

ACTION PLAN FOR REJUVENATION OF POLLUTED STRETCH (MANNAR - THAKAZHY) OF RIVER PAMBA

(PRIORITY IV)



**Submitted by District Level Technical Committee
(Pathanamthitta District) Before the River Rejuvenation
Committee
(As per G.O (Ms) No.12/2019/WRD Dated 30.04.2019)**

As per G.O (Ms) No.12/2019/WRD Dated 30.04.2019, A District Level Technical Committee (Pathanamthitta District) was constituted for preparing Draft Action Plan for the Rejuvenation of polluted river stretches. The polluted stretch is Mannar to Thakazhy of Pamba River.

The members of the committee are as follows:

1. The Superintending Engineer, Irrigation Department : Chairperson
2. The Superintending Engineer, Kerala Water Authority : Member
3. The Environmental Engineer, District Office, Kerala State Pollution Control Board : Member & Convenor
4. The District Co-ordinator, District Suchitwa Mission : Member
5. The General Manager, Industries Department : Member
6. Additional District Magistrate, representing the Revenue Department and nominated by District Collector : Member

The Kerala State Pollution Control Board has been doing the analysis of Pamba River water for the last several years. The analysis report clearly indicate that the B.O.D value has never been more than 3.0mg/l from the year 2016 onwards. However the Dissolved Oxygen levels were found to be less than 5mg/l and the fecal coliform bacteria is more than 500CFU on many occasions. The analysis report for the period 2016 to 2018 is attached as Annexure-1.

The Action Plan for the polluted stretch Mannar to Thakazhy has been prepared after conducting joint site inspection and after detailed deliberations.

Dated this the 22nd day of July, 2019.

Member & Convener
Environmental Engineer
Kerala State Pollution Control Board

Chairman
Executive Engineer
Minor Irrigation

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EXECUTIVE SUMMARY

The river Pamba rises at an altitude of 1,650m (5,410 ft) on the Peerumedu Plateau in the Idukki district of Kerala. After traversing a distance of 176km (109 mi), the river joins the Arabian Sea through a number of channels. The basin extends over an area of 2,235 square km (863 sq mi) with the entire catchment area within Kerala state. The basin is bounded on the east by Western Ghats and on the west by Arabian Sea. The River Pamba enriches the lands of Pathanamthitta District and the Kuttanad area of Alappuzha District and few areas of Kottayam. The Pamba originates at Pulachimalai hill in the Peerumedu plateau in the Western Ghats at an altitude of 1,650 m (5,410ft).

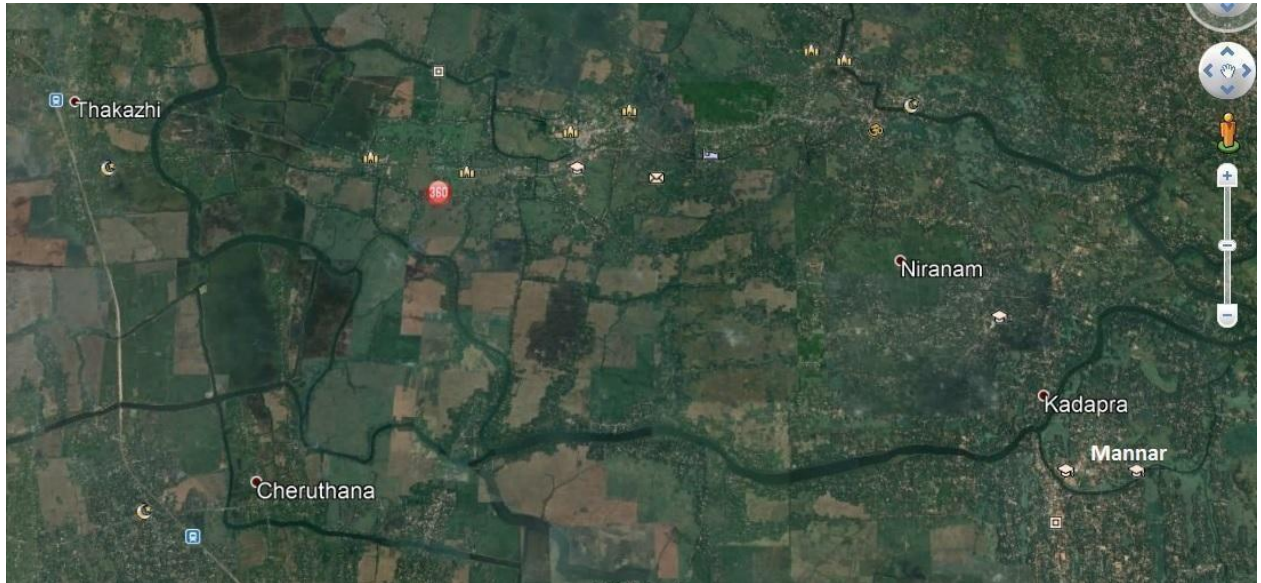
As per the list of polluted stretched submitted by CPCB in September, 2018, Pamba River in the stretch Mannar to Thakazhy has been identified as polluted stretch. It has been categorised as Priority IV polluted stretch since BOD value was observed in the range 3.3 to 7.8. As per the results of monthly monitoring from District Office of the Kerala State Pollution Control Board, District Office, Pathanamthitta, the B.O.D value has never been more than 3.0mg/l from the year 2016 onwards. However the Dissolved Oxygen levels were found to be less than 5mg/l and the fecal coliform bacteria is more than 500CFU on many occasions.

**DRAINS DISCHARGING POLLUTED WATER INTO THE
MANNAR-THAKAZHY STRETCH OF PAMBA RIVER AND THEIR
POLLUTION LOAD.**

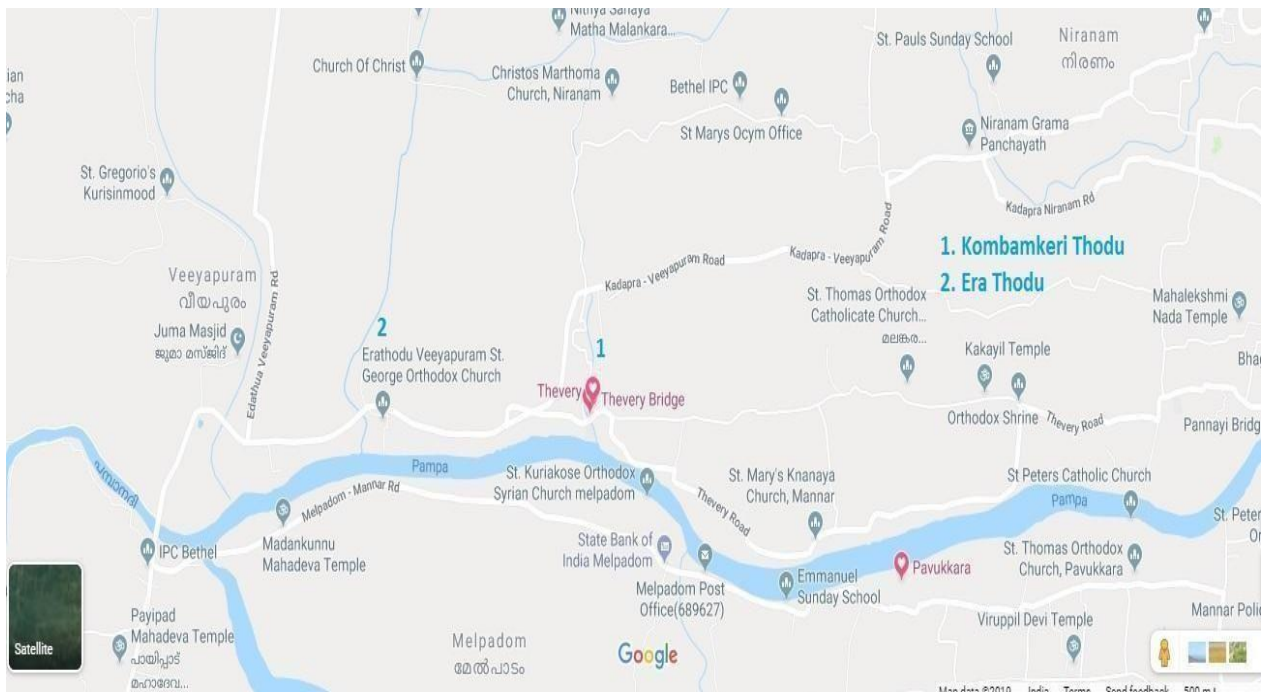
Sl. no	Name of the drain	Latitude/ Longitude	Flow Rate (cumecs)	BOD (mg/l)	COD (mg/l)	Pollution load in terms of BOD(kg/day)	TC(CFU/100 ml)
1	Parumala Drain (Near Parumala seminary L.P School)	9°19'33" 76°32'9"	0.053	120	320	0.549	3900
2	Mannar Town Drain (Town upstream)	9°19'27" 76°32'00'	0.93	60	192	4.821	3100
3	Kuriyathukadavu - Kuriyath Thodu	9°19'37" 76°31'26'	0.011	2.3	25.6	0.002	2600
4	Karuvelil Thodu (near Mannath Road)	9°19'42" 76°31'7"	0.63	1.8	22.4	0.098	2200
5	Nochithodu	9°19'33" 76°30'24'	2.408	2.4	19.2	0.499	1900
6	Pattaparambil Thodu	9°19'28" 76°30'1"	0.42	1.8	9.6	0.065	2400

7	Kappiyarise ry Thodu	9°19'37" 76°29'45"	0.72	2.5	9.6	0.155	1300
8	Kombamkeri (near St Thomas High School, Niranam West)	9°19'47" 76°29'20"	2.64	2.1	16	0.479	1100
9	Perackal Thodu, Niranam	9°19'45" 76°28'42"	0.25	1.7	3.2	0.037	2300
10	Era Thodu	9°19'49" 76°28'28"	0.15	1.9	19.2	0.025	1900
11	Kolarayaru	9°20'31" 76°32'11"	0.42	0.7	6.4	0.025	500

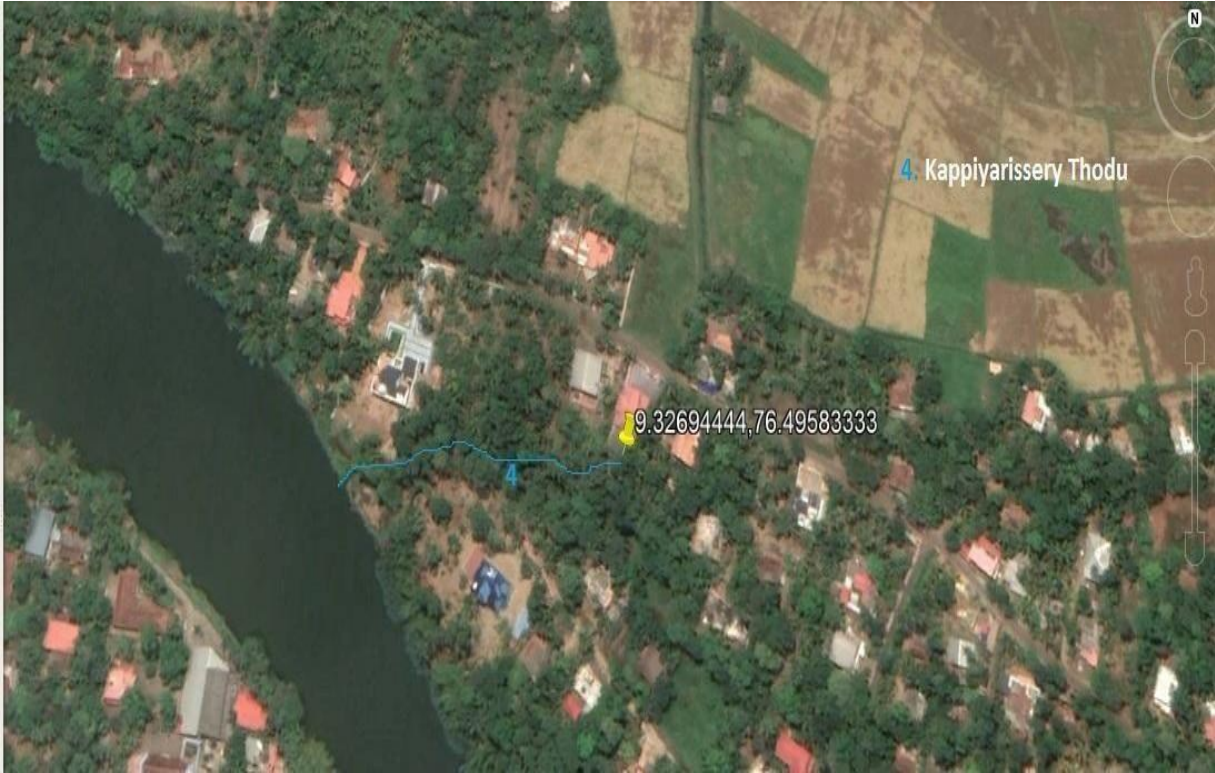
LOCATION OF THE IDENTIFIED DRAINS JOINING THE PAMBA RIVER



Mannar to Thakazhy stretch



Location of Kombamkeri and Era Thodu



Kappiyarissery Thodu joining Pamba River



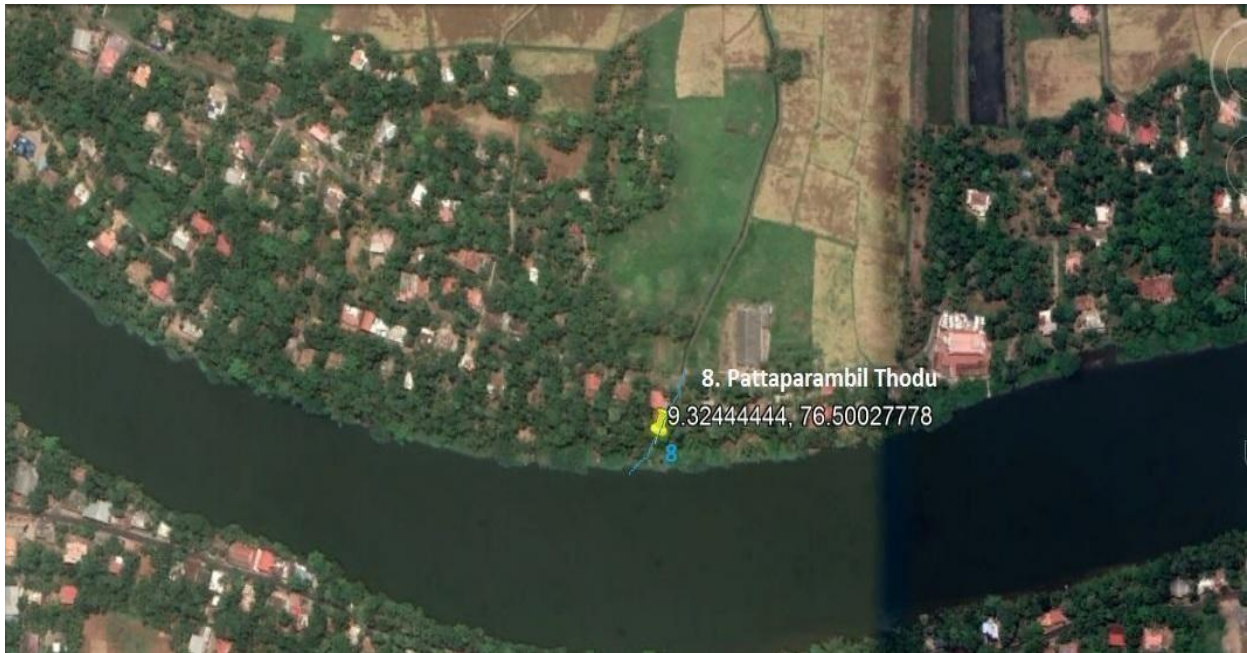
Karuvelil Thodu joining Pamba River



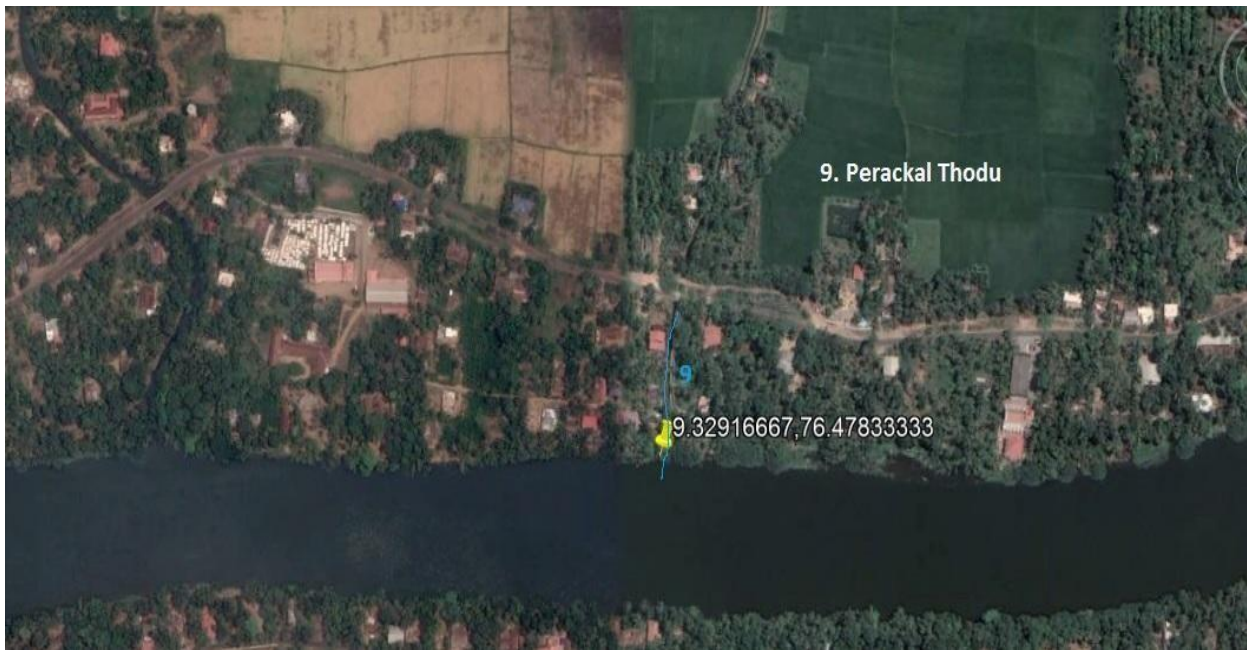
Kuriyathodu joining Pamba River



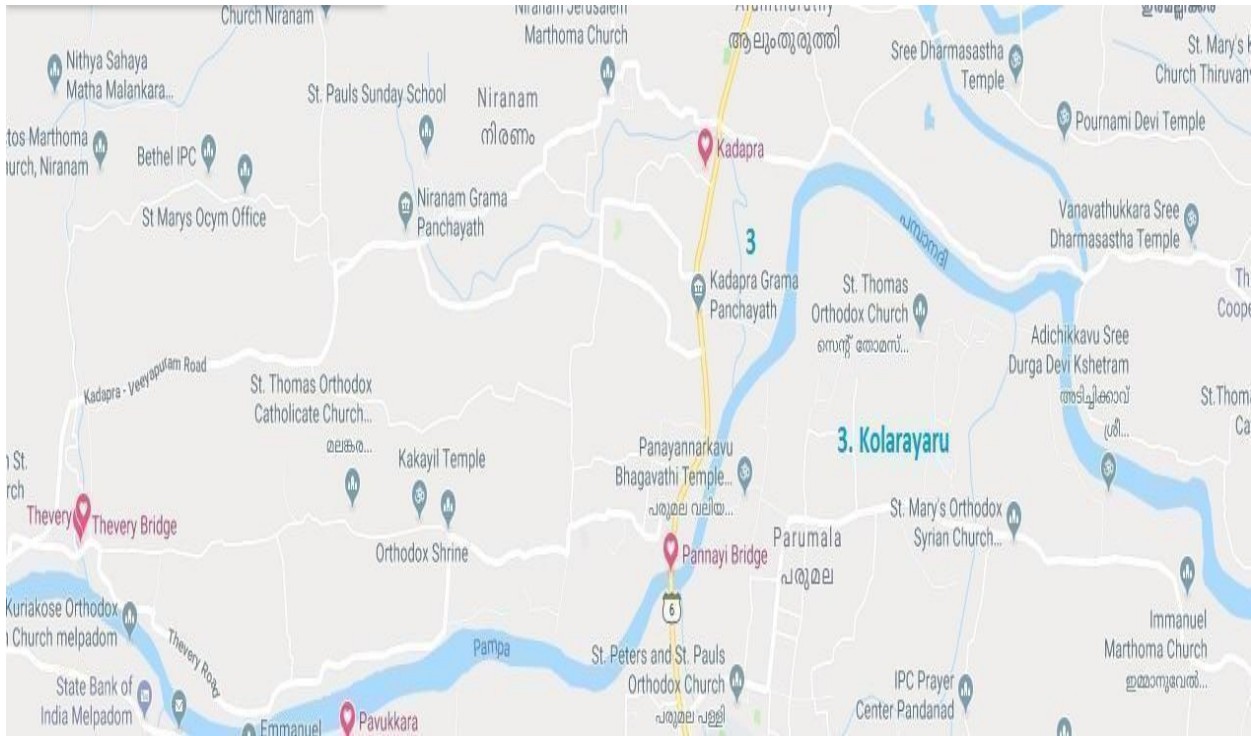
Nochi Thodu joining Pamba River



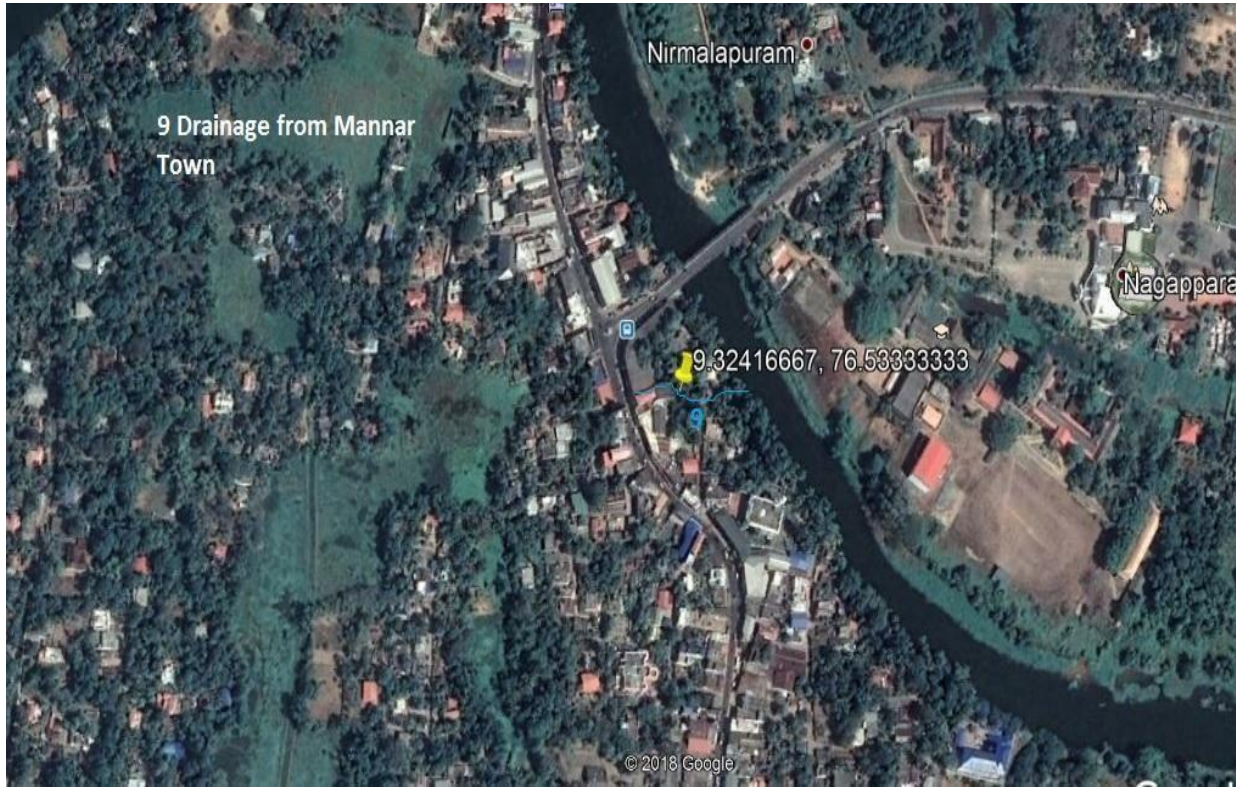
Pattaparambil Thodu joining Pamba



Perackal Thodu joining Pamba



Kolarayaru



Drainage from Mannar Town to Pamba

ACTION PLAN

Sl. no	Ref Para no.48 item no. as per NGT Order no 673/2018 dated20.9.2018	Activity	Implementing Agency	Estimated Expenditure in lakhs	Source of fund	Time line	Expected outcome
1	A(a)	No industries	-	-	-	-	-
2	A(a)	Monitoring of river water quality	Kerala State Pollution Control Board	1	Kerala State Pollution Control Board NWMP fund	Continuing project	Regular water quality assessment
3	C(ii)	Establishment of de-centralized solid waste treatment facility	Mannar Panchayat, Kadapra/ Niranam Panchayat	30	Plan/ Central/ State funds	Tentatively 2020-21	Better Solid Waste Management (SWM) reduce the river pollution due to solid waste dumping
4	C	Establishment of Material collection Facility (Solid Waste Management)	Mannar Panchayat, Kadapra/ Niranam Panchayat	10	Own/ Central/ State funds	Tentatively 2020-21	Better Solid Waste Management (SWM) reduce the river pollution due to solid waste dumping
5	C	Resource recovery facility (Solid Waste Management)	Mannar Panchayat, Kadapra/ Niranam Panchayat	8	Own/ Central/ State funds	Tentatively 2020-21	Better Solid Waste Management (SWM) reduce the river pollution due to solid waste dumping
6	C	Installing house hold and community level solid waste management units	Mannar Panchayat	80	Own/ Central/ State funds	Tentatively 2020-21	Better Solid Waste Management (SWM) reduce the river pollution due to solid waste dumping

7	C	Door to Door Collection and Transportation of MSW	Mannar Panchayat	10	User fee / Viability Gap Fund	Tentatively 202-2021	Better Solid Waste Management (SWM) reduce the river pollution due to solid waste dumping
8	E	<p>1. A Squad including Police Officers from Mannar and Pulikkezhu Policestation and public workers is created for preventing pollution of Pamba river</p> <p>2. Panchayat committee has taken decision to install CC TV Camera on the bank of river.</p> <p>3. Information for preventing the pollution of River Pamba has been circulated.</p>	Mannar Panchayat	48,000	Own fund	2019	Reduction of river pollution
9	E	1.A Squad including Police Officers from Edathua and Ambalappuzha Policestation and certain public is created	Thakazhi Panchayat	2 Lakhs	Plan Fund	2019	Reduction of river pollution

		for preventing pollution of Pamba River. 2.Panchayat committee has taken decision to install CC TV Camera on the bank of River					
10	E	Citizen Information Boards	Cheruthana Panchayat	3.98 Lakhs	CFC	2019	Reduction of river pollution
11	C	Construction of compound wall with fencing	Irrigation department	135.00	To be found	Tentatively 2020-21	Reduce the Tendency of people in throwing waste in to the river
12	C	Removing light jungle and muddies from river courses	Irrigation department	100.00	To be found	Tentatively 2020-21	Maintain better flow of river and self -cleansing
13	C	Electrical-Light arrangements and Surveillance cameras	LSGD	50.00	To be found	Tentatively 2020-21	Reduce the tendency of people in throwing waste in to the river

14	C	Regualting activites in flood plain zone, protection and management of flood plain zone	Irrigation department		Government constituted a river basin conservation and managemen t authority and a committee constituted for drafting river basin conservation act	Tentatively 2020-21	Regualting activites in flood plain zone, protection and management of flood plain zone
15		Greenery development- Plantation plan. Plantation on both sides of the river, setting up biodiversity parks on flood plains by removing encroachment	Irrigation department	100.00	State Fund	Tentatively 2020-21	Ecofriendly approach will create a positive attitude in public.

16	C (b) (ii)	Green Protocol implementation in all Offices institution & Public function	Mannar , Kadapra/ Niranam Panchayat Panchayat	5	State Plan fund Suchithwa mission	Tentatively 2019-2021	Reduce solid waste generation in Municipality
17	D(a)	Issues relating to E-flow, maintaining minimum environmental flow of river(by having watershed management provisions)	Irrigation department	50.00	State fund	Tentatively 2020-21	Government constituted a river basin conservation and management authority and a committee constituted for drafting river basin conservation act
18	D (b)	Irrigation practices	Irrigation department	2500.00	State fund	Tentatively 2020-21	Community micro irrigation and Participatory irrigation management
19	E	Awareness programmes for sections of public	Kerala State Pollution Control Board	1.0	Plan Scheme, Suchithwa mission, IEC fund	2019	Awareness of statutory provision of deterrent to pollution
20	C	Management of municipal, plastic Hazardous, Bio medical, and electrical waste	LSGD	50.00	To be funded	-do-	Better solid waste management (SWM) reduce the river pollution due to solid waste Dumping
21	E	Maintanance of bathing ghat	Irrigation department	22.00	Governm ent fund	Within 1 year	

ACTION BY GROUND WATER DEPARTMENT

Sl. No	Ref para item nos as per NGT Order no.673/2018 dated 20.09.2018	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	The stretch Mannar- Thakazhy falls under the Pulikeezhu Block. The net ground water availability of this block is 2394.53 Hectare-m. The extraction rate is 42.6%. There are only micro or small scale industries in the area. It is a safe block. No regulation is necessary at present.
2	B(ii)	Ground water recharging / rain water harvesting	The Ground Water Department has not yet implemented recharge schemes in this block as this is considered safe zone. There is proposal in future in this regard.
3	B(iii)	Periodic ground waste quality assessment and remedial actions in case of contaminated ground water tube wells/bore wells or hand pumps	The quality of ground water is very good in the area as per the Central Groundwater Board. They have two monitoring wells in the area.
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 785 - 1700 ha.m.

CHAPTER 1

INTRODUCTION

Central Pollution Control board (CPCB) is monitoring the water quality of aquatic resources all over the country at 3500 locations in 29 States and 6 Union Territories under National Water Monitoring Programme. The present monitoring network covers 2541 locations on the surface water and 989 on Wells (ground water). Water samples are being analyzed for 28 parameters consisting of physicochemical and bacteriological parameters for ambient water samples apart from the field observations. Besides this, 9 trace metals and 15 pesticides are analyzed in selected samples. Bio-monitoring is also carried out on specific locations.

OBJECTIVES OF WATER QUALITY MONITORING UNDER NWMP

- ☐ Rational planning of pollution control strategies and their prioritization;
- ☐ To assess nature and extent of pollution control needed in different water bodies or their part;
- ☐ Assimilative capacity of a water body thereby reducing cost on pollution control;
- ☐ The fitness of water for different uses;
- ☐ To evaluate effectiveness of pollution control measures already in existence;
- ☐ Water quality trend over a period of time;
- ☐ To understand the environmental fate of different pollutants

The water quality monitoring results obtained during the years indicate that the organic and bacterial contamination continue to be critical in water bodies. This is mainly due to discharge of domestic wastewater mostly in untreated form from the urban centres of the country. The municipal corporations and other urban local bodies at large are not able to treat increasing load of municipal sewage flowing into water bodies without treatment. Secondly the receiving water bodies also do not have adequate water for dilution. Therefore, the oxygen demand and bacterial pollution is increasing day by day. This is mainly responsible for water borne diseases. The water quality monitoring results were analysed with respect to indicator of oxygen consuming substances (Bio-chemical demand or BOD) and indicator of pathogenic bacteria (total coliform and faecal coliform).

IDENTIFICATION OF POLLUTED RIVER STRETCHES

The water quality data under National Water Quality Monitoring Programme for the year 2016 and 2017 is analysed statistically and monitoring locations exceeding the water quality criteria are identified as polluted. The polluted locations in a continuous sequence are defined as polluted river stretches and categorised in five priority classes based on BOD concentration exceeding to BOD levels >30 mg/l, BOD between 20&30 mg/l, BOD between 10&20mg/l, BOD between 6-10 mg/l and BOD between 3& 6 mg/l.

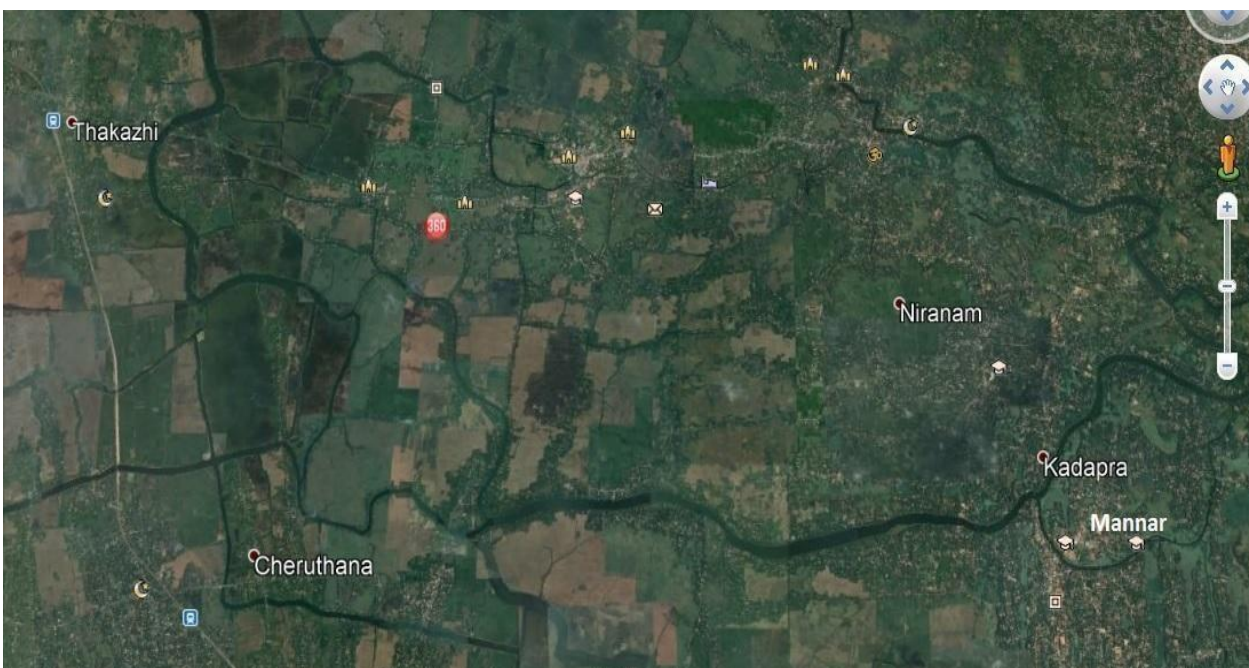
1.2 NGT ORDER ABOUT RIVER POLLUTED STRETCH

The National Green Tribunal (NGT) passed a landmark order on 20 September 2018 pertaining to increasing polluted river stretches in the country (NGT 2018). It ordered all states and union territories to prepare action plans within two months to improve the quality of polluted river stretches to —at least bathing purpose within six months of the finalisation of the plans. The NGT observed that the State Pollution Control Boards (SPCBs) have failed to check pollution. The tribunal distinctly stated that the chief secretary of each state and the administrator of each union territory will be responsible for preparation of the action plan. The NGT took suo-moto cognizance of a report published in the *Hindu* on 17 September 2018. The report was based on a study done by the Central Pollution Control Board (CPCB) for identifying polluted river stretches in the country (CPCB 2018). Similar studies were conducted by the CPCB in 2012 and 2015 (CPCB 2012, 2015). The 2018 study observed that the number of polluted stretches in the country was 351, an increase from 302 in 2015 and 150 in 2012. The 2018 data highlights that there are 45 river stretches attracting Priority I (Biochemical Oxygen Demand (BOD) value ≥ 30 mg/l) for restoration. Out these, five are in Gujarat, nine in Maharashtra and four in Tamil Nadu—the three most industrialised states in the country.

CHAPTER 2

MANNAR- THAKAZHY STRETCH OF PAMBA RIVER

The river Pamba rises at an altitude of 1,650 m (5,410 ft) on the Peerumadu Plateau in the Idukki district of Kerala. After traversing a distance of 176km (109 mi), the river joins the Arabian Sea through a number of channels. It flows through Ranni, Chengannoor, Kuttanadu, Ambalapuzha and finally merges in Vembanad Lake. Study area comprises of river stretch of Pamba from the region Mannar to Thakazhy. The study area comes under the 4th priority category of polluted river stretch classified by the Hon'ble National Green Tribunal. The river monitoring stations of Pamba as part of National Water Quality Monitoring Programme are located at Pamba down in Parumala, Chengannur Town and Near Thakazhy bridge. River stretch in between Pannayikadavu (down in Parumala) and Near Thakazhy bridge are selected for the study purpose. Pamba crosses the parts of Kadapra village of Pathanamthitta, Mannar village, Pavookkara, Thevary, Melppadam, Veeyapuram Village, Cheruthana Village of Alappuzha district in between Mannar to Thakazhy.



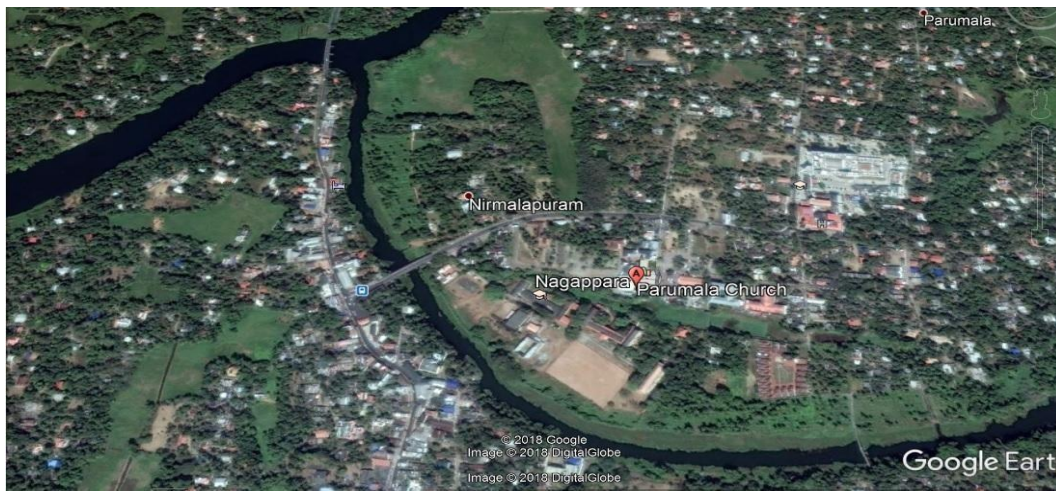
Map showing the river flow in the Mannar- Thakazhy stretch

As per the results of monthly monitoring from District Office of the Kerala State Pollution Control Board, District Office, Pathanamthitta, the B.O.D value has never been more than 3.0mg/l from the year 2016 onwards. However the Dissolved Oxygen levels were found to be less than 5mg/l and the fecal coliform bacteria is more than 500CFU on many occasions.

Monthly sampling is done at Mannar and Edathua. Sampling at Mannar is done only during the Sabarimala festival period from November 15th to January 20th. During this period lakh of pilgrims visit the shrine at Sabarimala after taking dip in Pamba River. However the Mannar- Thakazhy stretch is located at the downstream area of the Pamba River while Sabarimala is located in the upstream area. Edathua is not located in this stretch. The dissolved oxygen level in this stretch is low because of stagnation as the river is near to the final discharge into Vembanadu Lake. The coliform count in the area is however high. There are no medium or large scale industries located in the catchment area of this stretch. But there are number of micro level white and green category industries like cement hollow brick units, soda factories etc in this area. The board has not noticed direct discharge from industries into this stretch. Mannar is the only town located in this stretch. It has a population of 7076. Hotels and other commercial establishments discharge untreated or partially treated waste water into the storm water drains which reaches the river. It is observed that several residences located on the banks of the river also discharge sewage into the river. Septic tank facility and Septage Treatment Facility are to be provided by Local Bodies.



Photo of residence located on the bank of the river with discharges into the river.



Google image of Pamba River flowing through Mannar Town

During the inspection on 30.11.2018, it was identified that one bar hotel, namely Hotel Maharaja Palace was directly discharging the waste water into public drain bypassing the Effluent Treatment Plant. Other hotels like Rajan Hotel and Lodging, Parumala Junction, Mannar P O and Sajood Hotel , Parumala Junction, Mannar P O had only screening facility and the waste water after screening was discharged into the public drain. Also identified an automobile service station (M/s.Chettanapally Service Station, Parumala Junction, Mannar) which was discharging wash water without adequate treatment. There is a specialty hospital located in Parumala adjacent to Mannar Town (St.Gregorious Memorial International Hospital). It has an effluent treatment and seems working satisfactorily. But the possibility of discharge of waste water into the unused agricultural field cannot be ruled out. Hence strict monitoring is required. This can be achieved by frequent inspections by the Kerala State Pollution Control Board officials.

Quantification of waste generation in Mannar Town

It is observed that the Mannar Grama Panchayat do not have a public market. But some areas near the Private Bus Stand is used as way side shops to sell fish and meat. Fruits and vegetables are also sold through way side shops. On discussion with the Panchayat authority it is understood that around 1.5 tonnes of solid waste is generated per day. There is no solid waste processing centre. Plastic waste is occasionally collected by Kudumbasree workers and transported to block collection centers. Small scale de-centralized solid waste processing facility like Thumboormoozhy type aerobic composting is essential in Mannar town.



Fig 3. 2 Photo of Thumboormoozhy type aerobic composting unit

Also the town do not have any septage treatment facilities. The Panchayat claims that the residential buildings located on the river banks have septic tank and soak pit facilities. But it is highly possible that the overflow from these may flow into the river.

Thakazhy is a small village with population of 15951. There are no hospitals in the village. The village is comprised of several hectares of paddy fields. But cultivation is seldom done these days.



Pamba River flowing through Thakazhy

ANALYSIS REPORT OF PAMBA RIVER AT THAKAZHI & EDATHUA DURING 2016

Station	Month	Temperature (°C)	pH	conductivity (µS/cm)	DO (mg/L)	BOD (mg/L)	TC (CFU/100 mL)	FC (CFU/100 mL)
Thakazhi	January	28	6.1	65.6	2.6	2.3	2680	2400
Edathua		28	6.3	64.2	2.7	2	2240	2040
Thakazhi	February	28	7.7	793.8	3.9	0.4	810	540
Edathua		29	7.9	59.78	1.3	0.5	840	570
Thakazhi	March	35	6.3	63.2	5.5	0.7	700	550
Edathua		32	6.1	50.1	2.4	2	820	530
Thakazhi	April	32	6.9	62.82	4.1	1.9	640	320
Edathua		30	7	50.38	5.2	1	680	340
Thakazhi	May	26	6.1	62.2	1.6	2.8	590	310
Edathua		27	6.52	52.53	1.3	2.9	680	360
Thakazhi	June	27	6.4	85.3	3.7	1.7	520	330
Edathua		27	6.9	63.41	3	1.9	600	380
Thakazhi	July	27	6.6	60.33	5.7	1	470	230
Edathua		28	6.7	52.96	4.7	1.3	580	390
Thakazhi	August	26	6.7	56.82	6.4	1.3	590	260
Edathua		26	6.9	43.2	6.6	1.2	600	280
Thakazhi	September	28	6.5	51.69	4.9	0.3	590	220
Edathua		28	6.6	44.89	4.9	0.2	540	190
Thakazhi	October	28	6.6	53.9	6.7	0.9	610	280
Edathua		29	6.8	46.3	6.9	0.8	630	290
Thakazhi	November	30	6.7	60.2	2.7	1.6	1720	1680
Edathua		30	6.5	62.2	2.3	1.9	2100	1910
Thakazhi	December	32	6.5	64.78	6.2	0.4	1970	1850
Edathua		30	6.5	63.2	3.4	1.1	1780	1590

ANALYSIS REPORT OF PAMBA RIVER AT THAKAZHI & EDATHUA DURING 2017

Station	Month	Temperature (°C)	pH	conductivity (µS/cm)	DO (mg/L)	BOD (mg/L)	TC (CFU/100 mL)	FC (CFU/100 mL)
Thakazhi	January	28	6.5	56	7	0.2	2210	2070
Edathua		29	6.3	58.74	6.7	0.7	1900	1770
Thakazhi	February	30	6.6	58.6	6.9	1.2	820	690
Edathua		29	6.4	46.2	6	0.8	830	710
Thakazhi	March	28	6.2	44.8	5.9	0.9	730	610
Edathua		28	6.1	54.4	6.3	0.8	810	700
Thakazhi	April	29	6.5	48.2	5.8	0.3	650	540
Edathua		29	6.3	56.4	6.2	0.2	800	670
Thakazhi	May	28	6	64.6	6.1	0.4	650	360
Edathua		28	6.1	52.2	6	0.3	690	380
Thakazhi	June	30	6.3	56	1.3	1.3	540	450
Edathua		30	6.1	64.74	5.9	0.5	630	520
Thakazhi	July	28	6.6	54	4.7	1.2	580	460
Edathua		27	6.2	66.8	5.9	1.4	640	510
Thakazhi	August	28	6.4	58	5.2	1	560	440
Edathua		28	6.3	62	6.2	0.7	590	460
Thakazhi	September	27	6.5	54	6	1.2	530	400
Edathua		27	6.6	58	6.6	1	520	380
Thakazhi	October	28	6.3	62.88	4.4	0.7	700	390
Edathua		28	6.3	58.54	4.8	0.5	1100	920
Thakazhi	November	29	6.5	66.85	3.4	1	1560	1430
Edathua		29	6.4	72.81	3.2	1.1	1720	1540
Thakazhi	December	27	6.8	66.55	4.9	0.4	1980	1830
Edathua		27	6.9	66.97	3.5	1.9	1970	1810

ANALYSIS REPORT OF PAMBA RIVER AT THAKAZHI & EDATHUA DURING 2018

Station	Month	Temperature (°C)	pH	conductivity (µS/cm)	DO (mg/L)	BOD (mg/L)	TC (CFU/100 mL)	FC (CFU/100 mL)
Thakazhi	January	28	6.7	180	4.8	0.9	2000	1900
Edathua		28	6.9	58.9	4.4	0.8	1980	1820
Thakazhi	February	28	7	55	6.1	0.2	990	850
Edathua		28	6.8	60.5	4.2	0.2	960	830
Thakazhi	March	29	6.6	880	6	0.8	810	700
Edathua		29	6.6	38.63	7	1	790	680
Thakazhi	April	29	6.5	175	4.9	1.1	890	780
Edathua		29	6.7	73.6	3.8	2.1	850	720
Thakazhi	May	30	7.2	108	3.6	1	790	590
Edathua		30	7	55.51	5.5	0.8	780	570
Thakazhi	June	27	7.1	68.17	2.8	1.6	640	520
Edathua		27	7	50.61	4.8	0.9	650	480
Thakazhi	July	25	7	52.3	4.3	1	540	440
Edathua		26	7	42.6	5.4	0.1	580	450
Thakazhi	August	27	5.8	79.3	6.1	1.7	3650	2990
Edathua		27	5.9	85.1	6	1.6	3500	2740
Thakazhi	September	26	6.3	60.73	6.1	1.9	1900	1000
Edathua		26	6.3	51.15	4.3	1.3	1770	980
Thakazhi	October	26	6.8	70.7	6.1	0.4	1300	1000
Edathua		26	6.9	55.23	4.3	0.7	1570	1100

ANALYSIS REPORT OF PAMBA RIVER AT MANNAR (SABARIMALA FESTIVAL PERIOD) 2016-2018

Weekly Pamba River Monitoring								
Station	Date	Temp	PH	Conductivity	DO	BOD	TC	FC
Mannar	07.01.2016	29	5.9	62.5	2.4	2.1	2450	2150
	13.01.2016	28	5.8	62.2	2.7	2.2	2460	2140
	19.01.2016	29	5.8	60.4	2.8	2	2500	2160
	19.11.2016	30	6.2	66.8	2.7	0.2	2200	2130
	24.11.2016	32	6.3	45.48	5.5	0.4	2030	1900
	03.12.2016	30	6.5	68.5	4.5	1.2	2230	2180
	08.12.2016	29	6.2	46.02	6.4	0.3	3400	1260
	16.12.2016	30	6.7	51.03	5.9	0.7	3530	3370
	23.12.2016	31	6.5	44.92	6	0.1	2530	2350
	30.12.2016	29	6.1	68.2	6.9	0.6	2580	2460
	07.01.2017	29	6.5	48.83	6.8	0.7	2280	2170
	13.01.2017	29	6.3	42	6.5	0.3	2240	2110
	20.01.2017	29	6.2	47	6.5	0.1	2170	2060
	17.11.2017	29	6.2	50	4.7	1	1780	1590
	24.11.2017	29	6.3	69.81	2	1.3	2150	2010
	29.11.2017	26	6.7	73.12	2.5	1.7	2190	2030
	08.12.2017	27	6.7	62.2	2	1.1	2200	2100
	16.12.2017	27	6.3	45.32	6	0.7	1800	1760
	23.12.2017	27	7	52.02	5.5	0.4	1990	1880
	28.12.2017	29	7.3	66.76	3.2	1.1	1980	1890
06.01.2018	28	6.5	51.36	5.8	0.9	1960	1820	
11.01.2018	29	6.5	49.93	5	1	1980	1840	
17.01.2018	28	6.5	48.83	4.1	0.4	1840	1710	

CHAPTER3

ACTION PLAN FOR MANNAR- THAKAZHY STRETCH OF PAMBA RIVER

DISTRICT LEVEL TECHNICAL COMMITTEE FOR REJUVENATION OF POLLUTED STRETCHES

Based on the orders of the Hon'ble national Green tribunal (NGT) and other related documents, Government of Kerala, vide G.O.(Ms) No.12/2019/WRD dated 30-04-2019, constituted a District Level Committee for preparing an action plan for rejuvenation of polluted stretches in each district. The Committee in Pathanamthitta District is constituted as follows.

- 1.The Executive Engineer, Minor Irrigation Department : Chairperson
- 2.The Superintending Engineer, Kerala Water Authority : Member
- 3.The Environmental Engineer, District Office, Kerala State Pollution Control Board : Member & Convenor
- 4.The District Co- ordinator, District Suchitwa Mission :Member
- 5.The General Manager, Industries Department : Member
- 6.Additional District Magistrate , representing the Revenue Department and nominated by District Collector : Member

CONSTITUTION OF THE DISTRICT LEVEL TECHNICAL COMMITTEE

There was delay in constitution of the Committee as the Board had requested for exempting the Mannar- Thakazhy stretch of Pamba River from preparing action plan as the BOD was less than 3.0mg/l. The committee was constituted on 16.07.2019. The committee conducted joint inspection on 17.07.2019. The drains joining the polluted stretch were identified, its water tested and the velocity and cross sectional area was determined. The flow in the drains was determined. Based on the analysis reports, the B.O.D load was assessed.

FIELD VISIT AND FINDINGS

In this stretch, Mannar is the only town. Twelve drains were identified to be flowing into the Pamba River. Of these two, namely the Parumala storm water drain flowing near Parumala Seminary L.P School and that flowing through Mannar town are manmade storm water drains. The other 9 ones are natural thodu(drain). They vary in width from 2.3m to 13.5m. Of these three drains, namely the Karvelil Thodu, Nochithodu and Pattaparambil Thodu were seen to be

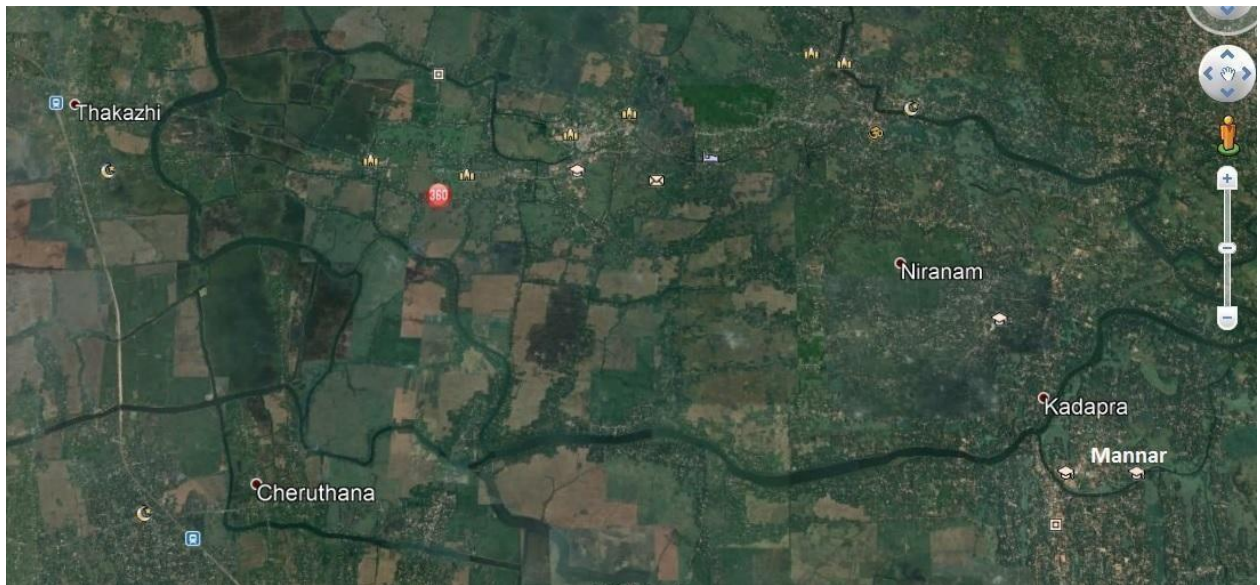
carrying polluted water. This is observed to be due to discharge of domestic waste water. The Kolarayaru and Kombamkeri Thodu are the major natural drains in the area. The flow in the drains are small varying from 0.011 cumecs(cubic metre per second) to 2.64 cusecs.

DRAINS DISCHARGING WATER INTO THE RIVER AND ITS POLLUTION LOAD

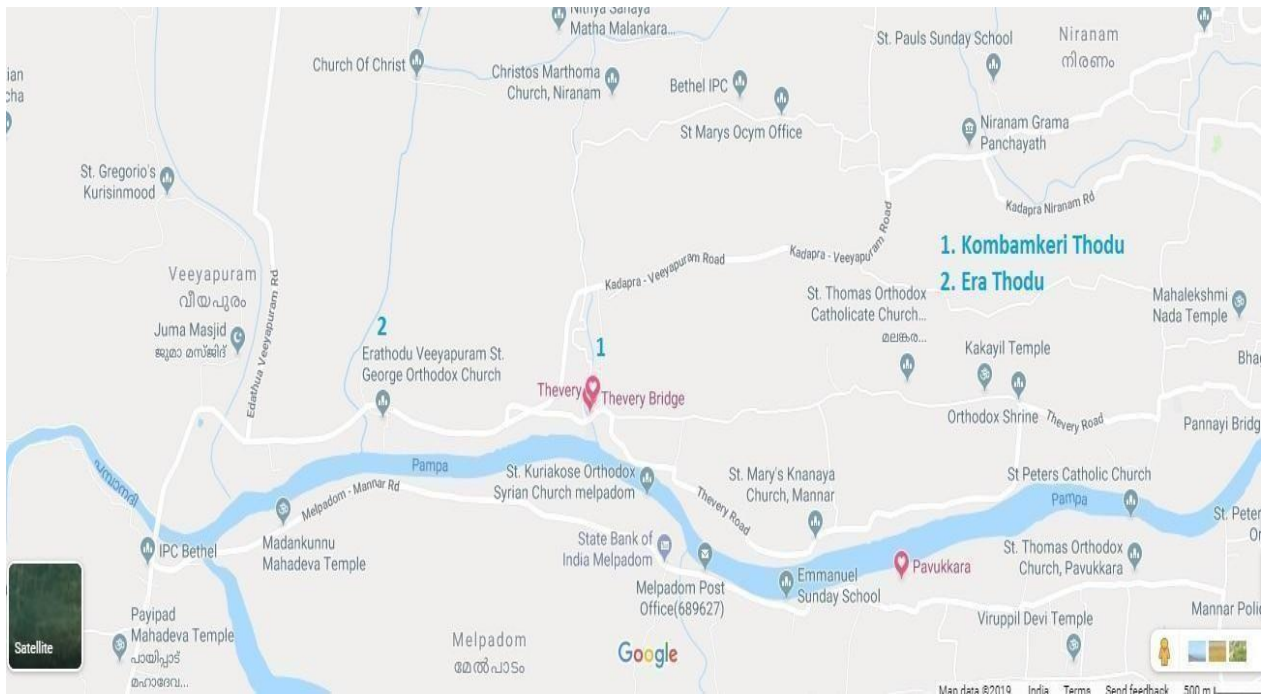
Sl. no	Name of the drain	Latitude/ Longitude	Flow Rate (cumecs)	BOD (mg/l)	COD (mg/l)	Pollution load in terms of BOD(kg/day)	TC(CFU/100 ml)
1	Parumala Drain (Near Parumala seminary L.P School)	9 ⁰ 19'33" 76 ⁰ 32'9"	0.053	120	320	0.549	3900
2	Mannar Town Drain (Town upstream)	9 ⁰ 19'27" 76 ⁰ 32'00"	0.93	60	192	4.821	3100
3	Kuriyathuka davu- Kuriyath Thodu	9 ⁰ 19'37" 76 ⁰ 31'26"	0.011	2.3	25.6	0.002	2600
4	Karuvelil Thodu (near Mannath Road)	9 ⁰ 19'42" 76 ⁰ 31'7"	0.63	1.8	22.4	0.098	2200
5	Nochithodu	9 ⁰ 19'33" 76 ⁰ 30'24"	2.408	2.4	19.2	0.499	1900
6	Pattaparambil Thodu	9 ⁰ 19'28" 76 ⁰ 30'1"	0.42	1.8	9.6	0.065	2400

7	Kappiyarise ry Thodu	9°19'37" 76°29'45"	0.72	2.5	9.6	0.155	1300
8	Kombamkeri (near St Thomas High School, Niranam West)	9°19'47" 76°29'20"	2.64	2.1	16	0.479	1100
9	Perackal Thodu, Niranam	9°19'45" 76°28'42"	0.25	1.7	3.2	0.037	2300
10	EraThodu	9°19'49" 76°28'28"	0.15	1.9	19.2	0.025	1900
11	Kolarayaru	9°20'31" 76°32'11"	0.42	0.7	6.4	0.025	500

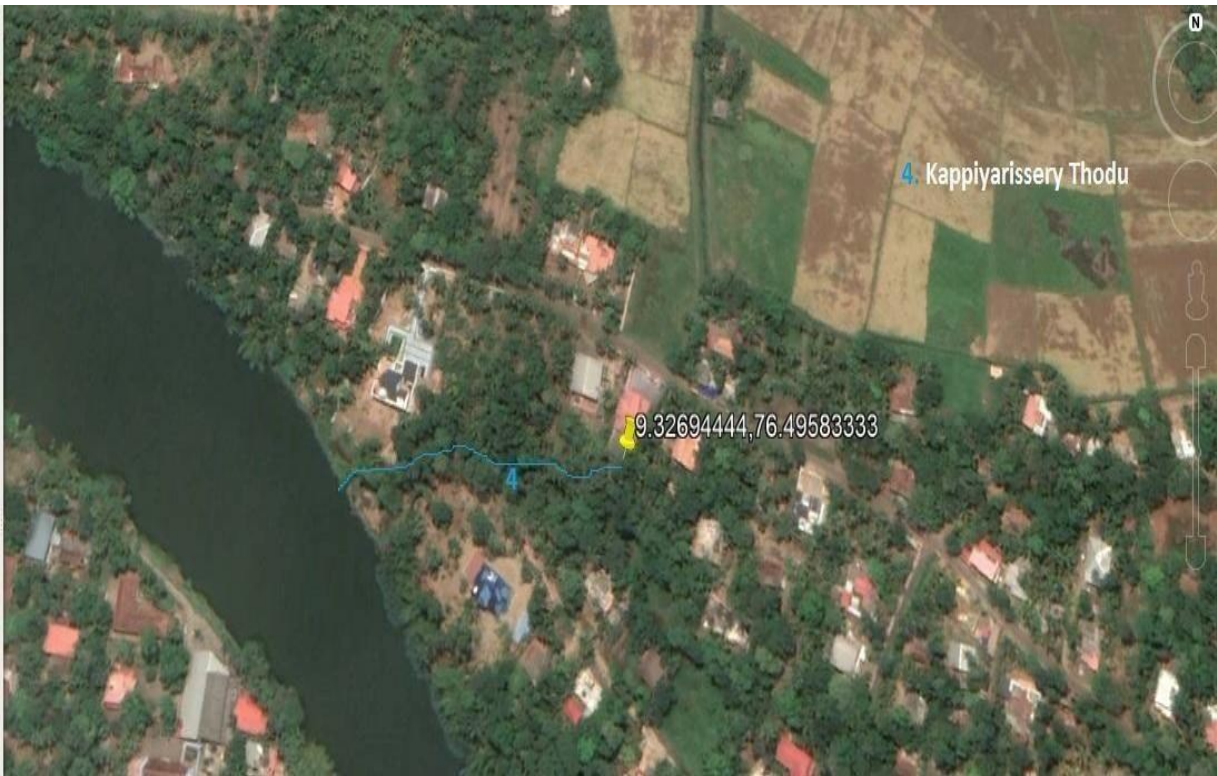
LOCATION OF THE IDENTIFIED DRAINS JOINING THE PAMBA RIVER



Mannar to Thakazhy stretch



Location of Kombamkeri and Era Thodu



Kappiyarissery Thodu



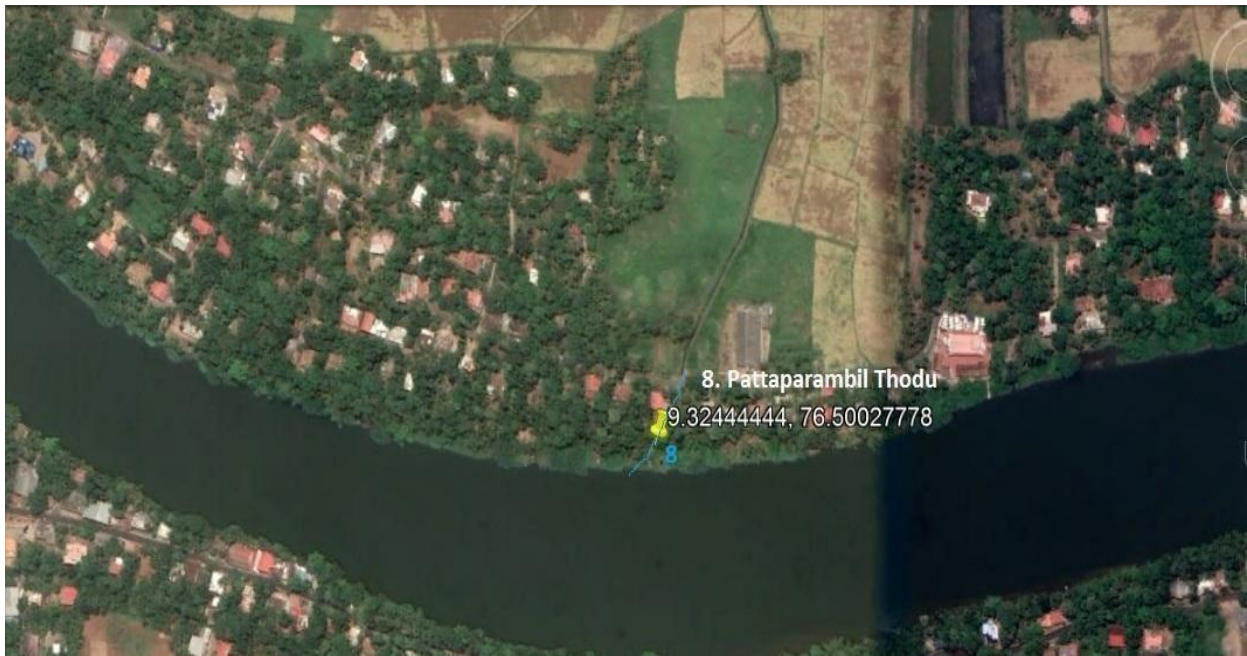
Karuvelil Thodu



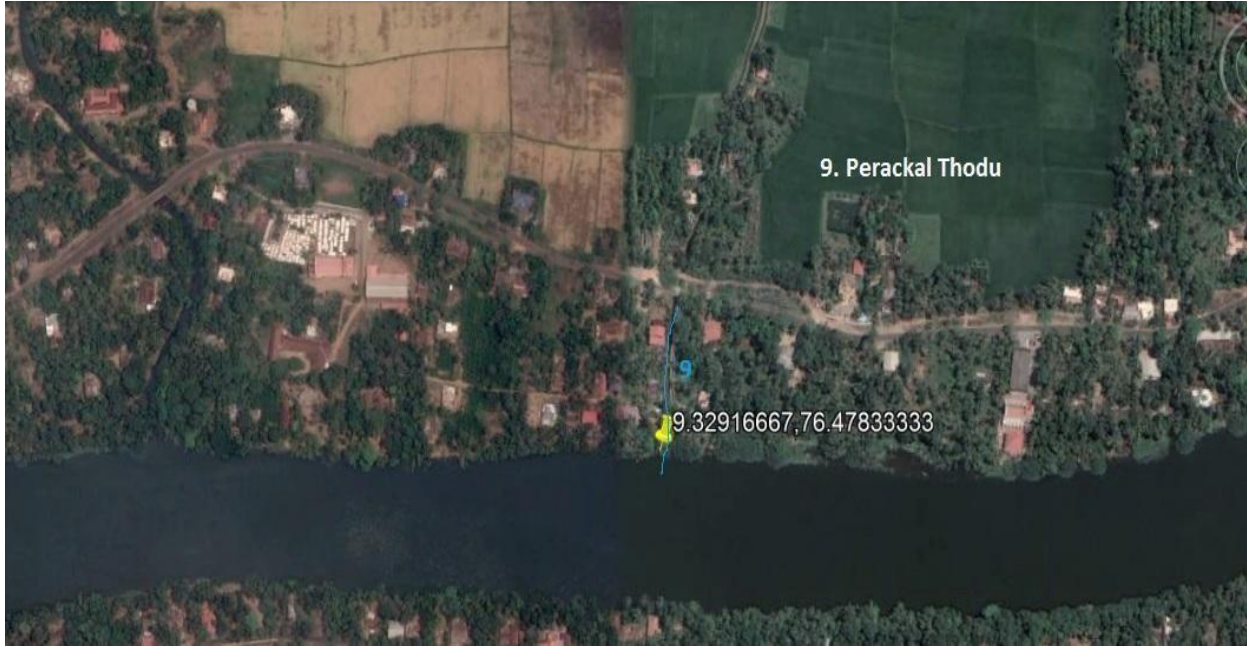
Kuriyathodu



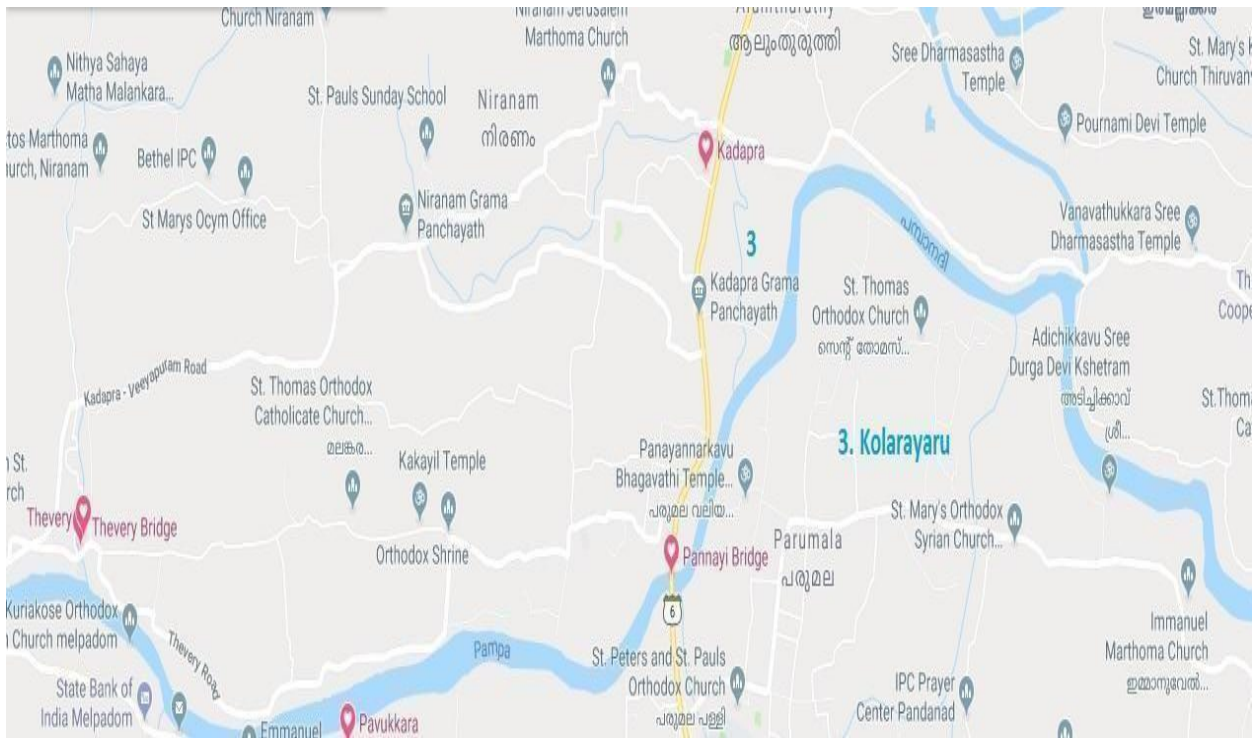
Nochi Thodu



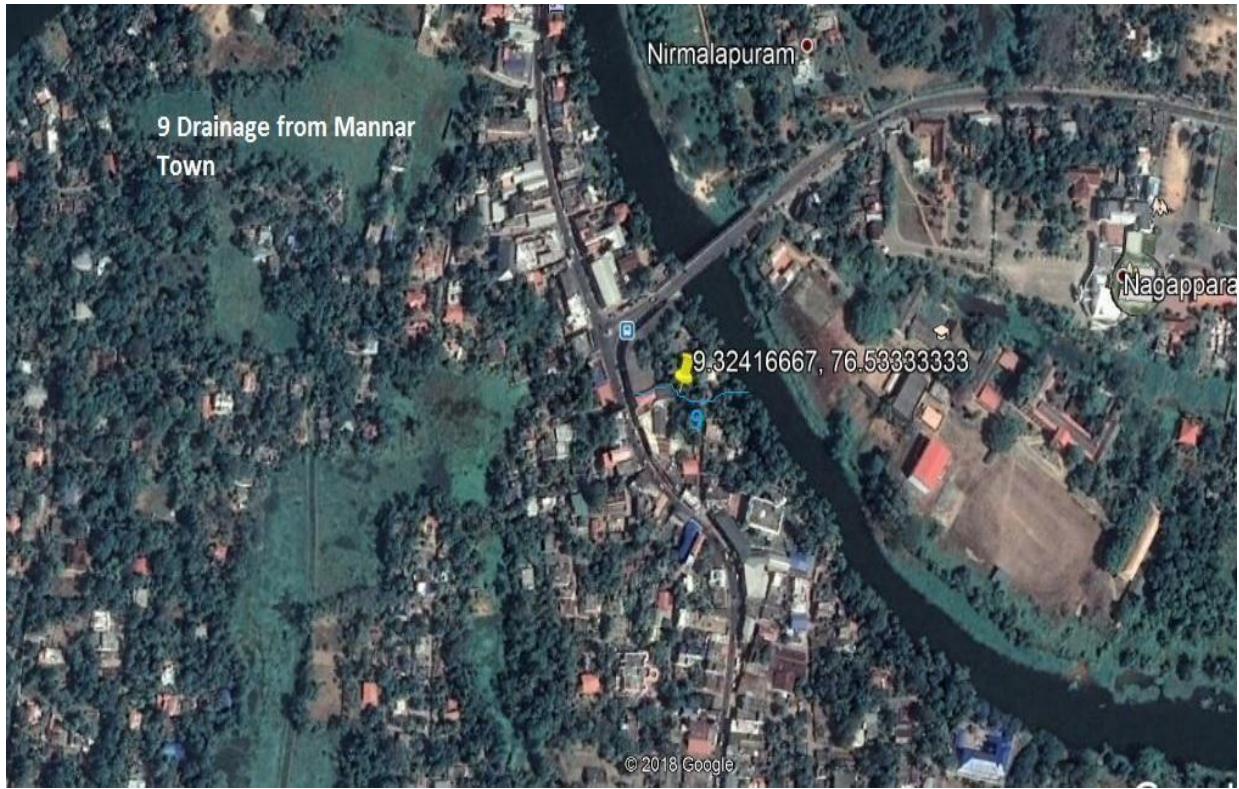
Pattaparambil Thodu



Perackal Thodu



Kolarayaru



Drainage from Mannar Town

ACTION PLAN

Sl. no	Ref Para no.48 item no. as per NGT Order no 673/2018 dated 20.9.2018	Activity	Implementing Agency	Estimated Expenditure in lakhs	Source of fund	Time line	Expected outcome
1	A(a)	No industries	-	-	-	-	-
2	A(a)	Monitoring of river water quality	Kerala State Pollution Control Board	1	Kerala State Pollution Control Board NWMP fund	Continuing project	Regular water quality assessment
3	C(ii)	Establishment of de-centralized solid waste treatment facility	Mannar Panchayat, Kadapra/ Niranam Panchayat	30	Plan/ Central/ State funds	Tentatively 2020-21	Better Solid Waste Management (SWM) reduce the river pollution due to solid waste dumping
4	C	Establishment of Material collection Facility (Solid Waste Management)	Mannar Panchayat, Kadapra/ Niranam Panchayat	10	Own/ Central/ State funds	Tentatively 2020-21	Better Solid Waste Management (SWM) reduce the river pollution due to solid waste dumping
5	C	Resource recovery facility (Solid Waste Management)	Mannar Panchayat, Kadapra/ Niranam Panchayat	8	Own/ Central/ State funds	Tentatively 2020-21	Better Solid Waste Management (SWM) reduce the river pollution due to solid waste dumping

6	C	Installing house hold and community level solid waste management units	Mannar Panchayat	80	Own/ Central/ State funds	Tentatively 2020-21	Better Solid Waste Management (SWM) reduce the river pollution due to solid waste dumping
7	C	Door to Door Collection and Transportation of MSW	Mannar Panchayat	10	User fee / Viability Gap Fund	Tentatively 202-2021	Better Solid Waste Management (SWM) reduce the river pollution due to solid waste dumping
8	E	1. A Squad including Police Officers from Mannar and Pulikkezhu Policestation and public workers is created for preventing pollution of Pamba river 2. Panchayat committee has taken decision to install CC TV Camera on the	Mannar Panchayat	48,000	Own fund	2019	Reduction of river pollution

		bank of river. 3. Information for preventing the pollution of River Pamba has been circulated.					
9	E	1.A Squad including Police Officers from Edathua and Ambalappuzha Policestation and certain public is created for preventing pollution of Pamba River. 2.Panchayat committee has taken decision to install CC TV Camera on the bank of River	Thakazhi Panchayat	2 Lakhs	Plan Fund	2019	Reduction of river pollution
10	E	Citizen Information Boards	Cheruthana Panchayat	3.98 Lakhs	CFC	2019	Reduction of river pollution
11	C	Construction of compound wall with fencing	Panchayat	135.00	To be found	Tentatively 2020-21	Reduce the Tendency of people in throwing waste in to the river

12	C	Removing light jungle and muddies from river courses	Irrigation department	100.00	To be found	Tentatively 2020-21	Maintain better flow of river and self - cleansing
13	C	Electrical-Light arrangements and Surveillance cameras	Irrigation department	50.00	To be found	Tentatively 2020-21	Reduce the tendency of people in throwing waste in to the river
14	C	Regualting activites in flood plain zone, protection and management of flood plain zone	Irrigation department		Government constituted a river basin conservation and management authority and a committee constituted for drafting river basin conservation act	Tentatively 2020-21	Regualting activites in flood plain zone, protection and management of flood plain zone

15	D	Greenery development-Plantation plan. Plantation on both sides of the river, setting up biodiversity parks on flood plains by removing encroachment	Irrigation department	100.00	State Fund	Tentatively 2020-21	Ecofriendly approach will create a positive attitude in public.
16	C (b) (ii)	Green Protocol implementation in all Offices institution & Public function	Mannar , Kadapra/ Niranam Panchayat Panchayat	5	State Plan fund Suchithwa mission	Tentatively 2019-2021	Reduce solid waste generation in Municipality
17	D(a)	Issues relating to E-flow, maintaining minimum environmental flow of river(by Having watershed management provisions)	Irrigation department	50.00	State fund	Tentatively 2020-21	Government constituted a river basin conservation and management authority and a committee constituted for drafting river basin conservation act

18	D (b)	Irrigation practices	Irrigation department	2500.00	State fund	Tentatively 2020-21	Community micro irrigation and Participatory irrigation management
19	E	Awareness programmes for sections of public	Kerala State Pollution Control Board	1.0	Plan Scheme, Suchithwa mission, IEC fund	2019	Awareness of statutory provision of deterrent to pollution
20	C	Management of municipal, plastic Hazardous, Bio medical, and electrical waste	LSGD	50.00	To be funded	-do-	Better solid waste management (SWM) reduce the river pollution due to solid waste Dumping

3.7 LONG TERM ACTION - ENVIRONMENTAL FLOW ASSESSMENT AND MECHANISM FOR IMPLEMENTATION

In order to maintain a natural healthy ecosystem in any river basin, the environmental flows (E Flows) should be maintained. Even though the present proposal is for the abatement of pollution in a particular stretch of Pamba, the scientific assessment of E flows requirement of the basin should also be considered as an important step in the comprehensive rejuvenation of this basin. It includes the identification of the quantity, quality and distribution of flow patterns along the length of the river and it provides a balance between the use and protection of natural water resources for people and biodiversity.

The present stretch is the lowest stretch of the Pamba River. Pollution has to be controlled at the upper stretches in order to minimize pollution in the lower stretch. All the drains flowing in the upper stretches have to be identified. Then only a permanent solution is possible.



