Revised Report

Action Plan for Rejuvenation of River Stretches (Priority I and II) in Telangana State

Submitted to:

Government of Telangana

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2.1 RIVER MUSI STRETCH

2.1.0 River Musi

River Musi also called as Musinuru is a tributary of the River Krishna flowing through Telangana State in India. The Musiriver gets its names from two streams namely Moosa and Esi which converge at the Tipu Khan bridge in the Golconda area. River Musi divides the city into new city and old city. The river originates from Anantagiri Hills near Vikarabad District and joins River Krishna at Wadapally in Nalgonda District. It has an aggregate length of 250 kms and it passes through Hyderabad city. River Musi is the only river that flows through the centre of the city. As per classification, River Musi falls under Priority-I for polluted river stretches.

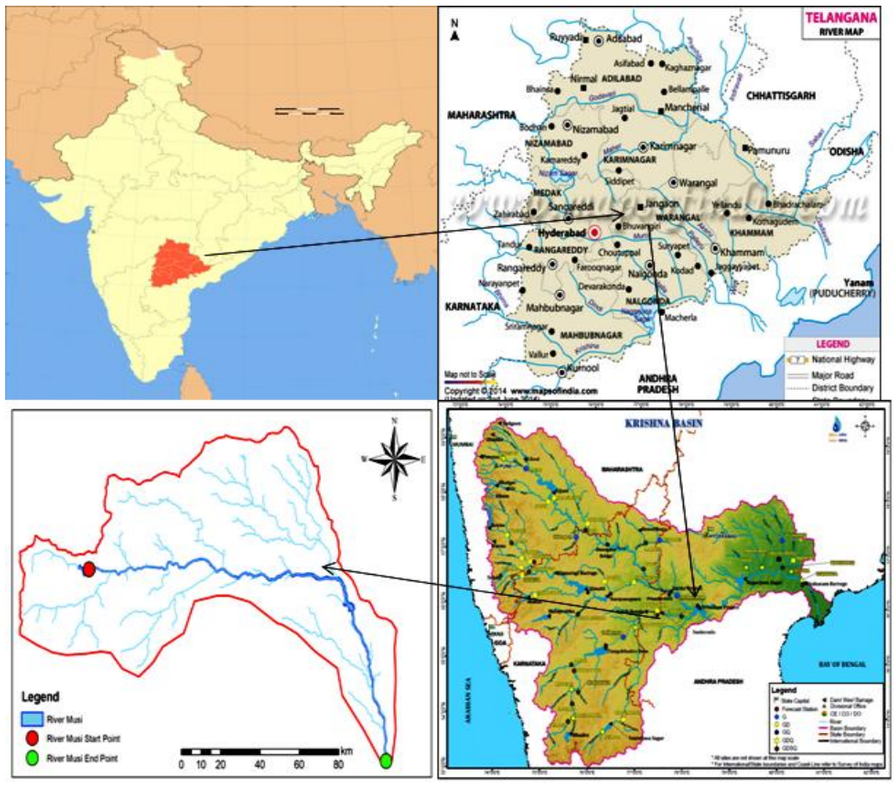

Fig 2.1.1 Location of Musi River Watershed

The Musi watershed covers an approximate area of 10,858 sq.km and depicted in **Fig 2.1.2.** The length of the stretch is 224.058 km of which the stretch from Osmansagar to Wadapally is about 140 km and Musi project is the main project on the river Musi.

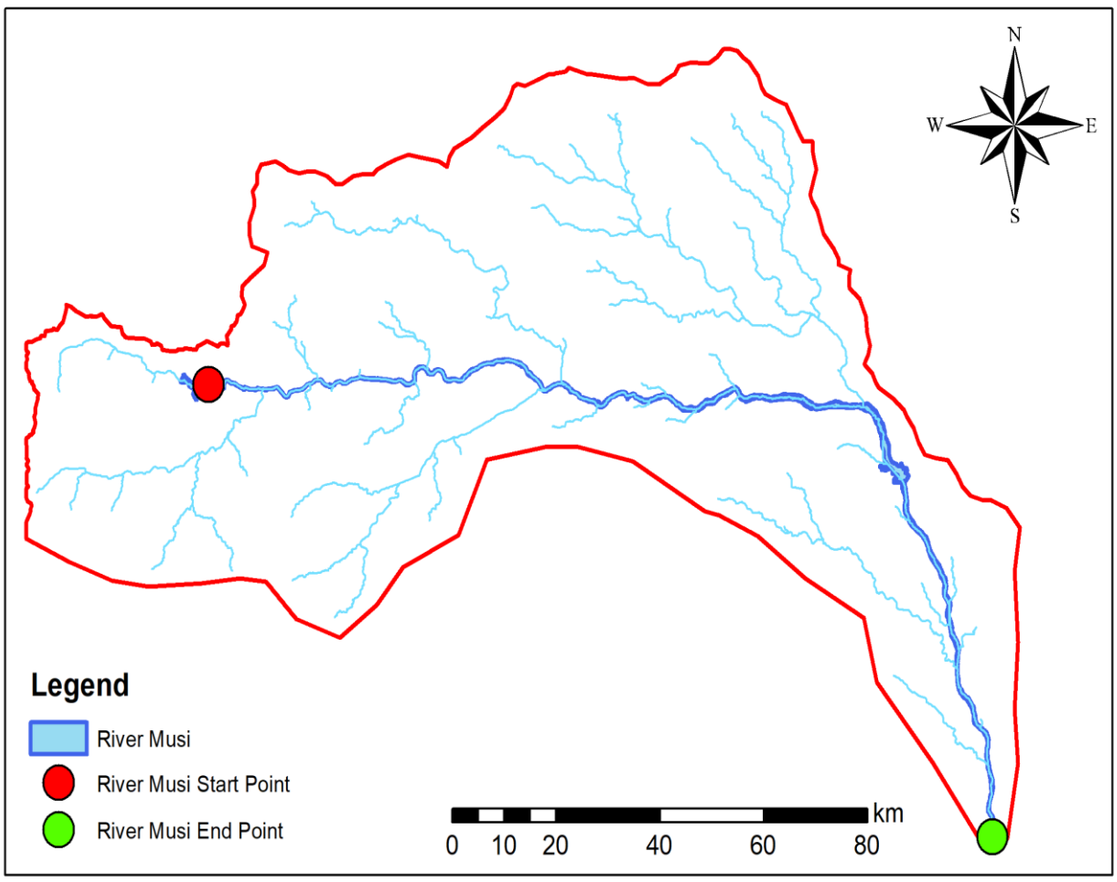

Fig 2.1.2 River Musi Watershed Map from Osman Sagar to Wadapally

2.1.2 Sewerage status and Treatment

Several drains join River Musi at various points along its stretch. There are 27 drains joining the Musi river along the whole stretch from Osman Sagar to Wadapally. Accordingly, Government of Telangana has set up various STPs at designated locations in Hyderabad city. Based on the last five decades population growth in the Musi watershed area, the total sewage generation is estimated to be around 1625 MLD by the year 2029. The present sewage treatment capacity is 725.8 MLD. Therefore, a gap of approximately 900 MLD will arise by the year 2029.

Table 2.1.4 Details about existing STPs along Musi river stretch

S.No.	STP location	Capacity (MLD)	STP Treatment method	Quantity of treated sewage from outlet of STP	Mode of disposal from STP
1	Nagole	172	UASB	172	Musi River
2	Attapur-I	23	SBR	51	Musi River
3	Attapur-II	51	SBR	51	Musi River
4	Khajakunta	12	MBBR	12	Pond
5	Mir Alam Tank	10	EA	10	Miralam Tank as well as gardening

6	DurgamCheruvu	5	EA	5	Durgam Cheruvu and water added at Shilparamam and KBR park for gardening purpose
7	Noor-Mohammed Kunta	4	EA	4	N M Kunta Lake
8	Langer House	1.2	EA	1.2	Langer House Talab
9	Khajaguda	7.0	EA	7.0	Bhairadha Cheruvu (Manikonda Cheruvu)
10	Amberpet	339	UASB followed by FAL	339	MUSI River
11	Nalla Cheruvu	30	UASB followed by FAL	30	MUSI River
12	Pedda Cheruvu (Nacharam)	10	EA (Tertiary Treatment)	10	To Pedda Cheruvu Lake
13	Patel Cheruvu	2.5	EA (Tertiary Treatment)	2.5	To Patel Cheruvu Lake
14	Saroornagar	2.5	EA (Tertiary Treatment)	2.5	To Saroornagar Lake
15	Safilguda	0.6	EA (Tertiary Treatment)	0.6	To Safilguda Lake
16	Khairtabad	20	MBBR	20	Into Hussain Sagar Lake
17	KIMS	30	MBBR	30	Into Hussain Sagar Lake
18	Rangadhamuni	5	EA	5	Into Rangadhamuni Cheruvu
19	Pragathinagar	2.5	MBBR	2.5	Pragathinagar Cheruvu
20	Krishna Kanth Park	0.5	EA	0.5	Ready for commissioning
21	Jalagam Vengal Rao Park	0.5	EA	0.5	Gardening and discharging into small lake inside the park
22	Gopanpally	Under construction			
Total STP capacity		**725.8 MLD**			

Note: UASB: Upflow Anaerobic Sludge Blanket Reactor; SBR: Sequencing Batch Reactor; MBR: Membrane Bio-reactor; MBBR: Moving Bed Bio Film Reactor; EA: Extended Aeration Technology; FAL: Facultative Lagoon

B. Faecal sludge and Septage Management through Co-treatment

The city of Hyderabad has existing STPs and these facilities can be gainfully used to co-treat the non-point source (Septic tank sewage). The co-treatment process involves

establishing a holding tank including stirring facility/recirculation system for homogenization of sludge and valve operation for controlled discharge of septage into the functional STPs. Further, to accomplish the goals of ODF++, HMWSSB envisages to have a regulatory system for licensing the desludging operators to prevent open dumping of septage in open areas. This can be achieved by empanelling the private desludging operators, training desludgers on the use of personal protective equipment (PPE), record keeping during desludging operations etc. The entire process is handed over to Administrative Staff College of India (ASCI) which will be completed by March 2019. The sanctioned amount for providing feacal sludge management arrangement in 18 STPs including consultation charges of ASCI is Rs. 5.00 Crores.

- The Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) and Greater Hyderabad Municipal Corporation (GHMC) have made significant progress to enhance coverage of toilet, sewerage system and waste water treatment capacities in the city.
- While the coverage in the core area is over 90%, the overall coverage of sewer system in the HMWSSB area is about 60%. The non-sewered areas are covered with on-site sanitation system such as septic tanks.
- HMWSSB proposed to cover the sewer network for the entire Hyderabad city. Accordingly, the septage transfer through trucks will be reduced gradually along with the network.
- The septic tanks in households and institutions lead to generation of large quantity of faecal waste. Like in most Cities in India, Hyderabad is currently facing a burden of untreated faecal waste entering the environment due to indiscriminate disposal of Septage (waste evacuated from septic tanks periodically) in open areas and water bodies by unregulated private desludgers causing significant public health and environmental risks.
- To achieve the vision of Swachh Telangana, Government of Telangana, vide GO.Ms.No. 176 dated 29th Sep 2018, has issued a policy on Faecal Sludge and Septage Management (FSSM) and encouraged all Urban Local Bodies (ULBs) to establish Faecal Sludge Treatment Plants (FSTPs) or promote co-treatment of faecal sludge at the existing sewage treatment plants.
- HMWS&SB has taken concrete steps to achieve this vision by initiating the process of converting all its STPs into co-treatment facilities.
- Administrative Staff College of India was engaged as a knowledge partner to effectively implement the faecal waste management system.
- Hyderabad is the first city in the country where all the 18 STPs in the city will be co-treating the faecal sludge collected from septic tanks (action plan enclosed).
- The co-treatment process involves establishing a holding tank including stirring facility/recirculation system for homogenization of sludge and valve operation for

controlled discharge of septage into the functional STPs. Pilot projects are implemented in three locations and based on this experience, co-treatment systems are implemented in 15 other locations.

- Private desludging operators have been empanelled and 61 trucks are provided with license to operate. The licensed operators have been given manifest form to maintain records of desludging from the point of desludging (at household/ institution) to the point of decanting (at STP)
- The licensed operators are also provided with a sticker to display on their vehicles to help them differentiate themselves from the unlicensed and illegal operators.
- The licensed operators will be given training on use of personal protective equipment and on Standard Operating Procedures for safe emptying and transportation of sludge. GPS devices are being installed in all trucks.
- HMWS&SB in rolling out Worker Safety and Well-being program that would involve registration and training of all licensed operators and workers, and implementation of insurance programs, financial support programs and best worker awards program.
- Hyderabad experience is being replicated in many metropolitan cities including in Delhi.

2.2.4 Reuse of treated sewage

- At present, a part of total sewage produced in Musi River stretch is used for irrigation purposes, either directly from open storm drains or treated effluent from STPs, especially in the downstream of Hyderabad. About 50% of the total sewage produced is being treated and finds its way to open storm drains along with untreated sewage in to Musi River, therefore the entire effort of treatment is wasted.
- Out of total 22 STPs in Hyderabad, some of the STPs like “Nallacheruvu” and “Nagole”, STPs are located along the Musi River bank. The land use of the

area surrounding these STPs is predominantly based on agriculture. These two STPs discharge their effluents in River Musi. Local framers lift water from the Musi. Water quality of this River stretch is poor since this stretch also receives untreated sewage, treated industrial wastewaters and partially treated sewage from the upstream drains. The treated sewage from the above 2 STPs can be directly supplied to the farmers. It would reduce the public health risk which may otherwise arise from the direct exposure of farmers to poor quality water and ingestion of pollutants and microbes resulting from the consumption of vegetable, etc. grown using the water from the polluted stretch of the River.

- It is reported that the regions like Musheerabad, Secunderabad, Picket, West Maredpally, Shanti Nagar, Humayun Nagar, Masab Tank, Saidabad, Saroor Nagar and Kanchanbaghshowed the higher rates of groundwater recharge during 2003-2012. More artificial recharge structures need to be constructed in these areas. Treated sewage from nearby STPS could be used for the artificial recharge.There are more than 3132 lakes in Hyderabad Metropolitan area which also serve as recharge of groundwater. STPs at Miralam Tank, Durgamcheruvu, Saroornagar Cheruvu, Lunger house, Safilguda, Khajaguda, Rangadhamuni Cheruvu, Noor-Mohammed kunta and Patel Cheruvu are discharging their treated sewage in to nearby respective lakes.
- A part of the treated sewage, after meeting the norms (Bureau of Indian Standards (BIS) - construction water quality (IS 456:2000)), at various STPs should be supplied for construction activities. Architects, builders, engineers and other construction companies may be educated about the use of recycled water for construction activities viz., mixing, curing, etc.as they recommend only fresh (soft) water for these purposes due to its hardness. Water with hardness in tune of 400 mg/lcan be used. The use of bore water (ground water) forall construction activities causing severe stress on ground water levels. Therefore, presently treated effluent from the Khairatabad and KIMS STPs are discharged into the HussainSagar lake. However, the treated water can be used for horticulture within those areas. Treated wastewater can be supplied in bulk quantities to the users at their centralized storage tank(s) on continuous basis. Other facilities required for application of treated wastewater on horticulture land, such as pumping, distribution, piping, etc. can be arranged by the respective users.
- Treated water from the Pedda cheruvu and Patel CheruvuSTPs which are located in the Nacharam industrial areacan be supplied to industries for cooling, washing and other purposes. The total water demand of industrial area could be easily met by reclaimed wastewater after treatment. Treated effluent with turbidity range from 1 to 30 NTU can be used in boilers, cooling towers, etc. The guidelines for industrial reuse of wastewater effluent do not

exist in India; therefore, these should be introduced and implemented for sustainable reuse of wastewater.

- It is evident that the potential usage of the treated effluent in Hyderabad is for rejuvenation of water bodies (lakes and ponds), irrigation, horticulture, groundwater recharge, industrial purpose and construction activities. Thus to mitigate public health risk, it is mandatory to employ tertiary treatment in all existing and proposed STPs.
- The various STPs have been proposed at various locations along the Musi stretch. The proposed STPs have been prioritized based on the distance of these STPs from the River stretch. The list of the proposed STPs as per the Priority is presented in Table 2.2.1.

Table 2.2.1 Location of Proposed STPs

S.No.	Location	Latitude/ Longitude	Capacity (MLD)	Remarks
PRIORITY I				
1.	Manikonda cheruvu	17° 24' 42.53" N 78° 22' 33.04" E	35	Sewage from Duragam Cheruvu and Khajaguda are received along with nearby colonies
2.	Before Inlet of Ibrahim Cheruvu	17° 23' 23.81" N 78° 22' 44.19" E	65	Sewage form Ibrahim lake directly meets at Musi
3.	Near confluence point of Sirimalle Nagar to Musi	17° 22' 7.25" N 78° 24' 35.1" E	35	Covering the colonies along the drain till Himayath Sagar Lake
4.	Bapughat STP with ID before meeting Musi	17° 22' 12.08" N 78° 24' 56.36" E	50	To treat the sewage overflowed to Musi after I&D
5.	Upgradation of Attapur STP from existing 74 MLD	17° 22' 22.78" N 78° 26' 01.68" E	30	To fulfill the Gap due to increase in sewage generation as per latest population
6.	Near Tejaswi Nagar	17° 21' 59.97" N 78° 26' 28.76" E	50	Un quantified sewage from Colonies around Tejaswini Nagar and Ziaguda area
7.	Near Shivaji Nagar	17° 21' 49.3" N 78° 27' 15.23" E	35	Un quantified sewage from Colonies around Tejaswini Nagar and Ziaguda area
8.	Upgradation of Amberpert STP/Set of New STP near Amberpet	17° 22' 39.7" N 78° 31' 40.3" E	130	To fulfill the Gap due to increase in sewage generation as per latest population

9.	Upgradation of Nalla Cheruvu STP/Set of New STP near Nalla Cheruvu STP	17° 23' 52.58" N 78° 34' 38.75" E	35	To fulfill the Gap due to increase in sewage generation as per latest population
10.	STP near Gowrelly drain	17° 22' 24.06" N 78° 39' 50.62" E	60	For unquantified sewage
11.	STP near Pochapally drain	17° 22' 16.67" N 78° 53' 22.96" E	25	Sewage from Qutbullahpur and colonies along the Drain
12.	STP near Chaitanyapuram drain	17° 22' 49.66" N 78° 55' 54.77" E	15	Sewage from Medchal and colonies along the Drain
13.	Miryalguda STP near Guduru	16°51'49.99"N 79°35'19.08"E	15	Sewage from Miryalaguda and nearby areas
14.	Hayat Nagar (Kuntlur)	17°21'22.73"N 78°39'16.98"E	50	Sewage from Kuntlur and nearby towns/villages
15.	Fateh Nagar	17°27'21.16"N 78°27'12.15"E	35	Sewage from Fatehnagar and nearby areas
16.	IDPL Township	17°29'9.11"N 78°27'26.90"E	65	Sewage from nearby areas
17.	Nagaram	17°28'50.34"N 78°36'20.95"E	35	Sewage from Nagaram, Dammaiguda, pocharam and Edulabad
18.	Hydershakote	17°22'11.93"N 78°24' 07.57"E	35	Sewage from Kismatpur, byragiguda and nearby areas
19.	Katedan	17°18'40.40"N 78°27' 02.52"E	35	Sewage from Padmasalipuram, Durganagar and nearby areas
20.	Kukkatpally	17°30'23.36"N 78°24' 02.74"E	35	Sewage from Kukatpally and nearby areas
21.	Fox Sagar Lake	17°31'01.97"N 78°28'06.38"E	30	Outlet of Fox Sagar
		TOTAL	**900 MLD**	

Table 2.2.2: Summary of Sewage Treatment

Present Sewage Generation	Project Sewage Generation by the year 2029*	Existing STPs Capacity	Gap of sewage to be treated by the year 2029* (Approx)
1450 MLD	**1625 MLD**	**725.8 MLD**	**900 MLD**

Sewage generation by the year 2029 has been calculated with a 30% projected increase in population

2.2.5 Proposed rejuvenation/beautification of Lakes

The rejuvenation of lakes has been proposed for those lakes which are receiving less than 1 MLD of sewage. 13 lakes have been identified for rejuvenation/beautification (Table 2.2.3).

Table 2.2.3: Proposed lakes for rejuvenation

S.No.	Location	Latitude/ Longitude
1.	Ramasamudram Lake	17° 20' 01.19" N 78° 58' 45.92" E
2.	Thumnaguda Lake	17° 20' 39.78" N 79° 02' 48.78" E
3.	Thumnaguda Lake 2	17° 20' 55.26" N 79° 4' 47.54" E
4.	Chillepalli Lake (near drain 26)	17° 20' 39.78" N 79° 02' 48.78" E
5.	Ravulapenta lake (near drain 23)	17° 01' 14.15" N 79° 35' 14.03" E
6.	Lake Near Gurunathpalle	17° 22' 52.64" N 79° 04' 03.00" E
7.	Vallabhapur drain lake	17° 14' 55.28" N 79° 30' 34.33" E
8.	Rudraram lake	16° 49' 39.61" N 79° 38' 8.89" E
9.	Anajipuram	17° 3' 23.15" N 79° 36' 29.62" E
10.	Madharam Kalan 1	17° 16' 16.17" N 79° 26' 50.45" E
11.	Madharam Kalan 2	17° 16' 55.32" N 79° 26' 45.63" E
12.	Near Thurakapalli Drain	17° 20' 56.71" N 79° 13' 15.03" E
13.	Pallewada	17° 19' 46.98" N 79° 8' 53.20" E

Table 2.2.4 Action Plan for rejuvenation of River Musi

S.No.	Action Plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
Industrial Pollution				
1.	Actions against the identified industries in operation without consents under air and water acts	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
2.	Action against Industries not installed ETPs or ETPs exist but not operating or ETP outlet or treated is not complying to the effluent discharge standards or norms	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
3.	Directions to all industries which are observed to be not in operation or closed or temporarily closed to remain close till further orders of TSPCB	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
Sewage Treatment Plan and Disposal Plan				
1.	District wise estimation of total sewage generation, existing treatment capacities, quantum of disposal of sewage presently through drains and the gaps in sewage treatment capacity	MA&UD, HMWS&SB, PHED (Urban areas)	Study awarded and the report is about to be submitted by July, 2019	HMWS&SB awarded the study to M/s. Shah Consultancy
2.	To undertake the measurement of flow of all the drains presently contributing to pollution load in river and to formulate DPR for each drain and corresponding town	State I&CAD, HMWS&SB, GHMC, PHED (Urban areas)	6 months	-
3.	Design and execution of STPs Set up of new STPs at the desired locations and follow up of the same	HMWS&SB, GHMC, PHED (Urban Area)	36 months	2,34,000/-
4.	Channelization including diversion of sewage generated from villages/towns etc through I&D of all the drains presently carrying sewage and for ensuring proper treatment of the upcoming STPs	HMWS&SB, GHMC, PHED (Urban Areas)	36 months at present a study is awarded to M/s. Shah Consultancy and the final report is expect by July, 2019	HMWS&SB awarded the study to M/s. Shah Consultancy for
5.	Implementation of the faecal management with co-treatement facilitied at various STPs	HMWS&SB	2 months	400/-
Groundwater Quality				
1.	Supply of potable water to the affected communities in the identified critical blocks	HMWS&SB, GHMC, Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As part of departmental activity

2.	Carrying assessment of groundwater survey for quality and to identify over exploited zones and critical zones in the city	SGWB	2 months and to continue as regular activity	As a part of departmental activity
3.	To ensure rain water harvesting by the, commercial and other Institutions and groundwater recharging with only clean water be encouraged by TSPCB/State Ground Water Board	SGWB / GHMC / TSPCB	3 months and to continue as regular activity	As a part of departmental activity
4.	Periodical ground water quality assessment and remedial actions in case of contaminated GW / TW / BW / HP and assessment of the need for regulating use of ground water for irrigation purposes	SGWB / TSPCB / / State I&CAD	2 months and to continue as regular activity	As a part of departmental activity
5.	Installation of piezometers and recharge shafts	SGWB	11 months	726.25
Flood Plain Zone				
1.	Plantation in flood plain zone	State I & CAD, HMWS&SB, GHMC, Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As a part of the Government Haritha Haram Programme
2.	Checking encroachments in the flood plain zone	State I&CAD, GHMC, Revenue Department	2 months	As a part of departmental activity
3.	Prohibition of disposal of municipal, bio-medical in drains	TSPCB, GHMC	Already under implementation and to continue the activity	As a part of departmental activity
4.	Prohibition of disposal of Plastic, Hazardous and E-waste in drains	TSPCB / State I & CAD	Already under implementation and to continue the activity	As a part of departmental activity
5.	Notification of Flood Plain Zone	State I&CAD	3 months	-
Environmental Flow (E-flow)				
1.	Measurement of flow of all the drains meeting the river and maintenance of all records	CWC / State I&CAD	6 months	88/- for water level measurement at 8 locations
2.	Water and Irrigation practises and organization of awareness programmes for the farmers	State I&CAD, GHMC, Revenue Department	3 months	-

PERT Chart with proposed timelines for Action Plan Implementation from June 2019 after the approval of action plan

Action Plan	June-Aug 2019	Sep-Nov 2019	Dec2019-Feb 2020	March-May 2020	June-Aug 2020	Sep-Nov 2020	Dec2020-Feb 2021	March-May 2021	June-Aug 2021	Sep-Nov 2021	Dec 2021-Feb 2022	March-May 2022
Identification of location for proposed STPs												
Preparation of DPR												
Tender finalisation and award of work												
Set up of STPs												
Installation of peizometers and recharge shafts												
Implmentation of fecal management with co-treatment facilities at various STPs												
Water Quality sampling after set up of STPs												
Flow measurements of all the drains and calculation of E-flow												
Preparation of final report after the implementation of the action plan												

The above action plan and the time lines mentioned would be contingent on the availability of land for construction of STPs at the identified locations, the delays involved in the process of removal of encroachments, land acquisition procedures and litigation thereon. Allocation of finances to the various components of the action plan involves legislative and administrative actions and predicting their timeliness accurately may not be feasible.

3.1 RIVER MANJEERA-NAKKAVAGU STRETCH

3.1.0 Manjeera-Nakkavagu stretch

Manjeera River, a tributary of River Godavari, originates from Balaghat Hills near AhemednagarDistrict at an altitude of 823 metres (2,700 ft)with total catchment area of 30,844 square kilometres (3,084,400 ha).It flows through Latur District of Maharashtra and Bidar District of Karnataka before entering Medak District in Telangana State. It flows for about 96 km in Medak District through Narayankhed, Jahirabad, Sangareddy and Narsapur Talukas. Ultimately, it outfalls into Godavari River at Basara near Nizamabad. The starting and ending point of polluted stretch of Manjeera based on CPCB recommendation of polluted river stretch has been taken-up for the rejuvenation of river Manjeera (**Table 3.1.1**). This stretch is demarcated from the upper and down streams points of the confluence of the rivers Manjeera and Nakkavagu.The details of the Manjeera River stretch.

Nakkavagu is a tributary of the River Manjeera, which flows through the Medchal-Malkajgiri, Rangareddyand Sangareddy Districts of Telangana.

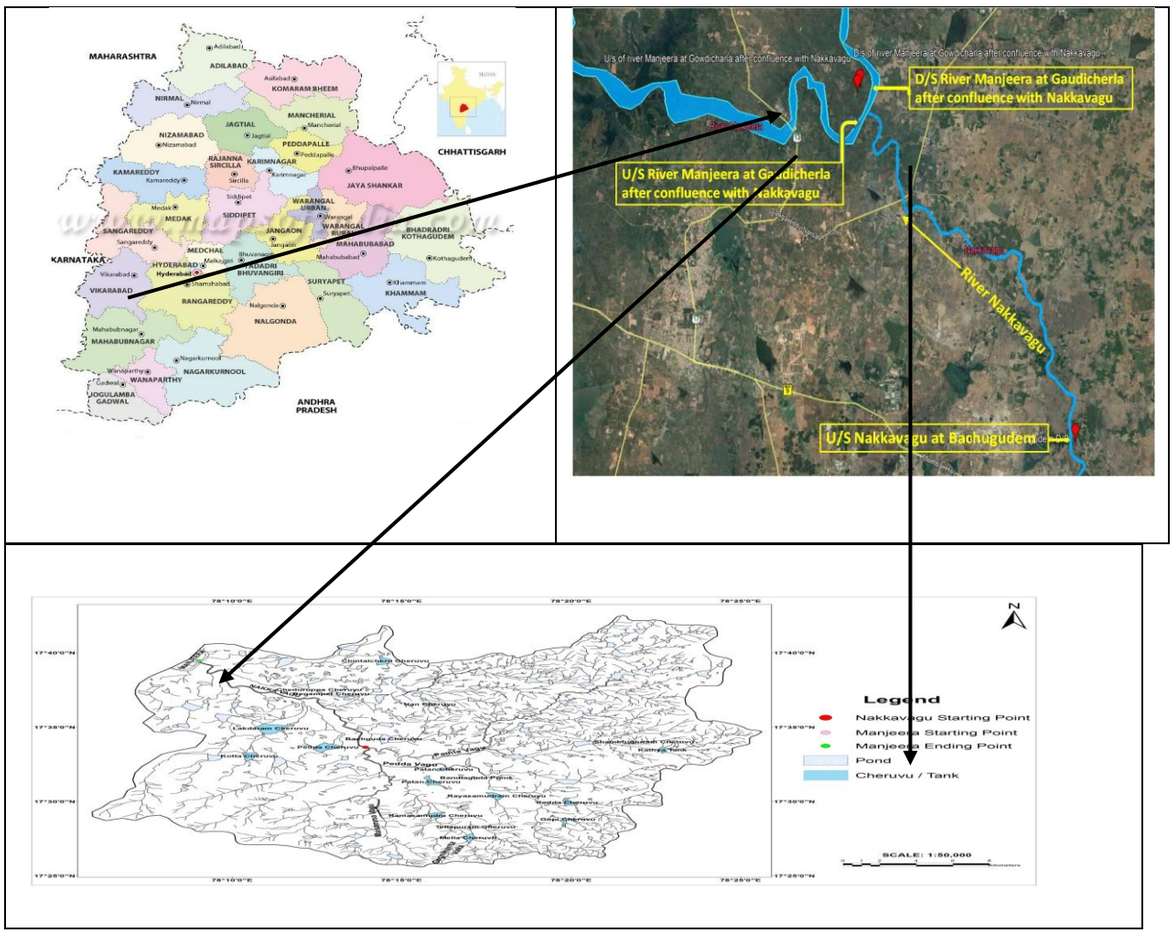

Fig. 3.1.1 Stretch Map of River Manjeera-Nakkavagu

Table 3.1.2 Polluted River Stretch Manjeera-Nakkavagu

S.No.	Stretch Name	Stretch Identified	Town Identified	Approx length of the stretch (in Km)
1.	Manjeera	Gowdicharla to Nakkavagu	Gowdicharla	2.0

3.1.1 Causes of River Manjeera-Nakkavagu Pollution

The Sewage discharge from the urban agglomeration of Patancheru, R.C. Puram mandals of Sangareddy District and the villages of river Nakkavagu is ultimately joining the river Manjeera at Gaudicherla Village (downstream of Manjeera and Nakkavagu confluence). The impact of pollution on Manjeera river stretch is the net result of sewage generated in Nakkavagu stream. The Pamulavagu, Peddavagu and Nakkavagu streams flowing through Urban agglomeration, act as diffuse sources of contamination along their courses to the confluence with the River Manjeera.

3.2.3.1 Industrial Pollution Control

a) Common effluent treatment plants (CETPs)

One CETP is located along the Nakkavagu stretch at Patancheru (PETL) with 135 member units of which 89 industries are located in the catchment area of Manjeera. The member industries of PETL send their effluents after primary treatment for further treatment and disposal. The treated effluent after meeting the outlet standards from CETP is being sent to Amberpet STP for further treatment.

3.2.3.2 Treatment of domestic sewage

The estimated sewage generation in River Manjeera-Nakkavagu watershed is about 45.69 MLD and there is no sewage treatment facility existing therefore the untreated sewage disposed through drains and may reach the river Manjeera. The Sewage and sullage is being disposed into Nakkavagu stretch through 9 major drains/nallahs.

3.2.4 Reuse of treated sewage

It is envisaged that the potential usage of the treated sewage in river stretch is for rejuvenation of water bodies (lakes and ponds), irrigation, horticulture, groundwater recharge, industrial purpose and construction activities. Thus to mitigate public health risk, it is mandatory to employ tertiary treatment in all proposed STPs.

Table 3.2.2 Summary of Sewage Treatment

Total Sewage Generated	Existing STPs Capacity	Proposed STPs capacity
71.0 MLD	**Nil**	**71.0 MLD**

As per the anticipated growth of population in the next 10 years.

The approximate range of overall cost for the installation of 09 STPs under Priority - I is around Rs.**14,000** lakhs to Rs.**14,560** lakhs and for 02 STPs under Priority - II the approximate cost may vary about Rs.**3625** lakhs - Rs.**3770** lakhs.

Table 3.2.4 Action Plan for rejuvenation of River Manjeera-Nakkavagu

S.No.	Action Plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
Industrial Pollution				
1	Actions against the identified industries in operation without consents under air and water acts	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
2	Action against Industries not installed ETPs or ETPs exist but not operating or ETP outlet or treated is not complying to the effluent discharge standards or norms	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
Sewage Treatment Plan and Disposal Plan				
1	District wise estimation of total sewage generation, existing treatment capacities, quantum of disposal of sewage presently through drains and the gaps in sewage treatment capacity	MA&UD, HMWS&SB, PHED	Study awarded and the report is about to be submitted within	HMWS&SB awarded the study to M/s. Shah Consultancy
3	Design, execution of STPs	HMWS&SB, GHMC, PHED (Urban Area)	36 months	18,330
4	Channelization including diversion of sewage generated from villages/towns etc through I&D of all the drains presently carrying sewage and for ensuring proper treatment of the upcoming STPs	HMWS&SB, GHMC, PHED (Urban Areas)	36 months	-
6	Treatment and disposal of septage and controlling open defecation	ULB / PHED	4 months	-
Groundwater Quality				
1	Supply of potable water to the affected communities in the identified critical blocks	HMWS&SB, GHMC, Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As part of departmental activity
2	Carrying assessment of groundwater survey for quality and to identify over exploited zones and critical zones in the city	SGWB	2 months and to continue as regular activity	As part of departmental activity
3	To ensure rain water harvesting by the Industrial, commercial and other Institutions and groundwater recharging with only clean water be encourages by TSPCB/State Groundwater Board	TSPCB / SGWB	3 months and to continue as regular activity	As part of departmental activity

4	Installation of piezometers and recharge shafts	SGWB	11 months	285.5
Flood Plain Zone				
1	Plantation in flood plain zone	State I & CAD, HMWS&SB, GHMC, Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As a part of the Government Haritha Haram Programme
2	Checking encroachments in the flood plain zone	State I & CAD, GHMC, Revenue Department	2 months	As part of departmental activity
3	Prohibition of disposal of municipal, bio-medical in drains	TSPCB, GHMC	Already under implementation and to continue the activity	As part of departmental activity
4	Prohibition of disposal of Plastic, Hazardous and E-waste in drains	TSPCB / State I&CAD	Already under implementation and to continue the activity	As part of departmental activity
5	Notification of Flood Plain Zone	State I&CAD	3 months	As part of departmental activity
Environmental Flow (E-flow)				
1	Measurement of flow of all the drains meeting the river and maintenance of all records	CWC / State I&CAD	6 months	33/- for water level measurement at 3 locations
2	Water and Irrigation practises and organization of awareness programmes for the farmers	State I&CAD, GHMC, Revenue Department	3 months	-

PERT Chart with proposed timelines for Action Plan Implementation from June 2019 after the approval of action plan

Action Plan	June-Aug 2019	Sep-Nov 2019	Dec2019-Feb 2020	March-May 2020	June-Aug 2020	Sep-Nov 2020	Dec2020-Feb 2021	March-May 2021	June-Aug 2021	Sep-Nov 2021	Dec 2021-Feb 2022	March-May 2022
Identification of location for proposed STPs												
Preparation of DPR												
Tender finalisation and award of work												
Set up of STPs												
Installation of peizometers and recharge shafts												
Implmentation of fecal management with co-treatment facilties at various STPs												

Water Quality sampling after set up of STPs												
Flow measurements of all the drains and calculation of E-flow												
Preparation of final report after the implementation of the action plan												

The above action plan and the time lines mentioned would be contingent on the availability of land for construction of STPs at the identified locations, the delays involved in the process of removal of encroachments, land acquisition procedures and litigation thereon. Allocation of finances to the various components of the action plan involves legislative and administrative actions and predicting their timeliness accurately may not be feasible.

Revised Report

Action Plan for Rejuvenation of River Stretches (Priority III, IV and V) in Telangana State

Submitted to:

Government of Telangana

CSIR-National Environmental Engineering Research Institute (NEERI)

Hyderabad Zonal Centre
Uppal Road, Hyderabad-500007

April 2019

Table: Action Plan for rejuvenation of Rivers (Priority III-V)

S. No.	Action Plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
Industrial Pollution				
4.	Actions against the identified industries in operation without consents under air and water acts	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
5.	Action against Industries not installed ETPs or ETPs exist but not operating or ETP outlet or treated is not complying to the effluent discharge standards or norms	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
6.	Directions to all industries which are observed to be not in operation or closed or temporarily closed to remain close till further orders of TSPCB	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
Sewage Treatment Plan and Disposal Plan				
6.	District wise estimation of total sewage generation, existing treatment capacities, quantum of disposal of sewage presently through drains and the gaps in sewage treatment capacity	MA&UD, PHED (Urban areas) and PR&RD	DPR for setting up of STPs at various places is under progress	-
7.	To undertake the measurement of flow of all the drains presently contributing to pollution load in river and to formulate DPR for each drain and corresponding town	State I&CAD, HMWS&SB, PHED (Urban areas)	6 months	-
8.	Design and execution of STPs Set up of new STPs at the desired locations and follow up of the same	HMWS&SB, GHMC, PHED (Urban Area)	36 months	Maneru: Rs. 4125 Karakavagu-Kinnerasani: Rs. 1568 Godavari: Rs.12618 Krishna: Rs. 17878

S. No.	Action Plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
9.	Channelization including diversion of sewage generated from villages/towns etc through I&D of all the drains presently carrying sewage and for ensuring proper treatment of the upcoming STPs	MA&UD, PHED (Urban Areas), PR&RD	24 months	DPRs under preparation
10.	Implementation of the faecal management with co-treatement facilitied at various STPs	MA&UD, PR&RD	2 months	Included in the estimates provided for STPs
Ground water Quality				
6.	Supply of potable water to the affected communities in the identified critical blocks	Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As part of Departmental activity
7.	Carrying assessment of groundwater survey for quality and to identify over exploited zones and critical zones in the city	SGWB	2 months and to continue as regular activity	As part of Departmental activity
8.	To ensure rain water harvesting by the, commercial and other Institutions and groundwater recharging with only clean water be encouraged by TSPCB/State Ground Water Board	SGWB / TSPCB	3 months and to continue as regular activity	As a part of departmental activity
9.	Periodical ground water quality assessment and remedial actions in case of contaminated GW / TW / BW / HP and assessment of the need for regulating use of ground water for irrigation purposes	SGWB / TSPCB / State I&CAD	2 months and to continue as regular activity	As a part of departmental activity

S. No.	Action Plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
10.	Installation of piezometers and recharge shafts	SGWB	11 months	<u>For Piezometers</u> Maneru : Rs. 85 Kinnerasani: Rs. 62 Godavari: Rs. 333 Krishna : Rs. 424 <u>For Recharge Shafts</u> Maneru-Karakavagu : Rs. 341.25 Godavari-Kinnerasani : 243.25 Krishna : Rs. 623
Flood Plain Zone				
6.	Plantation in flood plain zone	State I&CAD, Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As a part of the Government Haritha Haram Programme
7.	Checking encroachments in the flood plain zone	State I&CAD, Revenue Department	2 months	As a part of departmental activity
8.	Prohibition of disposal of municipal, bio-medical waste in drains	MA&UD, ULBs, TSPCB	Already under implementation and to continue the activity	As a part of departmental activity
9.	Prohibition of disposal of Plastic, Hazardous and E-waste in drains	ULBs, TSPCB	Already under implementation and to continue the activity	As a part of departmental activity
10.	Notification of Flood Plain Zone	State I&CAD	3 months	As a part of departmental activity
Environmental Flow (E-flow)				
3.	Measurement of flow of all the drains meeting the river and maintenance of all records	CWC / State I&CAD	6 months	As a part of departmental activity
4.	Water and Irrigation practises and organization of awareness programmes for the farmers	State I&CAD, Revenue Department	3 months	As a part of departmental activity

PERT Chart with proposed timelines for Action Plan Implementation from June, 2019 after the approval of action plan by RRC

Action Plan	June-Aug 2019	Sep-Nov 2019	Dec2019-Feb 2020	March-May 2020	June-Aug 2020	Sep-Nov 2020	Dec2020-Feb 2021	March-May 2021	June-Aug 2021	Sep-Nov 2021	Dec 2021-Feb 2022	March-May 2022
Identification of location for proposed STPs												
Preparation of DPR												
Tender finalisation and award of work												
Set up of STPs												
Installation of peizometers and recharge shafts												
Implementation of fecal management with co-treatment facilties at various STPs												
Water Quality sampling after set up of STPs												
Flow measurements of all the drains and calculation of E-flow												
Preparation of final report after the implementation of the action plan												

Challenges that could hinder the progress of action plan:

The above action plan and the time lines mentioned would be contingent on the availability of land for construction of STPs at the identified locations, the delays involved in the process of removal of encroachments, land acquisition procedures and litigation thereon. Allocation of finances to the various components of the action plan involves legislative and administrative actions and predicting their timeliness accurately may not be feasible. However the state government will leave no stone unturned to meet the timelines as laid down by the Hon'ble NGT and the Action Plan enumerated in the River Hindon.

Table 1: Proposed STPs and cost

S.No.	Name of the Stretch	Population*	No. of STPs	Capacity** (MLD)	Estimated Cost** (Rs.in Lakhs)
1	Maneru (Warangal to Somanpally)	1566036	1+16 WSPs	6+13.50	4125
2	Karakavagu-Kinnerasani (Along Palvancha)	178443	16 WSPs	5.05	1568

3	Godavari (Basar to Khammam)	2934341	1 + 6 WSPs	14[#]+14+25.3	12618
4	Krishna (Thangadi to Wadapally)	648148	7 + 2 WSPs	65.4 + 4.6	17878
Grand Total			**49**	**147.85**	**36,189**

WSP:Waste stabilization pond;*Population as per present population plus (+)15% growth is considered; ** Source: HMWS&SB and CPCB guidelines;[#]Upgradation of existing STP

2.1 MANERU RIVER STRETCH

2.1.1 Maneru River Basin/Water Shed

Maneru River, a tributary of River Godavari, originates from Kakur and flows east towards Karnagunta. It confluences with Godavari River after Somanpally village, covering a distance of 232 km at 18°42'31.90"N 79°48'48.74"E (**Fig. 2.1.1**). Maneru River covers three dams, the Upper Manair Dam at Narmal Village in Rajanna Sircilla District, Mid Maneru Dam at Manvada village in Rajanna Sircilla District and Lower Maneru Dam at Alugunur village, Karimnagar District. The lower Maneru dam is the major drinking water source for Karimnagar Town and also provides irrigation to a gross command area of 163,000 hectares (400,000 acres).

The industries in the river stretch are mostly agro-based industries and mechanical industries. Among agro-based industries, rice mills, cotton mills, oil mills, etc are important.

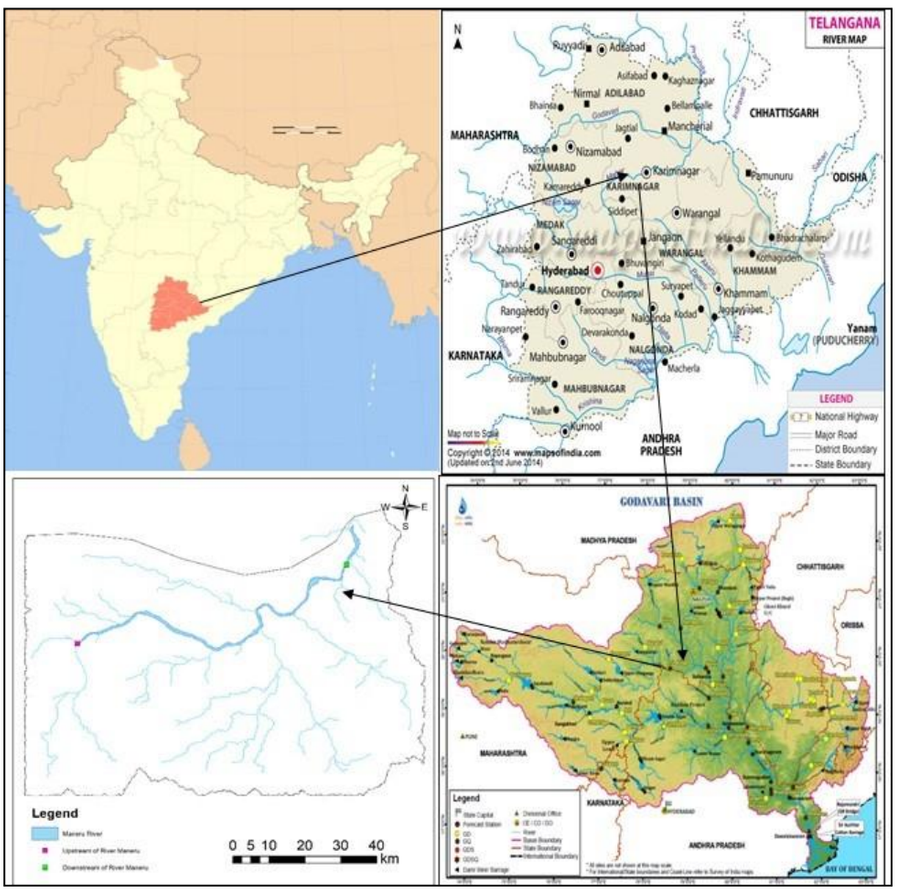

Fig 2.1.1 Location Map of Maneru River Stretch

2.1.2 Maneru river Watershed (Polluted river stretch- Priority III)

The present study of Maneru river stretch starts from lower Maneru Dam (LMD) at Karimnagar to Somanpally.

2.1.4 Major Source of pollution

River water gets contaminated due to discharge of pollutants in the water bodies without any treatment. The main causes of pollution are untreated domestic sewage discharge into the river. As the untreated sewage flows out of households, first it flows into the nearest water body and sewage contaminated water from these water bodies finally ends up in the rivers, which act as source of drinking water for cities.

On the river stretch of Maneru, STP and MSW dump site at Karimnagar are the major sources of pollutants.

The sewage generated from the towns and villages on the river bank of Maneru could be the major source of sewage pollution in the river stretch. The MSW dump site located at Karimnagar near the bank of river Maneru, may also have the possibility of leachate joining the river stretch.

As per the details obtained from PHED, the Maneru river stretch has STP at Karimnagar and its outlet is disposed in to Maneru river stretch and the sewage is being disposed by means of septic tanks followed by soak pits.

2.1.6 Details of existing STP and Domestic sewage management

There is an STP at Bommakal Housing Board Colony, Karimnagar as shown in **Fig. 2.1.5**. The capacity of the STP is 38 MLD and the out let of STP is disposed in to Maneru river stretch.

As per the information received from PHED, the proposed STP capacities for the Vemulawada, Siricilla, Huzurabad, Jammikunta, Parkal and Bhupalpally towns is 7.70 MLD, 17.60 MLD, 6.45 MLD, 6.30 MLD, 6.60 MLD and 8.83 MLD, respectively (total 53.48 MLD) of which 28.18MLD (excluding Vemulawada and siricilla which are in upstream) are in the identified polluted stretch. The details of existing STP and proposed STP are given in **Table 2.1.4**.

Table 2.1.4 Details of Existing STP at Karimnagar along Maneru river stretch

S. No.	STP Location	Location	Capacity	Operational status	Treatment method	Disposal	BOD (ppm)	COD (mg/l)
1.	Karimnagar	18°26'01.76"N 79°09'03.84"E	38 MLD	Yes	MBBR	in to Maneru river	10-270	20-700

Source:PH&E Department

Table 2.1.5 Details of Proposed STPs in the Maneru river Stretch

Name of Town/ village	Capacity (MLD)
Huzurabad	6.45
Jammikunta	6.30
Parkal	6.60
Bhupalpally	8.83
Total	**28.18**

Source: PH&E Department

Table 2.1.11 Existing Municipal Solid Waste Management Details in Maneru River Bank Towns

S.No.	Urban Local Body (ULB) Name	Total waste generated in the city (TPD)	Quantity of wet waste composted (TPD)	Total Dry Waste Recovered (TPD)	Quantity of Waste Disposed/Dumped (TPD)
1	Bhupalpalli(NP)	12	0	0	12
3	Parkala(NP)	10	0	0	10
5	Jammikunta(NP)	21	0.5	0	20.5
6	Huzurabad(NP)	20	1	0	19
Total:		**63**	**1.5**	**0**	**61.5**

2.2.5 Monitoring of Action Plan

Table 2.2.3 Action Plan for rejuvenation of River Maneru

S. No.	Action plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
Industrial pollution:				
1	Actions against the identified industries in operation without consents under air and water acts	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
2	Action against Industries not installed ETPs or ETPs exist but not operating or ETP outlet or treated is not complying to the effluent discharge standards or norms	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
3	Directions to all industries which are observed to be not in operation or closed or temporarily closed to remain close till further orders of TSPCB	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
Sewage Treatment Plan and Disposal Plan				
1	District wise estimation of total sewage generation, existing treatment capacities, quantum of disposal of sewage presently	MA&UD, PHED & PR&RD	DPR for setting up of STPs at various places is under progress	-

S. No.	Action plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
	through drains and the gaps in sewage treatment capacity			
2	To undertake the measurement of flow of all the drains presently contributing to pollution load in river and to formulate DPR for each drain and corresponding town and submission of DPR to MA &UD	State I & CAD, PHED	6 months	-
3	Design and execution of STPs Set up of new STPs at the desired locations and follow up of the same	HMWS &SB, PHED, PR&RD	36 months	Rs. 4125 lakhs
4	Channelization including diversion of sewage generated from villages/ towns etc. through I&D of all the drains presently carrying sewage and for ensuring proper treatment of the upcoming STPs	PHED, PR&RD	36 months. Preparation of DPRs are under progress	-
5	Implementation of the faecal management with co-treatment facilitated at various STPs	PHED, PR&RD	-	-
Ground water quality				
1	Supply of potable water to the affected communities in the identified critical blocks	Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As part of Departmental activity
2	Carrying assessment of groundwater survey for quality and to identify over exploited zones and critical zones in the watershed area	State ground water dept.	1 month and to continue as regular activity	As part of Departmental activity
3	To ensure rain water harvesting by the Industrial, commercial and other Institutions and groundwater recharging with only clean water be encouraged by TSPCB/ State Ground Water Board	TSPCB/ State Ground Water Department	3 months and to continue as regular activity	As a part of departmental activity
4	Installation of piezometers and recharge shafts.	State Ground Water Department	March 2020	Estimated cost for piezometeres Rs. 85 lakhs and for Recharge Shafts Rs. 341.25 Lakhs (Maneru Karakavagu Basin)
Flood Plain Zone				
1	Plantation in flood plain zone	State I & CAD, Rural Water Supply and Sanitation Department, PHED	1 month and to continue as regular activity	As a part of government Haritha Haram Programme

S. No.	Action plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
2	Checking encroachments in the flood plain zone	State I & CAD, Revenue Department, PHED	2 months	As a part of departmental activity
3	Prohibition of disposal of municipal, bio-medical in drains	TSPCB, ULBs	Already under implementation and to continue the activity	As a part of departmental activity
4	Segregation of waste into wet and dry waste at source	Local bodies	Already under implementation and to continue the activity	As a part of departmental activity
5	Prohibition of disposal of Plastic, Hazardous and E-waste in drains	TSPCB, ULBS State I&CAD	Already under implementation and to continue the activity	As a part of departmental activity
6	Removal of existing dumps along the river stretch with specific reference to dump at Karimnagar town	Local bodies	Already under implementation and to continue the activity	As a part of departmental activity
7	Notification of Flood Plain Zone	State I & CAD	3 months	As a part of departmental activity
Environmental Flow (E-flow)				
1	Measurement of flow of all the drains meeting the river and maintenance of all records	CWC / State I&CAD	6 months	-
2	Water and Irrigation practises and organization of awareness programmes for the farmers	State I & CAD, Revenue Department,	3 months	-

PERT Chart with proposed timelines for Action Plan Implementation from June 2019 after the approval of action plan by RRC

Action Plan	June-Aug 2019	Sep-Nov 2019	Dec2019-Feb 2020	March-May 2020	June-Aug 2020	Sep-Nov 2020	Dec2020-Feb 2021	March-May 2021	June-Aug 2021	Sep-Nov 2021	Dec 2021-Feb 2022	March-May 2022
Identification of location for proposed STPs												
Preparation of DPR												
Tender finalisation and award of work												
Set up of STPs												
Installation of peizometers and recharge shafts												
Implmentation of fecal management with co-treatment facilties at various STPs												
Water Quality sampling after set up of STPs												

Flow measurements of all the drains and calculation of E-flow												
Preparation of final report after the implementation of the action plan												

The above action plan and the time lines mentioned would be contingent on the availability of land for construction of STPs at the identified locations, the delays involved in the process of removal of encroachments, land acquisition procedures and litigation thereon. Allocation of finances to the various components of the action plan involves legislative and administrative actions and predicting their timeliness accurately may not be feasible.

3.1 KARAKAVAGU-KINNERASANI RIVER STRETCHES

3.1.1 River Karakavagu-Kinnerasani

Karakavagu is the sub tributary of the River Kinnerasani, a tributary of the river Godavari, and flows through Badhradri-Kothagudem district of Telangana State. According to the Irrigation Department, the river has the catchment area of 5.15 Sq. Km and runs about 18 Km through the Palvancha mandal before joining the main stream of Kinnerasani river. The Kothagudem Thermal Power Station (KTPS) is the major industry located on the bank of Karakavagu with an installed capacity of 1720 MW.

The river Kinnerasani, one of the tributary of the river Godavari, flows through Warangal and Khammam districts of Telangana State. The river runs about 132 km through the Mandals, Kothagudem, Gundala, Singareni, Julurpad, Chandrugunda, and Burgampahad, before joining Godavari at Burgampahad. Kinnerasani River has four major drains and one major industry, Kothagudem Thermal Power Station (KTPS) which is located on the bank of Karakavagu which ultimately joins Kinnerasani river. The River has the catchment area of 514.80 Sq. Miles (1320 Sq. km) covering four mandals, Gundala, Tekulapalli, Palvancha and Burgampadu. The River has a dam at Yanamboil village of Palvancha Mandal with the gross capacity of 8.40 TMC at the full reservoir level of 407 ft. This reservoir provides irrigation facilities to the farmers of Palvancha and Burgampadu Mandals of Kothagudem District apart from providing water to KTPS at Palvancha. The Dam and the Kinnerasani Wildlife Sanctuary, habitat for many endangered species, are the main tourist attractions along the river stretch. The river dissects the Kinnerasani wildlife sanctuary and passes through various villages and KTPS before finally joining the river Godavari.

The river stretch for Karakavagu along Palvancha region is considered as the study area (approximately 4.5 KM).

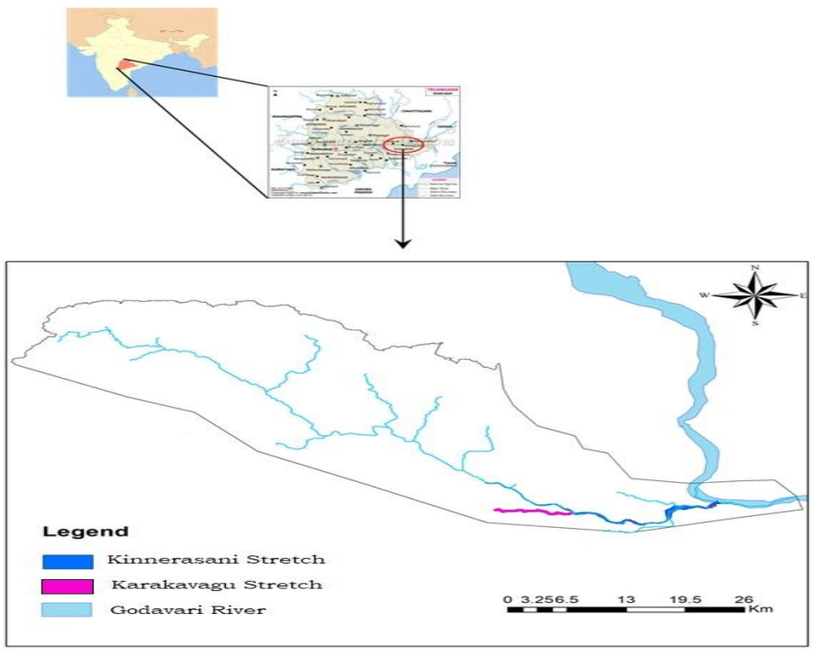

Fig. 3.1.2 Watershed maps for Karkavagu- Kinnerasani River stretch

3.1.4 Major source of pollution

The main causes of river pollution are untreated domestic sewage and treated industrial effluent discharges.

3.1.4.1 List of Drains/ Nallas and villages information along the river stretches

The river Karakavagu has only one drain and the population size of 86092 was observed in various villages/ towns around the river. The list of drains and the population living around the drains of Karkavagu-Kinnerasani Rivers are given in **Table 3.1.2**. The Kinnerasani river stretch has four drains which pass through various villages/ towns in the watershed area and the total number of population living in the villages / towns varies from drain to drain. Among four different drains, the smallest population size of 1,639 was observed in villages/ towns around Sangam-Rangapuram drain, whereas, the largest population size of 19,436, was observed in various villages/ towns around the drain Bhoorgampahad to Nakirapet. The population size mentioned in the table are based on the 2011 Census data. The Karakavagu and the locations of drains in the watershed area of Karkavagu- Kinnerasani river are shown in following **Fig. 3.1.3**.

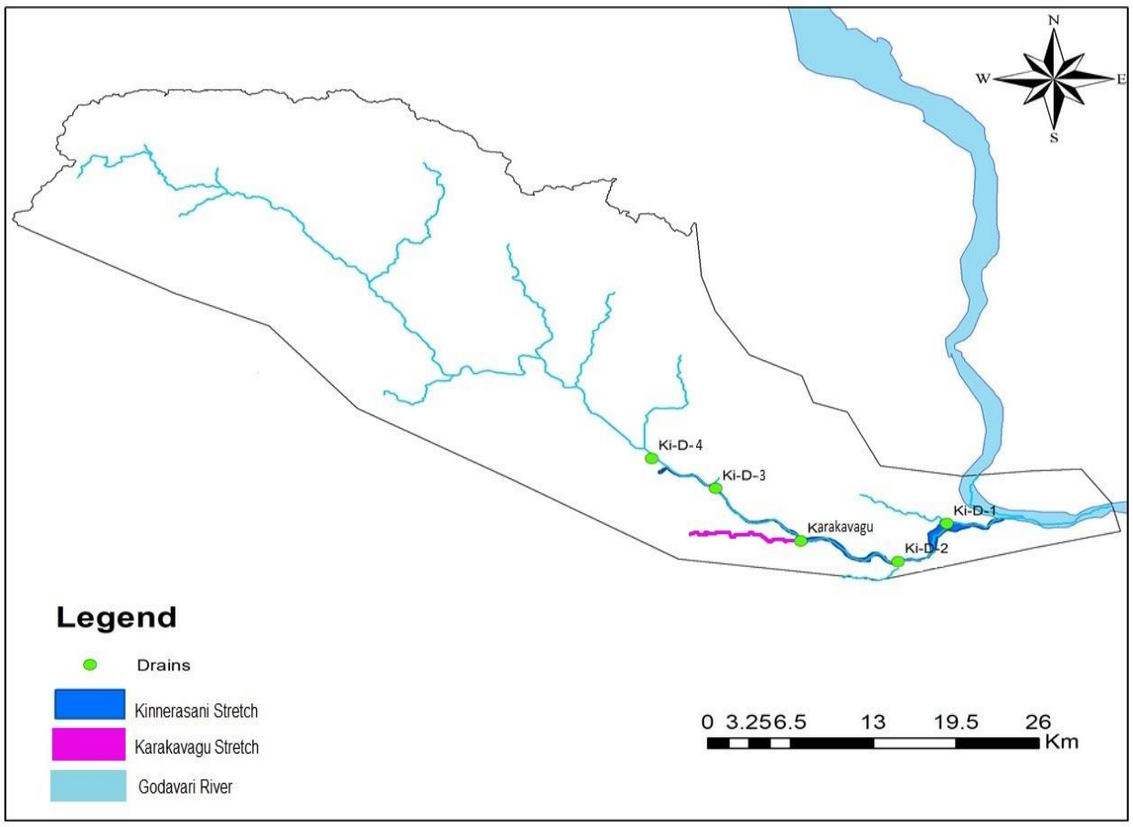

Fig. 3.1.3 Drains in the watershed area of Karkavagu- Kinnerasani river

3.2.3.2 Treatment of sewage

At present there is no treatment of sewage in the villages/towns along Karakavagu-Kinnerasani River Stretches as per data received from various departments. Presently, the sewage is being disposed through septic tank and soak pits. Based on the sewage

generation, WSPs (Waste Stabilization Ponds) and STP are recommended at different locations along Karakavagu-Kinnerasani River Stretch under three Priorities.

Table 3.2.2: Summary of Sewage Treatment

	Sewage Generation Calculated	Projected Sewage Generation by the year 2029*	Proposed STP /WSP Capacity on the basis of Projected Sewage generation by the year 2029*	STPs in pipeline (MLD)	Gap of sewage to be treated by the year 2029* (Approx)
Karakavagu & Kinnerasani	**11.03 MLD**	**15.57 MLD**	**20.25 MLD**	**15.20 MLD**	**5.05 MLD**

Sewage generation by the year 2029 has been calculated with a 15% projected increase in population

Table 3.2.7 Action Plan for rejuvenation

S.No.	Action Plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
Industrial Pollution				
1.	Actions against the identified industries in operation without consents under air and water acts	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
2.	Action against Industries not installed ETPs or ETPs exist but not operating or ETP outlet or treated is not complying to the effluent discharge standards or norms	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
3.	Directions to all industries which are observed to be not in operation or closed or temporarily closed to remain close till further orders of TSPCB	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
Sewage Treatment Plan and Disposal Plan				
1.	District wise estimation of total sewage generation, existing treatment capacities, quantum of disposal of sewage presently through drains and the gaps in sewage treatment capacity	MA&UD, HMWS&SB, PHED (Urban areas)	DPR for setting-up of STPs at various places is under progress.	-
2.	To undertake the measurement of flow of all the drains presently contributing to pollution load in river and to formulate DPR for each drain and corresponding town	State I&CAD, PHED (Urban areas), PR&RD	6 months	-
3.	Design and execution of STPs Set up of new STPs at the	HMWS&SB, PHED (Urban Area), PR&RD	36 months	Rs. 1568 lakhs

S.No.	Action Plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
	desired locations and follow up of the same			
4.	Channelization including diversion of sewage generated from villages/towns etc through I&D of all the drains presently carrying sewage and for ensuring proper treatment of the upcoming STPs	HMWS&SB, PHED (Urban Areas), PR&RD	-	-
5.	Implementation of the faecal management with co-treatment facilitated at various STPs	ULB	-	-
Groundwater Quality				
1.	Supply of potable water to the affected communities in the identified critical blocks	PHED, Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As part of Departmental activity
2.	Carrying assessment of groundwater survey for quality and to identify over exploited zones and critical zones in the city	SGWB	-	As part of Departmental activity
3.	To ensure rain water harvesting by the, commercial and other Institutions and groundwater recharging with only clean water be encouraged by TSPCB/State Ground Water Board	SGWB / TSPCB	3 months and to continue as regular activity	As a part of departmental activity
4.	Periodical ground water quality assessment and remedial actions in case of contaminated GW / TW / BW / HP and assessment of the need for regulating use of ground water for irrigation purposes	SGWB / TSPCB / State I&CAD	2 months and to continue as regular activity	As a part of departmental activity
5.	Installation of piezometers and recharge shafts	SGWB	-	Rs. 62 lakhs for Piezometeres Rs. 584.5 lakhs for Godavari-Kinnerasani basin
Flood Plain Zone				
1.	Plantation in flood plain zone	State I&CAD, Rural Water Supply and Sanitation Department	-	-
2.	Checking encroachments in the flood plain zone	State I&CAD, Revenue Department	2 months	As a part of departmental activity
3.	Prohibition of disposal of municipal, bio-medical in	TSPCB,	Already under implementation	As a part of departmental

S.No.	Action Plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
	drains		and to continue the activity	activity
4.	Prohibition of disposal of Plastic, Hazardous and E-waste in drains	TSPCB / State I&CAD	Already under implementation and to continue the activity	As a part of departmental activity
5.	Notification of Flood Plain Zone	State I&CAD	3 months	As a part of departmental activity
Environmental Flow (E-flow)				
1.	Measurement of flow of all the drains meeting the river and maintenance of all records	CWC / State I&CAD	6 months	-
2.	Water and Irrigation practises and organization of awareness programmes for the farmers	State I&CAD, Revenue Department	3 months	-

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Flow measurements of all the drains and calculation of E-flow												
Preparation of final report after the implementation of the action plan												

The above action plan and the time lines mentioned would be contingent on the availability of land for construction of STPs at the identified locations, the delays involved in the process of removal of encroachments, land acquisition procedures and litigation thereon. Allocation of finances to the various components of the action plan involves legislative and administrative actions and predicting their timeliness accurately may not be feasible.

4.1 GODAVARI RIVER STRETCH

4.1.1 River Godavari

Godavari, the Holy River also called as Southern Ganges or Dakshin Ganga, originates at Trimbakeshwar, Maharashtra in Western Ghat mountain region and travels 1495 Km from western to south-eastern part of India and merges with Bay of Bengal at Narsapuram, Andhra Pradesh. It is one of the largest peninsular rivers flowing in the Deccan Plateau and having the catchment area 3,12,812 Square Kilometres covering Maharashtra, Madhya Pradesh, Telangana, Chhattisgarh, Orissa, Karnataka and Andhra Pradesh and encompasses drains about 10% of India's total geographical area(Source: www.cwc.gov.in).

The Godavari basin as whole receives 1043 mm of the average annual rainfall, during the southwest monsoon (June to October). The basin is roughly triangular in shape and runs practically along the base of the triangle. (Source: www.cwc.gov.in)

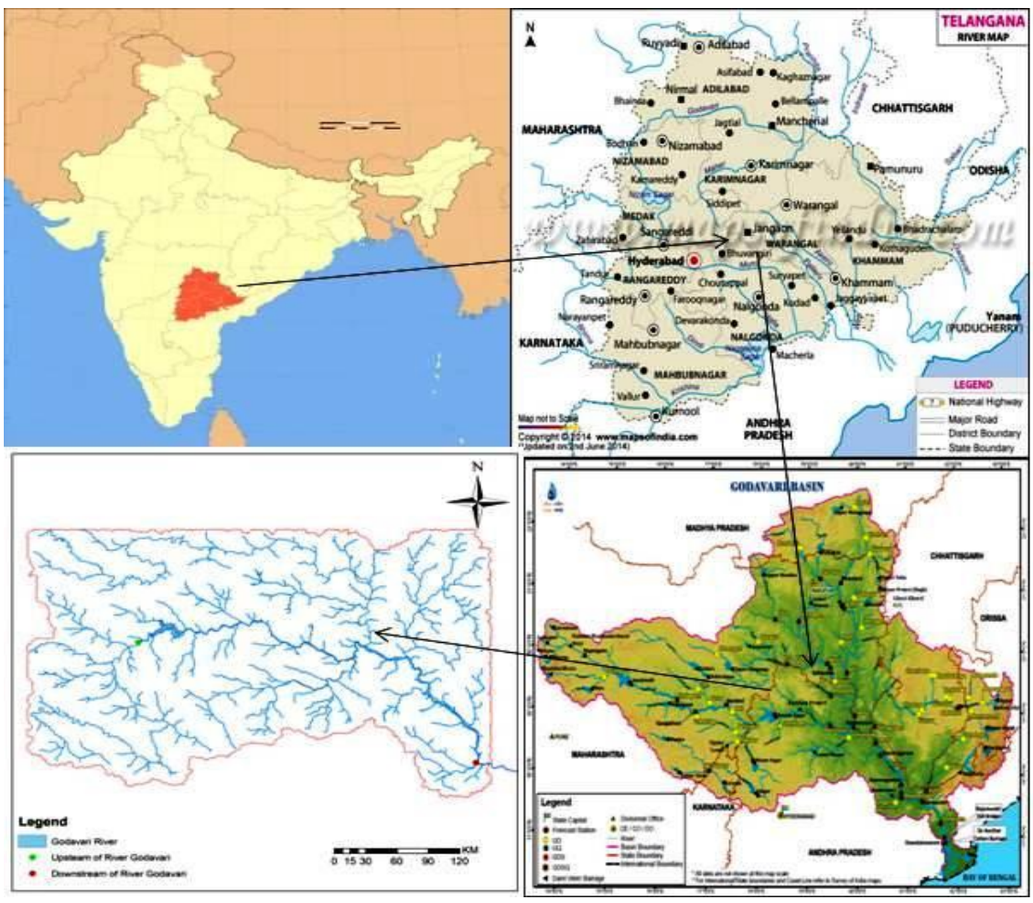

Fig 4.1.1 Location of Godavari Watershed

The sewage generation of >10 MLD is observed at five locations (6 drains). These are at Tungini (34.58), Bornapalli (16.83 MLD), Kotilingala (11.59 MLD), Manchiryal (25.22 MLD), Sinagareddypalle (25.02 MLD) and Bhoorgampahad (16.9 MLD).

Presently, the mode of sewage disposal is through soakpit, open Nallahs and through septic tanks in most of villages and small towns. There is no treatment of sewage along these drains or in those villages/towns nearby along the Godavari stretch. However, STPs are located at Mancherial with installed capacity of 6.5 MLD, Ramagundam with 18 MLD and Badrachalam with 2 MLD, however, they are not in operation. A 46.5 MLD STP is under commissioning stage at Nizamabad. Telangana state PHE Department is preparing sewerage system for Bhainsa, Armoor, Metpally, Korutla, Jagityal, Mandamarri, Bellampalli, Ramagundam and Munuguru for installation of STPs with capacity of 7.15, 6.26, 7.26, 9.46, 14.83, 9.44, 9.53, 38.82 and 4.53 MLD, respectively, while rest of the towns like Basar, Dharmapuri, Nirmal, Lakshettipet, Manthani, Kamalapur and Sarapaka lack both sewerage network and STP.

Table 4.1.3B Details of Existing STP

Sr. No.	STP Location	Capacity (MLD)	STP details treatment method	Operational Condition	Quantity of effluent from STP outlet	Mode of disposal from STP
1.	Nizamabad (UDG) A) Dubba B) Yellamgutta	46.5 (31.5 15)	MBBR	Yet to be commissioned	-	Yellayya Tank, Pulangvagu
2.	Ramagundem	4	-	NOP	-	Godavari River
3.	Malkapur at Ramagundam	14	-	NOP	-	Godavari River
4.	Bhadrachalam	2	-	NOP	-	Godavari River
5.	Mancherial , Reddy colony	4	-	NOP	-	Godavari River
6.	Mancherial, Saikunta	2.5	-	NOP	-	Godavari River
Total		**73**				

*NOP:Not in Operation; MBBR: Moving Bed Bio Film Reactor

Table 4.1.4 STPs under Pipeline

S. No.	STP Location	Capacity (MLD)	STP Treatment method	Mode of Disposal
1.	Bhainsa	7.15	-	-
2.	Armoor	6.26	-	-
3.	Metpalli	7.26	-	-
4.	Korutla	9.46	-	-
5.	Jagityal	14.83	-	-
6.	Mandamarri	9.44	-	-
7.	Bellampalli	9.53	-	-
8.	Ramgundam	38.82	-	-
9.	Manuguru	4.58	-	-
Total		**107.3**		

Table 4.1.5 Summary Table

Sr. No	No of Towns	Calculated Quantity of Sewage Generated in MLD	Existing/Proposed Treatment Quantity in MLD	Gap Quantity
1.	19 Major Towns and other Villages along the Drain	200	Existing STP-73	20
			PHED Proposed STPs -107	

Table 4.2.1 Details of Existing STP Details

Sr. No.	STP Location	Existing Capacity (MLD)	Upgradation Required (MLD)	Total Capacity (MLD)
1.	Nizamabad UDG) A) Dubba & B)Yellamgutta	31.5 + 15	-	46.5
2.	Ramagundam	4	-	18
3.	Malkapur at Ramagundam	14		
4.	Bhadrachalam	2	5.5	7.5
5.	Mancherial, Reddy colony	4	7.5	14
6.	Mancherial, Saikunta	2.5		
	Total	**73**	**13**	**86**

Table 4.2.2 Details of PHED STPs (Under Pipeline)

Sr. No	STP Location	Capacity Proposed (MLD)	Upgradation Required (MLD)	Total Capacity (MLD)
1.	Bhainsa	7.2	0.8	8.0
2.	Armoor	6.3	3.7	10
3.	Metpalli	7.3	3.7	11
4.	Korutla	9.5	0.5	10
5.	Jagityal	14.8	1.2	16
6.	Mandamarri	9.4	-	9.4
7.	Bellampalli	9.5	-	9.5
8.	Ramgundam	38.8	-	38.8
9.	Manuguru	4.6	1.4	6.0
	Total	**107.4**	**11.3**	**118.7**

Table 4.2.3 Details of Proposed STPs

Sr. No	STP Location	Population *	Latitude	Longitude	Estimated Sewage (MLD)	Proposed STP Capacity (MLD)	STP/ WSP
PRIORITY I							
1.	Basar	7730	18° 52' 23.02" N	77° 57' 36.88" E	0.8	1	WSP
2.	Dharmapuri	22804	18° 57' 16.28" N	79° 5' 53.71" E	2.5	3	WSP
3.	Laksettipet	14764	18° 53' 9.16" N	79° 12' 9.15" E	1.6	2	WSP
4.	Manthani	23708	18° 39' 13.61" N	79° 40' 17.41" E	2.6	3	WSP
5.	Kamalapur	21160	18° 16' 23.9" N	80° 29' 12.91" E	2.3	2.5	WSP
6.	Sarapaka	22447	17° 40' 25.81" N	80° 52' 12.32" E	2.4	2.5	WSP
PRIORITY II							
1.	Nirmal	116953	19° 4' 9.6"N	78° 20' 17.06"E	12.6	14	STP
Total						**28**	

Population estimated for 2029

Table 4.2.4 Summary Table

Sr. No	Sewage Estimated by 2029 (MLD)	Existing STP Capacity* (MLD) (A)	STP Capacity In Pipeline* (MLD) (B)	Proposed New STP Capacity (MLD) (C)	Total (A+B+C) (MLD)
1.	231	86	119	28	233

***** with upgradation

Table 4.2.6 Action Plan for rejuvenation of River Godavari

S.No.	Action Plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
Industrial Pollution				
1	Actions against the identified industries in operation without consents under air and water acts	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
2	Action against Industries not installed ETPs or ETPs exist but not operating or ETP outlet or treated is not complying to the effluent discharge standards or norms	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
3	Directions to all industries which are observed to be not in operation or closed or temporarily closed to remain close till further orders of TSPCB	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
Sewage Treatment Plan and Disposal Plan				
4	District wise estimation of total sewage generation, existing treatment capacities, quantum of disposal of sewage presently through drains and the gaps in sewage treatment capacity	MA&UD,ULBs, PR&RD HMWS &SB, PHED	DPR for setting up of STPs at various places is under progress	-
5	To undertake the measurement of flow of all the drains presently contributing to pollution load in river and to formulate DPR for each drain and corresponding town	State I&CAD, ULBs, PR&RD PHED	6 months	-
6	Design and execution of STPs Set up of new STPs at the desired locations and follow up of the same	HMWS &SB, PHED ULBs, PR&RD	36 months	Rs. 12618/-
7	Channelization including diversion of sewage generated from villages/towns etc through I&D of all the drains presently carrying sewage and for ensuring proper treatment of the upcoming STPs	ULBs, PR&RD PHED (Urban Areas)	36 months. Preparation of DPRs are under progress	-

8	Implementation of the faecal management with co-treatment facilitated at various STPs	ULBs, PR&RD and PHED	-	-
Groundwater Quality				
9	Supply of potable water to the affected communities in the identified critical blocks	ULBs, PR&RD Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As part of Departmental activity
10	Carrying assessment of groundwater survey for quality and to identify over exploited zones and critical zones in the city	SGWB	1 month and to continue as regular activity	As part of Departmental activity
11	To ensure rain water harvesting by the, commercial and other Institutions and groundwater recharging with only clean water be encouraged by TSPCB/State Ground Water Board	SGWB / ULBs, PR&RD TSPCB	3 months and to continue as regular activity	As a part of departmental activity
12	Periodical ground water quality assessment and remedial actions in case of contaminated GW / TW / BW / HP and assessment of the need for regulating use of ground water for irrigation purposes	SGWB / TSPCB / State I&CAD	2 months and to continue as regular activity	As a part of departmental activity
13	Installation of piezometers and recharge shafts	SGWB	12 months	Rs. 333 lakhs for piezometers and Rs. 243.25 lakhs for recharge shafts
Flood Plain Zone				
14	Plantation in flood plain zone	State I&CAD, ULBs, PR&RD Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As part of Government HarithaHaram programme
15	Checking encroachments in the flood plain zone	State I&CAD, Revenue Department	2 months	As a part of departmental activity
16	Prohibition of disposal of municipal, bio-medical in drains	TSPCB, ULBs, PR&RD	Already under implementation and to continue the activity	As a part of departmental activity
17	Prohibition of disposal of Plastic, Hazardous and E-waste in drains	TSPCB / State I&CAD	Already under implementation and to continue the activity	As a part of departmental activity
18	Notification of Flood Plain Zone	State I&CAD	3 months	-
Environmental Flow (E-flow)				
19	Measurement of flow of all the drains meeting the river and maintenance of all records	CWC / State I&CAD	6 months	

20	Water and Irrigation practises and organization of awareness programmes for the farmers	State I&CAD, ULBs, PR&RD Revenue Department	3 months	-

PERT Chart with proposed timelines for Action Plan Implementation from June, 2019 after the approval of action plan by RRC

Action Plan	June-Aug 2019	Sep-Nov 2019	Dec2019-Feb 2020	March-May 2020	June-Aug 2020	Sep-Nov 2020	Dec2020-Feb 2021	March-May 2021	June-Aug 2021	Sep-Nov 2021	Dec 2021-Feb 2022	March-May 2022
Identification of location for proposed STPs												
Preparation of DPR												
Tender finalisation and award of work												
Set up of STPs												
Installation of peizometers and recharge shafts												
Implementation of fecal management with co-treatment facilties at various STPs												
Water Quality sampling after set up of STPs												
Flow measurements of all the drains and calculation of E-flow												
Preparation of final report after the implementation of the action plan												

The above action plan and the time lines mentioned would be contingent on the availability of land for construction of STPs at the identified locations, the delays involved in the process of removal of encroachments, land acquisition procedures and litigation thereon. Allocation of finances to the various components of the action plan involves legislative and administrative actions and predicting their timeliness accurately may not be feasible.

5.1 KRISHNA RIVER STRETCH

5.1.1 Krishna River Basin/Watershed

River Krishna, fourth-biggest river in terms of water inflows and river basin area, originates in the Western Ghats at Mahabaleshwar at an elevation of about 1337 m in

Maharashtra state. It flows east to west in general and enter Telangana state near Thangadi Village in Mahabubnagar. It flows into Andhra Pradesh to its delta head at Vijayawada, and from there flows southeast and then south until it enters the Bay of Bengal. River Krishna is a major source of irrigation for Maharashtra, Karnataka, Telangana and Andhra Pradesh. The length of Krishna River is about 1400 km from its origin to its confluence point in Bay of Bengal and covers the drainage area of about 258948 sq. km and catchment area of 59503 sq. km (**Fig. 5.1.1**). There are about 13 major tributaries which join river Krishna along its 1400 km. course, out of which six are right bank tributaries and seven are left bank tributaries. Among the major tributaries, the Ghataprabha, the Malaprabha and the Tunga Bhadra are the principal right bank tributaries which together account for 35.45% of the total catchment whereas the Bhima, the Musi and the Munneru are the principal left bank tributaries which together account for 35.62% of the total catchment area. Tributaries of Krishna river in Telangana are Tungabhadra, Bhima, Dindi, Haliya, Musi, Paleru and Munneru. The tributaries of Krishna River and their confluence with Krishna River in Telangana state are Bhima at Thangidi in Mahabubnagar District, Dindi and Haliya at Chityala, Nalgonda district, Musi at Wadapally in Nalgonda District, Paleru at Jaggayyapeta at Krishna district. Munneru in Khammam District (along with Akeru - tributary to Munneru) at Thirthala in Khammam District.

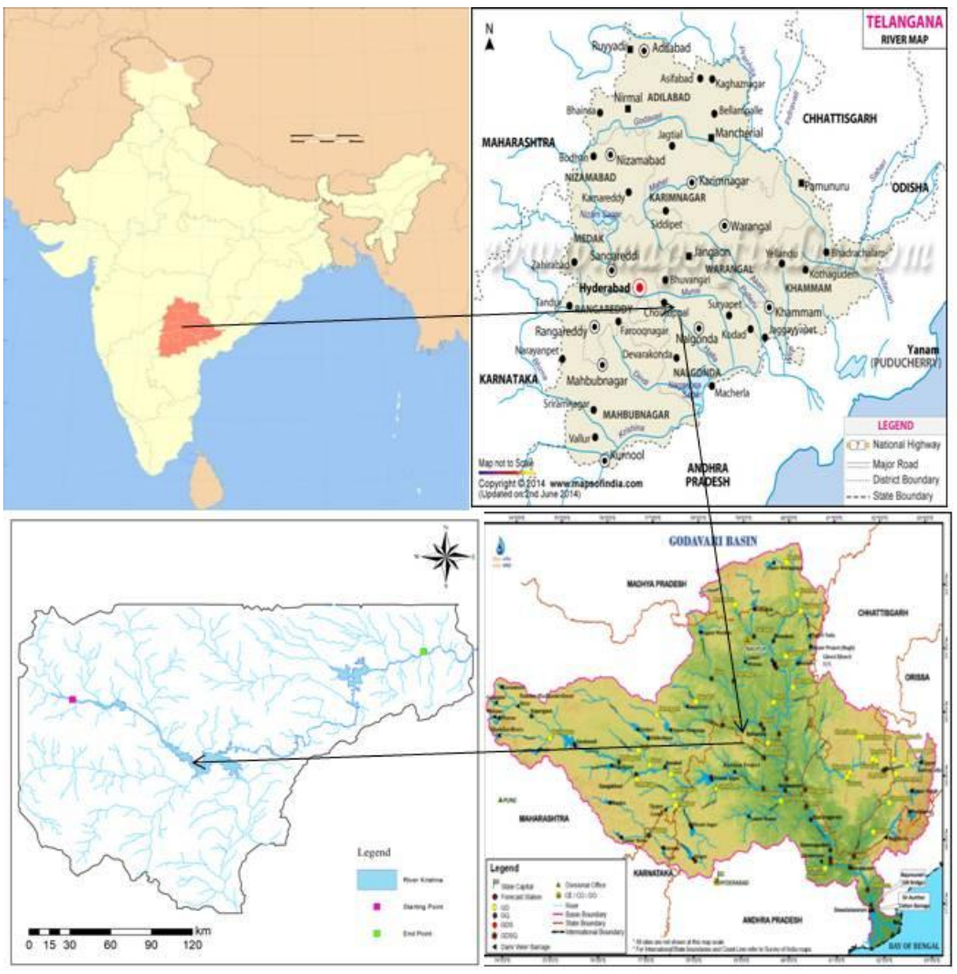

Fig. 5.1.1 Location of Krishna River Stretch (KRS)

5.1.2 Krishna River Stretch in Telangana State (Polluted River Stretch - Priority V)

In Telangana, the Krishna River's starting point is at Thangadi Village (16.38395 & 77.35696) of Mahabubnagar district and its ending point is at Wadapally (16.69372 & 79.67541) of Nalgonda district. This Stretch of Krishna River is considered for the present study on Rejuvenation of Polluted River Stretches of Telangana State (**Table 5.1.1**). The length of the Krishna River Stretch (KRS) in Telangana (From Thangadi to Wadapally) is about 416 km and has drainage area of about 77192 sq.km in erstwhile Andhra Pradesh.

Domestic sewage generation of the villages/towns along KRS is about 226.3 MLD.

Table 5.1.4 Details of STP with UGD under construction

S.No.	STP(UGD) location	Capacity (MLD)	STP(UGD) Details Treatment Method
1	Miryalaguda UGD	11.5	WSP technology
		5.45	MBBR technology
	Total	**16.95**	

Table 5.2.3 Sewage Treatment Proposed up to 15 km from KRS

Project Sewage Generation by the year 2029*	Existing STPs Capacity	Gap of sewage to be treated by the year 2029* (Approx)
70 MLD	**--**	**70 MLD**

Sewage generation by the year 2029 has been calculated with a 15% projected increase in population

Table 5.2.8 Action Plan for rejuvenation of River Krishna

S.No.	Action Plan	Organization responsible for implementation of action plan	Timeline	Budget (Rs. In lakhs)
Industrial Pollution				
1	Actions against the identified industries in operation without consents under air and water acts	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
2	Action against Industries not installed ETPs or ETPs exist but not operating or ETP outlet or treated is not complying to the effluent discharge standards or norms	TSPCB	Already under implementation and to continue as regular activity	As part of department activity

3	Directions to all industries which are observed to be not in operation or closed or temporarily closed to remain close till further orders of TSPCB	TSPCB	Already under implementation and to continue as regular activity	As part of department activity
Sewage Treatment Plan and Disposal Plan				
4	District wise estimation of total sewage generation, existing treatment capacities, quantum of disposal of sewage presently through drains and the gaps in sewage treatment capacity	MA&UD, HMWS &SB, PHED	DPR for setting up of STPs at Miryal guda is under progress	-
5	To undertake the measurement of flow of all the drains presently contributing to pollution load in river and to formulate DPR for each drain and corresponding town	State I&CAD, HMWS &SB, PHED	6 months	-
6	Design and execution of STPs Set up of new STPs at the desired locations and follow up of the same	HMWS &SB, PHED	36 months	Rs. 17878/-
7	Channelization including diversion of sewage generated from villages/towns etc through I&D of all the drains presently carrying sewage and for ensuring proper treatment of the upcoming STPs	HMWS&SB, GHMC, PHED (Urban Areas)	36 months	-
8	Implementation of the faecal management with co-treatment facilitated at various STPs	HMWS&SB and PHED	-	-
Groundwater Quality				
9	Supply of potable water to the affected communities in the identified critical blocks	HMWS&SB, GHMC, Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As part of Departmental activity
10	Carrying assessment of groundwater survey for quality and to identify over exploited zones and critical zones in the city	SGWB	1 month and to continue as regular activity	As part of Departmental activity
11	To ensure rain water harvesting by the, commercial and other Institutions and groundwater recharging with only clean water be encouraged by TSPCB/State Ground Water Board	SGWB / GHMC / TSPCB	3 months and to continue as regular activity	As a part of departmental activity

12	Periodical ground water quality assessment and remedial actions in case of contaminated GW / TW / BW / HP and assessment of the need for regulating use of ground water for irrigation purposes	SGWB / TSPCB / State I&CAD	2 months and to continue as regular activity	As a part of departmental activity
13	Installation of piezometers and recharge shafts	SGWB	12 months	Rs. 424 for piezometers and Rs. 623 for recharge shafts
Flood Plain Zone				
14	Plantation in flood plain zone	State I&CAD, HMWS&SB, GHMC, Rural Water Supply and Sanitation Department	1 month and to continue as regular activity	As part of Government HarithaHaram programme
15	Checking encroachments in the flood plain zone	State I&CAD, GHMC, Revenue Department	2 months	As a part of departmental activity
16	Prohibition of disposal of municipal, bio-medical in drains	TSPCB, GHMC	Already under implementation and to continue the activity	As a part of departmental activity
17	Prohibition of disposal of Plastic, Hazardous and E-waste in drains	TSPCB / State I&CAD	Already under implementation and to continue the activity	As a part of departmental activity
18	Notification of Flood Plain Zone	State I&CAD	3 months	As a part of departmental activity
Environmental Flow (E-flow)				
19	Measurement of flow of all the drains meeting the river and maintenance of all records	CWC / State I&CAD	6 months	
20	Water and Irrigation practises and organization of awareness programmes for the farmers	State I&CAD, GHMC, Revenue Department	3 months	-

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Identification of location for proposed STPs												
Preparation of DPR												
Tender finalisation and award of work												

Set up of STPs												
Installation of peizometers and recharge shafts												
Implementation of fecal management with co-treatment facilties at various STPs												
Water Quality sampling after set up of STPs												
Flow measurements of all the drains and calculation of E-flow												
Preparation of final report after the implementation of the action plan												

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