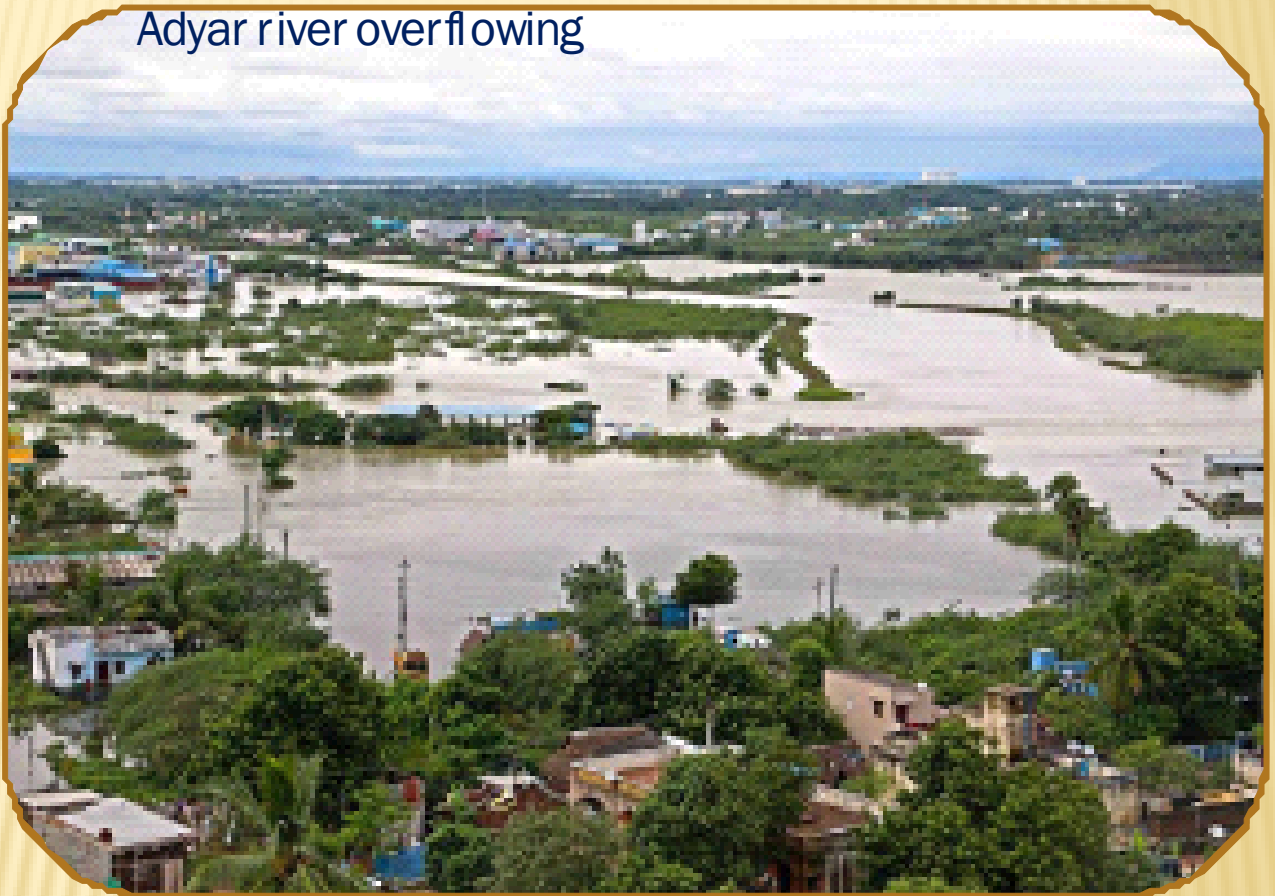


CHAPTER I

INTRODUCTION

Adyar river overflowing



CHAPTER I

INTRODUCTION

1.1 Floods of 2015

In November - December 2015, Chennai and its suburban areas received multiple torrential rain spells. In the worst affected districts of Chennai, Kancheepuram and Tiruvallur, the floods associated with the rains claimed 289 lives due to drowning, electrocution, wall collapse etc. The floods inundated 23.25 lakh houses and put life out of gear for several days. Floods are not new to the city; Chennai had experienced catastrophic flooding in 1943, 1976, 1985, 1998, 2002, and 2005 due to heavy rains associated with cyclonic activity.

Chennai receives sixty percentage of its annual average rainfall of 1,324 mm during North East Monsoon, between October and December, every year. The contours of Chennai and its suburban areas have an average elevation of 6.7 metre above Mean Sea Level (MSL), with few isolated hillocks in the south west with maximum height of 60 metre above MSL. Adyar, Cooum and Kosasthalaiyar are the three main rivers in Chennai Metropolitan Area¹ (CMA). Buckingham Canal, constructed as a navigational canal in 1806, along the coast, flows through CMA, connects the three rivers. Besides the three rivers and the Buckingham Canal, a host of smaller *nullahs* also play their role in draining rain water.

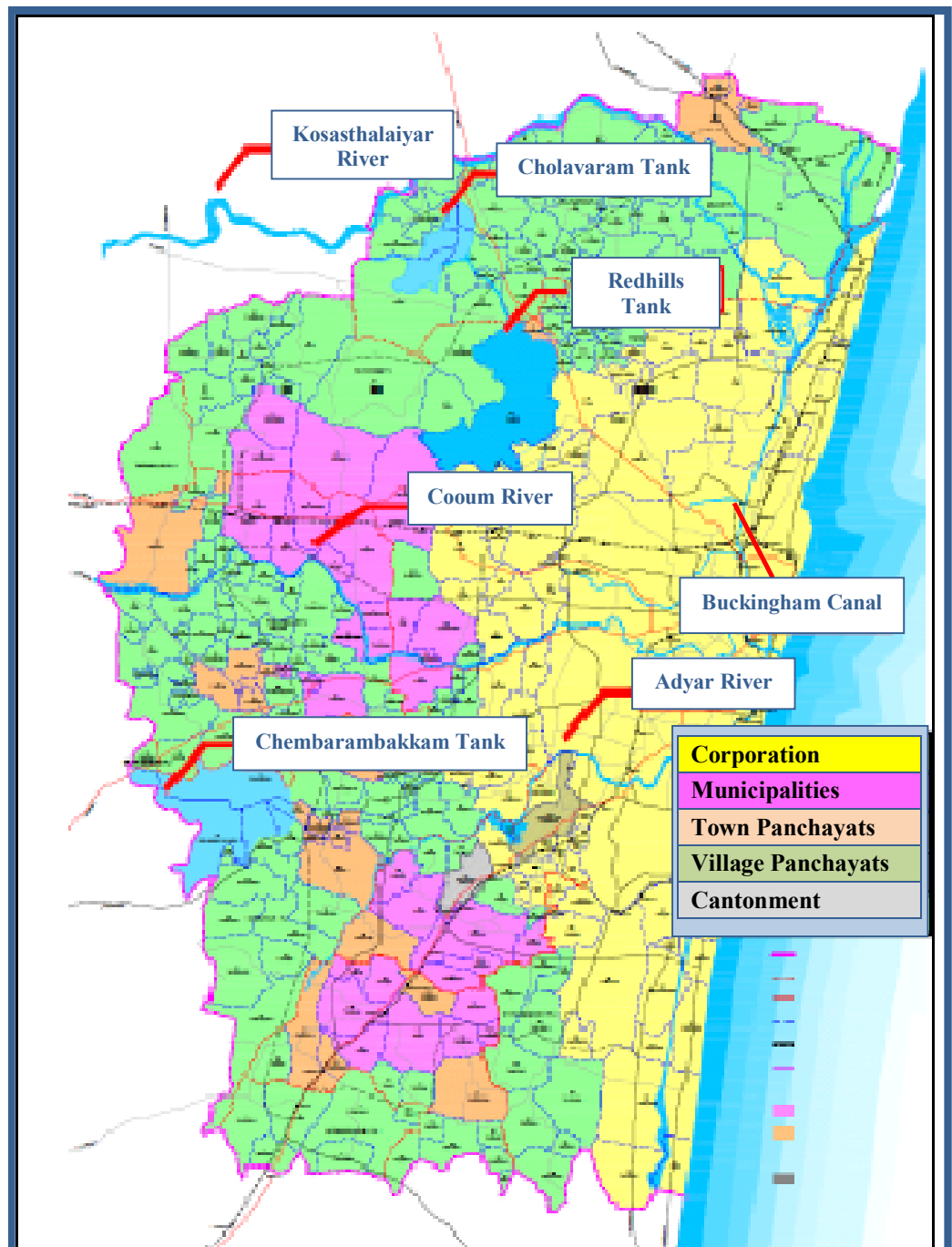
The three major tanks in CMA are Cholavaram (capacity 1.005 TMC²), Redhills (3.300 TMC) and Chembarambakkam (3.645 TMC). Cholavaram Tank is the secondary storage tank, receiving water from the Poondi Reservoir, which lies outside CMA. Redhills Tank is the main source of water supply to Chennai City and during storm events, water is released into Redhills surplus channel, which enters the Kosasthalaiyar River and discharges into the sea. Chembarambakkam Tank, in the southern part of CMA, releases its surplus into Adyar River. These tanks play a major role in moderating flow of flood water in the rivers and consequently, impact the flooding in CMA. **Map 1.1** depicts the water bodies in CMA.

Abbreviations used in this report are listed in the Glossary at Page 145

¹ Metropolitan area comprises Greater Chennai Corporation, eight Municipalities, 11 Town Panchayats and 179 Village Panchayats in Chennai, Kancheepuram and Tiruvallur districts

² Thousand Million Cubic Feet

Map 1.1: Rivers and tanks in Chennai Metropolitan Area



(Source: Chennai Metropolitan Development Authority)

1.2 Incidence of rainfall

During North East Monsoon, 2015, heavy rains lashed Chennai between 15 and 17 November 2015 and the second spell of heavy rains was on 23 November 2015. The third spell on 1 December 2015 marooned large parts of the metropolis. Worst affected areas were Adyar, Alandur, Ambattur, Kodambakkam and Perungudi zones of Greater Chennai Corporation (GCC)

and adjoining suburban areas of Pallavapuram, Peerkankaranai, Perungalathur, Sembakkam and Tambaram, due to overflowing of rivers, chocking of storm water drains, etc.

The details of normal rainfall³ and the actual rainfall in millimetre during North East Monsoon, 2015 are given in **Table 1.1**.

Table 1.1: Normal and actual rainfall (in millimetre)

District	12 to 18 November 2015		19 to 25 November 2015		26 November to 2 December 2015	
	Normal rainfall	Actual rainfall	Normal rainfall	Actual rainfall	Normal rainfall	Actual rainfall
Chennai	104.9	449.9	82.0	217.5	53.4	347.3
Kancheepuram	59.8	452.3	66.6	238.6	46.0	459.0
Tiruvallur	67.3	414.0	54.5	180.1	41.1	342.6

(Source: Data from India Meteorological Department)

The floods during November - December 2015, brought to fore the indiscriminate development in the watershed areas, encroachment of water bodies and deficiencies in development and maintenance of infrastructural facilities for flood prevention and control and lack of preparedness, inadequacies in flood management and response, as commented in the succeeding chapters of this Report.

1.3 Statutory and Institutional framework for flood management

According to National Institute of Disaster Management, flooding occurs due to uneven distribution of rainfall, coupled with unplanned urbanisation, and encroachment of natural drainage channels and urban lakes.

The TN Town and Country Planning Act, 1971 and the First and Second Master Plans framed under the Act provide the backbone for orderly urbanisation to mitigate the impact of floods. The National Water Policy (NWP) promotes planning, development and management of water resources, to avert natural disasters like floods, through structural and non-structural measures, with emphasis on preparedness for flood along with coping mechanisms. Central Water Commission (CWC) is involved in framing guidelines to prevent flooding and has also instituted a flood forecasting system. The Dam Safety Organisation of CWC has issued Dam Safety Procedures for efficient operation of dams.

Following the enactment of the Disaster Management Act, 2005, (DM Act), GoI constituted the National Disaster Management Authority (NDMA) as the apex body for disaster management in India. TN State Disaster Management Agency (TNSDMA) is the State level body for disaster management.

The National Disaster Management Guidelines for Management of Floods, 2008, elaborates the mechanism for (i) preparedness for prevention of flood, (ii) flood forecasting and warning, (iii) maintenance of water storage structures like dams and reservoirs, (iv) regulation and enforcement of

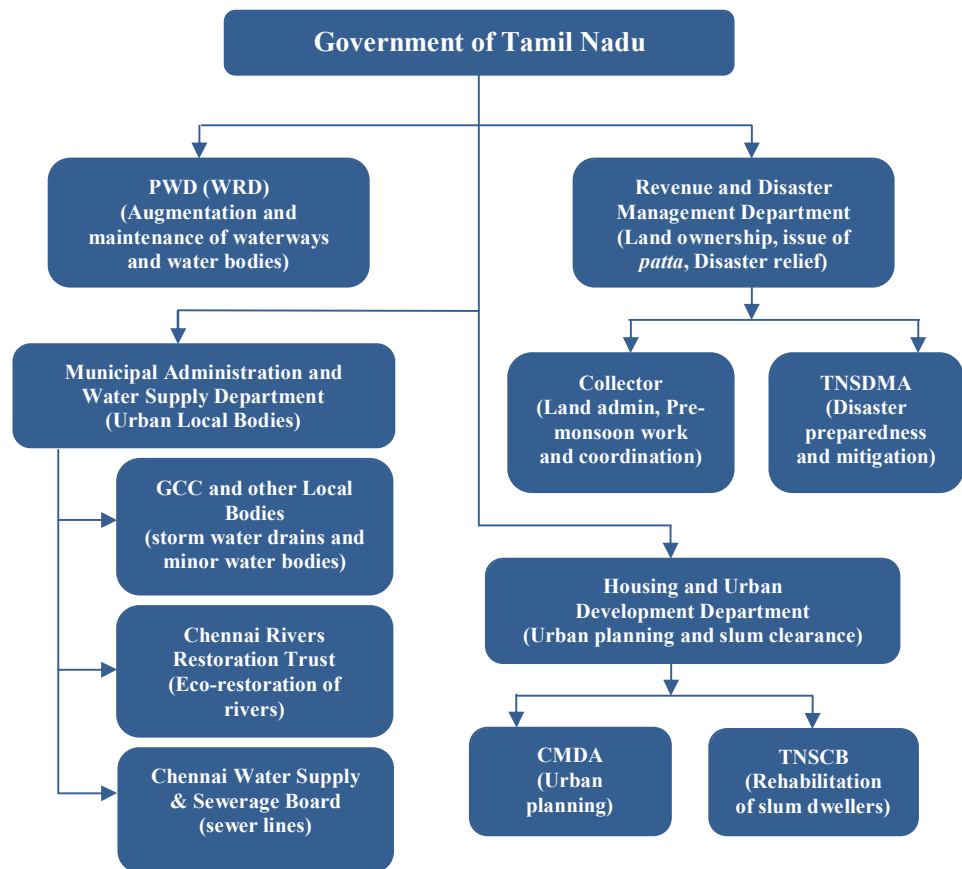
³

Long term average of 30 years rainfall

systemic measures like flood plain zoning, constructions in flood prone areas, (v) capacity development and (vi) institutional framework and financial arrangement for disaster response.

1.4 Departments and agencies audited

Audit teams from the office of the Accountant General (General and Social Sector Audit (G&SSA)) audited Revenue and Disaster Management Department, Municipal Administration and Water Supply Department and Housing and Urban Development Department. Audit teams from the Office of the Accountant General (Economic and Revenue Sector Audit (E&RSA)) audited Public Works Department. The various agencies audited are depicted in the Chart below:



- Chennai Metropolitan Development Authority (CMDA) is involved in planning and overseeing the effective implementation of the Master Plans in minimising the impact of urbanisation on water bodies and waterways.
- Water Resources Department (WRD) is the principal stakeholder for managing large water bodies and the macro drainage⁴ system.
- Revenue and Disaster Management Department is an important stakeholder as custodian of Government land.

⁴ Rivers and canals constitute macro drainage networks

- GCC, Municipalities and other local bodies are responsible for the micro drainage - storm water drainage system.
- Chennai Rivers Restoration Trust (CRRT), a body constituted by GoTN in January 2010, works in coordination with other agencies for restoration of the rivers, tanks and its catchment areas.
- Tamil Nadu Slum Clearance Board (TNSCB) works to evict slums and rehabilitate and resettle the slum families.
- TNSDMA, established under DM Act, 2005, is responsible for preparation of plans for disaster preparedness and managing disasters.

1.5 Audit Objectives

The Performance Audit was conducted with a view to assess whether:

- The Master Plans of CMDA were effectively implemented to ensure sustainable development of the metropolis with due regard to preservation of water bodies and land use plans;
- The Government effectively addressed the issue of encroachments in and around water bodies and elsewhere in CMA, which hinder free flow of rain water;
- Implementation of flood management programmes, including coordination among the related agencies, was effective and economic;
- Response and efforts to mitigate loss during the flood was timely, adequate and effective and
- Internal control mechanism, including performance evaluation and monitoring, was effective.

1.6 Audit Criteria

The Performance Audit was benchmarked against the criteria derived from the following documents:

- National Water Policy 2012 and State Water Policy, 1994
- The TN Land Encroachment Act, 1905
- The TN Protection of Tanks and Eviction of Encroachment Act, 2007
- The National Disaster Management Act, 2005 and National Disaster Management Guidelines for Management of Floods, 2008
- CWC guidelines and Dam Safety Procedures
- The Chennai City Municipal Corporation Act, 1919 and its Rules
- The TN District Municipalities' Act, 1920
- The TN Town and Country Planning Act, 1971 and its Rules
- The Registration Act, 1908
- First and Second Master Plans of CMDA and GCC's City Development Plan
- XII Five Year Plan

- Guidelines of Indian Roads Congress
- Manuals of various Government Departments/Boards/Agencies

1.7 Scope and Coverage of Audit

The Performance Audit was conducted from June to November 2016, covering the period from 2011-12 to 2015-16. In respect of relief measures, the Audit covered the period 2015-16. References to earlier periods were made, wherever necessary for trend analysis.

We focused on:

- Adherence to the Master Plans prepared by CMDA and regulation of developmental activities by way of layout approvals in flood plains, extent of reclassification of zones and monitoring the execution of recommendations
- Eviction of families encroaching the river margins by TNSCB and status of projects executed by WRD under Jawaharlal Nehru National Urban Renewal Mission (JNNURM) scheme and for augmentation of water storage facilities
- Construction and maintenance of Storm Water Drains (SWD) and canals in Chennai City by GCC and in the suburban areas by the respective local bodies
- Pre-monsoon works carried out in rivers and canals, *nullahs*, SWDs, and other water bodies
- Flood management, preparedness, mitigation and response by TNSDMA, in coordination with other related agencies

Action taken on previous audit observations/recommendations on the subject and also Public Accounts Committee (PAC) recommendations, as detailed in **Paragraph 1.8**, were also the focus of study.

1.8 Previous Audits

(i) A Performance Audit on “Alleviation of flood and abatement of water pollution in Chennai City through Chennai Waterways Project” was included in the Report of the Comptroller and Auditor General of India (C&AG) (Civil), GoTN for the year ended 31 March 2006 with recommendations for flood alleviation in Chennai City. The Report was discussed by PAC in November 2009. PAC recommended for (a) prompt action for increasing the storage capacity of tanks by removing encroachment, (b) completion of flood prevention works undertaken in Buckingham Canal and (c) taking steps on sustainable basis, to keep the Adyar mouth open by removal of sand bars and by construction of groynes⁵.

(ii) A Performance Audit was conducted on the implementation of JNNURM and findings included in the Report of C&AG (Local Bodies), GoTN for the year ended 31 March 2011. The findings included non-completion/delay in completion of several works to prevent flooding. Another Performance Audit on Irrigation activities in Chennai Region was

⁵ Barrier to protect from erosion

conducted and included in the Report of C&AG (Economic Sector), GoTN for the year ended March 2013. This Report included finding on mismanagement of projects aimed at improving water bodies. These Reports were not taken up for discussion by PAC (March 2017).

1.9 Audit Methodology

Records were checked at the Secretariat and field offices of various departments, GCC, Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB), CMDA, TNSCB and CRRT, and three Municipalities and three Town Panchayats in Chennai suburban areas.

Besides scrutiny of records and collection of information through Audit enquiries and analytical procedures, the methodology included, (i) analysis using *Google Hybrid- Land use information system* – the GIS tool available in the website of CMDA to identify the extent of developments in water bodies, open space, non-urban zones and catchment areas which are to be preserved as per Second Master Plan (SMP), (ii) joint inspections conducted by the Accountants General (G&SSA) and (E&RSA) and Audit teams along with the officials from WRD, Revenue Department, GCC and sampled local bodies, (iii) Digital analysis of satellite imageries of CMA, and (iv) Consultations with Experts engaged by Audit for technical issues on town planning and water resources, brought out in the Report.

1.10 Sampling

Sample selection was based on judgmental basis, largely dependent on areas affected due to floods in 2015. Urban planning, flood management/ augmentation of storage facilities, macro and micro drainages and encroachment on water bodies were studied in the departments and related agencies. Sampling was not applied for audit of preparedness, rescue and relief measures.

Field units sampled for audit were as given in **Table 1.2** below:

Table 1.2: Field units audited

Auditee Units	Total	Samples
Zones of GCC	15	5 ⁶
Municipalities	8	3 ⁷
Town Panchayats	11	4 ⁸
WRD Divisions	3	3 ⁹

⁶ Adyar, Alandur, Ambattur, Kodambakkam and Perungudi

⁷ Pallavapuram, Sembakkam and Tambaram

⁸ Kundrathur, Peerankaranai, Perungalathur and Thiruneermalai

⁹ Three jurisdictional divisions - Araniyar Basin Division, Lower Palar Basin Division and Kosasthalaiyar Basin Division