ACTION PLAN FOR DEEPAR BEEL

PRIORITY III

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1. Basic information about the Stretch

Deepor Beel is a permanent fresh water lake and largest Beel in the Brahmaputra valley of Lower Assam. Deepor Beel is the only Ramsar site in Assam and amongst the third Ramsar site of the north eastern region of India. It is located between latitude 26°03′26″–26°09′26″N and longitude 90°36′39″–90°41′25″E and situated 10 km southwest of Guwahati city, surrounded by residential, commercial and institutional areas. It is situated at an altitude of 53 meters above MSL, maximum depth is 4m, however during the dry season it drops to about 1 m. Ramsar Convention in 2002 declared 40.14 sq km as Deepor Beel wetland and 4.14 sq km area was proposed as a bird sanctuary under the Wildlife Protection Act of India, 1972 (Government of Assam, 1989).The main inlets of the beel are the Mora Bharalu and the Basishtha-Bahini rivers which carry the sewage as well as rain water from Guwahati city. The only outlet of the beel is Khanajan located towards the northeast having connection with the main river Brahmaputra. The beel is fringed by Rani-Garbhanga reserve forest in the south and the beel has also been playing crucial role in catering the biological need of elephant population of Rani and Garbhanga Reserve Forest with other important mammals of the area. The Deepor Beel and its fringe areas are made up of recent alluvium consisting of clay, silt, sand and pebbles.

1.1. Polluted river stretch/length

The total area of the polluted stretch of Deepar Beel is 40.14 sq km (Fig 1). The area has been suffering from environmental degradation due to continuous encroachment and waste dumping as the Guwahati Municipality dump yard (24 Ha) located in Boragaon, lies in the eastern corner of Deepor Beel. The encroachment of the beel is also very evident and rampant as there are a number of dwelling units and cement structures and hence encroachment and settlements around the periphery has contributed to shrinking of the beel. The wetland ecosystem is also disturbed by the railway railroad in the southern boundary and the embankment for the railroad has resulted in the water flow blockage.

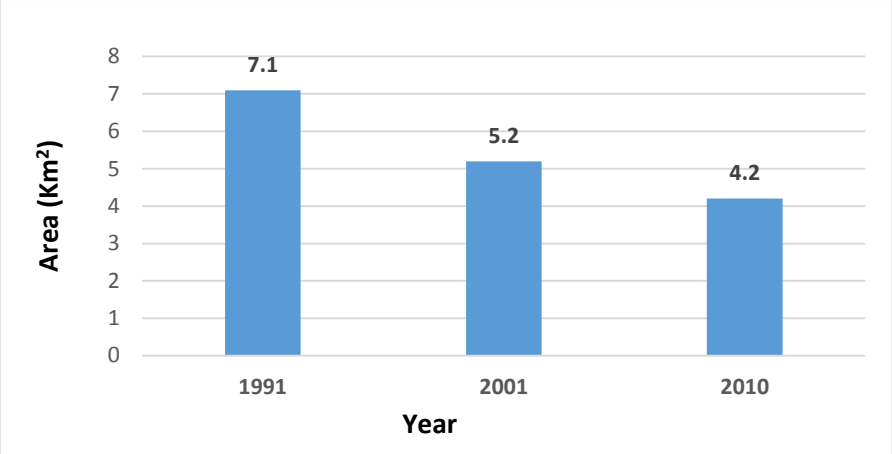

Fig 1: Decadal changes in the spatial extent of Deepar Beel (1990-2010)

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 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 Deepar Beel

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 DeeparBeel are as follows

5.1. Industrial Pollution Control

There has been no account of industrial estate/notified industrial area in the Deepar beel catchment area. Only few stone quarries exist in the Rani Garbhanga Hill which are carried out at a radius of more than 500 m away from the wetland. However, it is observed that these activities do not contribute any water pollution and degrade the water quality of the wetland.

However, classified industrial units are observed with infrastructural facilities (ETPs, STPs) in the periphery of Guwahati city along with few small scale industrial establishments. These industrial units are likely to contribute pollution load in the wetland through the Mora Bharalu channel. Deepar beel is the only major storm water storage basin and acts as the natural storm water reservoir for the Guwahati city through the Mora bharalu rivulet. Mora bharalu river is a channel that is abandoned by the river Bharalu at Fatasil Ambari and meets Basistha Bahini river at Pamohi which eventually confluence with Deepar Beel. The length of the MoraBharalu rivulet from Fatasil Ambari till the confluence with Deepar Beel is 13.5 kms and runs through Fatasil ambari, Bishnupur, Kalapahar colony, Dhirenpara, Manpara, Subhash Pally, Garchuk and Pamohi.The classified industry details situated at the periphery 500 m radius of the Deepar Beel Polluted Stretch is presented at **Table I.**

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.

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

Guwahati is the only city located around 10 kms away from Deepar beel. However, the villages around Deepar Beel has a total population of approximately 5000 population and 1200 numbers of households most of which belong to lower income groups living under the poverty line and depend directly or indirectly on the wetland's natural resources. The major villages identified across the catchment areas are Chakardeo, Pamohi, Sakardhum Mikir, MatiaPahar, Deochotal, Maghuwapara, Banghara Than, Dharapur Chariali, Gorchuk, Boragaonetc. These villages discharge sewage of approximately 540 KLD which is very minimal and can be managed by adopting stringent remedial actions.

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

Guwahati is the major city responsible for discharging of sewage, as the Deepar Beel serves as the storm water reservoir and usually filled up with rain water generally by the end of June along with the city sewage through the Mora Bharalu rivulet. An estimated 540 KLD of sewage is generated from the catchment area of Deepar Beel.

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

Deepar beel is the only major storm water storage basin and acts as the natural storm water reservoir for the Guwahati city through the Mora bharalu rivulet. Mora bharalu river is a channel that is abandoned by the river Bharalu at Fatasil Ambari and meets Basistha Bahini river at Pamohi

which eventually confluence with Deepar Beel. The length of the Mora Bharalu rivulet from Fatasil Ambari till the confluence with Deepar Beel is 13.5 kms and runs through Fatasilambari, Bishnupur, Kalapahar colony, Dhirenpara, Manpara, Subhash Pally, Garchuk and Pamohi.

Hence the untreated Guwahati city sewage received by the wetland through the Mora Bharalu channel plays a major role in polluting the wetland. Sewage Treatment Plant has already been proposed for Guwahati city along the bank of River Bharalu at three points having total capacity of 75 MLD namely at Jonali point, another near the confluence of Borsola with Bharalu River at Sarabbhati area and the last one at just before confluence with Brahmaputra river at Bharalumukh.

In this regard, Action Plan for Bharalu river has already been prepared along with the treatment capacity and cost estimate of the three proposed STPs .

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	DeeparBeel	5000	675	540	Nil	Nil	540

6.4. Water Quality of Deepar Beel

The water quality of Deepar Beel is monitored at two locations as given in the table below in **Table III**

Table III: Monitoring locations details

S.No	Sampling Location	Coordinates
1	Deepor Beel near Dharapur Chariali	26°8'6.72" N 91°37'32.4" E
2	Deepor Beel near IASST, Boragaon	26°6'50.2" N 91°39'49.3" E

The change in the water quality of Deepar Beel in terms of BOD value in mg/l for the period 2016-2019 is presented below in **Table IV**

Table IV: BOD value in mg/l of Deepar Beel for the year 2016-19

Deepor Beel near Dharapur Chariali								Deepor Beel near IASST, Boragaon							
Year	BOD	Year	BOD	Year	BOD	Year	BOD	Year	BOD	Year	BOD	Year	BOD	Year	BOD
Jan-16	2.7	Jan-17	3.0	Jan-18	3.6	Jan-19	2.7	Jan-16	4.2	Jan-17	2.8	Jan-18	4.4	Jan-19	2.6
Feb-16	0.8	Feb-17	6.9	Feb-18	3.6	Feb-19	4.1	Feb-16	2.0	Feb-17	2.8	Feb-18	6.0	Feb-19	4.6
Mar-16	1.8	Mar-17	3.4	Mar-18	4.6	Mar-19	4.8	Mar-16	3.6	Mar-17	3.3	Mar-18	4.0	Mar-19	4.2
Apr-16	2.0	Apr-17	4.2	Apr-18	5.6	Apr-19	4.8	Apr-16	3.0	Apr-17	2.4	Apr-18	4.6	Apr-19	4.6
May-16	2.9	May-17	3.3	May-18	4.8	May-19	4.4	May-16	11.4	May-17	3.1	May-18	5.5	May-19	4.2
Jun-16	3.3	Jun-17	6.5	Jun-18	5.3	Jun-19	3.9	Jun-16	5.4	Jun-17	7.2	Jun-18	4.8	Jun-19	3.8
Jul-16	2.2	Jul-17	2.6	Jul-18	5.0	Jul-19	3.5	Jul-16	6.0	Jul-17	2.9	Jul-18	8.5	Jul-19	3.5
Aug-16	2.6	Aug-17	2.9	Aug-18	7.0	Aug-19	3.4	Aug-16	7.5	Aug-17	2.9	Aug-18	8.2	Aug-19	3.2
Sep-16	10.6	Sep-17	3.8	Sep-18	5.0	Sep-19	3.0	Sep-16	5.4	Sep-17	3.6	Sep-18	4.8	Sep-19	3.1
Oct-16	5.3	Oct-17	2.9	Oct-18	4.7	Oct-19	3.3	Oct-16	5.0	Oct-17	3.1	Oct-18	2.6	Oct-19	3.1
Nov-16	3.5	Nov-17	4.8	Nov-18	11	Nov-19	3.4	Nov-16	3.8	Nov-17	4.6	Nov-18	12.0	Nov-19	3.2
Dec-16	3.4	Dec-17	5.4	Dec-18	3.6	Dec-19	3.4	Dec-16	2.2	Dec-17	4.8	Dec-18	3.6	Dec-19	3.6

The above data indicated that the BOD value has failed to meet the standard criteria in most of the occasions. The BOD value which indicates organic load generally increases due to the waste generated from the activity of the residents in the form of domestic household waste through different drains and channels. This consistent exceedance of BOD value may be due to the untreated city sewage received by the wetland through the Mora Bharalu rivulet at confluence with Deepar Beel at Pamohi. The dumping of municipal solid wastes in its close proximity at Boragaon by the Guwahati Municipal Corporation (GMC) has also pushed the wetland's pollution to alarming levels. The problem gets aggravated during the monsoons, with rainwater sweeping large amounts of garbage from the dumping site to the Beel. Hence this constant failure to meet the standard criteria may be due to solid waste dumping site at Boragaon and the untreated city sewage as the Guwahati city does not have a Sewage Treatment facility for the waste.

However, Action Plan for Bharalu river has already been prepared and approved by CPCB along with the treatment capacity and cost estimate of the three proposed STPs.

6.5. Drains contributing to pollution

No drains were observed to be directly connected to the beel. However, Deepar beel is the only major storm water storage basin and acts as the natural storm water reservoir for the Guwahati city through the Morabharalu rivulet. Morabharalu river is an abandoned channel by the river Bharalu at Fatasil Ambari and meets Basistha Bahini river at Pamohi and eventually

confluence with DeeparBeel. The length of the MoraBharalu rivulet from Fatasil Ambari is 13.5 kms and runs through Fatasil ambari, Bishnupur, Kalapahar colony, Dhirenpara, Manpara, Subhash Pally, Garchuk and Pamohi.

6.6. Characteristics of the major drains

The morabharalu rivulet which joins the Basistha Bahini river mainly carries sewages. The water quality of the Mora Bharalu rivulet is presented in Table V below.

Table V: water quality of the Mora Bharalu rivulet

Parameter	Value
D.O. (mg/L)	4.5
pH	7.4
BOD(mg/L)	4.8
COD(mg/L)	28.3
RCl_2 (mg/L)	0.4
TSS (mg/L)	44.0
TDS (mg/L)	106.0
Free NH_3-N (mg/L)	Nil
Total Chromium (mg/L)	BDL
Nickel (mg/L)	BDL
Cadmium (mg/L)	BDL
Zinc (mg/L)	0.026
Mercury (mg/L)	BDL
Total Coliform (MPN/100ml)	15000
Faecal Coliform (MPN/100ml)	2000

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

Action initiated to measure the flow of Mora Bharalu Basistha Bahini river.

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

The wetlands is generally fed by the Basistha Bahini river along with sewage from Mora Bharalu rivulet. . During monsoon the sluice-gate of Bharalu river is closed as the Brahmaputra flows above the water level of the Bharalu channel and the city water is diverted to Deepor Beel via the Mora bharulu.

Dumping of municipal solid wastes in its close proximity at Boragaon by the Guwahati Municipal Corporation (GMC) has also pushed the wetland's pollution to alarming levels. Hence the major threats of the beel is as follows

- Solid waste disposal by GMC at Boragaon
- Drainage of city's municipal and industrial waste from point and nonpoint sources

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

Government of Assam has already proposed to set up three (03) numbers of STPs in the Guwahati city.

In this regard, Action Plan for Bharalu river has already been prepared and approved by CPCB along with the treatment capacity and cost estimate of the three proposed STPs.

As the untreated city sewage enters the wetland through the mora bharalu river with its origin at Fatasil ambari, hence separate STP would not be required in the vicinity of the wetland.

6.10. Interception and diversion of drains /in situ treatment given

03 numbers of STPs have been proposed with interceptor drains for in situ treatment before outfall.

In this regard, Action Plan for Bharalu river has already been prepared and approved by CPCB along with the treatment capacity and cost estimate of the three proposed STPs.

6.11. Drainage system/ sewerage network present/proposed

Encroachment has blocked the natural drainage pattern of the Deepor Beel causing the water level imbalance in the Beel. Natural drainage of local origin like Basistha Bahini, morabharalu and kalmani are responsible for draining off majority of the city sewage.

There is no sewerage system at present. Three numbers of STPs along with interceptor drains for collection of the sewage of the basin has been proposed at Guwahati city. All the sewage of the catchment area of the

river/wetland shall be collected by interceptor drains and shall be treated in the proposed STPs before outfall in to the river/wetland.

6.12. Treatment and Disposal of Septage and controlling Open Defecation

Some of the households in the villages are equipped with ordinary septic tanks and most of the local dwellers have kuccha latrines.

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.
- To shift the municipal solid waste ground situated at Boragaon to a different location
- The discharge should be trapped by strainers before draining off to the river.
- Prohibition of direct disposal of solid waste in the banks of the wetland.
- 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.

6.13. Short Term Measures

- Periodical cleaning of Deepor Beel..
- Strict vigilance of the industries to check that no industrial effluent is out falling in the drains

7. Controlled Ground water Extraction and quality Assessment

About 49% of the households rely on tube well to obtain potable water. Very few numbers of the population owns earthen well whereas some of them depends on both supplied water as well as concrete well.

The details of estimated ground water resource in Kamrup district is presented below in **Table VI**

Table VI: Estimation of ground water resource in the Kamrup district

Ground water extraction details	Ground water	Irrigation Practices	Ground water recharging mechanism	Rain water harvesting
Gross Ground Water Draft	1487.29 mcm	Minor and medium irrigation schemes such as DTW and STW	Recharging of groundwater are done by creation of Pond/lakes under government schemes.	The roof top rainwater harvesting is practiced.
Net Ground Water Availability	715.97 mcm			
Stage of Ground Water Development	43%			
Existing draft for Irrigation Use	586 mcm			
Future provision for Domestic & Industrial Use	105.16 mcm			

The Kamrup district is still under 'Safe' category and sufficient resources are still available for future development

7.1. Status of Ground Water

The water quality is found to be well within the permissible limit for drinking, irrigation and industrial purposes. Due to slightly higher content of iron in some sporadic patches of the area and fluoride content exceeding permissible limit in some pockets in and around Guwahati City, water needs to be treated before being used for drinking purpose.

However, as per the data generated from PCBA, the ground water quality around the Deepar Beel areais found to be within the permissible limit and safe for domestic and irrigation purposes.

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/wetland 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 Deepar Beel

Name	Flood plain areas
DeeparBeel	Chakardeo, Pamohi, SakardhumMikir, MatiaPahar, Deochotal, Maghuwapara, Banghara Than

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**	➢ 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**	➢ Dumping is carried out unscientifically in the open space at Boragaon Dumping ground ➢ Lack of unscientific disposal facilities/infrastructure technology like decentralized composting or bio-methanation plant, waste to energy plant, solid waste management plant. ➢ The individual households adopt insitu management like burial/composting in their premises.	Municipal Body is in process and inducted the following activity ➢ To shift the municipal solid waste plant at the Beel which is causing a huge trash dump near it. ➢ Awareness generation regarding the solid waste management rules	Guwahati Municipal Corporation
3	**Plastic Waste**	➢ Dumping is carried out unscientifically in the open space along with the municipal waste.	➢ Issue directions to Municipal Board to segregate and collect plastic waste and initiate necessary steps to channelize the waste to authorized agencies for recycling and	Guwahati Municipal Corporation/Pollution Control Board Assam

Sl. No	Type	Status	Proposed actions	Authority
			reprocessing	
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	➢ Awareness campaign regarding health and other issues related to Hazardous waste ➢ PCBA has initiated correspondence with the Govt. of Assam for allotment of land for TSDF.	Pollution Control Board Assam
5	**Bio-medical Waste**	➢ Segregation at the source under Biomedical waste Management Rules, 1998 as amended ➢ The segregated waste is transported and then incinerated by Fresh Air Waste Management Services Pvt. Ltd at Common Biomedical Waste Treatment Facility, Panikheti	➢ Direction issued to all HCF unit to implement the BMW Rules, 2016 as ammended in all HCF Units. (As per guidelines of CPCB) ➢ Four more Common Biomedical Waste Treatment Facility (CBWTF) are proposed for the other towns of the State as one CBWTF is permitted at a radius of 70 kms,	HCF units/Pollution Control Board Assam
6	**E –waste**	➢ Annual return in (Form-3) is submitted by E-Waste generating units to PCBA from time to time for onwards transmission to CPCB ➢ Most of the e-waste generator have sent their e-waste to their respective manufacturer. ➢ There is no authorised recycler, refurbisher, dismantler etc. available to ensure environmentally sound management of E-waste. ➢ There is no "facility" wherein the process of dismantling, recycling, and disposal of e-	➢ Few entrepreneur approached PCBA for registration and authorisation as Recycler	Pollution Control Board Assam

Sl. No	Type	Status	Proposed actions	Authority
		waste are carried out.		

8.3. Gaps identified in waste management

Presently, around 3000 Kg/Day of gaps has been identified from the villages of Deepar Beel and 574200 Kg/Day from the Guwahati city alone.

8.4. Greenery development - Plantation Plan

State Government has initiated afforestation in the degraded forestland and also raising roadside plantation

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

- Raise plantation along the river/wetland bank to control the flow run off water directly to the wetland
- Mass awareness among the public not to harvest the vegetation from the catchment area for their personal and commercial purpose and encourage them to plant local plants on the catchment area

9. Environmental Flow (E-Flow)

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

The entire wetland is perennial. The wetland maintain a steady flow all throughout the period, however during dry period a major drop in the flow is observed.The maximum depth is 4m and during the dry season it drops to about 1 m.

9.2. Irrigation practices in the river

Any kind of irrigation practices are not proposed or initiated yet though some part of the catchment area is used for agricultural purposes.

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 ResourceDepartment
- 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 state aquatic body 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.

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:

- Morabharalu after confluence with Deepar Beel
- Mid point of DeeparBeel
- Khanamukh before joining Brahmaputra

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/wetland 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 Deepar Beel, 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/wetlandconservation 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/wetland restoration project.

13. Action Plan

Table VII: Action Points

Type	Action Points	Responsible Authority	Time Targeted
Industries	a) Strict observation/ monitoring of industrial effluent/waste water discharge strictly for compliance. a) Stringent action against non-complying industrial units b) No industry should operate or continue manufacturing process unless they	**Pollution Control Board Assam**	**3 Months (August, 2019 To October, 2019)**

Type	Action Points	Responsible Authority	Time Targeted
	possess valid permission for ground water extraction from Central Ground Water Authority (CGWA) c) Small service providing units like street food selling vendors, laundry etc should not be allowed to dispose solid, liquid or semi-liquid wastes directly into the drains or sewers. d) Set up online monitoring system in the major industries. e) To stress all the industrial units to adopt cleaner technology and take appropriate measures for reduction of effluent, recycling and reuse of treated water f) Directions has been issued for Zero Liquid Discharge (ZLD) in the major polluting industrial units.		
Interception and treatment of raw sewage	a) Proposal to be sent for execution and proper management of sewage treatment of Mora Bharalu River before	**PCBA/Guwahati Municipal Corporation/ Guwahati Development Department/ District Administration/ Water Resource Department**	**2 Years (June,2019 to March, 2021)**

Type	Action Points	Responsible Authority	Time Targeted
	mixing with DeeparBeel. b) 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. c) 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. d) Sewage Treatment Plant should also consider treatment and disposal of sewage for the catchment area settlement including discharge from toilets constructed under Swachh Bharat Mission e) To trap the discharge using strainers before falling into wetland.		

Type	Action Points	Responsible Authority	Time Targeted
	f) 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. g) 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, industries etc. and also identification of over exploited and critical blocks with respect to the ground water extraction. b) Carry out assessment of ground water survey in the	**PCBA/CGWA**	Continuous

Type	Action Points	Responsible Authority	Time Targeted
	catchment area of the identified polluted stretch once in a year to ensure quality.		
	c) All the industries should have valid NOC from CGWA. d) To promote roof top rain water harvesting by the industrial, commercial including individual households thereby recharging the ground water. Directions to be issued that no industries should inject their treated effluent for ground water recharging.	**PCBA/CGWA**	**6 Months (February,2020 to July, 2020)**
Flood Plain Zone	a) Conservation of the wetland through watershed management. b) Cleaning of the aquatic vegetation regularly c) Afforestation on the catchment area d) Recreational activities to be promoted. e) Erection of pathway of the banks. f) Checking encroachment in the flood plain zone of the polluted stretch	**Soil Conservation Department/Water Resource/ Guwahati Municipal Corporation /Forest Department/ Tourism Department/PWD Assam/District Administration/Revenue Department**	**6 Months (February,2020 to July, 2020)**

Type	Action Points	Responsible Authority	Time Targeted
	g) Prohibition of disposal of municipal, plastic, biomedical and other wastes in the wetland h) Demarcation of the flood plain zone.		
	The plan for the polluted stretches of the wetland may be implemented in a time bound manner by fragmenting activities as a) Modification of 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 wetland 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	**Pollution Control Board Assam**	**3 Months (June,2019 to August, 2020)** **c) Monthly Basis**
Solid Waste	a) Directions to be issued to shift the municipal solid waste plant at the Beel which is causing a huge trash dump near it	**Guwahati Municipal Corporation/ Water Resource Department**	**3 Months (November, 2019 to January, 2020)**

Type	Action Points	Responsible Authority	Time Targeted
	and to identify an alternative place for the plant b) Proposals to be sent for execution and proper management of solid waste of the MSW dumping site at Boragaon near Deepar Beel. c) Prohibition of direct disposal of solid waste in the banks of the wetland. d) Frequent Surface cleaning by removal of debris, plastics etc.		
Environmental Flow	a) Flow measurement of the wetland should be carried out by the concerned department on monthly basis and the record has to be maintained b) Fresh water flowing through escape channels/small barrages should be checked.	**Water Resource Department**	**Continuous**
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.	**Village Panchayats/PCBA/NGOS**	**Continuous**

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