



Government of Puducherry

**District Environment Plan
Karaikal District**



**Department of Revenue And
Disaster Management
&**

**Department of Science
Technology & Environment**

December 2019

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1. Introduction

Karaikal district is named after its Headquarters, Karaikal. It is located 135 kms away from Puducherry on the coast of Bay of Bengal. Karaikal is an enclave within Nagapattinam and Thiruvarur districts of Tamil Nadu. Unlike Puducherry district, Karaikal is a contiguous plain track with a total geographical area of 157 Sq. kms. Karaikal is a newly created district with effect from June 1, 2005.

As per Census of India 2011, Karaikal district with a total population of 2,00,222 ranks second in term of population among the 4 districts of the Union Territory of the total population of Karaikal district 51 per cent are rural population and rest 49 per cent are residing in urban areas. The density of population of the district is 1275 persons per Square Kilometre. Karaikal district recorded the lowest density of population among the districts of the Union Territory. Male-Female Sex ratio of the district has significantly improved from 1022 females per 1000 males in 2001 census to 1047 in 2011 census. (0-6) Child Sex ratio has decreased by 10 points, from 979 in 2001 census to 969 girls per 1000 boys in 2011 census. Karaikal district has recorded the highest proportion of Scheduled Caste population. The proportion of Scheduled Caste population to the total population of the district is 17.7 per cent. No tribe is scheduled as Scheduled tribe in the district as per Presidential order. Karaikal consists of 2 Taluks namely, Karaikal and Thirunallartaluks. Karaikal Taluk is the most populated taluk in the district with 1,44,200 population. Karaikal district has one Statutory Town namely Karaikal (M), a Census Town namely Tirumalairayanapattinam (CT) and 28 Revenue Villages. Il 28 villages of this district are inhabited. Among the villages in this district, Kottucherry has returned 9711 persons and recorded as the most populated village while Subrayapuram with a total population of 1069 persons is returned as least populated village in the district. Effective Literacy rate of the district has significantly improved from 81.9 in 2001 to 87.1 in 2011. Male literacy rate has recorded 92.4 per cent while the female literacy rate of the district is 82.0 per cent. Gender gap in literacy rate has significantly narrowed down from 14.7 in 2001 from 10.4 in 2011 census.

Work participation rate in the district is 34.1. Male Work Participation rate is recorded as 54.3 while Female Work Participation rate registered as 14.8. Out of 68,301 total workers, 58,342 (85.4%) are main workers and 9,959 (14.6 %) are marginal workers.

Karaikal is part of Cauvery basin and is located in the tail end portion of the Cauvery Delta. Rice cultivating Delta District with a long coastline. Total irrigated area – 10,980.16 Ha. Karaikal is endowed with extraordinarily diverse and distinctive traditional waterbodies found in different parts of the district commonly known as ponds, tanks, lakes which are an inherent part of the society in local culture and serve a variety of purposes. Nearly 1/3rd of them are associated with temples as theerthams. They play an important role in maintaining and restoring the ecological balance. They act as sources of drinking water and irrigation, recharge groundwater, control floods, support biodiversity and tourism, and form part of cultural & religious values besides providing livelihood opportunities to a large number of people.

2. Water Resource Management

(i) Surface Water

The main source of water for Karaikal District are Cauvery Water from Mettur Dam, Monsoon rains (North East Monsoon, South West Monsoon & Summer Rain) and traditional Ponds / Tanks / Wells / Lakes.

Rivers, Canals and its branches in Karaikal

Karaikal is drained by seven tributaries of Cauvery as detailed below and the receipt of Cauvery Water through them depends on the release of water from Mettur Dam.

Sl.No.	Name of the River	Length (Km)	Drain enter in the River
1	Nandalar	15.2	Konnakavali drain
2	Nattar	12.6	Andoor and Kottuchery drain
3	Vanjiyar	12.3	Nedungadu drainage

4	Noolar	16.6	Amagarthur drainage and Thirunallar drain
5	Arasalar	11.76	Karaikal drainage
6	Thirumalairajanar	10.22	T.R.Pattinam drainage
7	Puravadaiyanar	3.35	Polagam drainage


All these rivers are confluence into the Bay of Bengal. Check dams have been constructed in all the seven rivers. A network of canals branches out from these rivers to feed the irrigation channels and ponds. Major / Minor River canals - 593.589 Kms and Total irrigated area – 10,980.16 Ha

Fig: 1 Rivers and Canals of Karaikal District



Ponds, Tanks, Lakes & Wells in Karaikal

In Karaikal, traditionally, surface water storage is emphasised. Surface flow system or water bodies have sustained the Karaikal agriculture and acts as a bulwark against salt water intrusion. Karaikal District do not have many lakes or large ponds. But there are around 549 ponds / tanks as per the survey of Revenue and Agriculture Department which is huge in



numbers for a small district with 160 sq. kms area. These water bodies had proper inlet and outlet interconnected by network of irrigation channels with cascading plan for draining of water: One pond fills – overflows - next pond fills – overflows and so on. For Centuries, these water bodies played a vital role in ensuring water security to Karaikal and surrounding areas and were once the main source of water for bathing, cultivation and other purposes. In urban localities ponds work as source of drinking water, absorption of flood water and a conduit for ground water recharge. There were considerable number of wells, which were once the source of potable water for public.

Due to urbanization, most of the wells have been closed, except a few wells, which stand as a mere land mark. There are No major lakes / large ponds except the recently installed artificial Lakes:

- | | |
|--------------------------|----------------|
| (a) Nallambal lake | - 77.64 Acres |
| (b) Chettikottagam lake | - 15.22 Acres |
| (c) Padutharkollai lake | - 35.43 Acres |
| (d) Mini lake at Polagam | - 12.956 Acres |
| (e) Tank at Polagam | - 15.459 Acres |
| (f) Kazhugumedu lake | - 9.884 Acres |

Failing monsoon and insufficient release of water from Mettur Dam, these waterbodies could not store water.

There is acute shortage of water in major ponds in Karaikal District during last few years. Most of the ponds are dried. Considering the situation, during last year, the Commissioners were directed to ensure that no water was pumped out from the ponds, irrespective of its ownership, to keep the available water for public as well as cattle use. PWD, Commune Panchayat restricted public water distribution time. In some areas potable water was arranged through tankers. The percentage of green grass for cattle is deteriorating rapidly. Prolonged and continuous neglect of maintenance of water bodies, encroachments in the tank bund, foreshore, water-spread and supply channels, deforestation in the catchment for urbanization & housing, use of tank beds as dumping yards and thus silting of tank beds and choking up feeder channels requires serious attention by concerned authorities.

- ❖ Among the above rivers, Arasalar is larger one. Arasalar is having a total run of 24 Km, enters Karaikal, a little east of Kalanganni. It forms the natural boundary line separating Neravy Commune from Thirunallar on the north-west and Karaikal on the north-east.
- ❖ It runs a distance of 12 Km, in Karaikal district before entering into the Bay of Bengal. The construction of Kannambadi Dam in 1916 and Mettur Dam in 1932 have reduced the flow of water in Arasalar.
- ❖ It has been categorized as Priority IV by CPCB based on the value of BOD of the River (7 mg/l).

Replenishing Water bodies: The Strategic Plan


It is of utmost importance for meeting the rising demand for water augmentation, improving the health of waterbodies as they provide various ecosystem services that are required to manage microclimate, biodiversity and nutrient cycling. Traditionally, water was seen as a responsibility of citizens and the community collectively took the responsibility of not only building but also of maintaining the waterbodies. This needs to be brought back into the system.

Cities and Towns may not run out of water if urban planning engages more critically with the city's terrain, along with propagation of knowledge about the local history of lakes, meaningful community engagement and ownership of waterbodies. It is at this point and as part of the nation wide programme "Jal Shakti Abhiyan", the Karaikal District administration launched –"NamNeer_Karaikal" **நம்நீர்காரைக்கால்** on **3rd July 2019** in Karaikal District.

Nam Neer – Objectives

The following are the objectives of Nam Neer programme:

- ❖ Comprehensive improvement and restoration of water bodies, thereby increasing tank storage capacity,
- ❖ Ground Water Recharge,

- 
- ❖ Increased availability of drinking water,
 - ❖ Improvement in agriculture/horticulture productivity,
 - ❖ Improvement of catchment areas of water bodies commands,
 - ❖ Improved water use efficiency and conjunctive use of surface and ground water,
 - ❖ Community participation and self-supporting system
 - ❖ Capacity building of communities, in better water management,
 - ❖ Development of tourism, cultural activities, etc.

The mission Nam Neer focuses on better management of Cauvery water and rainwater by digging, cleaning and de-silting ponds and wells that have traditionally stored water. The objective is to enhance the development of Minor Irrigation infrastructure, strengthening community based irrigation management in a decentralized manner and to adopt a comprehensive programme for restoration of tanks and sources of water to effectively utilize Cauvery water and rainwater.

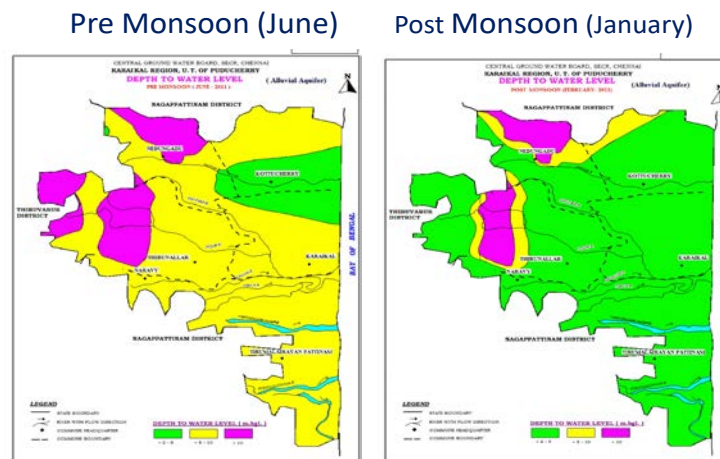
There is acute shortage of water in major ponds in Karaikal District during last few years. Most of the ponds are dried. Considering the situation, during last year, the Commissioners were directed to ensure that no water was pumped out from the ponds, irrespective of its ownership, to keep the available water for public as well as cattle use. PWD, Commune Panchayat restricted public water distribution time. In some areas potable water was arranged through tankers. The percentage of green grass for cattles is deteriorating rapidly. Prolonged and continuous neglect of maintenance of water bodies, encroachments in the tank bund, foreshore, water-spread and supply channels, deforestation in the catchment for urbanization & housing, use of tank beds as dumping yards and thus silting of tank beds and choking up feeder channels requires serious attention by concerned authorities.

(ii) Ground water

The groundwater study by the Central Ground Water Board (CGWB) and the Agriculture department has marked the district as “Safe”. In recent times, the non availability of surface water in recent times has resulted in groundwater being used as a supplementary source. Competing demands from agriculture, businesses, and communities are putting a

strain on water resources. Population growth, rapid urbanization, an upward looking economy and rising standards of living and massive exploitation of ground water for irrigation has lowered per capita water availability. This will lead to change in surface water dynamics of the UT and Karaikal District.

Fig 2: Ground Water Level



Increase dependency on Ground Water

Increase in use of groundwater as a supplementary source for irrigation and commercial purposes has been noticed. Around 1200 tube wells are present in this District. Competing demands from agriculture, businesses, and communities resulting in lowered per capita water availability

- 1901 - 1960 m³/year
- 2025 - 600 m³/year
- 2025 - 224 m³/year (Projected)

(Source: Central Ground Water Board (CGWB) Report for UT of Puducherry)

Ground Water Quality

The quality of Groundwater from shallow alluvial aquifer is almost neutral in nature with P^H values ranging from 6.7 to 7.9. The water is generally sodium – bicarbonate- chloride type, the bicarbonate predominating over chloride. The electrical conductivity values are between 1500 to 3000 microhos/cm at 25⁰C.

In deeper Tertiary aquifer, the quality of groundwater is alkaline with PH ranges from 7.6 to 8.9. The quality of groundwater in the eastern part is poor and unfit for both domestic

and industrial purpose. The groundwater in the western part of the region is comparatively better with EC values generally ranging around 1500 micromhos/cm at 25⁰C. The chloride concentration is within 500 ppm.

The water from both shallow alluvial aquifer and deeper Cuddalore aquifers in western part of the region is fit for domestic purpose. It is generally unsuitable for irrigational purpose due to higher concentration of sodium in water. Therefore, the groundwater is conjunctively used with surface water for irrigation.

Table: 1 Water Quality Monitoring Stations in Karaikal

Location	Type	Latitude	Longitude	Date of Inception
Arasalar	River	10° 54' 34.2" N	79° 49' 4.2" E	15-05-02
T.R.Pattinam	Borewell	10° 50' 28.6" N	79° 49' 55.6" E	16-05-06
Vadamattam	Borewell	11° 58' 5.7" N	79° 47' 43.8" E	16-05-06

Fig: 3 Location of Water Quality Monitoring Stations in Karaikal

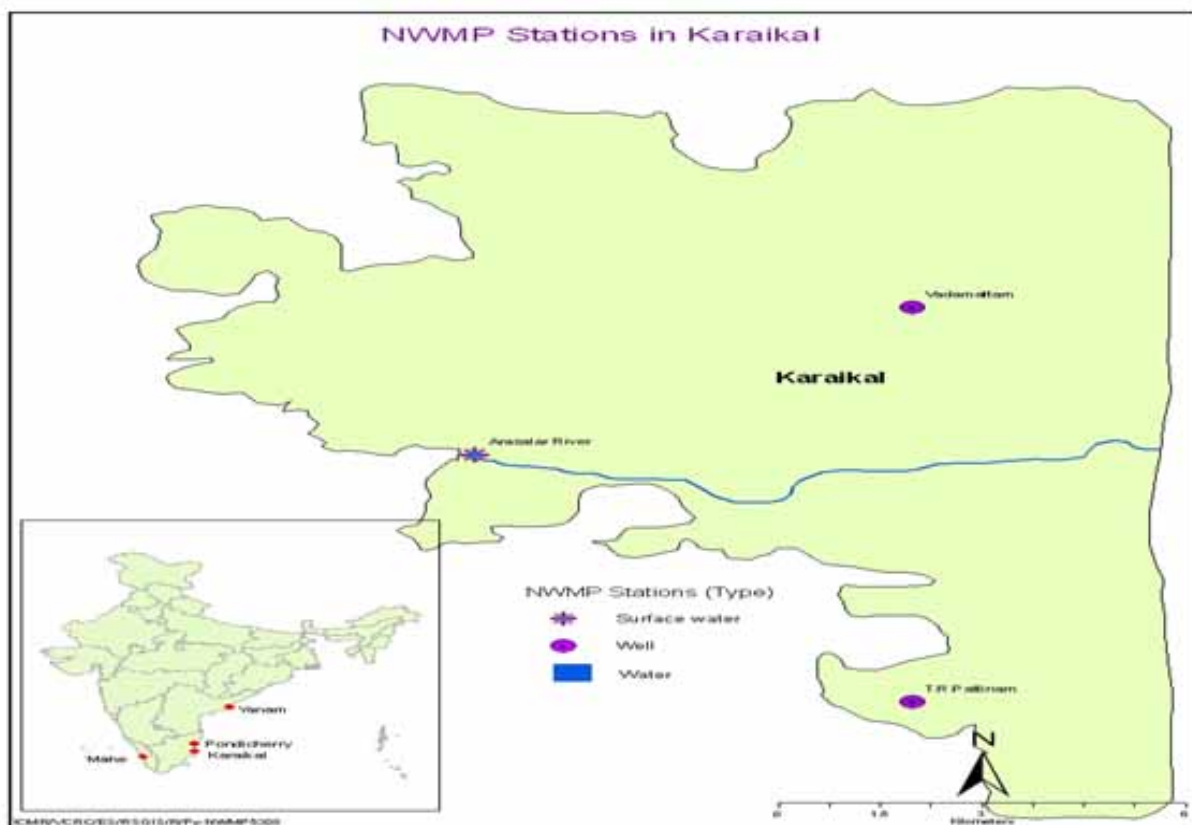
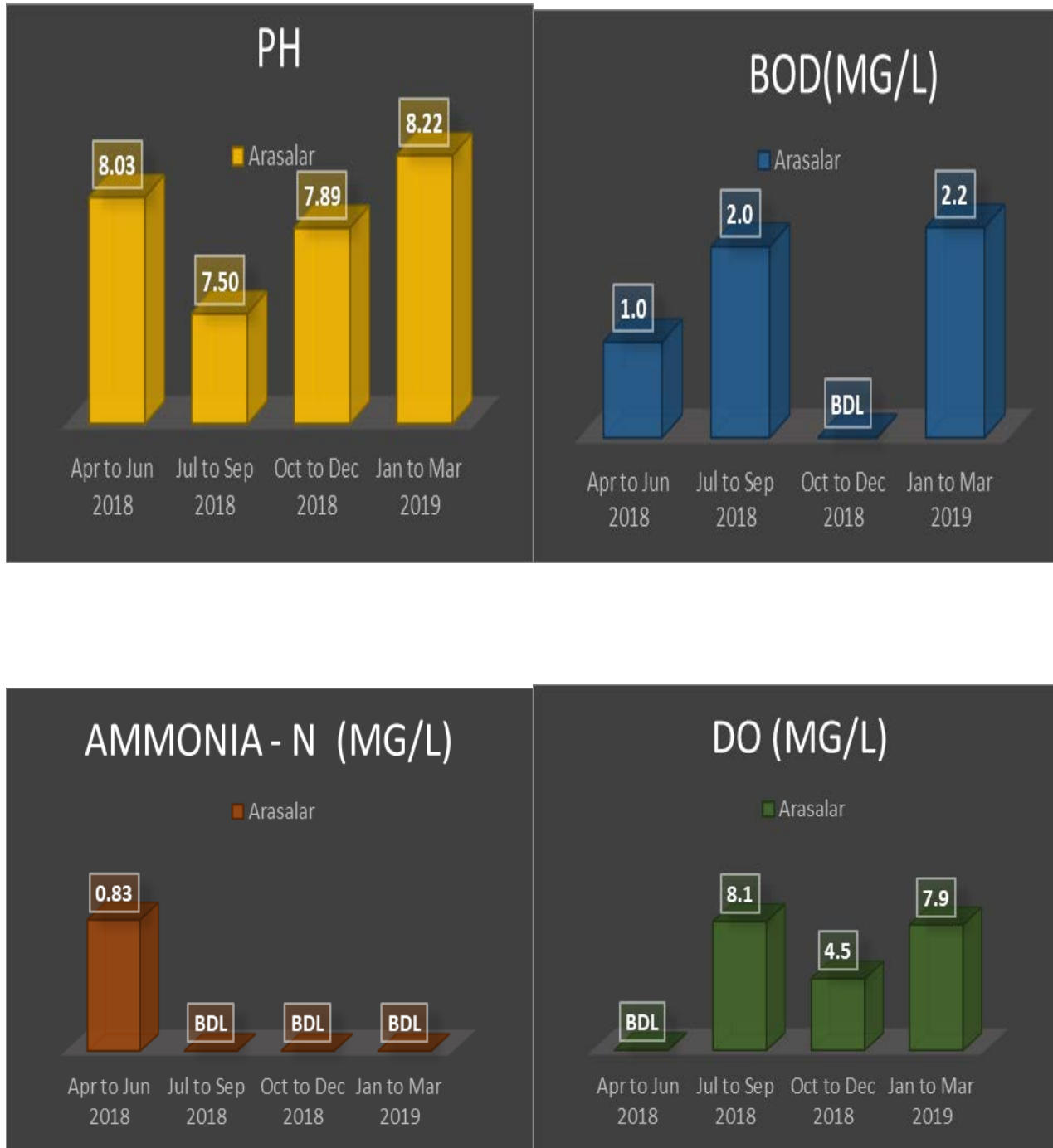


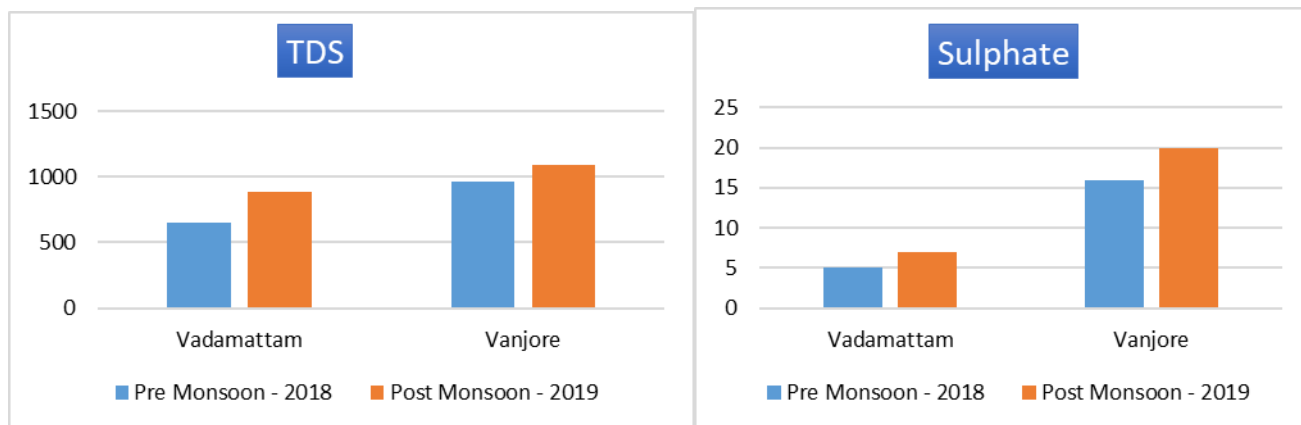
Fig. 4 Status of Arasalar River water Quality



Note: BDL – Below Detection Limit

Fig: 5 Status of water Quality of Karaikal Borewell





Ground water and Surface water quality in Karaikal District are in healthy status except value of TDS. Higher TDS is due to salt water intrusion.

3. Air Quality Improvement

Ambient air quality of Karaikal District is being monitored under CPCB sponsored project, National Ambient Air Quality Monitoring Programme (NAMP). The details of the monitoring programme is given below:

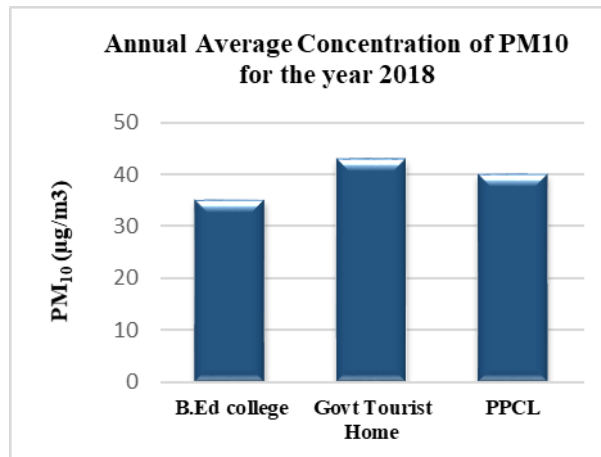
Table 2: National Ambient Air Quality Monitoring Stations at Karaikal

Sl. No.	Location Name	Location Type	Source of Pollution
1	B.Ed. College, Nehru Nagar, Karaikal	Residential area	Vehicle emission and natural dust from road
2	Govt. Guest House, Kovilpathu, Karaikal	Residential cum Commercial area	Vehicle emission and natural dust from road
3	PPCL, Polagam, T.R. Pattinam, Karaikal	Industrial area	Industrial Pollution and vehicular pollution.

Table 3: Annual Average Concentration of Pollutant

Sl.No	Location	Pollutant in $\mu\text{g}/\text{m}^3$		
1	B.Ed college	35	3.1	6.1
2	Govt Tourist Home	43	4.5	8.1
3	PPCL	40	3.9	7.3
Standard		60	50	40

Fig. 6 Concentration of PM₁₀



The values of PM₁₀ ranges from 35 $\mu\text{g}/\text{m}^3$ to 43 $\mu\text{g}/\text{m}^3$, SO₂ is in the range of 3.1 $\mu\text{g}/\text{m}^3$ to 4.5 $\mu\text{g}/\text{m}^3$ and NO₂ is in the range of 6.1 $\mu\text{g}/\text{m}^3$ to 8.1 $\mu\text{g}/\text{m}^3$. Except the values of PM₁₀, all the other pollutants values are very meager when compared to National Ambient Air Quality Standards. Air quality of Karaikal district falls under Category “GOOD” of Air quality Index. It is noticed that air quality in Keezhavanjore village is affected by coal handling operation of Karaikal Port.

Fig. 7 Concentration of SO₂

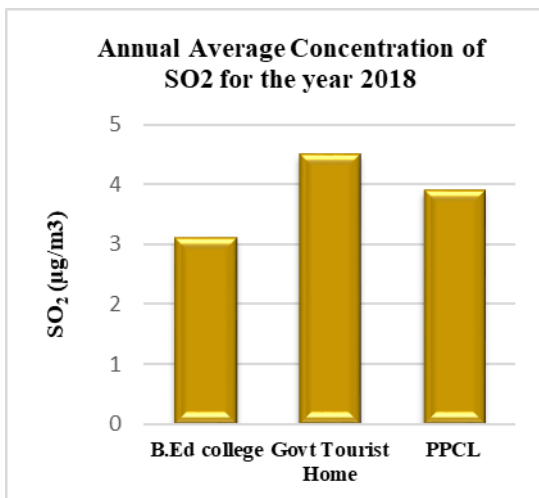
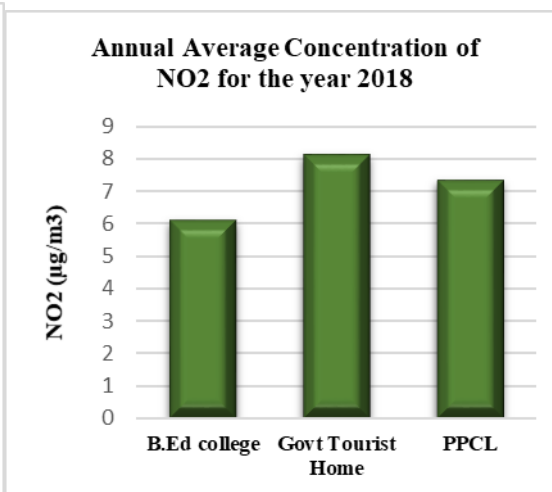


Fig. 8 Concentration of NO₂



Main sources of air pollution are automobile, industrial activity and Karaikal port. All the industries are permitted to operate with stipulated pollution control devices. No industry is allowed to use dirty fuels like raw coal, tyres etc. Pollution potential units are installed Continuous Online Environmental Monitoring System (COEMS) with connectivity to PPCC portal.

4. Noise Pollution Control Measures

Major sources of Noise pollution are vehicles, industrial activity, construction process and loud speaker played during festival season. No hot spot has been identified in Karaikal district.

5. Sewage Treatment Plant

It is estimated that around 18 MLD of sewage is generated in the Karaikal district. Most of the sewage is disposed through conventional method of soak pit and septic tank. A comprehensive sewerage scheme with estimated cost of Rs. 162.33 Crore has been proposed for Karaikal district. Underground sewerage scheme for Thirunallar Temple town has been proposed with the cost of Rs.5.72 Crore. 3 MLD Sewage Treatment Plant with the cost of Rs. 6 corers has been proposed to be install on the Arasallar bank under Restoration of polluted water stretches.

6. Industrial Effluent Management

No water based industry are present in the Karaikal district. Few personal care units are generates effluent and the same is being treated in suitable treatment plant before it is discharged.

Table 4: Effluent generating industries

Sl.No.	Name of the Industry	Quantity
1.	M/s. Ammaiyar Milk Dairy, 172/1A/2, Nedungadu Main Road, Melakasakudy, Karaikal.	2 KLD
2.	M/s. Chemplast Sanmar Ltd., R. S. No. 37 - 40, Melavanjore Village, T. R. Pattinam Commune, Karaikal	85 KLD
3.	M/s. Jyothy Laboratories Limited, No. 131, Peralam Main Road, Thirunallar Commune, Karaikal	18 KLD
4.	M/s. Karaikal Port Private Limited, Keezhavanjore Village, T.R.Pattinam Commune, Karaikal	100 KLD
5.	Vinayaka Mission Medical College and Hospital, Karaikal	37

7. Integrated Waste Management

Solid Waste Management

Details of Solid waste generated in the Karaikal District is given below

Table 5: Details of Solid waste generation

Sl.No	Name of the Municipalities / Commune Panchayat	Solid Waste Generate (TPD)
1.	Karaikal Municipality	40
2.	Kottucherry Commune Panchayat	6.5
3.	Nedungadu Commune Panchayat	5
4.	Thirunallar Commune Panchayat	5
5.	Neravy Commune Panchayat	3
6.	T.R. Paattinam Commune Panchayat	5
	Total	64.5

Task of Solid waste management for Karaikal Municipality has been entrusted with a NGO, Hand in Hand. With continuous awareness programme conducted to the public, about the importance of source segregation, scientific solution for the solid waste has been achieved fully.

Table 6: Karaikal Municipality

Description	Units
No of wards	18
No of residential households	22532
Commercial establishments	2414

Table 7: Karaikal Municipality -Ward Details

Ward Number	Ward Name	Total Households
1	Keezhakasakudy	1610
2	Thalatheru	1184
3	Ammankoilpathu	1686
4	Koilpathu	2270
5	PuliankottaiSalai	1785
6	Dharmapuram	1604
7	Water Tank	1231
8	Valatheru	1678
9	MaideenPalli	1046
10	AmmaiyarKoil	754
11	Kadar Sulthan	1007
12	Kothukulam	946
13	AnthoniarKoil	904
14	MadaKoil	448
15	Madagadi	979
16	Kirambuthottam	891
17	Oduthurai	1347
18	Akkaraivattam	1162
Total Households		22532
Total Shops		2414

Collection & Transportation Arrangements of MSW

Primary Collection

Door to door garbage collection with source segregation is being executed at all residential households, commercial establishments, government buildings, educational institutions etc. Apart from that, horticultural waste, bulk waste is also collected as scheduled.

A two bin and bag system is being followed for an effective source segregation of waste. The Municipality has provided a big blue colour bag to all the households to store the recyclable waste. The residents are advised to store the recyclable waste in the bag and the bio degradable and inert wastes separately in bins.


Door to door collection of garbage commences at 6 a.m. in the Municipality. A goods vehicle (similar to Tata Ace) with four Green Friends (Green Friends are the people involved in door to door collection, street sweeping, drainage cleaning and waste processing) collects the waste from households along with a motivator. Five bins are placed in the vehicle to store the collected segregated waste. The collection process is being done in a manner that three Green Friends collect the segregated wastes from households and deposit them in respective bins placed in the vehicle and while one Green Friend clean the streets covered by the vehicle. The goods vehicle with four Green Friends and a motivator covers the allocated area during the day. The garbage collection from households concludes around 12 pm. The process of waste collection from households is being executed in the entire Municipality everyday using goods vehicles. Each vehicle collects around 1 tonnes of waste per day.

ONE UNIT (1000 Households)

Four Green Friends

(3 Green Friends engaged in door to door collection of waste; 1 Green Friend for street cleaning)

One Motivator



Commercial Establishments generate significant amounts of wastes everyday along with Government buildings and Educational Institutions. Garbage from such establishments are collected by tractors on a daily basis. Tractors are allocated with certain area to perform the collection activities. A total of 5 Green Friends are assigned in each tractor where one Green Friend collects garbage from commercial establishments, two Green Friends collect the street waste and two Green Friends remain in the tractor and do further segregation and deposit the collected garbage. The waste collection from commercial establishment commences at 9 a.m. and concludes at 5 p.m.

Bulk waste and Horticultural waste are collected using tractor with tipper every day with five Green Friends involved. The tipper covers the entire Municipality and collect wastes generated due to landscape maintenance, cropping trees and construction debris. The tipper also collects the generated waste at weekly market. The collection commences at 9 a.m. and concludes at 5 p.m.

Night activity

Two tractors with 5 Green Friends (male) are allocated for street sweeping and clearing of accumulated garbage in the following areas: a) Bharathiyar Street, b) Nehru Street, c) Church Street, d) Thirunallar road, e) Kamarajar Street, f) Government square, g) Major Pakkirisamy Pillai Street and h) around bus stand. This arrangement is made to tackle the wastes generated in these areas, since the quantum of wastes generated is higher at these locations.

Special occasions

The Municipality of Karaikal being a host for a variety of local festivals all over the years, the Municipality attract people in massive numbers and act as a source for garbage generation. Additional vehicles and man power are engaged during the below mentioned festival days. However, the general SWM work involving household waste collection and waste processing at the RRP happened as scheduled plan. For your reference, please find below the table giving details of local festivals in Karaikal Municipality.

Table 8: local festivals in Karaikal Municipality

Sl. No.	Name of Festival	Duration (days)	Waste Generation/Day (ton)	Tractors Requirement/Day (no)	Manpower Requirement/Day (no)
1.	Mangani Festival	One Month	1.5	2	20
2.	Kandoori Festival	15 days	1	1	10
3.	Church Festival	One Week	1	1	10
4.	Carnival Festival	5 days	1	1	10
5.	Flower Show	3 days	1	1	10
6.	Pongal	7 days	1	1	10
7.	Fact-De-Pondi	3 days	1	1	10

The particular for waste collection are as follows:


- ❖ One Goods carrier vehicle (auto) is assigned for every 1000 households with 4 Green Friends + 1 driver
- ❖ Two tractors with trailer is assigned for every 800 shops & roads, government buildings and educational institutions in a certain area with 5 Green Friends + 1 driver
- ❖ One tractor with tipper is assigned for bulk & horticultural waste
- ❖ Two tractors are assigned for night shift work
- ❖ One Goods carrier vehicle is assigned with 3 Green Friends + 1 driver to collect meat wastes from shops within the Municipality

No secondary collection is being used as it is irrelevant in this scenario, since all the motor vehicles reach the Resource Recovery Park directly with ease.

Resource Recovery Park (Waste Processing Area)

– Resource recovery park with all the facilities developed by the Municipality

The processing of different wastes takes place at the Resource Recovery Park (RRP) situated at Paravaipet. At the RRP unit, the waste is managed and processed according to their types. Presently, the RRP has a compost sieving machine, bio gas unit, vermin compost shed, recycle storage room and a platform for window etc.



Once garbage collection is done, all collection vehicles reach the RRP and the waste is unloaded. The vehicles unload the recyclable and biodegradable wastes on to a platform separately. The waste is further segregated by green friends manually ensuring effective segregation mechanism.

The biodegradable waste are taken to the composting platform and is composted by windrow mechanism on platforms allocated for windrow formation. The organic waste is converted to bio compost using cow dung / EM solution in a period of 60 -90 days. The recyclable wastes are taken to the recycle waste processing room where it is further sorted and sold to local vendors for further recycling. Inert wastes are taken directly to the landfill from collection vehicles.

A 40 cubic meter biogas plant is set up to process the generated meat waste in the municipality. To facilitate the process, a goods vehicle is assigned to collect wastes from meat shops on a daily basis. The meat waste is converted into energy by feeding them into the biogas plant as feed material. A total of 72 meat shops and 51 fish stalls are present and the average per day waste generation of around 600 kg is now being fed to the bio digester and trials are run for power generation. The plant includes waste shredder, hydrolysis tank, biogas digester and gas holder for gas production. A generator installed for power generation now produces electricity and this is being used to power the lights in the RRP.

Awareness and Information Dissemination

For making any project a success, active participation of local people is of prime importance. To make the people aware of the benefits of proper SWM and the harmful effects of the current practice, the collection vehicles are fitted with audio equipment to promulgate source segregation among the residents. The motivator of every goods vehicle visits door to door and constantly runs awareness campaign about source segregation. All the community dustbins in the residential areas are removed to strengthen the door to door collection system among the residents. Display boards with the message about 'Source Segregation' shall be erected in the main streets. Other IEC activities like mass cleaning, rallies involving school students, street plays, etc., are also conducted in parallel to create awareness among public.

Goods Vehicle – Ward Wise

In Karaikal Municipality, all wards are implemented with proper SWM system. The allotment of good vehicles for 18 wards are as follows:

1. Keezhakasakudy and Ammankoilpathu wards are covered on a daily basis **4 vehicles** are deployed for waste collection in these 2 wards. A total of 3296 households are present in these wards. These 2 wards are divided into 2 sections with 1100 households each.
2. **1 vehicle** is deployed for Thalatheru ward for waste collection on a daily basis.
3. **2 vehicles** are deployed for Koilpathu ward for waste collection on a daily basis.
- 3.**3 vehicles** are deployed for Puliankottai Salai and Water Tank wards. A total of 3016 households are present in these wards. The wards are divided into 3 sections; with each section comprising 1000 households. One vehicle is deployed in each section for waste collection on a daily basis.
- 4.**2 vehicles** are deployed for Valatheru and Ammaiyaar Koil wards. A total of 2432 households are present in these wards. The wards are divided into 2 sections with each section comprising 1216 households. One vehicle is deployed in each section for waste collection on a daily basis.
5. **1 vehicle** is deployed for Maideen Palli ward for waste collection on a daily basis.
6. **1 vehicle** is deployed for Kadar Sulthan ward for waste collection on a daily basis.
- 7.**1 vehicle** is deployed for Kothukulam ward for waste collection on a daily basis.
8. **2 vehicles** are deployed for Anthoniar Koil & Mada Koil wards covering a total of 1288 households for waste collection on a daily basis.
9. **1 vehicle** is deployed for Madagadi ward for waste collection on a daily basis.
- 10.**1 vehicle** shall be deployed for Kirambuthottam ward for waste collection on a daily basis.
11. Dharmapuram and Oduthurai wards are covered on a daily basis. **3 vehicles** are deployed for waste collection in these 2 wards. A total of 2951 households are present in these wards. These 2 wards are divided into 3 sections with around 1000 households each. The

vehicles cover all 3 sections every day.

12.1 vehicle is deployed for Akkaraivattam ward for waste collection on a daily basis.

13.1 vehicle is deployed for meat waste collection from shops in all wards on a daily basis.

Table 9: Goods Vehicle Systematization

Sl. No.	Name of the Ward	No. of households	No. of goods vehicle required
1.	Keezhakasakudy	1610	4
2.	Ammankoilpathu	1686	
3.	Thalatheru	1184	1
4.	Koilpathu	2270	2
5.	PuliankottaiSalai	1785	3
6.	Water Tank	1231	
7.	Valatheru	1678	2
8.	AmmaiyarKoil	754	
9.	MaideenPalli	1046	1
10.	Kadar Sulthan	1007	1
11.	Kothukulam	946	1
12.	Anthoniarkoil	904	2
13.	MadaKoil	448	
14.	Madagadi	979	1
15.	Kirambuthottam	891	1
16.	Dharmapuram	1604	3
17.	Oduthurai	1347	
18.	Akkaraivattam	1162	1
19.	Meat Waste Collection	-	1
Total		22532	24

Table 10: Manpower Requirement & Allocation

Sl.No.	Particular	No. of units	No. of Green Friends per unit	Green Friend required
1.	Door to door collection	23	4	92
2.	Meat waste collection	1	3	3
3.	Commercial area waste collection	3	5	15
4.	Night shift work	1	5	5
5.	SWM Shed activity	-	-	10
Total				130

Note: Substitute Green Friends are planned to manage the weekly off of the regular Green Friends

Construction and Demolition Waste

Karaikal district generates approximately 12 TPD of C&D waste. Currently the valuable materials are segregated and the inert material is being land filled in low laying area.

Plastic waste management

It is estimated that 6 TPD of plastic waste is generated in Karaikal District. These waste are segregated and channelized to the authorised plastic waste recycling facility. Two Brand owners i.e. M/s. Godrej Sara Lee and M/s. Jothy Laboratories are functioning in the district. They have formulated Action Plan in compliance with the Extended Producer Responsibility (EPR).

Bio-Medical Waste management

120 Health Care Facilities (HCF) are located in Karaikal District with total bed strength of 1477. It is estimated that 40 Kg of Biomedical waste is generated every day. It is collected, transported and disposed in the Common Bio-Medical Waste Treatment Facility (CBMWTF) situated in Puducherry.

Table 11: Details of Bio-Medical Waste management

“Type of waste	Quantity (kg/day)
Incinerable	400
Autoclave	80
Glassware	60
Needles/Syringe	10

Table 12: Details of HCFs in Karaikal

Sl. No.	Type of Hospital	Government	Private	Total No.
1.	Bedded	13	8	21
2.	Non bedded	3	96	99
	Total beds	635	842	1477

Table 13: Details of authorisation issued to HCFs in Karaikal

Sl. No.	Type of Hospital	Government	Private	Total quantity
1.	Bedded	12	7	382.25
2.	Non bedded	4	2	27.65
	Total quantity of	16	9	409.9 kg/day

In Karaikal district there are 120 HCFs. Out of this 16 Govt. Hospitals and 104 private hospitals are functioning. The total BMW generated from Govt. Hospital is 635 Kgs/day. The Private hospitals are generating 842 kgs/ day. These BMW are disposed through CBMWTF located at Thuthipet, Puducherry. Few of the hospitals are disposing through CBMWTF available at neighbouring state like Tamil Nadu.

Hazardous Waste Management

In Karaikal District, 9 units are generating hazardous waste of 8.17 TPA. The details are given below:

Table 14: Hazardous Waste Generation based on district wise

District	No. of Industries	Landfillable (TPA)	Incinerable (TPA)	Recyclable/utilizable (TPA)	Total (TPA)
Karaikal	9	0	0.5	7.665	8.17

Incinerable waste is disposed in co processing in the Cement plant located at Tamil Nadu. Recyclable waste is disposed through authorised re processor.

8. Mining Regulation Plan

River Bed Sand Mining

No River bed sand mining is permitted.

Encroachment of River Tank, Pond

There is no Encroachment of River Tank in this district. However, the encroachment on the pond has been removed in the month of July and August 2019 and the most of ponds in the Karaikal have been revamped in order to increase the capacity of ponds for rain-harvesting under the “Nan Neer” Scheme initiated by the District Authority Karaikal. The sapling of trees has also been undertaken around the bed of ponds.

Measures taken to complete illegal mining activity

A flying squad consistency of the Revenue officials has been constituted to monitor illegal sand mining activities in round the clock.

Available legal Administrative frame work to regulate mining activity

- 1) The Pondicherry Mining Minerals (Concession) Rules 1977.
- 2) The Mines & Minerals (Development & Regulation) Act, 1957.

Alternative source for carry out construction activity

Most of the people of this district are using M-sand as an alternate to River sand due to scarcity of River Sand. Import of River sand from other countries to meet the domestic need is permitted by the State Government under the monitoring & regulation of District Authority.

9. Improving Forest Cover

Moderate dense Forest in Karaikal district has been estimated as 6.83 Sq.Km. and Open Forest has been estimated as 8.57 Sq.Km. Under Social and Agro Forest scheme, 52.54 Ha. Of land has been brought under plantation. 25 acres of Mangroves plantation present in the district. Total no of tree planted during the last 3 years are as given below:

Table 15: Tree Plantation

Year	No. of Trees Planted
2017	2023
2018	7859
2019	7362
Total	17,244

A Central Forest Nursery is being maintained by Forest Department to support Aforestation programme in the district. Regular extension programmes are conducted for student awareness and biodiversity by conducting Vanamahotsava and Other programmes in educational institutions. NGOs are also involved in all plantation activities.

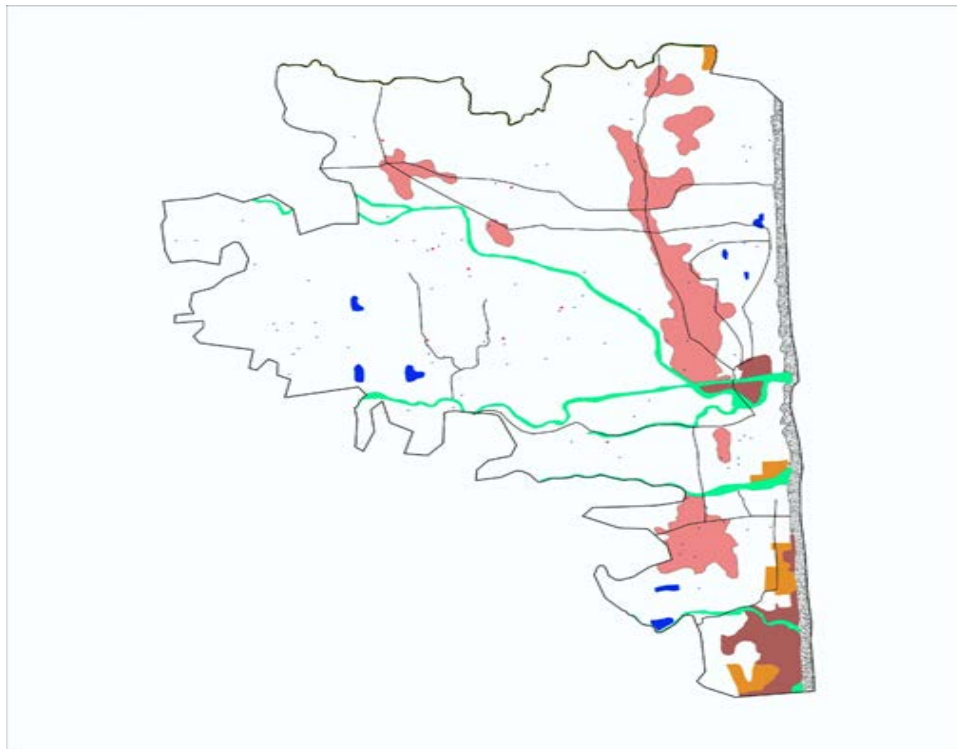
10. Wet Land Management

Total 114 wetlands are mapped including 94 small wetlands (<2.25 ha) with 1632 ha area. Sand / beach contributed 26.47% to the total wetland area. The river / stream with 421 ha (25.80% area) is the second major wetland category, followed by intertidal mud flats with 389 ha area i.e. 23.84.

Open water spread of the wetlands is significantly higher in post monsoon (584 ha) than during pre monsoon (352 ha), indicating the rainfall dependence of the wetlands in the district. Aquatic vegetation is only in the monsoon (22 ha). The qualitative turbidity of water is moderate in both the seasons.

Wet Land map of Karaikal

Fig: 9 Wet land map of Karaikal



9. Coastal Zone Management

Karaikal District is a small coastal enclave of Union Territory of Puducherry which was formerly part of French India. Karaikal is bounded on the North and South by Nagapattinam district of Tamil Nadu state, on the west by Tiruvarur district of Tamil Nadu, and on the East by the Bay of Bengal. The enclave is located 132 km south of the city of Pondicherry, and is known for its rich cultural heritage.

The coastal setting of the Karaikal District makes it highly vulnerable to the coastal disasters and climate change impacts. The limited coastal resources and the rising economic activities that compete for these vital resources are leading to more and more conflict.

Karaikal District is located in the Deltaic Region of Cauvery River Basin. The region is a monotonous peneplain with elevation not more than five meters above mean sea level at any point. Aeolian action is evident in the coastal tract in the form of sand dunes and mounds. Being situated on sea coast, coastal geomorphological units like sand dunes, tidal inlet, spit bars, coastal beach with swamps and marshes are common. Sand dunes are found in patches on plains.

The coastal area of the district is occupied by coastal community settlements. Beach resorts, farmhouses, aquaculture ponds, tourist spots, and parks. Fishing is the main occupation of people living in the suburban coastline, whereas in the urban coastline the inhabitants are also employed by industries and governmental and non-governmental organizations. Karaikal Port is another major activity along the coastline.

Table 16: Details of Coastal Area

Length of coastline along Bay of Bengal	17.08 kms
Length of tidal influenced inland water bodies like rivers and creeks	93.29 kms

Ecologically Sensitive Areas

Mangroves

Karaikal region is located close to the popular Muthupet Mangrove Forest area in Tamil Nadu. The region was devoid on naturally occurring mangroves in the past. Post Tsunami, manmade mangroves were developed in about 10 Hectares of land along the estuary portion of River Arasalaru by M.S. Swaminathan Foundation and funded by the Department of Tourism and, Development, Forest and, Wildlife and Fisheries of Pondicherry during 2009- 10. Currently, the area of mangroves is 32. 3 ha, which harbours six species true mangrove plants and 108 species of mangrove associated plants. The mangroves of Karaikal fall into two groups according to their habitats in nature: true mangroves and mangrove associates. True mangroves refer to species that specifically grow in intertidal zones, while mangrove associates are capable of occurring in either littoral or terrestrial habitats. The mangroves receive marine water from the Bay of Bengal and fresh water from the River Arasalaru and other small tributaries of river Cauvery.

Sand Dunes

Sand Dunes are formed by wind drift from the exposed sand areas of inter-tidal and supra tidal areas; the dunes take various shape and sizes and the height of which can go up to 10 m in undisturbed coastal areas. Karaikal region being a coastal province has moderate to good formation of sand dunes. The extent of sand dunes in about 0.22 Km² which is about 0.3% of land area. In some hamlets in Karaikal, communities have traditionally located their hamlets on sand dunes and elevated places and many of the village names end with the word “medu” which, in Tamil, means ‘an elevated place’.

Sand dunes play a vital role in disaster mitigation especially protection of other coastal features like vegetation and essentially forms as a part of the coastal ecosystem. In Karaikal District, it has been observed that the effects of the tsunami were reduced in places with sand dunes and Pandanus plants, in comparison to places where these natural protective features were absent.

The distribution of sand dunes in this region has not been mapped so far though their occurrence is reported. A project is proposed to be undertaken under the Integrated Coastal



Zone Management Project funded by MoEF&CC for Mapping the Sand Dunes and Protecting them.

Other ESAs

Salt marshes and Mudflats are other ecologically sensitive areas notices in the region. There is no Turtle Nesting Grounds reported in this region.

Coastal Issues

The major issues of the coastal areas are beach erosion, pollution of water bodies, solid waste dumping, shrinkage of habitats like mangroves and geomorphic features like sand dunes, declining fishery resources, rapid growth of population and decreasing livelihood opportunities. The coastal issues are elaborated below.

Ports & Harbour

Karaikal Port is an all-weather deep water port developed on Build, Operate and Transfer format under Public Private Partnership by the Government of Puducherry. The port was commissioned in April 2009 and developed in an area of 600 acres, Karaikal Port is located near the town of Karaikal in the Union Territory of Pondicherry, India. Since operations, the port has handled diverse cargo such as Coal, Sugar, Cement, Fertilizers, Project cargo, Agro commodities, Liquid cargo and Containers.

A fishing harbor also exists at the mouth of River Arasalaru.

The activities of these Ports and Harbours needs to be closely monitored to prevent marine pollution and coastal erosion.

Tourism

Tourism is an important activity in Karaikal District due to its coastal setting and rich spiritual heritage. The several pilgrimage places located in the neighbouring Tamil Nadu regions also made Karaikal as a tourism hub. The growth of tourism activities has led to rapid development of coastal beach resorts, hotels, guest houses and restaurants. The solid waste and waste water management from these tourism infrastructures requires special attention.

Coastal Pollution

Coastal areas are under pressure due to industrial growth and population explosion. Rapid development along the coast has resulted in increased migration to coastal cities and the expansion of coastal settlements. Hon'ble National Green Tribunal (NGT) in O.A.NO.829 of 2019, directed all the coastal States to include components of coastal pollution issues in the District Environment Plan. The coastal stretch of Karaikal faces the threat of coastal pollution due to the rapidly increasing tourism activities, resorts and hotels. Besides waste water discharged from domestic and commercial activities to the nearby drainage canals finally enters in to the sea through the creeks and channels. Public Works Department has prepared proposal to bring entire urban households in underground sewer connectivity with appropriate sewage treatment system.

Industries located nearer to the coast are ensured to discharge the effluent only with proper treatment. The coastal water quality of the region needs to be monitored regularly and suitable action to prevent discharge of any untreated waste water to be taken up.

Coastal Erosion

Puducherry coast is facing the problem of shoreline erosion due to natural effects like wave force and littoral drift, and anthropogenic effects like construction of Breakwaters. The status of shoreline changes along Puducherry and Karaikal coast was studied by the National Centre for Sustainable Coastal Management, Anna University, Chennai and the findings are given below:

Table 17: Status of Shoreline Changes

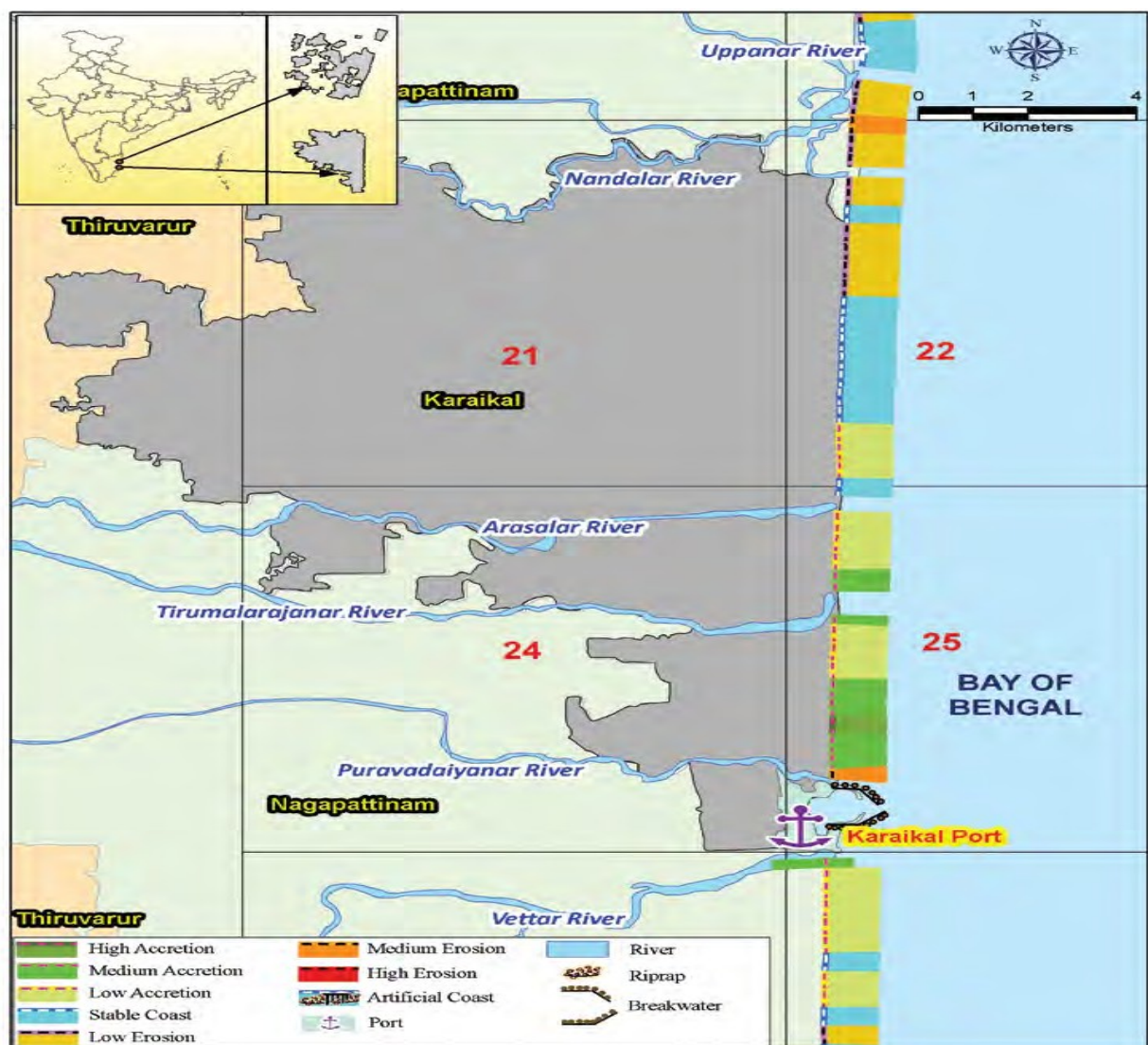
Classification of Coast	Extent (km)	Percent of Coast	Cumulative (%)
Length of Coastline including river mouths and Ports	17.30		
High Erosion Zone			
Medium Erosion Zone	0.29	1.68	
Low Erosion Zone	1.99	11.50	13.18[#]
Artificial Coast (km): Seawalls/ Riprap			

Stable Coast	3.98	23.01	23.01
High Accretion Zone	0.50	2.90	
Medium Accretion Zone	2.82	16.27	
Low Accretion Zone	4.60	26.59	45.76^{\$}
Number of Ports/ Harbours	1		
Number of Fish Landing Centres	4		
Number of Groynes/ Breakwaters	2	81.9	81.9

- ❖ The Karaikal Coast is approximately 17.3 km long including river mouths and port, of which nearly 3.98 km (23%) of the coast is “stable”, where no shoreline change is observed. Approximately 8 km (46%) of this coastal stretch is “accreting” (sum of high, medium and low accretion zones)
- ❖ Low “erosion” zone accounts for 2.0 km (~11.5%) of the total coastline. The other notable feature of the Karaikal coast is the absence of shoreline protection structures such as seawalls/ ripraps. The Karaikal Port was commissioned in September 2009 which has two breakwaters: the northern and the southern breakwater. Medium erosion is observed on the northern side of the Karaikal Port while medium accretion is observed on the southern side of the Karaikal Port.
- ❖ Medium erosion is observed south of the Virasolanar River mouth. The coastal area from north of Santhirapadi to Sinnurpet shows low erosion. The coast is stable from Sinnurpet to Thivettakudi and low erosion is observed between Mandapattur to Kottucherri. The coast is again stable from Kottuchcherimedu upto south of Kilinjimedu. A major part of the coast is dominated by tidal flats and dunes are observed at the southern end near Kilinjimedu.
- ❖ The coast is stable at Kilinjimedu and north of Arasalar River. Whereas, low accretion is observed in the coastal stretches between Kovilpattu to Kazhavely. South of the Arasalar River, the coast is accreting, although low accretion is observed and medium accretion occurs at Akakravattam and south of Thirumalairajanar River. This coast is dominated by tidal flats, younger coastal plains and a few stretches of coastal dunes.

- ❖ The coast is highly varying with erosion dominating the northern part of the north breakwater of Karaikal Port followed by zones of medium and high and low accretion respectively up to the mouth of Thirumalairajanar River. South of Karaikal Port, medium and low accretion is observed. Fish landing centres are dominant around the Karaikal Port area and the Vettar River. This part of the coast is dominated by narrow tidal flats, and younger coastal plains.

Fig: 10 Shoreline Changes Map of Karaikal Region



Coastal Zone Management – Legal Framework

Govt. of India has issued a Coastal Regulation Zone (CRZ) Notification, 1991 which was subsequently revised and reissued in the year 2011 and 2019. The CRZ Notification regulates all the developmental activities in the Coastal Regulation Zone. The coastal Regulation Zone extends between LTL and HTL and upto 500 meters from HTL on the landward side. Further, CRZ also applies to the land area between HTL to 100 meters or width of the creek whichever is less on the landward side along the tidal influenced water bodies that are connected to the sea. The water portion of tidal influenced water bodies and water area upto 12 nautical mile in the sea is also covered under CRZ.

Government of Puducherry is enforcing the CRZ Notification through the Puducherry Coastal Zone Management Authority (PCZMA) at UT level and the Regional Coastal Zone Management Authorities constituted at the regional level.

The Coastal Zone Management Plan Maps have been prepared for the U.T. of Puducherry through Institute of Remote Sensing (IRS), Anna University and approved by MoEF&CC wherein the coastal regulation zone has been categorized as follows

- ❖ CRZ-IA – Ecologically Sensitive Areas like Mangroves, Turtle Nesting Grounds, Sand dunes, etc. CRZ-IB – Area between LTL and HTL
- ❖ CRZ-II – Considerably developed coastal areas
- ❖ CRZ-III – Rural areas
- ❖ CRZ-IVA – Upto 12 nautical miles in the sea
- ❖ CRZ-IVB – Water portion of tidal influenced water bodies upto 5 ppt salinity

Table 18: Area Statement for Karaikal District as per CRZ Notification, 2011

Sl.No.		Karaikal
1	HTL Length along coastline in Kms.	17.08
2	HTL Length along Rivers / Creeks in Kms.	93.29
CRZ AREA IN SQ.KMS		
3	MANGROVES (CRZ - IA)	0.12
4	50m BUFFER FROM MANGROVES (CRZ - IA)	0.23
5	SALT MARSH (CRZ - IA)	0.05
6	MUDFLAT (CRZ - IA)	0.03
7	ARCHEOLOGICAL & HERITAGE (CRZ - IA)	-
8	SAND DUNE (CRZ - IA)	-
9	TURTLE NESTING GROUND (CRZ- IA)	-
10	CRZ – IB	2.73
11	CRZ – II	5.11
12	CRZ – III	5.55
13	CRZ – IVA	383.67
14	CRZ – IVB	1.28

Table 19: Details of Coastal Villages falling under CRZ in Karaikal District

Sea	River / Creek Name	CRZ - II Village Name	CRZ - III Village Name
Puducherry Region			
Bay of Bengal	Nandalar River	Karaikal	Akkaravattam
	Arasalar River	Akkaravattam	Keezhaiyur north

Tirumalarajanar River Vettar River	Oduthurai	Keezhaiyur south
	Kizhavelly	Kizhakasakudy
	Dharmapuram	Kizhavelly
	Kovilpattu	Kottucheery
	Thalatheru	Kovilpattu
	Kizhakasakudy	Thalatheru
		Thiruvattakudy

Coastal ecosystems are of great importance and of immense value to mankind in the present and in the future. They are being degraded at an alarming rate by various preventable activities including that of human interference. The coastal ecosystems are to be monitored periodically for better management plans. Remote sensing technology has considerable potential in monitoring the changes periodically. DST&E is proposing to prepare a geospatial data base on the coastal resources of Puducherry under the Integrated Coastal Zone Management Project which will help the planners in identifying and addressing the key issues. The significant coastal issues are erosion rate, deteriorating coastal water quality and infrastructure developments for tourism. These issues are addressed by the implementation of appropriate protective measures and legal instruments.

