

**ACTION PLAN FOR
RESTORATION OF POLLUTED
STRETCH (HAJIYARPALLI) OF
RIVER KADALUNDY**

PRIORITY V

May 2019

Contents

Executive Summary	3-8
Chapter 1 Introduction	9-11
Chapter 2 Assessment of river water quality	11-27
Chapter 3 Action plan	28-34

Executive Summary

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

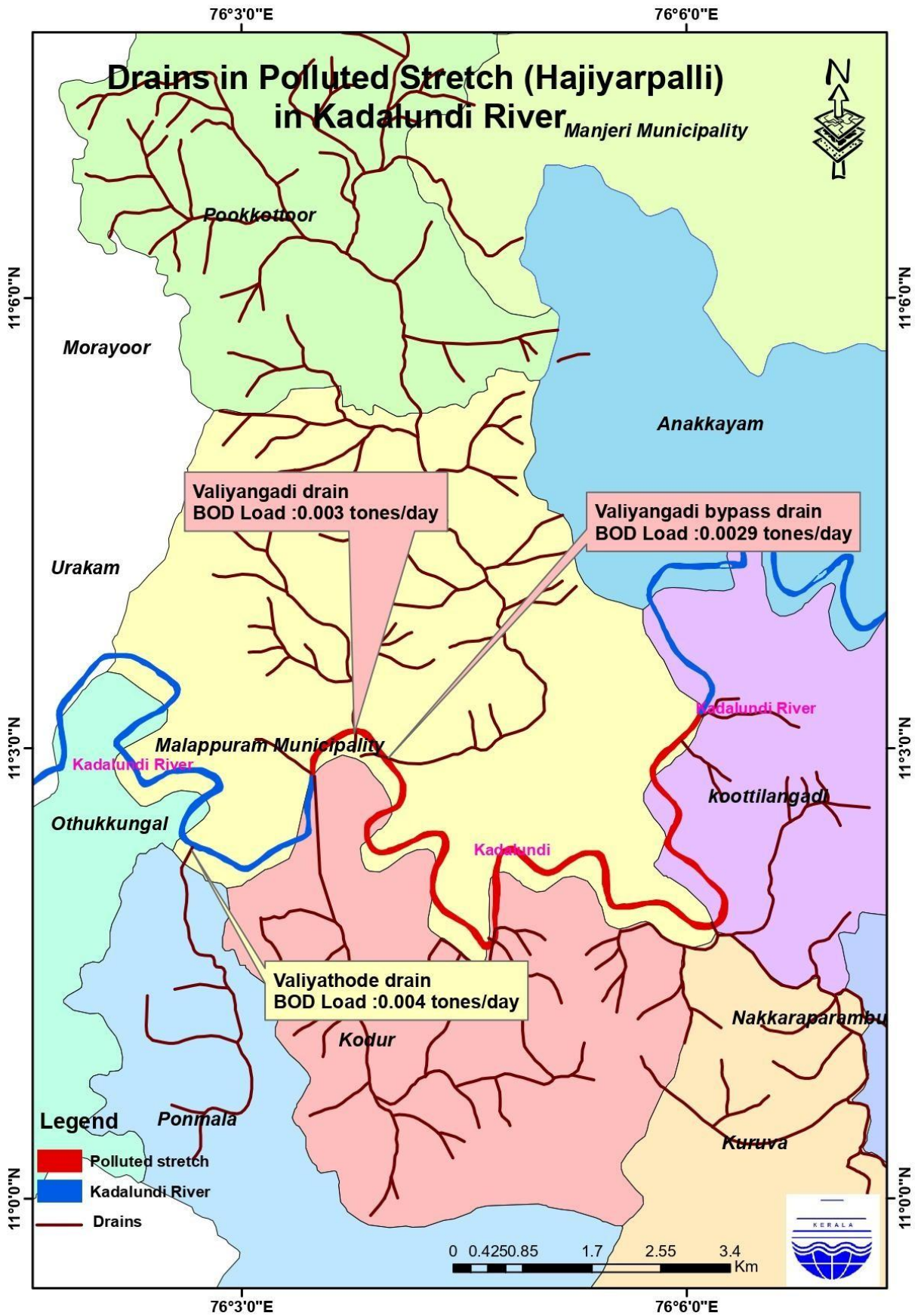
Kadalundy river originates from the western ghats and flows through Malappuram district. A small portion of Kadalundy river flows through Hajiyarpally (Malappuram). It has a length of nearly 120 Km and finally debouches into the Arabian Sea. A famous bird sanctuary is located on the banks of Kadalundi River near Beypore port. It has a length of nearly 120 Km and finally debouches into the Arabian Sea. A famous bird sanctuary is located on the banks of Kadalundi River near Beypore port. It flows through Malappuram Municipality.

Three drains were identified as joining this polluted stretch. The pollution load in terms of BOD was assessed.

SL NO	NAME OF DRAIN	POLLUTION LOAD BOD IN TPD
1	VALIYANGADI DRAIN	0.003
2	VALIYANGADI BYPASS DRAIN	0.0029
3	VALIYATHOD DRAIN	0.004

The river passes through six panchayats and major portion of the identified polluted stretch of kadalundi river at Hajiyarpally flows through Malappuram Municipality.

The map showing the identified drains is attached as below:-



As per the letter number PCB/HO/EE4/RIVER WATER/2019 dated 13.05.2019 Board officers along with official from Suchithwa mission discussed with the Chairperson ,Municipal Secretary and Health officers of Malppuram Municipality regarding the above river polluted stretch. The Municipality informed that they have already taken action for the effective management of liquid waste. The waste water treatment plant is installed at the municipality owned quarters and is about to be operational .For the management of solid waste the action plan has been submitted.An RRF, plastic bailing unit and plastic shredding unit is functioning at the municipal office compound itself, as they faced problem to acquire land due to public protest

2.Malappuram Municipality-Short Term Solid & Liquid Waste Management Action Plan

Sl .No	Ref para No 48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Unit	No. of Units	Costs in Rs.Cr	Fine imposed	Source of fund	Time for completion
1	2.1 (ii)	Slaughter house and Poultry house	1 Under proposal	0	1	12500/-	KIIFB&Suchitwami ssion	JULY2010
2	2.2 (E)	Valiyathodu Cleaning		8 Km length	14,00,000/-		Own fund	completed
3	2.3 (E)	Installation of screening net in the Valiyathode	Installation of screening net	12	10,00,000/-		Plan fund	December 2019
4	2.4A(b)	Identification of polluting points in Kadalundi river & awareness campaign	River walk(puzha nadatham)	15 Km length	NIL	NIL	NIL	completed
5	2.5A(b)	Sanitation facility and treatment of waste water in the markets	Treatment plant	1	28,50,000/-		Plan fund	completed
6	2.6A(b)	The discharge of waste water from the surrounding houses to the Valiyathodu	Blocking of discharge of liquid waste	24	15,260/-		Own fund	completed
7	2.7A(b)	Identification of illegal outlets into strom water			5600/-	10,500/-		continuing

		drains and fine shall be imposed on such units.						
8	2.8 C(ii)	Biodegradable waste	Bio bins	176	4,40,000/-		Plan fund	March 2020
			Bucket compost	269	3,00,000/-		Plan fund	March 2020
			Thumboo rmuzhi Aerobic bins	4	6,49,440/-		Plan fund	March 2020
			Biogas plant	55	8,00,000/-		Plan fund	March 2020
9	2.9 C(ii)	Non biodegradable waste	MCF	5	25,00,000/-		Plan fund	March 2020
			Plastic shudding and bailing	1	12,01,500/-		Plan fund	completed
			Echo kiosk	1	2,00,000/-		Plan fund	March 2020
10	2.10 E	Identification and monitoring of illegal activities	Cctv Network installation	1	8,00,000/-		Plan fund	March 2020

	Ref para No 48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Cost	Implementing agency	Source of fund	Time line
1	2.2.1 C(ii)	River water quality monitoring - Ttirurangadi, Hajiyarpally	10,36,000/-	Kerala State Pollution Control Board	National Water Quality Monitoring Programme (NWMP), CPCB fund	Ongoing; monthly frequency

2	2.2.2 C (ii)	,River water quality monitoring – Ttirurangad,kooriyad, Manikut,Hajiyarpally, Anakkayam,Oravamb rum	1.5 lakhs	Kerala State Pollution Control Board	State Water Monitoring Programme , KSPCB fund (SWMP), KSPCB fund	Ongoing Seasonal monitoring – pre- monsoon, monsoon, post- monsoon
3	2.2.3 A(b)	Inspection and effluent quality monitoring of the flats, industrial units, service stations, hospitals, hotels etc. in Malappuram Municipal area		Kerala State Pollution Control Board	KSPCB funds,	Ongoing Interval: Red – 1 month. Orange – 3 m. Green – 6 m.

Action Plan by Ground Water Department

Sl.No	Ref para No 48 as per NGT Order no 673/2018 dated 20.9.2018	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 (mankada, vengara and malappuram) comes under the Kadalundi river basin. Out of three blocks, malappuram and vengara are semi-critical blocks and the rest is a safe one, stage of groundwater extraction ranges from 69.43 % to 79.84%
2	B(ii)	Ground water recharging / rain water harvesting	The average pre -monsoon groundwater level ranges from 7.59 mbgl - 13.57 mbgl. Groundwater Department has implemented 3 no of roof top rain water recharging through recharge pit schemes in vengara block.
3	B(iii)	Periodic ground water quality assessment and remedial actions in case of contaminated ground water tube wells/bore wells or hand pumps	Groundwater Department has 6 observation dug wells and 14 bore wells in the river stretch. (report attached) (Map No: 7 attached)
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 979.683 - 1857.49 ha.m.

CHAPTER 1

INTRODUCTION

INTRODUCTION

The Kadalundi River is formed by the union of tributaries **Olipuzha and Veliyar** which originate from Cherakombanmala and Erattukombanmala of the silent Valley. It has a length of nearly 120 Km and finally debouches into the Arabian Sea. A famous bird sanctuary is located on the banks of Kadalundi River near Beypore port.

ACTIVITY

There is a kva pumping staton at hajiarpalli

LAND USE

Broadly, four types of landuse can be seen in the district. A large part of the area, especially the coastal tract and the midland areas come under arable land, used for cultivation of different crops, both irrigated and non-irrigated. The coastal tracts are densely inhabited. Forests are seen along the east and north, forming part of tropical evergreen forest supporting a variety of plant and animal life. Cashew and rubber are the main commercial crops of the area. The thick laterite 'duricrust' capping the hillocks generally does not support any vegetation, hence such areas are demarcated as wasteland.

WATERSHED

The main watershed area in Kadalundy river is Anakkayam

ACTUAL USE OF RIVER

Irrigation ,Drinking ,tourism and bathing.

The Kadalundi Bird Sanctuary

The Kadalundi Bird Sanctuary is a most popular tourism site located at the estuary spreading over cluster of islands. The location of Kadalundi Bird Sanctuary is at Kadalundi estuary. There are around hundreds of different varieties of native birds and around sixty different types of migratory birds which reach here annually in a large number.

The Kadalundi Aquatics

The Kadalundi estuary has considerably good fish population as it is in very close to the sea and hence has both fresh and salt water species. There is a large fish worker community here depending on this resource especially species like Poozhan, Thirutha, Malan, Chameen and its different varieties.

The Biodiversity of Kadalundi Estuary

According to the survey conducted by Centre for Environment and Development in 2003, the flora in the Kadalundi Estuary consists of 19 tree species and 180 herbs, shrubs and climbers. The fauna includes 34 species of fish and 34 species of fish and 19 species of insects including 12 butterflies are identified. The kadalundi estuary has very large bird population of about 53 species, birds of the order Charadriiform, particularly Caridae family (Gulls and Terns) dominates the estuary bird community. The other common birds are sand pipers, plovers and stints are the next most numerous forms in that order. These birds mainly stay on mud flats adjacent to the railway bridge, only to feed on the small organisms like worms, crabs and other tiny creatures in the mud flats.

The Kadalundi Vallikkunu Community Reserve

The Kadalundi Vallikkunu Community Reserve is established in this area which covers 1.5 km², with good patches of mangrove forest. Studies carried out by Centre for Environment and Development in 2003, shows that the followed by *Avicennia officinalis*.

Tourism in Kadalundi Estuary

The Kadalundi area is scenically very beautiful with the estuary on one side and the sea on the other and with thick luxuriant mangrove vegetation, where the later is home to a large number of migratory as well as resident birds. Hence Kadalundi hold high tourism potentiality with special thrust to bird watching, game fishing etc. Boating using pedal and row boats is possible in this area. A Biodiversity interpretation centre can be developed with special focus avifauna, mangroves and fishes.

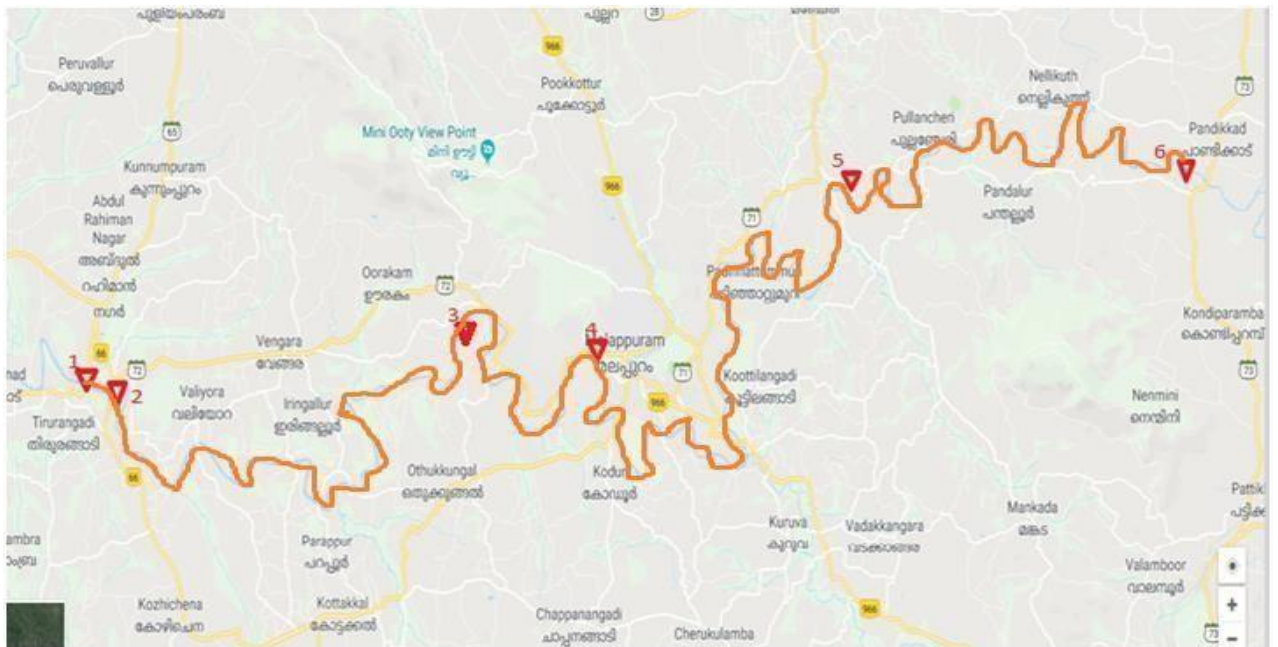
The Kadalundi Bird Sanctuary hill lies in the Malappuram District around 200 m above sea level is a cluster of islands where the Kadalundipuzha River flows into the Arabian Sea. It is 20 km away from Kozhikode city and Karipur International Airport is very near. It has hundred species of native birds and 60 species of migratory birds are recorded it includes terns, gulls, herons, sandpipers and cormorants.

The species like Whimbrels and Brahminy Kites are also here. Sanctuary has a wide variety of fish, mussels and crabs. Valillapuzha is a suburb of Malappuram and the wonderful story behind Valillapuzha lake is a belief and it says it originated within one night made by "Jinns" and the muddy was dropped in another area of vazhakkad formed a kunnu so this area named it as endless river "valillapuzha". Tenhipalam panchayat where the University of Calicut is located and is the first university in Malabar region.

CHAPTER 2

ASSESSMENT OF RIVER WATER QUALITY AT HAJIYARAPPALLY

RIVER MAP OF KADALUNDI RIVER



SAMPLING POINTS:

1. TIRURANGAD
2. KOOIRIYAD
3. MANIKUTH
4. HAJIRAPALLI
5. ANAKKAYAM
6. ORAVAMBRAM

THE ANALYSIS REPORT (PAST 2 YEARS AND RECENT) OF HAJIYARPALLY IS
ATTACHED TO THIS REPORT

2016

PARAMETER S	MONTH											
	JAN	FEB	MARC H L	APRI	MAY	JUNE	JUL Y	AUGUS T	SEP	OCT	NOV	DEC
PH	6.6	6.8	6.9	7.3	6.5	6.7	6.8	6.5	6.4	6.5	6.8	7.5
CONDUCTIV ITY	97	228	2280	10200	16480	160	68	170	130	123	132	227
DO	4	5.8	3.1	3.5	3	3.8	5.7	4.4	6.4	4.5	4.6	2.1
BOD	0.5	1.3	1.1	1.5	1	1.8	2.1	0.2	0.8	1.5	3	2
COD	2.1	6	4.5	6	4	7.5	8.5	1	3.5	6	12	8
TOTAL HARDNESS	14	38	228	400	220	30	22	48	36	28	32	42
SODIUM TOTAL	15.35	36	459.6	2338	3844	35.47	15	13.34	15.5	15.2	20.43	39.84
COLIFORM	120	88	96	100	80	80	128	44	72	60	44	80

2017

PARAMETERS	MONTH											
	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEP	OCT	NOV	DEC
PH	7	6.6	6.9	7.5	7.5	6.5	6.9	6.6	6.6	7	6.9	7.3
CONDUCTIVIT Y	80	88	105.3	124.3	138.6	130	94	86	58	77.01	84	90
DO	6.5	8	5.8	5.5	6.9	6.9	6.8	6.9	6.8	6.1	6.6	5.1
BOD	0.6	0.6	3.6	3.3	1.8	1.2	4.2	0.3	3	1.2	1.2	1.2
COD	2.5	2.5	14.5	13.5	7.5	5	17	1.5	12	5	5	5

TOTAL HARDNES S	24	20	40	40	20	35	30	25	14	27	30	29
SODIUM	8	9.8	11.39	12.5	11.82	14.29		7.56	6.2	7.09	6	7
TOTAL COLIFOR M	240	640	2400	120	40	28	24	440	68	60	104	256

THE WASTE WATER DRAINS TO KADALUNDI RIVER AT HAJIYARPALLI



PARAMETERS	2016			2017			2018		
	MIN.	MAX.	AVE.	MIN.	MAX.	AVE.	MIN.	MAX.	AVE.
PH	6.4	7.1	6.8	6.5	7.5	6.9	6.5	7.3	6.9
CONDUCTIVITY	60	106	75.7	58	138.6	96.3	71	138	99.9
DO	5.6	7.6	6.9	5.1	6.9	6.5	5	86	6.9
BOD	0.3	2.8	1.5	0.3	4.2	1.9	0.2	3.6	1.5
COD	1.5	11.5	6.2	1.5	17	7.6	1	15	7.2
TOTAL HARDNESS	16	34	21.7	14	40	27.8	20	37	27.7
SODIUM	6	39.04	10.7	6	14.29	9.2	3.19	74	15
TOTAL COLIFORM	4	180	79.6	24	2400	368.3	20	240	96.8

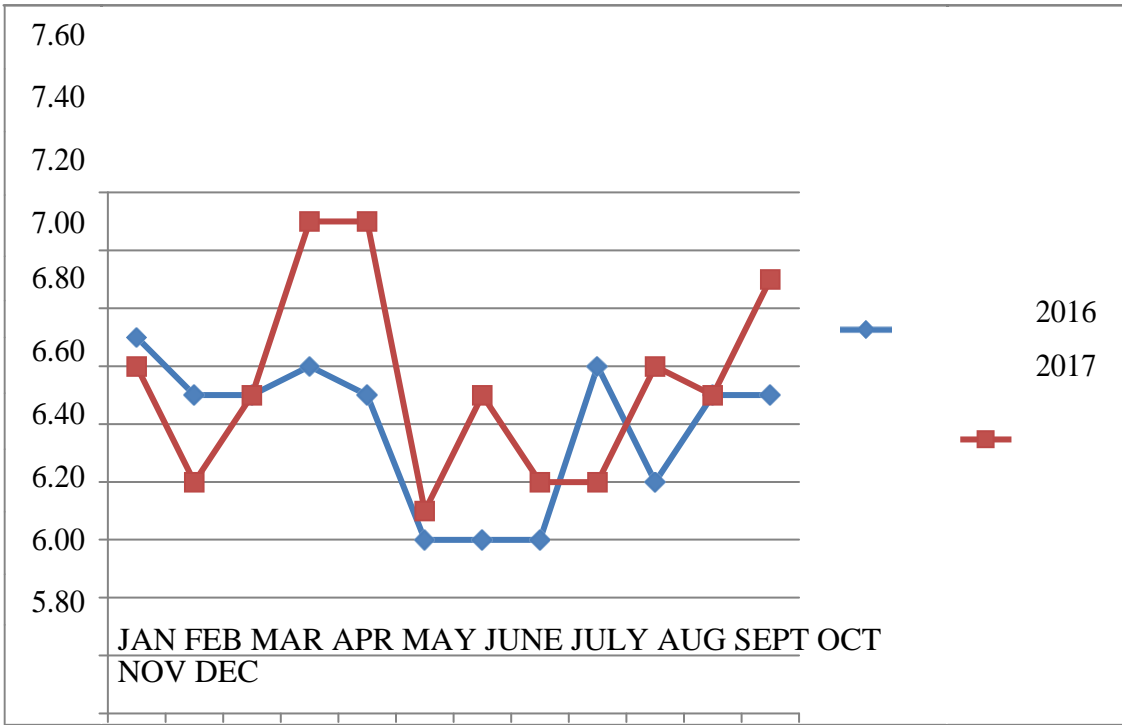




THE GRAPHICAL REPRESENTATION OF KADALUNDY RIVER (HAJIYARPALLI) IS SHOWN BELOW

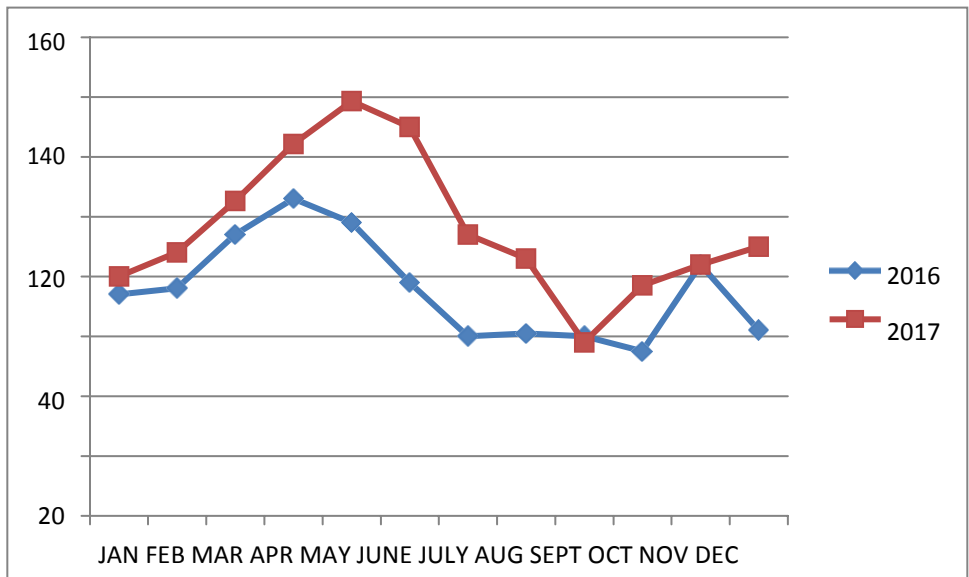
pH

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
2016	7.10	6.90	6.90	7.00	6.90	6.40	6.40	6.40	7.00	6.60	6.90	6.90
2017	7.00	6.60	6.90	7.50	7.50	6.50	6.90	6.60	6.60	7.00	6.90	7.30
2018	6.50	6.90	7.00	7.20	7.00	7.30	7.10	7.00	6.80	7.00	7.00	

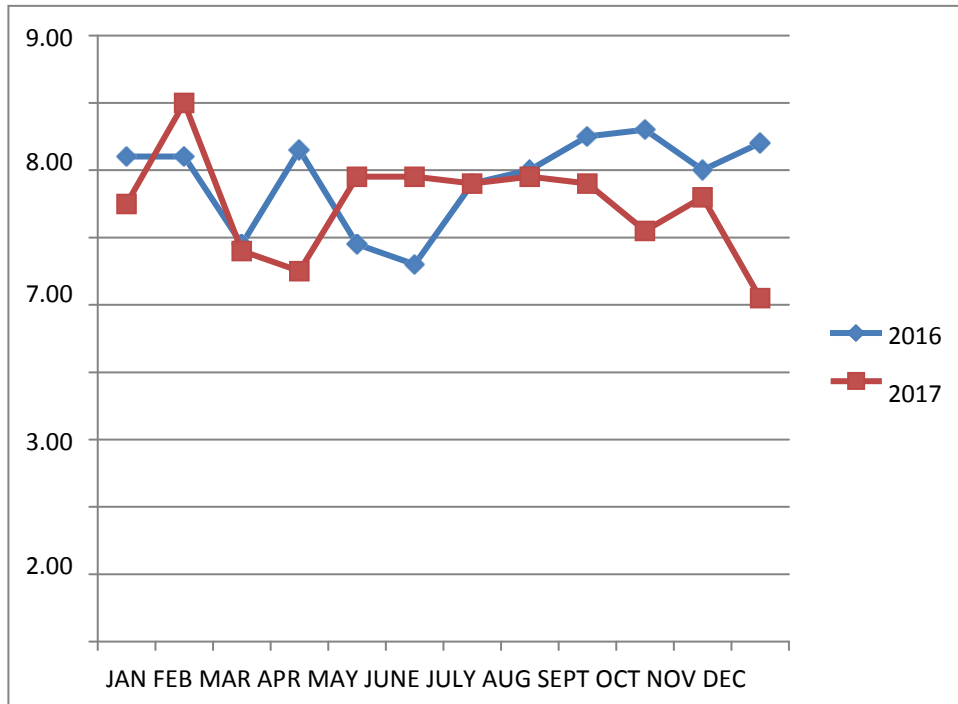


CONDUCTIVITY

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
2016	74	76	94	106	98	78	60	61	60	55	84	62
2017	80	88	105.3	124.3	138.6	130	94	86	58	77.01	84	90
2018	82	100	138	141	133	99	80	71	91	79.49	84	



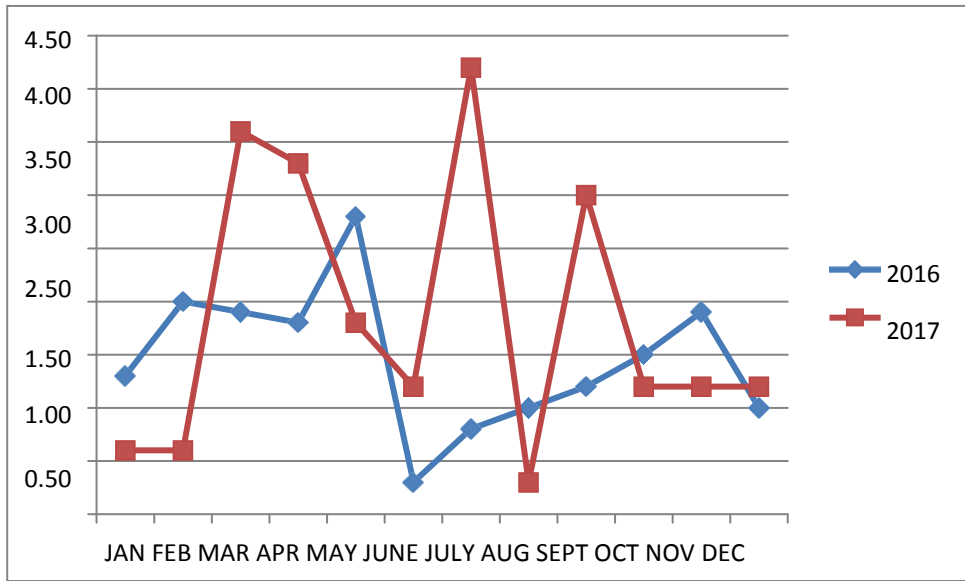
DO



	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
2016	7.20	7.20	5.90	7.30	5.90	5.60	6.80	7.00	7.50	7.60	7.00	7.40
2017	6.50	8.00	5.80	5.50	6.90	6.90	6.80	6.90	6.80	6.10	6.60	5.10
2018	8	6.7	7.5	7.2	5	6.4	7	6	6.7	8.6	7.1	

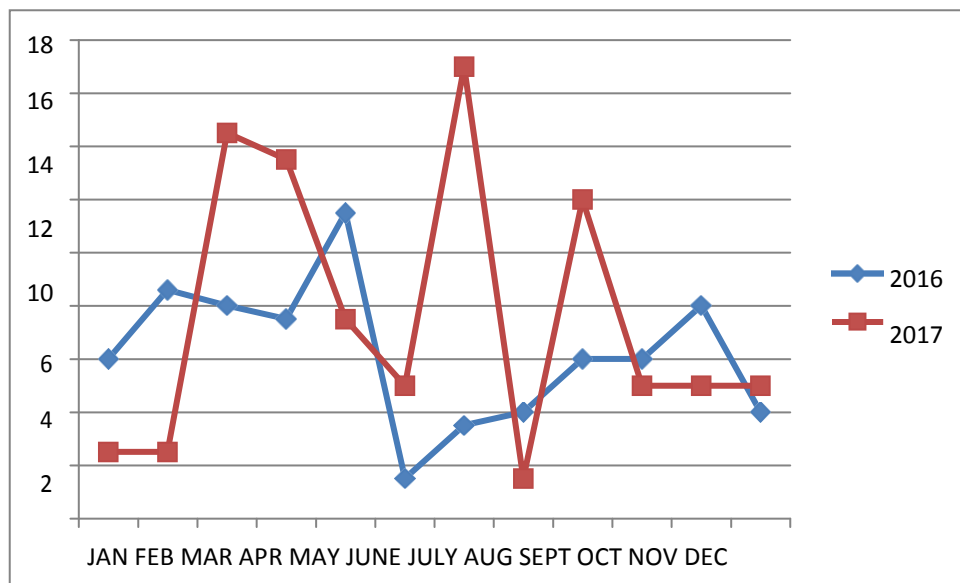
BOD

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
2016	1.30	2.00	1.90	1.80	2.80	0.30	0.80	1.00	1.20	1.50	1.90	1.00
2017	0.60	0.60	3.60	3.30	1.80	1.20	4.20	0.30	3.00	1.20	1.20	1.20
2018	0.4	1.2	1.2	2.2	1.2	3.6	1.6	0.6	2	2.8	0.2	



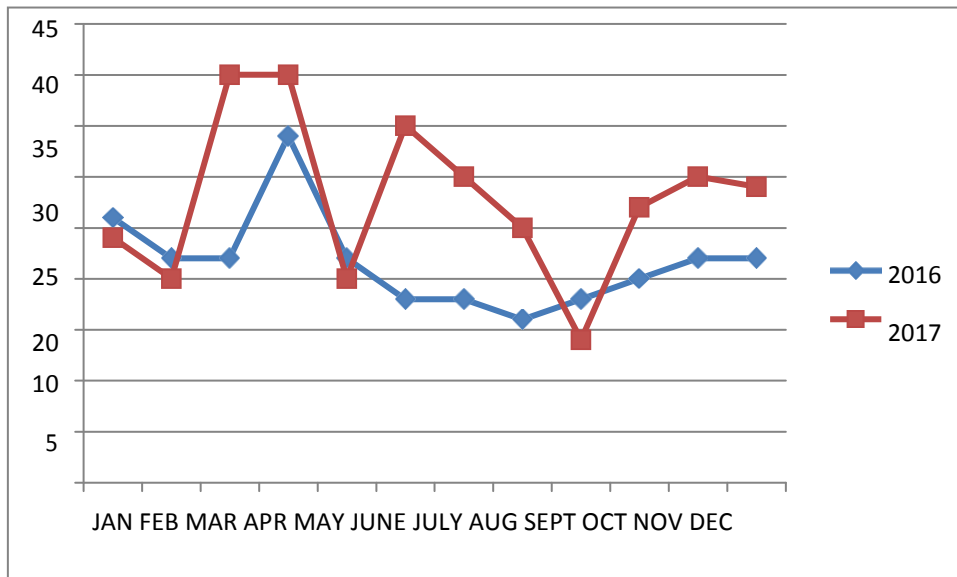
COD

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
2016	6	8.6	8	7.5	11.5	1.5	3.5	4	6	6	8	4
2017	2.5	2.5	14.5	13.5	7.5	5	17	1.5	12	5	5	5
2018	2	5	5	11	11	15	6.5	2.5	8	12	1	



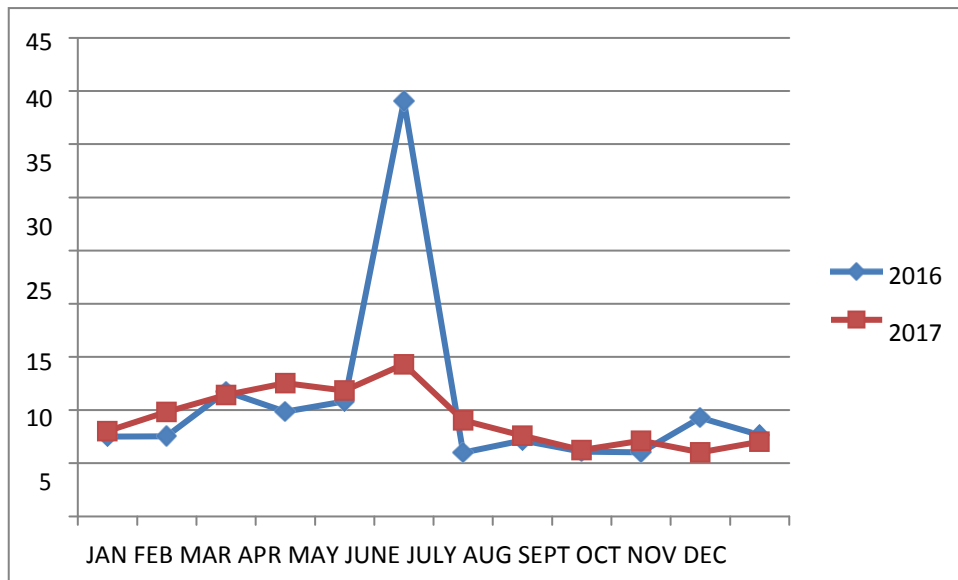
TOTAL HARDNESS

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
2016	26	22	22	34	22	18	18	16	18	20	22	22
2017	24	20	40	40	20	35	30	25	14	27	30	29
2018	26	28	35	35	37	28	26	20	20	22	28	



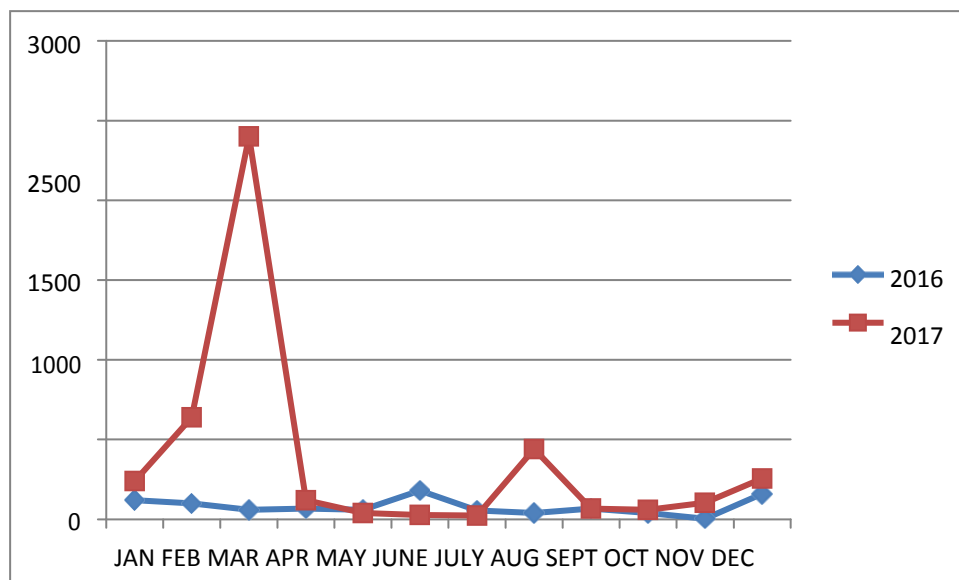
SODIUM

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
2016	7.49	7.52	11.73	9.81	10.8	39.04	5.98	7.12	6.06	6	9.25	7.63
2017	8	9.8	11.39	12.5	11.82	14.29	9	7.56	6.2	7.09	6	7
2018	74	10	12	13	12.2	10	7	7	8.81	7.99	3.19	



TOTAL COLIFORM

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
2016	120	100	60	68	60	180	56	40	68	40	4	160
2017	240	640	2400	120	40	28	24	440	68	60	104	256
2018	100	132	141	180	76	60	40	44	32	20	240	



WATER QUALITY ASSESSMENT

There are six sampling stations in Kadalundi River .They are Thirurangadi, Kooriyad, Manikuth, Hajiyarpalli, Anakkayam and Oravambrum. The point to be studied in Kadalundy river is Hajiyarpalli. There are no industries and factories on the banks of the river. But. two public drainage joining in Hajiyarpalli - Valiyaparambthodu and Thamarakkuzhi.

Temperature of Kadalundi river ranged from 28.5°C to 32.6°C. The pH range suitable for the existence of most biological life is typically 6-9. The value of **pH** of the water vary from 6.4 to 7.5. pH range between 6.5 and 9.5 has been found to be suitable for fish production . The pH values of all the sites during the sampling period were within the prescribed limits (6.5-8.5) as per standards.

The conductivity values in the water samples ranged from 68 to 31000 $\mu\text{S}/\text{cm}$. **Electrical conductivity** . According to BIS standards, the desired limit of electrical conductivity of river water is 50 to 3000 $\mu\text{S}/\text{cm}$. From the result of the present study, it is noticed that conductivity of the water samples at various sites of Tirur River are not exceeding the desired limit.

Total hardness in the river varies from 10mg/L to 40 mg/L. Total hardness of surface water varied according to seasons. The analysis revealed that the total hardness of water is within the desirable limit .

Dissolved oxygen concentration ranges from 5 to 8.8 mg/L in the study. The low levels of DO concentration in the fresh water aquatic systems is an indication of high levels of organic pollution. During summer, dissolved oxygen concentration is low in this stretch. From this it is clear that Kadalundi River water is unfit for the survival of aquatic life in summer season.

BOD ranges from 0.3-4.2mg/l. The highest value 4.4 mg/L is obtained in June 2018.

Total Coliform value ranges from 12 to 2400 TC/100ml in 2017 .E.coli in fresh water indicates the presence of pathogens from animal or human feces. The higher value of coliform bacteria and organic pollution is mainly due to the discharge of waste water from market,hotels auditorium,residential buildings etc in malappuram town directly through the public drain/ small drains which joins into the river. From the periodical monitoring data of 2016 to 2018 the NWMP station at Hajiyarpally in kadalundi River, it can be observed that, the BOD values are well within limits over the entire period and never exceeding the allowable limits. The decrease in drinking quality of river water arises due to presence of coli forms which indicate chances of pollution due to fecal contamination. This is not a permanent problem, and may be time specific, which can be easily alienat. KSPCB is regularly monitoring six stations under NWMP and SWMP in the Kadalundy river.The monitoring results for the past two years is attached as below:-

TABLE 1.ANALYSIS REPORT HAJIYARPALLY (KADALUNDY RIVER)

MONTHS	.HAJIYARPALLY 2017					.HAJIYARPALLY 2018				
	PARAMETERS					PARAMETERS				
	PH	CONDUCTIVITY	DO	BOD	TC	PH	CONDUCTIVITY	DO	BOD	TC
JANUARY	7	80	6.5	0.6	240	6.5	82	8	0.4	100
FEBRUARY	6.6	88	8	0.6	640	6.9	100	6.7	1.2	132
MARCH	6.9	105	5.8	3.6	2400	7	138	7.5	1.2	141
APRIL	7.5	124	5.5	3.3	120	7.2	141	7.2	2.2	110
MAY	7.5	139	6.9	1.8	40	7	133	5	1.2	76
JUNE	6.5	130	6.9	1.2	28	7.3	99	6.4	3.6	60
JULY	6.9	94	6.8	4.2	24	7.1	80	7	1.6	40
AUGUST	6.6	86	6.9	0.3	440	7	71	6	0.6	44
SEPTEMBER	6.6	58	6.8	3	68	6.5	91	6.7	2	32
OCTOBER	7	77	6.1	1.2	27	7	79.49	8.6	2.8	20
NOVEMBER	6.9	84	6.6	1.2	104	7	84	7.1	0.2	240
DECEMBER	7.3	90	5.1	1.2	256	7	111	7.6	1.4	120

TABLE .2 The analysis report for the past four months is attached as below(2019 JANUARY TO APRIL)

MONTHS	PH	CONDUCTIVITY	DO	BOD	TC
JANUARY	6.7	87	8.3	1.4	44
FEBRUARY	7.5	169	6.5	1.3	24
MARCH	7	114	8.3	1.9	40
APRIL	7.5	169	6.5	1.3	24

From the analysis report ,Kadalundy river at Hajiyarpally is not highly polluted.

ACTION PLAN

- Common sewage treatment facility must be provided in malappuram municipality.
- Control of non point pollution from agricultural runoff, human defecation, cattle wallowing into the river.
- Development to conserve the biotic diversity of the river to augment its productivity.
- Special meetings of Gramasabhas of all wards situated on the banks of the kadalundi river and its Tributaries would be convened to carry out awareness programs.
- Police and health departments would keep an eye on the river to prevent dumping of waste.
- To tighten the vigil against illegal sand mining from the river.
- To restrict or ban if necessary entry of tourist to the region during summer.

CHAPTER 3

ACTION PLAN FOR KADALUNDI RIVER

Kadalundy river originates from the western ghats and flows through Malappuram district. A small portion of Kadalundy river flows through Hajiyarpally (Malappuram)

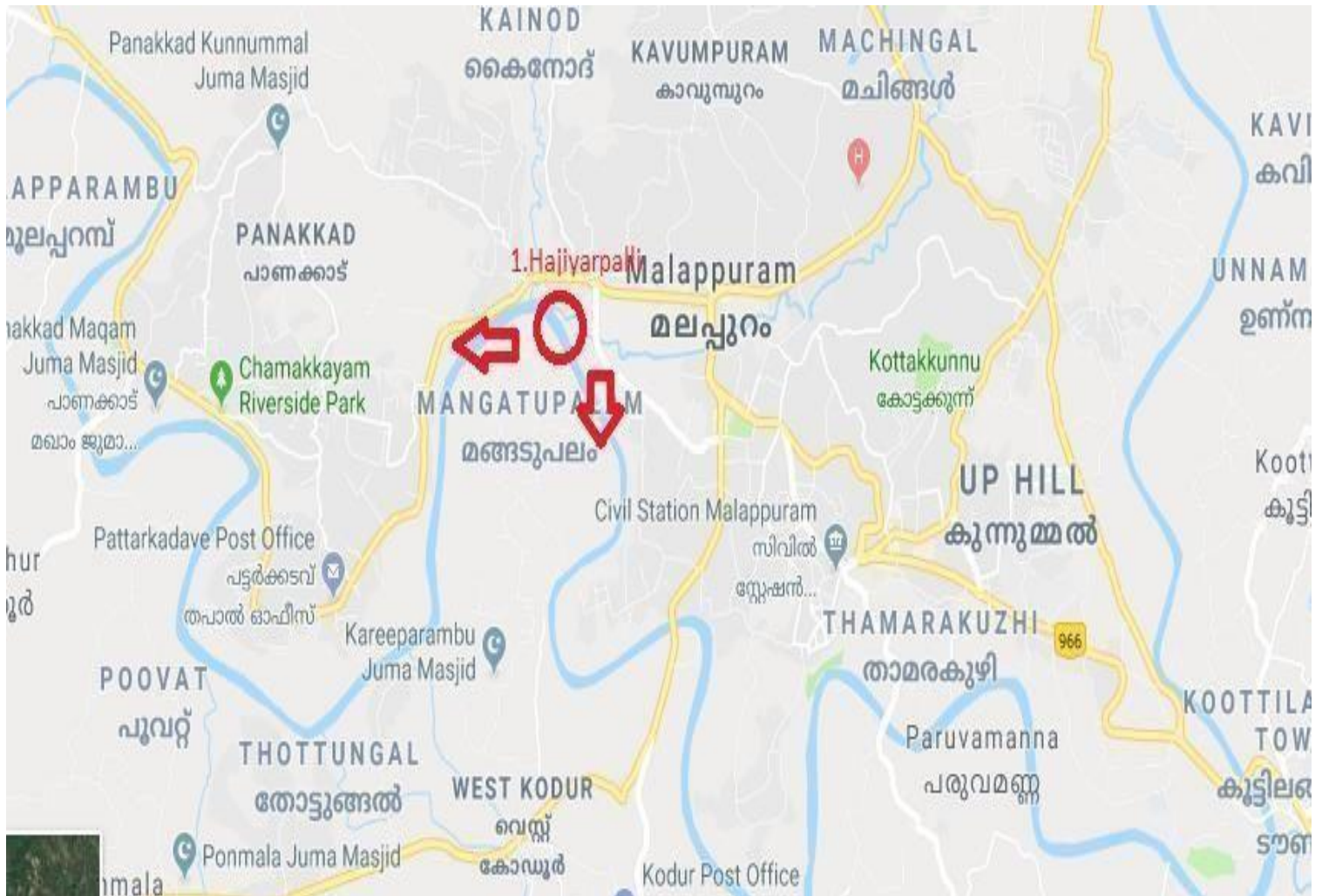
KSPCB identified three drains and their pollution load were assessed, which is attached as below:-

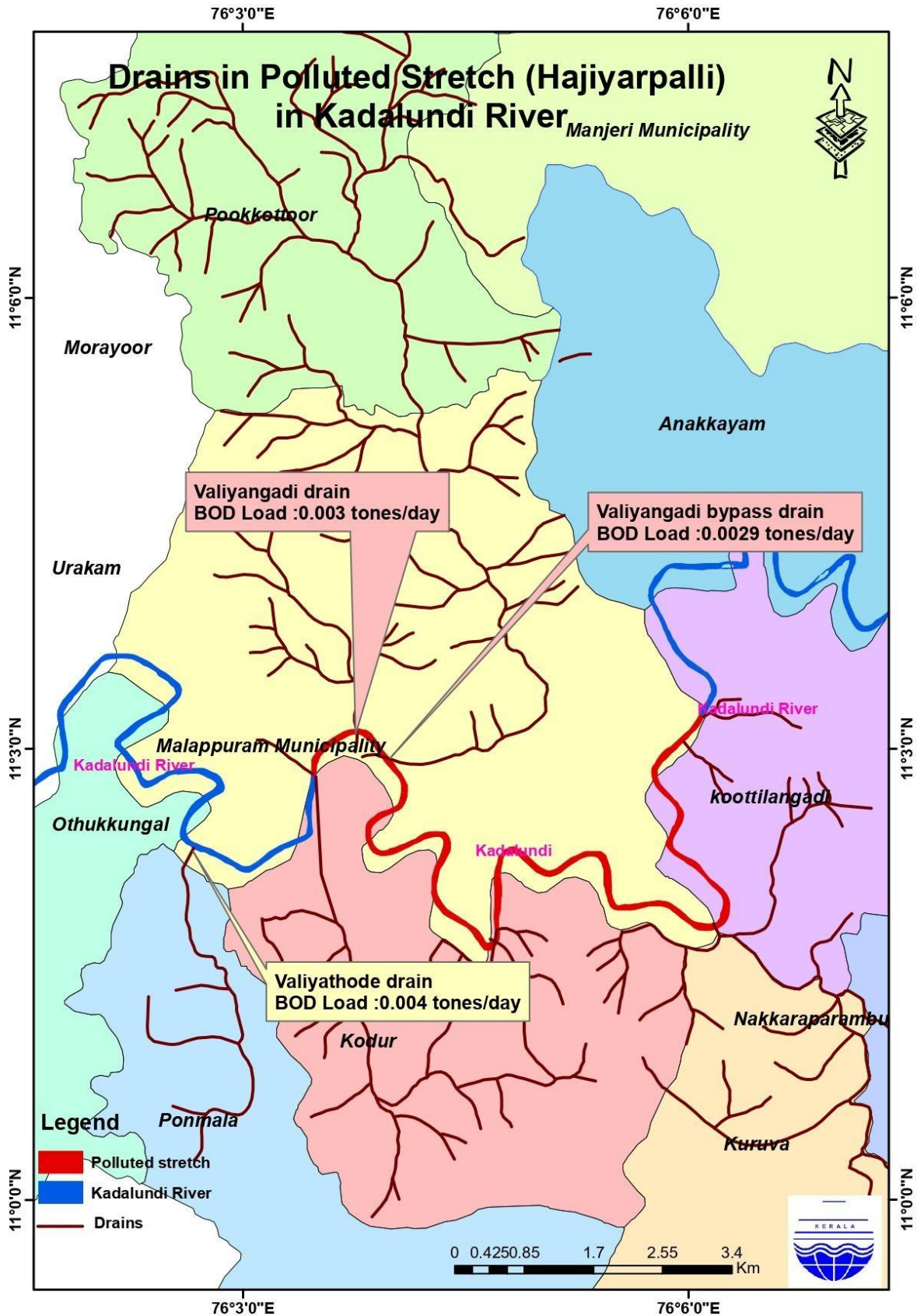
TABLE 3.

SL NO	NAME OF DRAIN	POLLUTION LOAD BOD IN TPD
1	VALIYANGADI DRAIN	0.003
2	VALIYANGADI BYPASS DRAIN	0.0029
3	VALIYATHOD DRAIN	0.004

The river passes through six panchayats and major portion of the identified polluted stretch of kadalundi river at Hajiyarpally flows through Malappuram Municipality.

The map showing the identified drains is attached as below:-





As per the letter number PCB/HO/EE4/RIVER WATER/2019 dated 13.05.2019 Board officers along with official from Suchithwa mission discussed with the Chairperson ,Municipal Secretary and Health officers of Malpppuram Municipality regarding the above river polluted stretch. The Municipality informed that they have already taken action for the effective management of liquid waste. The waste water treatment plant is installed at the municipality owned quarters and is about to be operational .For the management of solid waste the action plan has been submitted.An RRF, plastic bailing unit and plastic shredding unit is functioning at the municipal office compound itself, as they faced problem to acquire land due to public protest .

The draft action plan is attached.

2.Malappuram Municipality-Short Term Solid & Liquid Waste Management Action Plan

Sl .No	Ref para No 48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Unit	No. of Units	Costs in Rs.Cr	Fine imposed	Source of fund	Time for completion
1	2.1 (ii)	Slaughter house and Poultry house	1 Under proposal	0	1	12500/-	KIIFB&Suchitwami ssion	JULY2010
2	2.2 (E)	Valiyathodu Cleaning		8 Km length	14,00,000/-		Own fund	completed
3	2.3 (E)	Installation of screening net in the Valiyathode	Installati on of screening net	12	10,00,000/-		Plan fund	December 2019
4	2.4A(b)	Identification of polluting points in Kadalundi river & awareness campaign	River walk(puz ha nadatham)	15 Km length	NIL	NIL	NIL	completed
5	2.5A(b)	Sanitation facility and treatment of waste water in the markets	Treatment plant	1	28,50,000/-		Plan fund	completed
6	2.6A(b)	The discharge of waste water from the surrounding houses to the Valiyathodu	Blocking of discharge of liquid waste	24	15,260/-		Own fund	completed

7	2.7A(b)	Identification of illegal outlets into storm water drains and fine shall be imposed on such units.			5600/-	10,500/-		continuing
8	2.8 C(ii)	Biodegradable waste	Bio bins	176	4,40,000/-		Plan fund	March 2020
			Bucket compost	269	3,00,000/-		Plan fund	March 2020
			Thumboo rmuzhi Aerobic bins	4	6,49,440/-		Plan fund	March 2020
			Biogas plant	55	8,00,000/-		Plan fund	March 2020
9	2.9 C(ii)	Non biodegradable waste	MCF	5	25,00,000/-		Plan fund	March 2020
			Plastic shudding and bailing	1	12,01,500/-		Plan fund	completed
			Echo kiosk	1	2,00,000/-		Plan fund	March 2020
10	2.10 E	Identification and monitoring of illegal activities	Cctv Network installation	1	8,00,000/-		Plan fund	March 2020

Sl No	Ref para No 48 as per NGT Order no 673/2018 dated 20.9.2018	Activity	Cost	Implementing agency	Source of fund	Time line
1	2.2.1 C(ii)	River water quality monitoring - Ttirurangadi, Hajaripally	10,36,000/-	Kerala State Pollution Control Board	National Water Quality Monitoring Programme (NWMP), CPCB fund	Ongoing; monthly frequency

2	2.2.2 C (ii)	,River water quality monitoring – Ttirurangad,kooriyad, Manikut,Hajiyarpally, Anakkayam,Oravamb rum	1.5 lakhs	Kerala State Pollution Control Board	State Water Monitoring Programme , KSPCB fund (SWMP), KSPCB fund	Ongoing Seasonal monitoring – pre-monsoon, monsoon, post-monsoon
3	2.2.3 A(b)	Inspection and effluent quality monitoring of the flats, industrial units, service stations, hospitals, hotels etc. in Malappuram Municipal area		Kerala State Pollution Control Board	KSPCB funds,	Ongoing Interval: Red – 1 month. Orange – 3 m. Green – 6 m.

Action Plan by Ground Water Department

Sl.No	Ref para No 48 as per NGT Order no 673/2018 dated 20.9.2018	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 (mankada, vengara and malappuram) comes under the Kadalundi river basin. Out of three blocks, malappuram and vengara are semi-critical blocks and the rest is a safe one, stage of groundwater extraction ranges from 69.43 % to 79.84%
2	B(ii)	Ground water recharging / rain water harvesting	The average pre -monsoon groundwater level ranges from 7.59 mbgl - 13.57 mbgl. Groundwater Department has implemented 3 no of roof top rain water recharging through recharge pit schemes in vengara block.
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 6 observation dug wells and 14 bore wells in the river stretch. (report attached) (Map No: 7 attached)
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 979.683 - 1857.49 ha.m.