ACTION PLAN FOR KOHORA RIVER-PRIORITY V

1. Basic information about the Stretch

The river which originate from the high mountains of KarbiAnglong and straight away moves downstream towards the Kaziranga National Park. The river together with six smaller tributaries namely MoraDhansiri, Diphlu, MoraDiphlu, Deopani and Deochur flow through Kaziranga and join together and in a confluence the with the Brahmaputra in the western border of Kaziranga in Nagaon District.The Kohorariver forms the lifeline for most of the wild animals at Kohora central range of Kaziranga National Park.

The length of the river is 5 kms based on the data acquired from Water Resource Department.

1.1. Polluted river stretch/length

The length of the polluted stretch of Kohorariver at NH crossing is 0.7 km (approx.) with an area of 0.7 sq.km. **(Fig 1).**The stretch identified as polluted Kohora to Bagori.

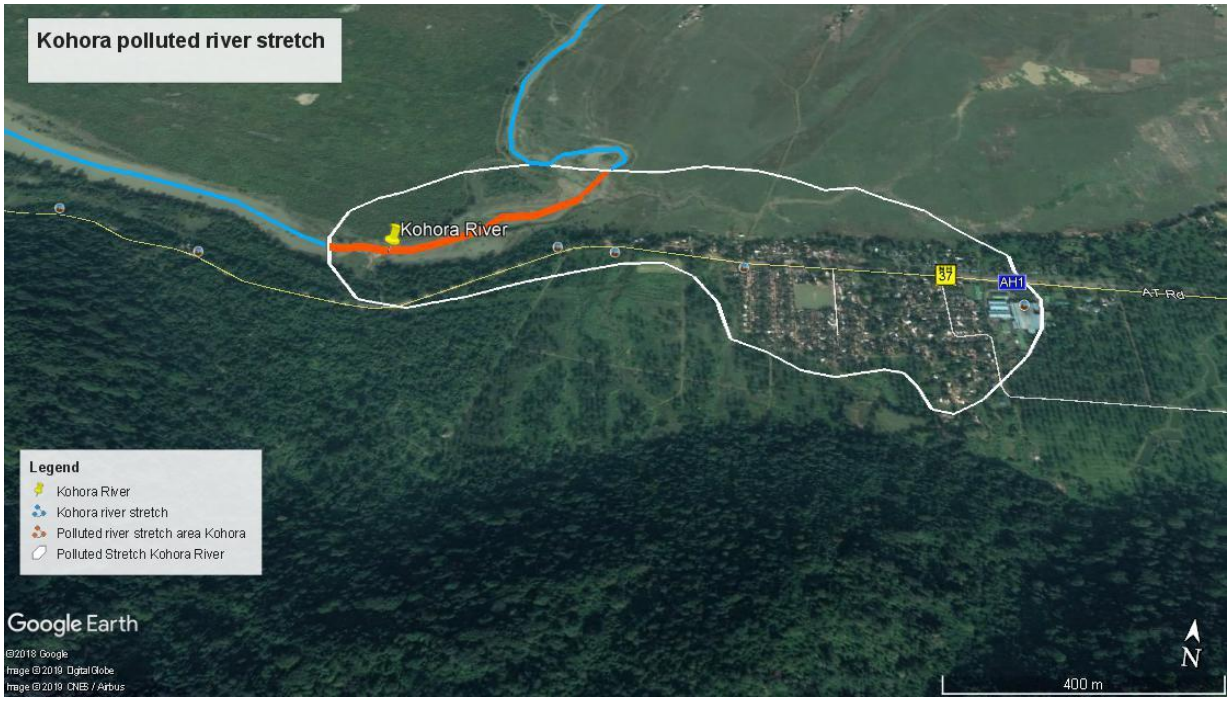

Fig 1: Map showing the polluted river stretch of Kohorariver at NH crossing, Kohora

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, Tiltled 'More river stretches are now critically polluted CPCB', Government of Assam constituted River Rejuvenation Committee (RRC) vide memorandum673/2018 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 Kohora polluted river stretch

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 Kohora river are as follows

5.1. Industrial Pollution Control

Classified industrial units in the form of Resorts and Hotels are situated in the demarcated area of the polluted river stretch. However these industrial units are not located within 500 m radius of the catchment of polluted river stretch. Moreover, it is also observed that none of the industrial units discharge their effluent directly into the river stretch as they have captive ETP for treatment of their effluent.

The garbage and other wastes generated from the resorts and hotels are dumped in their own premises which get decomposed and then turns into manure.

Further directions were issued by the PCBA to all the industrial units which has failed to comply with the discharged norms. Moreover, the Board has also issued direction to build their own set up in their premises which do not have STP/ETP

Table I: Industry Details as per the following within 500 m radius of the polluted river stretch

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

There has been no account of industrial estate/notified industrial area within 500 m radius of the Kohora catchment area

5.3. Industries without consent/authorisation

No industrial estate/notified industrial area observed within 500 m radius of the Kohora catchment area

5.4 Number of directions issued to industries

No industrial estate/notified industrial area observed in the vicinity of the river

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

There has been no account of industrial estate/notified industrial area within 500 m radius of the Kohora catchment area

5.6. Number of industries having captive ETPs and treatment capacity

There has been no account of industrial estate/notified industrial areawithin 500 m radius of the Kohora catchment area

5.7. Number of industries are members of the CETPs

There is no any CETPs at present

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

There is no any CETPs at present in the catchment area of the wetland.

5.9. OCEMS installation status by industries

There has been no account of industrial estate/notified industrial area within 500 m radius of the Kohora catchment area.

5.10. Gaps in treatment of industrial effluent

There is no gap in treatment of industrial effluent.

Following are the suggestions for control of industrial pollution control

- The industry that will extract groundwater for manufacturing process should not operate unless they possess valid permission for groundwater extraction from Central Ground Water Authority.
- No industries should discharge their effluent directly into drains without treatment, rather they should reuse their treated effluent/sewage.
- Direction to be issued to the units which are not complying to the effluent discharge norms as per Section 5 of the Environment (Protection) Act, 1986, by PCBA for ensuring compliance to the discharge norms.

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

6.1. Major towns located on the bank

Kohora is the major town/localitythat lies at Golaghat district is located on the bank of the polluted stretch of kohora river. Kohora town is divided into two parts namely No.1 Kohora and No.2. Kohora with approximate population of2571as per Census 2011. The locality is medium sized with 541 numbers of households.

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

The major town responsible for contribution of sewage in the polluted stretches of Kohora riveris Kohora. The waste generated by Kohora town is around 277.7 KLD.

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

As per the survey done, the sewage generation from the Kohora town is minimal and hence the untreated sewage can be taken care of by adopting stringent remedial actions.

Table II: Sewage generation and gaps in treatment

S.N	Area	Population as per 2011 census	Water Consumption (KLD) @135lpcd	Sewage Generation (KLD)	No. of STPs proposed	Existing Treatment capacity (KLD)	Gaps in KLD
1	No.1 Kohora	1899	256.4	205.1	Nil	Nil	205.1
2	No.2. Kohora	672	90.7	72.6	Nil	Nil	72.6

6.4. Water Quality of the river stretch

There is one (01) sampling location of Kohorariver under NWMP which is presented as below in **Table III**

Table III: Monitoring Locations Details

Sampling Location	Coordinates
Kohora river at NH crossing, Kohora	26°35'38" N 93°20'11.09" E

The change in the water quality of Kohora river in terms of BOD value for the period 2016-2019 is presented below in **Table IV**

Table IV: BOD value in mg/l of Kohorariver at NH crossing, Kohora for the year 2016-17

Year	BOD Value	Year	BOD Value	Year	BOD Value	Year	BOD Value
Jan-16	0.9	Jan-17	1.2	Jan-18	1.6	Jan-19	1.8
Feb-16	0.9	Feb-17	0.8	Feb-18	2.0	Feb-19	2.8
Mar-16	1.4	Mar-17	2.8	Mar-18	1.2	Mar-19	2.2
Apr-16	2.0	Apr-17	1.6	Apr-18	1.3	Apr-19	2.2
May-16	**3.3**	May-17	2.0	May-18	1.2		
Jun-16	1.6	Jun-17	2.6	Jun-18	1.6		
Jul-16	2.7	Jul-17	1.8	Jul-18	1.8		
Aug-16	**4.4**	Aug-17	1.4	Aug-18	**3.4**		
Sep-16	2.2	Sep-17	1.2	Sep-18	1.6		
Oct-16	1.2	Oct-17	2.7	Oct-18	2.6		
Nov-16	2.1	Nov-17	1.8	Nov-18	2.8		
Dec-16	**3.0**	Dec-17	0.7	Dec-18	**8.0**		

The above data indicated that BOD value has exceeded the standard criteria in only five (05) occasions out of forty (40) occasions. Assam is cursed with the catastrophic flood every year and hence this incidental exceedance of BOD value may be due to additional organic matter introduced in the river as a result of continuous rainfall during this disastrous calamity. Moreover, BOD level have also increased during dry period and this may be due to decomposition and high concentration of organic matter as their rate of dilution is very low due to lean flow of the river. Hence this marginal exceedance of BOD value can be considered as incidental and can be omitted from the polluted river stretch.Moreover this incidental increase of BOD load does not reflect the extremity of pollution.

6.5. Drains contributing to pollution

Kuchcha nullahs or constructed drains of natural origin exist in the identified area to evacuate the domestic sewage originated from individual households. Moreover,most of the households have individual drainage that has been connected to soak pit, kitchen garden and stagnated pool to take care of the waste. However, the discharges from the open drains gets absorbed by the soil before making their way to the river. Some of the individuals follow segregation at the source and perform composting and burning of garbage

6.6. Characteristics of the major drains

All the drains contributing to pollution of the river are domestic and commercial sewage carrying drains.Direct dumping of residential and commercial garbage into the channel is making it shallower and heavily silted. As a result, during rainy season water overflows and inundates the areas. It is also observed that 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.

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

Action initiated to measure the flow of various out falling drains.

6.8. Sewage generation from the towns located on the banks of the polluted river

The main contributor of pollution in the riveris municipal sewage. There are no treatment systems for the sewages which are dumped in open thereby ultimately finding their ways to water bodies without treatment.

Moreover, the river has become a regular dumping site for the tourist visiting the Park for different activities.

6.9. Number of Sewage treatment plants present and treatment capacity, and gaps

There is no any sewage treatment plant at present.

6.10. Number of STPs proposed and capacity

As per the survey done, STP is not required for such minimal sewage generated area.

6.11. Drainage system/ sewerage network present/proposed

Some natural drainage like streams and rivulets of local origin are acting as the main drainage system

There is no sewerage system at present. No sewerage system has been proposed under this project. The sewage generation is minimal and by adopting stringent remedial actions, sewage generation and treatment can be done.

6.12. Treatment and Disposal of Septage and controlling Open Defecation

About 85 % of the population use kutchcha toilets while only 15% use pucca toilets. It is also reported that most of the population who uses pucca toilets have received plates for toilets from village panchayat under the scheme Nirmal Bharat. Moreover, toilets are also constructed in the schools under Swachh Vidyalaya Abhiyan, SSA Assam.

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

- The discharge should be trapped by strainers before draining off to the river.
- Every individual households should be connected to sewer lines.
- 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 tocontrol 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

The district is potential from ground water point of view as revealed by the studies carried out by CGWB. The stage of ground water development is 17%,

which shows under the SAFE category. As long-term water level trend does not show any major change so the whole district may be considered as SAFE

The details of estimated ground water resource inthe Golaghat district is presentedbelow in **Table V**

TableV: Estimation of ground water resource in the Golaghat district

Ground water extraction details	Ground water	Ground water recharging mechanism	Rain water harvesting
Net Ground Water Availability	1316.24 mcm	Recharging of groundwater are done by creation of Pond/lakes under government schemes.	The roof top rainwater harvesting is practiced.
Gross Ground Water Draft	221.43 mcm		
Stage of Ground Water Development	17%		
Future provision for Domestic & Industrial Use	31.39 mcm		
Future Provision for Irrigation Use	1087.34 mcm		

(a) Irrigation Practices

At present, one Deep tube Well project is underway at Kohora town under NABARD by Golaghat Division, Irrigation Department which is presented in **Table VI**

Table VI: Irrigation schemes in progress at Kohora

Village	Name of Scheme	Created Potential
No. 2 Kohora	DTWS at No. 2 Kohora Area	60 ha

7.1. Status of Ground Water

The ground water is suitable for domestic, irrigation and industrial purposes. However, the high concentration of iron beyond permissible limit in ground water in some areas only poses problem, which can be lowered by aeration and filtration method.

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 element like Arsenic, Fluoride, Iron etc.
- Alternate sources of drinking water should be explored and prioritized.
- Awareness campaigns about health hazards due to intake of excessive Arsenic, Fluoride are the need of the time.
- Role of pesticides used for agricultural activity should be carefully observed.
- Survey should be conducted regarding ground water uses by different categories such as domestic, Industries etc and also to identify the over exploited and critical areas in the river stretches with respect to ground water extraction.
- Effective management of industrial effluent or sewage for preventing contamination of ground water sources.
- The industry that will extract groundwater for manufacturing process should not operate unless they possess valid permission for groundwater extraction from Central Ground Water Authority.
- Strict vigilance and conducting inspection of the industries to rule out any forceful treated effluent injection in to ground water resources.
- 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 river stretch

Sl. No	Name of River	Flood plain areas
1	Kohora river at NH crossing	No.1 Kohora and No.2 Kohora

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

Table VII: Management of Industrial, Municipal, Biomedical, Plastic and Electronics Waste

Sl. No	Type	Status	Proposed actions	Authority
1	**Industrial Waste**	➢ No industrial waste dumped on land or discharged into water bodies/river. ➢ Industrial wastes are managed by industries itself ➢ Authorisation have been granted to different industries in line with Water act 1974, Hazardous Waste (Management, Handling and Transboundary Movement) Rule, 2008 as amended. ➢ Regular monitoring by PCBA to ensure that the terms and conditions are strictly adhered in accordance with the prescribed standards.	Direction issued to the industries to identify the non-point sources and arrest contamination of storm water.	Pollution Control Board Assam
2	**Municipal waste**	➢ Municipal Body has incorporated collection of Municipal Solid Waste ward wise from the generation point for treatment and disposal. ➢ Dumping is carried out unscientifically in the open space. ➢ No proper segregation of bio-degradable and non-	Municipal Body is in process of inducting the following activity ➢ Implementation of segregation of waste at source ➢ Door-to-door garbage Collection of waste ➢ Formation of Sanitation task Force ➢ Formation of	Municipal Body

Sl. No	Type	Status	Proposed actions	Authority
		biodegradable waste ➢ No proper segregation of dry and wet waste ➢ Lack of unscientific disposal facilities/infrastructure technology like decentralized composting or bio-methanation plant, waste to energy plant, solid waste management plant.	Neighbourhood Community ➢ Awareness campaigns Processing and disposal of waste	
3	**Plastic Waste**	➢ Dumping is carried out unscientifically in the open space along with the municipal waste. ➢ No proper segregation of bio-degradable and non-biodegradable waste ➢ No proper segregation of dry and wet waste ➢ Lack of unscientific disposal facilities/infrastructure technology like decentralized composting or bio-methanation plant, waste to energy plant, solid waste management plant.		
4	**Hazardous Waste**	➢ Hazardous waste are managed by hazardous waste generating industries itself by disposing the same through authorised recycler, secured landfill area, Bio-remediation etc. ➢ Lack of TSDF facility for commonly utilization by hazardous waste generating industries		

Sl. No	Type	Status	Proposed actions	Authority
5	**Bio-medical Waste**	➢ Segregation at the source under Biomedical waste Management Rules, 1998 as amended ➢ The HCFs have installed ETP for treatment of liquid waste generated	Direction issued to all HCF unit to implement the BMW Rules, 2016 as amended in all HCF Units. (As per guidelines of CPCB)	HCF units/Pollution Control Board Assam
6	**E –waste**	➢ E-Waste Inventorisation and Annual return in (Form-3) is submitted by E-Waste generating units to PCBA from time to time for onwards transmission to CPCB ➢ There is no authorised recycler, co-processor, collection centre, refurbisher, dismantler etc. available to ensure environmentally sound management of E-waste. ➢ There is no "facility" wherein the process incidental to the collection, reception, storage, segregation, refurbishing, dismantling, recycling, treatment and disposal of e-waste are carried out.	Few entrepreneur approached PCBA for registration and authorisation as Collection center and dismantler	Pollution Control Board Assam

8.3. Gaps identified in waste management

Presently, around 1542.6 Kg/day of gaps has been identified for municipal solid waste management

8.4. Greenery development - Plantation Plan

State Department 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 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 river maintains lean and thin flow except monsoon all throughout the year.

9.2. Irrigation practices in the river

The river can be of great use for good irrigation practices for the people. The following table indicates the ongoing irrigation practices in Kohora river.

Table VIII: Irrigation schemes in progress at Kohora river

Sl. No.	Activity	Component	Created Potential
1	Kohora FIS	Har Khetko Pani	100 ha

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 and evaluation schedule and plan is proposed, which is under.

12.1 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:

- Upstream of River.
- Before confluence with Brahmaputra river

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 Kohora 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 IX: 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) **No Sewage Treatment Plant (STP)** has been proposed at these villages.	**Not Applicable**	
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	**PCBA/CGWA**	**Continuous**

Type	Action Points	Responsible Authority	Time Targeted
	ensure quality. c) To promote roof top rain water harvesting 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) 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.	**Soil Conservation Department/Water Resource/ ULBs /Forest Department/ Tourism Department/PWD Assam/Local Administration**	**6 Months (February,2020 to July, 2020)**
	The plan for the polluted stretches of the river may be implemented in a time bound manner by fragmenting activities as a) Modification of	**Pollution Control Board Assam**	**3 Months (June,2019 to August, 2020)** **c) Monthly Basis**

Type	Action Points	Responsible Authority	Time Targeted
	consent conditions in and around the polluted stretches. b) Surveillance of sources of pollution in contrast to the norms. c) Assessment of water quality of the polluted stretches on monthly basis has already been commencing d) The monitoring committee may convene meeting of Stakeholder organizations on Quarterly basis with under the chairmanship of Chief Secretary		
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.	**Village Panchayats/ Water Resource Department**	**3 Months (November, 2019 to January, 2020)**
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**
Public Awareness	a) Awareness programs to highlight the issues	**Village Panchayats/PCBA/NGOs**	**Continuous**

Type	Action Points	Responsible Authority	Time Targeted
	related with the direct discharge of solid waste and open defecation. b) Mass awareness to conserve water.		

Members of River Rejuvenation Committee (RRC)

Secretary to the Govt of Assam
Environment & Forest Department

Secretary to the Govt of Assam
Urban Development Department

20/7/19

Commissioner
Industries and Commerce Assam

Member Secretary
Pollution Control Board Assam