REVISED ACTION PLAN FOR

RESTORATION OF

UMKHRAH RIVER IDENTIFIED AS (Priority-I) POLLUTED RIVER STRECTHES

OF MEGHALAYA

[In compliance with the Direction of Hon'ble National Green Tribunal dated 19/12/2018 in connection with Original Application No. 673/2018 in the matter of News Item Published in the Hindus titled as "More River

Stretches are now Critically Polluted: CPCB"]

Submitted by

River Rejuvenation Committee

Government of Meghalaya

October, 2019

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Executive Summary

Umkhrah River is one of the major perennial rivers originating from the foothill of Shillong peak and flows across the Shillong city from Northeast to Northwest direction and passes through some heavily congested localities viz. Nongthymmai, Rynjah, Lapalang, Umpling, Umkaliar,Nongmynsong, Polo, Wahingdoh, Jaiaw, Mawlai and Mawpdang areas. On its way the river is joined by many streams/drains which pass through some localities viz Nongrah-Poktieh part of Mawlynrei, Nongrim hill, Laitumkhrah,Lachumiere.The Umkhrah river joins with Umshyrpi River at the northwest direction of the Shillong city to form the Wah Ro-Ro. The Wah Ro-Ro finally discharges itself into the Umiam River, which is the main source of water to Umiam reservoir.

There is no major industrial unit on the catchment of the river .However many small scale units are in operation in the city. Some of these units are in automobile repairing and servicing workshop, steel and wooden furniture, tyre retreading, printing press, bakeries and confectioneries, flour mills, rice mills and other handicraft units. There are 20 drains originating from different localities as mentioned above which mostly carry sewage / municipal wastes and these ultimately emptied in to river Umkhrah thereby adversely affecting the river water quality.

Based on the water quality submitted by Meghalaya State pollution Control Board the Umkhrah river from Demthring to Mawlai with an approximately 10 kms length has been identified as polluted stretch by Central Pollution Control Board due to high concentration of BOD which is above 30mg/l.

Hon'ble NGT Order: in O/A No. 673 of 2018: Principal Bench, New Delhi in their Order dated 20th 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. This action plan has been prepared accordingly. The action plan includes components like identification of polluting sources including functioning/ status of STPs/ ETPs/ CETP and solid waste management and processing facilities, quantification and characterization of solid waste, trade and sewage generated in the catchment area of polluted river stretch. The action plan addresses issues relating to; ground water extraction, adopting good irrigation practices, protection and management of Flood Plain Zones (FPZ), rain water harvesting, ground water charging, maintaining minimum environment flow of river and plantation on both sides of the river. The action plan focuses on proper interception and diversion of sewage carrying drains to a proposed Decentralized Sewage Treatment Plant (STP). The action plan provides for speedy and definite or specific timelines for execution of steps

1. INTRODUCTION

Umkhrah River is one of the major rivers flowing across the Shillong city. It flows from Northeast to Northwest direction of the city. The river passes through some congested and heavily populated localities. All along the course, the river receives the untreated sewage, solid waste, municipal waste etc. generated in the city and its outskirts either directly or through drains.(The Umkhrah River joins the Umshyrpi River at the northwest direction of the Shillong city to form the Wah Ro-Ro. The Wah Ro-Ro joins with the Umiam River, which is the main source of water to Umiam reservoir0

(a) Major Towns or Cities in the catchment of Umkhrah River

Umkhrah River is one of the major rivers flowing across the Shillong city. It flows from Northeast to Northwest direction of the city. The river passes through some localities viz. Nongthymmai, Rynjah, Lapalang, Umpling, Umkaliar,Nongmynsong, Polo, Wahiingdoh, Jaiaw, Mawlai and Mawpdang areas..

The river flows through the heart of the Shillong city. Map of the rivers is shown in **Figure 1.**

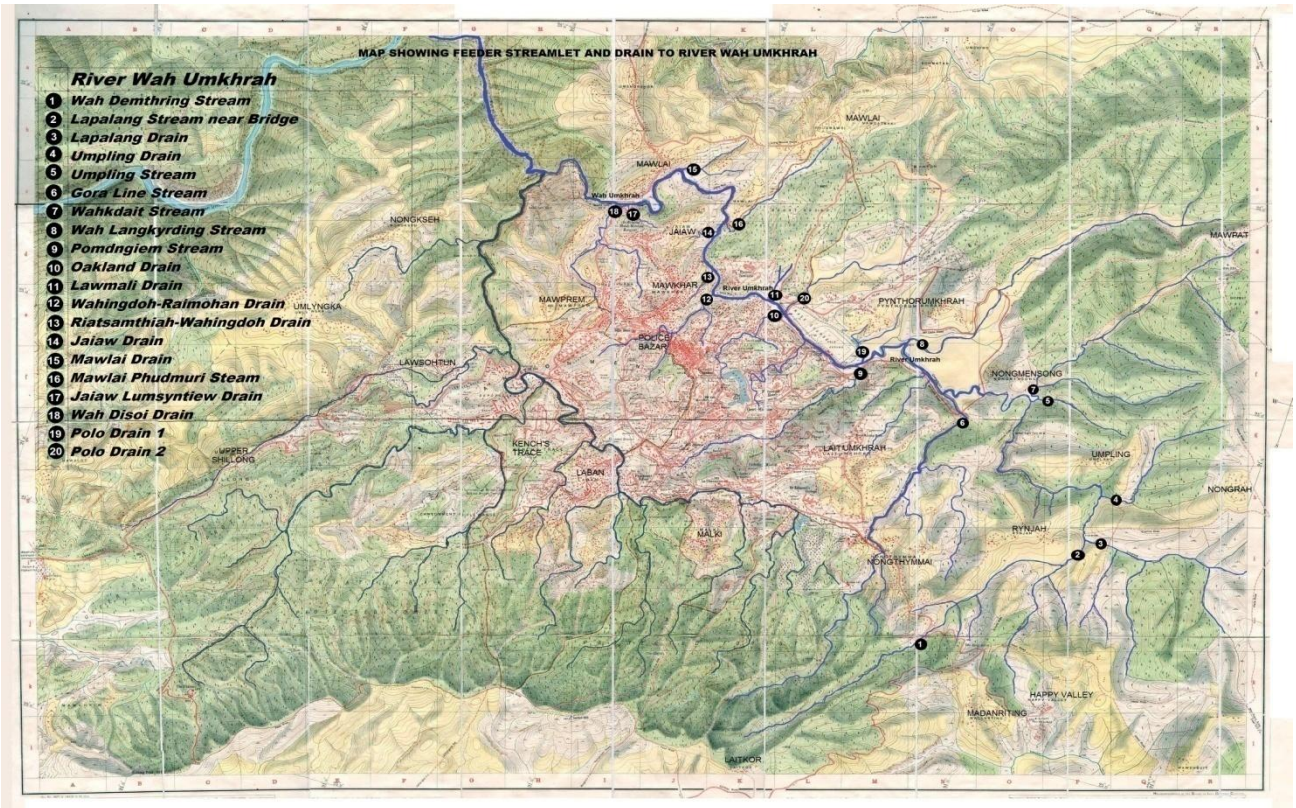

Figure 1 : Map of Umkhrah

(b) Source of Pollution in River Umkhrah River

The sources of pollution of the river Umkhrah include both point and non-point sources. Point sources of pollution are from the dry latrines located along the river Umkhrah and its tributaries, effluents from hotels, restaurants, automobile workshops, hospitals, nursing homes, slaughter houses, vegetable, meat and fish markets situated in the catchment areas. Non-point sources of

pollution include indirect discharge of untreated sewage, municipal waste water, dumping of solid wastes, agricultural runoffs.

(b) Major Industrial Areas in the Catchment of River Umkhrah

There is no major industrial area but isolated industries are present in the catchment area of the Umkhrah River.

(c) Major Drains contributing to Pollution of River Umkhrah:-

There are 20 major drains which pass through some localities viz Nongrah-Poktieh part of Mawlynrei, Nongrim Hill, Laitumkhrah ,Lachumiere, Nongmynsong, Polo, Wahiingdoh, Jaiaw, Mawlai ,Mawpdang,Mawprem ,Garikhana and discharging the untreated sewage and municipal wastes into the Umkhrah river.Table 1 below indicated the identified drains and their co-ordinates

Table 1 : Major Drains contributing to Pollution in River Umkhrah

River	Outfalls	GPS Coordinates
Umkhrah	Wah Demthring Stream	25°33'30.50"N, 91°54'28.58"E
	Lapalang Stream near Bridge	25°34'12.65"N, 91°55'5.89"E
	Lapalang Stream	25°34'12.60"N, 91°55'11.77"E
	Umpling Drain	25°34'27.11"N, 91°55'7.95"E
	Umpling Stream	25°34'47.96"N, 91°54'42.18"E
	Gora Line Stream	25°34'39.98"N, 91°54'15.98"E
	Wah Kdait Drain	25°34'48.73"N, 91°54'36.99"E
	Wah Thangsniang stream	25°34'54.10"N, 91°53'55.25"E
	Pomdngiem Stream	25°34'44.29"N, 91°53'44.86"E
	Oakland Drain	25°34'52.76"N, 91°53'14.06"E
	Lawmali Drain	25°35'1.41"N, 91°52'55.90"E
	Wahingdoh- Raimohan Drain	25°34'53.38"N, 91°52'55.14"E
	Riatsamthiah, Wahingdoh	25°35'1.07"N, 91°52'53.17"E
	Jaiaw Drain	25°35'7.65"N, 91°52'48.60"E
	Mawlai Drain	25°35'29.24"N, 91°52'35.10"E
	Mawlai Phudmuri Stream	25°35'15.38"N, 91°52'54.22"E
	Jaiaw Lumsyntiew Drain	25°35'11.37"N, 91°52'23.12"E
	Wah Disoi Drain	25°35'12.00"N, 91°52'21.38"E
	Polo Drain1	25°34'50.02"N, 91°53'44.93"E
	Polo Drain2	25°34'57.39"N, 91°53'19.11"E

2.0 OBJECTIVES/ACHIEVABLE TARGETS FOR RESTORATION OF POLLUTED UMKHRAH RIVER

It is an important aspect for restoration of Umkhrah River in context of meeting water quality for designated uses.It would not be possible to achieve the river quality of Class 'B' since the Umkhrah river is flowing across the Shillong City and it is passing through the most congested and densely populated localities.The water of the river has never been used for bathing purposes but it has been used for agricultural purposes and hydro power generation at the downstream of the river. Efforts would be made to improve the river quality class by prevention and control measures. However,

goals can be met for Class 'E' i.e, for irrigation, industrial cooling and controlled waste disposal. The water quality can be maintained at the level as per **the Primary Criteria for irrigation stipulated by CPCB**

Sl. No	Parameters	Class 'E' Water Quality Criteria for Irrigation
1	pH	6 to 8.5
2	Dissolved Oxygen (DO)	-
3	Sodium Absorption Ratio	$\leq$ 26
4	Boron	
5	Free Ammonia	-
6	Electrical Conductivity at 25 ^{o} C µmhos/cm	$\leq$ 2250
7	BOD	-
8	FC	-

3.0 Water Quality of the River ,drains and ground water sources (located in the catchment of the river of the Umkhrah River) for the year 2018 & 2019 (Jan-September):

3.1 Water Quality of the River

Water quality monitoring of the Umkhrah river is being carried out by the Meghalaya State Pollution Control Board under National Water Quality Monitoring Programme at the following Sampling locations:

1.Demthring,
2.Umkaliar,
3.Mawlai(Phudmuri)
4.Mawpdang, Mawlai

The data for the year 2018 and 2019 (Jan-September) are given in **Tables 2 – 9** below for the identified stretches

Table-2 : Water Quality Data of Umkhrah River at Demthring, Shillong, 2018

MONTH	pH	DO mg/l	BOD mg/l	FC MPN/100ml	TC MPN/100ml
JAN	7.2	3.0	**24.0**	11000	39000
FEB	7.2	3.8	**18.0**	12000	47000

MARCH	7.3	2.5	**24.0**	17000	49000
APRIL	7.3	3.0	**24.0**	21000	54000
MAY	7.0	3.5	**21.0**	22000	58000
JUNE	6.9	3.5	**22.0**	31000	70000
JULY	7.0	1.5	**30.0**	44000	84000
AUGUST	7.0	2.0	**25.0**	47000	110000
SEPTEMBER	6.9	2.7	**20.5**	49000	130000
OCTOBER	6.9	1.6	**35.0**	58000	130000
NOVEMBER	7.6	2.2	**30.0**	63000	140000
DECEMBER	7.5	2.0	**34.0**	70000	140000
AVERAGE	7.15	2.6	**25.6**	37083	87583
RANGE	6.9-7.6	1.5-3.8	**18-35**	11000-70000	39000-140000

Table-3: Water Quality Data of Umkhrah River at Umkaliar, Shillong 2018

MONTH	**pH**	**DO mg/l**	**BOD mg/l**	**FC MPN/100ml**	**TC MPN/100ml**
JAN	7.7	6.0	**12.0**	19000	58000
FEB	7.7	4.0	**9.5**	21000	63000
MARCH	7.5	3.8	**14.0**	23000	70000
APRIL	7.4	3.5	**20.0**	26000	79000
MAY	7.3	5.0	**12.0**	27000	84000
JUNE	7.2	5.3	**14.0**	33000	94000
JULY	7.1	5.1	**16.0**	47000	110000
AUGUST	7.2	5.2	**14.0**	49000	120000
SEPTEMBER	7.2	4.8	**20.0**	58000	130000
OCTOBER	7.3	4.8	**25.0**	63000	140000
NOVEMBER	7.8	5.0	**27.0**	70000	170000
DECEMBER	7.7	5.3	**24.0**	79000	170000
AVERAGE	7.4	4.8	**17.2**	42916	107333
RANGE	7.1-7.8	3.5-6.0	**9.5-27.0**	19000-79000	58000-170000

Table-4: Water Quality Data of Umkhrah River at Mawlai Phudmuri(Near Slaughter House) Shillong 2018

MONTH	**pH**	**DO mg/l**	**BOD mg/l**	**FC MPN/100ml**	**TC MPN/100ml**
JAN	7.6	1.0	**46.0**	35000	84000

FEB	7.6	1.3	**35.0**	36000	94000
MARCH	7.2	1.5	**32.0**	43000	110000
APRIL	7.3	1.2	**35.0**	47000	120000
MAY	7.2	2.0	**29.0**	49000	130000
JUNE	7.2	2.4	**35.0**	58000	150000
JULY	7.2	1.4	**34.0**	70000	170000
AUGUST	7.3	1.8	**28.0**	79000	220000
SEPTEMBER	7.2	1.5	**30.0**	84000	24000
OCTOBER	7.2	1.0	**40.0**	94000	280000
NOVEMBER	7.6	1.2	**37.0**	110000	330000
DECEMBER	7.6	0.8	**45.0**	120000	350000
AVERAGE	7.35	1.42	**35.5**	68750	171833
RANGE	7.2-7.6	0.8-2.4	**28-46.0**	35000-120000	24000-350000

Table-5: Water Quality Data of Umkhrah River At Mawpdang Mawlai, Shillong, 2018

MONTH	**pH**	**DO mg/l**	**BOD mg/l**	**FC MPN/100ml**	**TC MPN/100ml**
JAN	7.4	2.6	**32.0**	29000	120000
FEB	7.4	2.9	**27.0**	31000	130000
MARCH	7.1	2.4	**35.0**	47000	140000
APRIL	7.2	2.0	**38.0**	54000	150000
MAY	7.1	2.3	**34.0**	58000	170000
JUNE	7.2	3.0	**26.0**	79000	220000
JULY	7.3	2.0	**30.0**	94000	240000
AUGUST	7.4	2.8	**32.0**	110000	280000
SEPTEMBER	7.4	2.4	**34.0**	120000	280000
OCTOBER	7.3	1.2	**38.0**	130000	350000
NOVEMBER	7.6	1.9	**32.9**	130000	380000
DECEMBER	7.7	1.0	**30.0**	140000	410000
AVERAGE	7.34	2.2	**32.4**	85166	239166.
RANGE	7.1-7.7	1-3.0	**26-38.0**	29000-140000	120000-410000

Table-6: Water Quality Data of Umkhrah River at Demthring, Shillong,(Jan –Sept 2019)

MONTH	**pH**	**DO mg/L**	**BOD mg/L**	**FC MPN/100ml**	**TC MPN/100ml**
JAN	7.3	1.5	**40.0**	79000	150000

FEB	7.2	1.2	**44.0**	84000	170000
MARCH	7.2	0.8	**50.0**	94000	220000
APRIL	7.2	1.0	**48.0**	110000	240000
MAY	7.1	1.2	**46.0**	94000	220000
JUNE	7.0	2.0	41.0	84000	210000
JULY	6.8	3.6	25.0	40000	94000
AUGUST	7.6	3.7	23.0	34000	75000
SEPTEMBER	7.5	3.8	21.0	26000	58000

Table-7: Water Quality Data of Umkhrah River at Umkaliar, Shillong,(Jan -Sept 2019)

MONTH	pH	DO mg/L	BOD mg/L	FC MPN/100ml	TC MPN/100ml
JAN	7.5	5.0	**28.0**	83000	200000
FEB	7.5	4.8	**28.5**	83000	210000
MARCH	7.3	4.0	**28.0**	94000	240000
APRIL	7.3	2.5	**40.0**	120000	280000
MAY	7.2	2.8	**39.5**	110000	260000
JUNE	7.2	3.0	35.0	94000	240000
JULY	7.3	5.6	18.0	32000	84000
AUGUST	7.4	5.8	15.0	27000	63000
SEPTEMBER	7.4	6.0	12.0	14000	47000

Table-8: Water Quality Data of Umkhrah River at Mawlai Phudmuri(Near Slaughter House), Shillong Jan –Sept 2019

MONTH	pH	DO mg/L	BOD mg/L	FC MPN/100ml	TC MPN/100ml
JAN	7.5	0.5	**43.0**	130000	360000
FEB	7.4	0.4	**44.2**	140000	380000
MARCH	7.4	0.6	**40.0**	170000	410000
APRIL	7.4	0.5	**56.0**	210000	460000
MAY	7.2	0.6	**55.5**	200000	430000
JUNE	7.3	1.0	42.0	170000	390000
JULY	7.4	2.9	31.5	42000	110000
AUGUST	7.9	3.0	31.0	38000	110000
SEPTEMBER	7.6	3.1	33.0	28000	84000

Table-9: Water Quality Data of Umkhrah River at Mawpdang Mawlai, Shillong(Jan-sept)2019

MONTH	pH	DO mg/L	BOD mg/L	FC MPN/100ml	TC MPN/100ml
JAN	7.4	1.2	**36.0**	160000	420000
FEB	7.2	1.0	**37.5**	170000	430000
MARCH	7.1	1.2	**35.0**	210000	470000
APRIL	7.1	0.8	**40.0**	230000	490000
MAY	7.1	1.0	**39.0**	220000	470000
JUNE	7.4	1.3	33.0	210000	430000
JULY	6.9	3.2	31.0	45000	112000
AUGUST	8.1	3.4	30.0	38000	110000
SEPTEMBER	7.7	3.4	26.0	34000	94000

3.2 Water **quality characteristic of waste water from the drains and the flow**

Tables **10** below provided the water quality characteristic of the drains and the flow

Table 10: Water Quality Data of drains discharging into the Umkhrah River

Sl. No.	Stream/Drain	Flow MLD	pH	Dissolved oxygen (mg/l)	BOD (mg/l)	Total Coliform (MPN/100 ml)	Feacal Coliform (MPN/100 ml)	Zn (mg/l)	Cr (mg/l)	Ni (mg/l)	Cu (mg/l)	As (mg/l)
1.	Wah Demthring Source - Demthring, Nongthymmai, Madanriting	3.45	7.0	2.8	10.4	12000	8000	BDL	BDL	BDL	BDL	BDL
2.	Lapalang stream - Lapalang	0.06	5.9	3.9	9.5	8000	5400	BDL	BDL	BDL	BDL	BDL
3.	Phud Raimut Drain Happy Valley	0.36	7.0	4.5	9.0	7000	4200	BDL	BDL	BDL	BDL	BDL
4.	Umpling Drain	0.74	6.9	4.6	8.5	7000	4600	BDL	BDL	BDL	BDL	BDL
5.	Umpling stream	1.5	7.0	4.2	9.4	5000	2400	BDL	BDL	BDL	BDL	BDL
6.	Goraline Stream (Laitumkhrah,Nongrim Hills)	7.75	6.8	1.7	20.5	35000	22000	BDL	BDL	BDL	BDL	BDL
7.	Wah Kdait Drain Mawpat, Nongmynsong	5.81	7.2	5.1	7.6	8900	5200	BDL	BDL	BDL	BDL	BDL
8.	Wah Thangsniang Stream Lawjynriew, Lumpyngngad, Jingkieng, Nongthymmai, Nongrim Hills, MES, Nongrimbah, Nongrimmaw, Demsieniong	0.28	7.0	2.2	16.2	30000	24000	BDL	BDL	BDL	BDL	BDL
9.	Pomdngiew stream Laitumkhrah Lower Lachumiere,	0.155	6.8	1.9	19.0	22000	18000	BDL	BDL	BDL	BDL	BDL

	Laitumkhrah											
10.	Oakland Drain Botanical Garden, Ward's Lake, Oakland, Jail Road Bazar	4.67	7.0	1.8	29.0	38000	26000	BDL	BDL	BDL	BDL	BDL
11.	Wahingdoh Raimohan Drain Keating Road, Mawlonghat, Bara Bazar (Motphran), Mawkhar, Police Bazar,Umsohsun, Jail Road, Wahiingdoh	7.12	7.2	0.4	50.0	78000	42000	BDL	BDL	BDL	BDL	BDL
12.	Lawmali Drain Ganesh Das Hospital, Pasteur Institute	4.39	7.1	2.4	25.0	28000	17400	BDL	BDL	BDL	BDL	BDL
13.	Raitsamthiah Wahiingdoh Drain	1.21	6.8	0.9	45.0	45000	25000	BDL	BDL	BDL	BDL	BDL
14.	Jaiaw Drain Raitsamthiah	1.21	6.9	1.0	33.0	44000	22000	BDL	BDL	BDL	BDL	BDL
15.	Mawlai Stream Mawlai Phudmawri, Nongmali	5.1	7.1	1.4	29.0	18000	11000	BDL	BDL	BDL	BDL	BDL
16.	Mawlai Phudmawri Drain- Mawlai Phudmawri, Slaughter House Areas wastes and	0.52	6.6	0.5	50.0	62000	37000	BDL	BDL	BDL	BDL	BDL
17.	Jaiaw lumsyntiew drain K.J.P Synod Hospital, Jaiaw	0.03	6.9	1.9	28.0	24000	15000	BDL	BDL	BDL	BDL	BDL
18.	Wah Disoi Drain Mawprem, Garikhana, Lama Villa, Jaiaw Langsning, Slaughter House Area, Naspatighari	0.85	7.2	1.7	32.0	38000	20000	BDL	BDL	BDL	BDL	BDL
19.	Polo Drain 1	0.05	6.8	0.9	60.0	99000	48000	BDL	BDL	BDL	BDL	BDL
20.	Polo drain 2	0.07	7.3	0.9	50.0	80000	40000	BDL	BDL	BDL	BDL	BDL

3.0 GROUND WATER QUALITY

The available ground water quality data from areas in the vicinity of the river Umkhrah as per the data available with Meghalaya State Pollution Control Board are given in Table 11

TABLE-11: GROUND WATER QUALITY DATA IN THE CATCHMENT of UMKHRAH RIVER

Sampling Locations→ / **Parameters ↓**	**Borewell Polo, South Furlong, Shillong (Opposite of Stadium Gate)**	Borewell **Nongmynsong, Shillong.**	**Borewell Wahingdoh, Shillong.**	Borewell **Umkdait, Nongmynsong, Shillong Borewell**	**Borewell Laitumkhrah, Shillong**	**Borewell Police Bazar, Shillong.**	**Borewell Wahingdoh, Shillong.**	**Borewell Golf Link, Pynthor Umkhrah, Shillong**	***Drinking WaterNorms as per IS 10500:2012***
pH	6.7	6.2	6.2	**4.0**	6.7	6.2	6.2	6.3	6.5-8.5
Conductivity (mg/l)	800.0	805.0	150.0	400.0	167.0	170.0	150.0	417.0	-
Chloride (mg/l)	82.0	103.0	27.0	36.0	27.0	27.0	27.0	85.0	250.0
Alkalinity (mg/l)	262.0	72.0	28.0	Nil	34.0	28.0	28.0	56.0	200.0

Total Hardness (mg/l)	200.0	100.0	50.0	82.0	38.0	46.0	50.0	84.0	200.0
Nitrate-N (mg/l)	10.4	41.8	1.15	32.8	5.7	2.0	1.15	10.8	45.0
Iron (mg/l)	1.6	1.0	4.6	0.16	5.0	3.0	4.6	2.0	0.3
Total Coliform (MPN/100ml)	>8	6.2	6.2	-		6.2		>8	Shall not be detectabkle

From the result table, it has been observed that out of 8(eight) ground water samples tested, only one is acidic in nature. Iron concentration is beyond the prescribed standard limit in all locations. Total coliform is also detected in 5(five) samples. The rest of the analyzed parameters are found within the standard limit for all the collected groundwater samples.

Some of the quality assessment of the ground has also been carried out by the Central Ground Water Board

It may be noted that the from the ground water analysis, in some of the samples the ph value is in the range of 3.8 - 4. Low ph value may be attributed to the geological condition of the catchment area. The area has abundance of pine trees which grows on laterite soil condition. As per literature it is known that the lateritic soil is acidic in nature**.**

Groundwater monitoring is also carried out by Central Ground Water Board

Capping and other measures will be initiated at the locations where groundwater is contaminated and PHE & CGWB will be consulted for taking remedial measures.

The Meghalaya has monitored the ground water quality of new monitoring stations and the additional parameters viz Faecal coliform and Metals were also analysed .Table below indicated the analysis data .

TABLE-11 A: GROUND WATER QUALITY DATA IN THE CATCHMENT OF UMKHRAH RIVER, SHILLONG - SEPTEMBER 2019

Sampling Locations→ / **Parameters ↓**	***Drinking WaterNorms as per IS 10500:2012***	**Borewell Wahingdoh**	**Deep Tube Well Dong Kamon, Nongmynsong**	**Well Forest Rest House, Forest Colony, Polo**
pH	6.5-8.5	6.2	6.3	6.0
Conductivity (mg/l)	-	150.0	45.0	47.0
Turbidity (NTU)	1.0	1.0	1.0	1.0
Chloride (mg/l)	250.0	27.0	10.0	10.0
Alkalinity (mg/l)	200.0	28.0	18.0	16.0
Total Hardness (mg/l)	200.0	50.0	16.0	20.0
Nitrate-N (mg/l)	45.0	1.15	2.85	8.34

Iron (mg/l)	0.3	4.6	0.36	0.32
Total Coliform (MPN/100ml)	Shall not be detectable	6.2	<1.8	540
Faecal Coliform (MPN/100ml)	Shall not be detectable	Not Detected	<1.8	280
Zn (mg/l)	5.0 mg/l	BDL	BDL	BDL
Cr (mg/l)	0.05	BDL	BDL	BDL
Ni (mg/l)	0.02	BDL	BDL	BDL
Cu (mg/l)	0.05	BDL	BDL	BDL
As (mg/l)	0.01	BDL	BDL	BDL
Lead (mg/l)	0.01	BDL	BDL	BDL
Nickel (mg/l)	0.02	BDL	BDL	BDL
Cadmium(mg/l)	0.003	BDL	BDL	BDL
Manganese(mg/l)	0.1	BDL	BDL	BDL

4. IDENTIFICATION OF SOURCES OF POLLUTION:

Major sources of pollution in Rivers Umkhrah are:

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

5.0 COMPONENTS OF ACTION PLAN

Following components have identified for preparation of action plan for rejuvenation of river in compliance to the Hon'ble NGT Orders as detailed below:

The proposed action plan covers following components:

SOURCE CONTROL

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

5.1 Channelization, treatment, utilization and disposal of treated domestic sewage

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

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

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

(d) Identification of areas for installing decentralized sewage treatment plants.

5.2 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

5.3 Solid 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 of Umkhrah River 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.

5.4 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.

5.5 Ecological/Environmental Flow (E-Flow)

(a) Issues relating to E-Flow

(b) Irrigation practices

6. DETAILED GAP ANALYSIS

6.1 SEWAGE MANAGEMENT: Umkhrah Catchments

As per the information acquired from Shillong Municipal Board, the design population will have to be estimated with due regard to all the factors governing the future growth and development of the project are in the industrial, commercial, educational, social and administration spheres. Special factors causing sudden immigration or influx of population have also been foreseen to the extent possible.

The sewage flow is considered as 80% of the net water supplied to the consumer. Considering 135 lpcd water supply, the rate of sewage generation works out as 108 lpcd and the same has been adopted. The population in the catchment of Umkhrah river as per 2011 census is about 354759 and projected population is about 470900. Apart from the living population, Shillong being a tourist place has a **floating population**. As per the tourism latest report, the total number of Tourists per day in Shillong is **approximately 3500**. The sewage generation of the floating population is also considered. Main source of water for Shillong is from Greater Shillong Water Supply Scheme

(PHED) which is a surface water source of Umiam River, Mawphlang.The detailed gap analysis is given in the **Table 13** below for the Umkhrah River:

Table 12: Gap Analysis with respect to sewage

Rivers	Towns	Population (2011)	Population (2032)	Projected Total Water Consumption (135 lpcd) (MLD)	Projected Estimated Average Sewage Generation(MLD)*	Existing STPs		**Gap (MLD)**
						Nos	Capacity	
Umkhrah	Shillong	354759	470900	**63.57**	**50.86**	-	-	**50.86**

Base on the projected population, the estimated gap in sewage management is **50.86 MLD**. Taking into account 3500 floating population per day, the Gap of **50.86 MLD** is multiplied by a factor of **1.011**. Hence the **Gap is 51.42 MLD**

Presently, Septic tanks have been made by individual households for disposal of sewage and the supernatant is directly or indirectly disposed of in nearby drains which join the 20 drains which joins the Umkhrah river. There is no underground planned pipe sewerage system in Shillong and thus sewage management is being done with natural slope in open drain system leading to valleys. Due to the land constraint in city of Shillong, laying of sewer pipe lines and having a common Sewage Treatment Plant is not feasible. Hence decentralized types of Sewage Treatment Plants are proposed at the outfalls of the major drains**.**

6.2 INDUSTRIAL EFFLUENT MANAGEMENT

In the catchment of the Umkhrah River there are no industrial estates but the industries are isolated in pockets which are in operation. The total number of industries which fall in the catchment of Umkhrah River are 121 in number. The number of industries categorically located in and around the catchment area of the Umkhrah river stretch is as shown in **Table 13:**

Table 13: Number of Industries Operating in the Catchment

Sl. No.	**River**	**Identified River Stretch**	**Type of Industries/category**	**Number of Industries**
1.	Umkhrah	Nongthymmai, Rynjah, Lapalang, Umpling, Umkaliar,Nongmynsong, Polo, Wahiingdoh, Jaiaw, Mawlai and Mawpdang areas	Red Category	6
			Water polluting /small scale	115

The total water consumption of the industries, the total effluent generated and number of captive ETPs along with the Gap Analysis within the catchment of Umkhrah River are given in the **Table 14**

Table 14: Gap Analysis of Effluent Generated by Industries

. River	Type of Industries/ category	No. of Industries	No. of Industries having Captive ETPs	No. of Industries not having Captive ETPs	Total Water Consumption by the Industries (MLD)	Industrial Effluent Generated by the Industries (MLD)	Industrial Treated Effluent	GAP	Mode of Disposal
1. Umkhrah	Red Category	6	4	2	1.6294	1.3035	1.1035	**0.2**	**Treated Effluent is Disposed off to Drains**
	Water polluting /small scale	115	115	-					

In the catchment of Umkhrah River out of the total of 121 numbers of industries, 119 industries have captive ETPs while 2 industries under red category do not have a captive ETP. The amount of water consumption by the industries is **1.6294 MLD** and the amount of industrial effluent generated is **1.3035 MLD. 1.1035 MLD** of effluent is treated. Hence there is a **gap of 0.2 MLD.**
The samples of effluent from the captive ETPs are tested from time to time to check if the industries are complying as per the treated effluent standards. Therefore under Section 5 of the Environment (Protection) Act, 1986, non compliant industries are issued directions by the Meghalaya State Pollution Control Board. The detailed gap analysis of industrial effluent is given in **Annexure I** for the Umkhrah River.

In the river catchment there are 121 number of industries majorly comprising of hospitals, servicing units such as car washing, laundry, hotels, restaurants, bakeries.

119 out of 121 numbers of industries have been issued consent under Air (Prevention & Control of Pollution) Act, 1981 and Water (Prevention & Control of Pollution) Act, 1974. For which industries where they have establish ETPs

9 out of 11 hospitals have been granted authorization under Bio medical Waste Rules, 2016. 3 hospitals are not having ETPs which are generating around 200KLD waste water. Presently, these hospitals are discharging waste water into nearby drains without imparting any treatment**.**

6 .3 SOLID WASTE MANAGEMENT

Sl. No.	**Town or City**	**Population (2011)**	**Expected population (in 2032)**	**Future 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	Shillong (Catchment of Umkhrah)	354759	470900	164.81	**A compost Plant is under construction for bio-degradable waste**	**170 TPD (under construction)**	**164.81**

Under the Ministry of Housing & Urban Affairs and Asian Development Bank funded North Eastern Region Capital Cities Development Investment Program (NERCCDIP), the Urban Affairs Department through the State Investment Program Management and Implementation Unit (SIPMIU) and the Design Management and Supervision Consultants appointed under the project in collaboration with the Shillong Municipal Board, interventions has been made for improvement of Solid Waste Management in Shillong.

For treatment of the bio-degradable waste, a 170 TPD Compost Plant is under Construction at Marten, Shillong which is expected to be completed in March 2020.

For Scientific disposal of waste a 6500 sqm sanitary landfill site has been developed and commissioned on 2nd October 2017 at Marten, Shillong. An additional 15000 sqm sanitary landfill site is also completed.

6.4 INDUSTRIAL HAZARDOUS WASTE

Automobile Service Centers are already covered under consent mechanism under Water Act (Prevention and Control of Pollution) Act 1974 and these to be brought under the HW & OW (M&H) Rules, 2016 and regulate them through authorization process.

6.5 BIOMEDICAL WASTE MANAGEMENT

There are about **25 numbers of Non bedded Clinics/Laboratory and 13 numbers of bedded Hospitals/ Nursing Homes** operating in Shillong city. It is estimated that about 334.5 Kg/day biomedical waste is generated from these healthcare facilities. There is one Common Bio-medical Waste Treatment Facility (CBMWTF) in the state of Meghalaya but it is non functional. The Common Bio-medical Waste Treatment Facility (CBMWTF) is under repair and renovation.

Hospitals generating bio-medical waste should have deep burial provision for temporary disposal of generated biomedical waste till existing CBMWTF is upgraded/ new CBMWTF becomes operational.

Meghalaya State Pollution Control Board (MSPCB) to issue advisory to Hospitals generating biomedical waste to have deep burial provision for temporary disposal of generated bio-medical wastes till CBMWTF becomes operational.

6.6 CONSTRUCTION & DEMOLITION WASTE

The concerned departments viz. PWD, CPWD, Urban Affairs Department, Meghalaya Urban Development Authority etc have been requested to identify land for disposing off the construction and demolition waste. As such no major large scale construction or demolition is carried out within the catchment area of the two rivers. Small scale housing construction and demolition is carried out where in the waste is used for land filling and levelling.

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 Umkhrah.

7.0 . UMKHRAH RIVERS REJUVENATION PLAN:

7.1 Action plan for management of sewage:

(a) Each household within the catchment area of the Umkhrah river needs to have a septic tanks and a soak pit.

(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) **Decentralized Sewage Treatment Plants (STPs)** will be installed at outfalls of the major drains of the Umkhrah River along with channelization and diversion works of drains. Sludge generation will be 1% after sedimentation tank. It will be collected in sludge holding tank. Settled sludge will be disposed off to solid waste landfill and supernatant will be recycled back to STP inlet.

A concept "On feacal sludge treatment plant, intermediate sewage pumping stations and nallah waste water treatment plant (STP)" has been prepared by Department of Urban Affairs, Shillong for the 3 (three), outfalls of the Umkhrah river stretch which are under their jurisdiction. The funds for carrying out the proposed works has been approved under AMRUT Scheme

Preliminary consideration of drains is as mentioned as below;

- Junction of Wahthangsniang and Umkhrah
- Junction of Wahingdoh and Umkhrah
- Junction of Wahdasoi and Umkhrah

(d) Construction of a Septage Treatment Plant has been initiated in the existing municipal dumpsite**.**

(e) Bio-remediation will be carried out for the other drains

(f) Interception and diversion of sewage from all drain contributing to pollution included in the DPR for ensuring tapping and conveyance of sewage to STPs .

(g) Installation supply and commissioning of cesspool truck/sucking machine including GPS tracking for collection from the septic tanks of households.

(h) Installation of Plant 1.5 MLD capacity inclusive of wastewater collected from Nallah behind Shillong Municipal Board Office and Septage collected from septic tanks of individual households.

7.2 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.

(e). Hotels/Restaurants particularly located on road-side should not dispose untreated sewage and solid waste into nearby public drain or rivers. Such establishments should be properly regulated and levied with fines in case of any violation.

7.3 Action plan for management of Solid Waste Management:

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, pellats making as well as landfill with leachate treatement provision in accordance with solid waste management rules, 2016 as further amendments made thereof.
viii. Biomining and Capping of existing municipal dumpsite in accordance with the SWM rules, 2016

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7.4 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) – By Forest and Environment Department, Meghalaya

ii) Checking and removal of encroachments periodically- District Administration

There has been considerable encroachment along the course of Umkhrah River. This is largely due to issue of pattas by traditional authorities. Consequently, there has been reduction in the width as well as capacity of stream course. Since 1994-1995, several eviction notices were issued besides demolition drives against the residents encroaching along the streams course particularly along the stretch of Mc Cabe Road. However, interim protection has been allowed by the Court from time to time. Subsequently during the year 2005, a public notice was issued by the Deputy Commissioner to

the effect that land at Mc Cabe Road, Shillong is disputed and anybody indulging in the sales and purchase of land in that area would be doing so at their own risk. This notice was challenged before the Hon'ble Court and the Hon'ble Court granted a status quo. During 2007, the Hon'ble High Court has directed the Additional Deputy Commissioner to make an inventory of Constructions which was said to be illegal. The Hon'ble High Court during May 2001 declared all the construction along the Wah Umkhrah at Mc Cabe Road Stretch from Polo junction upto the bridge at Wah Pomdngiem as illegal. Meghalaya Urban Development Authority was asked to demolish the illegal structures. When Meghalaya Urban Development Authority tried to demolish, the matter was stalled by the order of Hon'ble High Court. In the Order of the National Green Tribunal in Application No. 144 of 2014 dated 29th January, 2015, where direction has been issued to identify and remove unauthorized structures. Meghalaya Urban Development Authority while in the process of preparing the inventory of the structures therein the Petitioners approached the Supreme Court vide Special Leave to Appeal (C) No, (i) 26495 of 2015 and the directions of the High Court was stayed. The matter since then is in the Supreme Court.

iii) Prohibition of disposal of municipal and bio-medical waste particularly in drains-By District Administration/Shillong Municipal Board;

iv) Department of Water Resources, Meghalaya may notify FPZ - within one year.

7.5 Greenery development- Plantation plan/Biodiversity Parks:

The Umkhrah river flows through the main part of Shillong city , The plantations and the soil & water conservation structures can help to control the flow of runoff water directly to rivers or low lying areas in rainy seasons reducing thereby soil erosion. These helps to impounded and re-charge the ground water. These in turn, rejuvenate the local streams. These measures in turn help to maintain the health of the rivers and also help in reducing pollution in river by maintaining continuous inflow of river water towards downstream.. Along the banks of the two rivers, majority of the land falls under private ownership, hence the land owners would be encourage to raise plantation.The Forest and Environment Department has prepared a proposal for plantation on both sides of the river at 9(nine) identified locations.

A botanical garden under the Forest and Environment Department is present within the catchment area of the river Umkhrah.

7.6 Sand Mining in river stretches:

There has been no account of sand mining in the Umkhrah rivers stretch.

7.7 Environmental Flow (E-Flow):

The river Umkhrah 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. By-laws are made in the Urban Affairs Department for provisions of roof top rain water harvesting. Hydrological Stations will be set up along the stretch of the river Umkhrah by Water Resources Department.

8.0 MONITORING OF ACTION PLAN

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 Meghalaya vide order N0. ENV.5/2018/44 Dated 24.01.2019.

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

Action Plan for River Rejuvenation of polluted river stretches shall be prepared and monitored by the Committee.

River Rejuvenation Committee:-

1. PCCF & HOFF, Forest & Environment Department, Meghalaya - Chairman
2. Director, Urban Affairs Department, Meghalaya - Member Convener
3. Director, Commerce and Industries Department, Meghalaya - Member
4. Member Secretary, Meghalaya State Pollution Control Board - Member

9 . ACTION PLAN:

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 Umkhrah	Execution Agency/ Department	Time Target	Amount (in rupees)	Remarks
1.	**SEWAGE MANAGEMENT**				
	(i) Installation and commissioning of decentralized STPs at the 3 outfalls of Umkhrah River and (ii) Channelization including diversion of sewage generated from household/ townships/interception of all the drains presently carrying sewage and for ensuring proper treatment through	Urban Affair Department, Shillong Municipal Board, KHADC with the assistance of Water Resources Deptt	30th March 2021	69.40 Crores 17.99 Crores	Funds for installation of STPs at the 3 (three) outfalls has been approved under the AMRUT Scheme. Funds will be sought for the other 17 remaining outfalls.

	the upcoming Decentralized Sewage Treatment Plants at the major outfalls of the drains. (iii) Installation supply and commissioning of 26 Numbers of cesspool truck/sucking machine(13 numbers: 2000 Liters capacity and 13 numbers: 6000 Liters capacity) including GPS tracking for collection from the septic tanks of households. (iv) Faecal Sludge Treatment Plant for treatment of Septage from individual households (1.5 MLD) along with site development works (v) Bio-remediation of other minor drains	Urban Affairs Department & Shillong Municipal Board Meghalaya Basin Development Authority (MBDA) and Urban Affairs Department.		5.86 Crores 6 Crores 3.44 Crores	Fund to be sought

	Utilisation of treated waste water 1. Irrigating the nearby plantation areas within the vicinity of Faecal Sludge 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	Urban Affair Department, Shillong Municipal Board		-	After commissioning the project "Pollution abatement of river Umkhrah" utilization of treated waste water will be started.
2. INDUSTRIAL POLLUTION CONTROL					
	Action against the industries not installed ETPs or ETPs exist but not operating or ETP outlet or treated effluent is not complying to the effluent discharge standards or norms.	MSPCB	Continuous Process		Directions, show cause notices and Closure notices are issued.
3. SOLID WASTE MANAGEMENT:					

Solid Waste Management Project. 1. A Solid Waste Management Project is being initiated by the Urban Affairs Department for the development of the scientific waste management facilities for Shillong 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. 2. Development of integrated solid waste management facility (provision of segregation, treatment, compost, pellats making as well as sanitary landfill with leachate treatment provision in accordance with solid waste management rules, 2016 as further amendments made thereof.		Urban Affairs Department Shillong Municipal Board	30th March 2021	80 Crores	Financial assistance awaited.
4. E-WASTE AND PLASTIC WASTE ASSESSMENT:					
	1. Inventory (Assessment, quantification and characterization) of waste on E-Waste & Plastic waste	Meghalaya Pollution Control Board	30th March 2021	-	Meghalaya State Pollution Control Board has yet to complete inventory, assessment, quantification and characterization of E-Waste & Plastic waste in 2018.
	2. Development of collection centres.				Karo Sambhav has set up a collection centre in Shillong
5. BIO-MEDICAL WASTE MANAGEMENT:					
	Development of one Common Biomedical waste treatment facility	Urban Affairs Department, Shillong	30th March 2021	1.4 Crores	

		Municipal Board			
	Installation of Captive ETPs at all the Government Hospitals	Health Department (Engineering Wing)	30th April 2021	2 Crores	Works has started. Show Cause Notice has been issued by MSPCB to the Health Department
6. HAZARDOUS WASTE and Other Waste MANAGEMENT:					
	Automobile Service Centres be covered under Consent under Water Act (Prevention and Control of Pollution) Act 1974 and authorisation under HW & OW (M&H) Rules, 2016 as amended.	Meghalaya Pollution Control Board	Continuous activity		
7. Groundwater Quality					
	Groundwater quality monitoring stations will be identified at salient points in the catchment of river Umkhrah	Meghalaya State Pollution Control Board, CGWB	Continuous activity	-	
8. Flood Plain Zone:					
	Prohibition on illegal disposal of waste and removal of encroachment from river banks.	District Administration & Urban Affairs Department	Continuous activity	-	Matter is stalled at Supreme Court as (Matter is Sujudice)
9. Environmental Flow (E-Flow) and Groundwater recharge measures:					
	Provisions of roof top rain water harvesting in Govt. building, commercial buildings, hotels and Houses Setting up of Hydrological Stations. (non- recurring cost)	District Administration/ Urban Affairs Department Water Resources Department	Continuous activity 30th March 2021	- 0.054 Crores	By-laws are made in the Urban AffairsDepartment. Funding through State Government
10. GREEN DEVELOPMENT:					
	Plantation on both sides of the river and in the	Forest & Environment	30th March	0.25	Financial Assistance yet to be acquired

	private land and individual land owner	Department	2021	Crores	
11. CLEANING & AWARENESS ACTIVITIES					
	Public awareness programme through add on media	Forest & Environment Department, MSPCB, District Administration	30th March 2021	0.25 Crores	It will cover in the project "Pollution abatement of rivers Umkhrah and Umshyrpi" .
	GRAND TOTAL AMOUNT			**186.644 Crores**	