

**Mapping Coastal Wetlands of Kerala using
high-resolution satellite data**

Final Report

Project sponsored by Kerala state Biodiversity Board

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Introduction

The Salim Ali Centre has earlier web enabled the inland wetlands. This was done by taking advantage of the existing wetland maps at 1:12500 scale. Coastal Wetlands of Kerala include the back waters, estuaries, mudflats, mangroves and other wetlands in the CRZ boundary (500 M from HTL). These have not been mapped to a very high resolution (1:4000 or better). For effective conservation monitoring, these data and information is very vital and also offer a people oriented and user friendly features. High resolution satellite images combined with open source GIS tools offer a great opportunity to institutionalize coastal area wetland conservation and wise use. Moreover, in line with GoK's policy of using Free and open source software, the proposed project is highly pertinent and has a tremendous demonstrative value for other Natural Resource Management as well. The project has the origins specifically due to a request received from the Kerala State Biodiversity Board.

Objectives

- To map the coastal wetlands of Kerala at 1:4000 scale or better.
- The coastal ecosystems which would include the mangroves, estuaries, mud flats, sea shore, vegetation, plantations, and wetlands within 500 m zone of CRZ.

Methodology

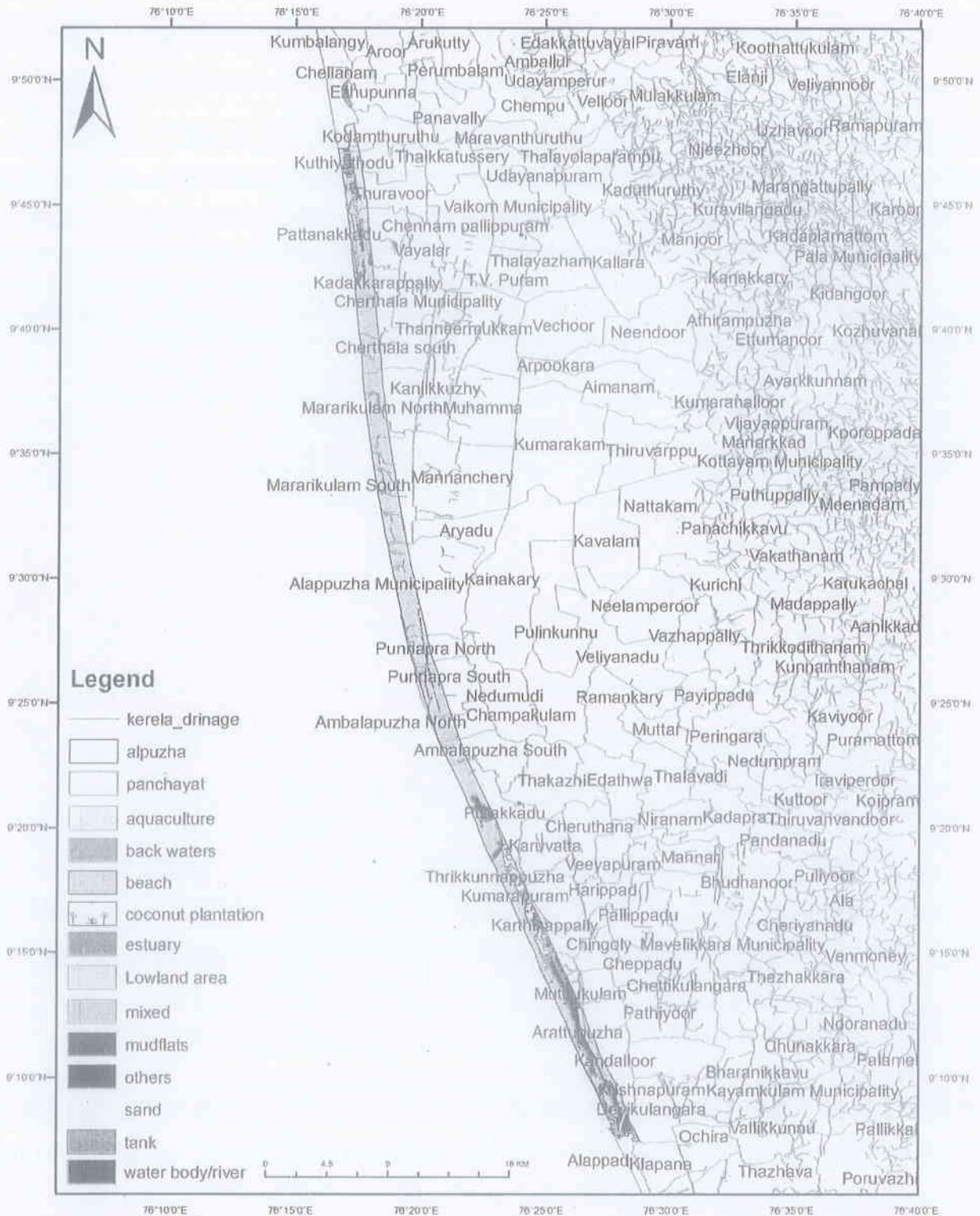
The Google earth images are captured and made jpegs. All the images are rectified by using rectified IRS LISS III dataset. All images are mosaic district wise to bring one image which is useful for mapping the entire coast. The downloaded datasets are made UTM projection and WGS84 datum. The buffer of 1.5 km from the coast was made. The coastal wetland features like beach, back water, mangrove, coastal pond, ditches, swamps, sand, saltpan etc. were delineated. The high tide line zone (500 m) from the coast was marked to know the vulnerability.

Results and Discussion

Mapping of coast area from 1.5 km from the coast is completed. Different wetland classes were delineated and checked with other available literature and images. The area statistics for all 9 districts has been given below. A total of 83394.8 ha area were mapped as river followed by 8817.9 ha, water logged area (180 ha), low land area (197 ha), mangroves (116 ha), back waters (123.1 ha), aquaculture (680 ha). The coconut plantation, plantation and other areas like power plants, construction sites etc. are separately mapped. All coastal wetlands 1.5 km from the coast has been mapped and presented in the last. District wise wetlands were mapped and presented below. Panchayat administrative layers were overlaid on wetland mapping and the respective wetlands

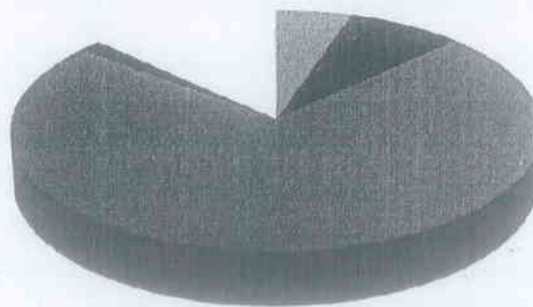
coming under the Panchayat was delineated and given below for all districts. There are total 9 coastal districts are there in Kerala. There is a 1.5 km buffer made from the coast and high tide line zone demarcated.

Coastal wetland map of Alappuzha district



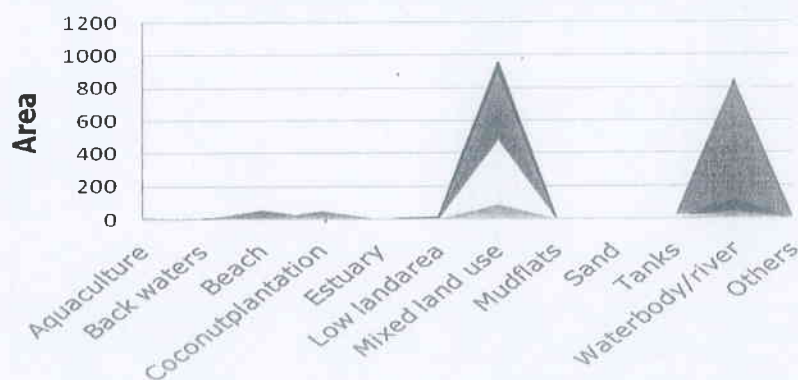
Alappuzha district statistics

Aquaculture	558.85
Back waters	32.44
Beach	161.99
Canal	0.00
Coconut plantation	562.63
Estuary	6.85
Lowland area	105.70
Mangroves	0.00
Mixed Land use	8037.82
Mudflats	18.70
Plantation	0.00
Sand	3.09
Tank	181.74
Water body/river	1387.68
Waterlogged	0.00
Sea	0.00
Others	18.96
Total(Hectares)	11076.44

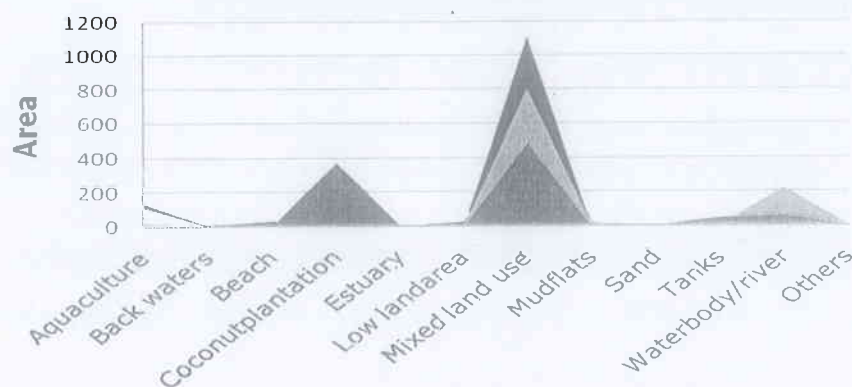


■ Aquaculture(5.05%)
■ Back waters(0.29%)
■ Beach(1.46%)
■ Canal(0.00%)
■ Coconut plantation(5.08%)
■ Estuary(0.06%)
■ Lowland area(0.95%)
■ Mangroves(0.00%)
■ Mixed(72.57%)
■ Mudflats(0.17%)
■ Plantation(0.00%)
■ Sand(0.03%)
■ Tank(1.64%)
■ Water body/river(12.53%)
■ Waterlogged(0.00%)
■ Sea(0.00%)
■ Others(0.17%)

Panchayat level statistics of Alappuzha district



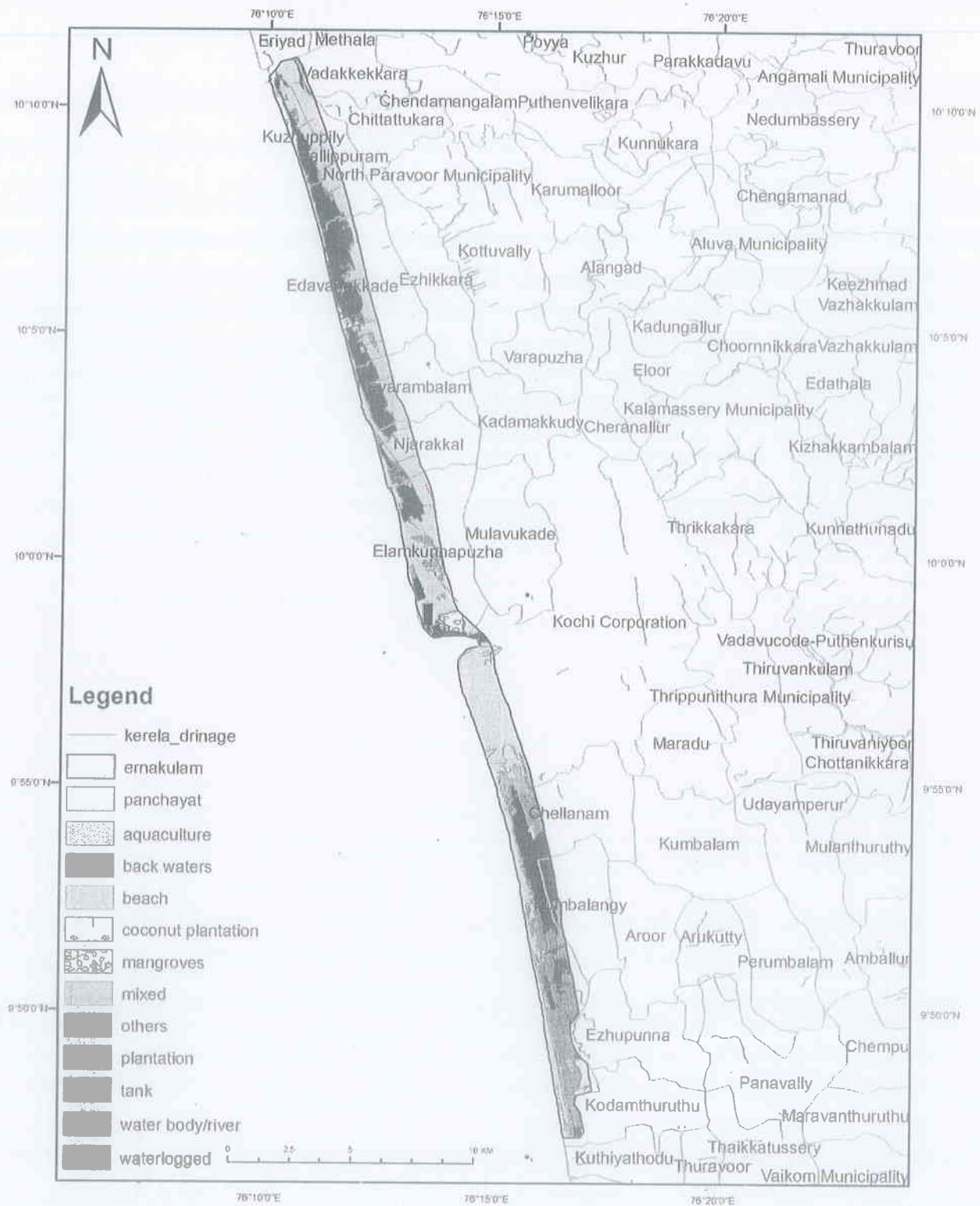
Panchayat level statistics of Alappuzha district

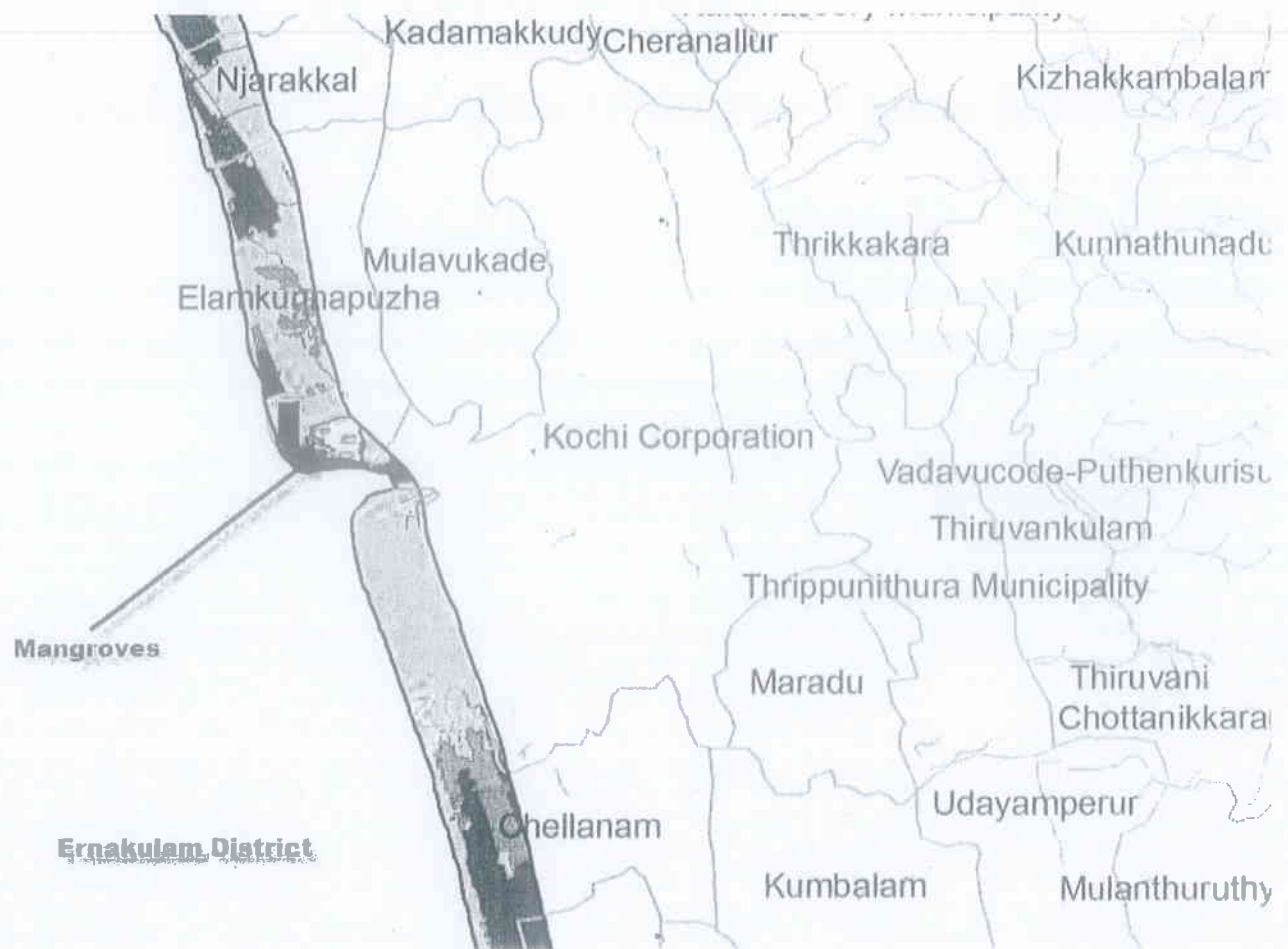


Panchayat level statistics of Alappuzha district

Panchayats	Aquaculture	Back waters	Beach	Coconut plantation	Estuary	Lowland area	Mixed Land use	Mudflats	Sand	Tank	Water body Or river	Others
Alappuzha Municipality	0.00	4.49	24.48	0.00	0.00	14.12	952.93	0.00	0.00	0.00	0.00	0.00
Ambalapuzha North	0.00	0.00	11.00	0.00	0.00	0.00	269.99	0.00	0.00	0.84	0.00	0.00
Ambalapuzha South	0.00	0.00	2.20	0.00	0.00	0.00	255.35	0.00	0.00	0.51	0.00	0.00
Arattupuzha	0.00	0.00	58.72	8.67	1.15	0.00	902.15	0.00	3.09	13.55	855.96	18.96
Cherthala south	0.00	5.45	0.15	0.00	0.00	0.00	663.62	0.00	0.00	0.00	0.00	0.00
Devikulangara	0.00	0.00	0.00	11.48	0.00	0.00	20.66	0.00	0.00	0.00	115.39	0.00
Ezhupunna	16.70	0.00	0.00	2.11	0.00	0.00	0.00	0.00	0.00	1.58	43.93	0.00
Kadakkarappally	10.39	0.00	0.00	0.00	0.00	0.00	475.78	0.00	0.00	28.23	15.54	0.00
Kandalloor	0.00	0.00	0.00	0.00	0.00	0.00	84.02	0.00	0.00	0.00	0.00	0.00
Karthikappally	0.00	0.00	0.00	51.09	0.00	0.00	0.00	0.00	0.00	6.89	18.79	0.00
Kodamthuruthu	130.25	0.00	0.13	0.00	0.00	0.00	13.14	0.00	0.00	3.22	14.72	0.00
Kuthiyathodu	84.42	0.00	0.00	0.00	0.00	0.00	56.95	0.00	0.00	3.55	8.41	0.00
Mararikulam North	0.00	6.32	0.19	0.00	0.00	0.00	667.04	0.00	0.00	0.00	0.00	0.00
Mararikulam South	0.00	10.57	0.94	0.00	0.00	0.00	1105.50	0.00	0.00	0.00	0.00	0.00
Muthukulam	0.00	0.00	0.00	0.00	0.00	0.00	31.67	0.00	0.00	0.00	0.00	0.00
Pattanakkadu	106.92	0.00	3.24	5.35	0.00	55.40	292.08	0.00	0.00	28.15	18.39	0.00
Punnappra North	0.00	2.03	26.58	0.00	0.00	13.20	289.23	0.00	0.00	0.00	0.00	0.00
Punnappra South	0.00	3.58	28.50	0.00	0.00	22.99	533.74	0.00	0.00	0.43	0.00	0.00
Purakkadu	17.93	0.00	4.25	104.61	5.13	0.00	798.00	18.70	0.00	3.60	217.31	0.00
Thrikkunnappuzha	0.00	0.00	0.52	368.45	0.00	0.00	485.70	0.00	0.00	43.16	58.75	0.00
Thuravoor	192.24	0.00	1.09	10.88	0.57	0.00	140.27	0.00	0.00	48.05	20.50	0.00
Total	558.86	32.44	161.99	562.63	6.85	105.70	8037.82	18.70	3.09	181.74	1387.68	18.96

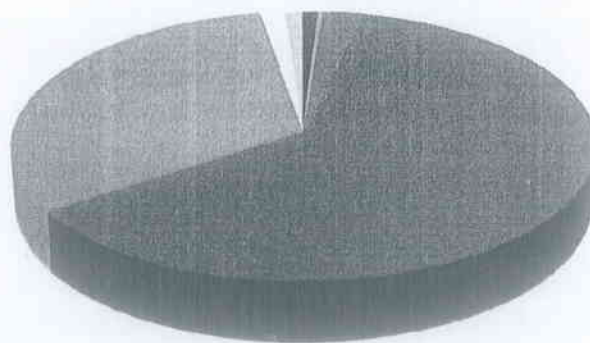
Coastal wetland map of Ernakulum district





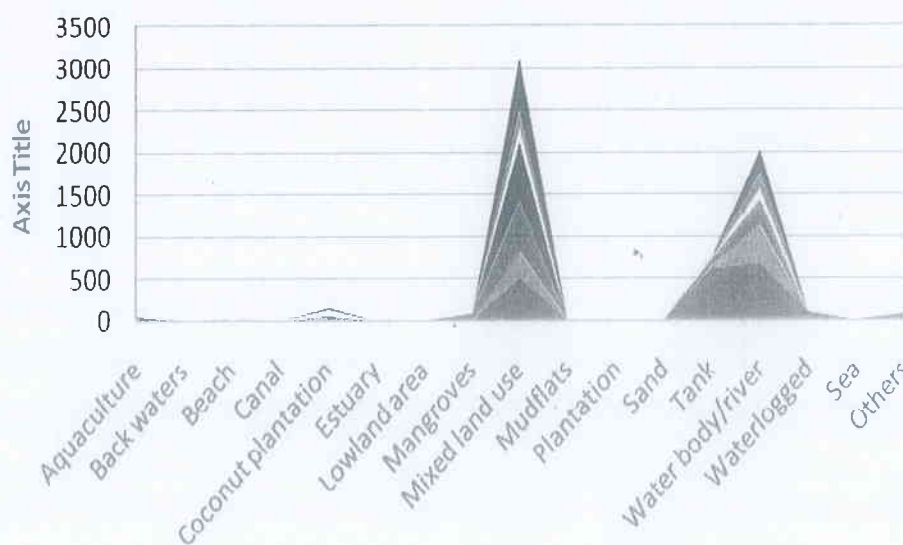
Ernakulam district statistics

Aquaculture	60.60
Back waters	0.23
Beach	13.40
Canal	0.00
Coconut plantation	158.24
Estuary	0.00
Lowland area	0.00
Mangroves	72.29
Mixed land use	3131.21
Mudflats	0.00
Plantation	1.25
Sand	0.00
Tank	751.55
Water body/river	2034.31
Waterlogged	92.93
Sea	0.00
Others	71.04
Total(Hectares)	6387.06



- Aquaculture(0.95%)
- Back waters(0.00%)
- Beach(0.21%)
- Canal(0.00%)
- Coconut plantation(2.48%)
- Estuary(0.00%)
- Lowland area(0.00%)
- Mangroves(1.13%)
- Mixed(49.02%)
- Mudflats(0.00%)
- Plantation(0.02%)
- Sand(0.00%)
- Tank(11.77%)
- Water body/river(31.85%)
- Waterlogged(1.46%)
- Sea(0.00%)
- Others(1.11%)

Panchayat level statistics of Ernakulam district

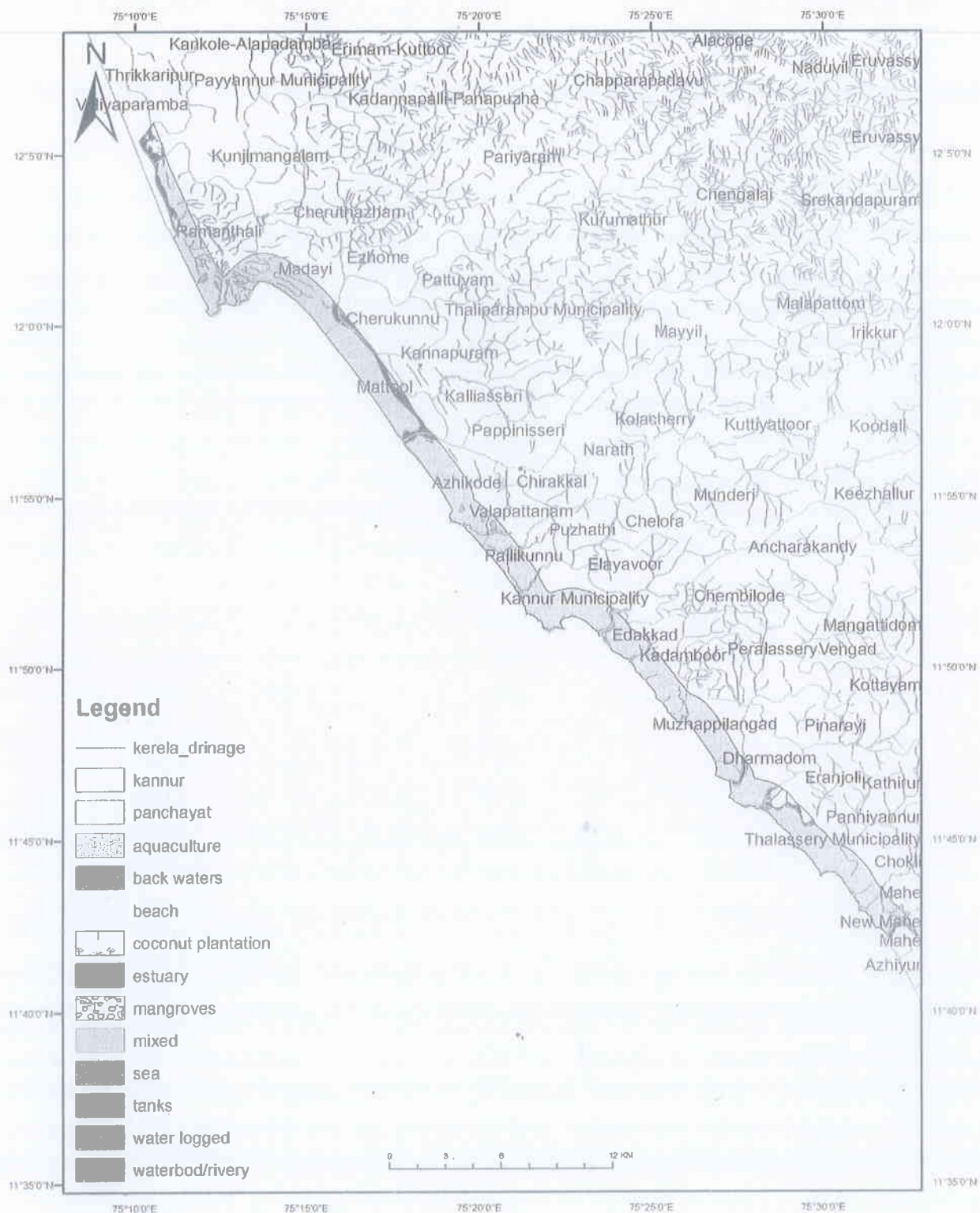


- Vadakkekara
- Pallippuram
- Njarakkal
- Nayarambalam
- Kuzhuppily
- Kumbalangy
- Kochi Corporation
- Elamkunnappuzha
- Edavanakkade

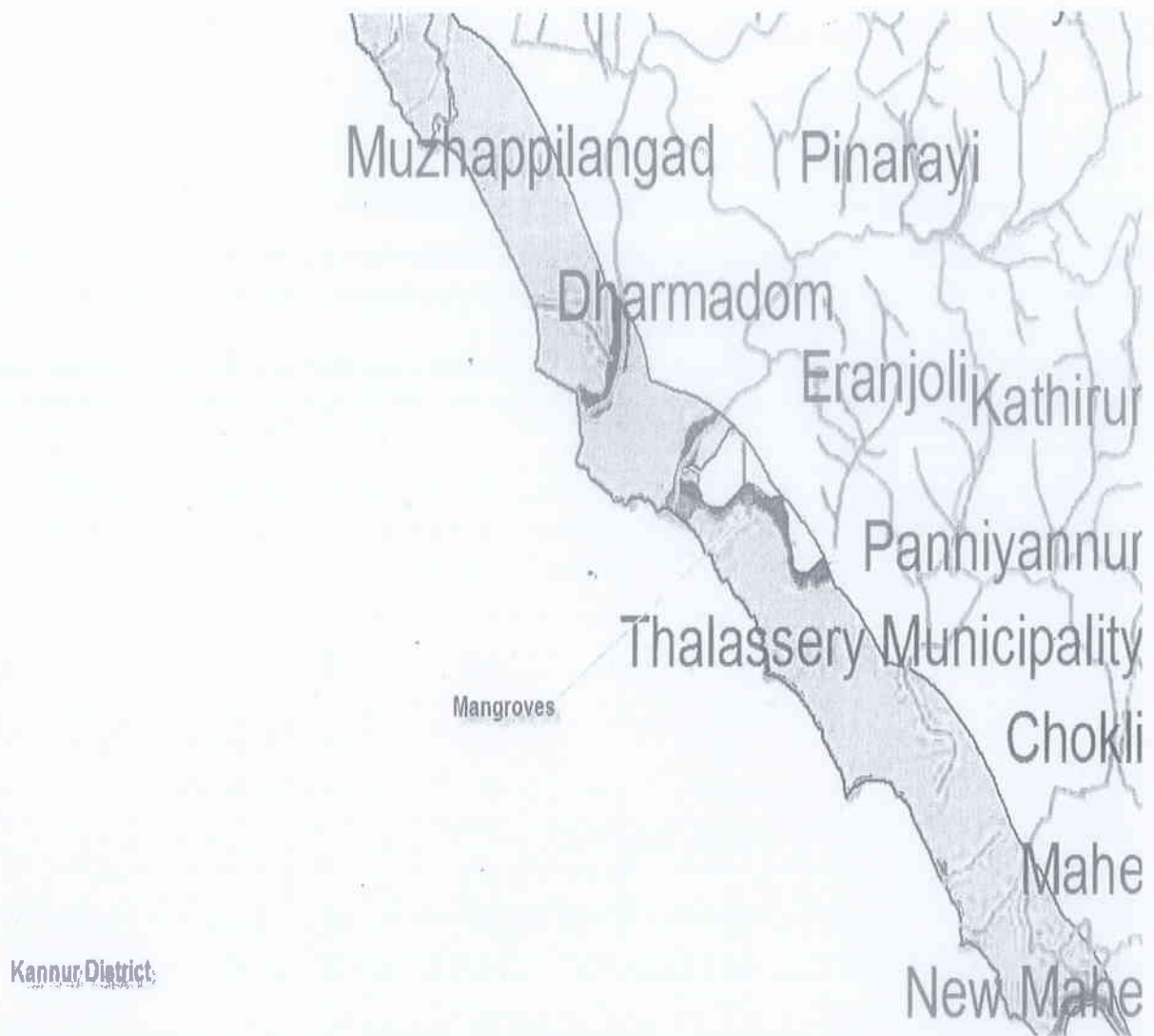
Panchayat level statistics of Ernakulum district

Panchayats	Aquaculture	Back waters	Beach	Coconut plantation	Mangroves	Mixed land use	Plantation	Tank	Water body Or river	Waterlogged	Others
Chellanam	60.60	0.23	1.75	0.00	0.00	514.90	0.49	628.27	678.90	92.93	0.00
Chittattukara	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.10	0.00	0.00
Edavanakkade	0.00	0.00	0.36	65.41	0.00	301.56	0.76	18.64	439.79	0.00	0.00
Elamkunnappuzha	0.00	0.00	7.31	0.00	71.49	613.08	0.00	65.33	171.73	0.00	71.04
Kochi Corporation	0.00	0.00	1.00	0.00	0.00	691.95	0.00	0.00	32.77	0.00	0.00
Kumbalangy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.82	107.99	0.00	0.00
Kuzhuppilly	0.00	0.00	0.00	62.23	0.00	172.83	0.00	8.55	131.86	0.00	0.00
Nayarambalam	0.00	0.00	1.61	0.00	0.00	198.83	0.00	0.00	196.66	0.00	0.00
Njarakkal	0.00	0.00	0.64	0.00	0.00	253.02	0.00	3.82	92.39	0.00	0.00
Pallippuram	0.00	0.00	0.73	30.60	0.80	373.51	0.00	4.13	169.32	0.00	0.00
Vadakkekara	0.00	0.00	0.00	0.00	0.00	11.35	0.00	0.00	12.81	0.00	0.00
Total	60.60	0.23	13.40	158.24	72.29	3131.21	1.25	751.55	2034.31	92.93	71.04

Coastal wetland map of Kannur district

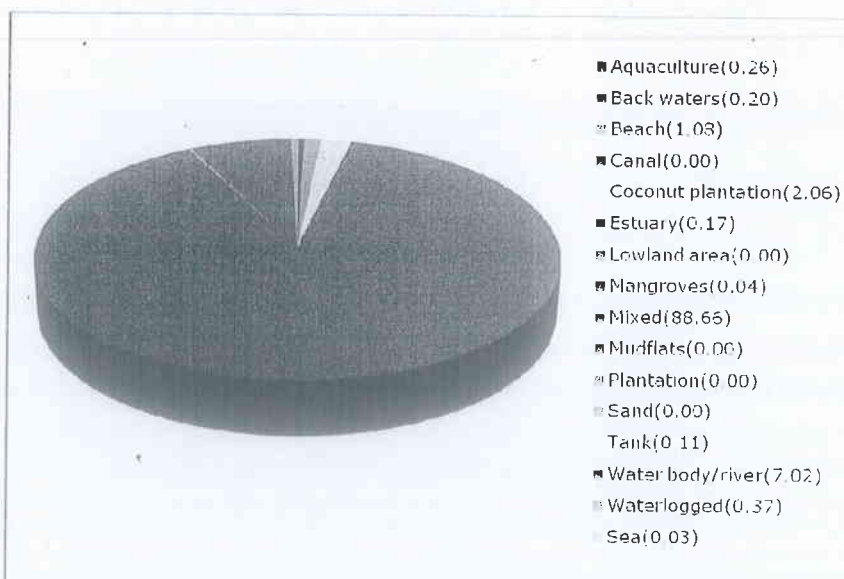


Mangroves in Kannur District

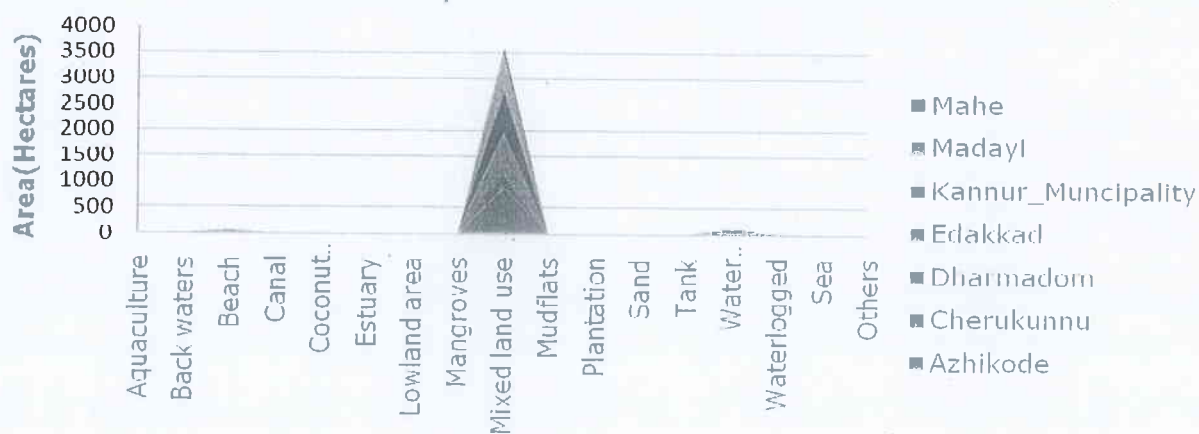


Kannur district statistics

Aquaculture	23.68
Back waters	17.77
Beach	96.93
Canal	0.00
Coconut plantation	185.90
Estuary	15.29
Lowland area	0.00
Mangroves	3.17
Mixed	7986.81
Mudflats	0.00
Plantation	0.00
Sand	0.00
Tank	10.08
Water body/river	632.62
Waterlogged	33.25
Sea	3.09
Others	0.00
Total(Hectares)	9008.61



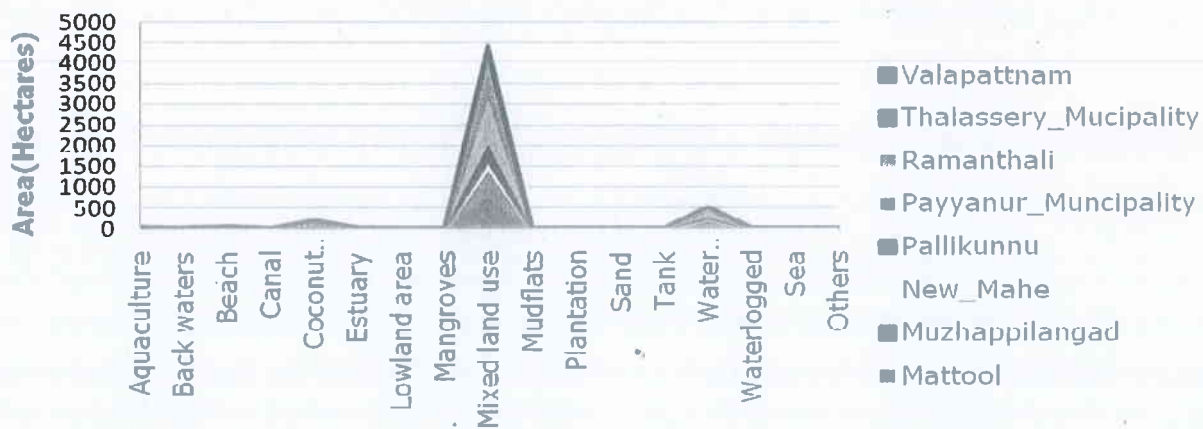
Panchayat level statistics of Kannur district



Panchayat level statistics of Kannur district

This stacked area chart illustrates the land use distribution across various Panchayats in Kannur district. The Y-axis measures the area in hectares, ranging from 0 to 5000. The X-axis lists different land use categories. The legend identifies eight Panchayats: Valapattanam, Thalassery_Municipality, Ramanthali, Payyanur_Municipality, Pallikunnu, New_Mahe, Muzhappilangad, and Mattool.

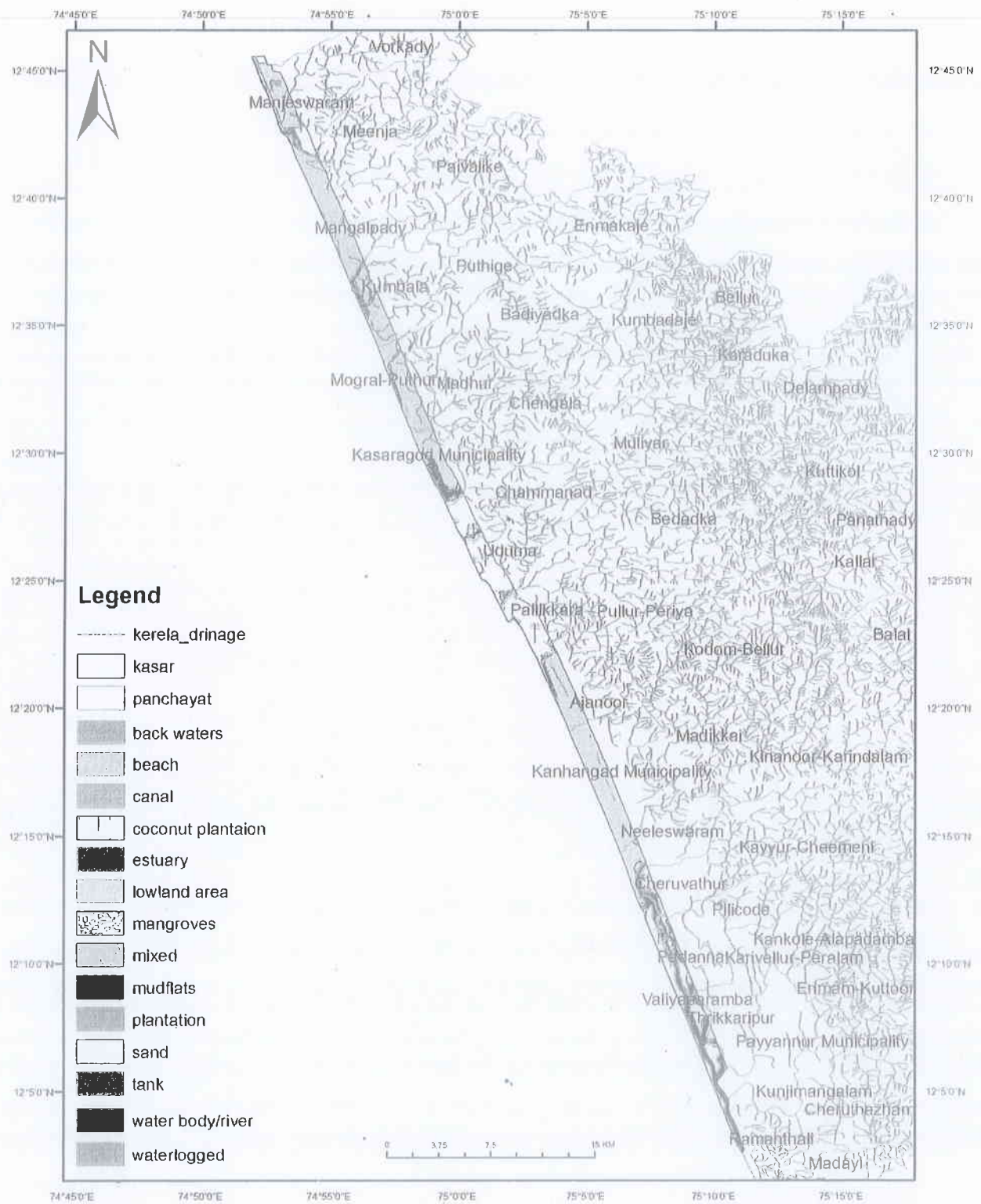
Land Use Category	Valapattanam	Thalassery_Municipality	Ramanthali	Payyanur_Municipality	Pallikunnu	New_Mahe	Muzhappilangad	Mattool
Aquaculture	0	0	0	0	0	0	0	0
Back waters	0	0	0	0	0	0	0	0
Beach	0	0	0	0	0	0	0	0
Canal	0	0	0	0	0	0	0	0
Coconut..	0	0	0	0	0	0	0	0
Estuary	0	0	0	0	0	0	0	0
Lowland area	0	0	0	0	0	0	0	0
Mangroves	0	0	0	0	0	0	0	0
Mixed land use	0	0	0	0	0	0	0	0
Mudflats	0	0	0	0	0	0	0	0
Plantation	0	0	0	0	0	0	0	0
Sand	0	0	0	0	0	0	0	0
Tank	0	0	0	0	0	0	0	0
Water..	0	0	0	0	0	0	0	0
Waterlogged	0	0	0	0	0	0	0	0
Sea	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0



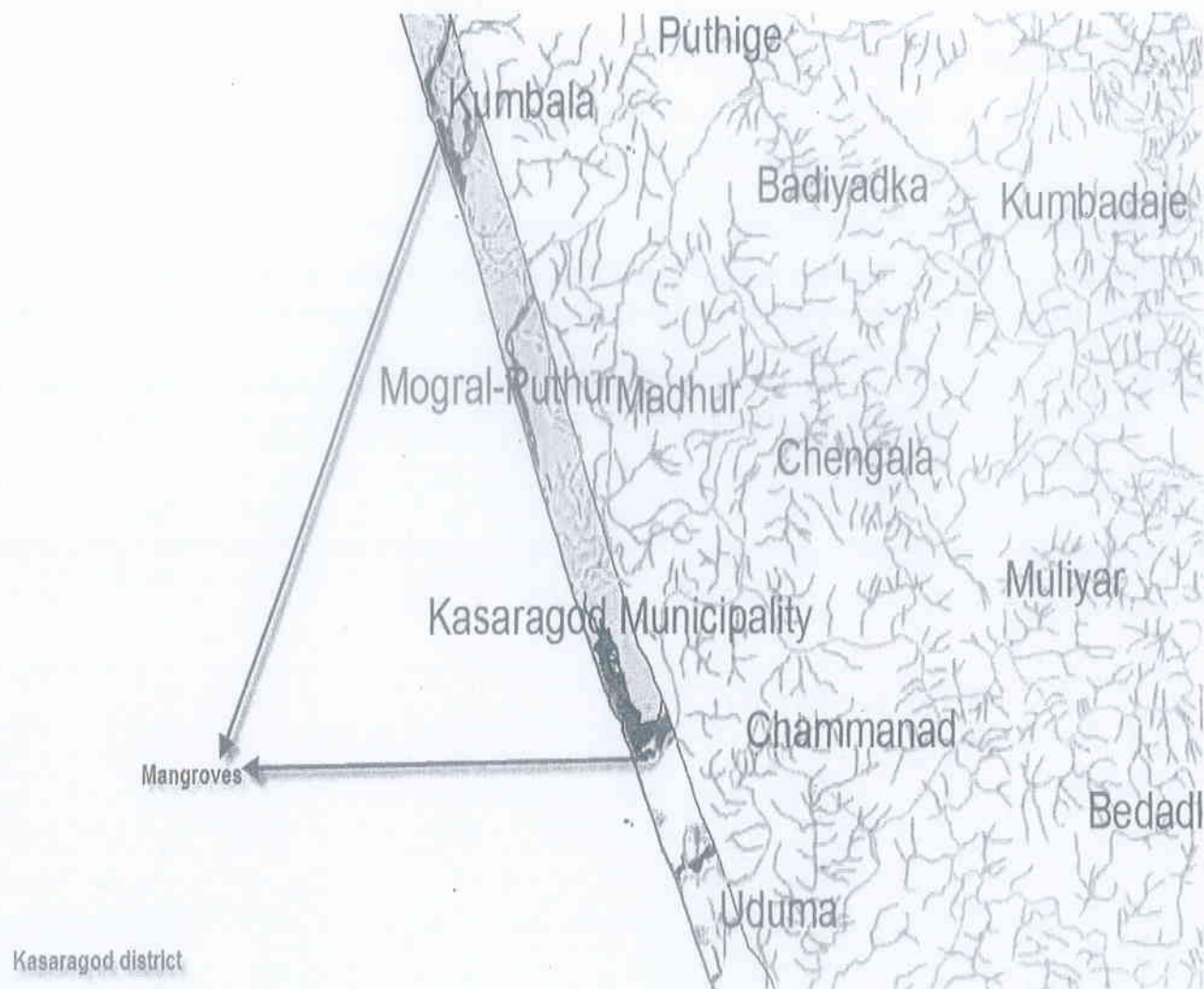
Panchayat level statistics of Kannur district

Panchayats	Aquaculture	Back waters	Beach	Coconut plantation	Estuary	Mangroves	Mixed land use	Tank	Water body /river	Waterlogged	Sea
Azhikode	0.00	0.00	20.23	0.00	0.00	0.00	888.72	0.00	42.93	21.77	2.58
Cherukunnu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.12	30.90	0.00	0.00
Dharmadam	0.12	0.00	2.74	0.00	3.15	0.00	265.39	0.00	29.35	0.00	0.00
Edakkad	0.00	5.16	5.74	0.00	0.00	0.00	824.12	0.00	0.00	0.00	0.34
Kannur Municipality	0.00	5.29	16.43	0.00	0.00	0.00	807.49	0.00	0.00	0.00	0.17
Madayi	0.00	0.00	11.50	0.00	0.00	0.00	708.77	0.97	32.09	0.00	0.00
Mahe	0.00	0.00	0.00	0.00	0.00	0.00	85.88	0.00	0.76	0.00	0.00
Mattool	0.00	0.00	11.75	0.00	0.00	0.82	802.36	-0.00	201.05	0.00	0.00
Muzhappilangad	0.00	7.32	7.12	0.00	1.26	0.00	667.48	0.00	31.67	0.00	0.00
New Mahe	0.00	0.00	0.98	0.00	1.34	0.00	190.92	0.00	26.69	0.00	0.00
Pallikunnu	0.00	0.00	4.38	0.00	0.00	0.00	356.67	0.00	0.00	0.00	0.00
Payyanur Municipality	0.00	0.00	0.00	70.20	0.00	0.00	1.91	0.00	87.74	0.00	0.00
Ramanthali	0.00	0.00	6.37	0.99	0.00	0.00	1262.61	0.00	90.26	0.00	0.00
Thalassery Municipality	23.56	0.00	9.68	114.72	9.55	2.35	978.31	0.00	59.18	0.00	0.00
Valapatnam	0.00	0.00	0.00	0.00	0.00	0.00	146.17	0.00	0.00	11.49	0.00
Total	23.68	17.77	96.93	185.90	15.29	3.17	7986.81	10.08	632.62	33.25	3.09

Coastal wetland map of Kasaragod district

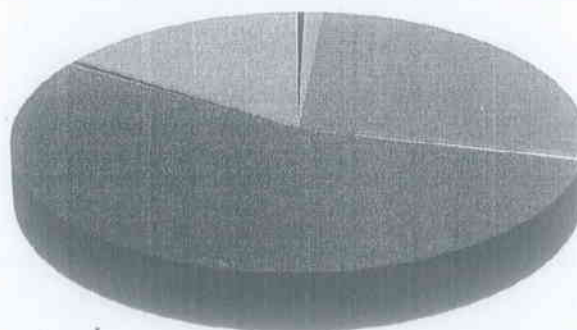


Mangroves in Kasaragod district



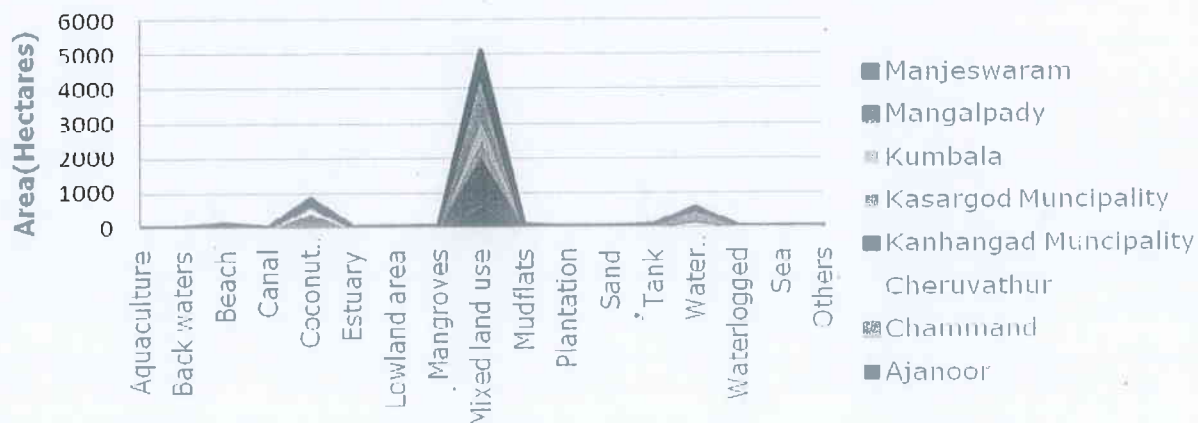
Kasaragod district statistics

Aquaculture	0.00
Back waters	51.12
Beach	129.68
Canal	0.22
Coconut plantation	3213.66
Estuary	15.82
Lowland area	27.56
Mangroves	37.33
Mixed	6424.48
Mudflats	68.56
Plantation	9.73
Sand	11.42
Tank	48.47
Water body/river	1813.91
Waterlogged	10.99
Sea	0.00
Others	0.00
Total(Hectares)	11862.96



- Aquaculture(0.00%)
- Back waters(0.43%)
- Beach(1.09%)
- Canal(0.00%)
- Coconut plantation(27.09%)
- Estuary(0.13%)
- Lowland area(0.23%)
- Mangroves(0.31%)
- Mixed(54.16%)
- Mudflats(0.58%)
- Plantation(0.08%)
- Sand(0.10%)
- Tank(0.41%)
- Water body/river(15.29%)
- Waterlogged(0.09%)
- Sea(0.00%)
- Others(0.00%)

Panchayat level statistics of Kasaragod district

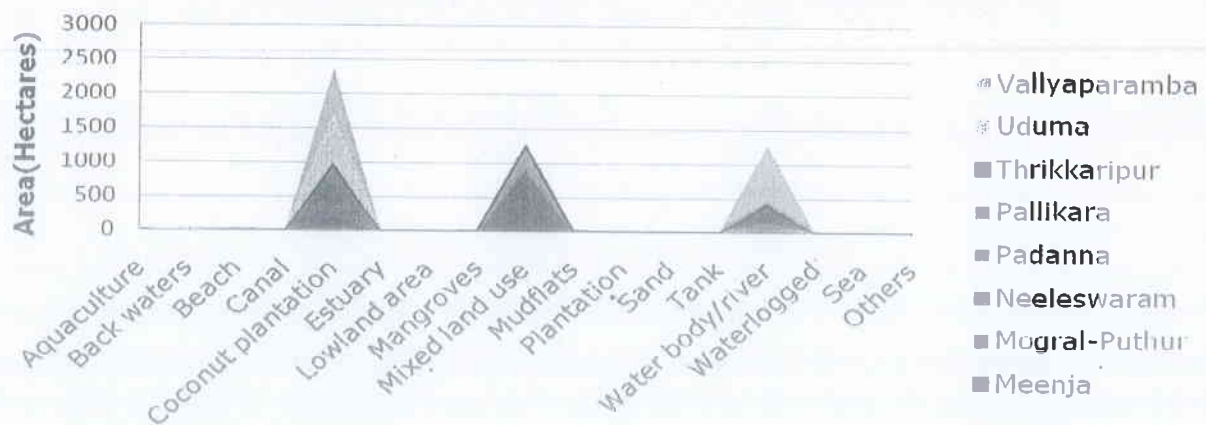


Area(Hectares)

3000
2500
2000
1500
1000
500
0

Aquaculture
Back waters
Beach
Canal
Coconut plantation
Estuary
Lowland area
Mangroves
Mixed land use
Mudflats
Plantation
Sand
Tank
Water body/river
Waterlogged
Sea
Others

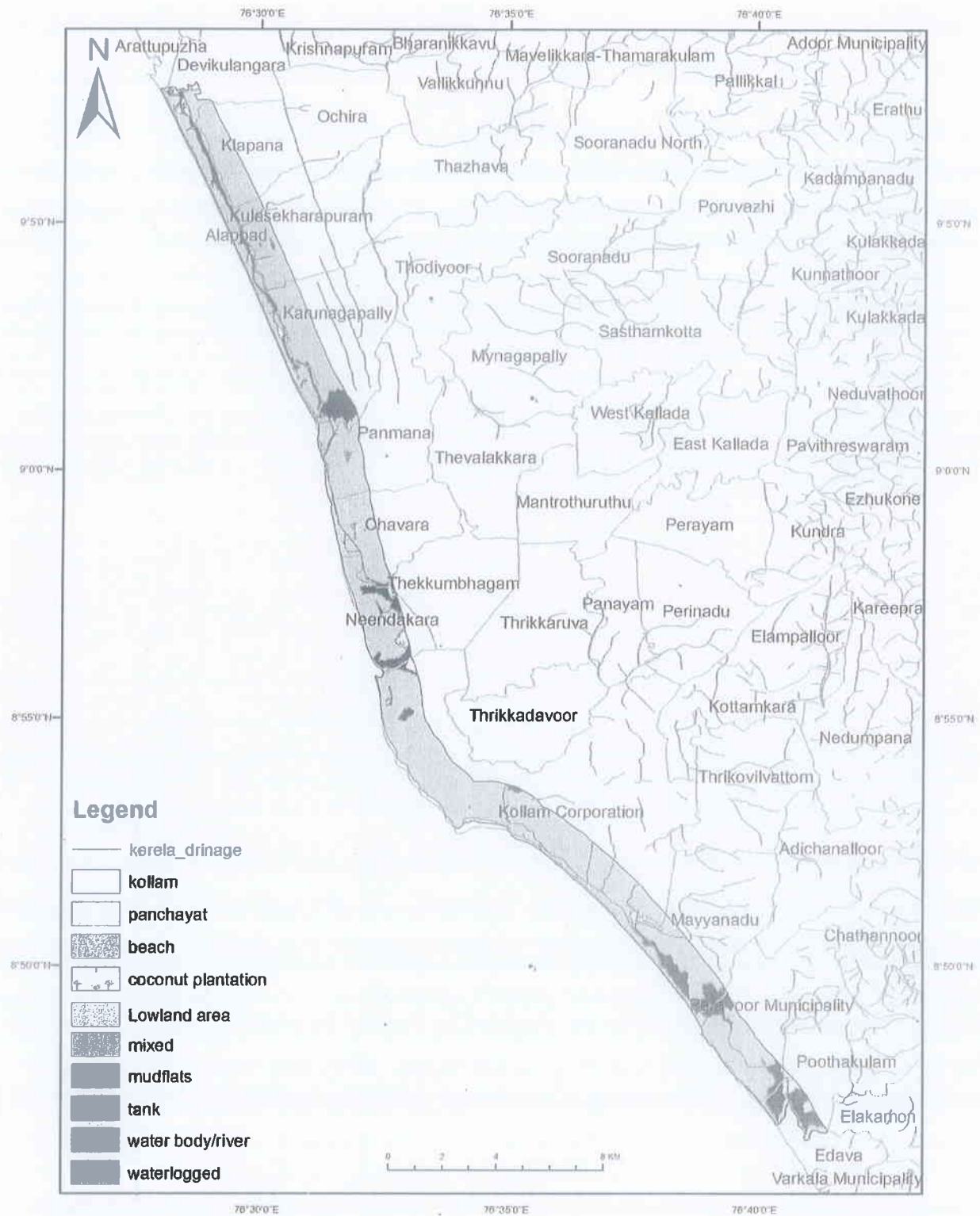
Vallyaparamba
Uduma
Thrikkaripur
Pallikara
Padanna
Neeleswaram
Mogral-Puthur
Meenja



Panchayat level statistics of Kasaragod district

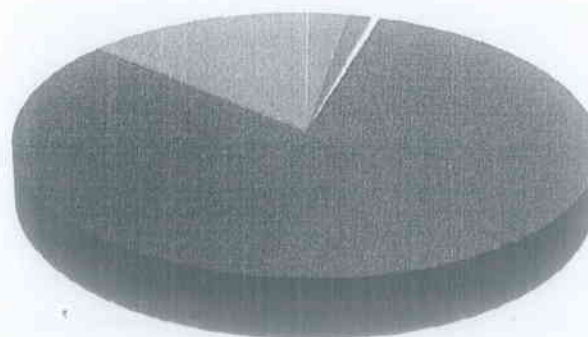
Panchayats	Back waters	Beach	Canal	Coconut	Estuary	Lowland	Mangroves	Mixed	Mudflats	Plantation	Sand	Tank	Water body	Waterlogged
Ajanoor	0.00	3.98	0.00	42.42	0.59	0.00	0.00	685.34	2.31	0.00	0.00	0.00	60.08	0.99
Chammand	0.00	4.17	0.00	422.34	0.00	2.47	0.00	0.00	0.00	0.00	0.00	0.27	23.67	0.00
Cheruvathur	0.00	0.00	0.00	150.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	76.39	0.00
Kanhangad Municipality	0.80	4.63	0.00	0.00	0.00	3.10	0.00	1332.47	0.00	0.00	0.00	2.22	1.14	1.87
Kasaragod Municipality	0.00	19.42	0.00	40.18	2.41	0.00	12.87	534.38	13.14	0.24	5.95	0.00	188.16	0.00
Kumbala	0.00	9.93	0.00	0.00	0.00	0.00	13.75	645.69	2.51	4.36	0.00	1.85	78.11	3.27
Mangalbady	9.56	25.83	0.00	0.00	2.11	0.00	1.95	1291.18	5.73	0.13	2.35	3.46	61.91	0.00
Manjeswaram	0.00	27.78	0.00	164.46	1.44	18.57	0.00	652.34	33.35	4.80	3.13	40.25	42.21	0.00
Meenja	0.00	0.00	0.00	3.16	0.00	0.00	0.00	44.89	0.02	0.00	0.00	0.00	3.41	0.00
Mbgral-Puthur	0.00	9.42	0.00	5.34	0.00	0.00	8.03	885.59	11.31	0.19	0.00	0.00	52.31	1.50
Neeleswaram	0.00	0.68	0.00	19.26	0.00	0.00	0.00	325.11	0.19	0.00	0.00	0.00	78.59	0.00
Padanna	0.00	0.00	0.00	201.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	245.95	0.00
Pallikara	0.04	5.39	0.22	729.27	0.00	0.00	0.00	1.22	0.00	0.00	0.00	0.00	12.76	3.37
Thrikkanipur	0.00	0.00	0.00	29.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.34	0.00
Uduma	40.73	6.61	0.00	690.33	0.00	3.42	0.00	0.00	0.00	0.00	0.00	0.27	0.62	0.00
Vallyaparamba	0.00	11.85	0.00	714.84	9.27	0.00	0.72	26.27	0.00	0.00	0.00	0.15	857.26	0.00
Total	51.12	129.68	0.22	3213.66	15.82	27.56	37.33	6424.48	68.56	9.73	11.42	48.47	1813.92	10.99

Coastal wetland map of Kollam district



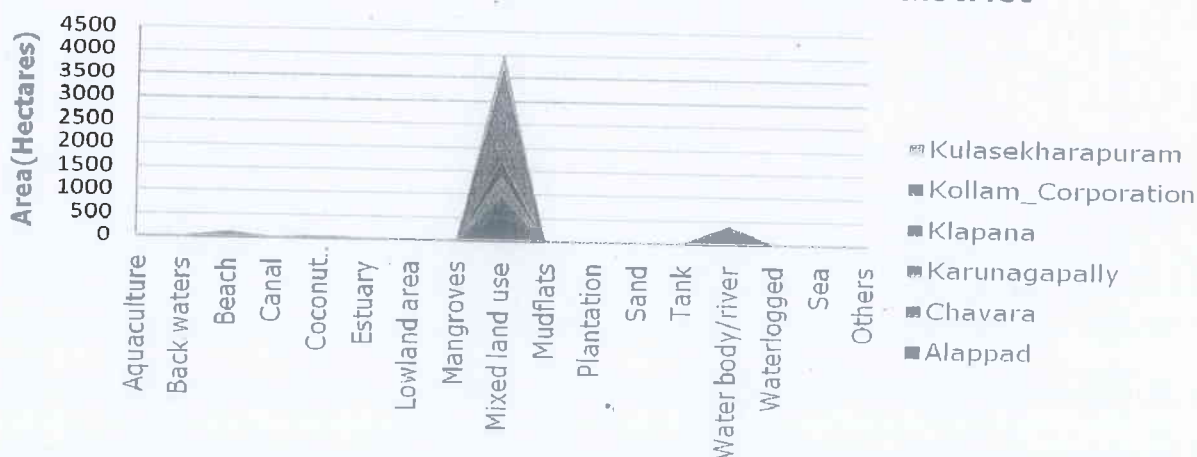
Kollam district statistics

Aquaculture	0.00
Back waters	0.00
Beach	161.97
Canal	0.00
Coconut plantation	107.99
Estuary	0.00
Lowland area	32.76
Mangroves	0.00
Mixed	5707.71
Mudflats	2.05
Plantation	0.00
Sand	0.00
Tank	7.01
Water body/river	969.85
Waterlogged	4.77
Sea	0.00
Others	0.00
Total(Hectares)	6994.10

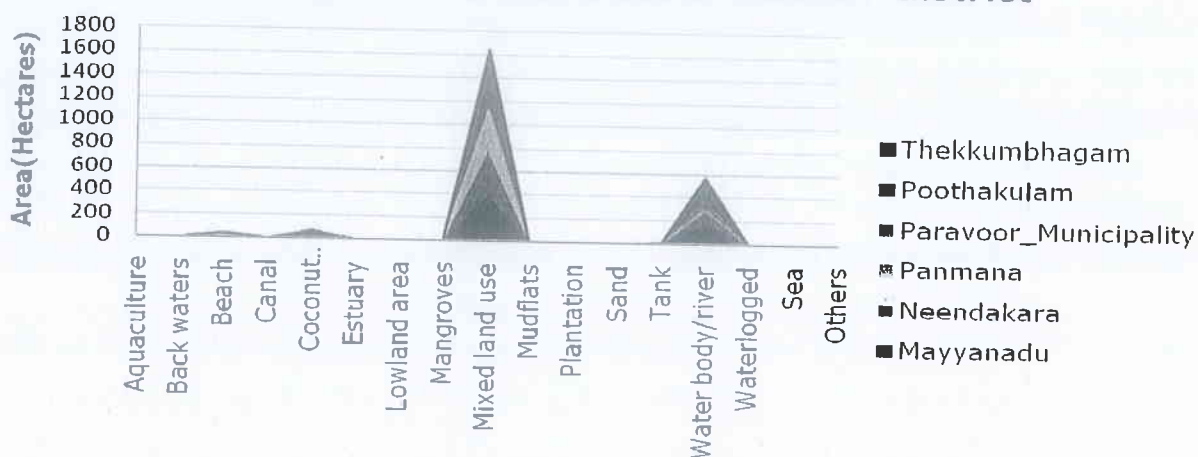


■ Aquaculture(0.00%)
■ Back waters(0.00%)
■ Beach(2.32%)
■ Canal(0.00%)
■ Coconut plantation(1.54%)
■ Estuary(0.00%)
■ Lowland area(0.47%)
■ Mangroves(0.00%)
■ Mixed(81.61%)
■ Mudflats(0.03%)
■ Plantation(0.00%)
■ Sand(0.00%)
■ Tank(0.10%)
■ Water body/ river(13.87%)
■ Waterlogged(0.07%)
■ Sea(0.00%)
■ Others(0.00%)

Panchayat level statistics of Kollam district



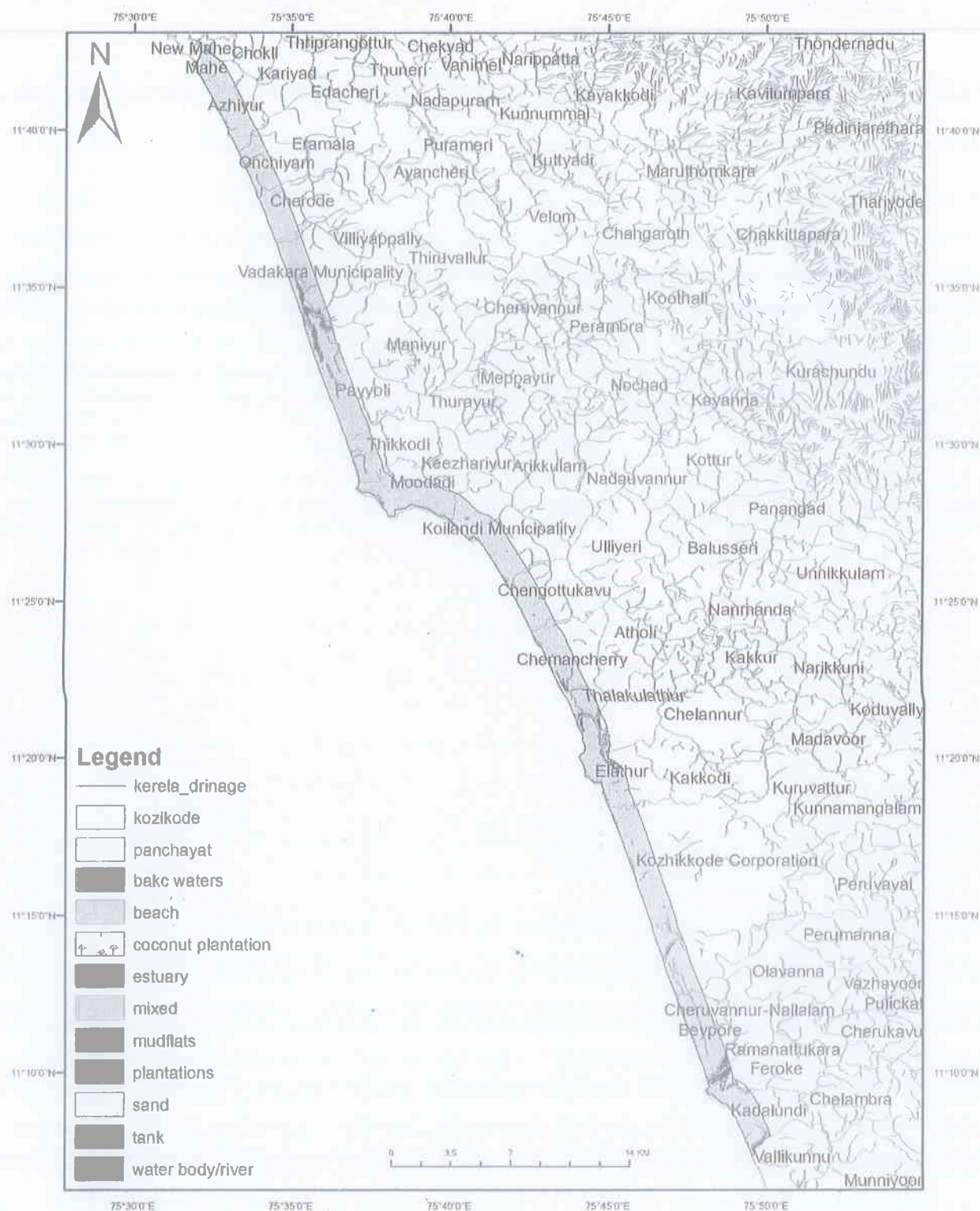
Panchayat level statistics of Kollam district



Panchayat wise statistics of Kollam district

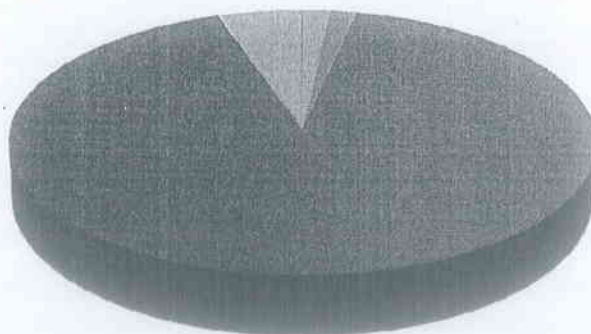
Panchayats	Back waters	Coconut Plantation	Estuary	Lowland area	Mudflats	Tank	Water body/river	Waterlogged
Alappad	59.86	28.49	0.00	502.00	1.27	0.00	184.66	0.00
Chavara	2.51	0.00	0.00	420.91	0.00	0.25	25.46	4.77
Karunagapally	0.05	0.00	0.00	464.83	0.05	0.00	120.15	0.00
Klapanā	0.00	0.00	0.00	355.06	0.00	0.00	0.00	0.00
Kollam Corporation	59.92	12.67	29.94	1987.99	0.73	0.00	62.70	0.00
Kulasekharapuram	0.00	0.00	0.00	340.16	0.00	0.00	7.85	0.00
Mayyanadu	7.87	0.00	2.81	388.76	0.00	0.00	174.96	0.00
Neendakara	2.90	18.42	0.00	395.30	0.00	0.00	119.09	0.00
Panmana	9.75	0.00	0.00	350.86	0.00	6.76	10.20	0.00
Paravoor Municipality	17.22	2.48	0.00	458.08	0.00	0.00	108.63	0.00
Poothakulam	1.89	45.93	0.00	42.69	0.00	0.00	151.47	0.00
Thekkumbhagam	0.00	0.00	0.00	1.07	0.00	0.00	4.68	0.00
Total	161.97	107.99	32.76	5707.71	2.05	7.01	969.85	4.77

Coastal wetland map of Kozhikode district



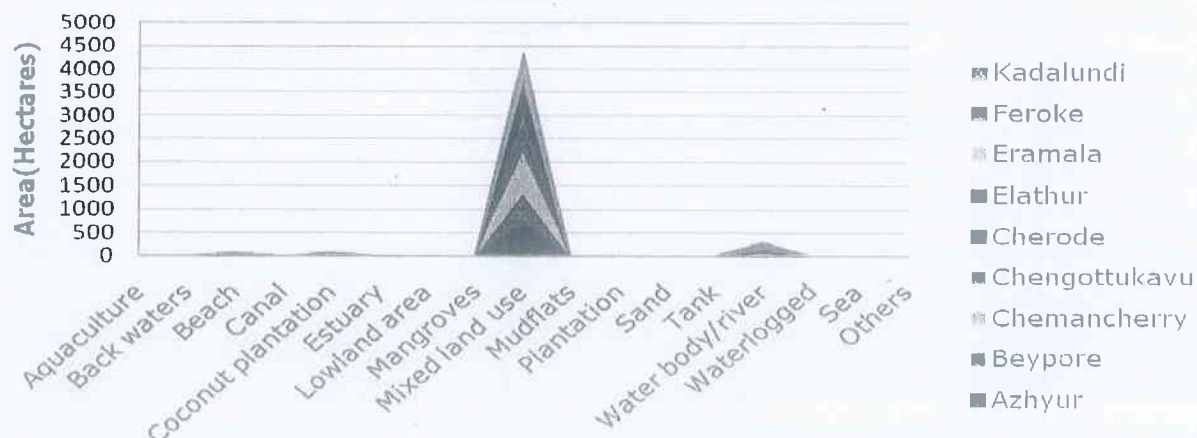
Kozhikode district statistics

Aquaculture	0.00
Back waters	6.81
Beach	172.38
Canal	0.00
Coconut plantation	159.56
Estuary	10.86
Lowland area	0.00
Mangroves	0.00
Mixed	10080.92
Mudflats	0.03
Plantation	0.43
Sand	8.69
Tank	6.37
Water body/river	553.32
Waterlogged	0.00
Sea	0.00
Others	0.00
Total(Hectares)	10999.36

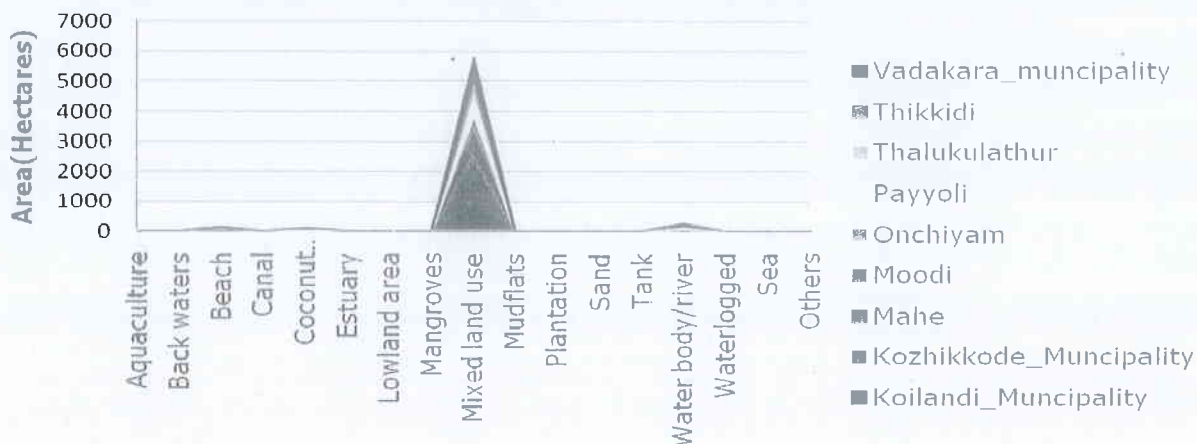


Aquaculture(0.00%)
Back waters(0.06%)
Beach(1.57%)
Canal(0.00%)
Coconut plantation(1.45%)
Estuary(0.10%)
Lowland area(0.00%)
Mangroves(0.00%)
Mixed(91.65%)
Mudflats(0.00%)
Plantation(0.00%)
Sand(0.08%)
Tank(0.06%)
Water body/river(5.03%)
Waterlogged(0.00%)
Sea(0.00%)
Others(0.00%)

Panchayat level statistics of Kozhikode district



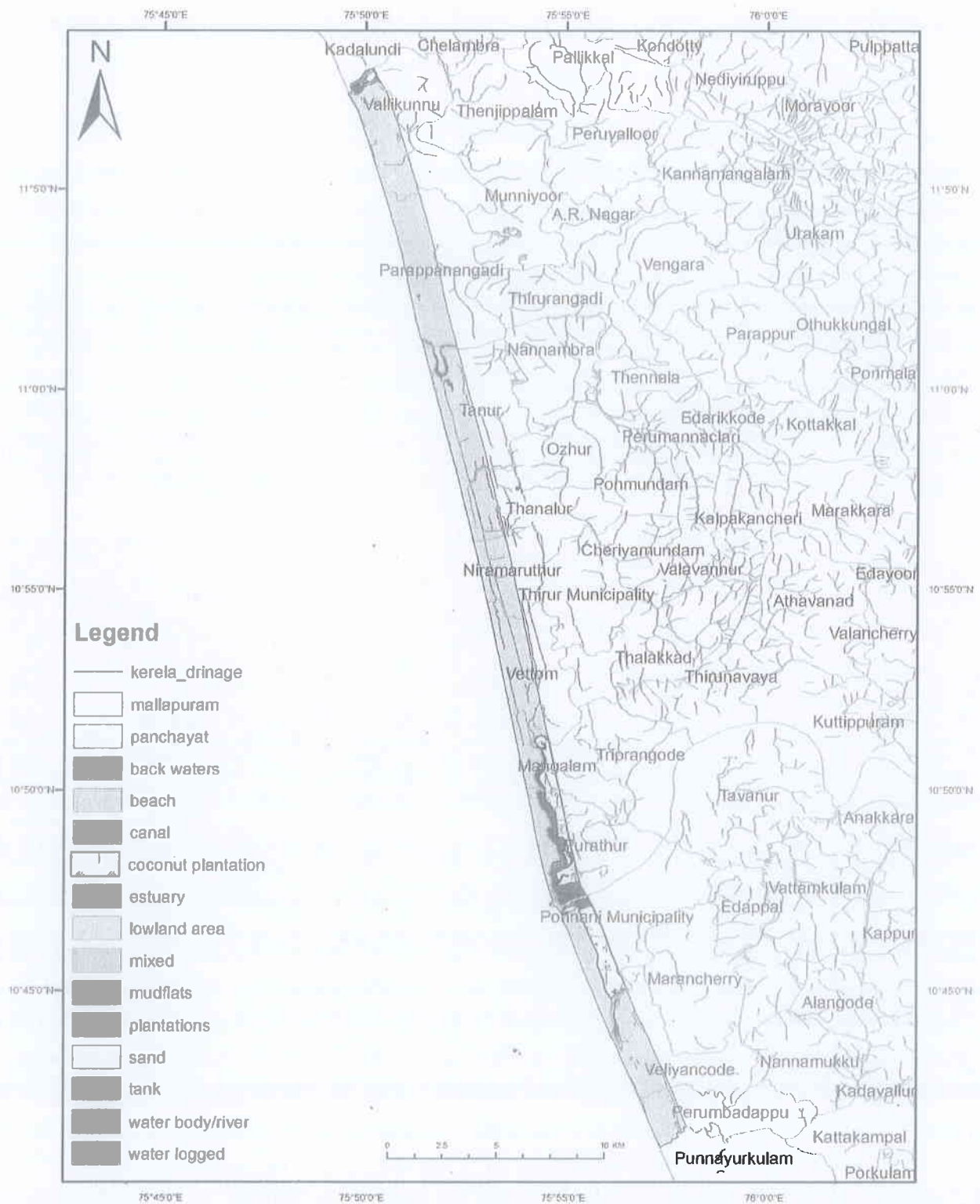
Panchayat level statistics of Kozhikode district



Panchayat wise statistics of Kozhikode district

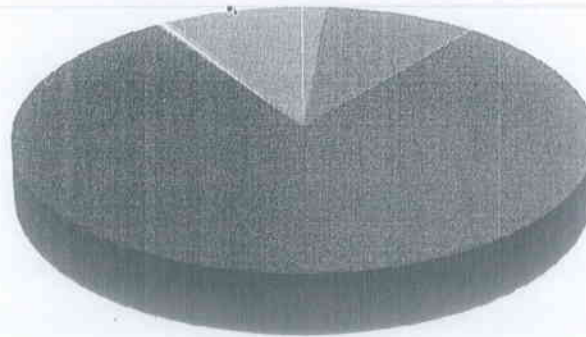
Panchayats	Back waters	Beach	Coconut plantation	Estuary	Mixed land use	Mudflats	Plantation	Sand	Tank	Water body/river
Azhur	0.44	5.33	0.00	0.00	668.62	0.00	0.24	0.00	0.41	0.23
Beyyore	0.00	0.00	0.00	0.00	689.60	0.00	0.00	0.00	0.00	34.47
Chemancherry	0.00	19.37	0.00	0.00	805.97	0.00	0.00	0.00	1.62	51.52
Chengottukavu	0.27	5.58	0.00	0.00	446.68	0.00	0.00	0.00	0.19	0.77
Cherode	0.00	0.00	0.00	0.00	477.87	0.00	0.00	0.00	0.00	0.00
Elathur	0.00	16.66	15.06	1.21	680.14	0.00	0.00	0.00	0.36	73.75
Eramala	0.00	0.00	0.00	0.00	12.96	0.00	0.00	0.00	0.00	0.00
Feroke	0.00	0.00	42.48	0.00	26.81	0.00	0.00	0.00	0.00	96.13
Kadalundi	0.00	10.32	7.28	3.25	521.17	0.03	0.19	0.00	0.23	40.62
Koilandi Municipality	0.00	22.44	0.00	0.00	820.97	0.00	0.00	0.00	0.49	5.37
Kozhikkode Municipality	0.00	32.72	0.00	2.14	1628.76	0.00	0.00	0.00	2.91	24.02
Mahe	0.00	3.91	0.00	0.00	157.08	0.00	0.00	0.00	0.00	5.24
Moodi	2.46	36.36	0.00	0.00	806.49	0.00	0.00	0.00	0.00	0.00
Onchiyam	0.90	0.00	0.00	0.00	430.60	0.00	0.00	0.00	0.00	0.00
Payyoli	0.00	5.49	13.52	0.00	921.22	0.00	0.00	0.00		104.23
Thalukulathur	0.00	0.00	67.15	0.00	1.88	0.00	0.00	0.00	0.00	32.06
Thikkidi	2.75	13.73	0.00	0.00	380.64	0.00	0.00	0.00	0.09	0.00
Vadakara municipality	0.00	0.49	14.08	4.26	603.45	0.00	0.00	8.69	0.08	84.91
Total	6.81	172.38	159.56	10.86	10080.92	0.03	0.43	8.69	6.37	553.32

Coastal wetland map of Malappuram district



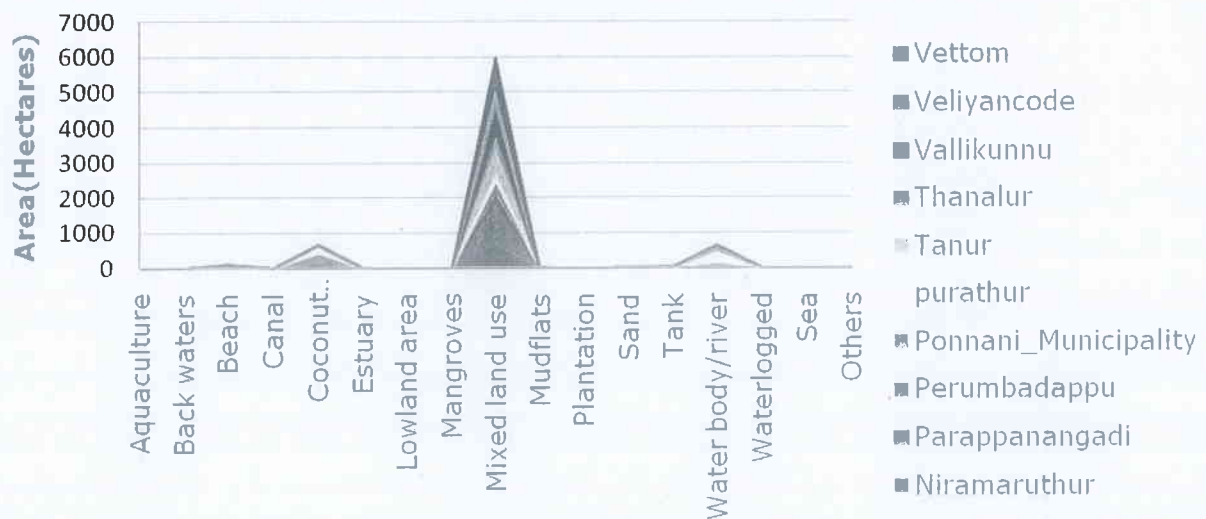
Mallapuram district statistics

Aquaculture	0.00
Back waters	2.34
Beach	104.85
Canal	4.56
Coconut plantation	672.33
Estuary	12.08
Lowland area	2.59
Mangroves	0.00
Mixed	5979.16
Mudflats	11.36
Plantation	5.88
Sand	15.46
Tank	21.91
Water body/river	642.47
Waterlogged	6.41
Sea	0.00
Others	0.00
Total(Hectares)	7481.40



- Aquaculture(0.00%)
- Back waters(0.03%)
- Beach(1.40%)
- Canal(0.06%)
- Coconut plantation(8.99%)
- Estuary(0.16%)
- Lowland area(0.03%)
- Mangroves(0.00%)
- Mixed(79.92%)
- Mudflats(0.15%)
- Plantation(0.08%)
- Sand(0.21%)
- Tank(0.29%)
- Water body/river(8.59%)
- Waterlogged(0.09%)
- Sea(0.00%)
- Others(0.00%)

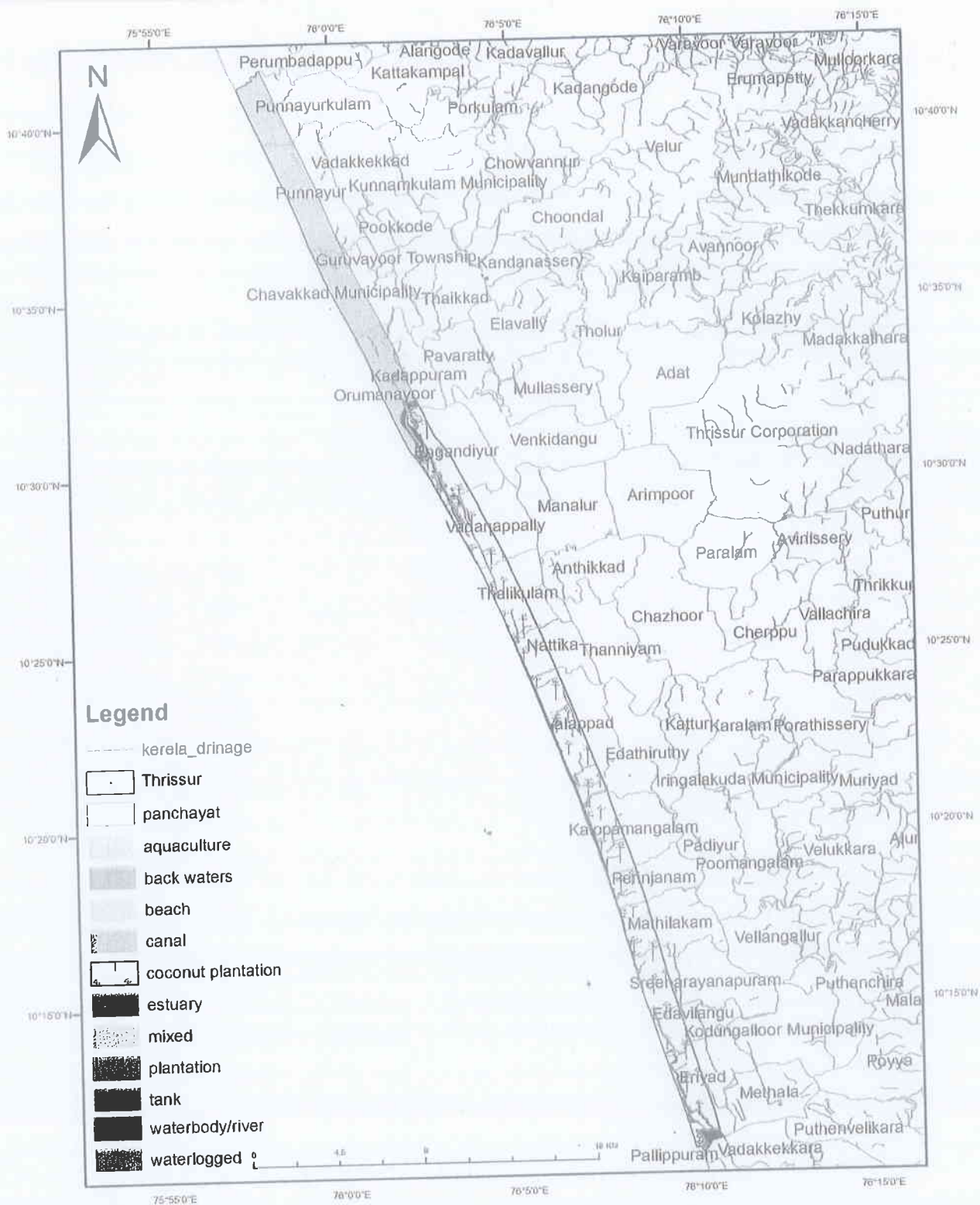
Panchayat level statistics of Malappuram district



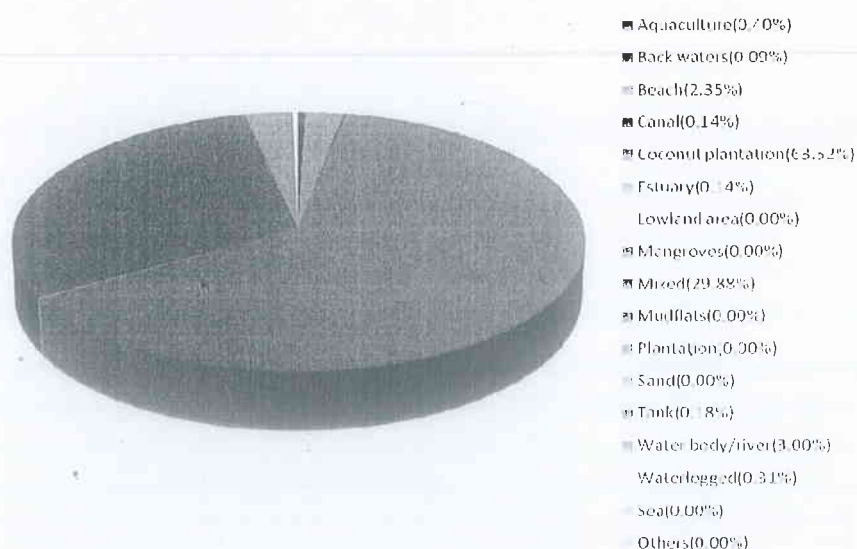
Panchayat wise statistics of Malappuram district

panchayats	Back waters	Beach	Canal	Coconut plantation	Estuary	Lowland area	Mixed land use	Mudflats	Plantation	Sand	Tank	Water body /river	Waterlogged
Mangalam	0.00	3.18	0.00	121.50	0.00	0.00	234.25	0.00	0.00	0.00	0.00	49.36	0.00
Niramaruthur	0.00	0.02	0.00	0.00	0.00	0.00	476.21	0.00	0.00	0.00	0.00	7.49	0.00
Parappanangadi	0.00	18.89	0.00	0.00	0.00	0.00	1046.57	0.00	0.00	0.00	0.00	15.73	0.00
Perumbadappu	0.00	6.24	2.40	0.00	0.00	0.00	323.87	0.00	0.00	0.00	7.48	0.00	0.00
Ponnani Municipality	0.00	8.21	0.00	300.22	0.00	0.00	365.56	0.00	0.00	15.46	1.53	75.24	0.00
purathur	0.00	20.40	0.00	210.95	10.75	0.00	221.21	0.00	0.00	0.00	0.00	312.41	0.00
Tanur	0.00	19.47	0.00	0.00	0.00	0.00	876.40	10.07	0.00	0.00	0.61	51.81	0.00
Thanalur	0.00	0.23	0.00	0.00	0.00	0.00	353.09	0.00	0.00	0.00	0.00	8.61	0.00
Valikunnu	2.34	14.39	0.00	25.30	0.00	0.00	752.62	1.28	1.27	0.00	0.12	50.64	6.41
Veliyancode	0.00	11.46	2.16	0.00	1.33	2.59	577.53	0.00	4.61	0.00	12.17	46.01	0.00
Vettom	0.00	2.35	0.00	14.36	0.00	0.00	751.85	0.00	0.00	0.00	0.00	25.18	0.00
Total	2.34	104.85	4.56	672.33	12.08	2.59	5979.16	11.36	5.88	15.46	21.91	642.47	6.41

Coastal wetland map of Thrissur district



Aquaculture	35.29
Back waters	7.96
Beach	210.22
Canal	12.47
Coconut plantation	5674.49
Estuary	12.19
Lowland area	0.00
Mangroves	0.00
Mixed	2669.20
Mudflats	0.00
Plantation	0.28
Sand	0.00
Tank	15.67
Water body/river	268.07
Waterlogged	27.82
Sea	0.00
Others	0.00
Total(Hectares)	8933.67



Area(Hectares)

3000
2500
2000
1500
1000
500
0

Aquaculture
Back waters
Beach
Canal
Coconut...
Estuary
Lowland area
Mangroves
Mixed land use
Mudflats
Plantation
Sand
Tank
Water body/river
Waterlogged
Sea
Others

Mathilakam
Kaippamangalam
Kadappuram
Eriyad
Engandiyur
Edavilangu
Edathiruthy
Chavakkad_Municipality

Area (Hectares)

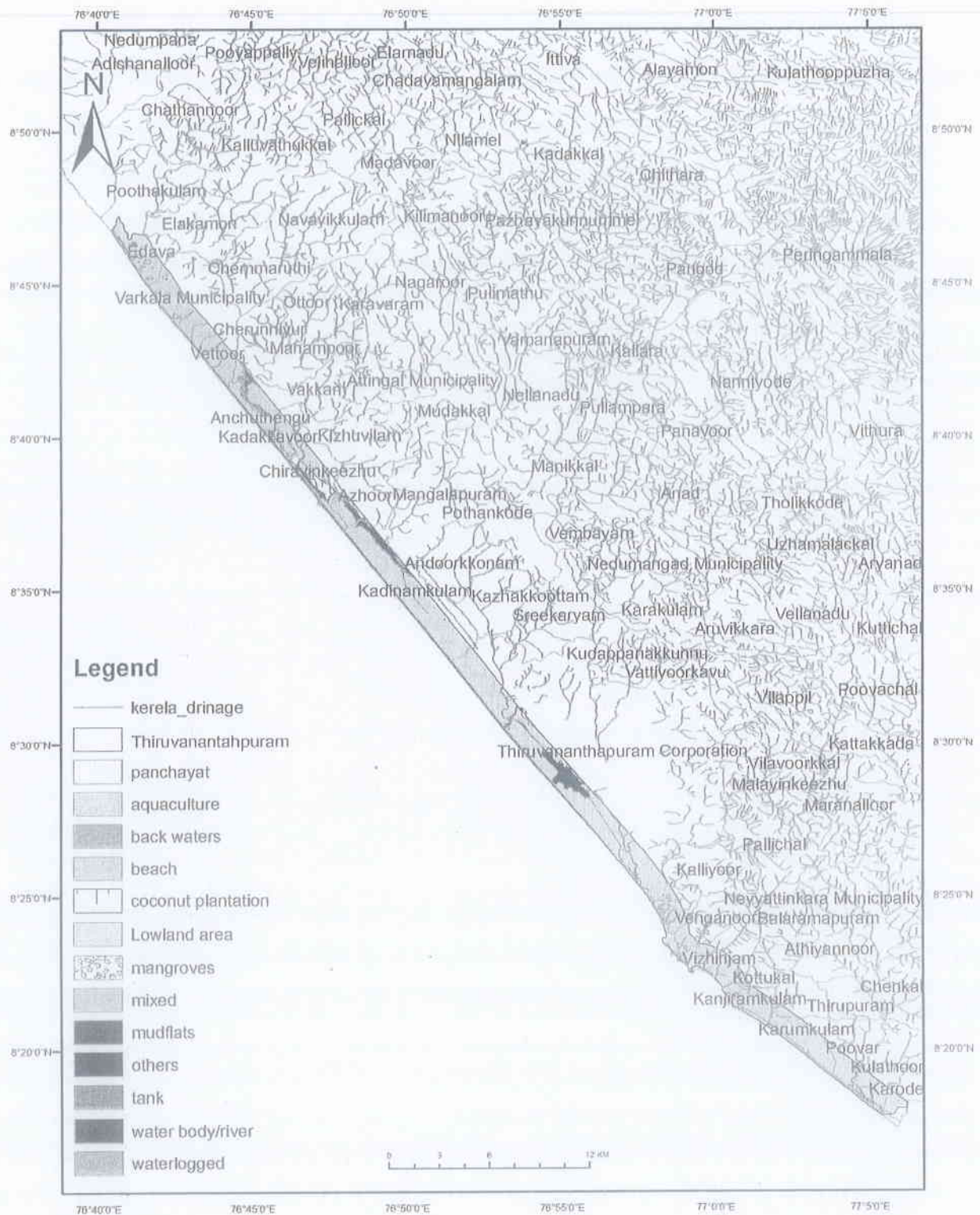
Valappad
Vadanappally
Thalikulam
Sreenarayanapuram
Punnayurkulam
Punnayur
Perinjanam
Orumanayoor
Nattika

Aquaculture
Back waters
Beach
Canal
Coconut..
Estuary
Lowland area
Mangroves
Mixed land use
Mudflats
Plantation
Sand
Tank
Water body/river
Waterlogged
Sea
Others

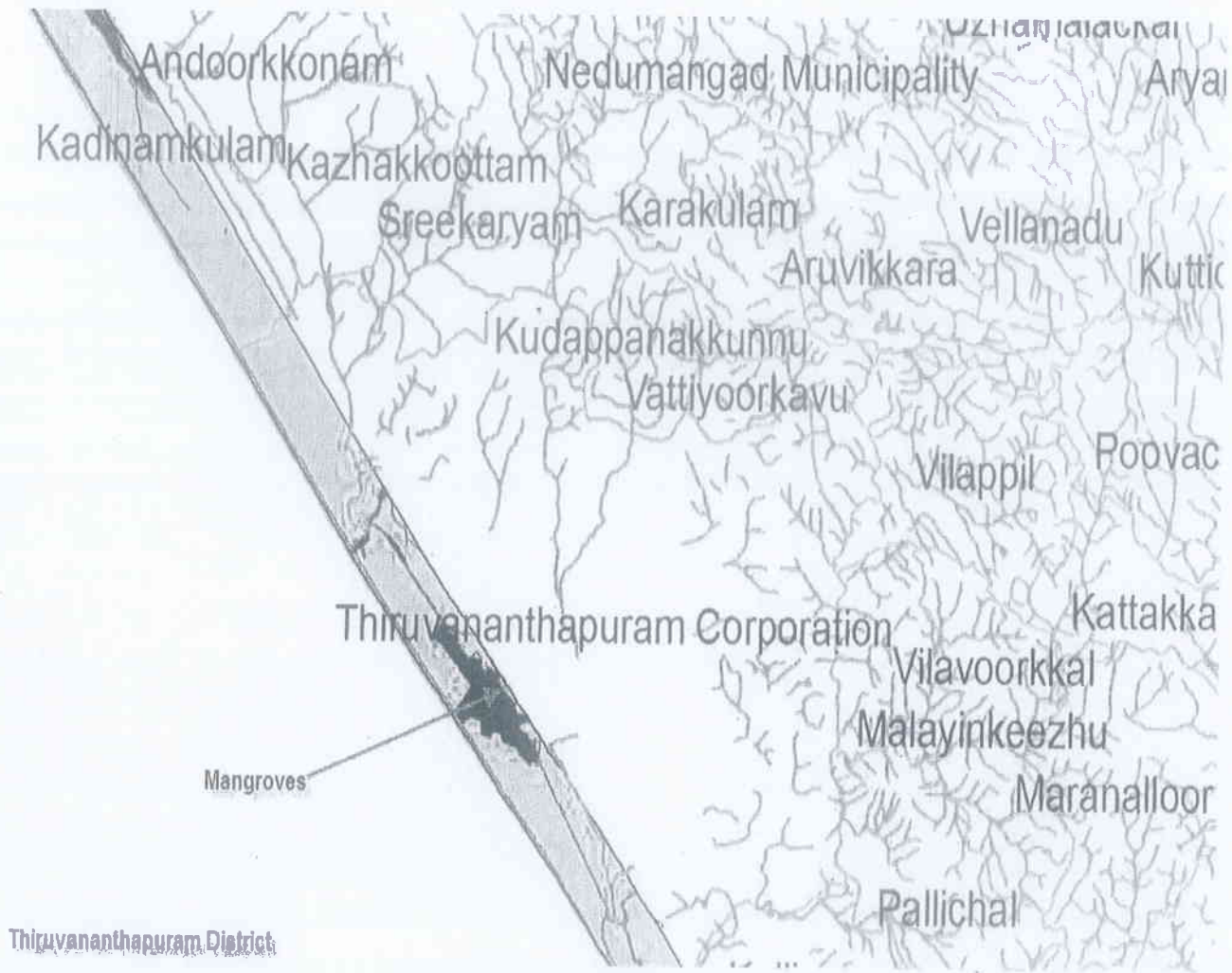
Panchayat level statistics of Thrissur district

Panchayats	Aquaculture	Back waters	Beach	Canal	Coconut plantation	Estuary	Mixed land use	Plantation	Tank	Water body/river	Waterlogged
Chavakkad Municipality	23.99	0.00	49.70	0.00	0.00	0.00	608.99	0.00	0.00	0.35	17.00
Edathiruthy	0.00	1.76	7.29	0.00	101.55	0.00	0.00	0.00	0.22	0.00	0.00
Edavilangu	0.00	0.41	0.00	0.00	297.34	0.00	0.00	0.00	0.16	0.21	0.00
Engandiyur	11.29	0.00	6.98	0.00	558.76	0.00	0.00	0.00	4.64	64.28	0.00
Eriyad	0.00	0.00	4.44	0.00	639.44	12.19	0.86	0.28	0.00	75.18	0.00
Kadappuram	0.00	0.00	0.00	0.00	0.02	0.00	101.83	0.00	0.00	29.28	0.00
Kaippamangalam	0.00	0.87	25.84	0.00	593.23	0.00	0.00	0.00	0.00	0.00	0.00
Mathilakam	0.00	0.29	6.75	0.00	380.72	0.00	0.00	0.00	0.00	0.21	0.00
Nattika	0.00	1.09	8.32		319.78	0.00	0.00	0.00	0.00	0.00	0.00
Orumanayoor	0.00	0.00	17.55	0.00	1.97	0.00	602.66	0.00	3.61	87.77	0.00
Perinjanam	0.00	0.59	2.08	0.00	266.41	0.00	0.00	0.00	0.00	0.00	0.00
Punnayur	0.00	0.00	55.14	6.80	0.00	0.00	843.24	0.00	0.00	0.00	10.82
Punnayurkulam	0.00	0.00	15.49	5.68	0.00	0.00	511.63	0.00	5.51	0.00	0.00
Sreenarayanapuram	0.00	0.23	1.89	0.00	502.77	0.00	0.00	0.00	0.00	0.00	0.00
Thalikulam	0.00	0.36	2.13	0.00	570.41	0.00	0.00	0.00	0.00	0.00	0.00
Vadanappally	0.00	0.00	6.61	0.00	553.96	0.00	0.00	0.00	0.81	10.79	0.00
Valappad	0.00	2.36	41.92	0.00	888.13	0.00	0.00	0.00	0.72	0.00	0.00
Total	35.28	7.96	210.22	12.47	5674.49	12.19	2669.20	0.28	15.67	268.07	27.82

Coastal wetland map of Thiruvananthapuram district

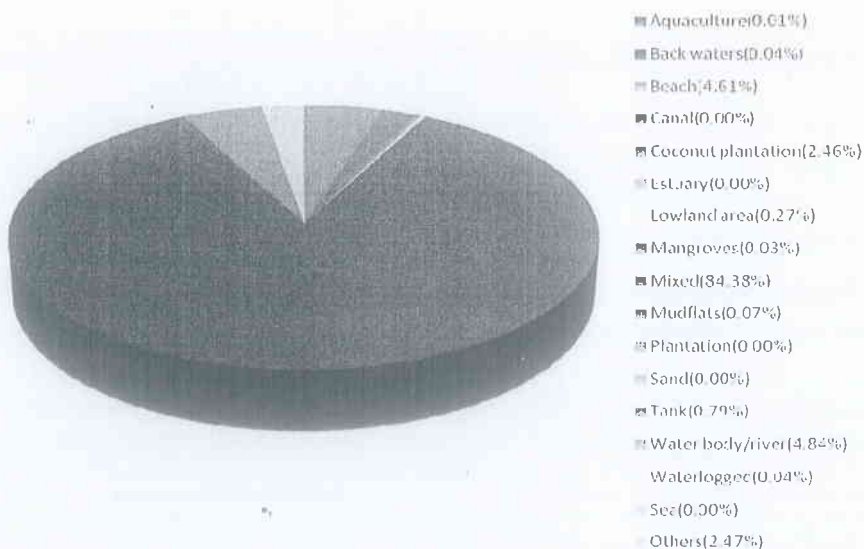


Mangroves in Thiruvananthapuram district

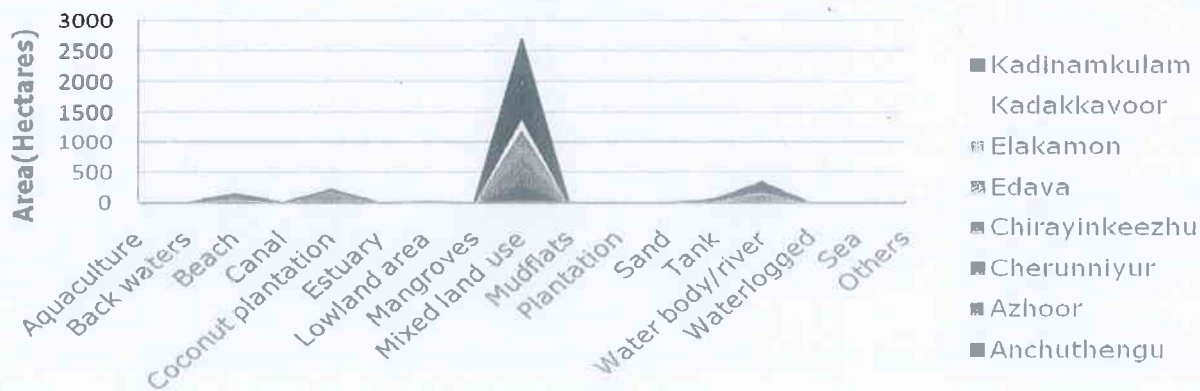


Thiruvananthapuram district statistics

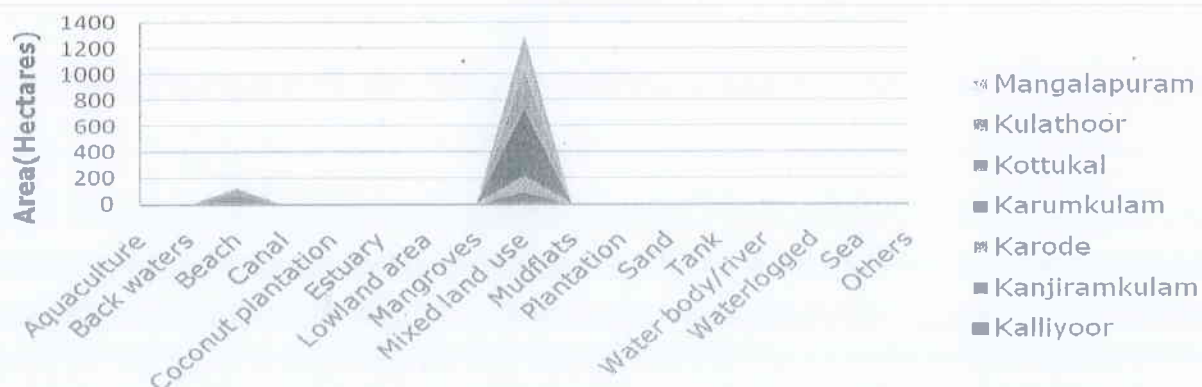
Aquaculture	1.58
Back waters	4.50
Beach	490.81
Canal	0.00
Coconut plantation	261.65
Estuary	0.00
Lowland area	28.45
Mangroves	3.24
Mixed	8987.80
Mudflats	7.11
Plantation	0.00
Sand	0.00
Tank	83.68
Water body/river	515.74
Waterlogged	3.88
Sea	0.00
Others	262.75
Total(Hectares)	10651.20



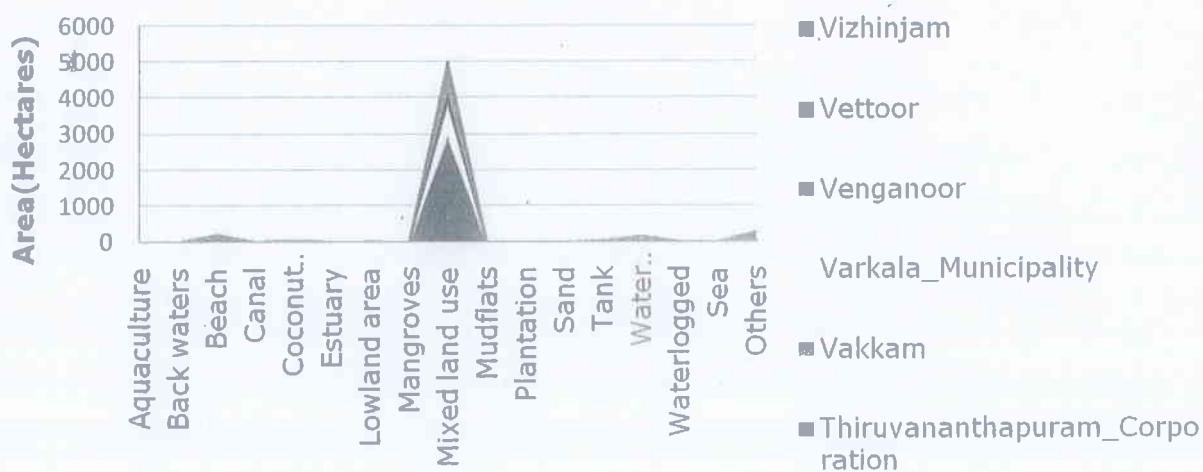
Panchayat level statistics of Thruvananthapuram district



Panchayat level statistics of Thruvananthapuram district



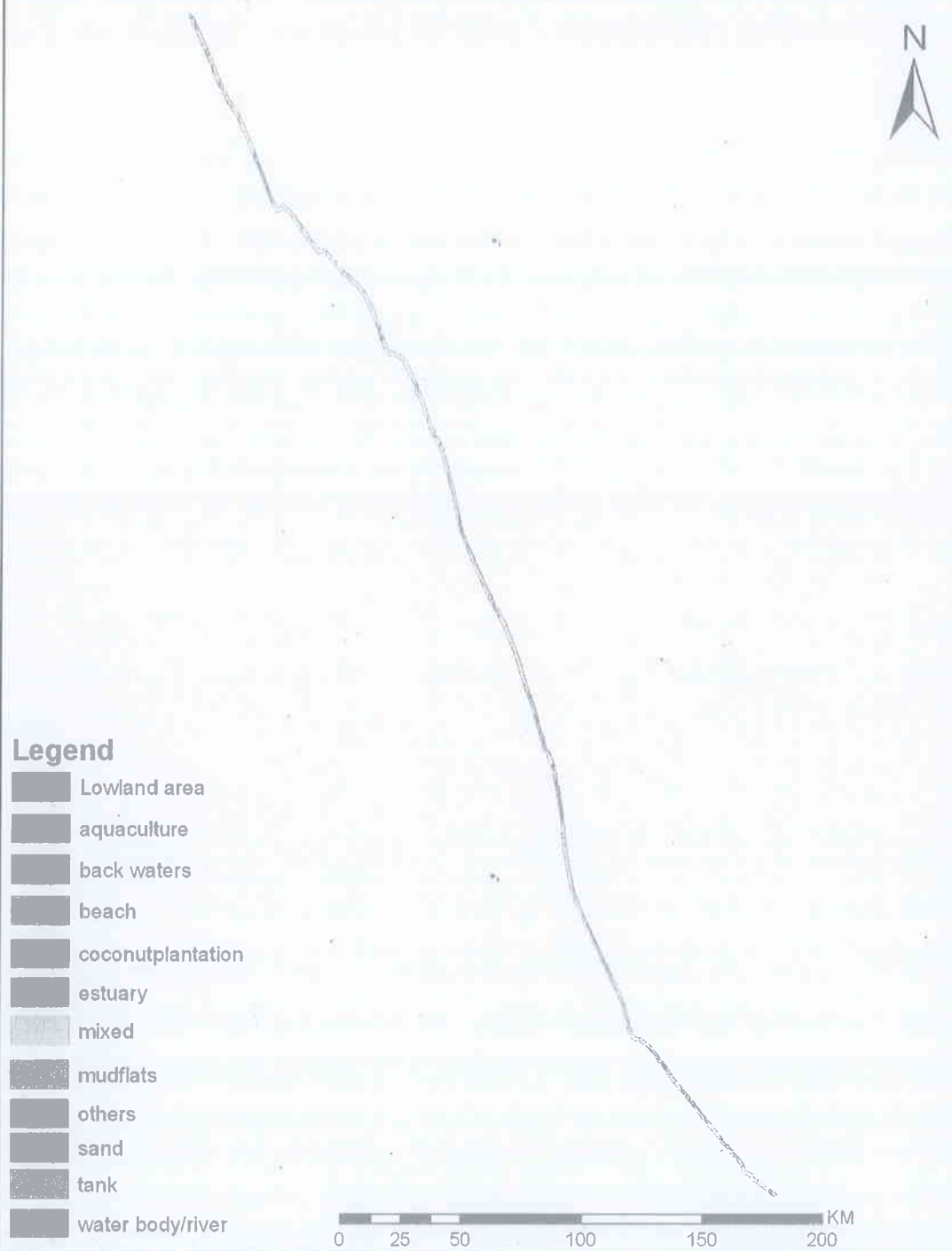
Panchayat level statistics of Thruvananthapuram district



Panchayat level statistics of Thiruvananthapuram district

panchayats	Aquaculture	Back waters	Beach	Coconut plantation	Lowland area	Mangroves	Mixed land use	Mudflats	Tank	Water body /river	Waterlogged	Others
Anchuthengu	0.00	0.00	32.14	4.81	0.00	0.00	230.06	0.00	13.02	28.33	0.00	0.00
Azhoor	0.00	0.00	0.00	56.56	0.00	0.00	123.32	0.00	22.82	49.50	0.00	0.00
Cherunniyur	0.00	0.00	0.00	0.00	0.00	0.00	55.43	0.00	1.90	4.22	0.00	0.00
Chirayinkeezhu	1.21	0.00	35.43	148.87	0.00	0.00	367.07	0.00	2.81	87.03	0.00	0.00
Edava	0.00	0.00	25.75	0.00	17.01	0.00	448.53	5.82	0.00	17.45	0.00	0.00
Elakamon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kadakkavoor	0.37	0.00	0.00	4.49	0.00	0.00	184.57	0.00	0.00	6.94	0.00	0.00
Kadinamkulam	0.00	0.00	57.13	1.69	0.00	0.00	1285.51	0.00	15.68	146.91	0.00	0.00
Kalliyoor	0.00	0.00	0.00	0.00	0.00	0.00	4.23	0.00	0.00	0.00	0.00	0.00
Kanjiramkulam	0.00	0.41	0.00	0.00	0.00	0.00	96.60	0.00	0.00	0.00	0.00	0.00
Karode	0.00	0.00	0.03	0.00	0.00	0.00	113.46	0.00	0.00	1.30	0.00	0.00
Karumkulam	0.00	3.31	71.90	0.00	0.00	0.00	520.94	0.00	0.00	0.00	0.00	0.00
Kottukal	0.00	0.79	40.37	0.00	0.00	0.00	300.59	0.00	0.00	0.00	0.00	0.00
Kulathoor	0.00	0.00	15.34	0.00	0.00	0.00	267.17	1.29	0.00	19.27	0.00	0.00
Mangalapuram	0.00	0.00	0.00	4.69	0.00	0.00	0.00	0.00	0.45	4.71	0.00	0.00
Poovar	0.00	0.00	28.79	0.00	0.00	0.00	259.88	0.00	0.00	23.51	0.00	0.00
Thiruvananthapuram Corporation	0.00	0.00	129.73	38.43	0.00	3.24	2611.85	0.00	4.27	64.89	3.88	262.75
Vakkam	0.00	0.00	0.00	2.12	0.00	0.00	201.72	0.00	22.73	57.95	0.00	0.00
Varkala Municipality	0.00	0.00	10.79	0.00	11.44	0.00	703.30	0.00	0.00	3.71	0.00	0.00
Venganoor	0.00	0.00	0.00	0.00	0.00	0.00	132.26	0.00	0.00	0.00	0.00	0.00
Vettoor	0.00	0.00	13.81	0.00	0.00	0.00	374.92	0.00	0.00	0.00	0.00	0.00
Vizhinjam	0.00	0.00	29.60	0.00	0.00	0.00	706.39	0.00	0.00	0.00	0.00	0.00
Total	1.58	4.50	490.81	261.65	28.45	3.24	8987.80	7.11	83.68	515.74	3.88	262.75

WETLANDS OF KERELA 1.5K.M FROM THE COAST



Coastal wetland map of Kerala (1.5 km from the coast)

Land use land cover of Kerala coast of 9 districts (1.5 km from the coast)

District Name	Aquaculture	Back waters	Beach	Canal	Coconut plantation	Estuary	lowland area	Mangroves	Mixed
Kasargod	0	51.12	129.68	0.22	3213.66	15.82	27.56	37.33	6424.48
Kannur	23.68	17.77	96.93	0	185.90	15.29	0	3.17	7986.81
Kozhikode	0	6.81	172.38	0	159.56	10.86	0	0	10080.92
Mallapuram	0	2.34	104.85	4.56	672.33	12.08	2.59	0	5979.16
Thirur	35.29	7.96	210.22	12.47	5674.49	12.19	0	0	2669.20
Ernakulam	60.60	0.23	13.40	0	158.24	0	0	72.29	3131.21
Alapuzza	558.86	32.44	161.99	0	562.63	6.85	105.70	0	8037.82
Kollam	0	0.00	161.97	0	107.99	0	32.76	0	5707.71
Thiruvananthapuram	1.58	4.50	490.81	0	261.65	0	28.45	3.24	8987.80
Total	680.02	123.17	1542.23	17.25	10996.45	73.09	197.06	116.03	59005.11
District Name	Mudflats	Plantation	Sand	Tank	Waterbody/ river	Waterlogged	Sea	others	
Kasargod	68.56	9.73	11.42	48.47	1813.91	10.99	0	0	
Kannur	0	0	0	10.08	632.62	33.25	3.09	0	
Kozhikode	0.03	0.43	8.69	6.37	553.32	0	0	0	
Mallapuram	11.36	5.88	15.46	21.91	642.47	6.41	0	0	
Thirur	0	0.28	0	15.67	268.07	27.82	0	0	
Ernakulam	0	1.25	0	751.55	2034.31	92.93	0	71.04	
Alapuzza	18.70	0	3.09	181.74	1387.68	0.00	0	18.96	
Kollam	2.05	0	0	7.01	969.85	4.77	0	0	
Thiruvananthapuram	7.11	0	0	83.68	515.74	3.88	0	262.75	
Total	107.81	17.56	38.66	1126.50	8817.97	180.06	3.09	352.75	

Conclusion

The mapping of all coastal wetlands was completed. The demarcated area of mangroves in Kannur, Kasargod, Ernakulam and Thiruvananthapuram districts should be conserved with immediate effect from human impact and urbanization. The aquaculture area is increasing day by day compared to other land cover such as back waters, mudflats, estuary and lowland areas. There is a mixed plantation land cover present which consists of species of coconut, cashew nut, casurina, home stead gardens etc. The demarcated high tide-line of 500 m from the coast drawn. All coastal wetland features must be protected and conserved.