ACTION PLAN FOR PAGLADIA RIVER AT NALBARI

PRIORITY IV

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1. Basic information about the Stretch

The Pagladia river originates on the southern slopes of Bhutan hills at an altitude of 3000 m above MSL at point having latitude of $26^0$59’ N and longitude of $91^0$27’ E. After traversing through the Bhutan territory, it enters the Nalbari district of Assam near Chowki. The river flows in a north southerly direction up to Bijalighat and then it flows in a south westerly direction up to its confluence near Lowpara village. The total length of the river is 196.80 km. Out of which it flows for a length of 19 km in the hill of the Bhutan territory and the rest 177.8 km through the Nalbari district of Assam.

The Mutanga river is one of the left bank tributary of Pagladia river. It originates from the Bhutan hills and covers a length of about 30 km. It joins the river Pagladia on left bank at 28.5 km below Chowki and 0.75 km upstream to Thalkuchi village. Another tributary named Darranga originating from the Bhutan hills joins Mutanga on its right bank near Barkajuli, approximately 6 km upstream of the confluence of Mutunga with Pagladia. The total catchment area of Mutunga river is 130 sq.km.

1 (i) Polluted river stretch/length

The length of the polluted stretch of Pagladia River is approximately 4 KM with an area of 16 sq.km. (Fig 1). The stretch identified as polluted is from Balakuchi to Khudra Sankara.

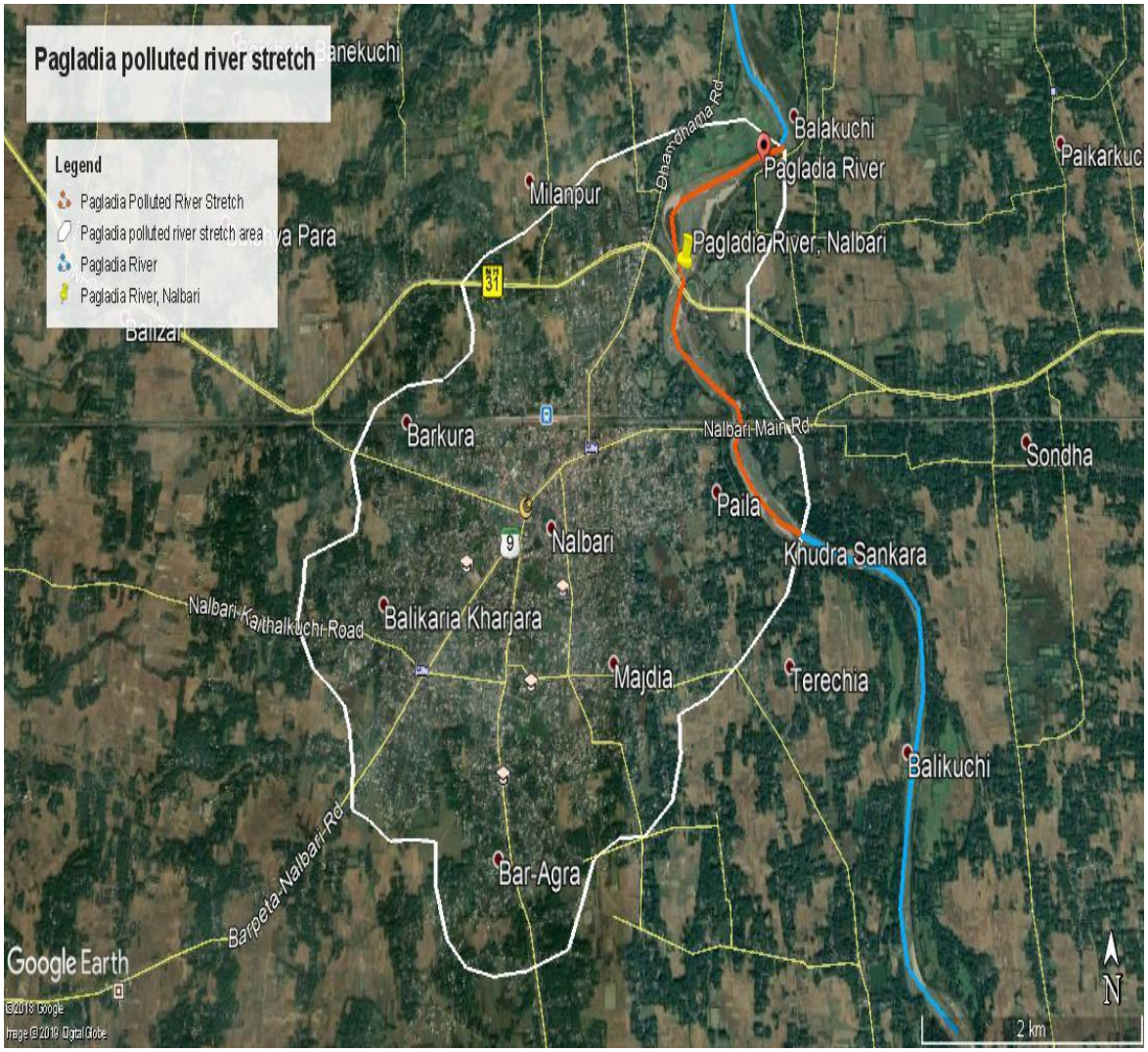

Fig 1: Map showing the polluted stretch of Pagladia river

2. Background:

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 Jacob Koshy, Titled 'More river stretches are now critically polluted CPCB', Government of Assam constituted River Rejuvenation Committee (RRC) vide memorandum 673/2018 dated 19/12/2018 for effective abatement of pollution, rejuvenation, protection and management of the identified polluted stretches, for bringing the polluted river stretches to be fit at least for bathing purposes within six months.

3. Basis of Action Plan for polluted stretch of Pagladia River

The action plan for rejuvenation, protection and management of the identified polluted river stretch of Assam has been prepared based on the following

- As per direction of Hon'ble National Green Tribunal, Principal Bench, New Delhi in the matter of news published in 'The Hindu' authored by Jacob Koshy, Tiltled 'More river stretches are now critically polluted CPCB'
- Comprehensive report on Prevention and Control of Pollution in River Hindon: An Action Plan for Rejuvenation' [Submitted in compliance to Hon'ble National Green Tribunal]

4. Components of Action Plan

(a) Industrial Pollution Control

- Inventorisation of industries
- Categories of industry and effluent quality
- Treatment of effluents, compliance with standards and mode of disposal of effluents
- Regulatory regime.

(b) Identification, Channelization, Treatment and Utilization of Treated Domestic Sewage

- Identification of towns in the catchment of river
- Town-wise Estimation of quantity of sewage generated and existing sewage treatment capacities to arrive at the gap between the sewage generation and treatment capacities;
- Identification of towns for installing sewerage system and sewage treatment plants.
- Storm water drains now carrying sewage and sullage joining river and interception and diversion of sewage to STPs,
- Treatment and disposal of septage and controlling open defecation.

(c) River catchment/Basin Management-Controlled ground water extraction and periodic quality assessment

- Periodic assessment of groundwater resources and regulation of ground water extraction by industries particularly in over exploited and critical zones/blocks.
- Ground water re-charging /rain water harvesting
- Periodic ground water quality assessment and remedial actions in case of contaminated groundwater tube wells/bore wells or hand pumps.
- Assessment of the need for regulating use of ground water for irrigation purposes.

(d) Flood Plain Zone

- Regulating activities in flood plain zone.
- Management of Municipal, Plastic, Hazardous, Bio-medical and Electrical and Electronic wastes.
- Greenery development- Plantation plan.

(e) Ecological/Environmental Flow (E-Flow)

- Issues relating to E-Flow
- Irrigation practices

(f) Such other issues which may be found relevant for restoring water quality to the prescribed standards.

5. Action Plan as per direction of Hon'ble NGT

The components to be discussed in the action plan for rejuvenation, protection and management of identified polluted stretch of Pagladia river are as follows

5.1. Industrial Pollution Control

No industrial estate/notified industrial area is located in the 500m periphery of the Pagladia river catchment area.

Table I: Details of the Industrial Pollution Control

Name of the Industry	Category	Total Water Consumption/ Waste Generation	Without consent/Directions issued	ETPs	CETPs	OCEMS	Gaps	Proposed CETP
NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL

5.2. Number of industries- category Red or water polluting/ small scale

No major/minor industrial estate/cluster are located on the 500 m periphery of the river bank.

5.3. Industries without consent/authorisation

Not Applicable

5.4 Number of directions issued to industries

Not Applicable

5.5. Total water consumption and the waste water generation by the industries

As there is no any industrial zone/belt in the catchment area, there is no possibility of water consumption and waste water generation.

5.6. Number of industries having captive ETPs and treatment capacity

Not Applicable

5.7. Number of industries are members of the CETPs

Not Applicable

5.8. Number of CETPs existing in the catchment of the polluted river stretch and the treatment capacity

Not Applicable

5.9. OCEMS installation status by industries

Not Applicable

5.10. Gaps in treatment of industrial effluent

There is no gap in treatment of industrial effluent as the catchment area does not fall under any industrial estates/Clusters.

5.11. Present/proposed CETP capacity/ Member unit

Not Applicable

6. Identification, Channelization, Treatment and Utilization of Treated Domestic Sewage

6.1. Major towns located on the bank

Nalbari is the main town located on the bank of the river. There are 12 wards under Nalbari Municipal Board which are located in the catchment area of the river

6.2. Town wise estimation of quantity of sewage generated and existing sewage treatment capacities

The population of the Nalbari Town in the catchment area of the river is 27839 with 6087 household as per 2011 census of India. The individual households have their own septic tank, soak pit, artificial pond for treatment of their liquid waste. There is no any existing sewage treatment Plant. Approximately 3006 KLD of sewage is being generated by the town.

6.3. Identification of towns for installing sewerage system and sewage treatment plants.

Nalbari town can be considered for installing sewerage system and sewage treatment Plant (STP) in consultation with the stakeholder's department and District administration. A 3.5 MLD STP has been proposed for Nalbari town.

Table II: Sewage generation and gaps in treatment

S.N	Area (sq.km)	Population as per 2011 census (Catchment villages of Pagladia river)	Water Consumption (KLD) @135 lpcd	Sewage Generation (KLD)	No. of STPs	Existing Treatment capacity (KLD)	Gaps in KLD
1	16	Ward No. 1 =1483 Ward No.2 = 3752 Ward No.3 = 1806 Ward No.4 = 3811 Ward No.5 = 2100 Ward No.6 = 696 Ward No.7 = 2666 Ward No.8 = 1351 Ward No.9 = 2776 Ward No.10 = 2584 Ward No.11 = 3321 Ward No.12= 1493 **Total = 27839**	3758	3006	Nil	Nil	3006

6.4. Water Quality of the river stretch

There is one (01) sampling location of Pagladia River under NWMP as per the following.

Table III: Monitoring Locations Details

Sampling Location	Coordinates
Pagladia River at Nalbari	26°27'34.31" N 91°27'15.21" E

The latest water quality trend in terms of BOD value from January 2016 till March 2019 is presented below:

Table IV: BOD value in mg/l of Pagladia river

Year	BOD Value (mg/l)	Year	BOD Value (mg/l)	Year	BOD Value (mg/l)	Year	BOD Value (mg/l)
Jan-16	0.9	Jan-17	0.6	Jan-18	0.8	Jan-19	2.2
Feb-16	0.7	Feb-17	1.0	Feb-18	2.8	Feb-19	2.7
Mar-16	1.3	Mar-17	1.2	Mar-18	2.4	Mar-19	1.8
Apr-16	1.1	Apr-17	4.6	Apr-18	1.0	Apr-19	2.9
May-16	1.2	May-17	3.2	May-18	1.6	May-19	2.2
Jun-16	1.1	Jun-17	2.7	Jun-18	4.2	Jun-19	1.8
Jul-16	3.7	Jul-17	2.7	Jul-18	2.5	Jul-19	1.2
Aug-16	5.2	Aug-17	2.9	Aug-18	1.4	Aug-19	1.4
Sep-16	8.2	Sep-17	2.8	Sep-18	2.6	Sep-19	1.3
Oct-16	3.9	Oct-17	5.2	Oct-18	3.3	Oct-19	1.2
Nov-16	2.5	Nov-17	2.8	Nov-18	1.7	Nov-19	1.5
Dec-16	2.0	Dec-17	2.8	Dec-18	2.4		

The above data indicates that the BOD load is above 3 mg/l only in nine (09) occasion out of forty seven (47) samplings carried out from January, 2016 till Nov, 2019.

During monsoon season breaching of embankment occurs due to high current of the river and the low lying areas are inundated with flood. The flood water washes out the top soil layer along with the debris in the catchment area of the river which is having high organic load resulting in increase of BOD level beyond permissible limit in some occasions.

6.5. Drains contributing to pollution

One drainage outfall has been identified from Bhugabeel from Ghograpar area which may carry the untreated sewage along with the storm water.

6.6. Treatment and Disposal of Septage and controlling Open Defecation

Individual households in the villages are equipped with septic tanks. However, around 1197 toilets have been constructed in the Nalbari (MB) under

the 'IHHL' mission which is an initiative of Swachh Bharat Abhiyan to achieve open defecation free area.

Following remedial actions will be taken in consideration of treatment and disposal of sewage

- Raise public awareness to control open defecation and understand the importance of toilets.

7. Controlled Ground water Extraction and quality Assessment

Table V: Estimation of ground water resource in the Nalbari district

Net Ground Water Availability	**943.50 mcm**	**Ground water recharging mechanism**	**Rain water harvesting**
Net Annual Ground Water Draft	457.28 mcm	Recharging of groundwater are done by creation of Pond/lakes under government schemes.	The roof top rainwater harvesting is practiced.
Projected demand for domestic and industrial uses up to 2025	36.03 mcm		
Stage of Ground Water Development	54%		

Irrigation Practices in Nalbari District

Certain schemes such as Lift Irrigation Scheme (LIS), Flow Irrigation Schemes (FIS) and Deep Tubewell (DTW) have been taken up for Nalbari district by the irrigation Department of Assam in collaboration with the Central government.

7.1. Status of Ground Water

Ground Water Development in the district is not up to the mark. Except a few deep and shallow tube wells, no much more construction has been made. Rural water supply by Public Health Department covers most of the parts of the district. Irrigation wells by ASMIDC, Irrigation Department and Agriculture Department have covered a few schemes with construction of shallow tube wells

As per CGWB report the ground water of Nalbari district is neutral to alkaline in nature with pH ranging between 6.9 and 7.9. The Electrical Conductivity value is within permissible limit. Calcium content is form 24 to 62 mg/l and well within permissible limit. The alkalinity value governed by anion content of carbonates and bicarbonates is within range of 43 to 275 mg/l.

The hardness of ground water ranging from 65 to 235 mg/l indicates that ground water is of soft to moderately hard in nature. The analysis of ground water samples from deep aquifer indicates its suitability for its domestic & irrigation use. The water is of medium salinity and contains low sodium.

In Nalbari district, stage of ground water development is 54%. The district is still under 'Safe' category. There is no any ground water issue with respect to its quality.

7.2. Remedial Actions

The following remedial actions will be taken in consideration of contaminated ground water sources, controlled ground water extraction and periodic quality assessment

- Ground water of deeper aquifers should be analyzed for periodic assessment of Iron.
- Alternate sources of drinking water should be explored and prioritized.
- Awareness campaigns about health hazards due to intake of excessive Iron is the need of the time.
- Role of pesticides used for agricultural activity should be carefully observed.
- Survey should be conducted regarding ground water uses for domestic purpose and also to identify the over exploited and critical areas in the river stretches with respect to ground water extraction.
- Effective management of sewage for preventing contamination of ground water sources.
- Roof top rain water harvesting techniques should be encouraged for industrial, commercial or individual households and community.

8. Flood Plain Zone

The following are the identified flood prone area for the polluted Pagladia river stretch

Name of River	Flood plain areas
Pagladia River	Barkura, Balikariakharjara, Majdia, Bar-Agra, Paila

The general gradient of Pagladia river is towards the river Brahmaputra in the south. The area on the bank of the river has very low elevation and is inundated during flood. Almost every year the district gets inundated by floods during monsoon season. The effect of flood and soil erosion is much more in southern part.

The Pagladia river embankment details are as follows.

S.N	Embankment	Length (km)
1	Left bank	42.8
2	Right Bank	46.8

8.1. Regulating activities in the Flood Plain Zone

Further following activities need to be regulated in the flood plain zones.

S.No	Action points	Responsible authority
1	Plantation in the flood plain zone	Forest Department
2	Checking Encroachment	Local administration
3	Demarcation of the flood plain zone	Water Resource Department
4	Prohibition of disposal of all kinds of wastes	District Administration

8.2. Waste management status and proposed actions for Municipal solid waste, industrial waste and Bio medical waste management

Table VI: Waste management status and proposed actions

Type	Status	Proposed Action	Authority
Industrial Waste	➢ No industrial units have been identified within 500 meters periphery of the catchment area.	➢ Not Applicable	Pollution Control Board Assam
Municipal waste management	➢ At Present Municipal Solid wastes are being dumped unscientifically near NH 31 along Pagladia river. ➢ ULBs are to prepare DPR for Solid waste management of the city in consultation with state governments. ➢ Municipal Body has engaged NGOs ward wise for collection of Municipal Solid Waste from the generation point for treatment and disposal. ➢ The wastes are being segregated into dry and wet waste categories and are collected separately and transported to disposal site.	➢ Directions have been issued by Pollution control Board, Assam to concerned Municipality Board in this regard. ➢ Awareness generation regarding solid waste management Rules. ➢ Implementation of segregation of waste at source ➢ Door-to-door garbage Collection of waste at least thrice in a week ➢ Formation of Sanitation task Force	Nalbari Municipality Board

Type	Status	Proposed Action	Authority
		➢ Formation of Neighbourhood Community ➢ Awareness campaigns Processing and disposal of waste	
Plastic waste	➢ At present plastic wastes are being dumped along with Municipal solid waste.	➢ Issue directions to Municipal Board, Village panchayats to segregate and collect plastic waste and initiate necessary steps to channelize the waste to authorized agencies for recycling and reprocessing	Nalbari Municipality Board, Village Panchayats.
Hazardous waste	➢ No industrial units have been identified within 500 meters periphery of the catchment area.	➢ Not Applicable	Pollution Control Board Assam
Bio-Medical waste	➢ No industrial units have been identified within 500 meters periphery of the catchment area.	➢ Not Applicable	HCF units
E –waste	➢ No bulk consumers and generators have been identified.	➢ Not Applicable	Pollution Control Board Assam

8.3. Gaps identified in waste management

About 17 MT of municipal solid wastes per day are being dumped unscientifically near NH 31 along the Pagladia river.

8.4. Greenery development - Plantation Plan

State has initiated afforestation in the degraded forestland, also raising roadside plantation besides creating check dams/embankments in the river catchment areas to combat erosion and soil conservation.

The following remedial actions has to be initiated in consideration of greenery development

- Raise plantation along the river bank to control the flow of run off water directly to the river
- Bamboo species to be raised as it is a good soil binder thereby stabilize the banks of the river from erosion

9. Environmental Flow (E-Flow)

9.1. Stretch of river perennial or non- perennial/flow available/water usage in the stretch

The entire river stretch is perennial. The discharge of Pagladia river as per the master plan of Brahmaputra Board is 1737.00 Cum. It is also observed that even during the dry season, the river maintains 50% of the average flow recorded. All the major tributaries of Brahmaputra river are perennial in nature and maintains 50% of the average flow even during non-monsoon season.

9.2. Irrigation practices in the river

The high volume of discharge and water level of the river can be of great use for good irrigation practices for the people. But the farmers of the region usually depends on rain water for cultivation as rainfall is plenty in Assam.

10. Identified organisations responsible for preparation and execution of the action plans

Organisations responsible for preparation and execution of the action plans are as follows:

- Secretary to the Govt. of Assam, Environment and Forest department
- Secretary to the Govt. of Assam, Urban Development department
- Commissioner, Industries and Commerce, Assam
- Member Secretary, Pollution Control Board Assam
- Commissioner, Guwahati Municipal Corporation
- Commissioner to the Govt. of Assam, Water Resource Department
- Divisional Forest officer, Social Forestry, Basistha, Guwahati -29

11. Monitoring mechanism proposed for implementation of action plans

The water quality assessment and evaluation of impacts is necessary to understand the river state at various stages of the project implementation and post implementation of the project. Therefore the water quality assessment and evaluation of the project achievements is essential component for the long term benefit of the project. The monitoring and evaluation also indicate for taking

corrective measure at appropriate time. The ill effects may be controlled by taking step at right time for right cause. The monitoring & evaluation schedule and plan proposed is as under-

11.1 Water Quality Stations (WQS):

The water quality monitoring will include following parameters, which shall be monitored at monthly interval or as and when required. The one complete unit to be purchased and identified parameters to be monitored at defined sampling stations.

The sampling stations are:

- Pagladia river near Nalbari town.

The parameters to be monitored are as follows.

1	pH	6	Bio-Chemical Oxygen Demand (BOD)
2	Turbidity	7	Faecal coliform
3	Conductivity	8	Total coliform
4	Temperature		
5	Dissolved Oxygen (DO)		

Most of the parameters will be monitored manually and will be incorporated in database.

12. Public Mass awareness etc.

Any river conservation project to be implemented successfully, public awareness is of utmost importance. Unless the public are made aware about the irreversible damage and pollution caused by indiscriminate littering and dumping of waste and garbage in drain and water bodies connected to Pagladia River, the project cannot be implemented in true sense of the word to achieve conservation. Some members of the communities are already aware that there is a need for river conservation programme and that they will be benefitted. Hence, it should be ensured with the following points

- The communities are effectively involved in all the stages of the project cycle from conceptualization, to preparation, to finalization, to implementation and finally O & M.

- Public Awareness & Public Participation should be affront-end activity of the project
- The entire programme of conservation should be conceived, formulated, implemented, monitored and evaluated in close consultation with the stake holding communities.
- Therefore, education and awareness programmes are key to the sustainability of the various components implemented as part of the river restoration project.

13. Action Plan

Table VII: Action Points

Type	Action Points	Responsible Authority	Time Targeted
Industries	a) No industrial units have been identified within 500 meters periphery of the catchment area.	**Not Applicable**	
Interception and treatment of raw sewage	a) The quality of waste water flowing in the drains of identified polluted stretch have to be analysed and studied to assess the drain wise characteristics of waste water. b) Concerned departments should design the installation of Sewage Treatment Plant (STP) based on flow details of the drains and utilization capacity and ensure that each households are connected to the sewers as applicable. c) Sewage Treatment Plant should also consider treatment and disposal of sewage for river catchment area settlement including discharge from toilets	**PCBA/ ULBs/ District Administration/ Water Resource Department**	**2 Years (June,2019 to May, 2021)**

Type	Action Points	Responsible Authority	Time Targeted
	constructed under Swachh Bharat Mission d) To trap the discharge using strainers before falling into river. e) Channelization including diversion of sewage generated from households to sewer lines/interception of all the drains presently carrying sewage and for ensuing proper treatment through the upcoming STPs. f) Local administration should provide pucca latrines to all the households through Individual Households Latrines (IHHL) Scheme under Swachh Bharat Mission.		
Ground Water Assessment	a) Conducting survey regarding ground water usage by category wise such as domestic, community, etc. and also identification of over exploited and critical blocks in the river stretches with respect to the ground water extraction. b) Carry out assessment of ground water survey in the catchment area of the identified polluted stretch once in a year to ensure quality. c) To promote roof top rain water harvesting by individual households	**PCBA/CGWA**	**Continuous**
Flood Plain Zone	a) Conservation of the river through watershed management.	**Soil Conservation Department/Water Resource /Forest Department/**	**6 Months (February,2020 to July, 2020)**

Type	Action Points	Responsible Authority	Time Targeted
	b) Cleaning of the river bed and bank. c) Afforestation on both the banks to prevent soil erosion d) Recreational activities to be promoted. e) Erection of pathway of the river banks. f) Checking encroachment in the flood plain zone of the polluted river stretch g) Prohibition of disposal of municipal, plastic, biomedical and other wastes in the polluted stretch of the river bank h) Demarcation of the flood plain zone.	**Tourism Department/PWD Assam/ULBs**	
	The plan for the polluted stretches of the river may be implemented in a time bound manner by fragmenting activities as a) Assessment of water quality of the polluted stretches on monthly basis has already been commencing b) The monitoring committee may convene meeting of Stakeholder organizations on Quarterly basis with under the chairmanship of Chief Secretary	**Pollution Control Board Assam**	**a) Monthly Basis** **b) Quarterly basis**
Solid Waste	a) Prohibition of direct disposal of solid waste in the river banks. b) Frequent River Surface cleaning by removal of debris, plastics etc.	**ULBs/ Water Resource Department**	**3 Months (November, 2019 to January, 2020)**
Environmental Flow	a) Flow measurement of the river should be carried out by	**Water Resource Department**	**Continuous**

Type	Action Points	Responsible Authority	Time Targeted
	the concerned department and the record has to be maintained b) Fresh water flowing through escape channels/small barrages should be checked. c) The river can be of good potential for irrigation practices and should be carried out by the farmers.		
Public Awareness	a) Awareness programs to highlight the issues related with the direct discharge of solid waste and open defecation. b) Mass awareness to conserve water.	**ULBs/PCBA/NGOs**	**Continuous**

14. Budget Estimate

1	No. of STPs	01 No.
2	Capacity of STP	3.5 MLD
3	Life of STPs	25 years
4	Cost of STPs , Interceptor drains/pipeline including pumping station Sewerage System	5.2 crores
7	For Captive power	0.5 Crore
Total Amount		**Rs. 5.7 Crores**

Approved by River Rejuvenation Committee (RRC)

Secretary to the Govt of Assam
Environment & Forest Department

Secretary to the Govt of Assam
Urban Development Department

Commissioner
Industries and Commerce Assam

Member Secretary
Pollution Control Board Assam