ACTION PLAN FOR REJUVENATION OF RIVER DHANSIRI, DIMAPUR, NAGALAND

PRIORITY - I

Approved by:

Nagaland River Rejuvenation Committee

(Constituted in compliance of order of the Hon'ble National Green Tribunal)

Submitted to:

Central Pollution Control Board, Delhi

July, 2019

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EXECUTIVE SUMMARY

Dimapur is the oldest human settlement in Nagaland. It is situated between longitude 93^0 43' East and latitude $25^0$54' North bordering Assam on the west of the state. Mainly flat terrain of the town supports the settlement to come up, hence fast growth of the town is observed in the last two decades. The extended area of the town increases municipal limit over the years and likely to increase further in forthcoming years. The project area considered as the total municipal limit for interception diversion and treatment of sewage and waste water as well as collection, transportation and disposal of solid waste. Besides this the public awareness is considered as the component for sustainability and participation of end users in the noble cause of pollution abatement. The treatment plant and disposal site for the solid waste management is to be considered part of the project irrespective of its location. Similarly the rivers that receive pollution load are also considered part of the project area to be studied for better management.

Sl. No	Salient Features of Town	Data
1	Geographic location	$25^0$48' & $26^0$00'N $93^0$30' & $93^0$54' E
2	Altitude	145 m
3	Climate	Subtropical
4	Temperature	10^0 – 40^0 C
5	Rainfall	1500-2000mm

Dhansiri and Diphu (Chathe) are the main rivers of Dimapur district of Nagaland. River Dhansiri originates from Laisang peak of Nagaland. It flows through a distance of 352 km from south to north before joining the Brahmaputra on its south bank. Its total catchment area is 1220 km^2.While flowing as the boundary between Karbi Anglong and Nagaland, it flanks a large wilderness very rich in wildlife. On one side is the Dhansiri Reserved Forest and on the other Intangki National Park. There are numerous perennially waterlogged swampy regions locally known as bils associated with this river. Point and non-point sources of pollution along with anthropogenic pressures affect the lotic ecosystems of the town.

In compliance to the Hon'ble National Green Tribunal order dated 20.09.2018, 19.12.2018 and 08.04.2019, Action Plan has been prepared for restoration of pollution river stretch of Dhansiri river from Full Nagarjan (station code:1796) as it enters Dimapur city area to Kushiabill, Nagaland-Assam Border (station code: 1928) as it exits Dimapur city area.

In order to improve the river water quality, proposed activities are interception, diversion and treatment of municipal drains, establishment of solid waste processing and disposal facility for Dimapur city, surveillance of water polluting industries, monitoring of drains, prohibition on illegal disposal of waste in river beds, groundwater quality monitoring and recharge of groundwater, plantation in catchment etc. In addition to the ongoing project of pollution abatement of river Diphu and Dhansiri sanctioned by Ministry of Environment, Forests & Climate Change, about Rs. 668.25 lakhs would be required for interception, diversion and treatment of municipal drains and establishment of solid waste processing and disposal facility for Dimapur city and river training works to prevent soil erosion.

1. INTRODUCTION:

The River Dhansiri originates from the Laisang peak in Peren district and flows through a distance of 352 km (219 miles) from south to north before joining the Brahmaputra on its south bank. It has a total catchments area of 1,220 km² (470 sq. miles). For the first 37 kms from the source, the river flows in a north-western direction where after turning to the north-east it flows for about 75.635 kms upto Dimapur, thereafter the direction of flow is generally northerly upto Golaghat, Assam. The river receives almost all the western and southern drainages of Nagaland.

2. ACHIVABLE TARGETS AS PER HON'BLE NGT DIRECTIONS:

Hon'ble NGT, Principal Bench, New Delhi in their Order dated 28th September, 2018 in O.A. No.673/2018 regarding monitoring and restoration of water quality of identified polluted river stretches have inter alia directed all States and Union Territories to prepare action plans within two months for bringing all the polluted river stretches to be fit at least for bathing purposes (i.e. BOD< 3 mg/L and FC< 500 MPN/100ml) within six months from the date of finalization of the action plans.

In compliance of the direction of Hon'ble National Green Tribunal, Principal Bench, New Delhi in the matter of news published in "The Hindu" authored by Shri Jacob Koshy, Titled "More river stretches are now critically polluted CPCB", Government of Nagaland constituted River Rejuvenation Committee (RRC) for effective abatement of pollution, rejuvenation, protection and management of the identified polluted River stretches under Priority-I, for bringing the polluted river stretches to be fit at least for bathing purposes within six months from the date of finalization of the action plans.

3. WATER QUALITY REPORTS FOR THE YEAR 2016-17:

Water quality monitoring is being carried out by the Nagaland Pollution Control Board under National Water Quality Monitoring Programme (NWMP), the data collected for the year 2016 and 2017 are as given blow:

Under Dimapur District in the year 2016, 2017 & 2018, there were 6 NWMP locations being monitored and analyzed in the river Dhansiri, which are discussed with various parameters in the *Tables 1 (a) (b) & (c)* given below.

Table 1 (a): Water Analysis report showing different parameters of minimum and maximum values during 2016 is given below:

Sl. No	PARAMETERS	STATION CODE											
		1796		1797		1798		1799		1800		1928	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1	Dissolved Oxygen (mg/l)	0.73	6.79	0.7	6.71	0.77	7.45	0.55	6.56	0.2	4.5	0.2	5.33
2	pH	7	8.43	7	7.8	7	7.7	6.5	7.69	6.5	7.71	7	8.13
3	Conductivity (µS/cm)	72.5	634	77.2	258	88.6	333	70.3	212	91.9	442	85	436
4	BOD (mg/l)	1	**8**	1	**10**	1	**9**	1	**8**	**3**	**50**	2	**25**
5	Nitrate- Nitrogen (mg/l)	0.22	1.18	0.22	1.47	0.27	1.3	0.54	1.62	0.3	11.5	0.42	2.12
6	Turbidity (NTU)	7.92	514	1.84	698	1.71	688	36.5	180	1.75	147	1.03	927
7	Phenolphthalein Alkalinity (mg/l)	0	4	0	10	0	2	0	4	0	0	0	2
8	Total Alkalinity (mg/l)	34	108	34	110	34	98	32	196	40	184	34	140
9	Chloride (mg/l)	2.6	14	3	20	4.1	18	2.4	11	11.5	69	2.1	40
10	Chemical Oxygen Demand (mg/l)	41	101	35	83	36	132	44	143	67	151	38	137
11	Ammonia Nitrogen (mg/l)	0.02	0.222	0.02	0.18	0.008	0.31	0.01	0.24	0.018	0.79	0.014	0.63
12	Total Hardness (mg/l)	30	98	36	102	34	104	30	88	36	102	36	110
13	Calcium Hardness (mg/l)	14	46	14	46	16	50	12	46	18	84	16	66
14	Magnesium Hardness (mg/l)	2.928	15.62	4.88	14.64	0.97	13.18	5.9	10.25	2.92	9.76	4.392	17.08
15	Sulphate (mg/l)	12	26	17	46	14	28	14	28	13	25	13	78
16	Total Dissolved Solids (mg/l)	36	317	39	129	44	166	35.1	101	46	219	42.5	218
17	Total Suspended Solids(mg/l)	0.05	1.08	0.046	0.44	0.02	0.46	0.01	0.295	0.03	0.525	0.016	0.74
18	Phosphate (mg/l)	0.5	1.4	0.6	1.2	0.4	1.8	0.3	1.6	0.3	2.4	0.6	7.8
19	Boron (mg/l)	0.045	0.137	0.06	0.11	0.05	0.07	0.068	0.094	0.04	0.154	0.028	0.063
20	Fluoride (mg/l)	0.1	0.32	0.07	0.37	0.06	0.23	0.07	0.4	0.07	0.16	0.05	0.19

Sl. No	PARAMETERS	STATION CODE											
		1796		1797		1798		1799		1800		1928	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
21	Cadmium (mg/l)	-	0.005	-	0.009	-	0.008	-	0.146	-	0.032	-	0.021
22	Lead (mg/l)	-	0.01	-	0.03	-	0.1	-	0.01	-	0.13	-	0.17
23	Chromium (mg/l)	-	0.002	-	0.004	-	0.004	-	0.001	-	0.004	-	0.003
24	Zinc (mg/l)	-	3.13	-	4.15	-	4.49	-	3.08	-	4.20	-	4.20
25	Iron (mg/l)	-	0.39	-	0.33	-	0.39	-	2.42	-	1.14	-	0.43
26	Arsenic (mg/l)	-	0	-	0	-	0	-	0	-	0	-	0

Sl. No	BIOMONITORING	STATION CODE											
		1796		1797		1798		1799		1800		1928	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1	Saprobic Score	-	-	-	-	-	-	-	-	-	-	5.1	5.9
2	Diversity Score	-	-	-	-	-	-	-	-	-	-	0.48	0.67
3	Water Quality	-	-	-	-	-	-	-	-	-	-	Mod	Mod
4	Water Quality Class	-	-	-	-	-	-	-	-	-	-	C	C
5	Indicator Colour	-	-	-	-	-	-	-	-	-	-	Green	Green

Station Code	Location	District	Type
1796	Full Nagarjan	Dimapur	River
1797	Bridge near Purana Bazaar	Dimapur	River
1798	Near Check Gate (Dimapur-Khatkhati Road)	Dimapur	River
1799	Town Boundary Bridge (Diphu Road)	Dimapur	River
1800	Nuton Bosti (Naga Cemetery)	Dimapur	River
1928	Nagaland - Assam Border	Dimapur	River

Table 1 (b): Water Analysis report showing different parameters of minimum and maximum values during 2017 is given below:

Sl. No	PARAMETERS	STATION CODE											
		1796		1797		1798		1799		1800		1928	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1	Dissolved Oxygen (mg/l)	0.78	6	1.26	6.4	1.1	6	1.37	7.2	0.15	3.1	0.79	8
2	pH	6.5	8.71	7	8.49	7	8.4	7	8.23	6.5	8.01	7	8.18
3	Conductivity (µS/cm)	100	429	101	251	101.6	23	90	190	135.6	391	96.8	334
4	BOD (mg/l)	1.4	**6**	1.8	**7**	1.8	**6**	2	**4**	**3.4**	**25**	1.9	**10**
5	Nitrate- Nitrogen (mg/l)	0.09	1.1	0.26	1.01	0.35	0.83	0.39	0.75	0.33	1.1	0.21	0.97
6	Turbidity (NTU)	8.49	473	6.73	750	5.83	370	54.9	334	3.1	246	7	361
7	Phenolphthalein Alkalinity (mg/l)	0	4	0	4	0	4	0	0	0	0	0	4
8	Total Alkalinity (mg/l)	40	128	44	122	50	126	44	98	50	170	40	144
9	Chloride (mg/l)	3.8	31.4	3.9	25	2.5	8.7	3.3	13.1	2.5	28.2	2.5	15.9
10	Chemical Oxygen Demand (mg/l)	15.7	46	7.3	36.5	10.8	22.7	12.7	31.9	16.1	39.2	8.1	39.6
11	Ammonia Nitrogen (mg/l)	0.01	2.06	0.04	0.65	0.08	0.83	0.07	0.49	0.97	4.8	0.1	3.7
12	Total Hardness (mg/l)	40	104	36	112	38	118	28	76	38	98	30	118
13	Calcium Hardness (mg/l)	20	60	18	56	20	56	18	42	30	64	20	58
14	Magnesium Hardness (mg/l)	0.97	13.18	1.95	13.66	0.97	18.05	0.48	10.25	0.49	10.74	2.44	18.05
15	Sulphate (mg/l)	14	38	17	37	15	38	12	27	12	27	15	37
16	Total Dissolved Solids (mg/l)	50	214	51	130	51	120	45	95	67.8	196	48.4	168
17	Total Suspended Solids(mg/l)	0.0037	1.2	0.0045	1.06	0.0053	0.835	0.0053	0.37	0.004	0.42	0.004	0.875
18	Phosphate (mg/l)	0.04	0.75	0.05	0.84	0.04	0.69	0.05	2.2	0.05	2.4	0.04	0.55
19	Boron (mg/l)	0.06	0.59	0.03	0.19	0.04	0.15	0.04	0.19	0.05	0.57	0.05	0.28
20	Potassium (mg/l)	3.1	32.8	3.1	5.3	3.2	5.4	3.3	5.5	4.4	8.3	3.4	5.3

Sl. No	PARAMETERS	STATION CODE											
		1796		1797		1798		1799		1800		1928	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
21	Fluoride (mg/l)	0.05	1	0.01	0.26	0.06	0.27	0.05	0.3	0.07	0.21	0.05	0.25
22	Cadmium (mg/l)	-	0.01	-	0.01	-	0.01	-	0.03	-	0.01	-	0.01
23	Copper (mg/l)	-	0.07	-	0.14	-	0.05	-	0.16	-	0.09	-	0.07
24	Lead (mg/l)	-	0	-	0	-	0	-	0	-	0	-	0
25	Chromium (mg/l)	-	0	-	0	-	0	-	0	-	0	-	0
26	Nickel	-	0.16	-	0.14	-	0.17	-	0.56	-	0.22	-	0.9
27	Zinc (mg/l)	-	2.6	-	2.39	-	2.14	-	2.08	-	0.9	-	2.18
28	Iron (mg/l)	-	0.86	-	2.12	-	0.83	-	3.48	-	2.39	-	0.74
29	Arsenic (mg/l)	-	0	-	0	-	0	-	0	-	0	-	0

Sl. No	BIOMONITORING	STATION CODE											
		1796		1797		1798		1799		1800		1928	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1	Saprobic Score	-	-	-	-	-	-	-	-	-	-	5.85	6
2	Diversity Score	-	-	-	-	-	-	-	-	-	-	0.3	0.81
3	Water Quality	-	-	-	-	-	-	-	-	-	-	Mod	Mod
4	Water Quality Class	-	-	-	-	-	-	-	-	-	-	C	C
5	Indicator Colour	-	-	-	-	-	-	-	-	-	-	Green	Green

Station Code	Location	District	Latitude	Longitude	Monitoring frequency
1796	Full Nagarjan, Dimapur	Dimapur	25˚53.21′	93˚44.15′	M
1797	Bridge Near Purana Bazaar, Dimapur	Dimapur	25˚54.77′	93˚44.58′	M
1798	Near Check Gate (Dimapur-Khatkhati Road)	Dimapur	25˚55.66′	93˚44.832′	M
1799	Town Boundary Bridge(Diphu Road) Dimapur	Dimapur	25˚54.22′	93˚40.90′	M
1800	Nuton Bosti, (Naga Cemetery) Nagaland	Dimapur	25˚55.28′	93˚43.49′	M
1928	Nagaland- Assam Border, Dimapur, Nagaland	Dimapur	25˚557.11′	93˚45.46′	M

Table 1 (c): Water Analysis report showing different parameters of minimum and maximum values during 2018 is given below:

Sl. No	PARAMETERS	STATION CODE											
		1796		1797		1798		1799		1800		1928	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1	Dissolved Oxygen (mg/l)	3.6	9.2	3.4	9.2	3.6	9	2.4	8.8	0.8	3.4	3.1	8.8
2	pH	7	8	6.5	8	7	7.6	7	7.5	6.4	7.3	6.5	8.5
3	Conductivity (µS/cm)	34.1	268	71.1	512	83	295	48.5	201	77.5	321	23.8	331
4	BOD (mg/l)	0.8	**3.6**	1.6	**4.4**	1.6	**4.4**	0.8	**4.8**	**3**	**10.4**	2	**5.6**
5	Nitrate- Nitrogen (mg/l)	0.3	1.3	0.4	1.1	0.3	1.2	0.28	0.8	0.3	1.8	0.29	1
6	Turbidity (NTU)	8.01	531	4.97	591	4.76	565	17.1	213	2.66	464	2.49	474
7	Phenolphthalein Alkalinity (mg/l)	0	4	0	6	0	6	0	0	0	0	0	2
8	Total Alkalinity (mg/l)	32	126	36	152	34	130	48	96	56	130	32	140
9	Chloride (mg/l)	2	13.6	5.2	39	5	11.2	3.6	13.8	13.4	27.3	6	18.6
10	Chemical Oxygen Demand (mg/l)	14	44	24.4	45	14.9	50	16.1	68	26.2	71	12.9	43
11	Ammonia Nitrogen (mg/l)	0.03	0.55	0.04	2.1	0.11	1.3	0.04	0.32	1.22	4.6	0.19	0.97
12	Total Hardness (mg/l)	28	120	32	228	30	118	42	94	54	94	32	114
13	Calcium Hardness (mg/l)	14	56	16	70	18	68	22	44	30	62	18	68
14	Magnesium Hardness (mg/l)	3.41	15.61	3.9	40.01	2.92	17.57	4.39	14.15	2.92	14.15	3.42	17.08
15	Sulphate (mg/l)	18	36	26	43	23	46	20	36	18	33	23	43
16	Total Dissolved Solids (mg/l)	12	134	23	256	32	147	22.1	104	32	139	12	165
17	Total Suspended Solids(mg/l)	0.09	0.43	0.08	0.376	0.07	0.94	0.06	0.26	0.04	0.68	0.05	0.312
18	Phosphate (mg/l)	0.03	1.86	0.07	4.46	0.05	5.2	0.06	0.73	0.13	2.81	0.04	1.06
19	Boron (mg/l)	0.02	0.18	0.03	0.07	0.03	0.09	0.02	0.14	0.03	0.5	0.03	0.24
20	Potassium (mg/l)	4.2	9.3	4.4	12	4	7.3	3.9	10	6	13.5	4.3	7.1

Sl. No	PARAMETERS	STATION CODE											
		1796		1797		1798		1799		1800		1928	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
21	Fluoride (mg/l)	0.06	0.7	0.07	0.6	0.05	0.5	0.08	0.27	0.06	0.5	0.06	0.25
22	Cadmium (mg/l)	0.004	0.005	0.008	0.01	0.003	0.004	0.006	0.008	0.007	0.009	0.005	0.007
23	Copper (mg/l)	0.1	0.17	0.12	0.21	0.04	0.05	0.14	0.48	0.08	0.09	0.08	0.09
24	Lead (mg/l)	0	0.004	0	0.003	0	0.004	0	0.002	0	0.005	0	0.007
25	Chromium (mg/l)	0	0	0	0	0	0	0	0	0	0	0	0
26	Nickel	0	0.03	0	0.05	0	0.02	0	0.03	0	0.57	0	0.06
27	Zinc (mg/l)	0.09	2.14	0.16	2.21	0.12	1.57	0.11	1.82	0.52	1.45	0.13	2.46
28	Iron (mg/l)	0.21	0.61	0.16	0.43	0.29	0.42	0.22	3.35	0.19	2.59	0.09	0.66
29	Arsenic (mg/l)	0	0	0	0	0	0	0	0	0	0	0	0

Sl. No	BIOMONITORING	STATION CODE											
		1796		1797		1798		1799		1800		1928	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1	Saprobic Score	-	-	-	-	-	-	-	-	-	-	5.6	6
2	Diversity Score	-	-	-	-	-	-	-	-	-	-	0.44	0.8
3	Water Quality	-	-	-	-	-	-	-	-	-	-	Mod	Mod
4	Water Quality Class	-	-	-	-	-	-	-	-	-	-	C	C
5	Indicator Colour	-	-	-	-	-	-	-	-	-	-	Green	Green

Dissolved oxygen (DO) is the amount of oxygen present in the water in the dissolved form. In one of the drains at Naga Cemetery, Dimapur DO level was found very low on an average of 0.2 mg/l during 2016. As per designated best use, DO should be above 4mg/l and in all the monitoring station it was recorded above the prescribed standards.

Biochemical Oxygen Demand (BOD) is a measure of the quantity of oxygen used by microorganisms (e.g., aerobic bacteria) in the oxidation of organic matter. BOD is one of the most important indicators of pollution. At the same station at Naga Cemetery, Dimapur, the highest BOD was observed at 50 mg/l. As per designated best use, BOD should be below 3mg/l however, the high levels of BOD may be attributed to the discharge of domestic wastewater mostly in untreated form and the municipal waste thrown directly into the water bodies without treatment. The relatively high levels of BOD can also be attributed to the presence of decaying organic matter. The other reason for high BOD level may be due to increased runoff from urban and agricultural fields.

The requirement of river water quality for wild life and fish propagation also requires more stringent conditions and river water quality has to maintain adequate Dissolved Oxygen (DO) content so as to support survival of fish and other aquatic life.

4. IDENTIFIED POLLUTED RIVER STRETCHES IN THE STATE:

Based on the water quality data for the year 2016, 2017 and 2018 which was submitted to the Central Pollution Control Board (CPCB), in Nagaland, River Dhansiri has been identified as polluted river stretches under Priority I based on high concentration of BOD, the details of the polluted rivers stretches is given below in the **Table 2** below:

Table 2: Details of the polluted river stretches under Priority I in the state of Nagaland

SL. No	Name of the rivers/streams	Details	Identified polluted stretches	BOD range	Priority wise
1	Dhansiri	River Dhansiri originates from Laisang peak in Peren district and flows through Dimapur. It flows through a distance of 352 km from south to north before joining River Brahmaputra.	Polluted stretches are tributaries & drains of Dhansiri and downstream of Dimapur city.	30 mg/l	I

5. ACTION PLAN FOR RESTORATION OF POLLUTED RIVER STRETCHES OF RIVER DHANSIRI (PRIORITY-I):

The River Dhansiri originates from the Laisang peak in Peren district and flows through a distance of 352 km (219 miles) from south to north before joining the Brahmaputra on its south bank. It has a

total catchments area of 1,220 km² (470sq miles). For the first 37 kms from the source, the river flows in a north-western direction where after turning to the north-east it flows for about 75.635 kms upto Dimapur, thereafter the direction of flow is generally northerly upto Golaghat, Assam (***Figure 1***). The river receives almost all the western and southern drainages of Nagaland.

Figure 1: *Map showing the River Dhansiri and River Chathe and the catchment areas*

The Diphu River traverses its entire journey through the hills of Nagaland and outflows into the Dhansiri(s) 9.6 km downstream of Dimapur. The length of the river is 48 km.

The water quality of River Dhansiri and its tributaries is being monitored at six locations on monthly basis by the Nagaland Pollution Control Board under National Water Quality Monitoring Programme (NWMP).

The Biochemical Oxygen Demand (BOD) is one of the most common measures of pollutant organic material in water. BOD indicates the amount of permissible organic matter present in water. As per the NWMP report on Dhansiri River, it states that the organic pollution measured in terms of BOD varying on different points or sources in Dimapur. There are no major polluting industries in Dimapur that discharges effluents in large quantity to cause serious contamination. Therefore, the main source of pollution is due to domestic waste and municipal sewage which is being dumped and flows into the nullahs & river. All sorts of waste and untreated sewage are released randomly into

the Dhansiri River in absence of a sewage treatment facility. It is an important aspect for revival of river Dhansiri in context of its utility as it is an important Perennial River. Under the present status, it appears that river Dhansiri may serve the purpose of drinking, bathing and irrigation and for this objective, municipal sewage generated should be treated properly.

6. MAJOR TOWNS AND INDUSTRIAL POCKETS IN THE CATCHMENT OF RIVER DHANSIRI

The major towns located on the catchment of River Dhansiri are Dimapur city and East Dimapur. However, the main pollution load comprises after crossing Dimapur city which has a total population of 1,22,834 (*2011 census*) consisting of 23 administrative wards with 35,000 households, whereas East Dimapur comprises a total population of 27,000.

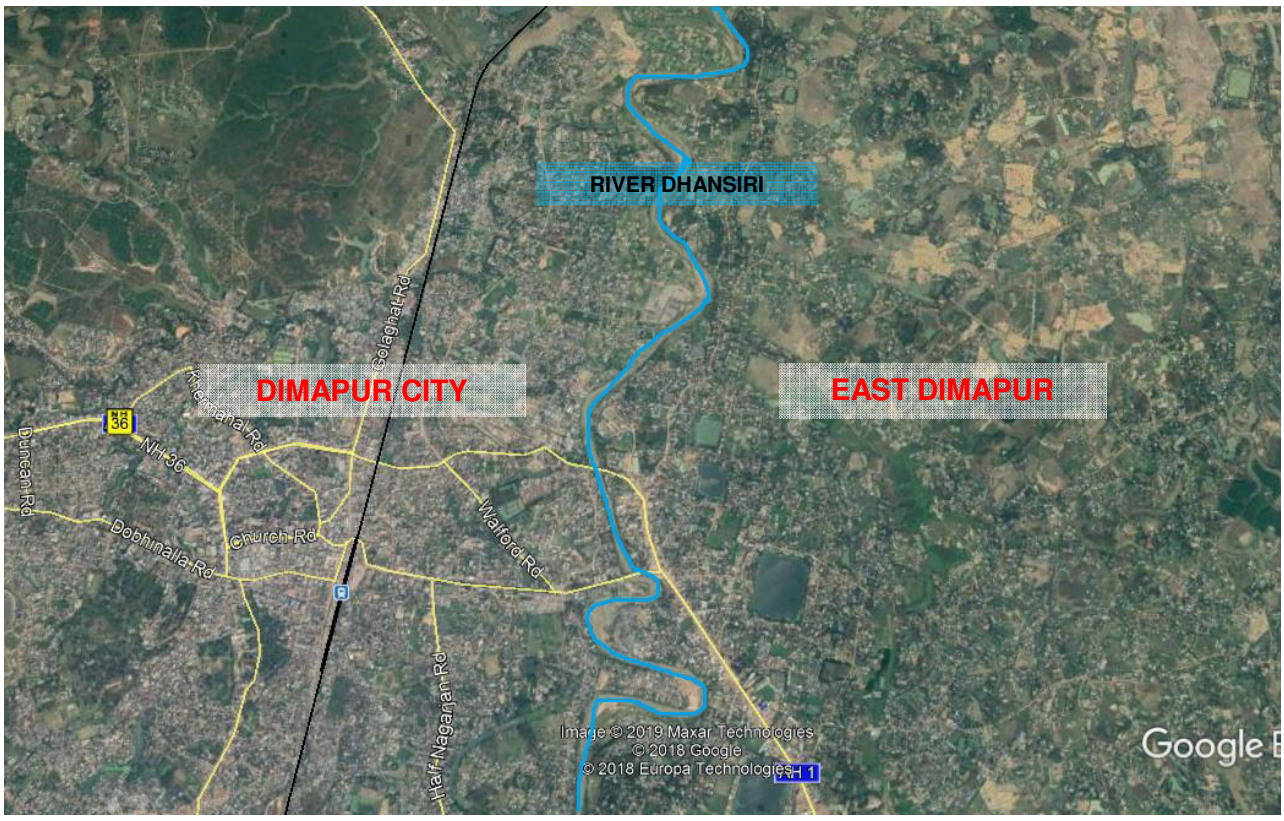

Figure 2: Map showing Dimapur city and East Dimapur along the catchment of River Dhansiri

There are no major industrials areas along the catchment of River Dhansiri, however, isolated industries are present in the catchment areas. The water polluting industry along the catchment of River Dhansiri is the M/s Modern Abattoir (Slaughter house) which has an ETP with a total capacity of 50 KLD, apart from this there is no such big industries consuming and generating waste water.

There is **no Common Effluent Treatment Plant (CEFT) in the state of Nagaland**.

7. MAJOR DRAINS CONTRIBUTING POLLUTION INTO RIVER DHANSIRI

There is no underground planned sewerage system in Dimapur and similar situation exist in other towns of the state, thus sewage management is being done with natural slope in open drain system leading to valleys. Means of night soil disposal is mostly through septic tanks, two pit privies.

There are 3 major drains contributing to the pollution load in the River Dhansiri which finally merges into River Dhansiri, the details are mentioned in the **Table 3** given below.

Table 3: Details of the major drains contributing to river Dhansiri

Sl. No	Details of nallah & Code	Latitude	Longitude	Altitude	Name of the Nallah and Location
1	Hospital Nullah (HN)	25˚54.763'N	093˚44.584'E	126 m	Near Purana bazaar bridge
2	Lengri Nullah (LN)	25˚55.922'N	093˚44.359'E	126 m	Below bridge, near slaughter house
3	Sugarmill Nullah(SGN)	25˚55.194'N	093˚45.036'E	133 m	Near Darogajan gate

A map showing the drains and wards/colonies contributing to pollution load and submerging into river Dhansiri is given in ***Figure 3*** below.

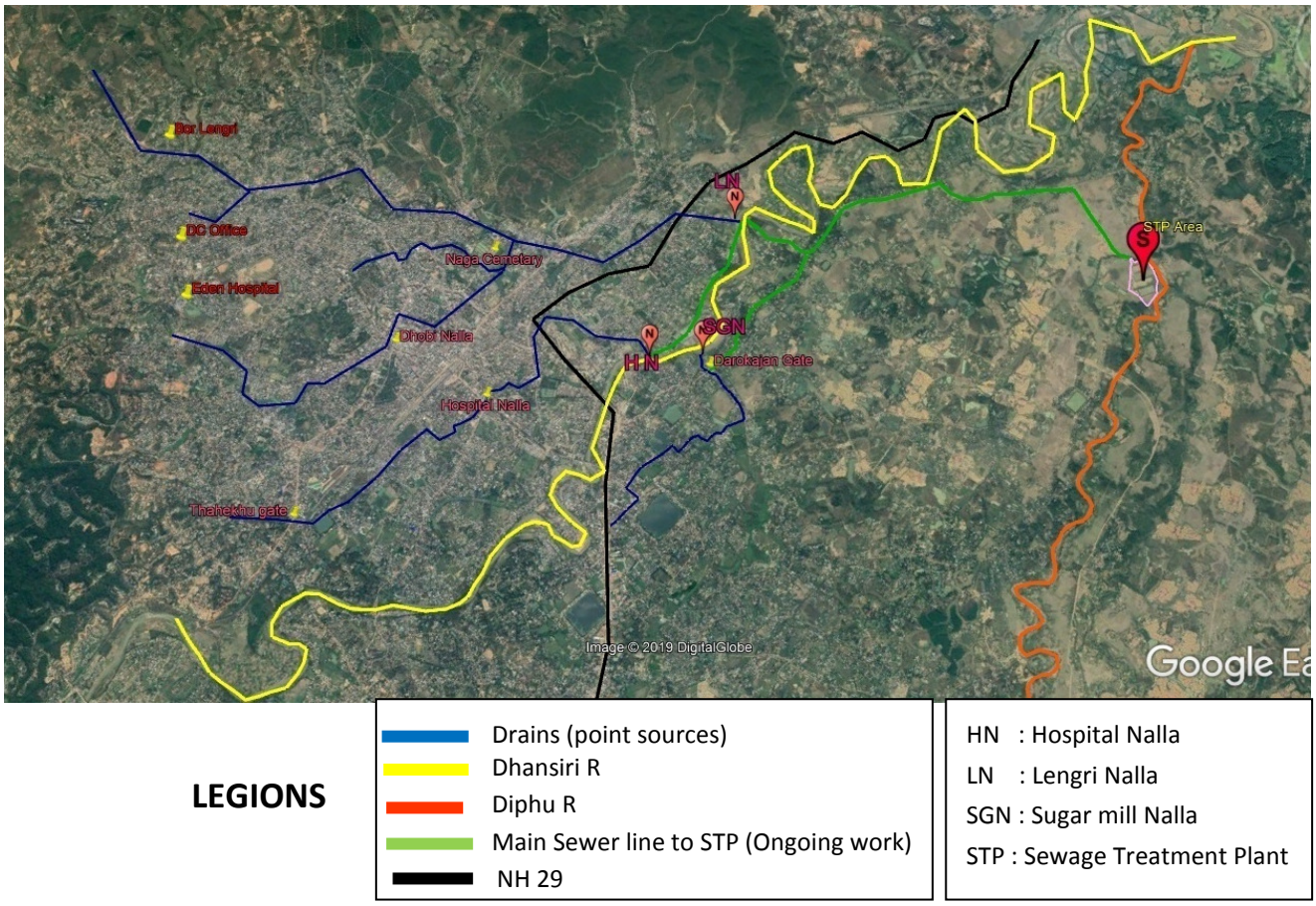

Figure 3: *Map showing the three major drains contributing to River Dhansiri and the site of the proposed STP*

The analysis report and the water quality of all the drains are shown in the ***Table 4*** given below:

Table 4: Analysis reports of different parameters for the three major drains.

Sl. No.	Parameter	Hospital Nullah (HN)	Lengri Nullah (LN)	Sugarmill Nullah (SGN)
1	Depth (cm)	23	28	27
2	Colour	Clear	Clear	Clear
3	Odour	Unpleasant	Septic	Unpleasant
4	Velocity (m/sec)	0.3	0.28	0.32
5	Water Temperature (˚C)	29.6	26.8	25.4
6	Air Temperature (˚C)	25.7	25	25.9
7	Dissolved Oxygen (mg/l)	4	0.8	3.04
8	pH	7.3	6.9	7.1
9	Conductivity (µS/cm)	325	559	344
10	Biochemical Oxygen Demand (mg/l)	**6.4**	**8.28**	**5.02**
11	Nitrate- Nitrogen (mg/l)	0.7	0.8	0.7
12	Turbidity (NTU)	46	15.65	9.63
13	Phenolphthalein Alkalinity (mg/l)	0	0	0
14	Total Alkalinity (mg/l)	238	384	232
15	Chemical Oxygen Demand (mg/l)	92	63	89
16	Ammonia- Nitrogen (mg/l)	3.2	3.23	1.97
17	Total Hardness (mg/l)	84	88	108
18	Calcium Hardness (mg/l)	40	70	72
19	Magnesium Hardness (mg/l)	10.37	4.39	8.78
20	Total Dissolved Solids (ppm)	143	258	163
21	Total Suspended Solids (mg/l)	0.26	0.18	0.12
22	Phosphate (mg/l)	0.48	1.5	0.47
23	Boron (mg/l)	0.06	0.08	0.07
24	Potassium (mg/l)	7.6	11.7	17.1
25	Fluoride (mg/l)	0.07	0.08	0.06

The discharge from the 3 major drains of River Dhansiri is given in **Table 5** below:

Sl. No.	Drains	Discharge (m^3/s)	
		Peak discharge	Lean discharge
1	Hospital Nullah (HN)	0.035	0.02
2	Lengri Nullah (LN)	0.089	0.06
3	Sugarmill Nullah (SGN)	0.05	0.025

8. NATIONAL WATER QUALITY MONITORING PROGRAMME (NWMP) ALONG THE RIVER DHANSIRI

In order to assess the water quality in the state, the Nagaland Pollution Control Board in collaboration with the Central Pollution Control Board under the National Water Quality Monitoring Programme (NWMP) monitors 6 (six) stations in the river Dhansiri, which are monitored on a monthly basis. Groundwater quality from 10 stations is monitored in Dimapur on a half yearly basis. The NWMP locations with coordinates are given in the **Table 6** below:

Table 6: Water Monitoring Stations at River Dhansiri and its tributaries:

District	Latitude & Longitude	Monitoring Location	Photos
Dimapur	25˚53.21' N 93˚44.15' E	Full Nagarjan, Dimapur	
Dimapur	25˚54.77' N 93˚44.58' E	Bridge near Purana Bazaar, Dimapur	
Dimapur	25˚55.66' N 93˚44.832' E	Near check gate (Dimapur-Khatkhati Road)	
Dimapur	25˚54.22' N 93˚40.90' E	Town boundary bridge (Diphu road) Dimapur	
Dimapur	25˚55.28' N 93˚43.49' E	Nuton Bosti, (Naga Cemetery) Dimapur, Nagaland	

Dimapur	25˚557.11' N 93˚45.46' E	Nagaland - Assam border, Dimapur, Nagaland	

Biochemical Oxygen Demand (BOD) is one of the most common measures of pollutant organic material in water. BOD indicates the amount of permissible organic matter present in water. As per the National Water Quality Monitoring Programme report on Dhansiri River, it states that the organic pollution measured in terms of bio-chemical oxygen demand (BOD) varying on different points or sources in Dimapur. There are no major polluting industries in Dimapur that discharges effluents in large quantity to cause serious contamination. Therefore, the main source of pollution is due to domestic waste and municipal sewage which is being dumped and flows into the nullahs & river. All sorts of waste and untreated sewage are released randomly into the Dhansiri River in absence of a sewage treatment facility. The details of the River Dhansiri are as follows:

Table 7: Details of River Dhansiri

Name of the rivers/streams	Details	Identified polluted stretches	Priority wise
Dhansiri (Nagaland)	River Dhansiri originates from Laisang peak in Peren district and flows through Dimapur. It flows through a distance of 352 km from south to north before joining River Brahmaputra.	Polluted stretches are tributaries & drains of Dhansiri and downstream of Dimapur city.	I

Comparison of the Annual Average value of DO and BOD in the Upstream and Downstream of River Dhansiri for the year 2016 to 2019 is given in the **Table 8** below:

Table 8: Upstream and Downstream value of River Dhansiri for the year 2016 to 2019.

Sl. No.	Year	Parameter of annual average value	River Dhansiri	
			Upstream (Full Nagarjan-1796)	Downstream (Nagaland-Assam Border-1928)
1	2016	Dissolved Oxygen (mg/l)	4.26	3.38
		Biochemical Oxygen Demand (mg/l)	**3.5**	**8**
2	2017	Dissolved Oxygen (mg/l)	4.77	4.46
		Biochemical Oxygen Demand (mg/l)	**3.39**	**5.15**
3	2018	Dissolved Oxygen (mg/l)	5.83	5.66
		Biochemical Oxygen Demand (mg/l)	2.15	**3.87**
4	2019 (January to June)	Dissolved Oxygen (mg/l)	5.63	5.51
		Biochemical Oxygen Demand (mg/l)	1.83	**3.38**

9. LATEST WATER QUALITY CHARACTERISTICS OF RIVER DHANSIRI:

In order to assess the water quality in the state, the Nagaland Pollution Control Board in collaboration with the Central Pollution Control Board under the National Water Quality Monitoring Programme (NWMP) monitors 28 (twenty eight) stations in Nagaland. Four major rivers namely Dhansiri and Chathe at Dimapur, Dzu at Kohima and Milak at Mokokchung are monitored on monthly basis. Groundwater quality sources are monitored from 10 stations on half yearly basis.

The water quality monitoring data have been analysed with respect to indicator of the Biochemical Oxygen Demand (BOD). The BOD measures the oxygen consumed by microorganisms in the oxidation of organic matter under specified incubation period. At the Station 1800, Naga Cemetery in Dimapur the highest BOD has reported at 6.72 mg/l. As stated by the designated best use, BOD should be below 3mg/l however, the discharge of domestic wastewater/sewage mostly in untreated form and the municipal waste thrown directly into the water bodies/nullahs/drains has been identified as prime source for this contaminates. The other reason for high BOD level may be due to increased runoff from urban and agricultural fields.

The Dissolved Oxygen (DO) is the amount of oxygen present in the water in the dissolved form. In the same nullah/drains at Naga Cemetery, Dimapur the DO level was found low on an average of 2.2 mg/l during 2018. As per designated best use, DO should be above 4mg/l and in all the monitoring station it was recorded above the prescribed standards.

The water analysis data for all the stations along the river Dhansiri for the year 2018 and 2019 (Jan-June) has been shown in the Tables 9 (a) & (b) given below:

Table 9 (a): Water Analysis Report showing the average values of different parameters during the year 2018 for River Dhansiri is given below:

Sl. No.	PARAMETERS	STATION CODE					
		1796	1797	1798	1799	1800	1928
1	Dissolved Oxygen (mg/l)	5.83	5.63	5.82	5.70	2.28	5.66
2	pH	7.4	7.32	7.4	7.25	6.8	7.35
3	Conductivity (µS/cm)	155.5	195.6	183.1	144.2	212.9	166.8
4	BOD (mg/l)	2.15	2.88	**3.25**	**3.04**	**6.72**	**3.87**
5	Nitrate- Nitrogen (mg/l)	0.60	0.67	0.56	0.50	0.7	0.56
6	Turbidity (NTU)	156.6	130.8	138.6	89.8	70.1	99.8
7	Phenolphthalein Alkalinity (mg/l)	0.83	0.83	0.5	0	0	0.16
8	Total Alkalinity (mg/l)	77	83.5	78.3	71.4	87.5	74.5
9	Chloride (mg/l)	8.1	16.4	8.5	7.4	17.3	10.6
10	Chemical Oxygen Demand (mg/l)	23.8	32.1	28	38.5	41.3	24.3
11	Ammonia Nitrogen (mg/l)	0.20	0.45	0.41	0.18	2.6	0.5
12	Total Hardness (mg/l)	76.6	89.5	80.6	63.6	71.5	72.6

Sl. No.	PARAMETERS	STATION CODE					
		1796	1797	1798	1799	1800	1928
13	Calcium Hardness (mg/l)	36.6	37.1	39.2	33.1	40.6	33.3
14	Magnesium Hardness (mg/l)	9.7	12.7	10.1	7.4	7.5	9.8
15	Sulphate (mg/l)	28.4	32.8	32.5	29.9	24.3	32.4
16	Total Dissolved Solids (mg/l)	77	96	90	71.5	100.3	81.8
17	Total Suspended Solids(mg/l)	0	0	0	0.14	0.19	0.22
18	Phosphate (mg/l)	0.47	0.61	1	0.25	0.73	0.36
19	Boron (mg/l)	0.08	0.04	0.05	0.06	0.07	0.07
20	Potassium (mg/l)	5.6	6.5	5.5	5.7	8.6	5.04
21	Fluoride (mg/l)	0.19	0.21	0.19	0.16	0.16	0.15
22	Arsenic (mg/l)	0	0	0	0	0	0
23	Cadmium (mg/l)	0.12	0.11	0.09	0.33	0.33	0.09
24	Copper (mg/l)	0.13	0.16	0.04	0.31	0.08	0.08
25	Lead (mg/l)	0.004	0.003	0.004	0.002	0.005	0.007
26	Nickel	0.03	0.05	0.02	0.03	0.57	0.06
27	Zinc (mg/l)	1.11	1.18	0.84	0.96	0.98	1.29
28	Iron (mg/l)	0.41	0.29	0.35	1.75	1.39	0.37
BIO- MONITORING							
29	Saprobic Score	-	-	-	-	-	5.8
30	Diversity Score	-	-	-	-	-	0.62
31	Water Quality	-	-	-	-	-	Moderate
32	Water Quality Class	-	-	-	-	-	C
33	Indicator Colour	-	-	-	-	-	Green

Table 9 (b): Water Analysis Report showing Average Value of different parameters during the year 2019 (Jan-June) is given below:

Sl. No.	PARAMETERS	STATION CODE					
		1796	1797	1798	1799	1800	1928
1	Dissolved Oxygen (mg/l)	5.64	5.68	5.67	5.77	**0.84**	5.51
2	pH	7.99	7.46	7.6	7.6	7.06	7.48
3	Conductivity (µS/cm)	208	271	227	181	305	232
4	BOD (mg/l)	1.83	2.5	**3.13**	1.84	**10.16**	**3.38**
5	Nitrate- Nitrogen (mg/l)	0.51	0.71	0.7	0.65	0.9	0.65
6	Turbidity (NTU)	28.30	22.00	26.37	63.11	11.28	27.87
7	Phenolphthalein Alkalinity (mg/l)	1.33	1.33	0.66	0	0	1.33
8	Total Alkalinity (mg/l)	109	148	115	120.3	162.1	113.3
9	Chloride (mg/l)	7.91	7.58	9.28	5.4	23.01	12.3
10	Chemical Oxygen Demand (mg/l)	71.5	55.66	40	26.33	74	47.83
11	Ammonia Nitrogen (mg/l)	0.16	1.45	0.60	0.14	2.99	1.16
12	Total Hardness (mg/l)	83	97	85	81.33	77.66	85.66
13	Calcium Hardness (mg/l)	40.33	47	45.66	41.33	47.33	43.66
14	Magnesium Hardness (mg/l)	10.48	12.04	9.52	9.75	7.39	10.23
15	Total Dissolved Solids (mg/l)	101.4	131.5	111.0	101	146.3	116.5
16	Total Suspended Solids(mg/l)	0.326	0.3	0.19	0.225	0.223	0.265
17	Phosphate (mg/l)	0.651	0.236	0.241	0.203	0.596	0.278
18	Boron (mg/l)	0.033	0.045	0.046	0.03	0.05	0.038
19	Potassium (mg/l)	4.28	6.24	5.2	3.3	8.3	4.66
20	Fluoride (mg/l)	0.056	0.056	0.181	0.121	0.066	0.316

Sl. No.	PARAMETERS	STATION CODE					
		1796	1797	1798	1799	1800	1928
21	Arsenic (mg/l)	0	0	0	0	0	0
22	Cadmium (mg/l)	0.007	0.003	0.004	0.039	0.008	0.004
23	Copper (mg/l)	0.22	0.08	0.1	0.23	0.08	0.09
24	Lead (mg/l)	0.002	0.002	0.003	0.002	0.004	0.005
25	Chromium (mg/l)	0	0	0	0	0	0
26	Nickel	0.02	0.03	0.02	0.01	0.03	0.04
27	Zinc (mg/l)	0.25	1.33	1.6	0.1	0.23	1.75
28	Iron (mg/l)	0.47	0.17	0.12	2.59	1.44	0.34
BIO- MONITORING							
29	Saprobic Score	-	-	-	-	-	5.3
30	Diversity Score	-	-	-	-	-	0.57
31	Water Quality	-	-	-	-	-	Moderate
32	Water Quality Class	-	-	-	-	-	C
33	Indicator Colour	-	-	-	-	-	Green

Station Code	Location	District	Type	Latitude	Longitude	Monitoring frequency
1796	Full Nagarjan	Dimapur	R	25°53.21′	93°44.15′	M
1797	Bridge near Purana Bazaar	Dimapur	R	25°54.77′	93°44.58′	M
1798	Near Check Gate (Dimapur-Khatkhati Road)	Dimapur	R	25°55.66′	93°44.832′	M
1799	Town Boundary Bridge (Diphu Road)	Dimapur	R	25°54.22′	93°40.90′	M
1800	Nuton Bosti, (Naga Cemetery)	Dimapur	R	25°55.28′	93°43.49′	M
1928	Nagaland- Assam Border	Dimapur	R	25°557.11′	93°45.46′	M

10.OBJECTIVE OF THE ACTION PLAN-ACHIEVABLE TARGETS:

It is an important aspect for revival of river Dhansiri in context of its utility as it is an important Perennial River. The ultimate goal for beneficial use of river will determine the level of actions to be taken for maintaining the water quality. ***Under the present circumstances, it appears that river Dhansiri may serve the purpose of bathing and irrigation and for this objective, municipal sewage generated should be treated properly.***

The requirement of river water quality for wild life and fish propagation also requires more stringent conditions and river water quality has to maintain adequate Dissolved Oxygen (DO) content so as to support survival of fish and other aquatic life. Municipal sewage which flows to River Dhansiri should be treated to meet the effluent discharge stipulated under Schedule – VI of the Environment (Protection) Rules, 1986, as well as the criteria given below in the **Table 10.**

Table 10: Suggested criteria for irrigation, wild life and survival of fish life:

Sl. No	Parameters	Class B (Outdoor bathing criteria)	Class 'D' Water Quality Criteria –for Propagation of Wildlife and Fish	Class 'E' Water Quality Criteria for Irrigation
1	pH	6.5 to 8.5	6.5 to 8.5	6 to 8.5
2	Dissolved Oxygen (DO)	5mg/l or more	≥ 4.0 mg/l	-
3	Sodium Absorption Ratio	-	-	≤ 26
4	Boron	-	-	≤ 26
5	Free Ammonia	-	≤ 1.2 mg/l	-
6	Electrical Conductivity at 25 ° C µmhos/cm	-	-	≤ 2250
7	BOD	3mg/l	-	-
8	Fecal coliform	500MPN/100ml	-	-

The Basis of Proposed Action Plan for rejuvenation of polluted river Dhansiri in Nagaland:

(i) Analysis reports of Nagaland Pollution Control Board & Central Pollution Control Board.

(ii) Order of the Hon'ble NGT (PB) New Delhi, titled "More river stretches are now critically polluted": CPCB (OA. 673/ 2018 in the matter of news item publish in the Hindu authored Shri. Jacob Koshy.

The National Water Quality Monitoring Programme under the Ministry of Environment and Forests and Climate Change (MoEF&CC) has listed Dhansiri river, running along the stretch of Dimapur, under the category of 'Polluted Rivers' (Priority I) in the country indicating that the water quality of Dhansiri river is degrading further beyond human consumption or even for bathing.

11. IDENTIFICATION OF SOURCES OF POLLUTION:

Major sources of pollution in River Dhansiri are:

i. Sewage / municipal drainage from the Dimapur city.
ii. Improper disposal of solid waste into the drains.
iii. Industrial effluents from the isolated located industries.

12. COMPONENTS OF ACTION PLAN:

Following components have been identified for preparation of action plan for rejuvenation of river in compliance to the Hon'ble NGT Orders. The proposed action plan covers following components:

SOURCE CONTROL

Source control includes industrial pollution and disposal of domestic sewage as detailed below:

12.1 **Channelization, treatment, utilization and disposal of treated domestic sewage:**

(a) Identification of towns and villages in the catchment of river Dhansiri and estimation of quantity of sewage generation.

(b) Storm water drains now carrying sewage and sullage joining river Dhansiri and interception and diversion of sewage to STPs.

(c) Treatment and disposal of septage and controlling open defecation.

(d) Identification of towns and villages for installing sewerage system and sewage treatment plants.

12.2 **Waste Management:**

(a) Collection, segregation, transportation, disposal and treatment of municipal solid wastes generated from town in accordance of provisions of the Solid Waste Management Rules, 2016.

(b) Restriction of illegal disposal of solid waste along the river bank and flood plain zones.

(c) Burning of solid waste should be strictly prohibited.

(d) Construction and demolition wastes should be disposed in designated areas and no case it should be disposed into river beds or flood plain zone.

12.3 **Industrial Pollution Control:**

(a) Inventorization of industries

(b) Category of industry and effluent quality

(c) Treatment of effluents, compliance with standards and mode of disposal of effluents

12.4 **Flood Plain Zone:**

(a) Regulating activities in flood plain zone.

(b) Management of Municipal, Plastic, Hazardous, Bio-medical and Electronic wastes.

(c) Afforestation in the catchment and aesthetic plantation programs.

(d) Improve irrigation practices.

12.5 **Ecological/Environmental Flow (E-Flow):**

(a) Issues relating to E-Flow.

(b) Irrigation practices.

13. DETAILED GAP ANALYSIS:

Detail gap analysis with regard to sewage, industrial effluents, waste (municipal solid waste, industrial hazardous waste, biomedical waste, plastic waste, construction and demolition waste) waste management are detailed below:

13.1 SEWAGE MANAGEMENT:

The major town attributing to River Dhansiri are Dimapur town and East Dimapur which are the main contributors of pollution load. Dimapur town has a total population of about 1,22,834 (2011 census) and the population is expected to grow 2,71,350 by 2035, whereas, East Dimapur has a population of 27,000 which is expected to grow by 59,644. Main source of water supply for this two towns are groundwater supply i.e. ring wells and bore wells. Considering, water supply is consumed at 135 LPCD, the sewage flow is considered as 80% of the net water supplied to the consumer which accounts to waste water generation of 16.19 MLD.

Presently, there are no STP in the Dimapur city, however, a project "Pollution abatement of rivers Diphu & Dhansiri" was approved and sanctioned by Ministry of Environment, Forests & Climate Change under National River Conservation Plan with 25.43 MLD capacity based on Waste Stabilization Pond Technology which will be implemented and 44% of the physical work is completed by the Public Health Engineering Department. The detail gap analysis of River Dhansiri is given in the **Table 11.**

Table 11: Detail GAP analysis of water consumption and generation in Dimapur city.

Sl. no	Town or City	Population (2011 census)	Expected population (in 2035)	Total Water consumption (at 135 LPCD) in MLD	Total sewage generation (80% of total water consumption) in MLD	Existing STPs details		GAP
						Total no. of STPs	Total capacity	
1	**Dimapur**	1, 22,834	271350	16.58	13.27	1 (under construction)	25.43 MLD	-9.24 MLD
2	**East Dimapur**	27,000	59644	3.65	2.92			
	TOTAL	**1,49,834**	**3,30,994**	**20.23**	**16.19**			

Presently, the total sewage generation consisting of both Dimapur town and East Dimapur is about 16.19 MLD, however, the present STP which is under construction has a total capacity of 25.43 MLD, therefore, it has a **Gap analysis of -9.24 MLD**.

Picture 1: Installation of sewer line at Dimapur by the PHED Department for Sewage Treatment Plant (STP)

However, taking into consideration base on the projected population of 3,30,994 in the year 2035, the estimated gap analysis in sewage management is 19.25 MLD.

Septic tanks have been made by individual households for disposal of sewage and the supernatant is directly or indirectly disposed off in nearby drains which join into the 3 major drains which finally merges into River Dhansiri.

Dimapur Municipal Council (DMC) under the AMRUT SAAP–I had constructed Septage Management Plant of 30 KLD capacity at Burma Camp, Dimapur. The Septage Management Plant is in operation.

Picture 2: Construction of Septage Management Plant at Burma Camp, Dimapur

13.2 INDUSTRIAL EFFLUENT MANAGEMENT:

There is no industrial estate in the catchment of river Dhansiri, however, some of the industries are in isolation. There are **615 number of industries in Dimapur city comprising of 6 nos. of Red Category, 296 nos. of Orange Category, 294 nos. of Green Category and 19 in White Category majorly comprising of stone crushers, brick kilns, steel fabrication, tyre retreading, mechanised furniture unit, etc** (*Annexure 1*).

The total amount of water consumption by the different category of industries is about 157 KLD and the amount of industrial effluent generated is 44.3 KLD. However, in Red Category there is only 1 (one) water polluting industries i.e. M/s. Modern Abattoir Unit, Burma Camp, Dimapur which is generating waste water of about 16.27 KLD, however, it has an ETP with a capacity of 50 KLD. Whereas, in Green and Orange category the industries are mainly small scale industries and the water consumption is not high. However, there is a Gap analysis of 11 KLD and 7.3 KLD in Orange and Green category respectively.

There are four (4 Nos) Hospitals with ETPs with a total capacity of 259 KLD and generating waste water of about 156 KLD.

All the 615 numbers of industries have been issued consent under Air (Prevention & Control of Pollution) Act, 1981 and Water (Prevention & Control of Pollution) Act, 1974.

The samples of effluent from the ETPs are tested from time to time to check if the industries are complying as per the treated effluent standards. All the units operating ETPs facility are complying with the discharge norm as prescribed.

Table 12: Details of industries with water consumption and generation:

Sl. No	Type of industries	Number of industries	Total Water consumption	Total industrial effluent generation	Existing treatment facilities		GAP
					Total no. of ETPs	Total capacity	
1	Red	6	76 KLD	26 KLD	1	50 KLD	-24 KLD
2	Orange	296	52 KLD	11 KLD	-	-	100%
3	Green	294	29 KLD	7.3 KLD	-	-	100%
4	White	19	-	-	-	-	-

13.3 MUNICIPAL SOLID WASTE MANAGEMENT:

Dimapur town is the major town in the catchment area of river Dhansiri. The Dimapur Municipal Council (DMC) and East Dimapur Town Council is the authority for collection, handling and disposal of municipal solid waste. There are 23 (twenty three) wards under the Dimapur Municipal Council.

A table showing the details of the towns in the catchment area of the Dhansiri River:

Table 13: Detail of the two towns projecting the waste generation

Sl. no	Town or City	Population (2011 census)	Expected population (in 2035)	Total solid waste generation (at 0.35 kg per head per day) in TPD	Existing treatment facility		GAP
					Total no. of Treatment facilities	Total capacity	
1	Dimapur	1, 22,834	2,71,350	109 TPD	Nil	-	100%
2	East Dimapur	27,000	59,644	9.4 TPD	Nil	-	100%

For managing the municipal solid waste, a Solid Waste Management Project has been proposed by the Dimapur Municipal Council (DMC) under Swachh Bharat Mission to the Ministry of Housing and Urban Affairs (MoHUA) with a total sanction of **Rs. 1,10.72 crores** (***One Hundred Ten Crores and Seventy Two Lakhs only***) wherein development of the scientific waste management facilities for Dimapur City will include Recycling Plant, bio-fertilizer production, particle board from waste matters and bricks will be manufactured. Only 5 to 10 % of the waste will land filled. However, financial assistance is still awaited.

The legacy waste in the DMC dumping site is in the bioremediation process is being implemented with the technical support from Dr. Ragini Jain, Founder & CEO Geetanjali

Envirotech & National Technical Expert in Swachh Bharat Mission India, SA UNEP Tech Partner, Member of ISWA.

Picture 3: Aerial view of Dimapur Municipal Council waste dump site in-process Bioremediation

Bioremediation process will be continued till the Solid Waste Management Project under Swachh Bharat Mission by Ministry of Urban Development is completed.

The Dimapur Municipal Council (DMC) has started the process of bio-mining in the existing dumpsite after the wastes are treated and bioremediated.

13.4 INDUSTRIAL HAZARDOUS WASTE:

There is only 1 (one) industrial hazardous wastes generating industry generating hazardous waste which is given below, however, the sludge generated is taken to IOC refinery in Assam following manifest as per Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2016 as amended. ***Therefore, considering the economic viability option for disposal of hazardous generated from only one industry no hazardous waste treatment, storage and disposal facility in Nagaland at this stage is required.***

Table 14: Detail of the industry handling hazardous waste:

Sl. no	Name & address of the industry	Name & quantity of hazardous chemicals being handled	Hazardous waste Generation in TPA
1	Indian Oil Corporation Limited, Dimapur Depot, Kevijau Colony, Dimapur- 797112, Nagaland	HSD-6280 KL MS- 1580 KL SKO- 2990 KL **Total: 10850 KL**	1500 kg/annum (1.5 TPA)

13.5 BIOMEDICAL WASTE MANAGEMENT:

There are about 75 numbers of Non bedded Clinics/Laboratory and 26 numbers of bedded Hospitals/ Nursing Homes operating in Dimapur city. **It is estimated that about 269 Kg/day biomedical waste is generated from these healthcare facilities** (*Annexure 2*).

Out of the 26 number of bedded hospital only 4 hospitals has ETP, the remaining 22 hospitals do not have ETPs and thus discharge the waste water directly into drains. The four (4) hospitals with ETPs facility are namely:

Table 15: List of Hospitals with Effluent Treatment Plant.

Sl. No	Name of the hospital	Capacity of the ETP (Litres/day)	Waste water generation
1.	M/s. Nikos Hospital & Research Centre Midland, Dimapur.	50,000 Litres/day	26,000 Litres/day
2.	M/s. Eden Medical Centre, Kashiram, Dimapur.	50,000 Litres/day	30,000 Litres/day
3.	M/s. Christian Institute of Health Sciences & Research, 4th Mile, Dimapur.	84,000 Litres/day	54,000 Litres/day
4.	M/s Zion Hospital & Research Centre, Purana Bazar, Dimapur	75,000 Litres/day	46,000 Litres/day

There is no Common Bio-medical Waste Treatment Facility (CBMWTF) in the state of Nagaland. Most of the HCFs are disposing their biomedical waste through deep burial, and the municipal waste generated is being collected by the Dimapur Municipal Council and East Dimapur Town Council for final disposal in the dumping yard. However, considering the environmental pollution control point of view there is a need for development of at least 1 (one) small scale CBWTF facility in the catchment of river Dhansiri.

13.6 CONSTRUCTION & DEMOLITION WASTE:

Presently there is no proper inventory with regard to the generation of construction and demolition waste, same is required to be carried out to develop adequate infrastructure for management of C&D waste generating in the catchment of river Dhansiri.

The concerned departments/ULBs have to identify land for disposing off the construction and demolition waste. **However, at present the generated construction and demolition wastes are used for filling up in low lying areas.**

13.7 GROUNDWATER QUALITY MONITORING:

Groundwater is an important source for drinking as well as for other useful activities. About 70% of the population in Dimapur district depends on groundwater. The groundwater quality management

is performed under the provision of the Water (Prevention and Control of Pollution) Act, 1974. The National Water Quality Monitoring Programme (NWMP) facilitates evaluation of nature and extent of pollution and effectiveness of pollution control measures, water quality trends and prioritization of pollution control efforts.

In collaboration with the Central Pollution Control Board the Nagaland Pollution Control Board (NPCB) under the NWMP monitors 8 stations from Ground water source in and around Dimapur District twice a year i.e., April and October. The NPCB follows the Monitoring Protocol as recommended by the Central Pollution Control Board and the Results are referred according to the Indian Standard Drinking Water Specification (Second Revision), BIS 10500:2012. Apart from field observations, 20 Core and General Parameters (physico-chemical) and 8 parameters of Trace Metals are measured/analyzed at the NPCB Laboratory. Assessment of pesticides could not be carried out; however, it will soon monitor and assess along with the other parameters.

The details of the sampling station along with location and the annual average value of different parameters are provided in the **Tables 16 to 18** given below.

Table 16: The list of NWMP stations monitoring the ground water quality is given below:

Station Code	Location	District	Type	Latitude	Longitude
2898	Openwell at Doyapur Dhansiripar	Dimapur	W	25˚45'41"	93˚36'01.6"
2899	Borewell at Dhansiripar	Dimapur	W	25˚47'11.5"	93˚37'35.9"
2900	Open well at Toulazouma village	Dimapur	W	25˚52'10.8"	93˚44'06.1"
2901	Open well at Lungwiram village	Dimapur	W	25˚52'57.7"	93˚44'36.7"
2902	Borewell at Thahekhu village	Dimapur	W	25˚52'00.6"	93˚42'55.6"
2903	Open well at Signal Angami village	Dimapur	W	25˚53'32.8"	93˚42'37.6"
2904	Open well at Naga Cemetery	Dimapur	W	25˚55'11.5"	93˚43'29.9"
2905	Borewell at Signal Point	Dimapur	W	25˚53.757′	93˚43.203′

Note: *W – (ring well & borewell)*

Table 17: Groundwater analysis report showing Average Value of different parameters during the year 2018 is given below:

Sl. No	PARAMETERS	Station code								IS 10500: 2012 norms for drinking water
		2898	2899	2900	2901	2902	2903	2904	2905	
1	Dissolved Oxygen (mg/l)	-	-	-	-	-	-	-	-	-
2	pH	5.75	7	6.5	6.5	8	7.1	6.65	6.4	**6.5-8.5**
3	Conductivity (µS/cm)	157	251	201.5	216.5	374	781	723	794.5	-
4	Nitrate- Nitrogen (mg/l)	2.3	0.3	1.5	9.95	0.26	0.33	5.9	0.4	-
5	Turbidity (NTU)	3.6	2.8	18.1	0.9	2.9	3.5	1.8	1.5	-
6	Phenolphthalein Alkalinity (mg/l)	0	5	0	0	8.15	0	0	0	**1**

7	Total Alkalinity (mg/l)	20	135	44	45	208	140	105	39	**-**
8	Chloride (mg/l)	27.8	9.2	27	13.4	6.8	29	167	29	**200**
9	Chemical Oxygen Demand (mg/l)	17.2	15.2	11	7.3	13	7.4	31.2	6.6	**250**
10	Ammonia Nitrogen (mg/l)	0.5	0.67	.016	0.08	0.73	1.48	11.12	0.2	**-**
11	Total Hardness (mg/l)	40	53	63	88	89	192	130.5	151	**0.5**
12	Calcium Hardness (mg/l)	21	10	43	67	20	117	37.5	111	**200**
13	Magnesium Hardness (mg/l)	4.6	10.4	4.8	5.1	16.8	32	22.6	9.7	**75**
14	Sulphate (mg/l)	19	21.5	24.5	22.5	26.5	34	25.5	26	**30**
15	Total Dissolved Solids (mg/l)	87.1	119.5	95	105	176.5	373	242	397	**-**
16	Total Suspended Solids(mg/l)	0.3	0.3	0.3	0.3	0.6	0.6	0.22	1.3	**500**
17	Phosphate (mg/l)	0.05	0.18	0.08	0.04	0.15	0.68	0.11	0.06	
18	Boron (mg/l)	0.02	0.02	0.03	0.09	0.05	0.05	0.07	0.22	**0.5**
19	Potassium (mg/l)	3	3.7	3.4	3.9	3.1	15.9	7.3	3.9	
20	Fluoride (mg/l)	0.07	0.12	0.07	0.07	0.09	0.23	0.08	0.07	**1.0**
21	Arsenic (mg/l)	0	0	0	0	0	0	0	0	**0.01**
22	Copper (mg/l)	0.04	0.10	0.09	0.07	0.07	0.04	0.06	0.24	**-**
23	Lead (mg/l)	0.03	0	0.03	0	0	0.02	0.01	0.01	**0.003**
24	Nickel	0.1	0.1	0.09	0.1	0.1	0.09	0.05	0.07	**0.05**
25	Zinc (mg/l)	1.41	0.42	0.99	0.52	0.18	0.75	2.27	2.04	**0.01**
26	Iron (mg/l)	0.29	1.07	0.40	0.13	0.38	0.62	1.14	3.26	**0.02**

Some of the following parameters reported to be below/beyond the Acceptable Limit are discussed below.

pH is basically the measurement of the concentration of hydrogen ions in water, in terms of acidity or alkalinity. Dissolved minerals from rocks and soil contribute to pH, but reaction of dissolved carbon dioxide with water is a major determinant. The pH of 5.75 and 6.4 from Station 2898 and 2905 are recorded to be below the Acceptable Limit.

Turbidity is the measure of the degree to which water loses its transparency due to the presence of suspended particles that include soil, algae, plankton, microbes and other substances. 0.9NTU at Station 2901 was the only station recorded to be Acceptable. Higher levels are associated with higher levels of disease- causing micro-organisms such as viruses, parasites and some bacteria. High turbidity also increases temperature which may lower dissolved oxygen levels in the water. The suspended particle can also help the attachment of heavy metals and many other toxic organic compounds and pesticides.

Alkalinity is the measure of the buffering capacity of a system or the ability of a solution to neutralize acids. It is greatly influenced by the underlying bedrock type and soil. High values may be caused by leaching of sewage and livestock waste, while very low readings may be due to heavy

rains or other acidic contamination. Abrupt changes may signify pollution. The highest alkalinity was observed at Station 2902 with a value of 208mg/l.

At Station 2904 the Ammonia Nitrogen was measured to be the highest with an average value of 11.12mg/l. The major sources of Phosphate contamination are from wastewater from faulty septic systems, livestock confinement and fertilizer runoff/agricultural drainage etc. Slight increase in Phosphate may cause numerous undesirable effects such as accelerated plant growth, algae blooms, and low dissolved oxygen levels. Phosphate levels below 0.03mg/l are generally considered to be unpolluted whereas all the stations reported to be above the limit.

Iron in one of the most common elements found on the earth's crust and nearly all water contains some measurable amount of iron. The highest Iron value of 3.26mg/l was detected at Station 2905. The lowest value of Copper has reported at 0.04mg/l from stations 2898 and 2903. The reports of the slightly presence of toxic substances such as Cadmium, Lead and Nickel also contributes to the contaminant for pollution of groundwater in Dimapur District.

Table 18: Groundwater analysis report showing Average Value of different parameters during the year 2019 (Jan to June) is given below:

Sl No	PARAMETERS	STATION CODE								IS 10500: 2012 norms for drinking water
		2898	2899	2900	2901	2902	2903	2904	2905	
1	Dissolved Oxygen (mg/l)	-	-	-	-	-	-	-	-	-
2	pH	5.9	6.8	6.09	6.7	7.3	6.6	6.47	6.55	6.5-8.5
3	Conductivity (µS/cm)	170	254	201	461	382	175	858	780	-
4	BOD (mg/l)	-	-	-	-	-	-	-	-	-
5	Nitrate- Nitrogen (mg/l)	2.1	0.7	1.1	16.7	0.4	0.5	12.8	0.5	-
6	Turbidity (NTU)	6.89	2.58	8.39	33.8	3.79	19.93	1.17	2.79	1
7	Phenolphthalein Alkalinity (mg/l)	0	0	8	0	0	20	0	0	-
8	Total Alkalinity (mg/l)	24	144	56	104	112	104	72	36	200
9	Chloride (mg/l)	28.6	3.5	29	4.7	5.5	6.5	6.7	2.6	250
10	Chemical Oxygen Demand (mg/l)	44	24	32	16	37	12	22	19	-
11	Ammonia Nitrogen (mg/l)	0.3	0.62	0.02	0.03	0.75	0.13	0.22	0.03	0.5
12	Total Hardness (mg/l)	76	68	88	132	88	88	128	152	200
13	Calcium Hardness (mg/l)	20	8	48	112	20	44	120	96	75
14	Magnesium Hardness (mg/l)	13.66	14.64	9.76	4.88	16.59	10.73	1.95	13.66	30
15	Total Dissolved Solids (mg/l)	88	125	102	233	191	91	436	419	-
16	Total Suspended Solids(mg/l)	0.26	0.21	0.28	0.57	0.3	0.14	1.27	1.53	500

17	Phosphate (mg/l)	0.07	0.28	0.52	0.18	0.3	0.11	0.07	0.14	
18	Boron (mg/l)	0.05	0.04	0.04	0.03	0.02	0.05	0.03	0.03	**0.5**
19	Potassium (mg/l)	-	-	-	-	-	-	-	-	
20	Fluoride (mg/l)	0.06	0.23	0.19	0.09	0.28	0.31	0.21	0.32	**1.0**
21	Arsenic (mg/l)	0	0	0	0	0	0	0	0	**0.01**
22	Cadmium (mg/l)	0.049	0.079	0.012	0.164	0.014	0.001	0.039	0.033	**-**
23	Copper (mg/l)	0.07	0.06	0.1	0.1	0.1	0.07	0.1	0.05	**0.003**
24	Lead (mg/l)	0.01	0	0.01	0	0	0.03	0.02	0.02	**0.05**
25	Chromium (mg/l)	0	0	0	0	0	0	0	0	**0.01**
26	Nickel	0.03	0.08	0.04	0.02	0.03	0.04	0.03	0.02	**0.02**
27	Zinc (mg/l)	2.09	1.21	2.47	2.93	1.68	1.22	1.48	0.87	**5**
28	Iron (mg/l)	0.58	1.29	0.2	0.16	0.11	0.21	0.08	0.22	**0.3**

The groundwater quality in comparison with the drinking water norms IS 10500; 2012 shows that most of the parameters monitored/analyzed are within the permissible limit, however, the trace metals especially Copper, Lead, Nickel and Iron are found in some of the monitoring stations which are the main contaminants for groundwater quality in Dimapur city.

14. RIVER DHANSIRI REJUVENATION PLAN:

14.1 ACTION PLAN FOR MANAGEMENT OF SEWAGE:

(a) Department of Water Resources would undertake measurement of flow of the drains formulate detailed project report (DPR) for each drain and corresponding town.

(b) The flow in each drain should exclude monsoon flow. Further, any drain if receiving fresh water from any escape channel etc, should be examined for its diversion rather than mixing with sewage.

(c) Sewage Treatment Plants (STP) for each town and related drains should be properly designed with the interception and diversion plan.

(d) Sewage Treatment Plant (STP) and its design should be based on its full utilization capacity and ensuring simultaneous house connections to sewers as applicable to each drain and town.

(e) Sewage Treatment Plan should also consider treatment and disposal of sewage from Villages including discharges from toilets constructed under Swachh Bharat Abhiyan.

(f) Hotels/Restaurants particularly located on road-side should not dispose untreated sewage and solid waste into nearby public drain or rivers. A directions will be issued to install a captive ETP and such establishments which do not comply will be regulated and levied with fines in case of any violation.

14.2 ACTION PLAN FOR MANAGEMENT OF INDUSTRIAL EFFLUENTS:

(a). All the industries (water polluting) will be directed to have captive ETPs and ensure to compliance to effluent discharge norms.

(b). All the water polluting industries will be directed to have online Continuous Effluent Monitoring System (OCEMS).

(c). Industries will be directed to adopt best practices to minimize water consumption and for recycling of treat waste water.

(d). Provision of waste water treatment system.

14.3 ACTION PLAN FOR MANAGEMENT OF UTILIZATION OF TREATED SEWAGE:

Treated sewage will be utilized for irrigation or agricultural or industrial cooling or construction activities purposes once the STPs become operational in the catchment of river Dhansiri Treated water channel may also linked with irrigation network in order to reduce ground water consumption for irrigation uses.

14.4 ACTION PLAN FOR MANAGEMENT OF SOLID WASTE:

i. Implementation of Door-to-Door collection.

ii. Source segregation as biodegradable and non-biodegradable wastes.

iii. Identification of suitable site for setting up common waste processing and secure landfill facility.

iv. Transportation, disposal and treatment facilities of municipal solid wastes generated from town in accordance of provisions of the Solid Waste Management Rules, 2016.

v. Restriction illegal disposal of solid waste along the river bank and flood plain zones.

vi. Prohibition on burning of solid wastes.

vii. Development of integrated solid waste management facility (provision of segregation, treatment, compost, pellets making as well as sanitary landfill with leachate treatment provision in accordance with solid waste management rules, 2016 as further amendments made thereof.

viii. Bio-mining and capping of existing municipal dumpsite in accordance with the Solid Waste Management Rules, 2016.

14.5 ACTION PLAN FOR MANAGEMENT OF FLOOD PLAIN ZONE (FPZ):

Department of Water Resources should identify /demarcate Flood Plain Zone and regulate the activities. Such regulations would also cover;

i) Plantation in Flood Plain Zone (FPZ).

ii) Checking and removal of encroachments periodically.

iii) Prohibition of disposal of municipal and bio-medical waste particularly in drains;

iv) Notification of the Flood Plain Zones.

14.6 ACTION PLAN FOR MANAGEMENT OF GREENERY DEVELOPMENT:

Adjacent to the banks of river Dhansiri, green coverage /parks wherever feasible will be developed by the Nagaland Forest Department and Public Health Engineering Department also under the project "Pollution abatement of rivers Diphu & Dhansiri" sanctioned by Ministry of Environment, Forests & Climate Change under National River Conservation Plan will undertake afforestations along the STP sites.

The Chief Wildlife Warden under the Department of Environment, Forests & Climate Change has declared and notified the status of community reserves forests (Privately/community owned protected areas) as on 8th May, 2019 vide letter no. CWL/GEN/391(Vol-VI)/197 Dated Dimapur the 8th May, 2019. ***It has notified 10 community reserved forests in Dimapur district which falls in the upstream and catchment area of the River Dhansiri with a total area of 23.025 Sq. km, it is unique as only few parts of the country where the privately/community owned protected area is more as compared to the Government Owned Protected Area.*** The Nagaland Forest Department along with the communities/tribes and allied departments of the state, have worked together, by involving hunting communities to bring about a conservation story in the remotest parts of the state, along the Indo-Myanmar border, through Community Reserve projects.

14.7 ACTION PLAN FOR MANAGEMENT OF ENVIRONMENTAL FLOW (E-FLOW):

The river Dhansiri carry natural waters during the monsoon and even during the lean season as the two rivers are perennial rivers. Provisions of roof top rain water harvesting in Govt. building, commercial buildings, hotels and Houses will be emphasized. **Restoration of old lakes for enhancement in storage capacity and as well as creation of artificial lakes or ponds.**

15. MONITORING OF THE ACTION PLANS:

In compliance with the order passed on OA No. 673/2018 dated 20.09.2018 by the Hon'ble National Green Tribunal (NGT) Principal Bench, New Delhi, "River Rejuvenation Committee" was constituted by the Governor of Nagaland, vide Notification No. FOR/NPCB-27/6/18, dated 2nd November, 2018.

The proposed Action Plans will be monitored by the River Rejuvenation Committee (RRC) which has been constituted by Government of Nagaland. CPCB experts also shall be invited for the RRC review meetings for taking feedback and suggestions.

The Committee shall function under the supervision and coordination of Principal Secretary, Environment, Forests and Climate Change. Action Plan for River Rejuvenation of polluted river stretches shall be prepared and monitored by the Committee.

River Rejuvenation Committee:

1. Director, Urban Development Department - Member
2. Director, Industries & Commerce - Member
3. Chief Engineer, Public Health Engineering Department - Member
4. APCCF, (Environment, Forests & Climate Change - Member
5. Member Secretary, Nagaland Pollution Control Board - Member Secretary

16. ACTION PLAN:

Short Term and Long Term Action and the Identified Authorities for initiating actions and the time limits for ensuring compliance

Short term and long term action plans and the implementing agencies responsible for execution of the action plans and the time limits are given in the table below.

Action plans with time lines and executing authorities with the budget estimates are given in the following Table below:

Sl. No	Action Plan for rejuvenation of River Dhansiri	Execution Agency/ Department	Time Target	Amount (in rupees)	Remarks
SEWAGE MANAGEMENT					
1	(i) Sewage Treatment Plant of 25.43 MLD capacity based on Waste Stabilization Pond Technology.	Public Health Engineering Department	30th June, 2021	82.80 Crores Sanctioned by MoEF&CC	Ongoing project The project "Pollution abatement of rivers Diphu & Dhansiri" was approved and sanctioned by Ministry of Environment, Forests & Climate Change under National River Conservation Plan with sharing pattern 70 (Centre) : 30 (State) Pollution Abatement Project 44.91% of physical work in progress. (Annexure I) An appeal for extension of time for completing the project is made to MoEF & CC till 30th June, 2021.
	(ii) Gravity sewer (300 mm to 1200 mm dia) Interception & Diversion works: Interception of major drains of Dimapur Town (Lengri Nalla, Hospital Nalla, Dhobinalla and Sugar Mill Nalla) contributing to Dhansiri River pollution and diverting it to the STP.				
	(iii) Laboratories & equipments for monitoring the quality of effluent of STPs.				

Sl. No	Action Plan for rejuvenation of River Dhansiri	Execution Agency/ Department	Time Target	Amount (in rupees)	Remarks
	(iv) STPs with a provision electromagnetic flow meters at inflow and outflow of STPs.	PHED	30th June, 2021	7 lakhs	Will propose the amount to National River Conservation Directorate (NRCD) in MoEF&CC
	(v) Installation of OCEMS at outlet of STPs and uploading of data in the NPCB and CPCB servers.	PHED	30th June, 2021	2.5 crore	
	(vi) STP with a provision of digester or drum filters for utilizing sludge cake as resource recovery or as manure.	PHED	30th June, 2021	5 crore	
2	Utilisation of treated waste water 1. Irrigating the nearby plantation areas within the vicinity of Sewage Treatment Plant. 2. Use of treated waste water for construction of infrastructure projects or building activity. 3. Flushing/cleaning of sewage drains. 4. Fire brigades. 5. Flushing purposes in the upcoming buildings especially Govt. building, etc. 6. Operation and maintenance of STP	1. Public Health Engineering Department 2. Dimapur Municipal Council 3. Nagaland Fire and Emergency Services Department	30th June, 2021	-	After commissioning the project "*Pollution abatement of rivers Diphu & Dhansiri*" the utilization of the treated waste water will be started.
3	Construction of Septage Management at Dimapur	Dimapur Municipal Council	Completed	-	Dimapur Municipal Council had constructed Septage Management Plant of 30 KLD capacity at Burma Camp, Dimapur under AMRUT SAAP–I.

Sl. No	Action Plan for rejuvenation of River Dhansiri	Execution Agency/ Department	Time Target	Amount (in rupees)	Remarks
					The Septage Management Plant is in operation.
INDUSTRIAL EFFLUENT MANAGEMENT					
1	Action against the identified industries in operation without Consent under Water & Air Act/Authorization under Hazardous and Other Wastes (Management & Trans-boundary Movement) Rules, 2016.	NPCB	31st March, 2020	Department own Budget	Action as per relevant provisions of Water Act, 1974 and Air Act, 1981 shall be taken against any unit found operating without mandatory consent of the NPCB.
2	Inventorization of the water polluting industries in the catchment of River Dhansiri covering assessment on aspects relating to Effluent Generation, ETP Capacities and final mode of effluent discharge	NPCB	31st Dec, 2019		
3	Action against the industries who have not installed ETPs or existing ETPs but not operating or treated effluent is not meeting the prescribed standards.	NPCB	31st Dec, 2019	Department own Budget	Directions will be issued to Hotels and car servicing centres to set up an ETP or settling tanks for trapping the oil and grease.
3	Estimation of industrial effluent generation and setting up of Common Effluent Treatment Plant wherever feasible.	Dept. of Industries and NPCB	31st Dec, 2019	-	A detail inventory and study will be carried out in the catchment of the River Dhansiri to ascertain the effluent generation and therafter a proposal will be initiated to the MoEF&CC for setting up of Common Effluent Treatment Plant.
4	Prohibition of Burning of any kind of waste including agro residue.	District Administration, and DMC	Ongoing	-	Notification already circulated and published in the local dailies.

Sl. No	Action Plan for rejuvenation of River Dhansiri	Execution Agency/ Department	Time Target	Amount (in rupees)	Remarks
SOLID WASTE MANAGEMENT:					
1	Solid Waste Management Project. A Solid Waste Management Project has been proposed under Swachh Bharat Mission to the Ministry of Housing and Urban Affairs. Development of the scientific waste management facilities for Dimapur City will include Recycling Plant, bio-fertilizer production, particle board from waste matters and bricks will be manufactured. Only 5 to 10 % of the waste will land filled.	Dimapur Municipal Council	31st June 2021	110.72 Crores	Approval from the Ministry of Housing and Urban Affairs still awaited.
2	Providing two waste bins for segregation of dry and wet waste	Dimapur Municipal Council	Completed	-	Dimapur Municipal Council has provided 70428 nos. of two waste bins (green & blue) to every household for segregation of dry and wet waste at source in 2018 under Swachh Bharat Mission.
3	Bioremediation of Dimapur Municipal Council existing dumpsite	Dimapur Municipal Council	On-going	-	Bioremediation process is implemented by the DMC with the technical support from Dr. Ragini Jain, Founder & CEO Geetanjali Envirotech & National Technical Expert in Swachh Bharat Mission India, SA UNEP Tech Partner, Member of ISWA. Bioremediation process will be continued till the Solid Waste Management

Sl. No	Action Plan for rejuvenation of River Dhansiri	Execution Agency/ Department	Time Target	Amount (in rupees)	Remarks
					Project under Swachh Bharat Mission by Ministry of Urban Development is completed.
BIO-MEDICAL WASTE MANAGEMENT:					
1	Development of one Common Biomedical Waste Treatment and Disposal Facility	Dimapur Municipal Council	31st March 2021	-	Land for setting up of CBWTF is available at Bamunpukhuri. DMC had submitted the DPR to the Government of Nagaland.
2	Setting up of ETPs in all the bedded hospitals including the Government and private hospitals.	NPCB	31st Dec, 2019	-	Will give directions to all the HCFs to set up an ETP.
E-WASTE AND PLASTIC WASTE ASSESSMENT:					
1	Inventory (Assessment, quantification and characterization) on E-Waste & Plastic waste	Nagaland Pollution Control Board	Completed	-	NPCB has completed inventory, assessment, quantification and characterization of E-Waste & Plastic waste in 2018.
2	Development of collection and dismantling centres	Dimapur Municipal Council	Ongoing	-	A one day interactive and awareness programme on handling and management of wastes was organized by NPCB on the 28th Feb, 2019 targeting the Material Recovery Facilities/Scrap dealers on how it can be managed most efficiently with least harm to the environment.
PUBLIC SANITATION:					
1	Construction of community toilets at vulnerable areas.	Dimapur Municipal Council	Completed	-	Dimapur Municipal Council under Swachh Bharat Mission (Urban) constructed 40 nos. of Community toilet in Dimapur.

Sl. No	Action Plan for rejuvenation of River Dhansiri	Execution Agency/ Department	Time Target	Amount (in rupees)	Remarks
2	Low Cost Sanitation: a) Community latrines with 12 seater capacity (17 Nos) b) Public lavatory with 3 seater capacity (16 nos)	PHED	30th June, 2021	-	It will covers in the project "Pollution abatement of rivers Diphu & Dhansiri" which was approved and sanctioned by Ministry of Environment, Forests & Climate Change under National River Conservation Plan
GROUND WATER AND DRAINS MANAGEMENT:					
1	Groundwater quality monitoring at salient points in the catchment of river Dhansiri and DMC dumping site during summer (May-June) and winter (December-January).	NPCB	31st Dec, 2019	-	Along with the existing 8 NWMP Ground water stations an additional Groundwater monitoring will be done in Summer and winter month.
2	Aspects such as ground water extraction, adopting ground water charging.	Water Resources Department.	Ongoing programmes	-	Water Resources department under the State Plan carry out activity wherein wells are dug for ground water extraction. Sensitization programme for ground water charging will also be imparted.
3	Adopting Good irrigation practices	Water Resources Department.	Ongoing programmes	-	Water Resources Department has been carrying out activities under the Minor Irrigation Schemes wherein diversion weir, protection wall and line & unlined canals are been constructed under the Ministry of water Resources.

FLOOD PLAIN ZONES:					
1	Prohibition on illegal disposal of waste and removal of encroachment from river banks.	District Administration & DMC	Continuous activity	-	Direction in this regard on illegal disposal of waste in the drainage has been issued by DMC in the local dailies on 13.03.2019. It further authorized the colony councils/GBs to implement the order and also impose fine against the defaulters in their respective colonies. It will be monitored regularly.
ENVIRONMENTAL FLOW (E-Flow):					
1	Provisions of roof top rain water harvesting in Govt. building, commercial buildings, hotels wherever feasible.	District Administration	31st Dec, 2019	-	Directions to be issued by the Government of Nagaland.
2	Water shed management in the catchment wherever feasible (restoration of old lakes for enhancement in storage capacity and as well as creation of artificial lakes or ponds)	PHED and Water Resources Department	-	-	A project proposal, "*Conservation and Ecological development of Padampukhuri lake*" has been submitted to the MoEF&CC by the PHED Department.
GREEN DEVELOPMENT:					
1	Plantation on both sides of the river and in the private land and individual land owner	Department of Environment, Forests & Climate Change	-	-	Development of Community Reserves in the upstream and catchment areas of River Dhansiri.
2	Afforestations along the STPs.	PHED	30th June, 2021	-	It will covers in the project "Pollution abatement of rivers Diphu & Dhansiri" which was approved and sanctioned by MoEF&CC under National River Conservation Plan

CLEANING & AWARENESS ACTIVITIES					
1	Awareness and cleaning of clogged drains	Dimapur Municipal Council	31st Dec. 2019	-	Cleaning of clogged drains and awareness. Will Seek financial assistance from CPCB under Environmental Compensation.
2	Public awareness programme through add on media	PHED	30th June, 2021	-	It will covers in the project "Pollution abatement of rivers Diphu & Dhansiri" which was approved and sanctioned by Ministry of Environment, Forests & Climate Change under National River Conservation Plan
MISCELLANOUS					
1	Regular monitoring and sampling of water quality of River Dhansiri and various drains on monthly basis.	NPCB	Monthly	-	Ongoing under the NWMP
2	Impact of water pollution on health of public and awareness thereof.	State Health Department	31st Dec, 2019	-	The Department of Health & Family Welfare will conduct awareness and health camps.
3	Prohibition of disposal of Municipal, Plastic and Bio-medical Waste particularly in drains	District Administration and DMC	31st Dec, 2019	-	The DMC had already issued notification to the wards/colonies.
4	Maintaining E-Flows	PHED	30th June, 2021	-	E-flow will be assessed after completion of STP and evaluation of the discharge during the lean season.
5	Development of bio-diversity parks	Department of Environment, Forests & CC	-	-	The Chief Wildlife Warden under the Department of Environment, Forests & CC has declared

					and notified the status of 10 community reserved forests (privately/community owned protected area) in Dimapur district which falls in the upstream and catchment area of the River Dhansiri with a total area of 23.025 Sq. km.
	GRAND TOTAL AMOUNT			**-**	-