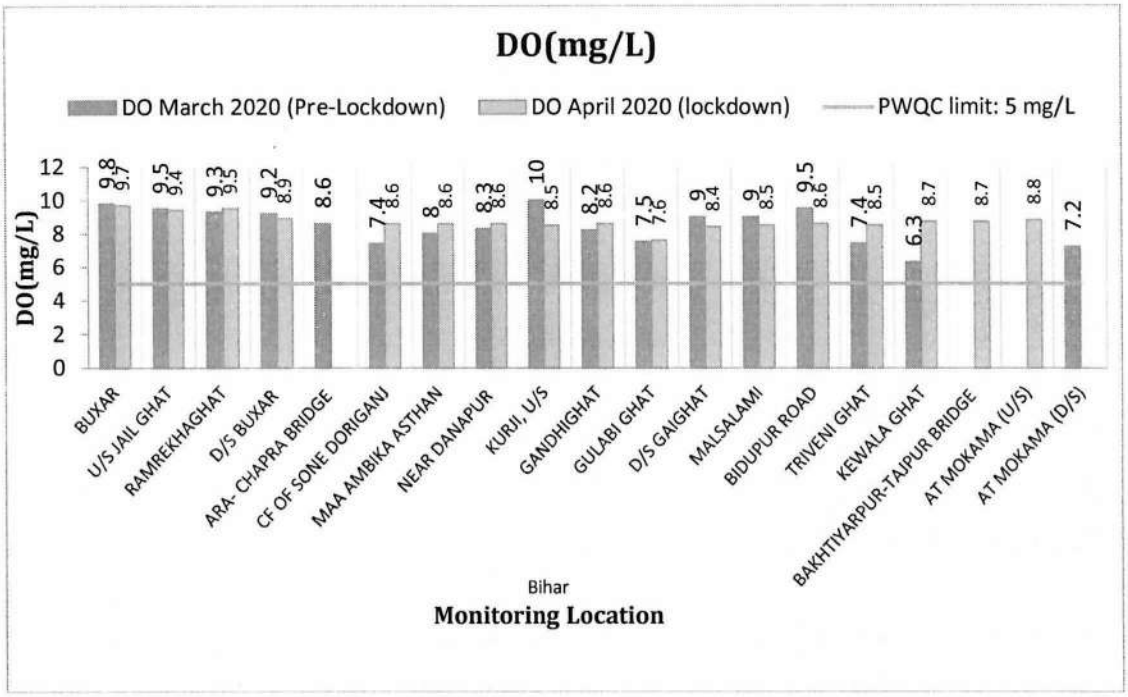

Figure 4.4: Water Quality of river Ganga for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Bihar

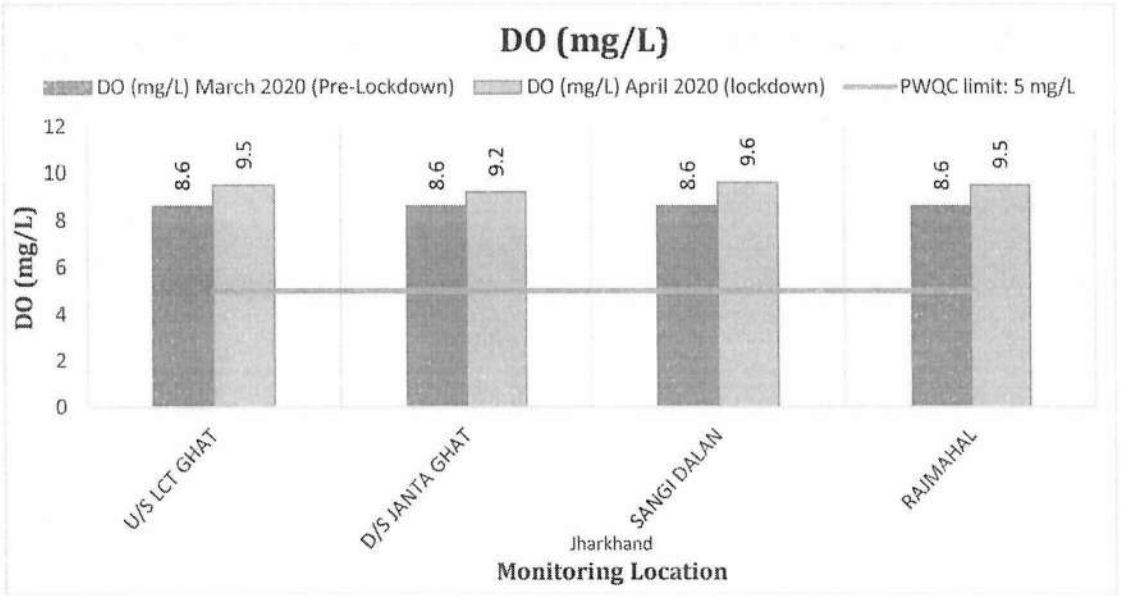

Figure 4.5: Water Quality of river Ganga for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Jharkhand

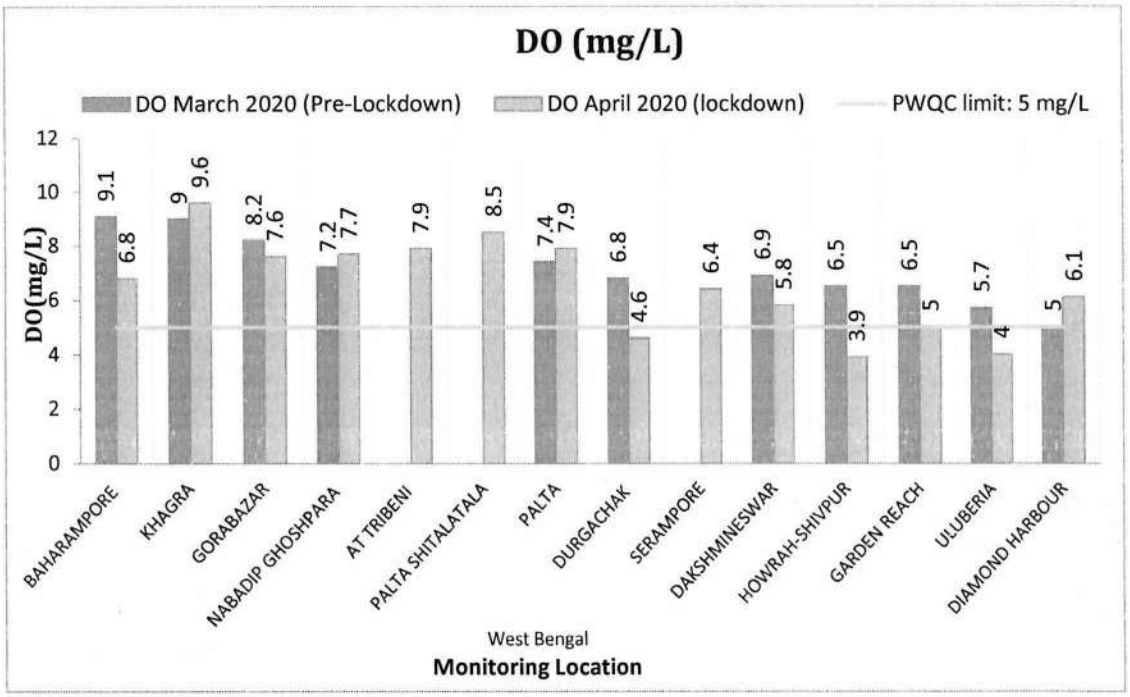

Figure 4.6: Water Quality of river Ganga for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in West Bengal

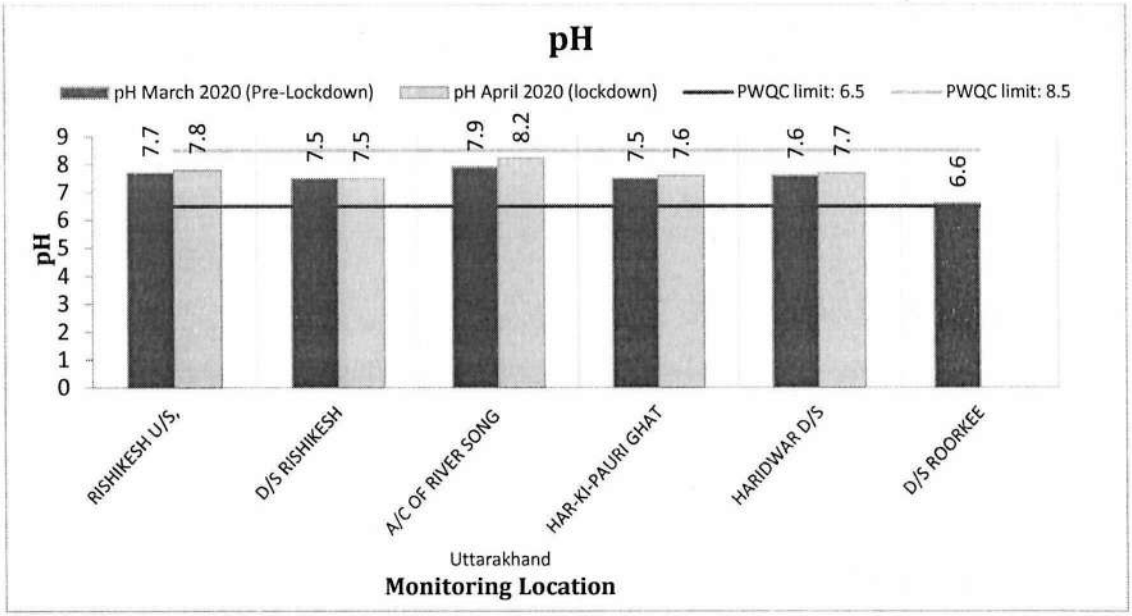

Figure 4.7: Water Quality of river Ganga for pH during pre-lockdown (March 2020) and lockdown (April 2020) in Uttarakhand

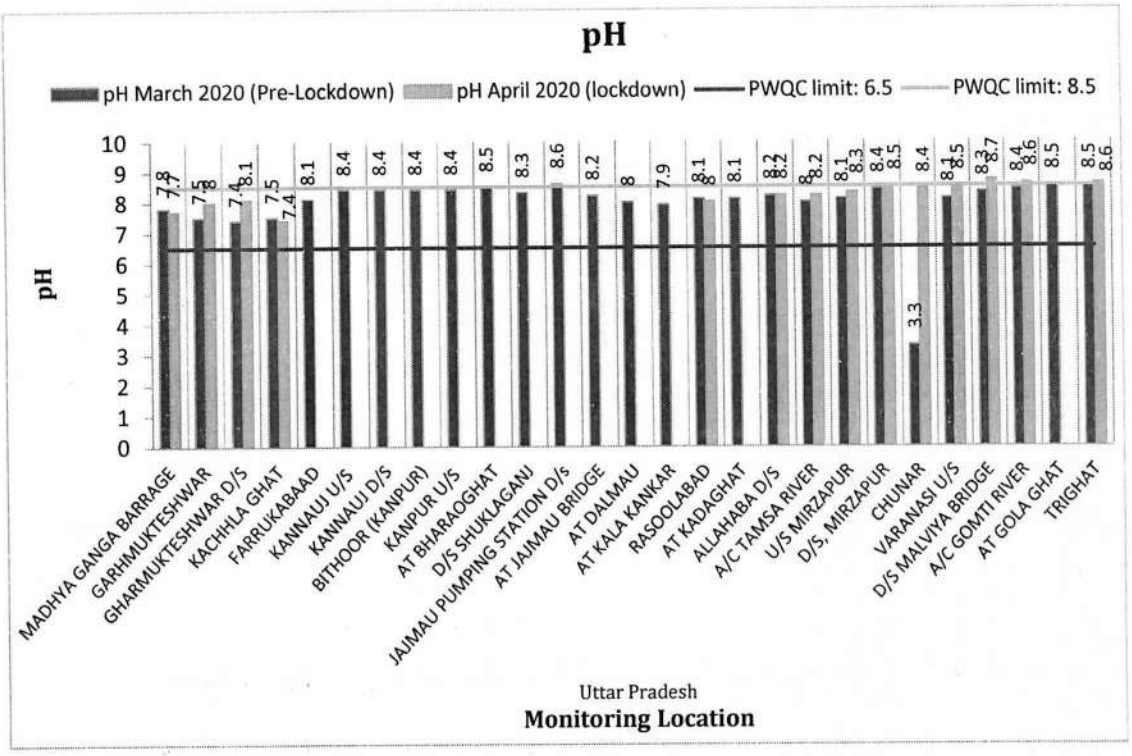

Figure 4.8: Water Quality of river Ganga for pH during pre-lockdown (March 2020) and lockdown (April 2020) in Uttar Pradesh

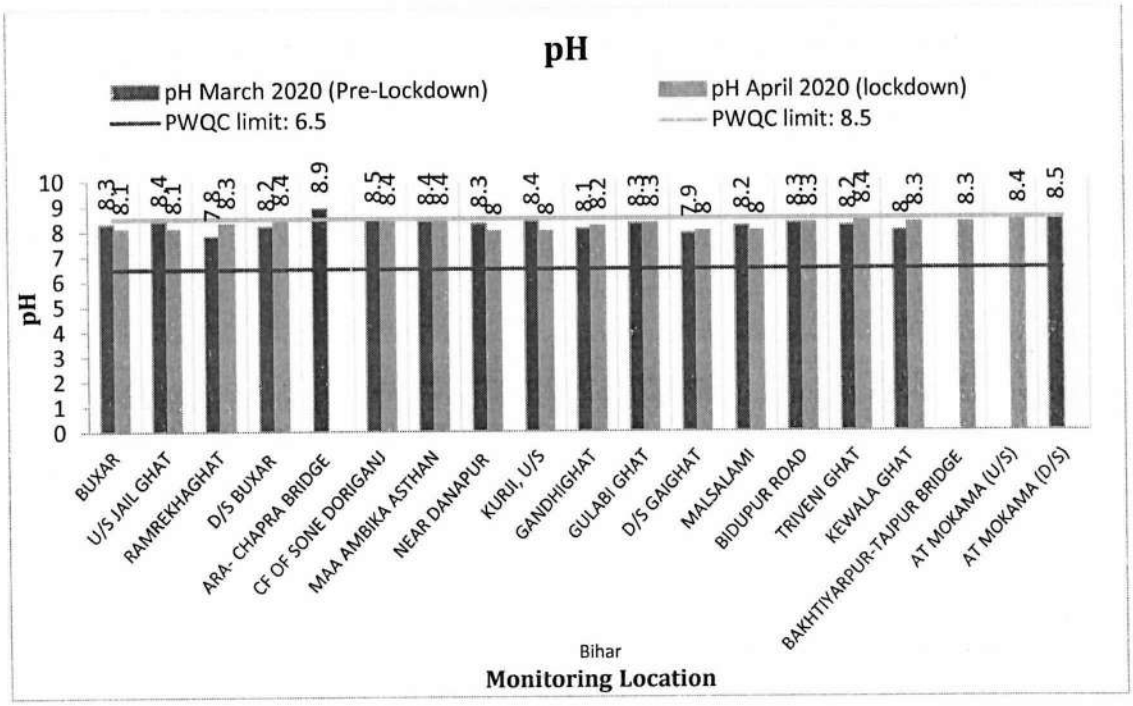

Figure 4.9: Water Quality of river Ganga for pH during pre-lockdown (March 2020) and lockdown (April 2020) in Bihar

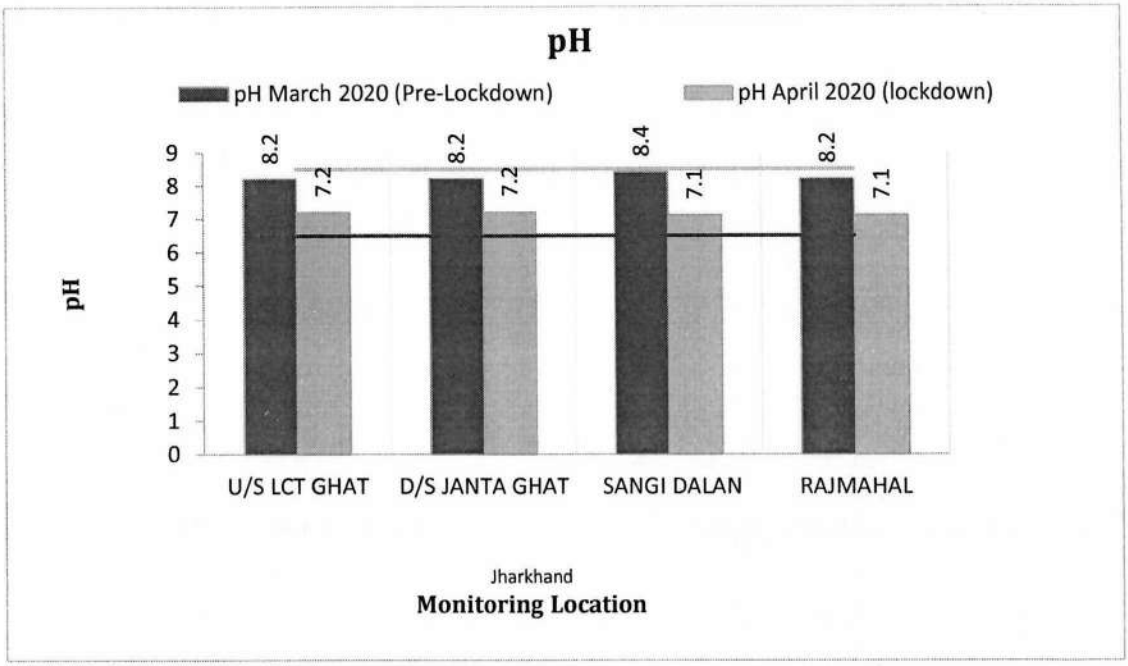

Figure 4.10: Water Quality of river Ganga for pH during pre-lockdown (March 2020) and lockdown (April 2020) in Jharkhand

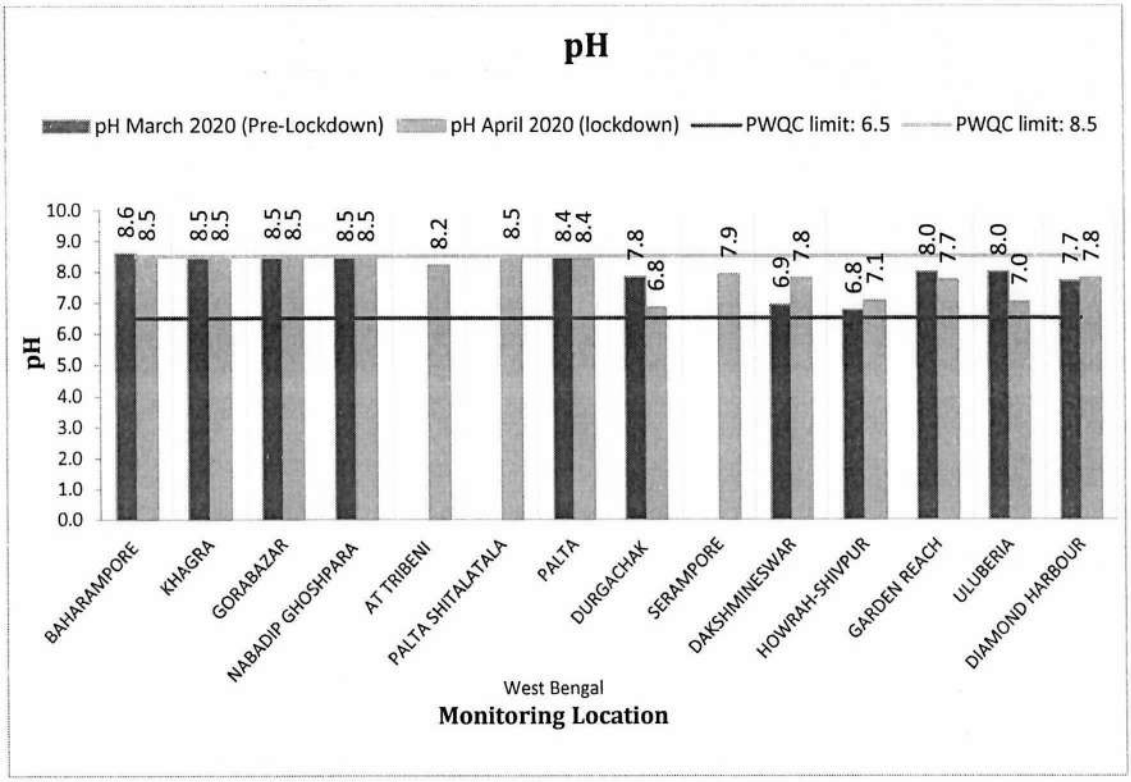

Figure 4.11: Water Quality of river Ganga for pH during pre-lockdown (March 2020) and lockdown (April 2020) in West Bengal

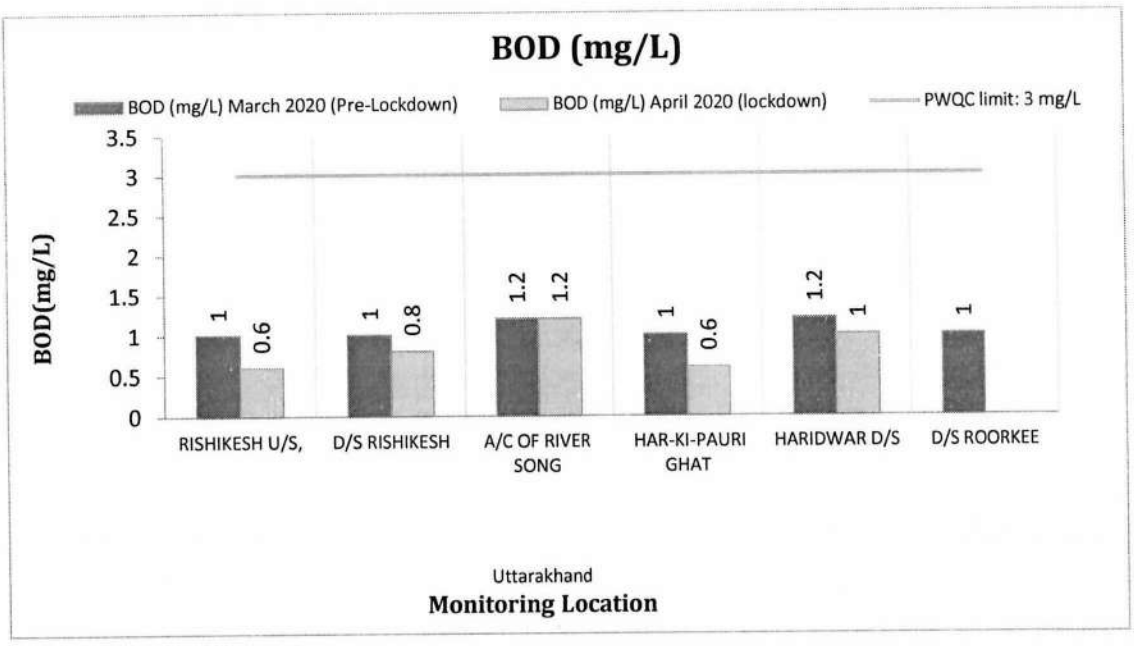

Figure 4.12: Water Quality of river Ganga for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Uttarakhand

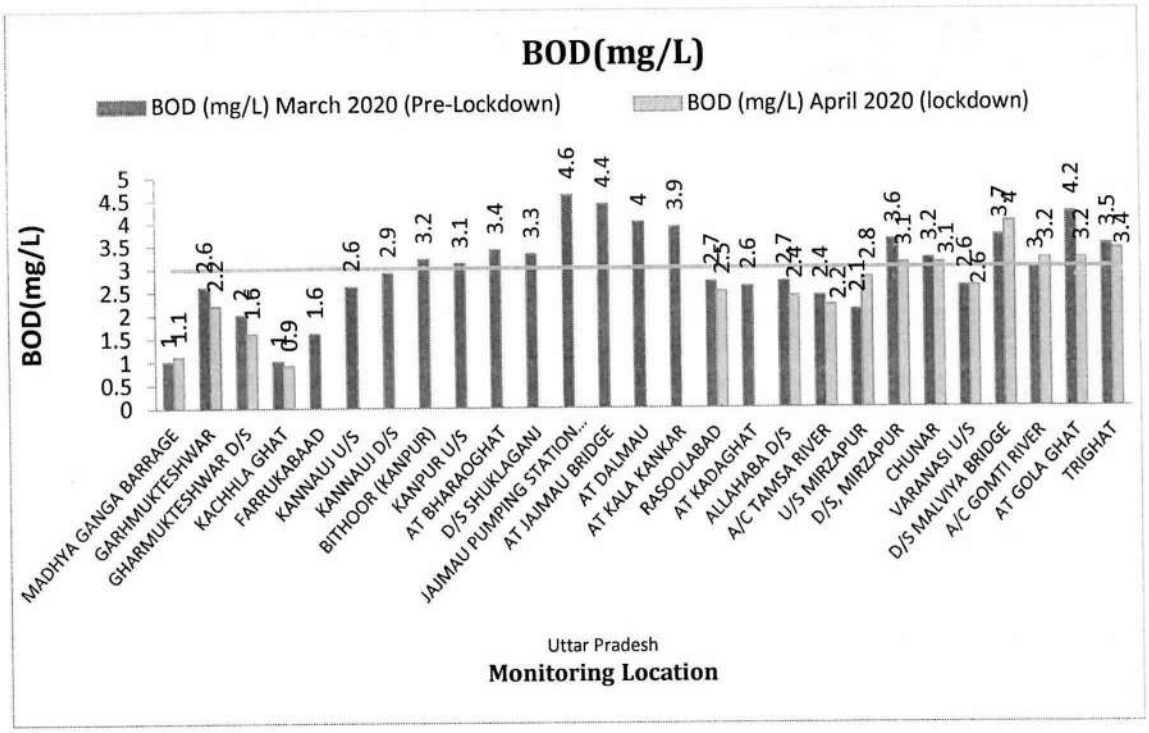

Figure 4.13: Water Quality of river Ganga for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Uttar Pradesh

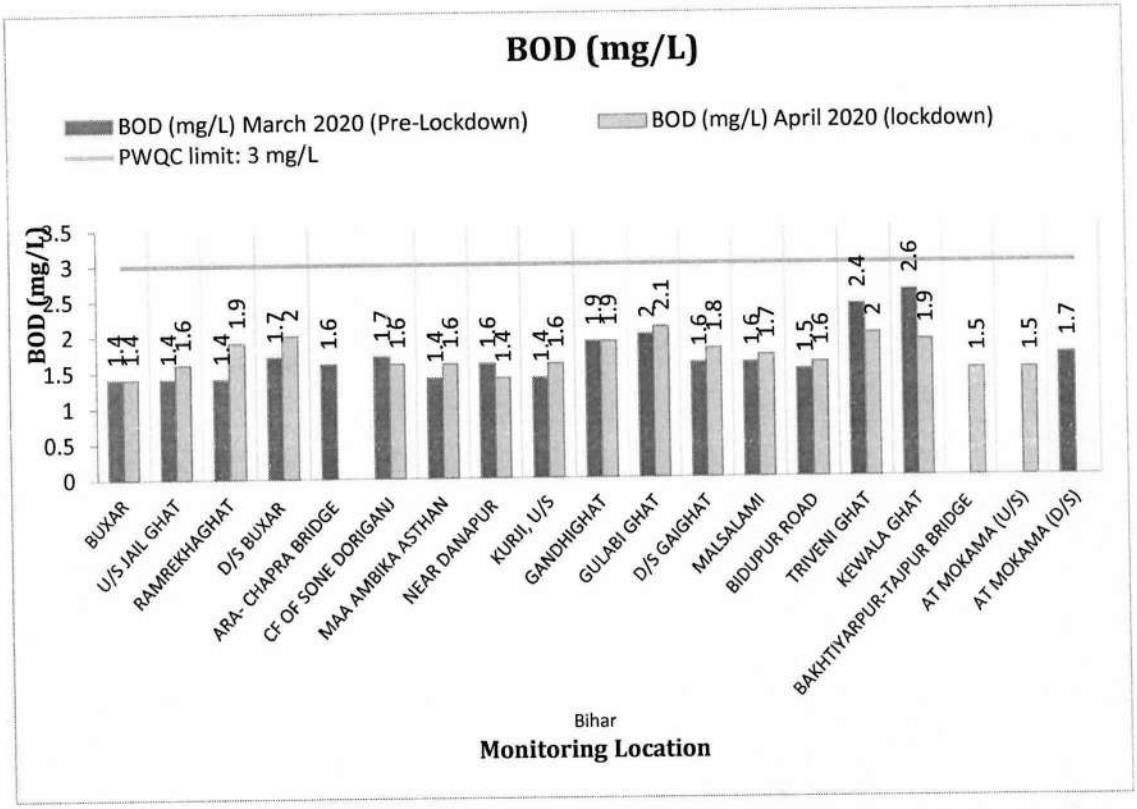

Figure 4.14: Water Quality of river Ganga for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Bihar

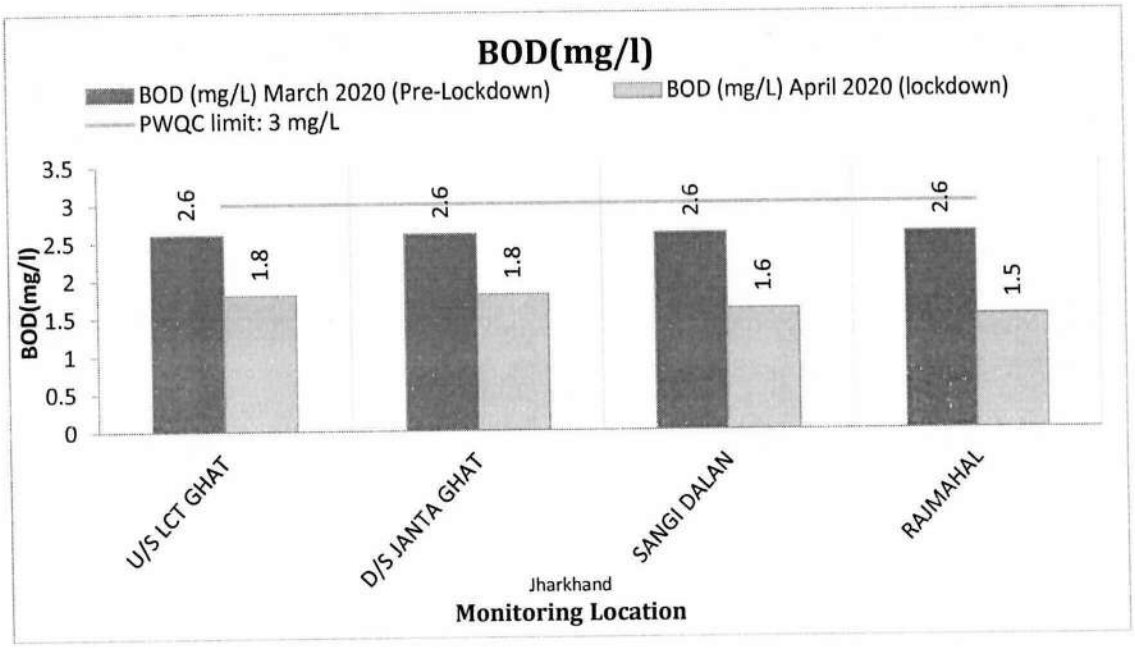

Figure 4.15: Water Quality of river Ganga for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Jharkhand

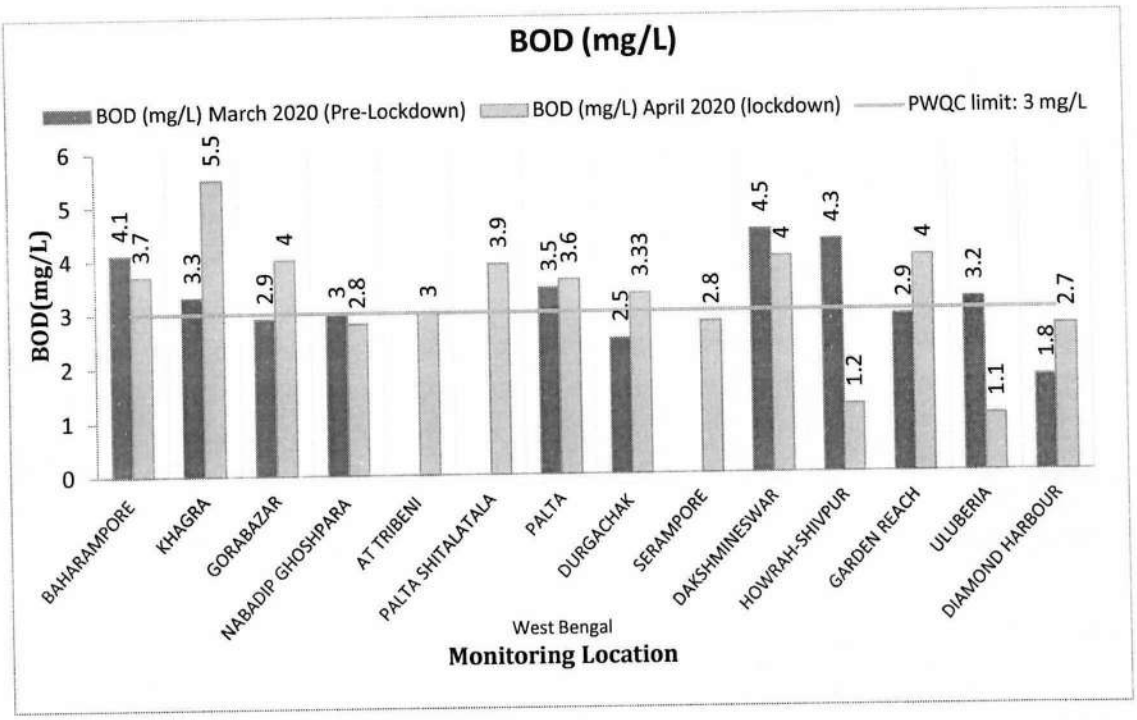

Figure 4.16: Water Quality of river Ganga for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in West Bengal

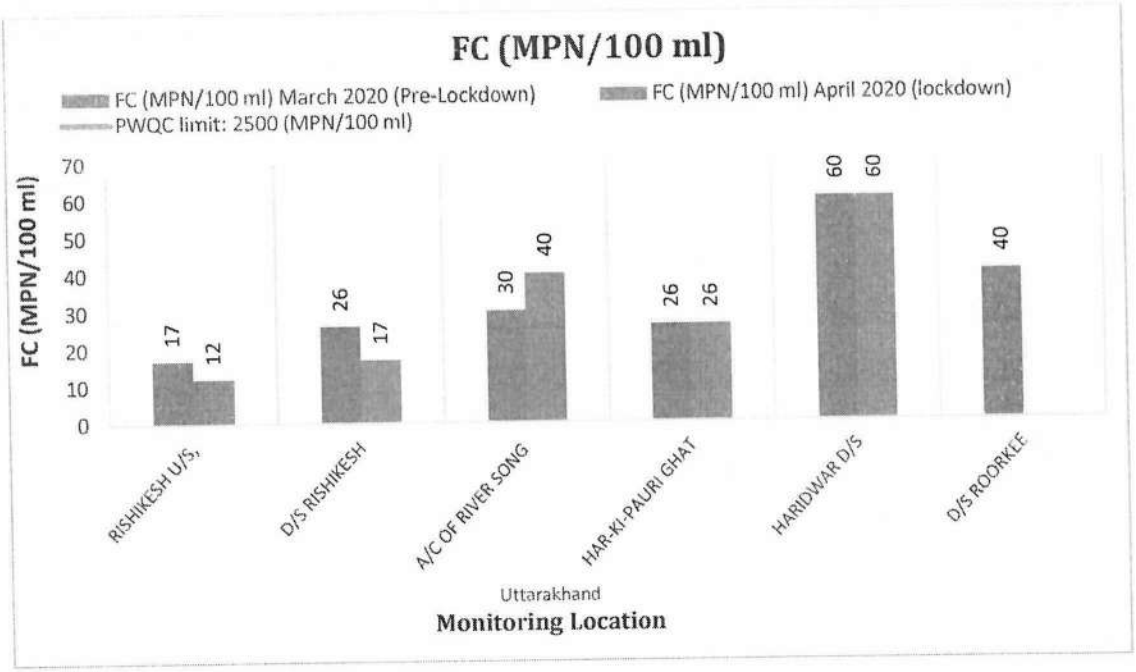

Figure 4.17: Water Quality of river Ganga for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) in Uttarakhand

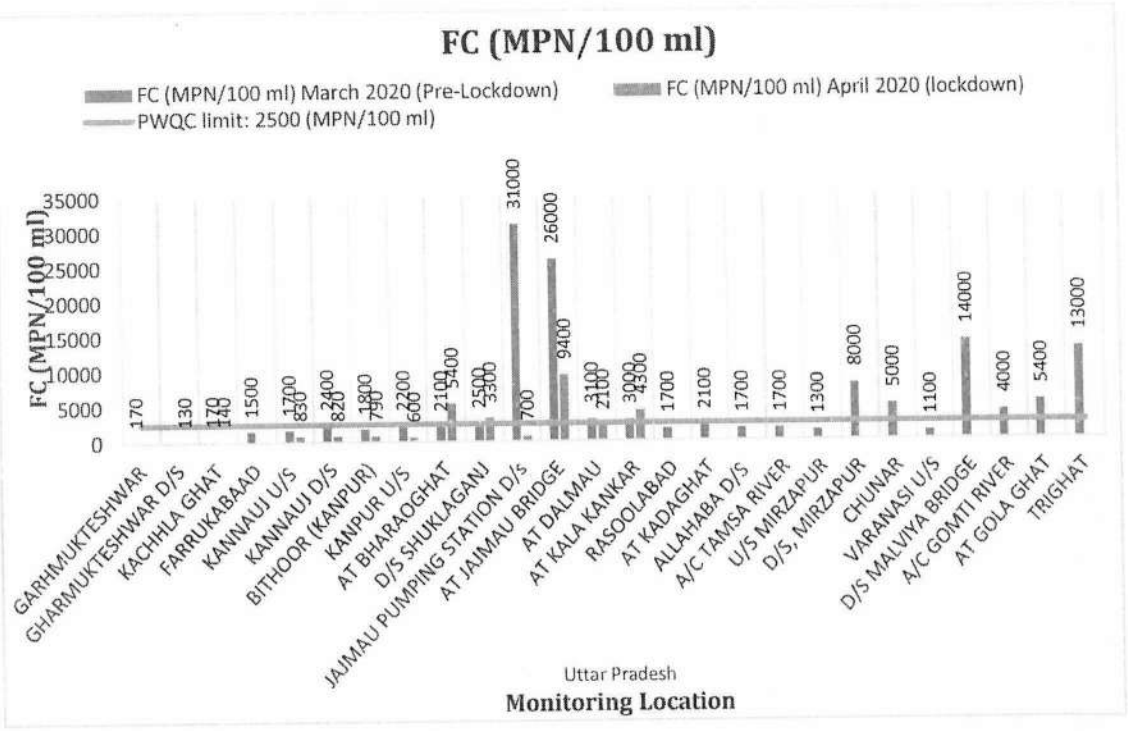

Figure 4.18: Water Quality of river Ganga for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) in Uttar Pradesh

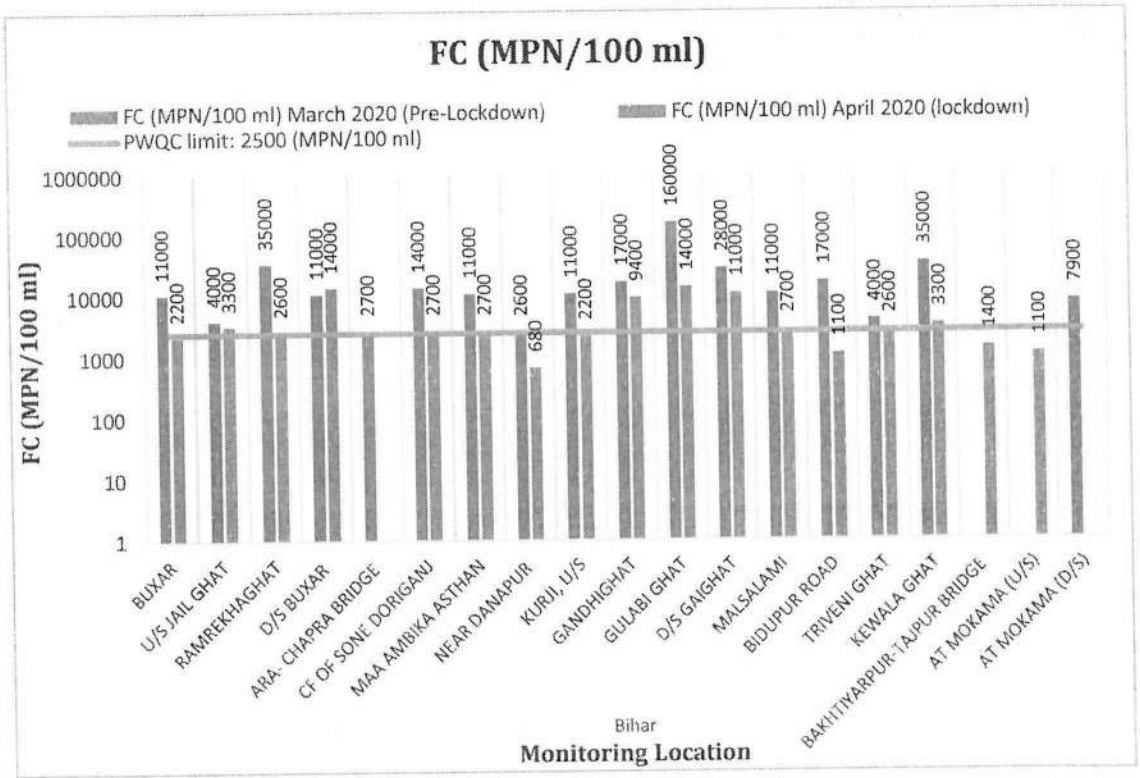

Figure 4.19: Water Quality of river Ganga for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) in Bihar

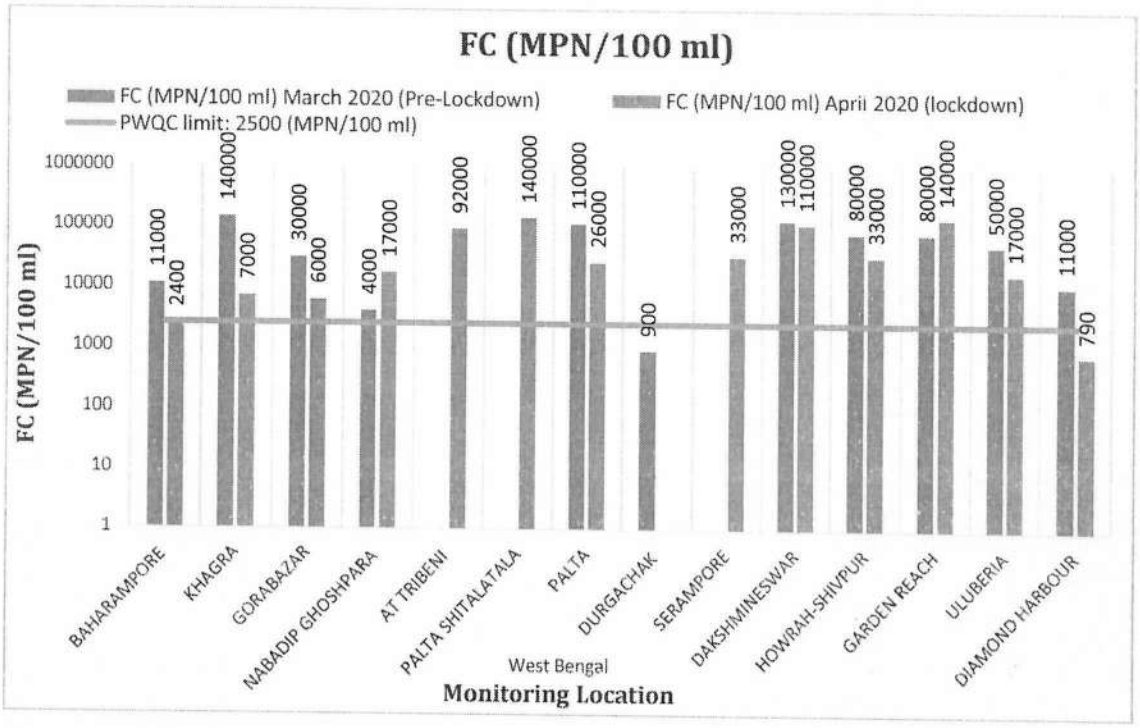

Figure 4.20: Water Quality of river Ganga for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) in West Bengal

4.4 Observations

Based on the analytical results collected from river Ganag, the following findings/observations are made:-

Uttarakhand

During the pre-lock down period (March 2020):-

- The analysis results for four critical parameters were observed to be in the order of pH (6.6 - 7.9), DO (9.6 - 11.6 mg/L), BOD (1.0 - 1.2 mg/L) and FC (17 - 60 MPN/100mL) for 06 monitored locations.
- All 06 monitored locations were found to be complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):-

- The analysis results for four critical parameters were noticed to be in the ranges of pH (7.5 - 8.2), DO (9.8 - 10.6 mgL), BOD (0.6 - 1.2 mg/L) and FC (12 – 60 MPN/100mL) at the 05 monitored locations.

- All 05 monitored locations were observed to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Over all water quality of river Ganga (Uttarakhand State): -

- The analysis results of the monitored locations revealed increasing trend of DO (4 %) at 2 locations and decreasing trend of DO (2 to 9 %) at 3 locations.

- Decreasing trend of BOD (17 - 40 %) at 4 locations, 'no' variation in BOD was observed at 1 location. Increasing trend of FC (33 %) at 1 location and decreasing trend of FC (29-35 %) at 2 locations and 'no' variation at 2 monitored locations were observed.

Uttar Pradesh

During the pre-lock down period (March 2020): -

- The analysis results designates the values of four critical parameters in the order of pH (3.3 - 8.6), DO (8.0 - 10.6 mg/L), BOD (1.0 - 4.6 mg/L) and FC (170 -31000 MPN/100mL) at the 27 monitored locations.

- 14 out of 27 monitored locations were found complying to the parameters viz., pH, DO, BOD and FC prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- Also, pH at 25 locations, DO at 27 locations, BOD at 14 locations and FC at 15monitored locations were complying with the criteria limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020)): -

- The analysis results for outdoor bathing criteria parameters were observed to be in the order of pH (7.4 - 8.7), DO (8.1 - 10.7 mg/L), BOD (0.9 - 4.0 mg/L) and FC (130-9400 MPN/100mL) at the 14 monitored locations.

- pH at 11 locations, DO at all 14 monitored locations, BOD at 09 locations and FC at 08 monitored locations were complying with the criteria limits for outdoor bathing. Also, 8 out of 14 monitored locations were found to be within the desirable limits for criteria parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on river Ganga (UP):-

- The analysis results revealed increasing trend of DO (1 -13 %) at 8 locations and decreasing trend of DO (2 - 9 %) at 6 locations, increasing trend of BOD (7 - 33 %) at 4 locations and decreasing trend of BOD (3 - 20 %) at 9 locations. 'No' variation was observed at 1 location. Also, decrease in variation of FC (33 - 67 %) at 10 monitored locations were observed.

Bihar

During the pre-lock down period (March 2020):-

- The analysis results for four critical parameters were found to be in the order of pH (7.8 - 8.9), DO (6.3 - 10 mg/L), BOD (1.4 - 2.6 mg/L) and FC (2600-160000 MPN/100mL) at the 17 monitored locations.

- All the 17 monitored locations were found complying with the criteria limits outdoor bathing parameters viz., pH, DO, BOD.

During the lock down period (April 2020):

- The analysis results for four criteria parameter were noticed to be in the order of pH (8.0 - 8.4), DO (7.6 - 9.7 mg/L), BOD (1.4 -2.1 mg/L) and FC (680-14000 MPN/100mL) at the 17 monitored locations. All 6 monitored locations were observed to be within the desirable limits for parameters (i.e. pH, DO and BOD) prescribed under Primary Water Quality Criteria for Outdoor Bathing and FC was complying at 06 monitored locations.

Overall observations on river Ganga (Bihar State):-

- The analysis results revealed increasing trend for DO (1 -38 %) at 8 locations whereas decreasing trend for DO (1 - 15 %) at 7 locations.

- Increasing trend were shown for BOD (5 -36 %) at 9 locations and FC (27 %) at 1 monitored location.

- Decreasing trend for BOD (6-27 %) at 4 locations and 'no' variation was observed at 2 monitored locations whereas decreasing trend for FC (18 -94 %) at 14 monitored locations were observed.

- There is significant reduction in FC during lockdown period in all the monitoring location. In terms of BOD, slight reduction at Kewala Ghat Patna (from 2.6 mg/l to 1.9 mg/l) was observed, however, no clear pattern of change in DO and BOD could be seen for all the stations.

Jharkhand

During the pre-lock down period (March 2020): -

- The analysis results indicate four critical parameters were found to be in the order of pH (8.2 - 8.4), DO (consistent as 8.6 mg/L) and BOD (consistent as 2.6 mg/L) at all the 04 monitored locations.

- 04 monitored locations complying with the analysed parameters (i.e. pH, DO and BOD) prescribed under Primary Water Quality Criteria for Outdoor Bathing. However, FC was not been analysed and reported by the Jharkhand SPCB.

During the lock down period (April 2020): -

- The analysis results for the analyzed parameters were observed to be in the order of pH (7.1 - 7.2), DO (9.2 - 9.6 mg/L), BOD (1.5 -1.8 mg/L) at the 04 monitored locations

- All the 04 monitored locations were found to be complying with the Primary Water Quality Criteria for Outdoor Bathing for analysed parameters viz., pH, DO & BOD.

Overall observations on river Ganga (Jharkhand State): -

- The analysis results reveal that increasing trend for DO (7 -12 %) and decreasing trend for BOD (31 -42 %) at all the 4 monitored locations. Jharkhand SPCB has not monitored FC parameter.

- There was a marginal improvement in terms of DO at all the monitored locations (8.6 mg/l in pre lockdown to 9.6 mg/l in lockdown period) and BOD (Max. 2.6 mg/l in pre lockdown period and minimum at 1.8 mg/L during lockdown period).

West Bengal

During the pre-lock down period (March 2020):-

- The analyzed parameters are in the order of pH (6.8 - 8.6), DO (5.0 - 9.1 mg/L), BOD (1.75- 4.5 mg/L) and FC (900 -140000 MPN/100mL) at the 11 monitored locations.

- Also, pH at 10 locations, DO at all 11 monitored locations, BOD at 05 locations whereas FC at 01 location were found to be complying with the criteria limits. Only 1 out of 11 monitored locations were found to be within the desirable limits for outdoor bathing criteria.

During the lock down period (April 2020): -

- During the lockdown period (April, 2020), the analysis results of four critical parameters were found to be in the order of pH (6.8 - 8.5), DO (3.9 - 9.6 mg/L), BOD (1.05 - 5.5 mg/L) and FC (790 - 140000 MPN/100mL) at the 14 monitored locations

- Also, pH at all 14 locations, DO at 11 locations, BOD at 06 locations and FC at 02 monitored locations were observed to be within the desirable limits as per Primary Water Quality Criteria for Outdoor Bathing

- Only 2 out of 14 monitored locations were found to be complying with the Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on river Ganga (West Bengal): -

- The analysis results revealed increasing trend were shown for DO (7-22 %) at 4 locations, BOD (4 -67 %) at 6 locations and FC (75 -325 %) at 2 monitored locations whereas decreasing trend were shown for DO (7-40 %) at 7 locations, BOD (7 -71 %) at 5 locations and FC (15 - 95%) at 8 monitored locations.

- Except at one location (Garden reach), all other monitored locations reveal reduction in FC in WB State except at two locations (at Gorabazar and Garden) during lockdown period whereas significant reduction in FC was at Khagra (40,000 to 7000 MPN/100 mL) and Palta (110,000 to 26,000 MPN/100 mL).

- In terms of BOD value, not much change has been observed except at Howrah-shivpur (4.3 mg/L to 1.25 mg/L) and Ulberia (3.2 to 1.05 mg/L) where there was a significant reduction in BOD.

Overall Observations on river Ganga (covering 5 States- Uttarakhand, U.P, Bihar, Jharkhand and West Bengal): -

The analysis results revealed that

- During pre-lockdown period (March, 2020), in Uttarakhand (6 out of 6 monitored locations), in Uttar Pradesh (14 out of 27 monitored locations), in Bihar (17 out of 17 monitored locations), in Jharkhand (all 4 monitored locations (FC not monitored)) and in West Bengal (1 out of 11 monitored locations) and overall, 42 out of 65 monitored

locations were found to be complying with the Primary Water Quality Criteria for Outdoor Bathing.

- During lockdown period (April 2020), in Uttarakhand (5 out of 5 monitored locations), in Uttar Pradesh (8 out of 14 monitored locations), in Bihar (6 out of 17 monitored locations), in Jharkhand (all 4 monitored locations (FC not moniotred)) and in West Bengal (2 out of 14 monitored locations) and overall, 25 out of 54 monitored locations were found to be within the desirable limits for Primary Water Quality Criteria for Outdoor Bathing.

- During lockdown (April 2020), maximum Dissolved Oxygen (DO) was observed at Kachhla Ghat, Aligarh (10.7mg/L) and minimum DO (3.9 mg/L) at Howrah-Shivpur, West Bengal. Maximum BOD (5.5 mg/L) was observed at Khagra and minimum as 'BDL' at 04 locations viz., Rishikesh U/s, D/s Rishikesh and Har-ki-pauri Ghat, Kachhla Ghat, Aligarh, while maximum FC count was observed at Garden Reach, West Bengal and Palta Shitalatala (140000MPN/100 mL) and minimum at Rishikesh U/s (12 MPN/100 mL)..

- Increasing trend were observed for DO (1% - 38 %) at 26 locations, BOD (4-67 %) at 19 locations while FC (27 - 325 %) at 4 monitored locations. Decreasing trend w.r.t DO (1% - 40%) at 23 locations, BOD (3-71 %) at 26 locations whereas FC (15 - 95 %) at 34 locations were observed. 'No' variation in BOD at 4 monitored locations while 'No' variation in FC was observed at 2 monitored locations.

4.5. Conclusion

During pre-lockdown, 42 out of 65 monitored locations and during lockdown, 25 out of 54 monitored locations (46.3 %) were found to be within the desirable limits prescribed under outdoor bathing criteria limits. Overall moderate improvement was observed w.r.t the parameters i.e., DO, BOD and FC.

5.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER YAMUNA

5.1 About Yamuna River

The Yamuna river originates from Yamunotri glacier in the Bandarpunch in the Himalayas in Uttarakhand State. From its source, the river Yamuna flows south through the Himalayan foothills of Uttarakhand into the Indo-Gangetic Plains. The Yamuna river traverses a distance of 1,376 km through the States of Himachal Pradesh, Haryana, Delhi and Uttar Pradesh and finally

confluences with River Ganga at Prayagraj. The main urban centres on the banks of River Yamuna are Yamunanagar, Karnal, Panipat and Sonepat, Baghpat,Delhi, Noida, Mathura, Agra, Firozabad, Etawah, Kalpi, Hamirpur, and Prayagraj. Major tributaries of river Yamuna are River Tons, Hindon, Ken, Chambal, Sasur Khedri, Betwa or Betravati. River Yamuna is polluted mainly due to discharge of treated/partially treated industrial effluents, municipal sewage generated from Haryana, Delhi and U.P States apart from lack of adequate infrastructure for management of wastes from the afore-said States.

5.2 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water Quality of river Yamuna is examined at 30 locations by Central Pollution Control Board (CPCB) in association with the State Pollution Control Boards of Uttarakhand, Himachal Pradesh, Haryana, Uttar Pradesh and CPCB HQ. State-wise Distribution of Water Quality Monitoring Locations under NWMP on river Yamuna is depicted in **Figure 5.1.**

5.3 Analytical Results

Monitoring of river Yamuna was carried out by the 4 States at 14 locations [(HP (04), Haryana (04), Delhi (05) and UP (1)] during Pre-Lockdown (March 2020) and 12 locations [(HP (04), Haryana (04), Delhi (03) and UP (1)] during Lockdown period (April 2020) to assess impact of lock-down on water quality of river Yamuna. Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented in **Table-5.1**.

Based on the monitoring & analysis of collected water samples from river Yamuna, the graphical presentation of river Yamuna with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are presented in **Figure 5.1 to Figure 5.5.**

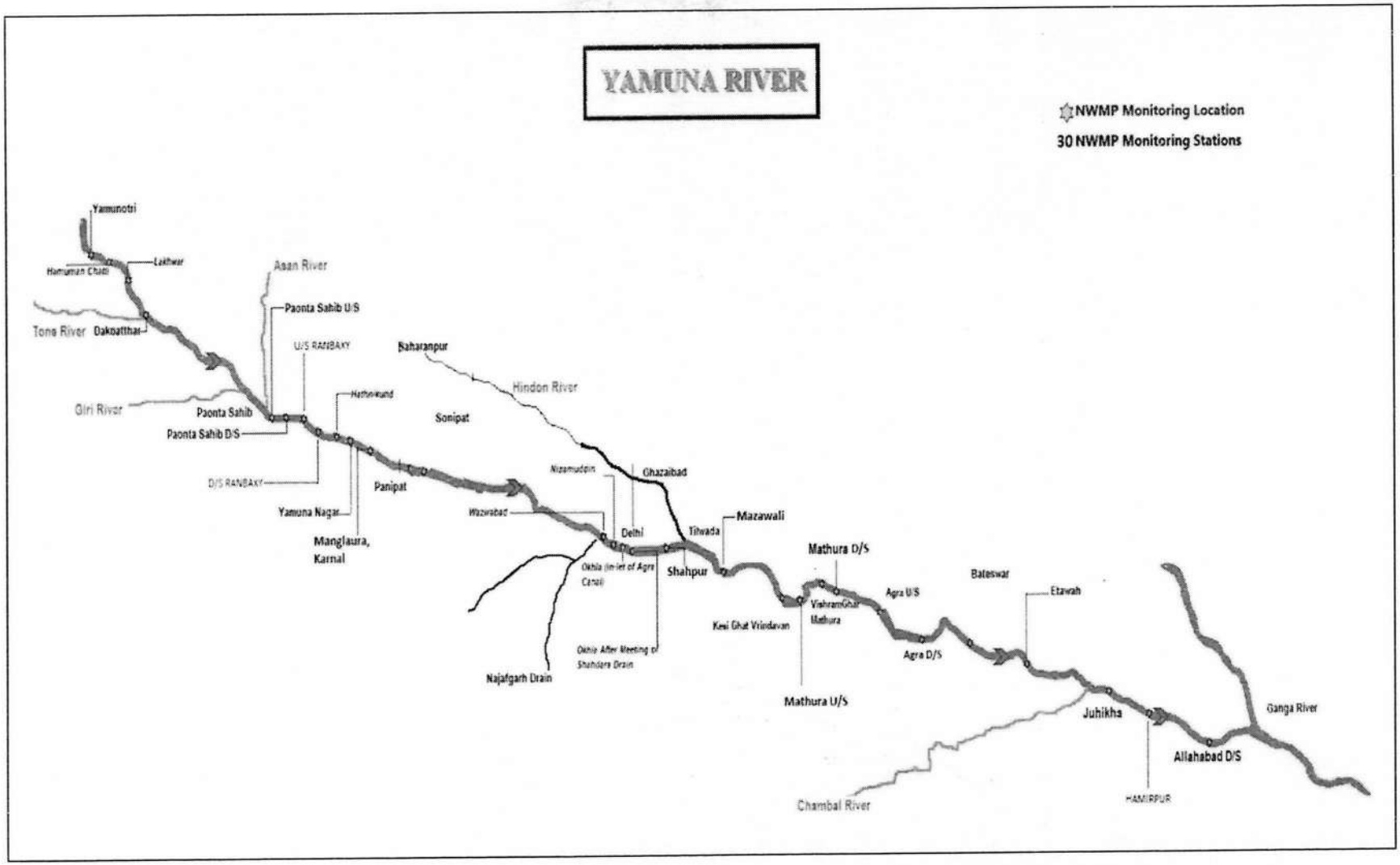

Figure 5.1: State-wise Distribution of Water Quality Monitoring Locations Under NWMP on River Yamuna

Table-5.1 Water Quality of River Yamuna during Pre (March 2020) and Lockdown Period (April 2020)

Monitoring Locations on River Yamuna	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			Complying Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100 mL			
HIMACHAL PRADESH												
At U/S Paonta Sahib	8.8	9.1	+3.41%	6.9	6.9	0.6	0.4	-33.30%	14	11	-21.43%	Complying
At D/S Paonta Sahib	8.9	9	+1.12%	7.1	7.0	0.8	0.4	-50.00%	17	12	-29.41%	Complying
At U/S Ranbaxy	8.6	8.9	+3.49%	7.2	7.5	0.7	0.4	-42.86%	10	10	Nil	Complying
At D/S Ranbaxy	8.7	8.8	+1.15%	7	7.5	0.7	0.4	-42.86%	12	10	-16.67%	Complying
No of locations monitored in HP	4 locations in March 2020 and 4 locations in April 2020											
No of monitoring locations results available	4	4	-	4	4	4	4	-	4	4	-	
No of locations complying to Criteria	4	4	-	4	4	4	4	-	4	4	-	
Range	8.6 – 8.9	8.8–9.1	Increase in % variation 1.12% – 3.49% at 4 locations	6.9 – 7.2	6.9 – 7.5	0.6 – 0.8	Consist-ant (0.4 mg/L) at all 4 monitored locations	Decrease in % variation 33.30 - 50 % at 4 locations	10 - 17	10 - 12	Decrease in % variation 16.67 - 29.41 % at 3 locations and 'No' variation at 1 location	-

Monitoring Locations on River Yamuna	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100 mL			Complying Status w.r.t PWQCOB
HARYANA												
At Hathnikund	7.9	8.4	+6.33%	7.6	8.2	2.5	-	-	600	200	-66.67%	Complying
AT Kalanaur, Yamuna Nagar	8.2	8.4	+2.44%	7.2	8.1	2.2	-	-	47000	27000	-42.55%	Non-complying
AT Khojkipur, Panipat	8.2	8.4	+2.44%	7.3	7.6	7	-	-	70000	200	-99.71 %	Non-complying
AT Palla, Sonepat	8.4	8.2	-2.38%	8.1	7.6	4.6	-	-	92000	46000	-50.00%	Non-complying
No of locations monitored	4 locations in March 2020 and 4 locations in April 2020											
No of monitoring locations results available	4	4	-	4	4	4	-	-	4	4	-	-
No of locations complying to Criteria	4	4	-	4	4	2	-	-	1	2	-	-
Range (Min – Max)	7.9 – 8.4	8.2 – 8.4	Increase in % variation 2.44 - 6.33 % at 3 locations and Decrease in % variation 2.38 % at 1 location	7.2 – 8.1	7.6 – 8.2	2.2-7	-	-	600 - 92000	200 - 46000	Decrease in % variation 42.55 - 99.71 % at 4 locations	-
DELHI												
At Palla	17.1	8.3	-51.46%	8.7	7.8	7.9	2	74.70%	1300	-	-	Non-complying
At Nizamudin	BDL	2.4	-	7.2	7.2	57	5.6	90.20%	9200000	-	-	Non-complying

Monitoring Locations on River Yamuna	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100 mL**			**Complying Status w.r.t PWQCOB**
At Okhla Bridge (Inlet of Agra Canal, Kalindi Kunj)	BDL	1.2	-	7.2	7.1	27	6.1	77.40%	2200000	-	-	Non-complying
At Okhla After Meeting of Shahdara Drain (Ohkla D/S)	-	-	-	7.3	-	78	-	-	1700000	-	-	Non-complying
At Agra Canal Madanpur, Khadar (Badarpur)	-	-	-	7.2	-	24	-	-	340000	-	-	Non-complying
No of locations monitored in Delhi	5 locations in March 2020 and 3 locations in April 2020											
No of monitoring locations results available	1	3	-	5	3	5	3	-	5	-	-	-
No of locations complying to Criteria	1	1	-	4	3	0	1	-	1	-	-	
Range	17.1	1.2 – 8.3	Decrease in % variation 51.46 % at 1 location	7.2 -8.7	7.1 – 7.8	7.9 – 78	2 – 6.1	Decrease in % variation 74.7 - 90.20% at 3 locations	1300 - 9200000	-	-	-
UTTAR PRADESH												
AT Allahabad D/S (Balua Ghat), U.P	8.1	9.3	14.81%	8	7.9	2.4	2	-16.70%	1300	310	-76.15%	Complying
No of locations monitored in UP	1 location both in March 2020 and April 2020											
No of monitoring locations results available	1	1	-	1	1	1	1	-	1	1	-	
No of locations complying to Criteria	1	1	-	1	1	1	1	-	1	1	-	

Monitoring Locations on River Yamuna	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100 mL**			**Complying Status w.r.t PWQCOB**
Range (Min – Max)	-	-	Increase in % variation 14.81 % at 1 location	-	-	-	-	Decrease in % variation 16.70 % at 1 location	-	-	Decrease in % variation 76.15 % at 1 location	-
Overall Water Quality Status of River Yamuna (HP, Haryana, Delhi and UP) during Pre-lockdown (March 2020) and Lockdown Period (April 2020)												
No. of locations monitored	14 locations in March 2020 and 12 locations in April 2020											
No. of monitoring locations for which monitored results available	10	12	-	14	12	14	08	-	14	09	-	-
Overall Range	7.9 - 17.1	1.2 - 9.3	% Increase 1.12% - 14.81% at 08 locations. % Decrease 2.38% - 51.46% at 02 locations	6.9 - 8.7	6.9 - 8.2	0.6 - 78	0.4 - 6.1	% Decrease 16.70% - 90.20% at 08 locations	10 - 9200000	10 - 46000	% Decrease 16.67% - 99.71 % at 08 locations and ' No' variation at 01 location.	

Note:- * Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

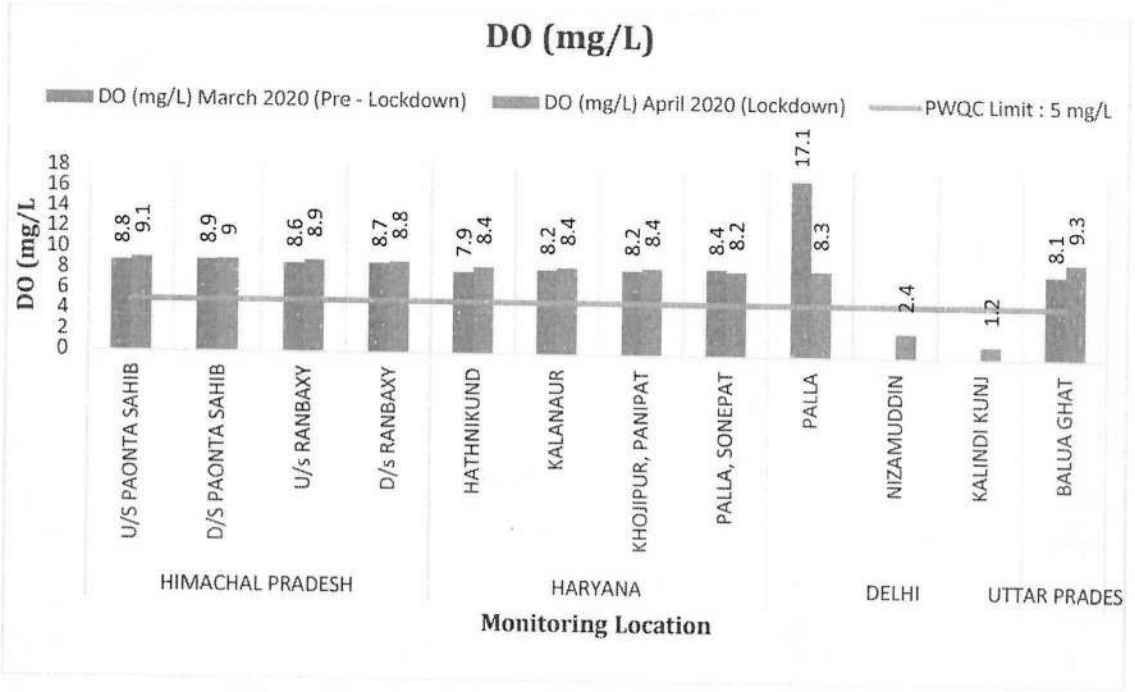

Figure 5.2: Water Quality of river Yamuna for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

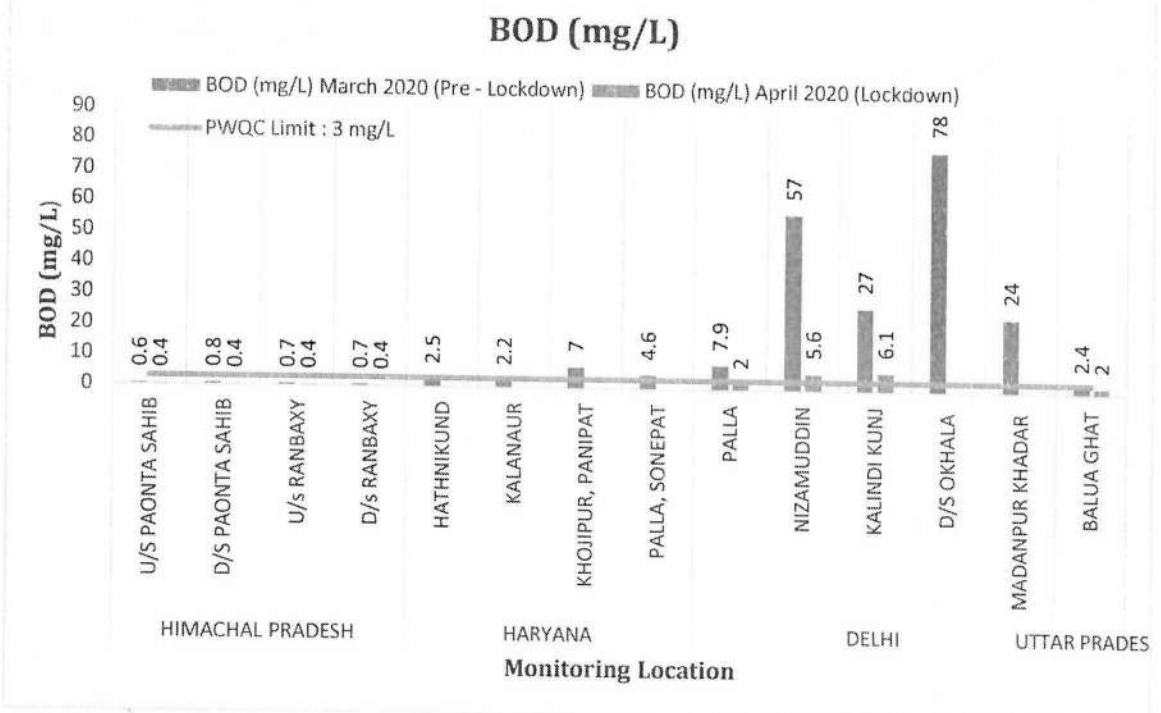

Figure 5.3: Water Quality of river Yamuna for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

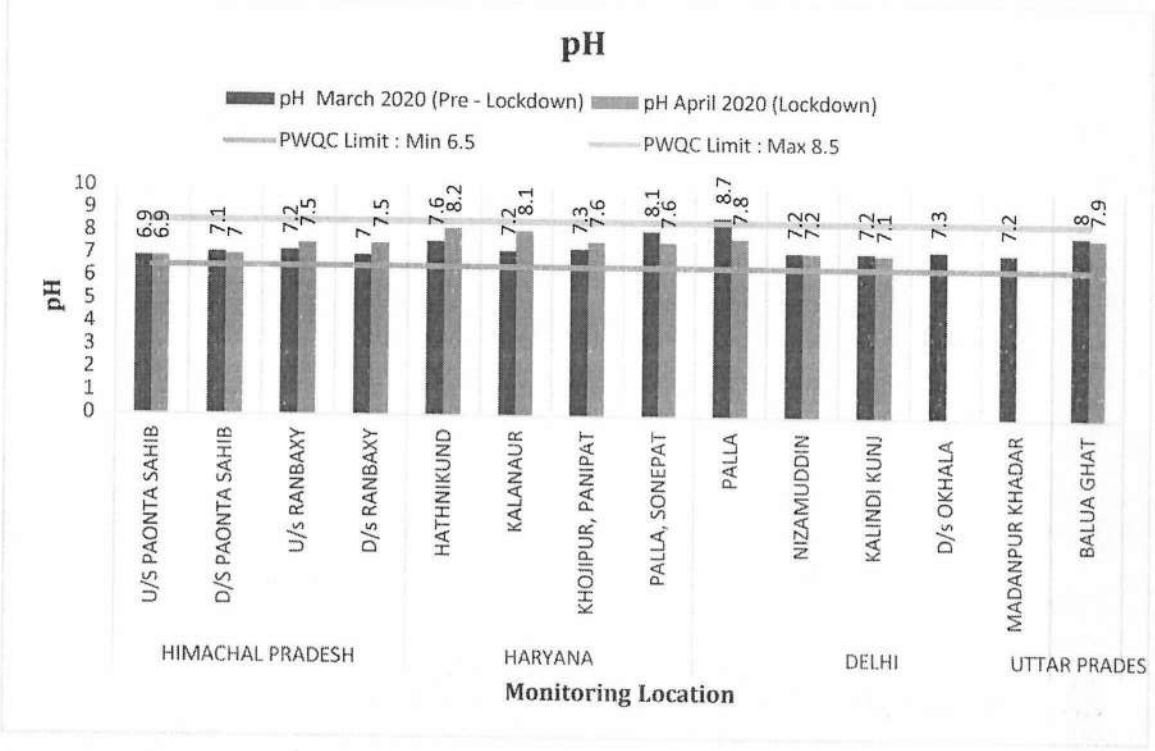

Figure 5.4: Water Quality of river Yamuna for pH during pre-lockdown (March 2020) and lockdown (April 2020)

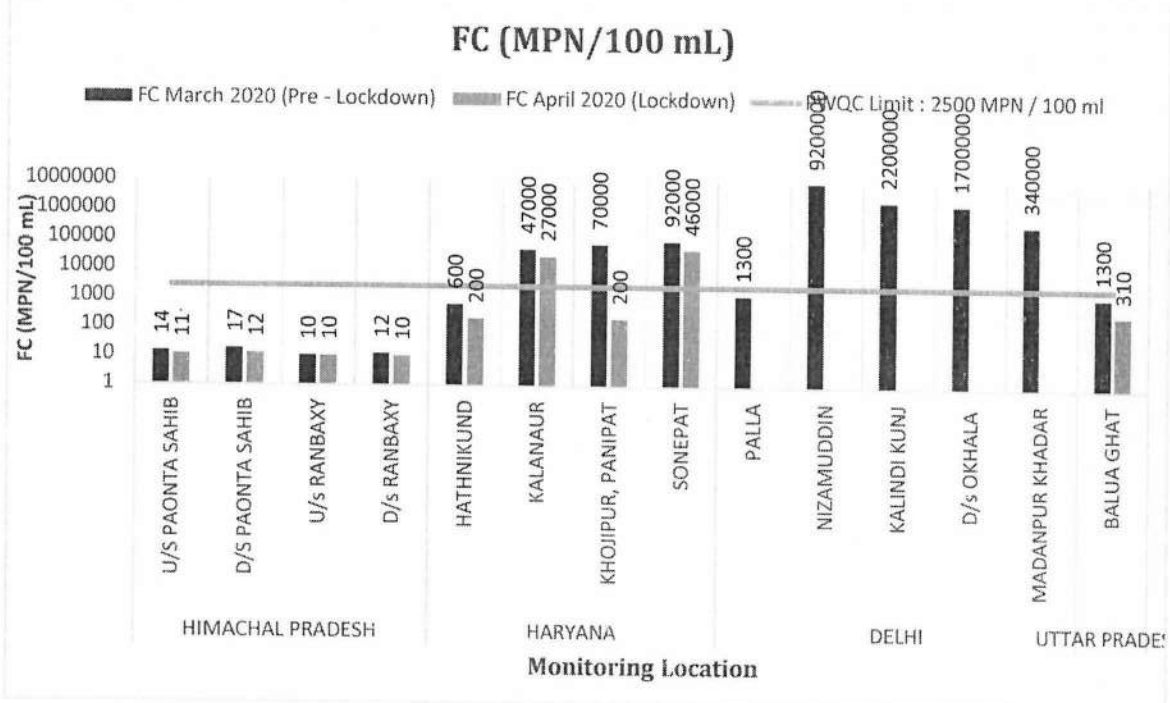

Figure 5.5: Water Quality of river Yamuna for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020)

5.4 Observations

Based on the analytical results, following findings/observations are made:

Himachal Pradesh:

During the pre-lock down period (March, 2020): -

- The analysis results for four critical parameters were found to be in the order of pH (6.9-7.2), DO (8.6-8.9mg/L), BOD (0.6-0.8 mg/L) and FC (10-17 MPN/100 mL) at 04 monitored locations.

- All 04 monitored locations are within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April, 2020): -

- The analysis results for four critical parameters were observed to be in the order of pH (6.9-7.5), DO (8.8-9.1 mg/L), BOD (Consistent at 0.4 mg/L) and FC (10-12 MPN/100 mL) at 04 monitored locations.

- All 04 monitored locations were found to be complying to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on river Yamuna (HP): -

- The analysis results revealed decreasing trend were observed for BOD (33.3% - 50%) at 04 locations, FC (16.67% - 29.41%) at 03 locations and 'no' variation in FC at 1 location whereas increasing trend was observed for DO (1.12%- 3.49%) at 04 monitored locations.

Haryana:

During the pre-lock down period (March, 2020): -

- The analysis results for four critical parameters were observed to be in the order of pH (7.2-8.1), DO (7.9-8.4 mg/L), BOD (2.2-7.0 mg/L) and FC (600-92000 MPN/100 mL) at 04 monitored locations

- Only 01 out of 4 monitored locations were found to be complying to the outdoor bathing criteria parameters (i.e. pH, DO, BOD and FC). Also, pH and DO at 04 locations, BOD at 02 locations and FC at 01 location were found to be within the desirable limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April, 2020): -

- The analysis results for four criteria parameters were found to be in the order of pH (7.6-8.2), DO (8.2-8.4 mg/L), BOD (Not reported by the HSPCB) and FC (200-46000 MPN/100 mL) at the 04 monitored locations.

- 2 out of 4 monitored location were observed to be complying to the parameters (i.e. pH, DO and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing. Also, pH & DO were found to be complying at 04 locations and FC complying at 02 locations for the limits prescribed under Primary Water Quality Criteria for Outdoor Bathing .

Overall Observations on river Yamuna (Haryana): -

- The analysis results revealed decreasing trend were observed for DO (2.38 %) at 1 location and FC (42.55 - 99.71 %) at 04 locations whereas increasing trend for DO (2.44 -6.33 %) at 3 locations.

- Overall, 1 out of 4 monitored locations were found to be complying to the Primary Water Quality Criteria for Outdoor Bathing.

Delhi:

During the pre-lock down period (March, 2020): -

- The analysis results for four critical parameters were found to be in the order of pH (7.2-8.7), DO (17.1 mg/L), BOD (7.9-78 mg/L) and FC (1300-920000 MPN/100 mL) at the 05 monitored locations.

- None of the monitored locations were found to be complying to the prescribed Primary Water Quality Criteria for Outdoor Bathing.

- Also, pH at 04 locations, DO at 01 location and FC at 01 location were found to be complying whereas BOD at all the 5 monitored locations

were observed to be not complying to the limits prescribed under Primary Water Quality for Outdoor Bathing.

During the lock down period (April, 2020): -

- The analysis results for four critical parameters were found to be in the range of pH (7.1-7.8), DO (1.2-8.3 mg/L) and BOD (2-6.1 mg/L) at the 05 monitored locations and FC parameter not reported for both the months.

- Also, pH at 03 locations, DO at 01 location and BOD at 01 monitored location were found to be within the desirable limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on river Yamuna (Delhi): -

The analysis results reveal that

- Decreasing trend were observed for DO (51.46%) at 01 location and BOD (74.70% - 90.20%) at 03 locations.

Uttar Pradesh:

During the pre-lock down period (March, 2020): -

- The analysis results for four critical parameters were found to be in the order of pH (8.0), DO (8.1 mg/L), BOD (2.4 mg/L) and FC (1300 MPN/100 mL) at 01 monitored location.

- 01 monitored location observed to be complying to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April, 2020): -

- The analysis results for four critical parameters were found to be in the range of pH (7.9), DO (9.3 mg/L), BOD (2.0 mg/L) and FC (310 MPN/100 mL) at 01 monitored location.

- 01 monitored location was observed to be complying to all the criteria parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall Observations on river Yamuna (Uttar Pradesh): -

- The analysis results revealed increasing trend were observed for DO (14.81%) at 1 location while decreasing trend was observed for BOD (16.70 %) at 1 location and FC (76.15 %) at 1 location.

Overall Observations on river Yamuna (covering HP, Haryana, Delhi and Uttar Pradesh States): -

- During pre-lockdown, 13 out of 14 locations, 10 out of 14 locations, 07 out of 14 locations, 07 out of 14 locations were found to be within the desirable limits for the criteria parameters viz., pH, DO, BOD and FC respectively.

- During lockdown, pH at 12 locations, DO at 10 locations, BOD at 06 locations, FC at 07 locations were found to be complying to the criteria parameters prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- During lockdown,on river Yamuna, maximum DO (9.3 mg/L) was observed at Allahabad D/s Balua Ghat, U.P and minimum DO (1.2 mg/L). at Okhla Bridge (Inlet of Agra Canal, Kalindi Kunj. Maximum BOD (6.1 mg/L) was observed at Okhla Bridge (Inlet of Agra Canal, Kalindi Kunj and minimum BOD (0.4 mg/L) was observed at 04 locations (viz., U/s Paonta Sahib, D/s Paonta Sahib, U/s Ranbaxy & D/s Ranbaxy in H.P) while maximum FC count (46000 MPN/100 mL) was observed at Palla, Sonepat and minimum (10 MPN/100 mL) was observed at 02 locations (viz., U/s Ranbaxy & D/S Ranbaxy).

- The analysis results revealed increasing trend was observed for DO (1.12% -14.81%) at 08 monitored locations while decreasing trend were marked for DO (2.38% - 51.46%) at 02 locations, BOD (16.70% -90.20%) at 08 monitored locations and FC (16.67% - 99.71 %) at 08 locations and 'no' variation was observed in case of FC at 01 location.

5.5 Conclusion

06 out of 14 monitored locations during pre-lockdown and 8 out of 12 monitored locations during lockdown were complying with the Primary Water Quality Criteria for Outdoor Bathing. Also, overall marginal enhancement in water quality of river Yamuna with respect to BOD and FC as well as interms of 66.67 % compliance of monitoring locations was observed.

6.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER CHAMBAL

6.1. About River Chambal

The River Chambal, is 960 kilometre long and one of the cleanest perennial river and originates in the Vindhya Range in Madhya Pradesh State. The river flows north-northeast through Madhya Pradesh, running for a time through Rajasthan then forming the boundary between Rajasthan and Madhya Pradesh before turning southeast to join the river Yamuna in Uttar Pradesh. Major left bank tributaries of river Chambal are Banas, Mej and right bank tributaries are Parbati, Kali Sindh and Shipra. Kota, Nagda, Sawai Madhopur, Karauli, Dholpur are the major cities on the banks of Chambal river. Kota is one of the industrial hubs in Northern India where chemical, cement and power plants industries are located.

6.2. Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

Water quality of river Chambal is assessed at 18 locations by Central Pollution Control Board (CPCB) in association with M.P. Pollution Control Board (MPPCB), Rajasthan State Pollution Control Board (RSPCB) and U.P. Pollution Control Board (UPPCB) under National Water Quality Monitoring Programme (NWMP). State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Chambal is depicted in **Figure 6.1**.

6.3 Analytical Results

Monitoring of river Chambal was carried out at 8 locations [MP (07) and Rajasthan (01)] during Pre-Lockdown (March 2020) and 13 locations [MP (06) and Rajasthan (07)] during Lockdown period (April 2020) to assess the impact of lockdown on water quality of river Chambal. The water quality of river Chambal for the Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented in **Table-6.1**.

Based on the monitoring & analysis of collected water samples from river Chambal, the water quality tendency of river Chambal with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are depicted in **Figure 6.2 to Figure 6.5**.

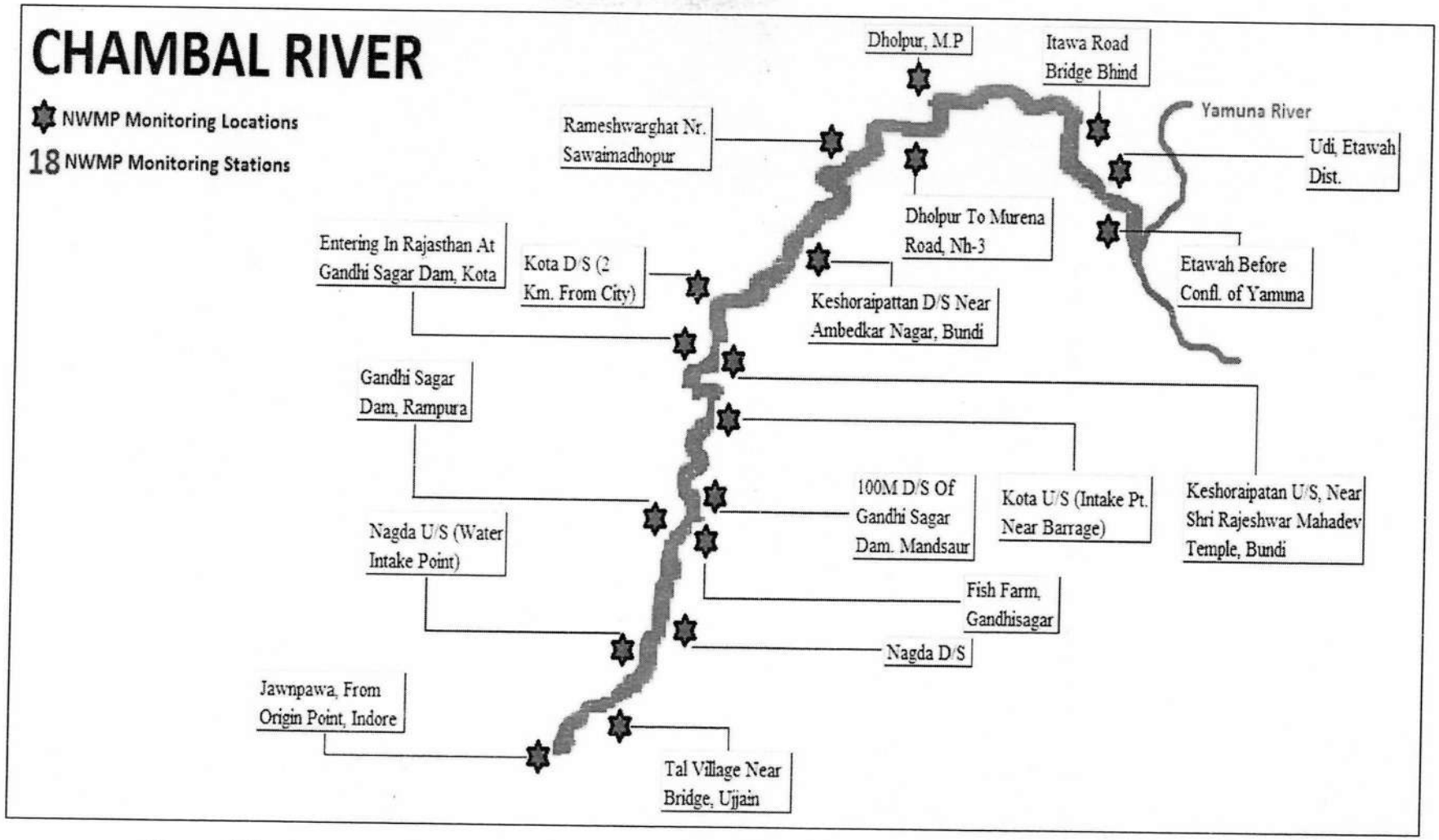

Figure 6.1: State-wise Distribution of Water Quality Monitoring Locations Under NWMP on River Chambal

Table-6.1: Water Quality of River Chambal during Pre (March 2020) and Lockdown Period (April 2020)

Monitoring Locations on River Chambal	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			< 2500 MPN/100mL			
MADHYA PRADESH												
At Nagda u/s Water Intake Point	7.2	7.4	2.8 %	7.7	7.9	2.2	2	-9%	4	4	0.0 %	Complying
At Nagda d/s, M.P.	BDL	2.0	Increase	7.8	7.9	30	28	-6.7%	14000	14000	0.0 %	Non-complying
Tal Village Near Bridge, Ujjain	7.9	6.8	-14%	7.8	7.8	4.2	3.4	-19%	25	21	-16%	Non-complying
At Gandhi Sagar Dam, Rampura	7.5	7.2	-4%	7.0	7.9	2.2	1.8	-10%	6	4	-33.3%	Complying
At 100m D/s of Gandhi Sagar Dam	7.6	7.4	-3%	8.0	7.9	2.2	2.2	Nil	6	5	-16.7 %	Complying
At Dholpur	6.3	8.0	27%	7.8	7.1	2.1	1.5	-29%	2	2	0.0 %	Complying
At Itawa Road Bridge, Bhind	7.1	-	-	7.8	-	2.2	-	-	2	-	-	Complying
No. locations monitored under NWMP	07 locations in March 2020 and 06 locations in April 2020											
No. of monitoring locations results available	07	06	-	07	06	07	06	-	07	06	-	-
No. of locations complying to Criteria	06	05	-	07	06	05	04	-	06	05	-	-
Range	BDL-7.9	2-8	Decrease in % variation 3 to 14 % at 3 locations, Increase in % variation 2.8 - 27 % at 3 locations	7-8	7.1-7.9	2.1- 30	1.5 - 28	Decrease in % variation 6.7 - 29 % at 5 locations and 'No' variation at 1 location	2- 14000	2-14000	Decrease in % variation 16 – 33.3 % at 3 locations and 'No' variation at 3 locations	-

Monitoring Locations on River Chambal	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			< 2500 MPN/100mL			
RAJASTHAN												
At Gandhi Sagar Dam	6.1	5.7	-7%	8.1	8.2	1.8	1.5	-17%	64	39	-39%	Complying
At Kota u/s (Intake Point . Near Barrage)	-	6.3	--	-	8.2	-	1.5	--	-	20	--	Complying
At Kota D/s (2 km.)City)	-	3.7	--	-	8.5	-	3.1	--	-	150	--	Non-complying
Keshoraipatan U/s, Near Shri Raje	-	3.3	--	-	8.6	-	3.2	--	-	120	--	Non-complying
At Keshoraipattan D/s Near Ambedkar	-	2.5	--	-	8.6	-	4.3	--	-	150	--	Non-complying
At Rameshwar Ghat Nr.Sawaimadhopur	-	4.1	--	-	8.6	-	2.7	--	-	75	--	Non-complying
Near Chambal Bridge, Dholpur to Mur	-	4.6	--	-	8.6	-	2.8	--	-	93	--	Non-complying
No. locations monitored in Rajasthan under NWMP	01 location in March 2020 and 07 locations in April 2020											
No. of monitoring locations results available	01	07	-	01	07	01	07		01	07		
No. of locations complying to Primary Water Quality Criteria for Outdoor Bathing	01	02	-	01	03	01	04	-	01	07	-	-
Range	6.1	2.5 - 6.3	% Decrease in variation 7 % at one location	8.1	8.2 - 8.6	1.8	1.5 - 4.3	% Decrease in variation 17 % at one location'	64	20 - 150	% Decrease in variation 39 % at one location	

Monitoring Locations on River Chambal	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			< 2500 MPN/100mL			
Overall Observations on Water Quality of River Chambal (MP & Rajasthan) during Pre-lockdown (March 2020) and Lockdown Period (April 2020)												
No. locations monitored on River Chambal under NWMP	08 locations in March 2020 and 13 locations in April 2020											
No. of monitoring locations results available (in M.P & Rajasthan)	08	13	-	08	13	08	13	-	08	13	-	
Overall Range	BDL -7.9	2 -8	Decrease in % variation 3 to 14 % at 4 locations and Increase in % variation 2.8 - 27 % at 3 locations	07 -8.1	7.1 - 8.6	1.8-30	1.5 - 28	Decrease in % variation 6.7 - 29 % at 6 locations and 'No' variation at 1 location	2 -14000	2 - 14000	Decrease in % variation 16 - 39 % at 4 locations and 'No' variation in 3 locations	

Note:- * Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

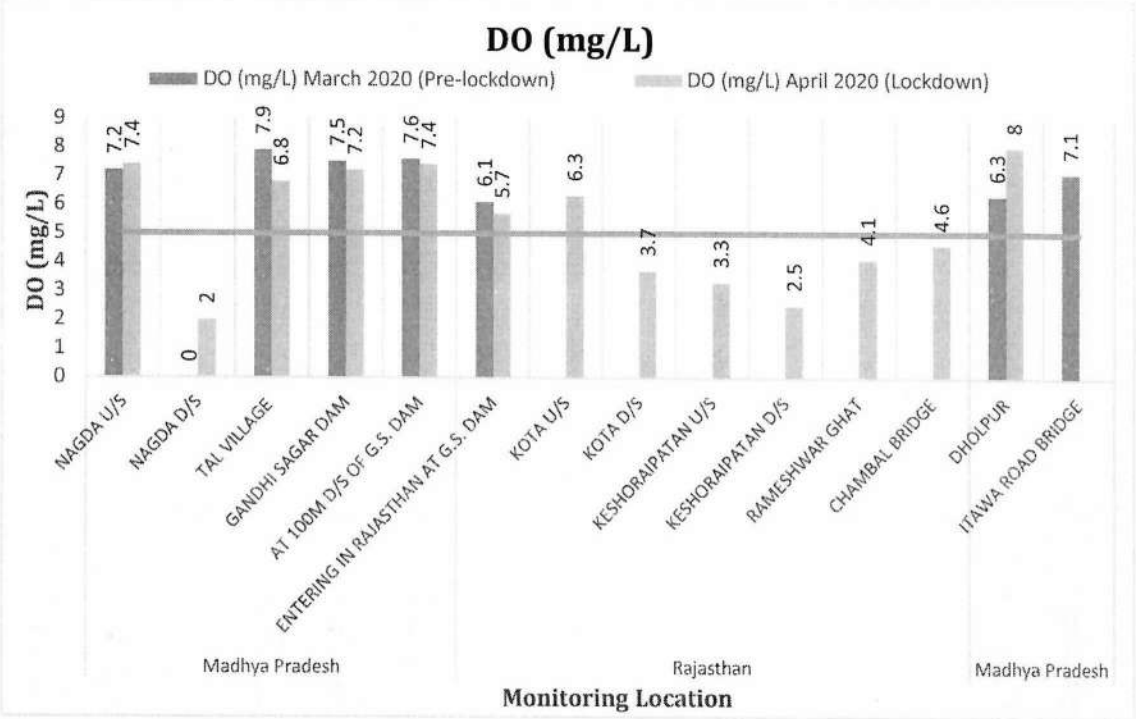

Figure 6.2 : Water Quality of River Chambal for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in MP & Rajasthan

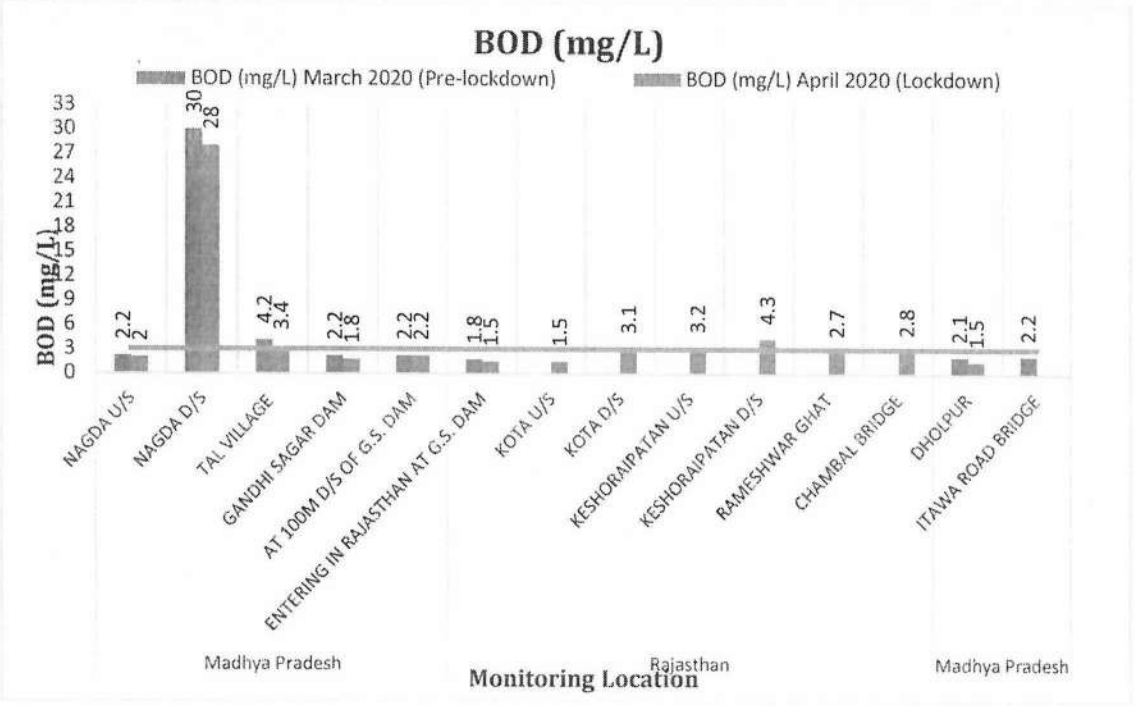

Figure 6.3: Water Quality of River Chambal for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in MP and Rajasthan

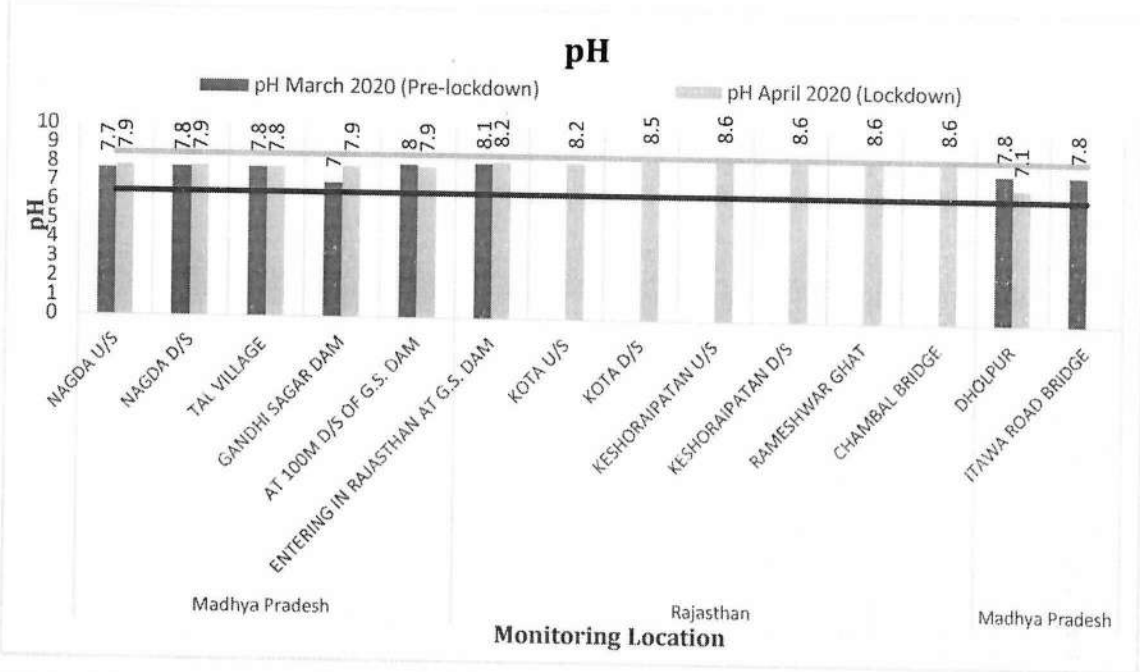

Figure 6.4: Water Quality of River Chambal for pH during pre-lockdown (March 2020) and lockdown (April 2020) in MP and Rajasthan

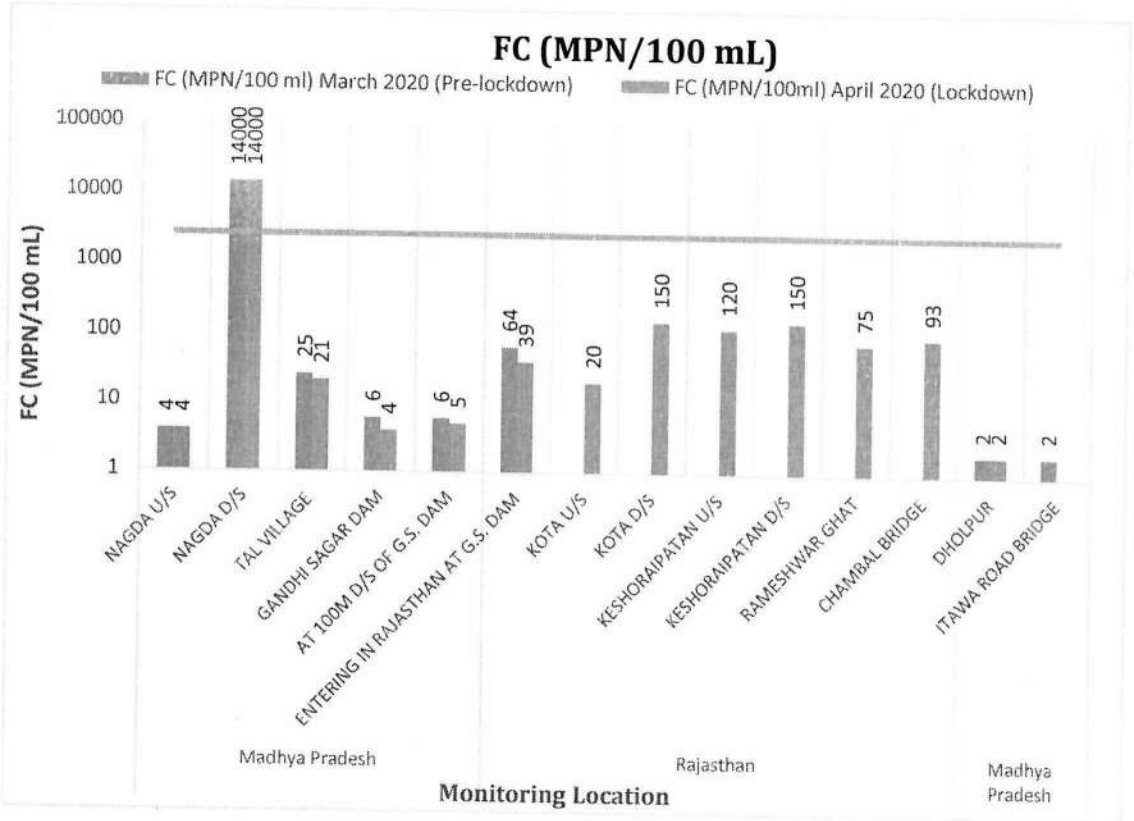

Figure 6.5: Water Quality of River Chambal for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) in MP and Rajasthan.

6.4 Observations

Based on the analytical results collected from river Chambal, following findings/observations are made:

Madhya Pradesh

During the pre-lock down period (March 2020):-

- The analysis results for four critical parameters were observed in the order of pH (7 - 8), DO (BDL-7.9 mg/L), BOD (2 -30 mg/L) and FC (2-14000 MPN/100 mL) at the 07 monitored locations.

- 5 out of 7 monitored locations were found to be complying to the outdoor bathing limits. BOD at 2 monitored locations and FC at 1 monitored location (D/s Nagda) were not complying to the Primary Water Quality Criteria for Outdoor Bathing whereas pH was complying at all the 07 monitored locations.

- Minimum DO as 'Nil', maximum BOD as 30 mg/L and maximum FC (14000 MPN/100 mL) were observed at D/s Nagda, which could be due to discharge of untreated municipal sewage or industrial discharge from Nagda.

During the lock down period (April 2020): -

- The analysis results for four critical parameters indicate pH (7.1-7.9), DO (2 - 8 mg/L), BOD (1.5 –28 mg/L) and FC (2 - 14000 MPN/100 mL) at the 06 monitored locations.

- 4 out of 6 monitored locations were found to be complying to the Primary Water Quality Criteria for Outdoor Bathing. Also, pH at 06 locations, DO & FC at 05 locations each and BOD at 04 locations were found to be within the desirable limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- Minimum DO as '2 mg/L', maximum BOD as 28 mg/L and maximum FC (14000 MPN/100 mL) were observed at D/s Nagda, which could be due to discharge of untreated municipal sewage discharge from Nagda city in .

Over all observations on river Chambal (M.P): -

- The minimum value of DO observed was 'BDL' at Nagda D/s and maximum DO (7.9 mg/L) at Tal Village, Near Bridge, Ujjain during pre-

lockdown whereas, minimum DO (2 mg/L) was observed at Nagda D/s and maximum DO (8.0 mg/l) at Dholpur during lockdown period reflecting industrial activity or domestic waste water discharge.

- Minimum BOD (2.1mg/L) was observed at Dholpur and maximum BOD (30 mg/L) at Nagda D/s during pre-lockdown period whereas, minimum BOD (1.5 mg/L) was observed at Dholpur and maximum BOD (28 mg/L) at Nagda D/s during lockdown. High values of BOD at Nagda can be attributed to high industrial activity or domestic waste water discharge in the region. However, due to restriction in industrial activity during lockdown period, marginal reduction in BOD was observed from 30 mg/L to 28 mg/L at Nagda D/s.

- Fecal Coliform (2 MPN/100 mL) was minimum at Itawa Road Bridge and at Dholpur and maximum FC (14000 MPN/100 mL) at Nagda D/s during pre-lockdown period whereas, minimum FC (2 MPN/100 mL) was observed at Dholpur and maximum FC (14000 MPN/100 ml) at Nagda D/s during lockdown period. High value of FC during both lockdown and pre-lockdown period at Nagda D/s indicates domestic waste water discharge into the river Chambal in the region.

- The analysis results showed decreasing trend for DO (3-14 %) at 3 locations, BOD (6.7 -29 %) at 5 locations and FC (16 -33 %) at 3 locations whereas increasing trend for DO (2.8 - 27 %) at 3 locations was observed. 'No' variation in BOD at 1 location and FC at 3 locations were observed.

Rajasthan

During the pre-lock down period (March 2020): -

- The analysis results of one monitored location indicate pH (8.1), DO (6.1 mg/L), BOD (1.8 mg/L) and FC (64 MPN/ 100 mL) and complied to the four critical parameters (i.e. pH, DO, BOD and FC) limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- Minimum DO as '6.1 mg/L', maximum BOD as 1.8 mg/L and maximum FC (64 MPN/100 mL) at Gandhi Sagar Dam were observed and complying to bathing criteria limits.

During the lock down period (April 2020): -

- The analysis results of seven monitored locations for four critical parameters were found to be in the ranges of pH (8.2-8.6), DO (2.5 -

6.3 mg/L), BOD (1.5 – 4.3 mg/L) and FC (20 - 150 MPN/100 mL) at 07 monitored locations.

- 02 monitored locations were observed to be complying with the analysed critical parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.
- Also, pH at 03 locations, DO at 02 locations, BOD at 04 locations and FC at all the 07 monitored locations were observed to be within the desirable limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.
- Minimum DO as '2.5 mg/L', maximum BOD as 4.3 mg/L and maximum FC (150 MPN/100 mL) were observed at Keshoripattan.

Over all observations on water quality of river Chambal (Rajasthan): -

- The analysis results shown decreasing trend of DO (7 %) at one location, BOD (17 %) at one location and FC (39 %) at one monitored location.

Overall Observations on River Chambal (covering MP & Rajasthan): -

- The minimum value of DO observed was 'BDL' at Nagda D/s and maximum DO (7.9 mg/L) at Tal Village, Near Bridge, Ujjain during pre-lockdown whereas, minimum DO (2 mg/L) was observed at Nagda D/s and maximum DO (8.0 mg/l) at Dholpur during lockdown period.
- Minimum BOD (1.8 mg/L) was observed at Gandhi Sagar Dam and maximum BOD (30 mg/L) at Nagda D/s during pre-lockdown period whereas, minimum BOD (1.5 mg/L) was observed at Dholpur, Gandhi Sagar Dam and at Kota U/s and maximum BOD (28 mg/L) at Nagda D/s during lockdown. High values of BOD at Nagda can be attributed to high industrial activity or domestic waste water discharge in the region. However, due to restriction in industrial activity during lockdown period, marginal BOD reduction was observed from 30 mg/L to 28 mg/L at Nagda D/s.
- Fecal Coliform count (2 MPN/100 mL) was observed as minimum at Dholpur and Itawa Road Bridge and maximum at Nagda D/s (14000 MPN/100 ml) during pre-lockdown period whereas, minimum FC was observed at Dholpur (2 MPN/100 ml) and maximum at Nagda D/s (14000 MPN/100 ml) during lockdown period. High value of FC during both lockdown and pre-lockdown period at Nagda D/s indicates high

domestic waste water discharge into the river Chambal in the region.

- The analysis results revealed decreasing trend of DO (3 -14 %) at 4 locations, BOD (6.7 - 29 %) at 6 locations and FC (16 -39 %) at 4 locations. Increasing trend of DO (2.8 - 27 %) at 3 monitored locations while 'no' variation in BOD at 1 location and FC at 3 monitored locations.

6.5 Conclusion

During Pre-lockdown (March 2020), 6 out of 8 monitored locations and 6 out of 13 monitored locations during lockdown (April 2020) were found to be complying with the Primary Water Quality Criteria for Outdoor Bathing. Althorugh,marginal improvement in water quality of river Chambal was observed with respect to DO, BOD and FC parameters, the water quality of river Chambal was deteriored in terms of % compliance of moniotored locations for the Primary Water Quality Criteria for Outdoor Bathing.

7. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER BRAHMAPUTRA

7.1 About Brahmaputra River

The Brahmaputra river originates from the Kailash ranges of Himalayas in Tibet and runs for about 2900 km through China, India and Bangladesh. After flowing through Tibet it enters India through Arunachal Pradesh and flows through Assam valley. After joining of two tributaries viz. the Dibang or Sikang and the Lohit, from here onwards the river is known as 'Brahmaputra', it then enters in Bangladesh and finally makes a delta along with river Ganga before its out fall in to Bay of Bengal. Out of the total length of 2900 km, its length in India is 916 Km. The major ion chemistry of the Brahmaputra is characterized by high bi-carbonate content and source rock influence. While higher values of Total Suspended Matter (TSM) than Total Dissolved Solids (TDS) during monsoon indicate predominance of physical weathering over chemical weathering, chemical weathering is relatively more pronounced during the dry season. On average, 60 % of the bicarbonates in the Brahmaputra water come from silicate weathering and the rest from the carbonates. During its course in Assam valley from Kobo to Dhubri the river is joined by about 20 (twenty) important tributaries on its North bank which includes river Subansiri, Ronganadi, Dikrong, Buroi, Borgong, Jiabharali, Dhansiri (North) Puthimari, Manas, Beki, Aie, Sonkosh while the Noadehing, Buridehing, Desang, Dikhow, Bhogdoi, Dhansiri (South), Kopilli, Kulsi, Krishnai, Dhdhnoi, Jinjiran are the main

tributaries on the south bank of the river Brahmaputra. In Assam, major towns located on the bank of Brahmaputra are Dibrugarh, Dhubri, Jorhat, Tezpur, Guwahati. There are no major/minor industrial estate/cluster located on the 500 m periphery of the Brahmaputra river bank. Sewage generated from Tezpur and Guwahati City are directly discharged and are the major sources of pollution in river Brahmaputra.

7.2 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

Water quality of river Brahmaputra is evaluated at 11 locations by Central Pollution Control Board in association with Pollution Control Board, Assam under National Water Quality Monitoring Programme (NWMP). State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Brahmaputra is depicted in **Figure 7.1.**

7.3 Analytical Results

Water quality monitoring of river Brahmaputra was carried out at 8 locations during pre-lockdown and at 10 locations during lockdown period by Pollution Control Board, Assam to assess the impact on water quality of river Brahmaputra. The analysis results of Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz i.e. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented below in **Table-7.1**.

Based on the monitoring & analysis of collected water samples from river Brahmaputra, the graphical presentation of river Brahmaputra with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are presented in **Figure 7.2 to Figure 7.5.**

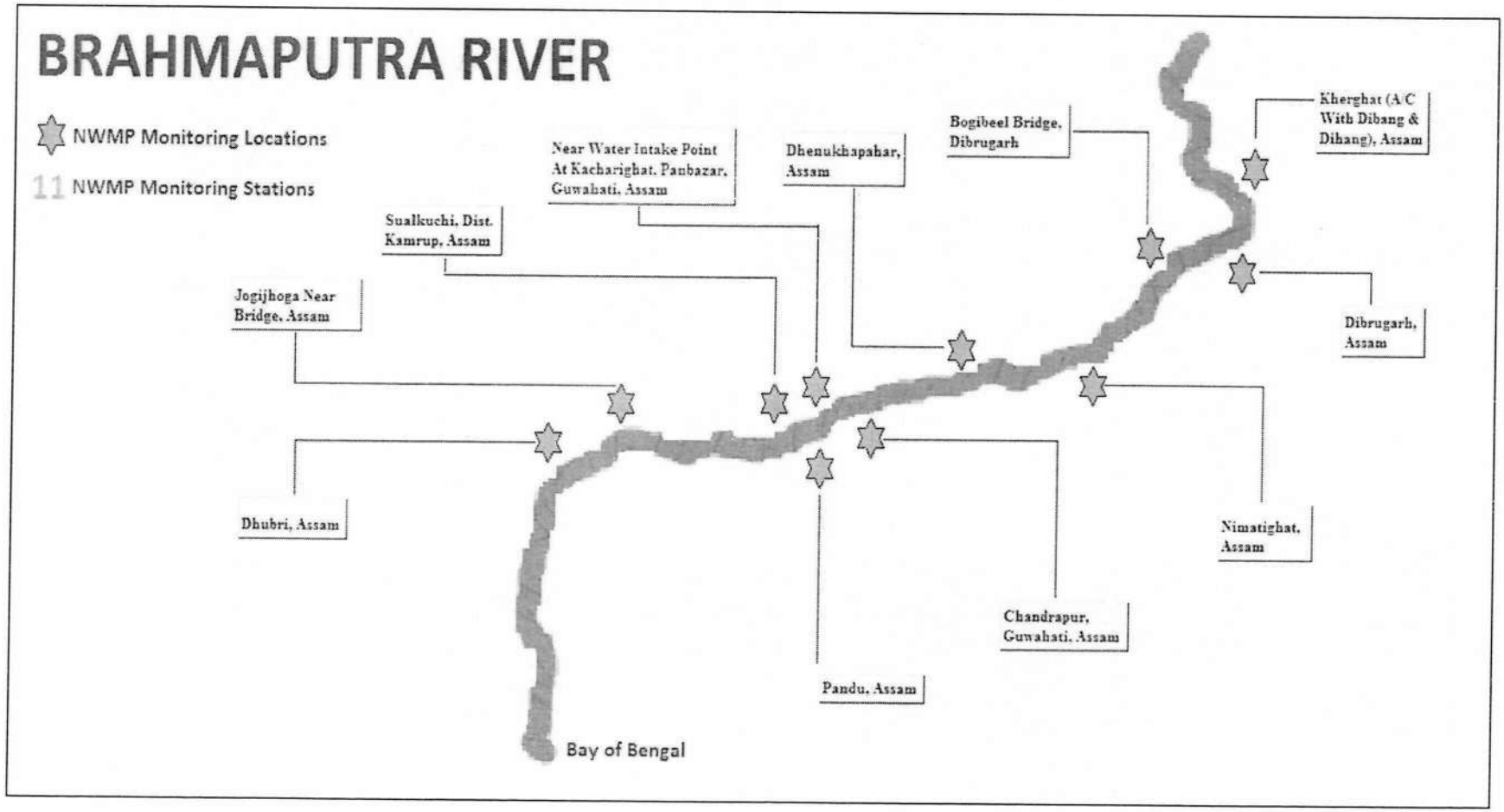

Figure 7.1: Water Quality Monitoring Locations Under NWMP on River Brahmaputra

Table 7.1: Water Quality of River Brahmaputra during Pre (March, 2020) and Lockdown Period (April, 2020)

Monitoring Location on River Brahmaputra in Assam State	Dissolved Oxygen (DO) (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100 mL)			Complying Status w.r.t PWQCOB
	March	April	Variation (% %)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100 mL**			
ASSAM												
At Dibrugarh	9.9	8.0	-19.19%	8.1	7.6	1.6	1.3	-18.8%	300	360	20.00%	Complying
At Pandu	9.5	10.3	8.42%	8.1	7.8	1.8	1.7	-5.6%	730	360	-50.68%	Complying
At Nimatighat	8.0	7.8	-2.50%	7.8	7.4	1.6	1.4	-12.5%	300	360	20.00%	Complying
At Jogijhoga, Nr. Bridge	5.1	7.2	41.18%	8.0	7.6	1.6	1.2	-25.0%	-	610	-	Complying
At Dhenukhapaha	-	6.6	-	-	7.9	-	1.1	-	-	720	-	Complying
At Chandrapur, Guwahati	10.2	9.4	-7.84%	7.8	7.7	1.6	1.2	-25.0%	300	300	0.00%	Complying
At Dhubri	5.3	7.3	37.74%	7.6	7.6	2.4	2.1	-12.5%	610	730	19.67%	Complying
At Sualkuchi, Dist.Kamrup	9.0	7.8	-13.33%	7.9	7.7	1.6	1.8	12.5%	610	300	-50.82%	Complying
Nr. WIP at Kachar	10.4	8.5	-18.27%	8.0	7.8	2.3	1.7	-26.1%	610	730	19.67%	Complying
At Bogibeel Bridge	-	8.7	-	-	7.6	-	1.8	-	-	360	-	Complying
Overall Observations on River Brahmaputra during Pre (March, 2020) and Lockdown Period (April, 2020)												
No of locations monitored	8 locations in March 2020 and 10 locations in April 2020											
No of monitored locations results available	8	10	-	8	10	8	10	-	7	10	-	-
No of locations complying to Bathing Criteria	8	10	-	8	10	8	10	-	7	10	-	
Overall Range	5.1 – 10.4	6.6 - 10.3	Decrease in % variation (2.5 to 19.19 %) at 5 locations and Increase in % variation (8.42 to 41.18%) at 3 locations	7.6 - 8.1	7.4 - 7.9	1.6 – 2.4	1.1 – 2.1	Decrease in % variation (5.6 to 26.1%) at 7 locations and increase in % variation of 12.5 % at 1 location	300 to 730	300 - 730	Decrease in % variation (50.68 to 50.82 %) at 2 locations and increase in % variation (19.67 to 20 %) at 4 locations and 'No' variation at 1 location	

Note:- * Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

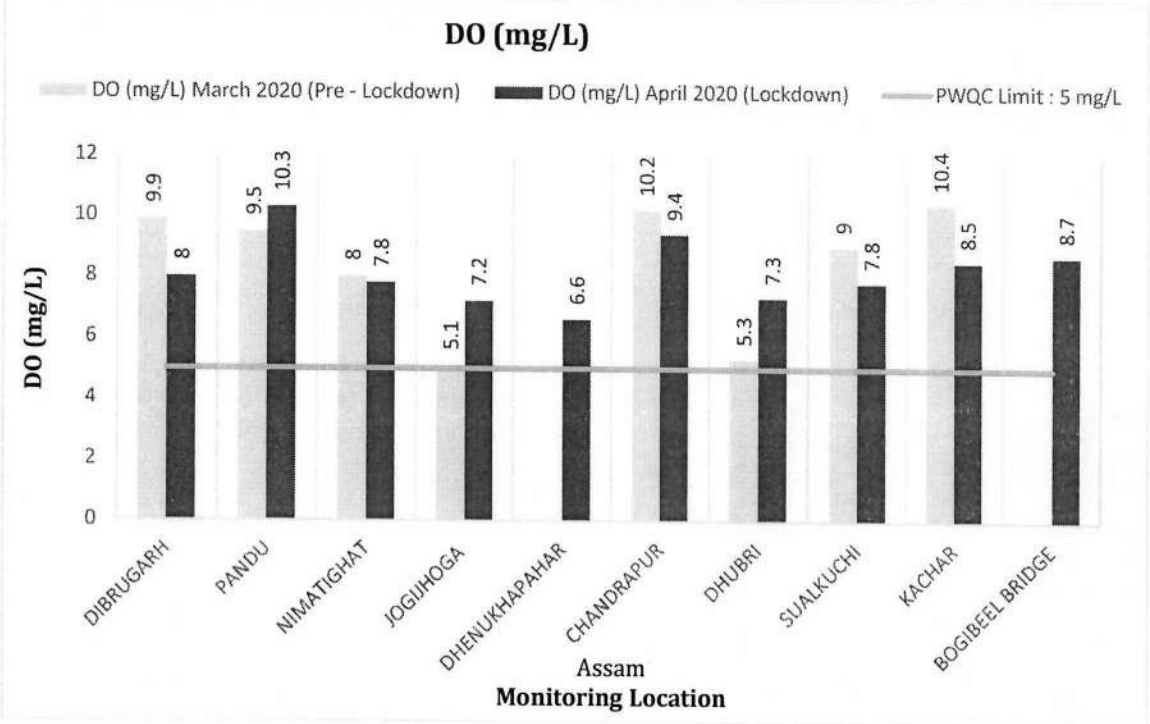

Figure 7.2: Water Quality of river Brahmaputra for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

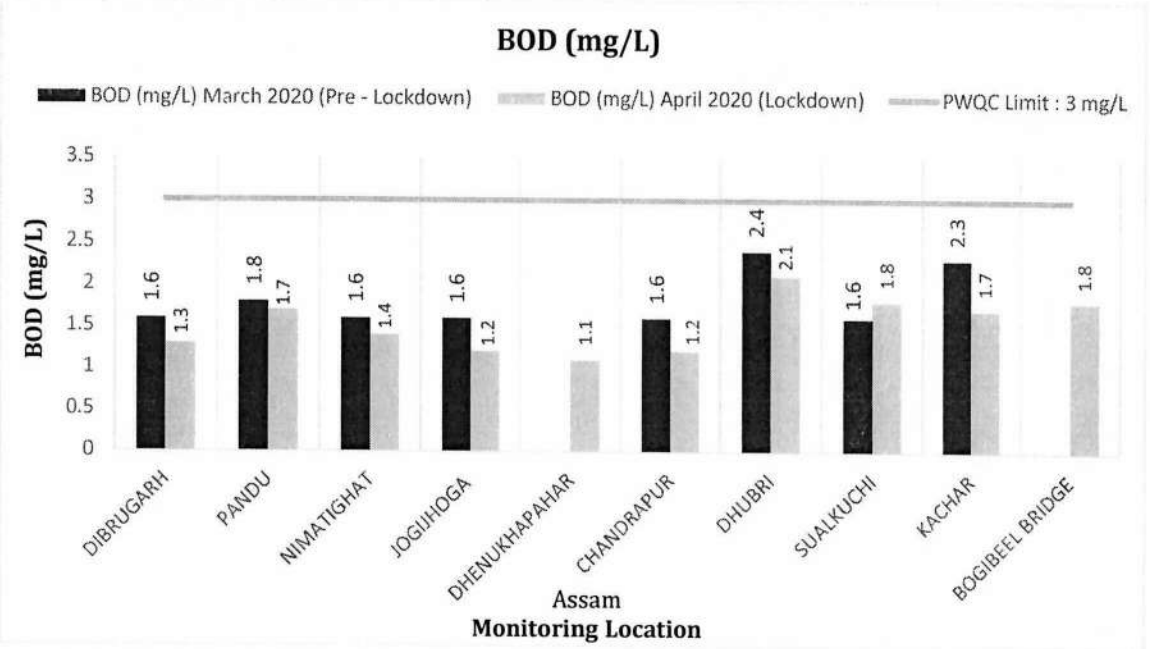

Figure 7.3: Water Quality of river Brahmaputra for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

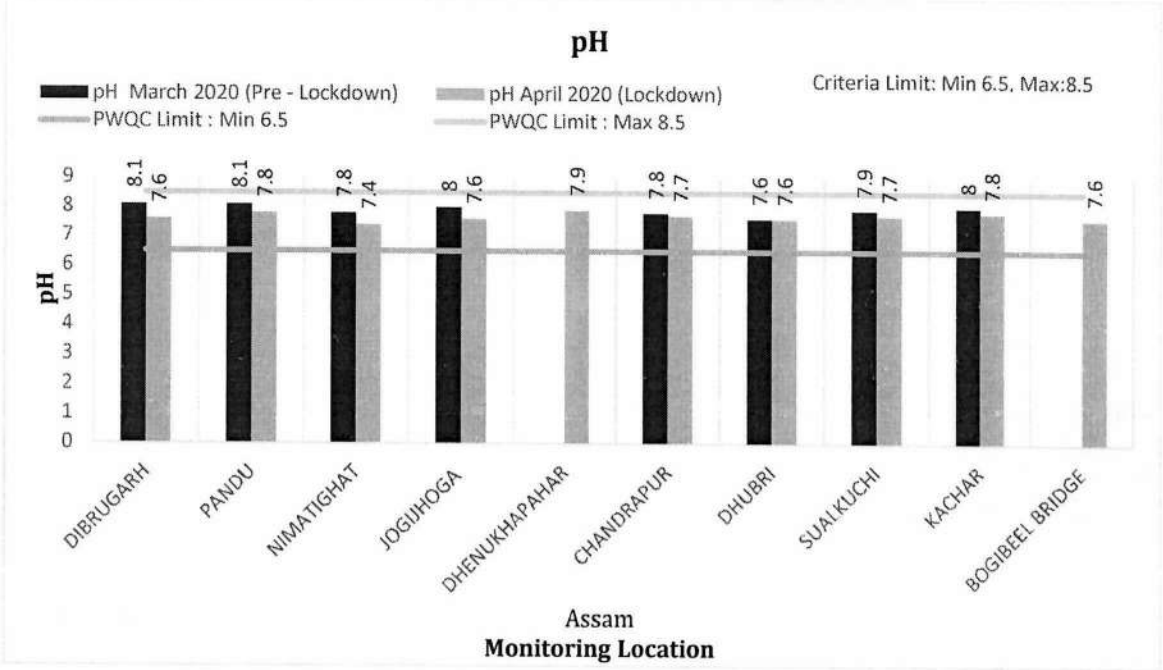

Figure 7.4: Water Quality of river Brahmaputra for pH during pre-lockdown (March 2020) and lockdown (April 2020)

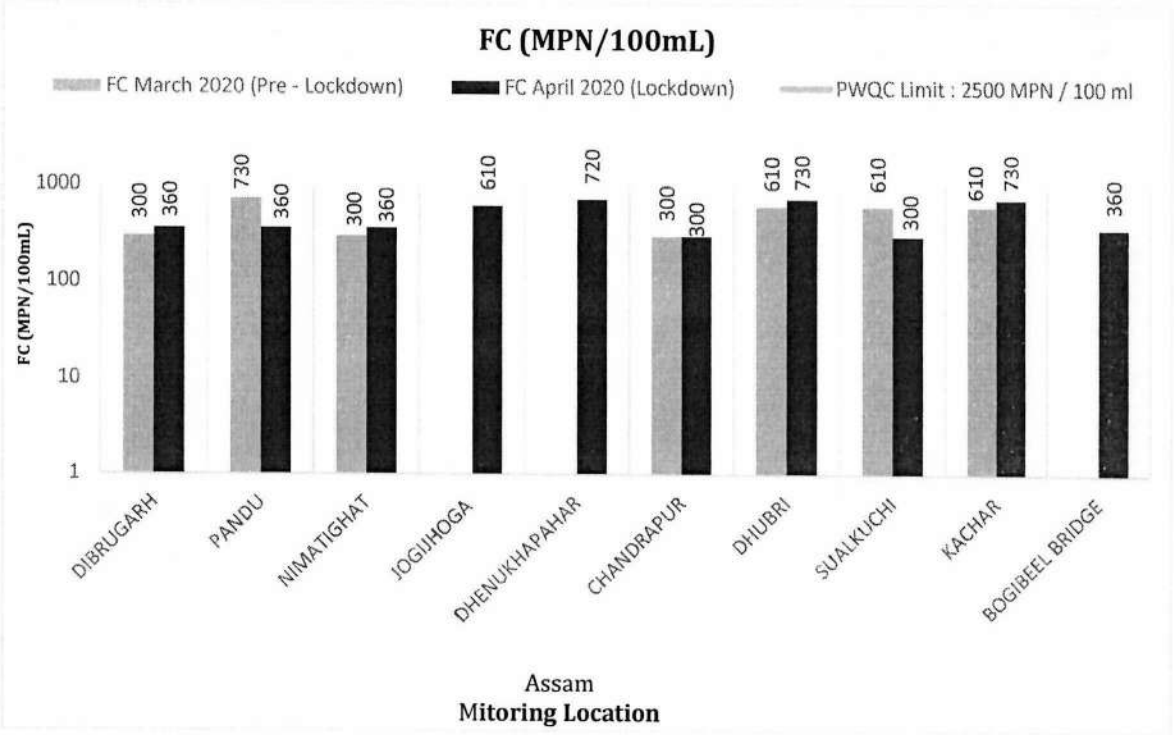

Figure 7.5: Water Quality of river Brahmaputra for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020)

7.4 Observations

Main observations on the analysis results of the collected water samples from River Brahmaputra are detailed in subsequent paras.

Assam

During the pre-lock down period (March, 2020): -

- The analysis results of four critical parameters at 8 monitored locations were observed to be in the order of pH (7.6-8.1), DO (5.1-10.4 mg/L), BOD (1.6-2.4 mg/L) and FC (300-730 MPN/100 mL) (not analysed for one location).

- 7 out of 8 monitored locations were observed to be complying to the limits for critical parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- The monitored results showed maximum DO (10.4 mg/L) at WIP, Kachar and minimum DO (5.1 mg/L) at Jogijhoga Nr Bridge whereas maximum BOD (2.4 mg/L) was observed at Dhubri and minimum BOD (1.6 mg/L) at 5 out of 8 monitored locations. Maximum FC count was observed as 730 MPN/100 mL at Pandu and minimum as 300 MPN/100 mL at 3 locations viz., Dibugarh, Nimatighat and at Chandrapur, Guwahati.

During the lock down period (April, 2020): -

- The analysis results of four parameters for 10 monitored locations were observed to be in the order of pH (7.4-7.9), DO (6.6-10.3 mg/L), BOD (1.1-2.1 mg/L) and FC (300-730 MPN/100 mL).

- All 10 monitored locations were found to be complying with the critical parameters (i.e. pH, DO, BOD and FC) limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- The monitored results showed maximum DO (10.3 mg/L) at Pandu and minimum at Dhenukhapaha (6.6 mg/L). whereas maximum BOD was observed at Dhubri (2.1 mg/L) and minimum at Dhenukhapaha (1.1 mg/L). Maximum FC count was observed as 730 MPN/100 mL at 02 locations (viz., Dhubri & Nr. Water Intake Point at Kachar) and minimum FC as 300 MPN/100 mL at 02 locations (viz., Chandrapur, Guwahati & at Sualkuchi, District Kamrup).

Overall Observations on River Brahmaputra (covering Assam): -

Only one monitored location on river Brahmaputra had local impacts which are visible from the analysis results. The analysis results of monitored locations on river Brahmaputra in Assam State revealed

- Decreasing trend of DO (2.5 -19.19 %) at 5 locations, BOD (5.6 - 26.1%) at 7 locations and FC (50.68 -50.82%) at 02 locations were observed.

- Increasing trend of DO (8.42 -41.18%) at 03 locations, BOD (12.5 %) at 1 location and FC (19.67 -20 %) at 4 locations were observed while 'No' variation in FC was observed at 1 location.

7.5 Conclusion

07 out of 08 monitored locations on river Brahmaputra during pre-lockdown period (March 2020) and all 10 monitored locations during lockdown period (April 2020) and overall, an improvement in water quality of river Brahmaputra was observed w.r.t the criteria parameters viz., DO, BOD and FC as well as 100 % compliance of all the monitored locations for the outdoor bathing criteria paramters was observed during lockdown period.

8.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER MAHI

8.1 About Mahi River

The river Mahi is 583 km long, originating in Madhya Pradesh State and passing through Rajasthan and Gujarat States and finally draining into Gulf of Khambhat in Gujarat. Main tributaries of river Mahi are River Som, Jakham, Moran and Bhadar. Important Urban Centres in the watershed of Mahi river are Ratlam, Jaora in Madhya Pradesh, Godhra, Vadodara, Dohad and Dabhoi in Gujarat and Banswara in Rajasthan.

Vadodara is the major center for industrial activity and majority of industrial units are pharmaceutical, petrochemicals, distillery, fertilizer, dyes & dye intermediates and pesticides. Industries such as fertilizer, oil refinery, caustic soda and Dyes & Dye Intermediate units located in Vadodara industrial estate are possible sources of discharges into the Gulf of Khambhat through the Vadodara effluent channel.

8.2. Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water Quality of river Mahi is evaluated at 17 locations by Central Pollution Control Board (CPCB) in association with M.P. Pollution Control Board (MPPCB), Gujarat Pollution Control Board (GPCB) & Rajasthan State Pollution Control Board (RSPCB) under National Water Quality Monitoring

Programme (NWMP). State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Mahi is depicted in **Figure 8.1**.

8.3 Analytical Results

Water quality of river Mahi was carried out at 14 locations during Pre-lockdown [MP (04), Rajasthan (01) and Gujarat (9)] and lockdown period [MP (04), Rajasthan (01) and Gujarat (9)] to assess the impact on water quality of river Mahi. The analysis results of Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented in **Table-8.1**.

Based on the monitoring & analysis of collected water samples from river Mahi, the water quality trend of river Mahi with respect to critical parameters viz., DO, pH, BOD and FC as observed during Pre-lockdown (March 2020) and lockdown period (April 2020) are depicted in **Figure 8.2 to Figure 8.5.**

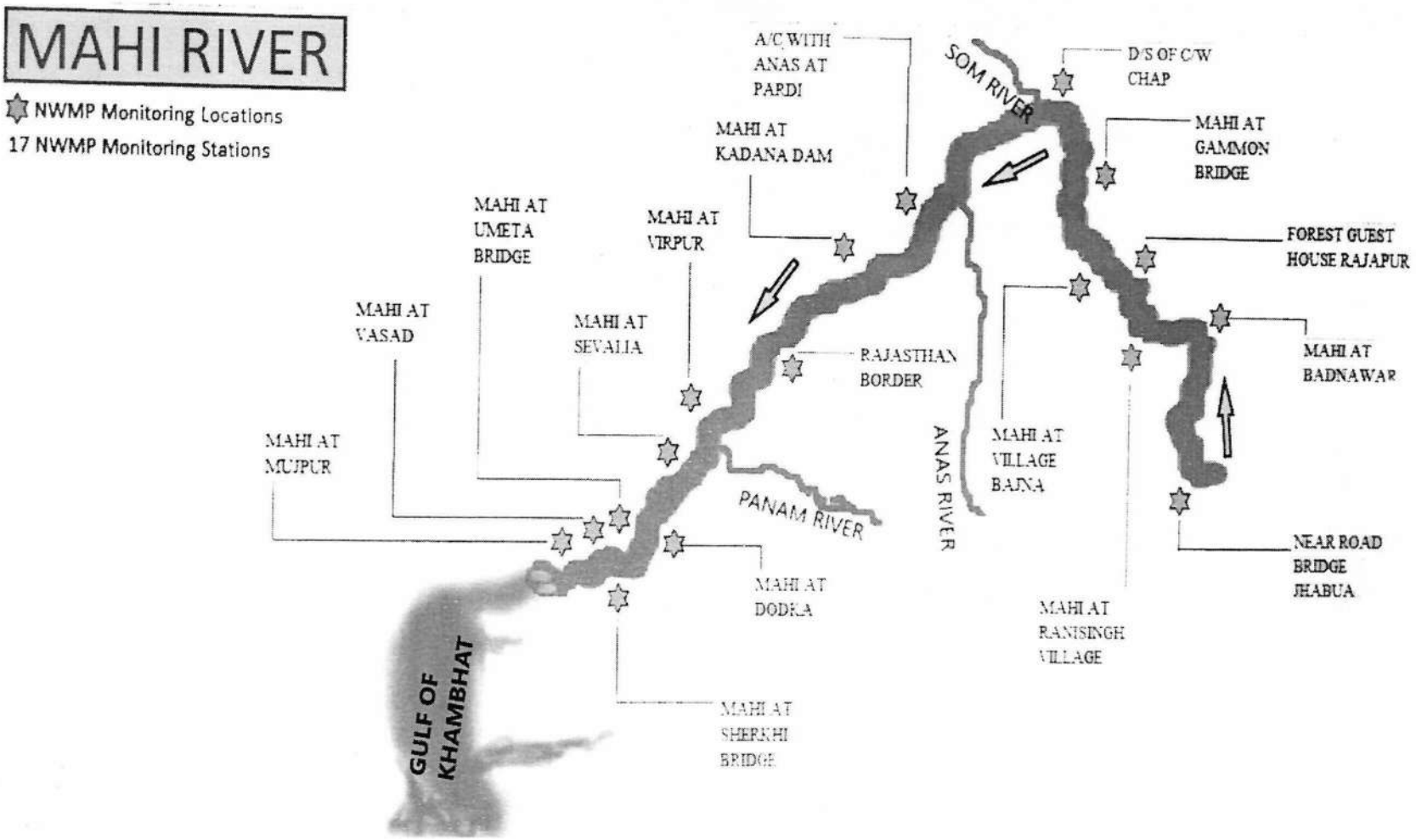

Figure 8.1: State-wise Distribution of Water Quality Monitoring Locations Under NWMP on River Mahi

Table-8.1: Water Quality of River Mahi during pre (March 2020) and during lockdown (April 2020)

Monitoring Locations on River Mahi	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform* (MPN/100mL)			Compliance status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100 mL**			
MADHYA PRADESH												
Near Road Bridge Jhabua	6.9	8	15.9%	7.6	8.3	1.4	BDL (0.8)	-43%	BDL	BDL	0.0%	Complying
At Badnawar, M.P	7.4	7.9	6.8%	7.7	8.1	1.3	BDL (0.8)	-38%	BDL	BDL	0.0%	Complying
At Ranisingh Village, Ratlam, Ujjain	7	7.4	5.7%	7.8	7.9	2	1.8	-10%	8	3	-62.5%	Complying
Forest Guest House, Rajapur Mataji Shivgarh, Ratlam	7.9	7.6	-3.8%	7.6	7.7	2	1.8	-10%	6	3	-50.0%	Complying
No. of locations monitored in MP State	04 locations in March 2020 and 04 locations in April 2020											
No. of monitoring locations results available	04 locations in March 2020 and 04 locations in April 2020											
No. of locations complying to PWQ Criteria	04	04	-	04	04	04	04	-	04	04	-	
Range	6.9-7.9	7.4-8.0	Decrease in % variation 3.8 at 1 location and Increase in % variation 5.7 - 15.9% at 3 locations	7.6-7.8	7.7-8.3	1.3-2.0	BDL -1.8	Decrease in % variation 10 - 43 % at 4 locations	BDL -8.0	BDL-3.0	Decrease in % variation 50 - 62.5 at 2 locations and 'No' % variation at 2 locations	
RAJASTHAN												
D/s Confluence with R. Chap (Under Sagwara – Sarhi Rd.Bldg)	4.4	4.9	11.4%	8.3	8.4	1.3	1	-23%	75	64	-14.7%	Non-complying
No. of locations monitored in Rajasthan	01 location in March 2020 and 01 in April 2020											

Monitoring Locations on River Mahi	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform* (MPN/100mL)			Compliance status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100 mL**			
No. of monitoring locations results available	01 location in March 2020 and 01 in April 2020											
No. of locations complying to PWQ Criteria	0	0	-	01	01	01	01	-	01	01	-	Non-complying
Range	-	-	Increase in % variation 11.4% at 1 location	-	-	-	-	Decrease in % variation 23 % at 1 location	-	-	Decrease in % variation 14.7 % at 1 location	-
GUJARAT												
Mahi After Confluence with Anas at Pardi (Banaswada)	7.8	8.3	6.4%	8.1	7.8	BDL (0.5)	BDL(0.4)	-20%	12	6	-50.0%	Complying
Near Rajasthan border at Kadana Dam	8.3	8.4	1.2%	7.9	7.8	BDL(0.4)	BDL(0.4)	0%	2	2	0.0%	Complying
At Virpur,	7.9	7.9	0.0%	8.1	8	BDL(0.4)	BDL(0.4)	0%	12	4	-66.7%	Complying
At Sevalia	7.8	7.9	1.3%	8.3	7.8	BDL(0.4)	BDL(0.3)	-25%	4	4	0.0%	Complying
At Umeta Bridge	7.6	8.1	6.6%	8.4	8.2	BDL(0.6)	BDL(0.5)	-17 %	26	12	-53.8%	Complying
At Dodka	8.2	8.2	0.0%	8.3	8	BDL(0.4)	BDL(0.4)	0%	12	4	-66.7%	Complying
At Vasad	7.7	7.7	0.0%	8.1	8.1	BDL(0.5)	BDL(0.4)	-20%	33	6	-81.8%	Complying
At Sherkhi Bridge	7.3	8.2	12.3%	8.3	8.3	BDL(0.6)	BDL(0.5)	-17 %	46	11	-76.1%	Complying
At Mujpur	7	6.5	-7.1%	8.3	8.1	BDL(0.6)	BDL(0.6)	0%	14	12	-14.3%	Complying
No. of locations monitored in Gujarat	09 locations in March 2020 and 09 locations in April 2020											-
No. of monitoring locations results available in Gujarat	09 locations in March 2020 and 09 locations in April 2020											-
No. of locations complying to PWQ Criteria for Bathing	09	09	-	09	09	09	09	-	09	09	-	-
Range	7.0-8.3	6.5-8.4	Decrease in % variation	7.9-8.4	7.8-8.3	BDL (0.4-0.6)	BDL (0.3-0.6)	Decrease in %	2 -46	2 -12	Decrease in %	-

Monitoring Locations on River Mahi	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform* (MPN/100mL)			Compliance status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100 mL**			
			7.1 % at 1 location and Increase in % variation 1.2 to 12.3% at 5 locations and 'No' % variation at 3 locations					variation 17 - 25 % at 5 locations and 'No' % variation at 4 locations			variation 14.3 -81.8 % at 7 locations and 'No' % variation at 2 locations	
Overall Observations on River Mahi (Covering 3 States viz., Madhya Pradesh, Rajasthan and Gujarat) during Pre-lockdown and Lockdown Period												
No. of locations monitored in all the 3 States	14 locations during Pre-lockdown (March 2020) and Lockdown (April 2020)											
No. of monitoring locations results available	14 locations during Pre-lockdown (March 2020) and Lockdown (April 2020)											
Overall Range	4.4 - 8.3	4.9 - 8.4	Decrease in % variation 3.8 - 7.1 % at 2 locations and Increase in % variation 1.2 - 15.9 % at 9 locations and 'No' % variation at 3 locations	7.6 -8.4	7.7 - 8.4	BDL - 2	BDL - 1.8	Decrease in % variation 10 -43 % at 10 locations and 'No' % variation at 4 locations	BDL - 75	BDL - 64	Decrease in % variation 14.3 - 81.8 % at 10 locations and 'No' % variation at 4 locations	

Note:- *(Values below 1 mg/L for BOD to be considered as BDL) and (Values below 1.8 MPN/100 mL for FC to be considered as BDL)

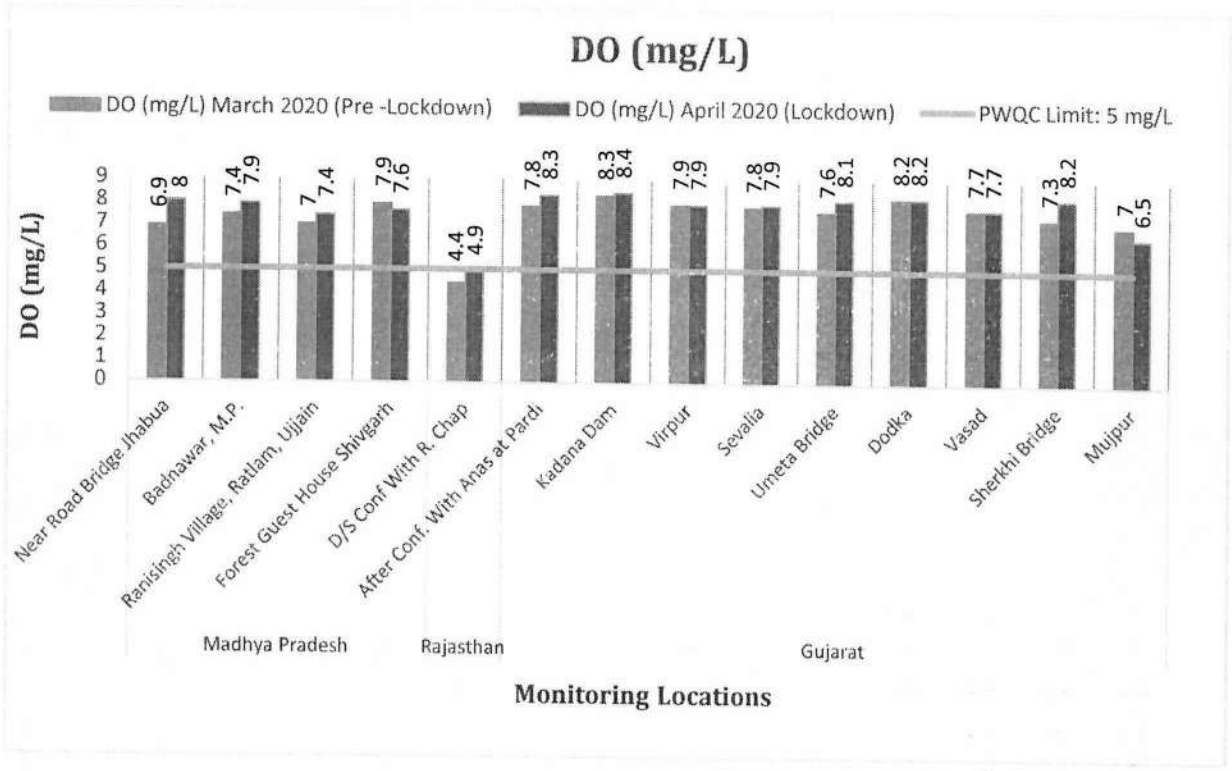

Figure 8.2: Water Quality of river Mahi for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

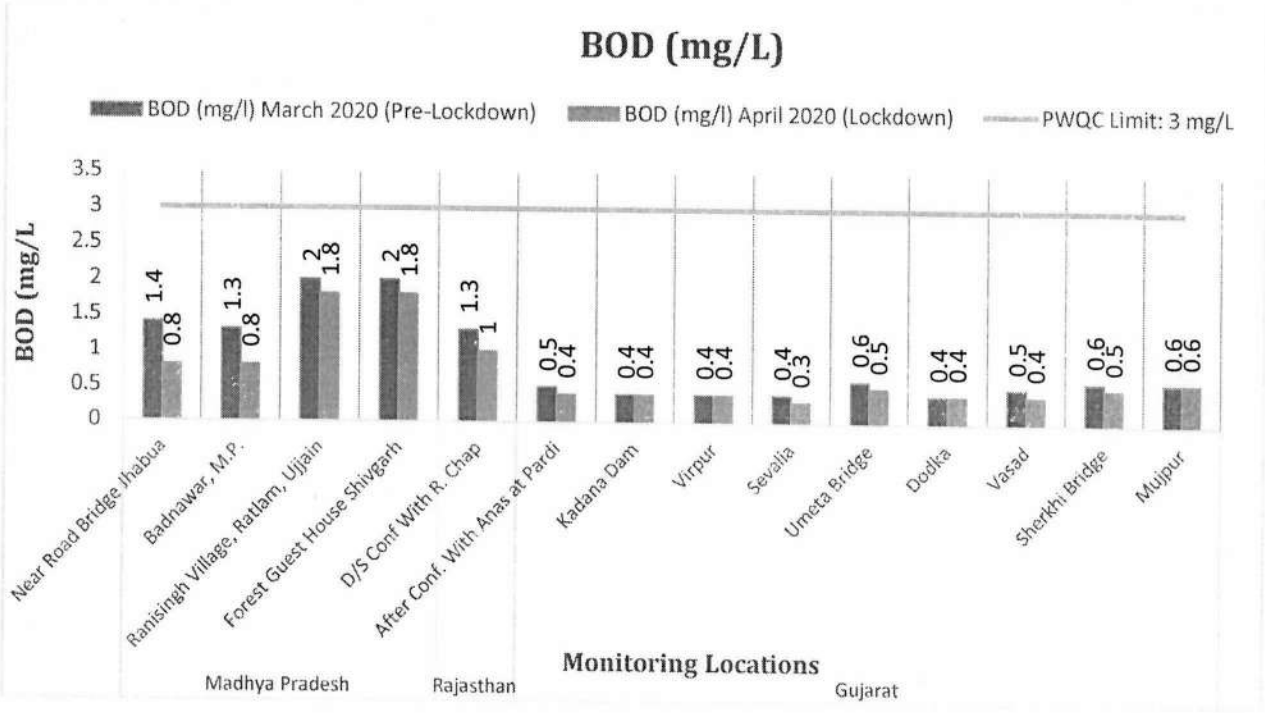

Figure 8.3: Water Quality of river Mahi for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

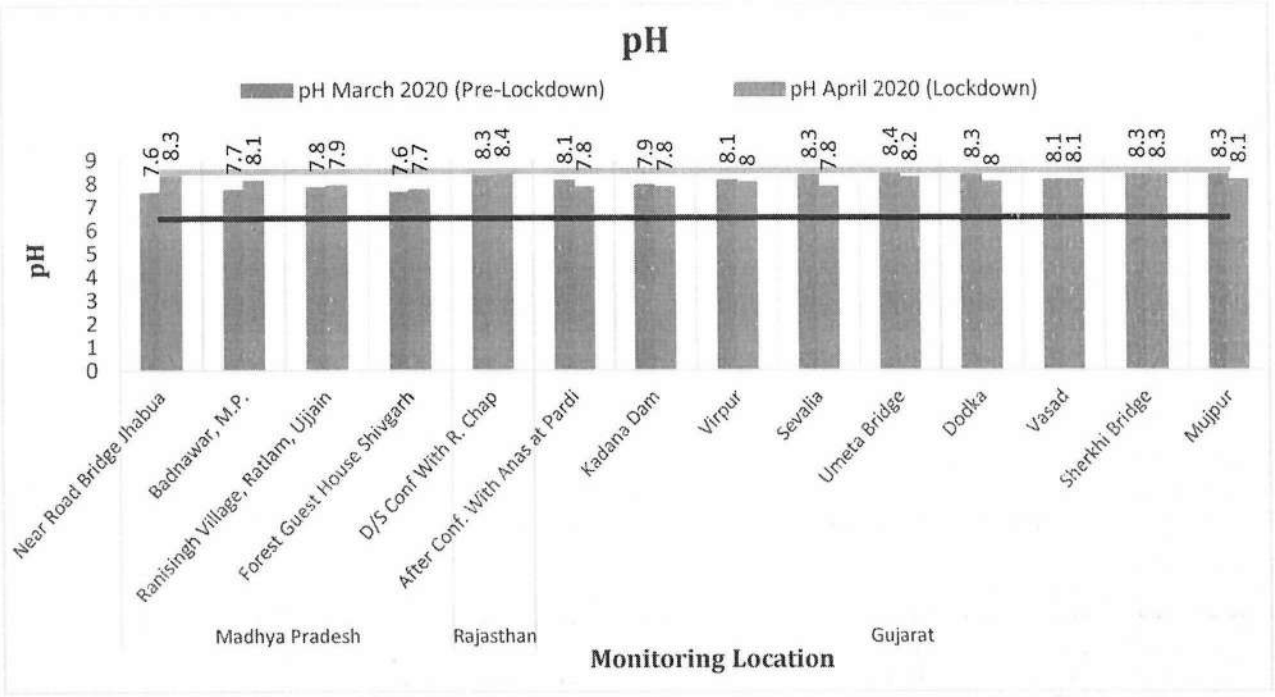

Figure 8.4: Water Quality of river Mahi for pH during pre-lockdown (March 2020) and lockdown (April 2020)

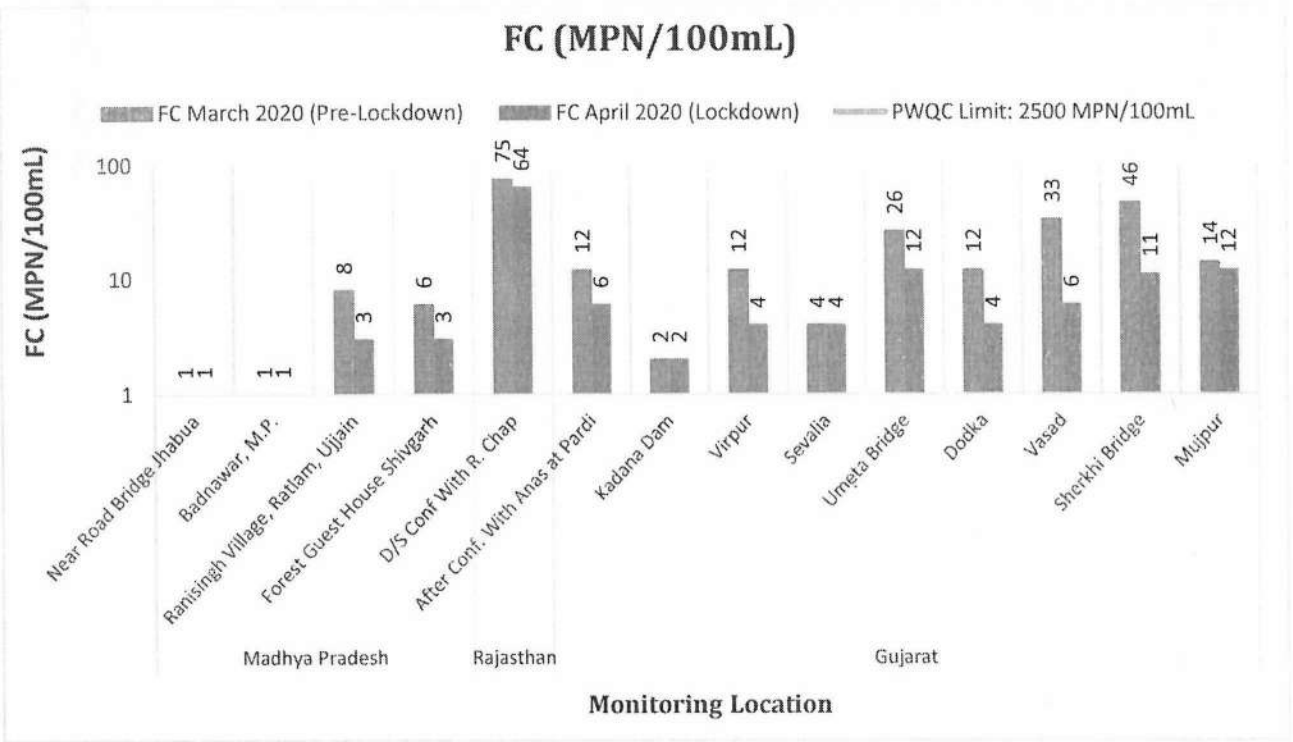

Figure 8.5: Water Quality of river Mahi for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020)

8.4 Observations

Based on the analytical results of the samples collected from river Mahi, following findings/observations are made:

Madhya Pradesh

During the pre-lock down period (March 2020): -

- The analysis results of 04 monitored locations were observed to be in the order of pH (7.6 - 7.8), DO (6.9 -7.9 mg/L), BOD (1.3 -2.0 mg/L) and FC (BDL-8.0 MPN/100mL) at 04 monitored locations.

- All the 4 monitored locations (04) were found to be complying with the monitored criteria parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- Maximum DO (7.9 mg/L) was observed at Rajapur Mataji Shivghar, Ratlam and minimum DO (6.9 mg/L) was observed at Road Bridge, Jhabua while maximum BOD (7.8 mg/L) and FC (8 MPN/100mL) was observed at Ranisingh Village, Ratlam.

During the lock down period (April 2020):-

- The analysis results of 04 monitored locations indicate pH (7.7- 8.3), DO (7.4 -8.0 mg/L), BOD (BDL -1.8 mg/L) and FC (BDL -3.0 MPN/100mL). All the monitored locations (04) were found to be within the desirable limits for the critical parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- Minimum DO (7.4 mg/L) was observed at Ranisngh Village, Ratlam while maximum BOD (1.8 mg/L) observed at 2 locations and minimum BOD (BDL) at 2 locations whereas and maximum FC (3 MPN/100mL) observed at 2 locations viz., Rajapur Mataji Shivghar, Ratlam and Ranisngh Village, Ratlam.

Overall observations on river Mahi within Madhya Pradesh State: -

- The analysis results revealed increasing trend of DO (5.7 -15.9 %) at 3 locations, and decreasing trend of DO (3.8 %) at 1 location, BOD (10-43 %) at 4 locations, FC (50-62.5 %) at 2 locations and 'no' variation in FC was observed at 2 locations.

Rajasthan

During the pre-lock down period (March 2020): -

- The analysis result of one monitored location shown pH (8.3), DO (4.4 mg/L), BOD (1.3 mg/L) and FC (75 MPN/100mL) at 01 location. pH, BOD and FC were observed to be complying with the bathing criteria limits whereas DO was not complying with the limit prescribed under Primary Water Quality Criteria for Bathing.

During the lock down period (April 2020): -

- The analysis result of one monitored location indicate pH (8.4), DO (4.9 mg/L), BOD (1 mg/L) and FC (64 MPN/100mL). One monitored location complying to the bathing criteria limits for the parameters (i.e. pH, BOD and FC) and DO was non-complying to the limit prescribed under Primary Water Quality Criteria for Bathing.

Overall observations on river Mahi within Rajasthan State: -

- The analysis results of one monitored location revealed increasing trend of DO (11.4 %), decreasing trend of BOD (23 %) and FC (14.7 %) was observed.

Gujarat

During the pre-lock down period (March 2020): -

- The analysis results of 9 monitored locations for four critical parameters were observed to be in the range of pH (7.9 -8.4), DO (7.0 -8.3 mg/L), BOD (0.4 -0.6 mg/L) and FC (2.0 -46 MPN/100mL).

- All the monitored locations (09) were found to be complying with the limits for criteria parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- Minimum DO (7 mg/L) was observed at Majpur while maximum and minimum BOD was observed as 'BDL' at all the monitored locations whereas maximum FC (46 MPN/100mL) observed at Sherkhi Bridge.

During the lock down period (April 2020): -

- The analysis results of 9 monitored locations for four critical parameters were observed to be in the order of pH (7.8-8.3), DO (6.5 -8.4 mg/L), BOD (0.3 -0.6 mg/L) and FC (2 -12 MPN/100mL).

- All the 9 monitored locations were complying within the limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- Minimum DO (6.5 mg/L) was observed at Majpur while maximum and minimum BOD observed as 'BDL' at all the monitored locations whereas maximum FC (12 MPN/100mL) observed at 2 locations viz., Umeta Bridge and Majpur.

Overall observations on river Mahi (Gujarat): -

- The analysis results reveal increasing trend of DO (1.2 to 12.3 %) at 5 locations while decreasing trend of DO (7.1 %) at 1 location, BOD (17 -25 %) at 5 locations, FC (14.3-81.8 %) at 7 locations

- 'No' variation was observed w.r.t DO at 3 locations, BOD at 4 locations and FC at 2 locations.

Overall Observations on River Mahi (covering Madhya Pradesh, Rajasthan and Gujarat): -

- During lockdown, maximum DO was observed at Rajasthan Border at Katana Dam (8.4 mg/L)) and minimum at D/s Confluence with River Chap (4.9 mg/L). Maximum BOD (1.8 mg/L) was observed at 02 locations- Ranisingh Village, Ratlam and Forest Guest house, Ratlam and minimum BOD was observed at Sevalia (0.3 mg/L) whereas maximum FO count was observed at D/s Confluence with River Chap (64 MPN/100 mL) and minimum as 'BDL' at 02 locations- Road Bridge, Jhabua and Badnawar.

- Overall, decreasing trend of DO (3.8 -7.1%) at 2 locations, BOD (10% to 43%) at 10 locations, FC (14.3%-81.8%) at 10 locations while increasing trend of DO (1.2% -15.9%) at 09 locations and 'No' variation in DO at 03 locations, BOD & FC at 04 locations were observed.

- 13 out of 14 locations on river Mahi within MP and Gujarat states were observed to be complying with the limit for parameters viz., pH, DO,

BOD and FC prescribed under Primary Water Quality Criteria for Outdoor Bathing and one location in Rajasthan was found to be non-complying with the DO parameter for outdoor bathing criteria limit.

8.5 Conclusion

13 out of 14 monitored locations on river Mahi during pre-lockdown (March 2020) and lockdown (April 2020) were observed to be complying with the Primary Water Quality Criteria for Outdoor Bathing. Also, an improvement in water quality of river Mahi was observed with respect to DO, BOD and FC and consistent % compliance of monitored loctions to Primary Water Quality Criteria for Outdoor Bathing was observed during pre-lockdown and lockdown period.

9.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER SABARMATI

9.1 About Sabarmati River

The Sabarmati river is one of the major west-flowing rivers in India. It originates in the Aravalli Range, Udaipur District of Rajasthan and meets the Gulf of Cambay of Arabian Sea after traversing 371 km in a south-westerly direction across Rajasthan and Gujarat States. 48 km of the river length is in Rajasthan, while 323 km is in Gujarat. The Right bank tributaries of river Sabarmati are river Sei, Siri and Dhamni, while left bank tributaries are Wakal, Harnav, Hathmati, Khari, Watrak etc. Ahmedabad city is located on the banks of the Sabarmati River. It has emerged as an important economic and industrial hub in the state of Gujarat having large, medium and small scale industries of various types. A large number of industries related to textiles, leather and leather goods, dyes & dye intermediates, chemicals, thermal power plant, pulp and paper, machinery, metal products, engineering, news print, automobile, plastic, rubber goods, drugs and pharmaceutical, etc. are located in the Ahmedabad city. There are 04 major industrial estates, and two major textile industrial clusters in Ahmedabad city.

9.2 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water quality of river Sabarmati is evaluated at 13 locations by Central Pollution Control Board in association with Gujarat Pollution Control Board (GPCB) under National Water Quality Monitoring Programme (NWMP). Distribution of Water Quality Monitoring Locations under NWMP on River

Sabarmati in Gujarat State is depicted in **Figure 9.1.**

9.3 Analytical Results

Water quality of river Sabarmati was carried out at 9 locations in Gujarat during Pre-lockdown (March 2020) and during lockdown period (April 2020) to assess the impact on water quality of river Sabarmati. The analysis results of Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented below in **Table-9.1**.

Based on the monitoring & analysis of collected water samples from river Sabarmati, the graphical presentation of river Sabarmati with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are presented in **Figure 9.2 to Figure 9.5.**

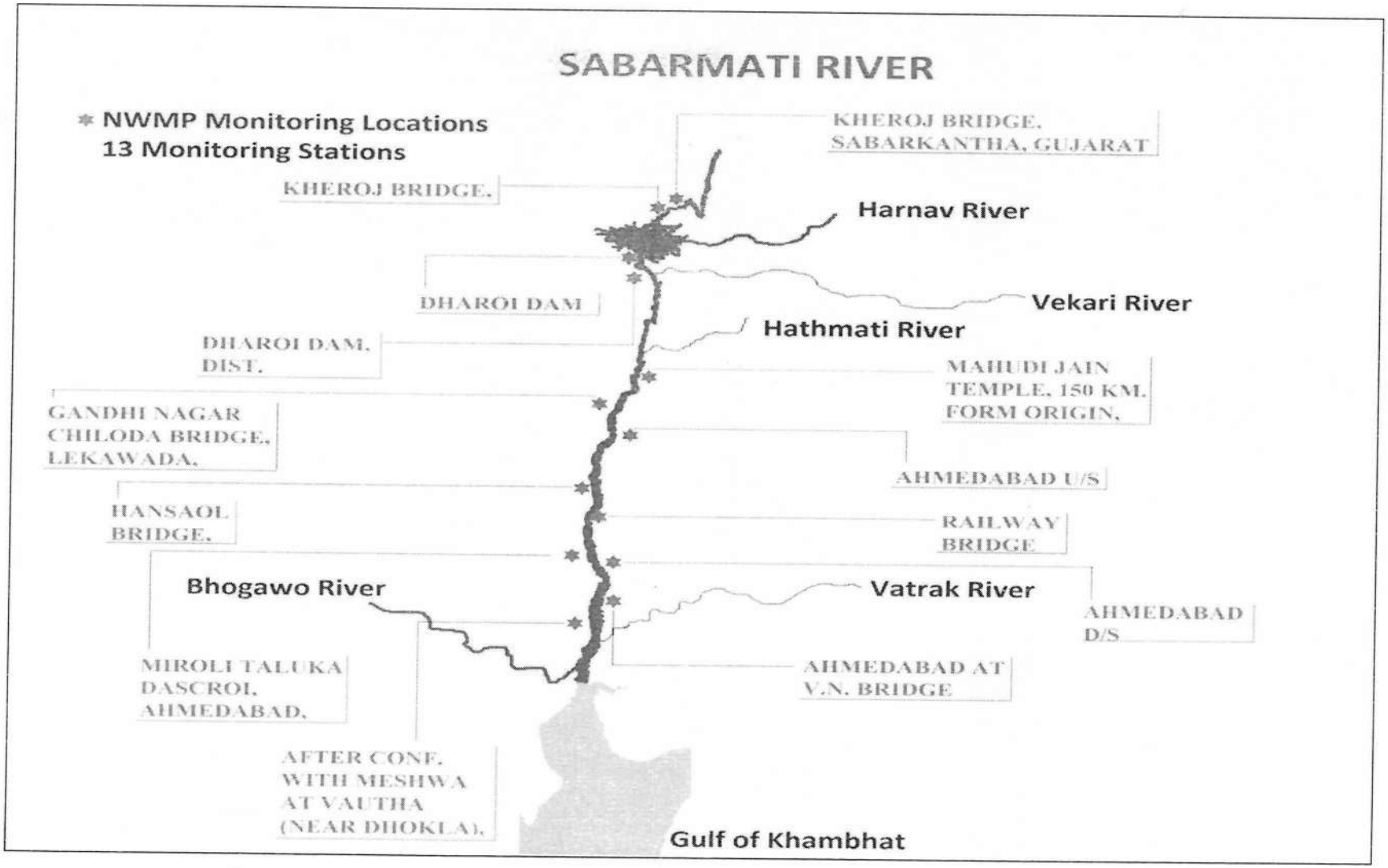

Figure 9.1: Water Quality Monitoring Locations Under NWMP on River Sabarmati

Table-9.1: Water Quality of River Sabarmati during pre (March 2020) and lockdown period (April 2020)

S. No	Monitoring Locations on River Sabarmati	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance status w.r.t PWQCOB
		March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
	Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
	GUJARAT												
1	At Dharoi Dam	7.7	6.7	-13.0%	8.3	7.9	BDL(0.8)	BDL (0.6)	-25.0%	2	2	0.0%	Complying
2	Dharoi Dam, Dt.Mehsana	7.6	6.5	-14.0%	8.3	8	BDL (0.7)	BDL (0.5)	-29.0%	2	2	0.0%	Complying
3	At Ahmedabad U/s	7.1	8	13.0%	7.9	8.1	2.6	1.2	-54.0%	63	60	-5.0%	Complying
4	At Hansaol Bridge	7.1	8	13.0%	7.9	8.1	2.6	1.2	-54.0%	63	60	-5.0%	Complying
5	At Railway Bridge Ahmedabad	7.5	8.2	9.0%	8.5	8.2	2.2	1.8	-18.0%	220	68	-69.0%	Complying
6	At Village Miroli, Ahmedabad	BDL (0.1)	4.2	4100.0%	8.1	7.1	46	20	-57.0%	330	170	-48.0%	Non-complying
7	At V.N. Bride, Ahmedabad	BDL (0.1)	BDL (0.1)	0.0%	8.3	7	87	57	-34.0%	1100	45	-96.0%	Non-complying
8	At Ahmedabad D/s	BDL (0.1)	4.2	4100.0%	8.1	7.1	46	20	-57.0%	330	170	-48.0%	Non-complying
9	After Confl. with River Meshwa at Vautha (Nr. Dhokla)	BDL (0.1)	4.3	4200.0%	8	7.9	34	12	-65.0%	220	110	-50.0%	Non-complying
Overall Observations on River Sabarmati during pre (March 2020) and lockdown period (April 2020)													
No. of locations monitored		09 During Pre-lockdown and at 09 locations during lockdown											
No. of monitoring locations results available		09 During Pre-lockdown and at 09 locations during lockdown											
No. of locations complying to PWQ Criteria		05	05	-	09	09	05	05	-	09	09	-	-
Range		BDL-7.7	BDL-8.2	Decrease in % Variation (13 to 14 % at 2 locations, Increase in % Variation (9 to 4200 % at 6 locations and 'No' variation at 1 location	7.9-8.5	7.0-8.2	BDL-87	BDL-57	Decrease in % Variation (18 to 65 % at 9 locations)	2-1100	2-170	Decrease in % Variation (5 to 96 % at 7 locations and 'No' variation at 2 locations	-

Note:- *Values below 1 mg/L for BOD and DO < 0.1 mg/L to be considered as Below Detection Limit (BDL)

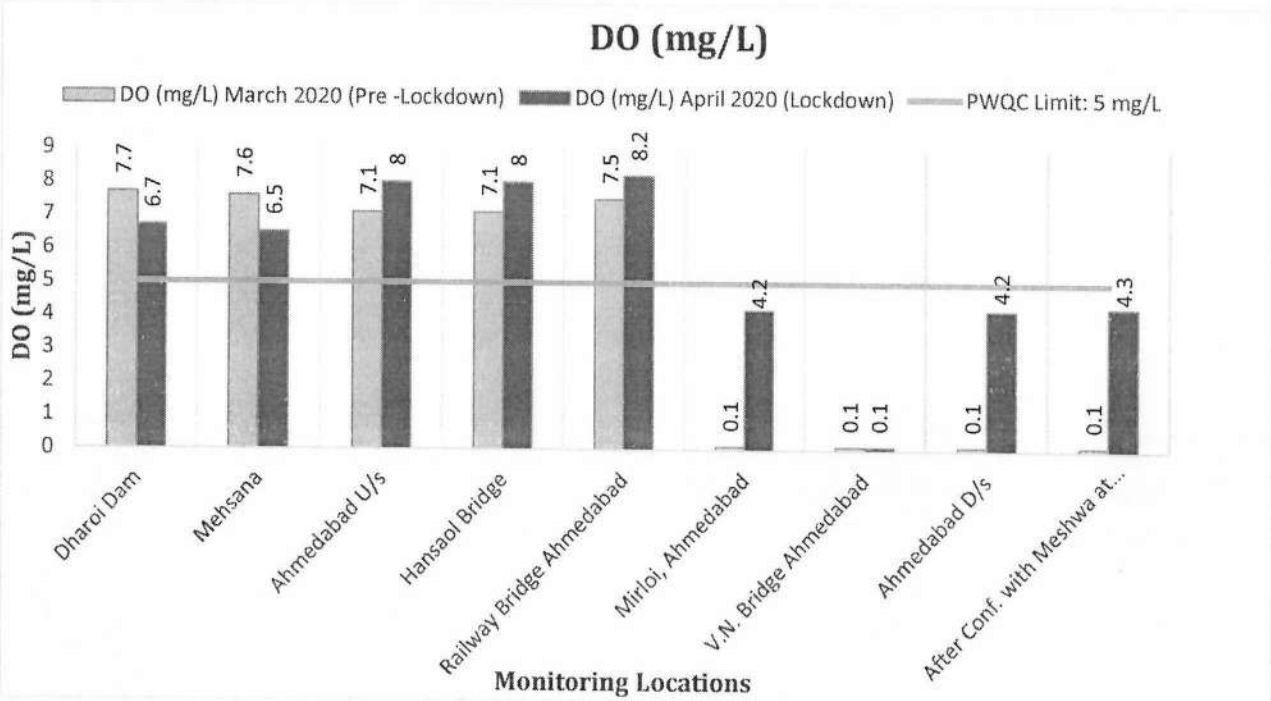

Figure 9.2: Water Quality of river Sabarmati for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

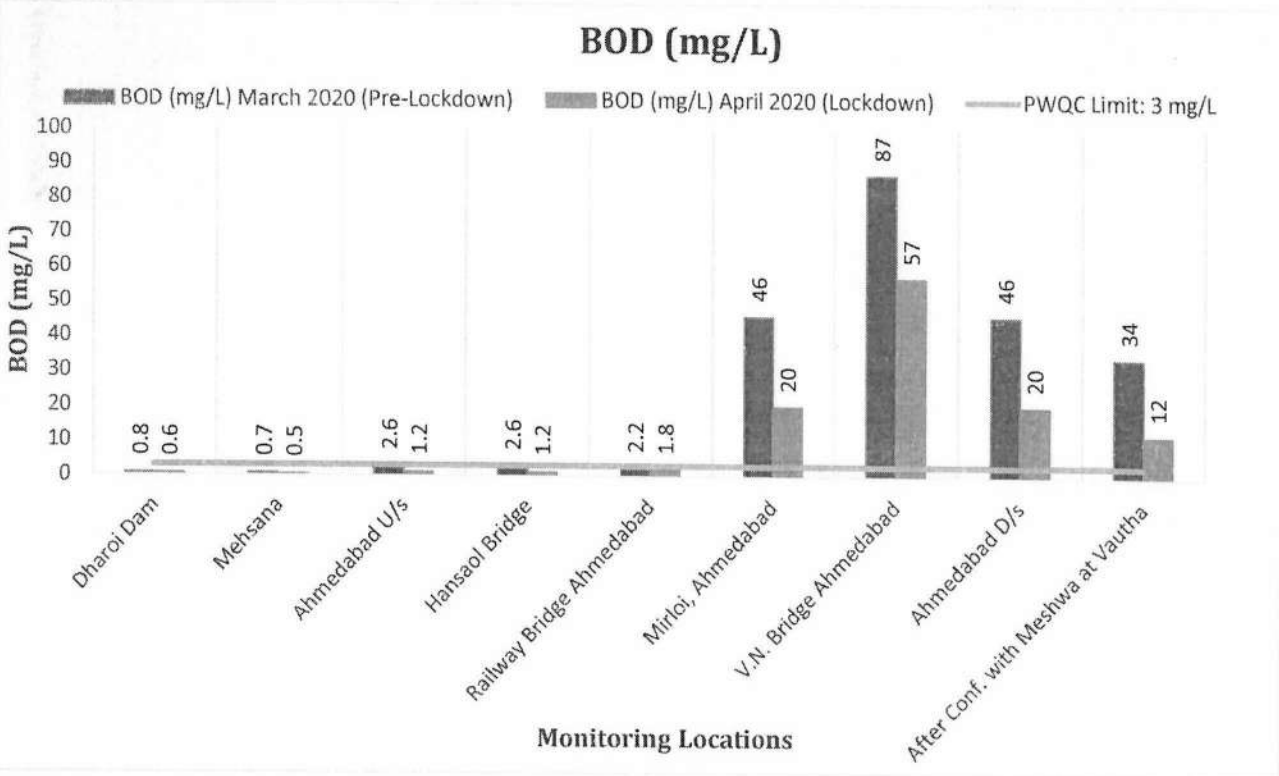

Figure 9.3: Water Quality of river Sabarmati for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

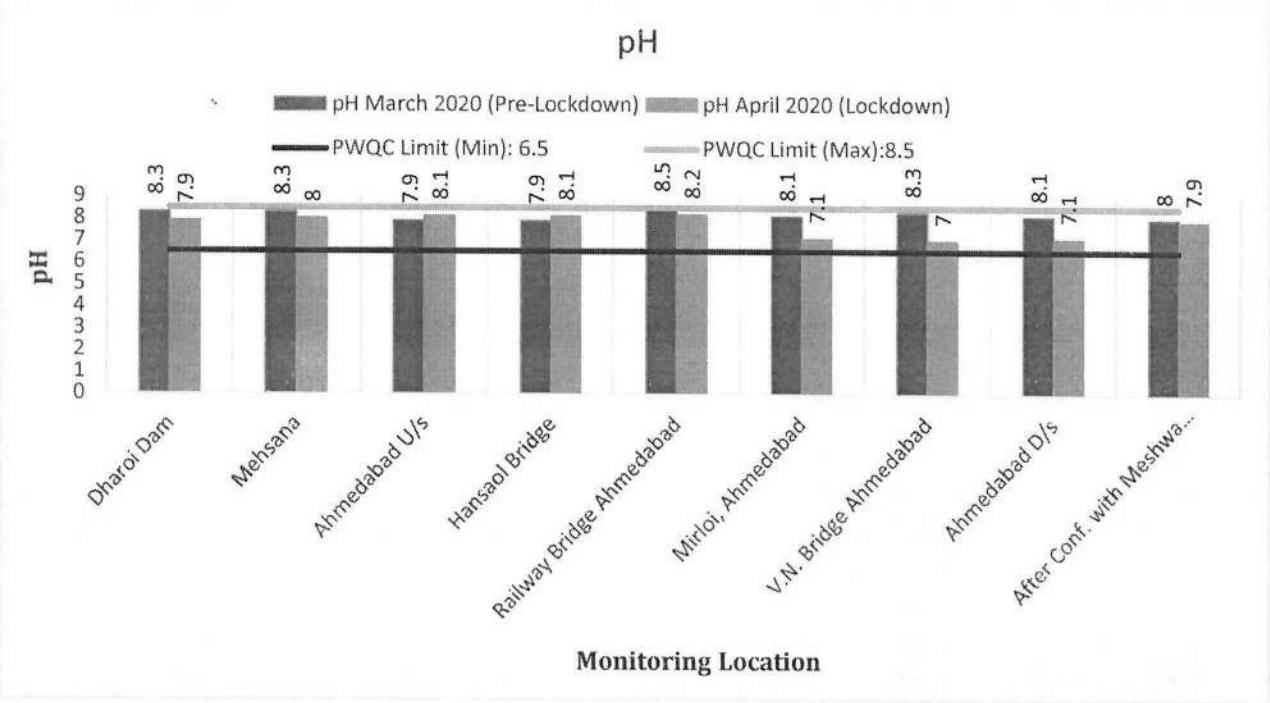

Figure 9.4: Water Quality of river Sabarmati for pH during pre-lockdown (March 2020) and lockdown (April 2020)

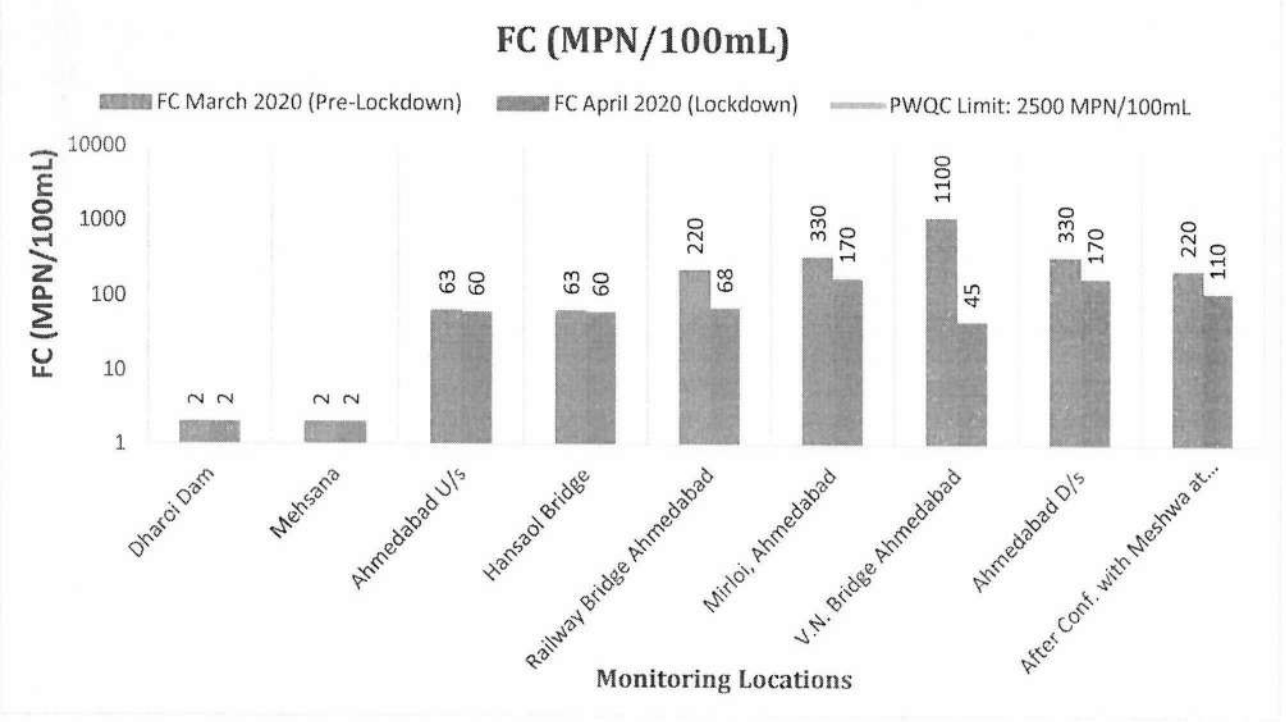

Figure 9.5: Water Quality of river Sabarmati for FC (MPN/100mL) during pre-lockdown and lockdown (April 2020)

9.4 Observations

Based on the analytical results of samples collected from river Sabarmati in Gujarat, following findings/observations are made:

Gujarat

During the pre-lock down period (March 2020):-

- The analysis results of 09 monitored locations indicate pH (7.9 -8.5), DO (0.1 (BDL) -7.7 mg/L), BOD (BDL (0.7) -87 mg/L) and FC (2 -1100 MPN/100mL). DO and BOD (at 5 locations), pH and FC (9 monitored locations) were found to be within the desirable limits for primary water quality criteria for outdoor bathing.

- Also, the water quality of river Sabarmati at Dharoi Dam after confluence with Meshwa at Vautha (Near Dhokla) was observed that DO (deteriorated from 7.7- BDL mg/L), BOD (increased from 0.8-34 mg/L) whereas FC (increased from 2 -220 MPN/100 mL)

During the lock down period (April 2020):-

- The analysis results of 09 monitored locations indicate pH (7.0 to 8.2), DO (0.1 (BDL) -8.2 mg/L), BOD ((BDL) 0.5 -57 mg/L) and FC (2 - 170 MPN/100mL) . pH and FC were found to be complying at all 09 monitored locations whereas DO and BOD were observed to be complying only at 05 locations.

- The water quality of river Sabarmati at Dharoi Dam after confluence with Meshwa at Vautha (Near Dhokla) observed that DO (deteriorated from 6.7 -4.3 mg/L), BOD (increased from 0.6 -12 mg/L), FC (increased from 2 -110 MPN/100 mL).

Overall observations on River Sabarmati (Gujarat State): -

- During lockdown, maximum DO was observed at Railway Bridge, Ahmedabad (8.2 mg/L)) and minimum observed as 'BDL' at V.N. Bridge, Ahmedabad. Maximum BOD was observed at V.N Bridge, Ahmedabad (57 mg/L) and minimum at Dharoi Dam, Dt. Mehsana (0.5 mg/L) whereas maximum FC count (170 MPN/100 mL) was observed at 02 locations viz., Vill. Maroli, Taluka Dascrol and Ahemdabad D/s and minimum of 02 MPN/100 mL at 02 locations i.e., at Dharoi Dam and Dharoi Dam, Dt Mehsana.

- Despite the water quality of river Sabarmati after confluence with Meshwa at Vautha (Near Dhokla-bottom most monitored location) observed as DO (increased to 4200%), BOD (decreased to 65%) and FC (decreased to 50 %). Both DO and BOD parameters are not complying with the limits for primary water quality criteria for outdoor bathing during pre-lockdown (in March 2020) and lockdown period in April 2020.

- Overall decreasing trend of DO (13% - 14%) at 02 locations, BOD (18% -65%) at 09 monitored locations and FC (5% -96%) at 07 locations whereas increasing trend of DO (9.0% - 4200%) at 06 locations and 'No' percent variation in DO at 01 location and FC at 02 locations were observed.

9.5 Conclusion

05 out of 09 monitored locations on river Sabarmati during pre and lockdown were observed to be complying with the Primary Water Quality Criteria for Outdoor Bathing. Also, an improvement in water quality of river Sabarmati was observed with respect to the criteria parameters viz., DO, BOD & FC at the monitored locations and consistent % compliance of monitored loctions on river Sabarmati to Primary Water Quality Criteria for Outdoor Bathing was observed during pre-lockdown and lockdown period.

10.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER MAHANADI

10.1 Mahanadi River

The Mahanadi River is a major river in East Central India which rises in Dhamtari district of Chhattisgarh. It is 858 kilometers long river flows through Chhattisgarh and Odisha States. The Mahanadi river empties into Bay of Bengal via several channels near Paradeep at False Point, Jagat Singhpur in Odisha. Total length of the river Mahanadi from origin to its outfall into Bay of Bengal is 851 km of which 357 km lies in Chattisgarh and 494 km in Odisha. The principal tributaries of the Mahanadi river on left bank of river Mahanadi are River Shivnath, Mand, Ib, Hasdeo and right bank tributaries are River Ong, Parry, Jonk, Telen. Hirakud Dam across the river Mahanadi is longest major earthen dam in India. The industrialized towns on the bank of Mahanadi River are Jagatpur, Paradeep, Sambalpur, Nayagarh and Cuttack consisting of major industries such as paper, textiles, thermal power plants, fertilizers, breweries, Sugar industries, Cement, coal mining, and aluminium smelter etc. From the point of view of significant environmental impacts, the

important medium scale industries are the chemical, textile, paper, cement, and leather tanning which consume large quantities of water.

10.2 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water Quality of River Mahanadi is monitored at 27 locations by Central Pollution Control Board (CPCB) in association with State Pollution Control Boards of Chhattisgarh (09) and Odisha (18) under National Water Quality Monitoring Programme (NWMP). State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Mahanadi is depicted in **Figure 10.1.**

10.3 Analytical Results

Water quality of river Mahanadi was carried out at 13 locations [Chhattisgarh State (5) and Odisha State (8)] during Pre-lockdown (March 2020) and at 22 locations [Chhattisgarh State (5) and Odisha State (17)] during lockdown period (April 2020) to assess the impact on water quality of river Mahanadi. The analysis results of Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented below in **Table-10.1**.

Based on the monitoring & analysis of collected water samples from river Mahanadi, the water quality trend of river Mahanadi with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are depicted in **Figure 10.2 to Figure 10.9.**

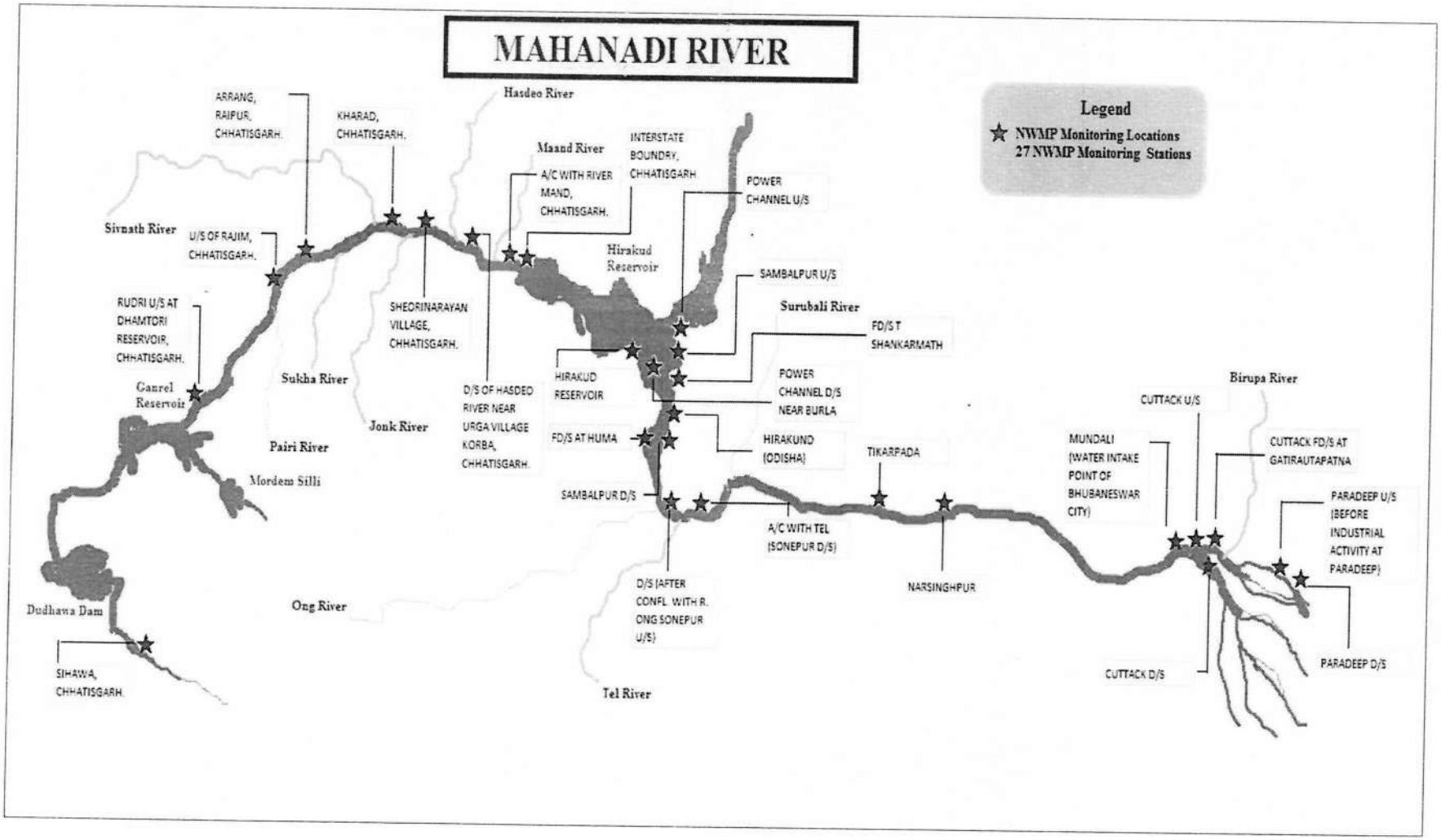

Figure 10.1. State-wise Distribution of Water Quality Monitoring Locations Under NWMP on River Mahanadi

Table-10.1 Water Quality of River Mahanadi during Pre (March, 2020) and Lockdown- period (April, 2020)

Monitoring Location on River Mahanadi	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform* (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	Apr	Variation (%)	March	Apr	March	Apr	Variation (%)	March	Apr	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
CHHATTISGARH												
At Kharad	7.6	7.3	-4%	8.5	8	1.3	1.4	8%	20	2	-90%	Complying
At Interstate Boundary	6.5	6.7	3%	7.6	7.5	1.5	1.6	7%	Not reported	8	-	Complying
At Heornarayan Village	6.5	6.3	-3%	8.5	8.2	1.4	1.3	-7%	30	1.8	-94%	Complying
At D/s of Hasdeo River Near Urga Village Korba	6.6	6.9	5%	7.1	7.1	1.2	0.9	-25%	Not reported	Not reported	-	Complying
At After confluence with River Mand	6.5	7	8%	8.5	8	1.4	1.2	-14%	30	2	-93%	Complying
No. locations monitored in Chhattisgarh	5 Locations monitored in Chhattisgarh during Pre-lockdown (March 2020) and Lockdown Period (April 2020)											
No. of monitoring locations results available	5	5	-	5	5	5	5		3	4		
No. of locations complying to Outdoor Bathing Criteria	5	5	-	5	5	5	5		3/3	4/4		
Range	6.5-7.6	6.3-7.3	Increase in percent variation (3 to 8 %) at 03 locations, Decrease in percent variation (3% to 4%) at 02 locations	7.1-8.5	7.1-8.2	1.2-1.5	0.9-1.6	Increase in percent variation (7 to 8 %) at 02 locations, Decrease in percent variation (7% to 25%) at 03 locations	20-30	1.8-8	Decrease in percent variation (90% to 94%) at 03 locations	

Monitoring Location on River Mahanadi	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform* (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	Apr	Variation (%)	March	Apr	March	Apr	Variation (%)	March	Apr	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
ODISHA												
Hirakud	-	8.6	-	-	8.11	-	BDL (0.3)	-	-	130		Complying
Power Channel U/s	-	8.2	-	-	8.05	-	BDL (0.2)	-	-	49		Complying
Power Channel D/s	-	7.6	-	-	7.32	-	BDL (0.4)	-	-	49		Complying
Sambalpur U/s	-	8.4	-	-	7.12	-	BDL (0.5)	-	-	79		Complying
Sambalpur D/s	-	8.2	-	-	7.31	-	1.4	-	-	130		Complying
Sambalpur D/s at Huma	-	8.4	-	-	7.48	-	BDL (0.5)	-	-	130		Complying
Sambalpur D/s at Shankarmath	-	8.2	-	-	7.22	-	BDL (0.8)	-	-	170		Complying
Sonepur U/s	-	8.4	-	-	7.61	-	BDL (0.4)	-	-	1.8		Complying
Sonepur D/s	-	8.8	-	-	7.59	-	BDL (0.6)	-	-	20		Complying
Tikarpada	6.6	6.6	0%	7.2	7.9	BDL (0.4)	BDL (0.2)	-50%	78	20	-74%	Complying
Narsinghpur	7.2	8.6	19%	8.4	7.9	BDL (0.4)	BDL (0.2)	-50%	78	45	-42%	Complying
Mundali (WIP) Bhubane	7.6	8.5	12%	8.3	8.1	BDL (0.3)	BDL (0.2)	-33%	68	20	-71%	Complying
Cuttak U/s	7.3	8.7	19%	8.4	8.2	BDL (0.5)	BDL (0.2)	-60%	1100	130	-88%	Complying
Cuttak D/s	6.8	7.2	6%	7.9	7.4	BDL (0.9)	BDL (0.5)	-44%	1300	220	-83%	Complying
Cuttack D/S at Gatirautapatna	8.1	7.6	-6%	7.8	7.5	BDL (0.8)	BDL (0.3)	-63%	1700	170	-90%	Complying
Paradeep U/S (Before Industrial Activity)	8.2	8.6	5%	7.7	8	1.3	BDL (0.2)	-85%	490	1.8	-99.60%	Complying
Paradeep D/s	8.6	8.4	-2%	7.6	8	2.4	BDL (0.5)	-79%	BDL (1.8)	BDL (1.8)	Nil	Complying
No. locations monitored	8 locations in March 2020 and 17 locations monitored in April 2020											
No. of monitoring locations results available in Odisha	8	17	-	8	17	8	17		8	17		
No. of locations complying to Criteria	8/8	17/17	-	8/8	17/17	8/8	17/17		8/8	17/17		
Range	6.6-8.6	6.6-8.8	Increase in % variation (5 to 19%) at 05 locations, Decrease in % variation (2% to 6%) at 02 locations and 'No' variation at 01 location	7.2-8.4	7.12-8.2	BDL (0.3)-2.4	BDL (0.2) - 1.4	Decrease in percent variation (33 % to 85%) at 08 locations	BDL (1.8)-1700	BDL (1.8)-220	Decrease in percent variation (42 % to 99.6%) at 07 locations and 'No' variation at 1 location	

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Monitoring Location on River Mahanadi	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform* (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	Apr	Variation (%)	March	Apr	March	Apr	Variation (%)	March	Apr	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
Overall Water Quality Status of River Mahanadi (Chattisgarh & Odisha) during Pre-lockdown (March 2020) and Lockdown Period (April 2020)												
No. locations monitored	13 locations in March 2020 and 22 locations monitored in April 2020											
No. of monitoring locations for which monitored results available	13	22	-	13	22	13	22	-	11	21	-	
Overall Range	6.5-8.6	6.3-8.8	Increase in percent variation (3 to 19%) at 08 locations. Decrease in percent variation (2% to 6 %) at 04 locations and 'No' variation at 01 location	7.1-8.5	7.1-8.2	BDL (0.3)-2.4	BDL (0.2)-1.6	Increase in percent variation (7to 8 %) at 02 locations. Decrease in percent variation (7% to 85%) at 11 locations	BDL (1.8)-1700	BDL (1.8)-220	Decrease in percent variation (42% to 99.6%) at 10 locations and 'No' variation at one location	

Note:- *Values below 1mg/L for BOD, < 0.1 mg/L for DO and <1.8 MPN/100 ML for FC to be considered as Below Detection Limit (BDL)

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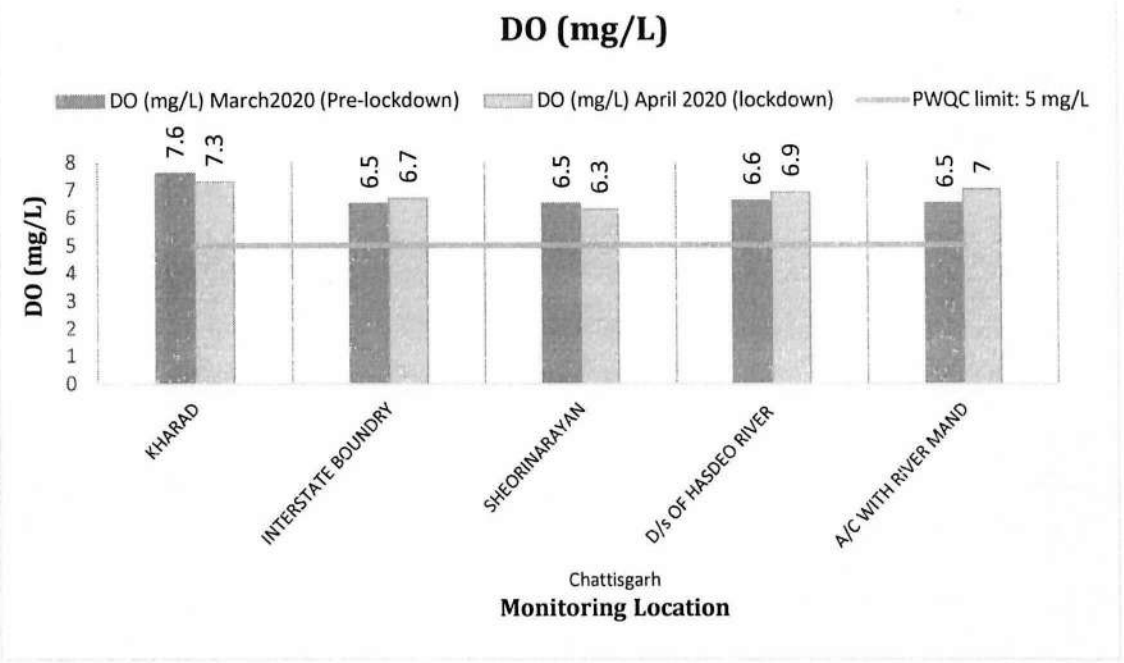

Figure 10.2: Water Quality of River Mahanadi for DO (mg/L) during pre-lockdown (March 2020) and Lockdown (April 2020) in Chhattisgarh

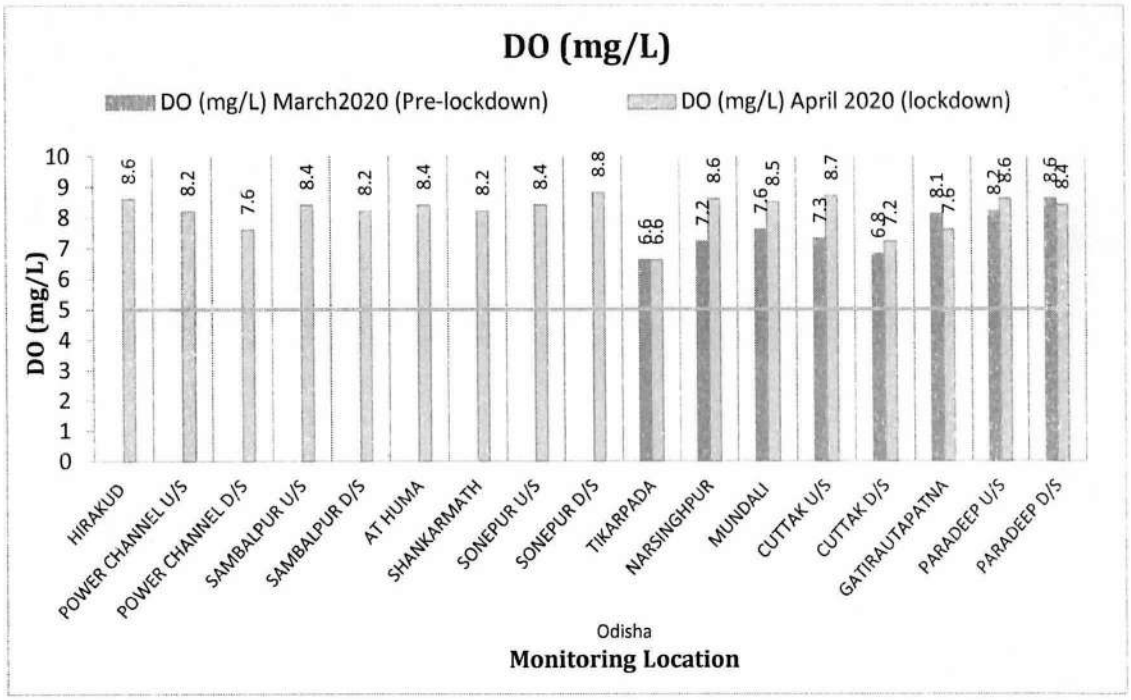

Figure 10.3: Water Quality of River Mahanadi for DO (mg/L) during pre-lockdown (March 2020) and Lockdown (April 2020) in Odisha

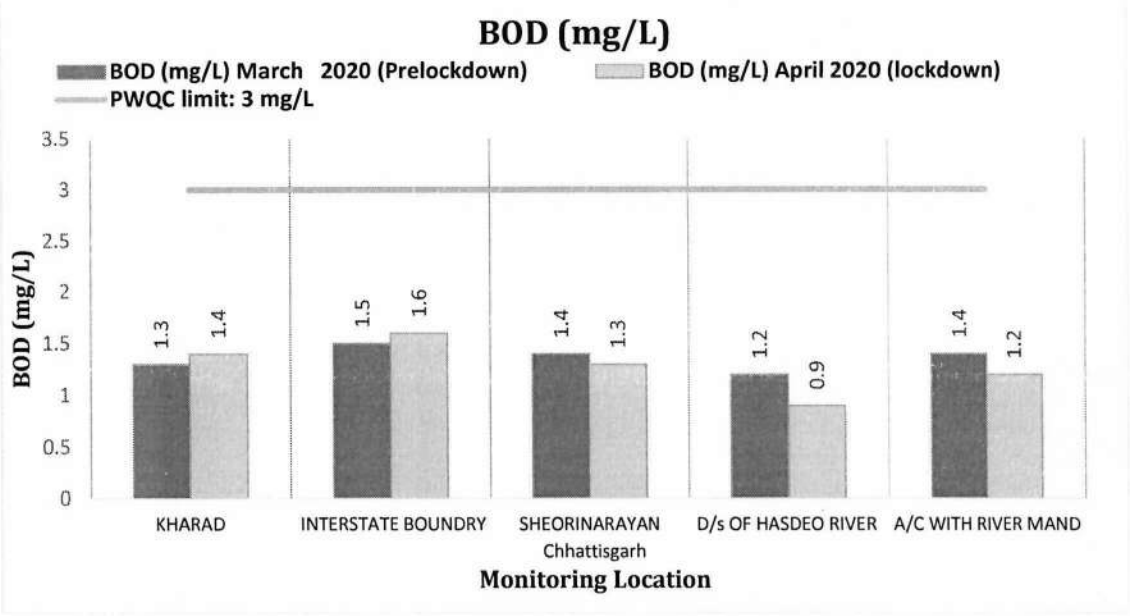

Figure 10.4: Water Quality of River Mahanadi for BOD (mg/L) Pre-lockdown and Lockdown(April 2020) in Chhattisgarh

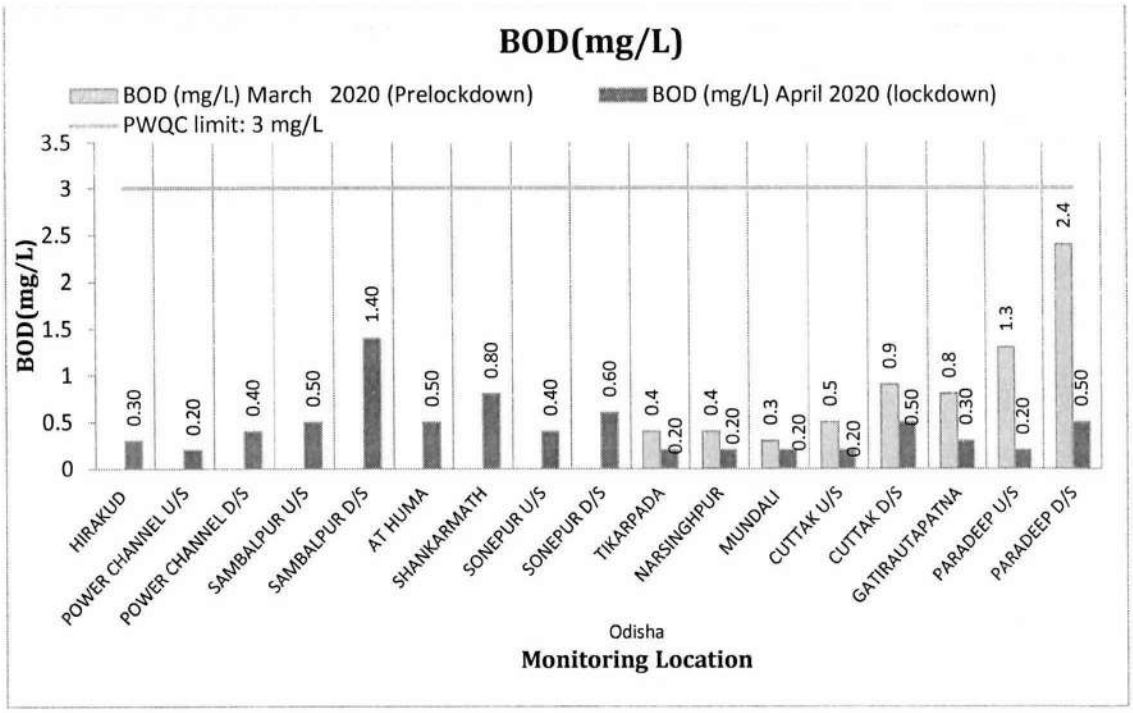

Figure10.5: Water Quality of River Mahanadi for BOD (mg/L) during pre-lockdown (March 2020) and Lockdown (April 2020) in Odisha

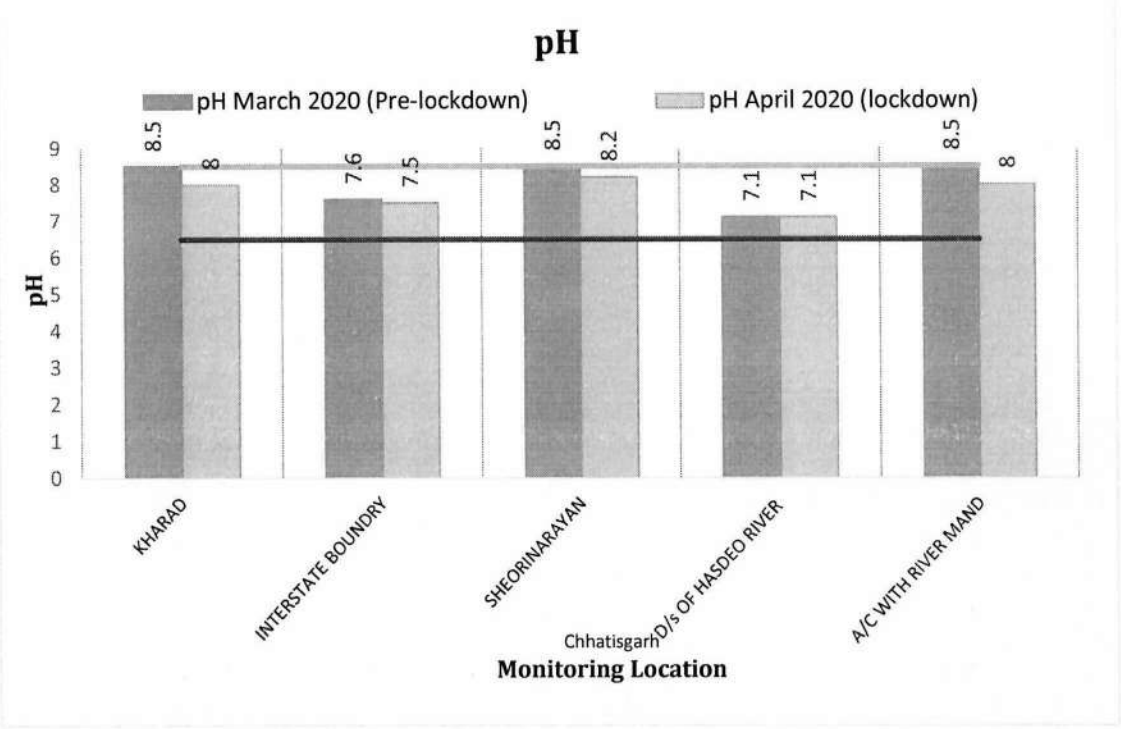

Figure 10.6: Water Quality of River Mahanadi for pH during pre-lockdown (March 2020) and Lockdown (April 2020) in Chhattisgarh

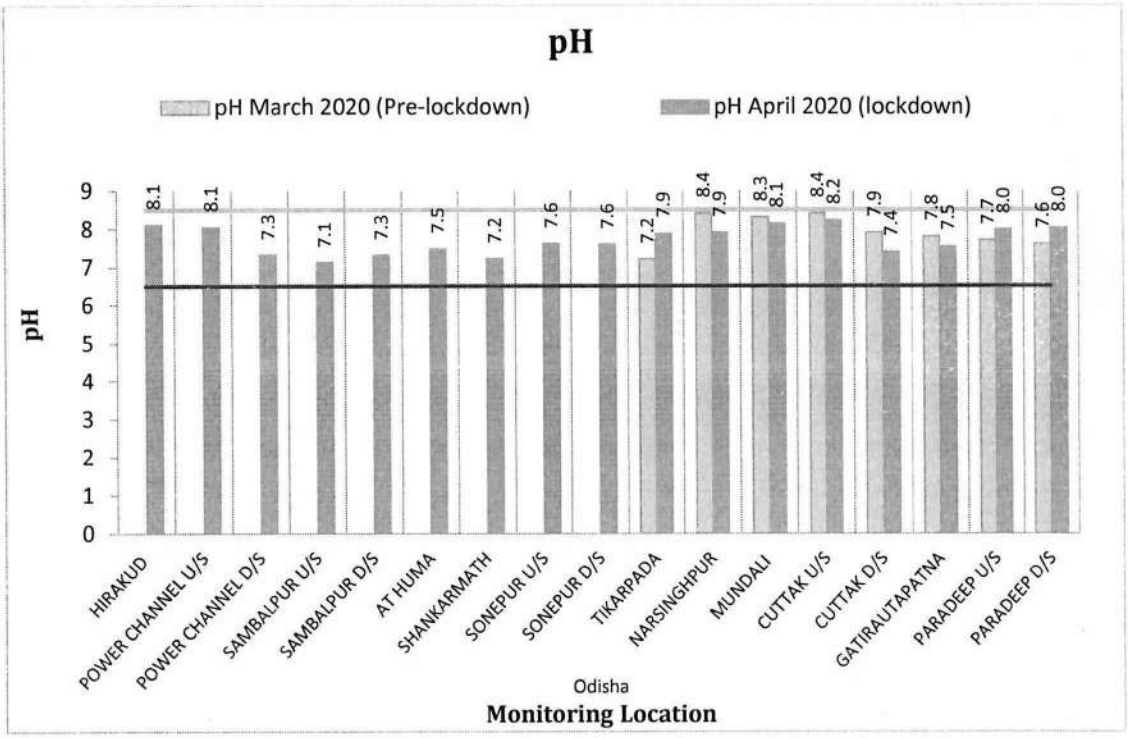

Figure 10.7: Water Quality of River Mahanadi for pH during pre-lockdown (March 2020) and Lockdown (April 2020) in Odisha

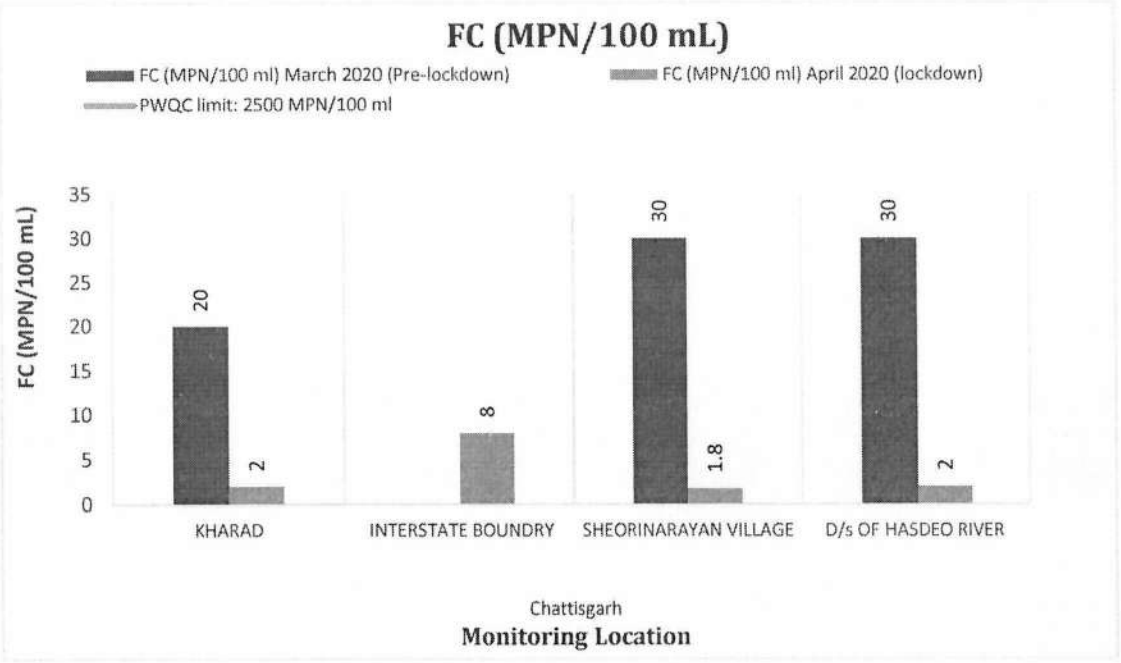

Figure 10.8: Water Quality of River Mahanadi for Fecal Coliform (MPN/100mL) during pre-lockdown (March 2020) and Lockdown (April 2020) in Chhattisgarh

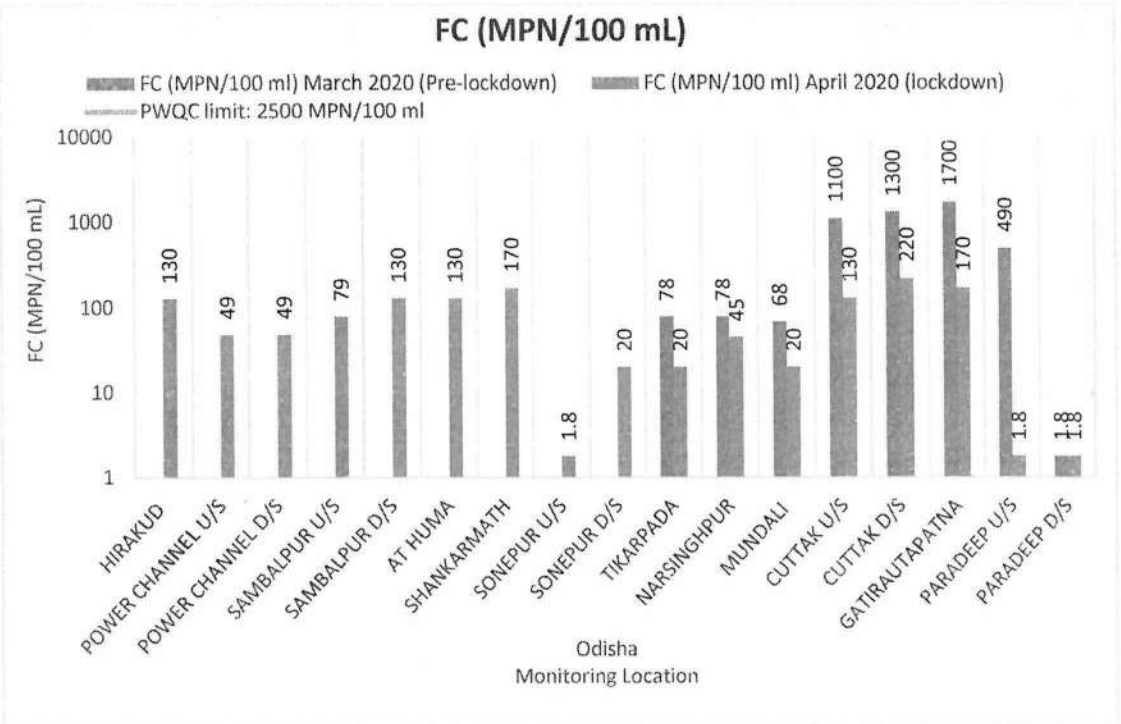

Figure 10.9: Water Quality of River Mahanadi for Fecal Coliform (MPN/100mL) during pre-lockdown (March 2020) and Lockdown (April 2020) in Odisha

10.4 Observations

Based on the analytical results of the samples collected from river Mahanadi, the following findings/observations are made for River Mahanadi: -

Chhattisgarh

During the pre-lock down period (March 2020): -

- The analysis results of the 05 monitored locations for the four critical parameters observed to be in the order of pH (7.1 - 8.5), DO (6.5 - 7.6 mg/L), BOD (1.2 - 1.5 mg/L) and FC (20 – 30 MPN/100 mL).

- Minimum DO (6.5 mg/L) was observed at 3 locations which include after confluence of river Mahanadi with River Mand, maximum DO (7.6 mg/L) was observed at Kharad while maximum BOD (1.5 mg/L) was observed at interstate boundary and minimum BOD (1.2 mg/L) observed at Near Urga village. Maximum FC (30 MPN/100mL) was observed at Heornarayan village and after confluence with river Mand.

- All 05 monitored locations were complying with the parameters (i.e. pH, DO, BOD) prescribed under Primary Water Quality Criteria for Outdoor Bathing. FC is complying at all 03 monitored locations (2 locations not reported for FC).

During the lock down period (April 2020): -

- The analysis results of 05 monitored locations for the four critical parameters observed to be in the range of pH (7.1 - 8.2), DO (6.3 - 7.3 mg/L), BOD (BDL(0.9) - 1.6 mg/L) and FC (BDL1.8 - 8.0 MPN/100 mL). 04 out of 05 monitored locations complying with the limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- Minimum DO (6.3 mg/L) was observed at Heornarayan village, maximum DO (7.3 mg/L) was observed at Kharad while maximum BOD (1.6 mg/L) was observed at interstate boundary and minimum BOD (0.9 mg/l) was observed at Near Urga village. Maximum FC (8 MPN/100mL) was observed at Heornarayan village.

Overall observation for river Mahanadi (Chhattisgarh):-

- The analysis results revealed decreasing trend of BOD (7 % -25 %) at 03 locations, DO (3% -4%) at 2 locations and FC (90% - 94%) at 03

monitored locations whereas increasing trend of DO (3% to 8%) at 3 locations and BOD (7% to 8%) at 02 monitored locations.

Odisha

During the pre-lock down period (March 2020):-

- The analysis results of 08 monitored locations for the four critical parameters observed to be in the order of pH (7.2 - 8.4), DO (6.6 - 8.6 mg/L), BOD (0.3 - 2.4 mg/L) and FC (1.8- 1700 MPN/100mL).

- Minimum DO (6.6 mg/L) was observed at Tikarpada, maximum DO (8.6 mg/L) was observed at Paradeep D/s while maximum BOD (2.4 mg/L) was observed at Paradeep D/s and minimum BOD (BDL mg/l) was observed at 6 out of 8 monitored locations. Maximum FC (1700 MPN/100mL) was observed at Cuttack D/s at Gatirautapatna and minimum FC (BDL MPN/100 mL) was observed at Paradeep D/s.

- All the 08 monitored locations were observed to be complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):-

- The analysis results of the 17 monitored locations for the four critical parameters were observed to be in the order of pH (7.12 - 8.2), DO (6.6 - 8.8 mg/L), BOD (0.2 -1.4 mg/L) and FC (1.8 – 220 MPN/100mL).

- Minimum DO (6.6 mg/L) was observed at Tikarpada, maximum DO (8.8 mg/L) was observed at Sonepur D/s while maximum BOD (1.4 mg/L) was observed at Samabalpur D/s and minimum BOD (BDL mg/l) was observed at 16 out of 17 monitored locations. Maximum FC (220 MPN/100mL) was observed at Cuttack D/s and minimum FC (BDL MPN/100 mL) was observed at Paradeep D/s.

- All 17 monitored locations complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on river Mahanadi (Odisha):-

- The analysis results revealed that decreasing trend of DO (2% -6%) at 02 locations, BOD (33%-85 %) at 08 monitored locations and FC (42 - 99.6%) at 07 locations whereas increasing trend of DO (5% -19%) at 05 locations were observed.

Overall Observations on river Mahanadi (Covering Chhattisgarh and Odisha States): -

- The analysis results revealed that during pre-lockdown, the monitored values were in the ranges of pH (7.1 -8.5), DO (6.5- 8.6 mg/L), BOD (0.3 - 2.4 mg/L) and FC (1.8- 1700 MPN/100mL) at the 13 monitored locations.

- During lockdown, the values were in the ranges of pH (7.1 -8.2), DO (6.3- 8.8 mg/L), BOD (BDL (0.2) - 1.6 mg/L) and FC (BDL(1.8) – 220 MPN/100mL) at the 22 monitored locations.

- The analysis results shown increasing trend of DO (3-19%) at 8 locations, BOD (7-8 %) at 2 locations while decreasing trend of DO (2-6 %) at 4 locations, BOD (7-8.5 %) at 11 locations and FC (42% - 99.6 %) at 10 locations and 'no' variation in DO & FC was observed at 1 monitored location.

10.5 Conclusion: -

13 monitored locations on River Mahanadi during lockdown (05 in Chhattisgarh and 8 locations in Odisha) during pre-lockdown and 22 monitored locations on River Mahanadi (05 in Chhattisgarh and 17 locations in Odisha) during lockdown were observed to be complying with the Primary Water Quality Criteria for Outdoor Bathing. Also, overall improvement in water quality of River Mahanadi was observed with respect to BOD and FC parameters and 100 % compliance of monitored locations to outdoor bathing criteria was observed.

11.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER TAPI

11.1 About Tapi River

Tapi River (also known as the Tapti) is the second largest westward inter-state flowing rivers of the Peninsular India. The river Tapi originates in the Betul district from a place called Multai in the eastern Satpura Range of southern Madhya Pradesh (MP). The Tapi River flows for about 724 km over

the plains of Vidharbha, Khandesh and Gujarat and in the states of Maharashtra and Madhya Pradesh and finally joins Arabian sea in Gulf of Cambay after flowing past the Surat city. There are 14 major tributaries (having a length more than 50 km). Major right bank tributaries are the river Vaki, Gomai, Arunavati and the Aner. On the left bank, important tributaries nare river Nesu, Arunavati, Buray, Panjhra, Bori, Girna, Vaghur, Purna, Mona and the river Sipna. Important towns beside the river include Bhusawal in Maharashtra, Betul, Multai, and Burhanpur in Madhya Pradesh, and Surat, Mandvi. Kamrej, Kathor and Dumas in Gujarat. In Madhya Pradesh, the industries are centred only in one District-East Nimar (Khandwa) while in Maharashtra, Jalgaon is the most industrialized area. Distillery units contribute the largest share in Maharashtra whereas textile occupies the predominant activity at Surat in Gujarat followed by food & beverages, paper & news print (at Nepanagar) and chemical industries.

11.2 Water Quality Monitoring Locations under NWMP on River Tapi

Water quality of river Tapi is monitored at 17 locations by Central Polltion Control Board (CPCB) in association with Gujarat Pollution Control Board (GPCB) and Maharashtra Pollution Control Board (MPCB) under National Water Quality Monitoring Programme (NWMP). The State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Tapi is depicted in **Figure 11.1.**

11.3 Analytical Results

Water quality of river Tapi was carried out at 9 locations [(Maharashtra-2 and Gujarat -7)] during Pre-lockdown (March 2020) and at 8 locations [(Maharashtra-2 and Gujarat -6)] during lockdown period (April 2020) to assess the impact on river water quality. The analysis results of Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, BOD and Fecal Coliform (FC) are presented in **Table-11.1**.

Based on the analysis, the graphical presentation of river Tapi with respect to DO, pH, BOD and FC during pre-lockdown (March 2020) and lockdown period (April 2020) are presented in **Figure 11.2 to Figure 11.5.**

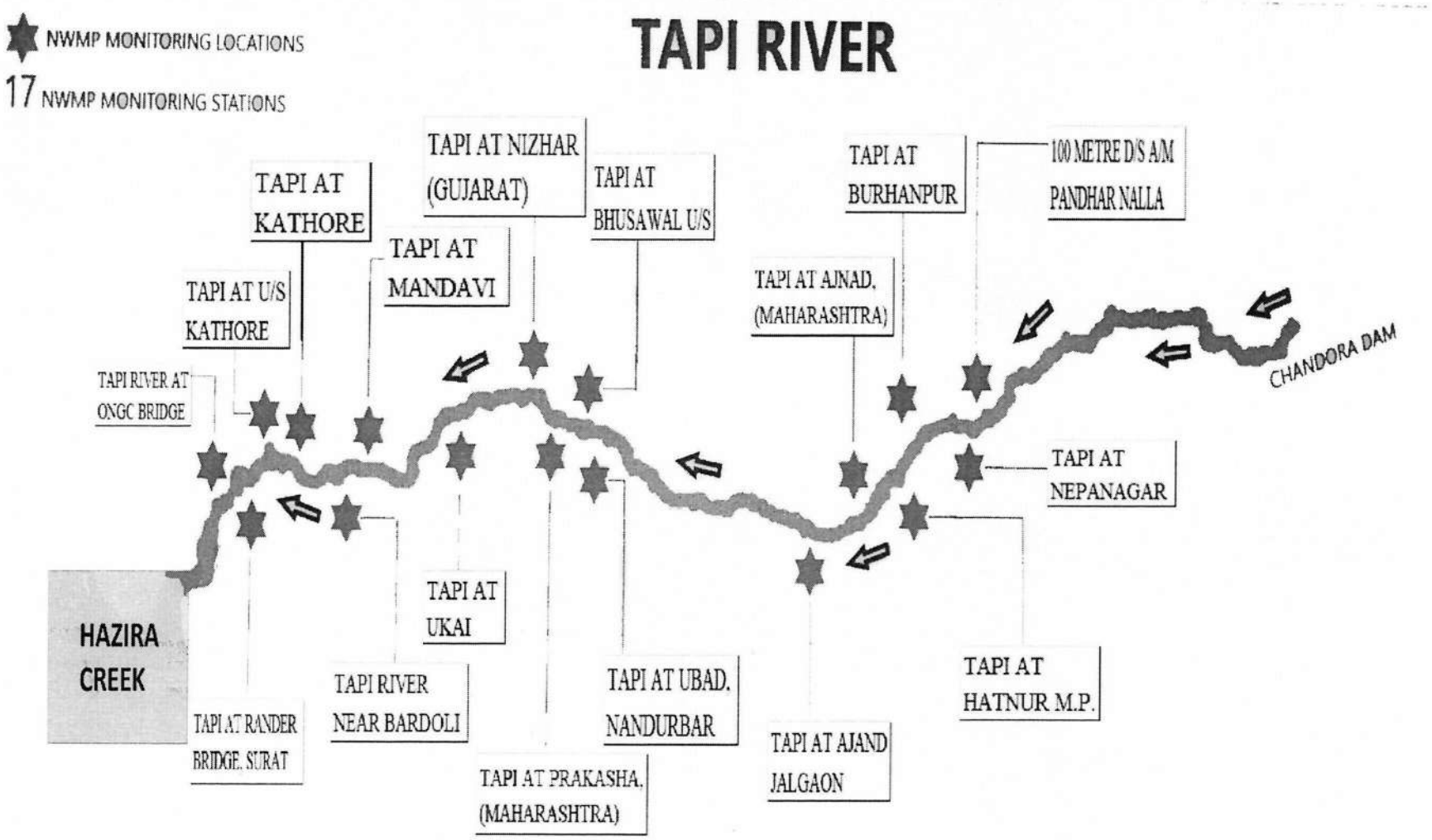

Figure 11.1: The State-wise Distribution of Water Quality Monitoring Locations Under NWMP on River Tapi

Table-11.1: Water Quality of River Tapi (Maharashtra & Gujarat) during Pre (March 2020) and Lockdown Period (April 2020)

Monitoring Locations on River Tapi	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Percent Variation	March	April	Percent Variation	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB):	**> 5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/ 100 mL**			
MAHARASHTRA												
Ajnad Village, Taluka Raver, Dist-Jalgaon	6	6.7	+ 12%	7.81	7.72	3.2	2.8	-13%	17	11	-35%	Non-complying
U/s Bhusawal Village Bhusawal, Railway Colony	5.8	6.2	+ 7%	7.84	7.80	4.0	4.0	Nil	14	13	-7%	Non-complying
No. locations monitored in Maharashtra	02 locations in March 2020 and 02 locations in April 2020											
No. of monitoring locations results available	02	02	-	02	02	02	02	-	02	02	-	-
No. of locations complying to Criteria	02	02	-	02	02	Nil	01	-	02	02	-	-
Range	5.8-6	6.2-6.7	Increase in percent variation (7%-12%) at 02 locations	7.81-7.84	7.72-7.80	3.2-4.0	2.8-4.0	Decrease in percent variation (13%) at 01 location and 'No' variation at 01 location	14-17	11-13	Decrease in percent variation (7% - 35%) at 02 locations	--
GUJARAT												
At Ukai, Sherula Bridge	7	-	_	7.1	-	BDL (0.9)	-	_	6	-	_	Complying
At Mandavi	7	7	Nil	7.2	7.1	BDL (0.8)	BDL (0.7)	-13%	9	6	-33%	Complying
Near Bardoli (Kapp Bridge) Bardoli	7	7	Nil	7	7.1	BDL (0.8)	BDL (0.7)	-13%	6	9	+ 50%	Complying

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Monitoring Locations on River Tapi	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Percent Variation	March	April	Percent Variation	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB):	**> 5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/ 100 mL**			
Kathore, (NH-8 Bridge)	7.2	7.2	Nil	7.3	7.1	BDL (0.8)	BDL (0.8)	Nil	6	9	+ 50%	Complying
Surat u/s Kathore,	7	7	Nil	7.5	7.1	BDL (0.9)	BDL (0.9)	Nil	9	6	-33%	Complying
Rander Bridge, Surat	7	7	Nil	7.7	7.1	1	BDL (0.9)	-10%	9	6	-33%	Complying
At ONGC Bridge, Surat	7 (Wrong Entry as 0.7)	6.9	-1.43 %	7.1	7.5	1.6	1.2	-25%	9	6	-33%	Complying
No. locations monitored in Gujarat	07 locations in March 2020 and 06 locations in April 2020 (one location-at Ukal Sherula Bridge Not monitored)											
No. of monitoring locations results available	07	06	-	07	06	07	06	-	07	06	-	-
No. of locations complying to Criteria	07	06	-	07	06	07	06	-	07	06	-	-
Range	7-7.2	6.9-7.2	~~Increase in percent variation (886%)~~ Decrease in % variation (1.43 %) at 01 location and 'No' variation at 05 locations	7-7.7	7.1-7.5	BDL (0.8)-1.6	BDL (0.7)-1.2	Decrease in percent variation (10% - 25%) at 04 locations, 'No' variation at 02 locations	6-9	6-9	Increase in percent variation (50%) at 02 locations, Decrease in Percent variation (33%) at 04 locations	-
Overall Water Quality Status of River Tapi (Maharashtra and Gujarat) during Pre-lockdown (March 2020) and Lockdown Period (April 2020)												
No. of locations monitored	09 locations in March 2020 and 08 locations in April 2020 (One location not monitored)											
No. of monitoring locations results available	09	08	-	09	08	09	08	-	09	08	-	-

Monitoring Locations on River Tapi	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Percent Variation	March	April	Percent Variation	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB):	**> 5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/ 100 mL**			
Overall Range	7 to 7.2	6.2 to 7.2	Increase in % variation (7%-12 %) at 02 locations , Decrease in % variation 1.43 % at 1 locations 'No' variation at 05 locations	7.0 to 7.84	7.1 to 7.8	BDL (0.8) to 4.0	BDL (0.7) to 4.0	Decrease (10% to 25%) at 05 locations and No' variation at 03 locations	06 to 17	06 to 13	Increase in percent variation (50%) at 02 locations, Decrease (7% to 35%) at 06 locations	-

Note: * Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

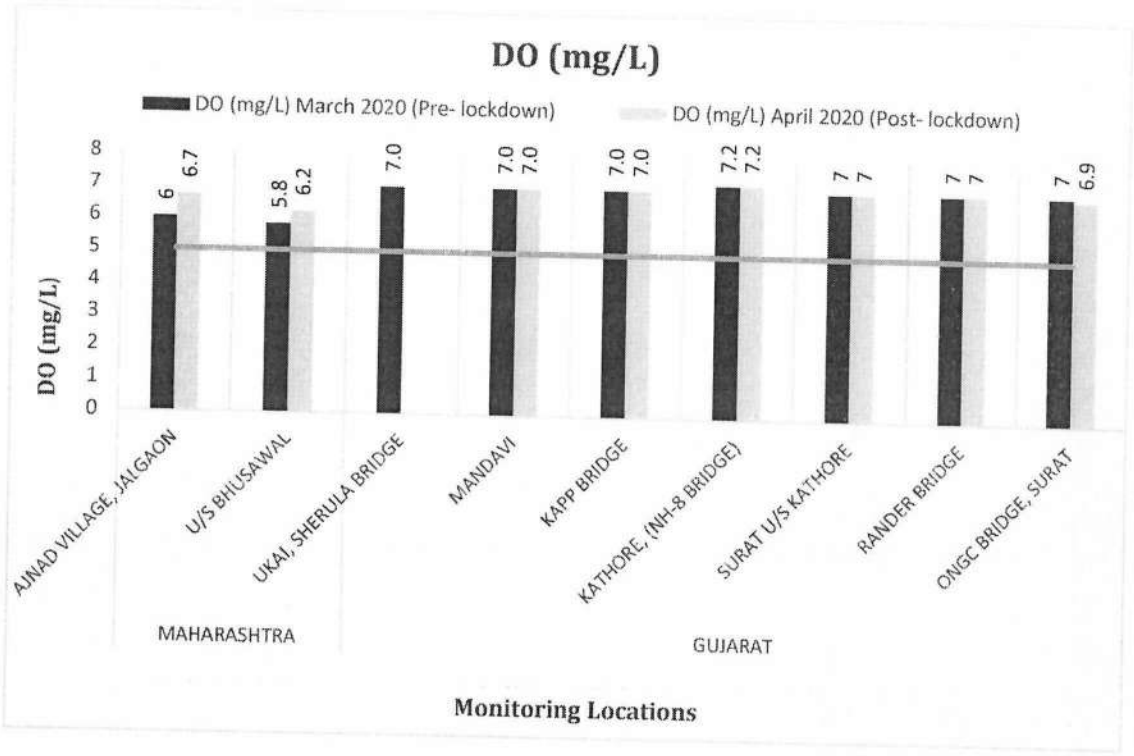

Figure 11.2: Water Quality of river Tapi for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Maharashtra and Gujarat.

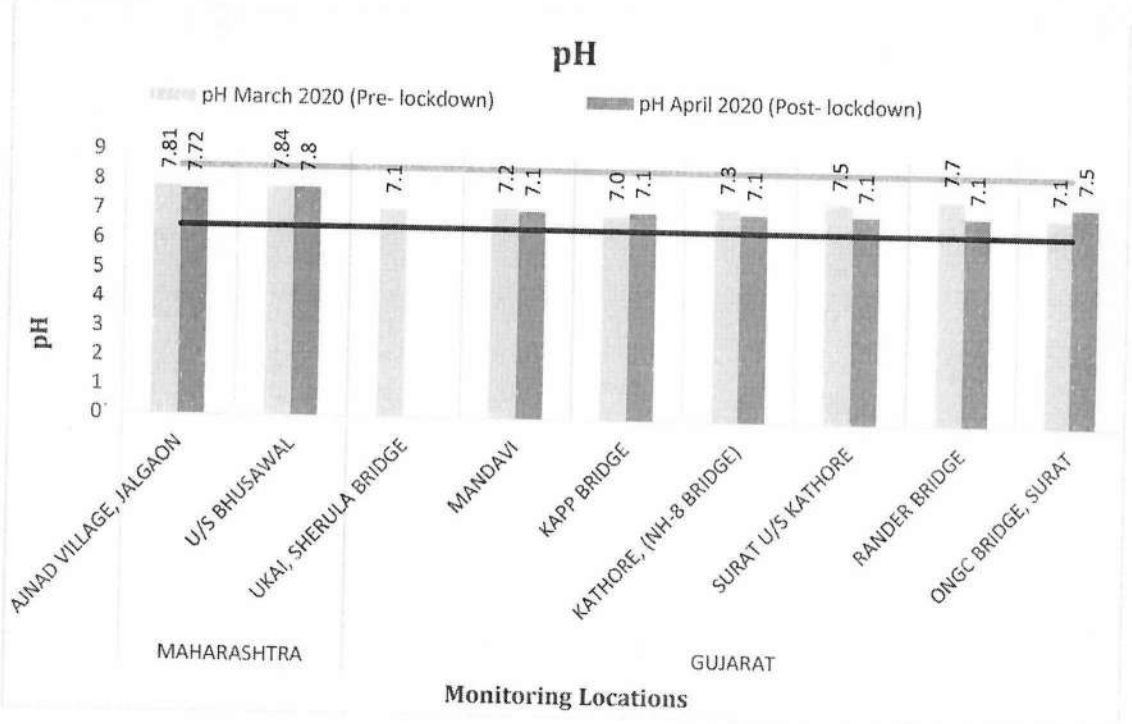

Figure 11.3: Water Quality of river Tapi for pH during pre-lockdown (March 2020) and lockdown (April 2020) in Maharashtra and Gujarat

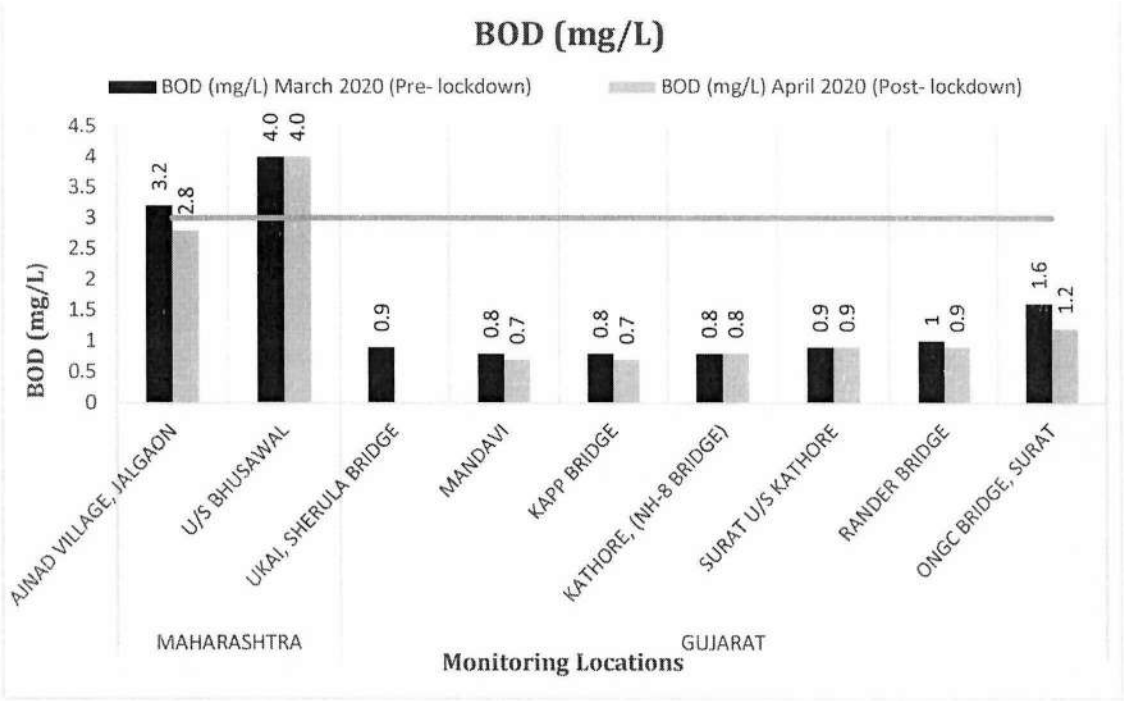

Figure 11.4: Water Quality of river Tapi for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Maharashtra and Gujarat.

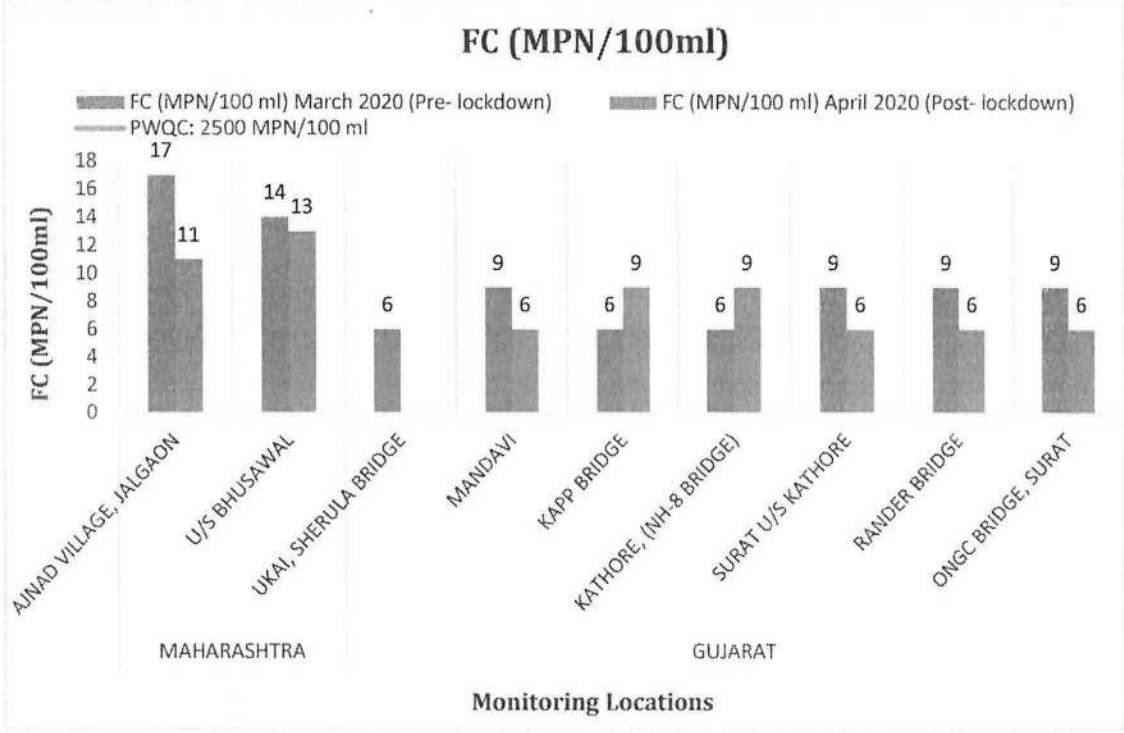

Figure 11.5: Water Quality of river Tapi for FC (MPN/100mL) during pre-lockdown

(March 2020) and lockdown (April 2020) in Maharashtra and Gujarat.

11.4 Observations

Based on the analytical results of samples collected from river Tapi, following findings/observations are made:

Maharashtra

During the pre-lock down period (March 2020): -

- The analysis results of 02 monitored locations for the four critical parameters observed to be in the order of pH (7.81-7.84), DO (5.8 – 6.0 mg/L), BOD (3.2 - 4.0 mg/L) and FC (14 - 17 MPN/100 mL).

- Minimum DO (5.8 mg/L) was observed at U/s Bhusawal Village, maximum DO (6 mg/L) was observed at Ajnad Village while maximum BOD (4 mg/L) was observed at U/s Bhusawal Village and minimum BOD (3.2 mg/L) was observed at Ajnad Village. Maximum FC (17 MPN/100mL) was observed at Ajnad Village and minimum FC (14 MPN/100 mL) was observed at U/s Bhusawal Village.

- 2 monitored locations complying with the parameters (i.e. DO, pH and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing while BOD found to be not complying at any of the 02 monitored locations.

During the lock down period (April 2020):

- The analysis results of the 02 monitored locations for the four critical parameters observed to be in the range of pH (7.72-7.80), DO (6.2–6.7 mg/L), BOD (2.8 -4.0 mg/L) and FC (11- 13 MPN/100mL).

- Minimum DO (6.2 mg/L) was observed at U/s Bhusawal Village, maximum DO (6.7 mg/L) was observed at Ajnad Village while maximum BOD (4 mg/L) was observed at U/s Bhusawal Village and minimum BOD (2.8 mg/L) was observed at Ajnad Village. Maximum FC (13 MPN/100mL) was observed at U/s Bhusawal Village and minimum FC (11 MPN/100 mL) was observed at Ajnad Village.

- 1 location is not complying to BOD limit prescribed under bathing criteria limit i.e., one out of 2 monitored location is complying to the bathing criteria limit for DO, p H, BOD and FC parameters

Overall observations on river Tapi (Maharashtra):-

- The analysis results shown increasing trend of DO (7 -12 %) at 2 locations and decreasing trend of BOD (13 %) at 1 location, FC (7-35 %) at 2 locations and 'no' variation in BOD was observed at 1 location.

Gujarat

During the pre-lock down period (March 2020): -

- The analysis results of the 07 monitored locations for four critical parameters observed to be in the order of pH (7-7.7), DO (7 – 7.2 mg/L), BOD (0.8 to 1.6 mg/L) and FC (06- 09 MPN/100 mL).

- Minimum DO (7 mg/L) was observed at 6 monitored locations, maximum DO (7.2 mg/L) was observed at Kathore (NH-8 Bridge) while maximum BOD (1.6 mg/L) was observed at ONGC Bridge and minimum BOD (BDL mg/L) was observed at 5 monitored locations. Maximum FC (9 MPN/100mL) and minimum FC (6 MPN/100 mL) was observed at 3 monitored locations each.

- All 7 monitored locations complying to the parameters (i.e. DO, pH, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020): -

- The analysis results of the 06 monitored locations for the four critical parameters observed to be in the order of pH (7.1-7.5), DO (6.9 – 7.2 mg/L), BOD (0.7 -1.2 mg/L) and FC (6-9 MPN/100mL).

- Minimum DO (6.9 mg/L) was observed at ONGC Bridge, maximum DO (7.2 mg/L) was observed at Kathore (NH-8 Bridge) while maximum BOD (1.2 mg/L) was observed at ONGC Bridge and minimum BOD (BDL mg/L) was observed at 5 monitored locations. Maximum FC (9 MPN/100mL) was observed ar 2 locations and minimum FC (6 MPN/100 mL) was observed at 4 monitored locations.

- All the 06 monitored locations complying to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on river Tapi (Gujarat):-

- The analysis results revealed increasing trend of FC (50 %) at 2 locations whereas decreasing trend of DO (1.42 %) at 1 location, BOD (10-25 %) at 4 locatios, FC (33 %) at 4 locations .'No' variation in DO at 5 locations and BOD at 2 locations was observed within Gujarat stretch of river Tapi.

Overall observations on river Tapi (Covering Maharashtra and Gujarat): -

- During pre-lockdown period (April 2020), 9 monitored locations for the four critical parameters observed to be in the order of pH (7 -7.84), DO (7– 7.2 mg/L), BOD (BDL(0.8)-4.0 mg/L) and FC (6-17 MPN/100mL).

- During lockdown period (March 2020), 8 monitored locations for the four critical parameters observed to be in the range of pH (7.1 -7.8), DO (6.2- 7.2 mg/L), BOD (0.7-4.0 mg/L) and FC (6-13 MPN/100mL). The analysis results also revealed maximum DO was observed at Kathore (NH-8 bridge) (7.2 mg/L) and minimum observed at U/s Bhusawal Village, Railway Colony (6.2 mg/L). Maximum BOD was observed at U/s Bhusawal Village, Railway Colony (4.0 mg/L) and minimum at 02 locations- Mandavi and Bardoli (Kapp Bridge) (0.7 mg/L). Maximum FC count was observed at U/s Bhusawal Village, Railway Colony (13 MPN/100 mL) and minimum at 04 locations- Mandavi, Surat U/s Kathore, Rander Bridge and ONGC bridge (6 MPN/100 mL).

- Over all increasing trend of DO (7 to 12 %) at 2 locations, FC (50 %) at 2 locations and decreasing trend of DO (1.43%) at 1 location, BOD (10-25 %) at 5 locations, FC (7-35 %) at 6 locations and 'no' variation in DO at 5 locations & BOD at 3 locations were observed.

11.5 Conclusion

During pre-lockdown (March 2020), 7 out of 9 monitored locations, 7 out of 8 monitored locations during lockdown period (April 2020) were observed to be complying with the Primary Water Quality Criteria for Outdoor Bathing parameters viz., pH, DO, BOD and FC.

Overall, marginal improvement in water quality of river Tapi was observed during the lockdown period with respect to DO, BOD and FC as well as in terms of compliance of monitoring locations (87.5 %) to the bathing criteria limits, during the lockdown period.

12.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER NARMADA

12.1 About Narmada River

The Narmada River rises from Amarkantak Hill in Anuppur District of East Madhya Pradesh forming the traditional boundary between North India and South India. It is one of only three major rivers in peninsular India that run from east to west (longest west flowing river). It flows over a length of 1,312 km through Deccan trap in between Vindhya and Satpura ranges of hills before draining through the Gulf of Khambhat into the Arabian Sea, in west of Bharuch city of Gujarat. It runs through the states of Madhya Pradesh, Maharashtra and Gujarat. The left bank tributaries of River Narmada are river Burhner, Banjar, Sher, Shakkar, Dudhi, Tawa (longest tributary), Ganjal, Kundi, Goi , Karjan & right bank tributaries are river Barna, Hiran, Tendoni, Choral, Man, Uri, Hatni & Orsang. Major cities or towns located on the banks of River Narmada are Dindori, Jabalpur, Harda, Hoshangabad, Barwani, Omkareshwar, Maheshwar, Narnada Nagar, Dewas, Mandla and Bharuch & Rajpipla in Gujarat State. The industrialized districts on the bank of Narmada river are Dhar, Jabalpur and Bharuch consisting of cluster of pharmaceuticals, pesticides, dyes & distilleries, leather & fertilizer units whereas in Jabalpur, Khandwa and Hoshangabad, the main industrial activities are the paper mills.

12.2 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water Quality of river Narmada is assessed at 54 locations by Central Pollution Control Board (CPCB) under National Water Quality Monitoring Programme (NWMP) in association with MPPCB (48), GPCB (05) and one location monitored by CPCB RD-Vadodara. State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Narmada is depicted in **Figure 12.1.**

12.3 Analytical Results

Water quality of river Narmada was carried out at 32 locations during Pre-Lockdown (March 2020) and Lockdown period (April 2020) to assess the impact on water quality of river Narmada. The analysis results of Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented below in **Table-12.1**.

Based on the monitoring & analysis of collected water samples from river Narmada, the water quality trend of river Narmada with respect to Primary Water Quality Criteria for Outdoor Bathing Parameters viz., DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are depicted in **Figure 12.2 to Figure 12.5.**

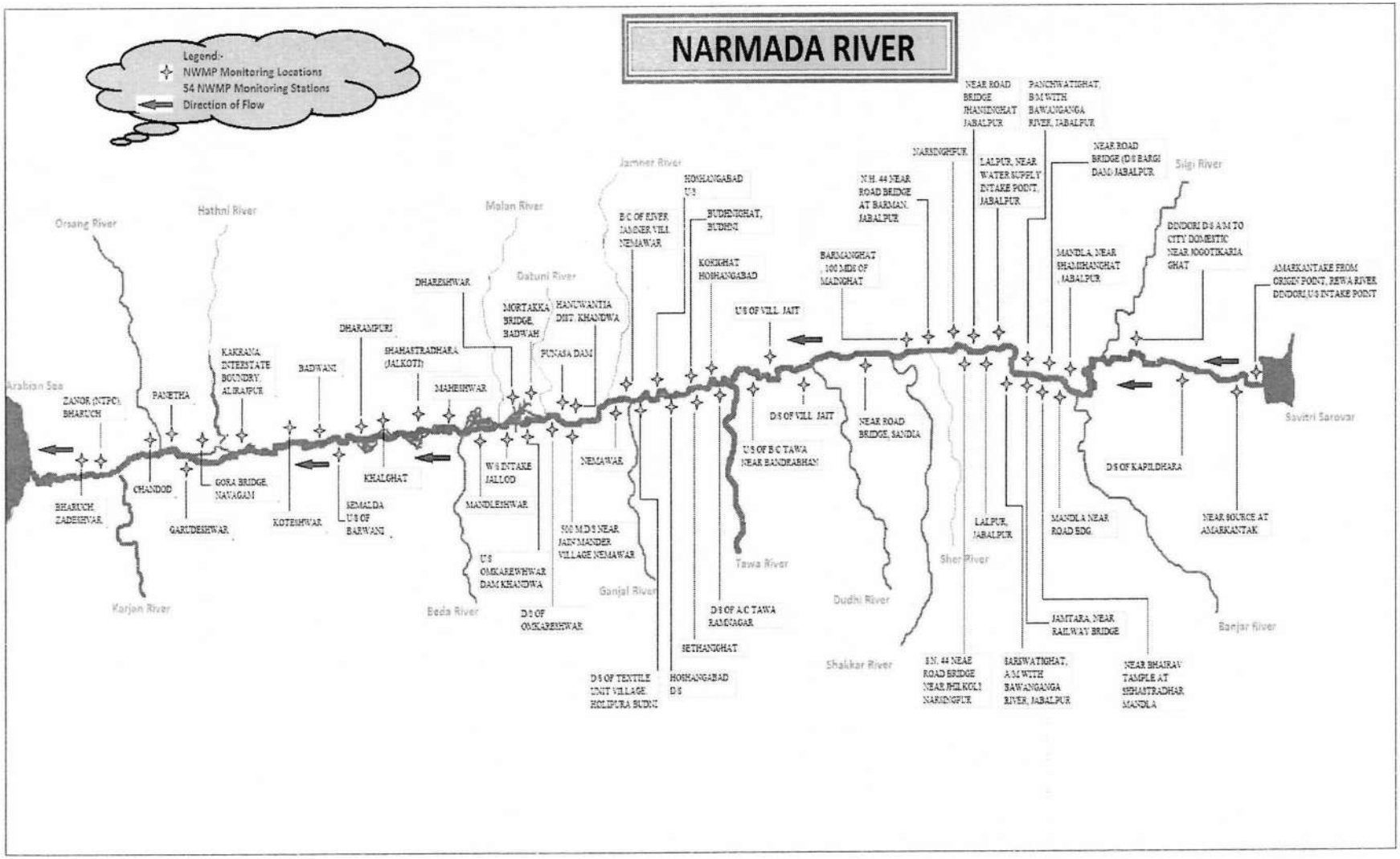

Figure 12.1 State-wise Distribution of Water Quality Monitoring locations Under NWMP on River Narmada

Table-12.1: Water Quality of River Narmada (MP & Gujarat) during Pre (March 2020) and Lockdown (April 2020)

Monitoring Location Details of River Narmada	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
MADHYA PRADESH												
At Amarkantak .	6.9	-	-	7.8	-	0.3	-	-	2	-	-	Complying
At Amarkantak .from Origin Point	8.2	-	-	7.8	-	1.1	-	-	18	-	-	Complying
At D/S of Kapildhara	7.4	-	-	7.8	-	1.1	-	-	18	-	-	Complying
AT Dindori D/S after mixing to City Domestic Sewage Nr. Jogotikarua Ghat	8.1	-	-	7.9	-	1.6	-	-	37	-	-	Complying
AT Mandla, Nr. Shamshanghat, Jabalpur	7.4	7.4	Nil	7.4	7.3	1.9	0.7	-63.16	2	2	Nil	Complying
AT Mandla Nr.Road Bridge	7.4	7.3	-1.35	7.5	7.4	1.4	0.8	-42.86	2	2	Nil	Complying
AT Saraswatighat, After mixting with Bawanganga River	7.4	7.5	1.35	8.3	7.3	1.8	1.1	-38.89	2	2	Nil	Complying
AT Panchwatighat , Before mixing with Bawan	7.4	7.2	-2.70	8.3	7.3	1.5	1	-33.33	2	2	Nil	Complying
Lalpur, Jabalpur	7.4	7.2	-2.70	8.3	7.4	1.4	0.8	-42.86	2	2	Nil	Complying
Nr. Road Bridge (D/s Bargi Dam) , Jabalpur	7.8	7	-10.26	7.3	7.8	1.7	0.4	-76.47	2	2	Nil	Complying
AT Narasinghpur, M.P.	7.4	7	-5.41	8.1	7	1.8	0.8	-55.56	2	2	Nil	Complying
AT Korighat, Hoshangabad	8	-	-	8.1	-	1.3	-	-	2	-	-	Complying
AT Sethnighat	8	-	-	8	-	1.4	-	-	2	-	-	Complying
AT Hoshangabad U/s	8.7	-	-	7.6	-	1.2	-	-	2	-	-	Complying
AT Hoshangabad D/s	8.7	-	-	7.4	-	1.4	-	-	2	-	-	Complying
Narmada at Nemawar	7.1	-	-	8.3	-	1.9	-	-	4	-	-	Complying
Near Punasa Dam, Punasa	7.3	7.8	6.85	8	8.3	0.9	0.7	-22.22	1	1	Nil	Complying

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Monitoring Location Details of River Narmada	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
AT D/s of Omkareshwar, MP	7.2	7.6	5.56	7.8	8	1.1	0.9	-18.18	1	1	Nil	Complying
Near Mortakka Bridge, Badwah.	7.7	7.8	1.30	8.1	8.1	1.1	0.8	-27.27	1	1	Nil	Complying
AT Lalpur, Naer water Supply Intake Point	7.5	7.2	-4.00	8.1	7.2	1.8	0.8	-55.56	2	2	Nil	Complying
AT Mandaleshwar	-	8	-	-	8.1	-	1	-	-	1	-	Complying
AT Maheshwar, MP	7.9	7.8	-1.27	8	8	1.3	1.1	-15.38	1	1	Nil	Complying
Near Bhairav Temple at Shastradhar Mandla	7.6	7.4	-2.63	7.6	7.4	1.6	0.9	-43.75	2	2	Nil	Complying
AT Dharampuri	7.8	7.8	Nil	8.1	8	1.4	1.2	-14.29	1	1	Nil	Complying
AT Semalda U/s Barwani	7.9	8	1.27	8.1	8.2	0.9	0.8	-11.11	1	1	Nil	Complying
AT Barwani	7.6	7.8	2.63	8	7.8	1.1	0.9	-18.18	1	1	Nil	Complying
AT Koteswar	7.8	7.9	1.28	8.2	8.3	1	0.8	-20.00	1	1	Nil	Complying
AT Kakrana, Inteerstate boundary, Alirajpur	7.8	7.9	1.28	8.3	8.3	1.1	0.7	-36.36	1	1	Nil	Complying
No of locations monitored	27 locations during Pre-lockdown (March 2020) and 19 locations during Lockdown (April 2020)											
No of monitoring locations monitored results available	27	19	-	27	19	27	19	-	27	19		
No of locations complying to Criteria	27	19	-	27	19	27	19	-	27	19		
Range	6.9-8.7	7.0-8.0	Decrease (1.27 % to 10.26%) at 8 location, Increase (1.27% to 6.85%) at 8 locations and 'No"	7.3-8.3	7.0-8.3	BDL (0.3)-1.9	BDL (0.4)-1.2	Decrease (11.1% to 76.47%) at 18 locations	1.0-37.0	1.0-2.0	'No' variation at 18 locations	

Monitoring Location Details of River Narmada	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
			variation at 2 locations									
GUJARAT												
Narmada at Garudeshwar	7.7	7.5	-2.60	8.1	7.7	0.6	0.6	0.00	22	23	4.55	Complying
Narmada at Panetha	7.7	7.4	-3.90	7.8	7.8	0.7	0.6	-14.29	22	21	-4.55	Complying
Narmada at Chandod	7.8	7.9	1.28	7.5	7.1	0.6	0.4	-33.33	12	11	-8.33	Complying
Narmada at Zanor (NTPC), Bharuch	7.4	7.5	1.35	8.2	7.5	0.8	0.8	Nil	33	49	48.48	Complying
Narmada at Bharuch, Zadeshvar	7.3	7.4	1.37	8.2	7.5	0.8	0.8	Nil	110	94	-14.55	Complying
No of locations monitored in Gujarat	5 locations during Pre-lockdown (March 2020) and 5 locations during Lockdown (April 2020)											
No of monitoring locations monitored results available	5	5	-	5	5	5	5	-	5	5	-	
No of locations complying to Criteria	5	5	-	5	5	5	5	-	5	5	-	
Range	7.3-7.8	7.4-7.9	Decrease (2.6%-3.9%) at 2 locations and Increase (1.28% to 1.37%) at 3 locations	7.5-8.2	7.1-7.8	0.6-0.8	0.4-0.8	Decrease (14.29% to 33.3%) at 2 locations and 'No' variation at 3 locations	12-110	11-94	Decrease (4.55% to 14.55%) at 3 locations and Increase (4.5 % to 48.48%) at 2 locations	

Monitoring Location Details of River Narmada	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
Overall Water Quality of River Narmada (MP and Gujarat) during Pre-lockdown (March 2020) and Lockdown Period (April 2020)												
No. of locations monitored	32 locations during Pre-lockdown (March 2020) and 24 locations during lockdown Period (April 2020)											
No. of monitoring locations for which monitored results available	32	24	-	32	24	32	24	-	32	24	-	
Overall Range	6.9-8.7	7.0-8.0	Decrease at (1.27 % to 10.26%) at 10 locations, Increase (1.27% to 6.85%) at 11 locations and 'No' variation at 2 locations	7.3-8.3	7.0-8.3	0.3-1.9	0.4-1.2	Decrease (11.1% to 76.47%) at 20 locations and 'No' variation at 3 locations	1.0-110	1.0-94	Decrease (4.55% to 14.55%) at 3 locations and Increase (4.5 % to 48.48%) at 2 locations and 'No' variation at 18 locations	

Note:- *Values below 1mg/L for BOD *and* Values below 1.8 MPN/100 mL for FC to be considered as Below Detection Limit (BDL)

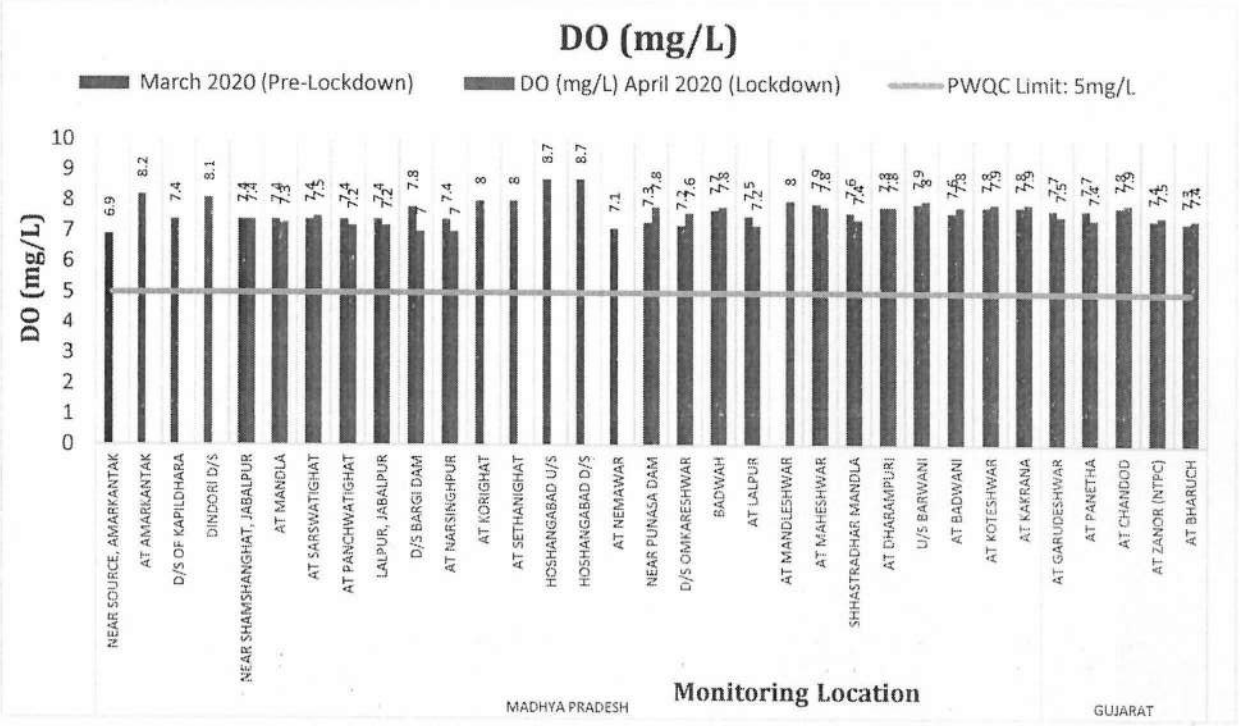

Figure 12.2: Water Quality of river Narmada in Madhya Pradesh and Gujarat States for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020).

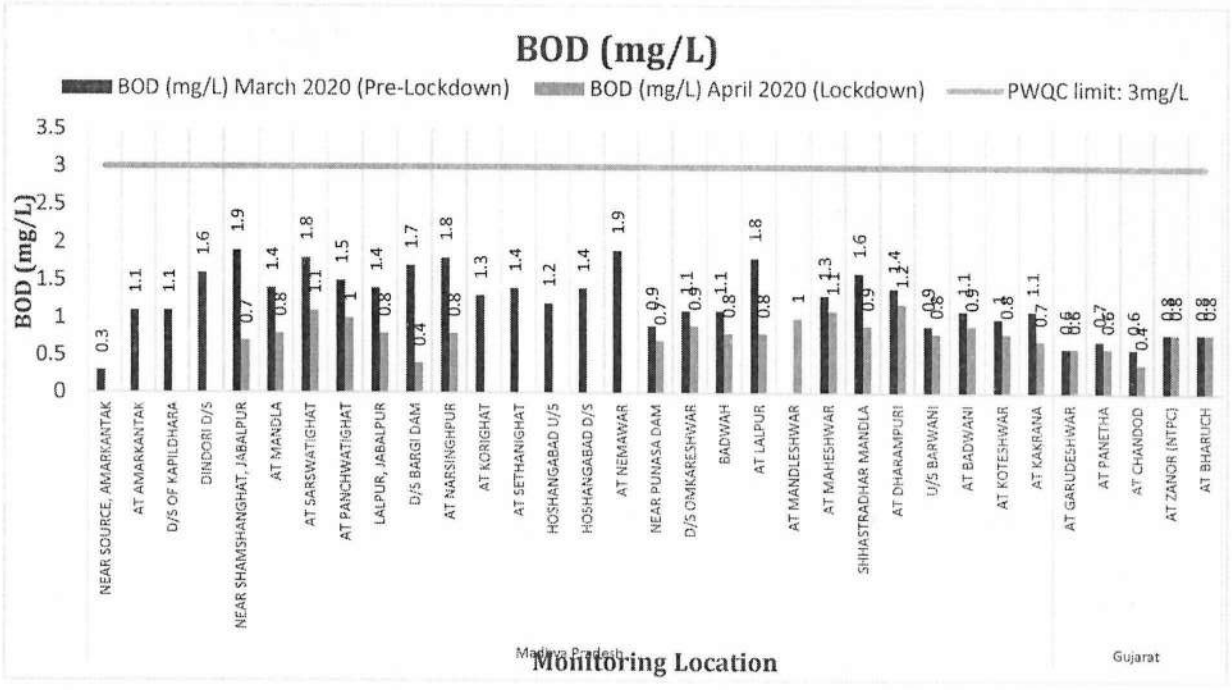

Figure 12.3: Water Quality of river Narmada in Madhya Pradesh and Gujarat States for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

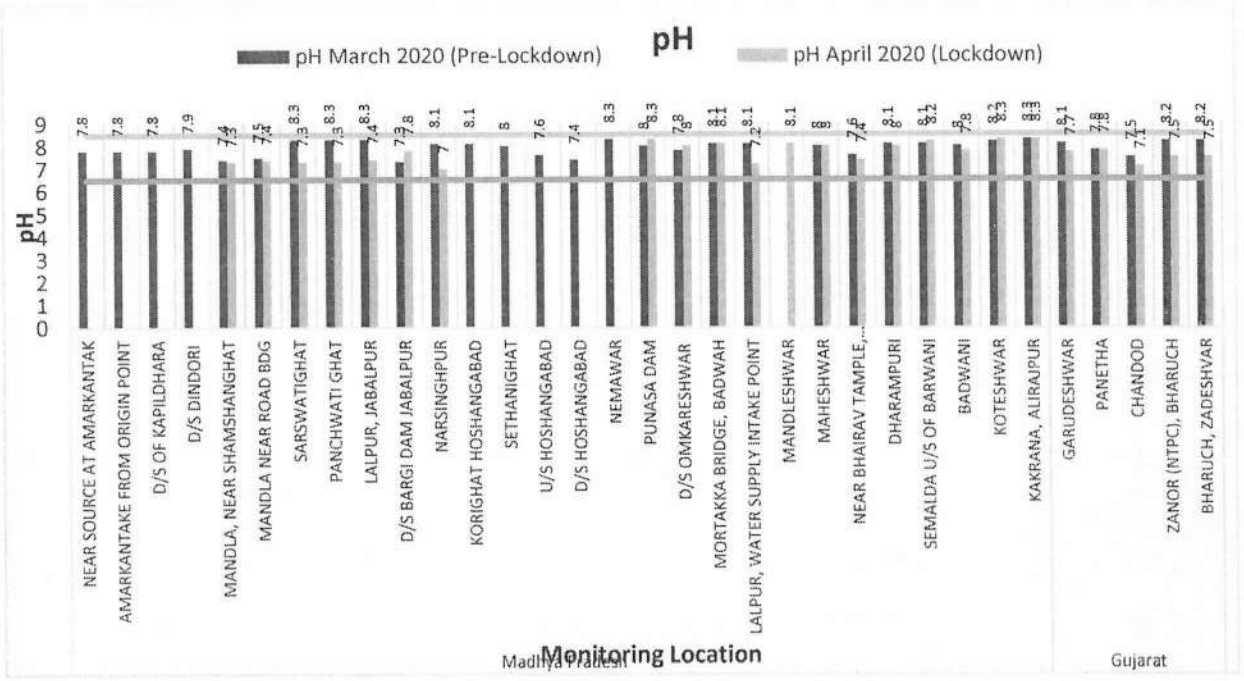

Figure 12.4: Water Quality of river Narmada in Madhya Pradesh and Gujarat States for pH during pre-lockdown (March 2020) and lockdown (April 2020)

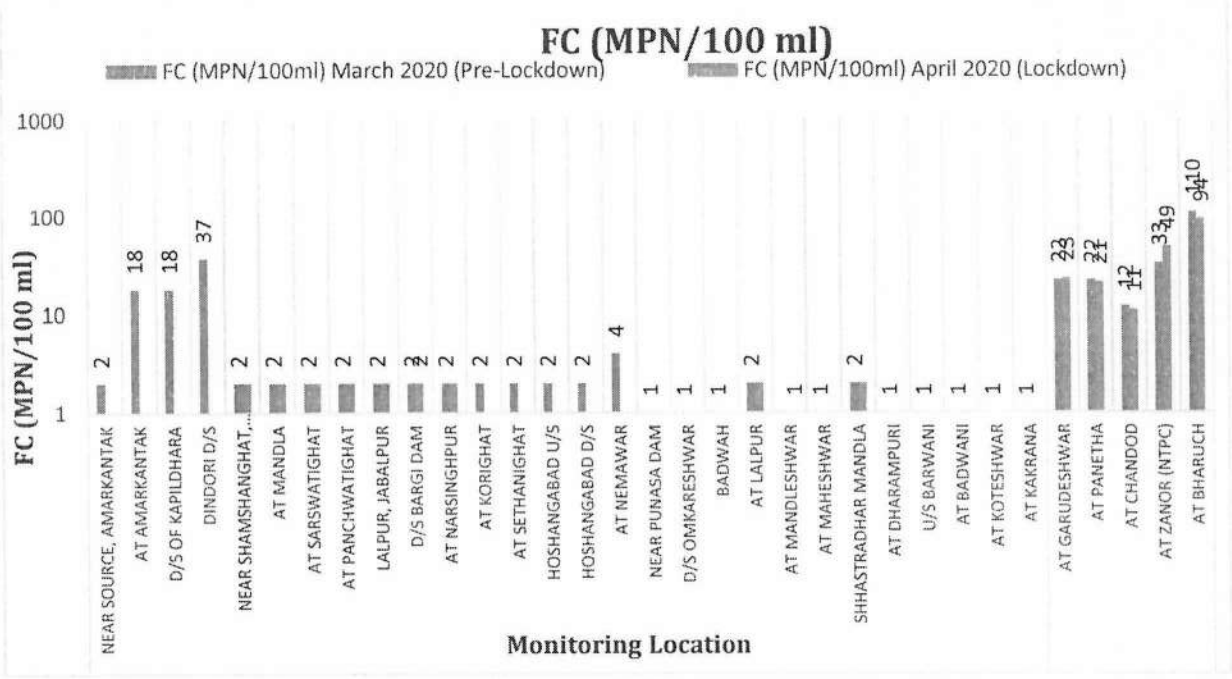

Figure 12.5: Water Quality of river Narmada in Madhya Pradesh and Gujarat States for FC during pre-lockdown (March 2020) and lockdown (April 2020)

12.4 Observations

Based on the analytical results of the samples collected from River Narmada, following findings/observations are made:

Madhya Pradesh

During the pre-lock down period (March 2020): -

- The analysis results for the criteria parameters were observed to be in the order of pH (7.3 - 8.3), DO (6.9 - 8.7 mg/L), BOD (BDL (0.3)-1.9 mg/L) and FC (BDL(1) - 37 MPN/100 mL) at 27 monitored locations.

- During pre-lockdown period (March 2020), the analysis results revealed that maximum DO was observed as 8.7 mg/L at 02 locations (Viz., at Hoshangabad U/s and D/s) and minimum observed as 6.9 mg/L at Amarkantak. Maximum BOD (1.9 mg/L) was observed at Mandla, Near Shamshanghat, Jabalpur and minimum observed as 0.3 mg/L at Amarkantak whereas maximum FC count (37 MPN/100 mL) was observed at Dindori which could be due to discharge of city sewage and minimum FC as BDL (1 MPN/100 mL) at 9 locations (Viz., at Punasa Dam, Punasa, at D/s of Omkareshwar, at Nr Mortakka Bridge, Badwah, at Maheshwar, at Dharampuri, at Semalda, at Barwani, at Koteshwar and at Kakrana, Interstate Boundry, Alirajpur).

- All 27 monitored locations complying with the desirable limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020): -

- The analysis results for the critical parameters were observed to be in the range of pH (7.0 - 8.3), DO (7.0 - 8.0 mg/L), BOD (BDL(0.4) - 1.2 mg/L) and FC (BDL(1.0)- 2.0 MPN/100mL) at 19 monitored locations.

- During lockdown period (April 2020), the analysis results revealed that maximum DO was observed as 8 mg/L at 02 locations (Viz., at Mandaleshwar & Semalda U/S Barwani) and minimum observed as 7 mg/L at 02 locations (Viz., Nr. Road Bridge (D/S Bargi Dam, Jabalpur) & Narsinghpur, MP). Maximum BOD was observed at Dharampuri as (1.2 mg/L) and minimum observed as 0.4 mg/L at Near Road Bridge (D/S Bargi Dam) Jabalpur whereas maximum FC count (2 MPN/100 mL) at 9 locations and minimum FC as BDL (1 MPN/100 mL) at 10 locations (Viz., at Punasa Dam, Punasa, at Near Mortakka Bridge, Badwah, D/s of Omkareshwar, at Mandleshwar, at Maheshwar, at Dharampuri, at Semalda U/s of Barwani, at Barwani, at Koteshwar and at Kakrana,

Interstate Boundry, Alirajpur).

- All 19 monitored locations complying with the limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on River Narmada stretch within MP State: -

- The analysis results reveal increasing trend of DO (1.27% - 6.85%) at 8 locations, and decreasing trend of DO (1.27 -10.26 %) at 8 locations, BOD (11.1 -76.47 %) at 18 locations and 'No' variation for DO at 2 locations and FC at 18 monitored locations were observed.

Gujarat

During the pre-lock down period (March 2020): -

- The analysis results for the critical parameters were observed to be in the order of pH (7.5 - 8.2), DO (7.3 -7.7 mg/L), BOD (BDL(0.6) - 0.8 mg/L) and FC (12 -110 MPN/100 mL) at the 5 monitored locations

- Minimum DO (7.3 mg/L) at Bharuch, Zadeshvar and maxicum DO (7.8 mg/L) was observed at Chandod. Maximum BOD (0.8 mg/L) was observed at 2 locations (viz., Zanor (NTPC), Bharuch and Bharch, Zadeshvar) and minimum BOD (BDL (0.6 mg/L) was observed at Chandod and Garudeshwar. Maximum FC (110 MPN/100 mL) was observed at Zadeshvar, Bharuch.

- All 5 monitored locations were found to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):-

- The analysis results for the critical parameters were found to be in the order of pH (7.1 - 7.8), DO (7.4 - 7.9 mg/L), BOD (0.4 - 0.8 mg/L) and FC (11- 94 MPN/100 mL) at the 5 monitored locations. Minimum DO (7.4 mg/L) was observed at Bharuch, Zadeshvar and maxicum DO (7.8 mg/L) was observed at Chandod. Maximum BOD (0.8 mg/L) was observed at 2 locations (viz., Zanor (NTPC), Bharuch and Bharch, Zadeshvar) and minimum BOD (BDL (0.4 mg/L) at Chandod. Maximum FC (94 MPN/100 mL) was observed at Zadeshvar, Bharuch.

- All 5 monitored locations were complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on River Narmada stretch within Gujarat State: -

- The analysis results reveal increasing trend of DO (1.28% - 1.37 %) at 3 locations, FC (4.5 - 48.48 %) at 2 locations and decreasing trend of DO (2.6 - 3.9 %) at 2 locations, BOD (14.29 - 33.3 %) at 2 locations, FC (4.55 - 14.55 %) at 3 locations and 'No' variation in BOD was observed at 3 locations.

Overall observations on Water Quality of river Narmada (Covering Madhya Pradesh and Gujarat): -

- During pre-lockdown period (March 2020), the analysis results shows pH (7.3 - 8.3), DO (6.9 - 8.7 mg/L), BOD (BDL (0.3)- 1.9mg/L) and FC (1 -110 MPN/100 mL) at the 32 monitored locations.
- All 32 monitored locations during pre-lockdown on river Narmada were observed to be complying with the parameters of Primary Water Quality Criteria for Outdoor Bathing.
- During lockdown period (April 2020), the analysis results reveal pH (7 - 8.3), DO (7 - 8 mg/L), BOD (BDL(0.4) - 1.2 mg/L) and FC (1 - 94 MPN/100 mL) at the 24 monitored locations.
- 24 out of 24 monitored locations during lockdown on river Narmada were found to be within the limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.
- Increasing trend of DO (1.27% -6.85%) at 11 locations and FC (4.5 % - 48.48%) at 2 locations whereas decreasing trend of DO (1.27 % -10.26%) at 10 locations, BOD (11.1% - 76.47%) at 20 locations and FC (4.55 -14.55%) at 03 locations were observed.
- 'No' variation was observed w.r.t DO at 2 locations, BOD at 3 locations and FC at 18 monitored locations.

12.5 Conclusion

During pre-lockdown (March 2020), 32 out of 32 monitored locations, 24 out of 24 monitored locations during lockdown (April 2020) and overall river Narmada shown 100 % compliance to the Primary Water Quality Criteria for Outdoor Bathing during pre-lockdown and lockdown.

13.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER SWARNAREKHA

13.1 About Swarnarekha (Subarnarekha) River

The river Swarnarekha originates south of Ranchi. Before falling in the Bay of Bengal near Talsari, the river flows through Ranchi and Singhbhum Districts of Jharkhand State. Thereafter, it flows for shorter distances through Paschim Midnapore district in West Bengal and Balasore district of Odisha. Swarnarekha river flows for a total length of 395 kilometres. Out of this, 269 km lies in Bihar, 64 km in West Bengal, and 62 km in Odisha. The prominent tributaries of the Swarnarekha are river Kharkai, Roro, Kanchi, Harmu Nadi, Damra, Karru, Chinguru, Karakari, Gurma, Garra, Singaduba, Kodia, Dulunga and river Khaijori. Jamshedpur is the largest Industrial city of Jharkhand, situated in the middle of the Swarnarekha river valley. Between Mayurbhanj and Singhbhum districts, on the right banks of the Subarnarekha, are the country's richest copper deposits. Mining activities are taking place near Jaduguda areas of Singhbhum district.

13.2 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water Quality of river Swarnarekha is monitored at 24 locations by Central Pollution Control (CPCB) Board in association with State Pollution Control Boards of Jharkhand (20 locations), West Bengal (02 locations) and Odisha (02 locations) under National Water Quality Monitoring Programme (NWMP). State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Swarnarekha is depicted in **Figure 13.1.**

13.3 Analytical Results

Water quality of river Swarnarekha was carried out at 05 locations (Jharkhand-04 and Odisha-01) during Pre-Lockdown (March 2020) and 15 locations (Jharkhand-14 and Odisha-01) during Lockdown period (April 2020) to assess the impact on water quality of river Swarnarekha. The analysis results of Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented in **Table-13.1**. Based on the monitoring & analysis of collected water samples from river Swarnarekha, the graphical presentation of river Swarnarekha with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) by the Jharkhand and Odisha States are presented in **Figure 13.2 to Figure 13.5**

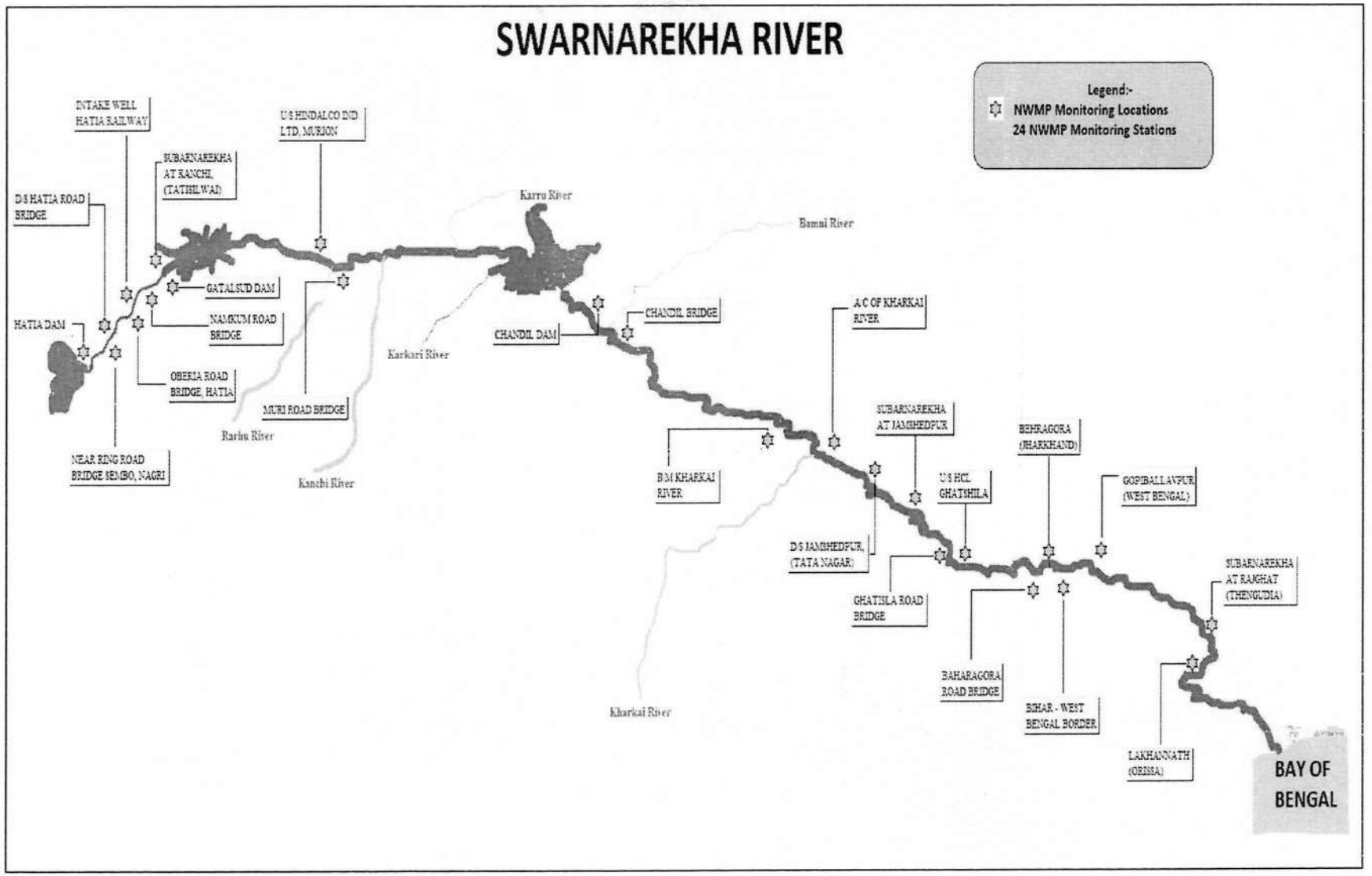

Figure 13.1: State-wise Distribution of Water Quality Monitoring Locations Under NWMP on River Swarnarekha

Table-13.1: Water Quality of River Swarnarekha (Jharkhand & Odisha) during Pre (March 2020) and Lockdown (April 2020)

Monitoring Location on River Swarnarekha	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing PWQCOB	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
JHARKHAND												
At Hatia Dam	-	7.6	-	-	7.5	-	1.2	-	-	-	-	Complying
Near Ring Road Bridge Sembo	7.9	7.3	-8%	7.4	7.3	2.9	3.4	+ 17%	150	-	-	Non-complying
Near Intake Well Hatia Railway	5	7.1	+ 42%	6.5	7.2	2.7	2.4	-11%	140	-	-	Complying
Near Oberia Road Bridge, Hatia	3.6	3.7	+ 3%	6.6	7.4	2.9	3.8	+ 31%	150	-	-	Non-complying
At Ranchi, (Tatisilwai)	7.9	6.6	-16%	7.4	7.3	2.9	5.8	+ 100%	150	-	-	Non-complying
At Namkum Road Bridge	-	6.2	-	-	7.5	-	6.4	-	-	-	-	Non-complying
At Gatalsud Dam	-	7.6	-	-	7.5	-	2.4	-	-	-	-	Complying
At Muri Road Bridge	-	7.1	-	-	7.5	-	3.8	-	-	-	-	Non-complying
At Chandil Dam	-	8.2	-	-	7.4	-	BDL (0.4)	-	-	-	-	Complying
At Chandil Bridge	-	8	-	-	7.4	-	BDL (0.6)	-	-	-	-	Complying
D/s Jamshedpur, (Tata Nagar)	-	5.2	-	-	7.6	-	4.8	-	-	-	-	Non-complying
At Jamshedpur	-	6	-	-	7.3	-	3.1	-	-	-	-	Non-complying
At Ghatisla Road Bridge	-	7.7	-	-	7.4	-	BDL (0.7)	-	-	-	-	Complying
At Baharagora Road Bridge	-	7.5	-	-	7.4	-	BDL (0.8)	-	-	-	-	Complying

Monitoring Location on River Swarnarekha	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing PWQCOB	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
No. locations monitored in Jharkhand	04 Locations in March 2020 and 14 locations in April 2020 (FC not monitored)											
No. of monitoring locations results available	04	14	-	04	14	04	14	-	04	Not monitored	-	-
No. of locations complying to Criteria	03	13	-	04	14	04	07	-	04	Not monitored	-	-
Range	3.6-7.9	3.7-8.2	Increase in % variation (3% to 42%) at 02 locations and decrease in percent variation (8%-16%) at 02 locations	6.5-7.4	7.2-7.6	2.7-2.9	BDL (0.4) - 6.4	Increase in % variation (17% to 100%) at 03 locations and decrease in percent variation (11%) at 01 location	140-150	-	-	-
ODISHA												
At Rajghat Thengudia, Odisha	7.6	8	5%	8.1	7.4	1.2	1	-17%	1300	220	-83.08%	Complying
Overall obsevations on River Swarnarekha during Pre-lockdown (March 2020) and Lockdown Period (April 2020) in Jharkhand and Odisha States												
No. locations monitored	05 locations in March 2020 and 15 locations in April 2020											
No. of monitoring locations results available	05	15	--	05	15	05	15	--	05	01	--	--

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Monitoring Location on River Swarnarekha	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing PWQCOB	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
No. of locations complying to Criteria	04	14	--	05	15	05	08	--	05	01	--	
Overall Range	3.6 -7.9	3.7 - 8.2-	Increase in % variation (3 to 42 %) at 3 locations & decrease in % variation (8%-16%) at 02 locations	6.5 to 8.1	7.2 to 7.6	1.2 -2.9	BDL (0.4) to 6.4	Increase in % variation (17% to 100%) at 03 locations and Decrease in % variation (11 to 17%) at 2 locations	140-1300	220	Decrease in % variation 83.08 % at 1 location	

Note:- *Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

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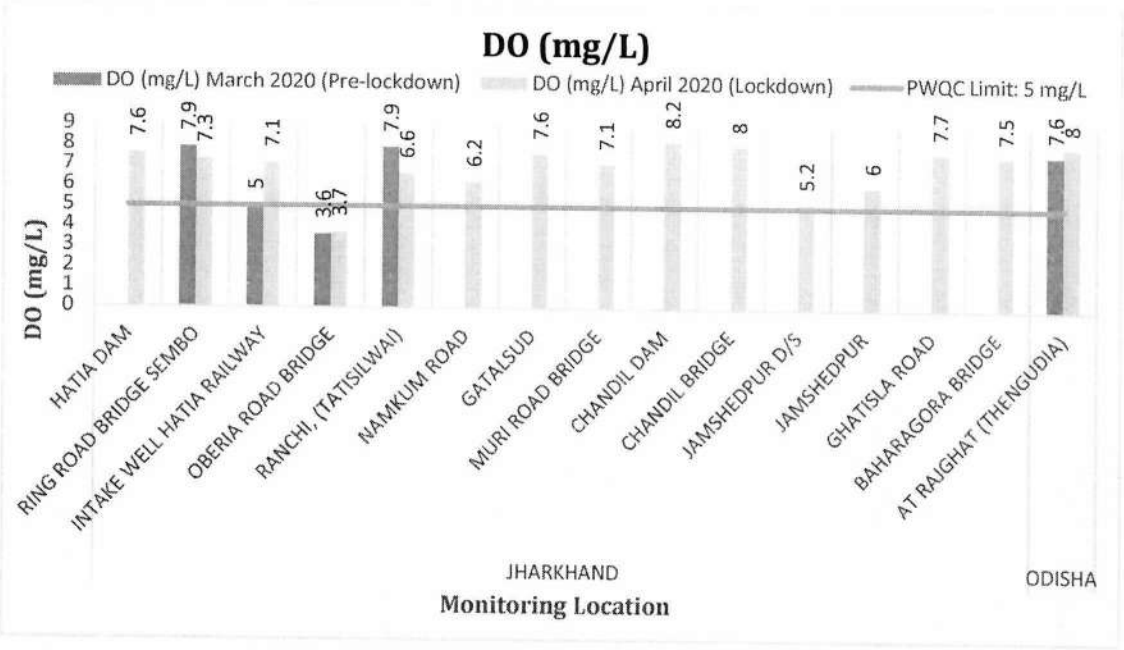

Figure 13.2: Water Quality of river Swarnarekha for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Jharkhand and Odisha

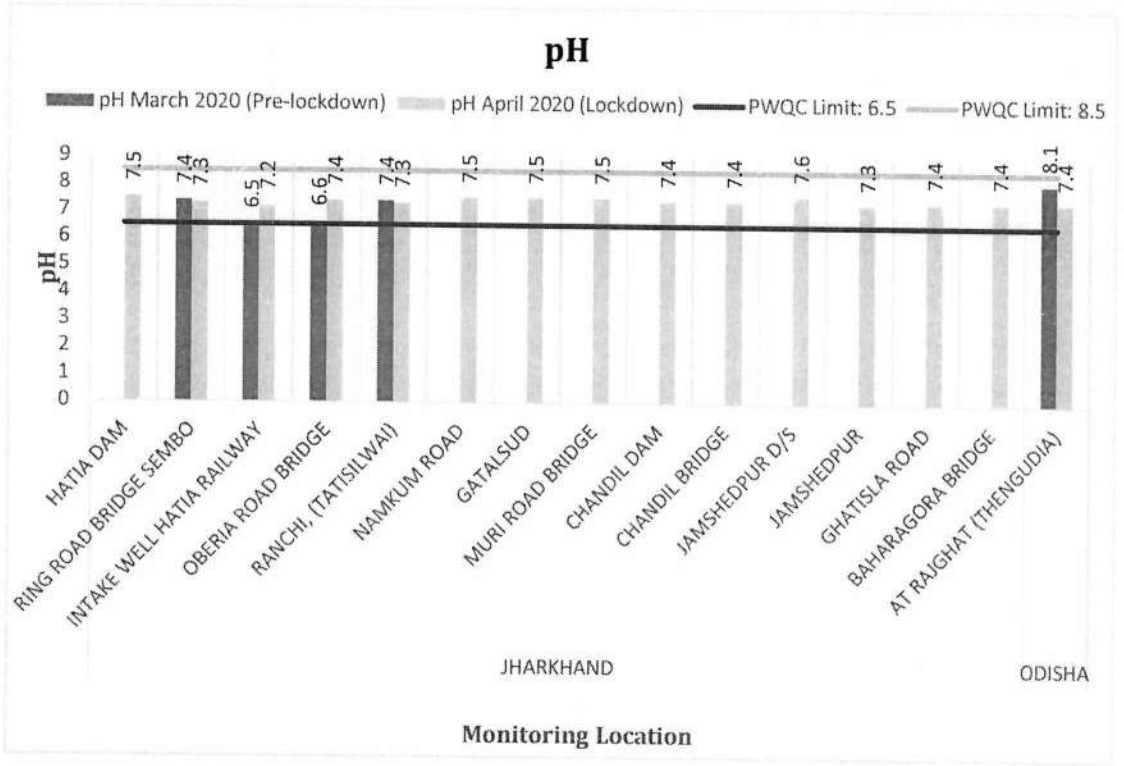

Figure 13.3: Water Quality of river Swarnarekha for pH during pre-lockdown (March 2020) and lockdown (April 2020) in Jharkhand and Odisha

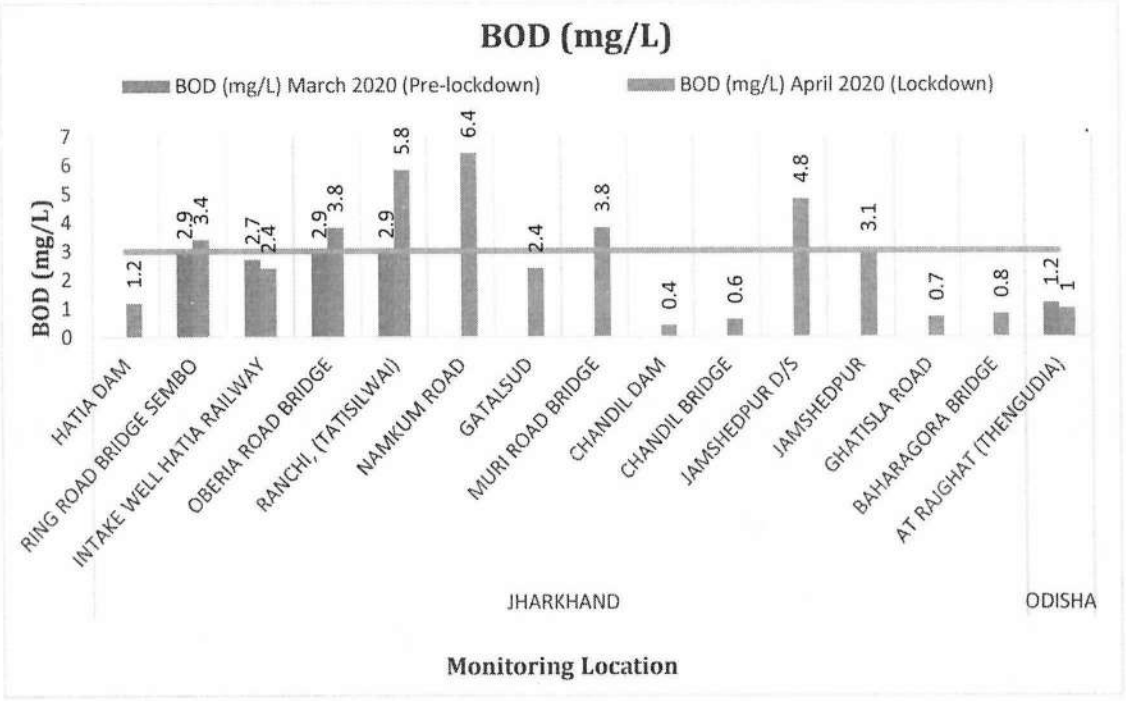

Figure 13.4: Water Quality of river Swarnarekha for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) in Jharkhand and Odisha

13.4 Observations

Based on the analytical results of the samples collected from river Swarnarekha, following findings/observations are made:

Jharkhand

During the pre-lock down period (March 2020): -

- The analysis results for the four critical parameters observed to be in the order of pH (6.5-7.4), DO (3.6 -7.9 mg/L), BOD (2.7 -2.9 mg/L) and FC (140 - 150 MPN/ 100 mL) at the 04 monitored locations.
- During lockdown, the analysis results revealed maximum DO (7.9 mg/L) was observed at Near Ring Road Bridge, Sembo and minimum DO (3.6 mg/L) at Oberia Road Bridge, Hatia whereas maximum BOD (2.9 mg/L) was observed at 3 locations and minimum BOD (2.7 mg/L) observed at Near Intake Well, Hatia Railway. Maximum FC count (150 MPN/100 mL) was observed at 3 locations and minimum BOD (140 MPN/100 mL) observed at Near Intake Well, Hatia Railway

- 3 out of 4 monitored locations were found to be complying to the parameters (i.e. pH, DO, BOD and FC) limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020): -

- The analysis results for the four critical parameters observed to be in the range of pH (7.2-7.6), DO (3.7 - 8.2 mg/L), BOD (BDL(0.4)–6.4 mg/L) at 14 monitored locations. FC not monitored by SPCB.

- During pre-lockdown, the analysis results revealed maximum DO (8.2 mg/L) was observed at Chandil Dam and minimum DO (3.7 mg/L) at Oberia Road Bridge, Hatia whereas maximum BOD (6.4 mg/L) was observed at Namkum Road Bridge and minimum BOD (BDL-0.4 mg/L) observed at Chandil Dam.

- pH at 14 locations, DO at 13 locations and BOD at 07 locations were found to be complyingwith the limits prescribed under Primary Water Quality Criteria for Outdoor Bathing

- 7 out of 14 monitored locations (excluding FC) were observed to be within the desirable limits (for pH, DO & BOD) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on water quality of river Swarnarekha within Jharkhand State:-

- The analysis results shown decreasing trend of DO (8 -16 %) at 02 locations, BOD (11 %) at 01 location and increasing trend of DO (3 - 42 %) at 02 locations and BOD (17 - 100 %) at 03 monitored locations.

Odisha

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters observed to be in the order of pH (8.1), DO (7.6 mg/L), BOD (1.2 mg/L) and FC (1300 MPN/ 100 mL) at the only 01 monitored location (Rajghat Thengudia, Odisha).

- Data of only 01 monitored location (Rajghat Thengudia, Odisha) was available and found to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020): -

- The analysis results for the four critical parameters observed to be in the order of pH (7.4), DO (8 mg/L), BOD (1 mg/L) and FC (220 MPN/100 mL) at the only 01 monitored location (Rajghat Thengudia, Odisha) and complying with the criteria parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on water quality of river Swarnarekha within Odisha State:-

- The analysis results of only one monitored location (Rajghat Thengudia, Odisha) shown decreasing trend of BOD (17%), FC (83.08 %) and increasing tendency of DO (5%).

Overall observations (covering both Jharkhand and Odisha States): -

- During lockdown, the analysis results revealed maximum DO is observed at Chandil Dam (8.2 mg/L) and minimum observed at Oberia Road bridge, Hatia (3.7 mg/L) whereas maximum BOD was observed at Namkum Road Bridge (6.4 mg/L) and minimum BOD observed as BDL (0.4 mg/L) at Chandil dam. Maximum FC count was observed at Rajghat, Thenugudia (220 MPN/100 mL).
- The analysis results revealed that the increasing trend of DO (3%- 42 % %) at 3 locations, BOD (17 -100%) at 3 locations and decreasing trend of DO (8 - 16 %) at 02 locations, BOD (11 -17 %) at 2 locations and FC (83.08 %) at 1 location.

13.5. Conclusion

During pre-lockdown, 4 out of 5 monitored locations and during lockdown, 8 out of 15 monitored locations were found to be complying with the Primary Water Quality Criteria for Outdoor Bathing. Also, the water quality of river Swarnarekha during the lockdown period was deteriorated in terms of % compliance of monitored locations (ie., 53.33 %) to the bathing criteria limits.

14.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER GODAVARI

14.1 About Godavari River

The River Godavari is 1,465 km long and ranks as India's second longest river after river Ganga and it flows from western to southern India. It is also referred to as Dakshin Gangotri. It originates at Triambakeshwar, Western Ghats (Brahmagiri hills), Nashik district, Maharashtra. Main stream of

Godavari flows through Maharashtra, Telangana & Andhra Pradesh and ultimately emptying into the Bay of Bengal at Narasapuram in West Godavari District, Andhra Pradesh (AP). Left tributaries of Godavari are river Purna, Indravati, Banganga, Kadva, Shivana, Sabari, Pranhita, Kadam and Taliperu. Right tributaries of Godavari are river Darna, Maner, Nasardi, Manjeera, Sindphana, Pravara and Kinnerasani. Important Towns or Cities along the river Godavari in Maharashtra are Triambakeshwar, Nashik, Nanded, Gangakhed, Gevrai, Sironcha, In Telangana State, main towns or cities are Nirmal, Basara, Adilabad, Battapur, Tadpakala, Dharmapuri, Goodem Gutta, Manthani, Kaleshwaram, Godavarikhani, Mancherial, Bhadrachalam and in AP, main towns or cities located on the banks of river Godavari are Yanam, Rajahmundry, Tallapudi, Kovvur, Antarvedi, Narsapur and Tadipudi. Major industrial activities are centred mainly at Aurangabad, Nashik, Rajahmundry. Sugar and distillery units are large in number in Maharashtra followed by pharmaceuticals, leather, pulp and paper as well as pesticide units. In Andhra Pradesh, sugar and distillery units are large in number followed by Pulp & Paper and fertilizer industries on the catchment of river Godavari.

14.2 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water Quality of river Godavari is monitored at 43 locations by CPCB in association with Maharashtra Pollution Control Board (MPCB), Telangana State Pollution Control Board (TSPCB) and Andhra Pradesh Pollution Control Board (APPCB) as well as CPCB (Vadodara & Bengaluru) under NWMP. State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Godavari is depicted in **Figure 14.1.**

14.3 Analytical Results

Water quality of river Godavari was carried out at 38 locations during Pre-Lockdown (March 2020) [Maharashtra (14), Telangana (17) and AP(7)] and at 37 locations during Lockdown period (April 2020) [Maharashtra (14), Telangana (16) and AP (7)] to assess the impact on water quality of river Godavari. The analysis results of Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. DO, pH, BOD and FC are presented below in **Table-14.1**.

Based on the monitoring & analysis of collected water samples from river Godavari, the water quality trend of river Godavari with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are depicted in **Figure 14.2 to Figure 14.5.**

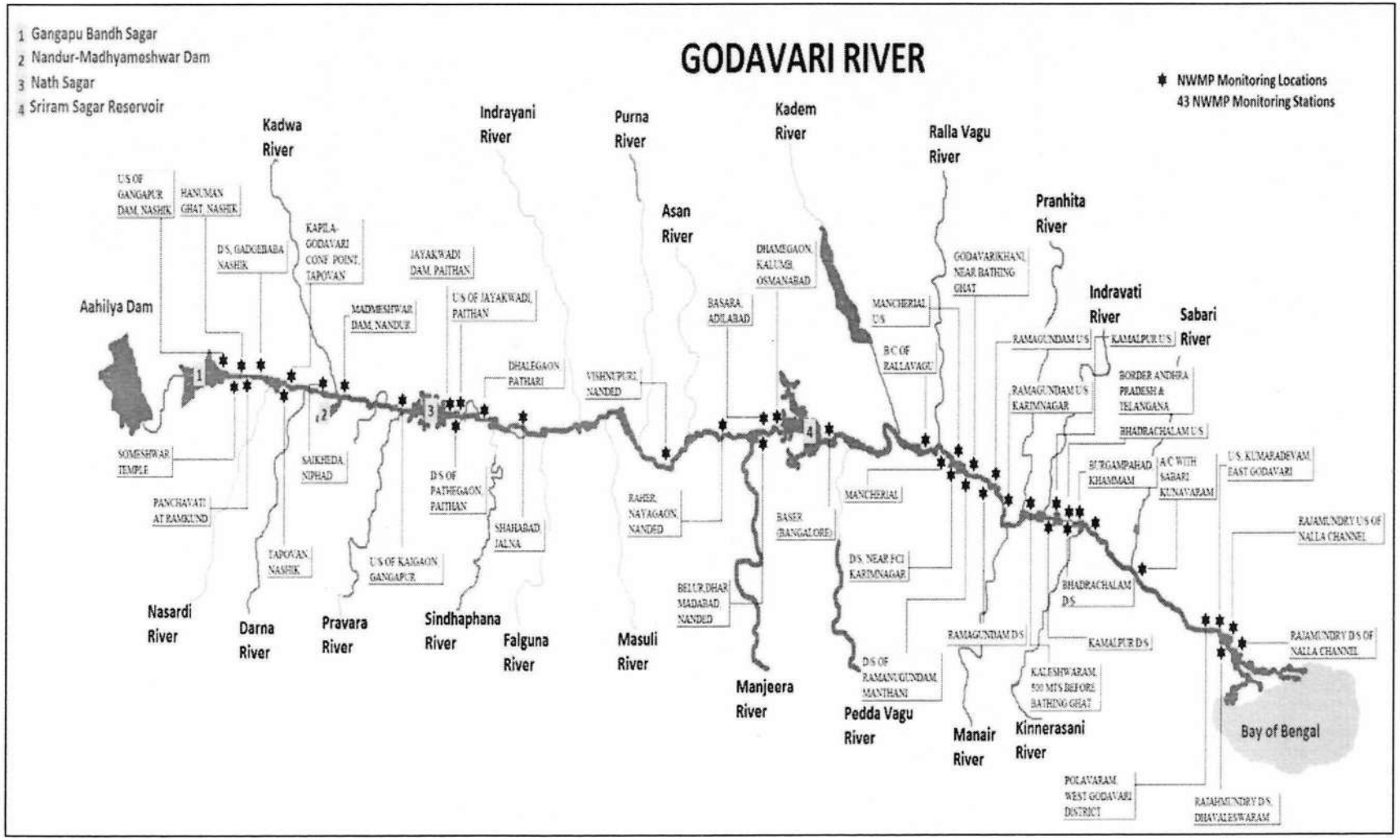

Figure 14.1: State-wise Distribution of Water Quality Monitoring Locations Under NWMP on River Godavari

Table-14.1: Water Quality of River Godavari during Pre (March 2020) and Lockdown Period (April 2020)

Monitoring Location Name on River Godavari	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
MAHARASHTRA												
U/s of Gangapur Dam, Nashik	6.7	6.8	1.5 %	7.3	7.3	3.0	2.8	-6.7 %	4	4	0.0 %	Complying
At Someshwar	5.8	6.5	12.1 %	8.0	7	3.4	3.2	-5.9 %	20	17	-15.0 %	Non-complying
At Tapovan	3.1	5	61.3 %	7.1	7.8	8.8	6.2	-29.5 %	70	47	-32.9 %	Non-complying
At Saikheda Village	5.6	6.3	12.5 %	7.8	7.1	3.8	3.4	-10.5 %	14	8	-42.9 %	Non-complying
D/s Nashik Near Amardham	5.1	5.9	15.7 %	8.1	7.2	5.2	3.8	-26.9 %	21	27	28.6 %	Non-complying
At Nandur-Madhmeshwar Dam	6.1	6.5	6.6 %	7.6	7.3	3.4	3.2	-5.9 %	11	6	-45.5 %	Non-complying
U/s of Aurangabad Reservoir,Kaigaon Tokka	6.4	6.2	-3.1 %	7.2	8	3.2	3.2	0.0 %	2	2	0.0 %	Non-complying
At Jaikwadi Dam, Paithan	6.8	6.7	-1.5 %	7.3	8.1	2.4	2.6	8.3 %	2	2	0.0 %	Complying
U/s of Paithan at Paithan intake pump house, Jayakwadi	6.6	6.8	3.0 %	7.3	8.1	2.8	2.4	-14.3 %	2	2	0.0 %	Complying
D/s of Paithan at Pathegaon bridge, Pathegaon	6.4	6.4	0.0 %	7.2	8.1	2.6	2.8	7.7 %	2	2	0.0 %	Complying
At Dhalegaon, Parbhani.	6.9	6.7	-2.9 %	7.1	8.1	2.2	2.8	27.3 %	2	2	0.0 %	Complying
At Latur water intake near Pump house, Dhamegaon	6.1	6.5	6.6 %	7.2	8.1	3.8	3	-21.1 %	2	2	0.0 %	Non-complying
Near Intake water pump house, Vishnupuri, Nanded	6.2	6.4	3.2 %	7.2	7.7	3.6	2.6	-27.8 %	2	2	0.0 %	Non-complying
At Raher, Nanded.	6.3	6.3	0.0 %	7.2	8	**3.2**	2.8	-12.5 %	2	2	0.0 %	Non-complying
No. locations monitored in Maharashtra	14 locations in March 2020 and 14 Locations in April 2020											
No. of monitoring locations results available	14	14	-	14	14	14	14	-	14	14	-	-
No. of locations complying to PWQC for Outdoor Bathing	13	14	-	14	14	5	8	-	14	14	-	-

Monitoring Location Name on River Godavari	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
Range	3.1 - 6.9	5 - 6.8	Increase in percent variation (1.5 to 61.3%) at 9 locations, Decrease in percent change (1.5 to 3.1%) at 3 locations and 'No' variation at 02 locations	7.1 - 8.1	7 - 8.1	2.2 - 8.8	2.4 - 6.2	Increase in percent variation (7.7 to 27.3%) at 3 locations, Decrease in percent change (5.9 to 29.5%) at 10 locations and 'No' variation at 01 location	2 - 70	2 - 47	Increase in percent variation (28.6%) at 1 location, Decrease in percent change (15 to 45.5%) at 4 locations and 'No' variation at 09 locations	-
TELANGANA												
At Basara	6.9	7.6	10.1 %	7.5	7.3	2.2	2.1	-4.5 %	2	2	Nil	Complying
Ali sagar Reservoir	7.1	7.4	4.2 %	7.3	7.3	2.1	2.1	Nil	2	2	Nil	Complying
Pochara Water Falls, Adilabad	7.3	7.2	-1.4 %	7.2	7.4	2.1	2.1	Nil	2	2	Nil	Complying
At Mancherial B/C of Rallavagu	5.3	5.7	7.5 %	8.1	8.4	2.1	2.4	14.3 %	4	4	Nil	Complying
Mancherial	4.7	5.6	19.1 %	8.3	8.3	3	2.1	-30 %	4	4	Nil	Non-complying
D/s Ramagundam near FCI intake well	4.7	6	27.7 %	8.2	8.4	2.1	2.1	0 %	4	4	Nil	Non-complying
Outlet of ash pond effluents of M/s.NTPC, Ramagundam	5.4	5.7	5.6 %	10.7	11.3	4	4	0 %	15	22	46.7 %	Non-complying
At Godavarikhani Near Bathing Ghat	5.8	5.8	Nil	8.1	8.4	3	2.1	-30 %	4	4	Nil	Complying
At Ramagundam U/s Nr.Dam	5.6	4	-28.6 %	8.2	8.4	2.1	2.8	33.3 %	2	4	100 %	Non-complying

Monitoring Location Name on River Godavari	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
D/s Ramagundam	4.1	6	46.3 %	8.1	8.2	2.1	2.1	Nil	20	20	Nil	Non-complying
At Kaleshwaram	6.2	-	-	8.1	-	2.1	-	-	4	-	-	Complying
U/s Kamalapur (V) at M/s.AP Rayons Ltd., Intake well	6.2	6.2	Nil	8	8.1	2.1	2.1	Nil	4	4	Nil	Complying
D/s Kamalapur (V) at M/s.AP Rayons Ltd., Discharge Point	6	6	Nil	8	8.1	2.1	2.1	Nil	2	4	100 %	Complying
U/s Bhadrachalam Bathing Ghat	5.5	6	9.1 %	7.8	8.3	2.1	2.1	Nil	4	4	Nil	Complying
D/s Bhadrachalam Bathing Ghat	5.2	5.5	5.8 %	7.9	8.3	3	2.8	-6.7 %	4	4	Nil	Complying
At Burgampahad	5.4	4	-25.9 %	7.7	8.3	3	2.9	-3.3 %	4	4	Nil	Non-complying
At Kunavaram at Sabari	6.2	6.2	Nil	7.8	8.3	2.1	2.1	Nil	2	2	Nil	Complying
No. locations monitored in Telangana	17 locations in March 2020 and 16 Locations in April 2020											
No. of monitoring locations results available	17	16	-	17	16	17	16	-	17	16	-	-
No. of locations complying to Criteria	14	14	-	16	15	16	15	-	17	16	-	-
Range	4.1 - 7.3	4 - 7.6	Increase in percent variation (4.2 to 46.3%) at 9 locations, Decrease in percent change (1.4 to 28.6%) at 3 locations and 'No' variation at 04 locations	7.2 - 10.7	7.3 - 11.3	2.1 - 4	2.1 - 4	Increase in percent variation (14.3 to 33.3%) at 2 locations, Decrease in percent change (3.3 to 30%) at 5 locations and 'No' variation at 09 locations	2 - 20	2 - 22	Increase in percent variation (46.7 to 100%) at 3 locations, and 'No' variation at 13 locations	-

Monitoring Location Name on River Godavari	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
Andhra Pradesh												
At Koundinyamukti (Kukunur) Border - AP & Telangana	7.7	6.5	-15.6 %	**8.7**	8.2	1.8	1.9	5.6 %	11	4	-63.6 %	Non-complying
A/c Sabari at Kunavaram	8.0	6.8	-15 %	7.5	7.7	1.5	1.3	-13.3 %	3	4	33.3 %	Complying
At Polavaram	6.5	6.6	1.5 %	7.8	7.8	2.3	1.5	-34.8 %	7	4	-42.9 %	Complying
U/s Rajahmundry at Kumaradevam	6.8	6.8	Nil	8.4	7.8	1.4	1.2	-14.3 %	4	4	Nil	Complying
D/s Rajahmundry at Dhawaleswaram	8.4	6.2	-26.2 %	7.8	8.1	1.4	2.2	57.1 %	15	9	-40 %	Complying
At Rajahmundry U/s of Nalla Channel	8.5	6.8	-20 %	7.4	7.5	2.2	1.3	-40.9 %	11	7	-36.4 %	Complying
At Rajahmundry D/s of Nalla Channel	6.5	6.4	-1.5 %	7.9	7.5	1.8	2.0	11.1 %	15	11	-26.7 %	Complying
No. locations monitored in AP	7 locations in March 2020 and 7 Locations in April 2020											
No. of monitoring locations results available in AP	7	7	-	7	7	7	7	-	7	7	-	-
No. of locations complying to Criteria	7	7	-	6	7	7	7	-	7	7	-	-
Range	6.5 - 8.5	6.2 - 6.8	Increase in percent variation (1.5%) at 1 location, Decrease in percent change (1.5 to 26.2%) at 5 locations and 'No' variation at 01 location	7.4 - 8.7	7.5 - 8.2	1.4 - 2.3	1.2 - 2.2	Increase in percent variation (5.6 to 57.1%) at 3 locations, Decrease in percent change (13.3 to 40.9%) at 4 locations	3 - 15	4 - 11	Increase in percent variation (33.3 %) at 1 location, Decrease in percent change (26.7 to 63.6%) at 5 locations and 'No' variation at 01 location	-

Monitoring Location Name on River Godavari	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
Overall observations on River Godavari (covering Maharashtra, Telangana and Andhra Pradesh) during Pre-lockdown and Lockdown Period												
Total No. of Locations Monitored	38 locations during Pre-lockdown (March 2020) and 37 locations during Lockdown in April 2020											
Total No. of monitoring locations results available	38	37		38	37	38	37		38	37		
Range	3.1- 8.5	4-7.6	Increase in percent variation (1.5% to 61.3 %) at 19 locations, Decrease in percent change (1.4 to 28.6%) at 11 locations and 'No' variation at 07 locations	7.1-10.7	7 – 11.3	1.4 -8.8	1.2 - 6.2	Increase in percent variation (5.6 to 57.1%) at 8 locations, Decrease in percent change (3.3 to 40.9%) at 19 locations and 'No' variation at 10 locations	2-70	2-47	Increase in percent variation (28.6 to 100%) at 5 locations, Decrease in percent change (15 to 63.6 %) at 9 locations and 'No' variation at 23 locations	-

Note:- *Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

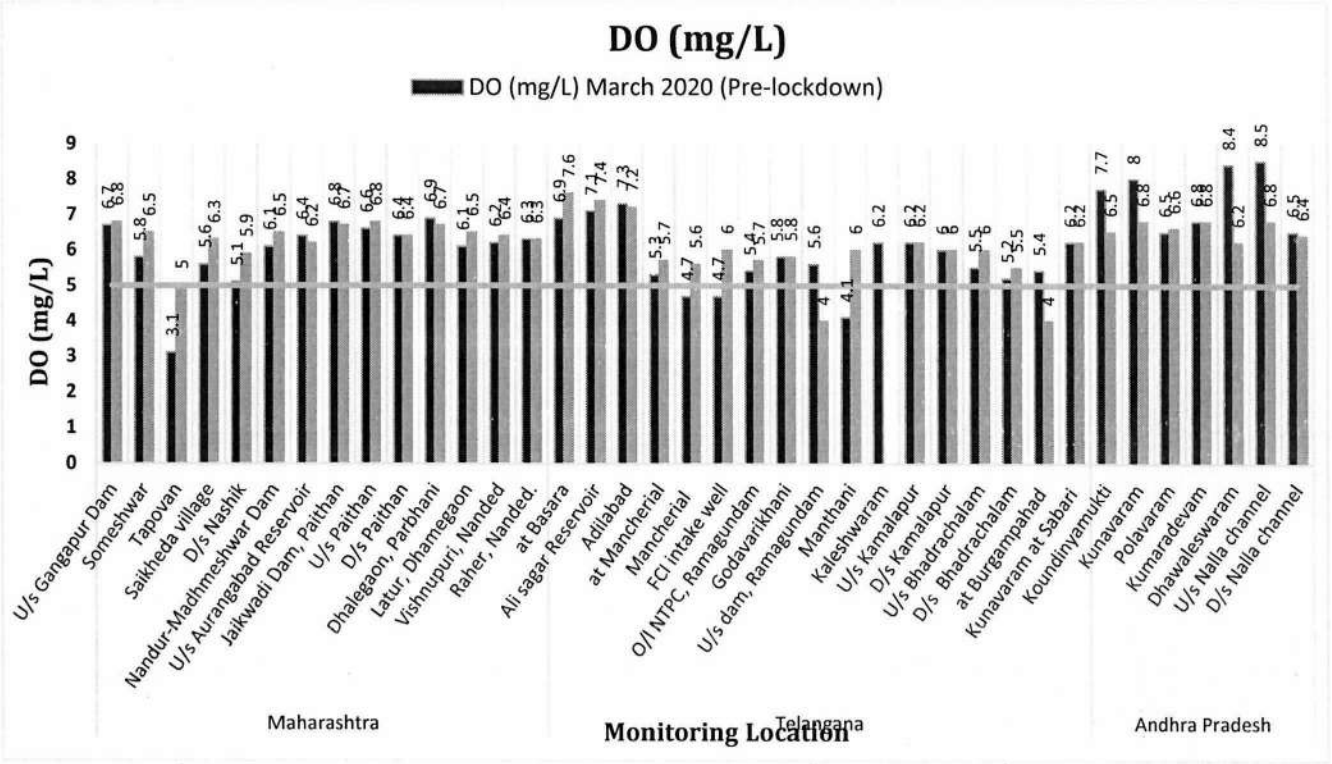

Figure 14.2: Water Quality of river Godavari for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

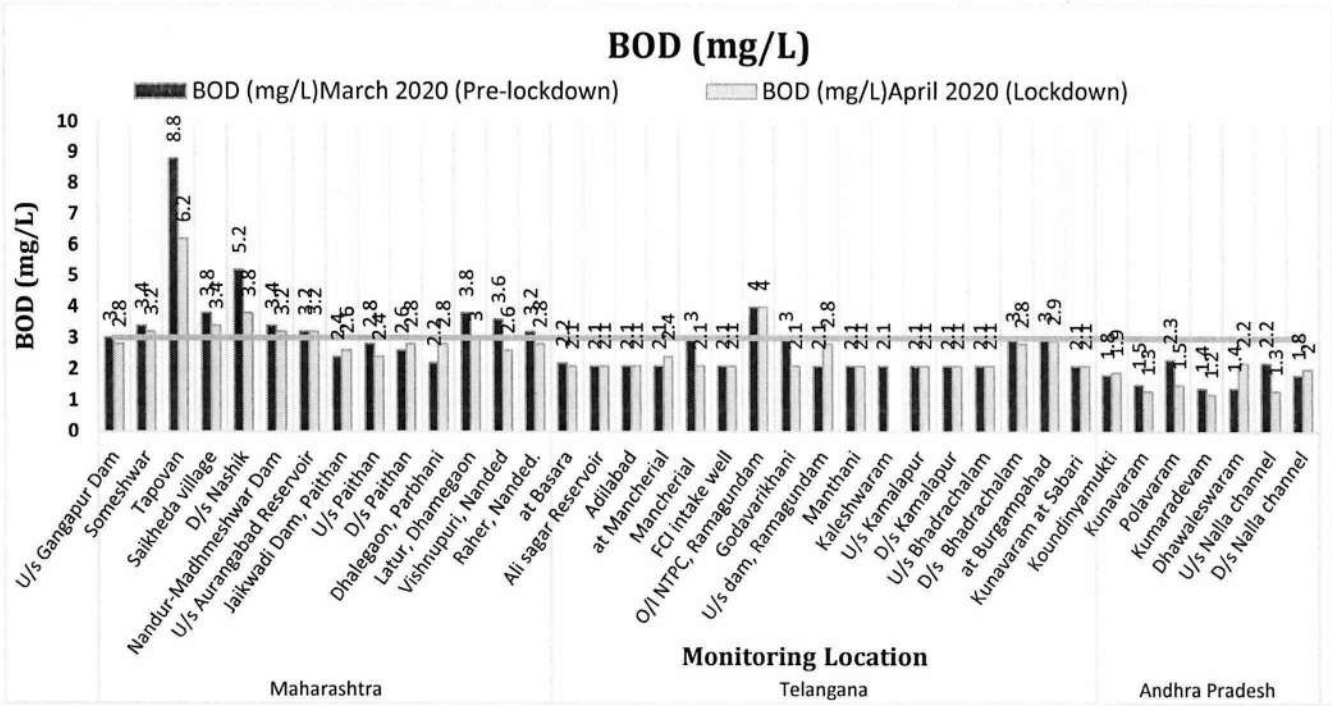

Figure 14.3: Water Quality of river Godavari for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

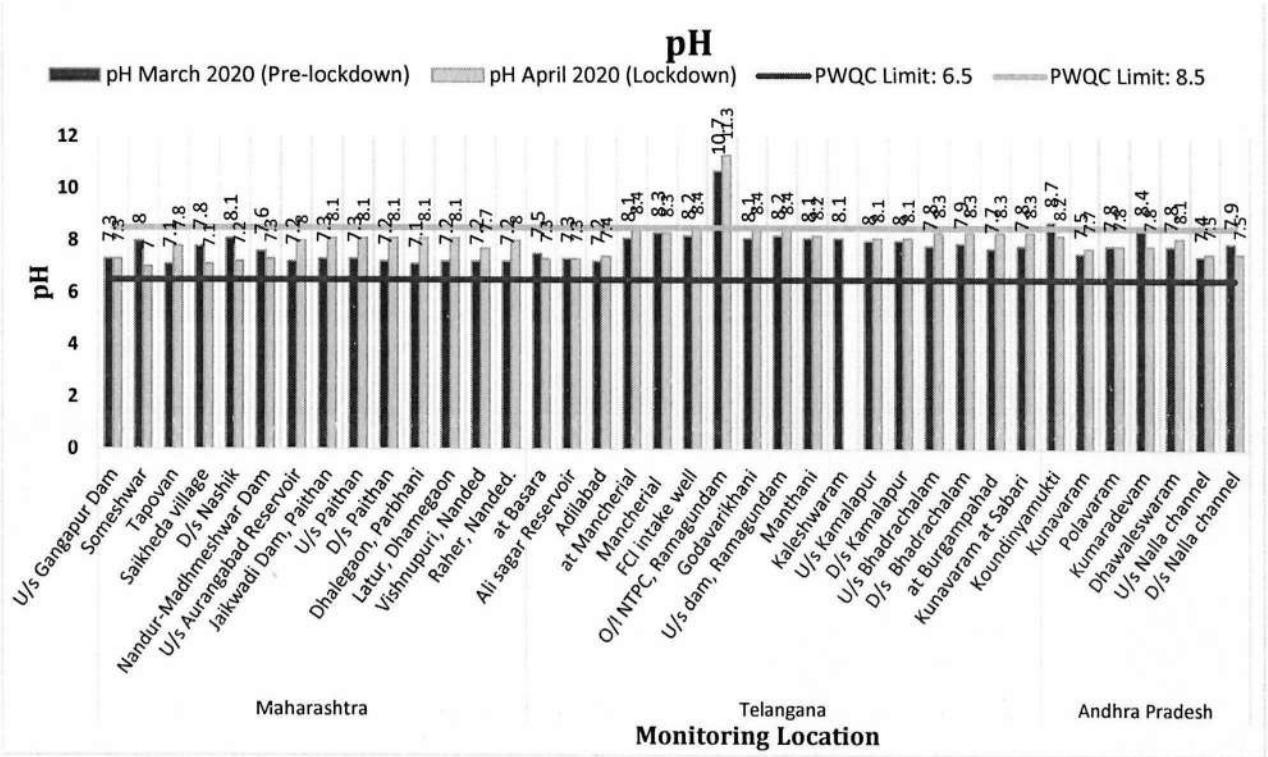

Figure 14.4: Water Quality of river Godavari for pH during pre-lockdown (March 2020) and lockdown (April 2020)

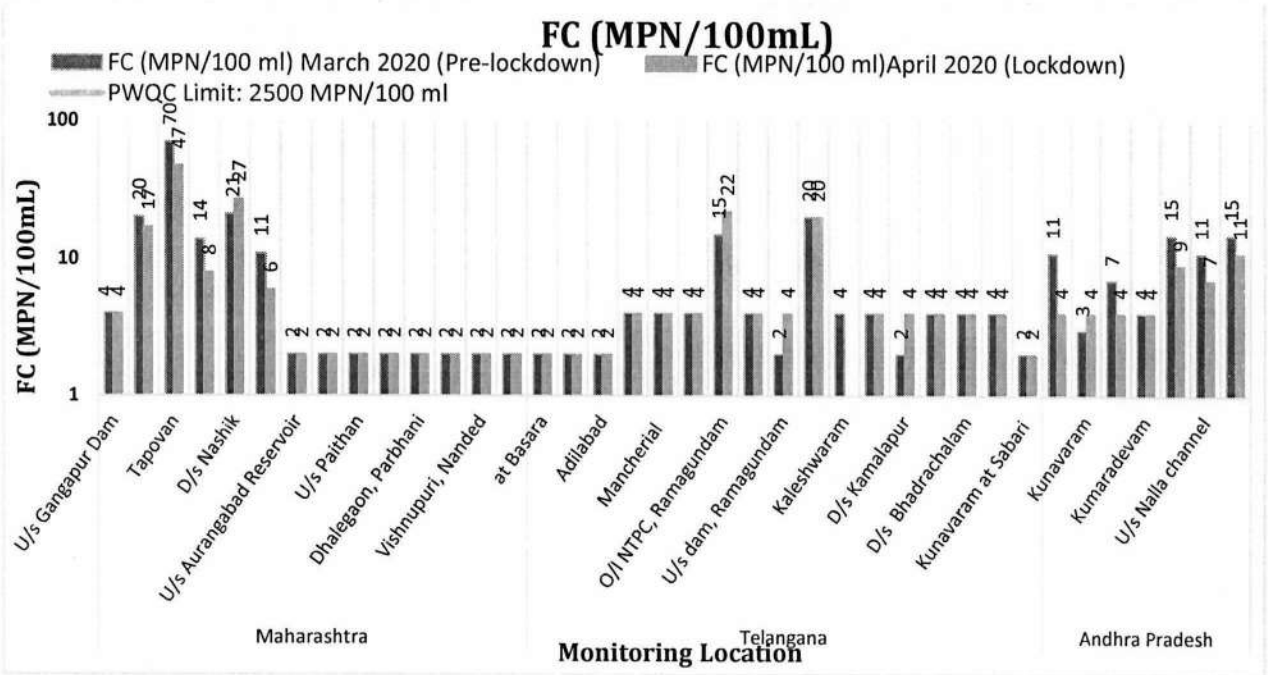

Figure 14.5: Water Quality of river Godavari for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020)

14.4 Observations

Based on the analytical results of samples collected from river Godavari, following findings/observations are made:

Maharashtra

During the pre-lock down period (March 2020): -

- The analysis results for the four critical parameters were observed to be in the order of pH (7.1 - 8.1), DO (3.1 - 6.9 mg/L), BOD (2.2 - 8.8 mg/L) and FC (2 – 70 MPN/100 mL) at all the 14 monitored locations.

- During pre-lockdown (March 2020), the analysis results revealed that maximum DO (6.9 mg/L) was observed at Dhlegaon, Parbhani and minimum DO (3.1 mg/L) at Tapovan whereas maximum BOD (8.8 mg/L) was observed at Tapovan and minimum was observed at (2.2 mg/L) at Dhalegaon, Parbhani. Maximum FC count (70 MPN/100 mL) was observed at Tapovan (due to wastewater discharge from Tapovan) and minimum FC (2 MPN/100 mL) was observed at 8 locations.

- 5 out of 14 monitored locations were found to be within the desirable limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020): -

- The analysis results for the four critical parameters were observed to be in the range of pH (7 - 8.1), DO (5 - 6.8 mg/L), BOD (2.4 - 6.2 mg/L) and FC (2 – 47 MPN/100 mL) at the 14 monitored locations.

- During lockdown (April 2020), the analysis results revealed that maximum DO (6.8 mg/L) was observed at U/s Intake Pump House, Jayakwadi and minimum DO (5 mg/L) at Tapovan whereas maximum BOD (6.2 mg/L) was observed at Tapovan and minimum was observed at (2.4 mg/L) at U/s Intake Pump House, Jayakwadi. Maximum FC count (47 MPN/100 mL) was observed at Tapovan (due to wastewater discharge from Tapovan) and minimum FC (2 MPN/100 mL) was observed at 8 locations.

- 8 out of 14 monitored locations were found to be complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on River Godavari stretch within Maharashtra State: -

- The analysis results reveaed increasing trend of DO (1.5% - 61.3 %) at 9 locations, BOD (7.7-27.3 %) at 3 locations, FC (28.6 %) at 1 location, and decreasing trend of DO (1.5 -3.1%) at 3 locations, BOD (5.9 -29.5 %) at 10 locations, FC (15 -45.5 %) at 4 locations. 'No' variation in DO (at 2 locations), BOD (at 01 location) and FC (at 09 locations) were observed.

Telangana

During the pre-lock down period (March 2020): -

- The analysis results for the four critical parameters were observed to be in the order of pH (7.2 - 10.7), DO (4.1 - 7.3 mg/L), BOD (2.1 – 4 mg/L) and FC (2 – 20 MPN/100 mL) at the 17 monitored locations.

- During pre-lockdown (March 2020), the analysis results revealed that maximum DO (7.3 mg/L) was observed at Pochara Water Fall, Adilabad and minimum DO (4.1 mg/L) at D/s Ramagundam whereas maximum BOD (4 mg/L) was observed at Ramagundam and minimum was observed at (2.1 mg/L) at 1 locations. Maximum FC count (20 MPN/100 mL) was observed at D/s Ramagundam (due to wastewater discharge from Ramagundam) and minimum FC (2 MPN/100 mL) was observed at 8 locations.

- 14 out of 17 monitored locations were observed to be within the desirable limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- Also, pH and BOD at 16 locations, DO at 14 locations, FC at 17 monitored locations were complying with the criteria limits.

During the lock down period (April 2020):-

- The analysis results for the four critical parameters observed to be in the order of pH (7.3 - 11.3), DO (4 - 7.6 mg/L), BOD (2.1 – 4 mg/L) and FC (2 – 22 MPN/100 mL) at the 17 monitored locations.

- During lockdown (April 2020), the analysis results revealed that maximum DO (7.6 mg/L) was observed at Basara and minimum DO (4 mg/L) at Burgampahad whereas maximum BOD (4 mg/L) was

observed at Ramagundam and minimum was observed at (2.1 mg/L) at 10 locations. Maximum FC count (22 MPN/100 mL) was observed at D/s Ramagundam (due to wastewater discharge from Ramagundam) and minimum FC (2 MPN/100 mL) was observed at 4 locations.

- 14 out of 16 monitored locations were found to be complying to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- Also, pH & BOD at 15 locations, DO at 14 locations, BOD and FC at all the 16 monitored locations were complying to the bathing water quality criteria limits

Overall observations on River Godavari stretch within Telangana State: -

- The analysis results revealed increasing trend of DO (4.2- 46.3 %) at 9 locations, BOD (14.3 -33.3 %) at 2 locations, FC (46.7-100 %) at 3 locations and decreasing trend of DO (1.4 -28.6%) at 3 locations, BOD (3.3-30 %) at 5 locations.

- 'No' variation in DO (at 4 locations), BOD (at 09 locations) and FC (at 13 locations) were observed.

Andhra Pradesh

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters were found to be in the order of pH (7.4 - 8.7), DO (6.5 - 8.5 mg/L), BOD (1.4 - 2.3 mg/L) and FC (3 – 15 MPN/100 mL) at the 7 monitored locations.

- The analysis results revealed that maximum DO (8.5 mg/L) was observed at Rajahmundry U/s Nallah Channel and minimum DO (6.5 mg/L) at 2 locations. Maximum BOD (2.3 mg/L) was observed at Polavaram and minimum (1.4 mg/L) was observed at 2 locations (U/s Rajahmundry at Kumaradevam and U/s Rajahmundry at Dhawaleswaram). Maximum FC count (15 MPN/100 mL) was observed at 2 locations (D/s Rajahmundry, Dhawaleswaram and at Rajahmundry D/s Nallah Channel) and minimum FC (3 MPN/100 mL) was observed after confluence of Sabari at Kunavaram.

- 6 out of 7 monitored locations were shown compliance to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020): -

- The analysis results indicate pH (7.5 - 8.2), DO (6.2 - 6.8 mg/L), BOD (1.2 - 2.2 mg/L) and FC (4 – 11 MPN/100 mL) at the 7 monitored locations.

- The analysis results revealed that maximum DO (6.8 mg/L) was observed at 3 locations and minimum DO (6.2 mg/L) at D/s Rajahmundry, Dhawaleswaram. Maximum BOD (2.2 mg/L) was observed at D/s Rajahmundry, Dhawaleswaram and minimum (1.2 mg/L) was observed at U/s Rajahmundry at Kumaradevam. Maximum FC count (11 MPN/100 mL) was observed at Rajahmundry D/s Nalla Channel) and minimum FC (4 MPN/100 mL) was observed at 4 locations.

- All the 7 monitored locations were found to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on River Godavari stretch within Andhra Pradesh State: -

- The analysis results reveal increasing trend of DO (1.5 %) at 1 location, BOD (5.6-57.1 %) at 3 locations, FC (33.3 %) at 1 location and decreasing trend of DO (1.5-26.2 %) at 5 locations, BOD (13.3-40.9 %) at 4 locations and FC (26.7-63.6 %) at 5 locations were observed.

- 'No' variation was observed in DO (at 1 location) and FC (at 1 location).

Overall observations on River Godavari (Covering Maharashtra, Telangana and Andhra Pradesh States): -

The analysis results reveal that

➢ During pre-lockdown (March 2020), 25 out of 38 monitored locations were found to be complying with the limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- During lockdown (April 2020), 29 out of 37 monitored locations were found to be within the desirable limits prescribed under Primary Water Quality Criteria for Outdoor Bathing. Analysis results revealed that maximum DO was observed at Basara (7.6 mg/L)) and minimum at Ramagundam upstream near dam and at Burgampahad (4.0 mg/L) whereas maximum BOD was observed at Tapovan (6.2 mg/L) and minimum was observed at Kumaradevam, U/s Rajahmundry (1.2 mg/L). Maximum FC count was observed at Tapovan (47 MPN/100 mL) and Minimum FC observed as 'BDL' at 12 locations.

- DO level U/s of Ramagundam drops suddenly as the River Godavari passes through Mancherial. Also, DO level at Burgampahad drops suddenly as the River receives wastewater from Bhadrachalam town. Maximum BOD was observed at Tapovan (6.2 mg/L) which could be due to confluence of River Nasardi (which receives wastewater from Nashik city) with river Godavari.

- Increasing trend of DO (1.5 - 61.3 %) at 19 monitored locations, BOD (5.6-57.1%) at 8 locations, FC (28.6 -100 %) were observed at 5 monitored locations.

- Decreasing trend of DO (1.4 - 28.6 %) at 11 monitored locations, BOD (3.3- 40.9 %) at 19 locations, FC (15 - 63.6 %) at 9 monitored locations were observed.

- 'No' variation in DO at 7 locations, BOD at 19 locations and FC at 23 monitored locations were observed

14.5 Conclusion

25 out of 38 monitored locations during pre-lockdown (March 2020), 29 out of 37 monitored locations during lockdown (April 2020) were found to be complying with the Primary Water Quality Criteria for Outdoor Bathing.

Also, marginal improvement in water quality of river Godavari was observed during the lockdown period specially w.r.t the parameters viz., DO, BOD and FC as well as intems of percent compliance of monitored locations.

15.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER KRISHNA

15.1 About Krishna River

The Krishna river originates in the Western Ghats near Mahabaleshwar in the State of Maharashtra and is one of the longest rivers in India. The Krishna river is 1288 km long and flows through Maharashtra, Karnataka before entering Telangana State and finally empties into the Bay of Bengal at Hamasala Deevi (near Koduru) in Andhra Pradesh, on the east coast. Vijayawada is the largest city on the bank of River Krishna. Main tributaries on the left bank of river Krishna are river Bhima, Dindi, Peddavagu, Musi, Paleru, Munneru and right bank tributaries are river Kundali, Venna, Konya, Panchganga, Dudhaganga, Ghataprabha, Malaprabha and Tungabhadra. The industrialized urban cities are Satara, Kolhapur, Solapur, Pune, and Sangli in Maharashtra State, Raichur, Hubli-Dharwad, Bijapur, Gulbarga, Bhadravati, Davangere, Belgaum, Chitradurga, Bagalkot are in Karnataka, Nalgonda and Suryapet in Telangana and Kurnool, Guntur, Vijayawada in Andhra Pradesh State consisting of leather & fertilizer units, Chemicals, Thermal Power plants, etc. Krishna river basin is endowed with rich mineral deposits such as oil & gas, coal, iron, limestone, dolomite, gold, granite, laterite, uranium, diamonds, etc. High alkalinity water is discharged from the ash dump areas of many coal fired power stations into the river Krishna which further increases the alkalinity of the river water whose water is naturally of high alkalinity since the river basin is draining vast area of basalt rock formations.

15.2 Water Quality Monitoring Locations under National Water Monitoring Programme (NWMP)

Water quality of river Krishna is monitored at 30 locations by Central Pollution Control Board (CPCB) in association with the State Pollution Control Boards of Maharashtra, Karnataka, Telangana and Andhra Pradesh under National Water Quality Monitoring Programme (NWMP). State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Krishna is depicted in **Figure -15.1.**

15.3 Analytical Results

Water quality of river Krishna was carried out at 26 locations [Maharashtra (09), Karnataka (05), Telangana (04) and AP (08)] during Pre-Lockdown (March 2020) and at 18 locations [Maharashtra (04), Karnataka (06), and AP (08)] during Lockdown period (April 2020) to assess the impact on water quality of river Krishna. The analysis results of Primary Water Quality Criteria for Outdoor

Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented in **Table- 15.1**.

Based on the monitoring & analysis of collected water samples from river Krishna, the graphical presentation of water quality of river Krishna with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are presented in **Figure 15.2 to Figure 15.9.**

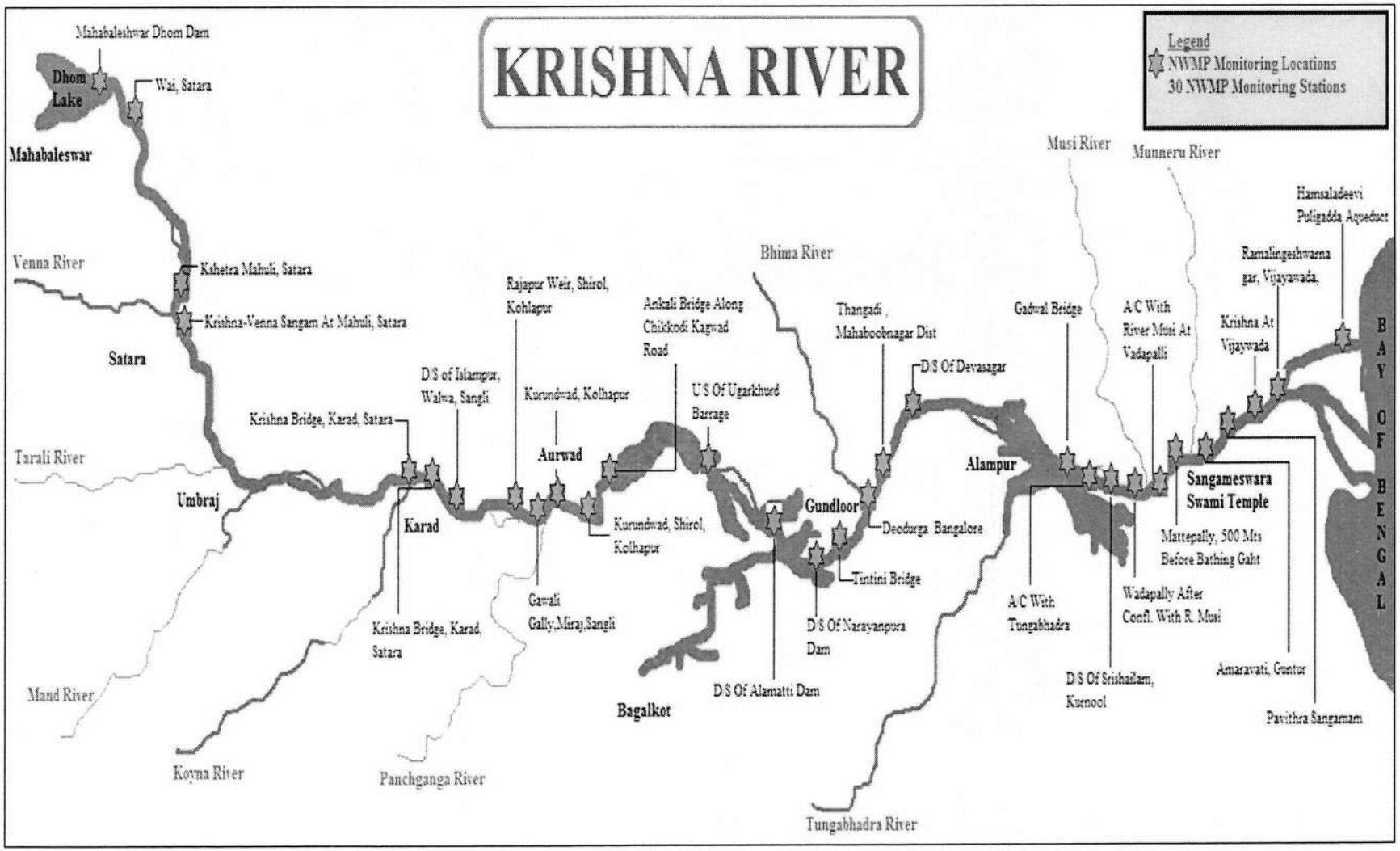

Figure 15.1: State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Krishna

Table-15.1: Water Quality of River Krishna during Pre (March 2020) and Lockdown (April 2020)

Name Of Monitoring Location on River Krishna	Dissolved Oxygen (mg/L)			pH		BOD (in mg/L)			Fecal Coliform (in MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
	MAHARASHTRA											
At Dhom Dam, Village. Wai,Aluka, Dt.Satara	6.7	-	-	7.0	-	3	-	-	30	-	-	Complying
At Wai, village. Wai Taluka. District. Satara.	6.6	-	-	7.1	-	3	-	-	110	-	-	Complying
At Kshetra Mahuli, Village and Taluka Kshetra. Mahuli, Dt. Satara.	6.6	-	-	7.3	-	3	-	-	200	-	-	Complying
At Venna Sangam Mahuli Village. District. Satara.	6.5	-	-	7.6	-	6.3	-	-	110	-	-	Non-complying
At Krishna Bridge, (at NH 4 Bridge) Village. Karad, District. Satara.	6.7	-	-	7	-	3	-	-	130	-	-	Complying
At Walwa, D/s of Islampur Near Vithal Temple, District- sangli	6.6	6.6	Nil	8.2	8.2	1.8	1.5	-17%	7	9	+28.5%	Complying
At Rajapur Weir, Village- Rajapur, District- kolhapur.	6.1	6.6	+8.2%	8.2	7.8	2	1.6	-20%	9	17	+84.8%	Complying
At Maighat, Village-Gawali Gally, Taluka-Miraj, District- Sangli.	6.6	6.7	+1.5%	8.3	7.8	1.8	1.5	-17%	7	7	Nil	Complying
At Kurundwad Near Santaji Narshingwadi, District- kolhapur.	6	6.6	+10.0%	8.2	7.9	2	1.6	-20%	12	14	+16.7%	Complying
No. Locations monitored in Maharashtra	09 Locations during Pre-lockdown (March 2020) and 04 Locations during Lockdown Period (April 2020)											

Name Of Monitoring Location on River Krishna	Dissolved Oxygen (mg/L)			pH		BOD (in mg/L)			Fecal Coliform (in MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
No. of monitoring locations results available in Maharashtra	09	04	-	09	04	09	04	-	09	04	-	
No. of locations complying to Criteria	09	04	-	09	04	08	04	-	09	04	-	
Range	6-6.7	6.6-6.7	Increase in percent variation (1.5 to 10.0%) at 03 locations) and 'No' variation at 1 location	7-8.3	7.8-8.2	1.8- 6.3	1.5-1.6	Decrease in percent variation (17 to 20%) at 04 locations)	7-200	7-17	Increase in percent variation (16.7 to 84.8%) at 03 locations. and No' variation at 1 location	
KARNATAKA												
Ankali Bridge along Chikkodi Kagwad Road	6	6.5	+8.3%	8.3	8.3	1 (BDL)	1.1	+10%	500	900	+80.0%	Complying
At U/s of Ugarkhurd barrage,	7.2	7.7	+6.9%	8	8.7	1.1	1 (BDL)	-10%	500	350	-30.0%	Non-complying
At D/s of Alamatti Dam	7.8	7.2	-7.7%	8.4	8.3	2.2	2.9	+32%	900	900	Nil	Complying
At D/s of Narayanpura Dam,	6.6	6.7	+1.5%	8.5	8.4	2.2	2.7	+23%	900	500	-44.4%	Complying
At Tintini Bridge,	-	7	-	-	8.1	-	2	-	-	170	-	Complying
At D/s of Devasagar Bridge	7.2	7	-2.8%	8.4	8.2	2.5	2	-20%	350	280	-20.0%	Complying
No. Locations monitored in Karnataka	05 Locations in March 2020 (Pre-lockdown) and 06 locations in April 2020 (During lockdown)											
No. of monitoring locations results available	05	06	-	05	06	05	06	-	05	06	-	

Name Of Monitoring Location on River Krishna	Dissolved Oxygen (mg/L)			pH		BOD (in mg/L)			Fecal Coliform (in MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
No. of locations complying to Criteria for Bathing	05	06	-	05	05	05	06	-	05	06	-	
Range	6-7.8	6.5-7.7	Decrease in percent variation (2.8 to 7.7) at 2 locations. Increase In percent variation (1.5 to 8.3%) at 03 locations	8-8.5	8.1-8.7	1-2.5	1-2.9	Decrease in percent variation (10 to 20 %at 2 locations and increase 10 - 32% at 03 locations)	350-900	170-900	Decrease in percent variation (20 to 44.4%) at 03 locations and increase of 80% at 1 location. and 'No 'variation at 1 location	
	TELANGANA											
At Thangadi , Mahbubnagar Dist.	5.7	-	-	8.7	-	4	-	-	2	-	-	Non-complying
At Gadwal Bridge	6.6	-	-	8.3	-	2.1	-	-	4	-	-	Complying
At Wadapally A/c with River Musi	6.5	-	-	7	-	3	-	-	3	-	-	Complying
At Mattepally, 500 m before Bathing Ghat	6.6	-	-	7.4	-	2.8	-	-	19	-	-	Complying
No. locations monitored in Telangana	04 locations In March 2020											
No. of monitoring locations monitored results available in Telangana	04	-	-	04	-	04	-	-	04	-	-	

Name Of Monitoring Location on River Krishna	Dissolved Oxygen (mg/L)			pH		BOD (in mg/L)			Fecal Coliform (in MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
No. of locations complying to Criteria for Bathing	04	-	-	03	-	03	-	-	04	-	-	
Range	5.7 -6.6	-	-	7-8.7	-	2.1 – 4	-	-	2-19		-	-
	ANDHRA PRADESH											
After Confluence with river Musi	7.4	7.2	-2.7%	7.6	7.71	1.8	1 (BDL)	-44%	3	3	Nil	Complying
After Confluence with River Tungabhadra, Sangameshwaram Kund	4.9	6.4	+30.6%	6.9	7.4	1 (BDL)	1.2	+20%	100	100	Nil	Non-complying
D/s of Srishailam, Kurnool	5.2	6.3	+21.2%	7.1	7.7	1 (BDL)	1 (BDL)	0.0%	100	300	+200.0%	Complying
At Vedadri , Kurnool	6.8	6.8	Nil	7.8	7.2	1.6	1.4	-13%	3	3	Nil	Complying
At Amaravati, Guntur	7.3	7.1	-2.7%	7.8	7.4	1 (BDL)	1 (BDL)	0.0	3	3	Nil	Complying
Pavithra Sangamam, After Confluence	7.2	7.1	-1.4%	7.7	7.6	1 (BDL)	1 (BDL)	0.0	3	3	Nil	Complying
At Vijaywada	7.1	7.2	+1.4%	7.8	7.7	1.2	1 (BDL)	-17%	3	23	+666.7%	Complying
At Hamsaladeevi Near Puligadda Aqueduct	4.6	4.8	+4.3%	7.9	7.9	2.6	2.2	-15%	3	3	Nil	Non-complying
No. locations monitored in AP	08 Locations in March 2020 (Pre-lockdown) and 08 locations in April 2020 (During lockdown)											
No. of monitoring locations monitored results available in AP	08 Locations in March 2020 (Pre-lockdown) and 08 locations in April 2020 (During lockdown)											
No. of locations complying to Criteria	06	07		08	08	08	08		08	08		

Name Of Monitoring Location on River Krishna	Dissolved Oxygen (mg/L)			pH		BOD (in mg/L)			Fecal Coliform (in MPN/100 mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
Range	4.6-7.4	4.8-7.2	Decrease in percent variation (1.4 to 2.7 %) at 3 locations and Increase (1.4 to 30.6%) at 04 locations and 'No' variation 1 location	6.9-7.9	7.2-7.9	BDL (1) -2.6	BDL (1) - 2.2	Decrease in percent variation (13 to 44 to %) at 4 locations and increase (20%) at 1 locations and 'No' variation at 3 locations	3-100	3-300	Increase in percent variation (200 to 666.7%) at 2 locations. And No' variation at 6 locations	
Overall Water Quality of river Krishna (covering Maharashtra, Karnataka, Telangana and Andhra Pradesh) during Pre and Lockdown Period												
No. locations monitored	26 locations monitored in March 2020 and 18 locations monitored in April 2020											
No. of monitoring locations for which monitored results available	26	18		26	18	26	18		26	18		
Range	4.6 – 7.8	4.8 – 7.7	Decrease (1.4 -7.7 %) at 5 locations Increase (1.4 – 30.6%) at 10 locations. No variation at 2 locations	6.9 – 8.7	7.2 – 8.7	1 (BDL) – 6.3	1 (BDL) – 2.9	Decrease in % 10 - 44 % at 10 locations Increase (10-32 %) at 4 locations. No variation at 3 locations	2 - 900	3 - 900	Decrease (20 to 44.4 %) at 3 locations Increase (16.7 – 666.7%) at 6 locations. No variation observed at 8 locations	

Note:- *Values below 1mg/L for BOD to be considered as Below Detecyion Limit (BDL)

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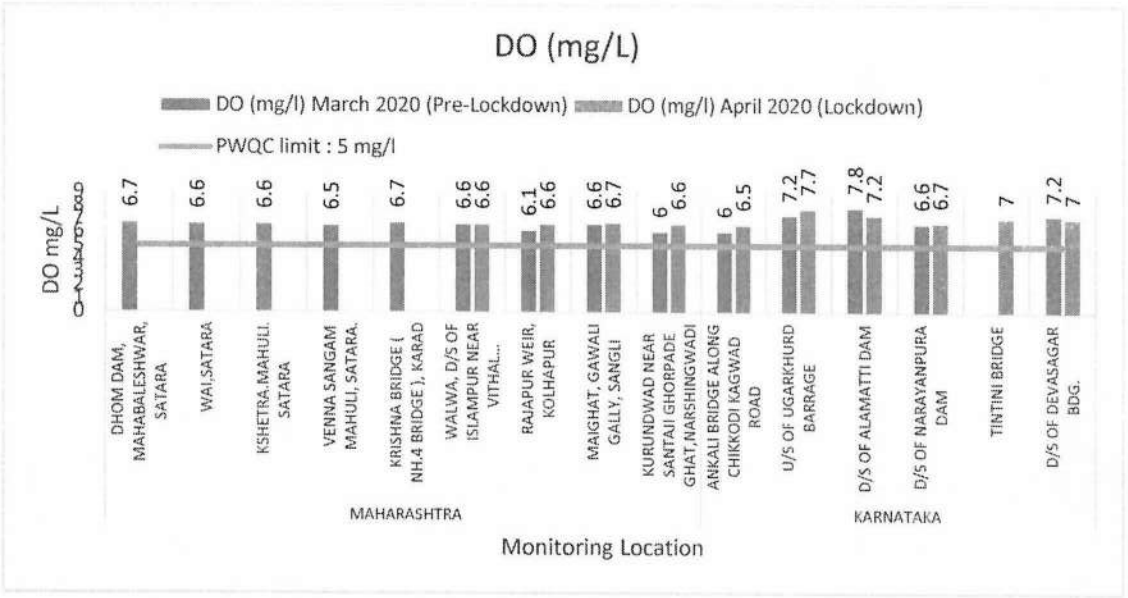

Figure – 15.2: Water Quality of river Krishna for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) for Maharashtra and Karnataka States

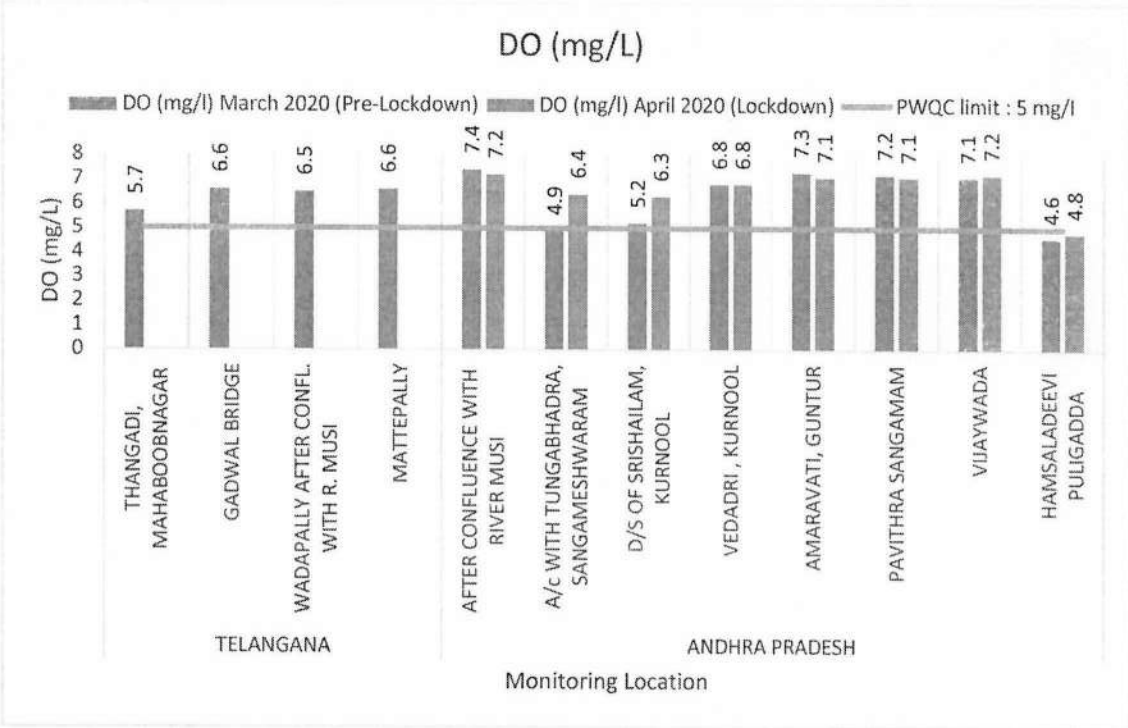

Figure – 15.3 : Water Quality of river Krishna for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) for Telangana and Andhra Pradesh States

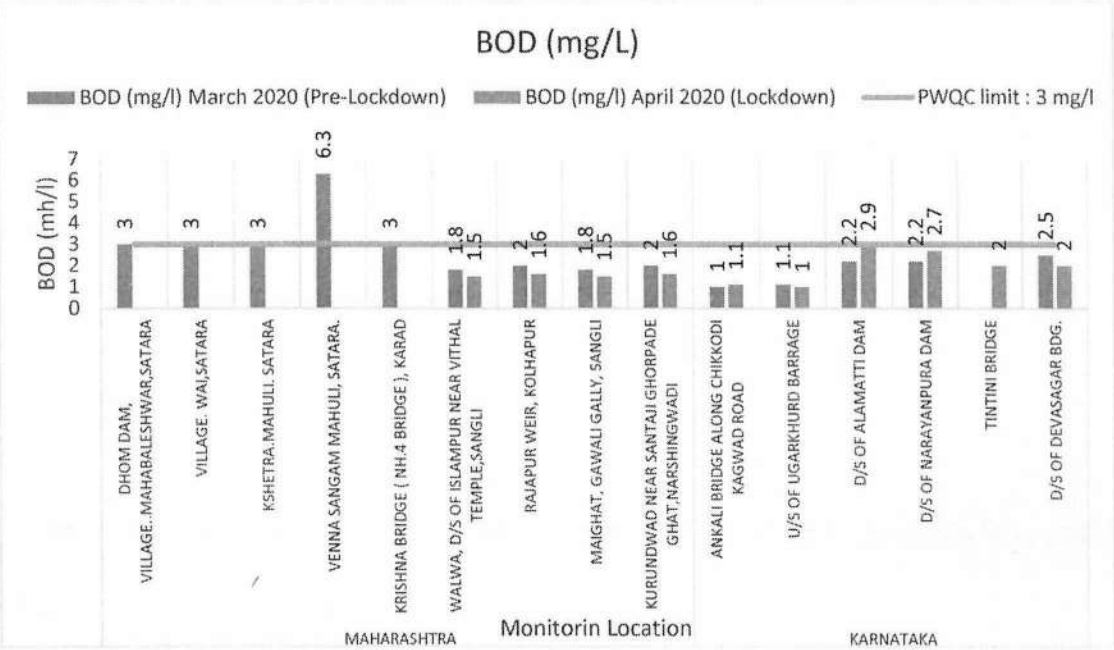

Figure – 15.4: Water Quality of river Krishna for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) for Maharashtra and Karnataka States

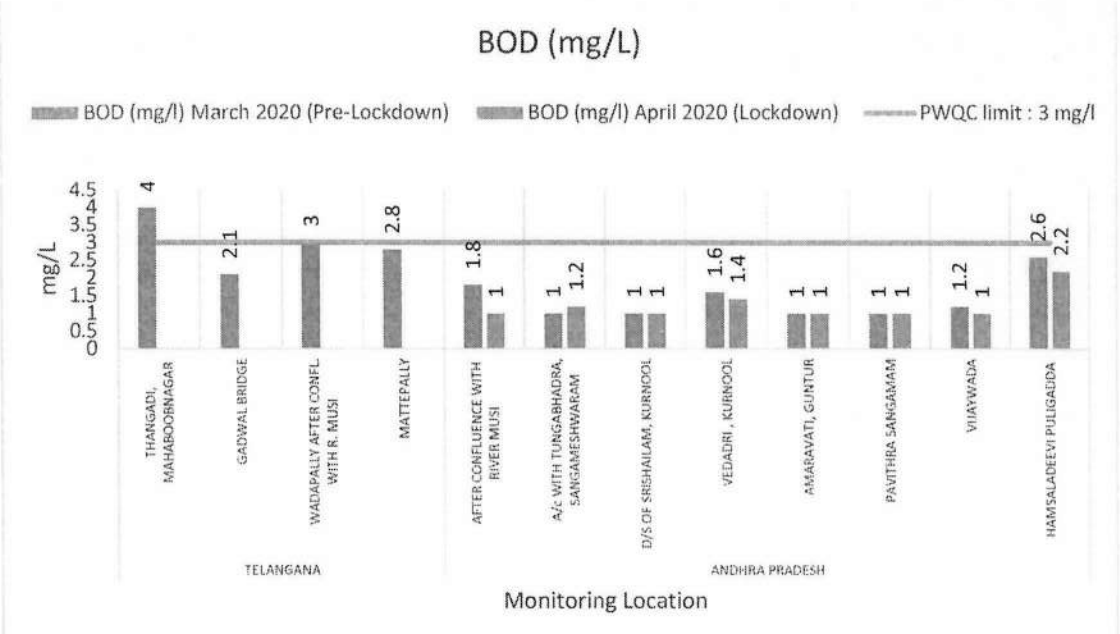

Figure – 15.5: Water Quality of river Krishna for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020) for Telangana and A.P.States

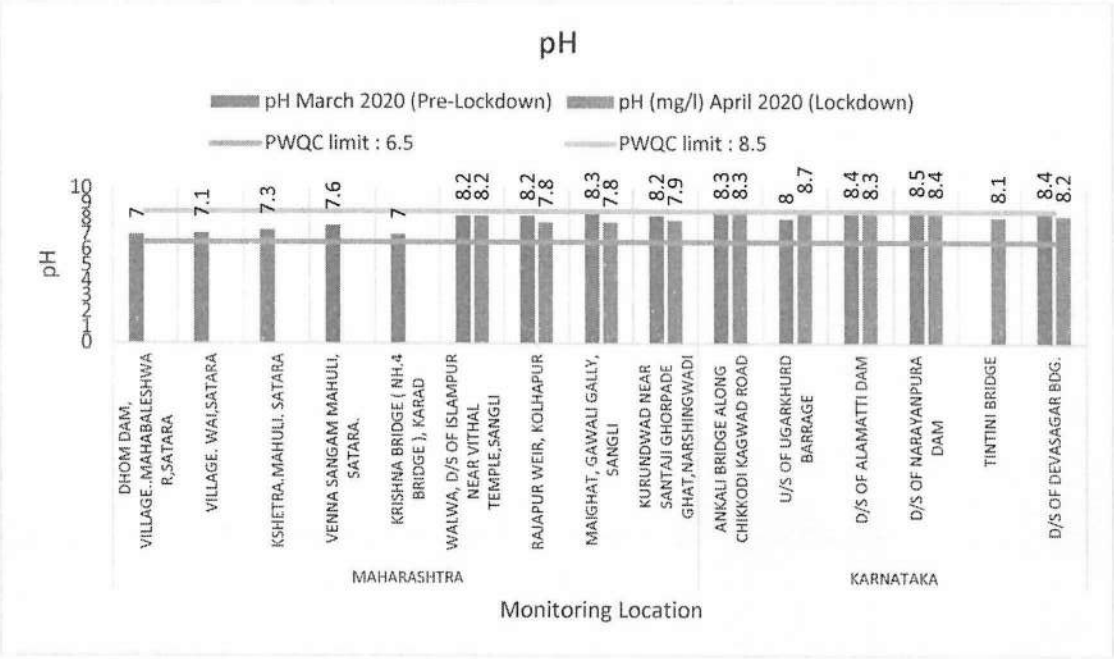

Figure – 15.6: Water Quality of river Krishna for pH during pre-lockdown (March 2020) and lockdown (April 2020) for Maharashtra and Karnataka States.

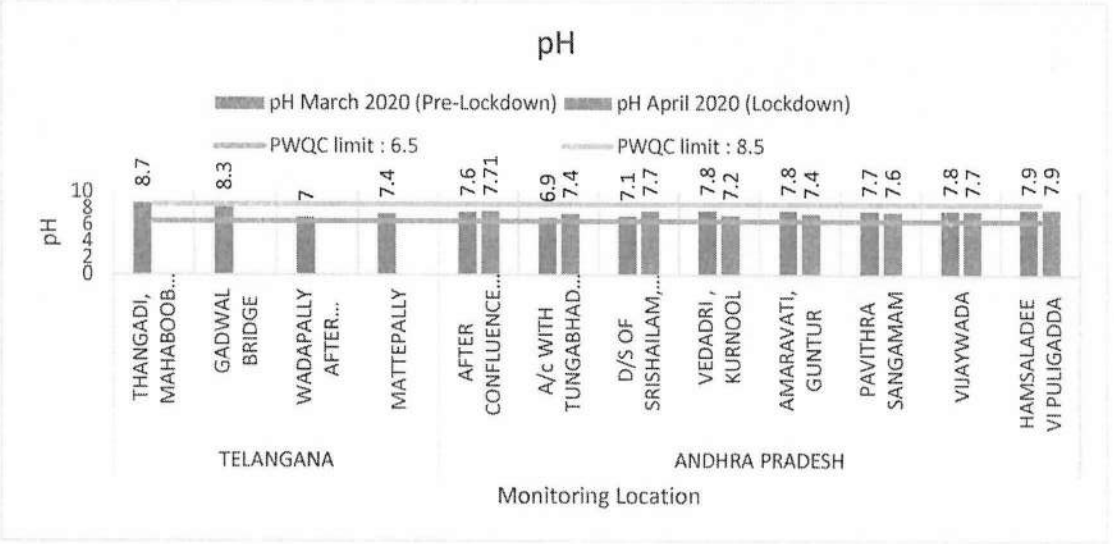

Figure – 15.7: Water Quality of river Krishna for pH during pre-lockdown (March 2020) and lockdown (April 2020) for Telangana and Andhra Pradesh States

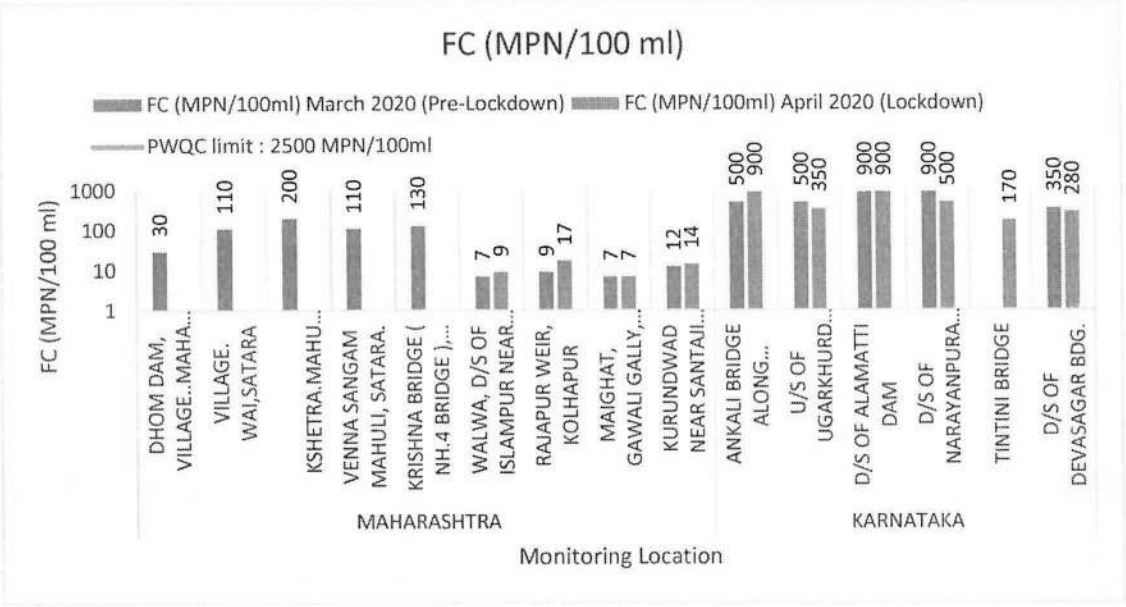

Figure – 15.8: Water Quality of river Krishna for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) for Maharashtra and Karnataka States

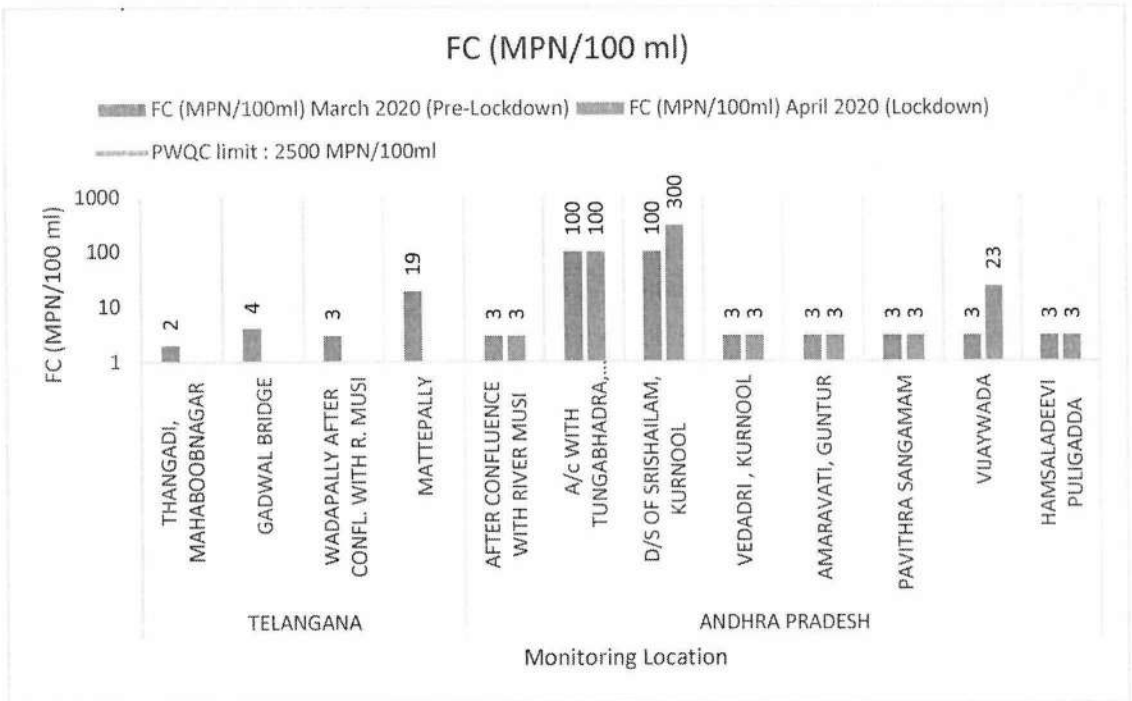

Figure – 15.9: Water Quality of river Krishna for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020) for Telangana and Andhra Pradesh States

15.4 Observations

Based on the analytical results of the samples collected from river Krishna, following findings/observations are made on river Krishna:

Maharashtra

During the pre-lock down period (March 2020):-

- The analysis results of the 9 monitored locations for the four critical parameters of outdoor bathing showed pH (7 -8.3), DO (6 -6.7 mg/L), BOD (1.8 -6.3 mg/L) and FC (7 -200 MPN/100mL).

- The alysis results of river Krishna showed minimum DO (6 mg/L) at Kurundwad whereas maximum BOD (6.3 mg/L) was observed at Venna Sangam. Maximum FC (200 MPN/100 mL) was observed at Kshetra Mahuli.

- 08 out of 09 monitored locations were found to be with the complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):- The analysis results indicate

- The analysis results for the four critical parameters of outdoor bathing observed to be in the order of pH (7.8 -8.2), DO (6.6 -6.7 mg/L), BOD (1.5 -1.6 mg/L) and FC (7 -17 MPN/100mL) at 04 monitored locations.

- The alysis results of river Krishna shows minimum DO (6.6 mg/L) at 3out of 4 monitored locations whereas maximum BOD (1.6 mg/L) was observed at Kurundwad. Maximum FC (17 MPN/100 mL) was observed at Rajapur Weir, Vilage Rajapur.

- All the 04 monitored locations were observed to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on River Krishna stretch within Maharashtra State: -

- The analysis results revealed increasing trend of DO (1.5 -10 %) at 3 locations, FC (16.7-84.8 %) at 3 locations and decreasing trend of BOD (17-20 %) at 4 locations were observed.

- 'No' variation in DO (at 1 location) and FC (at 1 location) were observed.

Karnataka

During the pre-lock down period (March 2020): -

- The analysis results for the four critical parameters were observed to be in the order of pH (8.0 -8.5), DO (6.0 -7.8 mg/L), BOD (1.0-2.5 mg/L) and FC (350 -900 MPN/100mL) at 05 monitored locations.

- The alysis results of river Krishna showed minimum DO (6 mg/L) at Ankali Bridge whereas maximum BOD (2.5 mg/L) was observed at Devasagar Bridge. Maximum FC (900 MPN/100 mL) was observed at 2 locations (which needs reverification).

- All 05 monitored locations were found to be complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):-

- The analysis results for the four critical parameters were found to be in the order of pH (8.1 - 8.7), DO (6.5 -7.7 mg/L), BOD (1.0 -2.9 mg/L) and FC (170 -900 MPN/100mL) at 06 monitored locations.

- The alysis results of river Krishna showed minimum DO (6.5 mg/L) at Ankali Bridge whereas maximum BOD (BDL mg/L) was observed at U/s of Ugarkhurd Barrage. Maximum FC (900 MPN/100 mL) was observed at D/s Almatti Dam (which needs re-verification)

- 5 out of 6 monitored locations were observed to be within the criteria limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing except pH non complying at one location.

Overall observations on River Krishna stretch within Karnataka State: -

- The analysis results revealed increasing trend of DO (1.5 -8.3 %) at 3 locations, BOD (10-32%) at 3 locations, FC (80 %) at 1 location.

- Decreasing trend of DO (2.8-7.7 %) at 2 locations, BOD (10-20 %) at 2 locations, FC (20-44.4 %) were observed.

- 'No' variation in FC (at 1 location) was observed.

Telangana

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters were observed to be in the order of pH (7 -8.7), DO (5.7 - 6.6 mg/L), BOD (2.1 -4 mg/L) and FC (2 -19 MPN/100mL) at 04 monitored locations.

- 3 out of 4 monitored locations were found to be complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):- Data not available/No monitoring done.

Andhra Pradesh

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters were observed to be in the order of pH (6.9 -7.9), DO (4.6-7.4 mg/L), BOD (1.0 -2.6 mg/L) and FC (3-100 MPN/100mL) at 08 monitored locations.

- 6 out of 8 monitored locations are complying to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):-

- The analysis results for the four critical parameters were found to be in the order of pH (7.2-7.9), DO (4.8-7.2 mg/L), BOD (01-2.2 mg/L) and FC (3 -300 MPN/100mL) at 8 monitored locations.

- 7 out of 8 monitored locations were observed to be complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on River Krishna stretch within Andhra Pradesh State:-

- The analysis results revealed increasing trend of DO (1.4 -30.6 %) at 4 locations, BOD (20 %) at 1 location, FC (200-666.7 %) at 2 locations and decreasing trend of DO (1.4-2.7 %) at 3 locations, BOD (13-44 %) at 4 locations were observed. '

- 'No' variation in DO at 1 location, BOD at 3 locations and FC at 6 locations were observed.

Overall observations on River Krishna (covering Maharashtra, Karnataka, Telangana and A.P): -

- During pre-lockdown (March 2020), analysis results were found to be in the order of pH (6.9-8.7), DO (4.6 -7.8 mg/L), BOD (1- 6.3 mg/L) and FC (2-900 MPN/100 mL). Also, 22 out of 26 monitored locations were found to be complying to the limits prescribed under Primary Water Quality Criteria for Outdoor Bathing.

- During lockdown (April 2020), analysis results were observed to be in the order of pH (7.2-8.7), DO (4.8 -7.7 mg/L), BOD (1-2.9 mg/L) and FC (3-900 MPN/100 mL). Also, 16 out of 18 monitored locations were found to be within the desirable limits prescribed under Primary Water Quality Criteria for Outdoor Bathing. Analysis results of river Krishna shows **m**aximum DO at U/S Ugarkhurd Barrage (7.7 mg/L)) and minimum at Hamsala Deevi, Puligadda Aqueduct (4.8 mg/L) whereas maximum BOD was observed at D/S Almatti Dam (2.9 mg/L) and minimum as 'BDL' at 06 locations viz U/S Ugarkhurd Barrage, at A/C Confluence with River Musi, D/S Srisailam Kurnool, Amravati, Guntur, Pavitra Sangam A/C & at Vijyawada. Maximum FC was observed at 2 locations viz Ankali Bridge & D/S Almatti Dam (900 MPN/100 mL) and minimum at 05 locations viz. Confluence with River Musi , Vedradri Kurnool , Amravati Guntur , Pavitra Sangam A/C & Hamsala Devi Puligada Aqueduct (03 MPN/100 mL).

- Overall, decreasing trend of DO (1.4 -7.7 %) at 05 locations, BOD (10 -44%) at 10 locations, FC (20-44.4%) at 3 locations were observed.

- Overall increasing trend of DO (1.4% -30.6%) at 10 locations, BOD (10 -32 %) at 4 locations and FC (16.7-666.7 %) at 6 locations were observed. 'No' variation was observed w.r.t DO (at 2 locations), BOD (at 3 locations) and FC (at 8 locations).

15.5 Conclusion

During pre-lockdown, 22 out of 26 monitored locations, 16 out of 18 monitored locations during lockdown were found to be complied with the Primary Water Quality Criteria for Outdoor Bathing. Overall, 16 monitored locations complied with the Primary Water Quality Criteria for Outdoor Bathing. Also, marginal improvement in water quality of river Krishna was observed with respect to parameters viz., DO & BOD.

16.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER PENNAR

16.1 About Pennar River

The Pennar (Penneru or Uttara Pinakini) river is a seasonal river which rises in the Nandi Hills in Chikkaballapur District of Karnataka and flows north and east through Karnataka & Andhra Pradesh (AP) covering a distance of 597 kilometres and finally drains into the Bay of Bengal in Nellore District of AP. The major left bank tributaries of river Pennar are river Jayamangali, Kunderu and Sagileru and major right bank tributaries are river Chitravathi, Papagni and Cheyyeru. Major cities or towns located on the banks of River Pennar are Chikkaballapur & Gauribidanur in Karnataka, Hindupur, Anantapur, Proddutur, Kadapa & Nellore in AP. The industries located in Anantapur District are mainly agro based such as cotton mills, sugar mills, rice mills and in Kadapa District mainly agro based, cotton, textile & mineral based whereas in Nellore district mainly food & agro based, textile, mineral & forest based industries.

16.2 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water Quality of river Pennar is monitored at 04 locations by the CPCB in association with Andhra Pradesh Pollution Control Board (APPCB) under National Water Quality Monitoring Programme (NWMP) during the period March 2020 (Pre-lockdown) and April 2020 (Lockdown). Distribution of Monitoring Locations on River Pennar within Andhra Pradesh State is depicted in **Figure 16.1.**

16.3 Analytical Results

During pre-lockdown and lockdown period, there was no flow at River Pennar before confluence with Chitravathi at Unganoor, Anantapur District in A.P. Water quality of river Pennar was carried out at 03 locations during Pre-Lockdown (March 2020) and at 03 locations during Lockdown period (April 2020) to assess the impact on water quality of river Pennar. The analysis results of Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented in **Table-16.1**.

Based on the monitoring & analysis of collected water samples from river Pennar, the water quality trend of river Pennar with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are depicted in **Figure 16.2 to Figure 16.5.**

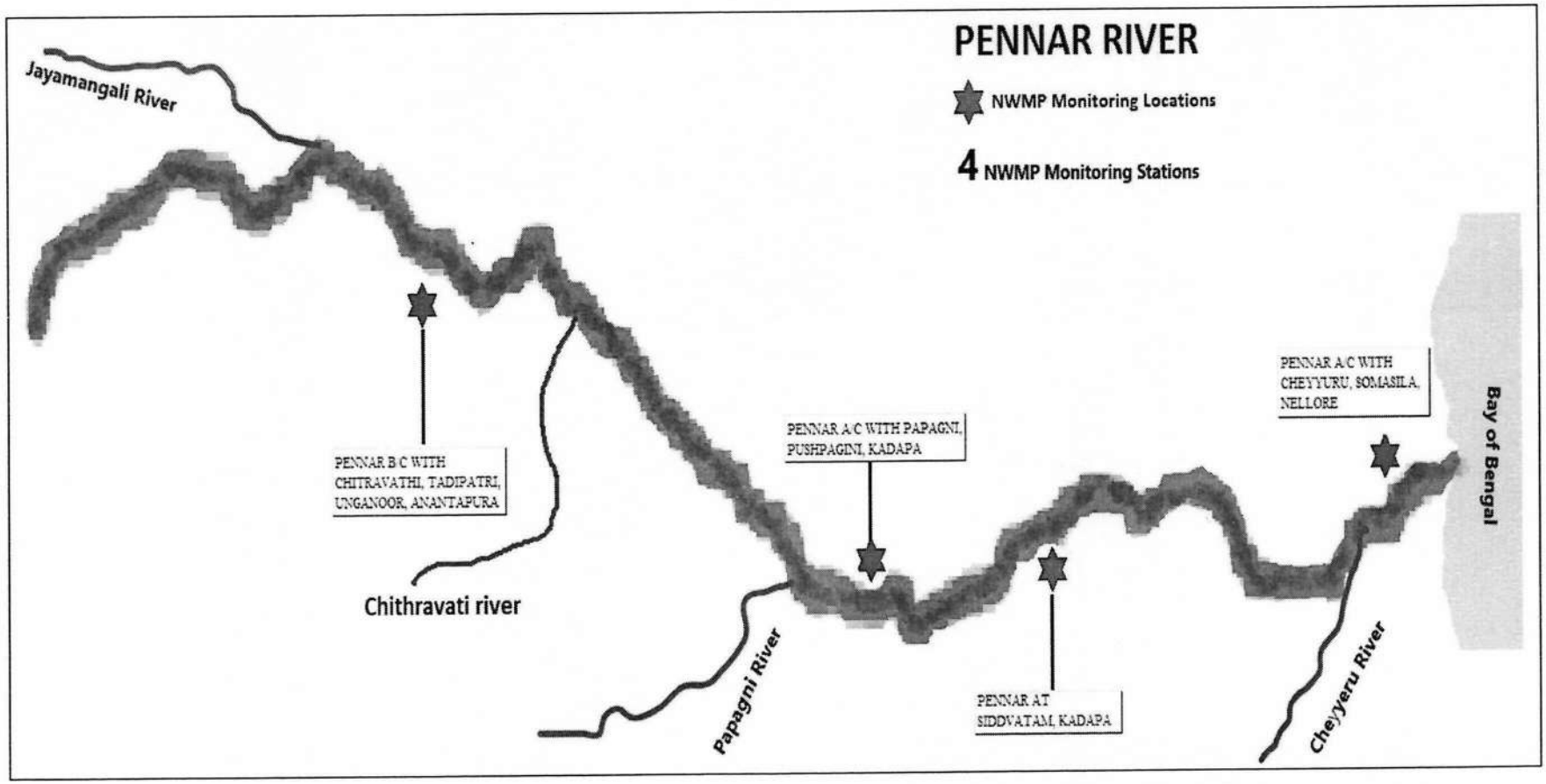

Figure 16.1 Distribution of Water Quality Monitoring Locations under NWMP on River Pennar (Andhra Pradesh)

Table 16.1: Water Quality of River Pennar during Pre (March 2020) and Lockdown Period (April 2020)

Monitoring Location on River Pennar	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
ANDHRA PRADESH												
B/c With Chitravathi, Unganoor, Anantapur Dt.	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
A/c With Papagni, Pushpagini	6.4	5.7	-10.90%	7.7	6.7	1.7	1	-41%	200	100	-50.00%	Complying
At Siddvatam, Kadapa	6.2	6	-3.20%	7.9	6.9	1.5	2.8	87%	100	200	100.00%	Complying
A/c With Cheyyuru, Somasila	7.4	6.9	-6.80%	7.78	7.43	1.4	1.2	-14%	3	3	Nil	Complying
No. of locations monitored	3 locations in March 2020 (Pre-lockdown) and 3 locations in April 2020 (Lockdown)											
No. of monitoring locations results available	3 locations in March 2020 (Pre-lockdown) and 3 locations in April 2020 (Lockdown)											
No. of locations complying to Criteria	3	3		3	3	3	3		3	3		
Range	6.2-7.4	5.7-6.9	Decrease in % variation (3.2 to 10.9) at 03 locations	7.7-7.9	6.7-7.43	1.4-1.7	1 - 2.8	Increase in % variation (87%) at 1 location. Decrease in % variation (14 to 41) at 02 locations	3-200	3-200	Increase in % variation (100%) at 1 location, Decrease in % variation (50%) at 01 location and 'No variation at 01 location	

Note:- *Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

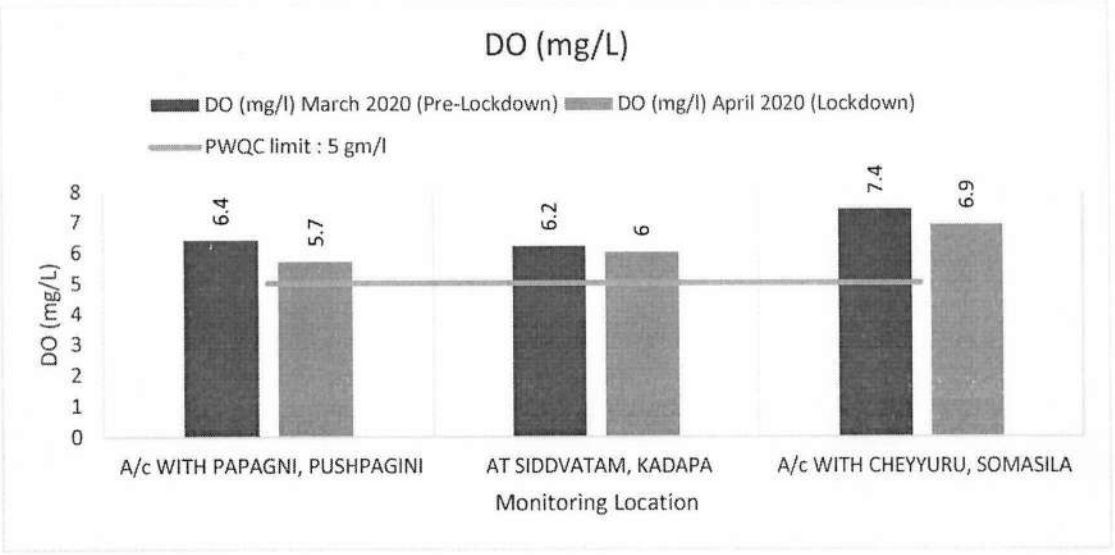

Figure 16.2 : Water Quality of river Pennar for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

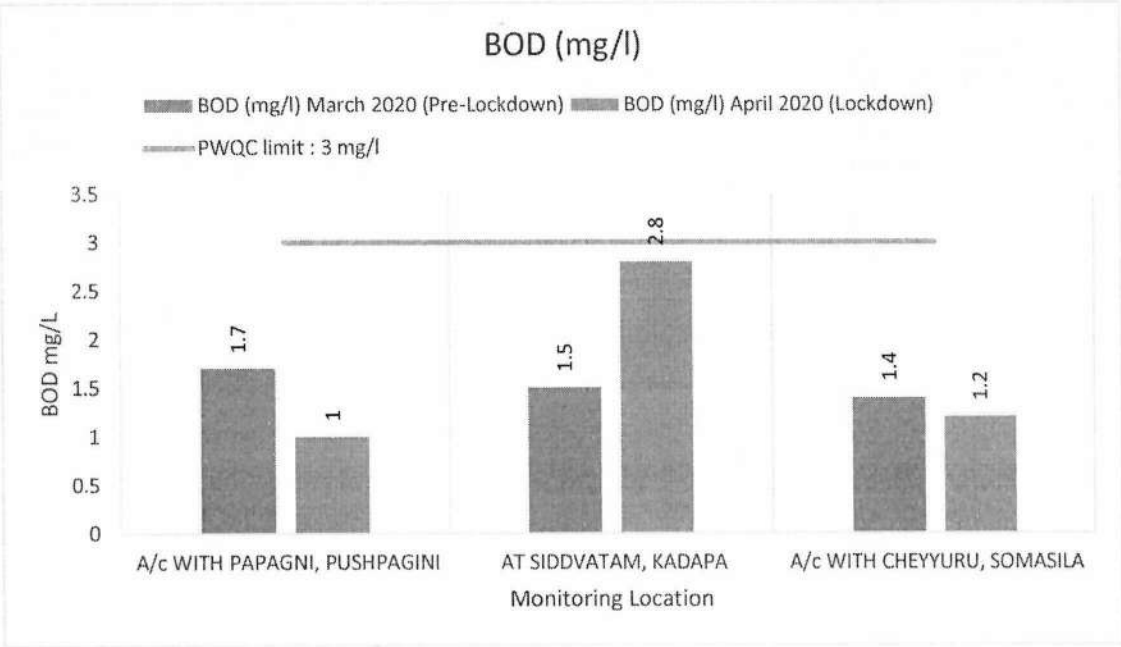

Figure 16.3: Water Quality of river Pennar for BOD (mg/L) during pre-lockdown (March2020) and lockdown (April 2020)

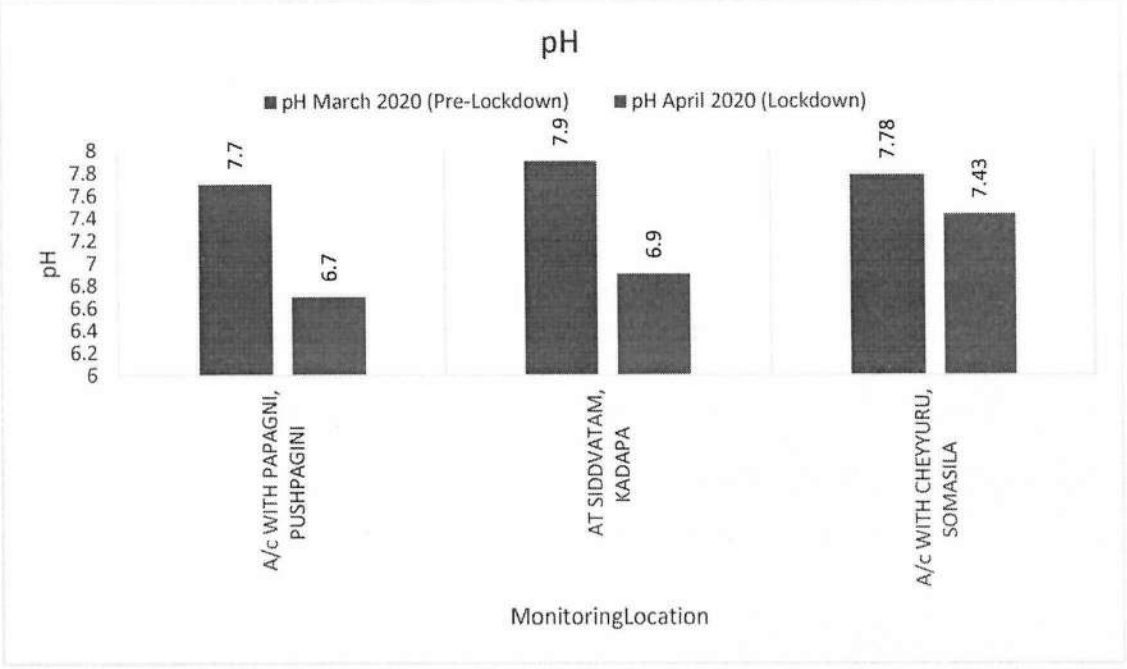

Figure 16.4: Water Quality of river Pennar for pH during pre-lockdown (March 2020) and lockdown (April 2020)

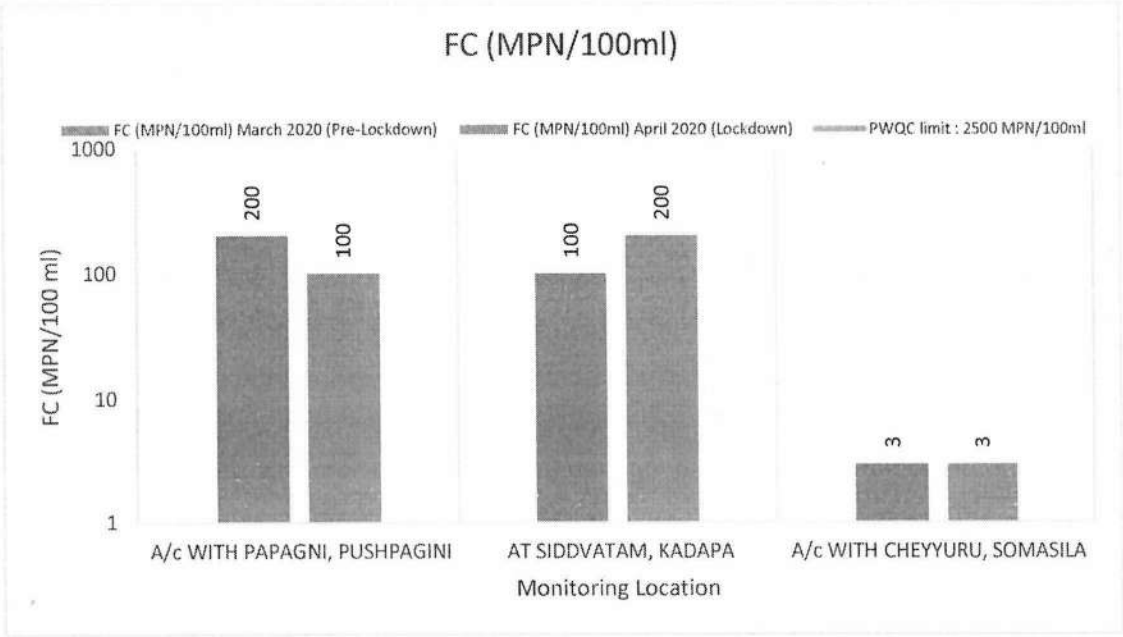

Figure 16.5: Water Quality of river Pennar for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020)

16.4 Observations

Out of 4 monitored locations on river pennar under NWMP, there was no flow at River Pennar before confluence with Chitravathi, Unganoor, Anantapur. Therefore, only 3 out of 4 locations were monitored in the month of March 2020 and April 2020. Based on the analytical results, following findings/observations are made:

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters were observed to be in the order of pH (7.7 -7.9), DO (6.2 -7.4 mg/L), BOD (1.4 -1.7 mg/L) and FC (3 -200 MPN/100 mL) at all the 03 monitored locations.

- All the 03 monitored locations were found to be complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):-

- The analysis results for the four critical parameters were found to be in the order of pH (6.7 -7.43), DO (5.7 -6.9 mg/L), BOD (1-2.8 mg/L) and FC (3 -200 MPN/100 mL) at the 03 monitored locations.

- Maximum DO was observed at A/C Cheyyuru Somasila (6.9 mg/L)) and minimum at after confluence with Papagni, at Pushpagini (5.7 mg/L). Maximum BOD was observed at Siddhavatm, Kadapa (2.8 mg/L) and minimum at A/C with Papagni , Pushpagini (01 mg/L) whereas maximum FC count observed at Siddhavatm, Kadapa (200 MPN/100 mL) and minimum at A/C Cheyyuru Somasila (03 MPN/100 mL).

- All the 03 monitored locations were found to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall Observations River Pennar (A.P): -

- The analysis results revealed that all the 03 monitored locations (during pre-lockdown and lockdown) were found to be complying with the primary water quality criteria for outdoor bathing parameters (viz., pH, DO, BOD and FC).

- Also, increasing trend of BOD (87%) at 1 location and FC (100%) at 1 location whereas decreasing trend of DO (3.2% to 10.9%) at 3

locations, BOD (14 % -41%) at 2 locations and FC (50%) at 1 location were observed. 'No' variation was observed w.r.t parameter FC at 1 monitored location.

16.5 Conclusion

03 out of 03 monitored locations on river Pennar during pre and lockdown period were observed to be complying (100 % compliance) with the Primary Water Quality Criteria for Outdoor Bathing limits notified under Environment (Protection) Rules, 1986. Also, considerable improvement in water quality of river Pennar was observed with respect to the parameters viz., DO, BOD and FC.

17.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER CAUVERY

17.1 About River Cauvery

River Cauvery originates from southwestern part of Karnataka at Talakaveri on the Brahmagiri range in the Western Ghats, Kodagu District, Karnataka State. It traverses through Tamil Nadu (TN) before its outfall into the Bay of Bengal covering a total distance of about 800 km. Before emptying into the Bay of Bengal south of Cuddalore in Tamil Nadu, it distributes into a large number of distributaries forming a wide delta known as "Daksina Ganga". It is the third largest river after Godavari and Krishna in Southern India and the largest in the State of Tamil Nadu which, on its course, bisects the TN State into North and South. The left bank tributaries of river Cauvery are Harangi, Hemavati, Shimsha, Arkavathy & right bank tributaries are river Lakshmana Tirtha, Kabini, Bhavani, Noyyal, Amaravati & Moyar.

Industrialized cities include Bangalore (Karnataka) and the towns Mettur, Pallipalayam, Komarapalayam in Tamil Nadu followed by the districts of Mysore and Mandya in Karnataka; Erode, Namakkal and Salem in Tamil Nadu. Various categories of industries located in these cities/towns include chemical, dyeing, leather/tanneries, pulp & paper, sugar mills, printing and bleaching industries.

17.2 Water Quality Monitoring Locations on River Cauvery under National Water Quality Monitoring Programme (NWMP)

The Water Quality of river Cauvery is monitored at 64 locations by Central Pollution Control Board (CPCB) in association with State Pollution Control Boards of Karnataka (at 24 locations) and Tamil Nadu (at 40 locations) under National Water Quality Monitoring Programme (NWMP). State-wise

Distribution of Water Quality Monitoring Locations under NWMP on River Cauvery is depicted in **Figure 17.1 and Figure 17.2.**

17.3 Analytical Results

Water quality of river Cauvery was carried out at 42 locations (Karnataka-22 and Tamilnadu-20) during Pre-Lockdown and at 33 locations (i.e., Karnataka (22) and Tamilnadu (11)) during Lockdown period to assess impact on water quality.

The water quality of river Cauvery for Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented below in **Table-17.1.**

Based on the monitoring & analysis of collected water samples from river Cauvery, the graphical presentation of water quality of river Cauvery with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are presented in **Figure 17.3 to Figure 17.10.**

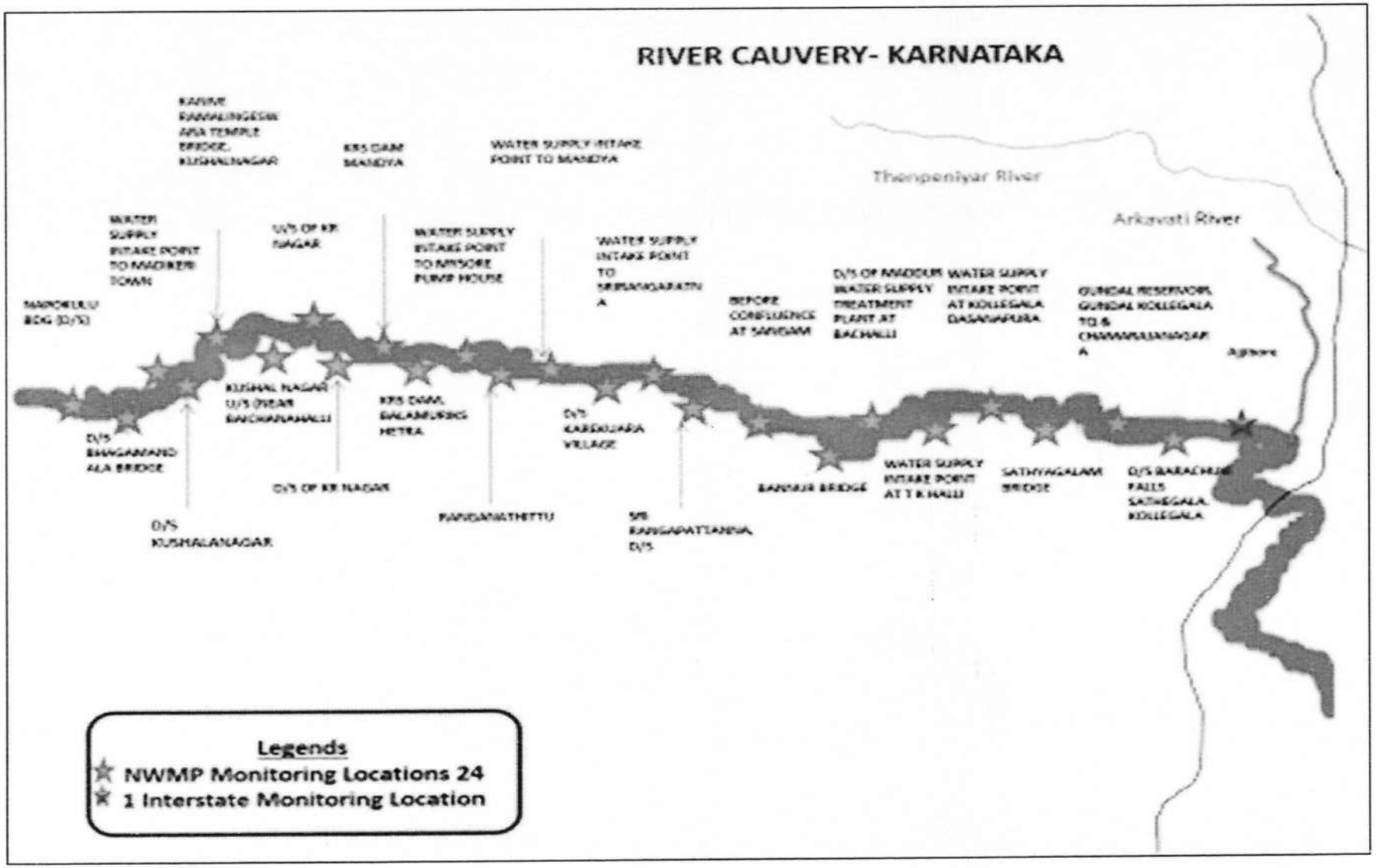

Figure 17.1: Water Quality Monitoring Locations under NMWP on River Cauvery (within Karnataka State)

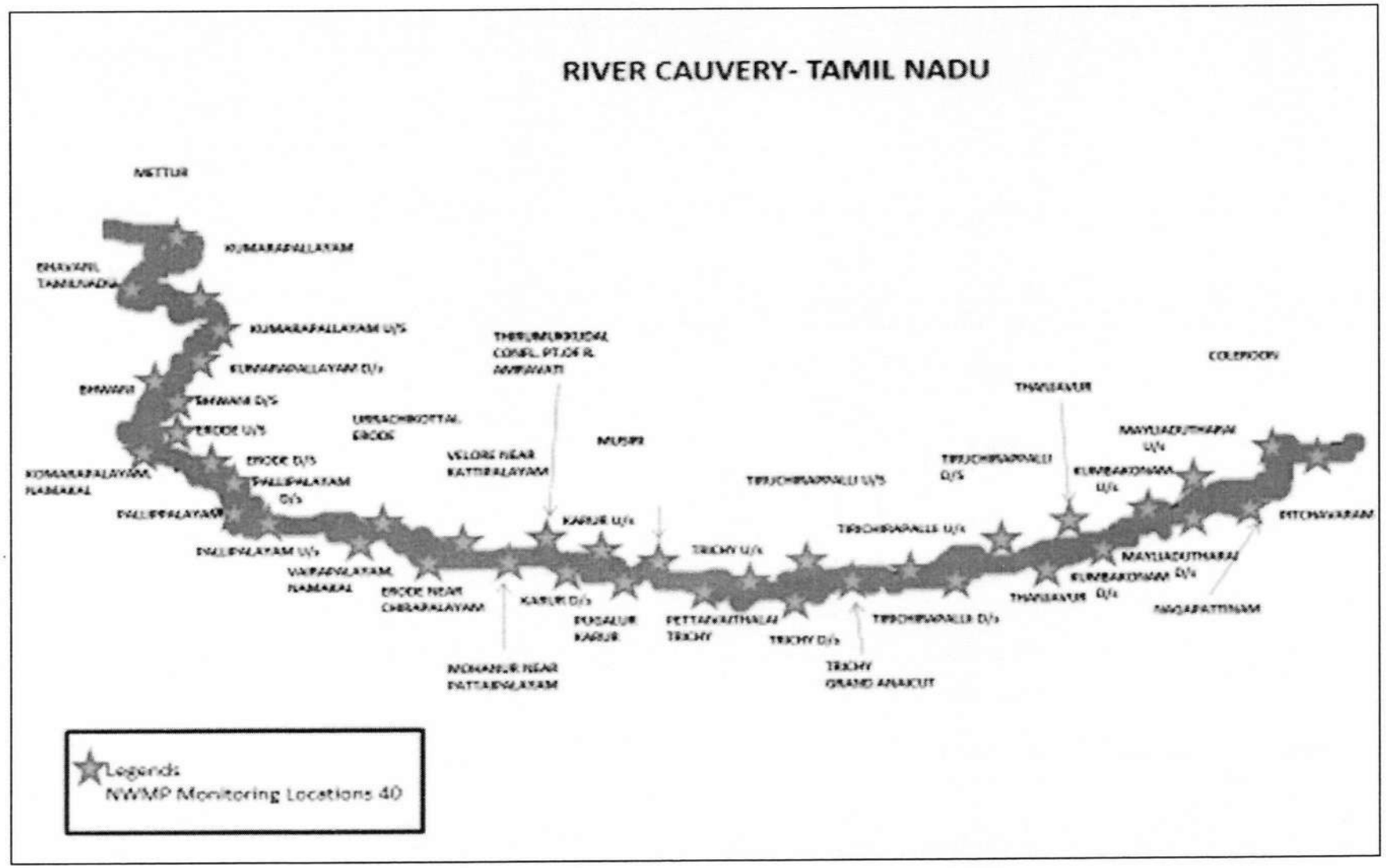

Figure 17.2: Water Quality Monitoring Locations under NMWP on River Cauvery (within Tamil Nadu State)

Table-17.1: Water Quality of River Cauvery during Pre (March 2020) and during Lockdown (April 2020)

Monitoring Location on River Cauvery	Dissolved Oxygen (mg/L)			pH		BOD (mg/L)*			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
KARNATAKA												
At Napoklu Bridge	6.9	7.8	13.04%	7.5	8	1.8	1	-44.44%	83	38	-54.22%	Complying
D/s of Cauvery at Bhagamandala bridge	6.4	7.2	12.50%	7.3	8.2	2	1.3	-35.00%	93	39	-58.06%	Complying
D/s of Cauvery at Kanive Ramalingeswara temple bridge , Kushalnagar	6.8	7.2	5.88%	7.6	8	1.8	1.2	-33.33%	68	27	-60.29%	Complying
D/s of Kushalnagar Town,	7	7.3	4.29%	7.1	8	1.6	1.3	-18.75%	45	33	-26.67%	Complying
W/s intake point to Madikeri Town, Kootehole	7	7.7	10.00%	7.8	8	1.8	1	-44.44%	78	34	-56.41%	Complying
At Kushalnagar Beechanahalli	6.9	7.1	2.90%	7.7	7.8	1.8	1.3	-27.78%	40	33	-17.50%	Complying
U/s of KR Nagar Town,	6.7	7	4.48%	7.9	8	2.1	1.2	-42.86%	260	91	-65.00%	Complying
At KRS Dam, Mandya	6.7	7.4	10.45%	7.8	7.9	1.8	1.1	-38.89%	320	91	-71.56%	Complying
D/s of KR Nagar Bridge	6.8	7	2.94%	7.9	8	1.8	1.4	-22.22%	340	110	-67.65%	Complying
W/s Intake Point to Mysore, Pump House,	6.5	7.3	12.31%	7.8	8	2	1	-50.00%	170	110	-35.29%	Complying
At KRS Dam, Balamuri Kshetra	6.9	7.4	7.25%	8	8	1.5	1.2	-20.00%	320	130	-59.38%	Complying
W/s Intake point to Mandya Town	6.3	6.9	9.52%	8	8	2.6	1.5	-42.31%	340	210	-38.24%	Complying
At Ranganathittu	6.5	6.6	1.54%	7.8	8.1	2	2	Nil	380	320	-15.79%	Complying
W/s Intake Point to Sri Rangapatna Town,	6.3	7.3	15.87%	8	8.1	2.5	1.3	-48.00%	430	140	-67.44%	Complying
D/s Karekura Village	6.7	7.2	7.46%	7.9	8	1.8	1.3	-27.78%	340	130	-61.76%	Complying
At S R Patna D/s of Road Bridge	6.3	6.8	7.94%	7.9	8.1	2.5	1.9	-24.00%	700	210	-70.00%	Complying
At Bannur Bridge	6.7	7.2	7.46%	7.6	8.1	2	1.2	-40.00%	460	110	-76.09%	Complying

Monitoring Location on River Cauvery	Dissolved Oxygen (mg/L)			pH		BOD (mg/L)*			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
D/s of Cauvery Maddur WTP @ Bachalli	6.9	6.9	Nil	7.8	7.8	1.8	1.8	Nil	220	220	Nil	Complying
W/s Intake Point at TK Halli	6.8	7.4	8.82%	7.9	8.2	1.8	1.3	-27.78%	260	110	-57.69%	Complying
W/s Intake point to Kollegala at Dasanapura	6.5	7	7.69%	7.9	8	2	1.6	-20.00%	340	130	-61.76%	Complying
At Sathegala Bridge	6.9	7.2	4.35%	8	8.1	2	1.5	-25.00%	380	170	-55.26%	Complying
D/s Barachuki Falls, Sathegala, Kollegala	7	7.2	2.86%	8.1	8.2	1.5	1.3	-13.33%	170	91	-46.47%	Complying
No of locations monitored in Karnataka	22 Locations during Pre-lockdown (March 2020) Lockdown (April 2020)											
No of monitoring locations results available in Karnataka	22	22	-	22	22	22	22	-	22	22	-	
No of locations complying to Criteria	22	22	-	22	22	22	22	-	22	22	-	
Range	6.3-7.0	6.6-7.8	Increase (1.54% to 15.87%) at 21 locations and No variation at 1 location	7.1-8.1	7.8-8.2	1.5-2.6	1.0-1.9	Decrease (13.33% to 50%) at 20 locations and 'No' variation at 2 locations	40-700	27-320	Decrease (15.78 % to 76.09%) at 21 locations and No variation at 1 location	
TAMIL NADU												
At Mettur	5.8	6.7	15.52%	8.6	7.6	2.5	2	-20.00%	46	21	-54.348%	Non-complying
Bhavani at Bhavani, Tamilnadu	6.3	6.7	6.35%	8.2	7.8	2	2	Nil	94	38	-59.574%	Complying
At Kumarapalayam U/S	6.1	--	-	8.2	-	2	-	-	140	-	-	Complying
At Bhawani D/S	6	-	-	8.4	-	2	-	-	210	-	-	Complying
At Erode U/S	6	-	-	8.4	-	2	-	-	31	-	-	Complying

Monitoring Location on River Cauvery	Dissolved Oxygen (mg/L)			pH		BOD (mg/L)*			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
Komarapalayam, Namakal, Tamilnadu	5.8	6.7	15.52%	7.7	8.3	2	2	Nil	210	49	-76.667%	Complying
At Pallipalayam D/S	6.1	-	-	7.9	-	2.2	-	-	170	-	-	Complying
At Pallippalayam	6.1	6.6	8.20%	7.6	7.5	2.2	2	-9.09%	170	26	-84.706%	Complying
At Vairapalayam, Namakal, TamilNadu	6.1	6.9	13.11%	8	8	2	2	Nil	220	31	-85.909%	Complying
At Urrachikottai, Erode, TamilNadu	5.8	6.7	15.52%	8.5	8.2	2	2	Nil	84	32	-61.905%	Complying
At Erode Near Chirapalayam, TN	6.2	6.8	9.68%	8.4	7.9	2	2	Nil	220	110	-50.000%	Complying
At Velore Near Kattipalayam, TN	5.6	6.1	8.93%	8.3	8.6	2	2	Nil	260	170	-34.615%	Non-complying
At Mohanur Near Pattaipalayam, TN	5.8	6	3.45%	8.1	8.5	2	2	Nil	250	200	-20.000%	Complying
At Thirumukkudal Confl. Pt.of R.Amravati,	6	6.3	5.00%	8.6	8.1	2	2	Nil	170	46	-72.941%	Non-complying
At Karur U/S	5.9	-	-	8.7	-	2	-	-	220	-	-	Non-complying
At Pugalur, Karur, TN	6	6.6	10.00%	8.8	8.1	2	2	Nil	210	58	-72.381%	Non-complying
At Mayiladuthurai D/S	2.1	-	-	7.9	-	7.5	-	-	140	-	-	Complying
At Mayiladuthurai, Nagapattinam, TN	6	-	-	7.7	-	2	-	-	110	-	-	Complying
At Pitchavaram,TN	5.9	-	-	7.7	-	2	-	-	140	-	-	Complying
At Coleroon, TN	6	-	-	8.3	-	2	-	-	170	-	-	Complying
No of locations monitored in TN	20 Locations during Pre-lockdown (March 2020) and 11 Locations during Lockdown (April 2020)											
No of locations results available	20	11	-	20	11	20	11	-	20	11	-	
No of locations complying to Criteria	20	11		16	**10**	19	**11**		20	**11**		
Range	2.1-6.3	6.0-6.9	Increase (3.45 % to 15.52%)	7.6-8.8	7.5-8.6	2.0-7.5	2.0 at all the locations	Decrease (9.09 % to 20%) at 2	31-260	21-200	Decrease (20% to 85.91%) at	

Monitoring Location on River Cauvery	Dissolved Oxygen (mg/L)			pH		BOD (mg/L)*			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
			at 11 locations					locations and No at 9 locations			11 locations	
Overall Water Quality of River Cauvery (Karnataka and Tamilnadu) during Pre-lockdown (March 2020) Lockdown (April 2020)												
No. of locations monitored	42 locations during Pre-lockdown (March 2020) and 33 locations during Lockdown (April 2020)											
No. of monitoring locations for which monitored results available	42	33	-	42	33	42	33	-	42	33	-	
Overall Range	2.1-7.0	6.0-7.8	Increase (1.54% to 15.87%) at 32 locations and No variation at 1 location	7.1 to 8.8	7.5-8.6	1.5-7.5	1.0-2.0	Decrease (9.09% to 50%) at 22 locations and No variation at 11 locations	31-700	21-320	Decrease (15.78 % to 85.91%) at 32 locations and No variation at 1 location	

Note:- *Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

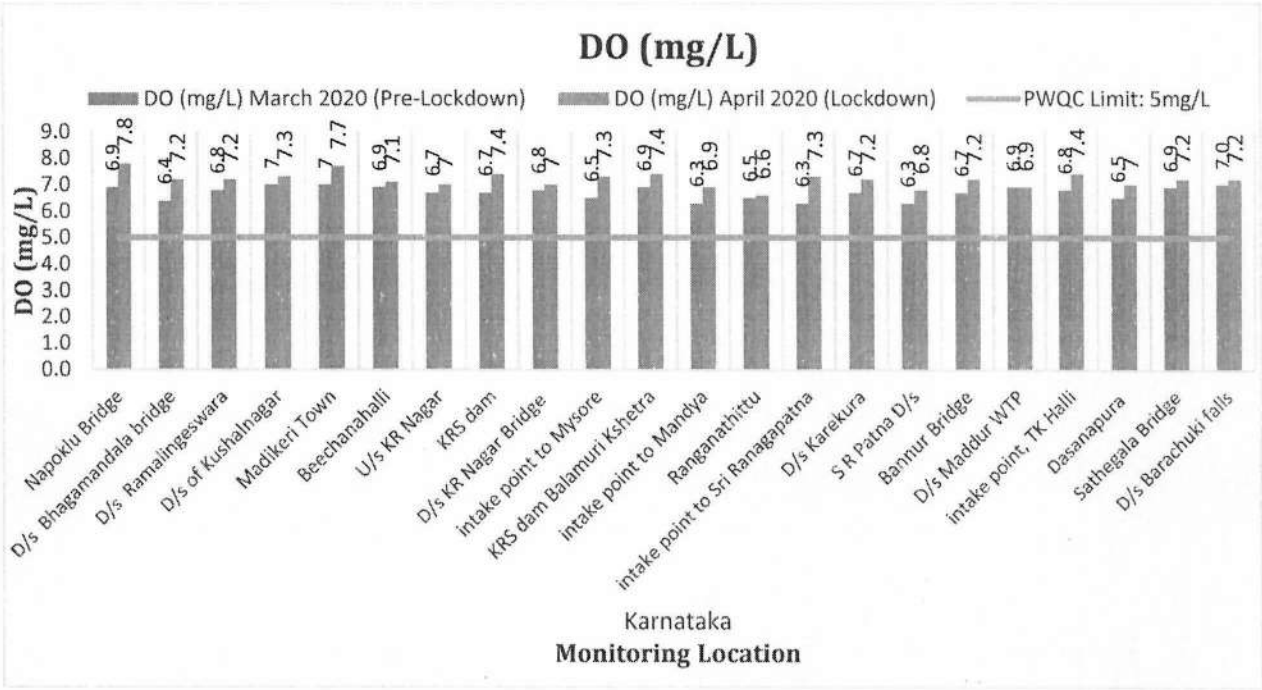

Figure 17.3 : Water Quality of river Cauvery in Karnataka for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

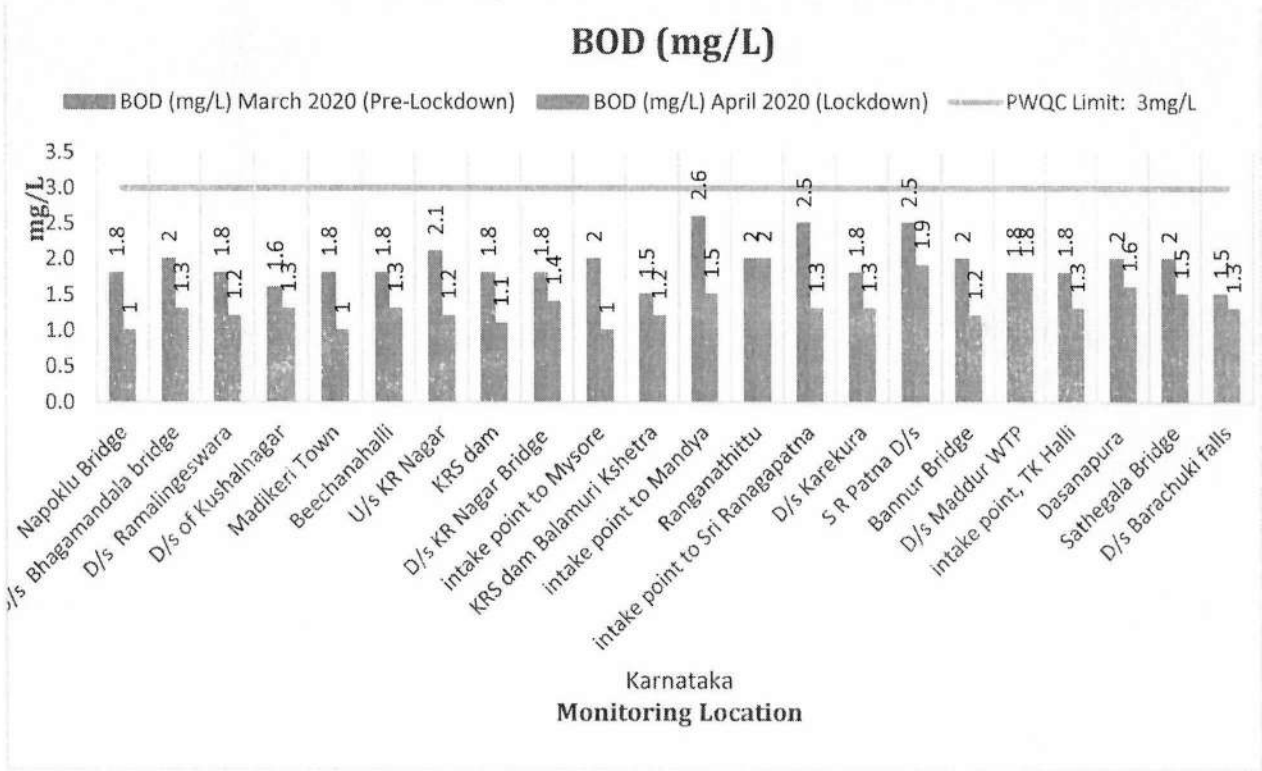

Figure 17.4: Water Quality of river Cauvery in Karnataka for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

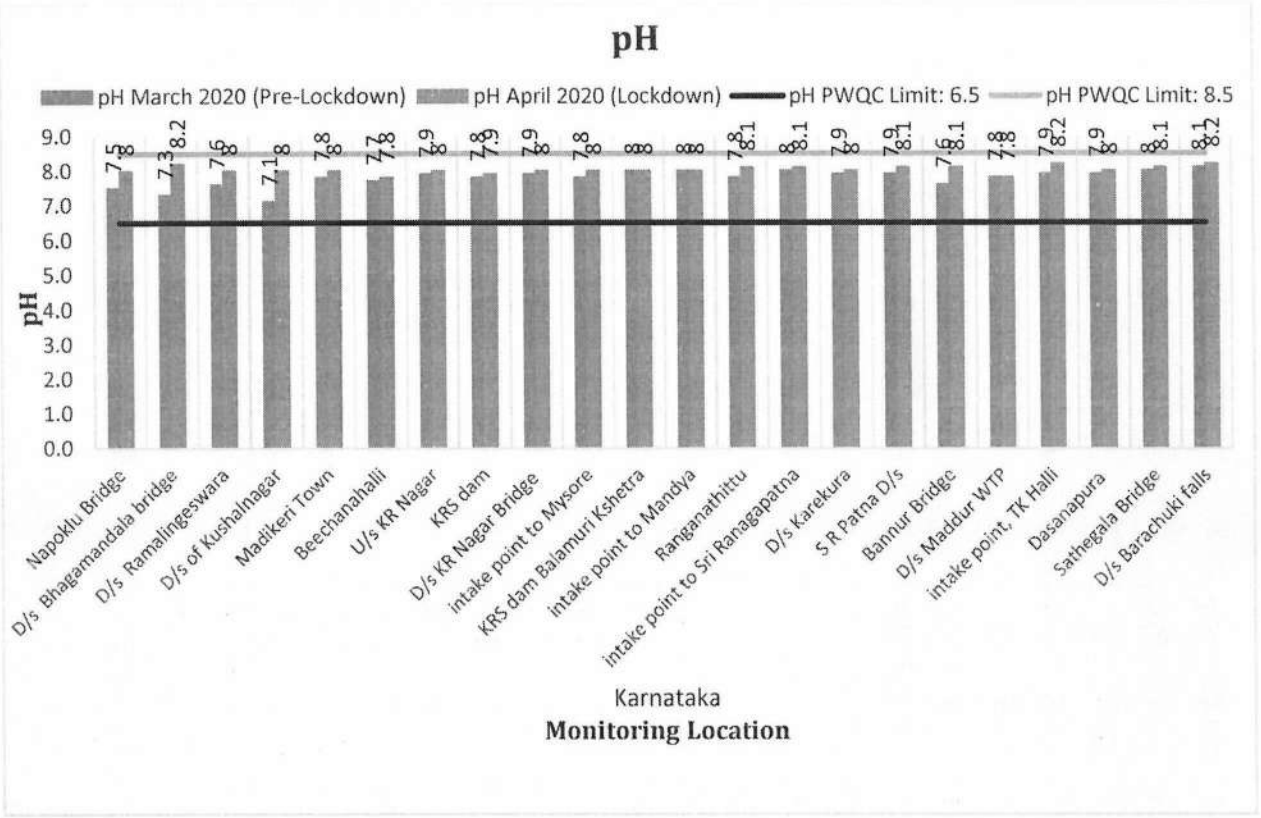

Figure 17.5: Water Quality of river Cauvery in Karnataka for pH during pre-lockdown (March 2020) and lockdown (April 2020)

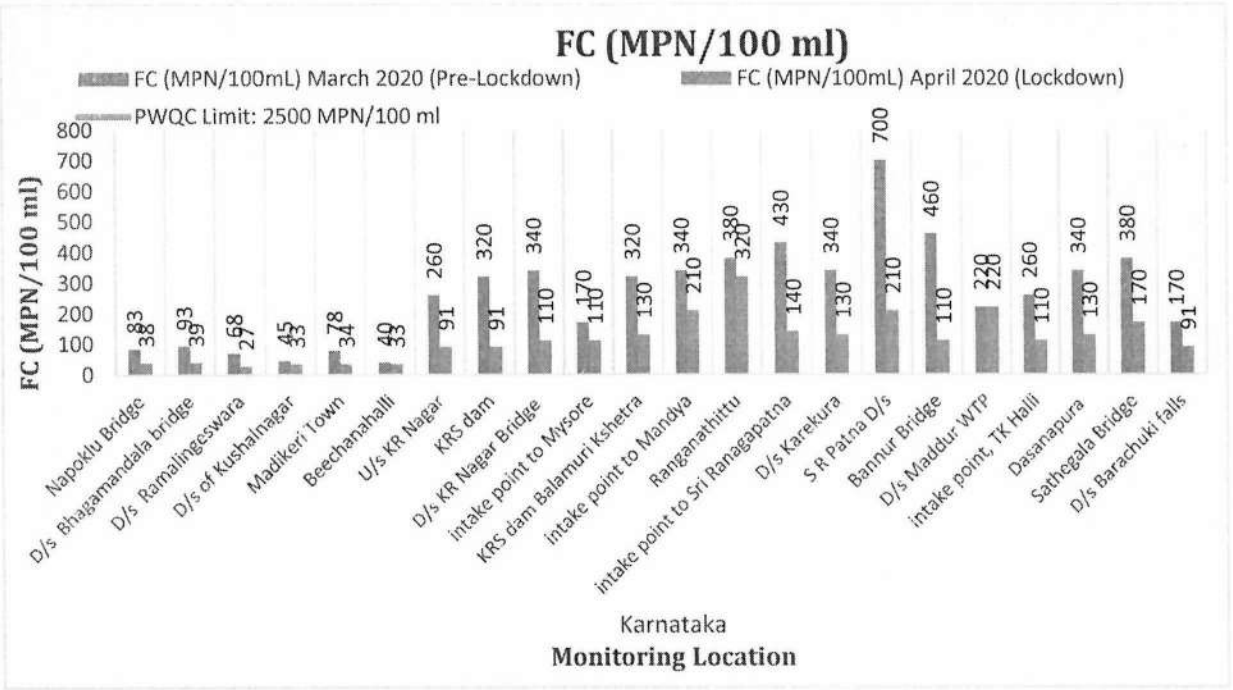

Figure 17.6: Water Quality of river Cauvery in Karnataka for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020)

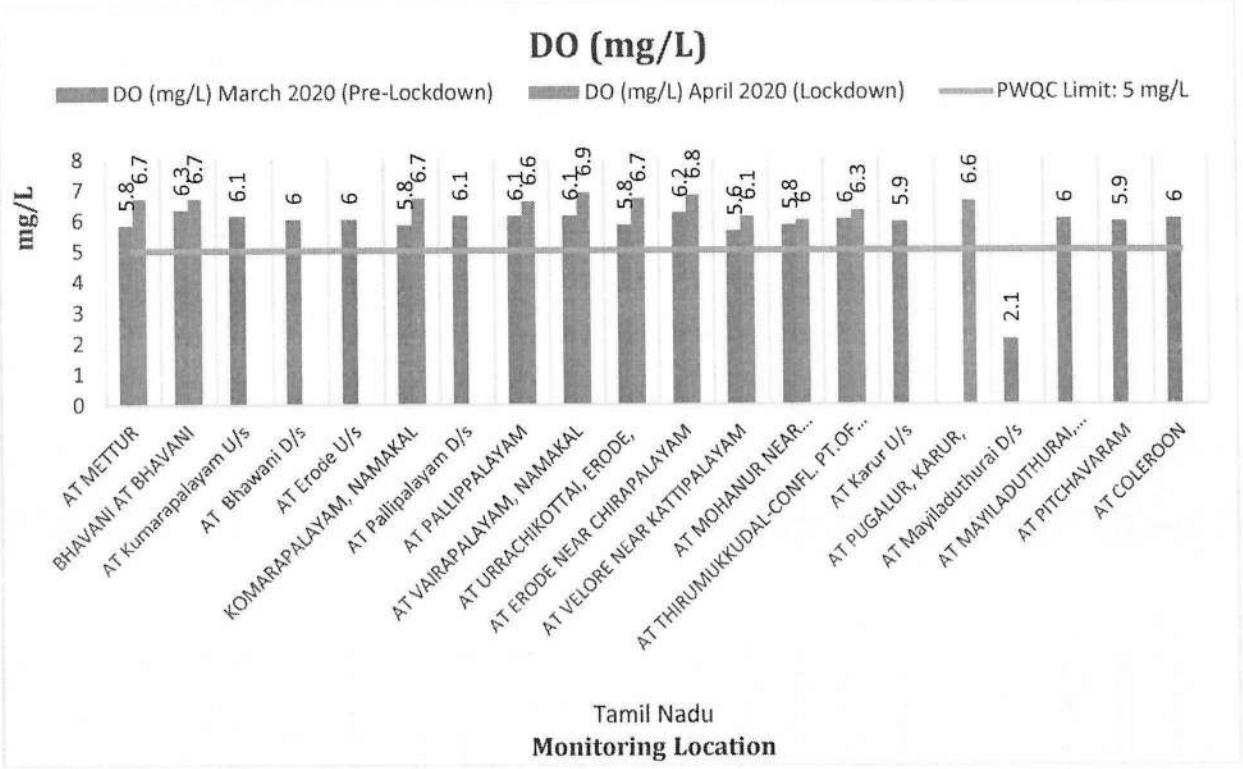

Figure 17.7 : Water Quality of river Cauvery in Tamil Nadu for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020).

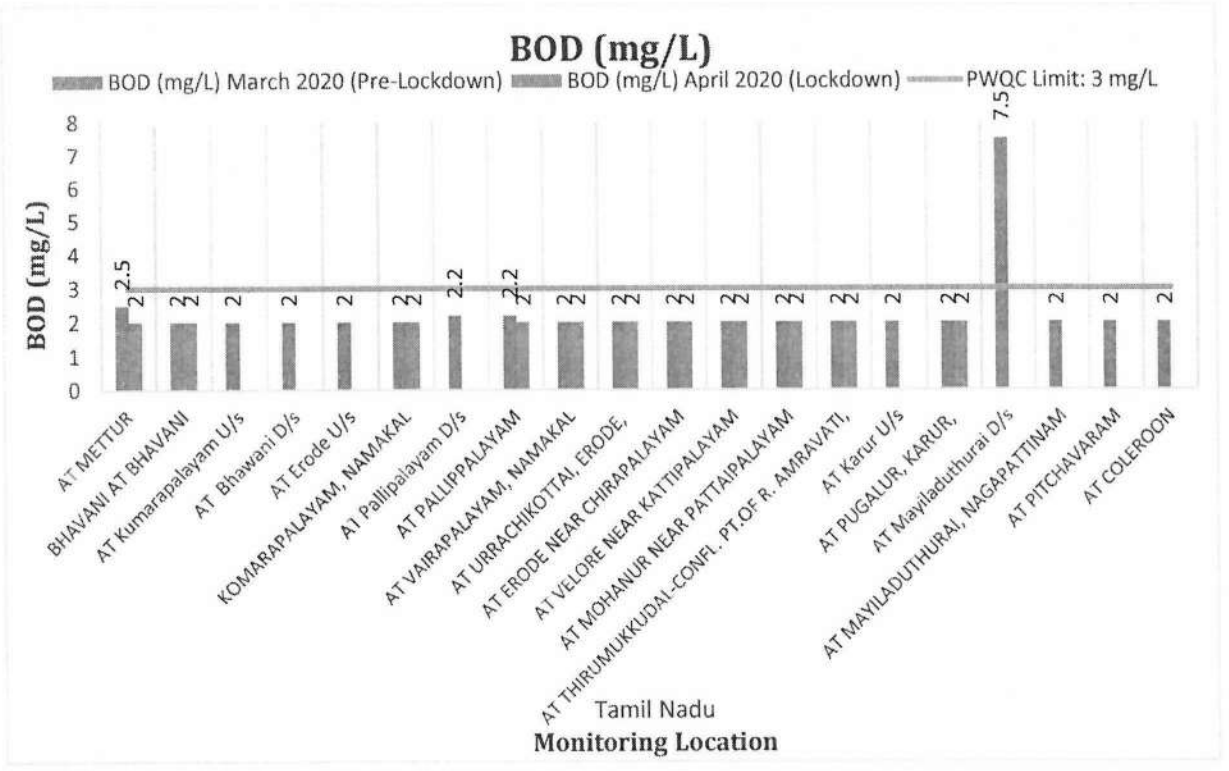

Figure 17.8: Water Quality of river Cauvery in Tamil Nadu for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020).

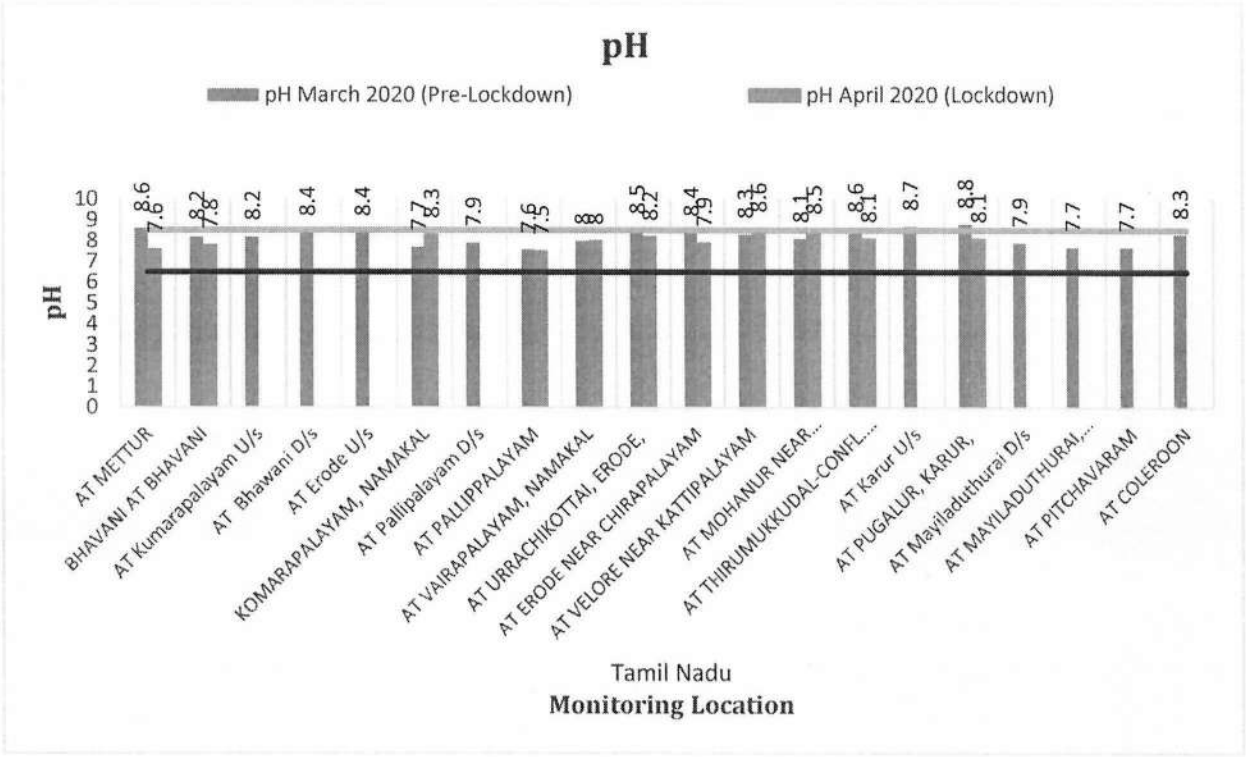

Figure 17.9: Water Quality of river Cauvery in Tamil Nadu for pH during pre-lockdown (March 2020) and lockdown (April 2020)

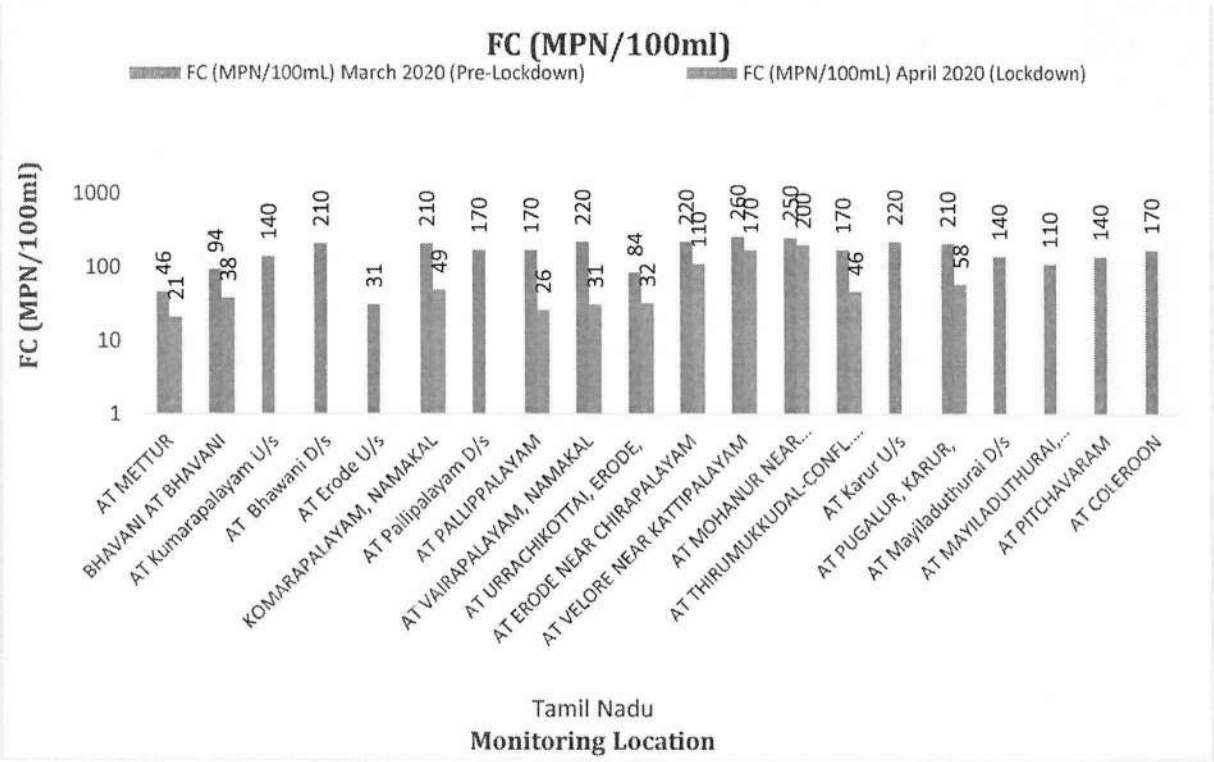

Figure 17.10: Water Quality of river Cauvery in TN for FC (MPN/100mL) during pre-lockdown (March 2020) and lockdown (April 2020)

17.4 Observations

Based on the analytical results of the samples collected from river Cauvery, following findings/observations are made:

Karnataka

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters were observed to be in the range of pH (7.1-8.1), DO (6.3-7.0 mg/L), BOD (1.5-2.6 mg/L) and FC (40-700 MPN/100 mL) at the 22 monitored locations.

- Maximum DO (7 mg/L) was observed at D/s Barachuki Falls and minimum DO (6.3 mg/L) at Intake Point to Srinranga Patna. Maximum BOD (2.6 mg/L) was observed at Intake Point to Mandya and minimum BOD (1.5 mg/L) at 2 locations (Viz., at KRS Dam, Balamuri Kshetra, D/s Balachuri Falls, Kollegala). Maximum Fecal Coliform (FC) count (700 MPN/100 mL) observed at Srinranga Patna D/s of Road Bridge and minimum (40 MPN/100 mL) at Kushalnagar, Beechanahalli.

- All the 22 monitored locations were found to be complying with the limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):-

- The analysis results for the four critical parameters were found to be in the order of pH (7.8-8.2), DO (6.6-7.8 mg/L), BOD (1.0-1.9 mg/L) and FC (27-320 MPN/100 mL) at the 22 monitored locations

- Maximum DO (7.8 mg/L) was observed at Napoklu Bridge and minimum DO (6.8 mg/L) at Srinranga Patna D/s. Maximum BOD (1.9 mg/L) was observed at Srinranga Patna and minimum BOD (1 mg/L) at 3 locations (Viz., at Napoklu Bridge , Intake Points to Madikeri and Mysore Pump Houses). Maximum Fecal Coliform (FC) count (320 MPN/100 mL) observed at Ranganathittu and minimum (27 MPN/100 mL) at Kanive Ramalingeswara Temple Bridge, Kushalnagar.

- All the 22 monitored locations were found to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on River Cauvery stretch within Karnataka State:-

- The analysis results shows increasing trend of DO (1.54- 15.87 %) at 21 locations while decreasing trend of BOD (13.33 -50 %) at 20 locations, FC (15.78-76.09 %) at 21 locations were observed. 'No' variation in DO (at 1 location), BOD (at 2 locations) and FC at 1 location.

Tamil Nadu

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters were observed to be in the range of pH (7.6-8.8), DO (2.1- 6.3 mg/L), BOD (2-7.5 mg/L) and FC (31-260 MPN/100 mL) at the 20 monitored locations.

- Maximum DO (6.3 mg/L) was observed at Bhavani and minimum DO (2.1 mg/L) at Mayiladuthurai D/s. Maximum BOD (7.5 mg/L) was observed at Mayiladuthurai D/s. Minimum BOD as '2 mg/l' at 16 monitored locations Maximum Fecal Coliform (FC) count observed at Vellore, Kattipalayam (260 MPN/100 mL) and minimum at Erode (31 MPN/100 mL).

- 16 out of 20 monitored locations were observed to be complying with the limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing. Also, pH at 16 locations, DO at 20 locations, BOD at 19 locations and FC at 20 monitored locations were observed to be complying with the Primary Water Quality Criteria for Outdoor Bathing .

During the lock down period (April 2020):-

- The analysis results for the four critical parameters were observed to be in the range of pH (7.5-8.6), DO (6.0-6.9 mg/L), BOD (2.0 mg/L) at all the 20 monitored locations and FC (21-220 MPN/100 mL) at the 11 monitored locations

- Maximum DO (6.9 mg/L) was observed at Vairapalayam and minimum DO (6 mg/L) at Mohanaur. BOD (2 mg/L) was observed at all the 11 monitored locations. Maximum Fecal Coliform (FC) count observed at Mohanur (260 MPN/100 mL) and minimum at Mettur (21 MPN/100 mL).

- 10 of 11 monitored locations were found to be complying to the limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing. Also, pH at 10 locations, DO, BOD and FC were observed to be within the desirable limits with the primary water quality criteria for outdoor bathing, at 11 monitored locations.

Overall observations on River Cauvery stretch within Karnataka State:-

- The analysis results reveal increasing trend of BOD (3.45-15.52 %) at 11 locations while decreasing trend of BOD (9-20 %) at 2 locations, FC (20-85.91 %) at 11 locations were observed. 'No' variation in BOD were observed at 9 locations.

Overall Observations on River Cauvery (covering Karnataka and Tamil Nadu):-

The analysis results reveal that

- During the pre-lockdown, pH (7.1-8.8), DO (2.1-7 mg/L), BOD (1.5 -7.5 mg/L) and FC (31-700 MPN/100 mL) at the 42 monitored locations. Also, pH at 38 locations, DO & FC at 42 locations, BOD at 41 monitored locations were complying within the desirable limits prescribed under the primary water quality criteria for outdoor bathing.

- During the lockdown, pH (7.5-8.6), DO (6-7.8 mg/L), BOD (1-2 mg/L) and FC (21-320 MPN/100 mL) at the 33 monitored locations. Also, pH at 32 locations, DO, BOD and FC were found to be complying at 33 monitored locations to the primary water quality criteria limits for outdoor bathing. Maximum DO was observed at Napoklu Bridge (7.8 mg/L)) and minimum at Mohanur, Near Pattaipalayam, Tamil Nadu (6 mg/L). Maximum BOD was observed as (2 mg/L) at 12 locations (viz., Near Ranganathittu, Mettur, Bhavani at Bhavani, at Komarapalayam, at Pallippalayam, Vairapalayam at Namakal, Urrachikottai at Erode, at Erode near Chirapalayam, at Velore Near Kattipalayam, at Mohanur Near Pattaipalayam, at Thirumukkudal-Confluence point of river Amravati and Pugalur at Karur. Minimum BOD as 'BDL' at 3 locations (Viz., at Napoklu Bridge, W/s intake point to Madikeri Town at Kootehole and W/s intake point to Mysore Pump House). Maximum Fecal Coliform (FC) count observed at Ranganathittu (320 MPN/100 mL) and minimum at Mettur (21 MPN/100 mL).

- Increasing trend of DO (1.54% -15.87%) at 32 locations and decreasing trend of BOD (9.09 % -50%) at 22 monitored locations and FC (15.78% -85.91%) at 32 locations were observed.

- 'No' variation in values of parameters i.e., DO (01 location), BOD (at 11 locations) and FC (at 1 location) were observed.

17.5. Conclusion

38 out of 42 monitored locations during pre-lockdown, 32 out of 33 locations during lockdown and overall 32 monitored locations were observed to be complying with the Primary Water Quality Criteria for Outdoor Bathing. Also, overall marginal improvement in water quality of river Cauvery was observed with respect to the parameters viz., DO, BOD and FC.

18.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER GHAGGAR

18.1 About Ghaggar River

The Ghaggar river is an intermittent river that originates in the Shivalik Hills of Himachal Pradesh and flows about 320 kilometre length through Punjab, Haryana and Rajasthan States. The river is known as 'Ghaggar' before the Ottu barrage and as the 'Hakra' downstream of the Ottu barrage. River Markhanda, Tangri and Chautang are the main tributaries of river Ghaggar. Main Sources of pollution identified contributing to pollution in river Ghaggar from Haryana includes main drains such as Sukhna Nallah, Jatton Wala Nallah, MDC Drain, Ambala Drain, Ghail drain, Sagarpara (Saraswati) Drain, Kaithal Drain and Ratia Drain Major towns on the banks of river Ghaggar within the jurisdiction of Haryana include Kurukshetra, Ambala, Karnal, Sirsa, Hissar and Jind whereas in Punjab State major towns are Khanaur, Moonak, Mohali, Derabassi, Rajpura, Sardulgarh, Sirhind, Zirakpur, Patiala, Sangrur, Ghanaur. Non-availability of adequate infrastructure facilities in the catchment area of river Ghaggar for treatment of generated sewage and solid waste apart from other factors including discharge of treated or partially treated/untreated sewage and industrial discharges mainly from sugar, distillery, pulp and paper industries.

18.2 Water Quality Monitoring Locations under National Water Quality Monitoring Programme (NWMP)

The Water Quality of river Ghaggar is monitored at 19 locations by Central Pollution Control Board (CPCB) in association with the Punjab Pollution Control Board (PPCB) and Haryana State Pollution Control Board (HSPCB) under National Water Quality Monitoring Programme (NWMP). State-wise Distribution of Water Quality Monitoring Locations under NWMP on River Ghaggar is depicted in **Figure 18.1.**

18.3 Analytical Results

Water quality of river Ghaggar was carried out at 19 locations (i.e., 5 locations in Haryana and 14 locations in Punjab) during Pre-Lockdown and Lockdown period to assess the impact on water quality of river Ghaggar. The water quality of river Ghaggar for Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented below in **Table 18.1**.

Based on the monitoring & analysis of collected water samples from river Ghaggar, the water quality trend of river Ghaggar with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are depicted in **Figure 18.2 to Figure 18.5.**

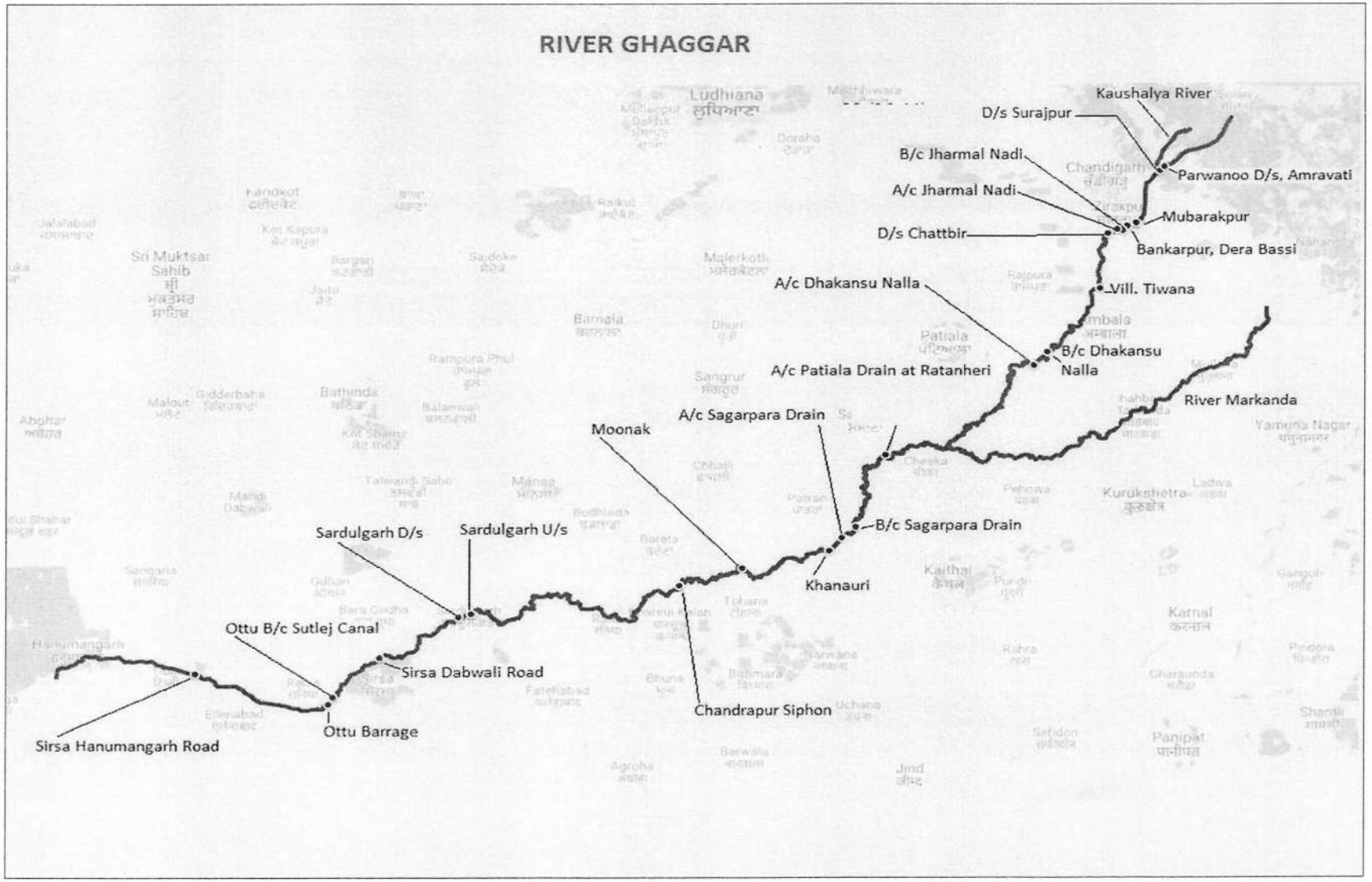

Figure 18.1: State-wise Distribution Water Quality Monitoring Locations under NWMP on River Ghaggar

Table-18.1 Water Quality of River Ghaggar during Pre (March 2020) and Lockdown Period (April 2020)

Monitoring Location on River Ghaggar	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
HARYANA												
D/s of Surajpur	9.2	8.0	-13	7.0	8.0	4.0	-	-	34000	17000	-50.0	Non-complying
GH-2 At Chanderpur Syphon	-	7.4	-	-	8.2	-	18	-	-	64000	-	Non-complying
GH-1 At Road Bridge, Sirsa- Debwali Road	2.1	6.8	223.8	8.5	7.9	54	16	-70.4	-	48000	-	Non-complying
Before Ottu Weir (Before Mixing of Sutlej Canal)	0.9	6.4	611.1	9.1	8.4	64	22	-65.6	35000	21000	-40.0	Non-complying
Kala Amb D/S Markanda	7.2	7.9	9.7	7.7	7.3	7.5	18	140.0	33000	21000	-36.4	Non-complying
No. locations monitored in Haryana	4 locations in March 2020 and 5 locations in April 2020											
No. of monitoring locations results available	4	5	-	4	5	4	4	-	3	5		
No. of locations complying to Criteria	2	5	-	3	5	Nil	Nil	-	Nil	Nil	-	
Range	0.9 - 9.2	6.4 - 8	Increase in variation 9.7 to 611.1 % (3 locations) and decrease in variation 13 % (1 location)	7 - 9.1	7.3 - 8.4	4 -64	16 - 22	Increase in variation 140 % (1 location) and decrease in variation 65.6 to 70.4 % (2 locations)	33000 - 35000	17000 - 64000	Decrease in variation 36.4 to 50 % (3 locations)	

Monitoring Location on River Ghaggar	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
PUNJAB												
Mubarakpur Rest House (Patiala)	6.9	7.3	5.8	8	7.7	11	5	-54.5	3400	1400	-58.8	Non-complying
Near Bankarpur, Derabassi	3.1	4.1	32.3	7.8	7.3	35	17	-51.4	3800	2600	-31.6	Non-complying
U/S Jharmal Choe	2.6	4.6	76.9	7.6	7.5	19	8	-57.9	3300	1700	-48.5	Non-complying
D/S Jharmal Nadi	2.4	3.4	41.7	7.1	7.3	28	10	-64.3	3400	2000	-41.2	Non-complying
D/S Chhatbir	2.3	4.1	78.3	7.6	7.3	43	8	-81.4	4600	1700	-63.0	Non-complying
U/S Dhakansu Nallah	2.2	5.1	131.8	7.9	7.5	20	5	-75.0	2700	1700	-37.0	Non-complying
D/S Dhakansu Nallah	2.0	4	100.0	7.7	7.4	26	7	-73.1	4000	2100	-47.5	Non-complying
Ratanheri, D/s Patiala Nadi	2.6	4	53.8	7.4	7.4	23	18	-21.7	3900	2500	-35.9	Non-complying
U/S Before Mixing With Sagarpara Drain	3.0	4.2	40.0	7.4	7.6	21	15	-28.6	3800	2200	-42.1	Non-complying
D/S after Mixing with Sagarpara Drain	2.0	3.1	55.0	7.5	7.7	27	20	-25.9	4700	2700	-42.6	Non-complying
At 100 m D/s C/F R. Saeaswati (Patiala)	2.5	4.0	60.0	7.3	7.6	18	12	-33.3	3300	2100	-36.4	Non-complying
Moonak	1.9	4.2	121.1	7.4	7.8	21	11	-47.6	4000	1700	-57.5	Non-complying
U/S Sardulgarh	5.0	6.2	24.0	7.5	7.5	16	7	-56.3	3100	1700	-45.2	Non-complying
D/S Sardulgarh	4.7	5.8	23.4	6.8	7.6	17	9	-47.1	3800	2000	-47.4	Non-complying
No. locations monitored	14 locations in March 2020 and 14 locations in April 2020											
No. of monitoring locations results available	14 locations in March 2020 and 14 locations in April 2020											
No. of locations complying to Criteria	2	4	-	14	14	Nil	Nil	-	Nil	12	-	
Range	1.9 – 6.9	3.1 – 7.3	Increase in variation 5.8 to 131.8 % (14 locations)	6.8 - 8	7.3 – 7.8	11 to 43	5 - 20	Decrease in variation 21.7 to 81.4 % (14 locations)	2700 - 4700	1400 2700 -	Decrease in variation 31.6 to 63 % (14 locations)	

Monitoring Location on River Ghaggar	Dissolved Oxygen (mg/L)			pH		BOD * (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
Overall Water Quality of River Ghaggar (Haryana and Punjab) during Pre (March 2020) and Lockdown Period (April 2020)												
No. locations monitored	18	19	-	18	19	-	18	18	-	17	19	
No. of monitoring locations monitored results available	18	19	-	18	19		18	18	-	17	19	
Range	0.9 – 9.2	3.1 – 8	Increase in variation 5.8 to 611.1 % (17 locations) and decrease in % variation 13 % (1 location)	6.8 – 9.1	7.3 – 8.4	4-64	5 - 22	Increase in variation 140 % (1 location) and Decrease in variation 21.7 to 81.4 % (16 locations)	2700 - 35000	1400 - 64000	Decrease in variation 31.6 to 63 % (17 locations)	

Note:- *Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

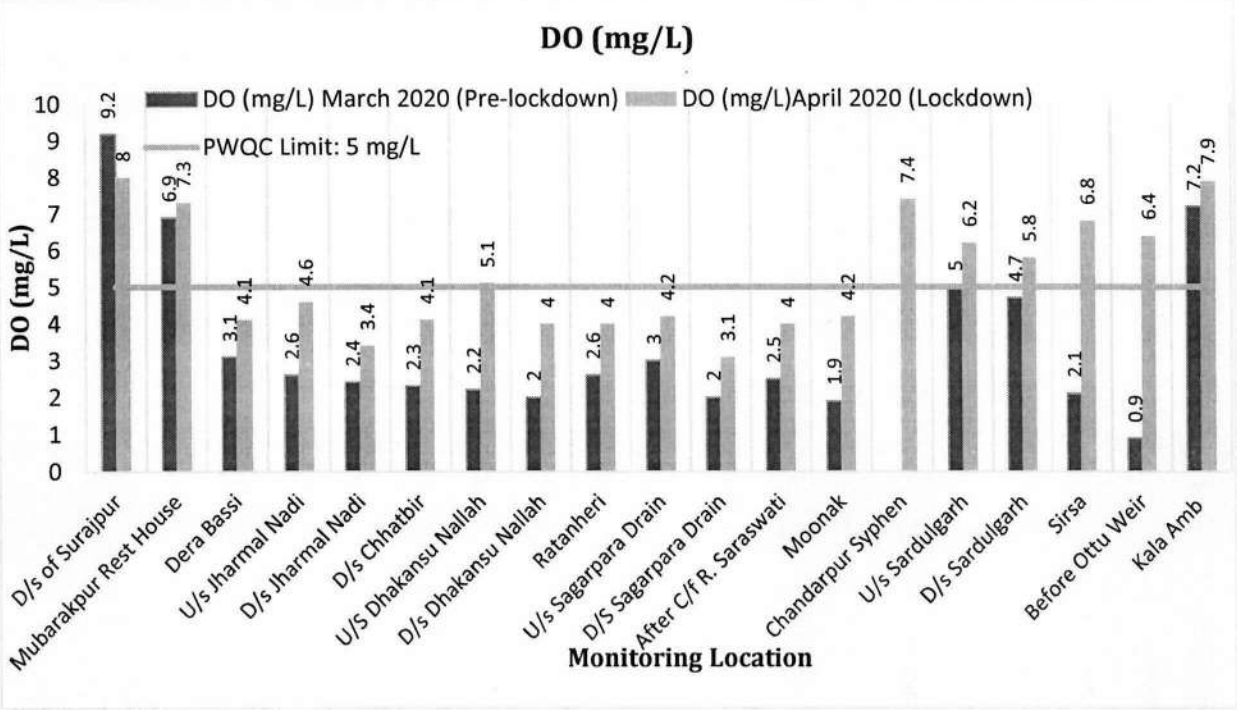

Figure 18.2: Water Quality of river Ghaggar for DO (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

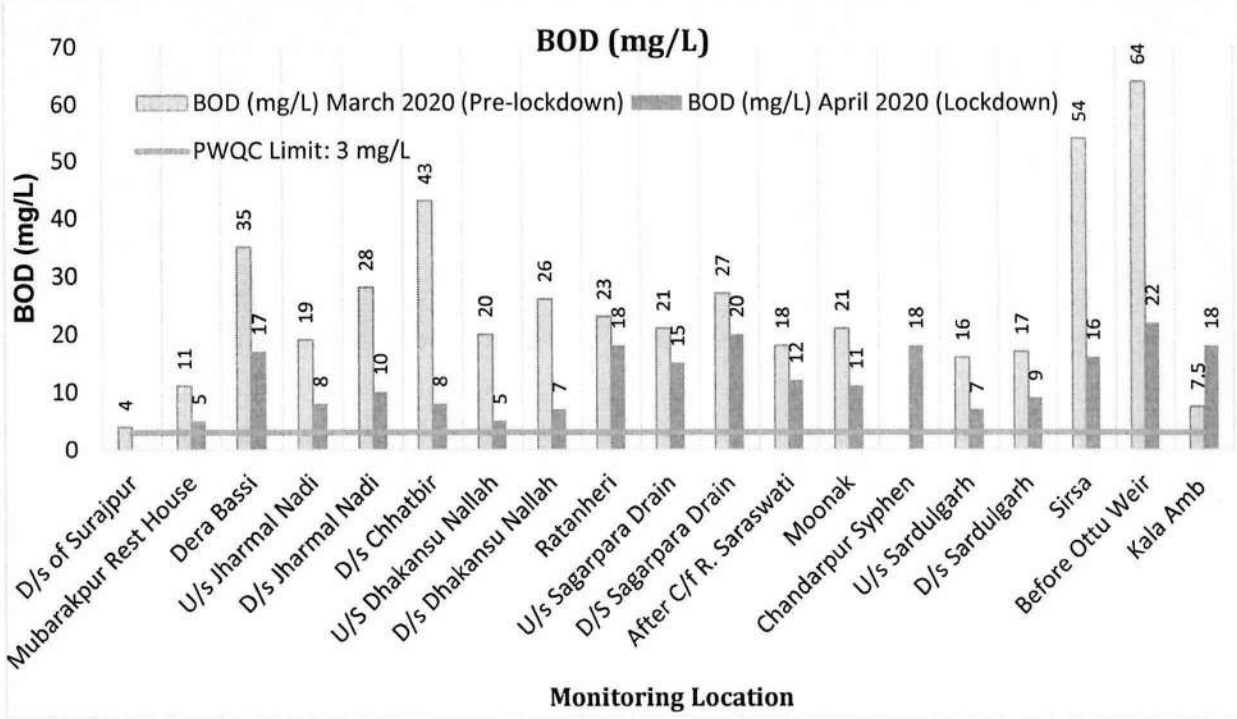

Figure 18.3: Water Quality of river Ghaggar for BOD (mg/L) during pre-lockdown (March 2020) and lockdown (April 2020)

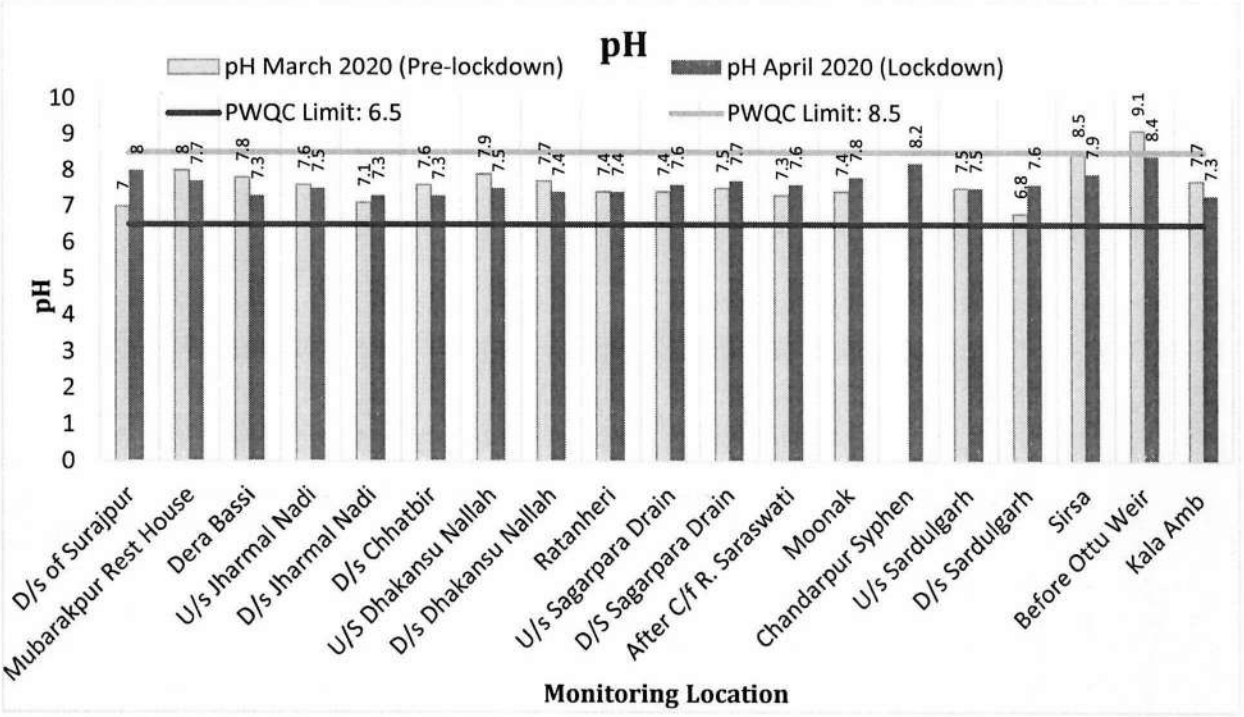

Figure 18.4: Water Quality of river Ghaggar for pH during pre-lockdown (March 2020) and lockdown (April 2020)

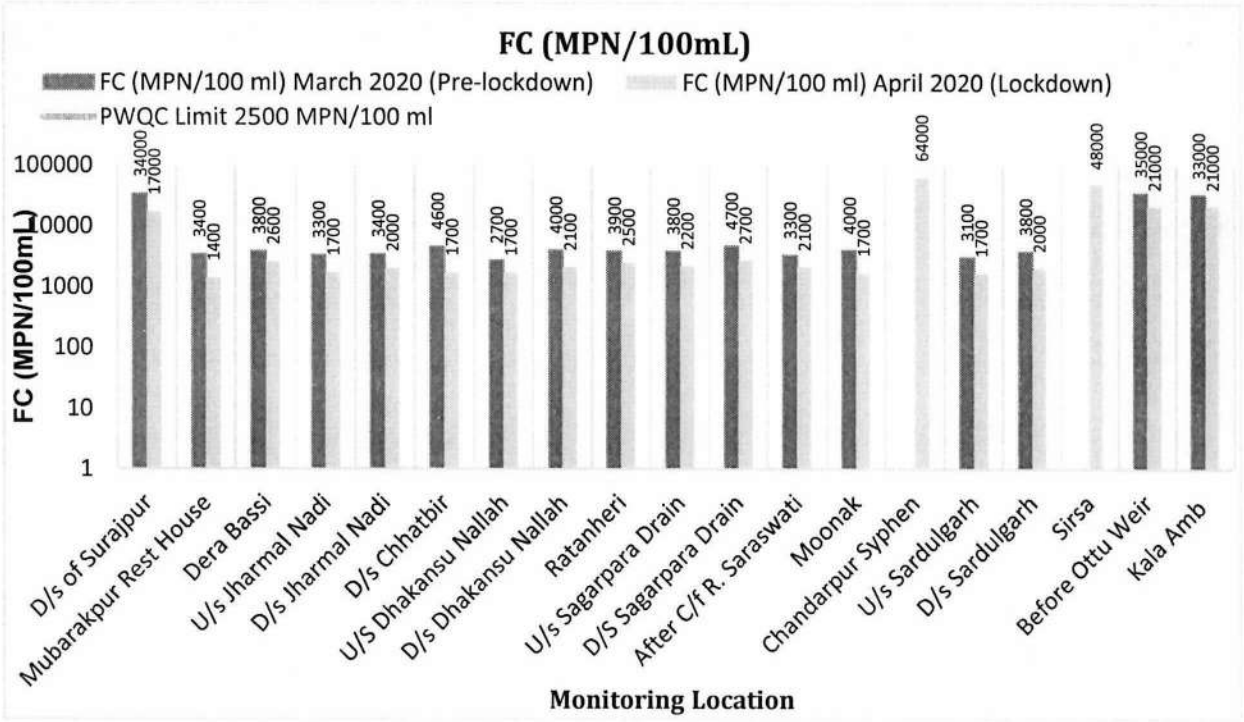

Figure 18.5: Water Quality of river Ghaggar for FC (MPN/100mL) during Pre-lockdown (March 2020) and lockdown (April 2020)

18.4 Observations

Based on the analytical results of the samples collected from river Ghaggar, following findings/observations are made:

Haryana

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters were observed to be in the order of pH (7 - 9.1), DO (0.9 - 9.2 mg/L), BOD (4 – 64 mg/L) and FC (33000 – 35000 MPN/100 mL) at the 5 monitored locations.

- Maximum DO (9.2 mg/L) was observed at D/s of Surajpur and minimum DO (0.9 mg/L) at Before Ottu Weir. Maximum BOD (64 mg/L) was observed at Before Ottu Weir and minimum BOD as '7 mg/l' at D/s of Surajpur. Maximum Fecal Coliform (FC) count observed at Before Ottu Weir (35000 MPN/100 mL) and minimum at D/s Markanda (33000 MPN/100 mL).

- All 4 monitored locations are not complying to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing. Also, pH at 4 locations, DO at 2 locations while BOD & FC were not complying to the limits prescribed under primary water quality criteria for outdoor bathing, at any of the monitored locations.

During the lock down period (April 2020):-

- The analysis results for the four critical parameters were found to be in the order of pH (7.3 - 8.4), DO (6.4 – 8 mg/L), BOD (16 – 22 mg/L) and FC (17000 – 64000 MPN/100 mL) at the 5 monitored locations

- Maximum DO (8 mg/L) was observed at D/s of Surajpur and minimum DO 6.4 mg/L) at Before Ottu Weir. Maximum BOD (64 mg/L) was observed at Before Ottu Weir and minimum BOD as '4 mg/l' at D/s of Surajpur. Maximum Fecal Coliform (FC) count64000 MPN/100 mL) was observed at Chanderpur Syphen and minimum (17000 MPN/100 mL) at D/s of Surajpur.

- All 5 monitored locations were observed to be complying with the limits for the parameters (i.e. pH and DO) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on river Ghaggar stretch within Haryana State: -

- During the lockdown and pre-lockdown period, the analysis results indicate increasing trend of DO (9.7 -611.1 %) at 3 locations and BOD (140 %) at 1 location were observed.

- Also, the analysis results indicate decreasing trend of DO (13 %) at 1 location, BOD (65.6 -70.4 %) at 2 locations and FC (36.4 -50 %) at 3 monitored locations were observed.

Punjab

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters were observed to be in the order of pH (6.8 - 8), DO (1.9 – 6.9 mg/L), BOD (11 – 43 mg/L) and FC (2700 – 4700 MPN/100 mL) at the 14 monitored locations.

- Maximum DO (6.9 mg/L) was observed at Mubarakpur and minimum DO (1.9 mg/L) at Moonak. Maximum BOD (43 mg/L) was observed at D/s Chatbir and minimum BOD as '11 mg/l' at Mubarakpur. Maximum Fecal Coliform (FC) count (4700 MPN/100 mL) was observed at D/s after mixing with Sagarpara Drain and minimum (2700 MPN/100 mL).at U/s Dhakansu Nallah

- All 14 monitored locations were observed to be not complying with the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing. Also, pH is complying at all 14 monitored locations, DO at 1 location whereas BOD & FC were found to be not complying to the bathing criteria limits at any of the monitored location.

During the lock down period (April 2020):-

- The analysis results for the four critical parameters observed to be in the order of pH (7.3 – 7.8), DO (3.1 – 7.3 mg/L), BOD (5 – 20 mg/L) and FC (1400 – 2700 MPN/100 mL) at the 14 monitored locations

- The analysis results of samples collected from River Ghaggar revealed that maximum DO was observed at Mubarakpur (7.3 mg/L)) and minimum at D/s after mixing with Sagarpara Drain (3.1 mg/L). Maximum BOD was

observed at D/s after mixing with Sagarpara Drain (20 mg/L). Minimum BOD (5 mg/L) was observed Mubarakpur Rest House (Patiala) and U/s Dhakansu Nallah. Maximum Fecal Coliform (FC) count observed at D/s after mixing with Sagarpara Drain (2700 MPN/100 mL) and minimum at Mubarakpur Rest House (Patiala) (1400 MPN/100 mL).

- All 14 monitored locations are not complying to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing. Also, pH is complying at 14 locations, DO is complying at 4 locations, BOD not complying at any location and FC complying at 12 out of 14 monitored locations.

Overall observations on river Ghaggar stretch within Punjab State: -

- The analysis results showed increasing trend of DO (5.8 -131.8 %) at 14 monitored locations, decreasing trend of BOD (21.7-81.4 %) at 14 locations and FC (31.6-63 %) at 14 monitored locations were observed.

Overall Observations on River Ghaggar (covering Haryana and Punjab States):-

The analysis results reveal that

- During the pre-lockdown, pH (6.8-9.1), DO (0.9-9.2 mg/L), BOD (4-64 mg/L) and FC (2700-47000 MPN/100 mL) at the 19 monitored locations. Also, pH at 19 locations and DO at 4 locations were within the desirable limits prescribed under the primary water quality criteria for outdoor bathing whereas BOD & FC were not complied to the criteria limits at all 19 monitored locations.

- During the lockdown, pH (7.3-8.4), DO (3.1-8 mg/L), BOD (4-64 mg/L) and FC (1400-64000 MPN/100 mL) at the 19 monitored locations. Also, pH at 19 locations, DO at 9 locations and FC at 12 monitored locations were found to be complying to the primary water quality criteria for outdoor bathing. Increasing trend of DO (5.8 to 611.1 %) at 17 locations, BOD (140%) at 1 location and decreasing trend of DO (13 %) at 1 location, BOD (21.7 to 81.4 %) at 16 locations, FC (31.6 % to 63 %) at 17 monitored locations were observed.

- During lockdown period (April, 2020), the analysis results of samples collected from River Ghaggar revealed that maximum DO was observed

at D/s Surajpur (8 mg/L)) and minimum at D/s after mixing with Sagarpara Drain (3.1 mg/L). Maximum BOD is observed at Ottu Weir (Before Mixing of Sutlej) (22 mg/L). Minimum BOD observed Mubarakpur Rest House (Patiala) and U/s Dhakansu Nallah (5 mg/L). Maximum Fecal Coliform (FC) count observed at Chandarpur Syphen (64000 MPN/100 mL) and minimum at Mubarakpur Rest House, Patiala (1400 MPN/100 mL).

18.5 Conclusion

None of the monitored locations on river Ghaggar during pre and lockdown period were complying with the Primary Water Quality Criteria for Outdoor Bathing. However, decreasing trend of BOD & FC values during lockdown period indicate marginal improvement in water quality of river Ghaggar.

19.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER BRAHMANI

19.1 About Brahmani River

The Brahmani River, in north-eastern Odisha State, is formed by the confluence of the Sankh and South Koel rivers at Vedvyas. The Brahmani river flows for 480 km and enroute join northern branches of the Mahanadi River, which then empties into the Bay of Bengal at Palmyras Point in Odisha. The industrial complex of Talcher city in Odisha is located in the catchment of Brahmani river. The wastewaters generated from the industries such as aluminium, thermal power station and mining operations are primarily responsible for deterioration of water quality of Brahmani river. River Brahmani and Baitarni outfall in the Bay of Bengal, forming a common delta.

19.2 Water Quality Monitoring Locations under National Water Quality Monitoring Program (NWMP)

The Water Quality of River Brahmani is monitored at 20 locations by Central Pollution Control Board (CPCB) in association with State Pollution Control Board, Odisha (OSPCB) under National Water Quality Monitoring Programme (NWMP). Distribution of Water Quality Monitoring Locations Under NWMP within Odisha State on River Brahmani is depicted in **Figure 19.1.**

19.3 Analytical Results-Brahmani

Water quality of river Brahmani was carried out at 20 locations during Pre-Lockdown and Lockdown period to evaluate the impact on water quality of river Brahmani. The water quality of river Brahmani for Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented below in **Table-19.1**.

Based on the monitoring & analysis of collected water samples from river Brahmani, the graphical presentation of water quality of river Brahmani with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are presented in **Figure 19.2 to Figure 19.5.**

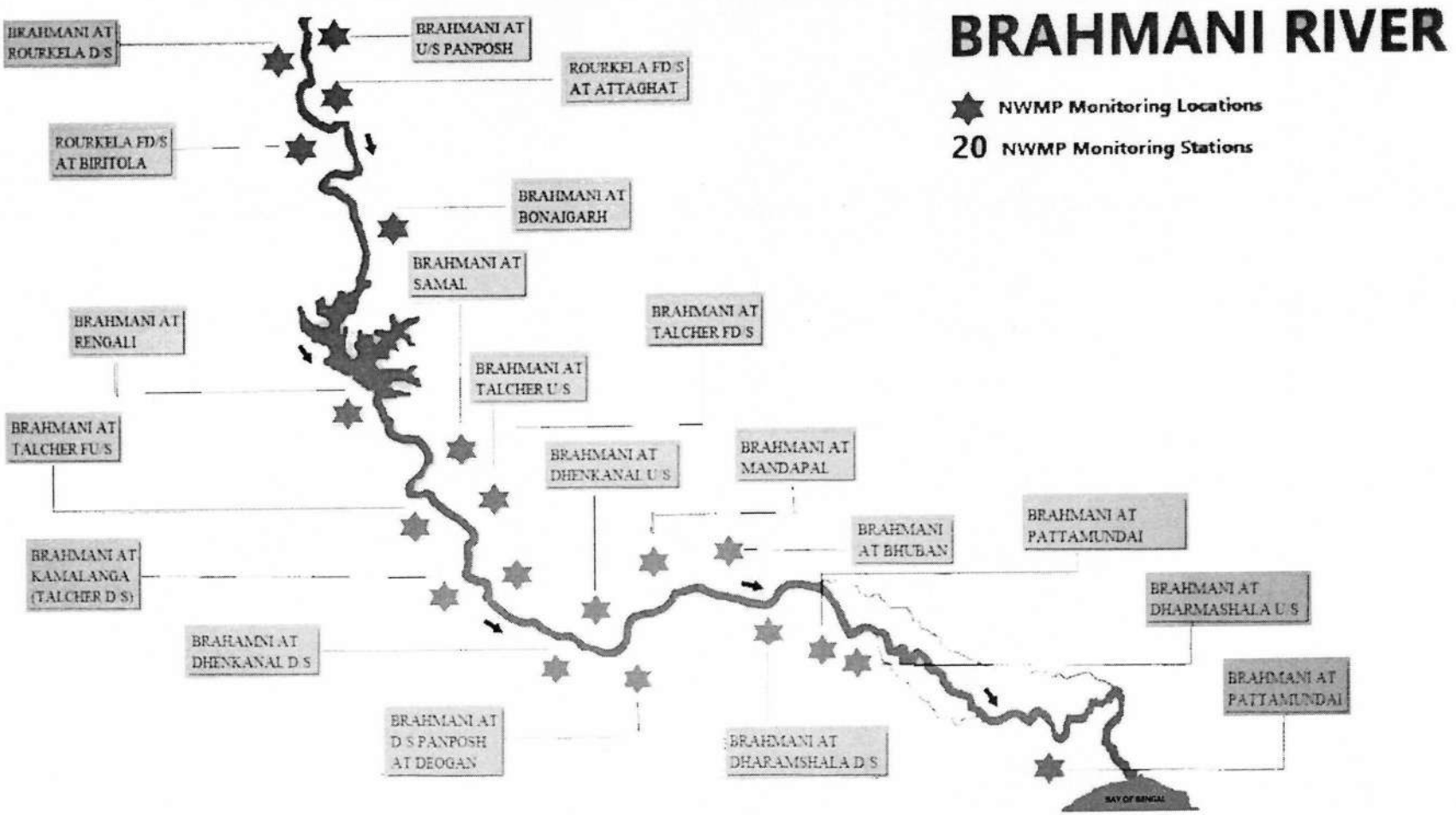

Figure 19.1: Distribution of Water Quality Monitoring Locations under NWMP on River Brahmani

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Table-19.1 : Water Quality of River Brahmani during Pre (March, 2020) and Lockdown period (April, 2020)

Monitoring Location on River Ghaggar	Dissolved Oxygen (mg/L)			pH		BOD* (mg/L)			Fecal Coliform (MPN/100mL)			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing (PWQCOB)	>5 mg/L			6.5-8.5		<3 mg/L			<2500 MPN/100mL			
ODISHA												
U/s Panposh					7	1.5	0.4	-73%	1300	490	-62%	Complying
Rourkela D/s at Jalda	5.4	6.1	13%	6.8	6.5	3.8	2.1	-45%	3300	1700	-48%	Non-complying
Rourkela D/s at Attaghat	6.8	7.8	15%	6.8	7.5	2.8	1.5	-46%	790	78	-90%	Complying
Rourkela D/s at Biritola	7.4	8.3	12%	6.8	7.3	2.6	0.6	-77%	170	78	-54%	Complying
At Bonaigarh	6.4	6.8	6%	6.9	7.2	0.8	0.2	-75%	170	78	-54%	Complying
At Rengali	8.2	8	-2%	7.2	7.1	1.1	0.4	-64%	110	1.5	-99%	Complying
At Samal	8.6	8.4	-2%	7.1	7.2	1.2	0.4	-67%	490	220	-55%	Complying
At Talcher U/s	7.4	7.9	7%	7.2	7	0.8	0.5	-38%	490	33	-93%	Complying
At Talcher F U/s (Intake Well of MCL)	7.2	7.4	3%	7.2	7.3	0.8	0.3	-63%	490	7.8	-98%	Complying
At Talcher F D/s	7.4	8	8%	7.8	7.9	1.6	0.6	-63%	490	23	-95%	Complying
Kamalanga	8.4	8.2	-2%	7.3	7.2	24	0.9	-96%	3300	46	-99%	Non-complying
Dhenkanal U/s	7	7.4	6%	7.4	7.6	1.2	0.2	-83%	230	130	-43%	Complying
D/s Panposh at Deogan	4.6	5.4	17%	6.9	6.7	4.1	2.8	-32%	7900	2200	-72%	Non-complying
Dhenkanal D/s, Dhenkanal Town	7.8	7.8	Nil	7.6	7.9	1.4	0.6	-57%	330	220	-33%	Complying
Bhuban	8	7.8	-3%	7.6	7.7	1.3	0.4	-69%	220	210	-5%	Complying
Mandapal	7.6	7.8	3%	7.2	7.2	0.9	0.2	-78%	790	790	Nil	Complying
Kabatabandha	7.6	7.8	3%	7.4	7.5	0.8	0.3	-63%	330	130	-61%	Complying
Dharamsala U/s, Jajpur District	7.1	7.8	10%	7.3	7.3	0.5	0.3	-40%	790	490	-38%	Complying
Dharamsala D/s	7.2	7.6	6%	7.4	7.3	1	0.2	-80%	790	330	-58%	Complying
Pattamundai	7.8	8.3	6%	7.9	8	0.5	0.3	-40%	460	330	-28%	Complying
No. locations monitored in Odhisa	20 locations monitored in Odisha during Pre-lockdown (March 2020) and Lockdown (April 2020)											

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No. of monitoring locations for which monitored results available	20	20	-	20	20	20	20	-	20	20	-	
No. of locations complying to Criteria	19	20	-	20	20	17	20	-	17	20	-	17 out of 20 monitored locations in March 2020 and 20 out of 20 Monitored locations in April 2020
Overall Range	4.6-8.6	5.4-8.4	Increase in percent variation (3 to 17 %) at 15 locations, Decrease in Percent variation (2% to 3%) at 04 locations) and 'No' variation at 01 location	6.8-7.9	6.5-8.0	BDL (0.5) - 24	BDL (0.2)-2.8	Decrease in percent variation (32 % to 96%) at 20 locations)	110-7900	1.5-2200	Decrease in percent variation (5% to 99%) at 19 locations) and 'No' variation at 1 location	

Note: *Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

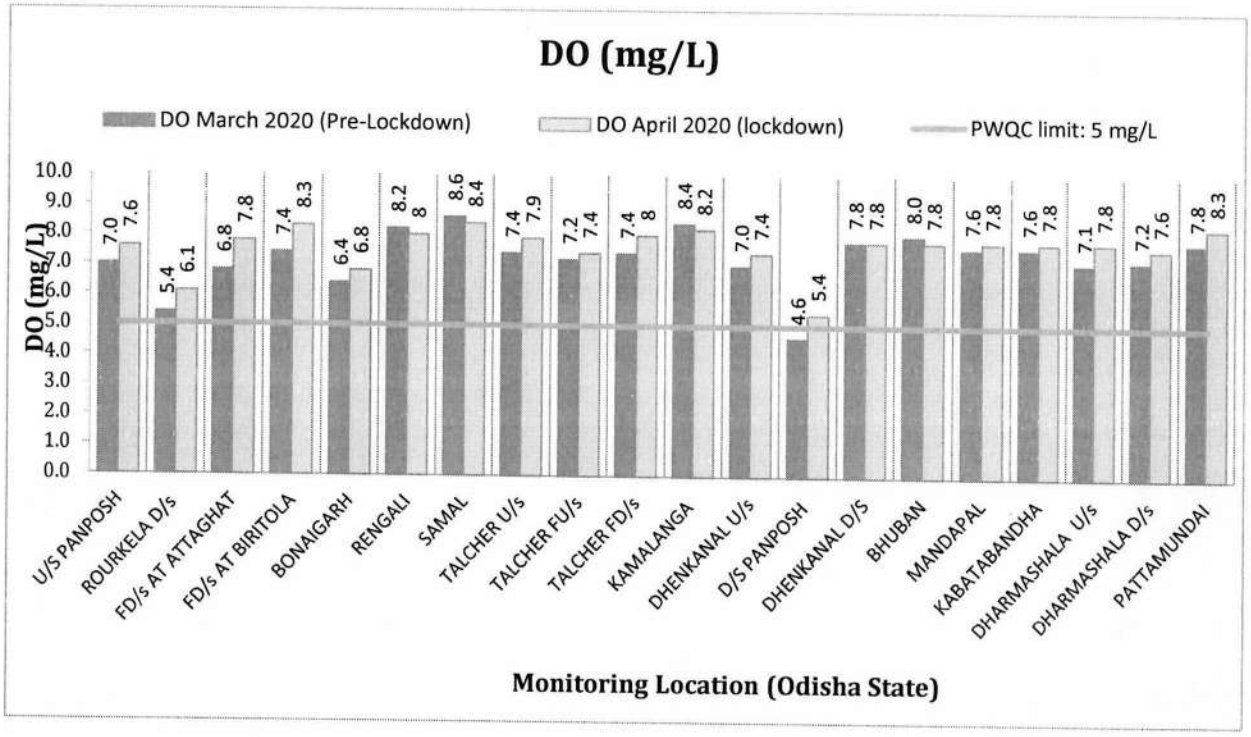

Figure 19.2 : Water Quality of River Brahmani for DO (mg/L) during pre-lockdown (March 2020) and Lockdown (April 2020)

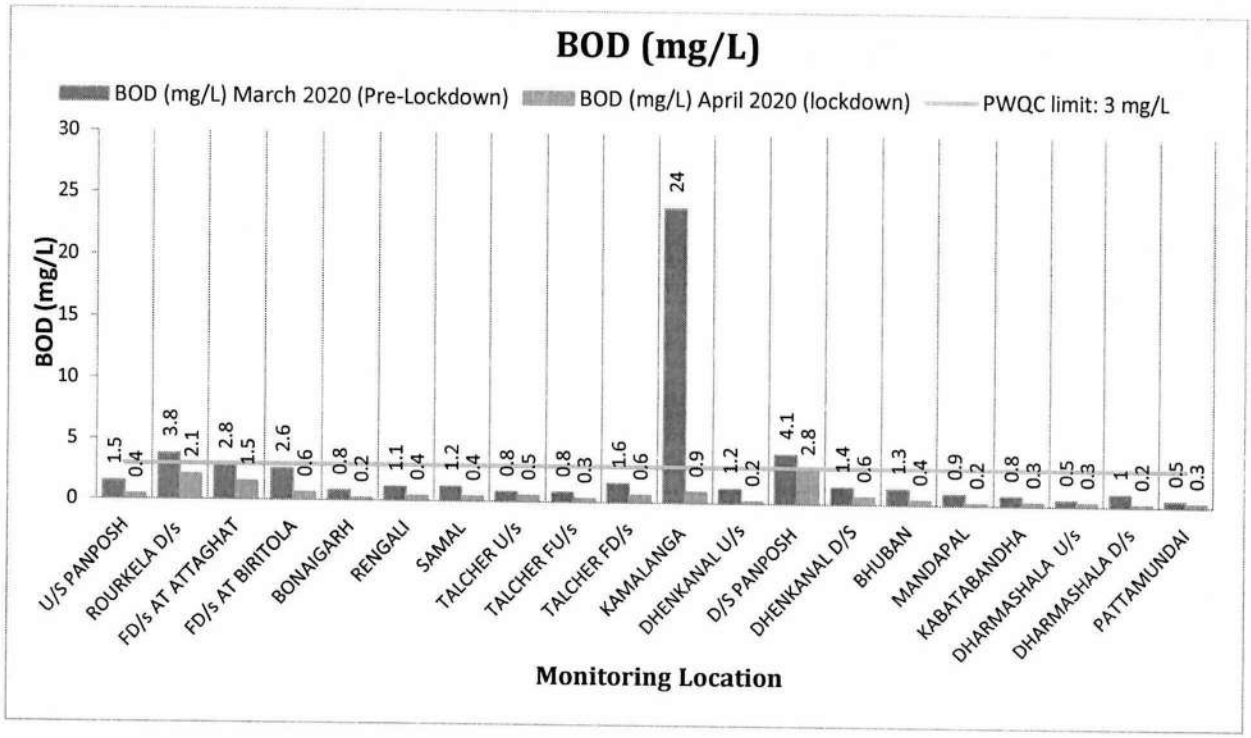

Figure 19.3 : Water Quality of River Brahmani for BOD (mg/L) during pre-lockdown (March 2020) and Lockdown (April 2020)

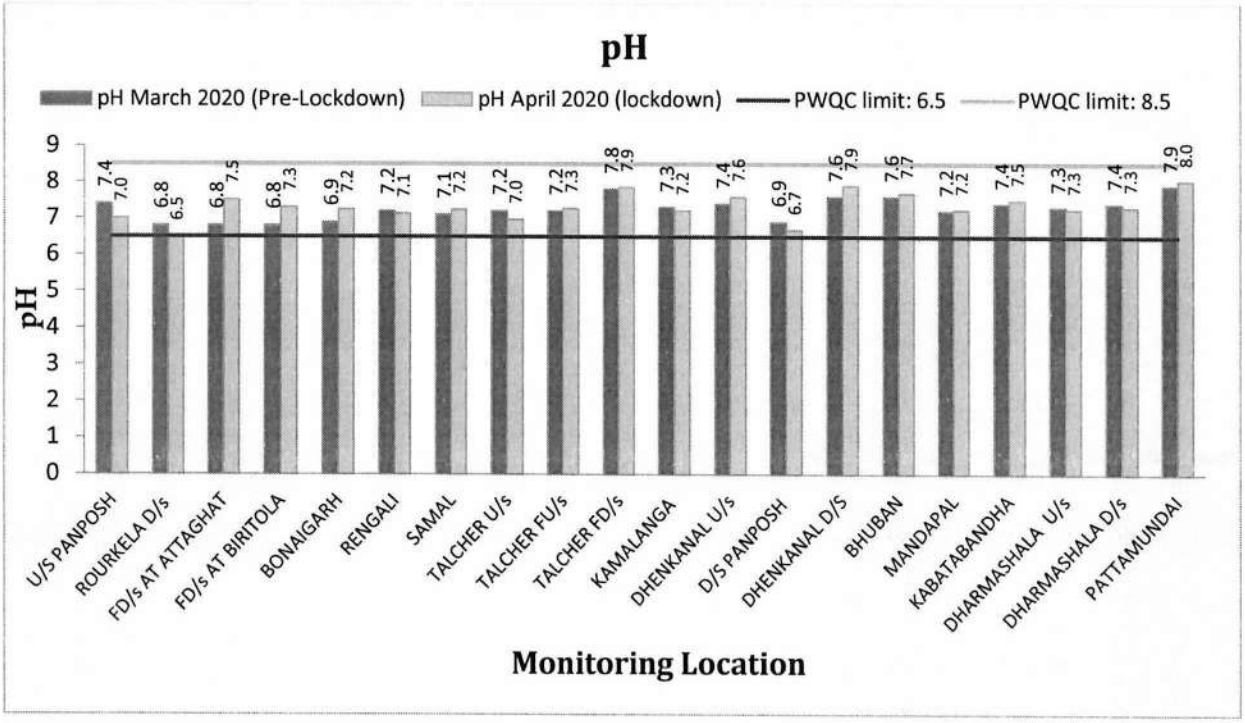

Figure 19.4: Water Quality of River Brahmani for pH during pre-lockdown (March 2020) and Lockdown (April 2020)

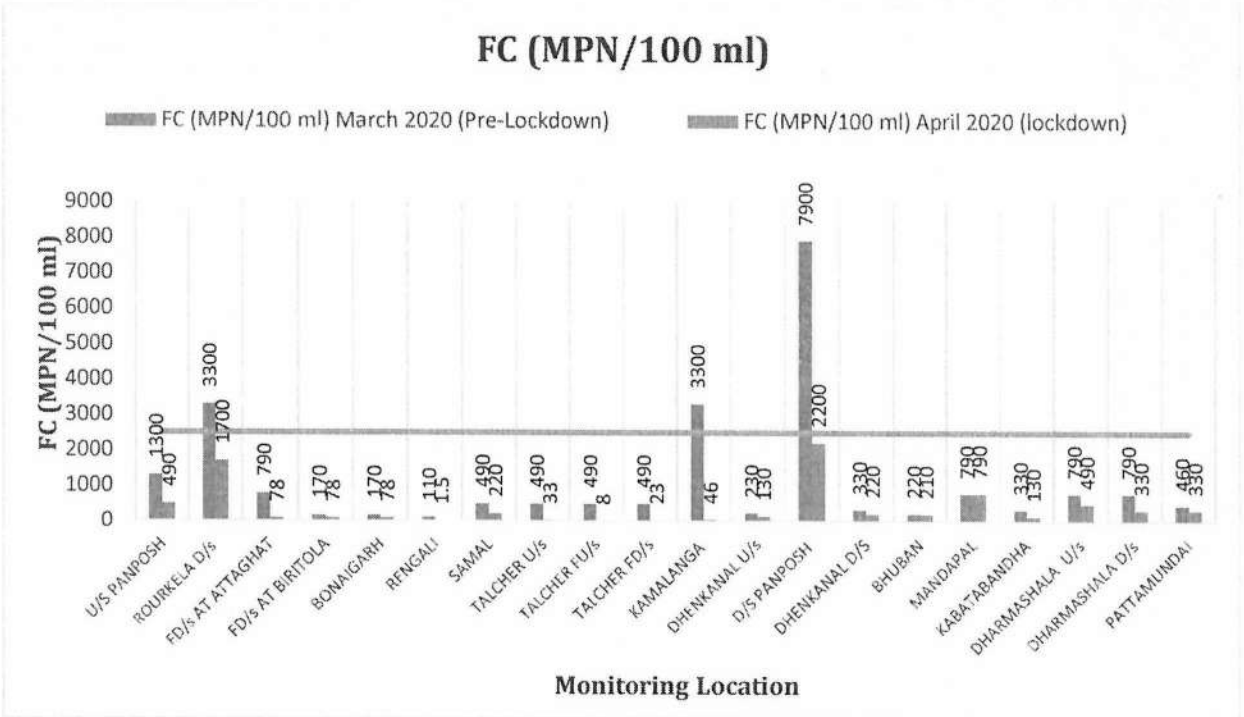

Figure 19.5: Water Quality of River Brahmani for Fecal Coliform (MPN/100mL) during pre-lockdown (March 2020) and Lockdown (April 2020).

19.4 Observations

Based on the analytical results of the samples collected from river Brahmani, the following findings/observations are made on River Brahmani: -

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters indicate pH (6.8- 7.9), DO (4.6- 8.6 mg/L), BOD (BDL (0.5) – 24 mg/L) and FC (110 – 7900 MPN/100mL) at the 20 monitored locations.

- The analysis results revealed maximum DO (8.6 mg/L) was observed at Samal and minimum DO (4.6 mg/L) at D/s Panposh, Deogan. Maximum BOD was observed at Kamalanga as 24 mg/L and minimum as 'BDL' at Dharamsala U/s, Jajpur District whereas maximum FC was observed at D/s Panposh,Deogan as 7900 MPN/100mL and minimum at Rengali as '110 MPN/100mL.

- 17 out of 20 monitored locations were found to be complying to the parameters (i.e. BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):-

- The analysis results for the four critical parameters were observed to be in the order of pH (6.5 - 8.0), DO (5.4 - 8.4 mg/L), BOD (BDL (0.2) - 2.8 mg/L) and FC (1.5 – 2200 MPN/100 mL) at the 20 locations.

- The analysis results revealed maximum DO (8.4 mg/L) was observed at Samal and minimum DO (5.4 mg/L) at D/s Panposh, Deogan. Maximum BOD was observed at D/s Panposh, Deogan as 2.8 mg/L and minimum as 'BDL' at 17 locations whereas maximum FC was observed at D/s Panposh,Deogan as 2200MPN/100mL and minimum at Rengali as 'BDL' (1.5 MPN/100mL).

- All 20 locations were complying to bathing criteria parameters.

Overall observations on river Brahmani:-

- Overall analysis results shows increasing trend of DO (3% to 17%) at 15 locations whereas decreasing trend of DO (2-3%) at 4 locations, BOD

(32%-96 %) at 20 locations and FC (5-99 %) at 19 monitored locations were observed. 'No' variation was observed w.r.t DO and FC at 1 location each.

19.5 Conclusion

17 out of 20 monitored locations during pre-lockdown, 20 out of 20 monitored locations during lockdown and overall, 17 monitored locations were observed to be complying with the Primary Water Quality Criteria for Outdoor Bathing. Also, overall improvement in water quality of River Brahmani was observed with respect to DO, BOD and FC.

20.0. IMPACT OF LOCKDOWN ON WATER QUALITY OF RIVER BAITARNI

20.1 About Baitarni River

The Baitarni river originates from Guptaganga hill ranges of Keonjhar district of Odisha. Total length of the river Baitarni about 355 km and it serves as a boundary between Jharkhand and Orissa States up to confluence of Kangira river. Both the rivers Brahmani and Baitarni outfall in the Bay of Bengal, forming a common delta.

20.2 Water Quality Monitoring Locations under National water quality monitoring program (NWMP)

The Water Quality of River Baitarni is monitored at 10 locations respectively by Central Pollution Control Board (CPCB) in association with State Pollution Control Board, Odisha (OSPCB) under National Water Quality Monitoring Programme (NWMP). Distribution of Water Quality Monitoring Locations under NWMP within Odisha State on River Baitarni is depicted in **Figure 20.1.**

20.3 Analytical Results

Water quality of river Brahmani was carried out at 10 locations during Pre-lockdown and 09 locations during lockdown to assess the impact on water quality. The water quality of river Baitarni for Primary Water Quality Criteria for Outdoor Bathing (PWQCOB) parameters viz. Dissolved Oxygen (DO), pH, Biochemical Oxygen Demand (BOD) and Fecal Coliform (FC) are presented below in **Table-20.1**. Based on the monitoring & analysis of collected water samples from river Baitarni, the water quality trend with respect to DO, pH, BOD and FC as observed during pre-lockdown (March 2020) and lockdown period (April 2020) are depicted in **Figure 20.2 to Figure 20.5.**

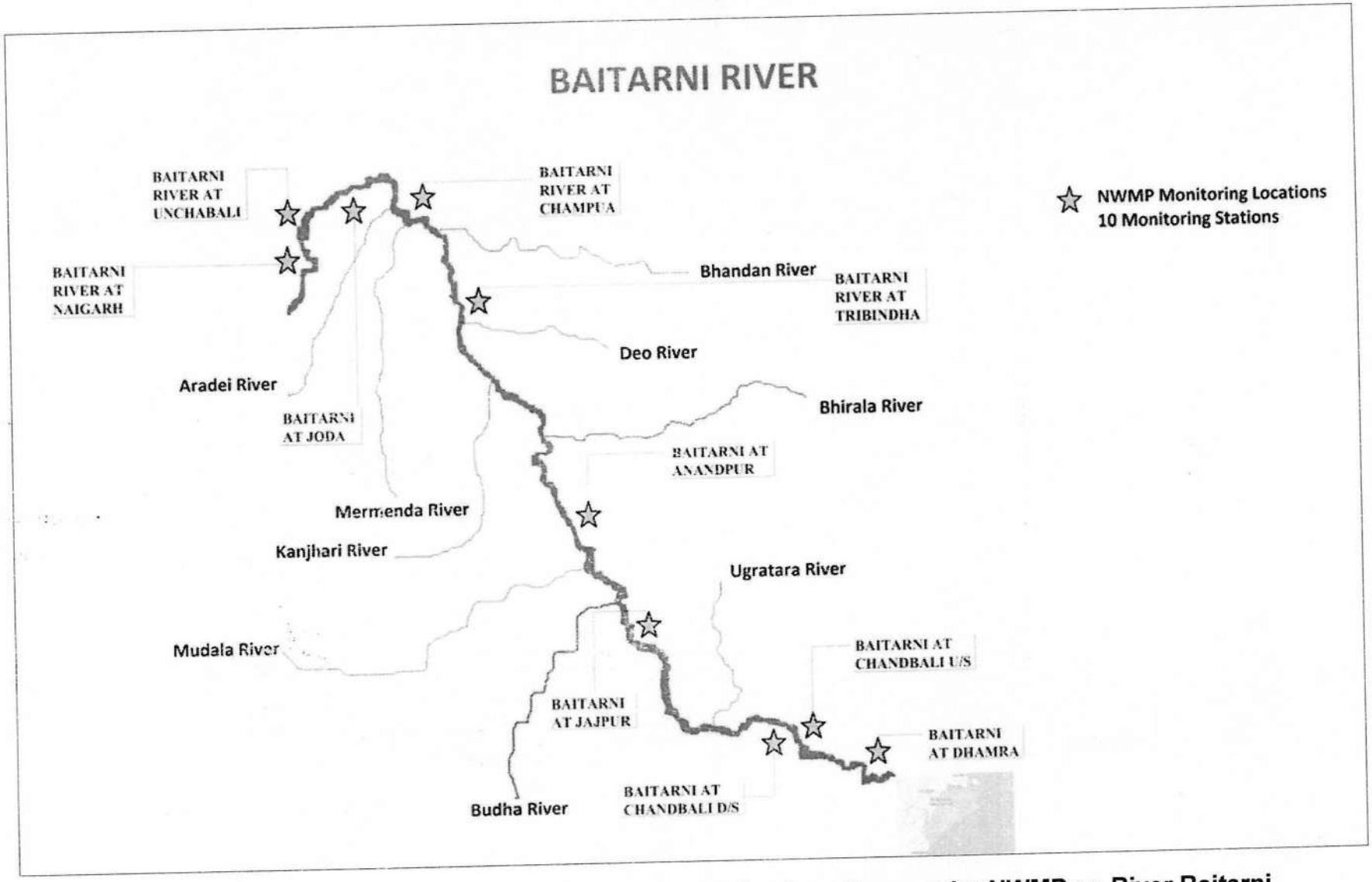

Figure 20.1:Distribution of Water Quality Monitoring Locations under NWMP on River Baitarni

Table-20.1: Water Quality of River Baitarni during pre (March, 2020) and Lockdown period (April, 2020) in Odisha

Monitoring locations on River Baitarni	Dissolved Oxygen (mg/L)			pH		BOD (mg/L)			Fecal Coliform in MPN/100 mL			Compliance Status w.r.t PWQCOB
	March	April	Variation (%)	March	April	March	April	Variation (%)	March	April	Variation (%)	
Primary Water Quality Criteria for Outdoor Bathing:	**>5 mg/L**			**6.5-8.5**		**<3 mg/L**			**<2500 MPN/100mL**			
ODISHA												
At Naigarh	6.5	6.9	6%	7.4	7.5	1	0.6	-40%	45	45	Nil	Complying
At Unchabali	6.3	6.9	10%	7.4	7.7	0.2	0.1	-50%	790	790	Nil	Complying
At Joda	6.9	7.4	7%	7.2	7.3	0.9	0.4	-56%	490	130	-73%	Complying
At Champua	6.8	7.6	12%	6.9	7.5	0.7	0.3	-57%	490	330	-33%	Complying
At Tribindha	7	7.2	3%	7.1	7.8	0.4	0.1	-75%	490	330	-33%	Complying
At Anandpur	7.6	7.8	3%	7.1	7.8	0.6	0.3	-50%	2300	1400	-39%	Complying
At Jajpur	7.2	7.6	6%	7.2	7.6	0.9	0.3	-67%	110	20	-82%	Complying
At Chandbali D/s	7.2	7.2	Nil	7.2	7.5	1.3	0.8	-38%	2400	1300	-46%	Complying
At Chandbali U/s	6.4	6.8	6%	7.1	7.3	1.1	0.3	-73%	1100	490	-55%	Complying
At Dhamra	7.8	-	-	7.4	-	1.8	-	-	170	-	-	Complying
No. of locations monitored by Odisha	10 locations in March 2020 and 09 locations in April 2020											
No. of monitoring locations monitored results available in Odisha	10	9		10	9	10	9		10	9		
No. of locations complying to Criteria	10	9		10	9	10	9		10	9		
Overall Range	6.3-7.8	6.8-7.8	Increase in % variation (3% to 12% at 8 locations and 'No' variation at 01 location.	6.9-7.4	7.3-7.8	BDL (0.2) - 1.8	BDL (0.1 to 0.8)	Decrease in % variation(38% to 75 % at 09 locations	45 - 2400	20-1400	Decrease in % variation (33% to 82 % at 07 locations and 'No' variation at 02 location.	

Note:-*Values below 1mg/L for BOD to be considered as Below Detection Limit (BDL)

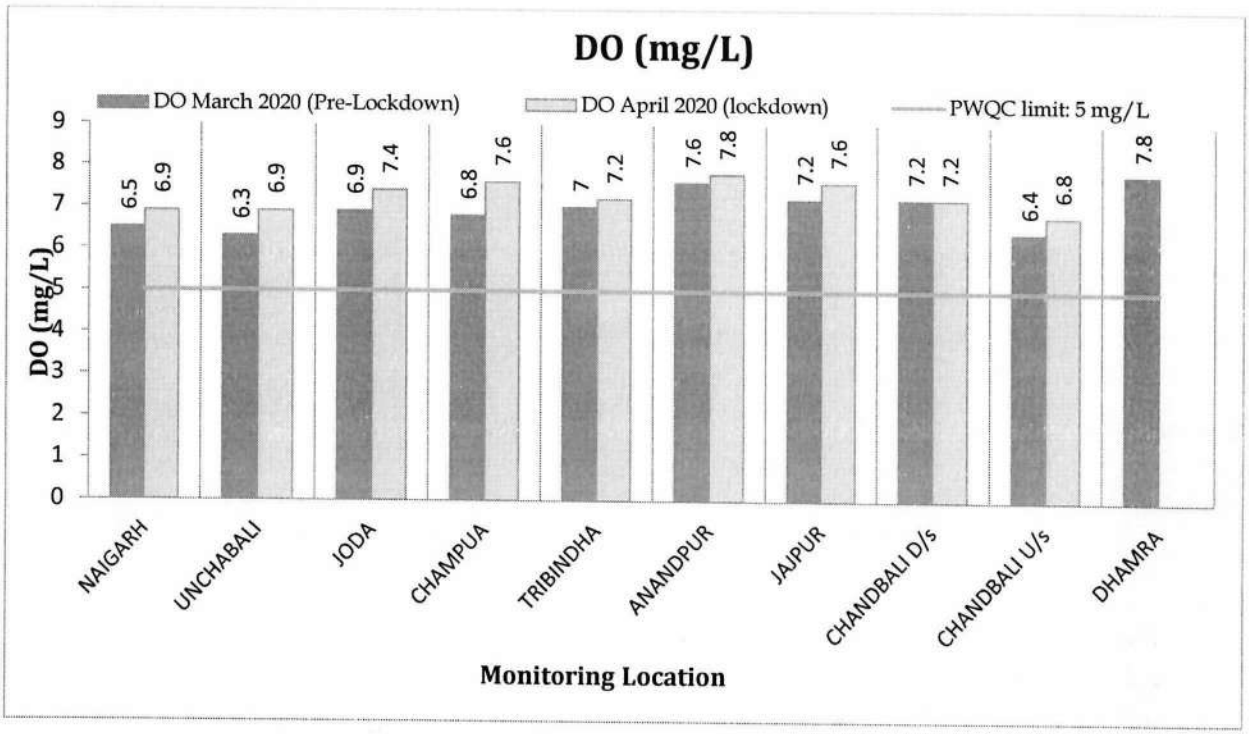

Figure 20.2: Water Quality of River Baitarni for DO (mg/L) during pre-lockdown (March 2020) and Lockdown (April 2020)

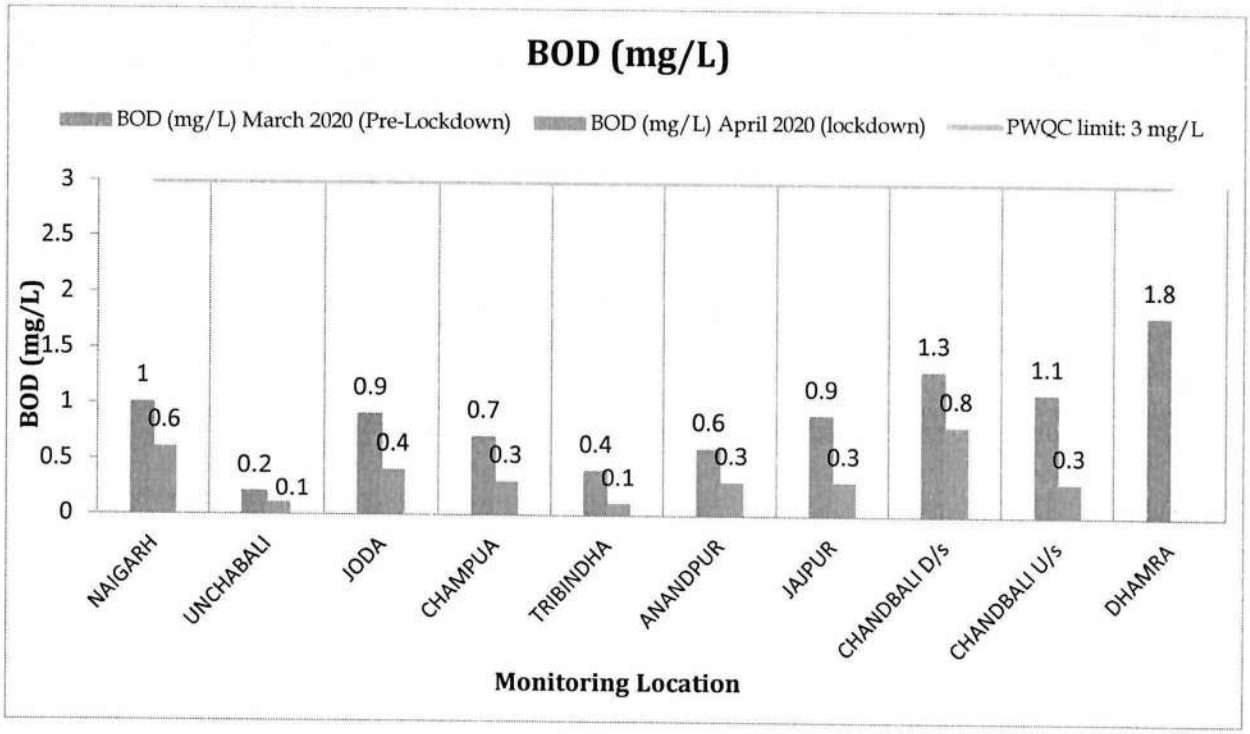

Figure 20.3: Water Quality of River Baitarni for BOD (mg/L) during pre-lockdown (March 2020) and Lockdown (April 2020)

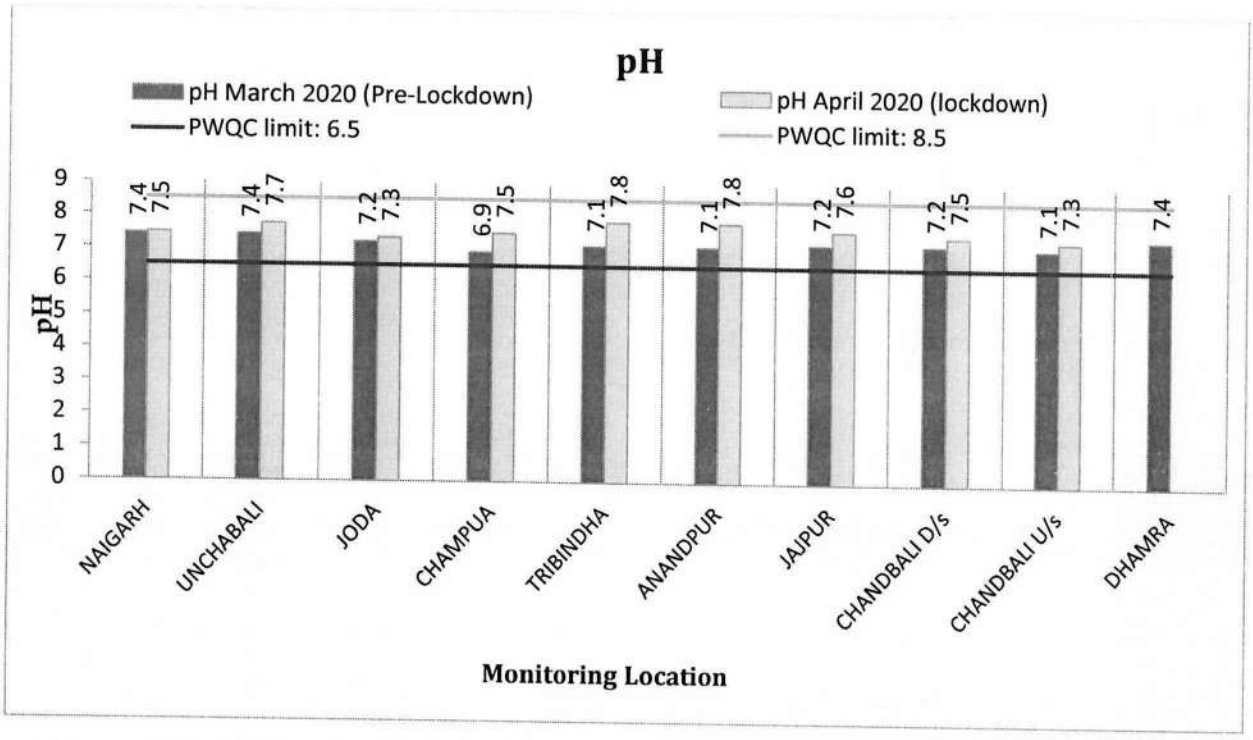

Figure 20.4: Water Quality of River Baitarni for pH during pre-lockdown (March 2020) and Lockdown (April 2020)

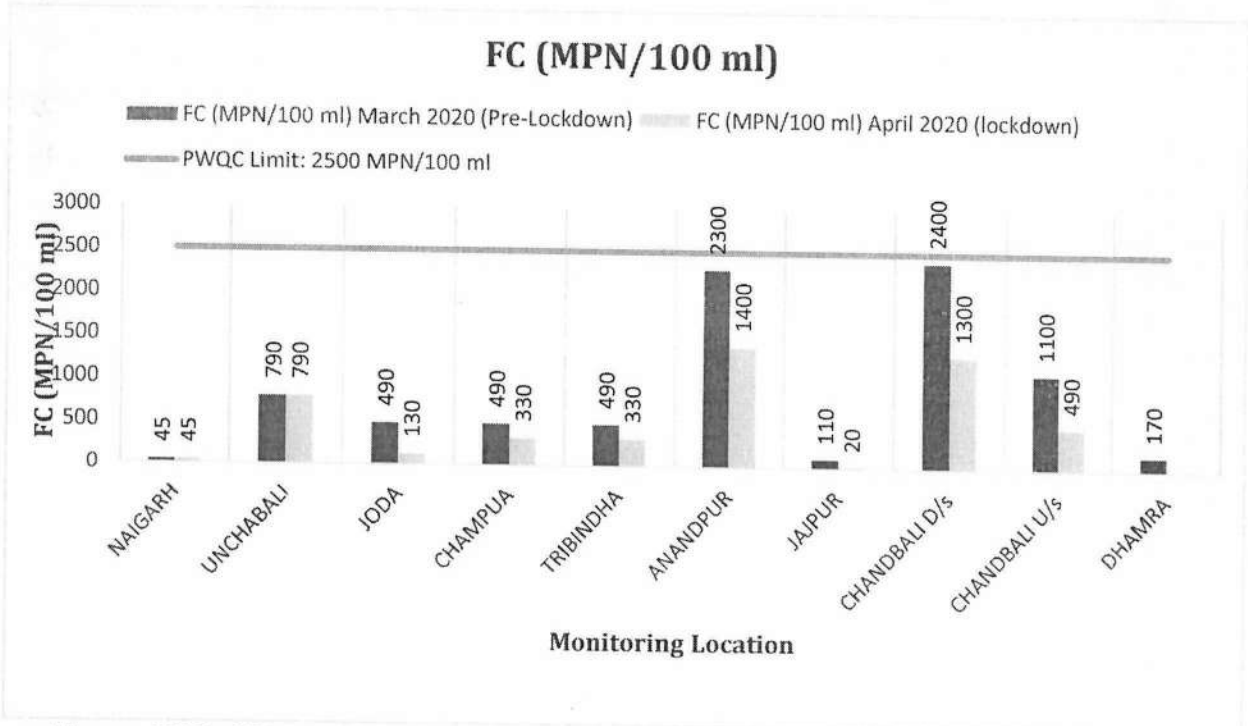

Figure 20.5: Water Quality of River Baitarni for Fecal Coliform (MPN/100mL) during pre-lockdown (March 2020) and Lockdown (April 2020)

20.4 Observations

Based on the analytical results of the samples collected from river Baitarni, the following findings/observations are made:-

During the pre-lock down period (March 2020):-

- The analysis results for the four critical parameters were observed to be in the order of pH (6.9 -7.4), DO (6.3 - 7.9 mg/L), BOD (0.2 - 1.8 mg/L) and FC (45 – 2400 MPN/100 mL) at the 10 monitored locations.

- The analsysis results of the river Baitarni revealed that maximum DO (7.8 mg/L) was observed at Dhamra and minimum at Unchabali (6.3 mg/L). Maximum BOD (1.8 mg/L) was observed at Dhamra. Maximum FC count (2400 MPN/100mL) was observed at D/s Chandbali and minimum at Naigarh (45 MPN/100mL).

- All 10 monitored locations were complying to the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

During the lock down period (April 2020):-

- The analysis results for the four critical parameters were found to be in the order of pH (7.3 - 7.8), DO (6.8 - 7.8 mg/L), BOD (0.1 - 0.8 mg/L) and FC (20 – 1400 MPN/100 mL) at the 09 monitored locations.

- The analsysis results of the river Baitarni revealed that maximum DO (7.6 mg/L) was observed at Champua and minimum at U/s Chandbali (6.8 mg/L). BOD was observed as 'BDL' at all 09 monitored locations viz., Joda, Anandpur, Jajpur,Chandbali U/s, Naigarh, Unchabali, Champua,Tribindha and D/s Chandbali. Maximum FC count (1400 MPN/100mL) was observed at Anandpur and minimum at Jajpur (20 MPN/100mL).

- All 09 monitored locations were observed to be within the desirable limits for the parameters (i.e. pH, DO, BOD and FC) prescribed under Primary Water Quality Criteria for Outdoor Bathing.

Overall observations on river Baitarni:-

➢ The analysis results showed increasing trend of DO (3 -12%) at 08 locations while decreasing trend of BOD (38 -75%) at 09 locations and FC (33 -82%) at 09 monitored locations were observed.'No' variation was observed w.r.t DO at 1 location and FC at 2 locations.

20.5 Conclusion

All 10 monitored locations monitored during pre-lockdown, all 9 monitored locations on river Baitarni monitored during lockdown were observed to be complying (100 % compliance) with the Primary Water Quality Criteria for Outdoor Bathing. Also, an improvement in water quality of river Baitarni was observed with respect to DO, BOD and FC.

21.0. OVERALL ANALYSIS AND CONCLUSION

21.1 Overall Analysis of Water Quality of all Major Rivers and conclusions

Twenty State Pollution Control Boards (SPCBs) have participated in the assessment and collected water samples from the 19 major rivers namely river Beas, Brahmaputra, Baitarni, Brahmani, Cauvery, Chambal, Ganga, Ghaggar, Godavari, Krishna, Mahanadi, Mahi, Narmada, Pennar, Sabarmati, Sutlej, Swarnarekha, Tapi and Yamuna during the lockdown period (April 2020). All designated water quality monitoring locations under NWMP could not be monitored during the lockdown due to restrictions. Samples were collected from 387 number of monitoring locations during pre-lockdown (March 2020) and 365 number of monitoring locations during lockdown (April 2020). The collected samples were analysed for the critical parameters viz. pH, DO, BOD and FC by the respective SPCBs/PCCs. River-wise minimum and maximum values for DO, BOD and FC as observed during the pre-lockdown and lockdown period are given in the **Table 21.1** below.

Table 21.1. River-wise minimum and maximum values for DO, BOD and FC as observed during the pre-lockdown and lockdown period

Name of the River	DO				BOD				FC			
	March 2020 (Pre-Lockdown)		April 2020 (Lockdown)		March 2020 (Pre-Lockdown)		April 2020 (Lockdown)		March 2020 (Pre-Lockdown)		April 2020 (Lockdown)	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Baitarni	6.3	7.8	6.8	7.8	0.2	1.8	0.1	0.8	45	2400	20	1400
Beas	7.2	9.7	7.1	10	BDL	1.6	BDL	1.3	2	210	8	170
Brahmani	4.6	8.6	5.4	8.4	BDL (0.5)	24	BDL (0.2)	2.8	110	7900	1.5	2200
Brahmaputra	5.1	10.4	6.6	10.3	1.6	2.4	1.1	2.1	300	730	300	730
Cauvery	2.1	7	6	7.8	1.5	7.5	1	2	31	700	21	320
Chambal	BDL	7.9	2	8	1.8	30	1.5	28	2	14000	2	14000
Ganga	5	11.6	3.9	10.7	1	4.6	BDL (0.6)	5.5	17	160000	12	140000
Ghaggar	0.9	9.2	3.1	8	4	64	5	22	2700	35000	1400	64000
Godavari	3.1	8.5	4	7.6	1.4	8.8	1.2	6.2	2	70	2	47

Name of the River	DO				BOD				FC			
	March 2020 (Pre-Lockdown)		April 2020 (Lockdown)		March 2020 (Pre-Lockdown)		April 2020 (Lockdown)		March 2020 (Pre-Lockdown)		April 2020 (Lockdown)	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
Krishna	4.6	7.8	4.8	7.7	1	6.3	1	2.9	2	900	3	900
Mahanadi	6.5	8.6	6.3	8.8	BDL (0.3)	2.4	BDL (0.2)	1.6	1.8	1700	1.8	220
Mahi	4.4	8.3	4.9	8.4	BDL (0.4)	2	BDL (0.3)	1.8	BDL(1)	75	BDL (1)	64
Narmada	6.9	8.7	7	8	BDL (0.3)	1.9	BDL (0.4)	1.2	1	110	1	94
Pennar	6.2	7.4	5.7	6.9	1.4	1.7	1	2.8	3	200	3	200
Sabarmati	BDL (0.1)	7.7	BDL(0.1)	8.2	BDL (0.7)	87	BDL (0.5)	57	2	1100	2	170
Satluj	2.8	9.7	2.8	10.6	1	14	1	16	34	230000	31	70000
Swarnarekha	3.6	7.9	3.7	8.2	1.2	2.9	BDL (0.4)	6.4	140	1300	-	220
Tapi	7	7.2	6.2	7.2	BDL (0.8)	4	BDL (0.7)	4	6	17	6	13
Yamuna	7.9	17.1	1.2	9.3	BDL (0.6)	78	BDL (0.4)	6.1	10	9200000	10	46000

The State-wise, river-wise number of loctions monitored, number of locations complying to the Primary Water Quality Criteria for Outdoor Bathing (PWQC) is presented in **Table 21.2**.

Table 21.2. The State-wise and river-wise status of compliance to the Primary Water Quality Criteria for Outdoor Bathing

S. No	Name of the River	State	Number of Monitoring Locations under NWMP	Number of Monitoring Locations Monitored		No of Locations Complying to the Primary Water Quality Criteria for Outdoor Bathing Paramters								Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing	
						DO		pH		BOD		FC			
				March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020
1	Beas	HP	20	16	12	16	12	16	12	16	12	16	11	22/22 (100%)	21/22 (95.45 %)
		Punjab	11	6	10	6	10	6	10	6	10	6	10		
2	Sutlej	HP	17	14	5	14	5	14	5	14	5	14	5	27/31 (87.1%)	18/23 (78.3%)
		Punjab	25	17	18	13	14	17	18	13	13	13	14		
3	Ganga	Uttarakhand	16	6	5	6	5	6	5	6	5	6	5	42/65 (64.6%)	25/54 (46.2%)
		UP	30	27	14	27	14	25	11	14	9	15	8		
		Bihar	33	17	17	17	17	17	17	17	17	17	6		
		Jharkhand	4	4	4	4	4	4	4	4	4	NA	NA		
		West Bengal	14	11	14	11	11	10	14	5	6	1	2		
4	Yamuna	Uttarakhand	4	-	-	-	-	-	-	-	-	-	-	6/14 (42.8%)	8/12 (66.67%)
		HP	4	4	4	4	4	4	4	4	4	4	4		
		Haryana	4	4	4	4	4	4	4	2	NA	1	2		
		Delhi	5	5	3	1	1	4	3	0	1	1	NA		
		UP	13	1	1	1	1	1	1	1	1	1	1		
5	Chambal	MP	9	7	6	6	5	7	6	5	4	6	5		

S. No	Name of the River	State	Number of Monitoring Locations under NWMP	Number of Monitoring Locations Monitored		No of Locations Complying to the Primary Water Quality Criteria for Outdoor Bathing Paramters								Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing	
						DO		pH		BOD		FC			
				March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020
		Rajasthan	7	1	7	1	2	1	3	1	4	1	7	6/8 (75%)	6/13 (46.15%)
		UP	2	-	-	-	-	-	-	-	-	-	-		
6	Brahmaputra	Assam	11	8	10	8	10	8	10	8	10	7	10	7/8 (87.5%)	10/10 (100%)
7	Mahi	MP	5	4	4	4	4	4	4	4	4	4	4	13/14 (92.85%)	13/14 (92.85%)
		Rajasthan	2	1	1	0	0	1	1	1	1	1	1		
		Gujarat	10	9	9	9	9	9	9	9	9	9	9		
8	Sabarmati	Gujarat	13	9	9	5	5	9	9	5	5	9	9	5/9 (55.55%)	5/9 (55.55%)
9	Mahanadi	Chhattisgarh	9	5	5	5	5	5	5	5	5	3	4	13/13 (100%)	22/22 (100 %)
		Odisha	18	8	17	8	17	8	17	8	17	8	177		
10	Tapi	MP	4	-	-	-	-	-	-	-	-	-	--		
		Gujarat	8	7	6	7	6	7	6	7	6	7	6	7/9 (77.8%)	7/8 (87.5%)
		Maharashtra	5	2	2	2	2	2	2	0	1	2	2		
11	Narmada	Gujarat	6	5	5	5	5	5	5	5	5	5	5	32/32 (100%)	24/24 (100%)
		MP	48	27	19	27	19	27	19	27	19	27	19		
12	Swarnarekha	Jharkhand	20	4	14	3	13	4	14	4	7	4	-	4/5 (80%)	8/15 (53..33%)
		Odisha	2	1	1	1	1	1	1	1	1	1	1		
		West Bengal	2	-	-	-	-	-	-	-	-	-	-		
13	Godavari	AP	8	7	7	7	7	6	7	7	7	7	7	25/38 (65.78%)	29/37 (78.37%)
		Telangana	17	17	16	14	14	16	15	16	15	17	16		
		Maharashtra	14	14	14	13	14	14	14	5	8	14	14		
14	Krishna	AP	9	8	8	6	7	8	8	8	8	8	8	22/26 (84.61%)	17/18 (94.44%)
		Karnataka	7	5	6	5	6	5	5	5	6	5	6		
		Telangana	4	4	-	4	-	3	-	3	-	4	-		
		Maharashtra	10	9	4	9	4	9	4	8	4	9	4		
15	Pennar	AP	4	3	3	3	3	3	3	3	3	3	3	3/3 (100%)	3/3 (100%)
16	Cauvery	Karnataka	24	22	22	22	22	22	22	22	22	22	22	38/42 (90.47%)	32/33 (96.96%)
		Tamil Nadu	40	20	11	20	11	16	10	19	11	20	11		
17	Ghaggar	Punjab	18	14	14	2	4	14	14	0	0	0	12	Nil/18	Nil/19
		Haryana	9	4	5	2	5	3	5	0	0	0	0		
		Rajasthan	1	-	-	-	-	-	-	-	-	-	-		
18	Brahmani	Odisha	20	20	20	19	20	20	20	17	20	17	20	17/20 (85%)	20/20 (100%)
19	Baitarni	Odisha	10	10	9	10	9	10	9	10	9	10	9	10/10 (100%)	9/9 (100%)
TOTAL			576	387	365	351	331	375	355	315	298	324	299	299/387 (77.26%)	277/365 (75.89%)

During pre-lockdown (March 2020):-

The analysis results revealed that

- 351 out of 387 monitored locations for DO, 375 monitored locations for pH, 315 monitored locations for BOD and 324 monitored locations for FC complied with Primary Water Quality Criteria for Outdoor Bathing.

- In summary, 299 out of 387 monitored locations complied (77.26 %) with criteria parameters listed under the Primary Water Quality Criteria for Outdoor Bathing.

During lockdown (April 2020):-

The analysis of results showed that

- 331 out of 365 monitored locations for DO, 355 monitored locations for pH, 298 monitored locations for BOD and 299 monitored locations for FC are complying with the outdoor bathing water quality criteria.

- It was observed that 277 out of 365 monitored locations in April 2020 complied (75.89 %) complied with Primary Water Quality Criteria for Outdoor Bathing, which implies that there is no significant improvement in water quality of major rivers monitored in the country, during the lockdown period.

Overall Observations on 19 Major Rivers Monitored during Pre-lockdown (March 2020) and Lockdown Period (April 2020): -

- Four rivers viz., Baitarni, Mahanadi, Narmada and Pennar showed 100 % compliance with the Primary Water Quality Criteria for Outdoor Bathing during Pre-lockdown and lockdown period.

- River Ghaggar failed to comply with the Primary Water Quality Criteria for Outdoor Bathing during Pre-lockdown and lockdown period.

- Water quality of two rivers viz., Sabarmati (55.6 %) and Mahi (92.9 %) remains unchanged in terms of compliance to Primary Water Quality Criteria for Outdoor Bathing during pre-lockdown and lockdown.

- Improvement in water quality w.r.t Primary Water Quality Criteria for Outdoor Bathing was noticed in case of 7 rivers viz., Brahmani (increase in compliance to the bathing criteria limits from 85 % to 100%), Brahmaputra (enhancement in compliance to the criteria limits from 87.5 % to 100 %), Cauvery (marginal improvement from 90.5 % to 96.97 %) , Godavari (increase in compliance from 65.8 % to 78.4 %), Krishna (improvement in compliance from 84.6 % to 94.4 %), Tapi (improved compliance from 77.8 % to 87.5 %) and Yamuna (increase in compliance from 42.8 % to 66.67 %) which may be attributed to (i) Minimal industrial effluent discharges in view of closure of almost all industries. (ii) No human activities involving disposal of worshipped pooja materials and garbage. (iii) No anthropogenic activities such as outdoor bathing, washing of clothes, vehicle washing and cattle washing, no pilgrimage activities etc. during lockdown phase and (iv) The cattle movement was also reduced considerably reducing biological contamination of surface water bodies.

- Water quality was deteriorated during the lock down period in case of five rivers viz., Beas (reduced from 100 % to 95.45 %), Chambal (reduced compliance to the criteria limits from 75 % to 46.15 %), Ganga (reduced compliance to the criteria limits from 64.6 % to 46.2 %), Sutlej (reduction in % compliance from 87.1 to 78.3%) and Swarnarekha (reduction in % compliance from 80 % to 53.33 %) which may be attributed to (i) discharge of untreated or partially treated sewage; (ii) pollutant concentrations are usually at their highest levels due to negligible dry season flow; and (iii) no fresh water discharges from the upstream.

- Cent percentage compliance was observed during lockdown w.r.t Primary Water Quality Criteria for Outdoor Bathing in case of 6 rivers (viz., river Baitarni, Brahmani , Brahmaputra, Mananadi, Narmada and Pennar) which may be attributed to availability of adequate infrastructure for management of sewage in the catchment of the respective river bodies and might had adequate dilution.

* * *

Annexure - I

State-wise Distribution of Water Quality Monitoring Locations under NWMP

Name of the State/UT	River	GW	Lake	Pond	Tank	Canal	Drain	STP	WTP	Creek/ Marine/ Sea/ Coastal	TOTAL
Andhra Pradesh	42	33	3		1	6	4	1		11	101
Arunachal	29										29
Assam	102	64	6	27	1						200
Bihar	96	70	3	2							171
Chandigarh		7	1				3				11
Chhattisgarh	29	8	1	1							39
Daman & Diu, Dadra & Nagar Haveli	13	12									25
Delhi	10	45	4			2	9		6		76
Goa	32	10	9			3		2		11	67
Gujarat	67	89	20	2	1	3		2		3	187
Haryana	20	29	3	1		14	1		3		71
Himachal Pradesh	142	49	5				23				219
Jammu and Kashmir	64	23	36				1				124
Jharkhand	65	3	4	4							76
Karnataka	109	2	80		95		1				287
Kerala	75	34	16	2		3		1			131
Lakshadweep		42		3							45
Madhya Pradesh	158	54	22	12	1						247
Maharashtra	162	50					10			34	256
Manipur	41	10	5	13		1					70
Meghalaya	64	13	7								84
Mizoram	46	26	1	2	1						76
Nagaland	17	10	2								29
Odisha	128	90	7	8		9	4	3		4	253
Puducherry	6	22	3								31
Punjab	61	46	3	3			9	8			130
Rajasthan	35	141	17	1		5					199
Sikkim	16							3			19
Tamil Nadu	86	22	8		1		5	16		5	143
Telangana	55	45	50	13	37		13	11			224
Tripura	38	57	8	10		7					120
Uttar Pradesh	115	40	2	2		1			2		162
Uttara khand	39	19	2			4		3			67
West Bengal	59	68	13			2					142
TOTAL	**2021**	**1233**	**341**	**106**	**138**	**60**	**83**	**50**	**11**	**68**	**4111**

Annexure - II

MINISTRY OF' ENVIRONMENT AND FORESTS

NOTIFICATION

New Delhi, the 25th September. 2000

93. Primary Water Quality Criteria for Bathing Waters.

In a water body or its part, water is subjected to several types of uses. Depending on the types of uses and activities, water quality criteria have been specified to determine its suitability for a particular purpose. Among the various types of uses there is one use that demands highest level of water quality or purity and that is termed as "Designated Best Use" in that stretch of water body. Based on this, water quality requirements have been specified for different uses in terms of primary water quality criteria. The primary water quality criteria for bathing water are specified along with the rationale in table 1.

Table 1.

PRIMARY WATER QUALITY CRITERIA FOR BATHING WATER
(Water used for organised outdoor bathing)

CRITERIA		RATIONALE
1. Fecal Coliform MPN/100 mL:	500 (desirable) 2500 (Maximum Permissible)	To ensure low sewage contamination. Fecal coliform and fecal streptococci are considered as they reflect the bacterial pathogenicity .
2. Fecal Streptococci MPN/100 mL:	100 (desirable) 500 (Maximum Permissible)	The desirable and permissible limits are suggested to allow for fluctuation in environmental conditions such as seasonal change, changes in flow conditions etc.
3 pH:	Between 6.5 —8.5	The range provides protection to the skin and delicate organs like eyes, nose, ears etc. which are directly exposed during outdoor bathing.
4. Dissolved Oxygen:	5 mg/1 or more	The minimum dissolved oxygen concentration of 5 mg/1 ensures reasonable freedom from oxygen consuming organic pollution immediately upstream which is necessary for preventing production of anaerobic gases (obnoxious gases) from sediment.
5. Biochemical Oxygen demand 3 day,27°C:	3 mg/L or less	The Biochemical Oxygen Demand of 3 mg/1 or less of the water ensures reasonable freedom from oxygen demanding pollutants and present production of obnoxious gases",

Annexure - III

State-wise and River-Wise Compliance Status of Monitored Locations

S. No	Name of the River	State	Number of Monitoring Locations under NWMP	Number of Monitoring Locations Monitored		No of Monitored Locations Complying to Primary Water Quality Criteria for Outdoor Bathing								Overall % variation observed during Pre-Lockdown and Lockdown			Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing		Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing	
						DO		pH		BOD		FC								
				March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	DO	BOD	FC	March 2020	April 2020	March 2020	April 2020
1	Beas	HP	20	16	12	16	12	16	12	16	12	16	11/11 (FC for one location not reported)	% Increase (1.4 to 16.67 %) at 7 locations % Decrease (1.06 to 5.15 %) at 11 locations	Constant at 12 locations and % Decrease (13.3 to 21.4 %) at 6 locations	% Increase (43.48 -300 %) at 3 locations and % Decrease (17.6 to 47.6 %) at 10 locations and no variation at 4 locations	16/16	11/11	22/22 (100%)	21/22 (95.45 %)
		Punjab	11	6	10	6	10	6	10	6	10	6	10				6/6	10/10		
2	Sutlej	HP	17	14	5	14	5	14	5	14	5	14	5	Decrease in percent variation (1.7 to 20.2 %) at 10 locations and increase in percent variation (1.1 to 30.8 %) at 12 locations	Decrease in percent variation (15.4 to 50 %) at 7 locations and increase in percent variation (7.5 to 14.3 %) at 4 locations and 'consistent at 12 locations'	Decrease in percent variation (2.2 to 74.7 %) at 12 locations and increase in percent variation (13 to 112.1 % at 8 locations and 'No' variation at 2 locations	14/14	5/5	27/31 (87.1%)	18/23 (78.3%)
		Punjab	25	17	18	13	14	17	18	13	13	13	14				13/17	13/18		

S. No	Name of the River	State	Number of Monitoring Locations under NWMP	Number of Monitoring Locations Monitored		No of Monitored Locations Complying to Primary Water Quality Criteria for Outdoor Bathing								Overall % variation observed during Pre-Lockdown and Lockdown			Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing		Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing	
						DO		pH		BOD		FC								
				March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	DO	BOD	FC	March 2020	April 2020	March 2020	April 2020
3	Ganga	Uttarakhand	16	6	5	6	5	6	5	6	5	6	5	% increase 1% to 38% at 26 locations % Decrease 1% to 40% at 23 locations	% increase 4% to 67% at 19 locations % Decrease 3% to 71 % at 26 locations and 'no' variation at 4 locations	% increase 27% to 325 % at 4 locations % Decrease 15% to 95 % at 34 locations and 'No' variation at 2 locations	6/6	5/5	42/65 (64.6%)	25/54 (46.2%)
		UP	30	27	14	27	14	25	11	14	9	15	8				14/27	8/14		
		Bihar	33	17	17	17	17	17	17	17	17	17	6				17/17	6/17		
		Jharkhand	4	4	4	4	4	4	4	4	4	NA	NA				4/4	4/4		
		West Bengal	14	11	14	11	11	10	14	5	6	1	2				1/11	2/14		
4	Yamuna	Uttarakhand	4	-	-	-	-	-	-	-	-	-	-	Increase in % variation (1.12% to 14.81%) at 08 locations Decrease (2.38% to 51.46%) at 02 locations	Decrease in variation (16.70% to 90.20%) at 08 locations	Decrease in % variation (16.67% to 99.71 %) at 08 locations and 'No' percent change at 01 location	-	-	6/14 (42.8%)	8/12 (66.67%)
		HP	4	4	4	4	4	4	4	4	4	4	4				4/4	4/4		
		Haryana	4	4	4	4	4	4	4	2	NA	1	2				1/4	2/4		
		Delhi	5	5	3	1	1	4	3	0	1	1	NA				Nil/5	1/3		
		UP	13	1	1	1	1	1	1	1	1	1	1				1/1	1/1		
5	Chambal	MP	9	7	6	6	5	7	6	5	4	6	5	Decrease in % variation 3 to 14 % at 4 locations and Increase in variation 2.8 to 27 %	Decrease in % variation 6.7 to 29 % at 6 locations and 'No' variation at 1 location	Decrease in % variation 16 to 39 % at 4 locations and 'No' variation at 3 locations	5/7	4/6	6/8 (75%)	6/13 (46.15%)
		Rajasthan	7	1	7	1	2	1	3	1	4	1	7				1/1	2/7		
		UP	2	-	-	-	-	-	-	-	-	-	-				-	-		

S. No	Name of the River	State	Number of Monitoring Locations under NWMP	Number of Monitoring Locations Monitored		No of Monitored Locations Complying to Primary Water Quality Criteria for Outdoor Bathing								Overall % variation observed during Pre-Lockdown and Lockdown			Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing		Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing	
						DO		pH		BOD		FC								
				March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	DO	BOD	FC	March 2020	April 2020	March 2020	April 2020
														at 3 locations						
6	Brahmaputra	Assam	11	8	10	8	10	8	10	8	10	7	10	Decrease in % variation (2.5 to 19.19 %) at 5 locations and Increase in % variation (8.42 to 41.18%) at 3 locations	Decrease in % variation (5.6 to 26.1%) at 7 locations and increase in % variation of 12.5 % at 1 location	Decrease in % variation (50.68 to 50.82 %) at 2 locations and increase in % variation (19.67 to 20 %) at 4 locations and 'No' variation at 1 location	7/8	10/10	7/8 (87.5%)	10/10 (100%)
7	Mahi	MP	5	4	4	4	4	4	4	4	4	4	4	Decrease in % variation 3.8 to 7.1 % at 2 locations and Increase in % variation 1.2 to 15.9 % at 9 locations and 'No' % variation at 3 locations	Decrease in % variation 10 to 43 % at 10 locations and Nno' % variation at 4 locations	Decrease in % variation 14.3 to 81.8 % at 10 locations and 'No' % variation at 4 locations	4/4	4/4	13/14 (92.85%)	13/14 (92.85%)
		Rajasthan	2	1	1	0	0	1	1	1	1	1	1				Nil/1	Nil/1		
		Gujarat	10	9	9	9	9	9	9	9	9	9	9				9/9	9/9		

S. No	Name of the River	State	Number of Monitoring Locations under NWMP	Number of Monitoring Locations Monitored		No of Monitored Locations Complying to Primary Water Quality Criteria for Outdoor Bathing								Overall % variation observed during Pre-Lockdown and Lockdown			Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing		Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing	
						DO		pH		BOD		FC								
				March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	DO	BOD	FC	March 2020	April 2020	March 2020	April 2020
8	Sabarmati	Gujarat	13	9	9	5	5	9	9	5	5	9	9	Decrease in % Variation (13 to 14 % at 2 locations, Increase in % Variation (9 to 4200 % at 6 locations and 'No' variation at 1 location	Decrease in % Variation (18 to 65 % at 9 locations)	Decrease in % Variation (5 to 96 % at 7 locations and 'No' variation at 2 locations	5/9	59	5/9 (55.55%)	5/9 (55.55%)
9	Mahanadi	Chhattisgarh	9	5	5	5	5	5	5	5	5	3/3 (FC not monitored for 2 locations)	4/4 (FC not monitored for 1 location)	Increase in percent variation (3 to 19%) at 08 locations. Decrease in percent variation (2% to 6 %) at 04 locations and 'No' variation at 01 location	Increase in percent variation (7 to 8 %) at 02 locations. Decrease in percent variation (7% to 85%) at 11 locations	Decrease in percent variation (42 % to 99.6%) at 10 locations and 'No' variation at one location	5/5	5/5	13/13 (100%)	22/22 (100 %)
		Odisha	18	8	17/17	8/8	17/17	8/8	17/17	8/8	17/17	8/8	17/17				8/8	17/17		

S. No	Name of the River	State	Number of Monitoring Locations under NWMP	Number of Monitoring Locations Monitored		No of Monitored Locations Complying to Primary Water Quality Criteria for Outdoor Bathing								Overall % variation observed during Pre-Lockdown and Lockdown			Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing		Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing	
						DO		pH		BOD		FC								
				March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	DO	BOD	FC	March 2020	April 2020	March 2020	April 2020
10	Tapi	MP	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		Gujarat	8	7	6	7	6	7	6	7	6	7	6	Increase (7% to 886%) at 03 locations and 'No' l percent change at 05 locations	Decrease (10% to 25%) at 05 locations and 'No' variation at 03 locations	Increase in percent variation (50%) at 02 locations, Decrease (7% to 35%) at 06 locations	7/7	6/6	7/9 (77.8%)	7/8 (87.5%)
		Maharashtra	5	2	2	2	2	2	2	0	1	2	2				Nil/2	1/2		
11	Narmada	Gujarat	6	5	5	5	5	5	5	5	5	5	5	Decrease at (1.27 % to 10.26%) at 10 locations, Increase (1.27% to 6.85%) at 11 locations and 'No' variation at 2 locations	Decrease (11.1% to 76.47%) at 20 locations and No variation at 3 locations	Decrease (4.55% to 14.55%) at 3 locations and Increase (4.5 % to 48.48%) at 2 locations and 'No' variation at 18 locations	5/5	5/5	32/32 (100%)	24/24 (100%)
		MP	48	27	19	27	19	27	19	27	19	27	19				27/27	19/19		
12	Swarnarekha	Jharkhand	20	4	14	3	13	4	14	4	7	4	-	Increase in % variation (3 to 42 %) at 3 locations and decrease in % variation (8%-16%)	Increase in % variation (17% to 100%) at 03 locations and Decrease in %	Decrease in % variation 8.31 % at 1 location	3/4	7/14	4/5 (80%)	8/15 (53..33%)
		Odisha	2	1	1	1	1	1	1	1	1	1	1				1/1	1/1		

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S. No	Name of the River	State	Number of Monitoring Locations under NWMP	Number of Monitoring Locations Monitored		No of Monitored Locations Complying to Primary Water Quality Criteria for Outdoor Bathing								Overall % variation observed during Pre-Lockdown and Lockdown			Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing		Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing	
						DO		pH		BOD		FC								
				March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	DO	BOD	FC	March 2020	April 2020	March 2020	April 2020
														at 02 locations	variation (11 to 17%) at 2 locations					
		West Bengal	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
13	Godavari	AP	8	7	7	7	7	6	7	7	7	7	7	Increase in percent variation (1.5% to 61.3 %) at 19 locations, Decrease in percent change (1.4 to 28.6%) at 11 locations and 'No' variation at 07 locations	Increase in percent variation (5.6 to 57.1%) at 8 locations, Decrease in percent change (3.3 to 40.9%) at 19 locations and 'No' variation at 10 locations	Increase in percent variation (28.6 to 100%) at 5 locations, Decrease in percent change (15 to 63.6 %) at 9 locations and 'No' variation at 23 location	6/7	7/7	25/38 (65.78%)	29/37 (78.37%)
		Telangana	17	17	16	14	14	16	15	16	15	17	16				14/17	14/16		
		Maharashtra	14	14	14	13	14	14	14	5	8	14	14				5/14	8/14		
14	Krishna	AP	9	8	8	6	7	8	8	8	8	8	8	Decrease (1.4 -7.7 %) at 5 locations Increase (1.4 – 30.6%) at 10 locations.	Decrease in % 10 - 44 % at 10 locations Increase (10-32 %) at 4 locations. No variation at 3 locations	Decrease (20 to 44.4 %) at 3 locations Increase (16.7 – 666.7%) at 6 locations. No variation observed at 8 locations	6/8	7/8	22/26 (84.61%)	17/18 (94.44%)
		Karnataka	7	5	6	5	6	5	5	5	6	5	6				5/5	6/6		
		Telangana	4	4	-	4	-	3	-	3	-	4	-				3/4	-		
		Maharashtra	10	9	4	9	4	9	4	8	4	9	4				8/9	4/4		

S. No	Name of the River	State	Number of Monitoring Locations under NWMP	Number of Monitoring Locations Monitored		No of Monitored Locations Complying to Primary Water Quality Criteria for Outdoor Bathing								Overall % variation observed during Pre-Lockdown and Lockdown			Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing		Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing	
						DO		pH		BOD		FC								
				March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	DO	BOD	FC	March 2020	April 2020	March 2020	April 2020
														No variation at 2 locations						
15	Pennar	AP	4	3	3	3	3	3	3	3	3	3	3	Decrease in % variation (3.2 to 10.9) at 03 locations	Increase in % variation (87%) at 1 location. Decrease in % variation (14 to 41) at 02 locations	Increase in % variation (100%) at 1 location, Decrease in % variation (50%) at 01 location and 'No' variation at 01 location	3/3	3/3	3/3 (100%)	3/3 (100%)
16	Cauvery	Karnataka	24	22	22	22	22	22	22	22	22	22	22	Increase (1.54% to 15.87%) at 32 locations and No variation at 1 location	Decrease (9.09% to 50%) at 22 locations and No variation at 11 locations	Decrease (15.78 % to 85.91%) at 32 locations and No variation at 1 location	22/22	22/22	38/42 (90.47%)	32/33 (96.96%)
		Tamil Nadu	40	20	11	20	11	16	10	19	11	20	11				16/20	10/11		
17	Ghaggar	Punjab	18	14	14	2	4	14	14	0	0	0	12	Increase in variation 5.8 to 611.1 % (17 locations) and decrease in %	Increase in variation 140 % (1 location) and Decrease in variation 21.7 to	Decrease in variation 31.6 to 63 % (17 locations)	Nil/14	Nil/14	Nil/18	Nil/19
		Haryana	9	4	5	2	5	3	5	0	0	0	0				Nil/4	Nil/5		

S. No	Name of the River	State	Number of Monitoring Locations under NWMP	Number of Monitoring Locations Monitored		No of Monitored Locations Complying to Primary Water Quality Criteria for Outdoor Bathing								Overall % variation observed during Pre-Lockdown and Lockdown			Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing		Compliance Status W.r.t Primary Water Quality Criteria for Outdoor Bathing	
						DO		pH		BOD		FC								
				March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	March 2020	April 2020	DO	BOD	FC	March 2020	April 2020	March 2020	April 2020
														variation 13 % (1 location)	81.4 % (16 locations)					
		Rajasthan	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
18	Brahmani	Odisha	20	20	20	19	20	20	20	17	20	17	20	Increase in percent variation (3 to 17 %) at 15 locations, Decrease in Percent variation (2% to 3%) at 04 locations) and 'No' variation at 1 location	Decrease in percent variation (32 % to 96%) at 20 locations)	Decrease in percent variation (5% to 99%) at 19 locations) 'No' variation at 1 location	17/20	20/20	17/20 (85%)	20/20 (100%)
19	Baitarni	Odisha	10	10	9	10	9	10	9	10	9	10	9	Increase in % variation (3% to 12% at 8 locations and 'No' variation at 01 location.	Decrease in % variation(38% to 75% at 09 locations	Decrease in % variation (33% to 82 % at 7 locations and 'No' variation at 02 locations	10/10	9/9	10/10 (100%)	9/9 (100%)

ANNEXURE XI

Item Nos. 01 & 02 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

(By Video Conferencing)

Original Application No. 593/2017

(arising from W.P. (Civil) No. 375/2012 on the file of the Hon'ble Supreme Court)

(With Report dated 13.02.2020 and 14.05.2020)

WITH

Original Application No. 148/2016

(With Report dated 15.05.2020)

Paryavaran Suraksha Samiti & Anr. Applicant(s)

Versus

Union of India & Ors. Respondent(s)

With

Mahesh Chandra Saxena Applicant(s)

Versus

South Delhi Municipal Corporation & Ors. Respondent(s)

Date of hearing: 21.05.2020

CORAM: **HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON**
HON'BLE MR. JUSTICE SHEO KUMAR SINGH, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

Applicant(s): Mr. Rahul Khurana, Advocate

Respondent(s): Mr. Raj Kumar, Advocate for CPCB
Mr. Balendu Shekhar, Advocate for EDMC
Mr. A.K. Prasad, Advocate for CGWA
Mr. Narendra Pal Singh, Advocate for DPCC

ORDER

INDEX

Background: Transfer of proceedings to this Tribunal by the Hon'ble Supreme Court vide order in (2017) 5 SCC 326 to monitor compliance of directions to set up STPs/ETPs/CETPs by 31.3.2018 (as per para 10 of the order of Hon'ble Supreme Court) by concerned Industries and Local Bodies to prevent water pollution.	Para 1
Proceedings before this Tribunal: Significant orders dated 3.8.2018, 19.2.2019 and 28.8.2019 in the light of data furnished by the CPCB based on information furnished by State PCBs/PCCs.	Para 2 - 8
Latest CPCB report dated 14.5.2020 furnishing status of compliance.	Para 9 - 12
Analysis of the report dated 14.5.2020	Para 13 - 15
Directions	Para 16 - 18
Consideration of consequential issue of utilization of treated water: Earlier proceedings leading to order dated 11.9.2020	Para 19 -21
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Further Directions	Para 24-25
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ORIGINAL APPLICATION NO. 593/2017 (PARYAVARAN SURAKSHA SAMITI & ANR. VS. UNION OF INDIA & ORS.)

Background: Transfer of proceedings to this Tribunal by the Hon'ble Supreme Court vide order in (2017) 5 SCC 326 to monitor compliance of directions to set up STPs/ETPs/CETPs by 31.3.2018 (as per para 10 of the order of Hon'ble Supreme Court) by concerned Industries and Local Bodies to prevent water pollution:

1. Proceedings in this matter are consequential to the order of the Hon'ble Supreme Court dated 22.02.2017 in *Paryavaran Suraksha*

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Samiti Vs. Union of India[1] transferring the proceedings in *W.P. (Civil) No. 375/2012* for monitoring compliance of the orders of the Hon'ble Supreme court. The order of the Hon'ble Supreme Court requires establishment and functioning of requisite ETPs/CETPs/STPs and in default to close industrial activities discharging effluents without treatment and to take action against local bodies for failing to install STPs and discharging sewage without treatment. Some of the observations in the judgment of the Hon'ble Supreme Court are:

> "***7.*** *Having effectuated the directions recorded in the foregoing paragraphs, the next step would be, to set up common effluent treatment plants.* ***We are informed, that for the aforesaid purpose, the financial contribution of the Central Government is to the extent of 50%, that of the State Government concerned (including the Union Territory concerned) is 25%. The balance 25%, is to be arranged by way of loans from banks****. The above loans, are to be repaid, by the industrial areas, and/or industrial clusters.* ***We are also informed that the setting up of a common effluent treatment plant, would ordinarily take approximately two years (in cases where the process has yet to be commenced). The reason for the above prolonged period, for setting up "common effluent treatment plants", according to the learned counsel, is not only financial, but also, the requirement of land acquisition, for the same****.*
>
> ***10. Given the responsibility vested in municipalities under Article 243-W of the Constitution, as also, in Item 6 of Schedule XII, wherein the aforesaid obligation, pointedly extends to "public health, sanitation conservancy and solid waste management", we are of the view that the onus to operate the existing common effluent treatment plants, rests on municipalities (and/or local bodies). Given the aforesaid responsibility, the municipalities (and/or local bodies) concerned, cannot be permitted to shy away from discharging this onerous duty. In case there are further financial constraints, the remedy lies in Articles 243-X and 243-Y of the Constitution. It will be open to the municipalities (and/or local bodies) concerned, to evolve norms to recover funds, for the purpose of generating finances to install and run all the "common effluent treatment plants", within the purview of the provisions referred to***

[1] (2017) 5 SCC 326

hereinabove. Needless to mention that such norms as may be evolved for generating financial resources, may include all or any of the commercial, industrial and domestic beneficiaries, of the facility. The process of evolving the above norms, shall be supervised by the State Government (Union Territory) concerned, through the Secretaries, Urban Development and Local Bodies, respectively (depending on the location of the respective common effluent treatment plant). The norms for generating funds for setting up and/or operating the "common effluent treatment plant" shall be finalised, on or before 31-3-2017, so as to be implemented with effect from the next financial year. In case, such norms are not in place, before the commencement of the next financial year, the State Governments (or the Union Territories) concerned, shall cater to the financial requirements, of running the "common effluent treatment plants", which are presently dysfunctional, from their own financial resources.

11. *Just in the manner suggested hereinabove, for the purpose of setting up of "common effluent treatment plants", the State Governments concerned (including, the Union Territories concerned) will prioritise such cities, towns and villages, which discharge* ***industrial pollutants and sewer, directly into rivers and water bodies.***

12. *We are of the view that in the manner suggested above,* ***the malady of sewer treatment, should also be dealt with simultaneously.*** *We, therefore, hereby direct that "sewage treatment plants" shall also be set up and made functional, within the timelines and the format, expressed hereinabove.*

13. ***We are of the view that mere directions are inconsequential, unless a rigid implementation mechanism is laid down.*** *We, therefore, hereby provide that the directions pertaining to continuation of industrial activity only when there is in place a functional "primary effluent treatment plants", and the setting up of functional "common effluent treatment plants" within the timelines, expressed above, shall be of the Member Secretaries of the Pollution Control Boards concerned.* ***The Secretary of the Department of Environment, of the State Government concerned (and the Union Territory concerned), shall be answerable in case of default. The Secretaries to the Government concerned shall be responsible for monitoring the progress and issuing necessary directions to the Pollution Control Board concerned, as may be required, for the implementation of the above directions.*** *They shall be also responsible for collecting and maintaining records of data, in respect of the*

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directions contained in this order. The said data shall be furnished to the Central Ground Water Authority, which shall evaluate the data and shall furnish the same to the Bench of the jurisdictional ***National Green Tribunal.***

14. To supervise complaints of non-implementation of the instant directions, the Benches concerned of the National Green Tribunal, will maintain running and numbered case files, by dividing the jurisdictional area into units. The abovementioned case files will be listed periodically. The Pollution Control Board concerned is also hereby directed to initiate such civil or criminal action, as may be permissible in law, against all or any of the defaulters."

(emphasis supplied)

Proceedings before this Tribunal: Significant orders dated 3.8.2018, 19.2.2019 and 28.8.2019 in the light of data furnished by the CPCB based on information furnished by State PCBs/PCCs:

2. Accordingly, on 25.05.2017, notice was issued to the Central Pollution Control Board (CPCB), the State Pollution Control Boards (SPCBs)/ Pollution Control Committees (PCCs) and the Ministry of Environment, Forest and Climate Change (MoEF&CC). They filed their status reports showing gaps in waste generated and treatment capacity. It was further stated that action had been initiated to remedy the situation. After considering the status report, the Tribunal, vide orders dated 04.07.2017, 18.09.2017 and 11.10.2017, sought information about the steps taken by the SPCBs/PCCs.

3. Vide order dated 03.08.2018, the matter was reviewed and after noting that in absence of functional ETPs/CETPs/STPs, untreated effluents were being discharged in water bodies leading to contamination of surface and ground water which causes various diseases and also has adverse consequence on aquatic organism due to decreased level of oxygen. The Tribunal directed the CPCB to

prepare an action plan. Direction was also given for monitoring by a Committee of two officers – one each representing MoEF&CC and CPCB at least once in every month. CPCB was required to place the progress report every three months on the website and take penal action for failure by way of recovery of compensation for damage to the environment, apart from other steps.

4. Vide order dated 19.02.2019, after considering the status report furnished by the CPCB, based on the reports furnished by the States/UTs, this Tribunal after referring to orders passed in O.A NO. 673/2018 for remedial action in respect of 351 polluted river stretches, which had direct nexus with the steps for ETPs/CETPs/STPs and order passed in O.A No. 606/2018 requiring Chief Secretaries to monitor progress *inter alia* on the subject of control of pollution of the river stretches, directed that the Chief Secretaries may look into the subject of setting up and proper functioning of ETPs/CETPs/STPs in their respective States/ UTs. Further direction issued was to prepare a report on assessment of compensation on account of discharge of untreated sewage and dumping of solid waste, loss to ecological services due to illegal mining, deforestation, after taking inputs from expert bodies. The Tribunal also directed the CPCB to compile its monitoring report with regard to 97 CETPs (assuming the total number of CETPs in the country to be 97) installed in different States. CPCB was also directed to furnish its report in *O.A. No. 95/2018, Aryavart Foundation Vs. M/s Vapi Green Enviro Ltd. & Ors.* which concerned the issue of inadequate functioning CETP leading to water pollution.

NATIONAL GREEN TRIBUNAL, NEW DELHI

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Further proceedings:

5. In the light of directions of this Tribunal dated 19.02.2019, the CPCB furnished reports dated 30.05.2019 updated on 19.07.2019 and 14.08.2019 giving the status of setting up of ETPs/ CETPs/STPs with regard to methodology for assessment of environmental compensation and monitoring of CETPs. The reports were considered exhaustively vide order dated 28.08.2019. Before we advert to the observations of this Tribunal with regard to the reports, we may refer to the observations on the main issue:

> *"1. The issue for consideration is establishment and functioning of ETPs/CETPs/STPs to prevent untreated sewage/effluents being discharged in water bodies, including rivers and canals meeting such rivers or otherwise. The magnitude of the problem is well acknowledged. In the year 1962 GoI set up a Committee for prevention of water pollution. The recommendations led to enactment of the Water (Prevention and Control of Pollution) Act, 1974 ("Water Act") in pursuance of Article 252 of the Constitution. The Water Act provides for the constitution of a Central Board and State Boards/Committees. No polluted matter can be discharged into a stream or well or on land, and no industry, operation or process can be established and no out-let for discharge of sewage used without consent of the State Board. The Water Act provides powers to give directions for closing any such activity as well as for prosecution. Power to give directions implicitly includes recovery of compensation on 'Polluter Pays' principle.*
>
> *2. Inspite of above statutory regime we are faced with serious problem of water pollution. The Hon'ble Supreme Court noted[2] that the water pollution caused serious diseases, including Cholera and Typhoid. Water pollution could not be ignored and adequate measures for prevention and control are necessary. Polluting industries were directed to be shifted on 'Precautionary' principle. It is not necessary to refer to all the judgments of the Hon'ble Supreme Court dealing with the significance of water and need to prevent pollution of water. We may only refer to the observations that everyone has right to have access to drinking water in quantum and equality equal to the basic needs. This is fundamental to life and part of Article 21.*[3]

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[2] (1988) 1 SCC 471

[3] APPCB vs. Prof. M.V Nayudu (2001) 2 SCC 62 at para 3, 4, State of Orissa Vs. Government of India (2009) 5 SCC 492, at para 58 "**Rivers in India are drying up, groundwater is being**

3. ***As per CPCB's report 2016[4], it has been estimated that 61,948 million liters per day (mld) sewage is generated from the urban areas of which treatment capacity of 23,277 mld is currently existent in India. Thereby the deficit in capacity of waste treatment is of 62%. There is no data available with regard to generation of sewage in the rural areas.***

4. ***We may note that discharge of untreated effluents and sewage is the principal cause of water pollution in the country as noted in cases relating to pollution of rivers.[5] Similarly, in the case of 100 polluted industrial clusters being dealt with by this Tribunal[6], water pollution is one of the factors polluting the said industrial clusters. As already noted, official data of CPCB is to the effect that 351 river stretches in the Country are polluted.*** *The Tribunal held that remedial action for restoration of the said river stretches is necessary.[7] In the said order, it was observed:*

> *"As already noted, well known causes of pollution of rivers are* ***dumping of untreated sewage and industrial waste, garbage, plastic waste, e-waste, bio-medical waste, municipal solid waste, diversion of river waters, encroachments of catchment areas and floodplains, over drawl of groundwater, river bank erosion on account of illegal sand mining. In spite of directions to install Effluent Treatment Plants (ETPs), Common Effluent Treatment Plants (CETPs), Sewage Treatment Plants (STPs), and adopting other anti-pollution measures, satisfactory situation has not been achieved. Tough governance is the need of the hour. If pollution does not stop, the industry has to be stopped. If sewage dumping***

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rapidly depleted, and canals are polluted. Yamuna in Delhi looks like a black drain. Several perennial rivers like Ganga and Brahmaputra are rapidly becoming seasonal. Rivers are dying or declining, and aquifers are getting over pumped. Industries, hotels, etc. are pumping out groundwater at an alarming rate, causing sharp decline in the groundwater levels."

[4] http://www.sulabhenvis.nic.in/Database/STST_wastewater_2090.aspx July 16, updated on December 6, 2016

[5] O.A No. 673 of 2018 this Tribunal is considering remedial action to rejuvenate 351 polluted river stretches. Therein, other cases of river pollution are mentioned thus "This Tribunal also considered the issue of pollution of river Yamuna, in Manoj Mishra Vs. Union of India, river Ganga in M.C. Mehta Vs. Union of India, river Ramganga which is a tributary of river Ganga in Mahendra Pandey Vs. Union of India & Ors., rivers Sutlej and Beas in the case of Sobha Singh & Ors. Vs. State of Punjab & Ors., river Son in Nityanand Mishra Vs. State of M.P. & Ors., river Ghaggar in Stench Grips Mansa's Sacred Ghaggar River (Suo-Moto Case)", river Hindon in Doaba Paryavaran Samiti Vs. State of U.P. & Ors., river Kasardi in Arvind Pundalik Mhatre Vs. Ministry of Environment, Forest and Climate Change & Ors., River Ami, Tapti, Rohani and Ramgarh lake in Meera Shukla Vs. Municipal Corporation, Gorakhpur & Ors., rivers Chenab and Tawi in the case of Amresh Singh Vs. Union of India & Ors. and Subarnarekha in Sudarsan Das Vs. State of West Bengal & Ors. and issued directions from time to time"

[6] O.A No. 1038/2018

[7] O. A No.673/2018, order dated 08.04.2019

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does not stop, local bodies have to be made accountable and their heads are to be prosecuted. Steps have to be taken for awareness and public involvement."

5. *All the States and UTs where polluted river stretches exist are required to constitute River Rejuvenation Committees to prepare actions plans for restoration (which are to be reviewed by the highest authority in the States, i.e Chief Secretary) to be monitored by CPCB and thereafter to be further monitored by this Tribunal. Accordingly, the action plans have been prepared which broadly envisage action to prevent discharge of untreated effluent/sewage. The same are being monitored by the CPCB and by this Tribunal and the matter is now listed for hearing on 29.11.2019. In O.A 606/2018 while dealing with the compliance of Solid Waste Management Rules, 2016, this Tribunal vide order dated 16.01.2019 directed personal appearance of all the Chief Secretaries with their monitoring reports on major environment issues including the rejuvenation of polluted river stretches.* ***The Chief Secretaries of all States/UTs have accordingly appeared and furnished their reports which envisages steps for setting up of ETPs/CETPs/STPs to prevent water pollution. The Chief Secretaries have to appear before this Tribunal with further progress reports on the subjects.***

6. *Further, control of pollution of river Ganga is being monitored by this Tribunal in O. A No. 200/2014 after transfer from the Hon'ble Supreme Court. Therein timelines have been prescribed to the effect that STPs be set up in time bound manner and no a drop of pollution be discharged in the river. The Tribunal observed:*

> *"Bioremediation and/or phytoremediation or any other remediation measures may start as an interim measure positively from 01.11.2019, failing which the State may be liable to pay compensation of Rs. 5 Lakhs per month per drain to be deposited with the CPCB. This however, is not to be taken as an excuse to delay the installation of STPs. For delay of the work, the Chief Secretary must identify the officers responsible and assign specific responsibilities. Wherever there are violations, adverse entries in the ACRs must be made in respect of such identified officers. For delay in setting up of STPs and sewerage network beyond prescribed timelines, State may be liable to pay Rs. 10 Lakhs per month per STP and its network. It will be open to the State to recover the said amount from the erring officers/contractors.*
>
> *With regard to works under construction, after 01.07.2020, direction for payment of environmental compensation of Rs. 10 lakhs per month to CPCB for discharging untreated sewage in any drain*

connected to river Ganga or its tributaries and Rs. 10 lakhs per month to CPCB per incomplete STP and its sewerage network will apply. Further with regard to the sectors where STP and sewerage network works have not yet started, the State has to pay an Environmental Compensation of Rs. 10 lakhs per month after 31.12.2020. The NMCG will also be equally liable for its failure to the extent of 50% of the amount to be paid. Till such compliance, bioremediation or any other appropriate interim measure may start from 01.11.2019."

(emphasis supplied)

6. We now refer to the observations of this Tribunal while considering the reports dated 30.05.2019 updated on 19.07.2019 and 14.08.2019:

"**I. <u>Report dated 30.05.2019 updated on 19.07.2019</u>**

13. *According to updated report dated19.07.2019, out of 62,897 number of industries requiring ETPs, 60,944 industries are operating with functional ETPs and 1949 industries are operating without ETPs. 59,258 industries are complying with environmental standards and 1,524 industries are noncomplying. There are total 192 CETPs, out of which 133 CETPs are complying with environmental standards and 59 CETPs are non-complying. There are total 13,709 STPs (Municipal and other than municipal), out of which, 13,113 STPs are complying with environmental standards and 637 STPs are non-complying 73 CETPs in construction/proposal stage, whereas, for STPs, 1164 projects (municipal and non-municipal) are under construction/proposal stage.*

14. *A report has also been prepared on the scale of environmental compensation to be recovered from individual/authorities for causing pollution or failure for preventing causing pollution, apart from illegal extraction of ground water, failure to implement Solid waste Management Rules, damage to environment by mining and steps taken to explore preparation of an annual environmental plan for the country. Extracts from the report which are considered significant for this order are:*

"I. Environment Compensation to be levied on Industrial Units

Recommendations

The Committee made following recommendations:

1.5.1 To begin with, Environmental Compensation may be levied by CPCB only when CPCB has issued the directions under the Environment (Protection) Act, 1986. In case of a, band c, Environmental Compensation may be calculated based on the formula "EC= Pl x N x Rx S x LF", wherein, Pl

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may be taken as 80, 50 and 30 for red, orange and green category of industries, respectively, and R may be taken as 250. Sand LF may be taken as prescribed in the preceding paragraphs

1.5.2 In case of d, e and f, the Environmental Compensation may be levied based on the detailed investigations by Expert Institutions/Organizations.

1.5.3 The Hon'ble Supreme Court in its order dated 22.02.2017 in the matter of Paryavaran Suraksha Samiti and another v/s Union of India and others {Writ Petition {Civil) No. 375 of 2012), directed that all running industrial units which require "consent to operate" from concerned State Pollution Control Board, have a primary effluent treatment plant in place. Therefore, no industry requiring ETP, shall be allowed to operate without ETP.
1.5.4 EC is not a substitute for taking actions under EP Act, Water Act or Air Act. In fact, units found polluting should be closed/prosecuted as per the Acts and Rules.

II. Environmental Compensation to be levied on all violations of Graded Response Action Plan (GRAP) in NCR.

Table No. 2.1: Environmental Compensation to be levied on all violations of Graded Response Action Plan (GRAP) in Delhi-NCR.

Activity	*State Of Air Quality*	*Environmental Compensation ()*
Industrial Emissions	*Severe +/Emergency*	*Rs 1.0 Crore*
	Severe	*Rs 50 Lakh*
	Very Poor	*Rs 25 Lakh*
	Moderate to Poor	*Rs 10 Lakh*
Vapour Recovery System (VRS) at Outlets of Oil Companies		
i. Not installed	*Target Date*	*Rs 1.0 Crore*
ii. Non functional	*Very poor to Severe +*	*Rs 50.0 Lakh*
	Moderate to Poor	*Rs 25.0 Lakh*
Construction sites (Offending plot more than 20,000 Sq.m.)	*Severe +/Emergency*	*Rs 1.0 Crore*
	Severe	*Rs 50 Lakh*
	Very Poor	*Rs 25 Lakh*
	Moderate to Poor	*Rs 10 Lakh*
Solid waste/ garbage dumping in Industrial Estates	*Very poor to Severe +*	*Rs 25.0 Lakh*
	Moderate to Poor	*Rs 10.0 Lakh*
Failure to water sprinkling on unpaved roads		
a) Hot-spots	*Very poor to Severe +*	*Rs 25.0 Lakh*
b) Other than Hot-spots	*Very poor to Severe +*	*Rs 10.0 Lakh*

III. Environmental Compensation to be levied in case of failure of preventing the pollutants being discharged in water bodies and failure to implement waste management rules:

Table No. 3.3: Minimum and Maximum EC to be levied for untreated/partially treated sewage discharge

Class of the City/Town	*Mega-City*	*Million-plus City*	*Class-I City/Town and others*
Minimum and Maximum values of EC (Total Capital Cost Component) recommended by the Committee (Lacs Rs.)	*Min. 2000* *Max. 20000*	*Min. 1000* *Max. 10000*	*Min. 100* *Max. 1000*
Minimum and Maximum values of EC (O&M Cost Component) recommended by the Committee (Lacs Rs./day)	*Min. 2* *Max. 20*	*Min. 1* *Max. 10*	*Min. 0.5* *Max. 5*

Table No. 3.4: Minimum and Maximum EC to be levied for improper municipal solid waste management

Class of the City/Town	*Mega-City*	*Million-plus City*	*Class-I City/Town and others*
Minimum and Maximum values of EC (Capital Cost Component) recommended by the Committee (Lacs Rs.)	*Min. 1000* *Max. 10000*	*Min. 500* *Max. 5000*	*Min. 100* *Max. 1000*
Minimum and Maximum values of EC (O&M Cost Component) recommended by the Committee (Lacs Rs./day)	*Min. 1.0* *Max. 10.0*	*Min. 0.5* *Max. 5.0*	*Min. 0.1* *Max. 1.0*

3.3 Environment Compensation for Discharge of Untreated/Partially Treated Sewage by Concerned Individual/ Authority:

BIS 15-1172:1993 suggests that for communities with population above 100,000, minimum of 150 to 200 lpcd of water demand is to be supplied. Further, 85% of return rate (CPHEEO Manual on Sewerage and Sewage Treatment Systems, 2013), may be considered for calculation of total sewage generation in a city. CPCB Report on "Performance evaluation of sewage treatment plants under NRCD, 2013", describes that the capital cost for 1 MLD STP ranges from 0.63 Cr. to 3 Cr. and O&M cost is around Rs. 30,000 per month. After detail deliberations, the Committee suggested to assume capital cost for STPs as Rs. 1.75 Cr/MLD (marginal average cost). Further, expected cost for conveyance system is assumed

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as Rs. 5.55 Cr./MLD (marginal average cost) and annual O&M cost as 10% of the combined capital cost. Population of the city may be taken as per the latest Census of India. Based on these assumptions, Environmental Compensation to be levied on concerned ULB may be calculated with the following formula:

EC= Capital Cost Factor x [Marginal Average Capital Cost for Treatment Facility x (Total Generation-Installed Capacity) + Marginal Average Capital Cost for Conveyance Facility x (Total Generation -Operational Capacity)]+ O&M Cost Factor x Marginal Average O&M Cost *x (Total Generation- Operational Capacity) x No. of Days for which facility was not available*
+ Environmental Externality x No. of Days for which facility was not available

Alternatively;

EC (Lacs Rs.)= [17.S{Total Sewage Generation - Installed Treatment Capacity)+ 55.S{Total Sewage Generation-Operational Capacity)] + 0.2(Sewage Generation-Operational Capacity) x N + Marginal Cost of Environmental Externality x (Total Sewage Generation-Operational Capacity) X N

Where; N= Number of days from the date of direction of CPCB/SPCB/PCC till the required capacity systems are provided by the concerned authority

Quantity of Sewage is in MLD

Table No. 3.5: Sample calculation for EC to be levied for discharge of untreated/partial treated Sewage

City	Delhi	Agra	Gurugram	Ambala
Population (2011)	1,63,49,831	17,60,285	8,76,969	5,00,774
Class	Mega-City	Million-plus City	Class-I Town	Class-I Town
Sewage Generation (MLD) *(as per the latest data available with CPCB)*	4195	381	486	37
Installed Treatment Capacity (MLD) (as per the latest data available with CPCB)	2500	220	404	45.5
Operational Capacity (MLD) (as per the latest data available with CPCB)	1900	140	300	24.5

Treatment Capacity Gap (MID)	2295	241	186	12.5
Calculated EC (capital cost component for STPs) in Lacs Rs.	29662.50	2817.50	1435.00	0.00
Calculated EC (capital cost component for Conveyance System) in Lacs. Rs.	127372.50	13375.50	10323.00	693.75
Calculated EC (Total capital cost component) in Lacs Rs.	157035.00	16193.00	11758.00	693.75
Minimum and Maximum values of EC (Total Capital Cost Component) recommended by the Committee (Lacs Rs.)	Min. 2000 Max. 20000	Min. 1000 Max. 10000	Min. 100 Max. 1000	Min. 100 Max. 1000
Final EC (Total Capital Cost Component) in Lacs Rs.	**20000.00**	**10000.00**	**1000.00**	**693.75**
Calculated EC (O&M Component in Lacs Rs./day	459.00	48.20	37.20	2.50
Minimum and Maximum values of EC (O&M Cost Component) recommended by the Committee (Lacs Rs./day)	Min. 2 Max. 20	Min. 1 Max. 10	Min. 0.5 Max. 5	Min. 0.5 Max. 5
Final EC (O&M Component) in Lacs. Rs./Day	**20.00**	**10.00**	**5.00**	**2.50**
Calculated Environmental Externality (Lacs Rs .Per Day)	2.0655	0.2049	0.1395	0.0094
Minimum and Maximum value of Environmental Externality recommended by the Committee (Lacs Rs. Per Day)	Min. 0.60 Max. 0.80	Min. 0.25 Max. 0.35	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10
Final Environmental Externality (Lacs Rs. Per day)	**0.80**	**0.25**	**0.10**	**0.05**

3.4 Environment Compensation to be Levied on Concerned Individual/Authority for Improper Solid Waste Management:

Environmental Compensation to be levied on concerned ULB may be calculated with the following formula:

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EC = Capital Cost Factor x Marginal Average Cost for Waste Management x (Per day waste generation-Per day waste disposed as per the Rules) + O&M Cost Factor x Marginal Average O&M Cost x (Per day waste generation-Per day waste disposed as per the Rules) x Number of days violation took place + Environmental Externality x N

Where;

Waste Quantity in tons per day (TPD)

N= Number of days from the date of direction of CPCB/SPCB/PCC till the required capacity systems are provided by the concerned authority

Simplifying;

EC (Lacs Rs.) = 2.4(Waste Generation - Waste Disposed as per the Rules) +0.02 (Waste Generation Waste Disposed as per the Rules) x N + Marginal Cost of Environmental Externality x (Waste Generation - Waste Disposed as per the Rules) x N

Table No. 3.6: Sample calculation for EC to be levied for improper management of Municipal Solid Waste

City	Delhi	Agra	Gurugram	Ambala
Population (2011)	1,63,49,831	17,60,285	8,76,969	5,00,774
Class	Mega-City	Million-plus City	Class-I Town	Class-I Town
Waste Generation (kg. per person per day)	0.6	0.5	0.4	0.4
Waste Generation (TPD)	9809.90	880.14	350.79	200.31
Waste Disposal as per Rules (TPD) *(assumed as 25% of waste generation for sample calculation)*	2452.47	220.04	87.70	50.08
Waste Management Capacity Gap (TPD)	7357.42	660.11	263.09	150.23
Calculated EC (capital cost component) in Lacs. Rs.	17657.82	1584.26	631.42	360.56
Minimum and Maximum values of EC (Capital Cost Component) recommended by the Committee (Lacs Rs.)	Min. 1000 Max. 10000	Min. 500 Max. 5000	Min. 100 Max. 1000	Min. 100 Max. 1000

Final EC (capital cost component) in Lacs. Rs.	**10000.00**	**1584.26**	**631.42**	**360.56**
Calculated EC (O&M Component) in Lacs. Rs./Day	147.15	13.20	5.26	3.00
Minimum and Maximum values of EC (O&M Cost Component) recommended by the Committee (Lacs Rs./Day)	Min. 1.0 Max. 10.0	Min. 0.5 Max. 5.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0
Final EC (O&M Component) in Lacs. Rs./Day	**10.00**	**5.00**	**1.00**	**1.00**
Calculated Environmental Externality (Lacs Rs. Per Day)	2.58	0.18	0.03	0.02
Minimum and Maximum value of Environmental Externality recommended by the Committee (Lacs Rs. per day)	Max. 0.80	Min. 0.25 Max. 0.35	Min. 0.01 Max. 0.05	Min. 0.01 Max. 0.05
Final Environmental Externality (Lacs Rs. per day)	**0.80**	**0.25**	**0.03**	**0.02**

IV. Environmental Compensation in Case of Illegal Extraction of Ground Water

4.5 Formula for Environmental Compensation for illegal extraction of ground water

The committee decided that the formula should be based on water consumption (Pump Yield & Time duration) and rates for imposing Environmental Compensation for violation of illegal abstraction of ground water. The committee has proposed following formula for calculation of Environmental Compensation (EC_{GW}):

EC_{GW} = Water Consumption per Day x No. of Days x Environmental Compensation Rate for illegal extraction of ground water (ECR_{GW})

Where water Consumption is in m^3/day and ECRGw in Rs./m^3

Yield of the pump varies based on the capacity/power of pump, water head etc. For reference purpose, yield of the pump may be assumed as given in ***Annexure-VI.***

Time duration will be the period from which pump is operated illegally.

In case of illegal extraction of ground water, quantity of discharge as per the meter reading or as

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calculated with assumptions of yield and time may be used for calculation of EC_{Gw}.

4.6 Environmental Compensation Rate (ECRGw) for illegal use of Ground Water:

The committee decided that the Environmental Compensation Rate (ECR_{Gw}) for illegal extraction of ground water should increase with increase in water consumption as well as water scarcity in the area. Further, ECR_{Gw} are kept relaxed for drinking and domestic use as compared to other uses, considering the basic need of human being.

As per CGWB, safe, semi-critical, critical and over-exploited areas are categorized from the ground water resources point of view (CGWB, 2017). List of safe, semi-critical, critical and over-exploited areas are available on the website of CGWB and can be accessed from- http://cgwa-noc.gov.in/LandingPage/NotifiedAreas/Categorization0fAssessmentUnits.pdf#ZOOM=150.

Environmental Compensation Rates (ECR_{Gw}) for illegal use of ground water (ECR_{Gw}) for various purposes such as drinking/domestic use, packaging units, mining and industrial sectors as finalized by the committee are given in tables below:

4.6.1 ECRGw for Drinking and Domestic use:

Drinking and Domestic use means uses of ground water in households, institutional activity, hospitals, commercial complexes, townships etc.

Sl. No.	Area Category	Water Consumption (m^3/day)			
		<2	2 to <5	5 to <25	25 & above
		Environmental Compensation Rate (ECRGw) in Rs./m^3			
1	Safe	4	6	8	10
2	Semi Critical	12	14	16	20
3	Critical	22	24	26	30
4	Over-Exploited	32	34	36	40
Minimum EC_{Gw}=Rs 10,000/- (for households) and Rs. 50,000 (for institutional activity, commercial complexes, townships etc.)					

4.6.2 ECRGw for Packaged drinking water units:

Sl. No.	Area Category	Water Consumption (m^3/day)			
		<200	200 to <1000	1000 to <5000	5000 &
		Environmental Compensation Rate (ECR_{Gw}) in Rs./m^3			
1	Safe	12	18	24	30
2	Semi critical	24	36	48	60
3	Critical	36	48	66	90
4	Over-exploited	48	72	96	120
Minimum EC_{Gw}=Rs 1,00,000/-					

4.6.3 ECR_{Gw} for Mining, Infrastructure and Dewatering Projects

Sl. No	Area Category	Water Consumption (m^3/day)			
		<200	200 to <1000	1000 to <5000	5000 &
		Environmental Compensation Rate (ECR_{Gw}) in Rs./m^3			
1	Safe	15	21	30	40
2	Semi critical	30	45	60	75
3	Critical	45	60	85	115
4	Over-exploited	60	90	120	150
Minimum EC_{GW}=Rs 1,00,000/-					

4.6.4 ECRGw for Industrial Units:

Sl. No.	Area Category	Water Consumption (m^3/day)			
		<200	200 to <1000	1000 to <5000	5000 &
		Environmental Compensation Rate (ECRGw) in			
1	Safe	20	30	40	50
2	Semi critical	40	60	80	100
3	Critical	60	80	110	150
4	Over-exploited	80	120	160	200
Minimum EC_{Gw} = Rs 1,00,000/-					

4.8 Recommendations

The committee has given following recommendations:

- *The minimum Environmental Compensation for illegal extraction of ground water for domestic purpose will be Rs. 10,000, for institutional/commercial use will be 50,000 and for other uses will be 1,00,000.*
- *In case of fixation of liability, it always lies with current owner of the premises where illegal extraction is taking place.*
- *Time duration may be assumed to be one year in case where no evidence for period of installation of bore well could be established.*
- *For Drinking and Domestic use, where metering is not present but storage tank facility is available, minimum water consumption per day may be assumed as similar to the storage capacity of the tank.*
- *For industrial ground water use, where metering is not available, water consumption may be assumed as per the consent conditions. Further, where in case industry is operating without consent, water consumption may be calculated based on the plant capacity (on the recommendation of SPCB/PCC, if required). SPCB/PCC may bring the issue of illegal extraction of ground water in industries in to the notice of CGWA for appropriate action by CGWA.*

NATIONAL GREEN TRIBUNAL

- *Authorities assigned for levy EC and taking penal action are listed below:*

S. No.	Actions	Authority
1.	To seal the illegal bore-well/tube-well to stop extraction of water and further closure of project	District Collector
2.	To levy EC_{Gw} as per prescribed method	District Collector,
3.	To levy EC on water pollution, as per the method prescribed in report of CPCB- "EC on industrial pollution"	CPCB/SPCB/PCC
4.	Prosecution of violator	CGWA under EP Act SPCB/PCC under Air and Water Act

- *CGWA may maintain a separate account for collection and utilization of fund, collected through the prescribed methodology in this report."*

"Discussion on the report dated 30.05.2019 updated on 19.07.2019

15. *It is clear from the order of the Hon'ble Supreme Court[8] that the responsibility of operating STPs under Article 243W and item 6 of Schedule XII to the Constitution is of local bodies who have to evolve norms to recover funds for the purpose which is to be supervised by the States/UTs. The norms were to be finalized upto 31.03.2017 to be implemented from the next year, i.e 01.04.2018. In absence thereof, the States/UTs have to cater to the financial requirement from its own resources. The States/UTs are to prioritize the cities, towns, villages discharging effluents/sewage directly into the water bodies. Industrial activity without proper treatment plants (ETPs and CETPs) is not to be allowed by the State PCBs and the Secretaries, Environment of the States/UTs are to be answerable. Thus, the source for financial resources for the STPs, stands finalized under the binding judgment of the Hon'ble Supreme Court. Authorities and persons accountable are identified. Rigid implementation has been laid down. This Tribunal has been required to monitor compliance of the directions and timelines.*

16. *It is in this background that the present report needs to be appraised and further directions given. As regards the Environmental compensation regime fixed for industrial units, GRAP, solid waste, sewage and ground water is accepted as an interim measure. With regard to setting up of STPs, while we appreciate the extensive work of the CPCB based on information furnished by States/UTs, the challenge remains about verification of the said data on the one hand and analysis of the steps taken and required on*

[8] Para 10-13 in *Paryavaran Suraksha Samiti Vs. Union of India, Supra*

the other. There is already a database available with the CPCB with regard to ETPs, CETPs, STPs, MSW facilities, Legacy Waste sites. This needs to be collated and river basinwise macro picture needs to be prepared by the CPCB in terms of need for interventions, existing infrastructure and gaps therein. The States have given timelines which need to be effectively monitored both by the CPCB and the Chief Secretaries in terms of its execution.

17. *As already noted, prevention of pollution of water is directly linked to access to potable water as well as food safety. Restoration of pristine glory of rivers is also of cultural and ecological significance. This necessitates effective steps to ensure that no pollution is discharged in water bodies. Doing so is a criminal offence under the Water Act and is harmful to the environment and public health. 'Precautionary' principle of environmental law is to be enforced. Thus, the mandate of law is that there must be 100% treatment of sewage as well as trade effluents. This Tribunal has already directed in the case of river Ganga that timelines laid down therein be adhered to for setting up of STPs and till then, interim measures be taken for treatment of sewage. There is no reason why this direction be not followed, so as to control pollution of all the river stretches in the country. The issue of ETPs/CETPs is being dealt with by an appropriate action against polluting industries. Setting up of STPs and MSW facilities is the responsibility of Local Bodies and in case of their default, of the States. Their failure on the subject has to be adequately monitored. Recovery of compensation on 'Polluter Pays' principle is a part of enforcement strategy but not a substitute for compliance. It is thus necessary to issue directions to all the States/UTs to enforce the compensation regime, latest with effect from 01.04.2020. We may not be taken to be condoning any past violations. The States/UTs have to enforce recovery of compensation from 01.04.2020 from the defaulting local bodies. On failure of the States/UTs, the States/UTs themselves have to pay the requisite amount of compensation to be deposited with the CPCB for restoration of environment. The Chief Secretaries of all the States may furnish their respective compliance reports as per directions already issued in O.A. No. 606/2018."*

"II. Report dated 14.08.2019 with regard to monitoring of CETPs

18. *The Committee inspected 127 CETPs in 14 States. Figure of CETP assumed to be 97 was not correct. 66 CETPs were found to be non-compliant. CPCB directed SPCBs to take following steps:*

    "1. SPCBs shall direct non-complying CETPs to take immediate corrective actions to comply with the environmental standards.

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2. *CETP should be directed to take action as per the recommendations provided at Annexure A-N within a time frame.*
3. *In case of non-complying CETPs, action as deemed fit including levying of environmental compensation may be taken.*
4. *In case, OCEMS are not connected with CPCB & SPCB servers, ensure a robust system of physical inspections to verify compliance by drawing samples."*

"Discussion on the report dated 14.08.2019

19. *We accept the recommendation of the CPCB and direct the Chief Secretaries, State Governments, Union Territories and the SPCBs/PCCs to take further action accordingly and furnish an action taken report accordingly. The CPCB to meanwhile compile and collate information with regard to ETPs, CETPs, STPs, MSW Facilities, Legacy Waste dump sites and complete the pending task on the subject before the next date and furnish a report.*

20. *The environmental compensation regime for CETP not meeting the prescribed norms need to be evolved by the CPCB."*

(emphasis supplied)

7. After the above discussion, this Tribunal proceeded to issue following directions:

"Directions

21. *We may now sum up our directions:*
   (i) The Environmental compensation regime fixed for industrial units, GRAP, solid waste, sewage and ground water in the report dated 30.05.2019 is accepted and the same may be acted upon as an interim measure.
   (ii) SPCBs/PCCs may ensure remedial action against non-compliant CETPs or individual industries in terms of not having ETPs/fully compliant ETPs or operating without consent or in violation of consent conditions. This may be overseen by the CPCB. CPCB may continue to compile information on this subject and furnish quarterly reports to this Tribunal which may also be uploaded on its website.
   (iii) All the Local Bodies and or the concerned departments of the State Government have to ensure 100% treatment of the generated sewage and in default to pay compensation which is to be recovered by the States/UTs, with effect from 01.04.2020. In default of such collection, the States/UTs are liable to pay such compensation. The CPCB is to collect the same and utilize for restoration of the environment.

(iv) *The CPCB needs to collate the available data base with regard to ETPs, CETPs, STPs, MSW facilities, Legacy Waste sites and prepare a river basin-wise macro picture in terms of gaps and needed interventions.*

(v) The Chief Secretaries of all the States/UTs may furnish their respective compliance reports on this subject also in O.A. No. 606/2018.

List for further consideration on 21.05.2020, unless required earlier. A copy of this order be placed on the file of O.A. No. 606/2018 relating to all States/UTs and be sent to Chief Secretaries of all States/UTs, Secretary MoEF&CC, Secretary Jal Shakti and Secretary, MoHUA.

(emphasis supplied)

8. Before proceeding further, we may also note further order of this Tribunal dated 06.12.2019 in *O.A. No. 673/2018* directing as follows:

"XII. Directions:

47. We now sum up our directions as follows:

i. 100% treatment of sewage may be ensured as directed by this Tribunal vide order dated 28.08.2019 in O.A. No. 593/2017 by 31.03.2020 atleast to the extent of in-situ remediation and before the said date, commencement of setting up of STPs and the work of connecting all the drains and other sources of generation of sewage to the STPs must be ensured. If this is not done, the local bodies and the concerned departments of the States/UTs will be liable to pay compensation as already directed vide order dated 22.08.2019 in the case of river Ganga i.e. Rs. 5 lakhs per month per drain, for default in in-situ remediation and Rs. 5 lakhs per STP for default in commencement of setting up of the STP.

ii. Timeline for completing all steps of action plans including completion of setting up STPs and their commissioning till 31.03.2021 in terms of order dated 08.04.2019 in the present case will remain as already directed. In default, compensation will be liable to be paid at the scale laid down in the order of this Tribunal dated 22.08.2019 in the case of river Ganga i.e. Rs. 10 lakhs per month per STP.

iii. We further direct that an institutional mechanism be evolved for ensuring compliance of above directions. For

this purpose, monitoring may be done by the Chief Secretaries of all the States/UTs at State level and at National level by the Secretary, Ministry of Jal Shakti with the assistance of NMCG and CPCB.

iv. ***For above purpose, a meeting at central level must be held with the Chief Secretaries of all the States/UTs atleast once in a month (option of video conferencing facility is open) to take stock of the progress and to plan further action. NMCG will be the nodal agency for compliance who may take assistance of CPCB and may give its quarterly report to this Tribunal commencing 01.04.2020.***

v. *The Chief Secretaries may set up appropriate monitoring mechanism at State level specifying accountability of nodal authorities not below the Secretary level and ensuring appropriate adverse entries in the ACRs of erring officers. Monitoring at State level must take place on fortnightly basis and record of progress maintained. The Chief Secretaries may have an accountable person attached in his office for this purpose.*

vi. *Monthly progress report may be furnished by the States/UTs to Secretary, Ministry of Jal Shakti with a copy to CPCB. Any default must be visited with serious consequences at every level, including initiation of prosecution, disciplinary action and entries in ACRs of the erring officers.*

vii. ***As already mentioned, procedures for DPRs/tender process needs to be shortened and if found viable business model developed at central/state level.***

viii. ***Wherever work is awarded to any contractor, performance guarantee must be taken in above terms.***

ix. *CPCB may finalize its recommendations for action plans relating to P-III and P-IV as has been done for P-I and P-II on or before 31.03.2020. This will not be a ground to delay the execution of the action plans prepared by the States which may start forthwith, if not already started.*

x. *The action plan prepared by the Delhi Government which is to be approved by the CPCB has to follow the action points delineated in the order of this Tribunal dated 11.09.2019 in O.A. No. 06/2012.*

xi. *Since the report of the CPCB has focused only on BOD and FC without other parameters for analysis such as pH, COD, DO and other recalcitrant toxic pollutants having tendency of bio magnification, a survey may now be conducted with reference to all the said parameters by involving the SPCB/PCCs within three months. Monitoring gaps be identified and upgraded so to cover upstream and downstream locations of major*

discharges to the river. CPCB may file a report on the subject before the next date by e-mail at judicial-ngt@gov.in.

xii. Rivers which have been identified as clean may be maintained."

(emphasis supplied)

Latest CPCB report dated 14.5.2020 furnishing status of compliance:

9. The CPCB has filed two reports:

(i). Report dated 13.02.2020 titled "Steps taken Report".

(ii). Report dated 14.05.2020 titled "Compliance Report".

10. Since report dated 14.05.2020 covers the entire subject, it is not necessary to refer to the report dated 13.02.2020 in detail. Report dated 14.05.2020 mentions the compliance status of ETPs/CETPs & STPs, as reported by State PCBs/PCCs as on 05.05.2020, which has been given in a tabular form and the summary is given as follows:

"i. As per the data received from SPCBs/PCCs, out of total 65,135 number of industries requiring ETPs, 63,108 industries are operating with functional ETPs and ***2,027 industries are operating without ETPs. Show-cause notices and closure directions have been issued to 968 and 881 industries, respectively for operating without ETPs. Legal cases have been filed against 7 industries and action is under process against 269 industries****. Out of 63,108 operational industries, 61,346 industries are complying with environmental standards and* ***1,616 industries are non-complying. Show-cause notices and closure directions have been issued to 921 and 260 industries, respectively for non-compliance. Legal cases have been filed against 22 industries and action is under process against 798 industries.***

ii. *As per the data received from SPCBs/PCCs, there are total 191 CETPs, out of which 128 CETPs are complying with environmental standards and* ***63 CETPs are non-complying. Show-cause notices and closure directions have been issued to 18 and 4 CETPs, respectively, for non-compliance. Legal cases have***

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been filed against 9 CETPs and action is under process against remaining 32 CETPs.

iii. As per the data received from SPCBs/PCCs, there are total 15,403 STPs (Municipal and other than municipal), out of which, 14,795 STPs are complying with environmental standards and ***608 STPs are non-complying. Show-cause notices and closure directions have been issued to 340 and 38 STPs, respectively for non-compliance. Legal cases have been filed against 15 STPs and action is under process against 215 STPs.***

iv. As per the data received from SPCBs/PCCs, there are 82 CETPs in construction/proposal stage, whereas, for STPs, 1084 projects (municipal and non-municipal) are under construction/proposal stage.

v. As per the data received from 36 SPCBs/PCCs, 14 SPCBs/PCCs (namely- Andhra Pradesh, Assam, Bihar, Goa, Haryana, Himachal Pradesh, Jharkhand, Kerala, Madhya Pradesh, Odisha, Puducherry, Tamil Nadu, Telangana, West Bengal) are displaying OCEMS data in public domain. The link provided by Maharashtra and Gujarat is password protected and data is not available in public domain. ***The 4 SPCBs (namely, Chhattisgarh, Jammu & Kashmir, Punjab and Sikkim) have not provided appropriate web links****. Further, Chandigarh PCC has clarified that Data will be displayed after upgradation of STPs. Mizoram SPCB has informed that there is no industry requiring OCEMS connectivity. Lakshadweep PCC informed that there is no industry in the Union Territory of Lakshadweep.*

*13 S****PCBs/PCCs (Andaman & Nicobar, Arunachal Pradesh, Daman & Diu, Dadra Nagar Haveli, Delhi, Karnataka, Manipur, Meghalaya, Nagaland, Rajasthan, Tripura, Uttar Pradesh and Uttarakhand) are not displaying OCEMS data in public domain."***

(emphasis supplied)

11. Action taken has been mentioned as 'river basin-wise data collection and analysis by CPCB for compliance of Hon'ble NGT directions dated 28.08.2019'; Status of Non-complying CTEPs; Meeting of the Monitoring Committee and Quarterly Steps Taken Reports. Extracts from the report are:

"3.0 Action taken by CPCB for compliance of Hon'ble NGT directions dated 28.08.2019:

i. *River basin wise macro picture of ETPs, CETPs, STPs, MSW facilities, Legacy Waste sites:*

The issue was deliberated in the meetings of the Monitoring Committee, wherein, it was observed that specific river basin wise data regarding location (latitude & longitude), waste generation and treatment etc. for each and every industry, CETP, STP, MSW facility and Legacy Waste Site is not available with CPCB. Further, to find out river-basin wise gaps in treatment system and needed interventions for particular sector, unit-wise data regarding actual generation, treatment and discharge of effluent/ waste etc. is required. Therefore, to compile such a compressive database, it was decided that information will be collected through online portal, by developing specific formats for each sector. This database will also be helpful for policy makers and regulators to critically analyse the needed interventions/ measures for abatement and control of pollution.

CPCB has finalized the formats for collection of information from concerned SPCBs/PCCs, for preparation of river basin wise macro picture related to ETPs and CETPs ***(Annexure-II & III)****. An online portal has also been developed by CPCB, which is available on the following weblink: http://125.19.52.219/gpi/riverbasin/. CPCB vide email dated 12.05.2020* ***(Annexure-IV)*** *requested all SPCBs/PCCs to provide the information on the portal by 31st May, 2020. The formats for STPs, MSW facilities and Legacy Waste Sites have been finalized and the same are given at* ***Annexure-V, Annexure-VI*** *and* ***Annexure-VII****, respectively. However, portal development for STPs, MSW facilities, Legacy Waste sites is in the process.*

It is to be noted that following river basin, as classified by Central Water Commission, Ministry of Jal Shakti, Government of India, are being considered for the data collection and analysis:

1. *Indus*
2(a). *Ganga (Upto Border)*
2(b). *Brahmaputra (Upto Border)*
2(c). *Barak etc. (Upto Border)*
3. *Godavari*
4. *Krishna*
5. *Cauvery*
6. *Pennar*
0. *East flowing rivers between Krishna and Pennar and between Mahanadi and Godavari*
7. *East flowing rivers between Krishna and Kanyakumari*
8. *Mahanadi*
1. *Brahmani and Baitarani*

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2. *Subernarekha*
3. *Sabarmati*
4. *Mahi*
5. *West flowing ivers of Kutch and Kathiawar including Luni*
6. *Narmada*
7. *Tapi*
8. *West flowing rivers from Tapi to Tadri*
9. *West flowing rivers from Tadri to Kanyakumari*
10. *Area of Inland drainage in Rajasthan*
11. *Minor river basins drainage to Bangladesh & Burma*

(Source: http://www.cwc.gov.in/river-basin-planning)

ii. Status of Non-complying CTEPs:

a) In compliance of Hon'ble NGT directions, during March-May, 2019, CPCB inspected a total number of 144 CETPs in 14 states, out of which 17 were found closed. As per the monitoring, 66 CETPs were found non-complying in terms of outlet standards. The compiled inspection-cum-monitoring reports and action taken by CPCB were submitted to Hon'ble NGT on 14.08.2019. CPCB has directed all concerned SPCBs, through directions u/s 18(1)(b) of Air and Water Act, issued on 13.08.2019, to take following actions against defaulting CETPs:

1. *SPCBs shall direct non-complying CETPs to take immediate corrective actions to comply with the environmental standards.*
2. *SPCBs shall direct all non-complying CETPs to take action as per the recommendations of CPCB, within a time frame.*
3. *In case of non-complying CETPs, action as deemed fit including levying of environmental compensation may be taken.*
4. *In case, OCEMS are not connected with CPCB & SPCB servers, ensure a robust system of physical inspections to verify compliance by drawing samples.*

CPCB has been following-up the matter with the concerned SPCBs/PCCs. Action Taken Reports, w.r.t. 66 non-complying CETPs has been received from all the 14 SPCBs. The dates of ATRs submitted by SPCBs/PCCs, are given at ***Annexure-VIII.***

As per the information received from concerned SPCBs, out of 66 noncomplying CETPs, 26 CETPs have complied the directions, however, 40 CETPs are still non-complying. Environmental compensation has been levied on 13

CETPs. Actions for levying EC / legal action are under process against 10 CETPs. The state-wise summary status of 66 non-complying CETPs and action taken by concerned SPCBs is given at ***Annexure-IX.*** *Further, CETP-wise compliance status of CPCB's directions and recommendations is attached at* ***Annexure-X.***

b) *Regarding evolving environmental compensation regime for CETPs, it is to submit that in compliance of Hon'ble NGT order dated 03.08.2017, in the matter of OA No. 593/2017 (Paryavaran Suraksha Samiti v/s UoI), CPCB has earlier finalized the following formula, which is primarily based on the Pollution Index (PI) of the concerned sector, for levying environmental compensation on a defaulting industry:*

$$EC = PI \times N \times R \times S \times LF$$

Where,
EC is Environmental Compensation in ₹
PI = Pollution Index of industrial sector
N = Number of days of violation took place
R = A factor in Rupees (₹) for EC
S = Factor for scale of operation
LF = Location factor
Presently, considering the PI value as 80, the same formula is being used for levying EC on non-complying CETPs. Further, as per the Hon'ble NGT directions CPCB is in the process of revising EC regime for non-complying CETPs. The issue was discussed in the Committee, dealing with the EC matter, on 17.02.2020 and 04.03.2020. CPCB will finalize the revised EC regime for non-complying CETPs, shortly.

iii. Meeting of the Monitoring Committee:

CPCB has been conducting meetings of the Monitoring Committee on regular basis to review the compliance status of ETPs/CETPs/STPs submitted by SPCBs/PCCs and to deliberate on issues for ensuring the compliance of Hon'ble NGT's directions. So far, fifteen meetings of the Monitoring Committee have been conducted. Since the date last hearing i.e. 28.08.2019, meetings of the Monitoring Committee were held on 27th September 2019, 9th December 2019, 13th February, 2019 at CPCB Head Office, Delhi.

iv. Quarterly Steps Taken Reports:

CPCB has been uploading Steps Taken Reports on its website, as directed by the Hon'ble Tribunal. The reports can be accessed through the URL-https://cpcb.nic.in/ngt-court-cases/. So far, six reports with the status as on 26.10.2018, 23.01.2019, 15.04.2019, 19.07.2019, 22.10.2019 and 04.02.2020 have been uploaded. The copies of the Steps Taken Report i.e. 22.10.2019 and

04.02.2020 were also submitted to the Hon'ble NGT through e-filing."

12. The report further mentions preparation of formats for collection of information from concerned States PCBs/PCCs, development of online portal. Compliance status is found to be as follow:

> *"As per the information received from concerned SPCBs,* ***out of 66 noncomplying CETPs, 26 CETPs have complied the directions, however, 40 CETPs are still non-complying. Environmental compensation has been levied on 13 CETPs. Actions for levying EC / legal action are under process against 10 CETPs.*** *The state-wise summary status of 66 non-complying CETPs and action taken by concerned SPCBs is given at Annexure-IX. Further, CETP-wise compliance status of CPCB's directions and recommendations is attached at Annexure-X."*

Analysis of the report dated 14.5.2020:

13. The above report shows that some steps have been initiated against non-compliant ETPs/CETPs/STPs while further steps need to be taken. With regard to industries not having ETP or not connected to CETP, pending construction of CETPs as mentioned in the above report, the State PCBs/PCCs may ensure that there is no discharge of any untreated pollutants by the industries and such polluting activities must be stopped and compensation recovered for the non-compliance, if any, apart from any other legal action in accordance with law. As regards non-compliant STPs, further action may be completed by the State PCBs/PCCs and it may be ensured that there is 100% treatment of sewage and till STPs are set up, atleast in-situ remediation takes place. However, on account of Corona pandemic which has affected several on-going activities, the timeline of levy of compensation in terms of order dated 28.08.2019 in *O.A. No. 593/2017* read with order dated 06.12.2019 in *O.A. No. 673/2018*, of 01.04.2020 may be read as 01.07.2020 and 01.04.2021 may be

read as 01.07.2021. Further reports may be taken by the CPCB from all the State PCBs/PCCs as per the system evolved by the CPCB from time to time.

14. At this stage, it will also be appropriate to mention the proceedings in another matter pending before this Tribunal which have bearing on the present case namely *O.A. No. 1038, News item published in "The Asian Age" Authored by Sanjay Kaw Titled "CPCB to rank industrial units on pollution levels"* which was last dealt with on 14.11.2019. Brief reference to same has been made in earlier order also. The issue therein was remedial action against pollution of industrial clusters, classified as such, based on Comprehensive Environmental Pollution Index (CEPI) prepared by CPCB on the basis of data furnished by the State PCBs/PCCs. The said data shows that 100 industrial clusters are polluted in terms of air, water and soil. Some of the salient observations in the said order are as follows:

> *"9.* ***In view of the above, since the data compiled so far shows increasing trend of air, water and soil pollution, meaningful action must result in reversing such trend and the violators of law cannot be allowed to have a free run at the core of environment and public health. Inaction by the statutory authorities is also at the cost of Rule of Law which is the mandate of the Constitution and is necessary for meaningful enforcement of legitimate constitutional rights of citizens and basic duty of a welfare State under the Constitution.***
>
> *10. We may note the observation of the Hon'ble Supreme Court in the subject of accountability of authorities for failing to discharge their duties. In* ***M.C. Mehta v. UOI & Ors.,*** *W.P Civil No. 13029/1985 vide order dated 04.11.2019, the Hon'ble Supreme Court observed:*
>
> > *".....Obviously, it is writ large that* ***the State Governments, Government of NCT of Delhi and civic bodies have miserably failed to discharge their liability as per the directive principles of State***

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Policy which have found statutory expression, they are being made statutory mockery and also the directions of this Court and High Courts in this regard are being violated with impunity.

.... Time has come when we have to fix the accountability for this kind of situation which has arisen and is destroying right to life itself in gross violation of Article 21 of the Constitution of India.

*.... **Everybody has to be answerable including the top state machinery percolating down to the level of gram panchayat. The very purpose of giving administration power up to the panchayat level is that there has to be proper administration and there is no room for such activities.** The action is clearly tortuous one and is clearly punishable under statutory provisions, besides the violation of the Court's order."*

In **Techi Tagi Tara vs. Rajendra Singh Bhandari and Ors., (2018) 11 SSC 734,** it was observed:

*"2..... **There can be no doubt that the protection and preservation of the environment is extremely vital for all of us and unless this responsibility is taken very seriously, particularly by the State Governments and the SPCBs**, we are inviting trouble that will have adverse consequences for future generations. Issues of sustainable development, public trust and intergenerational equity are not mere catch words, but are concepts of great importance in environmental jurisprudence.*

4. One of the principal attributes of good governance is the establishment of viable institutions comprising professionally competent persons and the strengthening of such institutions so that the duties and responsibilities conferred on them are performed with dedication and sincerity in public interest. This is applicable not only to administrative bodies but more so to statutory authorities- more so, because statutory authorities are the creation of a law made by a competent legislature, representing the will of the people."

11. ***The Tribunal has thus no option except to reiterate that meaningful action has to be taken by the State PCBs/PCCs as already directed and action taken report furnished showing the number of identified polluters in polluted industrial areas mentioned above, the extent of closure of polluting activities, the extent of environmental compensation recovered, the cost of restoration of the damage to the environment of the said areas, otherwise there will be no meaningful environmental governance. This may be failure of rule of law and breach of trust reposed in statutory authorities rendering their existence useless and burden on the society.***

On default, the Tribunal will have no option except to proceed against the Chairmen and the Member Secretaries of the State PCBs/PCCs by way of coercive action under Section 25 of the National Green Tribunal Act, 2010 read with Section 51 CPC. Such action may include replacement of persons heading such PCBs/PCCs or direction for stopping their salaries till meaningful action for compliance of order of this Tribunal. The Tribunal may also consider deterrent compensation to be recovered from the State PCBs/PCCs. Such action taken reports strictly in terms of law and order of this Tribunal referred to above may be furnished by the State PCBs/PCCS on or before 31.01.2020 to the CPCB. The CPCB may prepare a tabulated analysis of the same and file a consolidated report before this Tribunal before February 15, 2020 by email at judicial-ngt@gov.in. The CPCB may also revise its mechanism for expansion and new activities by red and orange category of industries in critically/ severely polluted areas consistent with the spirit of the earlier orders of this Tribunal and principles of environmental law to bring down the pollution load and ensure that activities do not further add to such load."

15. We may also refer to the proceedings in another connected matter being *O.A. No. 606/2018* dealing with the solid waste management and other issues. The same has also been briefly referred to earlier. The said matter was taken up in pursuance of the order of the Hon'ble Supreme Court dated 02.09.2014 in *Writ Petition No. 888/1996, Almitra H. Patel Vs. Union of India & Ors.*[9] In the said matter, this Tribunal flagged important environmental issues including solid waste and liquid waste management in the light of orders of the Hon'ble Supreme Court. On account of continuous non-compliance for a long period, the Chief Secretaries of all States/UTs were required to appear before this Tribunal vide order

[9] Operative part of the order of the Hon'ble Supreme Court reads:

"Enforcement of the Rules and efforts to upgrade the technology relevant to the handling of solid municipal waste is a perennial challenge and would require constant efforts and monitoring with a view to making the municipal authorities concerned accountable, taking note of dereliction, if any, issuing suitable directions consistent with the said Rules and direction incidental to the purpose underlying the Rules such as upgradation of technology wherever possible. **All these matters can, in our opinion, be best left to be handled by the National Green Tribunal established under the National Green Tribunal Act, 2010.** The Tribunal, it is common ground, is not only equipped with the necessary expertise to examine and deal with the environment related issues but is also competent to issue in appropriate cases directions considered necessary for enforcing the statutory provisions."

dated 16.01.2019. The Tribunal issued directions in the presence of the Chief Secretaries of all the States/UTs by separate orders. Since Chief Secretaries sought time for compliance, they were required to appear again with progress report on crucial issues, including water pollution leading to pollution of rivers and industrial clusters and other issues. Further order dated 12.09.2019 was passed with regard to the schedule of appearance of the Chief Secretaries in second round. Some of the Chief Secretaries have already appeared. It may be sufficient to refer to order dated 28.02.2020 (other orders be almost on same lines) inter-alia directing as follows:

> *"3. The matter was earlier considered by the Hon'ble Supreme Court inter-alia vide judgments reported in (2000) 2 SCC 679 and (2004) 13 SCC 538 directing scientific disposal of waste by setting up of compost plants/processing plants, preventing water percolation through heaps of garbage, creating focused* ***'solid waste management cells'*** *in all States and complying with the Municipal Solid Waste Management Rules, 2016 (SWM Rules, 2016) on urgent basis.* ***It was observed that the local authorities constituted for providing services to the citizens are lethargic and insufficient in their functioning which is impermissible. Non-accountability has led to lack of effort on the part of the employees.*** *Domestic garbage and sewage along with poor drainage system in an unplanned manner contribute heavily to the problem of solid waste. The number of slums have multiplied significantly occupying large areas of public land. Promise of free land attracts more land grabbers.* ***Instead of "slum clearance" there is "slum creation" in cities which is further aggravating the problem of domestic waste being strewn in the open****. Accordingly, the Court directed that provisions pertaining to sanitation and public health be complied with, streets and public premises be cleaned daily,* ***statutory authorities levy and recover charges from any person violating laws and ensure scientific disposal of waste****, landfill sites be identified keeping in mind requirement of the city for next 20 years and environmental considerations, sites be identified for setting up of compost plants, steps be taken to prevent fresh encroachments and compliance report be submitted within eight weeks.*

4. *Further observations in the judgment of the Hon'ble Supreme Court[10] are:*

"3. The petitioner has handed over a note in the Court showing the progress that has been made in some of the States and also setting out some of the suggestions, including the suggestion for creation of solid waste management cell, so as to put a focus on the issue and also to provide incentives to those who perform well as was tried in some of the States. The said note states as under:

"1. As a result of the Hon'ble Supreme Court's orders on 26-7-2004, in Maharashtra the number of authorisations granted for solid waste management (SWM) has increased from 32% to 98%, in Gujarat from 58% to 92% and in M.P. from NIL to 34%. No affidavits at all have been received from the 24 other States/UTs for which CPCB reported NIL or less than 3% authorisations in February 2004. All these States and their SPCBs can study and learn from Karnataka, Maharashtra and Gujarat's successes.

*2. **All States/UTs and their SPCBs/PCCs have totally ignored the improvement of existing open dumps, due by 31-12-2001**, let alone identifying and monitoring the existing sites. Simple steps can be taken immediately at almost no cost by every single ULB to prevent monsoon water percolation through the heaps, which produces highly polluting black run-off (leachate). Waste heaps can be made convex to eliminate standing water, upslope diversion drains can prevent water inflow, downslope diversion drains can capture leachate for recirculation onto the heaps, and disused heaps can be given soil cover for vegetative healing.*

*3. **Lack of funds is no excuse for inaction. Smaller towns in every State should go and learn from Suryapet in A.P. (population 103,000) and Namakkal in T.N. (population 53,000) which have both seen dustbin-free 'zero garbage towns' complying with the MSW Rules since 2003 with no financial input from the State or the Centre, just good management and a sense of commitment.***

*4. **States seem to use the Rules as an excuse to milk funds from the Centre, by making that a precondition for action and inflating waste processing costs 2-3 fold. The Supreme Court Committee recommended 1/3 contribution each from the city, State and Centre. Before***

[10] (2004) 13 SCC 538

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seeking 70-80% Centre's contribution, every State should first ensure that each city first spends its own share to immediately make its wastes non-polluting by simple sanitising/ stabilising, which is always the first step in composting viz. inoculate the waste with cow dung solution or bio culture and placing it in windrows (long heaps) which are turned at least once or twice over a period of 45 to 60 days.

5. *Unless each State creates a focussed **'solid waste management cell'** and rewards its cities for good performance, both of which Maharashtra has done, compliance with the MSW Rules seems to be an illusion.*

6. ***The admitted position is that the MSW Rules have not been complied with even after four years.** None of the functionaries have bothered or discharged their duties to ensure compliance. **Even existing dumps have not been improved.** Thus, deeper thought and urgent and immediate action is necessary to ensure compliance in future."*

26. *As per available statistics, there is huge gap in generation and treatment of solid and liquid waste in the country. **As per CPCB report 2016 (06.12.2016), as against 61948 MLD sewage generated in urban areas in India, the treatment capacity is 23277 MLD. The deficit in capacity is 62%.** There is no data of sewage generation in rural areas. **As per CPCB estimate of solid waste[11], about 65 million tonnes of waste is generated annually in the country out of which about 62 million tonnes is Municipal Solid Waste (MSW). Only about 75-80% of the municipal waste gets collected and out of this only 22- 28% is processed and treated and remaining is deposited indiscriminately at dump yards. It is projected that by the year 2031, the MSW generation shall increase to 165 million tonnes and to 436 million tonnes by 2050. There are more than 4000 dump sites as per CPCB data[12] which need to be remediated to avoid harmful impact on environment and public health.***

37. *The Chief Secretaries mentioned that the central assistance was inadequate which cannot be a justification for failure of the State in managing its waste. Waste management is responsibility of the State and Local Bodies, as already held by the Hon'ble Supreme Court in the judgments referred to above. If the funds available are inadequate, the State has to raise the same from the generators of waste.*

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11 http://164.100.47.193/lsscommittee/Urban%20Development/16_Urban_Development_25.pdf

12 Order dated 18.10.2019 in O.A. No. 606/2018 para 6

38. *The Chief Secretaries must ensure adverse entries in the service records of erring officers in respect of liquid waste management atleast from 01.04.2020.*

41. *In view of above, consistent with the directions referred to in Para 29 issued on 10.01.2020 in the case of UP, Punjab and Chandigarh which have also been repeated for other States in matters already dealt with, we direct:*

a. *In view of the fact that most of the statutory timelines have expired and directions of the Hon'ble Supreme Court and this Tribunal to comply with Solid Waste Management Rules, 2016 remain unexecuted, interim compensation scale is hereby laid down for continued failure after 31.03.2020. The compliance of the Rules requires taking of several steps mentioned in Rule 22 from Serial No. 1 to 10 (mentioned in para 12 above). Any such continued failure will result in liability of every Local Body to pay compensation at the rate of Rs. 10 lakh per month per Local Body for population of above 10 lakhs, Rs. 5 lakh per month per Local Body for population between 5 lakhs and 10 lakhs and Rs. 1 lakh per month per other Local Body from 01.04.2020 till compliance. If the Local Bodies are unable to bear financial burden, the liability will be of the State Governments with liberty to take remedial action against the erring Local Bodies. Apart from compensation, adverse entries must be made in the ACRs of the CEO of the said Local Bodies and other senior functionaries in Department of Urban Development etc. who are responsible for compliance of order of this Tribunal. Final compensation may be assessed and recovered by the State PCBs/PCCs in the light of Para 33 above within six months from today. CPCB may prepare a template and issue an appropriate direction to the State PCBs/PCCs for undertaking such an assessment in the light thereof within one month.*

b. *Legacy waste remediation was to 'commence' from 01.11.2019 in terms of order of this Tribunal dated 17.07.2019 in O.A. No. 519/2019 para 28[13] even though statutory timeline for 'completing' the said step is till 07.04.2021 (as per serial no. 11 in Rule 22), which direction remains unexecuted at most of the places and delay in clearing legacy waste is causing huge damage to environment in monetary terms as noted in para 33 above, pending assessment and*

[13] The Chief Secretaries may ensure allocation of funds for processing of legacy waste and its disposal and in their respective next reports, give the progress relating to management of all the legacy waste dumpsites. Remediation work on all other dumpsites may commence from 01.11.2019 and completed preferably within six months and in no case beyond one year. Substantial progress be made within six months. We are conscious that the SWM Rules provide for a maximum period of upto five years for the purpose, however there is no reason why the same should not happen earlier, in view of serious implications on the environment and public health.

NATIONAL GREEN TRIBUNAL

recovery of such damage by the concerned State PCB within four months from today, continued failure of every Local Body on the subject of commencing the work of legacy waste sites remediation from 01.04.2020 till compliance will result in liability to pay compensation at the rate of Rs. 10 lakh per month per Local Body for population of above 10 lakhs, Rs. 5 lakh per month per Local Body for population between 5 lakhs and 10 lakhs and Rs. 1 lakh per month per other Local Body. If the Local Bodies are unable to bear financial burden, the liability will be of the State Governments with liberty to take remedial action against the erring Local Bodies. Apart from compensation, adverse entries must be made in the ACRs of the CEO of the said Local Bodies and other senior functionaries in Department of Urban Development etc. who are responsible for compliance of order of this Tribunal. Final compensation may be assessed and recovered by the State PCBs/PCCs in the light of Para 33 above within six months from today.

c. *Further, with regard to thematic areas listed above in para 20, steps be ensured by the Chief Secretaries in terms of directions of this Tribunal especially w.r.t. plastic waste, bio-medical waste, construction and demolition waste which are linked with solid waste treatment and disposal. Action may also be ensured by the Chief Secretaries of the States/UTs with respect to remaining thematic areas viz. hazardous waste, e-waste, polluted industrial clusters, reuse of treated water, performance of CETPs/ETPs, groundwater extraction, groundwater recharge, restoration of water bodies, noise pollution and illegal sand mining.*

d. *The compensation regime already laid down for failure of the Local Bodies and/or Department of Irrigation and Public Health/In-charge Department to take action for treatment of sewage in terms of observations in Para 36 above will result in liability to pay compensation as already noted above which are reproduced for ready reference:*

   i. ***Interim measures for phytoremediation/ bioremediation etc. in respect of 100% sewage to reduce the pollution load on recipient water bodies – 31.03.2020. Compensation is payable for failure to do so at the rate of Rs. 5 lakh per month per drain by concerned Local Bodies/States (in terms of orders dated 28.08.2019 in O.A. No. 593/2017 and 06.12.2019 in O.A. No. 673/2018) w.e.f. 01.04.2020.***

   ii. ***Commencement of setting up of STPs – 31.03.2020. Compensation is payable for***

failure to do so at the rate of Rs. 5 lakh per month per STP by concerned Local Bodies/States (in terms of orders dated 28.08.2019 in O.A. No. 593/2017 and 06.12.2019 in O.A. No. 673/2018) w.e.f. 01.04.2020.

iii. Commissioning of STPs – 31.03.2021. Compensation is payable for failure to do so at the rate of Rs. 10 lakh per month per STP by concerned Local Bodies/States (in terms of orders dated 28.08.2019 in O.A. No. 593/2017 and 06.12.2019 in O.A. No. 673/2018) w.e.f. 01.04.2021.

e. *Compensation in above terms may be deposited with the CPCB for being spent on restoration of environment which may be ensured by the Chief Secretaries' of the States/UTs.*

f. *An 'Environment Monitoring Cell' may be set up in the office of Chief Secretaries of all the States/UTs within one month from today, if not already done for coordination and compliance of above directions which will be the responsibility of the Chief Secretaries of the States/UTs."*

g. Compliance reports in respect of significant environmental issues may be furnished in terms of order dated 07.01.2020 quarterly with a copy to CPCB."

(emphasis supplied)

Directions:

16. All States/UTs through their concerned departments such as Urban/Rural Development, Irrigation & Public Health, Local Bodies, Environment, etc. may ensure formulation and execution of plans for sewage treatment and utilization of treated sewage effluent with respect to each city, town and village, adhering to the timeline as directed by Hon'ble Supreme Court. STPs must meet the prescribed standards, including faecal coliform. CPCB may further continue efforts on compilation of River Basin-wise data. Action plans be firmed up with Budgets/Financial tie up. Such plans be overseen by Chief Secretary and forwarded to CPCB before 30.6.2020. CPCB may

consolidate all action plans and file a report accordingly. Ministry of Jal Shakti and Ministry of Housing and Urban Affairs may facilitate States/UTs for ensuring that water quality of rivers, lakes, water bodies and ground water is maintained. As observed in para 13 above, 100% treatment of sewage/effluent must be ensured and strict coercive action taken for any violation to enforce rule of law. Any party is free to move the Hon'ble Supreme Court for continued violation of its order after the deadline of 31.3.2018. This order is without prejudice to the said remedy as direction of the Hon'ble Supreme Court cannot be diluted or relaxed by this Tribunal in the course of execution.

17. **The CPCB may study and analyse the extent of reduction of industrial and sewage pollution load on the environment, including industrial areas and rivers and other water bodies and submit its detailed report to the Tribunal.**

18. **During the lockdown period there are reports that the water quality of river has improved, the reasons for the same may be got studied and analysed by the CPCB and report submitted to this Tribunal.[14] If the activities reopen, the compliance to standards must be maintained by ensuring full compliance of law by authorities statutorily responsible for the same.**

ORIGINAL APPLICATION NO. 148/2016 (MAHESH CHANDRA SAXENA VS. SOUTH DELHI MUNICIPAL CORPORATION & ORS.)

Consideration of consequential issue of utilization of treated water: Earlier proceedings leading to order dated 11.9.2020:

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[14] https://www.indiatoday.in/india/story/coronavirus-lockdown-india-fresh-air-clean-rivers-1669726-2020-04-22

19. This matter is connected with and incidental to the setting up of STPs. In the course of operation of STPs, treated water is generated and proper use of such water for secondary purposes can lead to availability of more clean water for drinking purposes. Right to access fresh drinking water is part of right to life. There is huge shortage of drinking water in the country. This Tribunal noted that in absence of proper planning, fresh water was being used for purposes for which treated water could easily be used. Some the statistics noted by the Tribunal and other pertinent observations in the order dated 11.09.2019 are as follows:

> *"1. ..... **Delhi is an urbanized city state having a population of about 20 millions which is expected to increase to 23 million by the year 2021. Present total water requirement for domestic purposes for population of 20 million @ 60 GPCD works out to 1200 MGD. Present average potable water production by Delhi Jal Board is about 936 MGD and includes about 80-85 MGD of ground water. Thus, there is a gap of 204 MGD. Only 81.3 households have piped water supply. Reuse of water both in domestic and industrial sectors is essential. Around 150 billion liters of sewage water is produced in India annually. 70% of Singapore drinks treated sewage water.[15] There appears to be no satisfactory plan with any of the States/Union Territories (UTs) in the country. This Tribunal monitored the matter with reference to the NCT of Delhi for more than two years and passed several orders.***
>
> *2. Finally, on 27.11.2018, the Tribunal considered the report of the Delhi Jal Board (DJB) dated 16.11.2018 to the effect that **460 MGD waste water was being treated but reuse of such water was not being ensured.***
>
> ***(emphasis supplied)***

20. The Tribunal further noted:

> *"3. **As per CPCB's report 2016[16], it has been estimated that 61,948 million liters per day (mld) sewage is generated from the urban areas of which treatment capacity of 23,277 mld is currently existent in India.***

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[15] Second interim report dated 31.07.2019 of Monitoring Committee constituted under O.A. No. 496/2016.

[16] http://www.sulabhenvis.nic.in/Database/STST_wastewater_2090.aspx July 16, updated on December 6, 2016

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Thereby the deficit in capacity of waste treatment is of 62%. *There is no data available with regard to generation of sewage in the rural areas. To remedy this situation orders have been passed by the Hon'ble Supreme Court[17] as well as this Tribunal[18] directing 100% treatment of the sewage and industrial effluents by installing requisite ETPs/CETPs/STPs. Proper utilization of treated water has implications not only to save potable water but also to prevent illegal extraction of groundwater and conservation of water bodies. Timelines have been laid down for ensuring treatment of sewage and effluents for preventing pollution of river Ganga[19] as well as other polluted river stretches which will result in more treated water being available.*

4. ***Having regard to the necessity to ensure utilization of treated waste water to reduce pressure on the ground water resources throughout the country, the Tribunal directed all the States/UTs in India to prepare and furnish their action plans within three months to the Central Pollution Control Board (CPCB) so that CPCB could review the same and issue further directions.***

5. *Report dated 01.05.2019 furnished by the CPCB was considered by this Tribunal on 10.05.2019 and it was noted that some of the States did not furnish their action plans and the action plans furnished by some of the States needed improvements. The Tribunal directed that the States/UTs which had not yet furnished their action plans may do it by 30.06.2019 and such action plans may have monitoring mechanism for coordination with the local bodies which will be the responsibility of the Chief Secretaries of the States/UTs.*

6. *The Tribunal observed:*

> *"7.* ***It is well known that absence of plan for reuse of treated water affects recharge of ground water and also results in fresh water being used for purposes for which treated water can alternatively be used. Proper plans for reuse of waste water can add to availability of potable water which is many times denied this basic need or has to travel long distances to fetch clean water****. This being a substantial question of environment, direction is issued to the States/UTs which have not yet submitted their action plans to do so latest by 30.06.2019, failing which the Tribunal may have to consider coercive measures, including compensation for loss to the environment. The plans may include a monitoring mechanism in the States for coordination with the local bodies. This will be the*

[17] Paryavaran Suraksha Samiti Vs. Union of India, (2017) 5 SCC 326
[18] Paryavaran Suraksha Samiti Vs. Union of India, O.A No. 593/2017 order dated 28.08.2019
[19] O.A No. 200/2014

responsibility of the Chief Secretaries of all the States/UTs.

8 The issue is also connected with the rejuvenation of 351 river stretches. The States/UTs may include this subject in the deliberations with the Central Monitoring Committee constituted in terms of orders dated 08.04.2019 in O.A. No. 673/2018, News item published in The Hindu authored by Shri Jacob Koshy titled More river stretches are now critically polluted CPCB and order dated 24.04.2019 in O.A.606/2018, Compliance of Municipal Solid Waste Management Rules, 2016. ***The Chief Secretaries may also include this subject in their reports to this Tribunal in pursuance of orders passed in O.A. No. 606/2018 on 16.01.2019 and further orders in their presence.***

9. The CPCB may place on its website guidelines for preparing an appropriate plan within two weeks from today and also furnish its final report after analysis of gaps in the plans by 31.07.2019 by e-mail at ngt.filing@gmail.com."

7. *In respect of Delhi, this Tribunal noted the stand of the DJB that Municipal Corporations and the* ***DDA may lift the treated water by tankers till the pipelines are laid for which time bound plans have been prepared and included in the action plan submitted to the CPCB. On this aspect, it was directed:***

"10. ... ***...*** ***...***
We understand that about 103 MGD of treated water is not being effectively used by DJB out of the total 459 MGD. This is a colossal waste of our precious natural resources and cannot be permitted. *This in our view needs to be expeditiously sorted out by Chief Secretary Delhi, Municipal Corporations and DDA by way of intersectoral coordination. We also direct that laying of pipelines be expedited in a time bound manner and revised plan to this regard be submitted which is duly vetted and ratified by CPCB."*

8. *As per the Monitoring Committee on Yamuna, a flat recovery rate towards collection and treatment of sewage can be an option towards viable sewage management.*

*"****A strong direction is needed to be given in order to make everyone pay a flat rate for sewage collection and treatment whether using below or upto 20 KL, as those using more than 20 KL in any case are paying for sewage treatment.*** *The DJB charges Rs. 11.93 per KL for the sewage it treats on behalf of NDMC*

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and the Cantonment Board. A specialized institution like the National Institute of Financial Policy & Planning or the C&AG may be directed to examine the costs involved and revenue generated as it is leading to mindless pollution of the environment and depletion of ground water".

(emphasis supplied)

21. The Tribunal considered the report of the CPCB furnished in pursuance of earlier order as follows:

> *"9.* ***Accordingly, further report has been furnished by the CPCB on 31.07.2019 to the effect that guidelines have been prepared for utilization of treated sewage from the STPs and uploaded on the website of CPCB on 24.04.2019. 23 States/UTs have furnished their action plans but 13 States/UTs have yet to submit. The action plans of 23 States/UTs needed further improvements.*** *'Major observations and shortcomings' are mentioned as follows:*
>
> *"1. Action plan received from State of Andhra Pradesh, Madhya Pradesh and NCT of Delhi has mentioned schemes for utilization of treated sewage in different sectors like horticulture, Metro washing, Power Plants, Construction activity, rejuvenation of water bodies (Pond/lakes), industrial sectors. Action plan also include firmed timelines for implementation of various schemes.*
> 2. *Action plan of Delhi covers all aspects as per suggested action plan. However, wastewater demand from bulk users like DDA, PWD, CPWD, DMCs, DMRC are comparative on lower side and same need to be enhanced. Chief Secretary may take up said matter with bulk users to increase the utilization of treated sewage. Option of restricted uses of bore wells by said stakeholders may explore to compel more demand of treated sewage.*
> 3. *Public Health Engineering Department, Manipur mentioned that they do not have any specific policy of utilization of treated wastewater from STPs.*
> 4. *Union Territory of Lakshadweep has mentioned that no STPs was installed in their territory and no action plan was provided.*
> 5. *Department of Urban Development and Municipal Affairs vide letter dated 29.04.2019 requested for extension of 02 months (June, 2019) for submission of action plan. However, no action plan has been received till date.*
> 6. *State of Gujrat has only submitted action plan related to Surat city which indicate use of treated sewage for industrial purpose.*

7. *Only three states have adequate capacity for sewage treatment - Himachal Pradesh and Chandigarh.*
8. *Utilization of treatment in industrial sector has been indicated by few states (Andhra Pradesh- Steel, Thermal Power Plant and Oil Refinery), Chhattisgarh & Odisha (Thermal Power Plant). Surat and Daman have indicated reuse of treated waste water in industrial clusters.*
9. *In most of the remaining states/UTs, Utilization of treated sewage has been indicated in activities like Horticulture and Irrigation. Other potential users of treated sewage like Industrial Clusters, Metro Rail, Indian Railways, Infrastructure Projects, Agriculture and Bus Depots have not been explored*
10. *Projection of future Sewage Generation and Treatment Capacity has not been done and same has not been taken into consideration in the utilization plan.*
11. *Timelines for implementation of proposed schemes have not been indicated."*

Some of the salient features of the guidelines which highlight suggestive actions for formulation of action plan for usage of treated waste water from sewage treatment plants are as follows:

"1. Estimate Present and Projected Sewage Generation and Treatment Capacity.
2. *Identify bulk users of Water: Industrial Clusters, Metro Rail, Indian Railways, Infrastructure Projects, Agriculture, Bus Depots and PWD.*
3. *Quantify their potential Water Demand.*
4. *Development of Dead Water Aquatic Sources (Lake, Pond etc).*
5. *Time line for establishing such infrastructure (Treatment, Conveyance and Utilization of Treated Sewage).*
6. *To promote use of treated waste water for various usage.*
7. *To promote supply of treated sewage to industrial clusters*
8. *Industrial clusters can set up treatment facility to meet their raw water requirement instead of drawing groundwater.*
9. *Maximizing re-use of treated waste- water will minimize groundwater abstraction."*

The States/UTs must submit their Action Plans to CPCB in terms of timelines and measurable indicators with regard to utilization of treated sewage water and institutional set up in the States/UTs validating the use of treated water in terms of its safety to human health and environment.

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10. *This Tribunal has held that standards of Faecal coliform need to be adhered to by the STPs so that treated sewage water can be safely utilized*[20].

11. *In view above, we direct that the States/UTs which have not yet furnished their action plans may do so on or before 30.11.2019, failing which defaulting States/UTs will be liable to pay compensation @ of Rs. 1 Lakh per month till action plans are filed. The States/UTs which have furnished the action plans may remove the deficiencies noticed above by 30.11.2019, failing which they will be liable to pay compensation @ of Rs. 1 Lakh per month. The compensation may be deposited with the CPCB which may be used for restoration of the environment.*

12. *The CPCB may furnish a consolidated report on or before 31.01.2020 by e-mail at judicial-ngt@gov.in. Information about the quantum of sewage generated and treated may also be furnished. The Chief Secretaries of the concerned States/UTs may monitor compliance of the order."*

(emphasis supplied)

Report of the CPCB dated 15.5.2020:

22. Accordingly, status report dated 15.05.2020 has been filed by the CPCB giving the gap analysis as follows:

"3.0 GAP ANALYSIS

As per Hon'ble NGT Directions dated 10.5.2019, suggestive measures for action plan for use of treated sewage was uploaded on CPCB's website. The same was also sent to all States/UTs vide letter dated 16.07.2019. CPCB had directed all States / UTs to cover the following action points in the Action Plan to be prepared for use of treated sewage:

i. *Estimation of quantity of present and projected sewage generation,*
ii. *Estimation of Present and planned treatment capacity*
iii. *Identification of Bulk users (Irrigation, horticulture, Industries, PWD and Railways etc) and to quantify the usage*
iv. *Estimation of quantity of treated sewage to be used by the bulk users*
v. *Specification time lines to meet the target.*

Accordingly, action plan submitted by 31 States / UTs were assessed based on its adequacy in addressing the above-mentioned points. The overview of the assessment is given in Table-1. Following are the major observations based on the assessment:

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[20] Order dated 21.12.2018 and 30.04.2019 in O.A. No. 1069/2018, Nitin Shankar Deshpande vs. UOI & Ors.

i. ***06 States/ UTs (Andhra Pradesh, Delhi, Puducherry, Haryana, Tamil Nadu, Madhya Pradesh) have addressed all the five action points as listed above in their action plan.***

ii. ***10 States/UTs have partially addressed the above- listed action points in their action plan. 09 States / UTs (Gujrat, Chhattisgarh, Jharkhand, Goa, Daman & Diu, Dadar Nagar Havelli, Jammu and Kashmir, Maharashtra and Rajasthan) have identified bulk users However, quantity of treated sewage to be used by these bulk-users as well as timelines for meeting these targets have not been specified. Chandigarh has not estimated the presented / projected qty of Sewage generation and not specified timelines for meeting the target.***

iii. ***08 States / UTs (Assam, Bihar, Himachal Pradesh, Mizoram, Nagaland, Meghalaya, Orissa and West Bengal) have submitted very limited information in the action plan.***

iv. ***Action plan received from 03 States (Kerala (Trivandrum), Karnataka (Bangalore), Telangana (Hyderabad) are city specific. Action plan for treated sewage reuse in the state not provided.***

v. ***Apart from above, it has been informed 4 States / UTs that due to local terrain and technical issues and action plan could not be conceptualized., 02 UTs (Lakshadweep, Andaman and Nicobar Islands) do not have STPs and having only septic management. Fecal Sludge Treatment Plant has been planned in these UTs. 02 States (Sikkim, Tripura) have high water table and therefore plan to discharge treated water to rivers.***

vi. ***5 States/ UTs (Arunachal Pradesh, Manipur, Uttar Pradesh, Uttarakhand, Punjab) have not submitted any information.***

CPCB's observations on the action plan submitted by the individual states/UTs have been enumerated in Table 1. Additional observations on the action plan submitted by the States /UTs are as follows:

i. ***Only 14 States/UTs (Andhra Pradesh, Daman & Diu, Delhi, Gujarat, Haryana, Himachal Pradesh, J&K, Madhya Pradesh, Maharashtra, Nagaland, Rajasthan, Tripura, Puducherry, A&N) have estimated present quantity of Sewage generated in their States/UTs.***

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ii. ***Only 3 States/UTs (Haryana, Himachal Pradesh, Jammu & Kashmir) have adequate capacity of Sewage treatment w.r.t to present quantity of sewage generated.***

iii. ***Major bulk users identified include- Irrigation, horticulture,, Rejuvenation of water bodies, Construction, Recreation, Railways, Vehicles and Coach washing, firefighting, recreation and industry.***

iv. ***13 States/UTs (Andhra Pradesh, Maharashtra, Chhattisgarh, Goa, Delhi, Rajasthan, Tamil Nadu, Puducherry, Odisha, Madhya Pradesh, Gujarat, Haryana, Jharkhand) plan to use treated sewage in industries which include Steel Plant, Thermal Power Plant, Refineries and Railways.***

v. ***Percentage of reuse of treated sewage planned maximum in Haryana (80 %) followed by Puducherry (55 %), Delhi (50 %), Chandigarh (35 %), Tamil Nadu (25%), Madhya Pradesh (20 %), Andhra Pradesh (5 %).***

vi. ***NCT of Delhi has set target to increase their re usage from 12.5 % to 60 %. In future, utilization of 341 MGD treated sewage are proposed for drinking purpose (197 MGD), Irrigation (112 MGD) and 10 MGD in rejuvenation of water bodies.***

vii. ***Time-line specified by States/UTs for implementation of Action Plan varies between 2020 -2030."***

(emphasis supplied)

Analysis of report dated 15.5.2020:

23. The above shows serious deficiencies on the part of several States/UTs in performing their constitutional obligation of properly and rationally managing the treated water so as to make more potable water available for drinking purposes. Some States have shown apathy and indifference in giving appropriate response.

Further Directions:

24. **Accordingly, we direct that States which have not addressed all the action points may do so promptly latest before 30.06.2020,**

reducing the time lines in the action plans. The timelines must coincide with the timelines for setting up of STPs since both the issues are interconnected. All the States may take steps accordingly. The CPCB may compile further information on the subject. The compliance for action plans will be the responsibility of the Secretaries of Urban Development/other concerned, including Irrigation & Public Health, Local Bodies, Rural Development Departments of all the States/UTs and to be overseen by the Chief Secretaries. The Ministry of Jal Shakti and Ministry of Housing and Urban Affairs, Government of India may also monitor and coordinate the situation appropriately in the interest of water qualities of rivers, lakes, water bodies and protection of groundwater.

25. **Needless to say that since the issue of sources of funding has already been dealt with in the orders of the Hon'ble Supreme Court, the States may not put up any excuse on this pretext in violation of the judgment of the Hon'ble Supreme Court.**

26. **Summary of directions:**

i. **All States/UTs through their concerned departments such as Urban/Rural Development, Irrigation & Public Health, Local Bodies, Environment, etc. may ensure formulation and execution of plans for sewage treatment and utilization of treated sewage effluent with respect to each city, town and village, adhering to the timeline as directed by Hon'ble Supreme Court. STPs must meet the prescribed standards, including faecal coliform.**

CPCB may further continue efforts on compilation of River Basin-wise data. Action plans be firmed up with Budgets/Financial tie up. Such plans be overseen by Chief Secretary and forwarded to CPCB before 30.6.2020. CPCB

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may consolidate all action plans and file a report accordingly.

Ministry of Jal Shakti and Ministry of Housing and Urban Affairs may facilitate States/UTs for ensuring that water quality of rivers, lakes, water bodies and ground water is maintained.

As observed in para 13 above, 100% treatment of sewage/effluent must be ensured and strict coercive action taken for any violation to enforce rule of law. Any party is free to move the Hon'ble Supreme Court for continued violation of its order after the deadline of 31.3.2018. This order is without prejudice to the said remedy as direction of the Hon'ble Supreme Court cannot be diluted or relaxed by this Tribunal in the course of execution. PCBs/PCCs are free to realise compensation for violations but from 1.7.2020, such compensation must be realised as per direction of this Tribunal failing which the erring State PCBs/PCCs will be accountable.

ii. **The CPCB may study and analyse the extent of reduction of industrial and sewage pollution load on the environment, including industrial areas and rivers and other water bodies and submit its detailed report to the Tribunal.**

iii. **During the lockdown period there are reports that the water quality of river has improved, the reasons for the same may be got studied and analysed by the CPCB and report submitted to this Tribunal. If the activities reopen, the compliance to standards must be maintained by ensuring full compliance of law by authorities statutorily responsible for the same.**

iv. **Accordingly, we direct that States which have not addressed all the action points with regard to the utilisation of sewage treated water may do so promptly latest before 30.06.2020, reducing the time lines in the action plans. The timelines must coincide with the**

timelines for setting up of STPs since both the issues are interconnected. The CPCB may compile further information on the subject accordingly.

v. **Needless to say that since the issue of sources of funding has already been dealt with in the orders of the Hon'ble Supreme Court, the States may not put up any excuse on this pretext in violation of the judgment of the Hon'ble Supreme Court.**

27. **The CPCB may furnish its report by 15.09.2020 giving the status of furnishing of action plans and their execution as on 31.08.2020 by e-mail at judicial-ngt@gov.in preferably in the form of searchable PDF/OCR Support PDF and not in the form of Image/PDF.**

A copy of this order be sent to the Chief Secretaries of all States/UTs, Secretaries of MoHUA and Ministry of Jal Shakti, Govt. of India, CPCB and all the State PCBs/PCCs by e-mail.

A copy of this be also sent to the Secretary General, Supreme Court of India with reference to the order of the Hon'ble Supreme Court Supreme Court in *(2017) 5 SCC 326*, for information and record.

List for further consideration 21.09.2020.

Adarsh Kumar Goel, CP

Sheo Kumar Singh, JM

Dr. Nagin Nanda, EM

May 21, 2020
Original Application No. 593/2017
Original Application No. 148/2016
DV

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