सत्यमेव जयते

GOVERNMENT OF PUDUCHERRY

STATE ENVIRONMENT PLAN
U.T. OF PUDUCHERRY

DEPARTMENT OF SCIENCE, TECHNOLOGY AND ENVIRONMENT

December 2019

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXURES

1. INTRODUCTION

The National Green Tribunal (NGT) vide its order dt. 26.09.2019 in O.A. No. 360 of 2018, has directed all the States Government to formulate District Environment Plan (DEP) by the District Collector with the assistance of State Pollution Control Board (SPCB) and Central Pollution Control Board (CPCB). Based on the District Environment Plans, Department of Environment, shall prepare State Environment Plan.

CPCB has formulated Data templates consists of seven thematic areas viz. Waste Management, Water quality, Sewage generation, Industrial waste water, Air quality, Mining activity and Noise Pollution. In addition to these components, Coastal Zone Management, Wetland and Biodiversity and greening of Puducherry have also been incorporated in the State Environment Plan as these are more relevant to this coastal U.T.

Environmental Management Plan (EMP), a term encompassing environmental planning, protection, monitoring, assessment, research, education, conservation and sustainable use of resources, is now accepted as a major guiding factor for sustainable development at the Regional and National level. Since the Brundtland Report appeared in 1987, the concept of sustainable development has become widely acknowledged by Governments and International Organisations. It is now being increasingly recognized that environmental factors and ecological imperatives must be in built to the total planning process if the long-term goal of making industrial development sustainable is to be achieved.

The concept of Environmental Management Plan emerged as an alternative to the traditional sectoral approach to solve environmental problems that prevailed during the 1970s. The latter has resulted in inefficient, ad-hoc procedures and contributed to the creation of new environmental problems, mainly due to difficulties in policy coordination.

The Union Territory of Pondicherry has attracted more number of industries in the past three decades, due to the various incentives given by the Government by way of tax concessions, power subsidies, tax holidays and soft loans that were not available in most of the other neighbouring states. The rapid growth of industries in the past decades has resulted in the increase in the level of pollution, population, urbanization and other related developments, pushing the environment impacts closer to the threshold limits of tolerance.

State Environment Plan (SEP) has been prepared inculcating two districts of the U.T. of Puducherry viz. Pondicherry and Karaikal districts based on series of Stakeholders consultation meetings. Due care has been taken while preparing this plan as U.T. of Puducherry is intersected by other three States viz. Tamil Nadu, Andhra and Kerala.

U.T. of Puducherry consists of diversity of ecosystems, social sectors, industrialisation and political systems, evolving appropriate strategies and planning is challenging task. This SEP would give idea about general environmental conditions, its quality, potential threats and its management strategies both through legal frame work, administrative reforms and conservation measures.

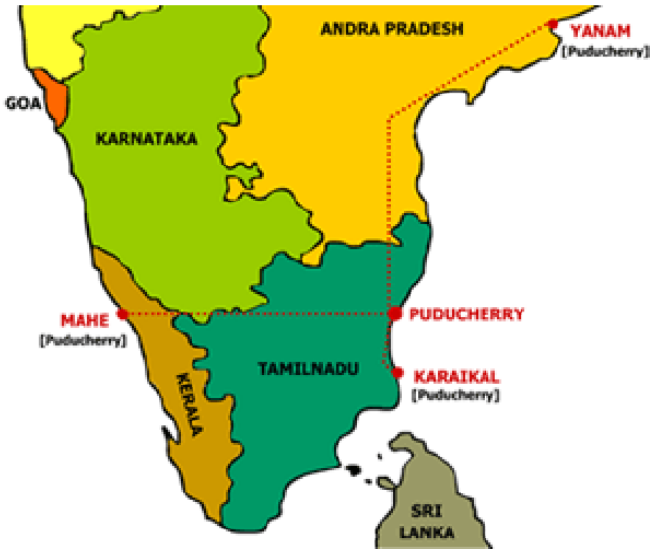
This SEP has been prepared with various inputs derived from the National Environmental Policy, 2016, State Water Policy, 2015, State Energy Policy, Puducherry Industrial Policy, 2016 and Comprehensive Development Plan, 2019.

This plan would assist in identifying the issues and facilitate in finding scientific and sustainable solution for prosperous Puducherry.

2. GLANCE OF PUDUCHERRY

The Union Territory of Pondicherry consists of four regions, namely Pondicherry Region (293 Km^2), Karaikal Region (161 Km^2), Yanam Region (20 Km^2) located along the east coast of India and Mahe (9 Km^2) located along the West Coast, covering a total area of

483 Km^2. All the four regions are at different locations, geographically separated from each other. Pondicherry and Karaikal are enclaves of Tamil Nadu, while Yanam and Mahe are Andhra Pradesh and Kerala respectively.



The Union Territory of Puducherry consists of two revenue districts viz., Puducherry and Karaikal. Puducherry District comprises of Puducherry, Mahe and Yanam regions. Karaikal District comprises of the Karaikal region. Puducherry region is intersected by the deltaic channels of River Gingee, River Pennaiyar and other streams forming the two main drainage basins. It is also interspersed with lagoons, lakes and tanks. Malattar, Ariankuppam and Pambai rivers are the other drainages in the region. Mahe and Yanam regions are located at the tail end of Mahe River and Gauthami-Godavari River respectively. Karaikal region forms part of the fertile Cauvery delta and the region is completely transacted by the rivers Arasalar, Nattar, Vanjiar, Noolar, Pravadaiyanar and the Thirumalarajanar.

Total population of the U.T. of Puducherry as per 2011 census is 1,247,953 of which male and female are 612,511 and 635,442 respectively. In 2001, total population was 974,345 in which males were 486,961 while females were 487,384. The total population growth in this decade was 28.08 percent while in previous decade it was 20.56

percent. The population of Puducherry forms 0.10 percent of India in 2011. Out of the total Puducherry population for 2011 census, 69.16 percent lives in urban regions of district. In total 657,209 people lives in urban areas of which males are 323,489 and females are 333,720. Sex Ratio in urban region of Puducherry district is 1032 as per 2011 census data. Similarly child sex ratio in Puducherry district was 978 in 2011 census.

3. WATER RESOURCE MANAGEMENT

A. Surface Water

Water is a precious finite resource. It cannot be created but can be destructed and be transferred one form to other. Saline water to portable water, sewage water to good quality water vice versa. Considering the availability of abundance of fresh water, we have been misusing the natural resource unwisely. When availability of fresh water is limited then development of the society will automatically come to a standstill. Now, we have realized that the water cycle is basic for life cycle.

Water bodies like tanks and ponds constructed to harvest rainwater for local use, serve many environmental functions including flood and soil erosion control, bio-diversity support and useful for irrigation, drinking water supply and groundwater recharge. They play an important role in maintaining and restoring the ecological balance and are essential sustaining all life forms. Now-a-days, relative importance of some of these water bodies has waned due to number of reasons such as shifting away from community-based tank system to individual beneficiary-oriented ground water dependent system, encroachments, silting, population pressure, multiplicity of agencies responsible for their upkeep etc.

Increasing drought conditions has also accelerated the decline in water resources and critical water shortage situation is faced. Hence, it is most important to develop, conserve and manage the scarce water resources in a sustainable manner. Efficient and effective water management with integrated or conjunctive utilization of ground and surface water resources

are the immediate need. Also, the quality of water is to be preserved by way of eliminating / minimizing all the polluting sources.

In Puducherry region there are 59 system tanks (i.e. tanks that are connected to river systems) and 25 non-system (rain fed) tanks which irrigate about 6600 hectares of land. The system tanks receive supply from the two rivers and three major tributaries. Water from the rivers and tributaries are conveyed to the tanks through feeder channels. Apart from the 25 non-system tanks there are nearly 609 ponds that can hold rainwater. Much of the rainfall runoff can be stored in the 84 tanks. The annual water availability of the Puducherry district is assessed to be 184.975 MCM, out of which share of surface water is 60.905 MCM (32.92%) and ground water is 124.07 MCM (67.08%).

The main source of irrigation prior to 1987 was 84 no's of tanks and lakes which were supplemented by 3,000 shallow tube wells. The practice of conjunctive usage of surface and ground water was neglected since middle of the 1980's and thereafter the entire requirement of water is being met out from groundwater leading to neglect of surface water resources.

There are No major lakes / large ponds present in Karaikal, Mahe and Yanam Region except the recently installed artificial Lakes in Karaikal district.

(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

Government of Puducherry is taking continuous efforts to protect and restore the water bodies in the Union Territory to sustain the ground water resources and fulfil the water requirement of present without compromising the needs of future generation.

Inspired by the Hon'ble Prime Minister's impetus on Jal Sanchay, Government of India has launched the Jal Shakti Abhiyan (JSA) to revive India back to a sustained system of water conservation. In line with this, Hon'ble Chief Minister of Puducherry launched the "Neerum Oorum" project on 05.09.2019 to protect and restore the water bodies and augment the ground water resources of Puducherry on mission mode. The project aims to revive Pondicherry district back to a sustained system of water conservation by the following five aspects with the leadership of District Collector: -

i. Water Conservation and rain water harvesting,
ii. Renovation of traditional and other water bodies,
iii. Reuse of water and recharging of structures,
iv. Water shed Development and Intensive afforestation

The following tasks have so far been carried out under the project.

Taking inventory: The number of water bodies in the district was available in the Revenue Records of the district. To help them make an inventory, a team was sent to survey the water bodies, document the same and provide a unique number to every pond based on its location – village, panchayat and sub-division. At present, about 454 Ponds (Kulam/Kuttai) and 84 Tanks (Lakes) are identified and available in Pondicherry district. The Standard Operating Procedures (SOPs) have been prepared by the 2 municipalities and 5 Commune Panchayats for rejuvenation of these ponds.

Corporate Social Responsibility, Convergence: Through convergence with MGNREGA Scheme, PWD, local bodies and with CSR support of many companies, banks and NGOs including Lions and Rotary Clubs, desilting of 120 ponds has been done to date. Further, work for another 80 ponds is in progress, including 30 temple ponds. About 200 km of canals were cleaned.

De-silting of canals: De-silting of canals, was undertaken with support from local leaders and officials from the district administration, as a part of Neerum Oorum. The project received vital support from the offices of the Governor and Chief Minister.

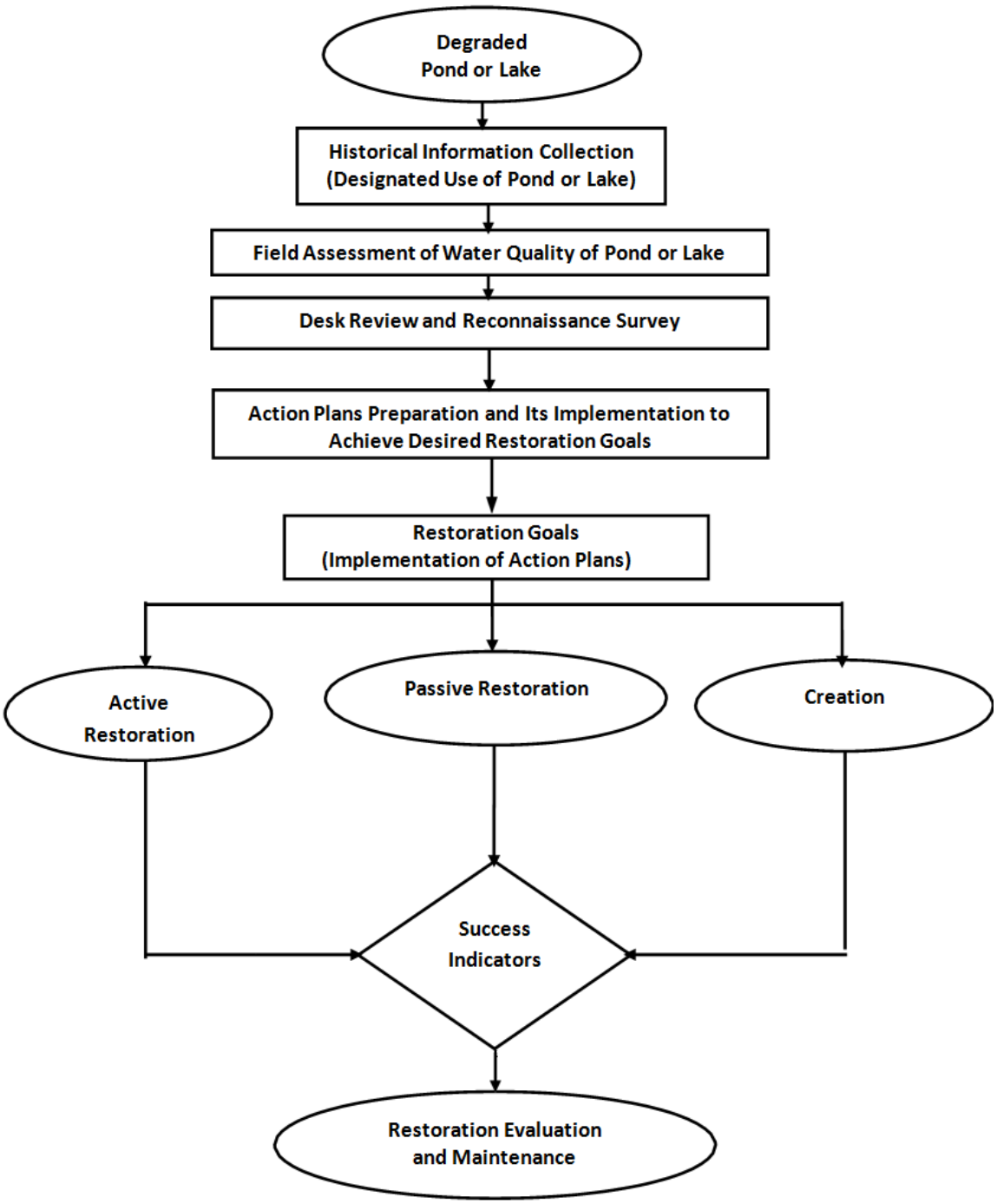
Neerum Oorum: The tagline for the water bodies' rejuvenation programme was 'Neerum Oorum. Advertisements were given in local newspapers, appealing for support from the public, corporate sector and institutions. More than a dozen companies provided free services.

Geo-tagging of water bodies: Government of Puducherry in association with the council of Scientific and Industrial Research (CSIR) – National Environmental Research Institute (NERI), Nagpur, has developed as Android-based mobile application called `NeerPadhivu-Jal Abhilekha' to digitize all water bodies in Puducherry and monitor change in the use of land in and around the water bodies using remote sensing and GID-based geotagging techniques. The application would also provide a platform for public participation.

Tong through crowd sourcing of the water body information system of Puducherry made available on the internet. The application, a first of its kind in the country, was launched on 15 November 2019.

Impact: Many of the ponds that were rejuvenated over the past few months now have water, increasing the water storage capacity of the district. This will also help increase the groundwater table. Care will also be taken to ensure that the ponds will be retained as water bodies. Plans are in the pipeline to improve the appearance and approach to the water bodies by building pavements around them and if space permits make a park near them that could have a picnic area or open air gym.

Fig. 1 Flow Chart of Restoration of Pond and Lake



Replenishing Water bodies: The Strategic Plan for Karaikal

Ponds, Tanks, Lakes & Wells

In Karaikal, traditionally, surface water storage has been emphasised. Surface flow system or water bodies have sustained the Karaikal agriculture practice 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. km 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 – over flows - 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 was considerable number of wells, which were once the source of potable water for public.

It is of utmost importance for meeting the rising demand for water augmentation, improving the health of water bodies 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 water bodies. 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"** 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.

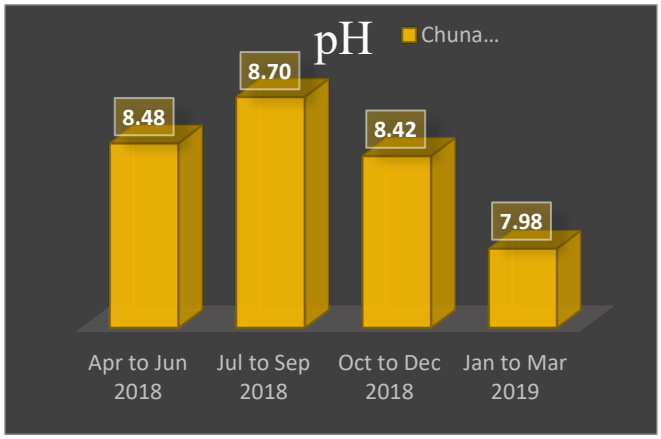
There is acute shortage of water in major ponds in Karaikal District during last few years. Most of the ponds are dried. Considering the situation, during last year, the Commissioners were directed to ensure that no water was pumped out from the ponds, irrespective of its ownership, to keep the available water for public as well as cattle use. PWD and Commune Panchayat restricted public water distribution time. In some areas potable water was arranged through tankers. Prolonged and continuous neglect of maintenance of water bodies, encroachments in the tank bund, foreshore, water-spread and supply channels,

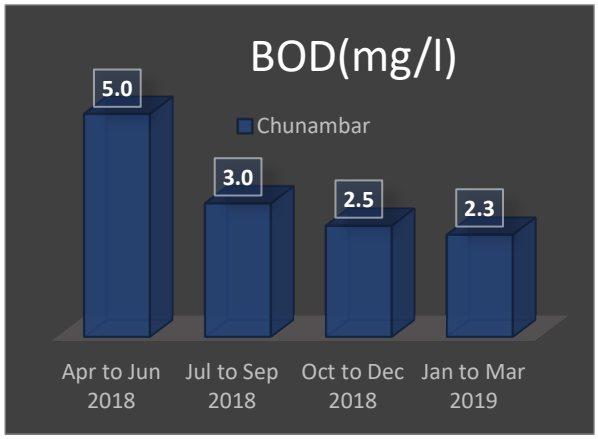
deforestation in the catchment for urbanization & housing, use of tank beds as dumping yards and thus silting of tank beds and choking up feeder channels requires serious attention by concerned authorities.

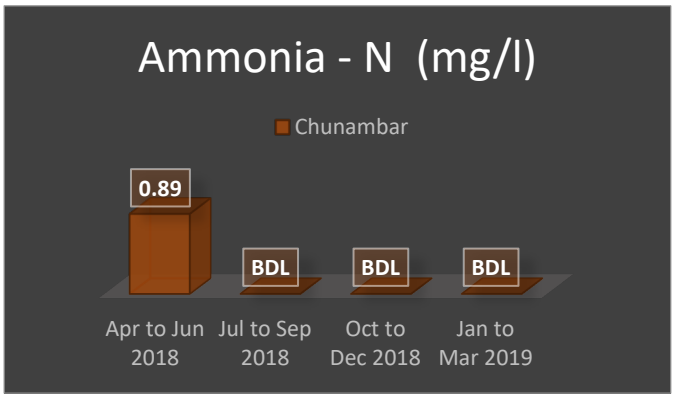
River

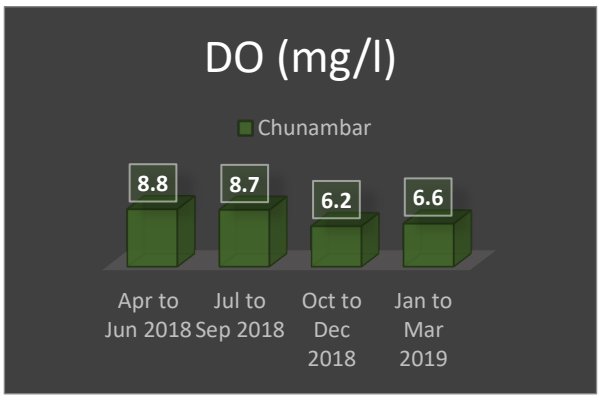
Sankaraparani river is the only River flowing in Puducherry District, it originates from Ginge in Tamil Nadu, hence it is also called Gingee river. It enters Puducherry at Suthukeney and flows into Puducherry for 34 km before reaching Bay of Bengal. It is a seasonal river and its flow depends on the rainfall of Gingee region. Based on the value of BOD (6 mg/l), Chunnambar river has been identified as one of the polluted stretches in our country and categorized as Priority V by Central Pollution Control Board (CPCB).

Fig. 2 Water quality of Sankaraparani River









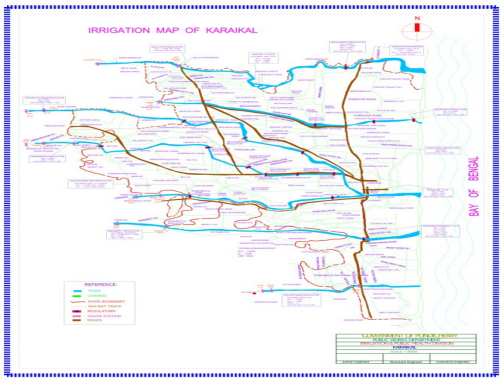
Karaikal is drained by seven tributaries of Cauvery as detailed below and the receipt of Cauvery Water through them depends on the release of water from Mettur Dam.

Table 1 Rivers in Karaikal

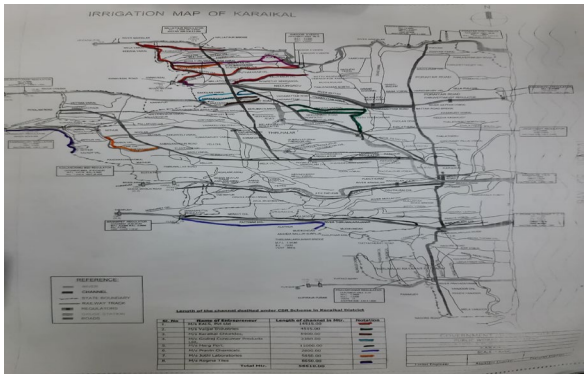
Sl.No.	Name of the River	Length (Km)	Drain enter in the River
1	Nandalar	15.2	Konnakavali drain
2	Nattar	12.6	Andoor and Kottuchery drain
3	Vanjiyar	12.3	Nedungadu drainage
4	Noolar	16.6	Amagarthur drainage and Thirunallar drain
5	Arasalar	11.76	Karaikal drainage
6	Thirumalairajanar	10.22	T.R.Pattinam drainage
7	Puravadaiyanar	3.35	Polagam drainage

Fig. 3 Rivers and Canals of Karaikal District

Rivers and its branches



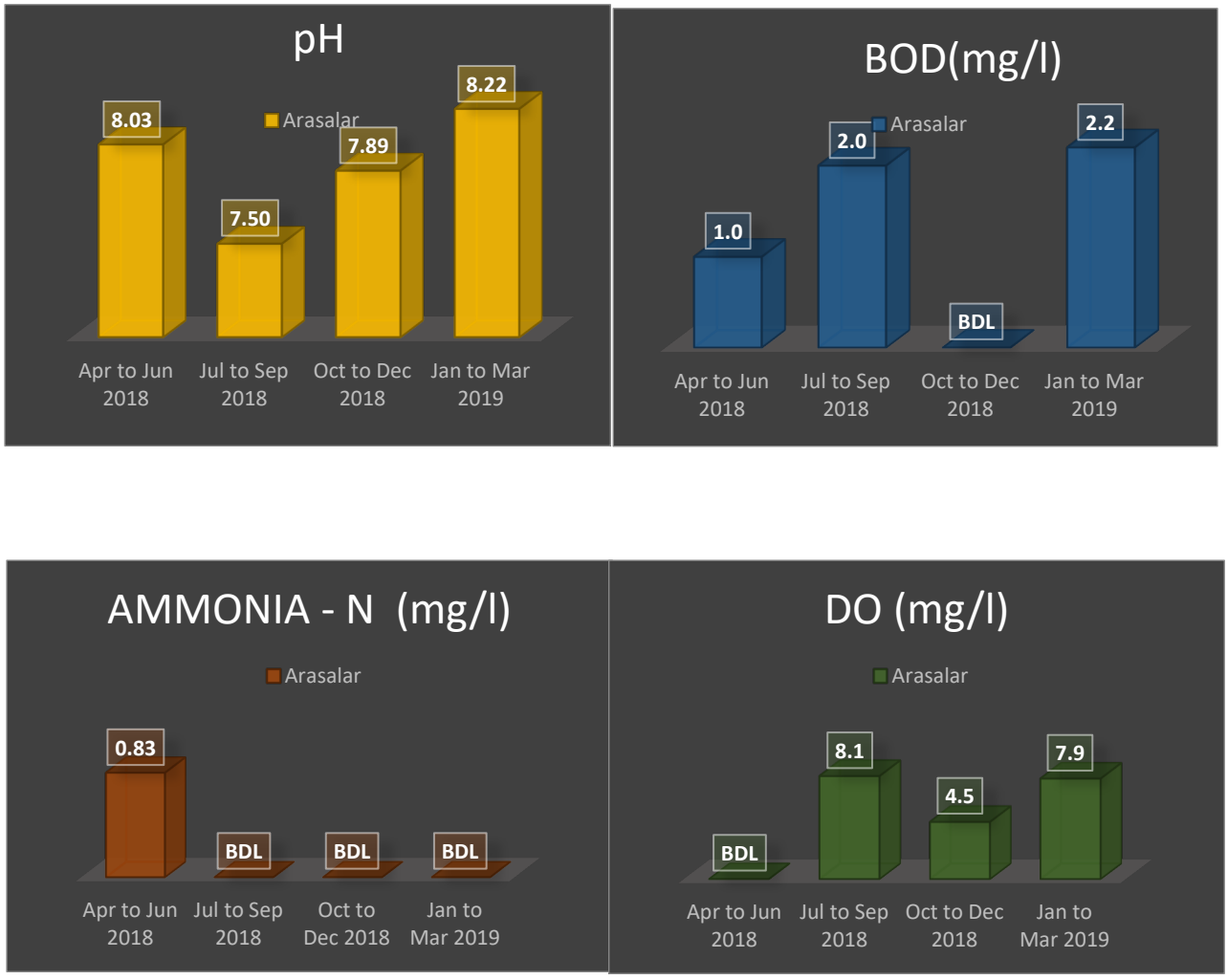
Target Locations



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 is 593.589 km and Total irrigated area is 10,980.16 Ha.

Arasalar is also identified as one of the polluted stretches in the country based on its BOD value (7 mg/l) and placed it in priority IV list.

Fig. 4 Arasalar River water Quality



Rejuvenation of Rivers

In pursuance of the Hon'ble National Green Tribunal (Principal Bench), New Delhi, orders dt. 20.09.2018 and 19.12.2018 in O.A. No. 673/2018, Action plans have been formulated with the objective of restoration of Chunnambar, Puducherry and Arasalar, Karaikal to meet the bathing standards of Dissolved Oxygen (DO), Biological Oxygen Demand (BOD) and faecal coliforms within 2 years period.

The Action Plan consists of the following ten components:

i. Assessment of pollution level in the river.

ii. Inventorization of industries located on the bank of the river and closing down of unauthorized industrial operations if any.

iii. Identification of polluted streams which contaminates the river.

iv. Identification and prevention of Municipal Solid Waste, Hazardous Waste and Bio-Medical Waste dumping.

v. Installation / upgradation of ETP/STP in the industries.

vi. Provision of STP in the habituated area of river bank.

vii. Eradication of open defecation on the River Bank

viii. Development of Green belt on the bank and improving biodiversity.

ix. Arresting sand mining.

x. Developing Information Education and Communication programmes (IEC).

Table 2: Gap analysis in waste water /sewage treatment in the industries located on the bank of Chunnambar

Sl. No.	Name of the Industry	Water Requirement (KLD)	Waste water	Sewage generation	ETP (KLD)	STP (KLD)	Gap analysis
1	M/s. Deedi Resort	33	-	26		40	Treatment capacity is sufficient
2	M/s.Wind Flower	10	-	7		10	Treatment capacity is sufficient but ineffective operation was noticed
3.	M/s.Pondicherry Distilleries Ltd. (Blending Unit)	150	55	8	70	-	STP of capacity 10 KLD need to be provided.
4.	M/s.Indian Oil Corporation	26	Nil	8	Nil		STP of capacity 10 KLD need to be provided
5	M/s.Jothy Laboratory	52	5	7	5	20	Sufficient capacity
6	M/s.Caplin Point	30	15	5	40		Sufficient capacity

Villiyanur is one of the urban agglomerations located on the bank of Sankaraparani river. Approximately 15,000 households and commercial establishments are located. It is estimated that around 0.6 MLD of sewage being is generated. Public Work Department (PWD) has initiated action to install 1 MLD Sewage Treatment Plant.

There are 23 Revenue villages are present on the bank of Sankaraparani River. Open Defecation is common phenomenon on the river bank which is the main causes for higher content of faecal coliform 1836 toilets have been completed by DRDA for the Households located on the river bank. Community Toilets would be installed on the River bank.

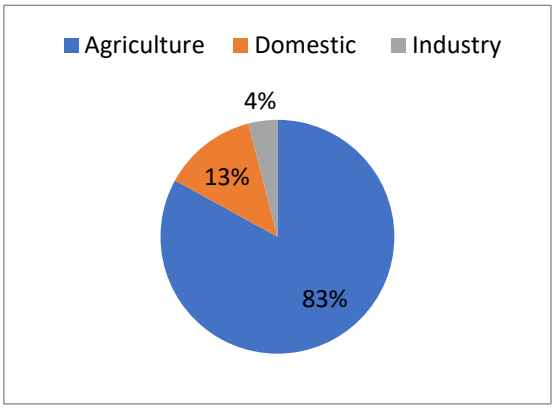
Sign boards have been erected on the bank of the river depicting message of not to dispose any type of wastes. Strict patrolling by the officials of Local bodies, PPCC and Police would be carried out to contain illegal discharge in the river.

B. Ground Water Resource

Ground water potential of Puducherry Region has been estimated as 140 million cubic meter. (Central Ground Water Board, 2016). Agriculture is the major ground water consumption sector (116 mm^3) followed by Domestic (18.5 mm^3) and Industrial Sector (5.4 mm^3)

The source of the water for the various activities including Domestic, Industrial and Commercial usage is met from the ground water as a result of which there is depletion in the underground water resources. 30% of over drawl of ground water is reported and thus Puducherry has been categorized as Over Exploited Zone. On an average, there is a drop in water level by 1 m to 1.5 m per year.

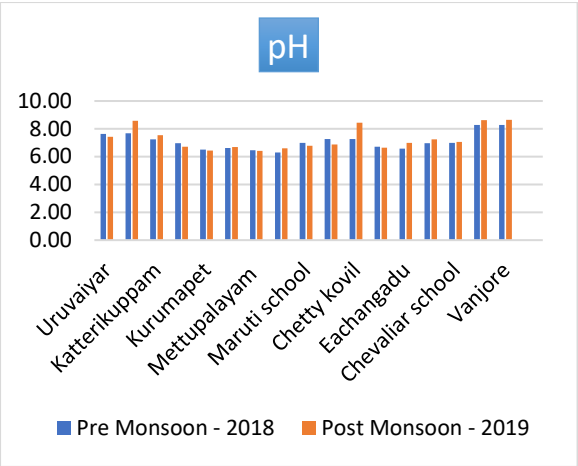
Fig. 5 Sector wise Ground Water Usage

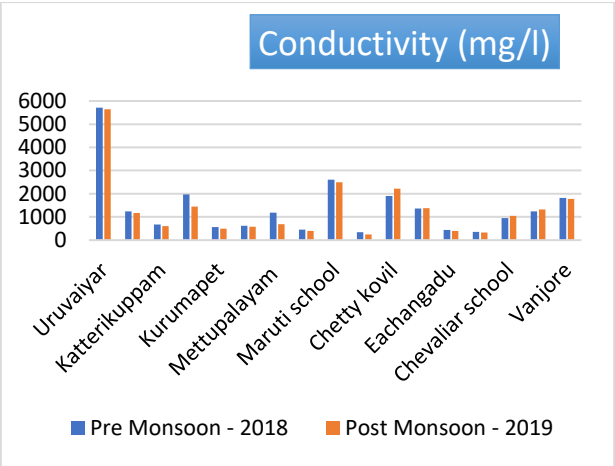


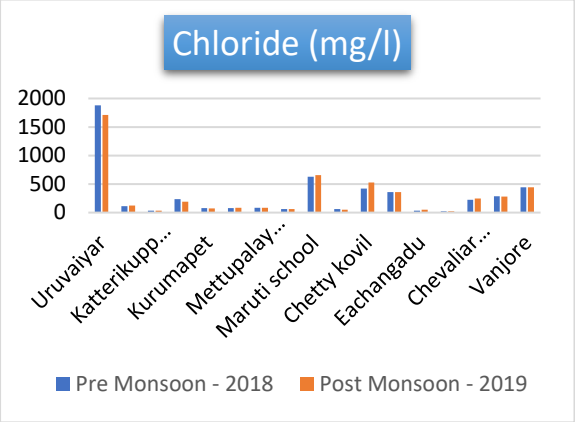
Ground water quality

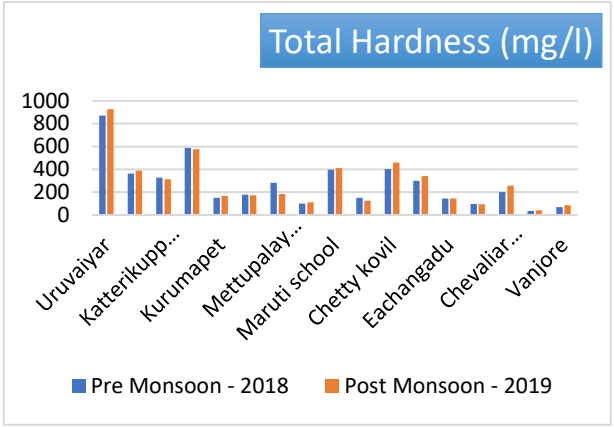
Ground water in the U.T of Puducherry was historically famous for taste and purity. But recently due to rapid urbanization and industrialisation, intrusion of sea water in the aquifer has changed the situation. Puducherry Pollution Control Committee has been periodically monitoring ground water quality in many places. The analysis report revealed that the value of Conductivity, TDS and Chloride are higher level in many places. This is due to salt water intrusion in the coastal aquifer. There is urgent need to conserve ground water resource and initiate various measures to improve ground water table level.

Fig. 6 Status of Ground Water Quality



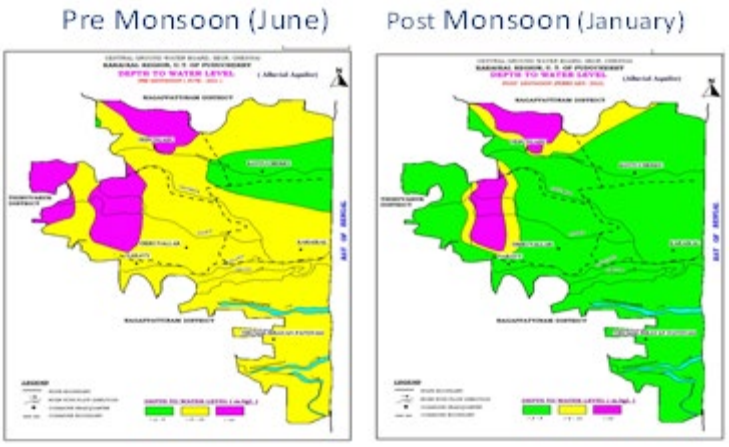






The groundwater study by the Central Ground Water Board (CGWB) and the Agriculture department has marked the Karaikal District as "Safe". In recent times, the non-availability of surface water has resulted in groundwater being used as a supplementary source. Competing demands from agriculture, businesses,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

Fig. 7 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)

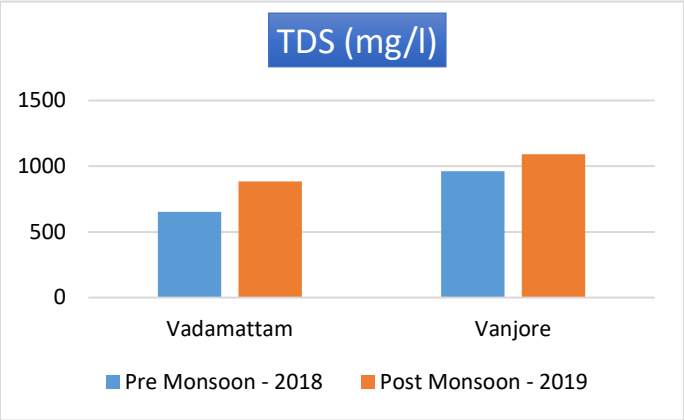
Ground Water Quality

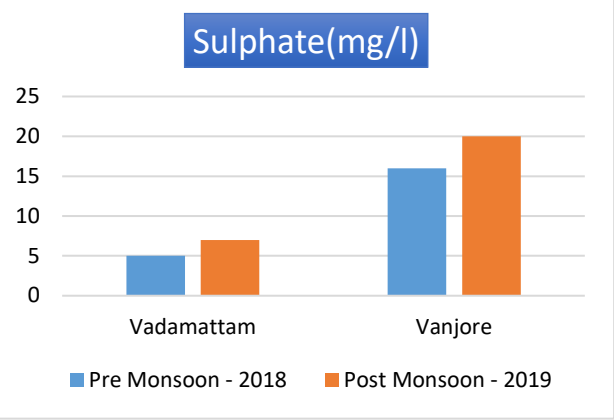
The quality of Groundwater from shallow alluvial aquifer is almost neutral in neutral in nature with pH values ranging from 6.7 to 7.9. The water is generally sodium – bicarbonate-chloride type, the bicarbonate predominating over chloride. The Electrical Conductivity (EC) values are between 1500 to 3000 µs/cm at 25^0C.

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 µs/cm at 25^0C. The chloride concentration is within 500 mg/l.

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.

Fig. 8 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.

STRATEGIC PLAN

Salt water intrusion is main issues need to be addressed in top priority. Intrusion has been taking place horizontally and vertically in the aquifer. Govt. Puducherry has already taken two important land mark decisions towards ground water conservation , one is imposed ban on sinking of bore well within 6 km of the coast and other is policy decision of not to encouraging water based industry in the U.T. of Puducherry.

Agriculture activity is major ground water consuming sector. Department of Agriculture, in order to encourage conservation of ground water resource, is providing subsidy for drip irrigation. Farmer is being educated to go for water less intensive crop for cultivation.

Industries are restricted to utilize ground water for their process and directed to utilize treated sewage /effluent for their usage. At any cost fresh water is not permitted for gardening and green belt development.

Rain Water Harvesting

In order to augment the ground water resources, suitable and appropriate rain water harvesting systems have been designed taking into consideration the hydrogeology, soil condition, rainfall and run off. All the public buildings will be provided with roof top rain water

harvesting systems. With respect to roof top rain harvesting system and reuse of waste water, necessary amendments in the Puducherry Building Bye-laws and Zoning regulations have already been made by issuing Government Order. Compliance of rain water harvesting structures in the occupancy certificate is to be ensured. Puducherry Planning Authority will examine the possibility of amending the Government Order for non-compliance of rain water harvesting for making it as a compoundable offence. Fiscal and tariff policy interventions will be made to encourage the individuals and Institutions for construction of such systems in their own premises. The old dug wells will be utilized for the purpose of harvesting rain water and recharging the ground water through appropriate schemes. In selected areas, erection of farm ponds to store the rain water and use at the time of scarcity will be encouraged by way of financial assistance.

In addition to conservation and restoration of Tanks and Ponds, rain water harvesting by the individuals and organizations is encouraged and has been made mandatory through Building Byelaws and regulations. Rain water harvesting in commercial, industrial and agricultural sector is proposed to be improved and strengthened by implementing year wise monitorable targets by Puducherry Planning Authority and Agriculture Department.

In view of the necessity of rainwater harvesting in the present time, a detailed commitment has been made in the “Water Policy of Puducherry”. According to this policy, all efforts will be made to store the surplus rain water in the canals, ravines and rivers by way of constructing small bed dams or regulators. In order to increase the utilizable water resources, traditional water conservation practices of rain water harvesting including roof top rain water harvesting will be mandated through appropriate regulations and be practiced. Periodic awareness campaign will be carried out by all the related Departments and Statutory Bodies.

Puducherry Ground Water Authority mandated installation of Rain Water Harvesting structures while issuing permission to the industry for withdrawal of ground water. 123 units were installed around 649 rainwater harvesting structure so far. **(Annexure – I)**

4. AIR QUALITY IMPROVEMENT

Puducherry Pollution Control Committee is carrying out manual ambient air quality monitoring at the following six locations in the U.T. of Puducherry under the 'National Air quality Monitoring Programme' (NAMP) of Central Pollution Control Board (CPCB). The monitoring of pollutants is carried out for 24 hours (4-hourly sampling for gaseous pollutants and 8-hourly sampling for particulate matter) with a frequency of twice a week.

Table 3: Annual Average Concentration of Pollutant at the Six Monitored Locations in the U.T. of Puducherry

Sl.No	Location	Pollutant in µg/m^3		
		PM_{10}	SO_2	NO_2
1	LAD	38	3.5	10.4
2	DSTE	46	4.1	12.9
3	PIPDIC	45	4.1	12.1
4	B.Ed college	35	3.1	6.1
5	Govt Tourist Home	43	4.5	8.1
6	PPCL	40	3.9	7.3
Standard		60	50	40

Fig. 9 Annual Average Concentration of PM_{10} for the year 2018

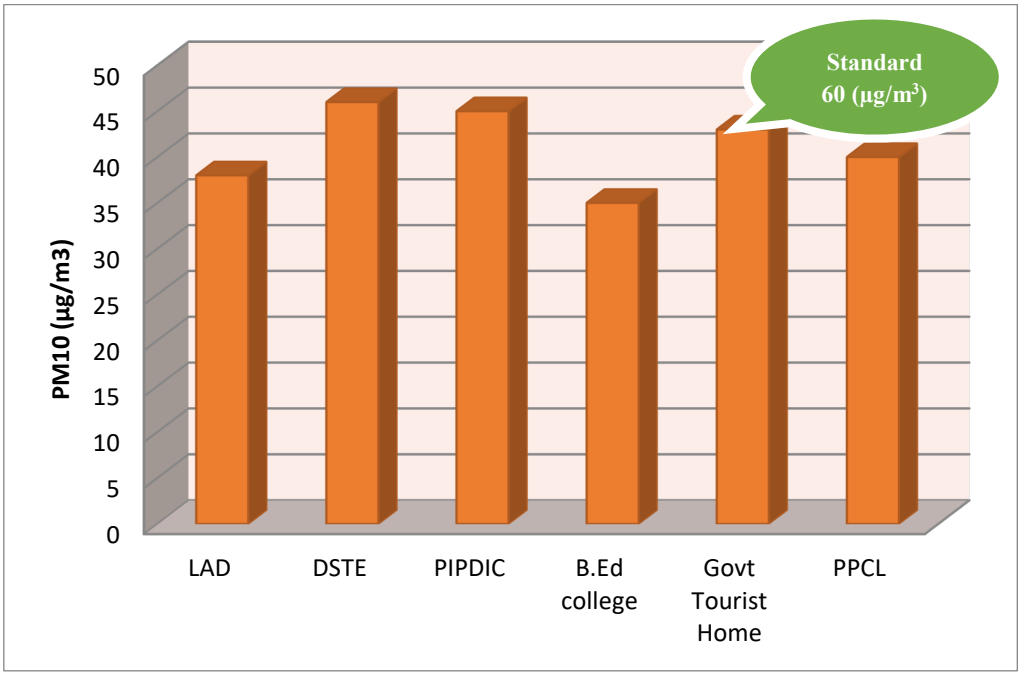


Fig. 10 Annual Average Concentration of SO_2 for the year 2018

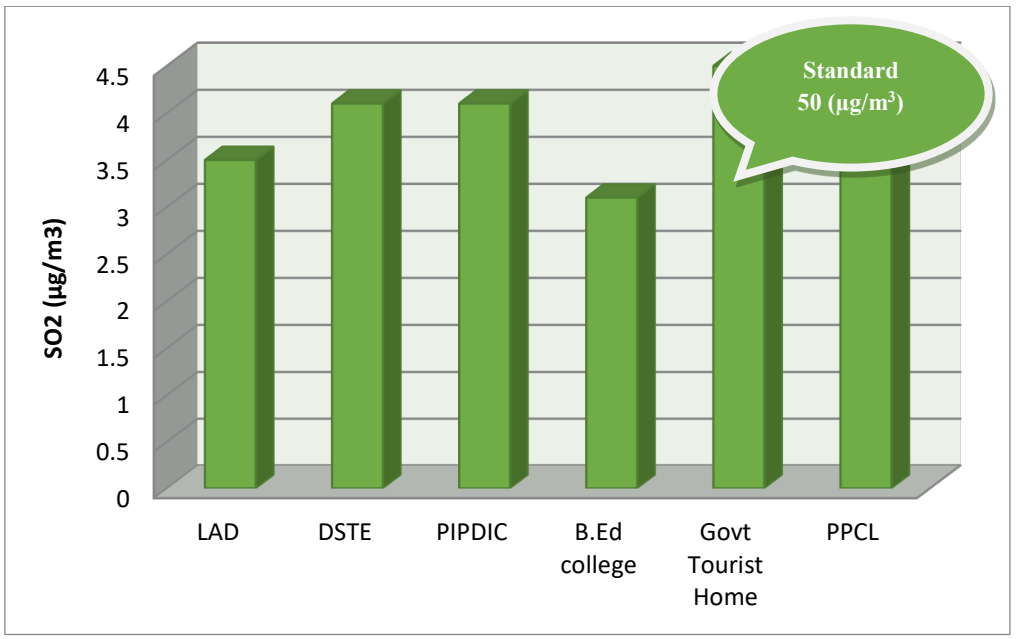
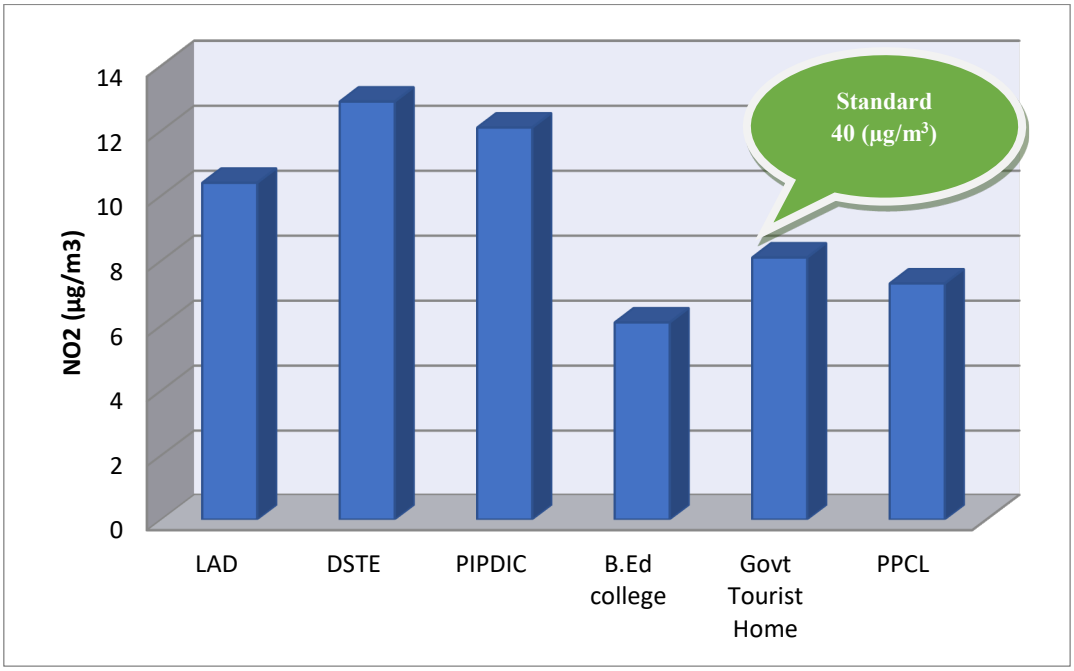


Fig. 11 Annual Average Concentration of NO_2 for the year 2018



- The monitoring result reveals that 24 Hourly average concentration of Particulate Matter (Size less than 10 µm) - PM_{10} measured in all the six locations are within the prescribed standard limit of 100 µg/$m^{3.}$

- Annual average concentration of PM_{10} measured in all the six locations are in the ranges from 35 – 46 (µg/m^3) which is within the prescribed standard limit of 60 µg/m^3

- The annual average concentrations of the pollutants viz., SO_2 & NO_2 in all the six locations are within the prescribed standard limits. One of the reasons for low levels of pollution in coastal cities like Puducherry is that it has excellent ventilation effects due to sea and land breezes, which reduces pollution levels.

Air Quality Index

Air Quality Index is a tool for effective communication of air quality status to people in terms which are easy to understand. It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour.

There are six AQI categories, namely Good, Satisfactory, Moderately Polluted, Poor, Very Poor, and Severe. Each of these categories is decided based on ambient concentration values of air pollutants and their likely health impacts (known as health breakpoints). AQ sub-index and health breakpoints are evolved for eight pollutants (PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, O_3, NH_3, and Pb) for which short-term (upto 24-hours) National Ambient Air Quality Standards are prescribed.

Based on the measured ambient concentrations of a pollutant, sub-index is calculated, which is a linear function of concentration (e.g. the sub-index for $PM_{2.5}$ will be 51 at concentration 31 $\mu g/m^3$, 100 at concentration 60 $\mu g/m^3$, and 75 at concentration of 45 $\mu g/m^3$). The worst sub-index determines the overall AQI.

Table 4: Status of Category-wise numbers of AQI in the UT of Puducherry for the year 2018

AQI Category	AQI Range $\mu g/m^3$	Colour Code	Number of AQI Values in Different Category		Pollutant-wise Number of AQI Values in AQI Category	Possible Health Impacts
			No of AQI Values	% of AQI Values	PM_{10}	
Good	0-50		463	82.1	463	Minimal Impact
Satisfactory	51-100		101	17.9	101	Minor breathing discomfort to sensitive people
Total AQI Values			564	100	564	

Note:- One observation means one AQI calculated for daily ambient air quality data at one station.

Table 5 National Air Quality Index

AQI	Possible Health Impacts
Good (0-50)	Minimal Impact
Satisfactory (51 - 100)	Minor breathing discomfort to sensitive people
Moderate (101 - 200)	Breathing discomfort to the people with lung disease, heart disease to the children and older adults
Poor (201 -300)	Breathing discomfort to people on prolonged exposure
Very Poor (301-400)	Respiratory illness to people on prolonged exposure
Severe (>400)	Respiratory effects even on healthy people

The calculated AQI values for 24 hourly average concentrations are categorized as Good to Satisfactory for the year 2018 at all the six locations. The Prominent parameter is PM_{10}. The AQI value calculated for the two cities for PM10 showed 82.1 % of AQI value i.e. 463 AQI values in the U.T of Puducherry out of total 564 AQI values revealed good air quality 17.9 % of AQI value i.e. 101 AQI values showed satisfactory air quality .

The overall AQI can give clear view about ambient air and the report reveals that PM_{10} is mainly responsible to determine the air quality which can be easier for a common man to understand. The PM_{10} concentration in the Puducherry and Karaikal region is sourced predominantly from the anthropogenic activity, which may be due to the increase in vehicle movement, road dust etc.

Broad guidelines for Public/Citizens:

AQI is an initiative intended to enhance public awareness and involvement in efforts to improve air quality. People can contribute by maintaining vehicles properly (e.g. get PUC checks, replace car air filter, maintain proper tyre pressure), following lane discipline & speed limits, avoiding prolonged idling and turning off engines at red traffic signals. In addition to the above, during severe or very poor AQI, people should minimize travel; avoid using private vehicles and instead use public transport, bikes or walk, and carpool.

Special drive to compact air pollution during Diwali:

As per the directions of Hon'ble Supreme Court of India, u/s. 144 of Cr. Pc has been imposed during Diwali time to restrict the indiscriminate use of firecrackers, which leads to very peak air pollution. Instructions have also been issued to the firework manufacturers with regard to ingredients used for firecrackers for strict compliance. Penal action u/s. 188 of IPC has been contemplated against the violators.

Industrial Fuel usage Scenario in Puducherry

Industrial units located in the U.T. of Puducherry uses various types of Fuels. Furnace Oil, HSD, LDO, Briquettes, Wood, husk and gasified coal are the major fuel used by the industries located in the U.T. of Puducherry. Raw coal is not permitted as fuel. There are 2 units viz. M/s. Hindustan Glass Container and M/s. Athiappa Chemicals are using Pet Coke as fuel and feed stock respectively. Around 60 units are using furnace oil as fuel.

Pet Coke and Furnace oil contains higher sulphur content of 3.5% and 4% respectively. Industries are permitted to use furnace oil with required pollution control devices like scrubber etc. connected with minimum of 15 m stack. Stack emission of the industries which use furnace oil as fuel revealed that all the parameters are within the prescribed standards. Properties of various fuels used in Puducherry are given in Table – 6

Table 6: Properties of Various Fuels

Fuel Types	Ash Content (%)	Sulphur Content (%)	Moisture (%)	Gross Calorific Value (Kcal/Kg)
Coal	38	0.5 to 0.8	5.98 %	4000
Furnace Oil	0.03 – 0.07%	2 to 4	<1 %	10,500
LDO	0.03 – 0.07%	0.5 – 1.8	<1 %	10,700
LSHS	0.03 – 0.07%	<0.5	<1 %	10,600
Diesel	0.03 – 0.07%	0.05 – 0.25	<1 %	10,800
Kerosene	0.03 – 0.07%	0.05 – 0.2	<1 %	11,100
Wood	0.03 – 0.07%	0.1	13	3000
Pet Coke	1	3.5	1.11	7981

STRATEGIC PLAN

The following recommendations have been proposed for maintaining

i. Considering presence of higher sulphur content in Coal and Pet coke, its usage as fuel may be prohibited.
ii. Liquid fuel viz. Furnace oil shall be used only with scrubber as pollution control device.
iii. Solid fuel of Briquettes and Refused Derived Fuel (RDF) shall be used with cyclone separator as Air Pollution Control Device.
iv. Raw wood as industrial fuel of more than 2 tons/hr is prohibited.

v. 25% of industrial solid fuel shall be RDF when it is produced in the U.T of Puducherry.

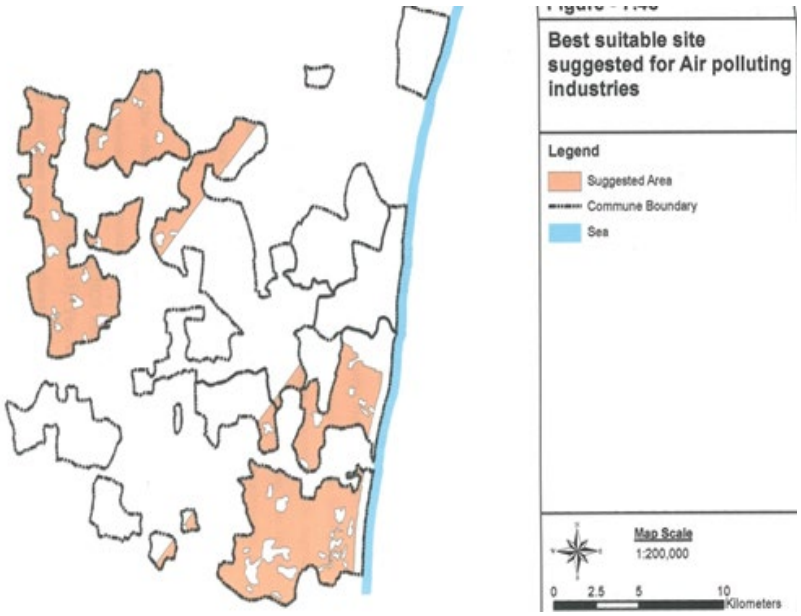
vi. 25% of consent fee reduction is applicable to the units which uses minimum of 50% of its fuel requirement through cleaner fuel like Liquid Petroleum Gas (LPG), Liquefied Natural Gas (LNG), Piped Natural Gas (PNG) , Bio-Gas and Solar power

Site suitability for Air pollution potential units

The predominant wind direction is SW during summer and NNE-ENE during winter season. Hence air pollution potential units shall be allowed to set up in South, South East and North West directions. Best suitable site for establishment of air pollution industries have been prepared based on the following features and presented in the Fig. 12.

- Availability of land and their other potential uses
- Presence of human settlements and population density
- Location of existing industries and their pollution potential
- Existing air quality
- Predominant wind direction

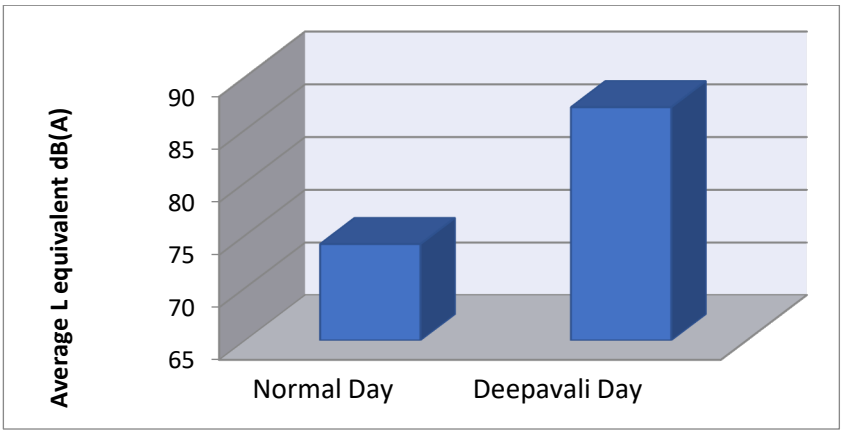
Fig. 12



5. NOISE POLLUTION CONTROL MEASURES

Noise pollution is one of the proven potential factor cause various health implications. Particularly it is harmful to senior citizen, cardiac patients and children. Nevertheless it is one of the neglected areas of environmental sector. Though Noise Pollution (Regulation and Control) Rules, was notified in the year, 2000, no remarkable action has been taken in this field. Under the provision of the Rules, designated authority has been notified under the chairmanship of Superintendent of Police. During Diwali festival time, increased noise level has been reported.

Fig. 13 Noise level in Deepavali



STRATEGIC PLAN

Currently not much regulation is exists for sitting noise pollution potential units. Service industries like flour mill and work shop are permitted in Residential area. Often Public complaints are being received against noise problem caused by these types of industries. It is proposed to evolve sitting criteria for locating such type of industries.

6. SEWAGE TREATMENT PLAN

Sewage Generation

a. Domestic Sector

Puducherry has Urban Population of 5.45 Lakhs. The Public Work Department (PWD) is providing the Drinking water supply and implementing Under Ground Sewerage System (UGSS) i.e. collection of sewage, and its treatment. The sewerage network of Puducherry is 447 Km. Sewage generated in the urban area is estimated as 58 MLD. However, the realized sewage generation is about 40 MLD, since 100% households connectivity to the sewer system is yet to be achieved.

b. Industrial Sector

There are 20 major sewage generation units in Puducherry (Fig.2). Around 3062 KLD of sewage is being generated of which 1943 KLD is utilized insitu.

Thus the remaining 1119 KLD is available for other usage **(Annexure – II)**.

Treated Sewage Water

Utilization of Treated Sewage Water is one of the promising field to conserve ground water resource. There are three numbers of 17 MLD capacity Sequence Batch Reactor (SBR) based Sewage Treatment Plants (STP) and 2 numbers of Upflow Anaerobic Sludge Blanket Reactor (UASB) based 2.5 MLD STP in operation. Details of available Treated Sewage Water are given in Table –7.

Table 7 Availability of Treated Sewage water

Sl. No.	STP Location	Capacity of Plant (MLD)	Quantity of Treated Sewage available (MLD)
1	Lawspet	17 (SBR) 2.5 (UASB)	16 2.5
2	Dubrayapet	17 (SBR) 2.5 (UASB)	5 2.5
3	Kanaganeri	17	5
Total		**56**	**31**

Scope of Utilization of Treated Sewage Water

Sewage is treated in Sequence Batch Reactor (SBR) and UASB. These are State of the art technologies and yield good quality water. It meet Central Pollution Control Board, (CPCB) prescribed standards for irrigation. Treated Sewage quality is given in Table- 8.

Government of Puducherry has constituted a Committee vide G.O. Ms. No. 1 dt. 19.01.2016 for sale of Secondary Treated Effluent Water. Currently one unit is purchasing 0.8 MLD treated sewage water at the rate of Rs. 13.99 / KL.

Fig. 14 Location of Major Sewage Treatment Plants in the industry

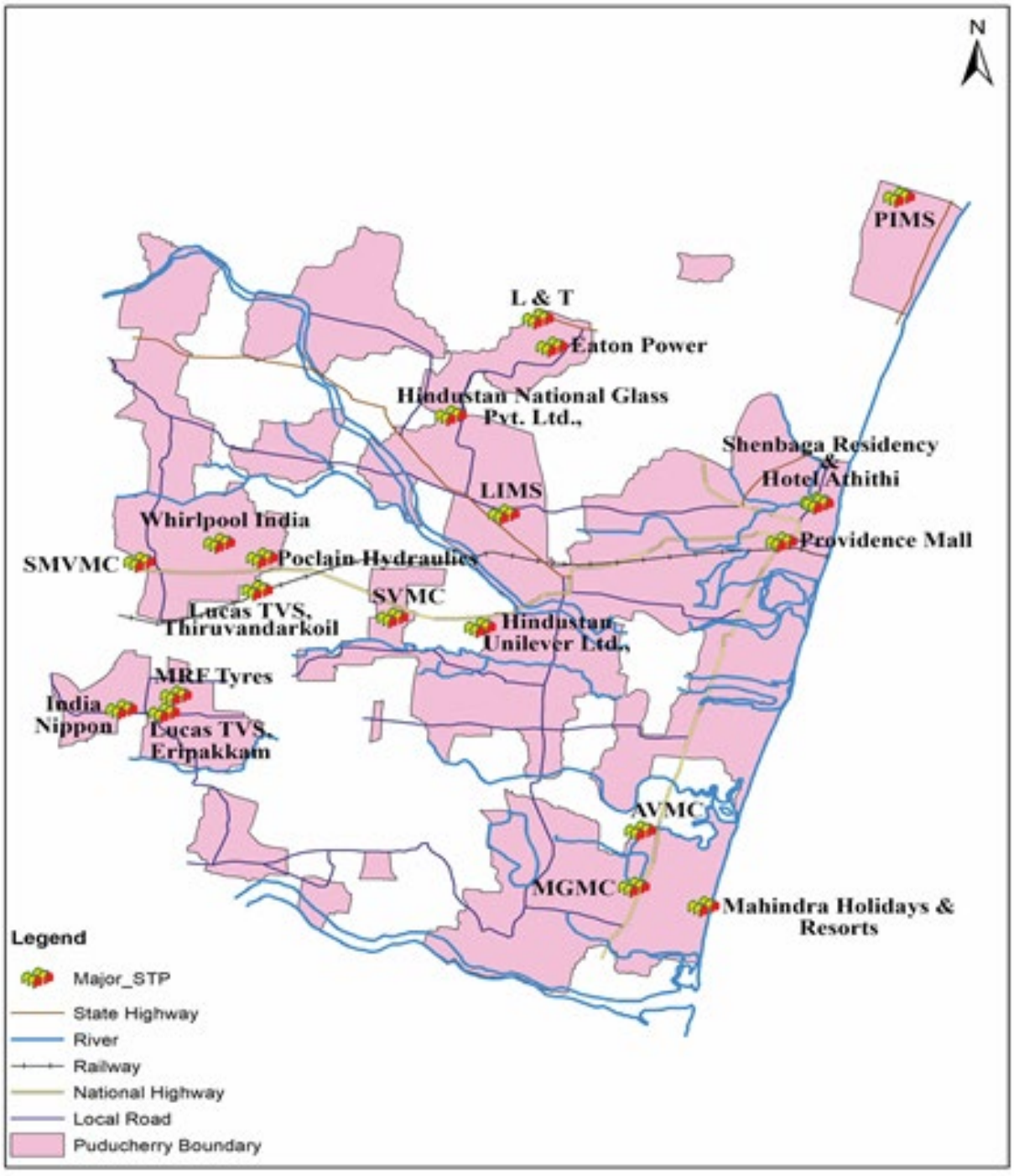


Fig. 15 Location of Major Sewage Treatment Plants

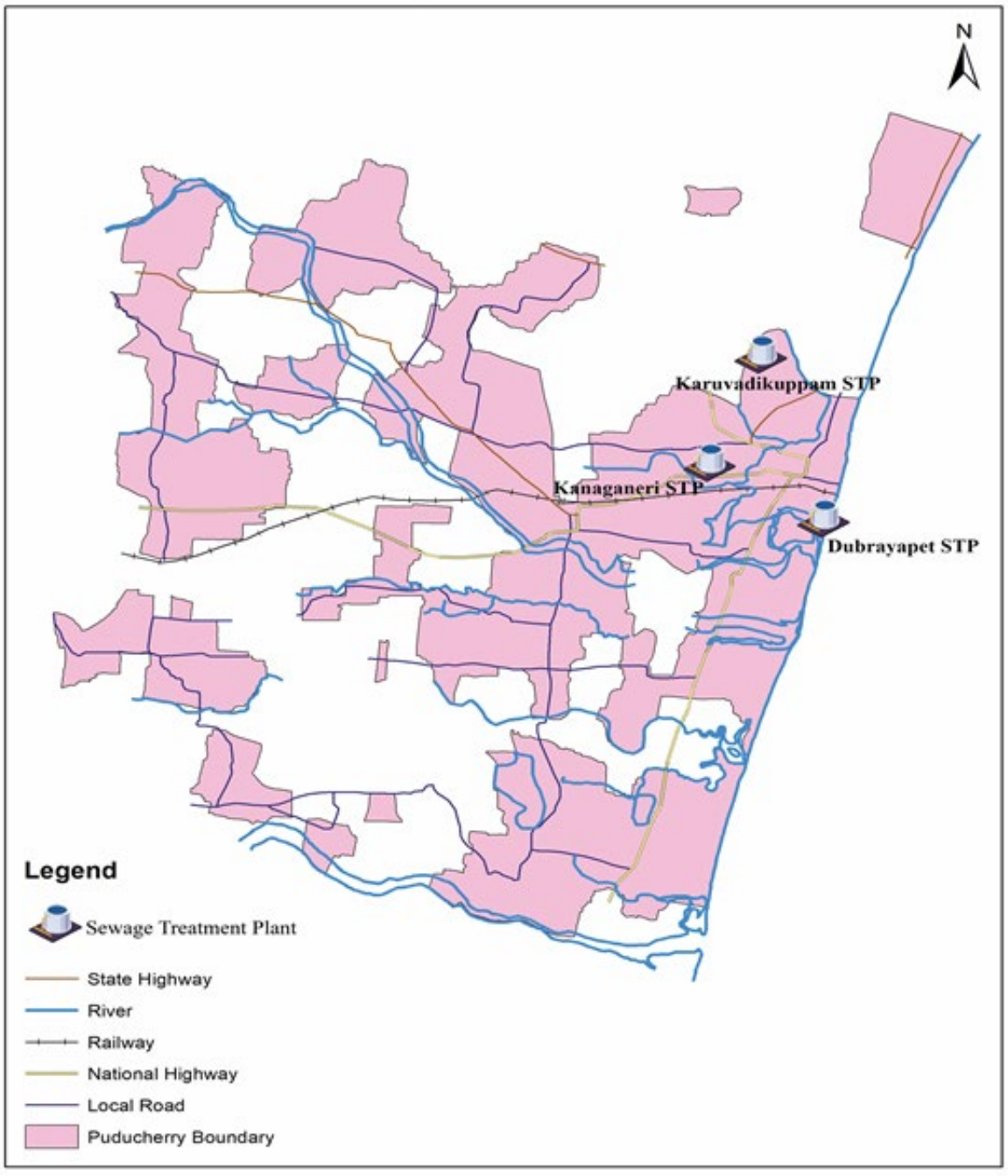


Table 8 Quality of Treated Sewage

Sl. No.	Parameters/Pollutants	Range
1	P^H	7-9
2	Biochemical Oxygen Demand	7.7 mg/l
3	Chemical Oxygen Demand	15 mg/l
4	Total Suspended Solids	10 mg/l
5	Total Kjeldahl Nitrogen	9.6 mg/l
6	Nitrate Nitrogen	8.8 mg/l
7	Ammonical Nitrogen	9.0 mg/l
8	Total Phosphate	2 mg/l
9	Faecal Coliform	Nil
10	Total Coliform	≤ 200 MPN/100 ml
11	Oil & Grease	5mg/l

Currently 15.3 MLD of treated sewage is utilized for various purpose. Details are given in Table.10

Table 9 Usage of Treated Sewage

Name of the STP	Usage	Quantity (MLD)
Lawspet STP	Industrial	0.8
	Fodder Grass raising	3
	Coconut Plantation	
	Silk cotton trees	
	Natural recharging through impounding reservoir	9
Dubrayapet STP	Watering the road side plantation by Municipality	0.015
	Construction activities	
Kanaganeri STP	Boating Operations in Kanaganeri	2.5
Total		15.3

Fig. 16 Utilization of treated Sewage for fodder cultivation

FODDERCROPS

SILK COTTON TREES

It is estimated that utilized treated sewage of 15.7 MLD from PWD owned STP's and 1 MLD from various industries and Institutes STP's are readily available for utilization.

7. INDUSTRIAL EFFLUENT MANAGEMENT

Discharge of untreated effluent/ partially treated effluent play havoc on surface water and ground water quality besides contaminating land resource. Thus effective treatment is paramount importance in environment management. It involves state of the art treatment technology vis-à-vis capacity of the treatment plant and discharge point. As Pondicherry has no perennial river flow, discharge of treated effluent in water bodies have been strictly prohibited. Only marine and land discharge is allowed. There are 78 effluent generating units are in operation in Puducherry District and 5 in Karaikal District. It generates approximately, 4746 KLD effluent (Annexure-III). No industry is allowed to discharge untreated effluent. Treatment system is mainly consists of Sequence Batch Reactor (SBR), Up flow Anaerobic Sludge Blanket (UASB), Activated Sludge Process and Membrane separation etc.

Outlet of ETP is periodically monitored by PPCC and NABL accredited laboratories. Any unit is found to violating the discharge standards, severe action is being initiated against the unit, including disconnection of power supply and launching of prosecution. 3 cases were filed against 2 hospitals and one unit under Section 19 of the Environment (Protection) Act, 1986 before the Chief Judicial Magistrate, Puducherry.

In order to conserve ground water resource, industries are insisted to reduce effluent generation by way of process improvement and recycle treated effluent into their process, boiler, washing and green belt development.

Maintaining Zero Liquid Discharge (ZLD)

Providing conventional treatment system for high pollution loaded effluent is not feasible. 6 such types of units are provided ZLD. Besides, avoiding discharge pollution, these ZLDS are generating 228 KLD of fresh water and used for process. 6 industries are maintaining ZLD.

Sitting of Effluent generation units

Hydrology and soil texture are important in determining sites for effluent discharging industries. Generally, aquifer flows from West to East (towards sea) in Pondicherry region. Hence effluent-discharging units shall be permitted on the Eastern side. It will also enable the industrial units to discharge their treated effluent in to the sea. As the load of pollutant being discharged on the land is alarming, it is strongly recommended to avoid any further land discharge.

Porosity vis-à-vis infiltration rate of the area is very much important in sitting effluent generating unit. Unfortunately, most of the effluents discharging units are located on high infiltration zone. It has caused ground water contamination. Effluent generating units shall be permitted to set up only in low infiltration zone and only treated effluent as per the norms must be allowed to discharge on to the land.

Based on the porosity of the soil, Pondicherry region has been classified into three categories viz. low infiltration zone, medium infiltration zone and high infiltration zone. Unfortunately, most of the effluent discharging units is currently located in the high filtration zone viz. Mettupalayam, Sedarapet and Kurumbapet. Hence effluent discharge leads to leaching and contamination of ground water aquifer. Government shall ban further setting up of effluent generating units and expansion of existing units in the high infiltration zone.

Fig. 17

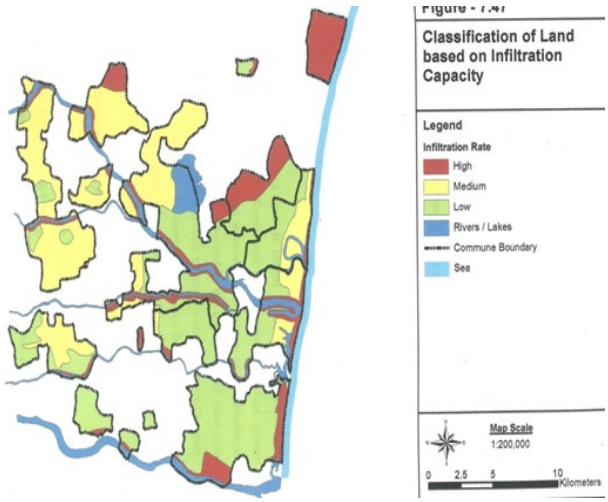
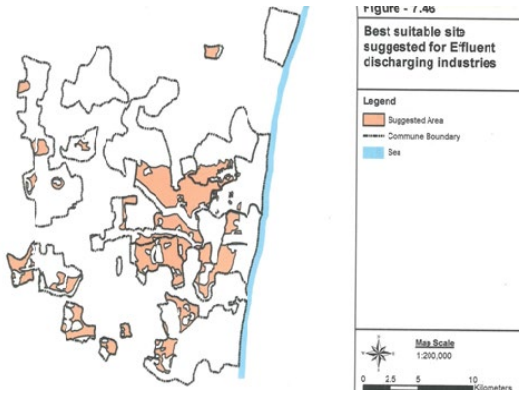


Fig. 18



8. INTEGRATED WASTE MANAGEMENT

a. SOLID WASTE MANAGEMENT

Solid Waste Management is being implemented by the Local bodies in the U.T. of Puducherry. 60 % of the total population is in urban area. It consists of Five Municipalities and 10 Commune Panchyats. Among the five Municipalities, Pondicherry and Oulgaret Municipalities are adjoining each other and hence these two municipal areas along with certain urbanized pockets of Ariyankuppam and Villianur Commune Panchayats are called Puducherry Urban Agglomeration area (PUAA). U.T. of Puducherry generates 543 TPD of solid waste. In which, Urban areas generates 409 TPD and Rural areas generates 134 TPD of Solid waste. The details are given in Table.

Table 10 Details of Solid waste generation in ULBs

Municipality	Number of Wards	Population (in lakhs)	Solid Waste Generated(TPD)
Pondicherry Municipality	42	2.4	175
Oulgaret Municipality	37	3	175
Karaikal Municipality	18	0.86	40
Mahe Municipality	15	0.4	3
Yanam Municipality	10	0.6	16
Total	122	7.26	409

Table 11: Details of Solid waste generated in Rural Local Bodies

Sl.No	Name of Commune Panchayat	Solid Waste Generate (TPD)
1	Ariyankuppam Commune Panchayat	25
2	Bahour Commune Panchayat	40
3	Mannadipet Commune Panchayat	25
4	Nettapakkam Commune Panchayat	10
5	Villianur Commune Panchayat	10
6	Kottucherry Commune Panchayat	6.5
7	Thirunallar Commune Panchayat	5
8	Nedungadu Commune Panchayat	5
9	Neravy Commune Panchayat	3
10	T.R. Paattinam Commune Panchayat	5
	Total	134.5

Table 12: Physical composition of solid waste generated

S.No	Category of Waste	Proportional Rate (%)
1	Kitchen Waste	11.1
2	Green Matter	23.0
3	PVC	1.2
4	Plastics	7.6
5	Textiles	7.6
6	Rubber & Leathers	0.8
7	Paper	3.1
8	Metals	0.2
9	Glasses	0.9
10	Ceramics and Others	0.1
11	Stones/Bricks/Concrete	1.6
12	Sand/Soil/Earth	29.9
14	Coconut Shell/Straw/Hay/Stalk/Wooden	12.9
	TOTAL	**100**

Table 13: Chemical Composition of solid waste generated in Puducherry

S.No	Parameters	Unit	Values
1	Volatile Solids	%	29.2
2	Non-Volatile Solids	%	70.8
3	Moisture Content	%	35.1
4	Organic Carbon	%	0.62
5	Nitrogen	mg/kg	912
6	C/N Ratio	-	6.9:1
7	Phosphorous as P	mg/kg	27
8	Sulphur as S	%	BDL
9	Chloride as Cl	mg/kg	11700
10	BOD	mg/kg	12215
11	COD	mg/kg	41130

Solid Waste Management Policy for Union Territory of Puducherry was notified on 01.08.2018 and the Solid Waste Management Action Plan was notified for Union Territory of Puducherry on April'18. Based on the State Action Plan, all the Local bodies have prepared their action plan adopted in their respective local bodies. The Action plan that is prepared to comply with the SWM Rules, 2016 brings out the current practice and future plan under every stages of the SWM process. The Puducherry Solid Waste Management Action Plan is based on following principles:

- Reduce, Reuse, Recycle
- 100% Collection of Waste.
- Segregation at source as well as during processing.
- Awareness and IEC activity
- Maximum resources recovery
- Effective and scientific treatment

For the purpose of Solid Waste Management, the Urban Agglomeration of Puducherry consisting of Puducherry and Oulgaret Municipality areas and parts of Ariyankuppam and Villianur Commune Panchayats are taken as one Unit and a single and unified system for Collection and Transportation (C&T) is in practice.

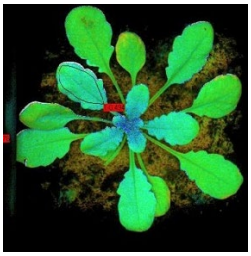
In Puducherry Urban Agglomeration (PUA), door to door collection and transportation of solid waste are in practice since 2010. The solid waste is collected from the PUAA area by the concessionaire M/s. Swachatha Corporation and taken to the landfill site at Kurumbapet which is located in the Oulgaret municipal area. In the PUAA area alone, 400 Metric Tonnes (MT) of waste is generated daily and around 350MT of waste from the PUAA area reaches the landfill site at Kurumbapet and remaining 50 MT consisting of silt reaches the C&D waste collection centre, Mettupalayam.

In Mahe Municipal area, all the bio-degradable waste are used by the households themselves for kitchen garden manure through pipe composting method and only non-bio degradable wastes to a quantity of 2 TPD are delivered to the Municipality which are scientifically processed

In Yanam Municipality, unsegregated collection at source is in practice. Preparation of RFP for floating tender for integrated SWM programme is under process.

In respect of PUAA, efforts to start scientific disposal of Solid Waste at MRF could not materialize due to stay granted by the Hon'ble NGT against any kind of activity in the MRF. Now, the stay granted has been vacated and the department is taking action to float RFP.

Segregation of Solid Waste is been done in selected wards and it is being implemented from 1st November 2019, it is being segregated into degradable and non-biodegradable waste.



Solid waste Management in Karaikal District

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.

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 festival days. However, the general SWM work involving household waste collection and waste processing at the RRP happened as scheduled plan.

Resource Recovery Park (Waste Processing Area)

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.

Legacy Waste

Disposal of Legacy Waste is greater challenges. Approximately 5 lakhs tons of solid waste has been dumped at Kurumbapet since 2010. Similarly around 1 lakhs tons of legacy waste is accumulated in Paravipet dump site. Govt. of Puducherry has initiated process for the disposal of this legacy waste through bio mining method.

Environment Quality Monitoring

The ambient Air Quality and Ground water quality are periodically monitored by Puducherry Pollution Control Committee. Ground water quality and Ambient air quality of the Kurumbapet dumping site are presented in **Table – 14 & 15**

Table 14 Ground Water Quality in Dumpsite

SI.No	Test Parameters	Result	Standard Limits
1	Temperature(◦C)	31	--
2	pH@25◦C	6.81	6.5-8.5
3	Total Dissolved Solids @180◦C mg/l	831	500
4	Chloride as Cl^- mg/l	196	250
5	Sulphate as SO	41.1	200
6	Nitrate-Nitrogen (NO_3- N)mg/l*	23.08	45
7	Total Hardness as C_aCO_3 mg/l	446	300
8	Arsenic as As	BDL (DL:0.005 Mg/l)	
9	Cadmium as Cd	BDL (DL:0.001 mg/l)	
10	Total Chromium as Cr	0.014 mg/l	
11	Copper as Cu	BDL (DL:0.01 mg/l)	
12	Cyanide as CN	BDL (DL:0.01 mg/l)	
13	Lead as Pb	BDL (DL:0.005 mg/l)	
14	Mercury as Hg	BDL (DL:0.0005 mg/l)	
15	Nickel as Ni	BDL (DL:0.005 mg/l)	
16	Iron as Fe	1.04 mg/l	
17	Zinc as Zn	0.031mg/l	
18	Phenolic Compounds as C_6H_5OH	BDL (DL:0.0005 mg/l)	
Note: BDL-Below Detection Limit; DL- Detected Limit.			

Table 15 Ambient Air Quality in Dumpsite

S.No	Test Parameters	Location:near water tank (Kurumbapet)	Location: near Kurumapet pump shed	Standards
	Chemical			
01	Ammonia (NH_3)	BDL(DL:20.0) $\mu g/m^3$)	BDL(DL:20.0) $\mu g/m^3$)	400
02	Carbon Monoxide (CO) (1 hour)	BDL(DL:1.14) mg/m^3)	BDL(DL:1.14) mg/m^3)	4
03	Ozone (O_3) (8 hour)	BDL(DL:20.0) $\mu g/m^3$)	BDL(DL:20.0) $\mu g/m^3$)	100
04	Particulate Matter (PM_{10})	63.6 µg /m^3	52.9 µg /m^3	100
05	Particulte Matter ($PM_{2.5}$)	26 µg /m^3	21 µg /m^3	60
06	Sulphur Dioxide (SO_2)	9.2 µg /m^3	11.6 µg /m^3	80
Heavy Metals				
07	Arsenic as As	BDL(DL:0.1) mg/m^3)	BDL(DL:0.1) mg/m^3)	-
08	Lead as Pb	BDL(DL:0.001) µg /m^3)	BDL(DL:0.001) µg /m^3)	1
09	Nicle as Ni Benzene in $\mu g/m^3$	BDL(DL:0.1) mg/m^3)	BDL(DL:0.1) mg/m^3)	-
PAH				
10	Benzo (a) Pyrene (Particulate phase)	BDL(DL:0.03 mg/m^3)	BDL(DL:0.03 mg/m^3)	-
VOC				
11	Benzene (C6H6)	BDL(DL:1.0 $\mu g/m^3$)	BDL(DL:1.0 $\mu g/m^3$)	-
12	Methane as CH4	Absent	Absent	-

Note: BDL: Below Detection Limit.

Remarks: The above sample complies as per National Ambient Air Quality Standards limit

STRATEGIC PLAN

Solid waste management need to be addressed in two different perspectives. Composition variation need to take into account for suitable solution. Preliminary analysis of composition of waste indicated that organic components are 75 % in the rural area whereas it is nearly 50 % in urban waste. Best method for Rural waste disposal is decentralised

composting as sufficient land as per the guidelines of Municipal Solid Waste Rules, 2016 would be available and demand for compost is more in the rural areas. All the 10 RLBs have identified suitable sites for establishing process and SLF facilities. Source segregation is already in practise in Karaikal District and Mahe Region in Puducherry District. Source segregation in other areas is near completion.

Biomethenisation plants of 1 TPD capacity installed as pilot plant in Karaikal Municipality and Oulgarete Municipality of Puducherry District with the financial assistance of PPCC are functioning well. 1 TPD Bio methenation plant will be installed in all the Rural local Bodies. Remaining Organic waste would be subjected to vermi composting.

The valuable plastic waste materials segregated from the waste will be supplied to the nearby Plastic waste recycling plants through PPCC authorised Recycler. Invaluable plastic materials will be stored and disposed through co processing as stipulated by CPCB in the cement plants located in Tamil Nadu. The inert materials will be disposed in SLF.

The Bomb caloric meter analysis of waste in urban area revealed that the calorific value is in the range of 2300 to 300 Kcal/Kg. It is suitable for Waste to Energy Plant. It is one of the proven successful method of waste disposal worldwide. ILFS has already submitted DPR for the Integrated waste processing complex including 6 MW, RDF based Power Plant. Government of Puducherry has initiated measures to execute it.

CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT

C&D waste consists 18 % of the total solid waste. Unless, it is collected, transported and disposed separately, solid waste management could not be successful. Oulgaret Municipality has identified a site near Mettupalayam for collection of Construction and Demolition waste (C & D waste) and obtained authorization under C & D waste Management Rules, 2016.

Total quantity of C&D waste generated during the year 2018 is 17820.99 MT. 845.6 MT collected during lean period and 2585 MT collected during peak period. The average C&D waste generated per day is 48.82 TPD.

Strict instruction has been issued to the private contractor M/s. Swachatha Corporation for avoiding mixing of silt with solid waste as per the agreement. (Article2-Clause 2.1(10)).

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.

STRATEGIC PLAN

C&D waste generated in Rural area is being used for filling low laying areas. In Urban area it is difficult to find such places due to land constraint. C&D processing plant will be established in all the Municipalities. Similar plant will be set up jointly in Rural Local Bodies.

PLASTIC WASTE MANAGEMENT

Based on the Central Pollution Control Board (CPCB) report, Puducherry city is figured in one of the 13 cities where plastic waste generation is more than 10 % of the total solid waste generated. It is estimated that 41.5 TPD of plastic waste is generated **(Table 16)** Plastic waste is segregated during door-to-door collection by the waste collector and by the rag pickers in the disposal sites. It is channelized to 42 Plastic Waste reprocessing units located in Puducherry by local scrap dealers. The invaluable plastic wastes are left over in the disposal site.

Table 16 Quantity of Plastic Waste Generated

District/Region	Puducherry	Karaikal	Mahe	Yanam
Quantity of Plastic waste generated	**35 TPD**	**6 TPD**	**0.2 TPD**	**0.3 TPD**

There are 53 plastic articles manufacturing units. Plastic waste generated from these units are collected and recycled by PPCC authorised recycling units.

There are Five Multi Layer Packaging (MLP) manufacturing units exists in Puducherry. The plastic waste generated from these industries could not be recycled. It is estimated that around 1278 tons of plastic waste is generated from MLP units. It is co processed in cement plants located in Tamil Nadu. M/s Hindustan Unilever Ltd., Vadamangalam, has collected the Multilayered plastic (MLP) through NGOs around a quantity of 272 MT and sent them for Co-Processing in Dalmia Cements, Ariyalur. Details are given in the Table-17.

Table 17 MLP Manufacturers

Sl. No	Name of the Unit	Quantity of PW Generation
1	Amcor Flexibiles India Private Limited, , Kandanpet Village, Manapet P.O., Bahour Commune, Puducherry	1193.9 T
2	Rajalakshmy Packaging Private Limited, Plot No.14 & 15, Sri Gokulam Nagar, Korukkumedu Road, Thavalakuppam, Puducherry	25 T
3	M/s. Aparna Paper Processing Industry (P) Limited, Sedarapet, Puducherry	30 MT
4	M/s. Aparna Paper Processing Industry (P) Limited-Unit II, Sedarapet Village, Puducherry	30 MT
	Total	**1278.9** MTA

Brand Owners

There are 9 Brand owners manufacturing mainly various personal products and household consumable items. As per the provision of Section 9 (4) of Plastic waste management Rules, 2016, all the 9 brand owners have obtained Registration from PPCC and have submitted Action Plan under Extended Producer Responsibility (EPR) to formulate channel link to collect and dispose the plastic waste. The details of waste generation are given

in Table. Under the Chairmanship of the Secretary (LAD), implementation of EPR status is being monitored.

Table 18 Brand Owners in U.T. of Puducherry

Sl. No	Name of the Unit	Quantity of PW Generation
1	M/s. Fena (P) Limited, A-67 & 68, PIPDIC Industrial Estate, Mettupalayam, Puducherry	0.6
2	M/s. Godrej Consumer Products Ltd., Sethur Village, Thirunallar Commune, Karaikal	10.81 T
3	M/s. Hindustan Unilever Limited, Detergent Factory, NH-45A, Vadamangalam, Puducherry	157
4	M/s. Radha Plastickote Industries, Vadakku Vanjore Road, Keezhaiyur south, T.R.Pattinam, Karaikal	3 T
5	M/s. Hindustan Unilever Limited, (Tea Factory), No.9(3) Cuddalore road, Kirumampakkam, Puducherry	16 T
6	M/s. Godrej Consumer Products Ltd., Kurumbagaram Village, Nedungadu Commune, Karaikal	26.2 T
7	M/s. Hindustan Unilever Limited, Personal Products Factory, Vadamangalam, Puducherry	118.7 T
	Total	332.31

Plastic waste in Road making

On experimental basis, with the supervision of Prof.Vasudevan, 100 mt roads was laid in M/s. AMCOR Industry using their own plastic waste. The road is very strong and durability. Efforts are being made to have more such type of roads.

Plastic Pyrolysis Unit

PPCC issued CTE for two plastic waste pyrolysis units in Sedrapet Industrial Estate, the unit yet to commence its production.

Bio-degradable Plastic manufacturing unit

M/s. Rajaganapathy, has established Bio-degradable Plastic granules manufacturing unit with capacity of 4500 TPA. PPCC issued Registration to M/s. Sre Tharma Sasta Agency to sell biodegradable carry bags obtained from M/s. Easy Flex Polymers Pvt. Ltd. Udaipur, Rajasthan,, CPCB registered manufacturer.

Ban on usage of Single Use Plastics

Realising the ill effect caused by usage of single use plastic, Govt. of Puducherry has imposed total ban on manufacturing, transport, stocking, sales and usage of single use plastic items with effect from 2nd August, 2019 vide, G.O.Ms. No.18/Envt/2019, Puducherry, date 30/07/19.

Action initiated against violators

- Four plastic manufacturing units were issued closure direction with disconnection of power for involving in manufacturing of banned plastic items violation of provision of Plastic Waste Management Rules, 2016. They are as follows:

    1. M/s Sri Krishna Polymers, Mettupalayam,
    2. M/s Sri Devidharshini polymers, Ariankuppam,
    3. M/s R.S. Polymers, Ottampalayam
    4. M/s.Kiran Plastics, Mettupalayam

- 6 cases have been filed under section 19 of Environment (Protection) Act, 1986 and violation was prosecuted. Penalty have been imposed to 5 major stockiest in Puducherry.

State Level Advisory Body has been constituted vide order No. 21116/LAS/A3/2017 dated 07.09.2017. It periodically monitors the implementation status of the provisions of the PWM, Rules, 2016.

STRATEGIC PLAN

Managing Plastic waste is not as challenges as being perceived. SUP is the main culprit in managing the plastic waste. Strict enforcement is required to enforce Govt. Order on ban on Single Use Plastic (SUP) items. Sufficient time has been given since the G.O. was notified. It is very difficult to phase out SUP by one Authority. All the notified implementing officer shall work together by imposing spot fine, prosecution and closure of the violating units and stockists.

As per the provision of rule 6 of Plastic Waste Management Rules, 2016, all the brand owners are ensured to set up their collection centre in collaboration with Local bodies to get back their product wrapper/packaging materials. In this time bound action plans have been submitted by all the Nine Brand owners present in the U.T. of Puducherry.

Other plastic waste will be sent to Plastic reprocessing units located various part of the U.T. through authorised Plastic waste re processor. Other inert and Thermo set plastic waste will be sent to co processing in cement plant located in Tamil Nadu until WTE is established.

IEC activities plays paramount role in keeping plastic menace away. DSTE along with LAD carry out various programmes in order to sown the ill effect of plastic in the mind of various sector of the societies viz. Student, Farmers, Women and Traders through reputed NGOs. Various IEC activities includes, conducting awareness rally, photographic, drawing and essay completion, selecting plastic free wards and villages and conferring award to them , distribution of cloth bags etc.

DSTE is in the process of completion of a Documentary movie on eradication of SUP. This movie will be screened in all the cinema theatres, schools, colleges and public places.

BIO-MEDICAL WASTE MANAGEMENT

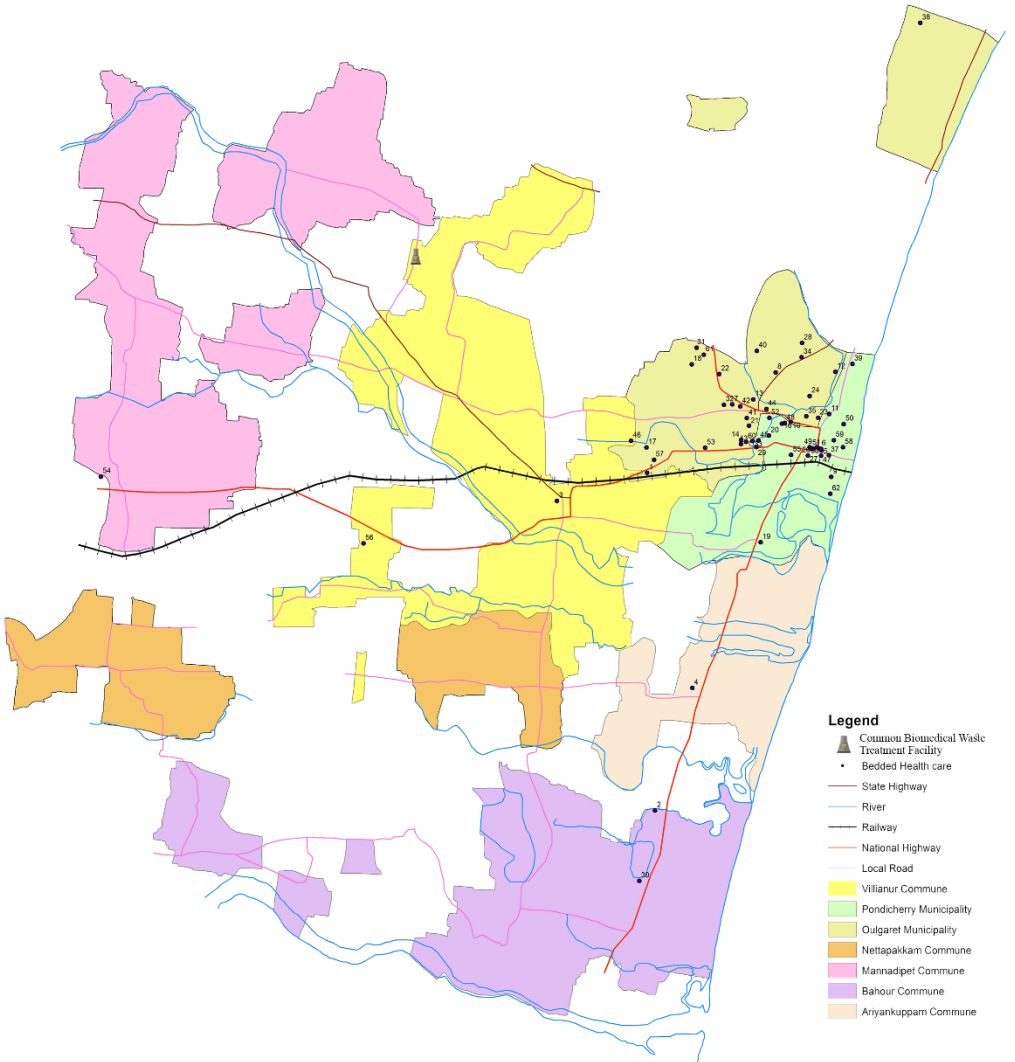
Puducherry is one of the preferable health destination. There are 9 Medical Colleges including renowned JIPMER, besides 380 Health Care Facilities (HCF) located in the U.T. of Puducherry. Though it gives pride to the U.T, proper disposal of Bio-medical waste (BMW) is a challenging task to the Government. Though the first Bio-medical waste management Rules, 1998 was notified more than 2 decades ago, scientific mode of Bio-medical waste disposal could not be achieved completely as witnessed in other parts of the country. Revised Bio-medical Waste Management Rules, was notified in the year 2016, which gives more teeth to the implementing authorities. Phasing out of chlorinated bags, adaptation of Bar coding system and fixation of GPS in the vehicle are ensured proper segregation, collection, transportation and disposal of BMW.

387 Health Care Facilities are present in the U.T. of Puducherry. Among them 86 are bedded and 301 are non-bedded. Details are given **Table – 19.**

Table 19 Details of Health Care Facilities

Total No. of HCFs	387
No. of bedded HCFs	86
No. of non-bedded HCFs	301
Clinics, dispensaries	25
Veterinary institutions	1
Animal houses & dispensaries	17
Pathological laboratories	213
Blood bank	3
Clinical establishment	14
Research Institutions	4
Ayush	24
Total No. of Beds	12112

Fig. 19 Location of Bedded Health Care Facilities



Sl.No.	Location
1	M/s. A.G. Padmavathi's Hospital ltd.,
2	M/s. Aarupadai Veedu Medical College & Hospital
3	M/s. Annai Eye Care Clinic
4	M/s. Aravind Eye Hospital
5	M/s. Arodia Clinical Labs
6	M/s. Arul Diagnostic Centre
7	M/s. Ashwini Maternity hospital
8	M/s. Be Well Hospital Pvt. Ltd.
9	M/s. Ceith India Hospital
10	M/s. Dr.Thomas Fertility center and Research Institute
11	M/s. Clinic Nallam
12	M/s. Curie Clinical Lab
13	M/s. Dakshin Women Care Hospital
14	M/s. Dr. Kumarans Hospital
15	M/s. Dr. T.L. Vasudevan ENT Surgical Clinic
16	M/s. East Coast Hospital (Speciality Centre)
17	M/s. East Coast Hospital Limited
18	M/s. ESI Hospital
19	M/s. ESV Maternity Hospital
20	M/s. Indira Gandhi Government General Hospital & Post Graduate Institute

Sl.No.	Location
21	M/s. Indira Gandhi Medical college and Research Institute
22	M/s. Jawaharlal Institute of Postgraduate Medical Education and
23	M/s. Jothi Eye Care Centre
24	M/s. Jothi's Hospital
25	M/s. Kamala Nursing Home
26	M/s. Kamaraj Uro Surgical Clinic
27	M/s. Kidney Centre Hospital
28	M/s. L.K. Nursing Home
29	M/s. Madhava Hospital
30	M/s. Mahatma Gandhi Medical College and Research Institute
31	M/s. Mahatma Gandhi Post Graduate Institute of Dental Sciences
32	M/s. Meenatchi Children's Clinic
33	M/s. Mohans Clinic
34	M/s. MVR Medical Centre
35	M/s. New Ashoka Nursing Home Pvt. Ltd
36	M/s. New Medical Centre (M/s Auro Care Pvt. Ltd)
37	M/s. New Medical Centre (M/s. Auro Care Pvt. Ltd)
38	M/s. Pondicherry Institute of Medical Sciences
39	M/s. Auromed Hospitals Pvt. Ltd (AUM)
40	M/s. Pondy Surgical Center

Sl.No.	Location
41	M/s. Rajiv Gandhi Women and Children Hospital
42	M/s. Rani Hospital
43	M/s. S.S. Clinic
44	M/s. S.S. Remedy Hospital
45	M/s. Sai Appollo Poly Clinic with Lab and ECG
46	M/s. Sakthi Deaddiction Cum Rehabilation Centre
47	M/s. Senthil Women and Child Hospital
48	M/s. Speciallity Centre
49	M/s. Sri Arunachalam Hospital
50	M/s. Sri Aurobindo Ashram Trust, Nursing Home
51	M/s. Sri Devi Nursing Home
52	M/s. Sri Krishna Nursing Home
53	M/s. Sri Mahalakshmi Nursing Home
54	M/s. Sri Manakula Vinayagar Medical college & Hospital
55	M/s. Sri Saikrupa Hospital
56	M/s. Sri vergateswara Medical college and Research Centre
57	M/s. Srishti Hospital
58	M/s. St. Joseph's Hospital
59	M/s. St. Mary's Eye Care
60	M/s. Vasan Eye Care Hosspital

Sl.No.	Location
61	M/s. Government Hospital for chest diseases
62	M/s. Mahatma Gandhi Government Leprosy Hospital

Table 20 Details of HCFs in Puducherry and Karaikal

Sl. No.	Type of HCF	Puducherry	Karaikal	Mahe	Yanam	Total No. of HCFs
1.	Bedded	67	19	1	4	86
2.	Non bedded	183	116	3	1	84
	Total beds	12112	635	102	56	12747

Table 21 Details of authorisation issued to HCFs in Karaikal

Sl. No.	Type of Hospital	Puducherry	Karaikal	Mahe	Yanam
1.	Bedded	62	19	1	4
2.	Non bedded	103	06	3	1
	Total No. of beds	165	25	4	5
	Total Qty. of BMW	3794	409.8	50.0	65.0

Bio-medical waste generation in the U. T. of Puducherry has been estimated as 5.24 TPD. One HCF is having captive biomedical waste treatment and disposal facility in General Hospital, Mahe which are involved in treatment and disposal of 28.6 Kgs /day bio-medical waste. One Common Bio-Medical Waste Treatment Facilities (CBWTF) is operating in

Puducherry Region and treating and disposing the Bio-Medical Waste generated in Puducherry and Karaikal region.

This CBMWTF facility is located in an industrial area of 20 Km. away from the Puducherry city. This facility is having 3.40 acres of land with built up area of 1.5 acres with internal roads, drainage facility, Bore well and sufficient Green belt.

Incinerator

The unit has an incinerator of capacity of 200 Kg/hour and operating for two shifts per day (8 hours per shift) with 30 meters chimney. The chimney is connected to the Air Pollution Control devices viz. cyclone separator and wet scrubber. The stack dia is 0.60 m with volumetric flow is 1,800 m^3/hr. The incinerator is having two chambers viz. primary and secondary chambers with 850 $\pm$ 50 C and 1050 $\pm$ 50 C temperature is maintained respectively. The incinerated ash is removed from the ash chamber and disposed in secured land filling area.

Penal Action Taken By PPPC on Violators

i) PPCC has filed 3 cases under Section 19 of Environment (Protection) Act, 1986 before Judicial Magistrate, Puducherry against the following Medical Colleges and Hospitals for violation of Bio-medical Waste (Management & Handling) Rules, 1998.

M/s. Mahatma Gandhi Medical College & Research Institute
M/s. Arupadai Veedu Medical College & Hospital and
M/s. AG Padmavathi's Hospital.

ii) Rs. 2.0 lakhs was forfeited from CBMWTF for non-compliance of emission standard of Bio-medical Waste Management Rules, 2016.

iii) Public Complaints have been received against M/s. Aarupadai Veedu Medical College & Hospital for discharge of untreated waste water into adjacent irrigation canal. PPCC officials conducted periodical surprise inspections and collected water sample from the

Effluent Treatment Plant of the hospital. Considering continuous violation of Medical College in excise of power conferred under Section 5 of Environment (Protection) Act, 1986 directed Superintendent Engineer, of Electricity Department to disconnect the power supply of the medical college, excluding hospital activities. After stoppage of discharge in the canal and initiation of up gradation of Effluent Treatment Plant, power supply was restored.

STRATEGIC PLAN

Proper collection, transport, treatment and disposal of Bio-medical waste is very crucial as it pose grave injuries not only to the environment but also to the health of the public. However, HCF are not much in concern for scientific method of disposal of BMW. It is need to be appreciated, most of the HCF changing towards better BMW management. With the continuous coordination and assistance of Directorate of Medical Services, PPCC able to brought under all the HCF located in the U.T. of Puducherry under the Authorization purview.

With the presence of one CBMWTF, disposal of BMW within 48 hrs is being ensured. This facility need to be improved in order to cater the need of future projected BMW. PPCC forfeited its Bank guarantee of Rs. 3 lakhs for not meeting the emission standards and also closed its operation for 20 days in order to upgrade its operation. Since, Continuous Online Environment Monitoring System (COEMS) is not properly displaying the various Consented parameters in the PPCC portal, PPCC deputed a technical person to the CBMWTF for strict vigil.

In order to ensure proper collection, transport and disposal of BMW, Bar Coding System is being implemented in all the HCF in collaboration with CBMWTF. A dedicated team with necessary technical set up has been established in PPCC to monitor the disposal of BMW of all the HCF located in the U.T. of Puducherry.

In general, any unit is found to violate the provisions of Consent conditions stipulated by PPCC, power connection of the unit would be disconnected under the provision of Section

5 of Environment (Protection) Act, 1986. But this provision could not be excised in the case of HCF as it involves providing sensitive health services to the public. Thus new instrument of imposing Environmental Compensation has been envisaged for the defaulting HCF.

HAZARDOUS WASTE MANAGEMENT

Hazardous wastes are wastes which have characteristics such as physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive, causes danger or is likely to cause danger to health or environment, whether alone or in contact with other wastes or substances. And therefore, it is necessary to handle and manage these wastes in an environmentally sound manner failing which they may have adverse effect to human health and environment. Government of India promulgated the regulations on Handling and Management of Hazardous Wastes through notifying Hazardous and Other Waste (Management and Transboundray Movement) Rules, 2016, in which scheme of environmentally sound system for handling and disposal of hazardous waste along with roles and responsibilities including the hazardous waste generators and various agencies have been laid down.

There are 120 hazardous waste generating industry are located in Puducherry District. Details of hazardous waste generation is given in Table – 22.

Table 22 Hazardous Waste Generation

District	No. of Industries	Landfillable (TPA)	Incinerable (TPA)	Recyclable/utilizable (TPA)	Total (TPA)
Puducherry	120	4815	535	32695	38037
Karaikal	9	0	0.5	7.665	8.17
Total	129	4815	535.5	32702.6	38045.17

Figure 20 shows the graphical information on type of industry located in U.T of Puducherry. The automobile parts manufacturing unit is found to be maximum in number in U.T of Puducherry further followed by Consumer products and steel industry units. The Plywood, Glass manufacturing, Port are found to be minimum. The major contributor of Hazardous Waste generation based on authorized quantity is Pharmaceutical industry of quantity 36080MTA followed by Transmission line towers manufacturing industry and Automobile parts manufacturing industries. **Figure 21** shows the Total Waste generation by different Sectors based on Authorized quantity.

Fig. 20 Number in unit in various sector of Industries in U.T of Puducherry

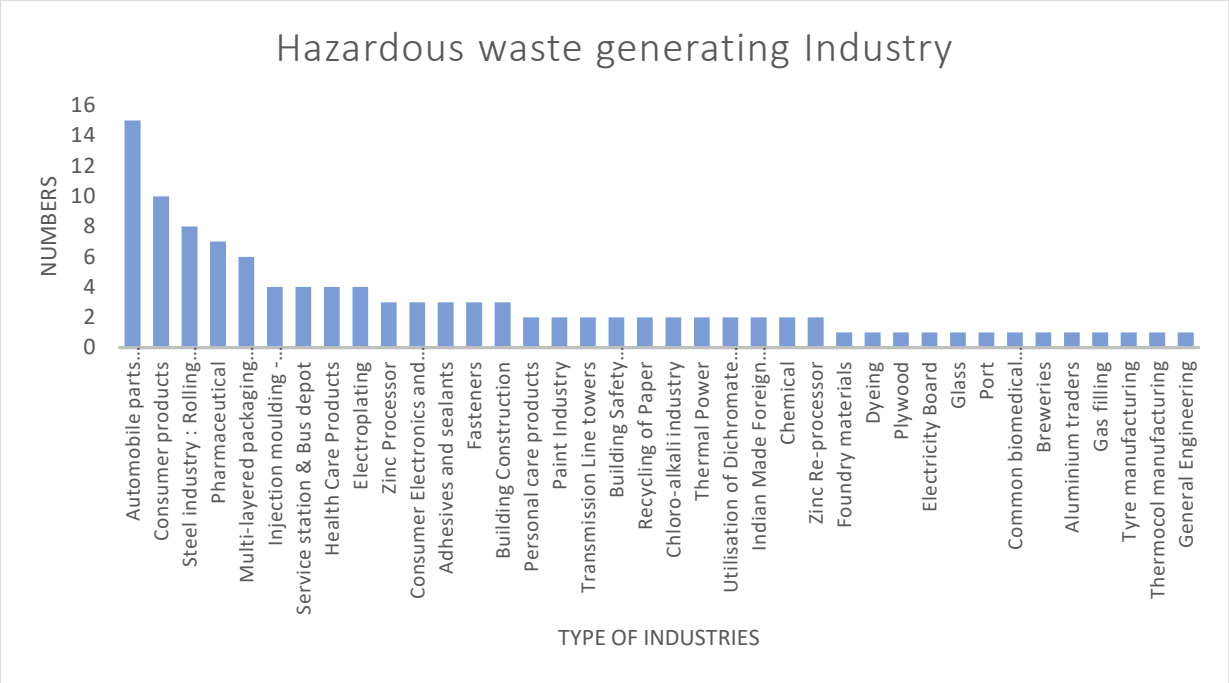
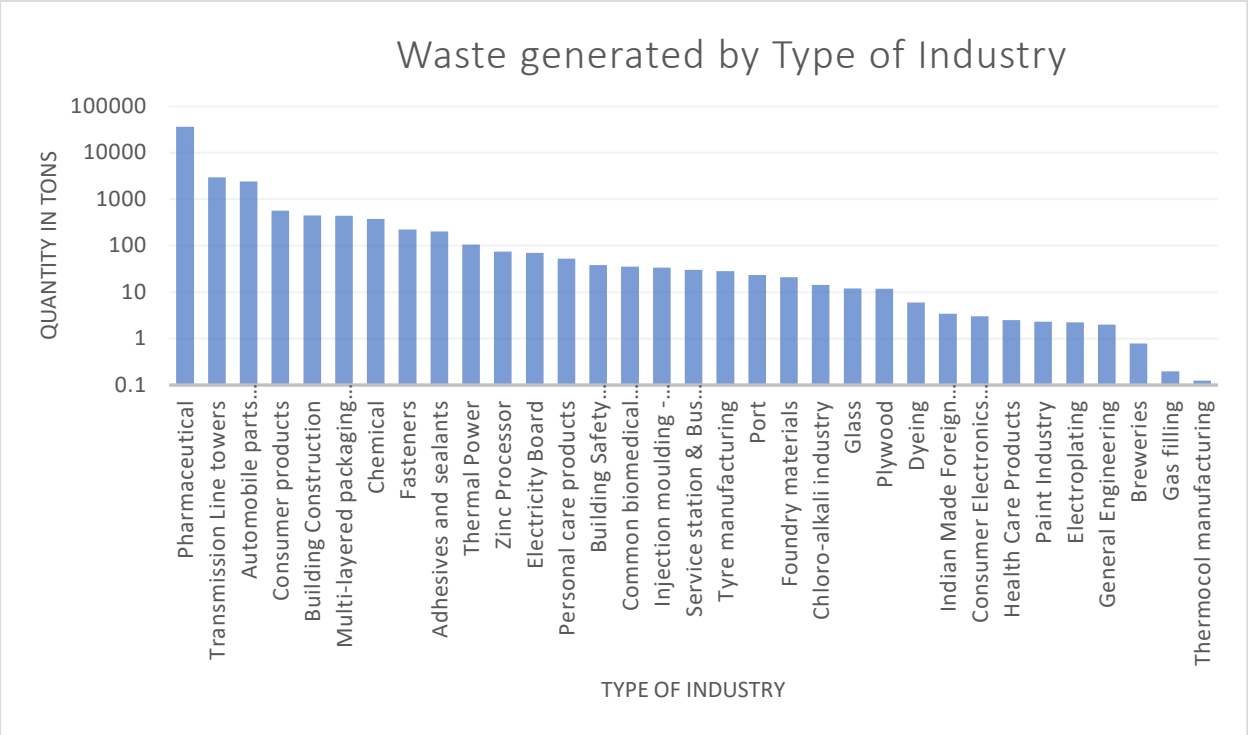


Fig. 21 Waste generation by different Sectors based on Authorized quantity



Hazardous Waste Disposal facilities

Currently, the Hazardous waste are majorly disposed to authorized disposal facilities located in other states. The industries in U.T of Puducherry are directed to enter into agreement with authorized facility for disposal in other state at the stage of authorisation. The major TSDF facilities located in other states are M/s Mother Earth Environ Tech, Bangalore has Landfill facility, M/s Enano Incintech, Bangalore, M/s Gomiti Incinco, Bangalore has Incineration facilities authorized by Karnataka State Pollution Control Board, M/s ACC Limited, Madukarai, M/s GEPIL, Ranipet, M/s Sandhiya Enviro Tech System are authorized by Tamil Nadu Pollution Control Board for Co-processing and Pre-processing.

Future Aspects Disposal of Hazardous Waste

In Puducherry, Consent to Establish was issued for setting up of Pre- Processing facility to M/s Nikkesh Enterprises and M/s Gujarat Enviro Protection Infrasturcture Limited. It is also proposed to setup a TSDF facility in Puducherry as per the Hon'ble NGT order 804/2017.

Action taken by PPCC on Hazardous Waste Violators

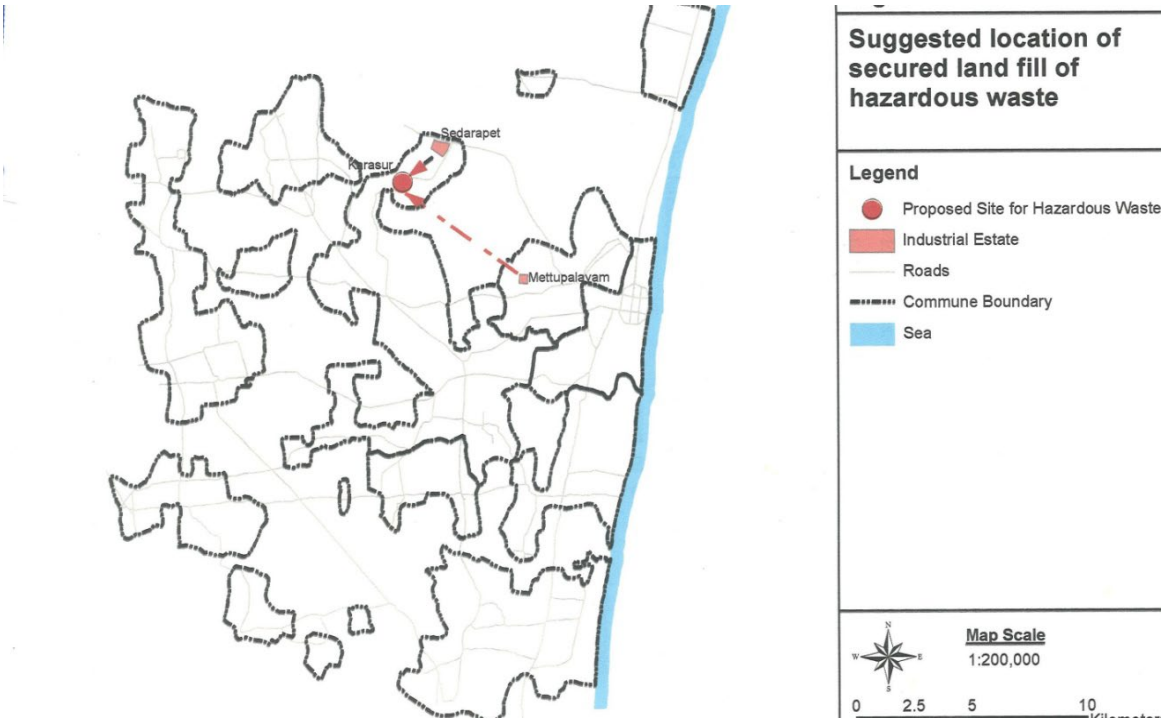
PPCC is taking severe action on violation of Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016. Based on the severity of the issue, PPCC issues direction or Show cause notice to the unit. PPCC has issued 8 show cause notice, revoked authorisation of 2 units and issued closure direction of 1 unit for violation of HOWM Rules, 2016.

STRATEGIC PLAN

Though common treatment facility is not exists in the U.T. of Puducherry, PPCC with continuous persuasion, could facilitated disposal of incinerable and landfillable hazardous waste to the common facility located in adjacent States. Major quantity of HW are recyclable and generated (90 %) from one Bulk drug unit. Waste chromate solution is major component. Two industries are utilizing these waste as per the SOP of CPCB and converting it to valuable dichromate material, used in Tanneries.

Hon'ble NGT in O.A.No.804 directed all the smaller States where HW generation are lesser than 5000 TPA, should set up TSDF before March, 2021. An attempt has been made to identify best suitable site for setting up of TSDF. After careful examination of many factors like presence of human settlement, ground water table, infiltration nature and availability of source of HW, Karasur located in Villiyanur Commune has been identified as best suitable site for TSDF.

Fig. 22



Submission of Annual report, Manifesto copy and provision of GPS in the HW transporting vehicles will eliminate illegal disposal of HW.

E-WASTE MANAGEMENT

Introduction

"Electronic waste" may be defined as discarded computers, mobile phones, office electronic equipment's, entertainment device electronics, television sets refrigerators etc. Because loads of surplus electronics are frequently commingled (good, recyclable, and non-recyclable), several public policy advocates apply the term "e-waste" broadly to all surplus electronics. Management of solid waste has become a critical issue for almost all the major cities in India. Increase in population coupled with the rapid urbanization of Indian cities, has lead to new conception patterns. Which typically affect the waste stream through the successive addition of new kinds of waste. Over last two decades, spectacular advances in technology and the changing lifestyle of people has lead to an increasing rate of consumption electronic

products. A trend today is dependence on information technology. The fast rate of technological change has lead to the rapid obsolescence rate of IT products added to the huge import of junk computers from abroad creating dramatic scenario for solid waste management.

E-WASTE is a collective name for discarded electronic devices that enter the waste stream from various sources. It includes electronic appliances such as televisions, personal computers, telephones, air conditioners, cell phones, electronic products, etc. The list of e-waste items is very large and can be further widened. Faster technological innovation and consequently a high obsolete rate poses a direct challenge for its proper disposal or recycling. This problem has assumed a global dimension, of which India is an integral and affected part.

The Ministry of Environment, Forest and Climate Change, Government of India notified the E-Waste Management Rules, 2016. Electronic waste or e-waste comprises old, end of life electrical and electronic appliances such as telephones, cellular telephones, computers, laptops, television sets, refrigerators, washing machine, air-conditioners, fluorescent and other mercury containing lamps etc., The rules apply to every manufacturer, producer, consumer, bulk consumer, collection centres, dealers, e-retailer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or electrical and electronic equipment.

As per the rules, the producer of the electrical and electronic equipment shall be responsible for collection and channelization of e-waste generated from the 'end-of-life' of their products under Extended Producers Responsibility. PPCC shall grant and renew authorization to the manufacturers, dismantlers, recyclers and refurbisher. PPCC shall monitor on the compliance of Extended Producer Responsibility by the producer of electrical or electronic equipment for channelization of e-waste to ensure environmentally sound management of such waste. PPCC shall conduct random inspection of dismantler or recycler or refurbisher, maintain online information regarding authorization granted, implementation of programmes to encourage environmentally sound recycling, and action against violations of the rules.

Source of E-waste

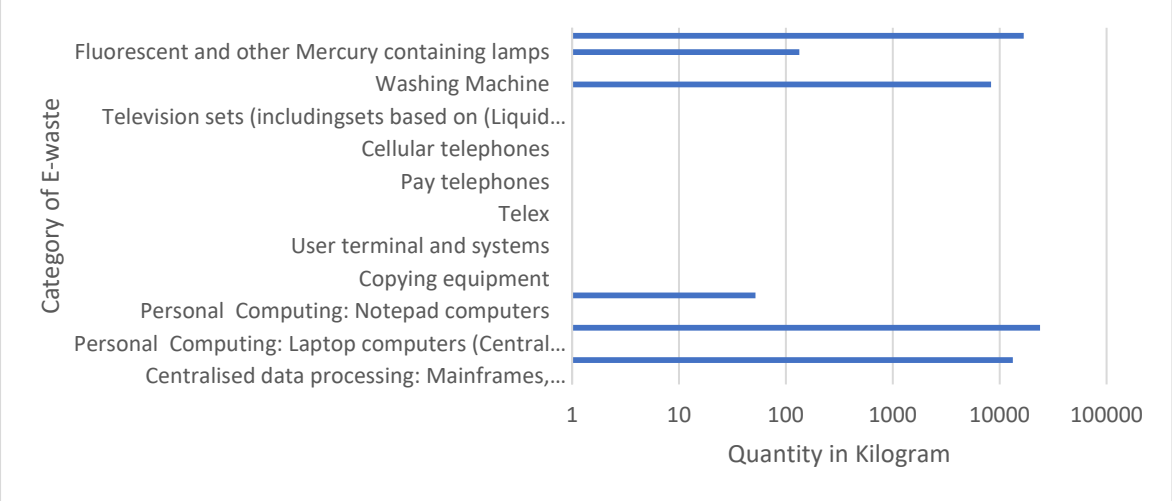
Electronic waste especially computer waste is growing exponentially in volume because of increasing demand of information technology and its application in the national growth process. Various government department, public as well as private sectors are fast feeding old electronics appliances such as computers, telephones, etc., into the waste stream.

- Industries
- Individual household
- Institutions, Government organization, Education institutions and Banks
- Electronic manufacturers and retailers

Status of E-Waste Management in Puducherry

PPCC issued authorization for 5 units (Manufacturer 3, Collection centre 2) under the E-Waste (Management) Rules. In U.T of Puducherry the major manufacturer of Electronic products are M/s Lenovo India Pvt. Ltd, M/s Acer India (P) Limited and M/s Whirlpool Pvt Ltd. The total generation of E-waste from U.T of Puducherry based on the annual returnsis62.5 tons for the year 2018-2019. The various category of E-waste generated as per E-waste management Rules, 2016 are shown below figure 1.1. PPCC has authorized 2 collection centres for collection of E-waste from U.T of Puducherry i.e M/s Planet savers and M/s Borax India Limited. The E-waste collected from Puducherry are being disposed to authorized recyclers or dismantlers such as M/s Exigo recycling pvt ltd, M/s Virogreen India Private Limited, and M/s Tesamm (India) Private Limited. There are no authorized recyclers or dismantlers located in U.T of Puducherry.

Fig. 23 E-Waste Generation in U.T of Puducherry



STRATEGIC PLAN

It is proposed to identify the collection points of Individual producers located in U.T of Puducherry and involve them actively in collection of E-waste through common service centres. In addition, E-waste drive are proposed to conduct to inhibit the informal trading, recycling and dismantling. PPCC also periodically inspects collection points to verify their conformity with Extended Producer Responsibility guidelines.

9. MINING REGULATION PLAN

River bed sand mining

River sand is one of the major components in construction activities. River beds viz. 69-Sankarabharani and Thenpennai in the Puducherry are the main source of sand. Generally, monsoon rains brings in a lot of sand in the rivers and such sand deposits are permitted to be removed from the surface, based on the depth of sand deposits available, after inspection of the sites jointly by the Revenue, Public Works Department, Science, Technology &

Environment Department and applicants (Government owned corporations *viz.*, M/s. PASIC, M/s. PAPSCO and M/s. PCBC). Normally, the sand is dug out from the dried river beds for the purpose of mineral development and to cater the needs of construction activities.

The sand Mining provisions are empowered from the Act, "Mines and Minerals (Regulations and Development) Act, 1957 (Act No. 67 of 1957)". In exercise of the powers conferred by sub-section (1) or section 15 of the Mines and Minerals (Regulations and Development) Act, 1957 (Act No. 67 of 1957), the Pondicherry Minor Minerals (Concession) Rules, 1977 was derived / farmed.

The Puducherry Minor Minerals (Concession) Rules, 1977, empower the Government of Puducherry to permit sand quarrying by means of mining lease or mining permit. Lease is given for sand mining in respect of area stipulated for a particular period and whereas permit is provided for mining of specific quantity. Grant of sand mining licence / permit is governed by above Rules.

Encroachment of river, tank and pond

106 encroachments have been reported in banks of some of the ponds, tanks and river bed. As part of Jal Shakti Abhiyan all the ponds, tanks are being revived by the respective estate officer i.e. Commissioners of local body and EE Irrigation Division by marking the boundaries, desilting and removing of encroachments thereon.

Type of Mining activity

No major minerals are available in Puducherry. Only river sand, which is a minor mineral is permitted to be excavated. As per the Sustainable Sand Mining Guidelines, 2016 published by the MoEF & CC, New Delhi & the notification of MoEF & CC, New Delhi dated 15.01.2016 no mining is allowed without Environmental Clearance. Based on the conditions laid down by the State Environmental Impact Assessment Authority (SEIAA), Puducherry mining activity will be carried out by the Govt. agencies/corporations by open cast semi-mechanized method, shallow mining of less than 1m from the top of the river bed.

No. of Mining Violations

Stringent action is being taken against the offenders involving in illegal sand mining/transportation. The action taken against those offenders for the past 4 years is detailed below:

Table 23 Mining Violation

Sl. No	Description	YEAR			
		2015-16	2016-17	2017-18	2018-2019
1.	Quantity of sand seized (cu.m)	140	560	700	1688
2.	Lorry captured	4	27	58	13
3.	Bullock carts captured	191	296	271	85
3.	No. of cases compounded	195	323	329	92
4.	No. of FIRs filed	10	16	13	45
5.	Compounding amount realized	Rs.6,33,300	Rs.15,53,000	Rs.34,33,000	Rs.10,14,000

Environment protection measures in mining activity

The following conditions are laid down during mining activity.

i. The depth of the excavation of sand, dimensions will not be exceeded as per the limit prescribed in EC.
ii. No sand mining in rainy season.
iii. To maintain safety and stability of river banks, 3 meters or 10% of the width of the river whichever is more will be left intact as no mining zone.
iv. Adequate safe guard measures will be taken against dust emission, noise pollution and health risks.

v. Sand mining operations will be carried out between 7. 00 A.M. and 5.00 P.M.

vi. The excavated sand from the river bed will be transported to the storage facility and shall be distributed further by adopting proper dust control measures during loading and transportation. The transport vehicles shall be covered with tarpaulin to minimize dust/sand particle emission.

Measures taken to compact illegal mining activity

In order to curtail the illegal sand mining and transportation activities and in compliance with the directions of the Hon'ble High Court of Madras, check posts have been set up at Pathukkannu junction point, Arumbarthapuram, and Mullodai. These check posts are functioning round the clock and manned with revenue officials and Home Guards. These check posts play a vital role in curbing the illegal sand transportation activities and keep a constant vigil.

Further, as directed by the Hon'ble National Green Tribunal, Southern Zone, Chennai Bench, the Special Task Force on illegal sand mining comprising the following members was constituted vide Order No. 5920/DRDM/C2/NGT/2013 dated 02.11.2015.

Table 24 Special Task Force

Sl.No.	Designation of the Official	Designation
1.	The Deputy Collector (Revenue)-South, Villianur	Chairman
2.	The Executive Engineer (Irrigation Division), Public Works Department, Puducherry	Member
3.	The Superintendent of Police (West)	Member
4.	The Tahsildar, Taluk Office, Bahour	Member
5.	The Revenue Officer, O/o. Deputy Collector (Revenue)-South, Vilianur	Member Secretary

- Monthly review meeting is being conducted by the Special Task Force constituted under the chairmanship of the Deputy Collector (Revenue) South with the members comprising The Superintendent of Police and PWD officials to monitor the activities done during previous month and the activities to be done in the coming month.

- The Minutes of the Meeting is conveyed to all the line departments for taking necessary action.

- Check Posts have been constituted in the main entry points at the following places, under the head of Revenue Inspectors of the department to prevent the movement of the vehicle carrying illegal sand:-

    a) Pathukannu
    b) Odiampet
    c) Periyar Nagar, Kuruvinatham.
    d) Thookupalam, Irulansandhai.

- Prohibitory Order under Section 144 CRPC has been issued on various occasions in the River bank.

- An awareness camp was conducted in Soriankuppam and Kuruvinatham Villages by the Tahsildar, Taluk Office, Bahour along with the SHO, Bahour and the Villagers were educated about the ill-effect of the illegal sand mining on environment in the camp.

- An order has been passed to freeze the GLR values in respect of eight private lands where illegal sand mining is taking place along the bank of Sankaraparani River vide order No.6787/DCRS/GLR/B1/2018 dt.05/02/2018.

- Warning Notices have been issued to the Bullock Cart owners of Bahour and Lorry owners of Pillaiyarkuppam to stop illegal sand mining.

- Since the illegal sand mining is taking place at the other side of the river which falls in the Tamilnadu region, Tahsildar and Revenue Divisional Officer of Cuddalore District, have also been requested from time to time to take steps to curtail illegal sand mining in the Tamil Nadu site of the River Thenpennaiyar.

- Periodical ditches are made by the PWD in the river bed of Thenpennaiyar and Sankarabharani to prevent the illegal miners from getting into the rivers.

- A Cattle Trap near Soriankuppam Burial Ground has been constructed in order to prevent the entry of the Bullock Carts into the Thenpennaiyar River for illegal Sand Mining.

- The sand mining squads are periodically demolishing the "floats/empty wooden barrel" which is being used to dig sand from the Sankaraparani River at Ariyapalayam.

- A team comprising of Police officials along with a Revenue Inspector has been deployed to carry out surprise raids/ attending complaints related to illegal sand mining/transportation during night time.

Available legal Administrative frame work to regulate mining activity

The sand Mining provisions are empowered from the act, "Mines and Minerals (Regulations and Development) Act, 1957 (Act No. 67 of 1957)". In exercise of the powers conferred by sub-section (1) or section 15 of the Mines and Minerals (Regulations and Development) Act, 1957 (Act No. 67 of 1957), the Pondicherry Minor Minerals (Concession) Rules, 1977 was derived / farmed.

The Pondicherry Minor Minerals (Concession) Rules, 1977, empower the Government of Puducherry to permit sand quarrying by means of mining lease or mining permit. Lease is given for sand mining in respect of area stipulated for a particular period and whereas permit

is provided for mining of specific quantity. Grant of sand mining licence / permit is governed by above Rules.

Prior Environmental Clearance under EIA Notification is obtained before granting mining lease. Sustainable sand Mining Management Guidelines, 2016 of MOEF is being followed.

Alternative source to carry out construction activity

To prevent illegal sand mining and to meet out the shortage of sand for construction purpose, it was decided to import river sand from foreign countries. Accordingly, "The Puducherry Import of Sand, Transportation and Storage Rules 2018" have been framed and published in the Extraordinary Gazette of Puducherry vide G.O. No.28 dated 05.06.2018 so as to allow the dealers to import and sell river sand to the general public. Under the said rules, 11 applicants have been registered as 'Importer of Sand' and 6 applicants have been registered as 'Mineral Dealer'. Further on 08.05.2019, M/s. Aban marketing & Exports Limited had imported **54,692.81** Metric Tonnes of sand from Malaysia through Karaikal Port. The imported sand is being sold to the general public through, a registered mineral dealer M/s. V.S.R Impex.

Further, the Public Works Department, Puducherry vide Circular No.342/PW/CE/EE(D)/AE(c) /F.No.734(B)/2017-18 dated 28.03.2018 had issued instructions to use crushed stone sand called as Manufacturing Sand (M-Sand) as an alternative source for construction purpose.

E-flow affected by illegal mining activity

Sankarabharani and Thenpennai are the major non-perennial rivers flowing in the Puducherry region. Due to failure of monsoon, non-availability of sand deposits and increased demand, sand is being excavated along the bunds indiscriminately by hand and bullock carts are used in transporting these unauthorizedly excavated sand. Due to illegal offenders, there exist some pits in the river beds in certain places which affect the natural flow of river current.

10. BIO-DIVERSITY AND GREENING PUDUCHERRY

U.T. of has no natural forest. Department of Forest and Wild Life has taken various measures to improve green cover of the U.T. Currently, 26.1 sq.km. of green cover has been developed by the Forest Department. Most of the plantation has been carried out in Social Forestry Scheme. Two nurseries were functioning one at Lawspet and another at Mettupalayam. Around 1 lakh seedlings have been produced annually in the two nurseries and distributed to the public at free of cost. One lakh trees have been planted for the last 3 years.

The Pondicherry Timber Transit Rules 1983, as amendment in 1999 is lonely available State legislation to curb illegal tree felling. Around 25 Nos. of illegal tree felling cases has been registered under Timber Transit Rules for the past 2 years.

Species

There 166 bird species have been spotted in Puducherry District of which 46 are migratory. In Reptiles, 3 species of turtles, 10 species of lizards and 16 species of snakes are reported.

Controlling Pouching activity

Through intensive Patrolling and enforcement in the provision of the Wildlife (Protection) Act, 1972. About 7 wildlife cases have been registered on the poachers during the last 2 years.

Details on Turtle nesting ground

Under Sea Turtle Conservation programme is being executed by this department. It may be noted that around 13,000 turtle eggs have been collected and maintained in natural hatchery center at Nallavadu and Panithittu. Out of them, 11,500 young hatchling were released in the Bay of Bengal during 2018 -19.

Details on endemic and endanger species

Out of 480 plant species recorded, 11 species were endemic

1. Andropogon pumilus
2. A systasia dalzelliana
3. Barberia acuminate
4. Cynodon barberii
5. Drypetes roxburghii
6. Loeilema anthephoroides
7. Jatropha tanjorensis
8. Maba buxifolia
9. Phyllanthus rotundifolia
10. Sarcostemma brunonianum
11. S. intermedium

Among the 480 plant species, 20 different species are categorized under rare/endangered/threatened/vulnerable red listed medicinal plants category

1. Acacia chundra
2. Achyranthes bientata
3. Aegle marmclos
4. Aristolochia indica
5. Buchanania axillaris
6. Cadba indica
7. Cassive glauca
8. Clastrus panialatus
9. Crateva magna
10. Ericostemma littorale
11. Hemedismus indica
12. Hugonia mystax

13. Justicia gendarussa
14. Kedrostis foetidissima
15. Plumbago Zeglamica
16. Pseudarthria viscid
17. Salacia chinensis
18. Santalum album
19. Semegarpus anacardium
20. Terminalia arjuna

Coastal plantation programme

About 4000 Mangrove seedlings were planted on the bank of the Chunnambar river from April 2019.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 25 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.

Government waste Land is available in the Southern-eastern region of Puducherry Region. Soil texture is sandy and dry with low fertility. Water holding capacity is very low. Suitable species are Palmira, Neem Aracia Longifolia, Cavarina and Eucalyptus etc. A new scheme would be implemented in the name of "CSR Forestry" where in Forest Department will do plantation and industring will assists in watering of their treated effluent.

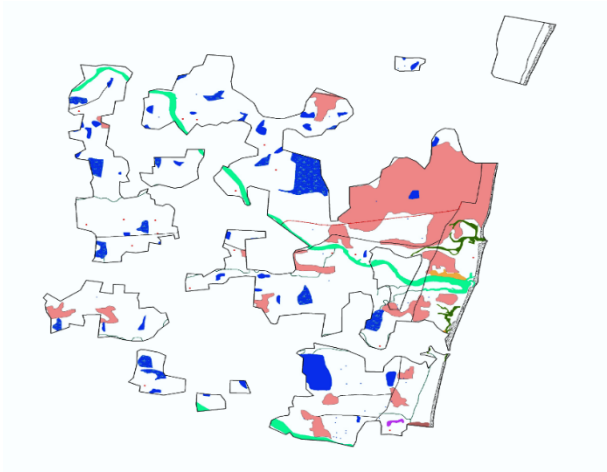
Apart from the dry land, lot of Govt. pramable lands are available in the rural areas. Suitable land will be identified and brought under plantation.

11. WET LAND CONSERVATION

Wet land is heart of Eco-system. It supports biodiversity more than any other system. It act as natural check dam by arresting the flowing of water and there by controlling flooding and improving recharging of ground water. 115 wet lands, including 39 small wet land (<2.25 ha) are identified in Puducherry with 3506 ha area. Lakes and ponds contributed to 31 % of total wetland area. Other identified wet land are Lagoons (1), Creeks (5), beach (6), mud flates (1) and salt marsh (1). **(Fig. 24)** Ossudu Eri has been notified as Bird sanctuary by Govt. of Puducherry. Wet lands are governed by Wet land (Conservation and Management) Rules 2017. Puducherry Union Territory Wetland Authority has been notified by the Govt. of Puducherry under the Chairmanship of Chief Secretary, Puducherry.

Wetland is generally influenced by anthropogenic activities like poaching, discharge of sewage, effluent and dumping of industrial, biomedical and domestic waste. Notification of Wet land is basic step for its effective protection. Next measures is documentation of these wet land. Continuous vigil on poaching, discharge of sewage/effluent and over grazing activities shall be carried out. Intensive plantation will improve biodiversity.

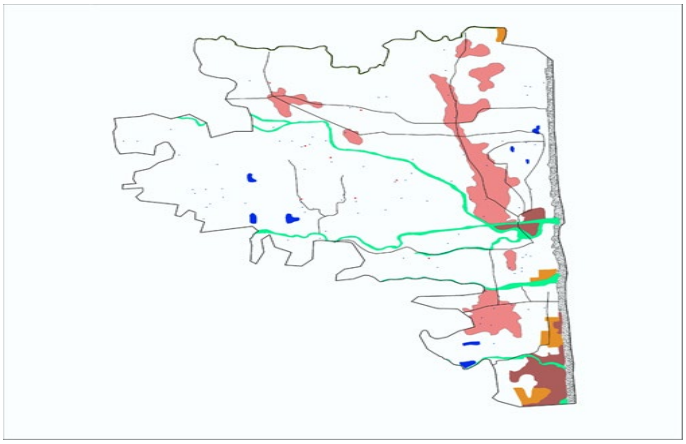
Fig. 24 Wet Land Map of Puducherry



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.

Fig. 25 Wet land map of Karaikal



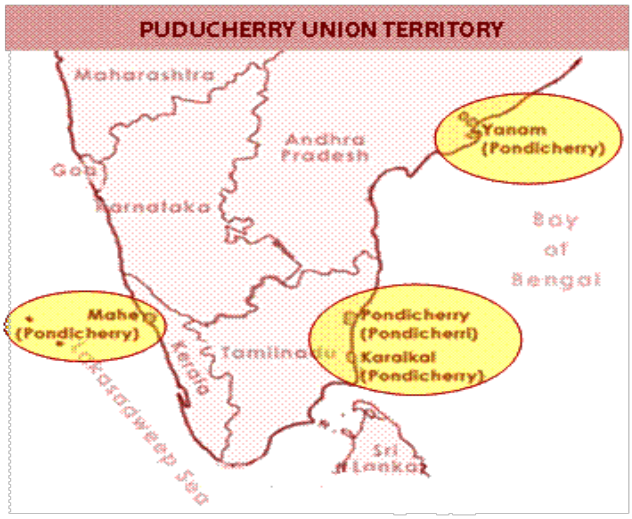
Wet land is the national importance. Though many waste land are present in the U.T of Puducherry, not much work has been carried out in identification and protection of the wet lands. Recently Government has taken various initiatives in identification and conservation of various wet lands present in the U.T of Puducherry. Larger wet land will be declared as Protective area, so that anthropogenic impact on these fragile land will be minimized. Bio-diversity improvement measures will be carried out, through Department of Forest.

12. COASTAL ZONE MANAGEMENT

Puducherry Union Territory comprises of four coastal enclaves viz. Puducherry, Mahe, Yanam and Mahe regions which are geographically separated from each other. For administration purpose the Union Territory is divided in to two districts Viz. Puducherry and Karaikal.

Puducherry District consists of Puducherry, Yanam and Mahe are located in the coastal area and dependent on the coastal resources for its development and wellbeing. Puducherry region is interwoven within the state of Tamil Nadu along the Bay of Bengal coast. Yanam region is located within the state of Andhra Pradesh a few km inland of the Bay of Bengal Coast along the banks of Gautami Godavari River which is a tidal influenced water body. Mahe is located within the states of Kerala along the Arabian Sea coast.

Karaikal District comprises of the Karaikal region which is located 132 km south of the city of Pondicherry and bounded by the state of Tamil Nadu on three sides and Bay of Bengal on the East.



The coastal setting of all the four regions of Puducherry UT 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 conflicts.

Coastal Geomorphology

i) Puducherry Region:

Pondicherry Region is a flat plain with an average elevation of about 20-25 metres above mean sea level. The marine plain stretches along the Bay of Bengal extends for about 22 km with a width ranging from 400 to 600 metres. The sea coast has a narrow flat beach with the sea almost touching the plain land at places. The marine plain consists of gently sloping lands with sand dunes. Other characteristic coastal land forms such as creeks and lagoons are also observed in it. The tidal flats extending along the coastal stretch are narrow, except around the Ariyankuppam estuary. Along the Puducherry coast, beaches are generally narrow and are undergoing severe erosion along the northern segment whereas in the southern segment, beaches are comparatively broad and depositional. Barrier dunes are seen as continuous mounds between Ariyankuppam, Kirumambakkam, Manapattu and Narambai areas. Dunes are also seen almost on the entire coast except at Manaveli, Pooranankuppam and Manapattu

coastal blocks. Estuarine mouths are prominent at Ariankuppam, north of Pooranankuppam and in the southern segment where both Gingee and Ponnaiyar rivers join the Bay of Bengal.

Table 26 Area Covered under CRZ in Puducherry

Length of coastline along Bay of Bengal	**22.23 km**
Length of tidal influenced inland water bodies like rivers and creeks	61.54 km

ii) Yanam Region

Yanam is a small area of 8 square miles in extent, situated on the left bank of the eastern branch of the Gautami – Godavari River in Andhra Pradesh. It is built on a place where the river Coringa and the Godavari meet and is bounded on the East and the South by these rivers. Its located at about nine kilometres from the Bay of Bengal coast. It consists of relatively smooth flood plains, alluvial tracts and fluvial landforms produced by the river.

Table 27 Area Covered under CRZ in Yanam

Length of coastline along Bay of Bengal	**Nil**
Length of tidal influenced inland water bodies like rivers and creeks	65.43 km

iii) Mahe Region

Mahe is a small coastal town situated on the west coast in Kerala, on the Malabar coast of the Arabian Sea located on the mouth of the Mayyazhi River. Mahe is bounded on the southwest by the Arabian sea, on the north by river Ponniyar (Moolakadavu) on

the other sides by a stretch of calcareous hills of medium height, which are linked to the Ghats by a series of wooded hillocks. Mahe is a land that has its soul so connected to Kerala even though it forms a part of the union territory of Pondicherry. Mahe has a beautiful landscape surrounded by river and serene beach.

Table 28 Area Covered under CRZ in Mahe

Length of coastline along Bay of Bengal	**1.46 km**
Length of tidal influenced inland water bodies like rivers and creeks	2.41 km

iv) Karaikal Region

Karaikal region 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 region 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 29 Area Covered under CRZ in Karaikal

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

Ecologically Sensitive Areas:

i) Mangroves

In Puducherry, mangroves exist as fringing vegetation distributed along the banks of the Ariankuppam estuary/backwaters. Though the waterway is a tributary of the river Gingee, freshwater input to this mangrove area is minimal and it mainly receives municipal and agricultural discharges. This tide-dominated estuary opens into the Bay of Bengal. Seven true mangrove floral species belonging to three families have been identified. The prominent species of mangroves found in this region include Bruguiera cylindrica, Rhizophora apiculata, Avicennia marina, Acanthus illicifolius, Suaeda monoica, Suaeda maritima, and Sesuvium portualacastrum. Mangrove associates found in these areas are Pongamia pinnata, Clerodendrum inerme, Enicostemma littora, Wattakaka volubilis, Hemidesmus indicus, Thespesia populnea and Scoparia dulcis.

In Yanam region thick mangrove vegetation is found along in the river islands of Gautanmi Godavari which is a major tourism attraction. Total mangroves area in Yanam region is about 449.2 ha with diverse species of 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 Arasalar 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 Arasalar and other small tributaries of river Cauvery.

ii) 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. Puducherry being a coastal province too has moderate to good formation of sand dunes in Puducherry and Karaikal regions.

The coastal zone of Puducherry region comprises newer and older dunes including saline areas of clayey texture. These dunes are well stabilized and the locals claim that they are quite ancient. Though most of the dunes here have Casuarina or coconut plantations, some areas also have mixed vegetation supporting species like Prosopis, Eucalyptus and other shrub species. The sand dunes along the beaches of Puducherry area are slowly vanishing due to human intervention and also due to beach erosion. Many of these dunes have been reported to have been flattened for agriculture, as the swales have a high mineral and clay content, making it a very fertile soil to grow paddy.

Karaikal region being a coastal province has moderate to good formation of sand dunes. The extent of sand dunes in about 0.22 Km^2 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. The distribution of sand dunes in both the regions 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.

Turtle Nesting Grounds

Eastern coastal regions of India are renowned for their marine turtle nesting beaches. The Gahirmatha beach of Orissa is one of the few remaining places where ‘arribadas’ or mass

nesting of Olive Ridley turtles (Lepidochelys olivacea) occurs. Along the Coramandel coast of Tamilnadu and Puducherry, the nesting beaches are spread from the Chennai coast to Point Calimere. Plants such as peach morning glory or Ipomoea pes-caprae (Linnaeus and raven's mustache or Spinifex littoreus and papyrus sedges or Cyperus arenarius are the coastal flora found in abundance here and serve as the natural nesting sites for sea turtles, such as the Olive Ridley (Lepidochelys olivacea), Leatherback (Dermochelys coriacea) and Hawksbill (Eretmochelys imbricate) turtles. The conservation status of these turtles is as Vulnerable (Olive Ridley, leatherback) and Critically Endangered (Hawksbill) according to the IUCN Red list of Threatened species. Because of this, the importance of awareness and conservation of turtles especially in this area is critical.

Earlier observations made by researchers, fishermen and wildlife enthusiasts in Puducherry identifies that Veerampattinam, Thengaithittu, Panithittu in the southern shores of the state as having wide shore areas with rich coastal vegetation and where most sightings were recorded when compared with the beaches in the northern shores of Puducherry. The nesting seasons for Olive Ridley turtles are unpredictable but generally appears focused between December and March. The Forest Department is taking initiatives on conservation of the nesting grounds in collaboration with the local fishing community to identify hatching spots and to help guard the temporary hatcheries.

Other ESAs

Salt marshes and Mudflats are other ecologically sensitive areas noticed in Puducherry and Karaikal regions.

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.

i) Ports & Harbour

The Minor Port of Puducherry region is situated in the East Coast of India between two Major Ports of India namely, Chennai and Tuticorin. It is an open roadstead anchorage port situated about 170 km south of Chennai in position 11º 56' N, Longitude - 79º 50' E and is suitable for lighterage operations during fair weather months (February to September).

The minor port of Pondicherry constructed in 1986 consists of a pile supported jetty connected with an offshore breakwater. The length of the northern breakwater is 50m and southern breakwater is about 120m. This breakwater was constructed with the provision of sand bypassing system of about 400,000m3/yr. However, since the sand bypassing system has not been utilized appropriately. Because of this, deposition occurred on the south side of the breakwater and erosion on the north side of the northern breakwater. For protection of shoreline erosion, the Puducherry government has built riprap using boulders weighing 0.50 to 1.50 tonnes for a total length of about 8.55 km. In many places along this riprap, the seabed below the riprap is eroded due to severe wave action and ground subsidence. In order to have a sustainable solution for coastal erosion the Government of Puducherry has conducted long term coastal studies through NIOT from 2012 to 2015 and a pilot project on Restoration of Puducherry Beach is being implemented through NIOT.

In Karaikal region, Karaikal Port is operating 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.

Fishing harbours are located at the Ariyankuppam river mouth of Puducherry, Arasalaru River mouth of Karaikal, at Godavari river in Yanam and at Mahe. The fishing harbor mouth at Puducherry experiences frequent sand accretion due to wave action, necessitating regular dredging at the mouth.

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

Tourism

Coastal Tourism is an important activity in Puducherry with upwards of 10 lakh tourists every year. About 10% of the tourists are from overseas. The serene beaches of Puducherry are a major tourism attraction. Also, the rich spiritual heritage of Puducherry and Karaikal Districts attracts lot of tourists from other parts of the country. 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. The coastal stretch of Puducherry and Karaikal District 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 backwaters and creeks.

The data collected in the coastal waters of Puducherry indicate that the dissolved oxygen level is within the permissible limits with an overall decline during the decade 2000-2010. Increased urbanization in the coastal areas has resulted in increased O_2 stress on the coastal waters. Moderate increase in levels of nitrate and phosphate has been observed over the years. High level of bacterial population in surface water indicates continued contamination of coastal waters due to untreated domestic sewage and industrial effluents.

The Government of Puducherry has submitted a proposal for implementation of the Integrated Coastal Zone Management Project in Puducherry UT which has been accepted by the MoEF&CC for implementation. Under this project Inventorization of all untreated waste

water sources entering into coastal area will be undertaken and suitable action plan designing and implementation of pilot sale treatment plants at selected locations will 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. In order to control coastal erosion, since 1969 the Puducherry Government constructed sea walls along the Puducherry town's coast. The status of shoreline changes along Puducherry was studies by the National Centre for Sustainable Coastal Management, Anna University, Chennai and the findings are given below:

Table 30 Shore line change in Puducherry Coast

Classification of Coast	Extent (km)	Percent of Coast	Cumulative (%)
Length of Coastline including river mouths and Ports	23.62		
High Erosion Zone			
Medium Erosion Zone	0.52	2.2	
Low Erosion Zone	0.46	2.0	
Artificial Coast: Seawalls/ Riprap	**6.18**	**26.2**	30.3
Stable Coast	**9.27**	**39.2**	39.2
High Accretion Zone			
Medium Accretion Zone	2.19	9.3	
Low Accretion Zone	5.00	21.2	**30.4**
Number of Ports/ Harbours	2		
Number of Fish Landing Centres	21		
Number of Groynes/ Breakwaters	**7**	**100.0**	**100.0**

- In the stretch between Pudukuppam and Periya Mudaliyarchavadi, the coast is “stable” and/ or accreting. This coast has many fish landing centres are dominated by tidal flats which tend to accumulate sediments. In addition, dunes are observed along this coastal area, providing stability to the entire coastal stretch.
- Covers the highly eroding coastal stretch between Bommaiyarpalayam and Puducherry’s Old Port. The most conspicuous features of this coastal stretch is the presence of coastal protection structures (seawalls/ riprap) and groynes all along the coast. The coastal stretch is classified as an “artificial coast” which has been undergoing high erosion in the past. Nearly 80% of this highly eroding stretch is managed by seawalls/ riprap as a coastal protection measure.
- Low erosion is observed in the north of Puducherry’s Old Port due to the presence of groynes. The coastal stretch near Bommaiyapalayam is stable with dune formations. The rest of the coast consists of tidal flats and younger coastal plain.
- The Ariyankuppam, Gingee and Malattar Rivers join the Bay of Bengal in the north and south respectively. Between the Gingee and Ariyankuppam rivers, medium accretion is observed. This extends upto south of Puducherry Port. Zones of low to medium erosion is observed from north of the Puducherry Port to Thengattittu. The southern side of the Puducherry Port consists of breakwaters and seawalls that trap sediments moving north, thereby creating erosion along the coastal stretch after the northern breakwater.
- The coast is stable, extending from Sivanathapuram in the north to Manapattu in the south. The coast is accreting in the region adjacent to Puranankuppam. The geomorphology of the coast is dominated by younger coastal plains.
- Stable coast throughout from Kirumambakkam in the north to the mouth of River Gadilam in the south.

Fig.26 Shoreline Changes Map of Puducherry Region

Table 31 Shore line changes in Karaikal coast

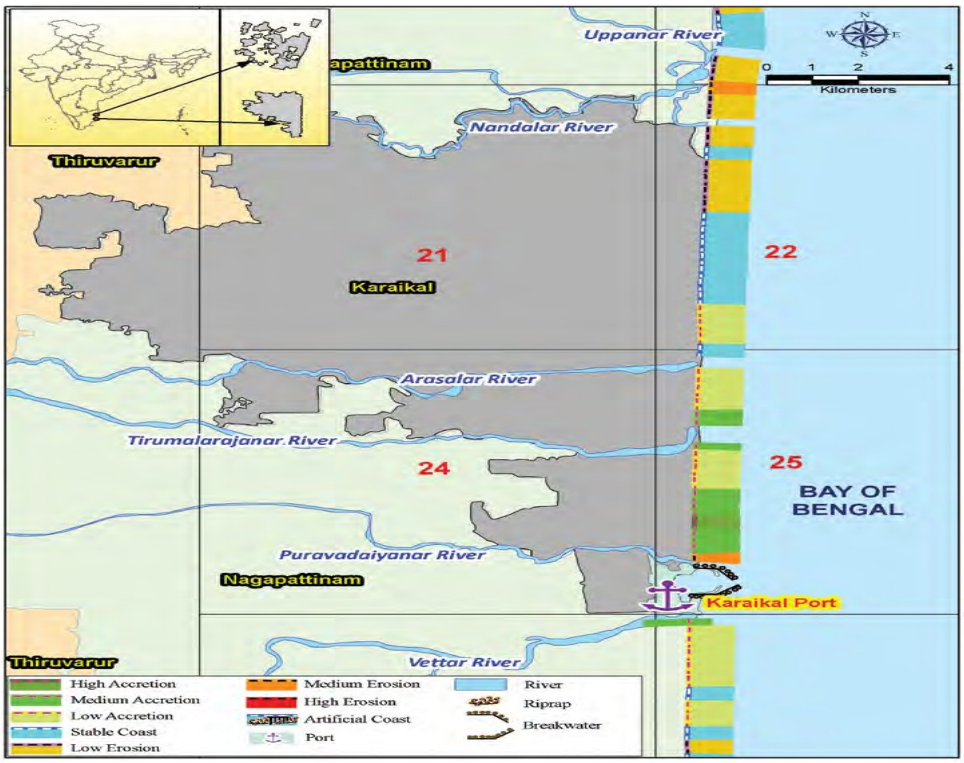
Classification of Coast	Extent (km)	Percent of Coast	Cumulative (%)
Length of Coastline including river mouths and Ports	17.30		
High Erosion Zone			
Medium Erosion Zone	0.29	1.68	
Low Erosion Zone	1.99	11.50	**13.18**
Artificial Coast (km): Seawalls/ Riprap			
Stable Coast	3.98	23.01	**23.01**
High 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 (Puducherry Union Territory) 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. 27 Shoreline Changes Map of Karaikal Region



i) Pilot Project for Restoration of Beaches

Based on the request of Govt. of Puducherry to conduct a scientific study to protect and nourish the coast of Puducherry and the adjoining areas by adopting site specific coastal protection and restoration techniques, the National Institute of Ocean Technology, Chennai (NIOT) monitored the coastal processes responsible for shoreline changes from 2012 and has prepared a comprehensive Shoreline Management Plan for Puducherry in May 2015. Based on the studies NIOT subsequently designed and implemented the pilot project **- Restoration of Puducherry Beach**.

The proposed solution involves

- ✓ Construction of one Nearshore Wedge reef opposite to the Chief Secretariat on the north end of Pondicherry town foreshore, with the crest at Chart Datum.
- ✓ Construction of one Offshore reef placed at the south end, at 300 m north of the pier, with the crest at 1 m above Chart Datum.
- ✓ Sand nourishment using 4,50,000 m3 of sand between northern and southern reef along the Coastline of Pondicherry Town near Gandhi Statue.

The goal of the near-shore wedge reef in the north is to provide a barrier to sediment losses, enabling sand to move naturally to the north while slowing the losses of sand from the town foreshore and the goal of the offshore reef at the south is to hold the sand on the beaches and prevent sand losses from the beach back to the Port.

The project commenced in March 2017 and construction of northern wedge reef was completed by August 2018. Sand nourishment was also carried out parallelly and it is to be continued. Construction of southern reef is yet to commence.

The fruits of this project is already visible as a Beach is already taking shape near the seawall and with the steady progress of the beach restoration project the city's coastline could soon travel back in time to its sandy past.

Fig. 28 Formation of beach

Fig. 29 General public rejoicing in the newly formed beach

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 32 Puducherry District - CRZ Area Statement as per CRZ Notification, 2011

SL.NO.		PUDUCHERRY	YANAM	MAHE
1	HTL Length along coastline in Km.	22.23	-	1.46
2	HTL Length along Rivers / Creeks in Km.	61.54	65.43	2.41
CRZ CLASSIFICATION - AREA IN Sq.Km				
3	Mangroves (CRZ - IA)	0.23	3.19	97.63 Sq.metres
4	50m Buffer from Mangroves (CRZ - IA)	0.74	**3.87**	-
5	Salt Marsh (CRZ - IA)	0.01	-	-
6	Mudflat (CRZ - IA)	0.02	-	-
7	Archaeological & Heritage (CRZ - IA)	0.18	-	-
8	Sand Dune (CRZ - IA)	0.19	-	-
9	Turtle Nesting Ground (CRZ- IA)	0.19	-	-
10	CRZ – IB	1.37	**1.14**	0.08
11	CRZ – II	7.28	**2.87**	0.80
12	CRZ – III	5.17	-	
13	CRZ – IVA	525.1	-	31.30
14	CRZ – IVB	3.17	**2.69**	0.13

i) **Table 33 Karaikal District -CRZ Area Statement as per CRZ Notification, 2011**

SL.NO.		KARAIKAL
1	HTL Length along coastline in Km.	17.08
2	HTL Length along Rivers / Creeks in Km.	93.29
	CRZ AREA IN SQ.KM	
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 34 Details of Coastal Villages falling under CRZ in Puducherry & Karaikal Districts

SEA	RIVER / CREEK NAME	CRZ - II VILLAGE NAME	CRZ - III VILLAGE NAME
PUDUCHERRY DISTRICT			
PUDUCHERRY REGION			
BAY OF BENGAL	Ariyankuppam River & Chunnambar River	Kalapet	Pooranku ppam
		Pillaichavady	Kirumampakkam
		Pondicherry	Pillayarkuppam
		Thengathittu	Manapattu
		Ariankuppam	
		Manavely	
		Murungapakkam	
		Olandai	
YANAM REGION			
NIL	Gautami Godavari River	Iskitippah_Island	NIL
		Adivipalam	
		Tippah	
		Yanam	
		Kalnakalapet	
		Mettakur	
MAHE REGION			
ARABIAN SEA	Mahe River	Kallayee	Nil
		MAHE	
KARAIKAL DISTRICT			
KARAIKAL REGION			
BAY OF BENGAL	Nandalar River Arasalar River Tirumalarajanar River Vettar River	Karaikal	Akkaravattam
		Akkaravattam	Keezhaiyur North
		Oduthurai	Keezhaiyur South
		Kizhavely	Kizhakasakudy
		Dharmapuram	Kizhavely
		Kovilpattu	Kottucheery
		Thalatheru	Kovilpattu
		Kizhakasakudy	Thalatheru
			Thiruvattakudy

STRATEGIC PLAN

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.

ANNEXURE - I

List of Industries Rain Water Harvesting Structures are constructed

Sl.No.	Industries Name	No. of Structures
1	M/s Fosico Industries, Mattupalayam, Puducherry	6
2	M/s Jothy Laboratory, Thethampakkam, Puducherry	2
3	M/s Ttk LG, Thirubhuvani, Puducherry	2
4	M/s Cheslind Textiles, Thirubhuvani, Puducherry	4
5	M/s Godrej Consumer Products, Nallur, Puducherry	6
6	M/s Axon Revocat (P) Ltd, Thirubhuvani, Puducherry	2
7	M/s Vasavi Educational Trust, Madagadipet, Puducherry	2
8	M/s Sri Pushpam Industries, Thirubuvanai, Puducherry	5
9	M/s Sri Balaji Industries, Kalitheerthalkuppam, Puducherry	3
10	M/s Pulkit Industry, Eripakkam, Puducherry	4
11	M/s GM Pens Private Ltd, Sedarapet, Puducherry	2
12	M/s VSP Papers, PSPalayam, Puducherry	2
13	M/s Appasamy Associate -Unit-II, Thiruvandarkoil, Puducherry	1
14	M/s Mahatma Gandhi Medical College, Pilliyarkuppam, Puducherry	4
15	M/s GM Pens Private Ltd, Thirubuvanai, Puducherry	2
16	M/s SPI Global, “Gothi Industrial Estate, Kurumpapet, Puduhcherry	3
17	M/s Premier distilleries, Mangalam, Puducherry	2

18	18 M/s Venkateshwara College of Engg & Tech, Ariyur, Puducherry	2
19	M/s Easun MR Tap Changers (P) Ltd, Thirubhuvani, Puducherry	2
20	M/s Rajaganapathy Paper Mills, Vadamangalam, Puducherry	2
21	M/s Rajaganapathy Paper Board, Vadamangalam, Puducherry	2
22	M/s Krishnasmy College of Education For Woman, Manapattu, Puducherry	4
23	M/s MRF, Private Limited, Eripakkam, Puducherry	7
24	M/s Hipro Ceramics Private Limited, Kalitheerthalkuppam, Puducherry	1
25	M/s ARAP Enterprises Private Limited, Sedarapet Puducherry	1
26	M/s Shasun Drugs & Chemicals, Kalapet, Puducherry	11
27	M/s Chemfab alkalies Private Limited, Kalapet, Puducherry	25
28	M/s Hindustan Unilivers Ltd (Soap Division), Vadamangalam, Puducherry	9
29	M/s Hindustan Unilivers Ltd (Personal Care Division), Vadamangalam, Puducherry	3
30	M/s Supreme (P) Ltd, Sanayasikuppam, Puducherry	10
31	M/s Neelkamal Industries, Senthanatham, Puducherry	3
32	M/s Superfil products Ltd, Thirubuvanai, Puducherry	1
33	M/s Berger Paints , PS Nallure, Puducherry	6
34	M/s Snam Alloys, Kariamanickam, Puducherry	3
35	M/s Pondicherry Distilleries, Ariyapalayam, Puducherry	4
36	M/s Kohinoor Printers, Thithipet, Puducherry	5
37	M/s Rajam Industries, Thithipet, Puducherry	2

38	M/s Lucas TVS, Thirubuvanai, Puducherry	3
39	M/s Superfil products Ltd, Mangalam, Puducherry	2
40	M/s Finewoods Private Ltd, Madugarai, Puducherry	2
41	M/s Natural Capsules (P) Ltd, Moolakulam, Puducherry	4
42	M/s Milton Laboratories, Thirubuvani, Puducherry	1
43	M/s Lucas TVS, Nettapakkam, Puducherry	4
44	M/s Hayagriva Polytechnic, Sooramangalam, Puducherry	3
45	M/s Santhosh Papers & Boards, Thirubuvanai, Puducherry	1
46	M/s GM Pens – EVR Street, - Sedarapet	2
47	M/s M/s Abirami Soap Works – Sembiapalayam	6
48	M/s Caplin point – Suthukeny	2
49	M/s Poclain Hydraulics – Thiruvandarkoil	3
50	M/s Petrogel – Thuthipet	2
51	Jipmer Hospital- Puducherry	8
52	M/s Providence Mall- Puducherry	3
53	M/s Samvi Plastic Products -Kurumbapet, Puducherry	1
54	M/s Teleflex limited - Thirubuvanai	2
55	M/s Manakula Vinayagar Engineering College-Madagadipet	9
56	M/s Manakula Vinayagar Medical College-Madagadipet	24
57	M/s Idhaya College of Arts & Science for Women,Pakkamudayanpet,	3
58	M/s Vasavi International School- Muthiyalpet, Puducherry	2

59	M/s True cartons – Sedarapet	1
60	M/s Micro Labs - Thirubuvanai	2
61	M/s KKNAG MAGIC, - Molapakkam Road, Kariamanickkam,	2
62	M/s SAB Millers, Mettupalayam	16
63	PIMS, Kalapet	9
64	Pondicherry University, Kalapet	11
65	Pondicherry Engineering College, Kalapet	6
66	M/s Sri Venkateswara Medical College, Aryiur	19
67	M/s. Guru Papers, Mettupalayam	2
68	M/s. Magna Chemicals, Mettupalayam	2
69	M/s. Christ Engineering College, Moolakulam	6
70	M/s. Achariya Engineering College, Villianur	4
71	M/s. Lakshmi narayana Medical College, Agaram	20
72	M/s J.R. Foods, Thirubuvanai	3
73	M/s Vel Biscuits, Sanyasikuppam	5
74	M/s. RAAK Institutions, Muthupillapalayam	5
75	M/s Rajivgandhi Vertinary College, Iyyankuttipalayam	7
76	M/s. SS Industries, Sedarapet	1
77	Government Arts College, Kadirkamam	2
78	M/s. L&T, Sedarapet	6
79	M/s Pallava Granites, Sedarapet	1
80	M/s Caplin Point, Suthukeny	1

81	M/s. Vimkar, Seadarapet	3
82	Muruga Theatre	1
83	M/s Vigneswara HSS, Sedarapet	1
84	M/s Nithya Packaging, Odiampet	3
85	M/s Santa Clara Convent, K. Manaveli	4
86	M/s Winbrose Distilleries, Odiampet	2
87	M/s Appasamy Associates, Thirubuvanai	2
88	M/ s Appasamy Associates, Vadamangalam	2
89	KVK, Kurumbapet	2
90	M/s Bharath Vidyashramam, Agaram	3
91	M/s Avvaiyar Engineering College, Thiruvandarkovil	2
92	M/s The Study School, Kalapet	4
93	M/s EATON Industries, Seadrapet	4
94	New Collectorate, Pettaiyanchathiram	2
95	M/s Alpha School, Muthialpet	1
96	Co- Operative Building Centre	1
97	M/s Manatec Pvt. Ltd, Korkadu	2
98	M/s Ponlait, Iyyankuttipalayam	1
99	Raj Nivas, Puducherry	1
100	M/s Shanmuga Cinemas, Puducherry	2
101	M/s Hotel Accord	3
102	M/s Hotel Sunway	2
103	M/s D’ Europe	2

104	M/s Hotel Karai Chettinadu	1
105	M/s DK Industries, Maducarai	1
106	M/s Nippon Electricals, Kariamanickkam	1
107	M/s G.G Organics, Thuthipet	1
108	M/s Ravikumar Distilleries, Katterikuppam	3
109	M/s Balaji Spirits, Sedarapet	3
110	M/s Primrose School, Moolakulam	1
111	M/s Sai KirubaHospital, Puducherry	1
112	M/s E-mox, Sedarapet	1
113	M/s Sabari College, Kirumampakkam	2
114	M/s Amcor industries, Kirumampakkam	4
115	M/s Mother son Industry, Thirubuvanai	2
116	M/s Mother son Sintermetal, Thiruvandarkoil	2
117	M/s Daya Petrochem, Sedarapet	1
118	M/s Pallava Granites, Sedarapet	1
119	M/s Reil Industries, Thuthipet	2
120	M/s Suja Rubber, Sedarapet	1
121	Govt. Dental College, Gorimedu	3
122	The Department of Agriculture constructed rooftop RWH structures in Government buildings	30
123	Public Works Department, Puducherry constructed rooftop RWH structures in Government schools and Colleges	165
	TOTAL	**649**

ANNEXURE – II

Sewage generated by Units/Institutes

Sl.No.	Name of the Unit	Quantity Generated (KLD)	Utilized Institu (KLD)	Availability (KLD)
1	M/s. Sri Manakula Vinayagar Medical College and Hospital	600	400	200
2	M/s. Pondicherry Institute of Medical Sciences	500	300	200
3	M/s. Sri Venkateshwaraa Medical College Hospital and Research Centre	400	200	200
4	M/s. Mahatma Gandhi Medical College and Research Institute	380	100	280
5	M/s. Aarupadai Veedu Medical College	240	200	40
6	M/s MRF Ltd., Eripakkam Puducherry	180	150	30
7	Providence Mall, Puducherry	80	50	30
8	M/s Lucas TVS Ltd., Eripakkam Village, NCP, Puducherry	96	90	6
9	Mahindra Holidays & Resorts India Pvt. Ltd., Valluvar Medu, Manapet Village, Bahour Commune, Puducherry.	60	60	0
10	WhirlpoolofIndia Ltd,Thirubhuvanai, Puducherry	55	55	0
11	M/s. Sri Lakshmi Narayana Institute of Medical Science Medical College & Hospital	200	100	100

12	Eaton Power Quality Pvt. Limited, No. 2, EVR Street, Sedarapet, Villianur Commune, Puducherry.	50	50	0
13	Larsen & Toubro Limited – TLT Unit, Mylam Road, Sedarapet, Villianur Commune, Puducherry	35	35	0
14	Lucas TVS Ltd, Kothapurinatham, Thiruvandarkoil, Puducherry	32	30	2
15	SPI Technologies India Pvt. Ltd., Gothi Industrial Estate, Kurumbapet, Villianur Commune Panchayat, Puducherry	32	20	12
16	Larsen & Toubro Limited – Form Work & Timber Shop Unit, Mylam Road, Sedarapet, Villianur Commune, Puducherry	30	25	5
17	Shenbaga Residency, No. 434, M.G. Road, Puducherry Municipality, Puducherry.	30	25	5
18	M/s India Nippon Electricals Limited, Madukarai, NCP, Puducherry	26	20	6
19	Hotel Athithi, S.V. Patel Salai, Puducherry Municipality, Puducherry.	23	20	3
20	Poclain Hydraulics Pvt. Ltd	13	13	0
Total		**3062 KLD**	**1943 KLD**	**1119 KLD**

ANNEXURE – III

List of Effluent Generating Units with Quantity in U.T of Puducherry

Sl.No	District	Commune Panchayat	Name of the Unit	Quantity Generated (KLD)
1	Puducherry	Oulgaret Commune	M/s. Foseco India Ltd, MSI Area PIPDIC Industrial Estate, Mettupalayam. Puducherry.	12
2			M/s. Ucal Fuel Systems Limited (Plant 2) A-98, A-100, A-107, PIPDIC Industrial Estate, Mettupalayam, Puducherry.	25
3			M/s. Ucal Fuel Systems Limited (Plant 9) Plant 9 ,B 132, B 133, PIPDIC Industrial Estate, Mettupalayam, Puducherry.	0.3
4			M/s. Universal Pharmaceuticals Pvt. Ltd. A 38, 18th Cross PIPDIC Industrial Estate, Mettupalayam, Puducherry.	1.5
5			M/s. Swathi Organics Specialty Pvt. Ltd. A35 A36, PIPDIC Industrial Estate, Mettupalayam, Puducherry.	1.5
6			M/s Guru Paper Mills Pvt Ltd, B-176, PIPDIC Industrial Estate, Mettupalayam, Puducherry	10
7			M/s Richy Rich, A-127, 28th Cross, PIPDIC Industrial Estate, Mettupalayam, Puducherry	0.4
8			M/s Natural Capsules Limited, R.S No.84, Perambai road, Pitchaveerampet, Oulgaret Municipality, Puducherry	52
9			M/s Sri Venkateshwara Sizing and Processing Mills , A31 32, 10thCross, PIPIDIC Industrial Estate, Mettupalayam, Puducherry	11
10			M/s The Flavors India (P) Ltd, C-5 & 14, PIPDIC Industrial Estate, Mettupalayam, Puducherry	2

11			IKON Associates, No 8 IV cross, PIPDIC Industrial Estate, Mettupalayam, Puducherry	1
12			Brightnex Pvt Ltd, Thattanchavady, Puducherry	2
13			Sun Fab, Plot NO B67, 68, VII cross road, PIPDIC industrial estate, Mettupalayam, Industrial Estate, Puducherry	3
14			Solara Active Pharma Sciences Pvt. Ltd., Kalapet	60(ZLD)
15			Chemfab Alkalis Pvt. Ltd., Kalapet	14
16		Puducherry Municipality	M/s. Sri Aurobindo Ashram Handmade Papers, No. 50, S.V. Patel Salai, Puducherry Municipality, Puducherry.	3
17			M/s. KUN HYUNDAI, (Kun Auto Co.Pvt.Ltd.,), Cuddalore main road, Murungapakkam, Puducherry Municipality, Puducherry.	3
18		Bahour commune	M/s. Lanson Motors Pvt. Ltd., R.S.No.53/1A & 53/3, Pondy to cuddalore main road, Kirumampakkam,Bahour Commune, Puducherry.	9
19			M/s. Bio Genomics Ltd., No.139, Manapet road, Kanniakoil, Bahour Commune, Puducherry.	6
20			M/s. Schangalaya Motors, R.S.No.105/2, Pillaiyarkuppam Main road, Bahour Commune, Puducherry.	3
21			M/s. Schakralaya Motors, R.S.No.52/2, Cuddalore to Pondy road, Kirumampakkam, Bahour Commune, Puducherry.	3
22			M/s.TPRS Enteprises Pvt.Ltd., Kanniakoil Manapet Road, Bahour Cmmune, Puducherry	3
23		Ariankuppam Commune	General Optics (Asia) ltd	11.4
24		Yanam Municipality	M/s. Sree Srinivasa Papers, Adavipolam, Yanam.	15(ZLD)

25		Mannadipet Commune	M/s. Aeon Formulation, R.S. No. 515/1, Vinayagar koil street, Thirubhuvanai, Puducherry	5
26			M/s. GKM new Pharma.,PIPDIC Electronic Estate, Thirubhuvanai, Mannadipet Commune, Puducherry.	3
27			M/s. Jyothy Laboratories, Thenthampakkam, Mannadipet Commune, Puducherry.	3
28			M/s. Skan Research lab Pvt. Ltd R.S. No. 3/7B, Pondy to Villuppuram Road, Puducherry.	2
29			M/s. Supreme Industries Ltd. Unit –II, R.S. No. 90,91, Sanyasi Kuppam, Mannadipet Commune, Puducherry.	20
30			M/s. Poclain Hydraulics Pvt. Ltd	5
31			Winner Diary, Kalitheerthalkuppam	32
32			Bymaa Laboratories	3
33			Best Care Formulation(P) Ltd, B15, PIPIDIC Electronic Park, Thirubhuvanai, Puducherry	3
34			TTK protective Devices Ltd Thiruvandarkoil, Puducherry	42
35			Caplin Point Laboratories, R.S.No. 85/3, Suthukeni, Puducherry	12
36			Rane Brake Lining Limited,Sanyasikuppam Puducherry	4
37			Indo French Laboratories, Thiruvandarkoil, Puducherry.	2
38			M/s. Dr. Milton Laboratories Pvt. Ltd, Sanyasikuppam, Puducherry	3.5
39			M/s. Motherson Sintermetal Technology Ltd, Thirubhuvanai, Puducherry	7
40			M/s. Micro Lab (Unit – III) , Thirubhuvanai, Puducherry	3

41			M/s. Arun Electronics, Thirubhuvanai, Puducherry	1.2
42			M/s. LSR Agro Foods, Thirubhuvanai,Puducherry	20
43			M/s. Teleflex Medical Pvt Ltd, Thirubhuvanai, Puducherry	30
44			M/s. V.S.B Paper Products, Vadhanur, PS palayam	20
45			M/s. SKN organics Pvt. Ltd, Thirubhuvanai, Puducherry	2
46			M/s. Vell Biscuits (P) Ltd Puducherry	9
47		Nettapakkam Commune	M/s. Berger Paints India Ltd., R.S.No.53-56, Pandacholanallur, Nettapakkam Commune, Puducherry	29
48			M/s. Subhiksha Dairy Products, R.S.No.68/1, Nathamedu, Eripakkam, Nettapakkam Commune, Kariyamanikkam Post, Puducherry – 605 106	4
49			M/s Abhirami Soap works R.S.No. 93/2, 1A & 1B, Sembiyapalayam Village, Embalam Main Road, Korkadu Post, Puducherry - 605 110.	18
50			M/s. Cavin Kare Private Ltd. R.S.No.81/1, Korkadu, Nettapakkam Commune, Panchayat, Puducherry - 605 110	2
51		Hospitals	M/s. Pondicherry Solid Waste Management Company Pvt. Ltd., Rajeev Gandhi Land Mark, ThuthipetVillage, Villyanur Commune, Puducherry.	10
52			M/s. Sri ManakulaVinayagar Medical College and Hospital, Kalitheerthalkuppam, Madagadipet, Puducherry- 605 107.	600
53			M/s Pondicherry Institute of Medical Sciences, Kanagachettikulam, Kalapet, Puducherry- 605 014.	400

54			M/s Aravind Eye Hospitals and Postgraduate Institute of Ophthalmology, Cuddalore Main Road, Thavalakuppam, Puducherry-7.	275
55			M/s. Mahatma Gandhi Medical College and Research Institute Pillayarkuppam Puducherry ETP I	600
56			M/s. Rajiv Gandhi Maternity Hospital, Ellaipillaichavady	280
57			M/s. AUM Hospital, Solainagar, Muthialpet	10
58			M/s. Sri Lakshmi Narayana Institute of Medical Sciences, Ossudu, Agaram Village, Villianur Commune, Koodapakkam Post, Puducherry- 605 502.	49
59			M/s Sri Venkateswara Medical College Hospital and Research Centre, PondyVillupuram Main Road, Ariyur Village, Villianur Commune Panchayat, Puducherry	400
60			M/s Aarupadai Veedu Medical College PondyCuddalore Main road, Kirumampakkam, Bahour Commune Panchayat, Kirumampakkam, Puducherry 607402	100
61			JIPMER Hospital, Dhanvandri Nagar, Puducherry	380
62			M/s A.G. Padmavati's Hospital, Atumparthapuram, Puducherry	45
63		Villianur Commune	M/s. Vinbros & Co., R.S. No. 250, Thirukanchi Road, Odiampet, Puducherry	20
64			M/s. Balaji Enterprises (Pondy) Pvt. Ltd.,R.S. No. 4/1, 4/2, Mailam Road, Sedarapet, Puducherry	6
65			M/s. Premier Distillery, R.S. No. 62/8, Madugarai Road, Mangalam, Villianur Commune Puducherry	1
66			M/s. Pondicherry Distilleries Ltd., R. S. No. 144 & 145, Ariyapalayam, Villianur, Pondicherry	55

67			M/s. Sai Supreme Textiles (P) Ltd.,R.S. No. 15/13 & 15/15,Vazhudavor Road,Kurumbapet, Puducherry	6
68			M/s. Steril GeneLife Sciences, Pvt. Ltd., Mangalam Village, Villianur Commune, Puducherry	41
69			M/s. Pondicherry Co-operative Milk Producers Union Limited, Kurumbapet, Puducherry	125
70			M/s. Sharun Pharmaceuticals Private Limited, R.S. No. 195/9, Pangur, Ariyur Village, Keezhur Road, Villianur Commune, Puducherry	2
71			M/s. Hindustan Unilever Limited, Personal Product Division, Off NH-45A, Vadamangalam, Puducherry	41
72			M/s. Hindustan Unilever Limited, Detergent Factory, Off NH-45A, Vadamangalam, Puducherry	96
73			M/s. G.G. Organics (P) Ltd., R.S. No. 122/6A & 120/1, Thuthipet,Villianur Commune, Puducherry	1(ZLD)
74			M/s. ATC Chemicals India (P) Ltd., R.S. No. 14/4 & 16, 15/9, Sedarapet, Villianur Commune, Puducherry	1(ZLD)
75			M/s. Sunbeam Generators (P) Ltd., R.S. No. 24/1, 2, 3A-D & 5, Canal Road, Koodapakkam, VillianurCommune, Puducherry	1(ZLD)
76			M/s. Nithya Packaging Pvt. Ltd. , R.S. No. 1/1 & 258/5, I.O.C. Gas Plant Road, Odiampet Village, Puducherry	150(ZLD)
77			M/s. SABMiller India Limited, Ayyankuttipalayam, Muthirapalayam Post, Puducherry	500
78			M/s. Ava Cholayil Health Care Pvt. Ltd., Odiampet, Villanur Commune, Puducherry.	0.4

79	Karaikal	Karaikal Municipality	M/s. Ammaiyar Milk Dairy, 172/1A/2, Nedungadu Main Road, Melakasakudy, Karaikal.	2
80			M/s. Chemplast Sanmar Ltd., R. S. No. 37 - 40, Melavanjore Village, T. R. Pattinam Commune, Karaikal	85
81			M/s. Jyothy Laboratories Limited, No. 131, Peralam Main Road, Thirunallar Commune, Karaikal	18
82			M/s. Karaikal Port Private Limited, Keezhavanjore Village, T.R.Pattinam Commune, Karaikal	100
83		Hospital	Vinayaka Mission Medical College and Hospital, Karaikal	37
Total quantity generated				**4746.2**

ANNEXURE – IV

List of Effluent Generating Units Maintaining ZLD

S.No	Name of the unit	Quantity Generated
1	Solara Active Pharma Sciences Pvt. Ltd., Kalapet	60
2	M/s. Sree Srinivasa Papers, Adavipolam, Yanam.	15
3	M/s. G.G. Organics (P) Ltd., R.S. No. 122/6A & 120/1, Thuthipet,Villianur Commune, Puducherry	1
4	M/s. ATC Chemicals India (P) Ltd., R.S. No. 14/4 & 16, 15/9, Sedarapet, Villianur Commune, Puducherry	1
5	M/s. Sunbeam Generators (P) Ltd., R.S. No. 24/1, 2, 3A-D & 5, Canal Road, Koodapakkam, VillianurCommune, Puducherry	1
6	M/s. Nithya Packaging Pvt. Ltd. , R.S. No. 1/1 & 258/5, I.O.C. Gas Plant Road, Odiampet Village, Puducherry	150
Total		**228**