# CHENNAI METROPOLITAN WATER SUPPLY AND SEWERAGE BOARD

# MEETING THE CHALLENGES IN WATER AND SANITATION

## *THE CHENNAI EXPERIENCE*

# STRUCTURE OF THE PRESENTATION

- General
- Water Supply Management
- Water Conservation Measures
- Sewerage Services Management
- PPP Initiatives

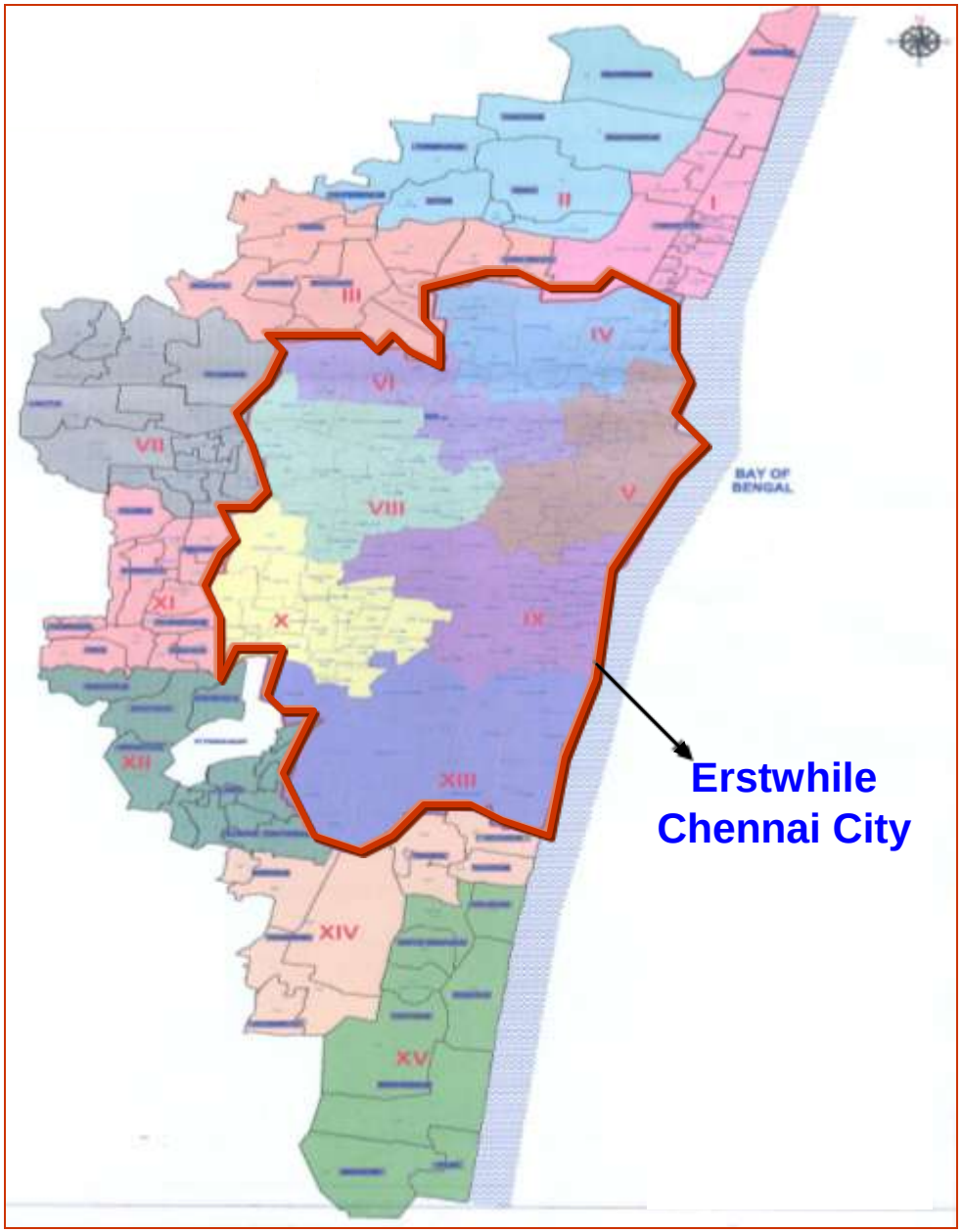
# Salient features of Chennai City

- Chennai, the capital of Tamil Nadu, is the fourth largest city in India
- The growth of the City started in 17th Century.
- Organized water supply commenced in 1872 & protected water supply in 1914



| | |
|---|---|
| 1. Geographical Area | : 426 Sq.Km |
| 2. Population | ; 6.73 Million (2011) (Expanded Chennai) |
| 3. Topography | : Flat |
| 4. Drainage | : Adayar & Cooum Rivers |
| 5. Average Rain fall | : 1100 mm to 1300 mm per year |
| 6. Temperature | : 30° c to 40° c |
| 7. Water Supply Sources | : Surface and ground water |
| 8. Present Supply Level | : 831 Mld (City 766 mld + Others 65 mld) |
| 9. Current Supply Rate | : Erstwhile Chennai City 145 lpcd + Added areas 40 lpcd |

# CMWSSB Area after Expansion

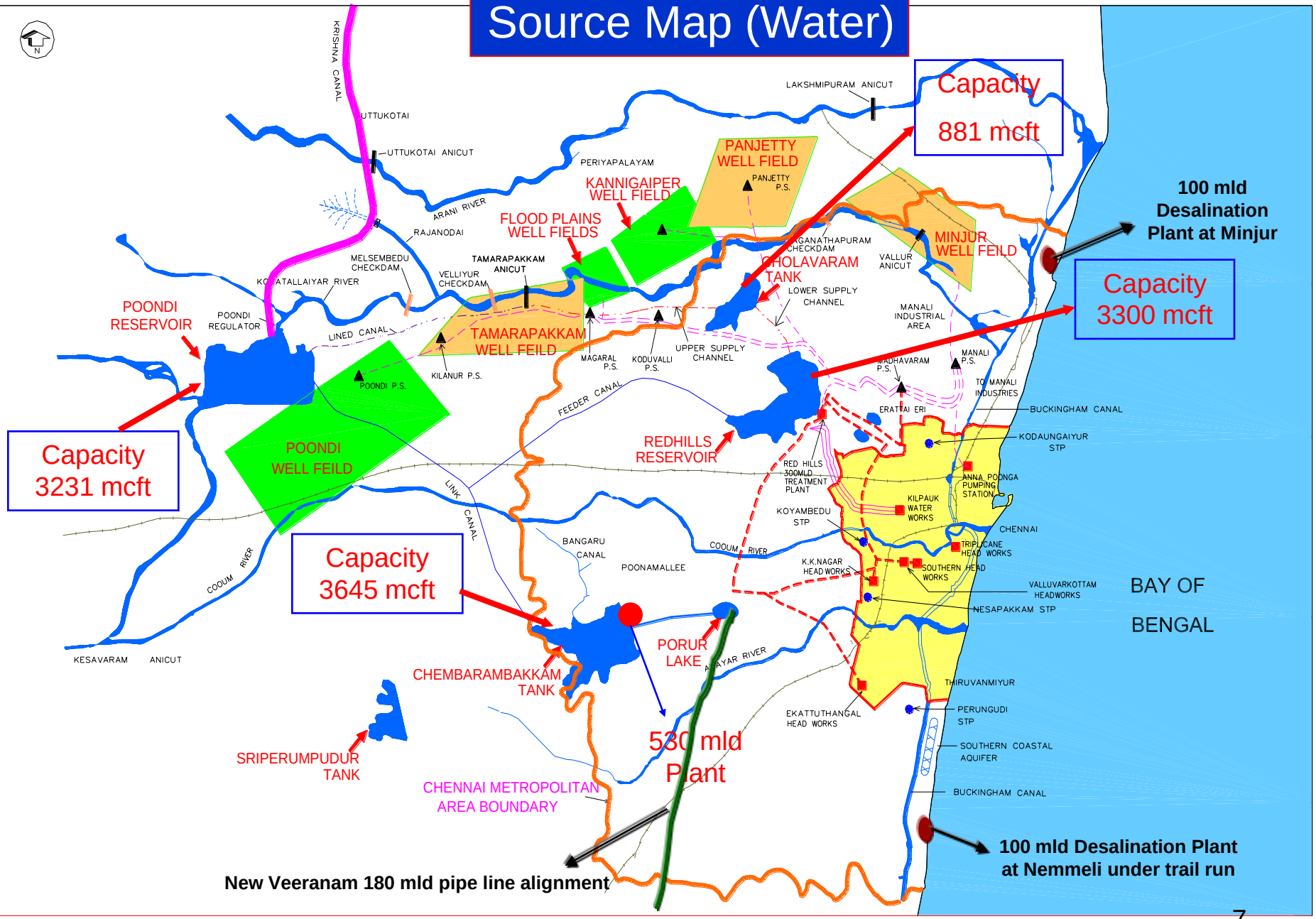


# Constitution of The Board

| | | |
|---|---|---|
| 1. | Hon'ble MINISTER<br>MUNICIPAL ADMINSTRATION & RURAL DEVELOPMENT | CHAIRMAN &<br>EX-OFFICIO DIRECTOR |
| 2. | PRINCIPAL SECRETARY<br>MUNICIPAL ADMINSTRATION & WATER SUPPLY DEPARTMENT | EX-OFFICIO DIRECTOR |
| 3. | PRINCIPAL SECRETARY<br>FINANCE DEPT | EX-OFFICIO DIRECTOR |
| 4. | MANAGING DIRECTOR<br>TWAD BOARD | EX-OFFICIO DIRECTOR |
| 5. | MEMBER SECRETARY<br>CMDA | EX-OFFICIO DIRECTOR |
| 6. | COMMISSIONER<br>CORPORATION OF CHENNAI | EX-OFFICIO DIRECTOR |
| 7. | MANAGING DIRECTOR<br>CMWSS BOARD | FULL TIME DIRECTOR |
| 8. | EXECUTIVE DIRECTOR<br>CMWSS BOARD | FULL TIME DIRECTOR |
| 9. | FINANCE DIRECTOR<br>CMWSS BOARD | FULL TIME DIRECTOR |
| 10. | ENGINEERING DIRECTOR<br>CMWSS BOARD | FULL TIME DIRECTOR |

# Water supply Management

# Source Map (Water)



# Chennai City Water Supply – Sources & Storage
# Total Storage Capacity 11.057 TMC

**Poondi – 3.231 TMC**

**Cholavaram – 0.881 TMC**

**Red Hills -3.300 TMC**

**Chembarambakkam – 3.645 TMC**

**Veeranam -1.465 TMC**

# Desalination Sources – Total Capacity 200 MLD

**Desal Plant Minjur – 100 MLD**
**(Commissioned on 30.10.2010)**

**Desal Plant Nemmeli - 100 MLD**
**(under trail run)**

# Water Treatment Plants
# Total Capacity 1494 MLD (Million Litres per Day)

**Kilpauk – 270 MLD**

**Red Hills – 300 MLD**

**Vadakuthu – 180 MLD**

**Chembarambakkam -530 MLD**

**Surapet – 14 MLD**

**Desal Plants – 100 MLD + 100 MLD (under trail run)**

# Water Supply Systems

**Sources / Reservoirs (5) & Desalination Plants (2)**

**831 MLD is supplied**

**Water Treatment Plants (5) – 1494 MLD**

**(100 MLD Desalination Plant at Nemmeli will be commissioned Feb 2013)**

**Water Distribution Stations (Head Works) – (16)**

**4444 kms**

**Distribution Network (2930 Kms) & Networks in added areas (1514)**

**House Service Connections (4,93,903)**

**Erstwhile City (3,96,483) + Added Area (97,420)**

**Consumers (7,29,389)**

**Erstwhile City (5,95,600) + Added Areas (1,33,789)**

# Daily Distribution of water to Chennai City

| | |
|---|---|
| **Pipeline / Lorry supply** | |
| 1.City | 686 MLD |
| 2.Added Areas | 80 MLD |
| **Sub Total** | **766 MLD** |
| Industrial Supply through pipeline | 37 MLD |
| Bulk Supply through pipeline | 28 MLD |
| **Grand Total** | **831 MLD** |

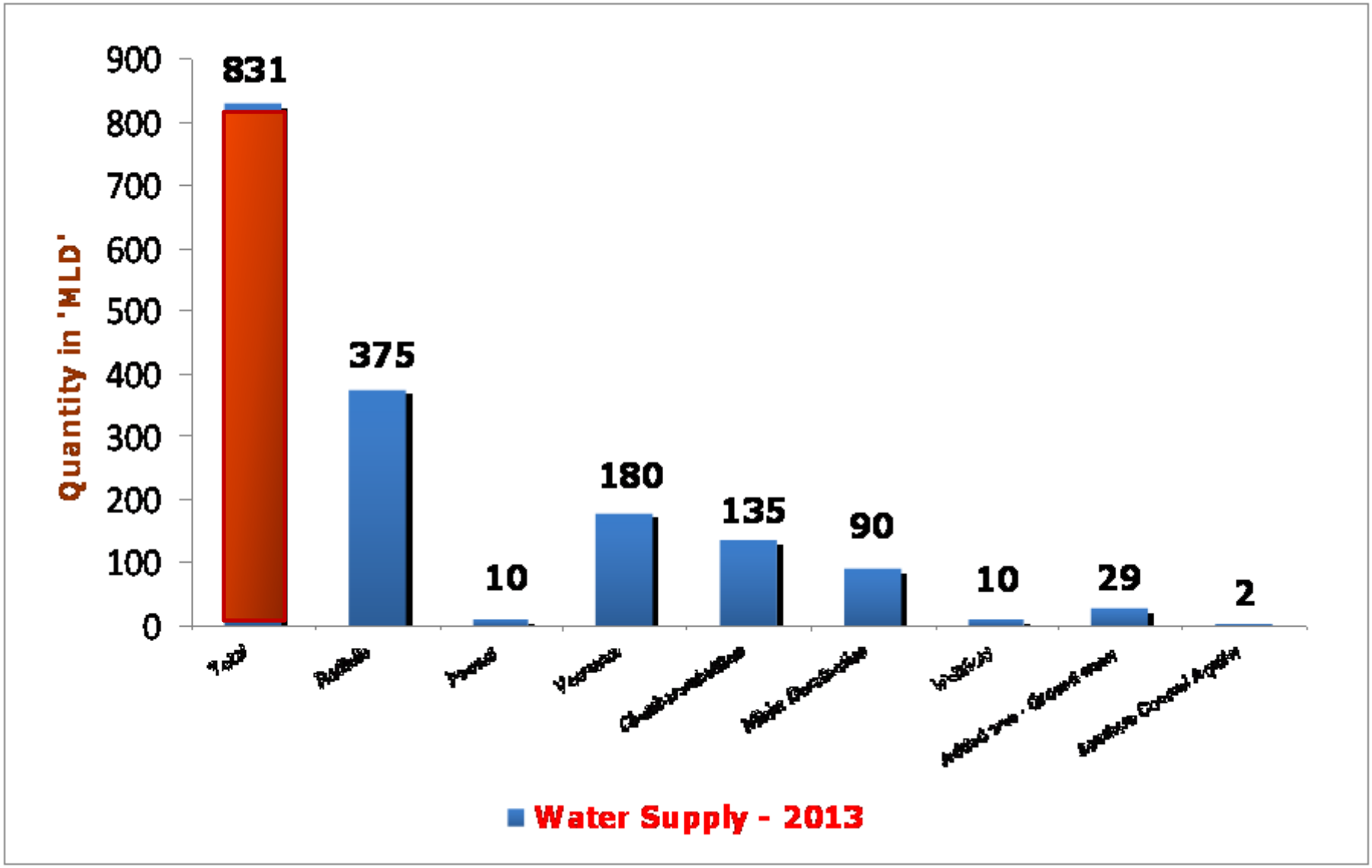
***PRESENT POPOULATION/DEMAND/SUPPLY/GAP***

- Demand For the present 6.73 Million Population = **1009 MLD**
- Present supply = **831 MLD**
- Gap = **178 MLD** **(100 MLD desal under trail run)**

FUTURE POPOULATION DEMAND – 2031 = **1447 MLD** **(Addl.Desal Plants – 400 MLD + 300 mld additional realization from Krishna water)**

FUTURE POPOULATION DEMAND – 2041 = **1783 MLD (Kaveri water – 900 MLD)**

# MULTIPLE SOURCES A CHALLENGE TO MANAGE



# Challenges in Water Supply

| Problems | Solutions | Status |
|---|---|---|
| Low Storage capacity of Reservoirs (only 12 TMC – we need 15 TMC) | New Reservoirs (3 TMC to be created and also Desalination Project) | Action by PWD |
| | | Feasibility study for 400 MLD Desalination plant. |
| Low Water Treatment capacity to meet future demand | New Treatment Plants (at least 2) necessary, | To be taken up on confirmation of sources/ allocation |
| Inadequate water carrying capacity from WTP to WDS | New lines between 530 MLD Water Treatment Plant and Water Distribution Stations. | Approval accorded and works to be taken up. |
| Inequitable distribution of water in the city (50 lpcd to 250 lpcd) | Pressure control valves and zoning methods necessary to maintain equal pressures | Being done |
| Frequent Leaks and Bursts due to very old pipes and encrusted pipes | Replacement of pipes (DI) in phased manner. | Permanent rectification works are being taken up periodically. |
| Low carrying capacity of pipes in distribution systems | Enlargement of pipes would ensure a flow and quantity. | Approved. Works already taken up (JnNURM/ Chennai Mega City Development Mission). |
| Non Revenue Water (NRW) / Unaccounted for water (UAW) | Volumetric Billing (Metering) & Enforcement | Works being carried out. |

# Challenges to meet additional water requirement - Added Local Body areas

- 42 Adjacent Local Bodies to be included within the Chennai City
- Present Per Capita supply is about 40 lpcd against the norm of 150 lpcd
- The total requirement for these added areas is 400 MLD
- Desalination is the option to meet the additional requirement. Consultants in place for DPR.
- To meet the future demand for the year 2041 new water source (Kaveri) to yield 15 TMC is planned (Feasibility study is in progress).

# WATER CONSERVATION MEASURES

- ✓ **Introduction of Ground Water Regulation Act – 1987 and amendment made in 2002**
- ✓ **Construction of Check dams**
- ✓ **Leak Detection and Rectification works**
- ✓ **Reuse of Waste water for Industrial use**
- ✓ **Rain water Harvesting**

# Sewerage Management

# Sewerage Systems

**Sewage generation per day (580 MLD)**

↓

**Connections (4,45,260)**
**Erstwhile City (3,67,297) + Added Area (77,693)**

↓

**Length of Sewer main (4265 kms)**
**Erstwhile City (2875 kms) + Added Area (1390 kms)**

↓

**No. of Pumping stations (218)**
**Erstwhile City (198 nos) + Added Area (20 nos)**

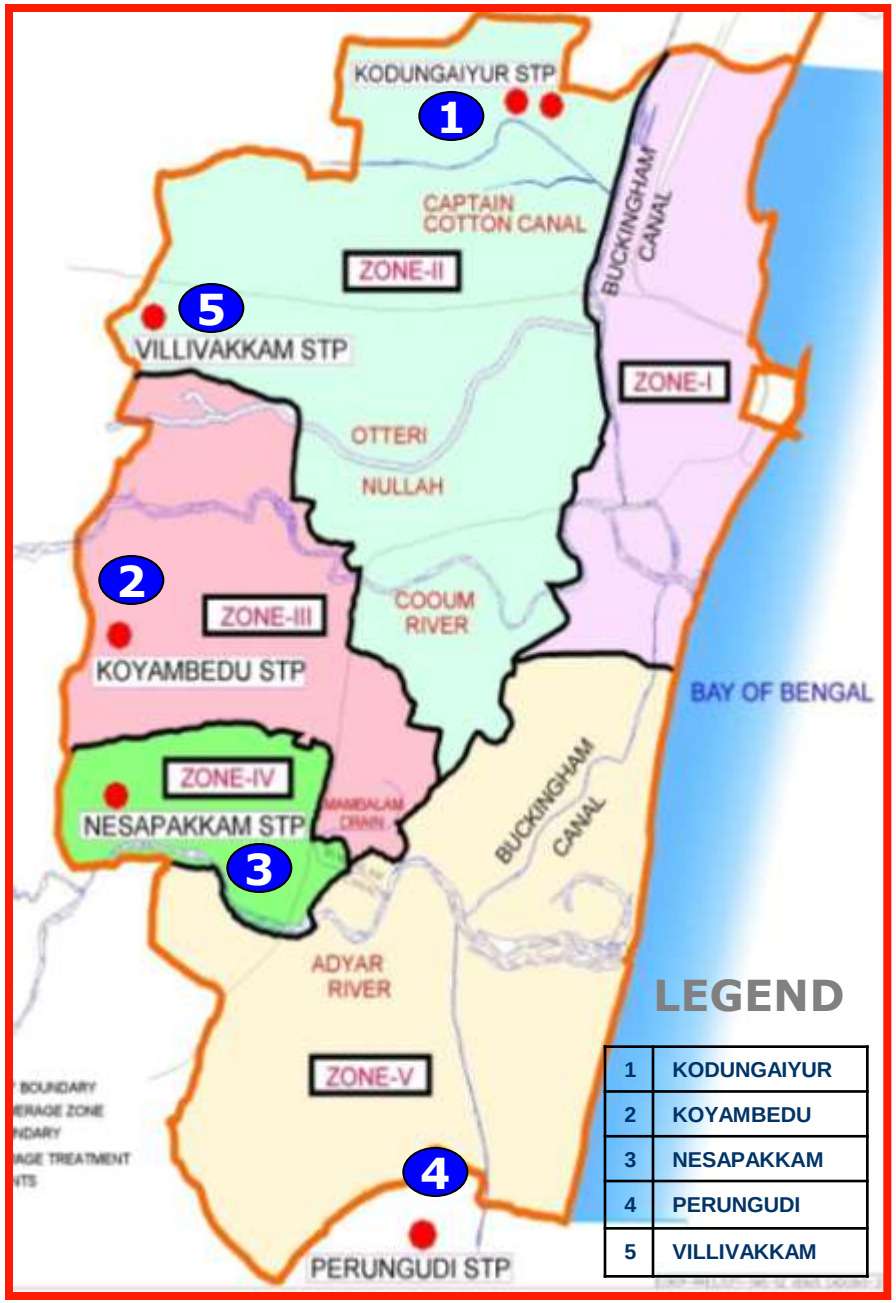
↓

**No. of Treatment Plants (10)**
**(Treatment capacity available 558 mld)**

↓

**Water ways / End Product**
**(35 MLD Secondary Treated sewage given to Industries**
**516 MLD let into City Water ways**
**after secondary treatment)**

# Sewerage system in Chennai city




| | |
|---|---|
| No. of consumers | 6,10,318 |
| Length of sewer mains | 4,266 Kms |
| No. of Pumping Stations | 218 |
| Treatment Plants | 10 Nos. |
| Existing Sewage Treatment Capacity | 558 mld |
| Sewage Treatment Plant (under construction) | 264 mld |
| Sewage Treatment Plant (Proposed) | 220 mld |

# Sewerage Treatment Plants

## Koyambedu


Treatment Capacity = 94 MLD

## Nesapakkam

Treatment Capacity = 63 MLD

## Perungudi

Treatment Capacity = 54 MLD

## Kodungaiyur

Treatment Capacity = 270 MLD

# Sewerage Treatment Plants- Power Production from Bio-gas


**Bio-Scrubber**

**Gas Engine**

# Challenges in Sewerage Services

| Problems | Solutions | Status |
|---|---|---|
| Inadequate / Sewage Pumping mains | Lines between pumping stations and STPs to be laid. | Improvement works being carried out periodically. |
| Inadequate sewage Treatment capacity | Additional STPs necessary at the right places | Under Progress – 264 MLD<br>Proposed – 220 MLD |
| Frequent leaks and Bursts of pipe lines | Enlargement of Pipes / replacement of old pipes | Improvement works being carried out periodically. |
| Frequent Blocks and overflows through manholes | Maintenance Issues (on emergency basis / less priority to preventive maintenance) | Systems strengthened & usage of machinery increased (Man entry into sewers is now completely prohibited) |
| High volumes of rain water getting into systems | Problematic areas need to be provided with storm water drains by Corporation of Chennai. | Co-ordination with other service departments to ensure effective dewatering. |
| Untreated sewerage into water ways | Sewerage Pumping Stations, Pipelines and Sewerage Treatment Plants | Approved. Works already taken up (JnNURM/ Chennai Mega City Development Mission). |
| Illegal disposal of sewage | Enforcement | Being done |
| Treated sewage wasted in water ways after incurring huge cost towards treatment. (The treated sewage is a potential resource for saving the fresh water) | TTRO | About 35 MLD of secondary treated sewage is supplied to industries apart from 7 MLD of raw sewage.<br>Another 45 MLD of TTRO water is proposed to be supplied to industries by 2016 |

# Meeting the Challenges in Sewerage Treatment – Savings in power cost using Bio-Gas produced in STPs

| **Power Generation** | |
|---|---|
| 1.From 4 Old STPs 270 MLD | 31,000 KwH/day |
| 2.From 2 STPs under construction 114 MLD | 16,000 KwH/day |
| 3.From Koyambedu STP 120 MLD | 17,000 KwH/day |
| 4.From Villivakkam STP 150 MLD | 22,000 KwH/day |
| Total | 86,000 KwH/day |
| **Expected Bio gas power in the year 2030** | **1,72,000** KwH/day |
| Expected revenue from Bio gas plant (120 MLD STP at Koyambedu) | |
| a. Electricity units (17000 units x Rs.4.50 x 30 days) | Rs.22,95,000 |
| For 12 months | Rs.2.75 crore/annum |
| b. Clean Development Mechanism (CDM) | |
| Investment for CDM credit (120 MLD x 0.8 T x 365 days x Rs.720) | Rs.2.52 crore/annum |
| Total earnings/year (a+b) | Rs.5.27 crore |
| Investment for gas generation | Rs.27.09 crore |
| Pay back period (27.09/5.27) | 5.1 years (say 5 years) |

Note: **CMWSSB is in the process availing Carbon Credit for reduced carbon emissions and saving power**

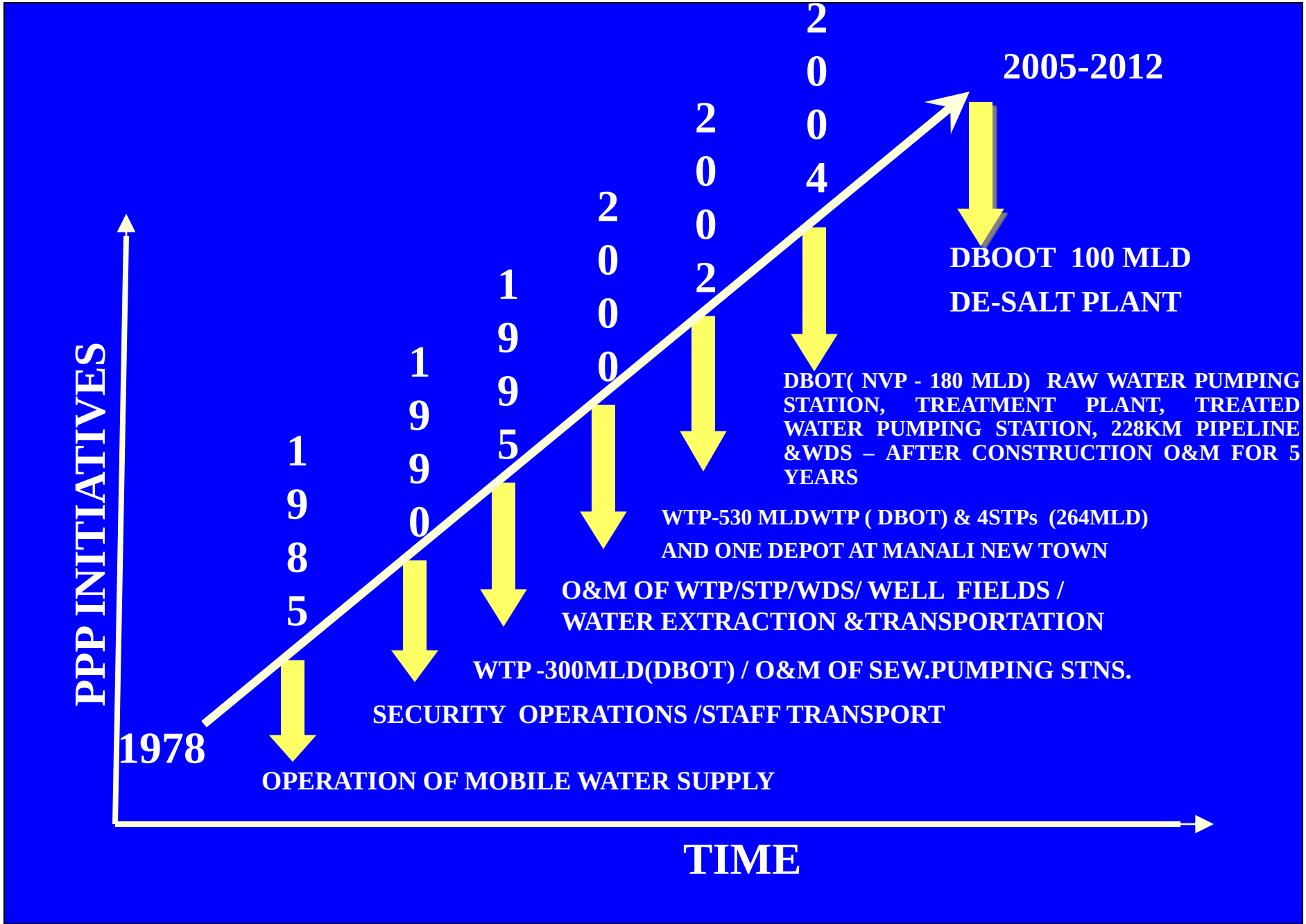
# Details of Biogas production and Gas engine at 5 STPs

| Sl. No | Location of STP | Capacity of gas engine (KW) | Gas Engine commissioned on | Total power generated up to Jan 2013 (KWH) | TNEB power savings up to Jan 2013 Rs in lakhs |
|---|---|---|---|---|---|
| 1 | Kodungaiyur 110mld | 1064 | Aug 06 | 2,95,72,570 | 1184.67 |
| 2 | Perungudi 54mld | 1064 | Aug 06 | 1,96,06,920 | 785.08 |
| 3 | Perungudi 60mld | 1064 | Jan 12 | 17,82,890 | 72.30 |
| 4 | Koyambedu 60mld | 625 | Oct 05 | 1,30,75,000 | 523.75 |
| 5 | Nesapakkam 40mld | 469 | May 06 | 1,17,81,142 | 471.74 |
| | Total 324 mld | 4286 | | 7,58,18,522 | 3037.54 |

# EVOLUTION OF PPP IN CHENNAI METROWATER

- ***Operation of Mobile water supply system***
- ***Outsourcing of Design/Consultancy services***
- ***Staff transport operations***
- ***O&M of water and sewerage installations***
- ***Water extraction from private sources***
- ***Computerization of Billing and Collection***

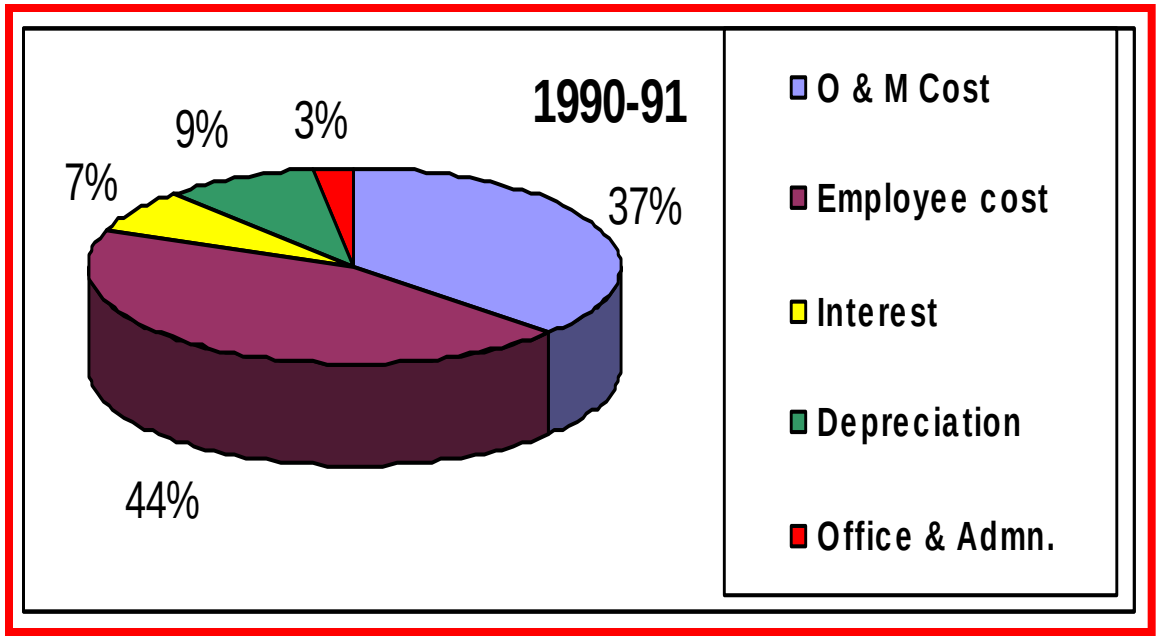
# HISTORY OF PPP IN METROWATER

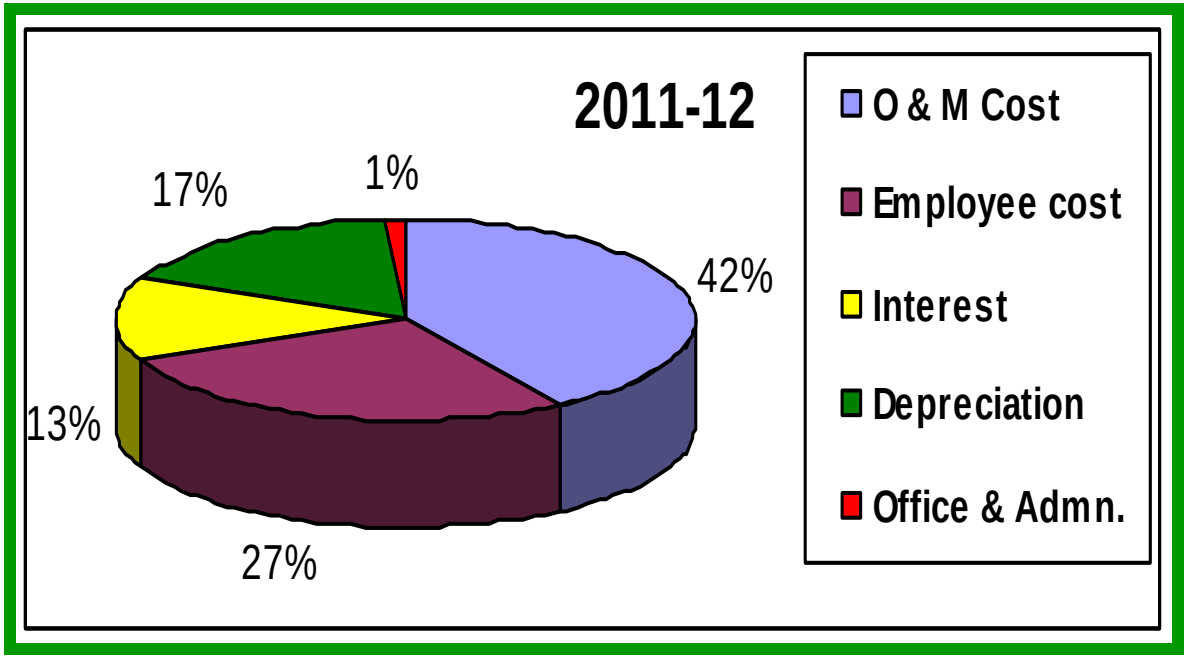


# Cost Savings through Private Sector Participation

| Details | Quantity | Cost Savings % |
|---|---|---|
| O & M of Water Treatment Plant | 2 No (3 Nos) | 10 |
| O & M of Water Distribution Stations | 16 Nos (16 Nos) | 30 |
| Water Transport Operations | Full | 18.5 |
| O & M of Sewage Treatment Plants | 6 Nos (6 Nos) | 33 |
| O & M of Sewage Pumping stations | 158 Nos (218 Nos) | 50 |

# PPP –The Cost Advantages



# Cost Comparison for Treatment of water at different Water Treatment plants

| Sl.No | Description | Cost for Treatment of 1 kilo litre of water |
|---|---|---|
| 1 | Red hills system | 1.41 |
| 2 | Veeranam | 2.26 |
| 3 | Chembarambakkam | 2.24 |
| 4 | Surapet | 3.78 |
| 5 | Wellfields | 12.94 |
| 6 | Desal water (Under DBOOT)<br>Desal water (Under EPC+7 yrs Maintenance) | 48.63<br>30.00 |
| 7 | Tertiary treated water for Industrial use (Proposed) | 45.00 |


THANK YOU