

## CHAPTER II

### Public Works Department

### 2 Performance Audit on Irrigation Activities in Chennai Region

#### Executive Summary

##### Introduction

In the State of Tamil Nadu, water is a limiting factor affecting production and productivity. Since Tamil Nadu does not have any perennial river, river basin planning, best suited for optimum utilisation of water resources is adopted. Government of Tamil Nadu in Eleventh Five Year Plan (2007-12) aimed at restoration and maintenance of existing water bodies, harnessing of surface water flowing into sea, taking up drainage works in major rivers, canals, tanks and coastal protection works. Ground water being main source for irrigation and drinking purposes, special emphasis is required for obtaining an accurate picture of ground water resources.

Given this background, Performance Audit on Irrigation Activities in Chennai Region comprising nine districts of Tamil Nadu was conducted.

##### Planning

State Water Policy was not revised in line with National Water Policy April 2002. In absence of revised State Water Policy with legal frame work for regulation and control of surface and ground water, Department did not have effective control over surface water and drawal of ground water.

##### Financial Management

Imprudent financial management resulted in locking up of Government funds of ₹ 217.12 crore outside Government account.

##### Implementation of schemes

Ineffective planning and delay in implementation of various schemes defeated intended objective of improving irrigation potential. An amount of ₹ 505.61 crore was locked up in 16 incomplete works ranging from one to eight years.

##### Ground and Surface Water

Rules and regulations were not framed to protect ground water resources against over exploitation. Observation wells maintained for monitoring ground water were also far below prescribed standards.

Due to ineffective functioning of Laboratory, water samples could not be analysed on special parameters since 2006 to identify presence of heavy metals, pesticides and pollutants which cause health hazard.

### **Hydrological and Meteorological Data**

Deficiencies in hydrological and meteorological data indicate that full potential of data could not be utilised for hydrological design, planning, water resources management, flood management and for formulation of schemes.

### **Environment**

Preventive measures to control sea water intrusion were inadequate. Coastal protection works were commenced without obtaining environmental clearance from GOI. Pollution in Palar River was not controlled despite high level of pollution since the year 2000.

### **Flood water Management**

Defective planning of flood control works in Chennai city led to delay and increased cost thereby defeating objective of the scheme formulated to avoid flooding in Chennai.

### **Monitoring**

Original capacity of tanks was not restored due to ineffective enforcement of Act for eviction of encroachments.

Water Resources Management remains unachieved even after a lapse of three years since establishment of SWaRMA, an agency constituted for this purpose.

## **2.1 Introduction**

Mandate of Water Resources Department (WRD) of Government is to (i) formulate schemes to effectively utilise available water resources, (ii) maintain and improve existing infrastructure and (iii) ensure effective functioning of irrigation systems. In Eleventh Five Year Plan (2007-12), WRD aimed at restoration and maintenance of existing water bodies, harnessing surface water flowing into sea, taking up drainage works in major rivers, canals, tanks and coastal protection works. In order to achieve above objectives, WRD carried out irrigation schemes for harnessing surface water, regulation of drawal of ground water, management of flood water, *etc.* Schemes were funded by Government besides financial assistance from National Bank for Agriculture and Rural Development (NABARD), Government of India (GOI) assisted Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and World Bank.

## **2.2 Organisational structure**

Secretary to Government is the administrative head of Public Works Department (PWD) of Government. PWD has two wings viz., Water Resources Department (WRD) and Buildings Organisation. Technical head of the WRD is Engineer-in-Chief (E-in-C) who co-ordinates with (i) Chief Engineers (CE) of four regions located at Chennai, Coimbatore, Madurai and Trichy and (ii) five functional CEs for Plan Formulation (PF), Design Research and Construction Support (DRCS),

Operation and Maintenance (O&M), Institute for Water Studies (IWS) and State Ground and Surface Water Resources Data Centre (SG&SWRDC). Each CE is assisted by Superintending Engineers (SE) and Executive Engineers (EE).

### 2.3 Audit objectives

Performance Audit was conducted to assess

- effectiveness of the planning process in selection of irrigation schemes/works;
- prudence in financial management;
- economy, efficiency and effectiveness in execution of schemes/works;
- adequacy of monitoring and evaluation and
- integrity of hydrological and meteorological data.

### 2.4 Audit criteria

Audit criteria were sourced from the following:

- Five Year and Annual Plans;
- Regulations, Orders/Instructions of the Government of India/Tamil Nadu;
- Policy notes of Government;
- Tamil Nadu Public Works Department Codes and Manuals, Departmental Schedule of Rates and
- Terms and Conditions governing the loan agreements with the funding agencies viz., World Bank and NABARD.

### 2.5 Audit coverage and Methodology

Chennai Region covers six out of seventeen river basins covering nine districts namely Chennai, Cuddalore, Dharmapuri, Kancheepuram, Krishnagiri, Tiruvannamalai, Tiruvallur, Vellore and Villupuram. The region has 18 reservoirs and 13,305 tanks with total storage capacity of 569.48 M<sup>5</sup> and 2,296.97 M<sup>3</sup> respectively in six river basins. PA was conducted during April 2013 to September 2013 covering the period 2008-2013.



<sup>5</sup> Million Cubic Meter

Audit objectives, criteria and methodology were discussed in Entry Conference (29 May 2013) with Government represented by Deputy Secretary and senior officers of Department. Audit findings were also discussed with Special Secretary and officers of Department in an Exit Conference (5 December 2013) and views expressed by them have been considered while finalising the report.

## **Audit Findings**

Findings of audit as a result of test check of records are detailed below:

### **2.6 Policy and Planning**

Government in the Eleventh Five Year Plan proposed strategies such as (i) restoration and maintenance of the existing water bodies (ii) carrying out drainage works in the major rivers, canals and tanks and (iii) implementation of the Tamil Nadu Ground water (Development and Management) Act, 2003. Since a large percentage of consumptive use is through irrigation, top priority is to be given to irrigation water management. This task requires a strong institutional arrangement for effective implementation of the policies for better water management.

#### **2.6.1 Water Policy**

State Water Policy needs to be revised in accordance with National Water Policy keeping in mind the basic concerns and principles. National Water Policy laid emphasis on integrated water resources development and management for optimal and sustainable utilization of available surface and ground water. Objective of National Water Policy is to take cognizance of the existing situation, to propose a framework for creation of a system of laws and institutions and for a plan of action with a unified national perspective.

Audit noticed that Tamil Nadu State Water Policy was formulated in the year 1994 based on the National Water Policy 1987. National Water Policy was updated and adopted by National Water Resources Council in April 2002. However, Tamil Nadu State Water Policy is yet to be revised by Government. A committee was constituted (August 2013) to submit draft State Water Policy to focus on development, conservation, utilisation and management of water resources and also for regulation of ground water. State Water Policy to be revised within the frame work provided by National Water Policy would facilitate enactment of legislation for regulation and control of ground and surface water. State Water Policy was not revised in line with National Water Policy April 2002. In absence of revised State Water Policy with legal frame work for regulation and control of surface and ground water, Department did not have effective control over surface water and drawal of ground water. Moreover, hydrological and meteorological data available with the Department for effective planning was also deficient as brought out in subsequent paragraph along with other issues.

## 2.7 Financial Management

Irrigation schemes were implemented with financial assistance from the State, GOI and loan assistance from NABARD and World Bank. Details of expenditure incurred on schemes during 2008-09 to 2012-13 pertaining to Chennai Region are given below:

(₹ in crore)		
Sl. No.	Schemes	Expenditure
1.	IAMWARM <sup>6</sup>	368.74
2.	State funded schemes and shared schemes <sup>7</sup>	919.61
3.	NABARD schemes	81.40
<b>Total</b>		<b>1,369.75</b>

Financial management is integral to ensuring that utilisation of funds in implementation of schemes was prudent and works were carried out economically and efficiently. Following instances revealed deficiencies in financial management:

### 2.7.1 Locking up of Government funds outside Government account

Flood protection works for improvements to Micro and Macro drainages in Chennai city under JNNURM Scheme (October 2009) were to be carried out by Corporation of Chennai (CoC) at a total estimated cost of ₹ 1,447.91 crore (Micro Drainage – ₹ 814.88 crore and Macro Drainage – ₹ 633.03 crore). Since WRD maintains Macro drainages in Chennai city, flood protection works in Macro drainages were to be carried out by WRD. Tamil Nadu Urban Finance and Infrastructure Development Corporation (TUFIDCO) was designated as nodal agency for release of funds.

Municipal Administration and Water Supply Department (MAWS) released funds amounting to ₹ 496.61 crore (2009-10 to 2013-14) to CoC through TUFIDCO which included ₹ 217.12 crore for works to be carried out by WRD. However, WRD did not obtain the amount of ₹ 217.12 crore from CoC, instead, incurred expenditure from budget allocation of Public Works Department. Government also did not monitor timely transfer of funds from CoC to PWD for executing Macro component but released funds to MAWS and PWD for executing the same work.

Thus, failure to obtain funds from CoC and incurring expenditure from budget allocation of PWD resulted in locking up of Government funds of ₹ 217.12 crore (December 2013) outside Government account for a period ranging from six

<sup>6</sup> World Bank assisted Irrigated Agriculture Modernisation and Water Bodies Restoration and Management Scheme.

<sup>7</sup> State schemes and shared schemes such as Floodwater Management Programme, JNNURM.

months to four years. Department replied (December 2013) that action would be initiated to obtain funds from CoC.

### 2.7.2 Non-availing of Central assistance

Taking cognizance of recurrent devastating floods every year, GOI formulated (August 2009) a scheme viz., Flood Management Programme (FMP) under State Sector in Eleventh Five year Plan. Funding pattern of the scheme between Central and State Governments was 75:25.

First instalment of ₹ 30.32 crore was released (March 2010/December 2010) by GOI and for release of second instalment, submission of utilisation certificates (UCs) for 70 *per cent* of earlier release including matching share of the State Government was mandatory. Further, release of Central assistance for schemes in subsequent years would be considered only if audited statements of expenditure are furnished to GOI within nine months of completion of financial year.

Audit scrutiny revealed that as against eligible Central share amounting to ₹ 269.39 crore being 75 *per cent* of total expenditure of ₹ 359.18 crore for five works sanctioned (July 2009 to July 2010) and completed (March 2012) in Chennai Region, Central assistance of only ₹ 30.32 crore was received (March to December 2010), leaving balance of ₹ 239.07 crore, due to belated/defective submission of audited statements and non-furnishing of requisite particulars. This resulted in postponement of availing Central assistance of ₹ 239.07 crore thereby over burdening the State exchequer.

Department replied (December 2013) that action would be initiated to obtain reimbursement from GOI.

### 2.7.3 Excess payment towards Price Adjustment

Tenders for the work of “Improvements<sup>8</sup> to South Buckingham Canal” were called for and last date for submission of tender was 10 March 2010. Agreement of work (June 2010) contemplated payment towards price adjustment to compensate fluctuations in rate on the components<sup>9</sup> based on Government Order (June 2009). All works for which price adjustment was contemplated must have mile stones fixed in physical terms. As per General conditions of contract, base quarter would be reckoned with reference to the quarter of calendar year in which last date for tender submission was fixed. In case of delayed agreement, the quarter in which agreement was signed would be reckoned as base quarter for the purpose of calculation of price adjustments.

Due to change in construction methodology in above work, new rates were arrived at for substituted item of works by Department and same were accepted by the contractor (August 2011 and September 2011) with revised milestone.

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<sup>8</sup> Widening and Deepening, Widening of water ways of Bridges from Okkiam Maduvu to Muttukadu Backwater (North Lock) from LS 10,500M to 23,500M.

<sup>9</sup> Labour, Cement, Steel, Plant and Machinery, Bitumen and Petroleum, Oil and Lubricants (POL).

Accordingly, supplementary agreement for substituted items of work was entered into with the contractor (March 2012).

Payment towards price adjustment for substituted item was made by Department for seven quarters. In five out of seven quarters, Department adopted quarter pertaining to submission of tender (January 2010-March 2010) as base quarter and for remaining two, Department adopted quarter in which rates for substituted items were approved (July to September 2011) as base quarter. Adoption of quarter pertaining to date of submission of tender as base quarter for substituted item instead of quarter in which rates for substituted items were approved resulted in excess payment to the tune of ₹ 5.87 crore (**Annexure 2**) to the contractor. Department agreed (December 2013) to recover excess payment from the contractor.

#### **2.7.4 Inadequate allotment of funds**

Tamil Nadu Public Works Department Code (PWD code) stipulate that no work shall begin unless a properly detailed design and estimate have been sanctioned, allotment of funds made and orders to begin issued by competent authority.

Work of formation of a check dam across Kanar Odai in Vellore District sanctioned (February 2001) with objective of irrigating 18.82 hectares (ha) was awarded (May 2001) for ₹ 0.89 crore. Worksite was, however, handed over (February 2007) after a delay of five and half years from date of award of work due to delay in obtaining permission from Forest Department (FD). As against total value of work done for ₹ 56.38 lakh, an amount of ₹ 21.08 lakh was paid (August 2007) to the contractor. The balance amount to the tune of ₹ 35.30 lakh could not be paid for want of funds.

Work was stopped midway since then (January 2008) due to non-allotment of funds and check dam remains incomplete. Proposal (August 2012) for allotment of funds for ₹ 64 lakh for execution of balance items of works was pending (January 2014) with Government.

Thus, non-execution of work for more than six years due to inadequate allotment of funds violating codal provisions resulted in non-achievement of objective even after incurring an expenditure/liability of ₹ 56.38 lakh on the executed work. Department replied (January 2014) that after allotment of funds, pending works would be completed.

## **2.8 Programme Implementation**

Schemes for optimum harnessing of surface water were not formulated despite there being demand for irrigation activities. Selection of unviable schemes and non-completion of projects due to delay in land acquisition, defective design, slow progress etc., defeated the intended objective of irrigation activities.

Audit observed that an amount of ₹ 505.61 crore was locked up in 16 incomplete works. Six works were incomplete for more than five years, four works more than four years but less than five years, one work for more than three years but less than

four years, one work more than two years but less than three years, four works more than one year but less than two years amounting to ₹ 286.26, ₹ 75.65, ₹ 5.13, ₹ 0.52 and ₹ 138.05 crore respectively (**Annexure 3**).

## 2.9. Surface water

Tamil Nadu does not have any perennial river. River basin planning, best suited for optimum utilisation of water resources is required. Water management for irrigation needs to be given top priority since a large percentage of consumptive use is through irrigation. Hence, new schemes such as construction of reservoirs, anicuts, checkdams, *etc.*, need to be formulated to harness surface water flowing into river and sea.

### 2.9.1 Utilisation of surface water

Considering gap in demand and supply of water and also with a view to achieve objective of preservation and stabilisation of existing water resources, Eleventh Five Year Plan envisaged (2007-12) utilisation of surface water flowing into sea by constructing structures to divert water to needy areas by formulating schemes. Audit noticed that there were deficiencies in formulation of such schemes as discussed below:

#### 2.9.1.1 Vellar Basin

Lower Coleroon Anicut (LCA) and Sethiathope Anicut (SA) are situated across Coleroon River and Vellar River respectively before they flow into sea. Details of storage capacity, irrigation demand, quantity supplied and let out to sea during the period from 2008-09 to 2012-13 are furnished below:

Details of quantity of water let out in sea

Sl. No.	Name of the Anicut	Storage capacity (Mcf) <sup>10</sup>	Irrigation demand TMC	Supplied Quantity TMC	Shortfall TMC	Quantity let out to Sea TMC
1.	LCA	150.13	156.60	80.62	75.98	154.18
2.	SA	104.00	51.75	9.06	42.69	103.16
<b>Total</b>		<b>254.13</b>	<b>208.35</b>	<b>89.68</b>	<b>118.67</b>	<b>257.34</b>

(Source: Details furnished by divisions)

Audit observed that despite shortfall in meeting irrigation demands, more than double the quantity was discharged into sea. Department, however, did not formulate schemes for constructing structures to harness the surplus quantity discharged into the sea in respect of above anicuts. On this being pointed out, Department replied (January 2014) that proposals for construction of checkdams were under consideration of Department.

<sup>10</sup> Million Cubic Feet



### **2.9.1.2 Palar Basin**

Palar River flows in Vellore and Kancheepuram districts and confluences at Sea. There were no harnessing structures like anicuts/check dams *etc.*, across Lower Palar River to harness surface water for a length of 115 km till it reaches Sea. As per flow data available with WRD, surface water flowing into sea measured at the nearest causeway was found to be 1,098 Mcft per year (average flow during past 21 years, upto 2000) and same was found to be 3,260 Mcft in the year 2004. Department during Exit Conference stated that proposal for construction of check dam across Lower Palar River was under consideration at various stages.

Fact, however, remains that schemes were not formulated to harness surface water as envisaged in Eleventh Five Year Plan.

### **2.9.2 Non-achievement of irrigation facilities**

With a view to harness surface water to meet deficit in demand for drinking and irrigation purposes, WRD constructed reservoirs, tanks, artificial recharge structures, checkdams, siphons *etc.* Audit, however, noticed that intended objective of meeting irrigation demand was not achieved due to reasons such as delay in land acquisition, defective design, *etc.*

#### **2.9.2.1 Project remaining incomplete due to non-acquisition of land**

PWD code stipulates that no work should be commenced on land which was not duly made over by responsible civil officers. Audit, however, noticed that following projects formulated with intention of tapping surface water potential could not take off due to non- acquisition of land:

##### **(a) Construction of Artificial Recharge Structure (ARS) across Mani Nadhi**

With a view to harness surface water to meet demand for drinking and irrigation purposes, Government accorded (October 2010) administrative approval for work of construction of Artificial Recharge Structure (ARS) across Mani Nadhi including formation of a supply channel to benefit an area of 61 ha.

Work which *inter alia* included three components viz., construction of check dam, construction of head sluice and formation of supply channel, was awarded (February 2011) for ₹ 1.08 crore and scheduled to be completed in August 2011. While work of construction of check dam and head sluice was completed (March 2011), work relating to formation of supply channel was not taken up (August 2013) pending acquisition of patta land of 2.89 ha. Proposal submitted to District Collector, Villupuram for acquiring such land through private negotiation as early as in March 2011 was pending with Collector (August 2013).

Audit noticed that Department did not ensure availability of land for formation of supply channel before awarding work to contractor. This resulted in non-achievement of intended objective of irrigating 61 ha of ayacuts even after incurring an expenditure of ₹ 0.83 crore.

**(b) Construction of reservoir across Koil Malayar**

Formation of reservoir across river Koil Malayar earlier taken up in August 1993 was revived in May 2005 at a cost of ₹ 12.98 crore under NABARD scheme. Work involved acquisition of lands (forest, patta and poramboke lands) to the extent of 59.75 ha. An amount of ₹ 3.37 crore was paid (August and September 2007) towards Compensatory Afforestation (CA) for executing work in forest lands and ₹ 45.09 lakh was remitted to Revenue Department for acquisition of patta land. Work was awarded (February 2007) to contractor with scheduled period of completion of 16 months. However, agreement was foreclosed (October 2008) and project was withdrawn from NABARD scheme due to delay in land acquisition.

Thus, ₹ 4.65 crore remain blocked up on projects which were commenced without ensuring availability of land. Department stated (December 2013) that necessary action would be taken for early completion of the projects.

**2.9.2.2 Projects remaining incomplete due to defective design**

Projects taken up to increase area under irrigation did not yield the intended result due to defective design in the following two cases.

**(a) Construction of siphon across Palar River**

Government accorded (November 1997) administrative sanction of ₹ 40 crore for “Construction of Mordhana Reservoir” including two sub works viz., “Construction of Right Main Canal (RMC) and Left Main Canal (LMC)”. Water released through RMC crossed Palar River through an aqueduct for a length of 400m to cater to a total ayacut of 1,378 ha situated on the right side of the Palar River with an assured supply from Mordhana Reservoir. Sub work of construction of above aqueduct in RMC was completed for a designed capacity of one lakh cusecs (Maximum Flood Discharge in the Palar River) in 2002 at a cost of ₹ 1.26 crore.

Special CE, during inspection (October 2006), noticed that top of aqueduct was not at uniform level and hence water level was not uniform. As a remedial measure, a dividing wall below aqueduct with necessary energy dissipation arrangements for designed discharge capacity of one lakh cusecs was constructed (March 2010) at a cost of ₹ 2.15 crore. However, during construction of dividing wall, aqueduct collapsed (November 2008) due to sudden flash flow of water of 5,000 cusecs. SE (Designs) opined that water pressure and lateral pressure were reasons for failure of aqueduct and also suggested (December 2008) construction of well siphon in lieu of aqueduct. Accordingly, construction of well siphon was completed (August 2013) at a cost of ₹ 1.39 crore.

Aqueduct designed for a capacity of one lakh cusecs could not withstand 5,000 cusecs due to defective design. Thus, expenditure of ₹ 3.41 crore on construction of aqueduct and remedial works was rendered wasteful besides defeating the intended objective of irrigating an ayacut of 1,378 ha. Department attributed (January 2014) reason for collapse of aqueduct to sudden flash flood. Fact,

however, remains that aqueduct did not withstand even lesser discharge of water than its designed capacity.

**(b) Construction of Shenbagathope Reservoir**

Construction of Shenbagathope Reservoir Project under NABARD loan assistance was formulated in 2001 with the objective of supplying water to four<sup>11</sup> anicuts in the downstream. Reservoir proposed at a cost of ₹ 34 crore was to feed 46 tanks covering 30 villages with a command area of 2,710 ha<sup>12</sup>.

Work of construction of reservoir *inter alia* included (i) formation of a reservoir across Kamandalar River and (ii) design, manufacturing, erection, testing and commissioning of seven radial shutters<sup>13</sup>. According to terms of agreement ( July 2004) with the contractor for erection of shutters, period of guarantee was 24 months and any defect in smooth functioning noticed during above period had to be made good by the contractor at his own cost. Components of formation of a reservoir work and commissioning of shutters were completed (March 2007) at a total cost of ₹ 28.78 crore.

While testing radial shutters commissioned and erected, Chief Engineer, Operation and Maintenance, WRD, noticed (May 2008) certain defects due to improper alignment of gates. Radial shutters were also in open condition and hence water could not be stored beyond sill level. Contractor did not rectify defects, though required, as per terms of agreement. Efforts of Department (2008 to 2010) to rectify defects through Departmental workshop were also not successful due to non-availability of experienced staff. Estimate prepared (April 2013) for ₹ nine crore for rectifying these defects in radial shutters of reservoir through a new agency was pending approval of Government (December 2013).

Inordinate delay in execution and subsequent delay in carrying out rectification works resulted in non-achievement of supplying water to four anicuts in the downstream, even after incurring an expenditure of ₹ 28.78 crore on construction of the reservoir and allied works. Department stated (December 2013) that necessary action would be taken for early completion of the project.

Thus, due to defective execution of original works and delay in carrying out remedial measures, above two projects initiated with objective of irrigating 4,088 ha could not be put to beneficial use. Besides, objective of Eleventh Five Year Plan to harness surface water and to increase area under irrigation remained unachieved even after incurring an expenditure of ₹ 32.19 crore.

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<sup>11</sup> (i) Aliyabad (ii) Vellore (iii) Kamakkur (iv) S.V. Nagar.

<sup>12</sup> Stabilisation 2,068 ha and gap filling 642 ha.

<sup>13</sup> The Radial Shutters are used for the process of controlling the over flow of the water when the situations of flooding come up.

### 2.9.2.3 **Dropped projects**

As per guidelines of NABARD, project should be selected after a comprehensive study of technical, economic, financial and organisational aspects to ensure that the capital resources are used to create productive assets which are expected to realise benefits over a period. Audit, however, noticed that project taken up under NABARD assistance was subsequently dropped on grounds of being uneconomical as discussed below:

Government accorded (August 1998) sanction for work of “Formation of a Reservoir across Vellakkal Kanar in Vellore District” at an estimated cost of ₹ 7.70 crore. As the proposed reservoir site was located in reserve forest area, Department remitted (March 2002) an amount of ₹ 82.67 lakh and also handed over (August 2004) land to the extent of 72 ha to Forest Department (FD) towards Compensatory Afforestation. While work was proposed with NABARD loan assistance for ₹ 10.30 crore, cost escalated to ₹ 11.50 crore (January 2005) due to delay in getting possession of forest land. Work could not be commenced as additional payments were to be made to FD. Finally, on request (November 2010) of Government, scheme was deleted (September 2011) from NABARD assistance in view of economic un-viability.

Despite sanction of project by NABARD, poor planning and belated handing over of land towards Compensatory Afforestation led to uneconomical cost of project thereby losing an opportunity of forming a reservoir.

Thus, due to non completion of schemes for reasons such as pending land acquisition process, defective design, selection of un-viable project *etc.*, intended objective of irrigating ayacuts effectively was defeated.

Department replied (December 2013) that preparation/sanction of revised estimates were under process for early completion of the pending projects.

## **2.10 Ground Water**

Ground Water wing of WRD also known as State Ground and Surface Water Resources Data Centre (SG&SWRDC) functions with objectives which *inter alia* include (i) Scientific ground water investigation and periodic assessment of ground water potential and (ii) Continuous monitoring of monthly hydrological, hydro meteorological water level parameters and water quality for ground and surface water. Ground water being main source of water for irrigation and drinking purposes, special emphasis is required for obtaining an accurate picture of ground water resources.

### **2.10.1 Issue of No Objection Certificate (NOC) for drawal of ground water**

Government enacted ‘The Tamil Nadu Ground Water (Development and Management) Act’ in the year 2003 to prevent indiscriminate drawal of ground water for sustainable development. Act contemplated formation of Tamil Nadu Ground Water Authority to protect ground water resources, safeguard against hazards of over exploitation and to ensure its planned development and proper

management in State. Government did not frame rules and regulations for implementation of Act (2003). Moreover, Government repealed (September 2013) the above Act with a view to comprehensively change it taking into account the present demand, need and supply. However, this is yet to be done (February 2014). As a result there has been no clear framework to monitor extraction of ground water as discussed below:

With a view to control indiscriminate drawal of ground water, Government issued orders (February 2004 and March 2012) prohibiting formulation of schemes in over exploited and critical blocks as categorised by them. As per guidelines issued by Central Ground Water Authority (CGWA), no NOC should be granted (with effect from November 2012) for drawal of ground water in over exploited areas and wherever State Government Authorities are in existence to manage and control ground water regimes, ground water regulations would be done by them. Chennai Region of WRD issued NOCs to 49 units during November 2001 to August 2011 for drawal of ground water.

Audit scrutiny of records on issue of NOCs in respect of these 49 units revealed the following discrepancies.

- NOC from State Ground water Authority for drawal of ground water is one of the main requirements to be complied with by packaged drinking water units for obtaining water quality Licence from Bureau of Indian Standards (BIS). Out of total number of 49 units for which NOC were issued, only two were issued for packaged drinking water units. It was, however, observed that 440 packaged drinking water units in Chennai Region were granted BIS Licence. Thus, it is evident that there was inadequate control mechanism to monitor drawal of ground water.
- In one case NOC was issued (June 2009) for drawal of ground water in over-exploited block<sup>14</sup> contrary to Government instructions.
- NOC was to be renewed after completion of three years from the date of issue. Though validity of NOCs in respect of 47 units expired during November 2004 to December 2013, only two units applied for renewal of NOC.

Department expressed their inability to prevent indiscriminate drawal of ground water due to non-framing of rules and regulations leaving protection of ground water resources against over exploitation vulnerable.

### **2.10.2 Monitoring of ground water structures through observation wells/Piezometers**

Observation wells/Piezometers<sup>15</sup> are non pumping wells identified by Department primarily for observing elevation of water and to obtain water quality samples to

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<sup>14</sup> Wallajabad Block, Kancheepuram District

<sup>15</sup> Piezometer: Small-diameter well open at a point or short length in the aquifer to allow measurement of hydraulic head at that point or short length

monitor ground water. As the current prescribed ratio of 1:500 of observation wells to ground water structures was inadequate, Planning Commission, GOI stressed (October 2011) the need to have a ratio of 1:100 for effective ground water management. Strengthening ground water monitoring system by establishing one Piezometer in each village was included in Twelfth Five Year Plan.

Audit scrutiny revealed that Department could maintain a ratio of 1:1000 only as against the prescribed ratio of 1:500. No action was initiated by it to enhance the ratio of observation wells or install a Piezometer. Hence, existing ratio was inadequate for effective ground water management and also far below the ratio prescribed by Planning Commission.

Department replied that existing proportion of observatory wells was satisfactory. However, Planning Commission recommended ratio of 1:100 after considering inadequacy of the existing prescribed ratio of 1:500.

## **2.11 Deficiencies in hydrological and meteorological data**

SG&SWRDC was established for continuous monitoring of surface and ground water quantity and quality, collection/storage of all processed and validated data of both surface and ground water and dissemination of hydrological and meteorological data to all potential users for water resource planning and management. Hydrological and Meteorological data are captured from equipments such as Staff Gauge, Current Meters, Standard Rain Gauge (SRG), Autographic Rain Gauge (ARG) and Full Climatic Stations (FCS). Hydrological and Meteorological data were analysed by audit and following observations are made:

- Hydrological and Meteorological data were not available either for continuous or intermittent period in SWDES<sup>16</sup> database. As a result, consolidated data of FCS was not published after 2005 by SG&SWRDC. Thus, inconsistencies in data resulted in absence of data integrity and same could not be utilised in full extent for planning, design, management for conservation and dependability of surface water to potential users for water resources planning and management.
- Water quality data relating to special parameters (heavy metals, pesticides and pollutants) which cause health hazards for human beings were not captured for surface water and ground water in Water Quality Data Entry System database as these tests were not conducted.
- Rainfall data and water quality data were not integrated in Ground Water Data Entry System (GWDES) database to monitor the influence of rainfall on ground water level fluctuations and the ground water quality parameters through GWDES database as stipulated in GWDES Manual.

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<sup>16</sup> Surface Water Data Entry System – A database to store all types of meteorological and hydrological data using SWDES Software.

- Comparison of rainfall data captured through SRG and ARG in 18 out of 23 stations in Chennai region revealed that deviations were not rectified by SG&SWRDC to ensure consistency of data entered by comparing related data that are observed and entered independently as stipulated in SWDES Manual.
- Meteorological data up to year 2010 sent to National Data Centre (NDC) of Indian Meteorological Department for inter agency validation were returned for rectification of errors and same was not rectified by SG&SWRDC. No response was received from Central Water Commission (CWC) for hydrological data sent for inter agency validation by SG&SWRDC. No follow-up action was taken by the Department. Department did not send hydrological and meteorological data to CWC and NDC after 2009 and 2011 respectively for inter agency validation as stipulated in SWDES Manual.
- Tamil Nadu e-Security Policy, 2010 envisages migration of data to the State Data Centre (SDC). However, data were stored in personal computers and backups were stored in external hard disks manually. Data were not migrated to SDC.
- Information on water quality and ground water level status were not updated in the website<sup>17</sup> maintained for the purpose of dissemination of information to the potential users after January 2008 and February 2011 respectively.
- Prime objectives of e-security and availability of information as envisaged in Tamil Nadu e-security Policy, 2010<sup>18</sup> remains largely unachieved.

The above deficiencies indicate that full potential of data could not be utilised for hydrological design, planning, water resources assessment, flood management and also for formulation of projects. Department accepted this (December 2013) and said deficiencies would be rectified.

## **2.12 Environment**

### **2.12.1 Special parameters on water quality not tested due to non-recognition of laboratory by Central Pollution Control Board (CPCB)**

Sections 51, 52 and 53 of the Water (Prevention and Control of Pollution), Act, 1974 stipulated establishment of a State Laboratory and appointment of Analyst to test samples. The Environment Protection Act, 1986 also stressed the need for such laboratories to carry out the functions. CPCB recognised (June 2001) one Geo-Chemical Laboratory in Chennai valid for a period of five years (May 2006).

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<sup>17</sup> [www.groundwatertnpwd.org.in](http://www.groundwatertnpwd.org.in) (English) and [www.nilaneer.in](http://www.nilaneer.in) (Tamil)

<sup>18</sup> Information Technology (B4) Department - G.O. Ms. No.42 dated 24.09.2010

Audit noticed that Department, after June 2006, did not take any initiative to obtain fresh recognition for laboratory and for appointment of Government Analyst. Department stated (July 2013) that fresh recognition was not sought for since Department could not comply with CPCB norms in respect of staff pattern. Consequently, special parameters like heavy metals, pesticides, inorganic carbon, organic carbon and total carbon which cause health hazard could not be analysed in water samples since 2006. Special parameters become all the more significant in view of fact that Department themselves identified presence of heavy metals such as lead and iron beyond permissible limit in water even as early as 2003.

However, at present only general parameters are being tested and report published by SG&SWRDC. Department accepting the audit observation stated that action would be initiated to make laboratory functional.

## **2.12.2 Control of Sea Erosion and Sea Water Intrusion**

Behaviour of sea varies throughout the year and consequent littoral drift causes erosion of land on one side and accretion of sand on other side. Loss of sand due to sea erosion is one of the problems faced by coastal areas of State. After disastrous Tsunami in the year 2004, Tamil Nadu Coast was adversely affected. During monsoon periods, problems were aggravated due to formation of cyclonic storms, surges, depression, low pressure zones *etc.* Due to rapid growth of industrialisation, urbanization, ground water in coastal aquifers is being extracted indiscriminately in most part of areas. Hence, Government decided to give priority to coastal protection works. Audit, however, observed lapses in execution of work to control sea water intrusion as evidenced from the following:

### **2.12.2.1 Commencement of work without obtaining environmental clearance**

For carrying out coastal protection works, Government directed (December 2011) that necessary environmental clearance as per Coastal Regulation Zone (CRZ) notification should be obtained before their commencement and guidelines prescribed by GOI were to be followed which was also reiterated by Tamil Nadu State Coastal Zone Management Authority (TNSCZMA), Chennai (November 2011).

Work of construction of sea wall and groynes (rigid hydraulic structure built from ocean shore to interrupt water flow) commenced (September 2012- January 2013) at four<sup>19</sup> sites without obtaining environmental clearance was stopped (March 2013) after incurring an expenditure of ₹ 7.11 crore due to public agitation and also on intervention of National Green Tribunal.

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<sup>19</sup> Three – Cuddalore and one – Villupuram district



Commencement of work without obtaining environmental clearance contravening guidelines issued by GOI and disregarding views of TNSCZMA, Chennai resulted in stoppage of work after incurring an expenditure of ₹ 7.11 crore.

Department, during Exit Conference, stated (December 2013) that work would be resumed after obtaining clearance from GOI.

#### **2.12.2.2 Non-formulation of schemes to control sea water intrusion**

- (a) Government decided (April 2009) to construct a checkdam across Palar near Vayalur in Kancheepuram District to arrest sea water intrusion and improve quality of water. Based on the suggestions of Regional Director, Central Ground Water Board (CGWB), State Level Technical Coordination Committee (SLTCC) submitted (August 2009) a proposal for ₹ 55.55 crore with 100 *per cent* funding by CGWB. While furnishing (July 2011) further details as required by CGWB, cost of scheme was worked out as ₹ 72.50 crore but scheme is yet to be formulated (May 2013).
- (b) Excessive extraction of ground water is the cause for sea water intrusion resulting in soil losing its fertility and uneconomical for cropping. Sea water intrusion was noticed in Minjur belt of North Chennai to the extent of 14.5 km from coast and about 10,000 ha in Gummidipoondi, Cholavaram and Ponneri Blocks were affected. However, no proposal was initiated by WRD to redress the issue.
- (c) CGWB extended financial assistance (December 2002) for Artificial Recharge to Ground Water. Government decided to avail financial assistance for scheme under artificial recharge to utilise surface water draining into sea during monsoon for recharging aquifers. A proposal for Artificial Recharge of Besant Nagar Aquifer to control sea water intrusion was formulated at a cost of ₹ 3.76 crore (October 2006) by utilising flood water from Velachery Tank. Project was, deferred due to encroachment in Velachery area. In the mean time, an alternate proposal (November 2007) of “Artificial recharge of Besant Nagar Acquirer by pumping flood water from Taramani” was found not feasible and proposal was deferred (July 2009). However, status report on sea water intrusion study in Besant Nagar in Chennai during the year 2007 to 2010 revealed that level of chloride was on increasing trend due to over extraction of ground water. Despite this, Department is yet to formulate scheme to control sea water intrusion.

Thus, non-pursuance of proposal to construct checkdam and non-formulation of schemes to prevent sea water intrusion defeated objective of improving quality of water. Department replied (December 2013) that necessary action would be initiated to arrest sea water intrusion.

### 2.12.3 Pollution in Palar River not controlled by WRD

Palar River, a major irrigation and drinking water source of Vellore and Kancheepuram Districts is also a recharge source for ground water to nearby areas. Large numbers of leather tanneries are functioning in Vellore District. A study on Pollution in Palar River conducted during 2000 by SG&SWRDC revealed that area to the extent of 8,015 ha was severely affected while 22,904 ha was moderately affected due to tannery effluents.

Another study on effect of tannery effluents in Palar River conducted in 2003 by SG&SWRDC also indicated that Total Dissolved Salts and Chloride value in river water increased to 9,766 mg/l from the level of 8,000 mg/l (year 2000) as against permissible level of 750 – 2,000 mg/l. Common Effluent Treatment Plant was not designed to reduce salt level in effluent. No steps were taken to contain pollution in Palar River.

During Exit Conference, Department replied (December 2013) that Pollution study was not conducted in Palar River since the year 2003 and pollution in river Palar would be controlled in coordination with Tamil Nadu Pollution Control Board.

### 2.13 Flood Water Management

Government sanctioned (October 2009) ₹ 633.03 crore under JNNURM to carry out improvement to Macro drainages to avoid flood water inundation. Flood protection works were carried out in ten packages along canals<sup>20</sup> and in tank. Audit observations are discussed in succeeding paragraphs.

#### 2.13.1 Flood Protection Works in South Buckingham Canal

➤ **Increase in cost and non completion of work due to change of construction methodology:**

Work of “Improvements to South Buckingham Canal from Okkiyam Maduvu to Muttukadu Backwater” was intended to increase discharge capacity of canal from 3,500 cusecs to 9,000 cusecs taking into account reduction in discharge quantum by 3,500 cusecs due to proposed “Construction of shortcut diversion Channel at confluence point of Buckingham Canal near Okkiyam Maduvu”. Since method of deploying machineries like poclain and conveying excavated earth by using tippers to dumping yard was found unsuitable while executing the work, alternate methodology using chain of poclains without deploying any tippers/lorries for conveyance was adopted. Design of bridge was also changed to pile foundation instead of raft foundation due to soil condition. As against proposed widening of 20m width to 100m for total length of 13,000m (from LS 10,500m to LS 23,500m), widening work was not completed for a length of 5,490 m due to non availability of funds. Adoption of alternate

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<sup>20</sup>

South Buckingham Canal, North Buckingham Canal and Central Buckingham Canal

methodology and change of design resulted in revision of estimates (February 2013) from ₹ 78.14 crore to ₹ 104.40 crore.

➤ **Construction of bridge in contravention to IRC specifications:**

Work of “Improvements to South Buckingham Canal from Okkiyam Maduvu to Muttukadu Backwater” *inter alia* included remodelling of two bridges of 12m width across South Buckingham Canal. At request of WRD, Highways Department granted NOC (February 2011) subject to condition that work would be carried out as per Indian Road Congress (IRC) and MORTH (Ministry of Road Transport and Highways) specifications since both the existing bridges are being maintained by Highways Department. However, bridges with three lanes (width increased from 12m to 15m) were constructed by WRD instead of two lanes having two directional traffic violating IRC specifications. Department stated that 15m width bridges with three lanes were constructed anticipating future expansion and volume of traffic. However, fact remains that WRD did not obtain traffic census from Highways Department and executed work without considering IRC specifications.

➤ **Work dropped due to non-availability of funds for land acquisition:**

Work of “Short cut diversion drainage from Buckingham Canal near Okkiyam Maduvu to sea” was proposed to divert portion of flood water (3,500 cusecs) from Okkiyam Maduvu to sea directly in view of time lag for discharging major portion of flood water, zero bed slope terrain, formation of sand bar and hindrance to flow at confluence with sea at Muttukadu. Objective of scheme to discharge sizable quantum of flood water from South Chennai catchments to Bay of Bengal through Buckingham Canal could not be achieved as work was dropped due to increase in land acquisition cost involving ₹ 100 crore. As a result, there would be excess discharge of water to extent of 3,500 cusecs over and above designed discharged capacity of 9,000 cusecs in South Buckingham Canal from Okkiyam Maduvu to Muttukadu Backwater.

Following two works commenced in July 2010 and May 2011 were not completed due to pending land acquisition and delay in shifting of service utilities as discussed below:

➤ **Work not completed pending land acquisition:**

Work of “Improvement to Veerangal Odai Drainage Course Channel” intended to mitigate flooding in Velachery and adjoining areas *inter alia* involved construction of flood protection wall for a length of 8,140m for draining flood water of Veerangal Odai surplus. Work to the extent of 677m was not completed (March 2013) and construction of wall to the extent of 25m (LS 3,925m to LS 3,950m) on both sides of canal was not taken up as land acquisition for the work was pending.

➤ **Non-completion of work due to delay in shifting of service utilities:**

Work of “Short cut diversion drainage channel for Velachery Tank Surplus” was intended to divert surplus discharge from Velachery Tank to South Buckingham Canal instead of draining into Pallikaranai Swamp to reduce its load. Work involved provision of a straight cut canal from Velachery Tank drain to connect it to South Buckingham Canal for a length of 4,100m. Audit observed that 48 *per cent* of work was not completed even after incurring an expenditure of ₹ 67.73 crore (September 2013) due to delay in shifting of service utilities (Tamil Nadu Electricity Board - ₹ 13.72 crore; Chennai Metropolitan Water Supply and Sewerage Board - ₹ 1.26 crore; Highways Department - ₹ 3.69 crore and Works expenditure - ₹ 49.06 crore), though due for completion in 2012.

Thus, intended objective of the works proposed in South Buckingham Canal to give flood relief and minimise period of inundation in flood affected areas in Velachery, Madipakkam and Pallikaranai in South Chennai remained largely unachieved.

**2.13.2 Flood Protection Work in North Buckingham Canal**

Work was intended to provide a new drainage channel to divert a portion of floods from Kodungaiyur Drain, Madhavaram Tank and Otteri Nullah to prevent inundation in North Chennai area at a cost of ₹ 63.05 (January 2010) crore. However, estimate was revised (March 2013) to ₹ 122.50 crore due to change in foundation type, inclusion of additional quantities and substituted items *etc.*

Audit analysis revealed that original estimate was prepared without conducting soil investigation as stipulated in PWD Code. Soil test conducted before commencement necessitated change in type of foundation with resultant cost escalation and submission of RAS proposal. Due to encroachment in work site, court cases, problems involving road cuts *etc.*, works could not be completed even after a lapse of nearly two years since extension of time beyond agreement period of completion and incurring an expenditure of ₹ 62.22 crore, though Department was aware of existence of encroachment before commencement of work. Further, non-conduct of soil test before preparation of estimate led to change in design and consequent cost escalation thereby defeating the objective of flood alleviation in Northern Chennai.

### 2.13.3 Flood Protection Work in Central Buckingham Canal

Work involving widening, deepening and construction of flood protection walls *etc.*, was sanctioned (January 2010) by Government for ₹ 83.89<sup>21</sup> crore to be executed in three slices. Slice 1 and 3 were not completed (March 2013) due to non eviction/delay in eviction of encroachments and work under Slice 2 was also not completed due to delay in finalisation of alignment as discussed below:

**a) Work not completed due to non eviction/delay in eviction of encroachments:**

Work under Slice 1 estimated at a cost of ₹ 14.67 crore to divert surplus water from Maduravoyal Tank to Cooum River for mitigating heavy flooding in Virugambakkam – Arumbakkam Drains was awarded (June 2010) despite existence of storied structures of Tamil Nadu Slum Clearance Board (TNSCB) and heavy encroachments in work site. Work was, however, not commenced (November 2011) pending eviction of encroachments and clearance from TNSCB. Work proposed to be taken up (November 2012) in an alternate alignment at revised estimate of ₹ 28.72 crore was also not commenced due to non-handing over of site (September 2013) even after lapse of more than one year. Work under Slice 3 “Improvements to Virugambakkam and Arumbakkam Drain” at an estimated cost of ₹ 33.22 crore was in progress to the extent of 58 *per cent* only due to delay in eviction of encroachments.

**b) Work not completed due to delay in finalisation of alignment:**

Work under Slice 2, taken up at an estimated cost of ₹ 21.33 crore to divert excess flood water through a cut and covered diversion channel to avoid flooding in Koyembedu Bus Stand, SAF Village area *etc.*, was entrusted to contractor (June 2010) without getting concurrence from Traffic Police and other line Departments. Consequently, alignment was to be shifted (December 2012) and work carried out adopting a new construction methodology. Length of 70m out of 2,040m of channel was completed (January 2014).

Thus, award of work before clearing encroachments and without obtaining consent from various Departments resulted in non-completion of work (September 2013). Consequently, mitigation of flooding in Central part of Chennai City remains largely unachieved.

### 2.13.4 Commencement of work without considering hydraulic designs for discharging surplus water from Ambattur Tank to Korattur Tank

Work was intended to mitigate inundation in Ambattur industrial area of North Chennai by discharging 1,830 cusecs of surplus water from Ambattur Tank to Korattur Tank at a cost of ₹ 19.63 crore. Even after lapse of more than one year from original period of completion (July 2012), work was not completed despite

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<sup>21</sup> Slice 1 ₹17.52 crore, Slice 2 ₹25.98 crore and Slice 3 ₹40.39 crore ( which includes overall lumpsum provision and contingencies of three slices ₹14.67 crore)

incurring an expenditure of ₹ 18.68 crore (September 2013). Audit scrutiny revealed the following:

- Estimate was prepared without conducting preliminary investigation. Consultant for checking hydraulic calculations, designs and drawings was appointed only after commencement of the work.
- Consultant's suggestions could not be complied with since Railways did not permit provision of additional vent for 570 cusecs citing future expansion.
- Highways Department also could not execute work of provision of additional vent for 815 cusecs immediately but accepted to take up the work at the time of widening of road.

Thus, work was taken up by Department, without considering hydraulic design<sup>22</sup> and also consent from Railway Authorities/Highways Department prior to award of work.

To sum up, flood control works in Chennai City area executed under JNNURM in three out of ten packages were yet to commence and in other seven packages, completion of works in near future appears remote pending RAS from Government. Audit observed that reasons for non-completion of work were preparation of estimate without adherence to codal provisions, change in design and methodology midway, delays in shifting of service utilities *etc.* Thus, objective of scheme formulated as envisaged in Eleventh Five Year Plan to avoid flooding in Chennai remained unachieved even after incurring an expenditure of ₹ 394.53 crore (September 2013).

Department replied that works under three packages of JNNURM which were not taken up were likely to be dropped and the remaining works would be completed on receipt of RAS and after shifting of service utilities.

However, the fact remains that alleviation of inundation of flood water in Chennai City remains largely unachieved.

## **2.14 Monitoring**

Monitoring and evaluation is imperative not only to ensure smooth progress of planned works but also to protect existing structures. However, deficiencies noticed during audit are detailed below:

### **2.14.1 Encroachments not evicted to restore water bodies**

State Planning Commission, in Eleventh Five Year Plan document observed that encroachments were serious issues affecting adversely water resources and in particular irrigation tanks. With a view to provide measures for eviction of encroachment and protection of tanks under the control of PWD (WRD), Government enacted (September 2007) the "Tamil Nadu Protection of Tanks and Eviction of Encroachment Act, 2007". Act provided for a survey of each tank for determining the limits in respect of area and preparation of proper charts and registers.

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<sup>22</sup>

Designing canal with reference to peak flood discharge

Charts and Registers, thus prepared, should be in possession of Department and encroachment upon any land within the boundaries of tank should be evicted. Audit scrutiny of records revealed the following:

➤ **Delay in survey and eviction of encroachments:**

Despite lapse of six years since enactment of the Act, survey of tank was completed only in respect of 1,359 out of 3,990 tanks (34 *per cent*) maintained by the Department. Seven hundred sixty six out of the 1,359 tanks surveyed (56 *per cent*) were restored by the Department. Only 21,421 (67 *per cent*) out of 32,140 encroachments identified were evicted.

Due to ineffective enforcement, original capacity of tanks was not restored by evicting encroachments in water bodies thereby defeating objective of the Act.

Department stated (December 2013) that effective action would be taken to restore water bodies by evicting encroachments in coordination with Revenue Department.

#### **2.14.2 Monitoring of Structural stability of Dam**

The Director of Dam Safety under the control of PWD is responsible for safety of large Dams in the State. Director is to prepare health status report of Dams on the basis of periodical inspections conducted four times in a year by the concerned Divisional Executive Engineers. Health Status Report is forwarded to CEs, E-in-C and Government for appropriate remedial action.

As seen from monsoon reports during the period from 2008-09 to 2012-13, major defects were noticed in Manimuktha Nadhi Dam, located across Manimuktha Nadhi, one of the major tributaries of Vellar River. During inspection (December 2010), EE/Vellar Basin division noticed severe sliding of earthen bund at several places on downstream and seepage of water. Director, during site inspection suggested (December 2010) to test soil samples of core and casing material to identify existence of filter arrangements. Subsequently, revetment pockets in the upstream of Dam also completely collapsed and dislocated due to 'Thane Cyclone' (December 2011). Though more than two years have lapsed since field inspection carried out by Director, no remedial measures were taken.

Due to non rectification of defects, structural safety of Dam is at risk posing threat to habitations and lands adjoining slided portion of Dam area. Department stated (December 2013) that proposal to set right defects in Manimuktha Nadhi Dam would be considered under Dam Rehabilitation and Improvement Project (Phase II).

### **2.14.3 Permanent remedial measures not taken to control meandering of Vellar River**

“Manual of instructions of Railway affecting tanks and works” (2012) of WRD emphasises that the maintenance of Railway Affecting works<sup>23</sup> needs to be given priority since it would cause serious damages/breaches or flooding of Railway line or bridge. Audit, however, noticed that there was delay in carrying out maintenance work to protect Railway track as detailed below:

Vellar River, over the years came closer to Railway track near Killai Station of Villupuram - Mailaduthurai Section (from 1400m in 1915 to 2.8m in 2012) due to meandering. Citing public safety and risk for travelling passengers, Southern Railway has been periodically requesting the PWD (WRD) to train the river course from as far back as 2006 and also cautioned that railway services would be suspended between Villupuram - Mailaduthurai Section during monsoon. Though an estimate for ₹ 32 crore for strengthening flood affected area of Vellar River was submitted (January 2010) by CE/Chennai Region to Government, only a temporary remedial measure was taken at a cost of ₹ 91.06 lakh (March 2011). Not satisfied with temporary arrangements, Railway Authorities insisted (November 2012) for protection of Railway track from submersion due to change of river course.

Despite persistent efforts by Railway Authorities since 2006, no permanent remedial measures were taken by WRD for permanent solution to ensure safety of public and trains passing through the route. Even as on date (February 2014), Railway line continues to be a safety hazard for travelling public. Department accepting (December 2013) audit observation informed that possibility of providing permanent remedial measure would be explored to control meandering of Vellar River.

### **2.14.4 Functioning of State Water Resources Management Agency (SWaRMA)**

Government constituted (April 2009) SWaRMA<sup>24</sup> to improve institutional arrangements and capacity for sustainable Water Resources Management in river basin frame work with objective of (i) allocating water efficiently across sectors and (ii) developing and managing the water resources of the State. Main functions of SWaRMA are:

- Preparation of an annual Water Audit for each river basin in the State.
- To develop a State Water Allocation data base.
- Providing advice in regulating water allocation for bulk users for optimal water utilization and water conservation incorporating environmental, social and economic objectives and in conformity with the State Water Policy.

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<sup>23</sup> Those works, the construction, defective design, failure, improper or poor maintenance or operation of which may cause serious damages/breaches or flooding of Railway line or bridge.

<sup>24</sup> Effectively functioning since 9.6.2011



Audit observed that preparation of database, water budget were in process and the remaining functions of SWaRMA were not completed. Proposal to assign regulatory powers to SWaRMA for water allocation for bulk users was yet to be given effect to by Government. Objective of formation of SWaRMA to improve institutional environment and to manage water resources of State remained unachieved even after lapse of three years since its formation.

Department assured (December 2013) that water audit in respect of river basins would be completed.

### **Conclusion**

- State Water Policy was not revised in line with National Water Policy April 2002. In absence of revised State Water Policy with legal frame work for regulation and control of surface and ground water, Department did not have effective control over surface water and drawal of ground water.
- Imprudent financial management resulted in locking up of Government funds of ₹ 217.12 crore outside Government account.
- Ineffective planning and delay in implementation of various schemes defeated intended objective of improving irrigation potential. An amount of ₹ 505.61 crore was locked up in 16 incomplete works ranging from one year to eight years.
- Rules and regulations were not framed to protect ground water resources against over exploitation. Observation wells maintained for monitoring ground water were also far below prescribed standards.
- Deficiencies in hydrological and meteorological data indicate that full potential of data could not be utilised for hydrological design, planning, water resources management, flood management and for formulation of schemes.
- Due to ineffective functioning of Laboratory, water samples could not be analysed on special parameters since 2006 to identify presence of heavy metals, pesticides and pollutants which cause health hazard.
- Preventive measures to control sea water intrusion were inadequate. Coastal protection works were commenced without obtaining environmental clearance from GOI. Pollution in Palar River was not controlled despite high level of pollution since the year 2000.

- Defective planning of flood control works in Chennai City led to delay and increased cost thereby defeating objective of the scheme formulated to avoid flooding in Chennai.
- Original capacity of tanks was not restored due to ineffective enforcement of Act for eviction of encroachments.
- Water Resources Management remains unachieved even after a lapse of three years since establishment of SWaRMA, an agency constituted for this purpose.

### **Recommendations**

- State Water Policy needs to be revised for water resources development and management. Action is needed to introduce a legal framework for monitoring over exploitation of ground water.
- Planning process should be improved and co-ordination with other Departments strengthened to ensure timely completion of schemes and avoid delays and cost escalations.
- System of capturing hydrological and meteorological data needs to be improved by strengthening internal control and inter agency validation.
- Department may take effective action for obtaining recognition for the Laboratory and improve their infrastructure to conduct necessary tests to ensure water quality.
- Control of sea water intrusion may be prioritised.
- Coastal protection works may be carried out after obtaining environmental clearance.