Proposed Action Plan for Rejuvenation of River Arkavathi

Karnataka State Pollution Control Board

"Parisara Bhavana", # 49, Church Street,

Bengaluru - 560 001

January 2019

INDEX

Proposed Action Plan for Rejuvenation of River Arkavathi

01. State : **Karnataka**
River Name : **Arkavathi**
River Stretch: **Thippagondanahalli Reservoir to Kanakapura town**
Priority : **III (BOD 10-20 mg/L)**
BOD Max. Value: **14 mg/L**

---

1. Arkavathi River

The Arkavathi River is falling in the jurisdiction of Bangalore Rural District and Ramanagara District. The River originates at Nandi Hills of Chikkaballapura district. It flows southwards to finally join River Cauvery at Sangam about 34 km downstream of Kanakapura. Hence it is considered as a tributary of Cauvery River. Four man made Reservoirs are constructed across the Arkavathi River namely Hesaraghatta Lake, Thippagondanahalli Reservoir, Manchanabele Dam and Harobele Dam mainly for the purpose of water supply to nearby towns.

About 8 km downstream of TG Halli Reservoir, the Manchanabele Dam, has been constructed across the River for supplying water to Magadi Town. The River further flows downstream for 20 km to reach Ramanagara Town. About 20 km downstream of Ramanagar, the Arkavathi River is joined by Vrishabavathi River (also called as Suvarnamukhi River) at a place called Nelligudde. The River further flows southwards for 7 km to reach Kanakapura Town. From Kanakapura Town, the River flows southwards for a length of 15 km to reach Harobele Dam. From Harobele Dam, the River flows about 17 km to reach Sangam.

The total polluted stretch of the River from T.G. Halli Reservoir to Kanakapura Town is about 55 km. The River passes through Savanadurga Reserve Forest and adjacent to Reserve Forests like Hulthur Reserve Forest and Handigundi Reserve Forest. Hence the River is a major source of water for wild life.

The Arkavathi River flow is very lean during non-monsoon season until it is joined by Vrishabavathi River.

Figure 1. The Arkavathi River Stretch

2. Sources of pollution:

As the River passes through Reserve Forests, there are no industries along the Arkavathi River Stretch. The main sources of pollution are as follows.

2.1 Sewage from Ramanagara Town :

Ramanagara CMC has a population of 95197 as per 2011 Census. They have provided STP of capacity 7.5 MLD at Sy No.99 of Archakarahalli Village, Ramanagara Taluk and District for treating the sewage generated from the CMC area. The STP has been designed by KUWSSB by considering 2025 population. The STP was commissioned in the year 2004.

The STP consists of inlet chamber (2 Nos, 4 m x 1m x 0.5m LD), Screen chamber (2 Nos, 3.25m x 0.5 m x 0.5 m LD), Grit chamber (2 Nos, 7.5 m x 2.5m x 0.65m LD), Parshall flume (2 Nos, 3.5m x 0.15 m throat width x0.5 m LD), Facultative aerated lagoons (2 Nos, 87.4 m x 50 m x 4.7m LD, with 20 aerators of 5 HP capacity), Aeration tank (2 Nos, 60.9 m x 20m x 1.6 m LD with 3 aerators of 5 HP capacity) and settling tank (1No, 31.5m x 20m x 3.5m LD).

About 60 % of the CMC area has been provided with UGD system and in rest of the area, individual septic tank and soak pits are provided. Action plan for the remaining area has to be provided.

However the STP is not being operated since long time. The sewage is being discharged to natural valleys / storm water drains which finally join the Arkavathi River.

2.2 Silk processing / filature units at Ramanagara :

Ramanagara is famous for its sericulture, and is nicknamed Silk Town & Silk City. The silk produced in this region forms the input for the famous Mysore Silk. Ramanagara is the largest market for silk cocoons in Asia. About 50 tons per day of cocoon arrive at the town.

There are more than 1000 silk reeling, twisting and silk waste processing cottage units in Ramanagara Town. The silk processing activity involves cooking of cocoon in Hot water and degumming by using hot water. The process generates considerable quantity of trade effluent with high BOD and COD. As most of the units are operating in unorganized small scale/ tiny sector, there is no treatment system adopted for the effluent. The same is being discharged to open drains and valleys ultimately reaching the Arkavathi River. Further, the KSPCB has also exempted the units from consent mechanism.

2.3 Sewage from Kanakapura Town:

The Kanakapura CMC has a population of 54,014 as per 2011 census. They have provided STP of capacity 6.29 MLD at Sy No. 249 & 250, Aralalu Village, Kanakapura Taluk. The STP consists of collection chamber, anaerobic pond (58 m x 29 m x 4.5 m), facultative pond – I (151m x 60m x 2.5m), facultative pond – II (151m x 60m x 2.5m).

About 80 % of the CMC area has been provided with UGD system and in rest of the area, individual septic tank and soak pits are provided. Action plan for the remaining area has to be provided.

However the STP is not being operated since long time. The sewage is being discharged to natural valleys / storm water drains which finally joins the Arkavathi River.

2.4 Polluted water from Vrishabavathi River:

The Vrishabavathi River which originates in the North western part of Bengluru, passes through western parts of Bengaluru before joining the Byramangala Reservoir. On the way it carries huge quantity of sewage / sullage from the Bengaluru City. Though BWSSB has two STPs (180 MLD & 75 MLD) in the Vrishabavathi Valley, it is estimated that about 500 MLD of untreated sewage flows through the River and joins Byramangala Reservoir. This is the predominant source of pollution to River Arkavathi.

2.5. Municipal Sewage Generation and Treatment

The Town wise sewage generation and treatment capacity developed so for is provided in **Table-1**

Table-1: **Status of Domestic Pollution in River - Arkavathi**

Sl No.	Name of the local body	Type	Total Sewage generation in MLD	Total Capacity of Sewage treatment in MLD	Status of STP
1	Ramanagara	CMC	8.4	7.56	Operational at present
2	Kanakapura	CMC	4.5	6.29	
3	Bengaluru (Vrushabhavathi Valley)	CC	500	180 75 10 1	
				60 (Kengeri)	Construction Completed

2.6. Dumping of Municipal Solid Wastes:

The two major towns in the stretch viz., Ramanagar and Kanakapura are yet to identify Municipal Solid Waste disposal site. These two towns together generate about 75 Tons of municipal solid waste. Improper solid waste management in these towns is resulting in entry of garbage into river through storm water drains and by direct dumping on river bank.

3. Characteristics of River water quality:

The monitoring results of Arkavathi River at downstream of Kanakapura Town & Thippagondanahalli Reservoir for the year 2017 & 2018 are shown in **Table-2**. River water quality of T.G.Halli reservoir conforms to Class D- means that the water is fit for propagation of wildlife, fisheries and D/s of Kanakapura town conforms to Class E-means that the water is fit for irrigation, industrial cooling and controlled waste disposal.

3.1 Status of Water Quality

The details of parameter and specific concentration are provided in **Table-2**

Table-2 : Status of Water Quality of River – Arkavathi

Year	Station/Location	DO (mg/L)		BOD(mg/L)		Fecal Coliform (MPN/100ml)		Total Coliform (MPN/100ml)		Class
		Min	Max	Min	Max	Min	Max	Min	Max	
2017	Thippagondanahalli Reservoir	5.0	9.2	3.0	14.0	17	7900	172	54200	D
	Down stream of kanakapura Town	0.5	6.6	3.3	14	$21x10^3$	$49x10^4$	$172x10^3$	$348x10^4$	E
2018	Thippagondanahalli Reservoir	4.3	7.6	2.0	8.0	17	17000	49	$1600 x10^2$	D
	Down stream of kanakapura Town	3.9	5.0	4.0	10.5	940	$46x10^4$	5400	$175x10^4$	E

The result indicates that the water is polluted due to sewage from Ramanagar, Kanakapura and Bengaluru City.

4. Action taken by the Board:

1. There are two private CETP's namely M/s. Pai & Pai Chemicals plot No.29/A,KIADB Industrial area ,Kumbalgodu ,Bengaluru-560074 & Plot No. 25-D ,1st phase Kumbalgodu ,Bengaluru-560074 are operating in this catchment area having capacities of 300KLD (Inorganic) & 40 KLD (organic) respectively ;which treats the trade effluents generated in the catchment area of this river and also other areas.
2. A Criminal Case has been filed against CMC, Ramanagar for discharging untreated sewage to the River at JMFC, Ramanagara (CC No. 909/2013). The case is under hearing stage. The progress made in restarting the STP is being monitored regularly.

3. A Criminal Case has been filed against CMC, Kanakapur for discharging untreated sewage to the River (CC No. 751/2006) at JMFC, Kanakapura. The case is under hearing. The progress made in restarting the STP is being monitored regularly.

4. The Board has issued directions to Ramanagara- Channapatna Urban Development Authority (RCUDA) to issue licenses to silk processing units with strict conditions to treat the effluent before discharging to drains (BO letter No.1153 dated 22.2.2013)

5. The Board has issued directions to BWSSB to set up additional STPs in the Vrishabavathi Valley to avoid discharge of untreated sewage into the River.

6. The industries in the Bidadi Industrial Area have been directed to contribute to rejuvenation of Byramangala Reservoir.

7. KSPCB has not given consents to the industries located in catchment area to discharge any treated/untreated effluents/sewage to the storm water drain. However joint monitoring of industries located in this catchment area was carried out along with BWSSB & CPCB Officers to verify any illegal discharges to the storm water drains/Ground water resources and Board initiate further penal action against the Defaulters.

8. Contaminated ground water was noticed in Peenya industrial area with regard to heavy metal contamination and Board has banned the establishment of new electroplating, surface treatment, powder coating industries in Peenya industrial area since 2012. A study has also been entrusted to NGRI Hyderabad to identify the contaminated bore wells & recommend the remedial measures. They have submitted recommendations and accordingly the Board has initiated action for closure of contaminated 31 bore wells.

5. Action to be taken for Rejuvenation of River Water Quality:

1. Providing 100 % UGD in Ramanagar and Kanakapura Towns with proper network of sewage collection and wet wells and 100 % treatment of sewage.

2. The effluent from the silk processing units shall also be treated in the STP of the CMC's. Direct discharge of effluent to drains shall not be allowed.

3. Finalizing the MSW processing site for Ramanagar and Kanakapura and proper management of solid wastes from these two towns.
4. Setting up of additional STPs in Vrishabavathi Valley by BWSSB to treat 100 % sewage and letting only the treated sewage into the River.
5. Installation of caution Boards and imposing penalties on persons discharging effluents / dumping solid wastes on River Banks.

6.0. Cost component involved in the Restoration of Polluted stretch

Cost component shall be an integral part of Detailed Project Report (DPR). Most of the cities and towns are deficient in treatment of its total sewage generated. In order to cater to each identified town on the bank of polluted river, gaps observed between total sewage generated and treatment capacity needs to be considered for planning.

Cost component shall invariably depend towards construction, operation and maintenance of sewage treatment plant. On an average Rupees 2.5 Crore has been estimated as Capital Cost per MLD (for primary, secondary and Tertiary treatment) excluding Operation and maintenance cost for all the available conventional and recent technologies. In some cities and towns designed capacity of STP is fully or partially underutilized due to inadequate sewerage network and other implementation issues.

1) Total estimated cost of **Rs. 0.87 Crores / annum** should be made budgetary provision by local bodies for operation and maintenance of existing STPs in the identified cities (Ramnagar & Kanakapura) along the Arkavathi River.

2) Total estimated cost of **Rs. 3.5 Crores /annum** should be made budgetary provision by BWSSB for operation and maintenance of existing two STPs in the identified cities (Bengaluru) along the Vrushabhavathi River, which is tributary to Arkavathi river.

3) Total estimated Capital cost for proposed new STP for Vrushabhavathi Valley (150MLD) is **Rs. 470 Crores** already made budgetary provision by BWSSB.

4) Total estimated Capital cost for proposed new STP for Vrushabhavathi Valley (40MLD) is **Rs. 73 Crores** already made budgetary provision by BWSSB.

5) Total estimated cost of **Rs. 10 Crores** is already made budgetary provision for commissioning of CETP at Peenya Industrial Area by Government.

6) Additionally, estimated cost of **Rs. 5 Crores** should be made budgetary provision for commissioning of CETPs at identified industrial areas (Bidadi & Harohalli) by KIADB.

Table -3: Cost Component involved in the Rejuvenation of Polluted Stretch of Arkavathi

Sl. No.	Activity	Cost in Rupees (Crores)	
1	Operation & maintenance (O&M) cost for existing STP per annum	Ramanagara 0.486	Kanakapura 0.384
2	Operation & maintenance (O&M) cost for existing BWSSB STP's per annum	3.5	
3	Capital cost for proposed new STP at Nayandanahalli (Vrushabhavathi Valley) (150MLD) Work is under progress	470 Crores	
4	Capital cost for proposed new STP at Doddabele (Vrushabhavathi Valley) (40MLD) Work is under progress	73 Crores	

5	Identification of suitable site within industrial areas i.e, Peenya Industrial area , Bidadi Industrial area & Harohalli Industrial area , Execution and Commissioning of Adequate Capacity CETP's.	Peenya Industrial area 10 Crores (200KLD, Tender under process)	Bidadi Industrial area 2.5 Crores (50KLD)	Harohalli Industrial area 2.5 Crores (50KLD)
	Total Rs.	**562.37 Crores**		

7. Status of Environmental Flow (E-Flow):

The details of Flow (discharge) is provided in **Table-4**

Table-4 : Status of E-Flow of River – Arkavathi

Year	Hydrological Observation Site	Flow (m^3/s)	
		Min	Max
2015	T. Bekuppe	4.2	30.36
2016		2.56	19.86

8. Action Plan- Short Term and Long Term Action and the Identified Authorities for initiating actions and the time limits for ensuring compliance

Short term and long term action plans and the implementing agencies responsible for execution of the action plans and the time limits are given in table as below :-

Sl. No.	Action plan for rejuvenation of river Arkavathi	Organization/ Agency Responsible for Execution of the Action plan	Time Target
I.	**Industrial Pollution Control**		
	(a) Compliance of industries located in catchment area with respect to effluent		Complied

	discharge standards and its disposal as per consent conditions	KSPCB	
	(b) Inventorisation of the industries in the catchment area of River Arkavathi covering assessment on aspects relating to Status of Consents under Water & Air Acts and Authorisation, Effluent Generation, ETP capacities and final mode of effluent discharges	KSPCB	Within three months
	(c) Actions against the Identified industries in operation without Consents under Water & Air Acts/Authorisation under the H& OW (M & TM) Rules, 2016 as amended	KSPCB	Within six months
	(d) Action against the industries not installed ETPs or ETPs exist but not operating or ETP outlet or treated effluent is not complying to the effluent discharge standards or norms	KSPCB	Within six months
	(e)Action against the red category industries for installation of OCEMS and not transferring data to CPCB and KSPCB	KSPCB	Complied
	(f) Small scale/tiny and service providing units located in urban or semi-urban limits like Dairies, Auto Service Stations to have minimum provision of O & G traps.	Local Authorities (Bengaluru ,Ramanagara and Kanakapura)/DMA	Within six months
	(g)Prohibition of Burning of any kind of waste including agro-residues.	State Govt. / District Administration and Local Authorities(Bengaluru ,Ramanagara and Kanakapura) and Agriculture Department	Within three months

	(h) Directions to all the Industries which are observed to be not in operation or closed or temporarily closed to remain close till further orders from CPCB.	KSPCB	Within three months
	(i) Estimation of industrial effluent generation and the existing CETP capacity and to arrive gap between the industrial effluent generation and the existing treatment capacity	KSPCB	Within six months (At present there are two private CETP in the said polluted river stretch)
	(j) Channelization of industrial effluents to CETPs for ensuring treatment to comply with the discharge standards.	KSPCB	Within 18 months (At present there are two private CETP's in the said polluted river stretch)
	(k) Identification of suitable site within industrial areas, Execution and Commissioning of Adequate Capacity CETPs.	State Government , KIADB and District/Local Administration	Within 24 months
II.	**Sewage Treatment and Disposal Plan**		
	(a) 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.	State Government, KUWS & DB, District Administration and local bodies (Bengaluru ,Ramanagara and Kanakapura)	Within six months
	(b) To undertake measurement of flow of all the drains presently contributing pollution load in river Arkavathi and to formulate detailed project report (DPR) for each drain and corresponding town and	State Government, KUWS & DB, District Administration /Local bodies (Bengaluru ,Ramanagara and	Within six months

	submission of DPR. .	Kanakapura)	
	(c)Proper design, execution of STPs with full utilisation capacity	State Government, KUWS & DB ,District/Local Administration/BWSSB	Within 24 months
	(d) Channelization including diversion of sewage generated from household/town ships/villages to sewer lines/interception of all the drains presently carrying sewage and for ensuring proper treatment through the upcoming STPs.	State Government, KUWS & DB ,District/Local Administration/ BWSSB	Within 18 months
	(e) Ensuring dairy/automobile service stations and Hotels / Restaurants particularly located on road-side should have a treatment system and levy of fine in case found violations	Local authorities/DMA	Within three months
III	**Ground water quality**		
	(a) Sealing of contaminated hand pumps and found to be unfit for drinking purpose by the public	State Government, Karnataka rural drinking water and Sanitation Department and Local authorities	Within three months
	(b) Supply of potable water to the affected communities in the identified critical blocks	State Government, Karnataka rural drinking water and Sanitation Department and Local authorities	Complied
	(c) Carrying assessment of ground water survey for quality and to identify over exploited and critical blocks in the districts (Bengaluru and Ramanagara).	State Ground Water Authority	Within three months

	(d) To conduct periodic surprise inspection of the industry to rule out any forceful injection of industrial effluents into ground water resources.	KSPCB/BWSSB/KGWA	Complied
	(e) All the industry should be directed to obtain NOC from the CGWB and action against the Units in Operation without obtaining of NOC from CGWA	KSPCB,CGWB/ CGWA and Karnataka Ground Water Authority	Within six months (KSPCB is issuing CFE/CFO with conditions to obtain NOC from CGWA).
	(f) To ensure rain water harvesting by the industrial, commercial and other institutions and groundwater recharging with only clean water be encouraged by CGWB/CGWA	CGWA/ Karnataka Ground Water Authority	Within six months (KSPCB is issuing CFE/CFO with conditions to rain water harvesting by the industrial, commercial and other institutions and groundwater recharging).

IV	**Flood Plain Zone (FPZ)**		
	(a)Plantation in Flood Plain Zone (FPZ)	Karnataka State Forest Department	Within six months
	(b)Checking encroachments in the FPZ of river Arkavathi	District and Local administration/DMA	Within six months
	(c)Prohibition of disposal of municipal plastic and bio- medical waste particularly in drains	Local administration/DMA	Within six months
	(d)Notification of Flood Plain Zone (FPZ)	State Government / Water Resources Department	Within six Months

V	Environmental Flow (E-Flow) and Irrigation Practices		
	(a)Measurement of flow in the river and records maintained	Central Water Commission / Water Resources Department	Regularly (Daily/ monthly)
	(b) To conserve water and good irrigation practices to be adopted by the farmers by organising mass awareness programmes and through media in vernacular language	Karnataka State Irrigation and Agriculture Departments/ Water Resources Department.	Once in six months

****