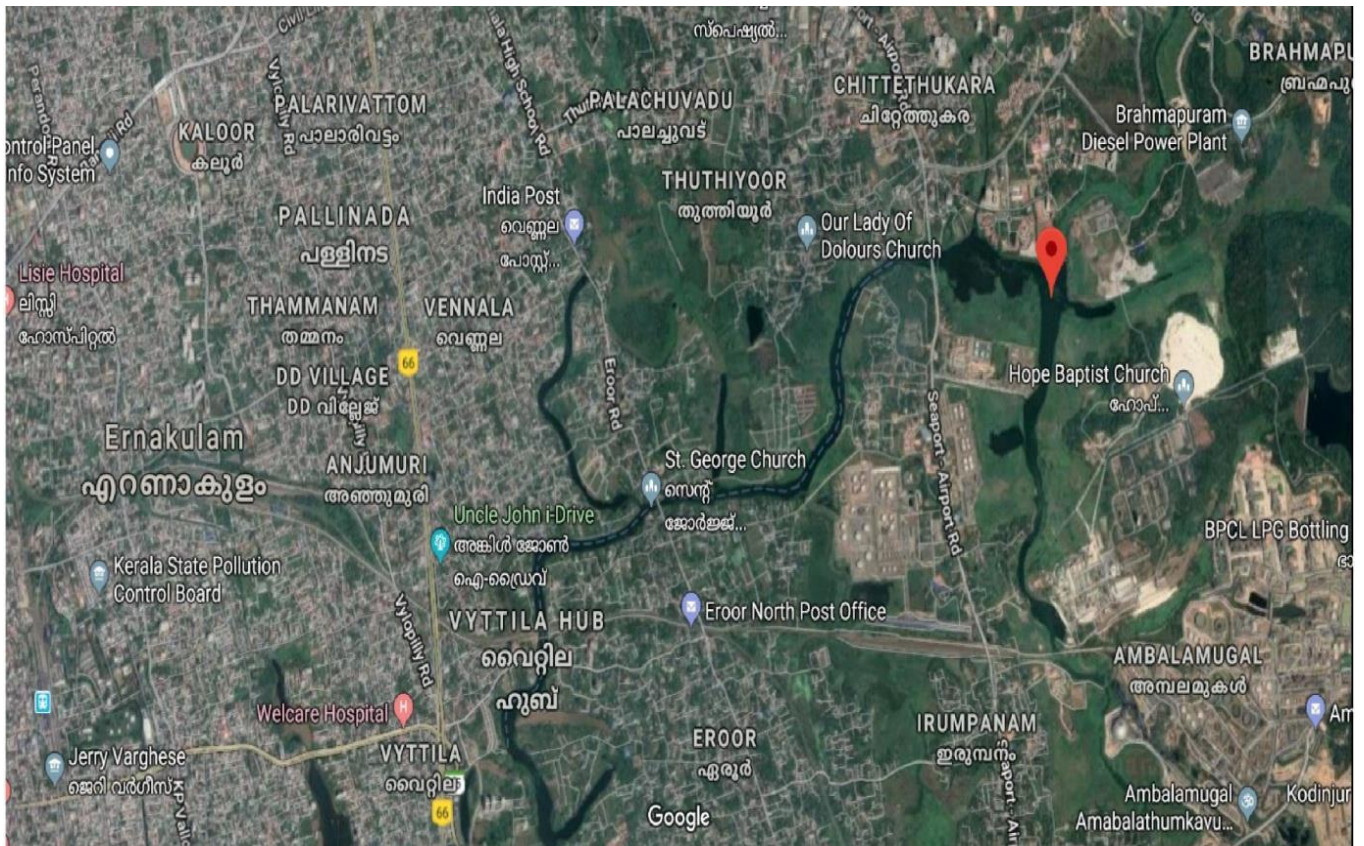


ACTION PLAN FOR RESTORATION OF POLLUTED STRETCH (IRUMPANAM_ KARINGACHIRA) OF RIVER CHITHRAPUZHA

Comprehensive report on prevention and control of pollution in chithrapuzha: an action plan for rejuvenation



ACTION PLAN FOR RIVER CHITRHAPUZHA – KERALA
(OA No.673/2018)

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EXECUTIVE SUMMARY

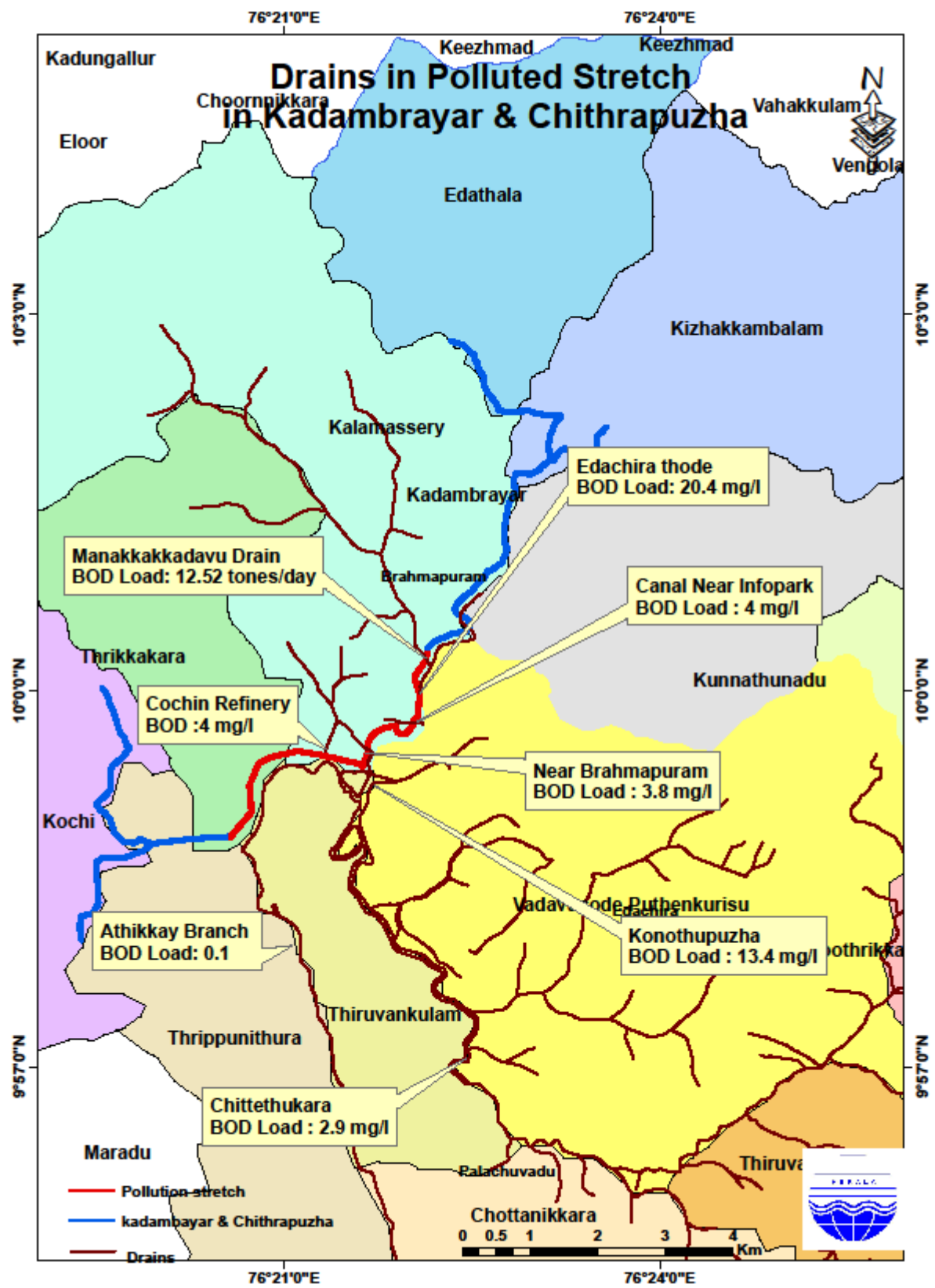
The draft action plan of Chithrapuzha was submitted before Hon'ble NGT earlier on 15-12-2019. The modified action plan is given below.

Chithrapuzha flows through Ambalamedu, Kochi area joins Kadambrayar near Brahmapuram , flows southward and joins Vembanad lake at Thevara ferry.As it is joined with Vembanad lake, salinity intrusion is noticed in Chithrapuzha .A temporary bund build in the month of November to check Salinity intrusion to Kadambrayar. Regular Water transport is there from Vyttila hub terminal to Kakkanad in Chithrapuzha

Five drains have been identified as joining the polluted stretch. The pollution load in terms of BOD was assessed. The map showing the drains and BOD load is given below.

1. Pollution load in drains

	Drain	Pollution load BOD in TPD
1	Drain joining Chithrappuzha near Brahmapuram dumping yard(Near FACT CD)	BOD=3.8mg/l
2	Drain from Cochin Refinery area	BOD=4 mg/l
3	Athikkayi Branch	0.097 TPD
4	Drain joining Chithrappuzha from CSEZ(Chittethukara)	BOD=2.9 mg/l
5	Vettuvellikkadavu(Konothupuzha joining Chithrappuzha)	BOD=13.4 mg/l



Joint inspection was conducted by KSPCB, Kerala Irrigation Department, Kerala Water Authority, Local Bodies and Suchitwa Mission and identified all drains lead to Polluted River Stretches and units that are causing pollution

2. Short term plan

(1) Drain joining Chithrappuzha (near Brahmapuram dumping yard) (Near FACT CD)

No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
2.1.1	2.1.1 C (ii)	Restricting seepage of leachate of plastic dumped in the dumping yard	Kochi Corporation	22 (Biomining of waste)	Plan fund	3 years	Reduced pollution load in drain leading to Chithrappuzha
2.1.2	Aa (iv)	Effluent monitoring from FACT	Kerala State Pollution Control Board	KSPCB funds		Ongoing; monthly frequency	-do-
2.1.3	Aa (iv)	Periodical Monitoring	Kerala State Pollution Control Board	KSPCB funds		-	-do-

2) Drain from Cochin Refinery area

No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
2.2.1	Aa (iv)	Surveillance to restrict the dumping of wastes into the river and its branches	Vadavucode – Puthencruz Panchayat with the help of Police	0.05	Govt Aid	Periodical Monitoring	Reduced pollution load in drain leading to Chithrapuzha
2.2.2	A(b)	Sanitation Survey	Vadavucode – Puthencruz Panchayat	0.01	Govt Aid	3 months	-do-
2.2.3	E	Periodical Cleaning of Chithrapuzha	Kerala Irrigation Department	0.403	-	Twice in 3 year	-do-
2.2.4		Already implemented Effluent Treatment facility in Cochin Refinery and periodical monitoring are ongoing (Pollution Control Board)					

3) Athikkayi branch (Provided temporary bund in joining section to check salinity intrusion)

No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
2.3.1	A(b)	Identification of major pollution causing units (Apartments, hospitals, service stations, markets and industries) in upstream	Thrikkakkara Municipality	1	Plan own fund	3 months	Inspection is being conducted and notices are being issued to polluting units such as apartments, hotels, service stations, markets,
			Pollution Control Board	-	KSPCB funds	-	

							industries.
2.3.2	A a(iv)	Surveillance to restrict the dumping of wastes into the river and its branches	Thrikkakkara Municipality with the help of Police	0.5	Plan own fund	Periodical Monitoring	Action is being taken to prepare a DPR for fencing
2.3.3	A a(iv)	Periodical Monitoring	Kerala State Pollution Control Board	--	KSPCB funds	-	-do-
2.3.4	A (b)	Sanitation Survey	Thrikkakara Municipality	0.25	Plan /own fund	6 months	Action is being taken to prepare a DPR which will be included in sanitation survey
2.4.5	E	Periodical Cleaning	Kerala Irrigation Department	0.045	Plan fund	Once in a year	-do-

4) Drain joining Chithrappuzha from CSEZ(Chittethukara)

No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
2.4.1	A (b)	Ensure proper functioning of ETP in CSEZ	Kerala State Pollution Control Board	-	KSPCB funds	Periodical monitoring on going	Reduced pollution load in drain

							leading to Chithrapuzha
2.4.2	A (b)	Sanitation Survey and periodical cleaning	Thrikkakkara Municipality	0.25	Plan /own fund	6 months	Action is being taken to prepare a DPR which will be included in sanitation survey. Cleaing of Kaithodu is also being done
2.4.3	Aa (iv)	Periodical Monitoring	Kerala State Pollution Control Board	-	KSPCB funds	-	-do-

5)Vettuvelikkadavu(Konothupuzha joining Chithrappuzha)

No.	Ref para No :48 as per NGT Order no 673/2018 dated20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
2.5.1	A(b)	Identifying and closing of all unauthorized outlets into	Thripunithura Municipality	Done by Municipal staffs	Own fund	6 months	Reduced pollution load in drain leading to Chithrappuzha

		the stream joining the river					
2.5.2	A(b)	Sanitation Survey	Thripunithura Municipality	Done by Municipal staffs	Own fund	3 months	-do-
2.5.3	Aa(iv)	Periodical Monitoring	Kerala State Pollution Control Board	-	KSPCB funds	-	-do-
2.5.4	C(ii)	Surveillance to restrict the dumping of wastes into the river and its branches	Thripunithura Municipality with the help of Police	Process already started	Own fund	6 months	-do-
2.5.5	E	Cleaning of Konothupuzha (work Proposal already submitted by Minor Irrigation)	Kerala Irrigation Department (Minor Irrigation)	0.17	Plan fund	Twice in year	-do-

Main Stretch (Kadambrayar-Chithrappuzha Confluence point to Irumpanam)

No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
a	E	Periodic Cleaning	Kerala Irrigation Department	0.073	Government Aid	Once in a year	Reduced pollution load in drain leading to Chithrappuzha

b	C (ii)	Surveillance to restrict the dumping of wastes into the river	Vadavucode -Puthercruz with the help of Police	0.05	CSR found and Govt. Aid	Periodical Monitoring	-do-
			Thripunithura Municipality with the help of Police	Process already started	Own fund	6 months	

(3) Monitoring

	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost	Source of fund	Time line	Remarks
3.1	A a(iv)	River water quality monitoring	Kerala State Pollution Control Board	Rs. 11,08,000	National Water Quality Monitoring Programme (NWMP), CPCB fund	Ongoing; monthly frequency	Monitoring of water quality
3.2	A (b)	Inspection and effluent quality monitoring of the flats, industrial units, service stations, hospitals, hotels etc	Kerala State Pollution Control Board	As per sampling charge	-	On going	-

5. ACTION PLAN BY GRAMAPANCHAYATH

No	Name of Grama panchayath	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost	Source of fund	Time line	Remarks
1	Vadavukad-Puthenkruze	C(ii)	Survivance of restrict dumping of waste to the river, Sanitation survey (with the help of Police)	Grama panchayath	600,000/-	Govt aid&CSR Fund	6 months	

6. Long term Plan

Sl.No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Long term measures proposed	Implementing agency	Amount Required (Rs.in Crore) and Source of fund	Time line	Remarks
4.1	E	Provide inspection bund for Chithrapuzha	Kerala Irrigation Department	3.36	Three years	DPR Preparation in 10 months (through consultants)
4.2	A (b)	Additional STP requirement (if needed)	(Thrikkakkara Municipality, Thripunithura Municipality)	Associated with Cochin Corporation Brahmapuram plant		
4.3		Restriction of illegal dumping of Septage in to the river	Police	-	-	

4.4		Flood Plain Zone(Management and Protection) Preparation of Inundation maps	Kerala Irrigation Dept	Included in Periyar Basin	3 Years	As part of rebuild Kerala Initiative Inundation maps are being prepared for Periyar basin with help of World Bank
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7. Action Plan by Ground Water Department

Sl.No	Ref para No :48 as per NGT Order no 673/2018 dated20.9.2018	Activity	Ground Water Department
1	B(i)	Ground Water resources and regulation of ground water extraction by industries particularly in over exploited as critical zones/blocks	As per Groundwater resources of Kerala, 2017 estimate a total number of 3 blocks (Edapally,Vadavukodu,Vazhakkulam) comes under the Chithra puzha river basin. All the blocks in the river stretch are safe with stage of groundwater extraction ranges from 25.38% to 56.63%
2	B(ii)	Ground water recharging / rain water harvesting	The average groundwater level ranges from 1.85mbgl -9.2 mbgl. Groundwater Department not yet proposed any recharge structures in this area.
3	B(iii)	Periodic ground waste quality assessment and remedial actions in case of contaminated ground water tube wells/bore wells or hand pumps	Groundwater Department has no observation wells in the river stretch.
4	B(iv)	For regulating use of ground water for irrigation purpose, adopting good irrigation practices	The total irrigation draft in the area ranges from 172.32 - 1028.5 ha.m.

CHAPTER 1

CHITHRAPUZHA

Chithrapuzha flows through Ambalamedu, Kochi area joins Kadambrayar near Brahmapuram , flows southward and joins Vembanad lake at Thevara ferry. As it is joined with Vembanad lake, salinity intrusion is noticed in Chithrapuzha .A temporary bund build in the month of November to check Salinity intrusion to Kadambrayar. Regular Water transport is there from Vyttila hub terminal to Kakkanad in Chithrapuzha.



Water quality status of Chithrapuzha

Chithrapuzha is monitored monthly at ten locations, such as Thevara , Thykoodam, Chambakkara , Kaniampuzha , Erroor ,Vettuveli ,Irumpanam ,FACT III,FACT II and FACT I.

Water quality data for the current year up to August is tabulated below:

parameters	Thevara	Thykooram	Chambakara	kaniampuzha	Eroor	Vettuvelli	Irumpalam	FACT III	FACT II	FACT I
pH	6.5-7.7	6.3-7.6	6.3-7.5	6.2-7.5	6.2-7.5	6.4-7.4	6.2-7.3	6.2-7.3	4-7.1	4.8-7.3
BOD	BDL-2.6	BDL-2.4	1-2.7	1.1-2.8	1-2.8	BDL-2.6	BDL-2.8	BDL-2	BDL-2.8	BDL-3
DO	4.3-8.7	2.9-6.9	2.9-5.5	2.9-7	2.8-7.5	3.2-7.4	2.9-8.4	1.6-9.1	3.3-6.8	4.3-6.3

Main Industries discharging effluent to Chithrapuzha river

Serial No	Name of the Industry	Type of industrial sector	Whether ETP/STP exists or not	ETP/STP operational status	Effluent quantity
1	FACT-CD	Fertilizer	yes	Operational	1500KLD
2	HOCL	Chemical	yes	Operational	600KLD
3	BPCL, Kochi Refinery	Petroleum refinery	Yes	Operational	9848KLD

Status of Other establishments observed in the catchment area

Sl.No.	Name of the Industry	Water Consumption (KLD)	Effluent Generation (KLD)	STP Capacity (KLD)	STP status
1	Laurel Groove	35	31	35	Partially Operational
2	Kent Glass House	135	108	110	Operational
3	Hotel Mermaid	55	45	45	Operational
4	Maxx Cochin Heritage	18	14.4	15	Not operational
5	Shwas Mystic Height (Phase I & II)	100.2	80	80	Operational

6	Shwas Mystic Height (Phase III)	60	40	40	Operational
7	The Wyte Fort Hotel	29.4	23.52	25	Operational
8	Hotel Crowne Plaza	357.275	163	165	Operational
9	Hotel Le Meridian	180	144	150	Operational
11	Rivera Retreats	80	80	80	Operational
12	Willington Enclave	-	-	-	Not operational

13	Chakolas Waterscapes	9	7.2	10	Operational
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Kochi refinery on the banks of Chithra Puzha River



Market on the banks of Chithra Puzha River

Main findings and observations

- Waste water from Chambakkara Market is being discharged into Chithrapuzha without any treatment.
- Certain establishments are discharging untreated/partially treated effluent to the drain leading to the river, which is a reason for the deterioration of the water quality.
- FACT- CD, Kochi Refinery and Hindustan Organic Chemicals Ltd are discharging their treated effluent into this river
- Domestic effluent outlets are observed
- Withering of weeds is the reason for deterioration of water quality
- As per the analysis report of the current year ,value of BOD is below 3mg/l in all months at all the 10 stations



WASTE DUMPING NEAR CHITHRAPUZHA RIVER



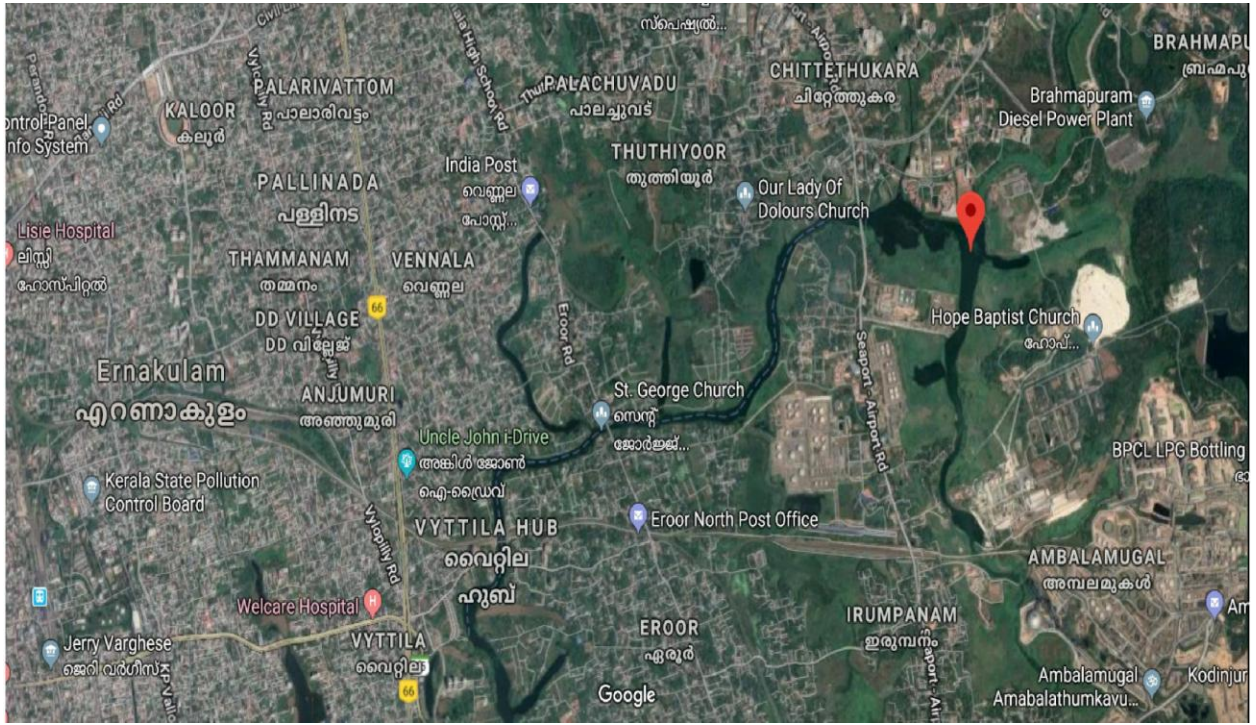
POLLUTED SWIMMING POOL

ACTION PLAN PROPOSED

- Effluent discharges from the establishments such as residential/commercial buildings into storm water drain shall conform to the prescribed standards
- Establishments which have not being brought under the consent regime of the board may be addressed and pollution control measures may be ensured
- Municipal authorities need to be vigilant against dumping of wastes and disposing domestic effluent into water bodies
- Waste water treatment facility for Chambakkara market shall be provided
- Periodical removal of weeds
- Deepening and cleaning of the entire river stretch can improve the flow condition, thereby increasing the DO level

CHAPTER 2

ACTION PLAN FOR RIVER CHITHRAPPUZHA- KERALA (OA-673/2018)

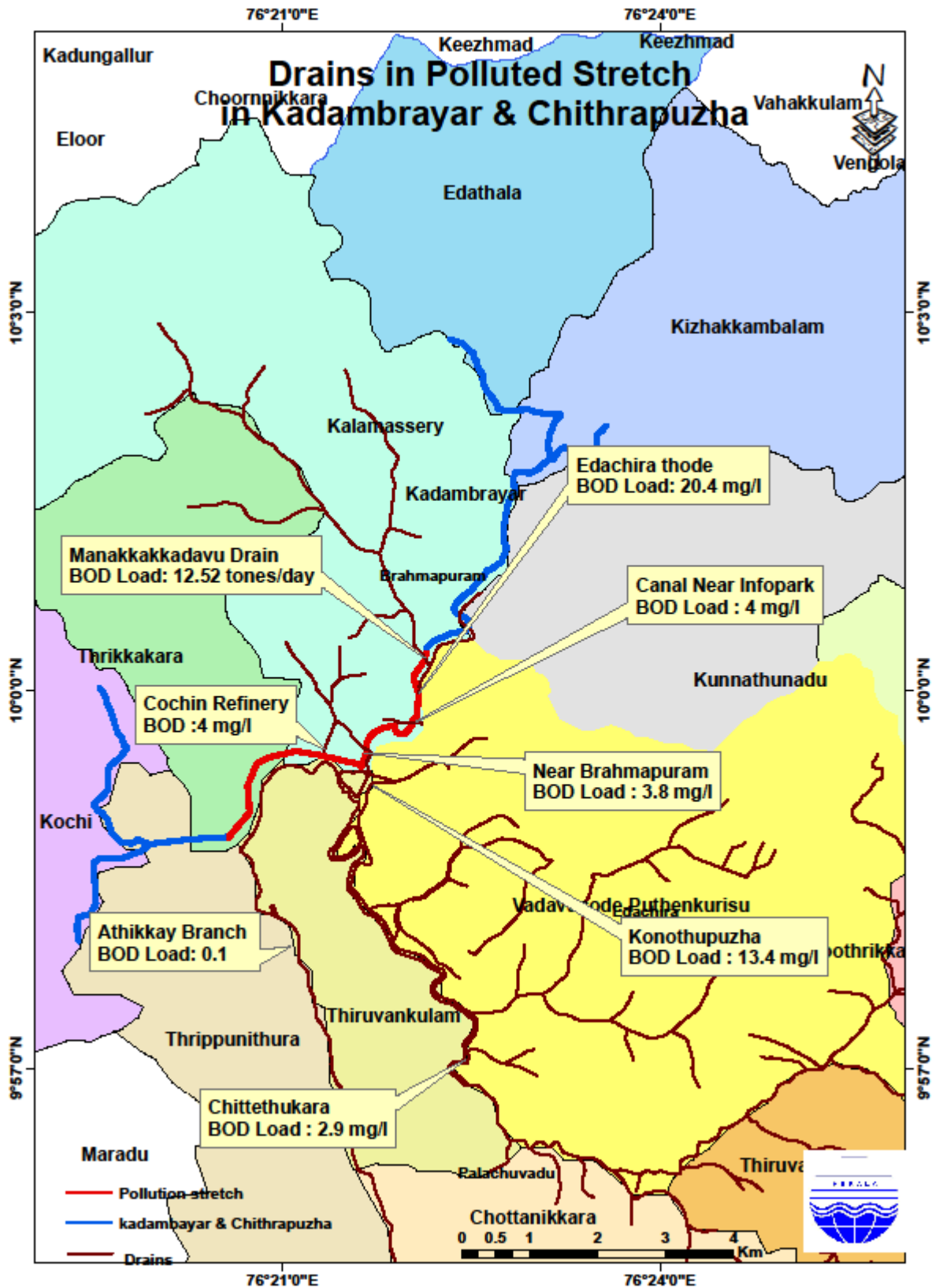


Chithrapuzha flows through Ambalamedu, Kochi area joins Kadambayar near Brahmapuram , flows southward and joins Vembanad lake at Thevara ferry.As it is joined with Vembanad lake, salinity intrusion is noticed in Chithrapuzha .A temporary bund build in the month of November to check Salinity intrusion to Kadambayar. Regular Water transport is there from Vyttila hub terminal to Kakkanad in Chithrapuzha

4)

Pollution load in drains

	Drain	Pollution load BOD in TPD
1	Drain joining Chithrappuzha near Brahmapuram dumping yard(Near FACT CD)	BOD=3.8mg/l
2	Drain from Cochin Refinery area	BOD=4 mg/l
3	Athikkayi Branch	0.097 TPD
4	Drain joining Chithrappuzha from CSEZ(Chittethukara)	BOD=2.9 mg/l
5	Vettuvellikadavu(Konothupuzha joining Chithrappuzha)	BOD=13.4 mg/l



Joint inspection was conducted by KSPCB, Kerala Irrigation Department, Kerala Water Authority, Local

Bodies and Suchitwa Mission and identified all drains lead to Polluted River Stretches and units that are causing pollution

3.

Short term plan

(2) Drain joining Chithrappuzha (near Brahmapuram dumping yard) (Near FACT CD)

No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
2.1.1	2.1.1 C (ii)	Restricting seepage of leachate of plastic dumped in the dumping yard	Kochi Corporation	22 (Biomining of waste)	Plan fund	3 years	Reduced pollution load in drain leading to Chithrappuzha
2.1.2	Aa (iv)	Effluent monitoring from FACT	Kerala State Pollution Control Board	KSPCB funds		Ongoing; monthly frequency	-do-
2.1.3	Aa (iv)	Periodical Monitoring	Kerala State Pollution Control Board	KSPCB funds		-	-do-

2) Drain from Cochin Refinery area

No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
2.2.1	Aa (iv)	Surveillance to restrict the dumping of wastes into the river and its branches	Vadavucode – Puthencruz Panchayat with the help of Police	0.05	Govt Aid	Periodical Monitoring	Reduced pollution load drain leading Chithrappuzha
2.2.2	A(b)	Sanitation Survey	Vadavucode – Puthencruz Panchayat	0.01	Govt Aid	3 months	-do-
2.2.3	E	Periodical Cleaning of Chithrapuzha	Kerala Irrigation Department	0.403	-	Twice in 3 year	-do-
2.2.4		Already implemented Effluent Treatment facility in Cochin Refinery and periodical monitoring are ongoing (Pollution Control Board)					

3) Athikkayi branch (Provided temporary bund in joining section to check salinity intrusion)

No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
2.3.1	A(b)	Identification of major pollution causing units (Apartments, hospitals, service stations, markets and industries) in upstream	Thrikkakkara Municipality	1	Plan own fund	3 months	Inspection is being conducted and notices are being issued to polluting units such as apartments, hotels, service stations, markets,
			Pollution Control Board	-	KSPCB funds	-	

							industries.
2.3.2	A a(iv)	Surveillance to restrict the dumping of wastes into the river and its branches	Thrikkakkara Municipality with the help of Police	0.5	Plan own fund	Periodical Monitoring	Action is being taken to prepare a DPR for fencing
2.3.3	A a(iv)	Periodical Monitoring	Kerala State Pollution Control Board	--	KSPCB funds	-	-do-
2.3.4	A (b)	Sanitation Survey	Thrikkakara Municipality	0.25	Plan /own fund	6 months	Action is being taken to prepare a DPR which will be included in sanitation survey
2.4.5	E	Periodical Cleaning	Kerala Irrigation Department	0.045	Plan fund	Once in a year	-do-

4) Drain joining Chithrappuzha from CSEZ(Chittethukara)

No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
2.4.1	A (b)	Ensure proper functioning of ETP in CSEZ	Kerala State Pollution Control Board	-	KSPCB funds	Periodical monitoring on going	Reduced pollution load in drain leading

							to Chithrapuzha
2.4.2	A (b)	Sanitation Survey and periodical cleaning	Thrikkakkara Municipality	0.25	Plan /own fund	6 months	Action is being taken to prepare a DPR which will be included in sanitation survey. Cleaing of Kaithodu is also being done
2.4.3	Aa (iv)	Periodical Monitoring	Kerala State Pollution Control Board	-	KSPCB funds	-	-do-

5)Vettuvellikadavu(Konothupuzha joining Chithrappuzha)

NO.	Ref para No :48 as per NGT Order no 673/2018 dated20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
2.5.1	A(b)	Identifying and closing of all unauthorized outlets into	Thripunithura Municipality	Done by Municipal staffs	Own fund	6 months	Reduced pollution load drain leading Chithrappuzha

		the stream joining the river					
2.5.2	A(b)	Sanitation Survey	Thripunithura Municipality	Done by Municipal staffs	Own fund	3 months	-do-
2.5.3	Aa(iv)	Periodical Monitoring	Kerala State Pollution Control Board	-	KSPCB funds	-	-do-
2.5.4	C(ii)	Surveillance to restrict the dumping of wastes into the river and its branches	Thripunithura Municipality with the help of Police	Process already started	Own fund	6 months	-do-
2.5.5	E	Cleaning of Konothupuzha (work Proposal already submitted by Minor Irrigation)	Kerala Irrigation Department (Minor Irrigation)	0.17	Plan fund	Twice in year	-do-

Main Stretch (Kadambayar-Chithrappuzha Confluence point to Irumpanam)

No.	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost (Rs. Cr)	Source of fund	Time line	Expected outcome
a	E	Periodic Cleaning	Kerala Irrigation Department	0.073	Government Aid	Once in a year	Reduced pollution load in drain leading to Chithrappuz

							ha
b	C (ii)	Surveillance to restrict the dumping of wastes into the river	Vadavucode -Puthercruz with the help of Police	0.05	CSR found and Govt. Aid	Periodical Monitoring	-do-
			Thripunithura Municipality with the help of Police	Process already started	Own fund	6 months	

(4) Monitoring

	Ref para No :48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing agency	Cost	Source of fund	Time line	Remarks
3.1	A a(iv)	River water quality monitoring	Kerala State Pollution Control Board	Rs. 11,08,000	National Water Quality Monitoring Programme (NWMP), CPCB fund	Ongoing; monthly frequency	Monitoring of water quality
3.2	A (b)	Inspection and effluent quality monitoring of the flats, industrial units, service stations, hospitals, hotels etc	Kerala State Pollution Control Board	As per sampling charge	-	On going	-

8. ACTION PLAN BY GRAMAPANCHAYATH

No	Name of Grama panchayath	Ref para No :48 as per NGT Order no 673/2018 dated20.9.2018	Activity	Implementing agency	Cost	Source of fund	Time line	Remarks
1	Vadavukad-Puthenkruze	C(ii)	Survivance of restrict dumping of waste to the river, Sanitation survey (with the help of Police)	Grama panchayath	600,000/-	Govt aid&CSR Fund	6 months	

9. Long term Plan

Sl.No.	Ref para No :48 as per NGT Order no 673/2018 dated20.9.2018	Long term measures proposed	Implementing agency	Amount Required (Rs.in Crore) and Source of fund	Time line	Remarks
4.1	E	Provide inspection bund for Chithrapuzha	Kerala Irrigation Department	3.36	Three years	DPR Preparation in 10 months (through consultants)
4.2	A (b)	Additional STP requirement (if needed)	(Thrikkakkara Municipality, Thripunithura Municipality)	Associated with Cochin Corporation Brahmapuram plant		

4.3		Restriction of illegal dumping of Septage in to the river	Police	-	-	
4.4		Flood Plain Zone(Management and Protection) Preparation of Inundation maps	Kerala Irrigation Dept	Included in Periyar Basin	3 Years	As part of rebuild Kerala Initiative Inundation maps are being prepared for Periyar basin with help of World Bank

10. Action Plan by Ground Water Department

Sl.No	Ref para No :48 as per NGT Order no 673/2018 dated20.9.2018	Activity	Ground Water Department
1	B(i)	Ground Water resources and regulation of ground water extraction by industries particularly in over exploited as critical zones/blocks	As per Groundwater resources of Kerala, 2017 estimate a total number of 3 blocks (Edapally,Vadavukodu,Vazhakkulam) comes under the Chithra puzha river basin. All the blocks in the river stretch are safe with stage of groundwater extraction ranges from 25.38% to 56.63%
2	B(ii)	Ground water recharging / rain water harvesting	The average groundwater level ranges from 1.85mbgl -9.2 mbgl. Groundwater Department not yet proposed any recharge structures in this area.
3	B(iii)	Periodic ground waste quality assessment and remedial actions in case of con taminated ground water tube wells/bore wells or hand pumps	Groundwater Department has no observation wells in the river stretch.
4	B(iv)	For regulating use of ground water for irrigation purpose, adopting good irrigation practices	The total irrigation draft in the area ranges from 172.32 - 1028.5 ha.m.

