

6. WATER SUPPLY AND SANITATION



6

WATER SUPPLY AND SANITATION

நீர்இன்று அமையாது உலகெனின், யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு.

– திருக்குறள் 20

When water fails, functions of nature cease, you say: Thus
when rain fails, no men can walk in “duty’s ordered way”.

– Thirukkural 20

Introduction

UN has recognised “The Right To Safe And Clean Drinking Water And Sanitation As A Human Right”. India voted in favour of this.

In India, Tamil Nadu occupies about 4 per cent of the geographical area and 6.04 per cent of the population but the available water resources is only 3 per cent of that of the Country. The national decadal growth rate was 17.64 per cent and the growth rate between 2001 and 2011 for Tamil Nadu stood at 15.5 per cent. Tamil Nadu is one of the most urbanised States with 48.45 per cent of its population living in urban areas. The average rainfall is 925 mm against the average rainfall of 1170 mm of the Country. It varies from 1200 mm near coastal areas to 550 mm in inland area. Though Tamil Nadu receives rainfall in the North east as well as south west monsoons, the precipitation is limited to about two months only. Thus Tamil Nadu is a deficit state from the point of view of water resources both for irrigation and drinking water and is dependent on the monsoons very heavily. Variations in the monsoon have serious impact on the economic life and

livelihood of its people especially in rural areas.

The task of providing safe drinking water and sanitation facilities for the rural areas in the State is the responsibility of the Department of Rural Development & Panchayat Raj and Tamil Nadu Water Supply & Drainage Board (TWAD).

The Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) has been playing a crucial role in delivery of protected water supply and sewerage services to the Chennai Metropolitan Area. In the case of urban local bodies, other than Chennai Metropolitan Area, the Tamil Nadu Water Supply and Drainage Board (TWAD Board) has been responsible for water supply and Sanitation. The Municipal Corporations and Special Grade Municipalities are also empowered to take up water supply schemes on their own.

In the Eleventh Five Year, an amount of ₹7555 crore was allocated for the Water Supply and Sanitation Sector. Out of this ₹3002 crore has been allocated for Rural Water Supply, ₹3281.79 crore for Urban



Water supply and sanitation ₹1271.86 crore for Sewerage. Provision of Drinking Water Supply has been ensured to all habitations, though a small proportion of them are

partially covered. Sanitation sector requires attention as there are still large areas that are not covered with basic facilities.

Water Supply

Rural Water Supply

The objective of providing Water Supply and Drainage facilities to rural and urban areas of Tamil Nadu other than Chennai Metropolitan Area is the main mandate of Tamil Nadu Water Supply and Drainage Board.(TWAD) TWAD Board has built up its capacity and capability considerably in all sectors and is ensuring effective implementation of water supply and sewerage schemes. The activities of the TWAD board include Planning, Investigation, Design Implementation and Commission of Water Supply and Sewerage Schemes in rural and urban areas, Operation and Maintenance of Combined Water Supply Schemes, Water Quality Monitoring and Surveillance Programme, activities on sustainability of drinking water sources and Training and Capacity building as shown in Table 6.1.

Table 6.1: Status of Rural Water Supply

Status	Habitations
Fully covered	84003
Partially Covered	10611
Uncovered	Nil
Total	94614

Source: Tamil Nadu water Supply & Drainage Board

Modified rural water supply guidelines issued under National Rural Drinking Water Project (NRDWP) emphasize a paradigm shift from the existing habitation coverage into household coverage as issued by the Government of India. A State Level Water and Sanitation Mission (SWSM) was formed in Tamil Nadu in 2009 to achieve the above goals and also for the effective implementation of works under the NRDWP.

A survey was conducted in the State in 2011, to assess the status of water supply coverage in the habitations. As per the survey, out of total 94,614 habitations, 84,003 habitations (89%) were supplied 40 LPCD or more (fully covered) and 10,611 habitations were provided 10 to 39 LPCD water (partially covered). There were no uncovered habitations at the end of the Eleventh Plan. (See Table 6.1) Rural habitations are covered through Individual Power Pump Schemes and Combined Water Supply Schemes. District wise coverage data of drinking water supply is given in the Annexure 6.1.

Review of Eleventh Five Year Plan Performance

During the Eleventh Five Year Plan period, TWAD board executed various water supply projects to the tune of ₹3865.23 crore benefitting 44,001 habitations. Yearwise details of the habitations benefitted and the expenditure incurred for Rural Water Supply by TWAD Board is given in Table 6.2.

Table 6.2: Performance of Eleventh Plan

Year	Habitations benefitted	Expenditure
		(₹ crore)
2007-08	12549	749.69
2008-09	10255	824.48
2009-10	8193	872.02
2010-11	7004	666.04
2011-12	6000	753.00
Total	44001	3865.23

Source: Tamil Nadu water Supply & Drainage Board



Coverage of habitations also involves schemes for water supply to schools, anganwadis, primary health centres, government hostels in rural areas. In addition to water supply schemes, programmes for artificial recharge of ground water, Quality monitoring and surveillance, Testing and arresting contamination were also implemented by TWAD Board. Among the programmes implemented for rural water supply, Combined Water Supply Schemes & Minimum Needs Programme of the State and National Rural Drinking Water Programme of the Government of India are the major programmes. With a view to enhance the

sustainability of drinking water sources, recharge structures such as check dams and recharge shafts have been constructed. Independent Water Purification Systems were also installed in water quality affected areas for the benefit of rural communities and schools.

The total outlay provided for the Rural Water Supply sector for the Eleventh Five Year Plan was ₹3002 crore. The expenditure during the Plan was ₹3865 crore. The cumulative performance of Rural Water Supply during Eleventh Five Year Plan is given in Table 6.3.

Table 6.3: Performance of Rural Water Supply in Eleventh Plan

S.No	Programme	Unit	Target	Achievement
1	Coverage of Habitations	Nos	40880	44001
2	Water Supply Schemes to Schools	Nos	9436	9427
3	Rejuvenation of Water Supply Schemes to Schools	Nos	4186	5043
4	Water Supply Schemes to Anganwadis	Nos	20738	20738
5	Water Supply Schemes to Primary Health Centre	Nos	239	239
6	Water Supply Schemes to Veterinary Hospitals	Nos	314	314
7	Water Supply Schemes to BC/ MBC, TW/ADW Hostels	Nos	578	578
8	Water Supply Schemes to Cattle Market, Bus stand, Weekly market	Nos	744	744
9	Recharge Structures	Nos	2143	2861
10	Rural Water Supply Under Minimum Needs Programme/ ARWSP/NRDWP (Spl. Components)	Nos	12928	12928
11	Rural Water Supply Under Minimum Needs Programme /ARWSP/NRDWP (TSP Plan)	Nos	1436	1436
12	Schemes for Artificial Ground Water Recharge Structure	Nos	1412	1412
13	Jalmani -Standalone Purification System	Nos	8500	8500
14	Water Quality Monitoring and Surveillance - Testing of water sources by laboratories	Nos	556734	556734
15	Water Quality Monitoring and Surveillance – Supply of Field testing kit to Village Panchayats	Nos	16628	16628
16	Supply of field H ₂ S vials to Panchayat Presidents to test for bacteriological contamination	Nos	1803068	1803068

Source: Tamil Nadu Water Supply and Drainage Board



Goals, Objectives & Strategies of Twelfth Five Year Plan

The State has set a Vision to provide “A World Class, Secure, Affordable and Sustainable Water Supply, Sanitation and Sewerage system Accessible to Every Citizen of Tamil Nadu” by the end of 2023. The objectives of the Twelfth Five Year Plan would be towards achieving the goals set by the Vision 2023 by ensuring Drinking Water Security and Source Sustainability.

Ensuring Drinking Water Security

The State envisions provisioning of minimum water security to all households and individuals. In the process of providing water security, the State would consider providing minimum quantity of water – even bottled water in minimum quantities to ensure that the poor and the vulnerable do not suffer.

The Twelfth Five Year Plan will see a paradigm shift with respect to water and the prime focus would be water security instead of mere water supply. The State would ensure to all citizens at least the minimum quantity of water required for drinking and cooking needs in safe and wholesome quantity and a desirable quality of water for other domestic use. Water security would include ensuring that water sources and related eco-systems are not only protected but also improved so that each person has access to adequate safe water at affordable cost to lead a healthy life protected from water borne diseases. Safe water is essential for sustenance of human health and life. The available water resources are finite and these are likely to get affected to a large extent by environmental degradation and climate change.

A State Water Policy is on the anvil and it would provide a strategic vision for the sector with ecological balance and equity. Demand management would be central to all planning and actions related to water. The policy would be governed by two principles

“Public Trust” and “Right to water”. The first implies that water is held by the State on behalf of the community and the second implies that the State shall ensure minimum quantity of water to individuals.

Rain Water Harvesting (RWH)

Rain is the pre-dominant source of all fresh water on earth. Rain Water Harvesting is relevant for both rural and urban areas and at Macro and Micro levels. Rain Water harvesting in rural areas is mostly traditional and is carried out in surface storage bodies like rivers, tanks, ponds, lakes etc., but in urban areas, due to lack of open space for capturing the runoff. RWH is mostly carried out in sub-soil storage as groundwater by injecting large amounts of rainwater into the soil during rains. Highest priority is being accorded for RWH works in rural areas. Nearly 75 per cent of works taken up under MGNREGS are RWH works.

RWH in urban areas unlike rural areas has to be carried out at both the macro and micro levels. It is the responsibility of the State to enforce and mandate at the macro level in terms of policy. The responsibility of implementing it at the micro level is vested with the society, namely, the households.

Rain water harvesting structures have been created throughout the State during the Tenth Plan period. This intensive programme had helped the ground water table to rise substantially and had led to better recharge of underground aquifer. In accordance with Government policy, the Urban Local Bodies (ULBs) have now initiated various measures for the rehabilitation of the rain water harvesting structures. Further, wherever rain water harvesting structures in ULBs are under repair, the ULBs have been asked to restore the structures. The awareness programme for Rain Water Harvesting is being continued in all ULBs. An action plan has been drawn by ULBs for the Revival, Rehabilitation and Maintenance of Rain Water Harvesting structures.



Water Quality

Water quality issues arise due to chemical pollution through excessive fertiliser use and reckless dumping of untreated waste into our rivers and water bodies. Increased and unscrupulous usage resulted in the disposal of waste water into the nearby water bodies without adopting safe disposal methods. Also most of the waste water and sewage water generated in the cities are partially let into the water bodies leading to major water quality problems of both the ground and surface water sources.

The present status of water quality in terms of Potability in Tamil Nadu in respect of major parameters such as Iron, Fluoride, TDS, Nitrate, Faecal Coliform bacteria in water has been mapped based on the testing of 3,42,854 drinking water sources up to 2011 and as shown in Table 6.4. As per the test results, it is evident that all the districts have at least any one of the quality problems and 3.94% of sources are having quality problem. It is essential to recognize water quality as a dynamic factor, and periodic testing should be conducted to ensure the quality as shown in Table 6.4.

Table 6.4: Contamination of Water Sources

S.No.	District	Sources Tested	Sources Contaminated	Percentage of Contamination
1	Ariyalur	4270	41	0.96
2	Coimbatore	7823	3302	42.21
3	Cuddalore	13935	0	0.00
4	Dharmapuri	10435	1320	12.65
5	Dindigul	14404	78	0.54
6	Erode	13023	229	1.76
7	Kancheepuram	13212	25	0.19
8	Kanniyakumari	4111	12	0.29
9	Karur	13063	753	5.76
10	Krishnagiri	9373	100	1.07
11	Madurai	12814	475	3.71
12	Nagapattinam	6321	286	4.52
13	Namakkal	12373	333	2.69
14	Perambalur	2495	90	3.61
15	Pudukkottai	14589	13	0.09
16	Ramanathapuram	7147	926	12.96
17	Salem	18653	1886	10.11
18	Sivaganga	11920	1278	10.72
19	Thanjavur	15164	221	1.46
20	The Nilgiris	2692	0	0.00



Table 6.4: Contamination of Water Sources (Contd.)

S.No.	District	Sources Tested	Sources Contaminated	Percentage of contamination
21	Theni	3892	2	0.05
22	Thiruvallur	10882	260	2.39
23	Thiruvarur	6551	83	1.27
24	Thoothukkudi	6692	19	0.28
25	Tiruchirappalli	12602	24	0.19
26	Tirunelveli	13395	9	0.07
27	Tiruppur	9500	101	1.06
28	Tiruvannamalai	19076	7	0.04
29	Vellore	27067	370	1.37
30	Villupuram	13489	0	0.00
31	Virudhunagar	11891	1278	10.75
Total		342854	13521	3.94

Source : Tamil Nadu Water Supply and Drainage Board

Water Quality Surveillance and Monitoring

In order to achieve the objective of ensuring quality water supply to the public, the TWAD Board has established one State level, 31 District level and 51 Sub divisional level laboratories. These laboratories have facilities for testing all the basic water quality parameters and for effective surveillance and monitoring of water supply sources in both rural and urban areas. It is pertinent to note that the State Level Laboratory, Chennai which was awarded ISO 9001-2000 Certification during January 2004, has now been upgraded to ISO 9001:2008 Certification. This laboratory has been recognized as the State Referral Institute for Tamil Nadu by the Government of India. All the drinking water sources would be tested periodically with the help of local bodies and the community.

Source Sustainability

In Tamil Nadu more than 90 percent of the available surface water and 45 percent of the ground water has been utilized. But the demand for water is continuously on the rise with the growth of population, and increasing growth in Industrial and Agricultural sectors. But the availability of water remains constant. Under the above circumstances the present trend of consumption would not be sustainable.

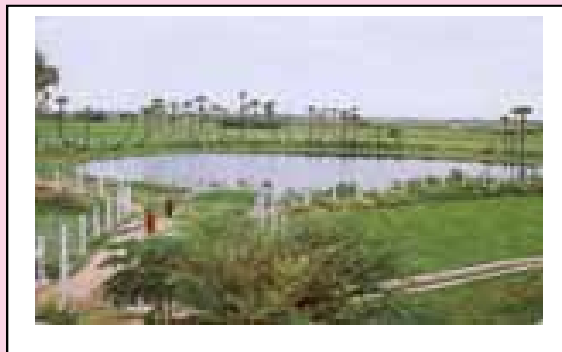
Hence, there must be a judicious mix of using not only the available water resources namely surface water and ground water, but also to use recycled waste water. In addition, conservation of available water resources and harvesting rain water can sustain us from a potential water crisis.



BOX 6.1: Rejuvenation of Traditional Water Bodies

Ooranies are traditional water bodies created to harvest rain water for drinking and other purposes. There are many Ooranies exclusively kept for drinking water purposes. Before the advent of modern drinking water supply schemes, Ooranies were used for collection and preservation of rain water. But over the period, such Ooranies were abandoned and became defunct. The Rejuvenation of Ooranies project has ensured clean water for the communities throughout the year with minimum O&M cost. In Edaiyur village in Kanchipuram district, an attempt was made by the Department of Rural Development & Panchayat Raj with support of an NGO-DHAN and technical support from Water Resources Department, Anna University to rejuvenate the Oorani for drinking water purpose.

The 'Edaiyur model,' attracted the attention of many, including the German Government. It is not that the villagers do not have any source of water. A full 'Oorani' will hold three million litres of water. The model is unique that it is decentralised management supported and ably administered by the people themselves. People also carry out the monitoring of water quality, inflow of water in the pond, losses of water due to evaporation, consumption and seepage. It is a self sustaining model where no power was used and recurring cost was nil.



Source: *The Hindu*, July 19, 2004.

Surface Water

Tamil Nadu has 17 major river basins with a surface water potential of 853 Thousand Million Cubic feet (TMC). More than 90% of the surface water has already been utilized. The State has initiated several schemes in the Twelfth Five year Plan for interlinking of rivers in the State. This allows for equitable distribution of water. This has been dealt with at length in the Irrigation sub chapter in the Agriculture Chapter of the document. There are 79 reservoirs having a total storage capacity of 243 TMC. These are essentially irrigation reservoirs. It has been estimated that an average of 177 TMC water flows into the sea as surplus in the years of more than average rainfall. The State is constructing check dams to arrest runoff and attempt storage of water for beneficial use.

Ground Water

About 73% of Tamil Nadu comprises of hard crystalline rocks and 27% comprises of sedimentary formation representing various geological formations from the pre-cambrian to the recent formations. The total available ground water in Tamil Nadu as per the Ground water estimation Committee is 734 TMC. According to the Committee, the status of utilization of ground water in the 385 blocks of the State is shown in Table 6.5.

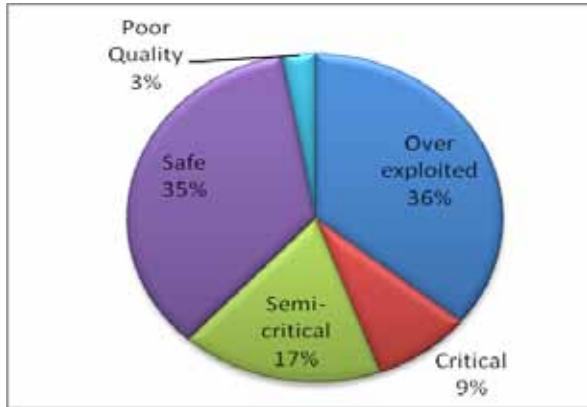
Table 6.5: Ground Water Utilization

Category	Ground water Utilization	No. of Blocks
Over exploited	More than 100%	138
Critical	90 to 100%	33
Semi-critical	70 to 90%	67
Safe	Less than 70%	136
Poor Quality		11
Total		385

Source: *Tamil Nadu Water Supply Board*



Graph 6.1: Groundwater Exploitation



On the whole, the total water resources available in the State have been estimated as 1587 TMC while the total demand (for agriculture and non-agriculture) is estimated to be 1893 TMC. Thus, there exists a total unmet gap of 306 TMC, i.e., 16% of demand. Only by Rain Water Harvesting initiatives, this gap can be addressed. Indiscriminate sand mining has adversely affected the thickness of sand, the sub surface sources and thereby reduced the saturated water column. Excessive extraction is affecting ground water quality. Surface water is stressed due to the pollution by industrial effluents, letting off waste from agricultural operations and untreated domestic sewage. The identification of the polluted water bodies would actually initiate the process of looking into source protection coupled with prevention of pollution.

Totally, there are 70,368 water bodies, of which minor irrigation tanks account for 21,609 and there are 48,759 ponds and 'ooranies'. (Districtwise list is given in the Annexe 6.2). The Department of Rural Development & Panchayat Raj in convergence with Public Works Department has planned to remove encroachments in the water bodies, falling under its jurisdiction, and restore the storage capacity of the water bodies to their original levels. The Hon'ble Chief Minister has announced the rejuvenation of 39,000 water bodies during Twelfth Five Year Plan period.

Box 6.2: Water sanctuaries

The mission of water Sanctuaries is to serve as the trustee for the nation's system of protected areas of water catchment and storage to conserve, protect, and enhance their biodiversity, ecological integrity and cultural legacy. This concept is being mooted to protect the scarce freshwater sources on similar lines as Marine water sanctuaries. These fresh water sanctuaries however, will ensure drinking water sustainability with standard quality.

Source: Working Group on Water Supply and Sanitation.

In the Twelfth Five year Plan, the State would undertake various artificial recharge projects in the over exploited, critical and semi critical blocks and where there is minimum 25 per cent dependability. The scheme is discussed in detail in the Agriculture chapter under Irrigation. Efforts would be made to protect catchments of all waterbodies using multi barrier concept, and reviving Rain Water Harvesting on mission mode approach. "Renewed Rain water Collection and Recharge Mission" would be undertaken and direct collection of water and usage will be promoted.

District level water security plans

The Twelfth Five Year Plan would see increased community participation by the activation of District level and Village level Water and Sanitation Committees (DWSC). The committees would provide inputs and be involved with the "WISE" water practices to prioritize water usage. Highest priority is accorded to the provision of minimum quantity of drinking water with basic quality.

The initiatives proposed in the Twelfth Five year Plan would lead to better water access, equitable distribution, community management of resources and capacity building of all the stakeholders. The Change Management Approach adopted and practiced by the TWAD board and adopted successfully



in the IAMWARM project involving nine Departments would be extended further to ensure water security.

Domestic Water Supply

The State envisages the supply of 24×7 piped water supply to all households living in both urban and rural areas as outlined in the Vision Tamil Nadu 2023. Already most of the villages are covered with piped water supply system. Under THAI scheme systematic efforts are being made to identify habitation wise existing coverage status and minimum water requirement of 40 LPCD is ensured to all habitations. In continuation of the effort, House Service Connection to all individual households would also be attempted in a phased manner. At least 75 per cent of the households would be provided with piped water supply during the plan period.

Urban Water Supply

Access to and provision of safe drinking water to every household in the ULBs has been one of the primary concerns of the Government. Ensuring equitable and adequate supply of drinking water and its effective delivery is a major challenge for the ULBs.

To achieve the above primary objective the Government has initiated various water supply projects under TNUDP-III, UIG, UIDSSMT (JnNURM), JICA, KfW. Agencies such as TWAD Board, CMWSS Board have also taken up implementation of water supply schemes. Apart from the above agencies, certain Corporations and Municipalities have also started implementation of major water supply schemes on their own.

The operational area of the CMWSSB has increased from 174 sq.km. to 426 sq.km. subsequent to the recent inclusion of 42 adjacent local bodies within the Chennai city limits.

Providing safe drinking water in adequate quantity to people of Chennai city

is the most important function of the Board. The drinking water requirement of Chennai city is met by drawing water from the surface reservoirs around Chennai city- Poondi, Redhills, Cholavaram, Chembarambakkam and also from Veeranam lake in Cuddalore District. Water is also received from the Kandaleru reservoir under Krishna Water Supply Project. In addition to this, CMWSSB is drawing about 100 MLD of water from the Desalination Plant at Minjur constructed on a Design, Build, Own, Operate and Transfer (DBOOT) basis. At present, the Board supplies about 765 MLD (Million Litres per Day) to domestic consumers in the City area and about 65 MLD of water to bulk consumers such as adjacent local bodies and industries located in Chennai Metropolitan Area. CMWSSB is taking necessary action to streamline water supply facilities to the areas which have been recently included within the Chennai City Corporation limits.

Status of Urban Water Supply

Water Supply is seen as a core service and coverage as measured by provision of protected water supply has been improved in the last 5 to 10 years. Water supply and demand in Chennai Urban Agglomeration is estimated at 1750 MLD and 2248 MLD in the Chennai Second Master Plan and the Chennai revised City Development Plan respectively. This gap between supply and demand requires a combination of conservative resource utilisation with sustainable supply augmentation.

Existing storage capacity of all water reservoirs is estimated at 11.057 TMC. Additional capacity of 4.2 TMC is envisaged through creation of new reservoirs and by deepening existing reservoirs.

The table 6.6 provides the status of water supply in ULBs other than Chennai City. As can be seen, coverage of protected water supply has been extended to all cities with more than a third of ULBs having 'good' coverage.



Table 6.6: Status of Water Supply in Urban Local Bodies (Other than Chennai Corporation)

Local Body	Good	Average	Poor	TOTAL
CORPORATIONS (Good > 110 LPCD, Average 70-109 LPCD, Poor – less than 70 LPCD)	1	7	1	9
MUNICIPALITIES (Good > 90 LPCD, Average 50-89 LPCD, Poor – less than 50 LPCD)	51	67	7	125
TOWN PANCHAYATS (Good > 70 LPCD, Average 40-69 LPCD, Poor – less than 40 LPCD)	336	179	14	529

Source: Tamil Nadu Water Supply and Drainage Board.

Even though over a third of the Corporations and Municipalities are provided with more than 110 LPCD of water, nearly two-thirds continue to get average to poor supply. This requires attention during the Twelfth plan.

Planning for Satellite townships

While planning for Satellite townships all aspects of the RWH shall be integrated. Township planning and layout shall be based on contours to plan roads, storm water drains and artificial ponds to store rain water. Hydro geological investigations will enable planning suitable infiltration sites. Separate water supply systems from different sources and appropriate waste water treatment and reuse systems would be designed so that these townships are water self sufficient townships too.

Twelfth Plan Strategies for Water Supply

The following are the strategies with regard to the Water Supply for both rural and urban areas.

- Managing our water resources efficiently and effectively (addressing both quantity and quality aspects)
- Planning and establishing an Integrated Drinking Water Grid for the State
- Formulate a State Drinking Water Policy and comprehensive drinking water legislation and guidelines
- Ensure stakeholder participation in the decision-making process
- Achieve capacity building within water-related institutions and promote water awareness in all water-using sectors
- Develop innovative technologies with respect to wise water use, water and waste water treatment, water reuse and recycling and alternative water sources
- Engage in extensive research and development in the water management
- Carry out assessment studies/protection for each river basin
- Establish monitoring and enforcement mechanisms
- Develop water-quality management taking into consideration the carrying capacity of the rivers and sustainable development indicators



- Mobilize mass media/NGOs over water awareness
- Develop multi-stake discussion and dialogues on relevant solutions
- Strengthen water-related institutions
- Build up a database on water sector and disseminate information

Integrated Urban Water Management

Urban water management fails to take into account, the challenges of the cities such as competing demand for water, sanitation and storm water resources. The management of water supply, sanitation and storm water have never been in consonance but each of them have been independently planned and delivered as a separate service – thus inter connections in the problems and potential solutions have not been explored. Broader urban planning processes fail to take into account urban water issues often and also basin level water management.

Integrated Urban Water Management differs from the conventional urban water management on the following issues:

- Multiple water sources within an urban catchment should be considered
- The quality of water from different water sources and distribution for different uses depending on the quality (including reclaimed water)
- Infrastructure and different processes like storage, distribution, treatment, recycling and disposal are planned as part of a single cycle.
- Conservation of water sources and exploitation of water resources at source would be given a thrust.
- Urban Water Planning would consider the different users dependent on same water sources.
- All formal (organizations, legislations and policies) and informal (norms and conventions) institutions that govern

water requirements of city would have to be considered while planning.

- It seeks to balance economic efficiency, social equity and environmental sustainability.

Integrated Water Resources Management would encompass Integrated Urban Water Management (IUWM).

Efficient Water Management System

Box 6.3: Components of Integrated Urban Water Management

- Alignment of water sub-sectors within cities and beyond
- Water conservation and efficiency efforts
- Water sensitive planning and design (including urban layout and landscaping)
- Storm water and waste water source control, pollution prevention and flow and quality management
- Use of mixtures of ecological solutions and infrastructure
- Use of non-structural tools such as education, pricing incentives, regulations and restriction regimes

Source: Towards Integrated Urban Water Management, Global water Partnership

The State would accord top priority to the efficient Water Management Systems in Corporations and Municipalities. The following measures have been taken:

- Implementing modern control and monitoring systems with the provision of Supervisory Control and Data Acquisition System (SCADA) to continuously monitor the transfer of data on water flow, performance, and efficient of pumps and motors, physical and chemical quality parameters of water etc.



- Replacing the inefficient motors and pumps to improve the efficiency of the pumping system in water supply
- Revamping the existing water supply network to ensure equitable distribution of water

Water use and Disposal – A Circular flow

In the Twelfth Five Year Plan, all water supply schemes would be integrated with concomitant water disposal system. Planning for water schemes if linked with reuse and recycling components is more sustainable in the long run. A major focus of the strategy is the creation of a circular process which involves reuse, rather than the historic linear process from use to disposal. This process requires recognition of four key stages in any wastewater management system from source to eventual return to the environment:

1. Managing wastewater at source (including water conservation and recycling)
2. Collection and treatment
3. Re use of treated wastewater and sludge
4. Re entry of treated waste into an ecosystem

Reduce and reuse wastewater - reduce wastewater at the source by improved technologies, e.g., less water consuming washing machines and toilet systems, or using recycled water (greywater) in toilets.

Collect rain water - Water reclamation and reuse offers an effective means of conserving our limited high-quality freshwater supplies and reduces the amount of water in waste and stormwater treatment plants, while helping to meet the ever growing demands for water.

Upgrade waste water treatment - Minimise pollution of receiving waterways through effective primary, secondary and tertiary treatment of raw sewage. Change household cleaners to ones that do not damage septic tanks and are easily biodegradable to reduce nutrients getting into systems rather than needing complex and

expensive treatment.

Control erosion at discharge - Prevent erosion of land or stream bank slopes where discharges are directed. Outfalls should be armoured with rock and riparian planting to minimise erosion.

Dispose of wastewater to land – Consider disposal of final wastewater via land based methods such as a drip line irrigation or artificial wetland systems instead of directly to waterways.

Reused, recycled or reclaimed water is water that is used more than one time before it passes back into the natural water cycle. Water recycling is the reuse of treated wastewater for beneficial purposes such as agricultural and landscape irrigation, industrial processes, toilet flushing, or replenishing a groundwater basin (referred to as groundwater recharge). Water reuse allows communities to be less dependent on groundwater and surface water sources and decrease diversion of water from sensitive ecosystems. Additionally, water reuse also reduces the nutrient loads from wastewater discharges into waterways, thereby reducing and preventing pollution. This “new” water source may also be used to replenish overdrawn water sources and rejuvenate or re-establish those previously destroyed.

Schemes in the Twelfth Five year Plan

Augmenting Drinking Water Supply to Chennai City

- Formation of a new reservoir near Kannankottai and Thervaikandigai villages: at ₹330 crore.
- Formation of New Storage Scheme near Thirukandalam and Bandikavanoor in Tiruvallur District at ₹70 crore
- Creation of additional Water Storage in Cholavaram, Porur, Nemam and Ayanapakkam and Restoration of Additional Storage Space in Chembarampakkam Tank with a proposed capacity of 2042 Mcft, at ₹130 crore.



Hogenakkal Water Supply and Fluorosis Mitigation Project

The Hogenakkal Water Supply and Fluorosis Mitigation Project is being implemented with the aim of supplying safe and potable drinking water to the people of Dharmapuri and Krishnagiri Districts. This project covers 3 Municipalities, 17 Town Panchayats and 6,755 Rural habitations in 18 Panchayat Unions in both the Districts at a cost of ₹1,928.80 crore. The population covered under this is 29.80 lakh.

The Project has been split up into five packages for prompt implementation. The Fluorosis Mitigation Component is implemented based on a comprehensive three-pronged approach, involving Hospitals, Schools and the Community. It is implemented in coordination with the Director of Medical and Rural Health Services, the Department of Public Health and Preventive Medicine, the Department of Medical Education, the Department of Education and the District Administration so as to assess the level of incidence of dental, skeletal and non-skeletal fluorosis among the people, in both Dharmapuri and Krishnagiri districts. The project also seeks to undertake mitigation measures through awareness and life style modification, nutritional supplementation and medical treatment in selected cases. All Government Doctors in the two districts have been trained to diagnose the incidence of fluorosis among the patients and to prescribe preventive measures. School teachers have been trained to assess the status of dental fluorosis amongst the students. 100% household health survey would be conducted to assess the prevalence of fluorosis amongst the 30 lakh population of both the districts.

Desalination plants

A 100 Million Litres per Day (MLD) desalination plant is being implemented at Nemmeli with the assistance of JnNURM. This is in addition to the 100 MLD desalination plant that is being implemented

on PPP mode at Minjur. Considering the growth and expansion of Chennai City, it has been proposed to set up another 400 MLD desalination plant south of Chennai.

New Water supply schemes in extended areas: Water supply schemes are under implementation in Ambattur, Alandur, Avadi, Maduravoyal, Nerkundram, Tambaram, Ulagaram-Puzhuthivakkam, Porur, IT corridor and Tiruvottiyur at a cost of ₹909 crore.

- Projects under Japan International Cooperative Agency (JICA) Fund: Water supply scheme to Madhavaram Municipality will be implemented at an estimated cost of ₹55 crore.
- 4 Water Distribution Stations and isolation of 8 distribution zones are executed as a part of JnNURM works to improve water supply in Chennai City.
- Combined Water Supply Scheme to Melur and 2 Other Municipalities, 6 Town Panchayats and 1,430 rural habitations in 8 Unions of Madurai District and 1 Town Panchayat in Sivagangai District with River Cauvery as source.
- Augmentation of Water Supply to Palladam Municipality, 23 Town Panchayats and 965 rural habitations in 8 Unions of Coimbatore and Tiruppur Districts with Pillur Dam as source.
- Combined water supply scheme to 7 Town Panchayats and 395 rural habitations in Virudhunagar District, with River Tamiraparani as source, near Mukkudal.
- Combined Water Supply Scheme to 755 rural habitations in Virudhunagar District with River Tamiraparani as source near Seevalaperi.
- Combined Water Supply Scheme to 637 rural habitations in Virudhunagar District with River Tamirabarani as source near Vallanadu.
- Combined Water Supply Scheme to 295 quality affected habitation and 315



wayside habitations in Sirkali, Kollidam, Sembanarkoil and Mayiladuthurai Unions in Nagapattinam District.

- Combined Water Supply Scheme to Attur & Narasingapuram Municipalities, 20 Town Panchayats and 1345 rural habitations in 12 Unions of Salem District.
- Combined Water Supply Scheme to Vellore Corporation, 11 Municipalities, 5 Town Panchayats and 944 wayside rural habitations of Vellore District with river Cauvery as source.
- Combined Water Supply Scheme to Cuddalore, Virudhachalam, Viluppuram and Tindivanam Municipalities, 13 Town Panchayats and 3593 rural habitations in 26 Panchayat Unions in Cuddalore and Viluppuram Districts with river Kollidam as source.
- Combined Water Supply Scheme to 3,642 rural habitations in 14 Panchayat unions of Pudukottai and Sivagangai Districts and Vallam Town Panchayat in Thanjavur District with River Cauvery and Kollidam as sources.
- Combined Water Supply Scheme to Zamin Uthukuli Town Panchayat and 63 rural habitations in Pollachi North, South Unions of Coimbatore District with river Azhiyar as source.
- Combined Water Supply Scheme to 158 rural habitations in Gudimangalam and Udumalaipettai Unions in Tiruppur District with Thirumurthy Dam as source.
- Combined Water Supply Scheme to 147 Rural habitations in Pappakudi (Part), Keelapavoor, Alangulam, Manur, Melaneelethanallur, Sankarankovil Unions in Tirunelveli District with river Tamirabarani as source.

- Combined Water Supply Scheme to Keelapavoor Town Panchayat and 163 rural habitations in Pappakudi (part), Kadayam and Keelapavoor Unions in Tirunelveli District with river Tamirabarani as source.
- Combined Water Supply Scheme to Udangudi Town Panchayat and 368 rural habitations in 12 Panchayat Unions of Thoothukudi District with river Tamirabarani as source.

The above schemes are proposed for the Twelfth Five Year Plan at an outlay of ₹3686.65 crore from the State funds. As part of the Central schemes, National Rural Drinking Water Programme (NRDWP) and National Lake Conservation Project would be implemented with a State contribution of ₹1752.10 crore. The Scheme wise outlay is provided at the end of the chapter.



Fig. 6.1: Rural Water Supply Scheme



SANITATION

Introduction

Access to clean water and sanitation and proper utilisation of the facilities is important for healthy living. Mere provision of facilities or creation of infrastructure do not either suffice in making sanitation a sustainable process or make the desired impact. Only when accompanied by adoption of correct behavioural practices and education these can have a positive impact on the health and hygiene conditions of the community.

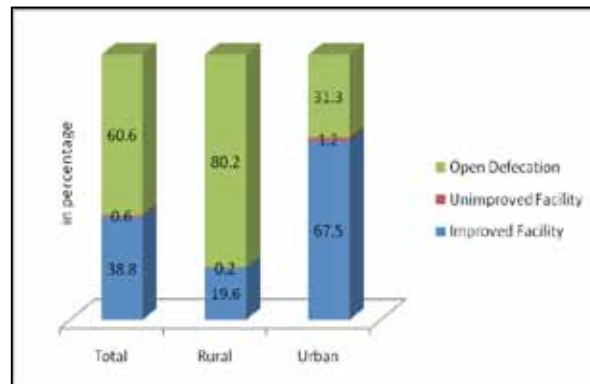
The Total Sanitation Campaign (TSC) renamed currently as Nirmal Bharat Abhiyan (NBA) of Government of India is a major programme for rural sanitation. Under Ground Sewerage Systems (UGSS) under JnNURM is a major scheme for urban sanitation.

Performance during Eleventh Five Year Plan

Rural Sanitation

Tamil Nadu was the leader and pioneer in the field of sanitation until 2006. Subsequently, TSC became a target-oriented programme, and hence it lost its momentum. Though toilets were constructed, they became dysfunctional due to various reasons. Inappropriate selection of toilet models, lack of superstructure, water scarcity, lack of technical support in case of failures are the main reasons for poor performance. Lack of sustained Information, Education and Communication (IEC) programmes has left thousands of toilets being unused. The Integrated Women Sanitary Complexes constructed in all village panchayats were defunct due to poor maintenance. Toilets were provided to schools and Anganwadis under the Total Sanitation Campaign.

Graph 6.2: Status of coverage of IHHL



Source: UNICEF, 2011

Urban Sanitation

Sanitation and safe disposal of human waste is a critical element of public health, directly impacting the well being of people. The absence of adequate number of toilets linked under ground sewerage scheme, absence of sufficient and well maintained public/community toilets and the age old practice of open defecation are posing serious sanitation problems and health hazards. Recognising this, the State has formulated two strategies in the sanitation sector, coverage of all towns by Under Ground Sewerage System and total elimination of Open Defecation by 2015. The districtwise status if availability of latrines is given in the Annexure 6.3.

Tamil Nadu is one of the few States that has come out with a comprehensive program for providing a sewerage network in Chennai city and all district headquarters with sustainable financing and user charges for sewerage connections. The successful model that involved financing of sewerage projects through a combination of user deposits, loans and government grants with user charges to manage debt servicing and O&M is being adapted to provide sewerage schemes across the State.



At present 99 per cent of the core areas of Chennai city have been covered with sewerage facilities. CMWSSB manages over 6,10,000 sewer connections and maintains a network of 2,600 km of sewer lines and 180 pumping stations. A number of new projects are being implemented in the newly added extended areas.

A treatment capacity of 1,490 MLD is required to meet wastewater treatment by 2026 but the existing Sewerage Treatment Capacity within the city is only about 526 MLD (including small Sewerage Treatment Plants (STP) available locally to serve the ULBs). An incremental treatment capacity of 900 MLD may therefore be required to serve the estimated population by 2026. This is proposed to be added in phases and also by expansion of the capacity of existing STPs. Greenfield STPs have also been established by CMWSSB at Perungudi and Nesapakkam.

Solid waste generation and the demand for waste collection services generally increase with life style improvements/modifications and economic development. The strategic priorities include diversion of waste from landfills by retrieval of recyclables based on a hierarchy that prioritized waste reduction and recycling over all other options; improving landfill safety, enhancing public outreach programs and environmental education in schools. A comprehensive waste management program should aim to recover all useful materials, envisioning the goal of Zero Waste areas.

Municipal Solid Waste Management (MSWM) is one of the essential services of the ULBs to keep the cities/towns clean and green. Due to rapid urbanisation and change in the lifestyle, there is a considerable increase in the quantity of waste as well as variations in the characteristics of waste. The collection, transportation, treatment and disposal of waste pose a major challenge to the ULBs.

The ULBs have taken efforts to make improvements in the Solid Waste Management services in accordance with the “Municipal Solid Waste (Management & Handling) Rules, 2000”. The ULBs in the State have already taken many good initiatives to bring about improvements in the Solid Waste Management services. For example, the Corporations of Madurai, Coimbatore, Salem and Namakkal Municipality have already established waste processing and disposal facilities through the PPP mode under the JnNURM and other sources of funding.

In the case of village panchayats, the solid waste management initiatives were taken up in few village panchayats as independent successful experiments but they remained islands of success without being scaled up or replicated across the State.

Twelfth Five Year Plan Approach and Strategies

The State has have given a new thrust to the Sanitation front towards declaring Tamil Nadu as an ‘Open Defecation Free State’, by strengthening institutional arrangements for implementation, ensuring availability of funds, provision of infrastructure and also through sustained IEC campaigns. All the Integrated Women Sanitary Complexes in rural areas have been renovated and efforts are on to ensure continuous usage and maintenance through the Habitation level user groups. ‘Clean Village Campaign’ for promotion of clean environment and sanitation in rural areas has been reintroduced. Effective disposal of solid and liquid wastes, ban on use of plastics with due emphasis on water conservation and rain water harvesting structures will be part of the campaign.

The inadequacy of proper sanitation facilities in many of our cities and towns, and lack of proper maintenance of public and community toilets contributes to the continuation of the practice of open defecation. A policy for achieving Open Defecation Free



Status in the urban areas by 2015 is being formulated that will ensure provision of sanitation facilities through UGSS, increased public conveniences to ensure that the health of the urban population in the state is protected and at the same time, pollution of land and water resources in the State is mitigated.

The State has formulated two major schemes for Urban Infrastructure Development - the **Chennai Mega City Development Mission (CMCDM)** for Chennai and suburban areas and the **Integrated Urban Development Mission (IUDM)** for all

other Corporations, Municipalities and Town Panchayats, to supplement the available funds under various schemes. Under these missions, existing schemes are dovetailed to improve the standards of basic infrastructure including sewerage and sanitation, storm water drains and solid waste management in an integrated manner. The additional resources provided under the Chennai Mega City Development Mission and the Integrated Urban Development Mission have given the much needed thrust to the development of basic amenities in urban areas and also stimulated economic growth through planned urbanization.

Box 6.4: Parameters for Sustainable Sanitation Village

- No open defecation in village leading to pollution of water sources
- 100 percent coverage and usage of toilets
- Special provision for aged, differently-abled, pregnant women
- 100 percent school sanitation (separate toilets for girls and boys)
- Water supply available for toilets
- No additional burden on women for fetching water for toilets
- Presence of a well-maintained drainage system (drain should not be clogged; water should not stagnate; should not pollute water sources)
- Grey water treated and reused
- Presence of solid waste management systems (like composts etc.; solid waste not found littered in the village; not clogging drains)
- High in hygiene behaviour (every one washes hand after defecation; handles drinking water with clean hands)
- Issues of menstrual hygiene addressed
- Local capacity available for operating and maintain sanitation systems
- Water quality tested by the community twice a year (indicative) and information disseminated and follow-up by confirmative tests and follow-up action taken
- Reduction in water borne diseases in the village validated by VHNs; no deaths reported

Source: Arghyam (2009)

Sanitation Security

Sanitation security is an integral part of health security. Tamil Nadu is committed to achieve Open Defecation Free status. In the Twelfth Five Year Plan, efforts would be taken to ensure that each household has access to sanitation facilities. Today the concept of

sanitation is expanded to include, personal hygiene, home sanitation, safe drinking water, garbage and excreta management, safe disposal of waste water and menstrual hygiene management. Twelfth Plan aims to have mosquito-free, fly-free, clean and healthy habitations through participatory and eco-friendly solid and liquid waste



management. Sanitation and water supply would become basic rights of everyone. There would be a paradigm shift in the approach to sanitation from shame and disgust to pride and dignity. Social marketing and brand ambassadors for sustainable sanitation promotion would be initiated. The adoption of good sanitation practices would become an indicator of economic well being.

Sanitation Messengers and Clinics

Every Village Panchayat will have Sanitation Messengers. Sanitary clinics will function for a cluster of villages. While Messengers will spread the awareness on Sanitation, Clinics would help to provide technical help for construction of latrines and repair the defunct toilets. The Sanitation Clinic would be provided with a corpus fund and basic facilities to discharge its duties. Women would play a key role in sanitation activities.

Focus on Appropriate Training

All stakeholders would be given an orientation on various aspects of sanitation and the condition under which different toilet models work efficiently. One main reason for the poor functioning of toilets in rural areas is the lack of adequate knowledge of technological options available for different terrain conditions. Because of that only a particular type of model is constructed as against the model which is suitable for the soil and area. This results in the failure of the toilet, and ultimately toilet becomes defunct. At present, all the related stakeholders are not aware of the real functioning of toilet systems. Hence the Twelfth Plan would aim at creating massive awareness to all stakeholders.

Schemes for the Twelfth Five Year Plan

Nirmal Bharat Abhiyan

Total Sanitation Campaign implemented during Eleventh Five Year Plan has been renamed as Nirmal Bharat Abhiyan, and will be continued to be implemented as a major sanitation programme for rural

Box 6.5: Toilet for Infants

A community based sensitisation and awareness programme on the infant toilet training was initiated in the State as part of Total Sanitation Campaign. Training was provided to the mothers with children in the age group 0-3 years on initiating early toilet training. Small kiddies toilet (Potty) were provided to the mothers and they were taught how to encourage the young ones to defecate in the toilet and later disposal of faecal matter safely. Maintenance of the potty by washing it properly with soap and water and then sun drying was also taught to prevent disease transmission. This concept of catching them young would go a long way in Sanitation promotion.

areas during the Twelfth Five Year Plan. This programme would be implemented in a demand driven mode and on a saturation approach. Anganwadi toilets, school toilets will also be taken up under this programme to ensure all anganwadis and schools have functional toilets. The State has enhanced the assistance to ₹11,000 for the construction of Individual Household latrines, by converging MGNREGS with NBA. The programme will be implemented through the Rural Development & Panchayat Raj Department, and hence the proposed outlay for the Plan falls under Rural Development sector. The State share has been proposed at ₹380.60 crore anticipating a central share of ₹963.40 crore during Twelfth Five Year Plan period.

Integrated Sanitary Complexes for Women

Integrated Sanitary Complexes for women aim at providing sanitation facilities for rural women. Each village panchayat has been provided with one such complex with assured water supply during the Tenth Plan period. But due to improper maintenance, many of the complexes became defunct during Eleventh Plan.



Fig. 6.2: Integrated Sanitary Complex for Women

As a measure to improve sanitation, all sanitation facilities have been taken up for repair and rejuvenation. User groups for the maintenance of the toilets have also been formed. Self Help Group women would be involved in sensitizing the women user groups.

Integrated Sanitary complexes for Men

Similar to the women sanitary complexes, sanitary complexes for men are planned to be constructed in the Twelfth Plan period. In order to eradicate open defecation in villages, the State has decided to construct these sanitary complexes in a phased manner.

Uninterrupted water supply and efficient waste handling system would ensure better functioning of sanitary complexes. During the Twelfth Five Year Plan it is planned to install **Zero Discharge Bio-digester Plant** in the sanitary complexes in a phased manner. Initially this would be installed in select sanitary complexes as a pilot and would be replicated throughout the State.

Toilets for the Differently Abled

The Town Panchayats have taken special efforts to provide barrier Free toilet facilities for the differently abled and specialized toilets are being constructed for them. A special programme was implemented for construction of 532 toilets at a cost of

₹9.93 crore in 503 Town Panchayats. Ramps, hand holding bars, suitable seats, alarm and electrification has been provided in the toilets. Special arrangements have been made for ablution. Provision of separate toilets for men and women has been ensured. During the Twelfth Plan, such specialised toilets for the differently abled will be incorporated in the Integrated Sanitary Complexes to be constructed.

School Sanitation and Hygiene Education

School Sanitation and Hygiene Education is very high on the National priority. The Government of Tamil Nadu is also laying a lot of emphasis on the same through the Total Sanitation Campaign (TSC) and Sarva Siksha Abiyan (SSA).

Tamil Nadu has shown some improvement in school sanitation and drinking water supply. However, despite construction of toilets, a number of toilets still remain unused or under repair. The table below shows the water and sanitation infrastructure in schools in Tamil Nadu.



Fig.6.3 : Handwash Programme

According to DISE 2011-12, 66.74% schools in Tamil Nadu had a common toilet and only 64.15% had a separate girls' toilet. The table 6.7 reveals that there is still a large unaddressed demand with respect to provision of sanitation facilities in schools.



Table 6.7: Sanitation Infrastructure in Schools

Indicator	Primary Only	Primary with Upper Primary	Primary with Upper Primary & Sec./ Hr. Sec.	Upper Primary Only	Upper Primary with Sec./ Higher Secondary	All Schools
Schools with common toilet (%)	70.53	66.79	52.58	53.95	56.60	66.74
Schools with girls toilet (%)	54.52	73.72	86.77	89.67	90.57	64.15

Source: DISE 2011-12

In a study conducted by UNICEF on 50 most backward blocks of Tamil Nadu, it was found that water and sanitation is one of the main issues affecting the education of children, especially girls. There are separate toilets provided for girls in most of the schools, especially in middle schools. However, water facilities are lacking in 50 per cent of the schools in the districts.

Box 6.6: Benefits of Investing in School Sanitation

- Effective learning
- Increases enrolment of girls
- Reduces incidence of disease and worm infections
- Environmental cleanliness
- Implementing child rights

The School Sanitation and Hygiene Education is also an integral part of the Total School Health programme which is a part of the curriculum in schools. The focus during the Twelfth Plan would be providing life skill based education to promote hygiene practices to reduce risks, a healthy and safe school environment, outreach to the families and communities through intensive IEC.

The following will be ensured for improving School Sanitation during the Twelfth Five Year Plan

- In all the Primary/Middle/High/Higher Secondary Schools separate latrines / urinals for boys and girls with adequate water supply will be provided.
- The toilets and other Water Sanitation & Hygiene (WASH) infrastructures constructed in the Elementary schools will be child friendly
- The existing Girls toilet blocks constructed in Schools will be improved as Girl friendly toilets with facilities for safe disposal of soiled sanitary Napkins. The new constructions will contain all the features of a Girl friendly toilet including Incinerator.
- All the schools will be provided with Hand Washing Facility with Soap
- Hygiene Education will be promoted. All the Schools will have a Teacher trained in Hygiene Education, especially in Menstrual Hygiene.
- All the Schools will have Sanitation Committees.

Menstrual Hygiene Management

Tamil Nadu pioneered several unique initiatives in the TSC and noteworthy was the initiative of bringing Menstrual Hygiene into the public domain and addressing it as part of the campaign. The recent State initiative to supply napkins procured from the SHG



units is a laudable one and offers immense potential in terms of social and economic capital formation at the panchayat level. This convergence across sectors like health, livelihood, education, environment etc would also contribute to the overall empowerment of women and strengthening the SHG movement in the state apart from improving menstrual hygiene and sanitation.

The State has taken a very positive and pioneering stand to promote the menstrual hygiene among the women and adolescent girls. The State has provisioned for the free supply of sanitary napkins to all the rural adolescent girls. Maternity pads are also being provided to the Post Natal mothers. Women prisoners are also to receive sanitary napkins. Tamil Nadu Corporation for Development of Women has initiated the process of integrating all SHG manufacturing groups to supply sanitary napkins under the Health scheme and procurement responsibility rests with the Tamil Nadu Medical Services Corporation.

Solid and Liquid Waste Management

The generation of Municipal Solid Waste in Chennai City after its expansion has increased to 4000 Metric Tonne per day. Corporation of Chennai is taking several new initiatives to cope with this daunting problem. Equipments like compactors, haulage trucks, loaders, mechanical sweepers, bins etc., are being procured at a cost of ₹57.60 crore. A detailed route chart for tricycles and compactor vehicles has been drawn up to

Box 6.7 Garbage disposal on call

Garbage disposal has been made easy with just a click. An online web portal (www.kuppathotti.com) facilitates garbage disposal at a prefixed convenient time for the residents of Chennai city. Created by an enthusiastic group of youth, this private organisation collects garbage from households and organisations on request, and pay them for the garbage.

effectively supervise solid waste management activities in the Corporation. A Short Message Service (SMS) pattern of reporting has been evolved for the field staff. The Corporation of Chennai has also outsourced conservancy activities in three zones to a private operator.

Meanwhile, a major initiative has been proposed to tackle the problem of Solid Waste Management by the publication of Expression Of Interest at the international level. The three distinct aspects relating to Solid Waste Management during the Twelfth Plan is as follows:

- Setting up of Integrated Municipal Solid Waste processing facilities for the Chennai city and local bodies with assistance from Corporation of Chennai, to deal with and manage the final disposal of over 2,500 M.T of Municipal Solid Waste on a daily basis.

Box 6.8: Bio Technology for SWM

Efficient Microorganism (EM) technology was developed by a Japanese professor of horticulture, Dr. Teruo Higa. EM was used to boost crop production, and improve yields with quality. It is also used in animal care and aquaculture and to counteract the fouling of bio-waste, foul odour and associated pest nuisance.

EM was introduced successfully in composting and solid waste management, sewage and effluent treatment, hygiene and sanitation, environmental rehabilitation of polluted soils and eutrophicated water bodies.

EM technology was experimented in Post-Tsunami hygiene management in the coastal areas of Tamil Nadu. Ambattur Municipal Corporation is using EM technology in its dump yards as these have adjoining residential areas and it has been possible to reduce foul odour.

Source: Auroville



- Remediation and Scientific closure of two major dump yards at Kodungaiyur and Perungudi with a definite timeline.
- Street Cleaning, Door-to-door collection of garbage and transportation to integrated processing facilities site in Zones/Wards assigned by Corporation of Chennai in a phased manner with timelines.

The Municipal Administration Department is also taking steps to access the best practices and technologies adopted in other parts of the country and abroad in Solid Waste Management. Major thrust to strengthen the Primary/Secondary Collection and Secondary transportation of Solid Waste in the ULBs would be given during the Twelfth Plan under Integrated Urban Development Mission (IUDM). It is proposed to implement a “Waste to Energy” Project in the Public Private Partnership (PPP) mode in Tirunelveli Corporation. All the ULBs will practice source segregation of solid waste into degradable and non-degradable components in a phased manner. The State is formulating a Policy on Integrated Solid Waste Management.

Solid Waste Management in Town Panchayats assumes great significance. More than 4100 vehicles are involved in primary collection and 1100 vehicles are utilized for secondary collection of solid waste. 7273 Sanitary workers and over 4400 members of Self Help Groups are involved in solid waste management. Town Panchayats have taken several unique initiatives for solid waste management. These include segregation at source, power from food waste, vermi composting, pelletisation of plastic waste etc. The Town Panchayats have effectively utilised plastic waste for laying Plastic Bitumen Roads. Similarly, vermi composting has been done commercially thereby adding to the revenue of the Town Panchayats. The Town Panchayats have also utilised the services of well run NGOs in the solid waste management programme. Under the Integrated Urban Development Mission, Solid Waste Management has been taken up on priority.

During the Twelfth Plan Period, a major thrust will be given to Solid Waste Management in rural areas too, which was hitherto unattended. ₹100 crore has been earmarked for Solid Waste Management in the Finance Commission Grant. There will be concerted action to upgrade the Panchayats in the State as “Zero Waste Panchayats” and conscious efforts will be bestowed to develop strategies that will delineate methods to achieve compliance of the **waste hierarchy**. Solid Waste Management in rural areas will be taken up in phases under Nirmal Bharat Abhiyan simultaneously with toilet construction. Attempts would be made at the Panchayat level for educating the households

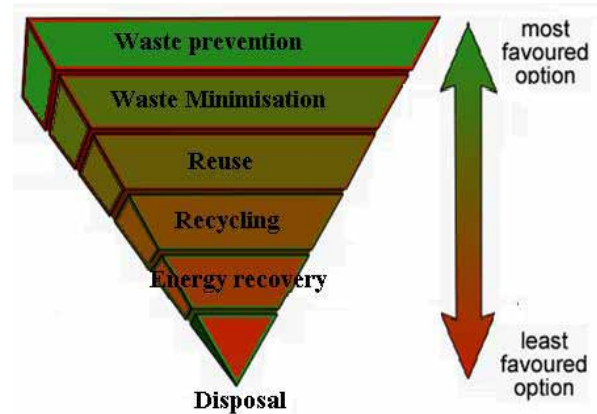


Fig.6.4: Solid Waste Management Hierachy

on segregation of wastes, collection of segregated waste, recycling plastics and composting bio-degradable waste. Reduction and Reuse at Source, recycling and composting after collection would be adopted by the panchayats for Solid Waste Management.

Establishing Common Scientific Sanitary Landfill (CoSSLaFi)

Effective Solid Waste Management also requires Scientific Sanitary landfill management. Presently, the landfills are not properly managed as per the SWM rules. Further the availability of necessary lands for future landfills also poses a severe threat. Hence installation of Common Scientific



Sanitary Landfill (CoSSLaFi) could be the solution. By pursuing a cluster approach, local bodies can address the solid waste management issue, in a coordinated manner. The CoSSLaFi can be managed by a SWM society comprising of CBOs, RWAs, NGOs and the ULBs concerned. PPP models can also be considered as that of the Common Treatment Facility in operation for Bio-medical waste. The task can also be entrusted to the existing Government organisations dealing with Waste Management with proper support towards Capacity Development for Planning, Design,

Installation, Operation and Maintenance.

Sewerage

The State Government has accorded priority to the implementation of sewerage schemes, with proper sewerage treatment plants in all the ULBs in a phased manner, in order to provide better sanitation. The Tamil Nadu Water Supply and Drainage Board, the Chennai Metropolitan Water Supply and Sewerage Board and the ULBs would be responsible for this.

Box 6.9: Bio-model of Liquid Waste Management

Recycling of waste water by rearing fish and ducks is a concept that could recycle up to 3 lakh litres of water every day. Each square meter area requires at least 4 ducks. This concept is easy to set up and is quite inexpensive when compared to the conventional methods.



The arrowhead motion and constant paddling action of ducks facilitates constant efficient water aeration. Catfishes are then introduced and they clear up all algal bloom and other small organisms that escape the ducks. Filtration consists of passing water through filtration media that acts as a strainer where suspended and colloidal matter and large quantity of bacteria are caught. The outcome is clean recycled water which is used for vegetation, plantation, and landscaping and fodder cultivation. The ducks get out of water to shed the droppings, which serve as a good source of manure. Eggs laid by ducks are consumable and a good source of income. Duck rearing used to be a regular practice in villages. Ducks were let out in the available water bodies, which kept the pollutants, mosquitoes and diseases at bay.

In tune with the increasing population and area of the Corporation, priority has been accorded for providing Sewerage service. Over the period, the length of the sewer mains has increased to 2,677 km and pumping stations to 209 and sewerage treatment capacity has

been improved from 56 MLD to 558 MLD. Numerous sewerage schemes have been taken up under JnNURM funds and TNUDP, Chennai Mega City Development Mission schemes.



During the Twelfth Five Year Plan sewerage schemes for Avadi, Ambattur, Tambaram, Maduravoyal, Thirumazhisai, Perungudi, Porur, Ullagaram-Puzhuthivakkam and Pallikaranai have been taken up under JnNURM funds. Improvement and extension of the Under Ground Sewerage Scheme would be planned and executed for all the areas of the Corporation in Twelfth Plan period.

Modernisation of sewer operations has been initiated and action has been taken to mechanise the operation and maintenance of the sewerage system. There are 83 numbers of Jet Rodding Machines and 70 numbers of Desilting Machines in operation. Adequate measures would be made to procure additional jet rodding machines and desilting machines to ensure proper and speedy maintenance of city sewers.

In order to achieve the aim of the Hon'ble Chief Minister of creating world class infrastructure for Chennai City, The CMWSSB has prepared Detailed Project Reports (DPRs) for strengthening the existing water supply and sewerage system in Chennai City and improvements in the added areas.

Action Plan for Chennai City

- Provision of sewerage network in Chennai Corporation by 2017
- Achievement of Service Level Benchmark (SLB) norms for sewerage as outlined by MoUD in all zones of core area of Chennai Corporation by 2017 and in the whole of Chennai Corporation by 2022
- Shifting to universal metering and volumetric billing in all zones of the core area of Chennai Corporation by 2017 and in the whole of Chennai Corporation by 2022

It has been planned to implement UGSS in a phased manner in the Corporations and Municipalities with necessary financial assistance under various schemes like

TNUDP-III, Urban Infrastructure and Governance (UIG/JnNURM), Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT/JnNURM), and KfW grants. Detailed Project Reports have been prepared for 117 Municipalities at an estimated cost of ₹7,100 crore and 3 Corporations (Tiruchirappalli, Coimbatore and Thoothukudi) at an estimated cost of ₹1,570 crore by the Tamil Nadu Water Supply and Drainage Board.

At present, Under Ground Sewerage Schemes have been taken up in 4 Town Panchayats and Detailed Project Reports for the remaining 525 Town Panchayats have been prepared at a cost of ₹12,904 crore.

Action Plan for other urban areas

- Providing sewerage network to all in the Urban Agglomeration (population greater than 100,000) by 2015 and covering all other urban areas of the State by 2017.
- Achievement of SLB norms for sewerage as outlined by MoUD in Urban Agglomerations (population greater than 100,000) by 2017 and in all urban areas in the State by 2022.

Waste Water Management

A comprehensive Action Plan for Waste Water Management to improve and integrate the sewerage system in Chennai and its suburban areas has been prepared. The scheme involves complete treatment and recycling of waste water and prevention of entry of sewage into the City's River System. The above scheme will be implemented during Twelfth Five Year Plan. This will facilitate an integrated management of Waste Water besides protecting the City's River System from pollution.

The sewage generated from the house sewer connections is linked to a sewerage system of approximately 2,677 km and it is collected in 209 sewage pumping stations. The five zones of the macro system covering the entire city have independent



zonal collection, conveyance, treatment and disposal facilities. The sewage from pumping stations is conveyed to 11 Sewage Treatment Plants. Sewage Treatment plants would be installed in Nesapakkam, Thiruvottiyur, Sholinganallur, Koyambedu, Navalur and other areas.

As an initiative to protect the waterways and water bodies, it has been planned to curtail the letting out of untreated sewage into the Cooum river basin, the Buckingham canal and the Adyar basin and to treat this sewage before discharge. This has been planned at a cost of ₹300 crore.

Nitrogen, phosphorus and potassium are valuable nutrients contained in wastewater. Unfortunately, these essential nutrients are lost in conventional wastewater treatment plants. Nutrients in wastewater (as organic carbon, nitrogen, phosphorus and potassium) can be balanced to irrigation needs, or natural waters can have nutrients added. This form of irrigation is called fertigation. The State would take concerted efforts to ensure that resources are used

efficiently, that land is not degraded or waterlogged and that natural water bodies are protected from salinity, turbidity, nutrient-enrichment, leached trace metals, pesticides and other harmful wastewater contaminants.

Recycling Waste Water

The Government, as a policy promotes the recycling of sewage to meet purposes other than drinking. The CMWSSB has initiated action to put up a 45 MLD Tertiary Treated Reverse Osmosis Plant in Koyambedu at a cost of ₹90 crore. More such projects will be implemented under PPP mode for recycling sewage to meet industrial needs. This would solve environmental problems and also take care of the water supply needs of the industries in and around Chennai City. Recycling of waste water by installing small treatment plants is feasible in residential complexes. The flat promoters of apartment complexes could take up the individual treatment facilities. This would be encouraged during the Twelfth Five Year Plan.



Fig.6.5: Desalination Plant at Nemili



Box 6.10: Cost Economics of waste water recycling in an Apartment

There are two types of waste water created in a house, each of which can be treated and used in various ways. **Grey water** is waste water from non-toilet plumbing fixtures such as showers, basins and taps. Grey water can be used for garden watering. Appropriately treated grey water can also be re-used indoors for toilet flushing and washing clothes. **Black water** is water that has been mixed with waste from the toilet. Black water requires biological or chemical treatment and disinfection before re-use.

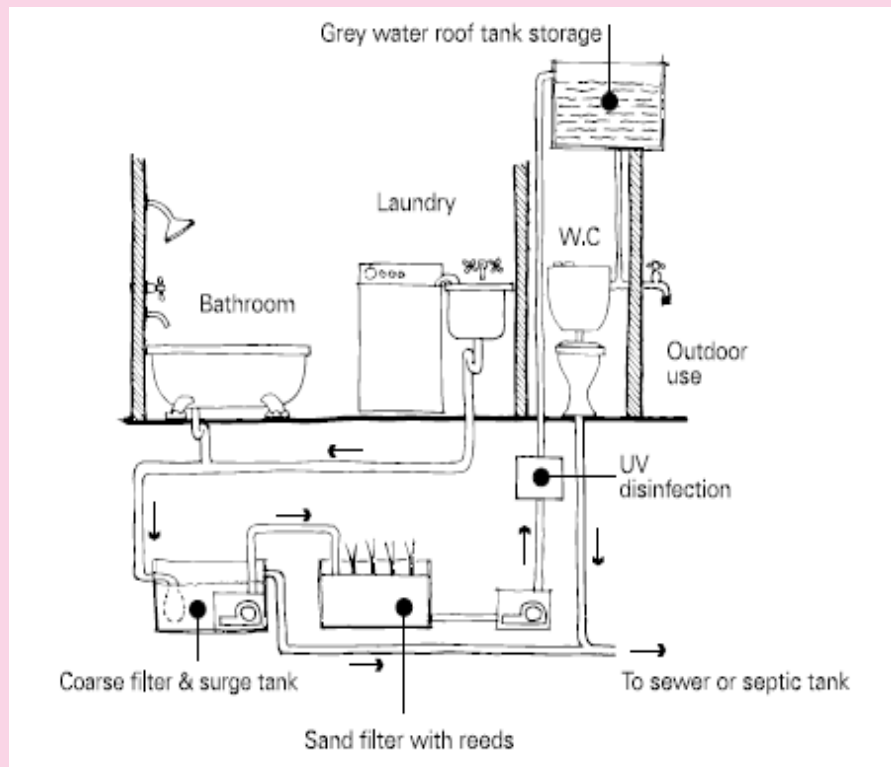
An apartment level treatment facility can be created to get around 800 to 1200 litres of processed water and the cost would be around ₹45,000/- per kl of grey water to be treated i.e. say about ₹70,000/-.

Savings in Quantity of water/ family at 30% of 135 lpcd = 5 x 40 = 200 lts.

Savings/ Month/ family = 30 x 200 = 6000 litres @ ₹20/kl = ₹120/-

Savings per flat = 8 units x Rs.120/- = ₹960/- or say ₹1000/-

Payback period = 70000/1000 = 70 months or say 6 years.



Typical Arrangement For Recycling Of Grey Water

Source: Working Group Report on Water Supply and Sanitation



Proposed Outlay

The total outlay for the Water Supply and Sanitation sector in the Twelfth Five Year Plan is proposed at ₹11,306.18 crore. The details are given in the table 6.8.

Table 6.8 Twelfth Plan Outlay - Water Supply and Sanitation

(₹ crore)

S.No.	Name of the Scheme	Proposed Outlay
A	Rural Water Supply - I State Schemes	
1	Rural Water Supply under Minimum Needs Programme	2,286.00
2	Hognekka Water Supply and Fluorosis Mitigation Project	985.00
3	Implementation of Combined Water Supply Scheme in Vellore Corporation and Surrounding areas	204.22
4	Implementation of CWSS in Salem District	195.43
5	Provision for Supervisory and data acquisition SCADA/ Telemetry system	16.00
	Total – State Schemes	3686.65
	II State Share in Central Schemes	
6	National Rural Drinking Water Programme	1750.00
7	National Lake Conservation Project	2.10
	Total State Share in Central Schemes II (6+7)	1752.10
	Total – Rural Water Supply	5438.75
B	Urban Water Supply	
	I - On going State Schemes	
1	Construction of dam for storage of Krishna river water	5.50
2	Providing assured and safe drinking water to tribal areas	1.10
3	Scheme for Artificial Ground water recharge structures	135.60
4	Rehabilitation and improvement works in Minor water resources under NADP-RKVY	16.00
5	Improvement of waters supply and drainage and road works under HADP	65.00



Table 6.8 Twelfth Plan Outlay - Water Supply and Sanitation (Contd.)

(₹ crore)

6	Grants to CMWSSB for viability gap support for Desalination project at Chennai Minjur	300.00
7	Share capital assistance to CMWSSB for Desalination plant at Nemmeli	317.42
8	JNNURM fund schemes – CMWSSB (State share)	190.94
9	Kumbakonam Sewerage scheme (STP) (State share)	0.38
Total – Ongoing Schemes I (1+2+3+.....9)		1031.94
II New Schemes - State Schemes		
1	Urban Water Supply (TWAD)	440.00
2	Underground Sewerage Schemes (TWAD)	180.00
3	Other Corporations (CMA)	545.00
4	Municipalities (CMA)	416.00
5	Pumping raw water from newly developed reservoir at Thervoikandigal to Poondi reservoir (CMWSSB)	165.00
6	Providing comprehensive water supply scheme to 31 ULBs added to city limit	245.00
7	Comprehensive water supply schemes to 6 Municipalities and 12 TPs outside city limit but within CMA	420.00
8	Construction of depot officers and area offices in added area	20.00
9	Improvements to transmission main and distribution network in old city (Water Supply)	200.00
Sewerage		
10	Providing comprehensive sewerage scheme to 31 ULBs added to city limit including construction of sewage treatment plants at required locations	325.00
11	Comprehensive Sewerage scheme to 4 Municipalities and 11 TPs outside city limit but within CMA	350.00
12	Construction of 45 MLD tertiary treatment plant at Koyambedu STP and laying conveying main to SIPCOT industries at Irungattukottai	90.00
13	Improvement to city water supply and sewerage system under mega city programme – 10 category of works	189.10



Table 6.8 Twelfth Plan Outlay - Water Supply and Sanitation (Contd.)

(₹ crore)

14	Providing ancillary structures in existing STPs for producing electricity	35.00
15	Prevention of overflow of sewage in city waterways – Improvements to SPSs	150.00
16	Other infrastructure and capacity building	47.59
17	Remodeling of old sewers	50.00
	Total – New Schemes II (1+2+3+.....17)	4835.49
	Total – Urban Water Supply and Sanitation I + II	5867.43
	Grand Total – Water Supply and Sanitation A+B	11306.18



Annexure 6.1
Status of Rural Water Supply

S.No.	District	Fully / Covered (>40 LPCD)	Partially covered (10-39 LPCD)	Not covered	Total
1	Ariyalur	1378	31	-	1409
2	Coimbatore	1765	267	-	2032
3	Cuddalore	3334	136	-	3470
4	Dharmapuri	3193	120	-	3313
5	Dindigul	2586	764	-	3350
6	Erode	3875	479	-	4354
7	Kancheepuram	3463	450	-	3913
8	Kanniyakumari	955	300	-	1255
9	Karur	1763	527	-	2290
10	Krishnagiri	4232	262	-	4494
11	Madurai	2053	161	-	2214
12	Nagapattinam	2382	517	-	2899
13	Namakkal	3070	535	-	3605
14	Perambalur	554	15	-	569
15	Pudukkottai	4204	234	-	4438
16	Ramanathapuram	2271	61	-	2332
17	Salem	5087	657	-	5744
18	Sivaganga	2731	295	-	3026
19	Thanjavur	3681	379	-	4080
20	The Nilgiris	1048	71	-	1219
21	Theni	647	138	-	785
22	Thiruvallur	3607	223	-	3830
23	Thiruvarur	2414	336	-	2750
24	Thoothukkudi	1324	394	-	1718
25	Tiruchirappalli	2311	672	-	2983
26	Tirunelveli	2281	204	-	2485
27	Tiruppur	2687	538	-	3225
28	Tiruvannamalai	4113	337	-	4450
29	Vellore	4656	1115	-	5771
30	Viluppuram	4393	347	-	4740
31	Virudhunagar	1845	46	-	1891
Total		84003	10611	-	94614

Source: Tamil Nadu Water Supply & Drainage Board



Annexure 6.2
District-wise Ponds, Ooranies and M.I tanks

S.No.	District	M.I. tanks	Ponds & Ooranies	Total
1	Ariyalur	477	1615	2092
2	Coimbatore	9	709	718
3	Cuddalore	254	2304	2558
4	Dharmapuri	555	628	1183
5	Dindigul	1577	1000	2577
6	Erode	19	597	616
7	Kancheepuram	1100	1241	2341
8	Kanniyakumari	599	300	899
9	Karur	108	388	496
10	Krishnagiri	1172	1211	2383
11	Madurai	1029	3233	4262
12	Nagapattinam	Nil	3979	3979
13	Namakkal	152	422	574
14	Perambalur	138	753	891
15	Pudukottai	3824	1795	5619
16	Ramanathapuram	818	2499	3317
17	Salem	242	375	617
18	Sivaganga	2776	4156	6932
19	Thanjavur	63	3131	3194
20	The Nilgiris	Nil	225	225
21	Theni	26	319	345
22	Tiruchi	1406	705	2111
23	Tirunelveli	769	769	1538
24	Tiruppur	10	1434	1444
25	Tiruvannamalai	1250	2027	3277
26	Tiruvarur	Nil	3602	3602
27	Thiruvallur	649	2059	2708
28	Thoothukudi	397	1148	1545
29	Vellore	633	854	1487
30	Viluppuram	1257	3551	4808
31	Virudhunagar	300	1730	2030
Total		21609	48759	70368

Source: Dept. of Rural Development & Panchayat Raj, GoTN



Annexure 6.3
Status of Availability of Latrines

S.No.	District	HHS with Latrine facility within the premises (%)	HHS without Latrine facility within the premises (%)	Alternative sources of HH without Latrine facility	
				Public latrine	Open
1	Ariyalur	18.14	81.86	2.21	97.79
2	Chennai	95.59	4.41	86.56	13.44
3	Coimbatore	66.69	33.31	33.46	66.54
4	Cuddalore	36.08	63.92	3.28	96.72
5	Dharmapuri	19.01	80.99	2.42	97.58
6	Dindigul	33.28	66.72	12.00	88.00
7	Erode	49.01	50.99	17.87	82.13
8	Kancheepuram	65.53	34.47	5.64	94.36
9	Kanniyakumari	87.46	12.54	43.15	56.85
10	Karur	41.24	58.76	9.40	90.60
11	Krishnagiri	33.02	66.98	4.08	95.92
12	Madurai	59.18	40.82	13.06	86.94
13	Nagapattinam	39.54	60.46	4.35	95.65
14	Namakkal	40.69	59.31	26.06	73.94
15	Perambalur	22.18	77.82	5.58	94.42
16	Pudukkottai	27.97	72.03	3.17	96.83
17	Ramanathapuram	36.62	63.38	5.28	94.72
18	Salem	34.95	65.05	17.17	82.83
19	Sivaganga	40.70	59.30	6.17	93.83
20	Thanjavur	45.06	54.94	7.42	92.58
21	The Nilgiris	51.89	48.11	23.80	76.20
22	Theni	39.35	60.65	33.81	66.19
23	Thiruvallur	67.85	32.15	6.91	93.09
24	Thiruvarur	39.71	60.29	5.76	94.24
25	Thoothukkudi	49.98	50.02	7.87	92.13
26	Tiruchirappall	48.52	51.48	16.19	83.81
27	Tirunelveli	47.64	52.36	17.65	82.35
28	Tiruppur	57.17	42.83	17.30	82.70
29	Tiruvannamalai	22.78	77.22	1.81	98.19
30	Vellore	41.11	58.89	4.08	95.92
31	Viluppuram	21.11	78.89	2.09	97.91
32	Virudhunagar	30.92	69.08	24.09	75.91
Total		48.29	51.71	11.58	88.42

Source : Census 2011