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.

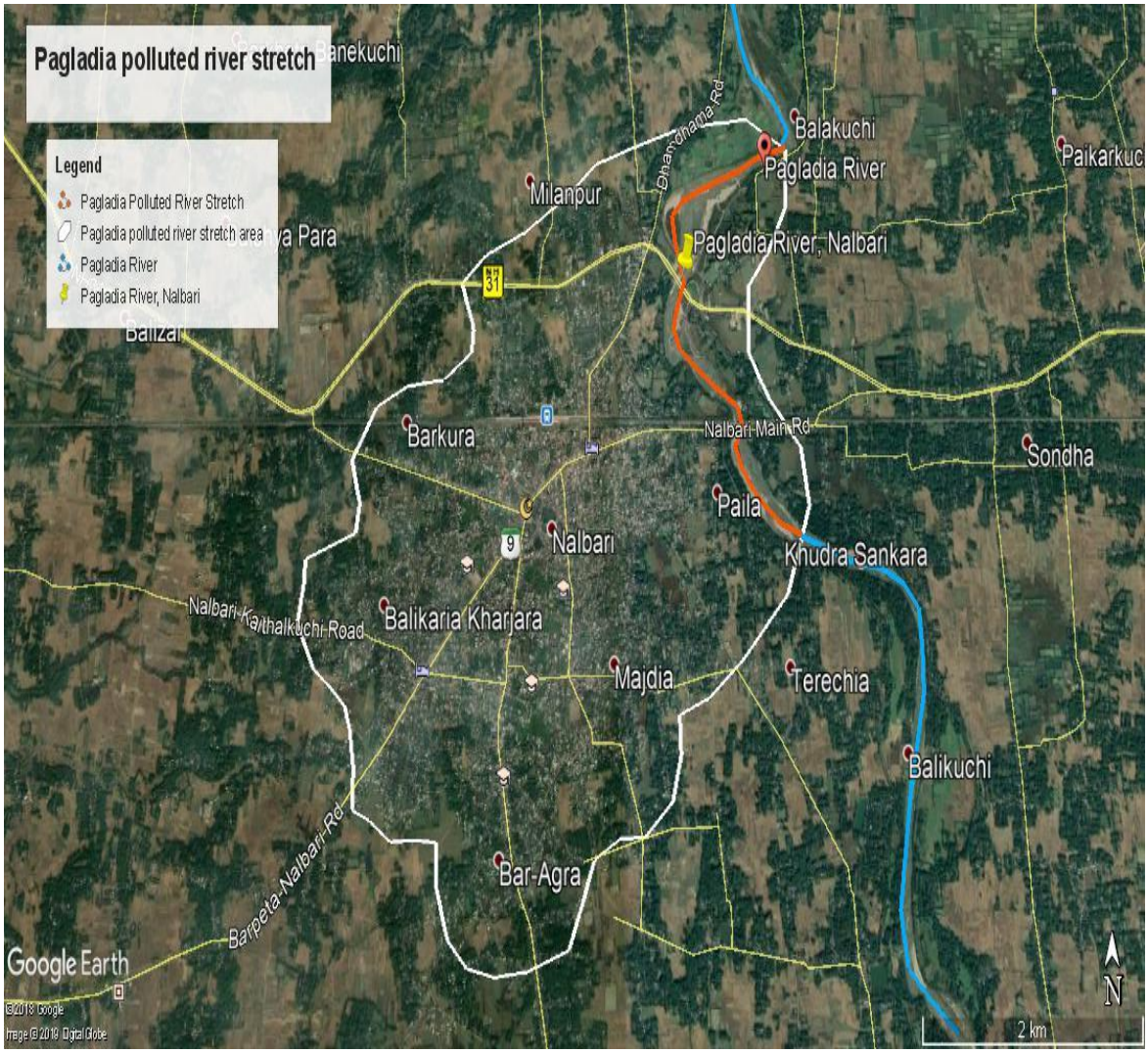

Fig 1: Map showing the polluted stretch of Pagladia river

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.

No Sewage Treatment Plant has been proposed in this Action Plan. The sewage generated can be minimised by adopting stringent remedial actions as below

a) The discharge should be trapped by strainers before draining off to the river.
b) In- situ treatment of sewage by Bioremediation.
c) Dosing of microbes near the drain outfall of all the drains

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	Nalbari Town	27839	3758	3006	Nil	Nil	3006

Table III: Total gap in projected population and sewage generation till 2035

S.N	Area (sq.km)	Projected Population till 2035	Water Consumption (KLD) @135 lpcd	Sewage Generation (KLD)	No. of STPs	Existing Treatment capacity (KLD)	Gaps in KLD
1	Nalbari Town	**42728**	5768.3	4614.6	Nil	Nil	4614.6

6.4. Water Quality of the river stretch

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

Table IV: 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 2020 is presented below:

Table V: 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)	Year	BOD Value (mg/l)
Jan-16	0.9	Jan-17	0.6	Jan-18	0.8	Jan-19	2.2	Jan-20	1.4
Feb-16	0.7	Feb-17	1.0	Feb-18	2.8	Feb-19	2.7	Feb-20	1.3
Mar-16	1.3	Mar-17	1.2	Mar-18	2.4	Mar-19	1.8	Mar-20	1.5
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	Dec-19	1.3		

The detail analytical data of the Pagladia river for the month of March 2020 are presented in **Table VI**

Table VI: Latest analysis report of Pagladia river- March 2020

Parameter	Value
D.O. (mg/L)	8.9
pH	7.8
Cond(µS/cm)	190
BOD(mg/L)	1.5
COD(mg/L)	7.0
NO_3 -N (mg/L)	1.3
TSS (mg/L)	76
Turbidity (NTU)	02
p-Alkalinity (mg/L)	Nil
m-Alkalinity (mg/L)	84
Hardness (mg/L)	50
Calcium as $CaCO_3$(mg/L)	30
Magnesium as $CaCO_3$ (mg/L)	20
Chloride as Cl- (mg/L)	08
Sulphate as SO_4^{-2} (mg/L)	21.3
Phosphate as PO_4 (mg/L)	0.08
TKN (mg/L)	0.66
NH_4-N (mg/L)	0.20
Total Dissolved Solids (mg/L)	114
TFS (mg/L)	28
Fluoride (mg/l)	0.20
Boron (mg/l)	0.011
Na (mg/L)	8.0
K (mg/L)	2.7
Total Iron (mg/L)	0.19
Lead (mg/L)	BDL
Zinc (mg/L)	0.033
Copper (mg/L)	BDL
Total Chromium (mg/L)	BDL
Nickel (mg/L)	BDL
Cadmium (mg/L)	BDL
Mercury (mg/L)	BDL
Arsenic(mg/L)	BDL
Total Coliform (MPN/100ml)	1100
Faecal Coliform (MPN/100ml)	610

The above data indicates that the BOD load is above 3 mg/l only in nine (09) occasion out of fifty one (51) samplings carried out from January, 2016 till March, 2020

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. However, based on water quality monitoring reports for the year 2019-2020, it is observed that the river Pagladia does not have polluted stretches at present. Since the river has significant amount of volume and discharge, it has the phenomenon of self-purification which is constantly taking place and hence no actions for rejuvenation of the mentioned river stretches of Pagladia river may be required.

6.5. Drains contributing to pollution

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

6.6. Characteristics of the major drains

The drains mainly carries commercial and domestic sewage. Direct dumping of residential and commercial garbage into the channel is making it shallower and heavily silted as the drains of the town are also becoming a regular garbage-dumping site. Moreover, these drains are not planned properly to carry even the regular water.

Table VII: Analysis report of the major drains contributing to pollution in the Pagladia river

Parameter	Bhugabeel at Ghograpar
D.O. (mg/L)	1.6
pH	6.8
Cond(µS/cm)	280
BOD(mg/L)	16.4
COD(mg/L)	46.6
NO_3 -N (mg/L)	2.9
TSS (mg/L)	68
Turbidity (NTU)	0.9
p-Alkalinity (mg/L)	Nil
m-Alkalinity (mg/L)	138
Hardness (mg/L)	110
Calcium as $CaCO_3$(mg/L)	68
Magnesium as $CaCO_3$ (mg/L)	42
Chloride as Cl- (mg/L)	16

Parameter	Bhugabeel at Ghograpar
Sulphate as SO_4^{-2} (mg/L)	22.4
Phosphate as PO_4 (mg/L)	0.84
TKN (mg/L)	11.8
NH_4-N (mg/L)	3.8
Total Dissolved Solids (mg/L)	182
TFS (mg/L)	44
Fluoride (mg/l)	0.38
Boron (mg/l)	0.029
Na (mg/L)	13.4
K (mg/L)	4.9
Total Iron (mg/L)	0.39
Lead (mg/L)	0.007
Zinc (mg/L)	0.052
Copper (mg/L)	0.004
Total Chromium (mg/L)	BDL
Nickel (mg/L)	BDL
Cadmium (mg/L)	BDL
Mercury (mg/L)	BDL
Arsenic(mg/L)	0.004
Total Coliform (MPN/100ml)	4400
Faecal Coliform (MPN/100ml)	2400

6.7. Flow details of the major drains contributing to river pollution

Discharge has been measured and it is around 0.024 m^3/sec

6.8. 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

- Every households should be recommended to have individual drainage that should be connected to soak pits or stagnated pool.
- The discharge should be trapped by strainers before draining off to the river.
- Roadside hotels/restaurants should not be allowed to dispose untreated sewage and solid waste into the nearby drains or rivers. These establishments should be properly regulated by the concerned authority.

- Public awareness to control open defecation and understand the sanitary hygiene.
- Local administration should provide proper pucca toilets for the individuals or atleast community toilets through the IHHL scheme under Swachh Bharat Mission.

7. Controlled Ground water Extraction and quality Assessment

Table VIII: 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. Ground water Quality of Nalbari area (Catchment of River Pagladia)

Table IX: Latest analysis report of Ground water at Nalbari – March 2020

Parameter	Value
pH	7.2
Cond(µS/cm)	284
BOD(mg/L)	1.4
COD(mg/L)	4.6
NO_3 -N (mg/L)	2.0
TSS (mg/L)	6
Turbidity (NTU)	2
p-Alkalinity (mg/L)	Nil
m-Alkalinity (mg/L)	68
Hardness (mg/L)	106
Calcium as $CaCO_3$(mg/L)	78
Magnesium as $CaCO_3$ (mg/L)	28
Chloride as Cl- (mg/L)	14
Sulphate as SO_4^{-2} (mg/L)	18.2
Phosphate as PO_4 (mg/L)	0.08
Total Dissolved Solids (mg/L)	182
TFS (mg/L)	42
Fluoride (mg/l)	0.34
Boron (mg/l)	0.010
Na (mg/L)	22.3
K (mg/L)	6.9
NH4-N (mg/L)	0.16
TKN (mg/L)	0.42
Total Iron (mg/L)	0.21
Lead (mg/L)	BDL
Zinc (mg/L)	0.042
Copper (mg/L)	BDL
Total Chromium (mg/L)	BDL
Nickel (mg/L)	BDL
Cadmium (mg/L)	BDL
Mercury (mg/L)	BDL
Arsenic(mg/L)	BDL
Total Coliform (MPN/100ml)	Nil
Faecal Coliform (MPN/100ml)	Nil

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 X: Waste management status and proposed actions

Type	Status	Proposed Action	Authority	Time Targeted
Industrial Waste	No industrial units have been identified within 500 meters periphery of the catchment area.	Not Applicable	Not Applicable	**Not Applicable**
Municipal waste	a) At Present Municipal Solid wastes are being dumped unscientifically near NH 31 along Pagladia river. b) ULBs are to prepare DPR for Solid waste management of the city in consultation with state governments. c) Municipal Body has engaged NGOs ward wise for collection of Municipal Solid Waste from the generation point for treatment and disposal. d) The wastes are being segregated into dry and wet waste categories and are collected separately and transported to disposal site.	Municipal Body is in process of inducting the following activity a) Implementation of segregation of waste at source b) Door-to-door garbage Collection of waste c) Formation of Sanitation task Force d) Formation of Neighbourhood Community e) Awareness campaigns f) Processing and disposal of waste	**Nalbari Municipality Board**	**3 Months** (April 2020 – June 2020)

Type	Status	Proposed Action	Authority	Time Targeted
Plastic waste	At present plastic wastes are being dumped along with Municipal solid waste.	Letter is being sent intermittently 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/ ULBs/Village Panchayats/Pollution Control Board Assam**	**3 Months (April 2020 – June 2020)**
Hazardous waste	No industrial units have been identified within 500 meters periphery of the catchment area.	Not Applicable	**Not Applicable**	**Not Applicable**
Bio-Medical waste	No industrial units have been identified within 500 meters periphery of the catchment area.	Not Applicable	**Not Applicable**	**Not Applicable**
E –waste	No bulk consumers and generators have been identified.	Not Applicable	**Not Applicable**	**Not Applicable**

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

8.5. Proposal for Biodiversity Park

At present there is no any land availability for establishment of Biodiversity Park in the catchment area of the river.

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.

9.3. Achievable Goals

Primary water Quality Criteria for Bathing water (water used for organised outdoor bathing)

Criteria	Rational
1. Fecal Coliform MPN/100 ml: 500 (desirable) 2500 (Maximum Permissible)	To ensure low sewage contamination. Fecal coliform and fecal streptococci are considered as they reflect the bacterial pathogenicity.
2. Fecal Streptococci MPN/100 ml: 100 (desirable) 500 (Maximum Permissible)	The desirable and permissible limits are suggested to allow for fluctuation in environmental conditions such as seasonal change, changes in flow conditions etc.
3. pH: : Between 6.5 -8.5	The range provides protection to the skin and delicate organs like eyes, nose, ears etc. which are directly exposed during outdoor bathing
4. Dissolved Oxygen: 5 mg/l or more	The minimum dissolved oxygen concentration of 5 mg/1 ensures reasonable freedom from oxygen consuming organic pollution immediately upstream which is necessary for preventing production of anaerobic gases (obnoxious gases) from sediment.

5. Biochemical Oxygen demand 3 day,27°C: 3 mg/l or less	The Biochemical Oxygen Demand of 3 mg/1 or less of the water ensures reasonable freedom from oxygen demanding pollutants and prevent production of obnoxious gases";

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 XI: Action Points

Type	Action Points	Implementation Status	Responsible Authority	Time Targeted	Cost Estimate (In crores)
Industries	a) No industrial units have been identified within 500 meters periphery of the catchment area.		**Not Applicable**		**Nil**
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) To trap the discharge using strainers before falling into river. c) Local administration should provide pucca latrines to all the households through	A meeting has been convened with the concerned stakeholders regarding initiation of in-situ treatment of sewage by bioremediation	**PCBA/ ULBs/ District Administration/ Water Resource Department**	**1 Years (April, 2020 to March, 2021)**	**1**

Type	Action Points	Implementation Status	Responsible Authority	Time Targeted	Cost Estimate (In crores)
	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		**PCBA/CGWA**	**Continuous**	**0.5**

Type	Action Points	Implementation Status	Responsible Authority	Time Targeted	Cost Estimate (In crores)
	by individual households				
Flood Plain Zone	a) Conservation of the river through watershed management. 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) Prohibition of disposal of municipal, plastic, biomedical and other wastes in the polluted stretch of the river bank g) Demarcation of the flood plain zone		**Soil Conservation Department/Water Resource /Forest Department/ Tourism Department/PWD Assam/ULBs**	**6 Months (February,2020 to July, 2020)**	**1**

Type	Action Points	Implementation Status	Responsible Authority	Time Targeted	Cost Estimate (In crores)
	h) Checking encroachment in the flood plain zone of the polluted river stretch		**Revenue Department/District Administration**	**To be decided by the Government**	
	g) The monitoring committee may convene meeting of Stakeholder organizations on Quarterly basis with under the chairmanship of Chief Secretary		**Pollution Control Board Assam**	**Quarterly basis**	**Nil**
	h) Assessment of water quality of the polluted stretches on monthly basis has already been commencing		**Pollution Control Board Assam**	**Monthly Basis**	**Nil**
Solid Waste	a) Prohibition of direct disposal of solid waste in the river banks. b) Frequent River Surface cleaning by		**ULBs/ Water Resource Department**	**3 Months (November, 2019 to January, 2020)**	**0.2**

Type	Action Points	Implementation Status	Responsible Authority	Time Targeted	Cost Estimate (In crores)
	removal of debris, plastics etc.				
Environmental Flow	a) Flow measurement of the river should be carried out by 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.		**Water Resource Department**	**Continuous**	**0.1**
Public Awareness	a) Awareness programs to highlight the issues related with the direct discharge of solid waste and open defecation.		**ULBs/PCBA/NGOs**	**Continuous**	**0.1**

Type	Action Points	Implementation Status	Responsible Authority	Time Targeted	Cost Estimate (In crores)
	b) Mass awareness to conserve water.				
Total Budget Estimate					**2.9 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