

SESSION – 1

**URBAN DEVELOPMENT AND MANAGEMENT:
INDIAN EXPERIENCE**

Session – I

Efforts of CMWSSB to reduce Pollution in Chennai City Waterways

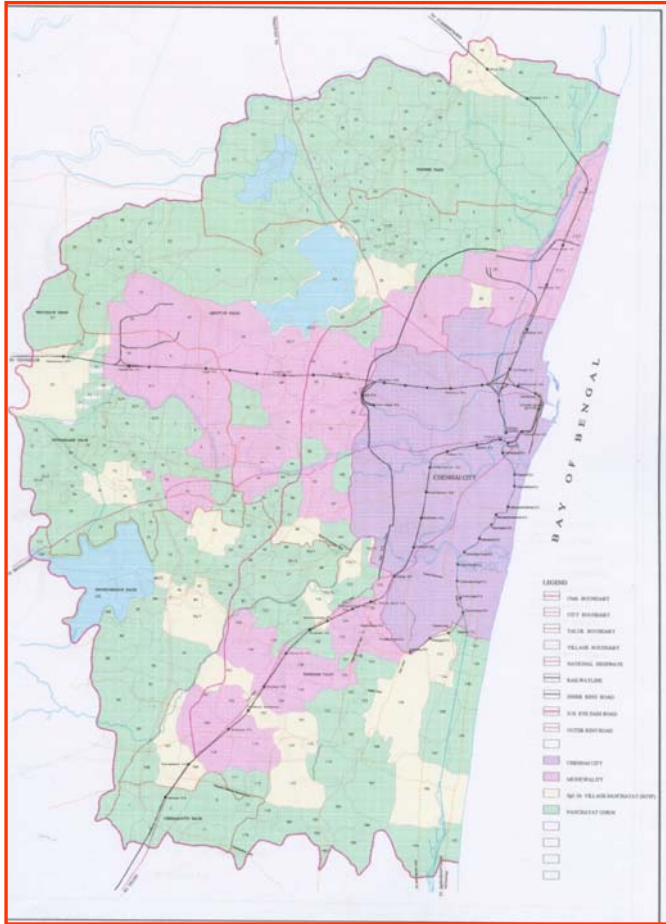
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CHENNAI METROPOLITAN AREA (CMA)

- | | |
|---|---|
| 1. Geographical Area | : 176 Sq.Km |
| 2. Latitude / Longitude | : 13°04' Minutes North / 80°15' Minutes East |
| 3. Population | : 5.37 Million (2009) - Projected |
| 4. Topography | : Flat |
| 5. Drainage | : Adayar & Cooum Rivers |
| 6. Average Rain fall | : 1100 mm to 1300 mm per year |
| 7. Temperature | : 30° c to 40° c |
| 8. Climate | : Tropical |
| 9. Humidity | : Vary between 65% and 80% |
| 10. Water Supply Sources | : Surface and Ground water |
| 11. Water Supply (per day)
Normal year | : 350 - 450 Mld |
| 12. Supply Rate (Per Day per
Head) (Normal year) | : 70 – 100 lpcd |
| 13. Current Water Supply (from
2006) | : 570 Mld (Domestic 490 mld +
Others 80 mld) |
| 14. Current Supply Rate | : 91 lpcd |



- The Chennai Metropolitan Area comprises the Chennai City and its outlying urban and rural areas
- The extent of CMA excluding St.Thomas Mount cantonment is 1189 Sq.km
- The Chennai City covers 176 Sq.km
- The outlying areas consists of the following:
 - 1 Cantonment
 - 16 Municipalities
 - 20 Town Panchayats
 - 214 Villages Panchayats
 spread over in 10 Panchayat Unions in Kancheepuram and Tiruvallur Districts

CMWSSB – PRESENT OPERATIONAL AREA

- Chennai City Corporation Area : 176 Sq.km
- Part of Ambattur Municipal Area
And Manali New Town : 7.88 Sq.km
(With in CMA Area)
- Total Population served : 5.37 Million

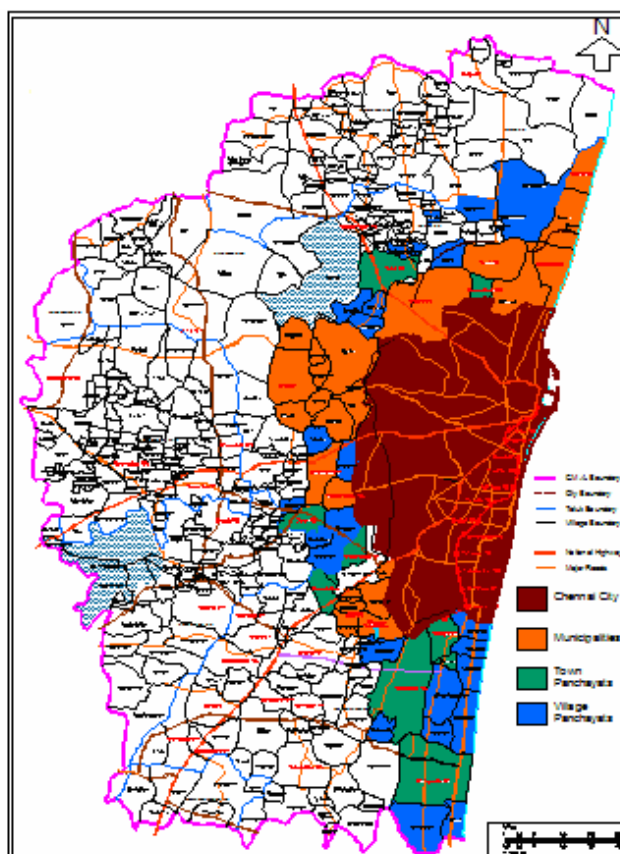
CMWSSB has already initiated measures to provide services for the entire Chennai Metropolitan Area (CMA)

PROPOSAL TO EXTEND CHANNAI MUNICIPAL CORPORATION

The following local bodies will be merged with Chennai Municipal Corporation

Proposed area : 426 Sq.km

- Municipalities - 9
- Town Panchayats - 8
- Village Panchayats - 25



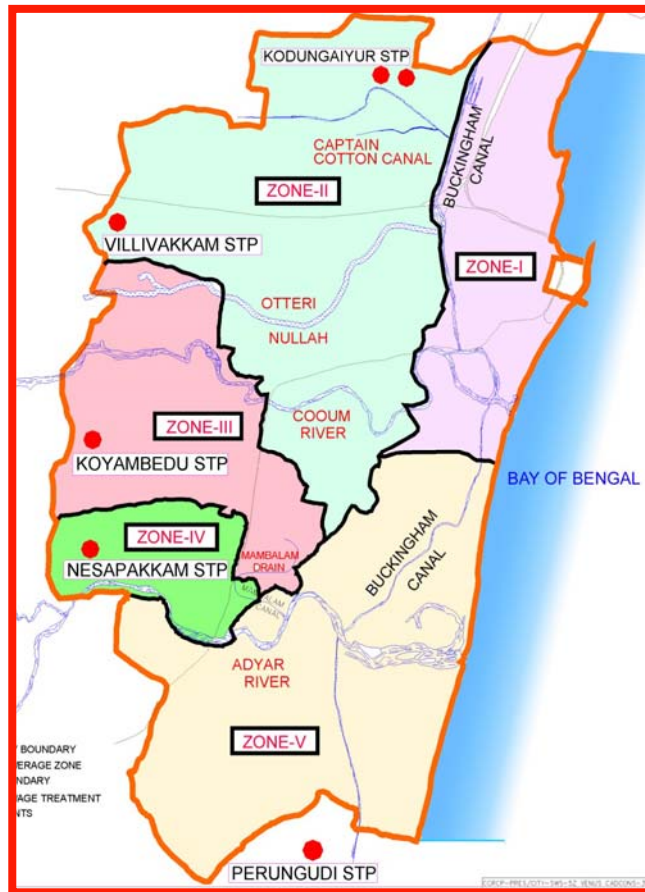
Chennai City Sewerage System

- Installed as early as in 1891
- Improved and expanded in the past 109 years
- Comprehensive zonal sewerage system formulated in the year 1961
- City divided into 5 zones
- Sewerage Pumping Stations : 193 Nos
- 1978 – 2000 Metro water has taken up improvement works in sewerage system with the financial assistance of Govt.of Tamil Nadu, World Bank, HUDCO and TUFIDCO at a total cost of Rs.425 Crores

Growth Profile – Sewerage System

Details	1978	Nov.2009
Area Covered	74%	99%
No.of House Connections	1,14,000	5,15,560
Length of sewer mains	1,223 Kms	2,663 Kms
No.of Pumping Stations	58 Nos	193 Nos
Treatment Plants	3 Nos.	9 Nos.
Treatment Capacity	57 mld	486 mld

SEWERAGE SYSTEMS IN CHENNAI CITY



- The Sewerage system for Chennai City has been divided into 5 drainage zones.
- These zones of macro systems covering the entire city have independent zonal collections, conveyance, treatment and disposal facilities
- The sewage treatment plant capacities in the 5 zones are as follows:

Zone I	Kodungaiyur	-	80 mld
Zone II	Kodungaiyur	-	190 mld
Zone III	Koyambedu	-	94 mld
Zone IV	Nesapakkam	-	63 mld
Zone V	Perungudi	-	54 mld
	Villivakkam	-	5 mld
	Total	-	486 mld

Chennai City Sewerage Zone I

Zone-I of sewerage system forms the oldest part of the City. It is in the North eastern portion of the City Bounded by Bay of Bengal to the East, The City limits to the North, The Buckingham Canal to the West Pycrafts Road to the South.

Areas Covered : Tondaiarpeta, Washermenpet, Royapuram, George Town, Chindadripeta .

Sewage Treatment at Kodungaiyur (Zone-I Plant)

Chennai City Sewerage Zone II

Zone-II of sewerage system is the largest of the five macro systems and serves the Central and Northern portions of the City. Bounded by Buckingham Canal in the East The Corporation limits in the North

Areas Covered: Nungambakkam, Chetpet, Kilpauk, Egmore, Purasaiwalkam, Ayanavaram, Perambur, Vyasarpadi, Sembium, Kolathur, Periyar Nagar, Jawahar Nagar and Kodungaiyur

Sewage Treatment at Kodungaiyur (Zone-II Plant)

Chennai City Sewerage Zone III

Zone-III of sewerage system lies between Zone - II and Zone-IV to the West.

Areas Covered: Thyagaraya Nagar, Kodambakkam, Arumbakkam, Anna Nagar and Koyambedu

Sewage Treatment at Koyambedu (Zone-III Plant)

Chennai City Sewerage Zone IV

Zone–IV is the smallest of the macro systems lying to the Southwest of the City

Areas Covered: Ashok Nagar, Saidapet, Jafferkhanpet, K.K. Nagar and Nesapakkam
Sewage Treatment at Nesapakkam (Zone–IV Plant)

Chennai City Sewerage Zone V

Zone–V is the second largest of the five macro systems and is to the South of the City which is bifurcated by the Adyar River

Areas Covered: Ice House, Mylapore, Adyar, Guindy, Velacherry, Gandhi Nagar, Indra Nagar

Sewage Treatment at Perungudi (Zone–V Plant)

Systemic Deficiencies

- Inadequate carrying capacity of sewer for the increased sewage flow
- Due to flat terrain conveyance of sewage to treatment plant has to be made through a number of pumping station
- Inadequacy of the pumping capacity to handle the increased sewage flow
- Inadequacy of the sewage treatment capacity to treat the entire sewage flow generated
- High concentration of silt – Many times greater than silt coming in other cities (unpaved surfaces, un cleared debris, use of abrasive powder for vessels cleaning etc.,) Average 0.4 m³/MLD compared to normal range of 0.05 to 0.15 m³/MLD.
- Silting up of sewers and frequent sewer obstructions (By misuse of sewers by and large in market places and slums)
- Resulting in surcharge and over flow of sewage
- Negative suction in sewage pumping stations
- Failure of Priming system
- Inadequate volume in the suction well in sewage pumping stations

Problems faced

1. Smell nuisance
2. Mosquito Breeding
3. Deterioration of public health
4. Ground water pollution due to stagnation of sewage in the water ways
5. Environmental degradation
6. Loss of aesthetic view

Major Project in Sewerage implemented

Chennai City Rivers Conservation Project

OBJECTIVES

1. To prevent the pollution in Chennai City Waterways.
2. To increase the capacity of the sewerage system and Treatment Plants.

COMPONENT WORKS OF CCRCP

Sl.No.	Name of work	Estimate Cost (Rs. in crores)	Implementing Agency
1	Desilting and removal of sand bars in Cooum and Adyar river	236.90	PWD
2	Rehabilitation and resettlement of slum dwellers living on the banks of Waterways	113.50	TNSCB
3	Prevention of untreated sewage flow reaching waterways	720.15	CMWSSB
4	Micro drainage/Storm Water Drainage Works	109.25	CMC
5	Project formulation, monitoring Co-ordination and management	20.20	CMA
	Total	1200.00	

CHENNAI CITY RIVER CONSERVATION PROJECT

Funding Pattern

Strengthening & capacity expansion of sewer system and Construction of STPs

Grant from Govt. of India - Rs. 491.52 Crores

Internal generation of CMWSSB - Rs. 228.63 Crores

Rs. 720.15 Crores

INTERCEPTION & DIVERSION WORKS

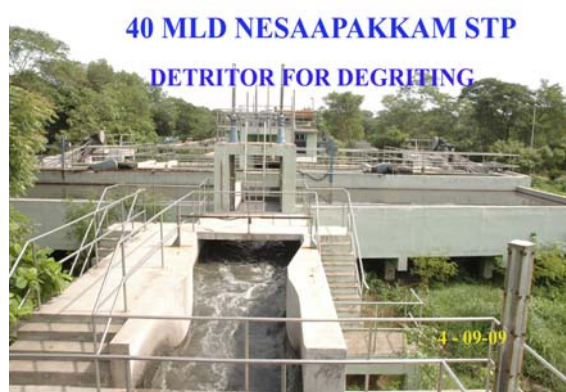
S.No	DESCRIPTION	QUANTITY
1	Interceptors	59.167 KM
2	Gravity main	17.296 KM
3	Manholes	2556 nos
4	Pumping Stations	31 nos
5	Pumping mains	28.848 KM

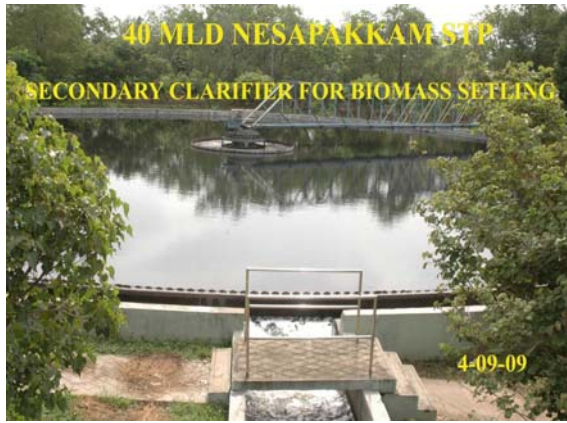
IMPROVEMENTS TO THE CAPACITY OF STPs

S.No	Location of STP	Capacity (mld)
1	Perungudi	54
2	Koyambedu	60
3	Nesapakkam	40
4	Kodungaiyur	110

DETAILS OF SEWAGE TREATMENT PLANTS

Sl.No.	Zone	Location	Year of Operation	Treatment capacity in MLD
1	I	Kodungaiyur	1991	80
2	II	Kodungaiyur	1989	80
3	II	Kodungaiyur	2006 (CCRCP)	110
4	II	Villivakkam	1991	5
5	III	Koyambedu	1978	34
6	III	Koyambedu	2005 (CCRCP)	60
7	IV	Nesapakkam	1974	23
8	IV	Nesapakkam	2006 (CCRCP)	40
9	V	Perungudi	2006 (CCRCP)	54
		Total		486
10	IV	Nesapakkam	Under construction (JNNURM)	54
11	V	Perungudi	Under construction (JNNURM)	60
12	III	Koyambedu	Posed to JNNURM funding	120
		Total		234





Standards achieved as per TNPCB & NRCD norms

BOD : < 18 mg/L
TSS : < 25 mg/L
Faecal Coliform : < 6000 MPN / 100 mL

Quality of Raw Sewage

BOD : 350 - 380 mg/L
TSS : 450 - 500 mg/L
Faecal Coliform : 15 lakhs to 28 lakhs MPN/100mL

Effluent Standards as per TNPCB & NRCD norms

BOD : < 20 mg/L
TSS : < 30 mg/L
Faecal Coliform : < 10000 MPN / 100 mL





BIO GAS PRODUCTION AND GAS ENGINE DETAILS FOR 4 STP'S

Sl. No.	Location of STP	Estimated gas production m3 per day *	Gas Engine		Make	Imported from	Cost of Gas Engine In Rs. Crores
			Capacity KVA	Max. power production KW			
1	Perungudi	10,080	1317	1064	GE Genbactor	Austria	2.67
2	Koyambedu	6,900	627	560	GE Genbactor	Austria	0.78
3	Nesapakkam	4,800	527	475	Deutz	Germany	2.00
4	Kodungaiyur	12,500	1317	1064	GE Genbactor	Austria	2.67

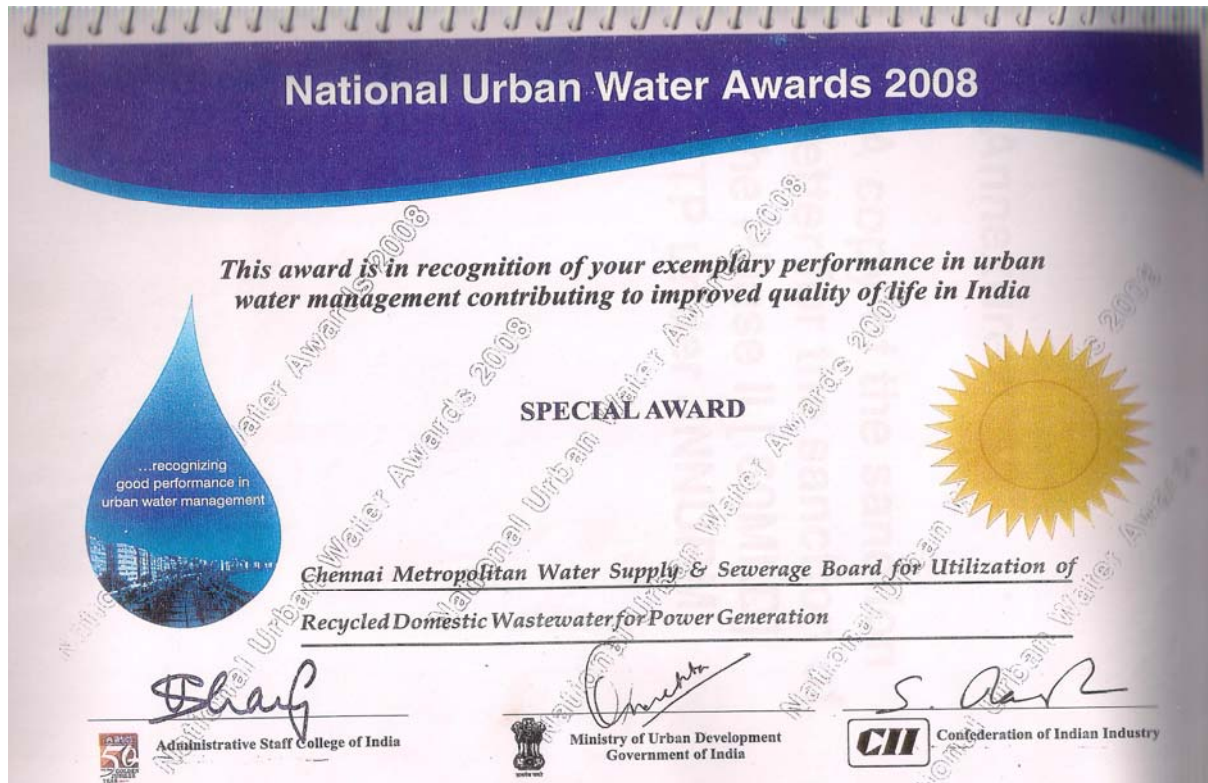
* Wherever gas volume is referred in this presentation it is volume of the gas at 50 millibar pressure and at 300C temperature.

POWER SAVING UTILISING BIO GAS FOR POWER GENERATION – 2008

Sl. No	Name of the Plant	Capacity in MLD	Total Unit reqd for operating the Plant/day in KWh	Total Unit reqd for operating the Plant/yr in KWh	Power generated from Bio Gas Engine/yr in KWh	Power generation from DG set/year in KWh	Power consumption on TNEB/year in KWh	Amount saving by using Bio gas engine in Rs.
1	Koyambedu	60.00	7270	2,660,940	22,59,600	2,34,440	1,66,900	79,08,600
2	Nesapakkam	40.00	6900	25,28,842	22,18,597	310,245	-	77,65,089
3	Perungudi	54.00	10600	38,84,956	34,22,100	1,82,701	2,80,155	119,77,350
4	Kodungaiyur	110.00	15600	57,06,731	55,87,810	29914	89007	195,57,335
		264.00	40380	14781469	1,34,88,107	757300	5,36,062	4,72,08,374

Total amount saving per year by using Bio Gas power in the year 2008 = **Rs.472 lakh**

Credits given by various organization



REUSE OF SECONDARY TREATED EFFLUENT

GREEN COVER

Supplying of 3 lakhs litres per day of treated effluent for Chennai Corporation parks @ free of cost





UGSS SCHEMES IN CMA

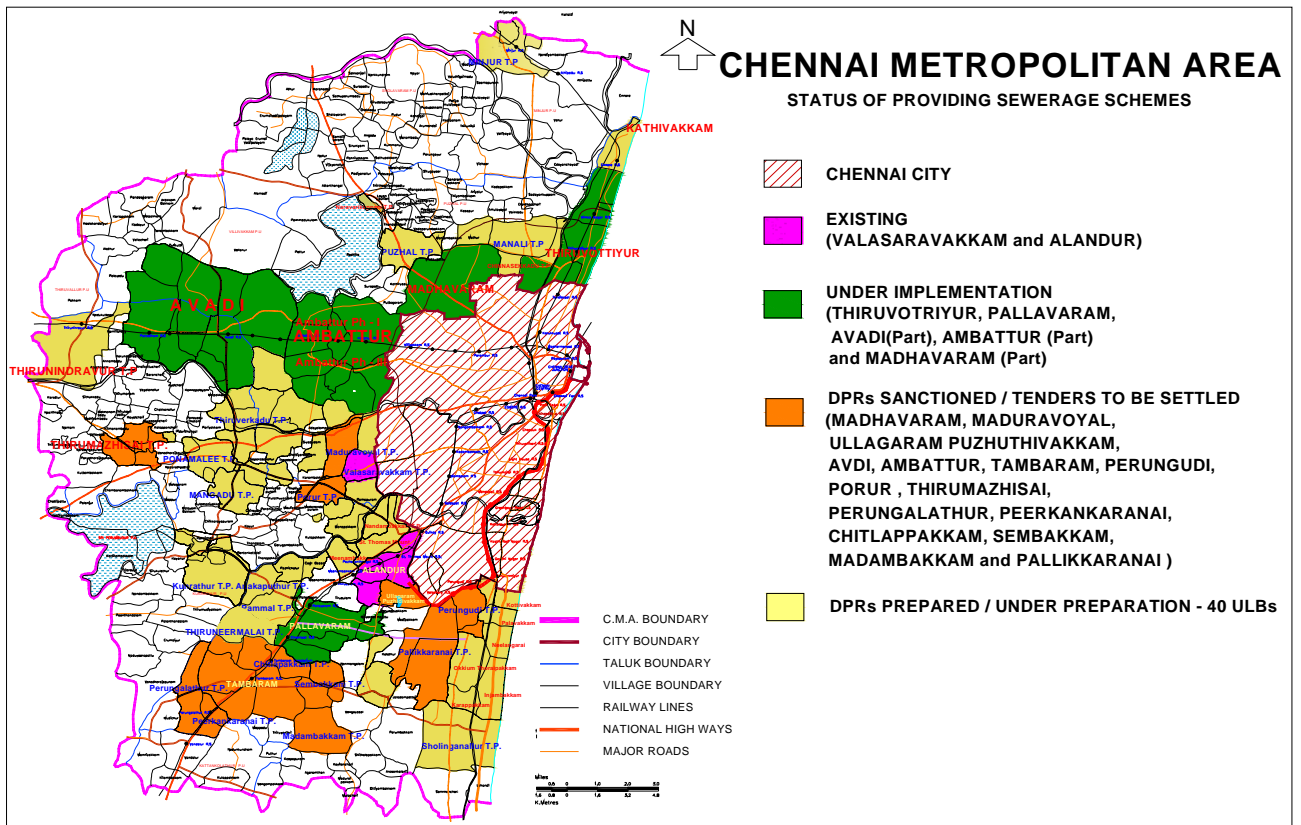
- Government in G.O.(D)No.106, MA&WS Dept. dated 17.05.2005, directed that CMWSSB shall be the nodal agency for executing sewerage schemes in CMA
- Depending on the level of urbanisation, it is proposed to take up water supply and sewerage schemes in the following local bodies in phased manner.

Sl. No.	Status of Local Body	Nos.
1	Municipalities	16
2	Town Panchayats	20
3	Village Panchayats	22
4	Cantonment	1
	Total	59

LIST OF 59 LOCAL BODIES

MUNICIPALITIES			
1.	Thiruvottiyur	9.	Valasaravakkam
2.	Kathivakkam	10.	Alandur
3.	Madhavaram	11.	Poonamallee
4.	Maduravoyal	12.	Thiruverkadu
5.	Avadi	13.	Pammal
6.	Ullagaram-Puzhuthivakkam	14.	Anakaputhur
7.	Pallavaram	15.	Tambaram
8.	Amabattur	16.	Manali
TOWN PANCHAYATS			
1.	Porur	11.	Kundrathur
2.	Chinnasekkadu	12.	Thiruneermalai
3.	Meenambakkam	13.	Perungalathur
4.	Naravarikuppam	14.	Peerangananai
5.	Thirunindravur	15.	Chitlapakkam
6.	Minjur	16.	Sembakkam

7.	Thirumazhisai	17.	Madambakkam
8.	Mangadu	18.	Perungudi
9.	Nandambakkam	19.	Pallikaranai
10.	Puzhal	20.	Sholinganallur
VILLAGE PANCHAYATS			
1	Manapakkam	12	Palavakkam
2	Ramapuram	13	Kovilambakkam
3	Kottivakkam	14	Medavakkam
4	Mugalivakkam	15	Karapakkam
5	Pozhichalur	16	Iyyappanthangal
6	Cowl Bazaar	17	Ayanambakkam
7	Nerkundram	18	Vanagaram
8	Madippakkam	19	Nolambur
9	Neelangerai	20	Kattuppakkam
10	Okkium-Thoraipakkam	21	Seneerkuppam
11	Injambakkam	22	Mathur
CANTONMENT			
1	St. Thomas Mount		



- **SCHEMES COMPLETED**

Municipalities

1. Alandur
2. Valsaravakkam

- **SCHEMES IN PROGRESS UNDER TNUDP-III**

Municipalities

1. Madhavaram
2. Pallavaram
3. Thiruvotriyur and
4. Ambattur Phase-I

SCHEMES SANCTIONED UNDER JNNURM

<p><u>Municipalities</u></p> <ol style="list-style-type: none"> 1) Avadi 2) Ambathr Phase – III 3) Tambaram 4) Maduravoyal 5) Ullagaram-Puzhuthivakkam <p><u>Town Panchayats</u></p> <ol style="list-style-type: none"> 1) Porur 	<ol style="list-style-type: none"> 1) Thirumazhisai 2) Perungudi 3) Madambakkam 4) Sembakkam 5) Chitlapakkam 6) Pallikaranai 7) Perungalathur 8) Peerkankaranai
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Total - 14 Urban local bodies

DPRs PREPARED

- Municipalities - 3
- Town Panchayats - 3
- Village Panchayats - 19
- Cantonment - 1
- Total - 26

DPRs UNDER PREPARATION

- Municipalities - 3
- Town Panchayats - 8
- Village Panchayats - 3
- Total - 14

Summary on implementation of comprehensive UGSS in 59 ULBs

Status of implementation	Already Covered	Sanctioned and under implementation		DPRs prepared	DPRs under preparation	Total
		TNUDP - III	JNNURM			
Municipalities	2	3	5	3	3	16
Town Panchayats			9	3	8	20
Village Panchayats				19	3	22
Cantonment				1		1
Total	2	3	14	26	14	59

CHENNAI RIVER RESTORATION WORKS

CHENNAI CITY DRAINAGE PATTERN

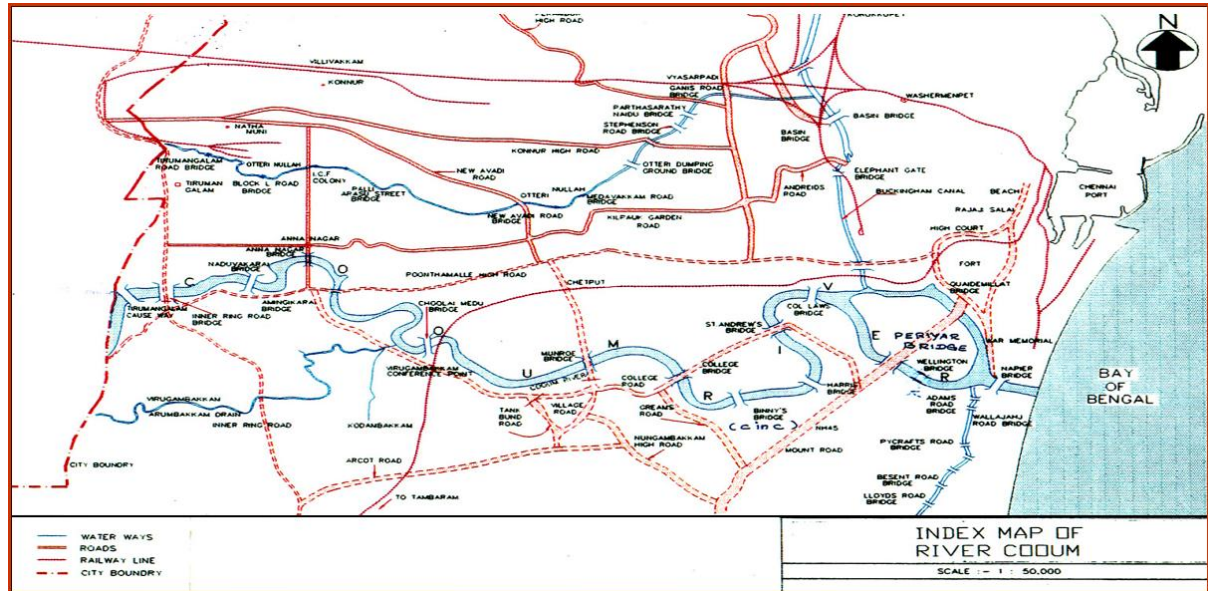
- The City drainage system is by 2 rivers and 5 major waterways besides a number of minor drains.

➤ River Cooum in city limits	17.98 Km
➤ River Adayar in city limits	12.20 Km
➤ North Buckingham Canal	17.00 Km
➤ Central Buckingham Canal	7.00 Km
➤ South Buckingham Canal	24.00 Km
➤ Otteri Nullah	10.84 Km
➤ Virugambakkam Arumbakkam Drain	6.36 Km

Outfalls identified in Cooum river

- As per EMAT survey there are totally 178 sewer outfalls identified in Chennai City
 - ✓ Along Cooum river - 127 nos.
 - ✓ Along Virugambakkam Canal - 26 nos.
 - ✓ Along Trustpuram Canal - 15 nos.
 - ✓ Additional outfalls other than EMAT survey - 10 nos.
- Out of which action is required for 99 outfall points
 - ✓ Outfalls in Cooum river basin - 57 nos.
 - ✓ Outfalls in Virugambakkam Canal - 24 nos.
 - ✓ Outfalls in Trustpuram Canal - 15 nos.
 - ✓ Additional outfalls other than EMAT survey - 3 nos.
- The Cooum river flows through central part of Chennai from west to east, entering the city at Anna Nagar and traverses a length of 17.98 kms.

- The river meanders through thickly populated areas of Anna Nagar, Nungambakkam, Chetpet, Egmore, Chintadripet etc.,
- The river after traversing the distance within the city, bifurcates into two arms – one leading to north and joining the river near the University and finally entering the Bay of Bengal.



Status of Pollution in Cooum River

- The river is heavily sedimented with silt sludge and other deposit starting from the city limits up to Chetpet Railway Bridge.
- From Chetpet Railway Bridge down to Napier Bridge the river is silted with considerable quantity of organic sludge and some quantity of coarse waste due to direct dumping and outfall of storm water drain.
- There are totally 7 sewage pumping stations viz., Anna Nagar B, East Namasivayapuram, Bharathipuram, Napier Park, Navalur Nagar, Greams Road and Langs Garden under Cooum river basin.
- Part of sewage generated from cooum river basin leads to Koyambedu STP (Zone III) and also part of sewage leads to Kodungaiyur STP (Zone I)
- There are totally 35 slums in the Cooum river basin.
 - Sewer available - 5 nos.
 - Sewers to be provided - 8 nos.
 - Sewers not possible - 22 nos.

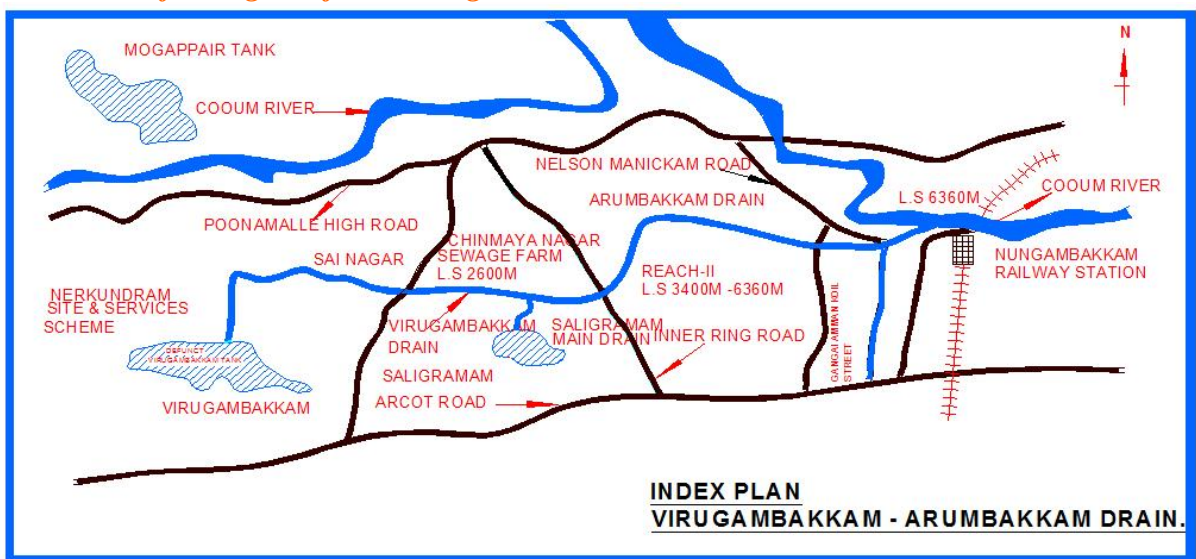
Koyambedu Sewage Treatment Plant

- Koyambedu treatment plant is located on the western boundary of Chennai City.
- The plant receives sewage from zone-III comprising areas of T.Nagar, Kodambakkam, Arumbakkam, Virugambakkam, Saligramam, Anna Nagar, Koyambedu and adjacent urban areas i.e. Mugappair.
- The sewage from this zone is pumped to the STP through 29 sewage pumping stations.

- Effluent after treatment is discharged into Cooum river near Arumbakkam bus stand through arch sewer of 34 mld capacity and balance discharged into Virugambakkam canal which again joined with Cooum river.

Sl.No.	Zone	Location	Year of Operation	Treatment capacity in MLD
1	III	Koyambedu	1978	34
2	III	Koyambedu	2005 (CCRCP)	60
		Total		94

Prevention of sewage outfalls at Virgambakkam Canal

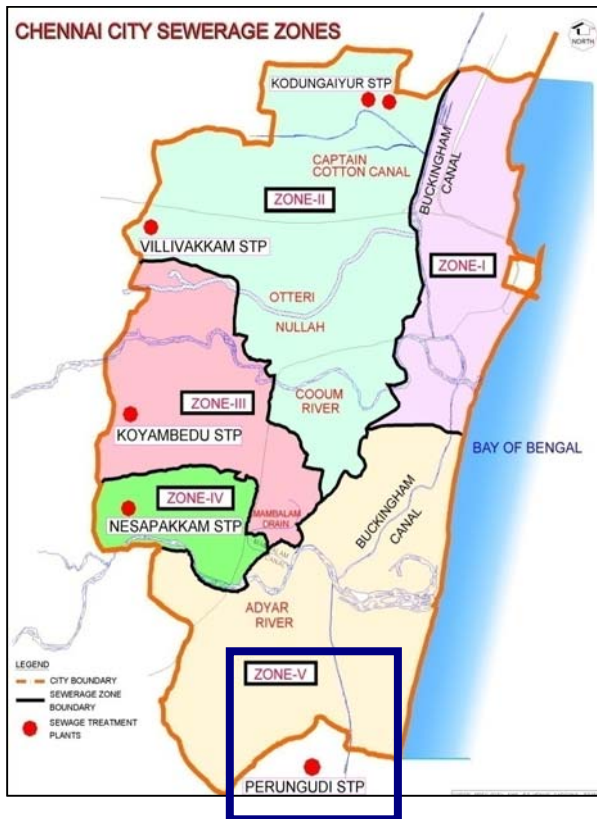


- Improvement works to the existing sewage pumping station at Greams Road providing screen well, suction well, pumping machineries etc., at an estimate cost of Rs. 217.74 lakhs and will be completed by 30.06.2010.
- Expansion capacity and strengthening of sewage system by laying interceptor in Langs Garden pumping station. Collection area size ranging from 400 to 600 mm dia for a length of 898 mts at an estimate cost of Rs.157.08 lakhs and will be completed by 31.01.2011.
- Construction of mini pumping station and laying of pumping main is under progress at Kulasekarapuram at an estimate cost of Rs.73.66 lakhs. This work will be completed by 31.03.2010. After completion of this work, 5 outfalls will be closed at Virugambakkam Canal.
- A separate pumping main from Kodambakkam-B sewage pumping station to Nesapakkam sewage treatment plant for segregating Kodambakkam-B pumping station.
- This work is taken up by from Kodambakkam-A sewage pumping station by diverting the sewage flow from Kodambakkam-B SPS to Nesapakkam STP instead of Koyambedu STP at an estimate cost of Rs. 427.00 lakhs and tenders are under evaluation.
- Completion of work by 28.02.2011.
- Completion of this work, 8 outfalls will be plugged at Trustpuram Canal

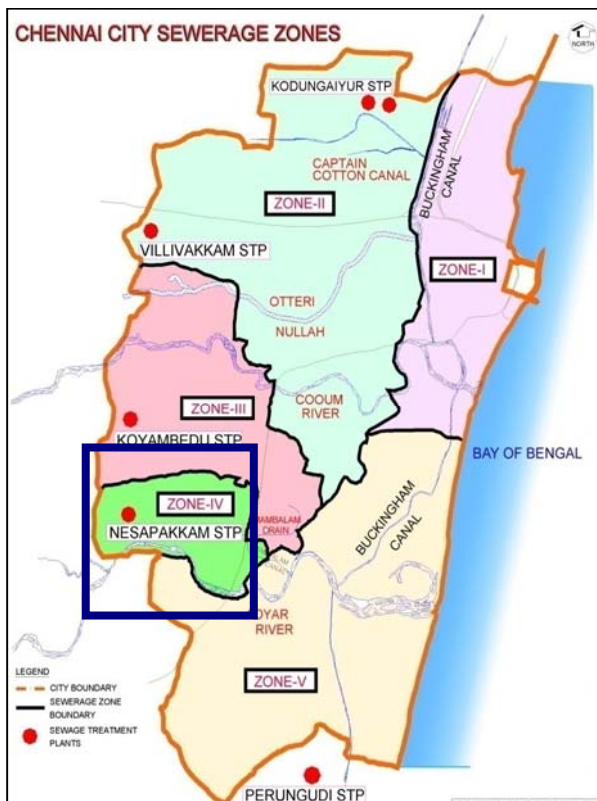
Sewerage schemes under implementation in Urban Local Bodies to prevent pollution in Cooum river basin

- Avadi UGSS
 - ✓ Estimate cost for UGSS - Rs.197.20 Crore
 - ✓ Total length of sewers to be laid - 123820 mts
 - ✓ Completion of work - Aug 2011
 - ✓ Proposed Sewage Treatment plants - 37 mld (Paruthipattu) & 4 mld (Muthapudupet)
- Ambattur UGSS
 - ✓ Estimate cost for UGSS - Rs.192.42 Crore
 - ✓ Total length of sewers to be laid - 87959 mts
 - ✓ Completion of work - Sep 2011
 - ✓ Sewage Treatment plants - Koyambedu & Kodungaiyur STPs maintained by CMWSSB
- Maduravoyal UGSS
 - ✓ Estimate cost for UGSS - Rs.60.01 Crore
 - ✓ Total length of sewers to be laid - 51227 mts
 - ✓ Completion of work - Sep 2011
 - ✓ Proposed Sewage Treatment plants - Koyambedu STP maintained by CMWSSB
- Thirmazhizai UGSS
 - ✓ Estimate cost for UGSS - Rs.19.52 Crore
 - ✓ Total length of sewers to be laid - 27600 mts
 - ✓ Completion of work - Mar 2012
 - ✓ Sewage Treatment plants - 3 mld at Thirumazhisai
- The Detailed Project Reports for sewerage schemes for ULBs of Thirverkadu, Poonamallee, Thirunindravur, Sennerkuppam, Vanagaram, Nolambur and Nerkundram have been prepared for 308.65 crore.
 - Municipalities
 1. Poonamallee (estimated cost) - Rs. 60.10 crore
 2. Thirverkadu (estimated cost) - Rs. 77.20 crore
 - Town Panchayats
 1. Thiruniravur (estimated cost) - Rs. 77.20 crore
 - Village panchayats
 1. Sennerkuppam (estimated cost) - Rs. 23.25 crore
 2. Vanagaram (estimated cost) - Rs. 24.00 crore
 3. Nolambur (estimated cost) - Rs. 17.40 crore
 4. Nerkundram (estimated cost) - Rs. 33.25 crore
 5. Ayyapakkam (estimated cost) - Rs. 35.42 crore

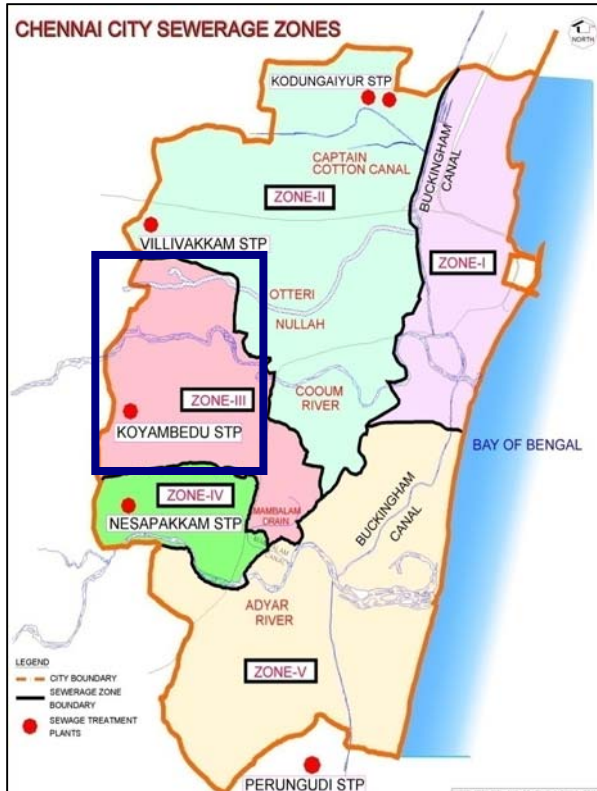
New Phase II Sewage Treatment Plant at Perungudi



- Additional flow to be received from Southern part of Chennai City due to Population growth.
- From 2009, flow realized in zone V STP is in the range of 60 to 65 MLD
- Capacity of the sewage treatment plant – 60 MLD
- The Sewage from the following AUAs are proposed to be treated in Perungudi STP
 1. Perungudi
 2. Kottivakkam
 3. Pallavaram
 4. Madipakkam
 5. Ullagaram - Puzhithivakkam
- Treated effluent discharge point at Buckingham Canal



- Augmentation of Chennai city water supply to 595 MLD at the rate of 110 lpcd.
- From 2007, flow realised in zone IV STP is in the range of 63 to 67 MLD
- Treatment capacity of the sewage treatment plant – 54 MLD
- The Sewage from the following local bodies are proposed to be treated in Nesapakkam STP
 1. Ramapuararam
 2. Manapakkam
 3. Mugalivakkam
 4. Porur
 5. Nandambakkam
- Treated effluent discharge point at Adyar river.



- Additional flow to be received from western part of Chennai City due to Population growth.
- From 2009, flow realised in zone III STP is in the range of 95 to 98 MLD
- Treatment capacity of the sewage treatment plant – 120 MLD
- The Sewage from the following AUAs are proposed to be treated in Koyambedu STP
 1. *Ambattur (Part)*
 2. *Maduravoyal*
 3. *Nerkundram*
 4. *Nolambur*
- Treated effluent discharge point at Cooum river

Session – I

Abatement of Pollution in City Waterways

*Thiru R.Ramachandran
Member Secretary, TNPCB*

City Waterways	
Major City Water Ways	Other Significant Water Ways
1. River Cooum	1. Captain Cotton Canal
2. River Adayar	2. Kodungaiyur Channel
3. Buckingham Canal	3. Virugambakkam Canal
4. Otteri Nullah	4. Haddows Road Canal
	5. Mambalam Drain

Status of City Waterways

Continued degradation in the river environment mainly due to

- increasing population
- encroachment on the banks of waterways
- discharge of sewage
- deposition of municipal garbage and construction debris

Cooum River

1. No natural flow in Cooum
2. Pollution is mainly due to
 - Discharge of sewage and wastewater
 - Untreated sewage and treated sewage from sewage treatment plants viz CMWSSB at Koyambedu
 - commercial establishment effluents
 - wastewater from illegal drain system reaching River Cooum
 - Portion of the treated sewage from Kodungaiyur STP is discharged into B'Canal which is connected to Cooum River.



Adayar River

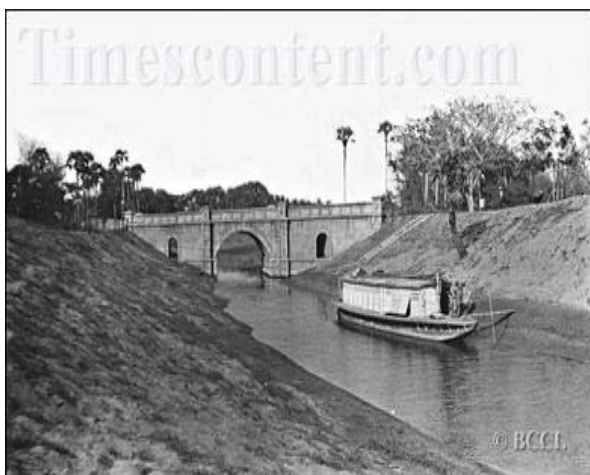
1. No natural flow in Adayar River
2. Pollution is mainly from
 - Uncollected sewage from unorganised sectors
 - out flow of CETP at Pammal
 - treated sewage from STP Nesapakkam
 - effluents discharged from commercial establishments
 - sewage from encroached slums
 - Sewage and wastewater from non industrial sources, dhobhi ghats at Saidapet

Adayar River (1960)



Buckingham Canal

1. A stagnant water body.
2. Pollution is mainly from
 - Major Industrial Effluent discharge from Manali and Ennore Industrial Area.
 - Commercial establishments
 - Sewage generated from encroached slums
 - wastewater from unauthorised drainage system





Otteri Nullah

1. A stagnant water body.
2. Pollution is mainly from
 - Effluents from commercial establishments
 - Sewage generated from encroached slums
 - Wastewater from unauthorised drainage

Sewage Treatment Plants

Standards Achieved

- BOD 5 @ 20°C : less than 20 mg/L
- TSS : less than 30 mg/L
- Faecal Coliform : less than 10000 MPN / 100 mL

Use of Treated Sewage

- From Kodungaiyur STP, about 36 MLD of secondary treated sewage is being supplied to Industries viz
 - Chennai Petroleum Corporation Ltd (CPCL) : 23.0 MLD
 - Madras Fertilizer Ltd (MFL) : 11.5 MLD
 - Manali Petro Chemicals (MPL) : 1.5 MLD
 -

	pH	TSS	TDS	Cl2	BOD	COD
Kodungaiyur STP Outlet I	7.63	68	756	222	62	128
Kodungaiyur STP Outlet II	7.93	32	1014	303	22	72
Koyambedu Old	7.96	18	934	200	20	56
Koyambedu New	7.63	72	918	271	36	80
Perungudi STP Outlet I	7.94	32	724	201	42	120
Villivakkam STP Outlet	7.40	206	912	243	62	176
Nesapakkam Old	7.45	34	574	121	8	24
Nesapakkam New	7.52	20	604	111	4	24

Points Monitored by TNPCB

River Cooum

1. Thirumangalam Cause way
2. STP Koyambedu Outlet
3. Aminjikarai Bridge
4. Namasivayapuram Cause way
5. Anderson Road Bridge
6. BinnyRoad Bridge
7. Chitra Talkies Bridge
8. Chinthadiripet Bridge
9. Laws Bridge
10. Periar Bridge
11. Quaid-eiMilleth Bridge
12. Napier Bridge

Buckingham Canal

1. Kathivakkam bridge
2. Manali road bridge
3. Basin road bridge
4. Elephant gate bridge
5. Central station bridge
6. Kamaraj road bridge
7. Wallaja road bridge
8. Dr. Radhakrishnan road
9. Elliots road bridge
10. Lattice road bridge

ADAYAR

1. Manapakkam Bridge
2. Ekkaduthangal Bridge
3. Maraimalai Adigal Bridge
4. Kotturpuram Bridge
5. Thiru.Vi.Ka Bridge

OTTERI NULLAH

1. Block East Road Bridge
2. Avadi road Bridge
3. Aspirin Garden Bridge
4. Kellys Road Bridge
5. Cooks Road Bridge
6. DSB&C Mill road Bridge
7. Vyasrpadi Road Bridge

Observations of TNPCB

1. All the STPs Operated by CMWSSB are generally achieving the standards of discharge for inland surface waters.
2. The Water Quality is good in River Adayar & River Coom prior to entry into city limit.
3. However in locations where treated sewage from CMWSSB plants is discharged deterioration noticed downstream
4. Otteri Nullah and other water bodies - major carriers of sewage.
5. Sewage supplied from the city successfully used after further treatment for cooling purposes.

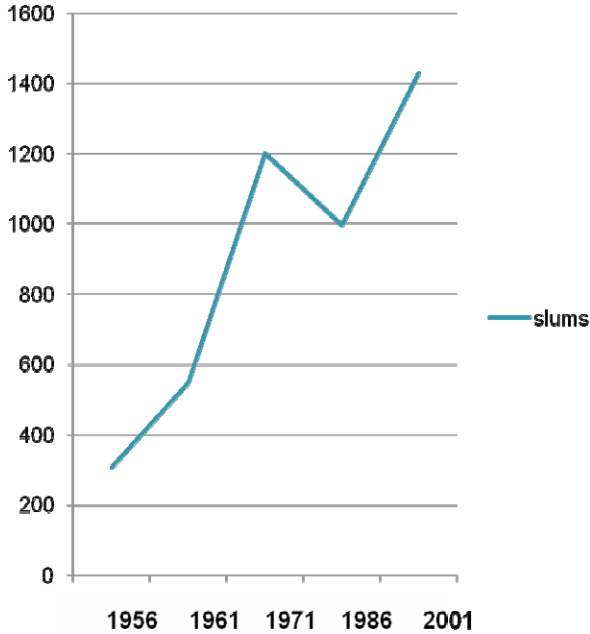
Suggestions of TNPCB

1. All unauthorised discharges to be stopped
2. Encroachments removed.
3. Storm Water drains to carry only rain water.
4. Disposal of wastewater by encroachments and commercial establishments to be stopped.
5. Deposited debris and garbage to be removed.
6. Water bodies to be naturally flushed during rains
7. Dredging to be done at river mouths.

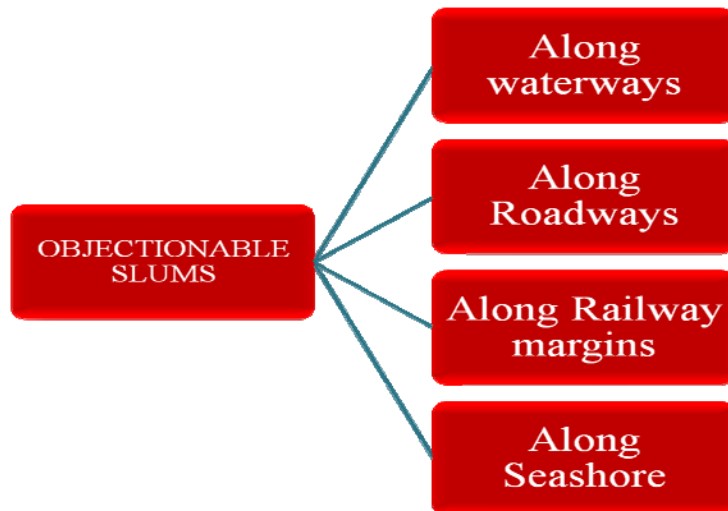
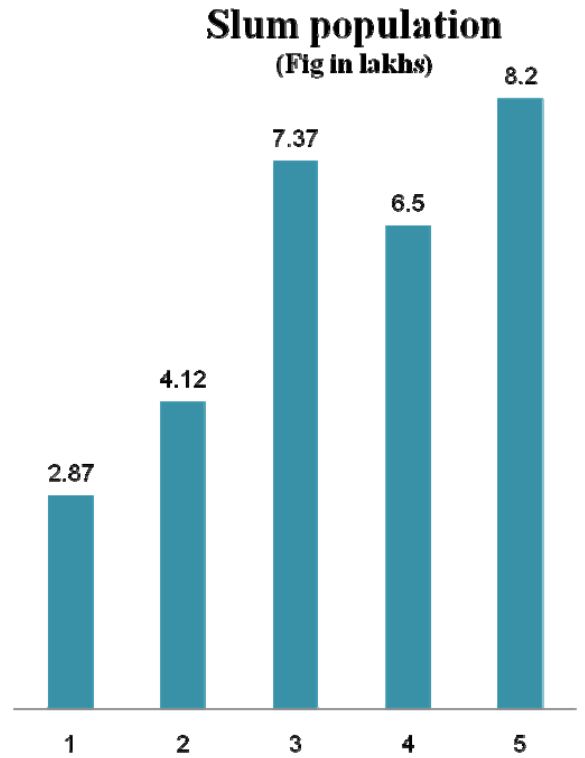
Resettlement and Rehabilitation of objectionable slums on waterways - Role of TNSCB

*Thiru T.K.Ramachandran, I.A.S.,
Managing Director, TNSCB*

Growth of Slums in Chennai



Year	No of slums	Slum population
1956	306	2.870
1961	548	4.120
1971	1202	7.370
1986	996	6.500
2001	1431	8.200



Objectionable Slums



Slums along Waterways



Slums along Road margin

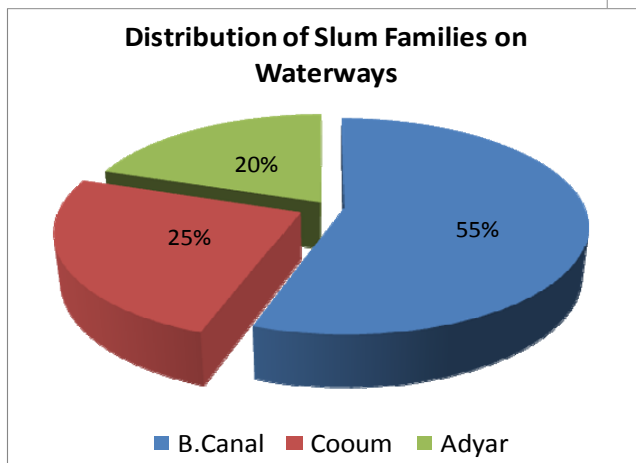
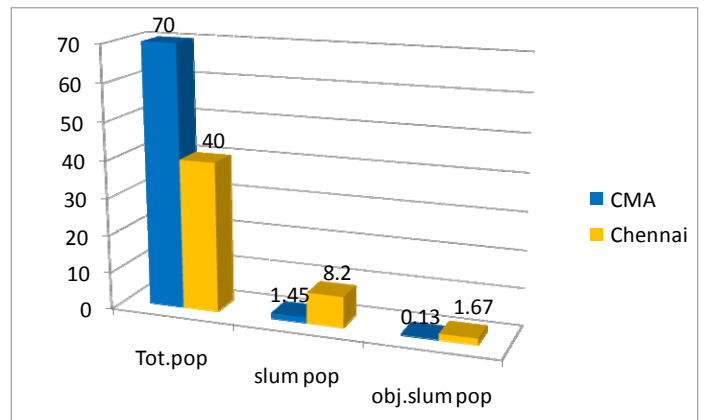


Slums along seashore



Slums along railway line

Population living in Objectionable slums on Waterways (Fig in Lakhs)



Modus Operandi

Step 1



Identification of Slum on Cooum river for Rehabilitation & Resettlement

Step 2

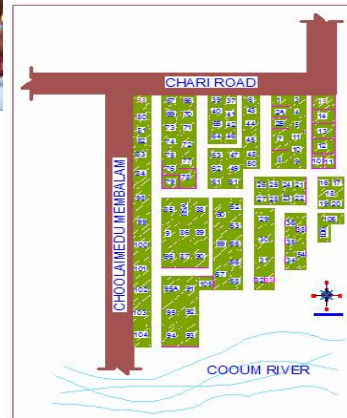


Discussion with the slum families

Step 3



Socio – Economic Survey



Topo Sketch

Step 4



Obtaining concurrence from affected families for the resettlement

Step 5



Removing the Encroachments along the waterways

Step 6



Transportation to the Rehabilitation site

Broad Strategies of TNSCB

- **Insitu Development** - Provision of Infrastructure Basic amenities like water supply, roads, sanitation, etc.,
- **Insitu Reconstruction** – Construction of dwelling units. Construction of tenements without any relocation
- **Rehabilitation & Resettlement** – provision of houses, infrastructure, livelihood programmes, etc., with a holistic approach.

Why Relocation?

- Non availability of urban land in proximity
- Provision of infrastructure facilities along with the housing is not possible in objectionable slums.

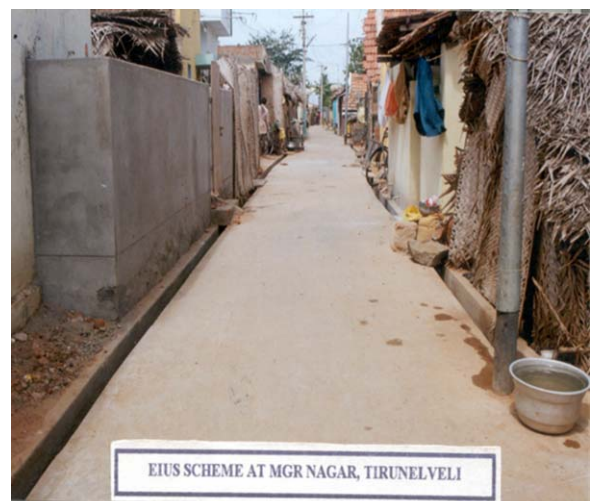
Issues in In-situ Developments

MUDP & TNUDP Schemes

- Narrow streets (3' – 5' wide)
- Haphazard growth of houses
- No set back/Less set back houses
- Lack of ventilation
- Inadequate open space
- No planned development

Tenemental Schemes

- Density based on Land availability
- Under utilisation of prime urban land
- Unable to provide social infrastructure
- Less FSI
- Cannot claim as a holistic development



Advantages of Relocation

Holistic approach:

- ❖ Housing with all infrastructure facilities
- ❖ Planned settlement with more park and open space
- ❖ Education in the neighbourhood
- ❖ Livelihood activities to make economically independent
- ❖ Extended transport facilities



Specific Issues in Resettlement

- | | | |
|----------------|---|--|
| Land | - | Non availability of urban land |
| Finance | - | Inadequate fund – High cost of construction |
| Capacity | - | Lack of capacity by the local body for additional population |
| Maintenance | : | Lack of People's Participation in maintenance |
| Encroachments: | | Non protection of land by the land owning departments further encourages encroachments |

Resulting in relocation of slum families in far away locations nearly 15 to 20 kms away from Chennai

The cost per unit works out to nearly Rs. 4 Lakh

Non-acceptance of local body to take over the new scheme for provision for infrastructure and its maintenance

Encourages formation of slums even after eviction and clearance

Latest Strategies

- ❖ Increase in space from 25 sqm to 36 sqm of plinth area per unit consisting of a hall, a lockable room, cooking alcove, separate bath & wc.
- ❖ Multi storey buildings at possible locations
- ❖ Rehabilitation Programmes including Housing , Infrastructure, Community facilities are being provided.
- ❖ Optimum Utilization of place by achieving the maximum FSI
- ❖ Use of latest technology and construction methodologies

Proposed Strategies :

Issue: The private sector has not been involved in the housing of underprivileged people.

Strategy: The housing for the urban poor/EWS group can be addressed only by the joint effort of both Government and the private sector.

- Premium FSI
- Transfer of Development Rights (TDR)
- Additional 50 % FSI

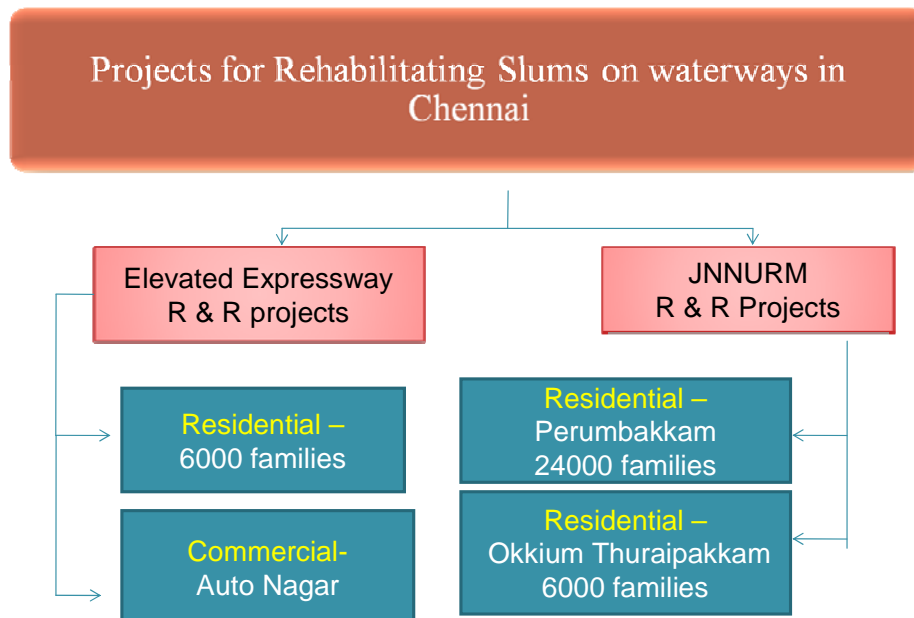
Issue: Increase in migrant population and urban population resulting in growth of slums and slum population

Strategy: Decongestion measures to accommodate the needs of future population through land use zoning.

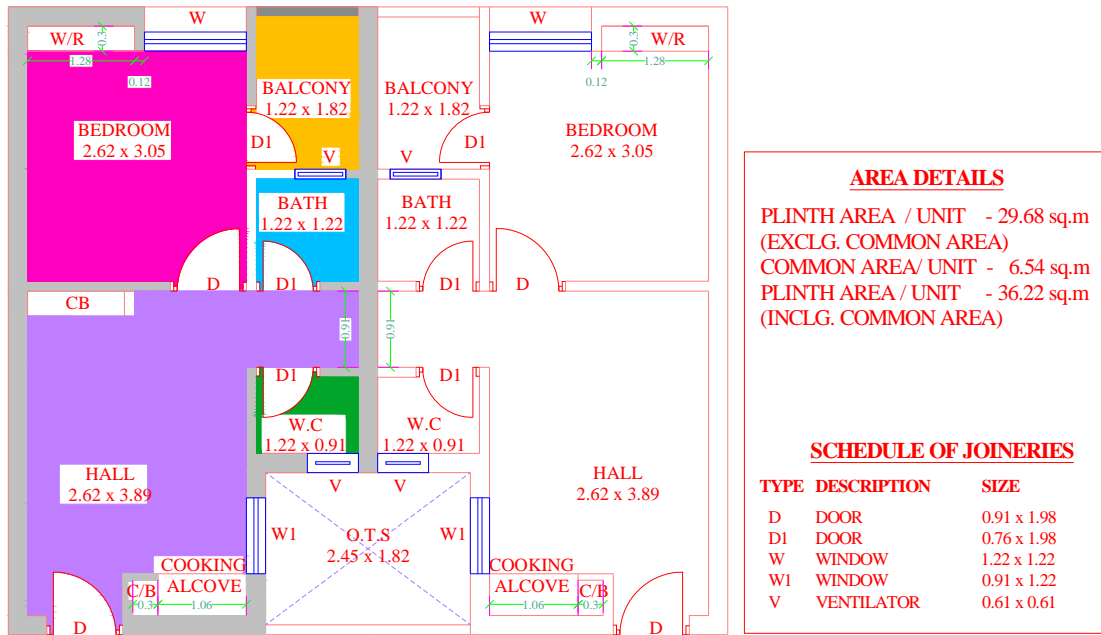
Issue: High increase in land cost & Non availability of land for the EWS housing

Strategy: Reservation of land for EWS housing should be given importance in Urban Planning.

We should consider housing not only on ownership but also on rental basis.



PROPOSED DESIGN AT PERUMBAKKAM



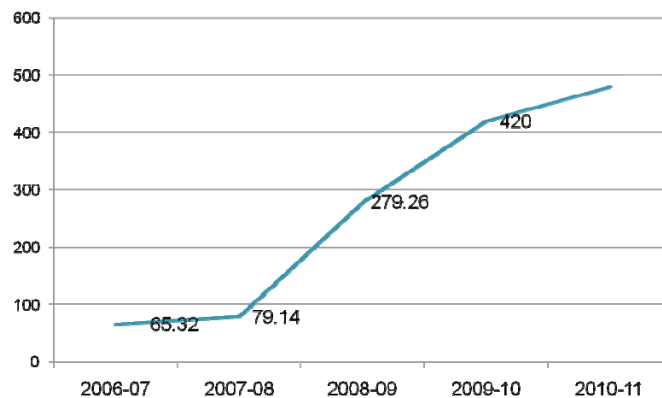


Livelihood Support



Overall Rehabilitation by TNSCB

In past 35 yrs : 77,000 families.
 In 5 years (2006 -2011) : 82,000 families



Financial Target Achievement (Fig. In crore)

Session – I
Tambaram and Pallavapuram Sewerage Projects
Thiru R.Regunathan
Chief Engineer, Directorate of Municipal Administration

Status of UGSS projects in CMA Municipalities

Municipalities	Cost (Rs .in crore)	Status
ALANDUR	46.00	Completed
VALASARAVAKKAM	20.00	Completed
AMBATTUR	170.00	Under Implementation
AVADI	160.00	Under Implementation
TIRUVOTTIYUR	81.00	Under Implementation
MADHAVARAM	43.00	Under Implementation
MADURAVOYAL	37.00	Under Implementation
PALLAVAPURAM	72.00	Under Implementation
TAMBARAM	161.00	Under Implementation
ULLAGARAM	33.00	Under Implementation
TOTAL	823.00	
KATTHIVAKKAM		DPR under preparation
MANALI		DPR under preparation
PAMMAL		DPR under preparation
ANAKAPUTHUR		DPR under preparation
TIRUVERKADU		DPR under preparation
POONAMALLEE		DPR under preparation

Status of Solid waste Management in CMA Municipalities

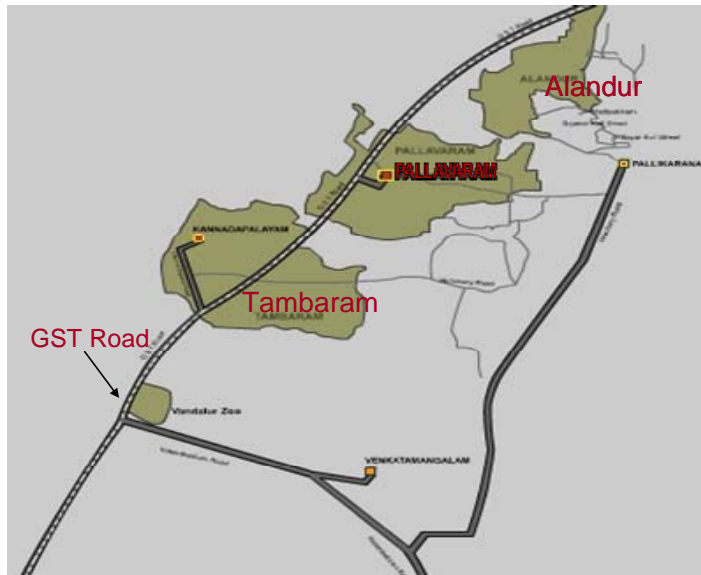
Municipalities	Location of Proposed Facility	Extent
ALANDUR	VENGADAMANGALAM	50 acres
PALLAVAPURAM		
TAMBARAM		
AMBATTUR	KUTHAMBAKKAM	60 acres
MADURAVOYAL		
VALASARAVAKKAM		
TIRUVERKADU		
POONAMALLEE		
THIRUV OTTIYUR	SATHANGADU	16 acres
KATHIVAKKAM		
MADHAVARAM		
MANALI		

AVADI	SEKKADU	8 acres
ULLAGARAM	Proposed to integrate Vengadamangalam Project	
PAMMAL		
ANAKAPUTHUR		

Introduction

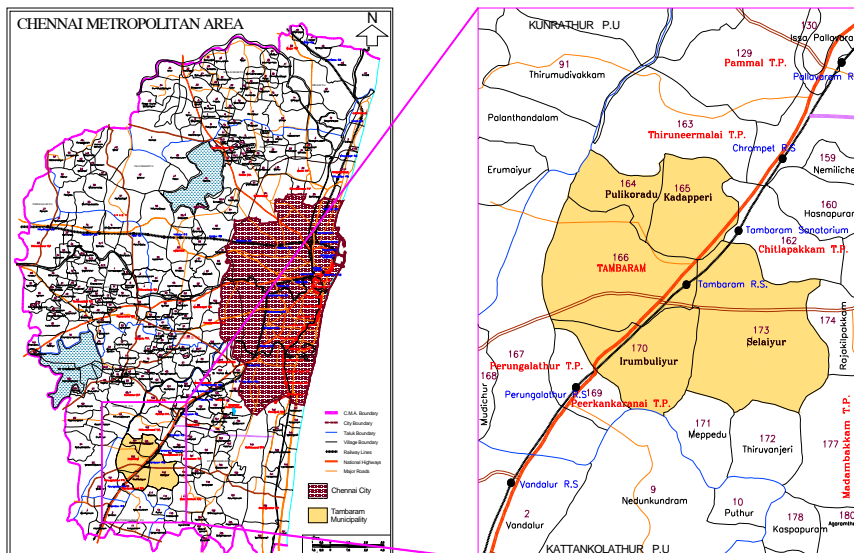
- Pallavapuram and Tambaram are two special grade municipalities among the 16 in Chennai Metropolitan Area
- Two towns do not have any sewerage system
- The existing sewage is let out into nearest water bodies which causes pollution
- Adyar River is the nearest waterways for the above municipalities

Location of Municipalities

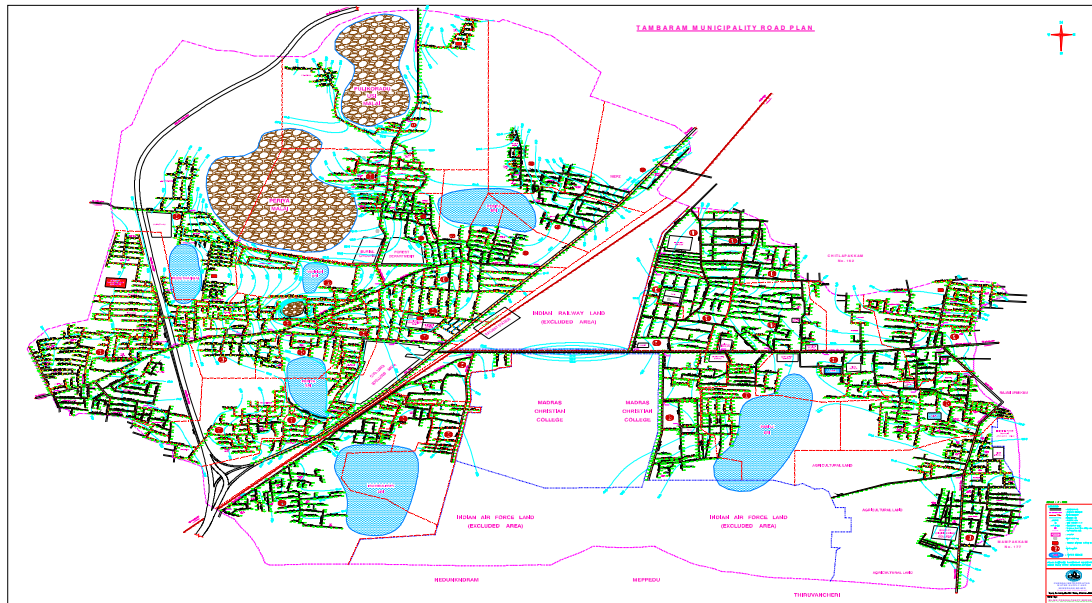


TAMBARAM UNDER GROUND SEWERAGE SCHEME

Index Plan Showing The Location of Tambaram Municipality in Chennai Metropolitan Area



PLAN SHOWING TAMBARAM MUNICIPALITY



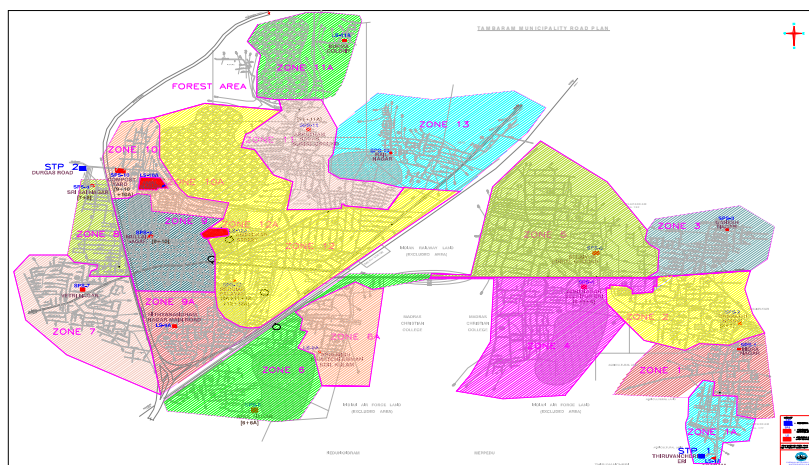
SALIENT FEATURES

- Total area : 20.72 sq km
- Total number of Wards : 39
- Street/Road Length : 184 km
- No. of streets : 961
- Population (2001- Census) : 1,37,933
- Projected Population
 - Base Year 2010 : 1,72,260
 - Intermediate Year 2025 : 2,49,483
 - Ultimate Year 2040 : 3,61,326
- Existing Sewerage system : No Sewerage system (only septic tanks)

The Town is divided into nineteen zones

Sub Pumping Stations:- 13

Lift Stations:- 6



Works proposed in the scheme

- Scheme designed for 30 years
- Collection system (Network of sewers) : 176.12 KM
- Nos. of Manholes : 6766
- No. of Sewage pumping stations : 19 (incl. 6 lift stations)
- Length of Sewage Pumping main with size ranging from 150 mm to 600 mm : 17.95 KM
- Sewage treatment plants : 2nos (East & West)

Zone-wise works proposed in detail

❖ ZONE I

- Collection System for a length of 7.312 KM
- Pumping Station at Indira Nagar
- Force Main 200 mm dia D.I. main for a length of 105 m from PS I to the 1100 mm dia RCC gravity main leading to STP1

❖ ZONE IA

- Collection System for a length of 4.534 KM
- Lift Station at Agaram Road
- Force Main 150 mm dia D.I. main for a length of 60 m from LS IA to the 1100 mm dia RCC gravity main leading to STP1

❖ ZONE II

- Collection System for a length of 13.077 KM
- Pumping Station at Bharathi Nagar
- Force Main 300 mm dia D.I. main for a length of 245 m from PS II to the 1100 mm dia RCC gravity main leading to STP1

❖ ZONE III

- Collection System for a length of 7.282 KM
- Pumping Station at Ganesh nagar
- Force Main 200 mm dia D.I. main for a length of 1535 m from PS III to PS II

❖ ZONE IV

- Collection System for a length of 13.930 KM
- Pumping Station at Adhi Nagar
- Force Main 500 mm dia D.I. main for a length of 2065 m from PS IV to the gravity main 1100 mm dia RCC pipe of length 1430 m leading to STP1

❖ ZONE V

- Collection System for a length of 24.261 KM
- Pumping Station at Selaiyur Burial ground
- Force Main 350 mm dia D.I. main for a length of 310 m from PS V to Manhole No.525 in Zone IV

❖ ZONE VI

- Collection System for a length of 10.109 KM

- Pumping Station at Arul nagar
- Force Main 300 mm dia D.I. main for a length of 3967 m from PS VI to Manhole No.326 in Zone IV
- ❖ **ZONE VIA**
- Collection System for a length of 4.973 KM
- Lift Station at Arulmigu Kamatchi Amman Koil Kulam
- Force Main 150 mm dia D.I. main for a length of 980 m from LS VIA to Manhole No.53 in Zone VI
- ❖ **ZONE VII**
- Collection System for a length of 13.244 KM
- Pumping Station at Vetri Nagar
- Force Main 250 mm dia D.I. main for a length of 651 m from PS VII to Manhole No.577 in Zone VIII
- ❖ **ZONE VIII**
- Collection System for a length of 6.309 KM
- Pumping Station at Sri Sai nagar
- Force Main 300 mm dia D.I. main for a length of 394 m from PS VIII to STP2
- ❖ **ZONE IX**
- Collection System for a length of 9.599 KM
- Pumping Station at Mullai Nagar
- Force Main 600 mm dia D.I. main for a length of 1205 m from PS IX to PS X
- ❖ **ZONE IXA**
- Collection System for a length of 6.683 KM
- Lift Station at Nithyanandha Nagar main Road
- Force Main 200 mm dia D.I. main for a length of 1275 m from LS IXA to Manhole No.652 in Zone XI
- ❖ **ZONE X**
- Collection System for a length of 6.448 KM
- Pumping Station at Compost Yard, Durgas Road
- Gravity Main 900 mm dia D.I. main for a length of 400 m from PS X to STP 2
- ❖ **ZONE XA**
- Collection System for a length of 0.686 KM
- Lift Station at Amal Nagar
- Force Main 150 mm dia D.I. main for a length of 185 m from LS XA to Manhole No.140 in Zone X
- ❖ **ZONE XI**
- Collection System for a length of 13.976 KM
- Pumping Station at Arputham Nagar Burial Ground
- Force Main 300 mm dia D.I. main for a length of 1486 m from PS XI to Manhole No.767 in Zone XII

❖ **ZONE XIA**

- Collection System for a length of 2.446 Km
- Lift Station at Burma Colony
- Force Main 150 mm dia D.I. main for a length of 1090 m from LS XIA to Manhole No.490 in Zone XI

❖ **ZONE XII**

- Collection System for a length of 21.951 Km
- Pumping Station at Reddiyar Palayam
- Force Main 600 mm dia D.I. main for a length of 384 m from PS XII to Manhole No.14 in Zone IX

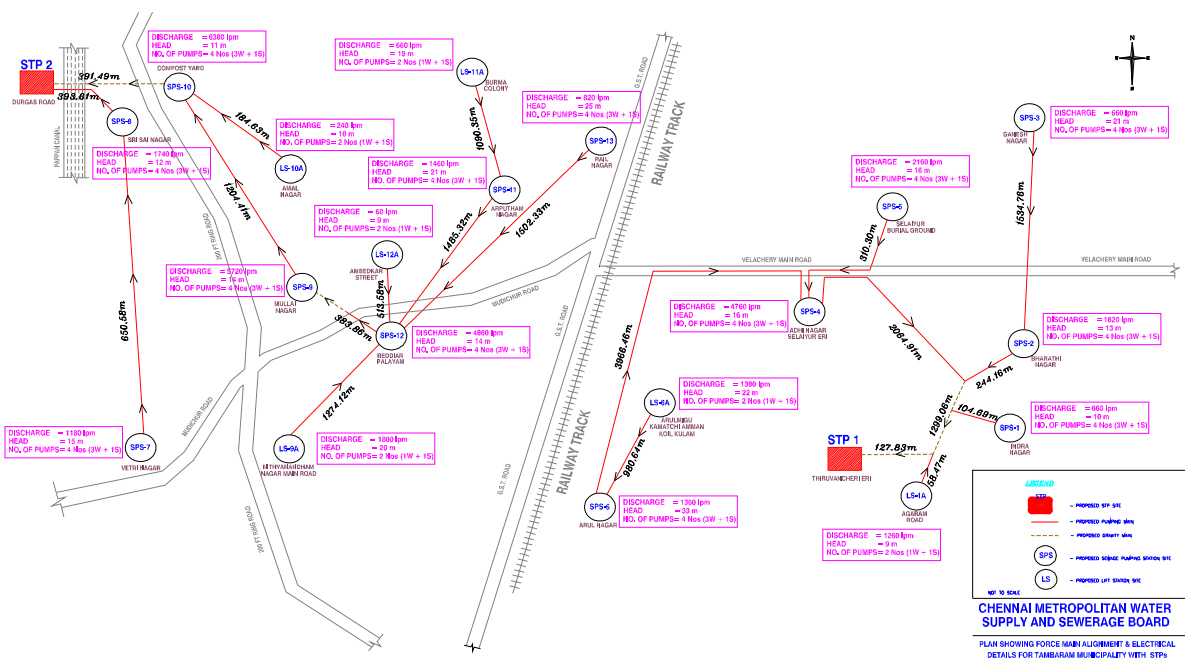
❖ **ZONE XIIA**

- Collection System for a length of 0.208 Km
- Lift Station at Ambedkar street
- Force Main 150 mm dia D.I. main for a length of 514 m from LS XIIA to Manhole No.153 in Zone XII

❖ **ZONE XIII**

- Collection System for a length of 9.088 KM
- Pumping Station at Rail nagar
- Force Main 200 mm dia D.I. main for a length of 1503 m from PS XIII to Manhole No.288 in Zone XII

Schematic line diagram of pumping mains with pump details



SEWAGE TREATMENT PLANTS

Sl.No.	Name	Location	Capacity	Zones Served
1	STP 1	Near Thiruvengeri Lake	15 mld	Zone I to VI , IA and VIA
2	STP 2	Durgas Road	15 mld	Zone VII to XIII, IXA, XA, XIA and XIIA

- ✳ It is proposed to convey the sewage from Zones I to VI,IA and VIA to the proposed STP 1 of 15 mld capacity near Thiruvengeri Lake. The treated effluent is proposed to be let in the Thiruvengeri Lake , which is located approx. at 100 m from the STP.
- ✳ It is proposed to convey the sewage from Zones VII to XIII, IXA, XA,XIA and XIIA to the proposed STP 2 of 15 mld capacity at Durgas Road. The treated effluent is proposed to be let in the Adyar River , through Pappan canal.

FUNDING PATTERN

Total Cost of the Project:- Rs.160.97 Crores

1. Government of India (JNNURM)	35%	: Rs. 5634.00 Lakhs
2. Government of Tamil Nadu	15%	: Rs. 2414.00 Lakhs
3. Tambaram Municipality	50%	: Rs. 8049.00 Lakhs
Total		Rs.16097.00 Lakhs

COMPONENTS IN THE PROJECT

Sl.No	Name of the component	Cost Rs. in Lakhs
1	Providing Collection system (19 Zones) for 176.12 KM	6901.00
2	Providing sewage pumping stations 13nos and 6nos. of lift station	1517.30
3	Providing pumping main with sizes ranging from 150 mm to 600 mm for 17.95km and Gravity main 900mm and 100mm dia for 1.830 km	1073.50
4	Construction of 2 nos. of STP	2400.00
	Sub total	11891.50
5	Contingencies @ 3% (approx)	382.00
6	Provision for road cut restoration charges	3189.27
7	TNEB service connections	17.59
8	Third Party Inspectiuon charges	nil
9	Administrative charges at 0.5%	59.45
10	Cost of shifting Utilities	556.78
	Grand Total	16096.59
	say	160.97 Cr.

FINANCIAL VIABILITY

Total Project Cost	16097.00	Lakhs
Government of India Grant 35 %	5634.00	Lakhs
State Government Grant 15 %	2414.00	Lakhs
ULB Mobilization (25% ULB + 25% MIDF loan) 50 %	8049.00	Lakhs
Total	16097.00	Lakhs
O & M Cost per year	731.07	Lakhs

Initial Connection Charges (Deposit) in rupees

For urban poor population	0
Domestic up to 300 sqft	3000
From 300 to 600 sqft	10000
From 600 to 1000 sqft	15000
From 1000 to 2000 sqft	25000
From 2000 and above	40000
Others (Industries, Business complex, Hospitals, Hotels, Marriage Halls)	50000

Tariff Rate per Month in Rs.

For urban poor population	nil
Domestic up to 300 sqft	75
From 300 to 600 sqft	150

Cash flow (annum)

Demand for year	690.00	Lakhs
Initial Connection Charges (New connection Charges) addition	287.50	Lakhs
Property Tax Component (30% of Collection)	269.08	Lakhs
Total (a)	1246.58	Lakhs

Less

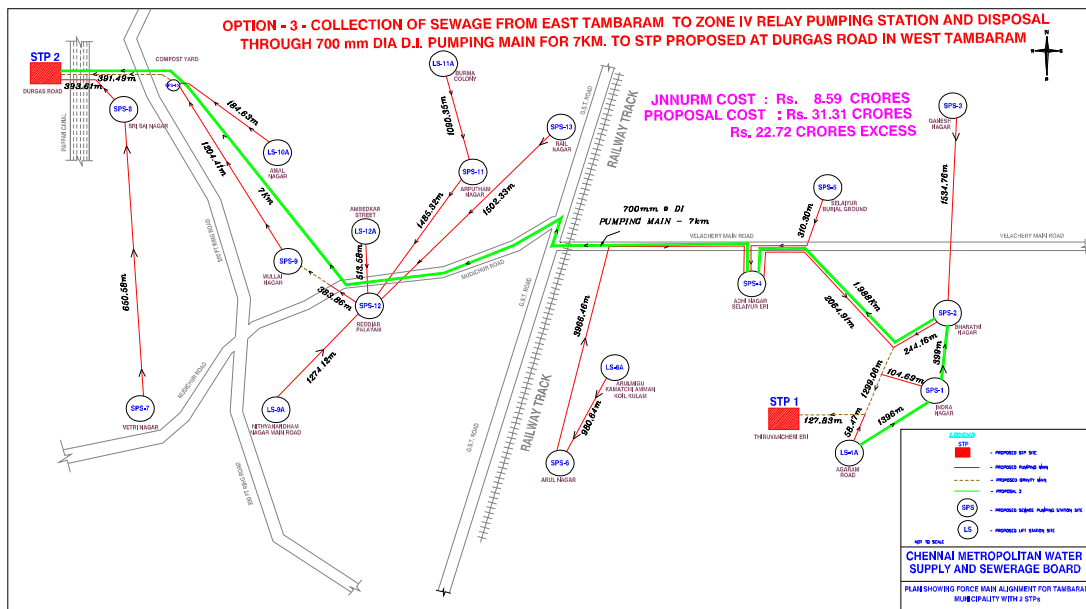
O & M Charges	731.07	Lakhs
Loan repayment & interest	408.00	Lakhs
Total (b)	1139.07	Lakhs
Surplus (a - b)	107.51	Lakhs

The entire scheme has been divided into 3 Packages.

Sl.No.	Description of Package	Status of the Package
1	Package I: Providing sewerage scheme to East Tambaram	Work Order Issued on 30.09.09 and work under execution

2	<i>Package II</i> : Providing sewerage scheme to West Tambaram	No response for first two calls. The estimate for Package-II has been revised to the current schedule of rates 2009-2010 and tenders were called for after obtaining Technical sanction from competent authority. Only one bid has been received on the due date and the same is under evaluation.
3	<i>Package III</i> : Construction of Two nos. of STP's. at East and West	Decided to provide one STP in Durgas road due to norms for discharge of treated effluents into Tiruvancheri Lake and Technology has been finalised as "SEQUENTIAL BATCH REACTOR"

OPTION III



COST COMPARISON OF OPTIONS

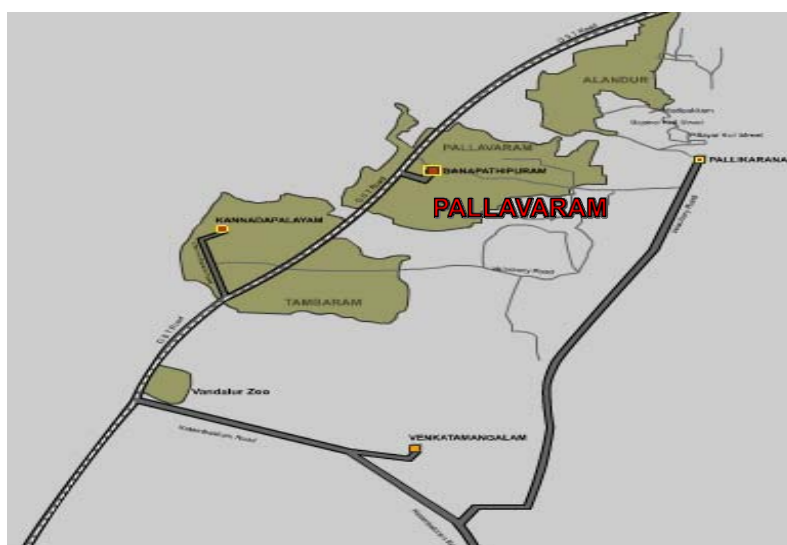
Sl.No.	Option	Cost of the Option including STP Cost	Fund available under JNNURM including STP Cost	Balance Funds Required	Remarks
1	1	Rs.33.68 crores + Rs. 39.60 crores (@ Rs.1.32 crore per mld for 30 mld)	Rs. 24 crores (@ Rs.80 lakhs per mld for 30 mld)	Rs. 49.28 crores	Construction of P.S. + Laying of P.M. + Difference in construction cost
2	2	Rs.34.00 crores + Rs. 39.60 crores (@ Rs.1.32 crore per mld for 30 mld)	Rs. 24 crores (@ Rs.80 lakhs per mld for 30 mld)	Rs. 49.60 crores	Construction of P.S. + Laying of P.M. + Difference in construction cost
3	3	Rs.31.31 crores + Rs. 39.60 crores (@ Rs.1.32 crore per mld for 30 mld)	Rs.8.59 crores + Rs. 24 crores (@ Rs.80 lakhs per mld for 30 mld)	Rs. 38.32 crores	Re-design of P.S. + Laying of P.M. + Difference in construction cost
4	4	Rs.31.94 crores + Rs. 39.60 crores (@ Rs.1.32 crore per mld for 30 mld)	Rs.8.59 crores + Rs. 24 crores (@ Rs.80 lakhs per mld for 30 mld)	Rs. 38.95 crores	Re-design of P.S. + Laying of P.M. + Difference in construction cost

Comparison of O and M expenditure

Sl. No	Option	O&M Charges of Old Proposal (including STP)	O&M Charges of New Proposal (including STP)	Balance Cost
1	Construction of Terminal P.S. at STP1 site and pumping through 750 mm dia D.I. for a length of 10 km. to STP2	Rs. 14.42 Lakhs + Rs. 45 Lakhs	Rs. 14.42 Lakhs + Rs. 3.30 Lakhs + Rs.14.85 Lakhs	Less Rs. 26.85 Lakhs
2	Collection of sewage from East Tambaram in Zone IV P.S. as Relay P.S. and pumping through 700 mm dia D.I . For a length of 7 km. to STP2	Rs. 14.42 Lakhs + Rs. 45 Lakhs	Rs. 15.77 Lakhs + Rs. 14.85 Lakhs	Less Rs. 28.80 Lakhs

PALLAVAPURAM MUNICIPAL SEWERAGE PROJECT

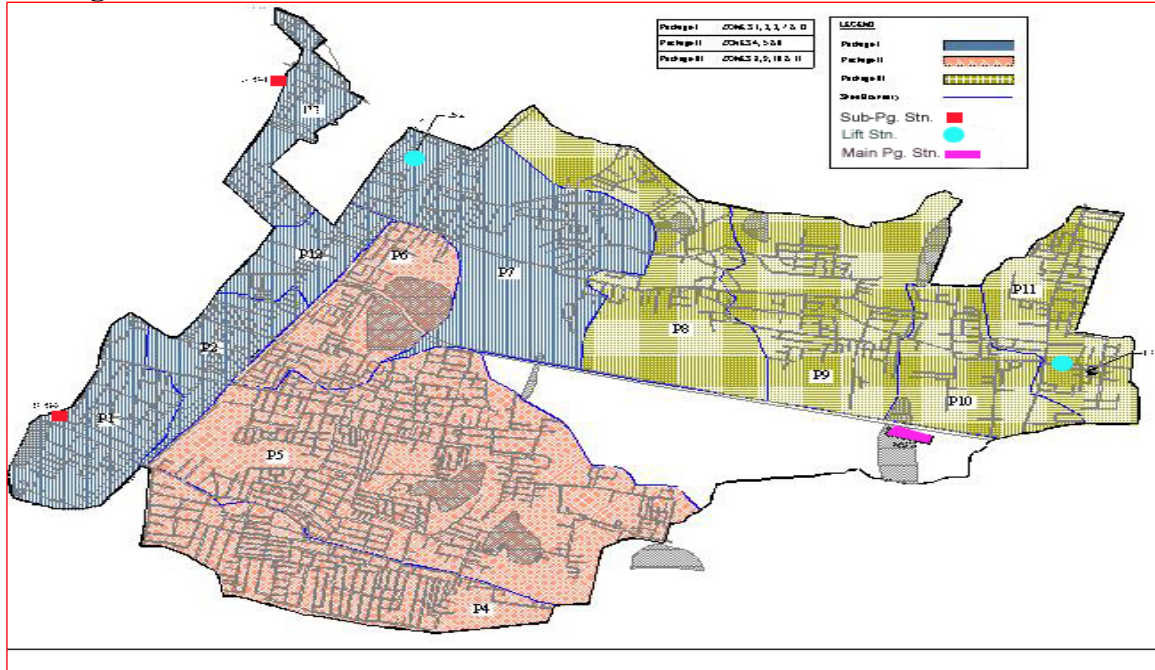
Location of Pallavapuram



Profile of Pallavapuram Municipality

Extent (Sq.Km)	18
Population(2001)	144623
Population(2008)	177082
Households	40010
No.of Wards	42
Water supply	45 lpcd
Road Length	210 KM
Income (2009-10)	20.86 Cr
Expenditure (2009-10)	23.70 Cr

Package Details



Project Objective

- A Open Drainage System exists in for Pallavapuram Municipality. The Drains finally let effluent in Pallavapuram Eri and Veeraragavan Eri,polluting them.
- So an Under Ground Sewerage System is planned with treatment through Metro Water Treatment Plant at Perungudi

Project Brief

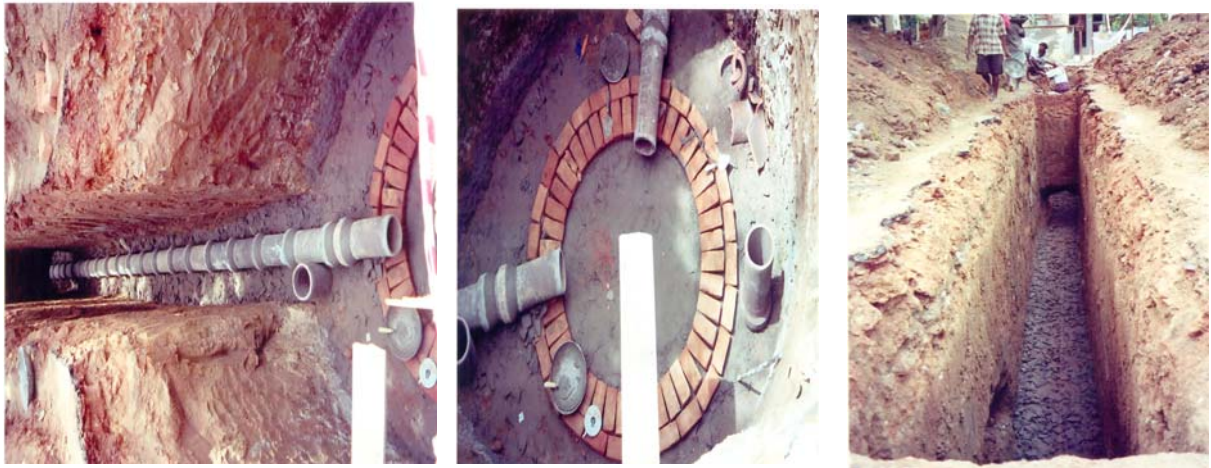
Name of the Work	Providing Under Ground Sewerage Scheme to Pallavapuram Municipality
Estimate Amount	Rs. 47.21Crores
Administrative sanction	1) G.O.Ms.No. 234. Dated 27.06.2002 2) Revised A.S. in GO No.559 MAWS dt 31.12.09
Administrative sanction Amount	1) Rs.36.73 Crores 2) Revised Rs.72.10 Crores
Technical Sanction	26.06.2005
No. of Packages	Original - Five Packages Revised - Six Packages
Tender Date	17.08.2005
Date of work Orders	29.11.2005
Date of commencement	20.01.2006
Contract Period	18 months

FUNDING PATTERN

		Details	Original	Revised
	i	Loan from TNUDF	Rs. 2371.00 Lakhs	Rs. 2578.00 Lakhs
	ii	Grant from GF 1	Rs. 850.00 Lakhs	Rs. 850.00 Lakhs
	Iii	Additional Grant	--	Rs. 511.00 Lakhs
	iv	ULB Contribution	Rs. 1500.00 Lakhs	Rs. 3271.00 Lakhs
	v	Total	Rs. 4721.00 Lakhs	Rs. 7210.00 Lakhs

STATUS OF EACH PACKAGE

Description	Package 1	Package 2	Package 3	Total
Laying of SW Pipe	35.457 KM	67.171 KM	30.770 KM	133.398 KM
Laying of RCC Pipe	6.556 KM	9.860 KM	7.313 KM	23.729 KM
Laying of HSC Pipe	30.121 KM	61.000 KM	27.193 KM	118.314 KM
Construction of Manholes	1578 Nos	2905 Nos.	1444 Nos.	5927 Nos.



Manhole and Pipe Line Works During Progress

STATUS OF PACKAGE- IV

Sewage Pumping Stations-2Nos

- Ramasamy Kuttai - Completed.
- Indira Nagar - Completed

Lift Stations-2 Nos

- Arulmurugan Nagar - Completed.
- Sarathy Street - Completed.



Ramasamy Kuttai Pumping Station



Indira Nagar Pumping Station



Arulmurugan Lifting Station



Keelkattalai Main Pumping Station

STATUS OF PACKAGE- V

Name of the work	Stage of work
Construction of Terminal Pumping Station at Keelkattalai	Sinking of Suction Wells and Grid Wells under Progress
Laying of Pumping main upto Perungudi STP maintained by CMWSSB	Pumping main laid for 3400 m against 8700 m.

Some Implementation Difficulties Encountered

Honorable High Court issued stay on 06.07.2006 based on PIL against construction of Main SPS within Keelkattalai Lake

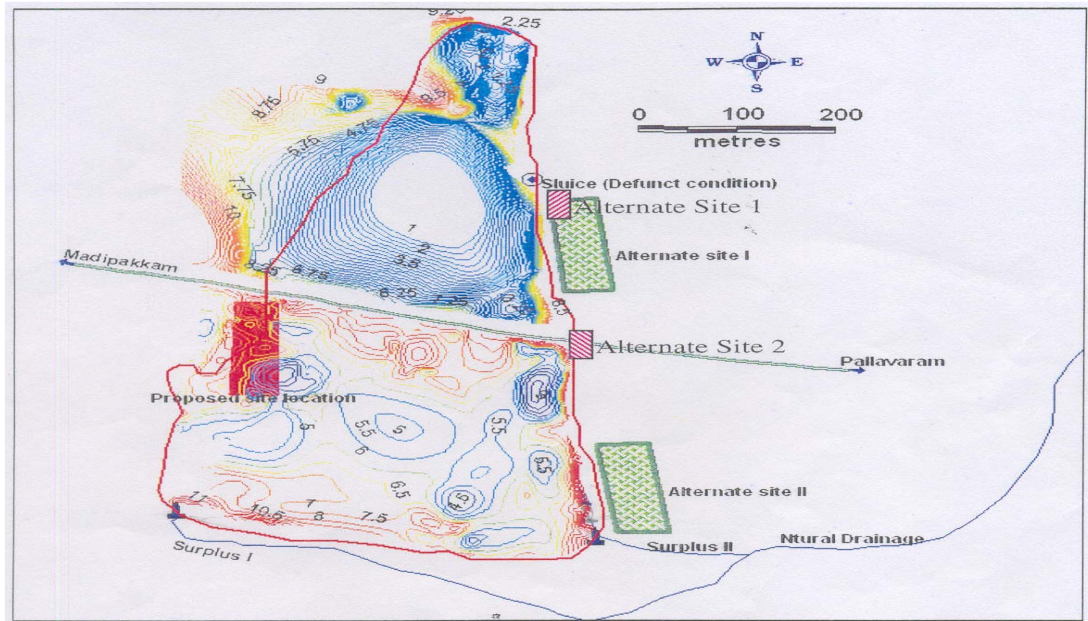
The Court also directed Vice Chancellor of Anna University to appoint an expert in water management to inspect main SPS activities and furnish report

The Expert team from Anna University inspected the site and recommended that the Pumping station site has to be located outside lake bund and suggested two locations. One is private land and the other is revenue land.

The Revenue land available for 0.62 acres has been selected by Pallavaram Municipality.

Earlier Sewage generated in Tambaram was also to be included in the proposal for 38 MLD. Due to land constraints sewage from Pallavaram alone is now to be treated now for 18 MLD.

New Pumping Stations



Transfer of Land

- ❖ The land of 0.62 acres (survey No.309/3) for construction of Main Sewage Pumping Station has been transferred from Revenue Department to Pallavaram Municipality vide G.O.No.654, dated 07.11.07.

Anticipated Date of Completion

Sl.No.	Package	Anticipated Date of Completion
1	Package V Pumping Main Station	Scheduled Date of Completion is 10.03.2010. Programmed to Complete by December 2010
2	Package VI Nanmangalam Sub Pumping Station	Date of Completion is 17.01.2011

After Completion of this Project

- Water Bodies will be protected from contamination
- Ensures good environment

Operation and Maintenance

- After completion, the project will be handed over to the ULB.
- The O and M is proposed to be privatized. Document is under finalization.
- Maintenance management training is to be imparted to the Engineering officials of the ULB.
- Training is also planned for the skilled workers involved in the system maintenance.
- More machineries are also to be deployed in maintenance.
- Public will also be educated by creating awareness. Committee is formed.

Status of UGSS projects in CMA Municipalities

Municipalities	Cost (Rs .in crore)	Status
ALANDUR	46.00	Completed
VALASARAVAKKAM	20.00	Completed
AMBATTUR	170.00	Under Implemntation
AVADI	160.00	Under Implemntation
TIRUVOTTIYUR	81.00	Under Implemntation
MADHAVARAM	43.00	Under Implemntation
MADURAVOYAL	37.00	Under Implemntation
TAMBARAM	161.00	Under Implemntation
ULLAGARAM	33.00	Under Implemntation
TOTAL	751.00	
KATTHIVAKKAM		DPR under preparation
MANALI		DPR under preparation
PAMMAL		DPR under preparation
ANAKAPUTHUR		DPR under preparation
TIRUVERKADU		DPR under preparation
POONAMALLEE		DPR under preparation

.....We know we have to face a big challenge in
maintenance.....but

We do hope

together with the cooperation from the citizen

we can manage

Chennai Rivers – Citizen’s Expectations

*Dr. Nandhitha Krishna
CPR Foundation, Chennai.*

I do not have any power point presentation and since I am a Historian, I am going to talk little bit about the history of the waterways and what it is. The waterways in Chennai constitutes an important environmental component, for the recharge of the aquifer, a simulation of waste water, for flood control and also for maintaining activities of the city. Chennai is fortunate because we have one of the world’s few cities with elaborate waterways, bisected by 2 east flowing rivers, Cooum divides the city, into half and Adayar divides the southern half of the city into two, of course we have historic B’Canal which runs parallel to the coast along the entire length of the city. Once upon a time these waterways was thriving artery for trade and transportation and today they are stinging expo. This is a matter of great great shame that we have after so many years and not able to clean up these rivers and if you ask me as a citizen what do I want, I want these waterways to be cleaned up.

The River Cooum has unenviable distinctions of being the most polluted river probably in the world. I do not know, definitely in the State. It is said that in the 18th Century even prominent residents like Pachaippa Mudaliar use to swim in the Cooum and I know my father has told me that when he was an Engineering Student in the Guindy, they use to go to bathe in the Cooum and always looking out for crocodiles. My father was student in the 20s and 30s may be so, I mean as far as back, as recent as that we have had very clean waterway. But to-day, the river Cooum has come to mean a bad smell. You know if you go somewhere where there is a bad smell. You say “Cooum Manakirathu” in Tamil. (i.e) Cooum is smelling even there is no Cooum nearby.

But do you know that the word Cooum is derived from Tamil word ‘Koovalam’ which denotes the person who is well versed in the science of ground water, well water and stagnant water and in fact it is said once upon a time bathing in the Cooum was so sacred, as it was equivalent to bathing in the Ganga. Today of course even in Ganga you do not get ‘punniam’ because it is so polluted. The other river Adyar, raises in Chembarambakkam tank and runs about 20 km before entering the city. Once upon a time the birds used to come here from nestings. I do remember when I was a child, I stand on the bridge and watch Flamingoes. Flamingoes in Madras city. I mean how many of us say, Flamingoes visit our cities and of course they are all gone. Today, islands and wild life have vanished and rivers

flow in open sewers with lots of pollutants. Other major waterway, B'Canal was built in 1806 and it is a tribute to Queen of England. It goes all the way to Vijayana gar if I am not mistaken and it was a major channel for transporting the goods. but of course the trade, and no maintenance has been carried out in the canal. I am sorry whatever CMDA says, we all know and especially after this MRTS has come, all rubble and thrashes are thrown into the what was B'Canal. So really there is no maintenance done. Over the years we have seen numerous projects, programmes for cleaning the city rivers and every new government comes in, immediately says that we are setting up a big study programme to study the cleaning of the waterways as first and last time. We go on studying and studying but that it is about it. In 1978, the Severn Trent appraised the situation and they recommended that there were 206 points of untreated sewage was let into river coom. The Project report suggested the methods by which the discharge of effluents and sewage could be stopped but it was shelved. In 1996 fresh attempts were made to clean up the rivers and the waterways and the Ministry of Environment and Forest sanctioned Rs.500 Crores under the National River Conservation Programme to Chennai Metro-water. It is labeled as Chennai city Waterways Improvement Projects to prevent the discharge of sewage into the Coom and Adyar. The main activity was, laying of the drains, to intercept the sewage waters, enhance the capacity of pumping stations and the Sewage treatment plants, By 2005, the Metro-water announced that the untreated sewage was no longer discharged into the river. However, we all know that this is far from reality. City rivers look and smell exactly as they did earlier. In a nutshell, despite investing a large amount of money and resources and I do not know where they have gone.

Chennai citizens have seen no tangible improvements in the waterways. Although every one understands the important role of these waterways in flood control, in ground water recharge and in solving the water crisis of the city. We see the people in early mornings, the first thing they are doing is to stand in the long ques, what is lacking is political will and public action. If these waterways are neglected, then it is the people of Chennai who find it difficult to cope up with water related problems. Now with all these pollutions and sewage going in to these water, let us not forget it is going to underground and mix up in the water; if you put a bore well and pump water up to water tank, you are bathing in it and you are bathing in sewage water. There is absolutely no clean water, so what happen?. Today we are given bottle water to drink and I mean it is a matter of shame. that we cannot give the basics of our people a clean drinking water. Clean Air, Clean Water are our rights. It is not a privilege, maybe the chocolate cake is a privilege; may be Marry and Torrantio is willing to give. We are not getting it and we get all kinds of reports For eg. I recently came across a

report that buffalos along the coom had the bio accumulation of lead in the buffalo milk. So this kind of things, to increase more and more. It is no use talking about this and studying this, unless every point at which the sewage is discharged in to the rivers is blocked and something else is to be done and the solution is not to go and take it and throw into the sea, just because we cannot see it. That is not the way out. We have to have treatment plants. They can go back into the coom, into the Adyar, between we need lots and lots of mini treatment plants right all along our waterways. B'Canal can become transportation way again. If these rivers have fresh water flowing into them just imagine you solve the water problems. My driver does not have to get up at one a.m., he is sleepy every morning, I am scared to go in the car with him because he has to wake up at 1.00 '0' clock to collect water. So we do not want this kind of life style, but we cannot all just go and get a bucket of water, When we are children we use to drink well water; it was very clean and to day if you have well we can't drink the well water because of heavy metal in the water. What do we expect and want CMDA is to take action. We want you to clean up water ways, we want you to stop all the sewerage that is going into waterways. There is no use in going on planning and planning. We have so many plans, just block all these sewerage points and please give us clean water. We are smelling this sting. We cannot go past Madras Club, Adyar. It is so beautiful. If you go and sit in the afternoon, you cannot sit in the varandah. The smell is overpowering of the Adyar. This is what we do not want. We want clean city, clean air and clean water are our rights and it is not the privilege that you give us.

I wanted to say what the citizens want. We want clean water; we want actions. We are hearing about the programmes about what we are going to do. We do not want to see plans. We want to see action and we want the various points in which sewer let into waterways should be closed. Thank you.

Session – I

Converting the Problem of Flooding into Potential for Water Source

Prof. Dr. S.Mohan

Director, National Institute for Technical Teachers Training Education and Research, Chennai.

Outline of this lecture

- ✓ Introduction
- ✓ Impact of Floods
- ✓ Challenges ahead & engineering solutions
- ✓ Case study
- ✓ Future Action Plan

Prelude

- Advantage of Chennai flood – Is it really tough topic to discuss?
- Whether flood can bring any positive things?
- But it provided me an opportunity to view the problem out of box, which sometimes provides a great solution.

Introduction

- Floods are an endemic problem in India.
- Every major flood event is immediately followed by a flood of a different kind – ‘scholarly’ articles analyzing the flood event and the current flood management paradigm.
- Technocrats are thinking that they can conquer the nature, *control the flood* and emasculate our rivers.
- But remember “Nature to be commanded must be obeyed.”

- The fate of Chennai people is written and rewritten, and often underscored, not in the texts of the developmental plans and reports but by the onslaught of frequent cataclysmic events (floods).
- Although the floods is not frequent but degree of preparedness is low and the urbanization is really out of control, the losses are usually staggering.
- The routine development plans frozen in time and spaces are naturally irrelevant in a dynamic situation such as the one we face, because the change is complex and quick.



Positive & Negative aspects

- Positive Aspects
 - Preferred places for socio-economic activity due to development potentials
 - Easy access to natural resources
 - Fertile land for agriculture
 - Services provided by ecosystems
- Negative aspects
 - areas recurrently affected by flooding

Following pictures depicts the positive aspects of flood (lighter sense)

No need to worry about gas price hike !



No need to worry about climate change!



Causes

- Reduction in Carrying Capacity of the river
 - Encroachment in river and tributaries (nullahs) draining into the rivers
 - Disposal of Debris and solid wastes including plastics
- Lack of Remote Rain Gauging and Telemetric Early Warning System

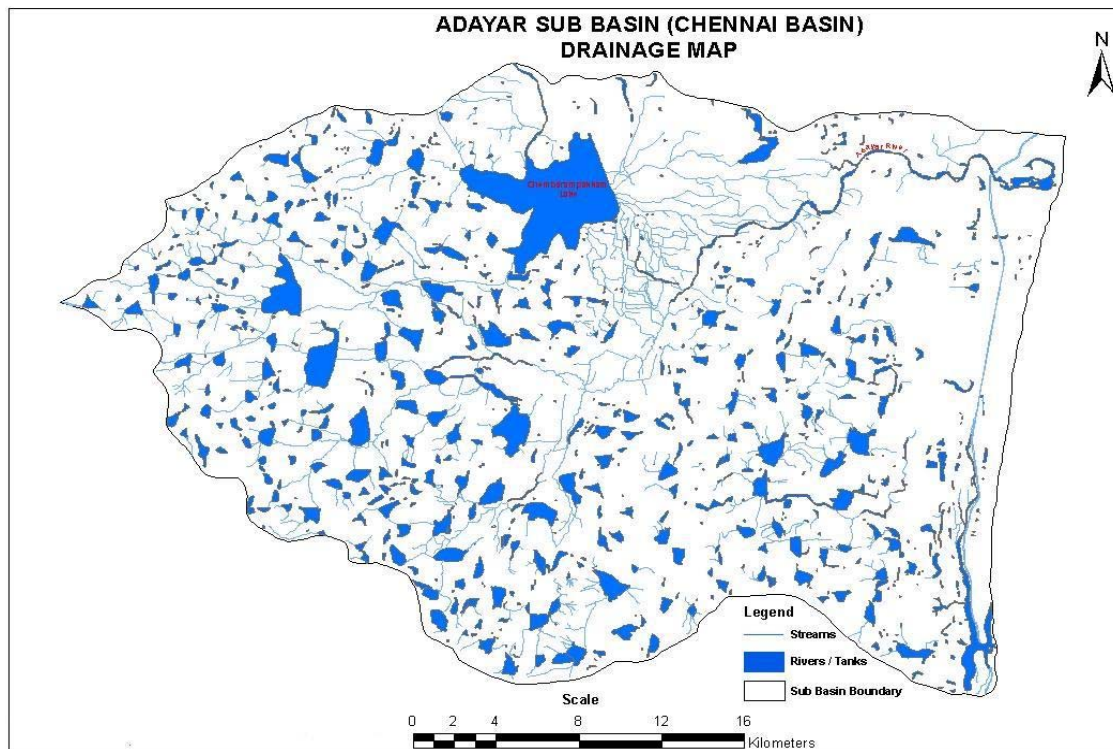
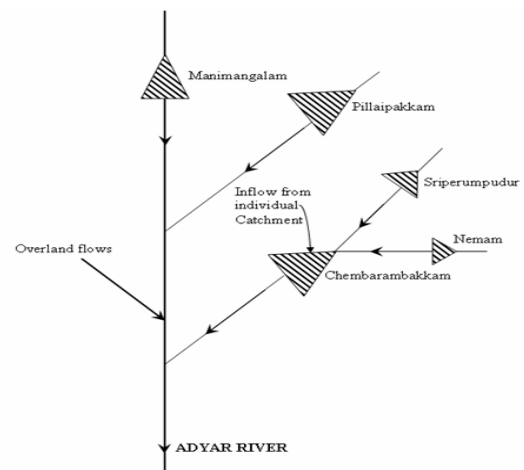
Effects

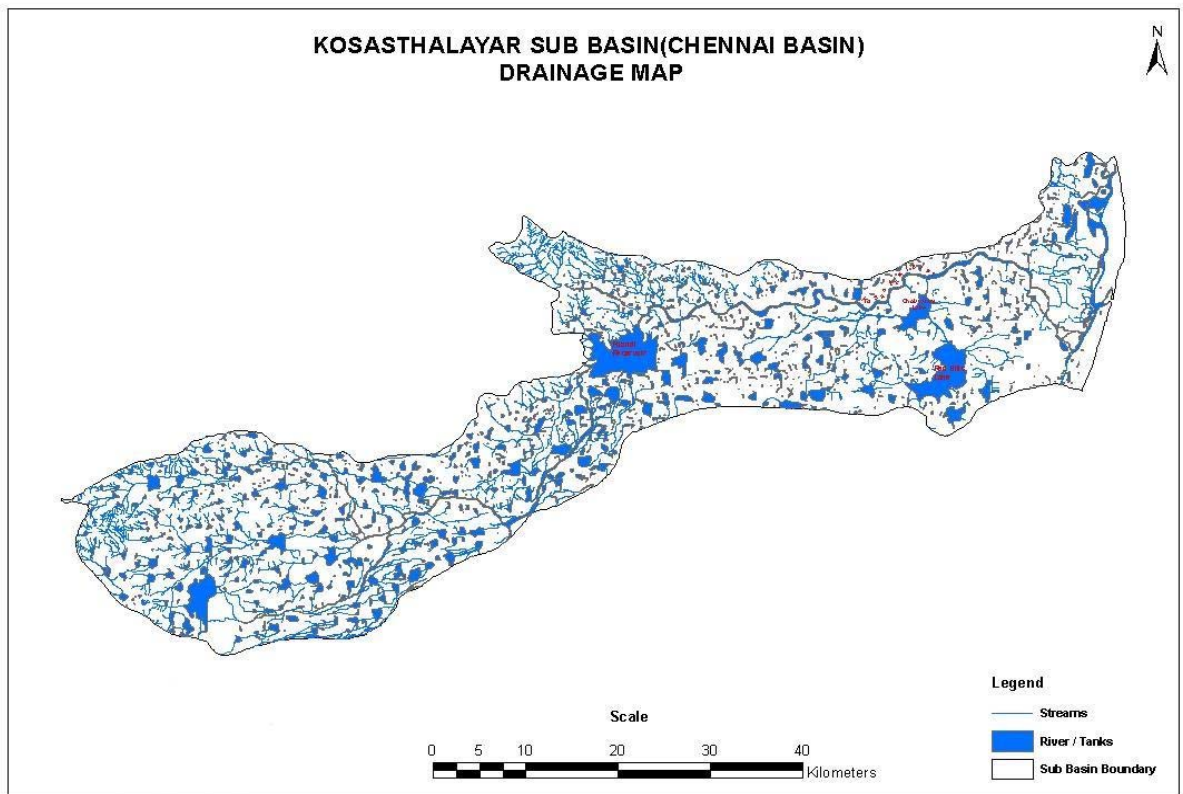
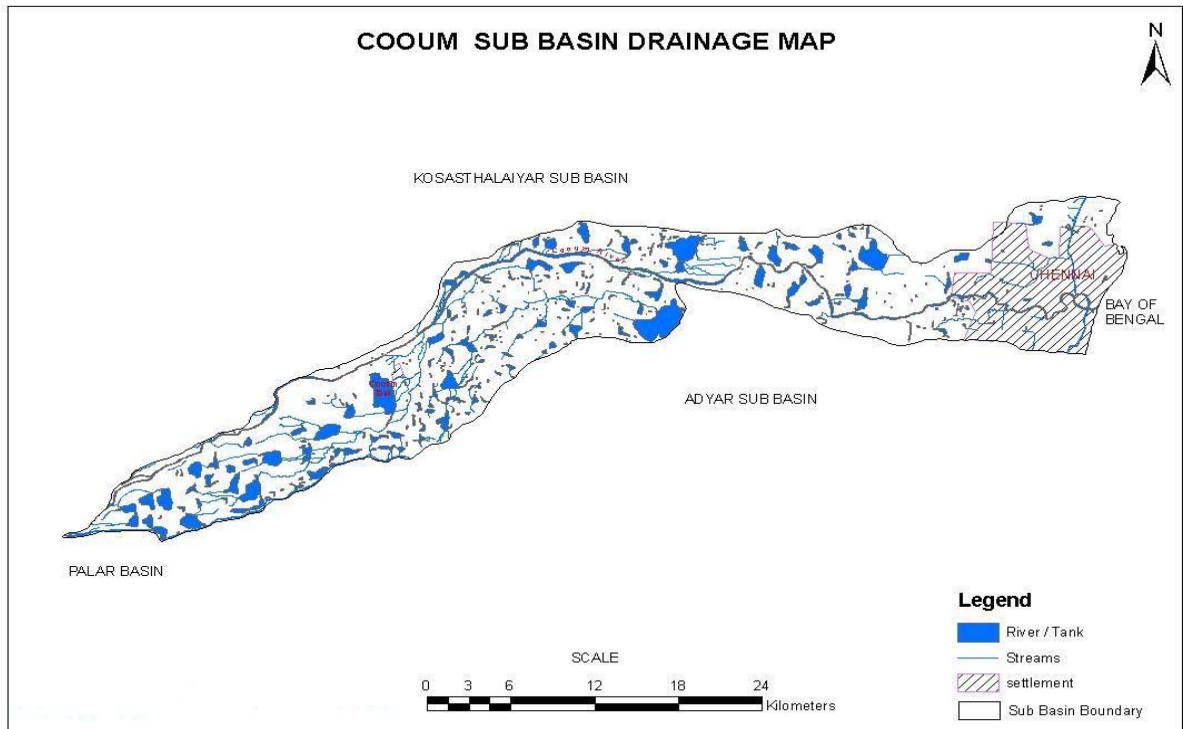
- I. Displacement of Families in the river banks
- II. Destruction of private property on the river banks
- III. Destruction of Biodiversity on the river banks
- IV. Disruption of Transport and communication systems
- V. Destruction of drainage and sewage system
- VI. Eroding of river banks
- VII. Adverse effect on Public Health

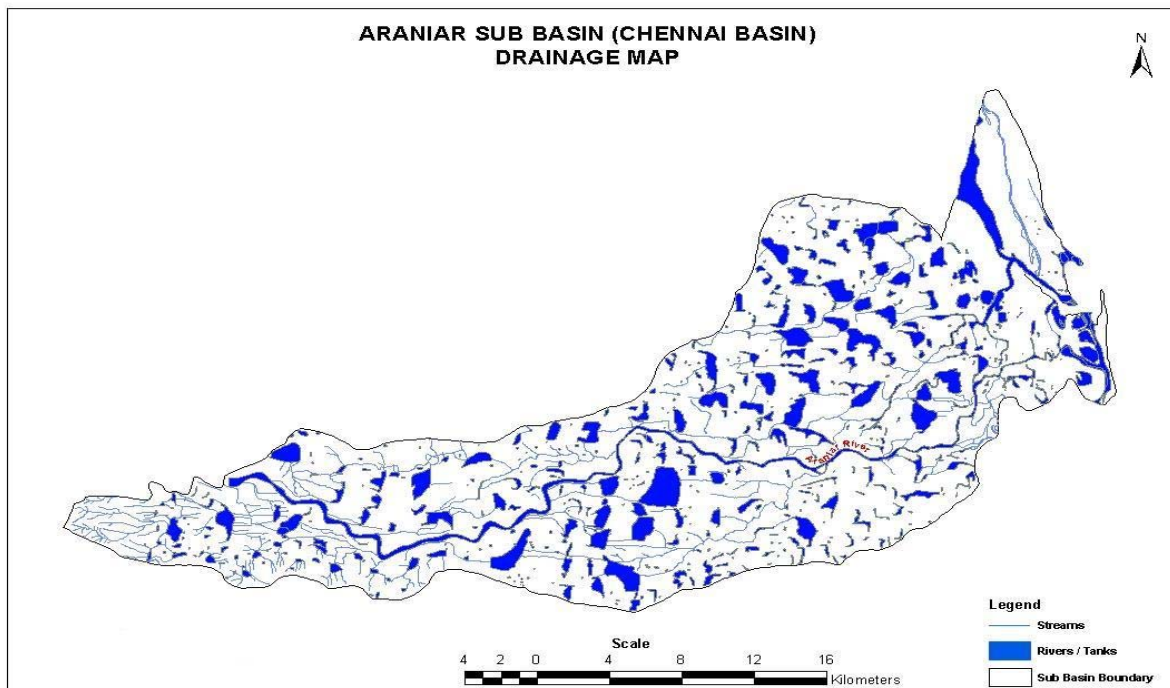
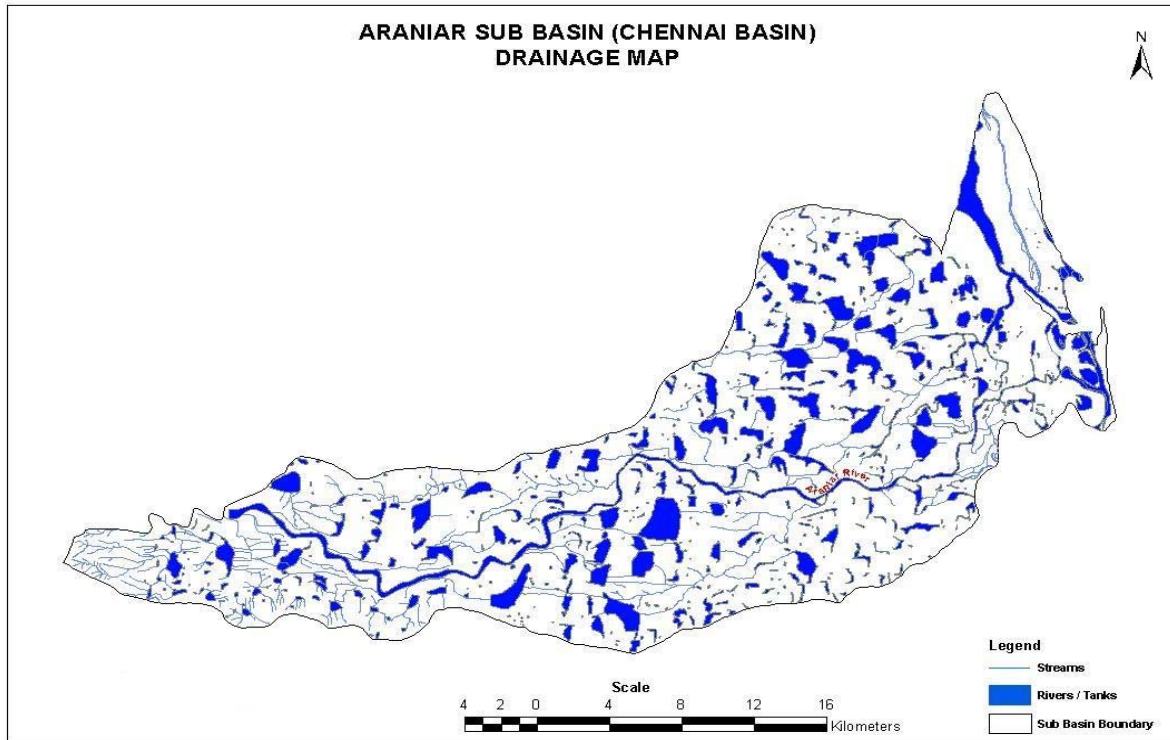
Flood Vulnerability is increasing with



- Rising population
- Haphazard Urbanization
- Developments in High-Risk zones
- Environmental Degradation
- Climate Change etc.







Function of Rivers and Drainages during Last Half Century

- Storm water & Flood conveyance during monsoon period
- Conveying untreated sullage, sewage and industrial effluents
- Dumping place for all sorts of solid wastes
- Place for Slums by encroachments

Inlets into Rivers and Drainages in CMA

- 512 micro drains falling into rivers & drainages
- 84% infalls are sewage & 11% storm water drainage.
- 27% infalls received by Cooum
- 29% infalls received by Buckingham Canal
- 19% infalls received by Adayar River

What we need is, therefore, the strategic thinking to be able to unfold scenarios before they really occur so that we can update our road map, revise our game plan, and sharpen our strategic sense.

Sharing of resources, pooling of expertise and leveraging of capacities come naturally with strategic thinking.

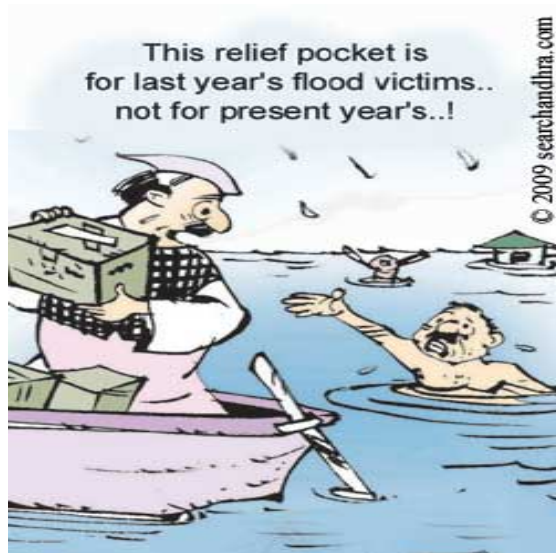
#1 – Know your problems in their entire varied dimensions

Flood provided challenge to us for answering the problems we face.

- How quick the community can respond to floods?
- Which are the locations known to be most vulnerable to the identified flood based on the past experience?
- What would be possible damage scenarios then?
- How much is the estimated economic worth of loss for every plausible damage scenario?
- What are the special problems of the disabled, the handicapped and the aged in the society?

#2 – Know your strengths- individual, combined and collateral- to face floods

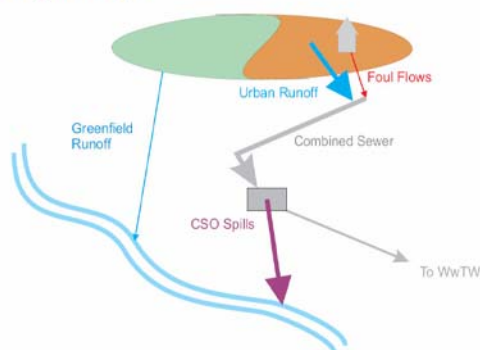
- Are the people of the area aware of, and familiar with the plan?
- Is the culture of mock-drills a part of the normal life of the people of the area?
- Are single and multi flood hazards maps of the area available to aid realistic risk assessment and facilitate development planning?
- How good is the infrastructure like hospitals, roads and bridges, communication system etc?
- Are we making a good use of the professional expertise available in the area?
- Are the new constructions in the area strictly regulated in terms of the prevalent building codes and byelaws?
- How much do you know about strengths of the neighbour hood (adjoining districts), and do you have an operational instrument of mutual help in the hour of crisis?
- How active and helpful are the NGO's and other community based organizations?



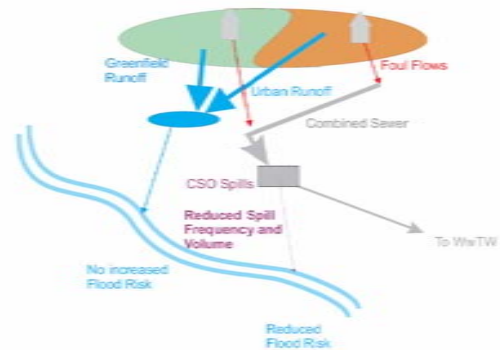
3 – Properly designed storm water drain

- The flat terrain of Chennai City literally necessitates effective Storm Water Drainage System to prevent flooding of streets.
- Chennai City which has 2815 k.m., of BRR's and Interior Roads requires Storm Water Drains in 70% of the total length of roads.
- Generally Storm Water Drains are constructed in roads which are 40 feet wide and above.
- Chennai flood made to find strategic solution for other streets from flooding
- Corporation of Chennai developed and maintains a Storm Water Drain net work of 334 km in the City.
- Corporation of Chennai, also maintains 16 canals of 27.92 K.M. criss-crossing city, from 2003-04.
- Rain water runoff gets drained through Storm Water Drain Net work & canals and reaches the sea via four waterways - Otteri Nullah, Buckingham Canal, Adyar River and Cooum River - running across the city.
- Remove surface water flows from the combined sewer
- Divert surface water to new strategic surface water systems
- By doing so, free capacity in the combined sewer for foul drainage from developments avoiding sewer system upgrades

Existing Drainage



Future Drainage

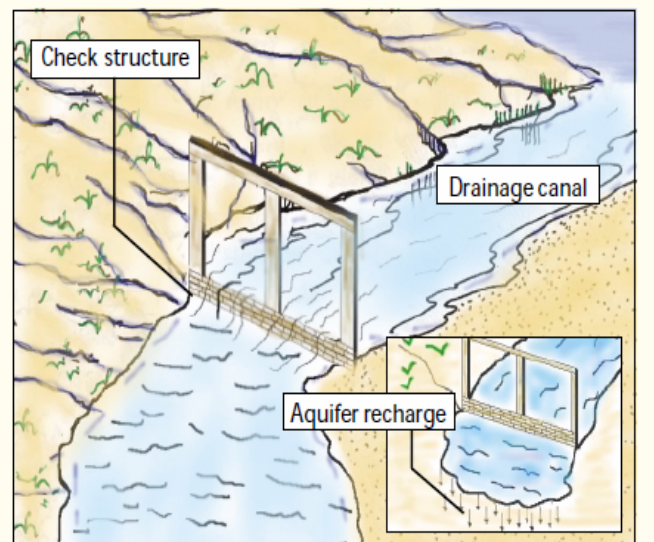




“Clogging of drains is the major problem. The practice of dumping all kinds of waste into the drains must stop.

People should realize that by dumping plastics waste into the drainage or canals, they are only inflicting harm on themselves. The impact of this practice is on them during rain”.

Recharge of aquifer



4 – Recharge of aquifer

- Flood water infiltration and ground water recharge of a shallow alluvial aquifer.
- Utilize the river bed/construct filter bed in a cascade manner for recharging aquifer during flood season.

5 – Optimize existing storage areas

- There are a number of flood storage areas, modify these to allow them to operate more effectively during flood events as urbanisation and the effects of climate change have altered river flows.

6 – Increase flood storage

- To increase flood water storage by looking for new storage areas and, or extending the existing storage.
- Increase the storage by deepening and rejuvenating the existing lakes.

Successful case study

- The Panama Canal is one of civil engineering's greatest triumphs.
- Engineers moved enough earth and rubble to bury the island of Manhattan to a depth of 12-feet, or enough to open a 16-foot-wide tunnel to the center of the Earth.
- How to tame the flood waters of the Chagres River, known to rise 25-feet in a single day during monsoon season?
- The engineers' solution was to erect a dam that, at the time, formed the world's largest man-made lake.
- The Canal operates as regularly today as it did in 1914. In each transit, 52 million gallons of fresh water is lost, but quickly replaced by Panama's heavy rainfall.
- The canal remains a testament to the combined skills of structural, geotechnical, hydraulic and sanitary engineers.

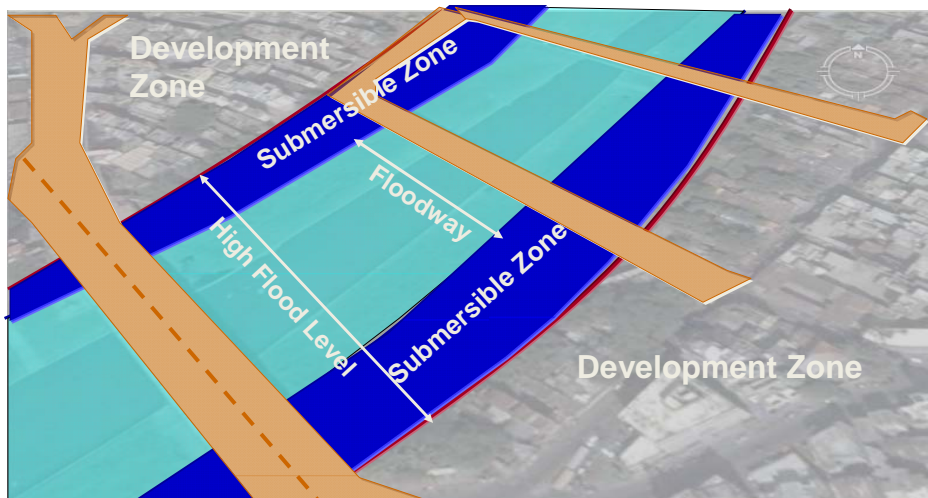
FUTURE ACTION PLAN FOR FLOOD FORECASTING & MANAGEMENT

1. **Installation of Remote Rain Gauging, level gauging and telemetry system for early warning** to control peak discharge from the Main Tank to within the limit during the rainy season
2. **Prevent encroachment** of the river and streams by declaration of Biodiversity Restoration Zones along the banks
3. **Use of Gabions/Reno Mattresses** on river banks for stabilization and allow percolation of water

Mapping and Delineation of the flood-prone area

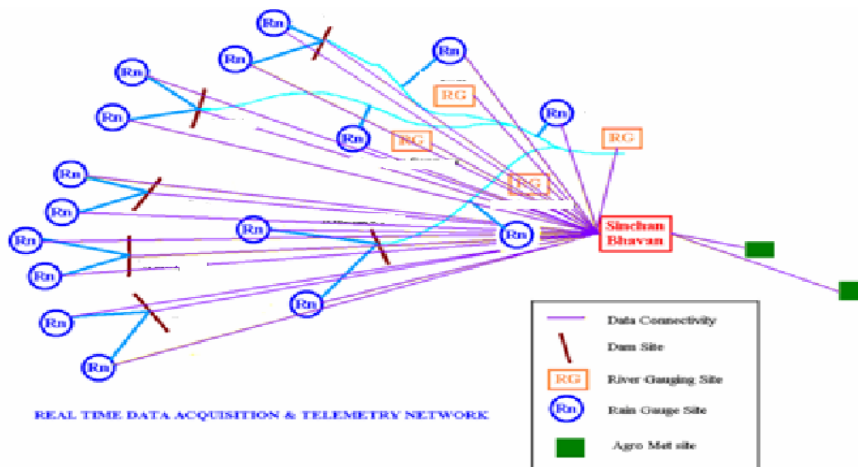
- **Use a probability-based analysis wherein systematic records and historical information on past flooding are used to develop a relation of probability of occurrence versus magnitude.**

Designation of Floodway (River Channel) and High Flood Level Components



Telemetry and Decision Support System for Flood Management

- Comprehensive Non Structural Flood Management System
- The proposed system can be divided into three important sub systems viz.
 - Telemetry System
 - Management Information System
 - Decision Support System



Methodology

- Telemetry System **gathers hydrological and meteorological data** such as
 - Rainfall data from rain-gauge stations in the catchment
 - Water level data from river gauge stations

- Reservoir level data from level sensors installed at the reservoirs
- Data is gathered without any human intervention
- Collected data is then presented to the **Management Information System and the Decision Support System**
- **Based on the received data and the pre-fed conditions/parameters/rules the system computes information required for controlling discharge of water**

Linking of Rivers for Chennai City Water needs during the Century

- Palar to Kosasthalaiyar : From Palar Anicut near Walajah to Poondi reservoir across Kosasthalaiyar through – Govindavadi channel, Kaveripakkam tank surplus, Cooum River, Kesavaram Anicut, Kosasthalaiyar River, Poondi Reservoir
- Palar to Adayar : From Palar Anicut near Walajah to Adyar river (Near Thiruneermalai) through Govindhavadi Cannel-Kambakkal Channel, Sriperumbudur tank and its Surplus, Chembarambakkam tank and its Surplus
- Araniyar to Kosasthalaiyar : From Araniyar Syphon across Araniyar river to Poondi reservoir across Kosasthalaiyar river through Kandaleru-Poondi Canal Anicut and in turn to Poondi reservoir.
- Cooum to Adayar : From Zamin Korattur Anicut across Cooum River (between Poonamallee and Tiruvallur) to Adyar through New Bangaru channel, Chembarambakkam tank and it's surplus course