



மெருதகா சென்னை மாநகராட்சி

GREATER CHENNAI CORPORATION

**CITY
DISASTER
MANAGEMENT
PERSPECTIVE
PLAN
2022**

GREATER CHENNAI CORPORATION



Victoria Public Hall -1888



CITY DISASTER MANAGEMENT PERSPECTIVE PLAN 2022

PREFACE



Chennai City located on the coramandel coast of the Bay of Bengal has a flat terrain in which most of the areas are with average elevation of barely 2.0 meters above mean sea level. The City features tropical wet and dry climate. Two major rivers flow through Chennai, the Cooum River and the Adyar River. The third river namely Kosasthalaiyar travels through the northern fringes of the City before draining into the Bay of Bengal at Ennore. The Buckingham Canal runs parallel to the coast linking the two rivers. The Otteri Nullah, an east–west stream runs through north Chennai join the Buckingham Canal at Basin Bridge. Many lakes of varying size are located on the western fringes of the City.

The topography and erratic climatic conditions makes Chennai City to witness disasters in several occasions such as cyclones, monsoon floods due to heavy down pour cloud burst, earthquakes, Tsunami etc,. There are some of the areas below the mean sea level which makes it difficult to manage inundation during heavy rainfall. Moreover disasters are beyond our control and capabilities wherein we can reduce the risk and prevent losses to certain extent. Greater Chennai Corporation as the jurisdictional disaster management authority has the foremost responsibility to effectively coordinate the disaster mitigation and response arrangements.

In this context, I would like to present the Citizens of Chennai, City Disaster Management Perspective Plan (CDMP) taking into account the global and national trends in disaster management and it incorporates the approaches suggested in the Sendai Framework for Disaster Risk Reduction 2015 – 2030 which outlines topmost priorities for action:-

- a) Understanding disaster risk.
- b) Strengthening disaster risk governance to manage disaster risk.
- c) Investing in disaster risk reduction for resilience and
- d) Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

As a initiative of smart governance on disaster management, we have set up an Integrated Command and Control Center that will actively share the disaster related information gathered through environmental sensors, rain gauges, flood monitoring sensors and CCTV surveillance and mobile command and control center. We have also considerably increased our investments in City infrastructure amenities combat disasters. The integrated storm water drain project is one of such example for it. We have adopted the suggestions made by the Advisory Committee for flood mitigation and management headed by former IAS officer Thiru. V.Thiruppugazh to overcome civic issues faced during the last monsoon in various parts of the Chennai City.

The City Disaster Management Plan provides a broad framework covering the implementation which requires very sincere and well coordinated approach among all stakeholders, active participation of the civil society, community based organizations and private sectors. I thank one and all including ‘Friends in disasters’, who play major role actively during disasters in the City. I request all the stakeholders to work together as a Team to make Chennai City disaster-resilient.



R. PRIYA

Honourable Mayor
Greater Chennai Corporation

VISION

To enhance the disaster preparedness, to maximize the ability to cope up with disasters and significantly reduce the losses of lives, livelihoods and properties. To minimize the vulnerability to disasters and thus make the city of Chennai disaster resilient and make it a safe place to live in.

MISSION

- Increase resilience and prevent the emergence of disasters by strengthening scientific and technical capabilities on all aspects of preparedness.
- Identify vulnerability of the different parts of the city to disasters and specify minimum standard measures to be adopted for prevention and mitigation of disasters.
- Assign well defined roles and responsibilities to various administrative units in the Greater Chennai Corporation to prepare, mitigate and respond to any disaster.
- Coordinate with Government Departments, NGOs, other Institutions as partners to reduce and manage disaster risks.
- Increase the capacity development comprehensively at all levels to effectively respond to multiple hazards of a disaster.

RATIONALE

As per Section 31 of the Disaster Management Act, 2005(DM Act), District Disaster Management Authority (DDMA) of each district in the country shall prepare City Disaster Management Plan (CDMP) which is to be approved by State Disaster Management Authority (SDMA). It is to be reviewed and updated annually. The DM Act further provides that DDMP shall, inter alia, include areas in the district vulnerable to different forms of disasters; measures to be taken for prevention, mitigation, capacity-building and preparedness. The DDMP shall also include response plans and procedures, in the event of a disaster providing for allocation of responsibilities to the Departments of the Government at the district level and the local authorities in the city; prompt response to disaster and relief thereof; procurement of essential resources; establishment of communication links; and the dissemination of information to the public to respond to any threatening disaster situation or disaster.

EXECUTIVE SUMMARY

The City Disaster Management Perspective Plan 2019-2030 (CDMP) is framed as a set of guidelines to be followed for effective disaster management at the district level and thus forms an action plan for the city of Chennai in its disaster preparedness, prevention mitigation and also for the monitoring of impending disasters. This plan has taken into account the vulnerabilities of Chennai for disasters based on its geography, demography, and its social and environmental aspects. It has been prepared based on the principles in National Disaster Management Plan (NDMP) and State Disaster Management Plan (SDMP). It also highlights Chennai's actions and priorities based on the State Disaster Management Perspective Plan 2018-2030 and the Sendai Framework for Disaster Risk Reduction 2015-2030.

The CDMP covers the occurrence of national calamities in the past such as floods, cyclones, and tsunamis. It also highlights mitigation strategies, assembly locations, and preparedness measures for different disasters. Areas that have faced inundation during previous natural disasters are also identified. The governance mechanism to manage disasters and to deal with the impacts is also highlighted by the various departments of the government and of Chennai Corporation.

The Control Room at the Greater Chennai Corporation serves as Chennai's Emergency Operations Centre. Based on the Standard Operating Procedures, in the event of a disaster, responsibilities of the concerned departments at the city level and of government are outlined to ensure prompt response to disaster. Immediate relief and rehabilitation measures by mobilizing essential resources with the proper dissemination of information to the public will be coordinated by the Control Room.

This plan outlines the investments and preparedness for disaster risk reduction by the Government of Tamil Nadu and Greater Chennai Corporation to proactively approach disasters based on the State Disaster Management Perspective Plan. It also demonstrates GCC's initiatives with Governmental and NGOs / Institutions to respond to disasters.

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1.0 INTRODUCTION

1.1 Disaster Management and Planning

Disaster is a hazard causing heavy loss to life, property and livelihood. The term disaster management deals with relief and rescue operations before and after the occurrence of the disaster. The disaster risk management is the systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to significantly minimize the impacts of natural hazards and related environmental and technological disaster. The disaster management plan has to be implemented to minimize the adverse impact of the multiple hazard with the broad context of sustainable development. The disaster management is the process of organization, planning and application of measures preparing for prevention, responding to and initial recovery from disasters. The management of resources and responsibilities for dealing with humanitarian aspects of emergencies.



The pie chart shows the typical disaster management action plan for any kind of disaster occurrence. The disaster is a result of the combination of many factors such as the exposure to hazards, the conditions of vulnerability that are present and insufficient capacity or measures to reduce or cope with the potential negative consequences. Disaster impacts may include loss of life, injuries, disease and other negative effects on human physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation.

1.2 Need of Disaster Management plan

The natural disaster is an unexpected event that cannot be prevented but its effect can be minimized. The disaster management plan has been framed for the prevention of danger or threat of any disaster, mitigation or reduction of risk of any disaster or its severity or consequences, capacity-building, preparedness to deal with any disaster, prompt response to any threatening disaster situation or disaster, assessing the severity or magnitude of effects of any disaster evacuation, rescue and relief and rehabilitation and reconstruction. The plan is framed based on the collection of catastrophic events. The disaster causes major threat to lives and property.

Protection includes the installation of alarms, fire suppression systems, establishment of basic building security measures, the assembly of emergency supply kits and the organisation of an in-house disaster response team. Response includes actions to be undertaken to deal with the demanding situation often with the help of outside expertise and advice. The plan should be easy and provide a speedier response. The necessary resources should be identified and the sources of assistance also should be identified.

The management plan can avert the disaster before it occurs, anticipating the future course of natural occurrence such as flood will reduce the vulnerability, to provide rehabilitation programme like construction of dwellings and other infrastructures, to undertake the liaison works, to protect and preserve the environment and to prevent the losses of life and property.

1.3 Scope of Disaster Planning

The scope of this Chennai disaster plan's entities (e.g., departments, agencies, private sector, NGOs, citizens) and covers entire geographic area of Greater Chennai Corporation. The guidelines of the Disaster Management Authority used largely for preparation of Disaster Plan for Greater Chennai Corporation covering revenue districts of Chennai, part of Tiruvallur and Kancheepuram Districts.

The purpose of the statement should include enough information to establish the direction of the plan. The scope should include all disaster phases such as Prevention, Preparedness, Mitigation, Response and Recovery, redressal to multiple hazards to be implemented in whole city/ in certain areas of the city and zone wise Disaster Management Plan on a micro scale.

Special care has been taken for special groups including disabled, aged, children, sick and pregnant women to ensure that the relevant Disaster Risk Reduction (DRR) concerns are integrated in the Plan. The plan is also focussed on the relief measures and necessary mitigation plans that are to be undertaken by the government bodies

1.4 Objective of the Disaster Planning

The main objective of this disaster plan includes prevention, mitigation, preparedness measures, response plan and procedures for Chennai City.

The following are the indicative list with possible objectives.

- * Closely follow the NDMA/SDMA directions in identifying impending disaster and to enhance the preparedness to face it.
- * Improve the timely warning and alerts to be delivered in precise manner so as to alert the people from major risks associated with the disaster.
- * Receive swiftly scientific/ technical advice from Government/ Institutions and ACT.
- * The quick response system to be implemented for proper communication to people in flood affected area.
- * Utilizing all agencies capable of providing assistance.
- * Effective co-ordination are the integral components of effective disaster management as the team have to work with good rapport to perform the work effectively.
- * The help and rescue operation has to be carried out with minimum delay so the needs are fulfilled within time to reduce the maximum losses and damages.
- * The field workers and officials should bring solace to the troubled minds by interacting with the people and encouraging them to be free from problem caused by the disaster.

1.5 Types Of Disasters

There are 28 types of common natural and manmade disasters, which can be classified into these following 5 sub-groups.

i. **Hydro- Meteorological Disasters (8)**

Cyclones, Droughts, Periodical floods/ Urban floods, Hailstorm, Cloud burst, Heat wave, Coastal Erosion, Thunder and Lightning.

ii. **Geological Disasters (3)**

Landslides, Earthquake and Tsunami.

iii. **Chemical, Industrial and Radiological (3)**

Industrial Fires, Gas & Chemical Leakages, Nuclear Disaster

iv. **Accidents Disasters (10)**

Forest Fires, Electrical Fires, Collapsing of Buildings, Urban Fires, Oil Spills, Serial Bomb Blasts, Festival Fire, Stampedes, Road/Rail Accidents, Air Crash and Boat Capsizing .

v. **Biological Disasters (4)**

Pest attacks, Food poisoning, Water borne diseases and Cattle epidemics.

1.6 Response Planning

The disaster response structure will be activated on the receipt of disaster warning /on the occurrence of the disaster. The aim of this plan is to establish an understanding of the structure and operating procedures for addressing all aspects of disaster preparedness and response in Chennai city. This plan seeks to ensure that the disaster preparedness for response is carried in a coordinated and collaborative manner, ensuring the greatest protection of life, property, health and environment.

Disaster early warning is a major element of disaster risk reduction. Early action can often prevent major catastrophes. To be effective and sustainable, they must actively involve the communities at risk.

Response mechanism of the concerned line departments along with the roles and responsibilities of each one of them and immediate relief to be provided to the affected population is also inclusive.

Greater Chennai Corporation Plan will essentially focus on

- i. Co-ordinating with Metrological Department to get the warning report against the severe weather phenomena like tropical cyclones, heavy rain, floods, seismicity etc.,
- ii. Establishment of contact centres for people through Telephones and Web connectivity. For all weather related enquiries to contact, Duty Officer, Area Cyclone Warning centre – 044 28271951
- iii. An early disaster warning system with very high frequency equipment and public address systems with sirens, addressing public through air media will be established.
- iv. Tsunami Alert has to be received from the Indian Tsunami Early Warning Centre (ITEWC) of the Indian National Centre for Ocean Information Services (INCOIS).
- v. The Greater Chennai Corporation has introduced individual complaint helplines at Head Quarter in each of the 15 zones. The 24-hour helpline will function till the end of the North-East monsoon. The complaint numbers will be directly picked up by the zonal Officers, helpline operators and complaints are forwarded to the concerned authorities for necessary action.
- vi. Working in close quarters with State Disaster Centre regularly to get disaster related information for necessary action.

1.7 Integration with the State Disaster Management Perspective Plan 2018-2030 and the Sendai Framework

The Government of India came up with the National Disaster Management Plan in May, 2016 integrating the Sendai Framework for Disaster Risk Reduction 2015-2030 adopted at the third United Nations World Conference in Sendai, Japan, in 2015. The Sendai Framework was the first International agreement adopted within the context of the post-2015 development agenda. Two other major international developments followed in the same year. The “Sustainable Development Goals 2015 – 2030” were adopted by all nations in September 2015, and the “Paris Agreement” was signed by the signatories of the UN Framework Convention on Climate Change to combat human induced climate change in December 2015. Disaster risk reduction is a common theme in these three global agreements.

The Paris Agreement on global climate change highlights the importance of averting, minimizing, and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events and the role of sustainable development in reducing the risk of loss and damage. Intrinsic to sustainable development is disaster risk reduction and the building of resilience to disasters. The Hon'ble Prime Minister of India declared a 10 point agenda in the Second Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR), held in New Delhi on November 2016. The 10 point agenda is the Roadmap for Disaster Risk Management to Climate Resilient and Sustainable Development.

The Government of Tamil Nadu has prepared the State Disaster Management Perspective Plan 2018-2030 which has accorded primacy to the priorities enunciated in the Sendai Framework, the Sustainable Development Goals, the Paris Agreement on Climate Change and the Hon'ble Prime Ministers 10 Point Agenda. The plan has been prepared as per the Disaster Management Act 2005(Para 23 item 4) and has relied on the National Disaster Management Authority Guidelines on State Disaster Management Plan. The Plan was developed based on an elaborate consultative process with the District Disaster Management Authorities, Departments of Government, civil society, and other multi-stakeholders.

The Sendai Framework is a 15-year voluntary, non-binding agreement which recognizes that countries have the primary role to reduce disaster risk but that responsibility should be shared with other stakeholders including local government, the private sector and other stakeholders. It aims for the following outcome "The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries."

The State Disaster Management Perspective Plan 2018-2030 aspires "to build a safe and disaster resistant Tamil Nadu through systems approach, inclusive development and mainstreaming disaster risk concerns into the development ethos of the State" with 14 goals as highlighted below.

1. Comprehensive Flood Protection through structural and non-structural interventions to reduce the risks and enhance resilience and resistance of the community with special reference to Thiruvallur, Kancheepuram, Cuddalore, Nagapattinam, Thoothukudi, Ramanathapuram and Kanyakumari Districts.

2. Minimise the risk of urban floods with special focus on Greater Chennai Corporation and its neighborhood.
3. Enhance the resilience of farmers to face the vagaries of monsoon and impacts of climate change with special reference to Delta Districts.
4. Recharge the aquifers in Blocks where groundwater is currently overexploited/ critical/semi-critical categories and convert into safe category.
5. Restore and protect ecologically fragile wetlands and Marsh Lands with special focus on Pallikaranai and Ennore Creek Areas and Gulf of Mannar.
6. Reclaim and restore areas affected by sea water intrusion and prevent sea water intrusion in coastal areas with special focus on Chennai, Thiruvallur and Cauvery Delta Districts.
7. Enhance bioshields to mitigate floods and storms in Coastal Districts
8. Restore and strengthen waterbodies and enhance the capacity of the water bodies through desiltation to mitigate floods and drought.
9. Promote sustainable agricultural practices in rainfed areas with special focus on Ramanathapuram, Dindigul, Perambalur, Sivagangai, Virudhunagar, Dharmapuri, Namakkal and Ariyalur Districts.
10. Reduce the risks in areas which are prone to specific disasters like landslides, forest fire etc. with a special focus on The Nilgiris, Coimbatore, Erode, Theni, Krishnagiri, Vellore, Villupuram, Dindigul and Thiruvallur Districts.
11. Enhance multistakeholder participation, especially community participation with social inclusion.
12. Strengthen non-structural measures to reduce the risks due to man-made and natural disasters.
13. Deliver climate resilient hydraulic infrastructure for irrigation and drainage to reduce inundation and flood damages, as well as sea water incursion with special focus on Delta Districts.
14. Build the capacity to manage Chemical, Biological, Radiological and Nuclear (CBRN) and other man-made disaster

Disaster risk management is highly complex requiring multipronged strategies by governments as well as by other stakeholders. Successful risk reduction strategies require a thorough understanding of the various disaster risks, robust disaster risk governance, thorough preparedness, effective response and build back better strategies. The disaster risk management to build resistant communities as well as transform areas vulnerable to disasters into disaster resilient areas; requires significant investments in disaster risk reduction from government as well as the private sector and communities. To address the goals that are specific and relevant to GCC, the various measures that are under implementation as well as planned to be taken up in the immediate future are explained in the subsequent chapters as per the Sendai Framework for Disaster Risk Reduction 2015-2030 and the State Disaster Management Perspective Plan 2018-2030.

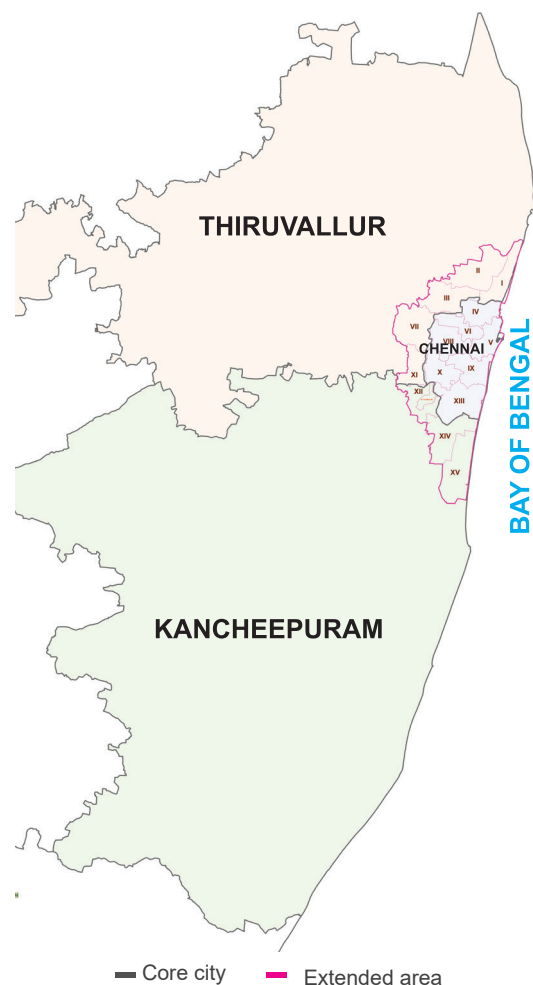
2.0 CHENNAI CITY: A PROFILE

2.1 City Profile

Chennai formerly known as the Madras or Madarasapattinam is the capital of the Tamil Nadu state. It is referred to as the “Gateway of South India”. Tamil Nadu is one among the most urbanized States in the Country and Chennai city is the fourth most populous Metropolitan city in India, next to Mumbai, Kolkatta and Delhi. Chennai City is situated in the North East end of Tamilnadu on the coast of Bay of Bengal. Chennai city is bounded by the Northern Latitudes of 12°59’ 10” and 13°08’ 50” and the Eastern Longitudes of 80°12’ 10” and 80°18’ 20”.

It is also called as the port city with a long coastal line of about 43 kms from Kathivakkam in the north to Uthandi in the south along the Bay of Bengal. The jurisdiction of the city has been expanded in the year 2011 by increasing the area from 174 sq.km to 426 Sq.km covering 3 revenue Districts namely Chennai, partly Kanchipuram and Thiruvallur. Chennai is one of the four cities in India through which the country is connected with the rest of the world through undersea fibre-optic cables, the other three being Mumbai, Kochi, and Tuticorin.

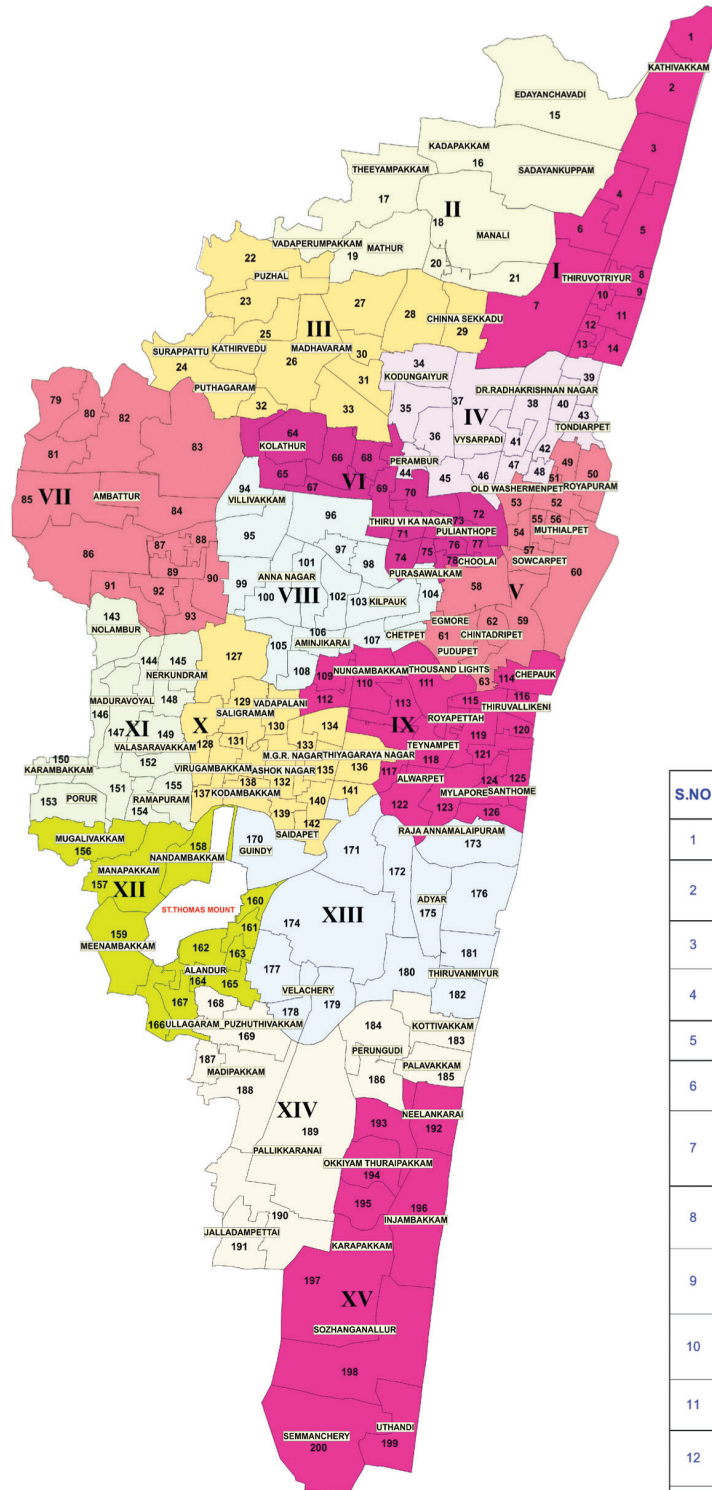
GCC with Adjacent Districts



2.2 Chennai Population

The average population of Chennai city is about 66.72 lakhs based on 2011 census with a sex ratio of 989 females for every thousand males, much above the national average of 929. TNSCB estimates that 1.08 Lakhs economically weaker section families living in undeveloped slums of which 72,827 families are living in objectionable slums. TNSCB has also estimated that there are about 37,000 families living in unobjectionable areas and 9,687 families in Adyar river banks and 14,237 families in Cooum river banks. The birth and death rate in Chennai is 400 and 160 respectively. The average literacy rate in the city is 81.27% much high compared to national average of 72.99%. The ward wise population of every zone is mentioned in the zonal chapters.

ZONAL BOUNDARY



BAY OF BENGAL

S.NO	ZONE	NAME OF THE ZONE	WARD NUMBER
1	I	THIRUVOTRIYUR	1 TO 14
2	II	MANALI	15 TO 21
3	III	MADHAVARAM	22 TO 33
4	IV	TONDIARPET	34 TO 48
5	V	ROYAPURAM	49 TO 63
6	VI	THIRU-VI-KA NAGAR	64 TO 78
7	VII	AMBATTUR	79 TO 93
8	VIII	ANNA NAGAR	94 TO 108
9	IX	TEYNAMPET	109 TO 126
10	X	KODAMBAKKAM	127 TO 142
11	XI	VALASARAVAKKAM	143 TO 155
12	XII	ALANDUR	156 TO 167
13	XIII	ADYAR	170 TO 182
14	XIV	PERUNGUDI	168,169 183 TO 191
15	XV	SOZHANGANALLUR	192 TO 200

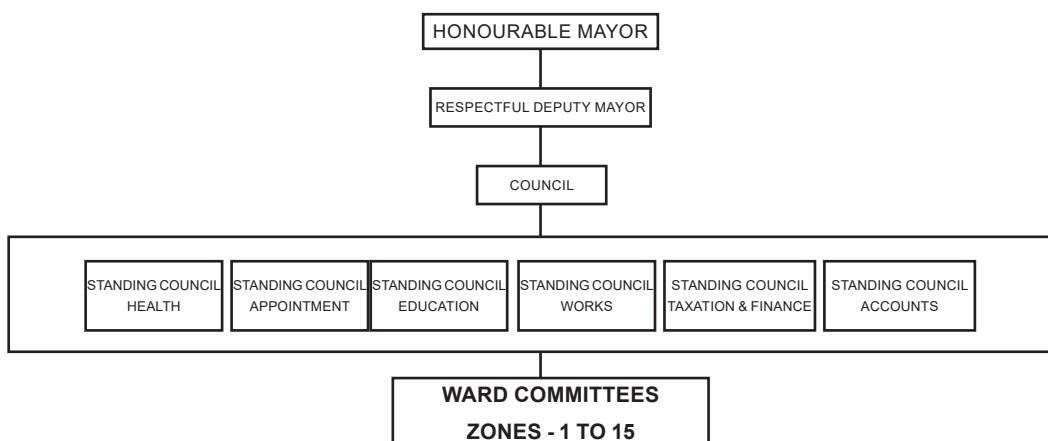
2.3 Evolution, Administration and Functions

The office of Greater Chennai Corporation is located at the Ripon Building, commissioned in 1913. Chennai city is governed by the Greater Chennai Corporation. It is being headed by the Mayor, who presides over 200 councilors each of whom represents one of the 200 wards of the city.

The Greater Chennai Corporation is administered by the Commissioner. There are 4 Joint/Deputy Commissioners in the Head Quarters assisting the Commissioner looking after Works, Health, Education and Revenue & Finance each. The functions of the Deputy Commissioners at the Head Quarters are to head the respective departments and report to the Commissioner. For effective administration and to render better service, the Greater Chennai Corporation is divided into three regions namely North, Central and South having 15 Zones, comprising 45 Units further divided into 200 Divisions. At 3 regional levels, Regional Deputy Commissioners North, Central and South are heading the regions each looking after 5 zones. The Zonal Officers/Assistant Commissioners are heading 15 Zones each with 2 Executive Engineers per Zone followed by “Unit offices” headed by Assistant Executive Engineer and “Divisional Offices” at grass root level headed by an Assistant Engineer/ Junior Engineer.

The administration of the Greater Chennai Corporation is being systematically organized with proper hierarchy. The administrative structures, duties and responsibilities of each officials, issues and preparedness plan are well discussed in detail for each zone in the zonal chapters.

COUNCIL CHART



2.4 Services Rendered by Greater Chennai Corporation

The major works carried are formation and maintenance of roads. Greater Chennai Corporation maintains 33,374 interior roads measuring a total length of 5,525 km and 471 bus route roads for 387 km. The Greater Chennai Corporation is maintaining 2,77,662 Street Lights, out of which 1,82,775 street lights have been converted in to LED lights. Greater Chennai Corporation is maintaining the storm water drains about 1894 km, and also maintains Canals, Flyovers, Health buildings, Schools, Parks, Community center, Burial ground etc., in the city. Greater Chennai Corporation is involved providing the basic amenities such as maintaining 602 Parks, 111 Traffic Islands and 113 community halls.

GCC runs 119 Primary Schools, 92 Middle Schools, 38 High Schools and 32 Higher Secondary Schools, totalling 281 Schools with 3116 teachers and 88,524 Students. GCC also runs 200 Kinter Garden Schools with in the existing school premises.

GCC provides Health Services through 138 Urban Primary Health Centers , 14 Urban Community Health Centers, 3 Emergency Obstetric Centers, 1 Communicable Disease Hospital with 238 medical officers, 1043 paramedical staff. On an average every day 17,800 out patients are treated in the above health centers.

Greater Chennai Corporation provides quality/hygienic food and drinking water through Amma Unavagam. As on date around 407 Amma Unavagam and 50 Amma Kudineer plants are functioning.

2.5 Essential Services by Other Authorities

The following Authorities like Madras High Court, Chennai Metropolitan Development Authority (CMDA), Greater Chennai Police, Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB), Tamil Nadu Generation and Distribution Corporation (TANGEDCO), Tamil Nadu Fire and Rescue Service (TNFRS), Airport, Ports, Railways, Road ways etc. also delivers essential service to the citizens.

**High Court****AirPort****Chennai Metro Rail Limited (CMRL)****Road ways****Chennai Port**

The services of authorities and departments are mentioned in detail in the following.

DEPARTMENTS	FUNCTIONS OR SERVICES
Madras High Court	Highest Judicial authority in the State
Chennai Metropolitan Development Authority (CMDA)	Responsible for planning and development of Chennai Metropolitan Area.
Greater Chennai Police	Maintains law and order, traffic in the city.

DEPARTMENTS	FUNCTIONS OR SERVICES
Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB)	It is exclusive agency which provides drinking water and maintains sewage systems in the city.
Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO)	Supply of electricity to house holds, street lights and other institutions.
Tamil Nadu Fire and Rescue Service (TNFRS).	Involved in fire and rescue operations.
Airways	The Chennai Airport handles both International and Domestic flights through Anna International terminal and Kamaraj Domestic terminal respectively. It is the third busiest airport in India and handles 12 million passengers in a year. The Airport located at a distance of 25 km from the city and is accessible by road, train and metro transport services.
Ports	The city is served by two major ports namely Chennai Port and Ennore Port. The Chennai port is the largest artificial port situated in Bay of Bengal handling an annual cargo tonnage of 61.46 million (2010–2011) and it is India's second busiest container hub, handling general industrial cargo, automobiles, etc. Chennai Port has 21 alongside berths in three distinct zones of the Chennai port namely the Ambedkar Dock, Jawahar Dock and Bharathi Dock. The Ennore port currently handles cargo such as coal, ore etc.
Railways	Chennai is the birthplace of the railway system in India. Chennai Central is the headquarter of the Southern Railway Zone. The city has two main railway terminals. Chennai Central station, provides access to other States and Chennai Egmore stations is a terminus primarily within Tamil Nadu; it also handles a few inter–state trains. The Chennai suburban railway network, one of the oldest in the country, consists of four broad gauge sectors terminating at two locations in the city, namely Chennai Central and Chennai Beach. The elevated Mass Rapid Transit System which links between Chennai Beach and Velachery. The Chennai Metro, officially Chennai Metro Rail Limited (CMRL), is a rapid transit system serving the city. The first stretch covering the seven stations from Koyambedu to Alandur over a distance of 10 kilometres being operated since June 29th 2015, the section between Chennai Airport and Little Mount commenced operation on 21st September 2016 and the stretch between Alandur and St. Thomas Mount commence operation on 14th October 2016. The stretch between Thirmangalam and Nehru Park over a distance of 7.36 KM commenced operation on 14th May 2017.

DEPARTMENTS	FUNCTIONS OR SERVICES
Roadways	Chennai is connected by four major National Highways (NH) that originates in the city. They are • NH 4 to Mumbai (via Bangalore) • NH 5 to Kolkata (via Bhubaneswar) • NH 45 to Theni (via Tiruchirapalli) • NH 205 to Anantapur, Andhra Pradesh (via Tirupati) The Chennai Mofussil Bus Terminus (CMBT), is one of the largest bus terminal in Asia, serves as the terminus for all intercity buses from Chennai. The Metropolitan Transport Corporation operates public transport buses in the City covering an area of 3,929 square kilometre.

2.6 Geography and Geology of City

2.6.1 Geology

The geology of Chennai comprises mostly of clay, sediment rocks and sandstone. The city is classified into three regions based on geology as sandy area, clayey area and hard-rock area. Sandy area are found along the river banks and the coast. Most of the cities were covered by clayey regions.

The main part of Chennai city such as T-Nagar, West-Mambalam, AnnaNagar, Perambur and Virugambakkam are covered with clayey. Hard rock areas are Adambakkam and a part in Saidapet. The sandy areas are Tiruvanmiyur, Adyar, Kottivakkam, Santhome, George Town, Tondiarpet and the rest of coastal Chennai.

The groundwater table in most of the area in Chennai is about 4 to 5m depths below the ground. The rainwater run-off in Chennai city percolates very quickly near the coastal area but in clayey and hard rock areas rainwater percolates slowly and held by the soil for a longer period of time.

2.6.2 Topography

Chennai is a plain terrain low-lying area and the land surface is almost flat like a pancake. The terrain is very flat with contours ranging from 2 m to 10 m above mean sea level with a few isolated hillocks. It rises slightly as the distance from the sea-shore increases but the average altitude of the city is not more than 7 m above mean sea level and the average slope varies at 0.7 m per km, while some localities are just at sea level and even in minus level. Terrain slope varies from 1: 5,000 to 1:10,000.

2.6.3 Green Cover and Wetlands

Green space distribution plays a imperative role in urban planning since they contribute significantly in enhancing ecological quality of metropolitan areas. Indian National Forest Policy aims at maintaining 33% of countries geographical area under forest and tree cover. Reserved Forest in Chennai city covers 2.71 Sq.km around Guindy National Park.

The land usage pattern in Chennai can be broadly classified as tree cover area of 72.82 Sq.km, Buildings cover 241 Sq.km, Parks cover 1.36 Sq.km, Water bodies cover 35.73 Sq.km and other area 104.40 Sq.km.

Name	Area in Sq km	Percentage
Buildings	241.50	56.7
Parks	9.20	2.2
Tanks	35.72	8.9
Temples	0.84	0.2
Trees	72.81	17.1
Others	65.93	15.5
Total	426.00	100.0

The Pallikaranai marsh land serves as a buffer for rain water draining from Velachery, Pallikaranai, Perungudi, Narayanapuram lake, Kilakattalai, Velachery and from a string of upstream lakes. GCC maintains 728 parks to an area of 1.66 Sq.km, 763 Open Space Reservation (OSR) land to an area of 16.05 lakhs Sq.km

2.6.4 Weather and Climate

The geographical location determines the weather and climate, being proximity to the sea and thermal equator and weather in Chennai relatively consistent with less variation in the seasonal temperature. The weather in Chennai is mostly hot and humid.

Experiencing the 3 major seasons namely summer, monsoon and winter, the city of Chennai has a tropical climate. April to June are the hottest months in Chennai recording maximum temperature during these months vary from 38-42

°C thus making Chennai very hot. However the cooling breeze at night comes as a relief to the residents of Chennai.

Climate data for Chennai													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	33 (91)	37 (99)	39 (102)	43 (109)	45 (113)	43 (109)	41 (106)	40 (104)	39 (102)	39 (102)	34 (93)	33 (91)	45 (113)
Average high °C (°F)	29 (84)	31 (88)	33 (91)	35 (95)	38 (100)	38 (100)	36 (97)	35 (95)	34 (93)	32 (90)	29 (84)	29 (84)	33.3 (91.8)
Average low °C (°F)	19 (66)	20 (68)	22 (72)	26 (79)	28 (82)	27 (81)	26 (79)	26 (79)	25 (77)	24 (75)	22 (72)	21 (70)	23.8 (75)
Record low °C (°F)	14 (57)	15 (59)	17 (63)	20 (68)	21 (70)	21 (70)	22 (72)	21 (70)	21 (70)	17 (63)	15 (59)	14 (57)	14 (57)
Average precipitation mm (inches)	16.2 (0.638)	3.7 (0.146)	3.0 (0.118)	13.6 (0.535)	48.9 (1.925)	53.7 (2.114)	97.8 (3.85)	149.7 (5.894)	109.1 (4.295)	282.7 (11.13)	350.3 (13.791)	138.2 (5.441)	1,266.9 (49.878)
Source: Indian Meteorological Department													

Chennai experiences two monsoons namely South West Monsoon from June to September and North East Monsoon from October to December every year. South West Monsoon sets in over the extreme south western tip of the peninsula by the end of May. The onset of Monsoon is characterised by a sudden spurt of rainfall activities. It progresses inland in stages and covers the entire country by the middle of July. The average rainfall of South West Monsoon is 439.10 mm. North East Monsoon essentially contribute the rainfall for the city. The city gets average rainfall of 760 mm during North East Monsoon. The average rainfall of the city throughout the year is about 1,300 mm.

The winter in Chennai is short period of time. In November to February Chennai experiencing the winter season. This is the most comfortable and pleasant time in Chennai. During the winter months, Chennai maintains an average maximum and minimum temperature of 24°C and 20 °C respectively. Moderate rainfall is also received in the winter months by the city. This makes the weather and climate in Chennai pleasurable as well as comfortable.

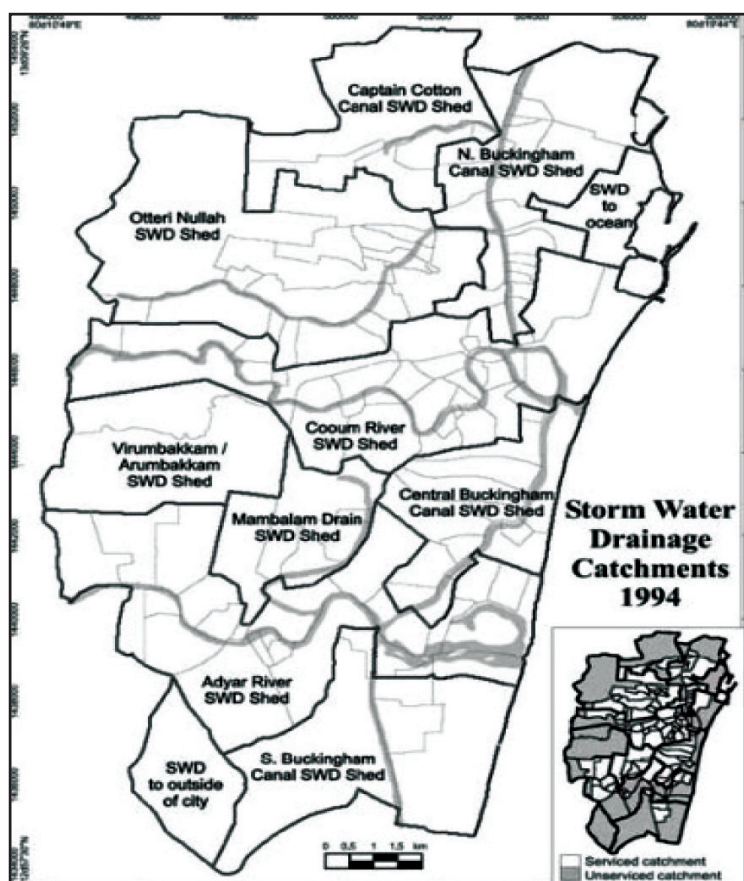
The lowest temperature that has been recorded in Chennai is 15.8 °C (60.4 °F) while the highest temperature being recorded as 45 °C (113 °F). The highest yearly rainfall in the city has been recorded to be 2,570 mm (101 in) in 2005. The formation of Cyclones in the Bay of Bengal has great influence in the city. The winds that prevail in Chennai in between April and October are the southwesterly wind while the remaining year experiences the northeasterly winds.

In Chennai IMD has two rain recording stations and 4 automated warning systems, the details are

1. Regional Meteorological Department, Nungambakkam
2. Airport Meteorological Department, Meenambakkam and four Automated Warning Systems in Avadi, DGP Office, Egmore, Sozhingnanallur and Madhavaram.

2.7 Hydrology of City

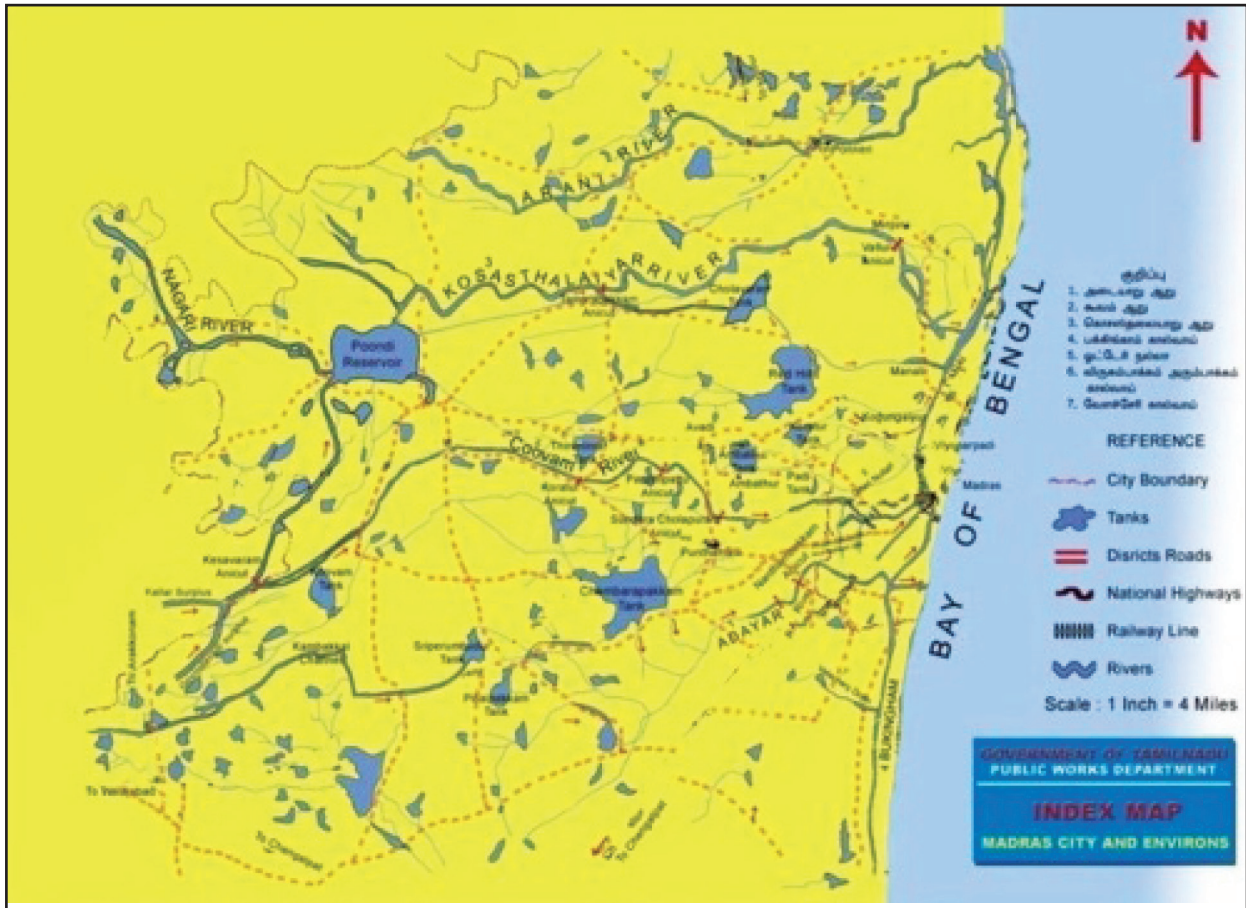
2.7.1 Water Bodies and Water Ways



There are 5 major water ways in the city maintained by the Public Works Department (PWD) and 31 minor Canals maintained by Greater Chennai Corporation. There are 9,224 storm water drains in the city for a length of 2,894 km which are drained to major and minor drainage systems. The storm water drainage catchment of Chennai city is presented in the map. The drainage systems in the city is divided into two types i) Macro Drainage and ii) Minor Drainage System.

2.7.2 Major Drainage System

Two major rivers meander through Chennai are the Cooum and Adyar River. A third river, Kosathalaiyar flows through the northern fringes of the city before draining into the Bay of Bengal, at Ennore. The Buckingham Canal, runs parallel to the coast, linking the two rivers. The Otteri Nullah, an east–west stream, runs through north Chennai and meets the Buckingham Canal at Basin Bridge. Several water bodies of varying size are located on the western fringes of the city. The drainage system with water bodies is given in detail in the following map.



Kosasthalaiyar River originates near Kaveripakkam near pallipet in Tiruvallur district and flows in eastward direction. It bifurcates into Cooum River and Kosasthalaiyar at Keshavaramanicut. The main branch of Kosasthalaiyar River then flows northwards and enters into Poondi Reservoir. Nagari River originating in Chittoor district, is a northern tributary and joins the Kosasthalaiyar River at Poondi reservoir. On the downstream side of Poondi reservoir, Kosasthalaiyar River flows through the Thiruvallur district and Chennai, and finally confluence with sea at Ennore.

Cooum River bifurcates from the main Kosasthalaiyar River at the Keshavaramanicut and flows eastwards through Kanchipuram district into Chennai and finally joins the sea near Napier Bridge. Surplus from about 75 tanks in the catchment reaches are linked with Cooum River.

Adyar River originates from two tank groups namely Pillapakkam and Kavanur in Kanchipuram District and flows through the Chennai before it joins the sea at Adyar Mouth. Surplus from about 450 tanks in the catchment, including a major tank at Chembarambakkam, reaches the Adyar River.

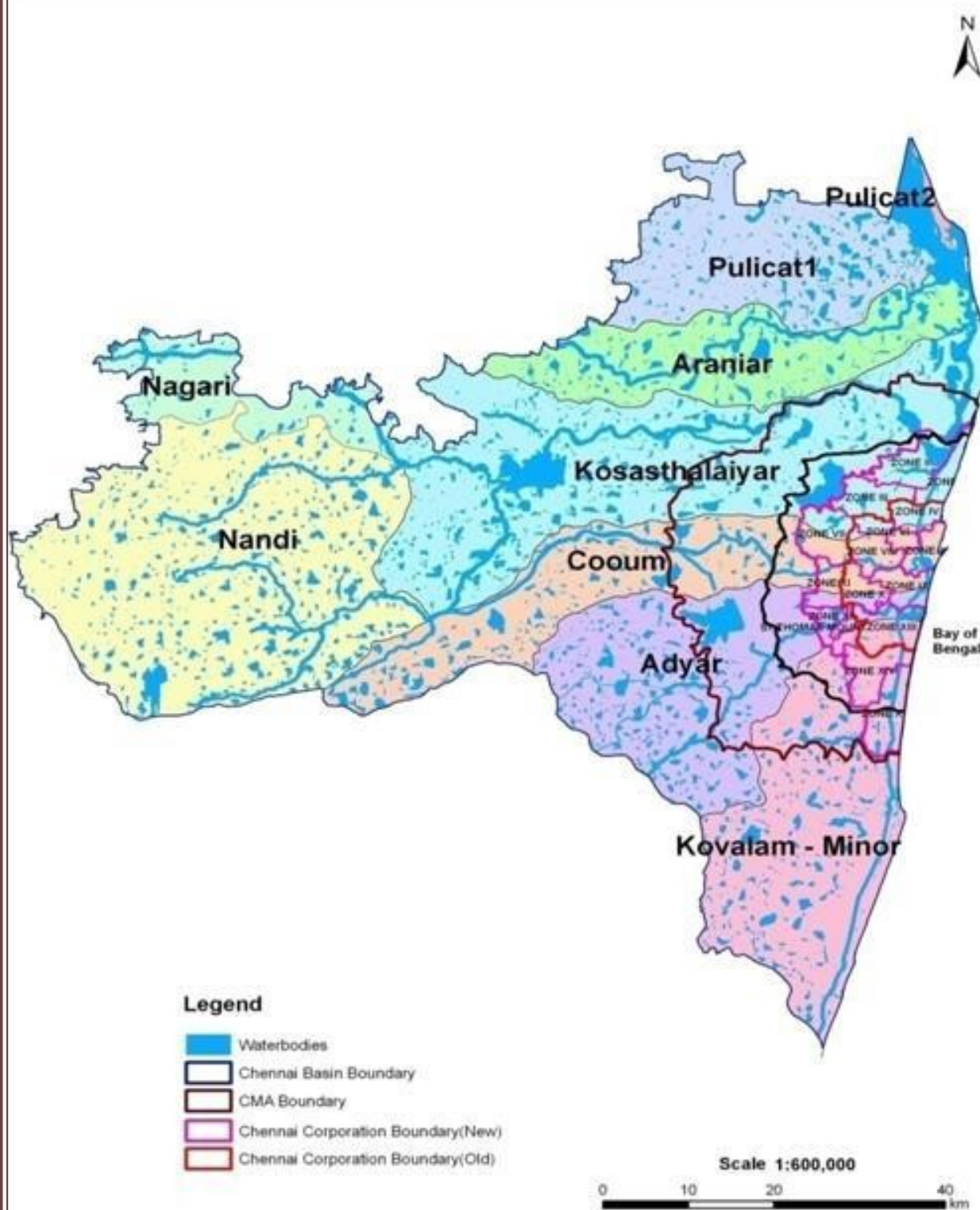
The Buckingham canal has been constructed more than 200 years ago, as a navigation channel. It originates close to Kakinada in Andhra Pradesh and runs along the east coast for a total length of 418 km. Its entry point into Chennai is near Athipattu village and the exit point is near Semmencheri village. While the three rivers run west to east, Buckingham canal runs north to south and connects all these three rivers at different points.

Besides the above three major river system, there are 31 minor canals running in the city linked with major drainage systems. While OtteriNullah, Kodungaiyur drain and Captain Cotton Canal drain into the Buckingham canal, Veerangalodai and Velacheri drain discharge into Pallikaranai marsh. Virugambakkam drain discharges into the Cooum River.

The waterways maintained by Public Works Department are detailed as follows.

Sl. No	List of Waterways	Length in Km
1	Adyar River	42.50
2	Buckingham Canal	47.90
3	Cooum River	65.00
4	OtteriNullah	8.70
5	Virugambakkam&Arumbakkam Canal	6.36
	Total	170.46

CHENNAI RIVER BASIN



2.7.3 Minor Drainage Network

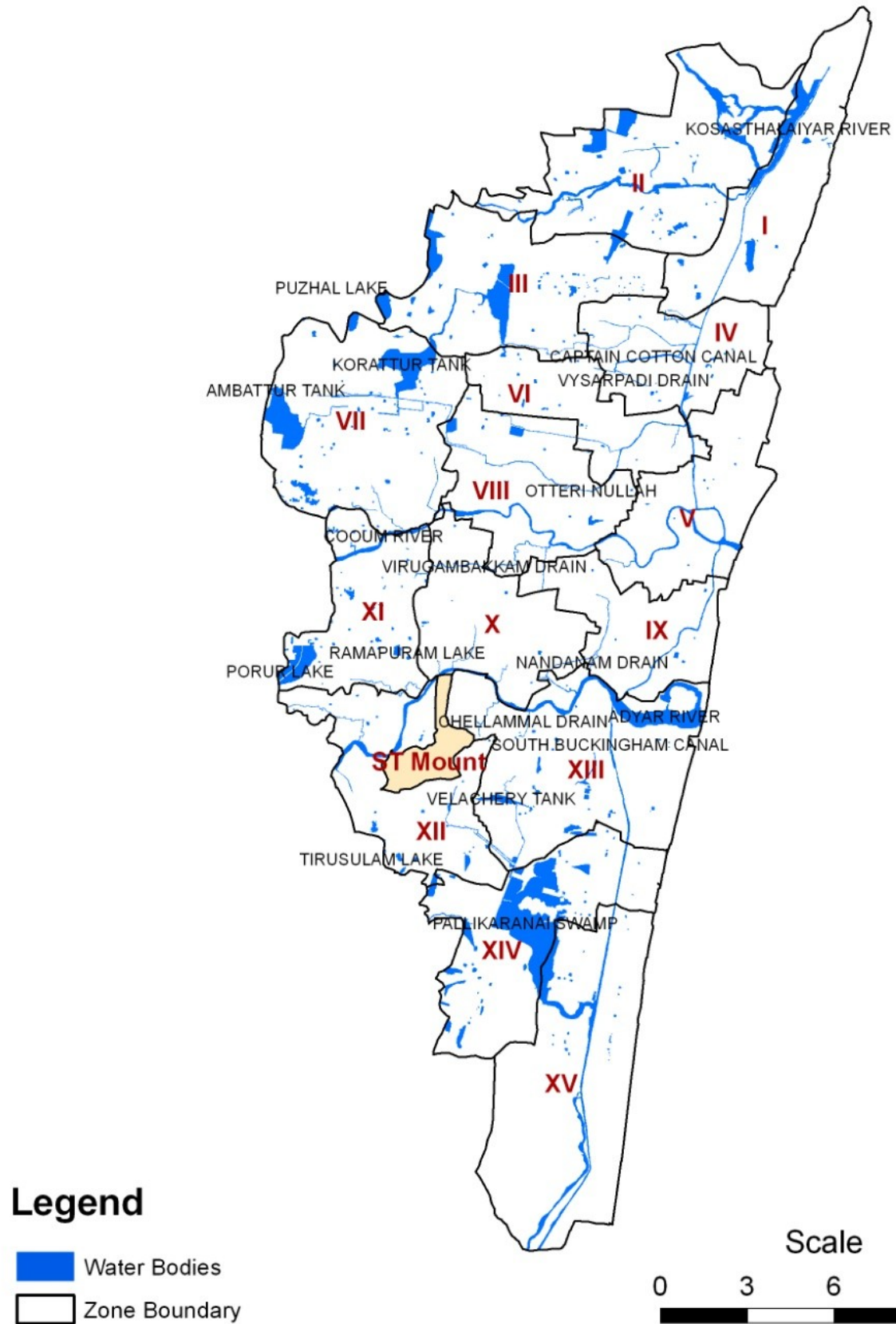
There are 31 minor natural drainages in the city connected with the macro drainages (16 in old city and 15 in the expanded areas) which are maintained by the Greater Chennai Corporation. In addition to this, a network of storm drains to the length of about 1,894 km discharges storm water into the sea through major / minor drains.

The Minor drainage or canals maintained by Greater Chennai Corporation with their respective zones are listed in the Table.

Minor Drainage system in Chennai city

SL No.	List of Water ways	Zone
1	Thamaraikulam Canal	I
2	Captain Cotton Canal	IV
3	Kodungaiyur Canal	IV
4	Link Canal	IV
5	Old Napalayan Canal	II
6	Thulasi Nagar Canal	II
7	MalaniPudurTNHB Canal	II
8	PeriyaEatchankuzhi Canal	II
9	Kadapakkam Lake Surplus Canal	II
10	Madhavaram – Manali Lake Canal	II
11	Vyasarpadi Canal	IV
12	Ekangipuram Canal	VI
13	Jawahar Canal	IV
14	T.V.S. Canal	VI
15	Nungambakkam Canal	IX
16	Nolambur Canal	VII & XI
17	AmbatturSidco Canal	VII
18	PadiKuppam Canal	VII
19	Trustpuram Canal	X
20	Mambalam Canal	IX & XIII
21	Nandanam Canal	IX
22	Chellammal College and Guindy Industrial Estate Canal	XIII
23	Reddykuppam Canal	X
24	M.G.R. Canal	X
25	Jafferkhanpet Canal	X
26	Rajbhavan Canal	XIII
27	Pallikaranai Canals	XIV
28	Nandambakkam Canal	XI & XII
29	Adambakkam Canal	XII
30	Large Lake Link Canal	XV
31	Secretariat Colony Canal	XV

ZONE BOUNDARIES WITH WATER BODIES



3.0 INSTITUTIONAL FRAMEWORK AND ARRANGEMENTS

“Disaster risk governance at the national, regional and global levels is vital to the management of disaster risk reduction in all sectors and ensuring the coherence of national and local frameworks of laws, regulations and public policies that, by defining roles and responsibilities, guide, encourage and incentivize the public and private sectors to take action and address disaster risk”

- Sendai Framework for Disaster Risk Reduction 2015-2030

This chapter provides an overview of the institutional framework and arrangements for disaster management in Chennai. It addresses priority 2 of the Sendai Framework that calls for strengthening disaster risk governance to manage disaster risk.

3.1 Relief Committee

GCC has formed a Relief Committee with the following members,

S.No	Committee Members	Designation
1	Commissioner, Greater Chennai Corporation	Chairman
2	Collector of Chennai	Member
3	Executive Director, Metro Water Chennai	Member
4	Joint Commissioner of Police (Traffic), Chennai	Member
5	Chief Engineer, Highways and Rural works	Member
6	Chief Engineer, PWD (Chennai & Environ area)	Member

The Chief Engineer in-charge of MRTS and the Joint Director /Deputy Director of Fire Services may also be invited for the meetings whenever required.

The duties of this committee is to monitor the following thrust area for disaster mitigation.

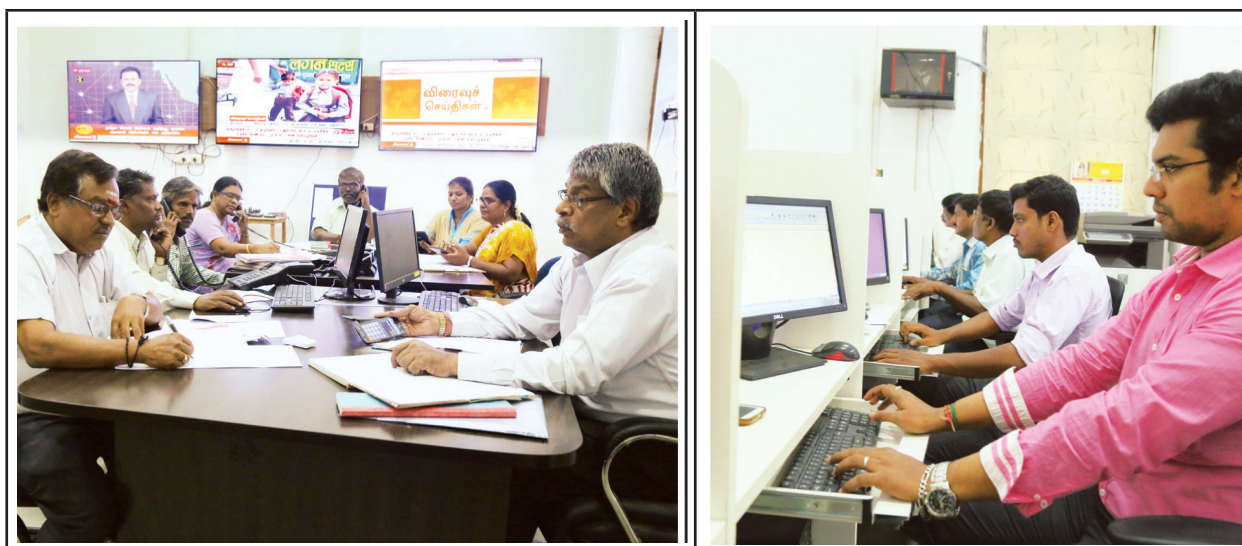
1. To evict the encroachments on regular basis, to maintain the free flow of rainwater.
2. To identify the vulnerable roads, subways, level crossings within the Greater Chennai Corporation limit which are likely to get inundated during the heavy rain periods.
3. To identify road and areas which are prone to inundation/ traffic congestion during periods of heavy rainfall.
4. To identify the areas which are likely to cause damages due to non-free flow of drainage water during the heavy rain periods.

5. To see the major drainage channels and also waterways like Adayar river, Cooum and Buckingham Canal, Otteri Nullah etc., free from encroachments, blocks etc., due to MRTS and other works.
6. To identify new drainage systems and also interlinking the existing drainage systems for efficient discharge of rain water during monsoon period.

3.2 Control Room Arrangements

The Control Room in Greater Chennai Corporation is functioning at Ripon Building. The Control Room is functioning under overall supervision of the Joint /Deputy Commissioner (Works) with other staff functioning 24x7. For perfect co-ordination, the officers/staffs from the other line departments like TANGEDCO, CMWSSB, FISHERIES, PWD, POLICE will also be pooled at Control Room during monsoon/emergency time.

The intensity of rainfall will be collected on daily basis from the Metrological Department. The Control Room is to monitor the overall flood situation in the field and collect details of water stagnation, tree fall, status of subways, relief centres, food packets issued, pumps utilized for the removal of inundated water, evacuation operation, collection and distribution of relief materials etc. For every two hour, reports will be collected from the Zonal Office and will be submitted to the Commissioner. The issues related to flood mitigation pertaining to other departments will also be coordinated by the Control Room.



The Public Works Department is periodically contacted for the status of flood levels in reservoirs around Chennai like Chembarabakkam lake, Narayanapuram, Red hills, Puzhal eri, etc., In case of breakdown of telephone and other communication networks, wireless network of GCC will be largely

used for continuity. Whatsapp group is formed with all officials engaged in flood work to exchange the information which will be coordinated by the Control Room duty staff.

A dedicated Public Relation Officer/Assistant Public Relation Officer will be posted in the Control Room for media management. He will collect data and details of relief operations from the field for press release. Press release will be done periodically with due approval of the Commissioner.

The other Control Rooms functioning at Secretariat, State Emergency Operation Center and Commissionerate of Revenue Administration office will also be coordinated. The contact details of all three Control Rooms are given in page number 143 of this booklet.

3.3 State and District Administration

3.3.1 State Level Administration

The State Disaster Management Authority (SDMA) under the chairmanship of the Hon'ble Chief Minister is responsible for coordinating the response to disasters and reducing risks. All measures for mitigation, preparedness, response and recovery are undertaken under the guidance and supervision of the Authority. The SDMA approves the State Disaster Management Plan and District Disaster Management Plans in accordance with the guidelines laid down by the National Disaster Management Authority. The Greater Chennai Corporation's annual City Disaster Management Plan serves as the District Disaster Management Plan.

The SDMA is supported by State Executive Committee (SEC). Disaster specific cells are being created to analyse the risk profile of the state in depth and to provide specific disaster risk reduction strategies for consideration of the SDMA. The Commissioner of Revenue Administration is the State Relief Commissioner and undertakes all activities relating to disaster management and mitigation besides managing relief and rehabilitation activities for any disaster in the State.

The Revenue Administration and Disaster Management Department is responsible for policy making and issuance of Government Orders based on approvals accorded by the SDMA, State Executive Committee and the Commissioner of Revenue Administration.

The State Advisory Committee has been constituted under the Chairmanship of the Principal Secretary / Commissioner of Revenue Administration. The Secretary, Revenue Disaster Management and Mitigation department is the co-chair. The Advisory Committee comprises of experts in various fields such as remote sensing, communication networks, weather forecasting, among others, to advice on measures for disaster risk reduction. The State Advisory Committee ensures that the concerns of diverse sectors are taken into account while formulating strategies for risk reduction.

3.3.2 District Level Administration

The District Disaster Management Authority (DDMA) has been constituted in Chennai under the Chairmanship of Commissioner. The District Disaster Management Authority acts as the District planning coordinating and implementing body for disaster management and takes all measures in accordance with the guidelines laid down by the State Disaster Management Authority. The District Disaster Management Authority in Chennai is chaired by the Commissioner, GCC.

The Control Room (DEOC) at Greater Chennai Corporation acts as a communication centre in Chennai city for dissemination of information received from SEOC. During disaster period, the Control Room functions round the clock by drafting the services of the Line Departments in Chennai for quick dissemination of alerts and collects information on the search, rescue, relief and rehabilitation operations from various quarters and updates the same to Commissioner of Revenue Administration & State Relief Commissioner.

The preparedness arrangements by Greater Chennai Corporation and coordination efforts with other departments and agencies have been articulated later.

3.3.3 Incident Response System

The management of response in disasters requires the government, communities, civil society and other stakeholders to carry out a large number of tasks. The activities involved in response management would depend on the nature and type of disaster. The Government of Tamil Nadu is adopting Incident Response System (IRS) in the state to ensure the unification of efforts of all the stakeholders to ensure immediate response during disasters to protect people and their properties. The Incident Response System provides a systematic,

proactive approach guiding the concerned departments and agencies at all levels of government, the private sector, and non-governmental organizations, to work seamlessly in disaster situations. For effective, efficient and comprehensive management of disasters in the State of Tamil Nadu, IRS is critical. The aim is not only to minimize loss of life and property but also strengthen and standardize the disaster response mechanism in the State.

Incident Response System for Natural Disasters: The Chief Secretary to the Government of Tamil Nadu is the overall Responsible Officer and is assisted by the Revenue and Disaster Management Department at the secretariat level and by the Commissioner of Revenue Administration / State Relief Commissioner who is the Incident Commander of the Incident Response System at the State level. The Commissioner, Disaster Management is the deputy Incident Commander. During Disasters all Line Departments function under the overall guidance of the Incident Commander. The Commissioner, GCC is the Incident Commander in Chennai.

Incident Response System for Manmade Disasters (Breakdown of Public Order, Terrorist Attack and Mutiny): The Ministry of Home Affairs, Government of India has prescribed a Crisis Management Plan for manmade disasters dealing with the breakdown of public order, terrorist attacks, mutiny, and migration/exodus/infiltration. As per the Plan, the appropriate institutional mechanism involving the State Crisis Management Group and District Crisis Management Group will be put in place.

Incident Response System for Epidemics, Disease Outbreak and CBRN: The Chief Secretary to the Government of Tamil Nadu will be the Responsible Officer assisted by the respective Secretary Health and Family Welfare Department at the government level. The State Relief Commissioner / Commissioner of Revenue Administration will be the Incident Commander by the Director of Public Health at the State-level. The Commissioner, GCC will be the Incident Commander in Chennai.

3.4 Other Departments and Stakeholders

3.4.1 Fire & Rescue Services Department

Fire and Rescue Services Department of the Government of Tamil Nadu is entrusted with the task of firefighting and rescue operations in times of emergency. The Fire and Rescue Services Directorate plays a very vital role in the area of

firefighting and fire prevention. Apart from firefighting, this department also undertakes rescue activities and helps people, marooned in floods and caught in the debris of fallen buildings, road and rail accidents and other natural and man-made disasters. Fully automated firefighting futuristic equipment and robots will play a major role in the years to come.

3.4.2 Tamil Nadu Disaster Response Force (TNDRF)

Though the community always acts as a first responder during disasters that strike with limited warning time as well as during disasters which can be forecast at least 20-24 hours prior to the event, the role of specially trained disaster response forces will be extremely vital for quick and before time evacuation of the people likely to be affected as well as for efficient search and rescue in case of necessity. Realizing the importance and significance of Special Forces, the Government of Tamil Nadu has decided to raise an exclusive battalion as Tamil Nadu Disaster Response Force and has also provided Rs.15 crores for procurement of State of the art Search, Rescue and Evacuation equipment. In the years to come the personnel of TNDRF will be continuously trained to upgrade their skills on par with NDRF. In addition, 2500 Police personnel from different specialized forces who have been trained in Search, Rescue and Evacuation operations will continue to be trained to take advantage of their location in all Districts. The SDRF personnel after being equipped with skills on par with NDRF will also be engaged in training young recruits (to the Police, Fire Services and other specialized services) in Search, Rescue and Evacuation operations so that over a period of time all the coastal districts will have well-trained personnel numbering about 300 – 500 Police / Fire services / Home guards etc. The SDRF personnel will also be utilized to train the First Responders identified from among the community, especially in the vulnerable areas. The disaster response force will be equipped in a phased manner with modern technology like unmanned aerial vehicles, robots etc., which will be used in the following ways:

- High Antennas for Radio Communications Tethered Drone (HARC-TD)
- HARC-Tethered Drone for improved network and communications range extension for tactical radio communicators, first responders and similar users of mission-critical radio networks.
- UAVs with sensor options such as visual, thermal, LiDAR etc. will be procured

for use to map disaster areas, generate high-resolution and 3D mapping, identify hot spot areas and upload the data in real time to coordinate search, rescue and evacuation efforts during natural disasters as well as industrial disasters.

GCC will request the assistance of TNDRF in case a disaster strikes.

3.4.3 Volunteers and Training

Community participation at grass root level is enabled through enrolment of able-bodied volunteers, with skills of swimming and climbing, as first responders. GCC maintains a database of volunteers and NGOs to support relief efforts. GCC has also trained 200 community volunteers through the centrally sponsored AapdaMitra Scheme. Elected representatives will be sensitized to the needs of the community during disasters and their capacities will be strengthened through orientation and other training programmes.

3.4.4 Civil Defence

The Civil Defence being a community based voluntary organization in addition to rescue, relief and rehabilitation, plays a significant role in the field of public awareness and also community capacity building to face any disaster situation as is being done by the Civil Defence in many countries. The Government of Tamil Nadu has accorded administrative and financial sanction for the formation of Civil Defence Training Institute at Palani at an estimated cost of Rs.1.92 crores and Rs.89.00 lakhs in 2014 for creating Civil Defence units in Chennai, Mamallapuram, Tiruchirappalli, Madurai and Thirunelveli. With a view to assisting officials during times of natural disasters, the Tamil Nadu Government will establish a 1,000 member-strong Civil Defence Corps for units proposed in five districts, including Chennai. The Corps units will come up in Chennai with a strength of 500 persons.

The necessity for such corps arose as there is a need for large number of human resources in areas affected by natural calamities such as cyclones or floods and to carry out rescue operations swiftly to ensure the early return of normalcy. Some of the youth organizations namely, National Cadet Corps (NCC), National Service Scheme (NSS) and Nehru Yuva Kendra Sangathan (NYKS) have the inherent advantage of availability for immediate assistance at the ground level in the event of any disaster. These organizations are also proposed to be integrated in the overall Disaster Management framework with linkages with the Civil Defence set-up at the State Headquarters and Greater Chennai Corporation Headquarters.

3.4.5 Preparedness & Response

Community participation in preparedness will be ensured through enrolment of First Responders in areas identified as vulnerable to flooding and other hazards. The capacities of these first responders will be further enhanced through appropriate training tailored for advanced level of response in flood situation, as well as, to other types of hazards, local risks and accidents with the help of government & non-government capacity building institutions. Greater Chennai Corporation conducted trainings through AapdaMitra Scheme.

3.4.6 Relief

Various stakeholders involvement is needed during different stages of relief. Identification of beneficiaries has to be done as per the guidelines/ broader framework given by the State Government and communities, who are the most important stakeholder, will be involved in identifying right beneficiaries. A coordination mechanism with NGOs and other stakeholders at state level, as well as at GCC level will be put in place to avoid duplication of efforts in relief distribution and to bring in more efficiency in terms of most affected areas getting more attention and equity in relief distribution.

3.4.7 Rehabilitation - Build Back Better

Multiple stakeholder involvement will also be encouraged for undertaking mitigation measures with an aim to build back better under the corporate social responsibility requirement of the profit-making public and private sectors as well as by dovetailing the projects being executed by civil societies from different sources of funding. Efforts will also be made to involve the community and other stakeholders in project implementation and monitoring.

3.4.8 Coordination with Central Agencies and Armed Forces

The Chief Secretary convenes a meeting of all central and state agencies prior to Northeast Monsoon in order to ensure perfect coordination among different agencies and to ensure efficient search, rescue and evacuation operation whenever necessity arises. The State Relief Commissioner / Commissioner of Revenue Administration shares the details of vulnerable areas and the map with the Central Agencies to help them familiarise with the vulnerable areas so that they can respond swiftly and effectively. These coordination meetings are held annually and special meetings are convened based on need. GCC receives instructions from the State Government.

4.0 CYCLONES AND FLOODS

The Chennai city has come across various natural calamities in the last three decades. In the following paras some of major disasters are discussed in detailed. During heavy flood in 1976 resulted in submergence of TNHB Quarters in Kotturpuram bank of Adayar river coupled with high & storm tide in the sea.

In 1996 the city was flooded by Adayar, Cooum and Kosasthalaiyar rivers. The surplus water from Poondi reservoir has collapsed Karanodai Bridge at Redhills. Similarly surplus water from Chembarambakkam Tank has flooded Adayar. In 1998, Thanikachalam Nagar, a residential colony in Madhavaram was flooded by Kodungaiyur canal.

During 2005, Chennai experienced an unprecedented maximum rain fall in a day. Cooum, Adayar, Otteri Nullah, B - Canal, Virugambakkam and Arumbakkam Canal flooded and people residing in the nearby areas were evacuated and many people became homeless. On 18th December 2005 in a school situated in MGR Nagar, K.K.Nagar where the relief material were distributed by the Government to the people affected by severe flood, 42 people died and 37 injured due to stampede.

In the same year the city was also exposed to a Cyclone named as Fanoos with a wind speed of 85 km/hr east of Chennai on 9th December.

In 2008 again there was Nisha cyclone with wind speed of 83 – 102 km/hr hits the city on 26th November by which the city was badly affected. The following are some of the cyclones that hit Chennai in different periods, Cyclone Jal in 2010 with the wind speed of 100 – 110 km/hr, Cyclone Thane in 2011 with the wind speed of 140 -165 km/hr, Cyclone Nilam in 2012 with the wind speed of 85 -100 km/hr.

The occurrence of flood is often in Chennai city. The measures have to be taken periodically and the development of prevention method is essential to minimise the damage. The preparedness strategy in the Greater Chennai Corporation is necessary for securing the lives of the people. In the following pages a subject wise detailed preparedness for disaster management will be discussed. Therefore the measure are considered as a bench mark to derive the well secure mitigation plan for the future to strive to keep the people away from flood.

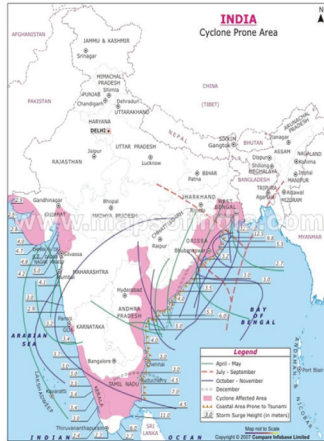
4.1 Cyclone

A cyclone (or more properly called Tropical Cyclones) is a system of wind with very low pressure at the centre and surrounded by high pressure outward that occurs over the ocean near the tropics. Cyclones are one of the natural hazards that affect East coast of India almost every year causing large loss of lives and properties. Tropical Cyclone (TC), also known as 'Cyclone', is the term used globally to cover tropical weather systems in which winds equal or exceed the minimum of 34 knot (62 kmph). Hazards associated with tropical cyclones are long duration rotatory high velocity winds, very heavy rain and storm tide (the combined effect of storm-surge and astronomical tide).

Although the North Indian Ocean (the Bay of Bengal and Arabian Sea) generates only about 7% of the world's cyclones (5 to 6 TC's per year) their impact is comparatively high and devastating, especially when they strike the coasts bordering the North Bay of Bengal. Further the Bay of Bengal (BOB) produces more frequent and fiercer cyclones than the Arabian Sea (AS). For better understanding of severity of wind speed, the cyclones are broadly classified as "Cyclonic Disturbances" with the maximum wind speed of 17 knots or more, "Cyclone" measuring wind speed of 34 knots or more and "Severe Cyclones" exceeding wind speed of 48 knots. Following table illustrates the annual frequencies of cyclonic disturbances, cyclone, severe cyclone over BOB and AS for the period 1900 to 2015.

Frequency of Disturbances

Y E A R	CYCLONIC DISTURBANCES				CYCLONES				SEVERE CYCLONES			
	BOB	AS	LAND	TOTAL	BOB	AS	LAND	TOTAL	BOB	AS	LAND	TOTAL
1900 TO 2015	1110	208	122	1440	460	116	13	589	210	68	3	281

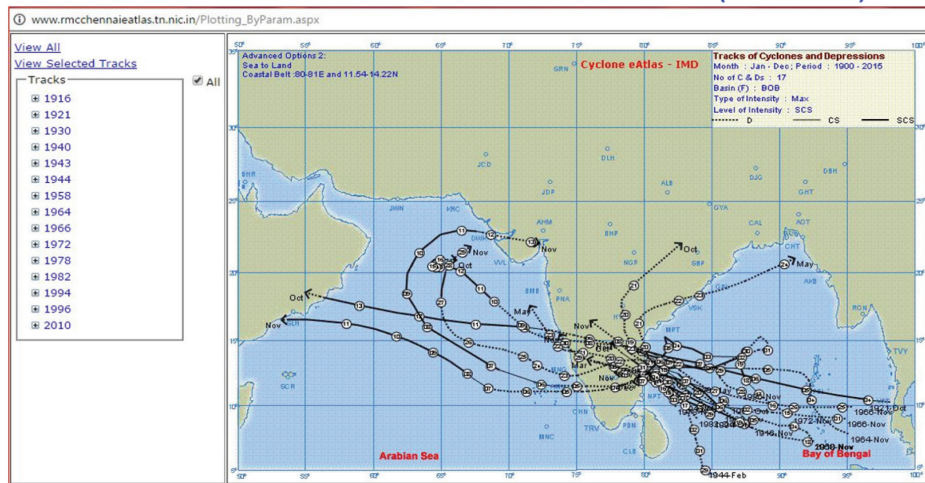


National Cyclone Risk Mitigation Project

The major Tropical cyclones which struck the coastal districts in India during the period 1891-2002

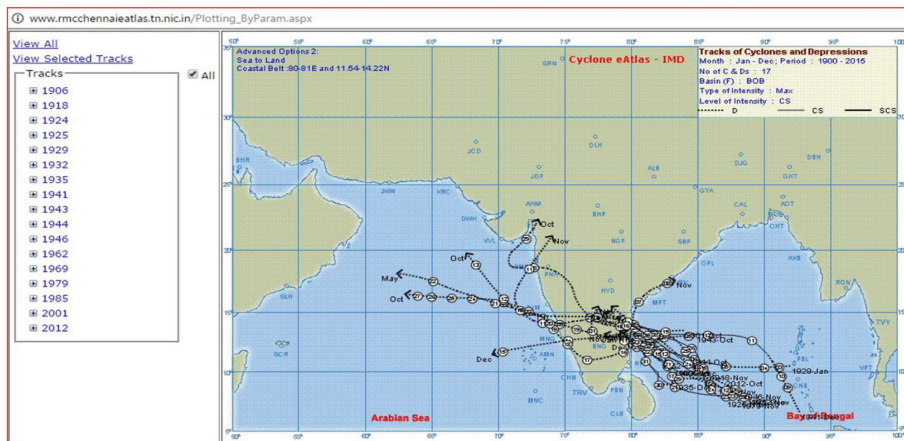
WEST COAST	MAJOR TROPICAL CYCLONES	EAST COAST	MAJOR TROPICAL CYCLONES
Kerala	3	West Bengal (69)	69
Karnataka	2	Odisha (98)	98
Maharashtra	13	Andhra Pradesh (79)	79
Goa	2	Tamil Nadu (54)	54
Gujarat	28	Pondicherry (8)	8
Tamil Nadu (54)		Chennai	18
		Cuddalore	7
		Southarcot	5
		Tanjavur	12
		Pudukkottal	5
		Ramnathpuram	3
		Tirunelveli	2
		Kanyakumari	2

SEVERE CYCLONIC STORM CROSSED BETWEEN NELLORE AND PONDICHERY
(LATITUDE 14°22'10"N – 11°54'34"N)
AFFECTING CHENNAI CITY OVER THE YEAR 1900 TO 2015 (FIFTEEN SCS)



SOURCE : IMD

CYCLONIC STORM CROSSED BETWEEN NELLORE AND PONDICHERY
(LATITUDE 14°22'10"N – 11°54'34"N)
AFFECTING CHENNAI CITY OVER THE YEAR 1900 TO 2015.(SEVENTEEN CS)



SOURCE : IMD

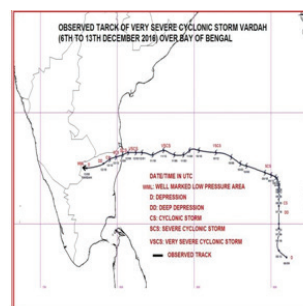
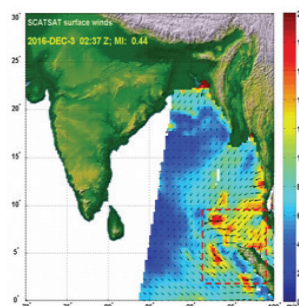
4.1.1 Nada Cyclonic Storm 2005

Under the influence of a trough, low pressure area formed in extreme southeast Bay of Bengal. It slowly consolidated enough to be classified as a depression BOB 2005 on 29 November. This was followed by the Joint Typhoon Warning Center (JTWC) issuing a Tropical Cyclone Formation Alert (TCFA) for the system while it was rapidly concentrating to a deep depression. Remaining as a deep depression for a short time, the storm quickly intensified into a cyclonic storm and was named Nada by the IMD. Shortly thereafter, the storm reached its peak intensity with winds exceeding 75 km/h and a minimum central pressure of 1,000 mbar. Over the following days, the storm encountered high wind shear, which together with land interaction caused it to rapidly weaken and cross the coast of Tamil Nadu near Karaikal as a depression. The system was last noted as a well marked low pressure area over southern Karnataka.

4.1.2 Vardah Cyclone 2016

Low pressure formed over South East Bay of Bengal on 6th December 2016 intensified in to Depression, Deep Depression, Cyclonic Storm and further intensified in to very severe cyclonic storm on 10 th December 2016 and crossed north Tamil Nadu near Chennai as a severe cyclonic storm with a maximum sustained wind speed of 100-110 kmph gusting to 140 kmph during 1500 -1700 hrs IST of 12 th December.

Cyclonic storm “Vardah” made landfall in Chennai city on 12th December, 2016 and barreled inland packing wind speed more than 140 km/hour which created a sea of devastation and an average rainfall was recorded as 119.10 mm. This cyclonic storm was the most severe in two decades which uprooted lakhs of trees, devastated 1000s of lamp posts, spoiled several electrical installations such as transformers, brought several kutcha rooftops to the ground, disabled communication lines and brought the transport system to a grinding halt.



4.1.2.1 Damages Caused

Heavy loss to Chennai green cover as 17,157 avenue trees were uprooted by the cyclone, by which 558 bus route roads and 24761 interior roads were blocked. Gantry boards, Signages were also ripped away. 65 bus route roads damaged to a length of 14.5 km and 3500 interior route roads to a length of 400 km were damaged. 81 electricity installations were covered with fallen trees which delayed the restoration of power supply. 6133 street lamp poles were damaged along with 2226 street lamp fittings. 30 storm water drains to a length of 4.35 km, 2030 footpaths to a length of 21.3 km and 531 bus shelters were damaged.



Ayanavaram



Whites Road, Royapettah



Nandanam



Haddows Road



Thiru.Vi.Ka Bridge



Manali

4.1.2.2 Strategies and Restoration

The G.C.C men and machinery swung into action immediately and a massive war footing exercise to clear the roads by removal of uprooted trees and debris was undertaken. 4197 men from other districts along with G.C.C workers totaling to 19,411 were rushed in for the restoration work. 565 saws were deployed for tree cutting. 449 JCB's and 819 lorries were put in service on this war footing exercise to clear the fallen trees. The total damages have been estimated at Rs.321.94 Crores. By working round the clock, all the bus route roads and interior route roads were cleared for traffic which were blocked by fallen trees. This work continued till 24th December 2016.

The damaged lamp posts and light fittings were restored jointly by GCC and TANGEDCO. Tamilnadu Fire and Rescue services deployed their field personnel and were very effective in these operations. 176 relief centres were kept ready, out of which 27 was opened immediately in which 9,696 people were evacuated from coastal areas in Zone-I (Kathivakkam, Periyakuppam, Tiruvottiyur), Zone -II (Edayanchavadi, Manali New town), Zone-XIII (Kuppam Beach road, Srinivasapuram) and Zone-XV (Neelankarai and Okkiam thoraipakkam). More than 6 lacks food packets were given to affected persons and 610 health camps were conducted.

The removed garden debris have been stored in 78 temporary storage locations across the city to speed up the restoration work. The severity of damages due to cyclone were minimized by meticulous planning and coordination with various Government departments and fore warning the people throughout 9th and 10th December, 2016. This effort had given a lot of insight for future disaster management. Maximum precautionary measures were taken along with the co-ordination of TANGEDCO.

The G.C.C. mobilized men and materials rapidly and left no stone unturned for the restoration of normalcy in the City of Chennai. The Corporation also availed the services of Indian Meteorological Department, National Disaster Response Force(NDRF), State Disaster Response Force(SDRF), Fire and Rescue Services Department and Health and Family Welfare Department strategically. Medical teams with all necessary medical equipments were pressed into service.

4.1.3 Impacts of Cyclone

- There are three main features of cyclone (high wind, rainfall and storm surge) which can cause widespread damage.
- A major factor in the growing losses caused by meteorological hazards is

the concentration of population and economic activity in coastal plains and low-lying areas that are subject to storm surges and land-borne flooding.

- High wind can damage structures like houses and other infrastructure (bridges, dams, embankments etc.); uproot electricity supply and telecommunication lines etc.
- Extremely heavy rain can cause flooding. Floods wash away human beings and animals and make water unfit for drinking. There can be outbreak of diseases like cholera, jaundice or viral fever due to intake of impure water. Water gets contaminated because of floating carcasses and corpses and mixing of sewage. Movement of stored food supplies also gets severely affected due to floods as rail tracks and roads are breached. The floodwaters turn the fields salty.
- Storm surge inundates low-lying coastal areas resulting in life loss and destruction of property. Besides it destroys vegetation and reduces soil fertility. It also affects environment as coral reefs can often suffer damage.

4.1.4 Cyclone mitigation strategies

- Future critical facilities should not be located in areas of accelerated winds.
- The most significant aspect of structural damage to buildings by high velocity wind results from roof damage. The roofs of existing buildings should be inspected and if necessary retrofitted to adequate standards.
- The roofs of existing critical facilities should be retrofitted to a higher standard to ensure wind resistance.
- Building openings such as windows and doors also suffer damage from high velocity winds. These openings if not constructed of wood or metal should be protected with shutters or temporary covers of adequate design.

4.1.5 Common Cyclone preparedness measures

- Communication plans with easily understandable terminology and methods.
- Proper maintenance and training of cyclone disaster services, including mass human resources such as community based disaster response teams.
- Development and exercise of cyclone warning methods combined with cyclone shelters and evacuation plans.
- Stockpiling and inventory, management of essential supplies and equipments.

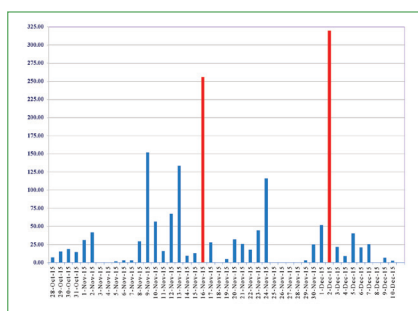
The detailed disaster management plan which has been detailed in this book for flood disaster will hold good for cyclone also.

4.2 Flood

The North East Monsoon sets on 28th October 2015, initially has not shown any disaster kind of down pouring, whereas from the second week of November heavy rain occurred which recorded as the wettest month of the last 100 years for receiving 1113.80 mm of rainfall.

Date	22.10.1969	27.10.2005	9.11.2015	13.1.2015	16.1.2015	02.12.2015
Rainfall in mm	279.7	272	166.8	147	256	319.6

This heavy rainfall coupled with a high speed wind resulted in fall of more than 911 trees in the City. Way back in 1918 Chennai has received 1088.40 mm in a month which remains maximum till date. The maximum rainfall recorded as 319.60mm on 02.12.2015 is the highest record on a single day. The day wise details of rainfall is depicted in the following table

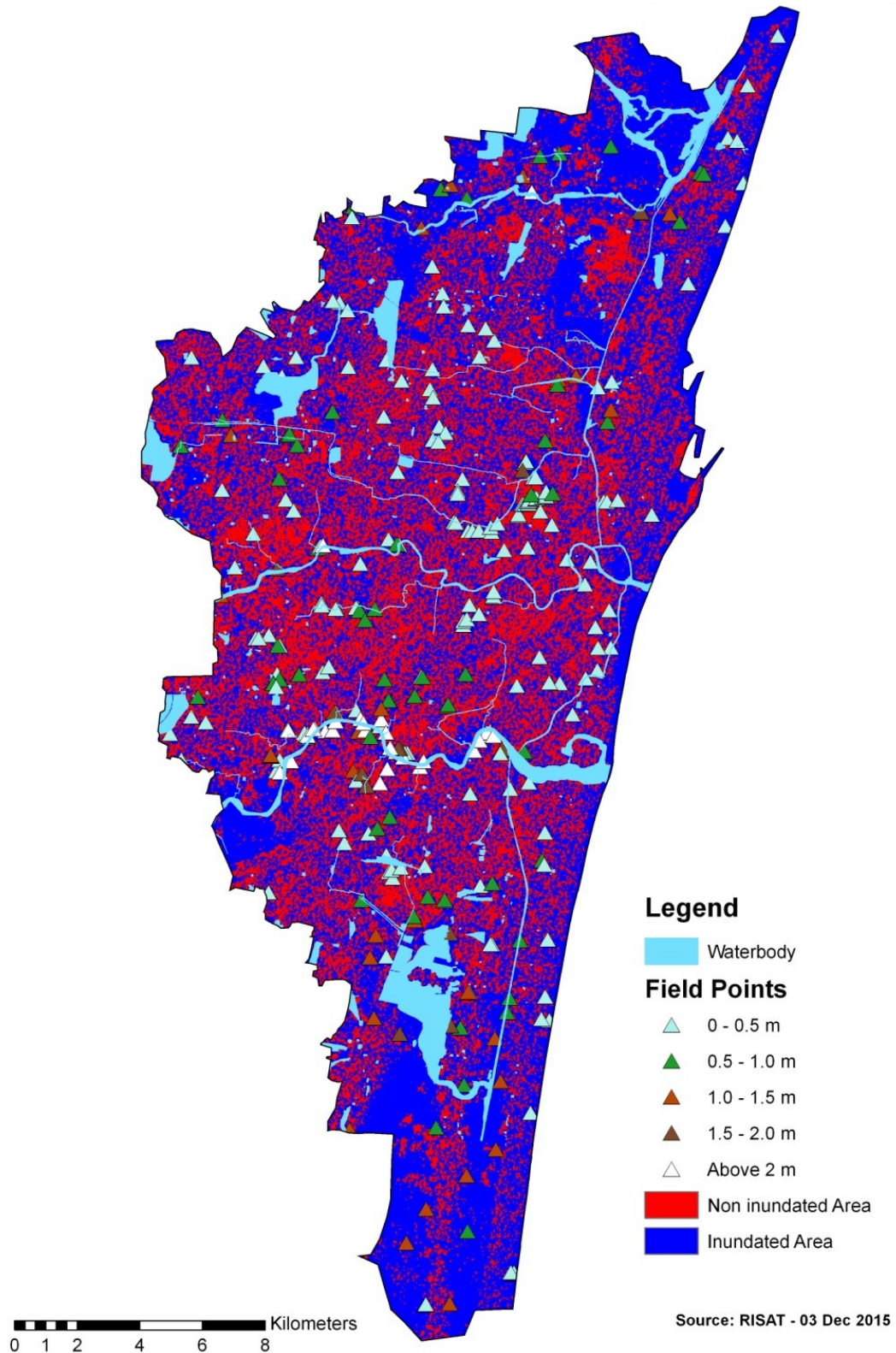


In Kanchipuram District out of 912 tanks 908 tanks were over flowing due to which excess water fed into Chembarambakkam lake through 170 drains causing flood in Adyar, Coovam rivers and link canals. Similarly in Kovalam basin 65 tanks were over flowing causing inundation in Sholinganallur and Perungudi areas. In Tiruvallur District surplus water released from Puzhal – Redhills, Poondi reservoir causing flood in Kosasthalaiar basin.

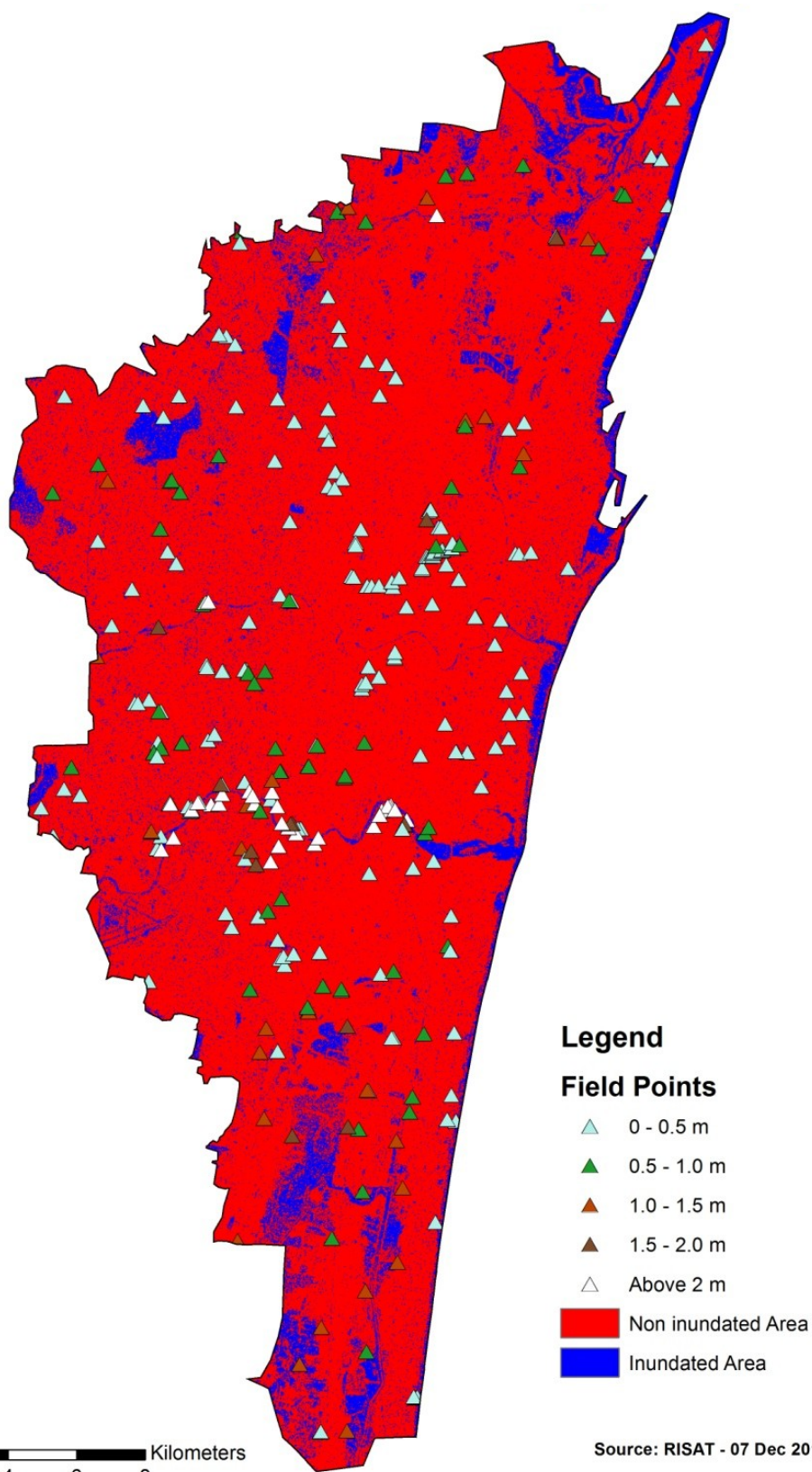
Some of the most affected areas are Mudichur, West Tambaram, Manapakkam, Saidapet, Jafferkhanpet, Kotturpuram etc. Many inundated areas were with more than 2 m height of water. The carrying capacity in Coovum and Buckingham canal exceeded beyond its designed capacity. Canals including 31 minor canals in Chennai city has flooded the near by areas. As a result of about 859 places in Chennai City were inundated due to heavy rainfall and Greater Chennai Corporation jointly with Other Departments cleared water stagnation and 911 fallen trees.

The satellite pictures showing nature and intensity of inundation during flood 2015 taken on 3rd and 7th December is given in the following pages

Inundation on 3 Dec 2015



Inundation on 7 Dec 2015



Chronic Inundation Locations During Monsoon - 2015

Sl. No	Zone	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet	Total
1	I	1	7	0	6	14
2	II	0	0	0	3	3
3	III	2	6	1	1	10
4	IV	0	7	0	7	14
5	V	0	1	0	12	13
6	VI	0	0	0	36	36
7	VII	0	0	0	6	6
8	VIII	1	1	0	7	9
9	IX	5	20	0	40	65
10	X	0	9	0	0	9
11	XI	4	13	0	9	26
12	XII	0	0	0	8	8
13	XIII	24	17	0	26	67
14	XIV	0	0	0	16	16
15	XV	0	3	0	7	10
TOTAL		37	84	1	184	306

Depth of Inundation During Monsoon - 2015							
S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
1	1	5	TH Road jn.of MRF Road				Yes
2	1	6	Kalaingar nagar	Yes			
3	1	1	SVM Nagar I main road				Yes
4	1	1	SVM Nagar II main road				Yes
5	1	1	Kamaraj salai		Yes		
6	1	4	AD Colony, Ernaavoor		Yes		
7	1	7	Kargil nagar, Rajaji nagar		Yes		
8	1	1	SVM Nagar, Ulaga-nathapuram		Yes		
9	1	10	Nandhi odai , Sadayank-uppam battai		Yes		
10	1	12	Srinivasapuram, B.K.N Colony				Yes
11	1	4	Kathivakkam high road				Yes
12	1	5	T.H. Road (MRF road junction)		Yes		
13	1	5	T.H. Road near Liftgate				Yes
14	1	6	Manali Express road, (Mul-lai nagar, Jothi nagar, TKS Nagar)		Yes		
15	2	15	Manali New Town 60 Feet Road				Yes (Only during flood)
16	2	16	Rajiv Gandhi Nagar from TPP Salai to Andarkuppam Main Road				Yes (Only during flood)
17	2	16	From Kanniammanpet pond to Kadappakkam Lake				Yes (Only during flood)
18	3	22	Mahalakshmi Nagar		Yes		
19	3	23	Punitha Anthoniyar Street		Yes		
20	3	23	Othai vadai Street		Yes		
21	3	31	Ambedhkar Nagar		Yes		
22	3	32	Sarathy Nagar				Yes
23	3	22	KS Nagar (Thirumalai Nagar)			Yes	
24	3	25	Collector Nagar	Yes			
25	3	25	Aringhar Anna Nagar,	Yes			
26	3	24	Ambattur Redhills road (Highway)		Yes		
27	3	25	GNT Road (Near Roundana)		Yes		

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
28	4	41	Carnesh Nagar				Yes
29	4	45	Sundram Power Lane				Yes
30	4	45	B.V Colony 19 and 20th Street				Yes
31	4	45	Annai Sathya Nagar				Yes
32	4	45	Ganesapuram Main Road				Yes
33	4	47	KH Road		Yes		
34	4	34	Construction of RCC Open Box type Retaining Wall and Bed including chain link fencing to Kodungaiyur canal North wing from Ch.0.0 to Ch.850m		Yes		
35	4	34	Construction of RCC Open Box type Retaining Wall and Bed including chain link fencing to Kodungaiyur canal North wing from Ch.850 to Ch.1150m		Yes		
36	4	34	Construction of RCC Open Box type Retaining Wall and Bed including chain link fencing to Kodungaiyur canal North wing from Ch.1675 to Ch.2191m		Yes		
37	4	40	Dismantling and Reconstruction of RCC Box type storm water drain of size 1200x1200mm along Kamarajar salai from Elaya street to AE koil st		Yes		
38	4	39	Dismantling and Reconstruction of RCC Box type storm water drain of size 1200x1200mm along T.H Road from North Terminal road to AE koil st				Yes
39	4	41	Providing Re-sectioning concrete lining and laying service road in link canal from Ch.2500 to 2940 in Captain Cotton Canal		Yes		

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
40	4	41	Providing Re-sectioning concrete lining and laying service road in link canal from Ch.2940 to 3360 in Captain Cotton Canal		Yes		
41	4	46	Sathya Moorthy Nagar 24th Block				Yes
42	5	54	Walltax Road				Yes
43	5	61	Ghandhi Irwan Bridge Road				Yes
44	5	58	EVK Sampath Salai,				Yes
45	5	61	Egmore High Road,				Yes
46	5	62	Arunachalam Road,				Yes
47	5	63	Chella pillayar Koil Street,				Yes
48	5	63	G.P. Road,				Yes
49	5	53	Vijayaragavalu Roundana,		Yes		
50	5	58	Sydnams Road,				Yes
51	5	53	Walltax Road				Yes
52	5	62	Singanna Chetty Street,				Yes
53	5	54	Walltax Road				Yes
54	5	59	VOC Salai,				Yes
55	6	64	Poombugar Nagar 1st Main Road				Yes
56	6	64	Poombugar Nagar 2nd Main Road				Yes
57	6	64	Dhanammal Nagar				Yes
58	6	64	Samuthirya Colony 1st Street				Yes
59	6	64	Anjugam Nagar 4th Street				Yes
60	6	64	Poombugar Nagar 11th Cross Street				Yes
61	6	64	Gandhi Street				Yes
62	6	64	MN Nagar				Yes
63	6	65	Hussain Colony 4th Street				Yes
64	6	65	Teachers Colony				Yes
65	6	66	Gandhimathi Street				Yes
66	6	66	Jawahar Nagar				Yes
67	6	67	Rangasiyee Street				Yes
68	6	68	Andiyappan Street				Yes
69	6	66	Kamaraj Street				Yes

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
70	6	68	Pallavan Street				Yes
71	6	71	Konnur High Road				Yes
72	6	72	Decaster Road				Yes
73	6	72	Doss Nagar Pallam				Yes
74	6	73	Ammaiyammal Street				Yes
75	6	74	Sec Colony 1st to 9th Street				Yes
76	6	75	Vallavan Street				Yes
77	6	77	Demellous Road (Near Haj Committee)				Yes
78	6	78	V.V.Koil Street				Yes
79	6	68	Maduraiswamy Madam				Yes
80	6	70	Bharathi Main Road				Yes
81	6	76	Straganas Road				Yes
82	6	76	Angalamman Koil Street				Yes
83	6	72	Dr. Ambedkar College Road				Yes
84	6	66	Shanthi Street				Yes
85	6	66	Ragavan Street				Yes
86	6	68	Mohamadin Salai				Yes
87	6	73	Lal Singh Street				Yes
88	6	73	Mannarswamy Street				Yes
89	6	67	Gopal Reddy Colony				Yes
90	6	73	New Ferrance Road				Yes
91	7	82	Gnanamoorthy Nagar & EB Colony				Yes
92	7	83	NAS Garden & TVS Nagar				Yes
93	7	86	Cth Road near Petrol Bunk				Yes
94	7	86	Annai Sathya Nagar				Yes
95	7	90	Thirumagalalam road				Yes
96	7	93	Vandiamman Koil st				Yes
97	8	94	Annai Sathya Nagar from Wheels India Culvert to Padi Bridge Culvert	Yes			
98	8	94	Villivakkam Sidco Nagar 2nd main road I main road to Burial Ground Compound Wall		Yes		

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
99	8	95	Anna Nagar 18th main road (South) Ch.500m (Reach I) from 100 feet road to Ch.500m				Yes
100	8	95	Anna Nagar 18th main road (South) from Ch.500m (Reach 2) to Otteri Nullah canal				Yes
101	8	95	Anna Nagar 18th main road (North) Ch.425m from Vasantham Colony to 2nd street (Reach II)				Yes
102	8	95	Anna Nagar 18th main road (North) from 100' road to Ch.425m (Reach I)				Yes
103	8	95	Kumarasamy Nagar ,Agathiyar canal				Yes
104	8	101	2nd Avenue, Anna Nagar (Roundana)				Yes
105	8	103	Kellys Road				Yes
106	9	109	Vanniyar 2nd Street				Yes
107	9	109	Gill Nagar 1nd street				Yes
108	9	110	School Road				Yes
109	9	110	Kamarajapuram Main Road				Yes
110	9	111	Maakkis Garden	Yes			
111	9	111	Thideer Nagar	Yes			
112	9	111	Conron Smith Road				Yes
113	9	113	Habibullah Road				Yes
114	9	113	G.N.Chetty Road				Yes
115	9	113	North usman street				Yes
116	9	113	Kodambakkam High road				Yes
117	9	114	C.N.K. Road				Yes
118	9	114	Sydoji Street				Yes
119	9	114	John Mohammad Street				Yes
120	9	114	Lock Nagar				Yes
121	9	115	Dr. Besant Road				Yes
122	9	116	Dr. Besant Road				Yes
123	9	117	North Usman Road		Yes		
124	9	117	G.N.C.Road	Yes			

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
125	9	117	South boug road		Yes		
126	9	117	Thirumalai pillai Street				Yes
127	9	113	Sarathapuram Street		Yes		
128	9	118	Kasthuri Estate 1st street				Yes
129	9	118	Kasthuri Estate 2nd street				Yes
130	9	119	Avvai Shanmugam Salai		Yes		
131	9	119	Lakshmipuram 2nd Street				Yes
132	9	119	Avvai Shanmugam Salai 1st Lane	Yes			
133	9	119	Royapettah High Road				Yes
134	9	119	P.S.Siva Swamy Street		Yes		
135	9	120	Dr. Natesan Road				Yes
136	9	121	Dr. Radha Krishnan Salai(jn of Thiru.Vi.Ka.High Road)				Yes
137	9	121	Dr. Radha Krishnan Salai (jn of Dr.Natesan Road)				Yes
138	9	121	Dr. Radha Krishnan Salai (infornt of Reliance Building)				Yes
139	9	122	K.B.Dasan Road		Yes		
140	9	122	Cresent Road		Yes		
141	9	122	Seethammal colony 3rd Street,		Yes		
142	9	122	Seethammal colony 4th street,		Yes		
143	9	122	Tankbund Road	Yes			
144	9	122	Nandhanam extension 1st Street		Yes		
145	9	122	Nandhanam extension 2nd Street		Yes		
146	9	122	Nandhanam extension 3rd Street		Yes		
147	9	122	Nandhanam extension 4th Street		Yes		
148	9	122	Nandhanam extension 5th street		Yes		
149	9	122	Nandhanam extension 6th Street		Yes		
150	9	122	Nandhanam extension 7th Street		Yes		

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
151	9	122	Nandhanam extension 8th Street		Yes		
152	9	122	Nandhanam extension 9th Street		Yes		
153	9	122	Nandhanam extension 10th Street		Yes		
154	9	122	Seethammal 1st Main Road		Yes		
155	9	123	R.A.Puram 1st main road				Yes
156	9	123	Eldams Road				Yes
157	9	123	R.A.Puram 3rd cross street				Yes
158	9	124	Kutcherry Road				Yes
159	9	125	Karaneswarar Pagoda Street				Yes
160	9	126	Santhome High Road				Yes
161	9	111	Whites Road				Yes
162	9	112	Railway border road				Yes
163	9	112	Sowrastra nagar 5th street				Yes
164	9	112	Trustpuram 1st cross street				Yes
165	9	112	Bharathishwarer colony 3rd street				Yes
166	9	112	Sivan koil street				Yes
167	9	118	Mayor Sundra (rao) road				Yes
168	9	121	Thiru-Vi-Ka 3rd street				Yes
169	9	113	Improvements of storm water drain at North Usman Road				Yes
170	9	113	Improvements of storm water drain and construction of 3 road crossing culverts Habibullah Road				Yes
171	10	127	Kaliamman Koil Street(from CMWSSB STP to Sai nagar annex)		Yes		
172	10	131	Rajamannar Salai		Yes		
173	10	134	Rangarajapuram		Yes		
174	10	128	Vembuliamman Koil street		Yes		
175	10	130	100 feet Road (junction of periyar pathai)		Yes		
176	10	136	North Usman Road		Yes		

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
177	10	127	100 feet road (junction of Kalamman Koil Street)		Yes		
178	10	127	Kalamman Koil Street (infront of police station)		Yes		
179	10	111 & 127	Construction of Storm water drain of size 900x900mm RCC Box type drain along Kalamman koil street at Koy-ambedu from Metro Water Office in Dn.111 to 100 ft road in Dn.127		Yes		
180	11	144	MMDA Colony 4th , 5th & 6th block				Yes
181	11	145	Pallavan Nagar				Yes
182	11	143	Gajalakshmi nagar	Yes			
183	11	143	VGN nagar phase III		Yes		
184	11	143	Sakthi nagar				yes
185	11	143	Vembuli amman koil street				Yes
186	11	146	Metro nagar				Yes
187	11	147	Krishna nagar		Yes		
188	11	147	Alapakkam main road		Yes		
189	11	147	Pallavan nagar				Yes
190	11	148	Anbu nagar		Yes		
191	11	148	Balavinayagar street		Yes		
192	11	148	CDN nagar				Yes
193	11	149	Radha avenue		Yes		
194	11	149	Sri Lakshmi nagar		Yes		
195	11	150	Mullai street				Yes
196	11	150	Arcot road		Yes		
197	11	151	Officers colony		Yes		
198	11	151	Annai sathya nagar		Yes		
199	11	153	Ganesh avenue 1st to 10th street		Yes		
200	11	155	Amman nagar	Yes			
201	11	155	Royala nagar	Yes			
202	11	155	Bakthi vedhandha avenue	Yes			
203	11	154	Bharathi salai		Yes		

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
204	11	148	Construction of storm water drain of size 1200x1200mm along IAS Qtrs road and Pachaiamman koil street from Dead End to Virugambakkam Canal				Yes
205	11	152	Sairam avenue		Yes		
206	12	156	Bhell Nagar				Yes
207	12	157	Kaviya Garden, CRR Puram Phase III, Purachi Thalivi Nagar, Bhell Nagar, Dharmarajapuram, Sathiya Nagar, Astalakshmi Avenue and Sedhu Lakshmi Avenue, River view colony				Yes
208	12	165	Bharathidasan Nagar,				Yes
209	12	167	Nanganallur 44th street				Yes
210	12	158	Construction of storm water drain along Ganapathi Colony from Thulasisingapuram to Adayar river of size 1200x1200mm				Yes
211	12	165	Bhuvaneswari Nagar,				Yes
212	12	165	Income Tax colony Area Back flow of sewage water				Yes
213	12	162	Thillai Ganga Nagar 25th Street, 27th Street, 28th Street, Thillai Ganga Nagar 2nd Main Road, and 4th Main Road				Yes
214	13	173	Mayflower garden		Yes		
215	13	173	R.A Puram IV cross street		Yes		
216	13	173	Valleswaranthottam		Yes		
217	13	173	Srinivasa avenue		Yes		
218	13	174	Mosque street				Yes
219	13	179	Gandhi road	Yes			
220	13	179	Vallalar street - Annai Indra nagar	Yes			
221	13	179	Sivasakthi street - Annai Indra nagar	Yes			

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
222	13	179	Kamatchiamman street - Annai Indra nagar	Yes			
223	13	179	Sastri street (Part)	Yes			
224	13	179	Udayam nagar & extn	Yes			
225	13	177	Astalakshmi nagar II, III, IV & V streets				Yes
226	13	173	MRC Nagar		Yes		
227	13	173	Vasantha avenue		Yes		
228	13	173	Kasthuri avenue		Yes		
229	13	175	L.B road				Yes
230	13	175	Kasthuribai nagar				Yes
231	13	175	Indra nagar				Yes
232	13	175	Anna avenue				Yes
233	13	176	Sastri nagar II, IX & XV cross street		Yes		
234	13	178	A.G.S Colony	Yes			
235	13	179	V.G.P Selva nagar Extn I to V streets	Yes			
236	13	179	V.G.P Selva nagar I cross street & I main road	Yes			
237	13	179	Bhuvaneshwari nagar I & III cross street & III main road	Yes			
238	13	179	Veenus colony II street	Yes			
239	13	181	Dr.Radhakrishnan nagar				Yes
240	13	181	Valmigi street				Yes
241	13	180	C.S.I.R road				Yes
242	13	174	Nehru nagar - Veerapandiy Kattabomman street		Yes		
243	13	174	Nehru nagar - Periyar street		Yes		
244	13	174	Nehru nagar - Anbil Dhar-malingam street		Yes		
245	13	174	Velachery main road		Yes		
246	13	182	Journalist colony		Yes		
247	13	171	Construction of SWD of size 1500x1500mm along and across Sardar Patel road (Opp to Rajbhavan)		Yes		

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
248	13	177	Construction of RCC Box type storm water drain along EB colony 2nd street from EB colony main road to Radha Nagar extension main road		Yes		
249	13	177	Construction of storm water drain along Lakshmi nagar 2nd street from Lakshmi Nagar main road to Rajiv Gandhi nagar main road		Yes		
250	13	182	Avvai nagar				Yes
251	13	182	Kannappa nagar				Yes
252	13	182	Ganapathy colony				Yes
253	13	172	Chitra nagar, Kotturpuram	Yes			
254	13	177	Ambedkar nagar II main road				Yes
255	13	177	Kamarajar street - Nehru nagar				Yes
256	13	177	TNHB Colony III main road				Yes
257	13	177	A.G.S Colony VI street				Yes
258	13	177	ASK Nagar				Yes
259	13	177	Ex Service man colony				Yes
260	13	177	Ambedkar nagar I cross street				Yes
261	13	177	TNHB Colony - EWS lanes				Yes
262	13	177	Nethaji colony I to IV cross streets				Yes
263	13	177	Andal nagar extn I to III streets				Yes
264	13	177	Venkateswara nagar III main road				Yes
265	13	177	A.G.S Colony III main road				Yes
266	13	177	Mahalakshmi nagar III cross street				Yes
267	13	177	Brindavan nagar II street		Yes		
268	13	179	Seshadripuram I main road	Yes			
269	13	170	Nagi (R) Thottam	Yes			

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
270	13	170	Chetti thottam	Yes			
271	13	170	Neruppumedu	Yes			
272	13	170	Vinayagapuram	Yes			
273	13	170	Anusuyamandapam	Yes			
274	13	178	Vijayanagar area	Yes			
275	13	178	Ram Nagar area	Yes			
276	13	179	Tansi nagar II, III, V, VII & X streets	Yes			
277	13	179	Dhandeeswaram nagar	Yes			
278	13	179	Seetharam nagar	Yes			
279	13	179	Sarathy nagar	Yes			
280	13	180	Velachery Taramani road (100' road)				Yes
281	14	184	MGR Salai, MRTS (Near ICDS)				Yes
282	14	187	Karthikeyapuram				Yes
283	14	187	New Kubera Nagar 5th & 7th Street				Yes
284	14	169	Ram Nagar (North)				Yes
285	14	169	Annai Therasa nagar				Yes
286	14	169	Puzhuthivakkam Bust Stand				Yes
287	14	186	OMR, Jn. of Thirumalai Nagar				Yes
288	14	185	ECR, Palgalai Nagar				Yes
289	14	183	ECR, Near BATA Show-room				Yes
290	14	183	ECR Opp. Fish market				Yes
291	14	184	OMR, MGR Salai Jn.				Yes
292	14	185	ECR, Govindan Nagar				Yes
293	14	188	Rajesh Nagar				Yes
294	14	188	Rajaji Nagar				Yes

S.No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
295	14	188	LIC Nagar				Yes
296	14	188	Madipakkam Bus Stand				Yes
297	15	192	Ellaiamman koil street				Yes
298	15	193	MCN Nagar				Yes
299	15	194	OMR - Mettukuppam (VPG Avenue Junction)		Yes		
300	15	197	Wipro Salai		Yes		
301	15	192	Construction of SWD of size 600x750mm along Kumaraguru Avenue , Neelankarai				Yes
302	15	192	Construction of SWD of size 1200x1200mm along Pandian Salai, Nee-lankarai				Yes
303	15	192	Construction of SWD of size 600x750m along Saraswathi Nagar South, Neelankarai		Yes		
304	15	193	Construction of SWD of size 900x900mm along Karpaga Vinayagar Koil Street, Vettuvankeni				Yes
305	15	196	Construction of storm water drain along Ist Avenue Main Road, Vettuvankeni				Yes
306	15	197	Lalbahadur Sasthiri Street				Yes

Chronic Inundation Locations During Monsoon - 2017

Sl. No.	ZONE	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet	Total
1	I			18	1	19
2	II				11	11
3	III				37	37
4	IV				23	23
5	V				3	3
6	VI				9	9
7	VII			4	8	12
8	VIII				5	5
9	IX				12	12
10	X				5	5
11	XI				1	1
12	XII				4	4
13	XIII				10	10
14	XIV			1	47	48
15	XV				6	6
Total		0	0	23	182	205

Depth of Inundation During Monsoon - 2017							
Sl. No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
1	I	3	Annai sivagami nagar 6th street			Yes	
2	I	4	Thiruveedhiamman koil 5th street			Yes	
3	I	4	Mettu street			Yes	
4	I	5	MRF road junction			Yes	
5	I	5	Jaigopal karodia school				Yes
6	I	5	Gandhi nagar (Inside Market)			Yes	
7	I	6	Kalaingar nagar 9th street			Yes	
8	I	6	Manali express road			Yes	
9	I	7	Rajaji nagar VOC street			Yes	
10	I	7	Rajaji nagar sathyamootthy street			Yes	
11	I	7	Rajaji nagar Kirubananadavariyar street			Yes	
12	I	7	Rajaji nagar Muthuramalingam street			Yes	
13	I	7	Kargil nagar pumping station			Yes	
14	I	10	Nandhiodai			Yes	
15	I	11	T.H road (Opp. To Zonal office)			Yes	
16	I	12	BKN colony			Yes	
17	I	13	Varadarajan street (Govt. school)			Yes	
18	I	13	Gandhi nagar (In railway land)			Yes	
19	I	14	T.H road (Rajakadai)			Yes	
20	II	15	Manali New Town 73rd Block				Yes
21	II	15	Edayanchavadi				Yes
22	II	15	Chinna Eachankuzhi				Yes
23	II	16	Manali New town 84th,89th,90th Block				Yes
24	II	16	Manali New town 89th Block				Yes
25	II	16	Manali New town 90th Block				Yes
26	II	17	Kosappur School				Yes
27	II	18	All Street				Yes
28	II	19	MMDA 46TH Street				Yes
29	II	20	Kamarajar Salai				Yes
30	II	21	Jalakandamariamman Koil Street				Yes
31	III	22	Vegetarian Village				Yes

Sl. No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
32	III	24	Sriram Nagar,				Yes
33	III	24	Venkateswara Nagar				Yes
34	III	24	Venkatasai Nagar				Yes
35	III	24	Vijayalakshmi Nagar				Yes
36	III	24	Grace Ngr				Yes
37	III	24	Elisabeth Ngr				Yes
38	III	24	Sathiyamoorthy Ngr				Yes
39	III	24	Ganapathy Ngr				Yes
40	III	24	Kamarajar Ngr				Yes
41	III	24	Krishna Ngr				Yes
42	III	24	Purushothaman Ngr				Yes
43	III	24	Velumurugan Ngr				Yes
44	III	25	padmavathy nagar GNT ROAD ROUNDANA,				Yes
45	III	25	Veeraragavan nagar				Yes
46	III	25	Collector Nagar				Yes
47	III	25	lakshmi Nagar				Yes
48	III	25	INTUC Nagar				Yes
49	III	25	Arignar Anna Ng				Yes
50	III	26	1.Ganapathy Siva Nagar, Thirupathy thangavel nagar				Yes
51	III	29	1.Perumal koil St				Yes
52	III	29	Perumal koil StExtension				Yes
53	III	29	Kakkan puram cross St				Yes
54	III	29	Velu St				Yes
55	III	29	Apparaj St				Yes
56	III	29	Devarajan 2nd Cross st				Yes
57	III	29	Gandhi Cross st				Yes
58	III	31	1.Kannapiran kovil st				Yes
59	III	31	kalkattashop				Yes
60	III	32	NANDHA NAGAR				Yes
61	III	32	VENKATESWARA NAGAR				Yes

Sl. No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
62	III	32	TEACHERS COLONY 4TH MAIN ROAD				Yes
63	III	33	Annapoorna Nagar entire Area(Vacant Land)				Yes
64	III	33	Ganapathy thottam,				Yes
65	III	33	Prakash Nagar				Yes
66	III	33	VIP Ngr				Yes
67	III	33	Elisabath Ngr				Yes
68	IV	34	Thendral Nagar				Yes
69	IV	35	Muthamil Nagar 202nd Street				Yes
70	IV	35	Gandhi Nagar				Yes
71	IV	35	Krishna Salai				Yes
72	IV	37	Abirami Avenue 14th Street				Yes
73	IV	37	MKB Nagar 4th Cross Street				Yes
74	IV	38	Vaithiyanathan Street				Yes
75	IV	38	Patel Nagar 3rd Street				Yes
76	IV	38	Nehru Nagar 13th Street				Yes
77	IV	38	Nethaji Nagar 2nd Street				Yes
78	IV	40	Thiruvalluvar Nagar				Yes
79	IV	41	MGR Nagar 5th, 6th, 7th & 8th Street				Yes
80	IV	41	Parthasarathy Street				Yes
81	IV	41	Marimuthu Street				Yes
82	IV	41	Kasthuribai Street				Yes
83	IV	44	Kamaraj Street				Yes
84	IV	44	Palani andavar Koil Street				Yes
85	IV	45	Annai Sathya Nagar				Yes
86	IV	45	B.V.Colony 18th Street				Yes
87	IV	46	Palla 2nd & 3rd Street				Yes
88	IV	46	E.H Road (Moorthingar Opp Eswaran Koil)				Yes
89	IV	46	S.M.Nagar Main Road				Yes
90	IV	47	Meenambal Nagar 5th Street				Yes
91	V	53	C.B.Road				Yes
92	V	57	Prakasam Salai				Yes
93	V	58	Ritherdon road				Yes

Sl. No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
94	VI	64	Siva Sakthi Nagar				Yes
95	VI	64	Appasamy Street				Yes
96	VI	65	Ambedkar Nagar 1st Cross Street				Yes
97	VI	65	Ashok Avenue				Yes
98	VI	69	Bunder Garden				Yes
99	VI	72	Decaster Road				Yes
100	VI	74	Secratriate Colony 4nd Street				Yes
101	VI	74	Secratriate Colony 6th Street				Yes
102	VI	77	Elephant gate Road				Yes
103	VII	79	Manolodai St				Yes
104	VII	80	Sabari st, Chital st				Yes
105	VII	81	OT Bus stand				Yes
106	VII		Singapore complex				Yes
107	VII	82	Sakthi Nagar, Vital st			Yes	
108	VII	82	Vanasakthi Nagar,TVS Nagar,Sastha Nagar,				Yes
109	VII	83	Iyyappan st				Yes
110	VII	84	Kanniamman Koil st,			Yes	
111	VII	84	Bajanai Koil st, Dass industrial estate				Yes
112	VII	86	TNHB Phase-III			Yes	
113	VII	86	Rampoorna Nagar			Yes	
114	VII	89	Akshyacolony				Yes
115	VIII	99	H BLOCK 5TH STREET				Yes
116	VIII	105	Razak Garden				Yes
117	VIII	105	INDRA GANDHI STREET				Yes
118	VIII	105	MMDA COLONY H BLOCK				Yes
119	VIII	105	J BLOCK				Yes
120	IX	110	School Road				Yes
121	IX	110	Strelling Road				Yes
122	IX	111	Whites Road				Yes
123	IX	111	Gopalapuram 1st street				Yes
124	IX	113	Prakasam Salai				Yes
125	IX	113	Nungambakkm High Road (Near Park Hotel)				Yes

Sl. No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
126	IX	115	Dr.Besant road (Uruthu School)				Yes
127	IX	118	Anna Salai				Yes
128	IX	119	Avvai Shanmugam Salai 1st lane				Yes
129	IX	119	Lakshmipuram 2nd Street				Yes
130	IX	121	Dr.R.K.Salai				Yes
131	IX	122	Chamiers Road				Yes
132	X	127	Kaliamman Koil street Near Market				Yes
133	X	136	Bazulla Road				Yes
134	X	136	Burkit Road				Yes
135	X	127	Kaliamman Koil street				Yes
136	X	131	R.K.Shanmugam Salai				Yes
137	XI	148	Thangal Karai, Periyar Nagar				Yes
138	XII	156	PANICHATHAMMAN KOIL				Yes
139	XII	161	IG OFFICE				Yes
140	XII	162	KANNAN COLONY				Yes
141	XII	165	BALAJI NAGAR EXTN.(VACANTLAND to SWD)				Yes
142	XIII	174	CGHSS - Five furlong road				Yes
143	XIII	174	Radhakrishnan street				Yes
144	XIII	174	Pandiyan street				Yes
145	XIII	174	Velachery main road				Yes
146	XIII	177	Venkateswara nagar III street (Vacant land - 1 & Dhandeeswaram disposal - 1)				Yes
147	XIII	177	TNHB III avenue (Vacant land)				Yes
148	XIII	179	Park avenue III street				Yes
149	XIII	179	V.G.P Selva nagar IV main road				Yes
150	XIII	180	Kennady street				Yes
151	XIII	180	Anna street				Yes
152	XIV	168	Giri Street				Yes
153	XIV	169	Ram Nager Ist st				Yes
154	XIV	169	Sivasubramaniyam st				Yes
155	XIV	169	Jaya Nagar				Yes

Sl. No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
156	XIV	169	Thanthai Periyar School				Yes
157	XIV	169	Manikandan street				Yes
158	XIV	187	New Kuberan Nagar 5th street				Yes
159	XIV	187	New Kuberan Nagar 7th street				Yes
160	XIV	187	Kathikeyapuram 12th street				Yes
161	XIV	188	Arul murugan nagar 1st street				Yes
162	XIV	188	Vishal Nager Main Road				Yes
163	XIV	188	Krishnaveni Ammal Nagar				Yes
164	XIV	188	mahalakshmi nagar				Yes
165	XIV	188	madipakkam bus stand				Yes
166	XIV	188	Govindaswamy Nagar				Yes
167	XIV	188	Arul murugan nagar 4th street				Yes
168	XIV	188	Veeramani Street				Yes
169	XIV	188	Kuberan nagar 14th street				Yes
170	XIV	188	Kuberan nagar 15th street				Yes
171	XIV	189	perumal Nagar				Yes
172	XIV	189	meru Nagar Main road				Yes
173	XIV	189	kamaraj Street				Yes
174	XIV	190	kannan thasan Nagar (park)				Yes
175	XIV	190	nehru Street (part)				Yes
176	XIV	190	Kovalan Nagar 6th street				Yes
177	XIV	190	Rajiv Street (part)				Yes
178	XIV	191	pallavan Street				Yes
179	XIV	191	pallavan Nagar 1 Street (part)				Yes
180	XIV	191	pallavan Nagar 2 Street (part)				Yes
181	XIV	191	pallavan Nagar 3 Street (part)				Yes
182	XIV	191	pallavan Nagar 4 Street (part)				Yes
183	XIV	191	padamavathi nagar main road				Yes
184	XIV	191	Nagathamman kovil st			Yes	
185	XIV	191	Indra gandhi street				Yes
186	XIV	191	Rajiv gandhi street				Yes
187	XIV	191	Mani megali Street				Yes
188	XIV	191	Bagavathu Singh Street				Yes
189	XIV	191	Manikkam Street				Yes

Sl. No	Zone	Ward	Location	Very High Vulnerability Above 5 Feet	High Vulnerability 3 to 5 Feet	Medium Vulnerability 2 to 3 Feet	Low Vulnerability less than 2 feet
190	XIV	191	Nethaji Street				Yes
191	XIV	191	Kovalan Street				Yes
192	XIV	191	Rajeshwari Street				Yes
193	XIV	191	Kannagi Street				Yes
194	XIV	191	Kambar Street				Yes
195	XIV	191	Indhra Street				Yes
196	XIV	191	Kumarakurubarar Street				Yes
197	XIV	191	Rajiv Gandhi Cross Street				Yes
198	XIV	191	Vaithiya Lingam Stret				Yes
199	XIV	191	Pachayappan Koil Street				Yes
200	XV	192	Kabaleeswarar Nagar 5th cross street				Yes
201	XV	193	MCN Nagar Extn 3rd Street				Yes
202	XV	194	Raju Nagar 1st and 2nd Street				Yes
203	XV	196	Bethel Nagar				Yes
204	XV	196	ECR-Jn of Gandhi Street				Yes
205	XV	197	Bajanai Kovil Street				Yes
			TOTAL				

NORTH EAST MONSOON-2018

Chronic Inundation Location During Monsoon - 2018

Sl. No	Zone	Very high vulnerability Above 5 feet	High vulnerability 3 to 5 feet	Medium vulnerability 2 to 3 feet	Low vulnerability Less than 2 feet	TOTAL
1	I	—	—	—	2	2
2	III	—	—	1	2	3
3	VII	—	—		7	7
4	VIII	—	—	—	3	3
5	XI				2	2
6	XIV	—	—	—	17	17
7	XV	—	—	—	19	19
TOTAL				1	52	53

NORTH EAST MONSOON-2018							
Depth of Inundation During Monsoon -2018							
No of stagnation : 53 locations							
Sl.No	Zone	Div	Location	Very high vulnerability Above 5 feet	High vulnerability 3 to 5 feet	Medium vulnerability 2 to 3 feet	Low vulnerability Less than 2 feet
1	1	6	Jothi Nagar				Yes
2	1	7	Rajaji Nagar				Yes
3	3	22	Thirumalai nagar				Yes
4	3	26	Sivaganapathi nagar	—	—	—	Yes
5	3	26	Perimalum nagar	—	—	Yes	—
6	7	82	Karukku Main Road	—	—	—	Yes
7	7	83	TVS Nagar East, Balaji Nagar	—	—	—	Yes
8	7	83	Iyappan Nagar,	—	—	—	Yes
9	7	83	Balaji Nagar	—	—	—	Yes
10	7	91	Jeswanth Nagar				Yes
11	7	92	Vellalar Street				Yes
12	7	93	Padikuppam Main road				Yes
13	8	94	MTH ROAD NEAR VILLI-VAKKAM POLICE STATION				Yes
14	8	104	DR ALAGAPPA ROAD				Yes
15	8	104	SUNDARAM LANE				Yes
16	11	147	Nagenthiran Street				Yes
17	11	150	Chettiyaragaram Main Road				Yes
18	14	169	Ram nagar 1st street	—	—	—	Yes
19	14	169	Ram nagar 2nd street	—	—	—	Yes
20	14	169	Ram nagar 3rd street	—	—	—	Yes
21	14	169	Ram nagar 5th street	—	—	—	Yes
22	14	169	Ram nagar 7th street	—	—	—	Yes
23	14	169	Ram nagar 8th street	—	—	—	Yes
24	14	169	Manikandan street	—	—	—	Yes
25	14	169	Sivasubramaniyam street	—	—	—	Yes
26	14	169	Sivaprakasham 1st street	—	—	—	Yes
27	14	169	Balaji nagar 24th street	—	—	—	Yes

28	14	169	Annai Therasa nagar 7th street	—	—	—	Yes
29	14	169	Annai Therasa nagar 4st street	—	—	—	Yes
30	14	169	Annai Therasa nagar 14th street	—	—	—	Yes
31	14	169	Ramalingam nagar main road	—	—	—	Yes
32	14	169	Jaya nagar	—	—	—	Yes
33	14	183	Division office	—	—	—	Yes
34	14	187	Saraswathi street	—	—	—	Yes
35	15	192	Infront of Maharastra Bank at ECR Road Neelankarai	—	—	—	Yes
36	15	192	Ellaiyamman Koil 4th Street, Neelankarai	—	—	—	Yes
37	15	193	Mahathma Gandhi 2nd Main Road	—	—	—	Yes
38	15	193	Karpaga Vinayagar Nagar 3rd Street	—	—	—	Yes
39	15	193	Karpaga Vinayagar Nagar 4th Street	—	—	—	Yes
40	15	193	Karpaga Vinayagar Nagar 5th Street	—	—	—	Yes
41	15	193	Kasthuribai 10th cross street	—	—	—	Yes
42	15	193	Karpaga Vinayagar Nagar 7th Street	—	—	—	Yes
43	15	194	Balaji Nagar	—	—	—	Yes
44	15	194	Bharathiyar Nagar	—	—	—	Yes
45	15	195	Saraswathi Nagar 4th Cross Street	—	—	—	Yes
46	15	196	ECR Road Pilominal School	—	—	—	Yes
47	15	196	Ramalinga nagar	—	—	—	Yes
48	15	197	Annai Fathima school	—	—	—	Yes
49	15	197	Classic Farm Retreat 1st st	—	—	—	Yes
50	15	198	Ponniyamman koil 5th cross street	—	—	—	Yes
51	15	200	Thiruvalluvar Nagar	—	—	—	Yes
52	15	200	Jawahar nagar 5th.6th cr st	—	—	—	Yes
53	15	200	Nookampalayam link road	—	—	—	Yes

Chronic Inundation Locations During Monsoon - 2019

Sl.No.	ZONE	No.of.Water Stagnation locations	Very High Vulnerability	High Vulnerability	Medium Vulnerability	Low Vulnerability	Total
1	I	1				1	1
2	II	0				0	0
3	III	1				1	1
4	IV	0				0	0
5	V	2				2	2
6	VI	1				1	1
7	VII	1				1	1
8	VIII	1				1	1
9	IX	2				2	2
10	X	2				2	2
11	XI	1				1	1
12	XII	0				0	0
13	XIII	1				1	1
14	XIV	4				4	4
15	XV	2				2	2
		19	0	0	0	19	19

Depth of Inundation During Monsoon -2019

Sl.No.	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet
1	1	7	Kargil Nagar, Thiruvotriyur				Yes
2	3	24	Surapet Main Road				Yes
3	5	56	Prakasam Salai				Yes
4	5	58	EVK Sampath Salai				Yes
5	6	69	Paper Mills road				Yes
6	7	83	North Avenue, TNHB 27th,28th,42th,49th,50th,61st				Yes
7	8	100 , 102	P.H Road, Near Arumbakkam and Near Mosque				Yes
8	9	113	Nungambakkam High (Near Park Hotel)				Yes
9	9	117	North Usman Road				Yes
10	10	127	Jawahar lal nehru, 100 feet road, Koyambedu junction				Yes
11	10	130	100 Feet road, CMRL , Vadapalani junction				Yes
12	11	152	Arcot road infront of lamech school				Yes
13	13	174	Vellachery Main Road Phoenix Mall Near vijaya nagar junction				Yes
14	14	188 , 169 , 187	Ram Nagar 6th, 8th ,9th Street				Yes
15	14	191	Quidamillath Street				Yes
16	14	188,187	Kuberan Nagar				Yes
17	14	169,187	Sadasivam Nagar				Yes
18	15	200	Nookkambaalayam link road				Yes
19	15	200	Jawahar Nagar				Yes
			TOTAL				

Chronic Inundation Locations During Monsoon - 2020

Sl. No.	ZONE	No.of.Water Stagnation locations	Very High Vulnerability	High Vulnerability	Medium Vulnerability	Low Vulnerability	Total
1	I	1				1	1
2	II	0				0	0
3	III	0				0	0
4	IV	2				2	2
5	V	1				1	1
6	VI	2				2	2
7	VII	1				1	1
8	VIII	2				2	2
9	IX	2				2	2
10	X	2				2	2
11	XI	2				2	2
12	XII	1				1	1
13	XIII	3				3	3
14	XIV	2				2	2
15	XV	2				2	2
		23	0	0	0	23	23

Depth of Inundation During Monsoon -2020

Sl.No.	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet
1	1	07	Kargil Nagar, Thiruvotriyur				Yes
2	4	42	Kailasam Street.				Yes
3	4	47	Meenambal Nagar, Kathivakkam High Road.				Yes
4	5	57	Prakasam Salai,				Yes
5	6	65 & 66	Senthil Nagar 1 st Main Road & Selvi Nagar 1 to 5 Street. Periyar Nagar (Kathikeyan Salai), Jaganathan Salai.				Yes
6	6	77	Pulianthope High Road				Yes
7	7	83	North Avenue, Korattur				Yes
8	8	94	Baba Nagar, Villivakkam, South Jaganatha Nagar 3 rd Main Road.				Yes
9	8	100	3 rd Avenue, Anna Nagar				Yes
10	9	113	Habibullah Road				Yes
11	9	123	R.A Puram 1 st Main Road				Yes
12	10	131	Rajammannar Salai & R.K. Shanmugam Salai.				Yes
13	10	136	Bazullah Road				Yes

14	11	143	Gajalakshmi Nagar Main Road & Gajalakshmi Nagar 5 th Street				Yes
15	11	150	Arcot Road Northern side (from Porur Jun to Karambakkam Police Booth)				Yes
16	12	162 & 164	Kannan Colony, Vembuli Amman Koil Road, Alandur				Yes
17	13	174	City Link Road, Five Furlong Road, Cart Track Road, Pillaiyar Koil Street, Nethaji Road.				Yes
18	13	177	Velachery AGS Colony 4th Street & 5 th Street				Yes
19	13	180	MGR Main Road. Periyar Nagar, Tharaman				Yes
20	14	169	Ram Nagar 10 th & 11 th Street.				Yes
21	14	188	Mayilai Balaji Nagar (Kuberan Nagar, Ram Nagar South) Pallikaranai.				Yes
22	15	196	Selva Nagar				Yes
23	15	200	Semmancheri Housing Board Colony, Semmancheri EzhilmugaNagar, Jawahar Nagar.				Yes
			TOTAL				

Chronic Inundation Locations During Monsoon - 2021

Sl.No.	ZONE	No.of.Water Stagnation locations	Very High Vulnerability	High Vulnerability	Medium Vulnerability	Low Vulnerability	Total
1	I	16			3	13	16
2	II	6		1	1	4	6
3	III	60		2	9	49	60
4	IV	50		3	6	41	50
5	V	53			1	52	53
6	VI	14			7	7	14
7	VII	10			5	5	10
8	VIII	33			5	28	33
9	IX	58		1	6	51	58
10	X	37		1	4	32	37
11	XI	27			1	26	27
12	XII	21			1	20	21
13	XIII	48		7	2	39	48
14	XIV	79		3	6	70	79
15	XV	49			4	45	49
		561	0	18	61	482	561

Depth of Inundation During Monsoon -2021

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
1	1	1	K.H Road near Vinayakar Kovil				Yes	
2	1	1	K.H.Road			Yes		
3	1	1	S.V M Nagar Burial Ground			Yes		
4	1	2	Valluvar nagar subway				Yes	
5	1	2	Kamaraj Nagar 7th Street				Yes	
6	1	2	Periyar Kupam Barial Ground				Yes	
7	1	2	Nehru Nagar				Yes	
8	1	3	Etps Colony				Yes	
9	1	4	AD Colony				Yes	
10	1	4	Jothi Nagar				Yes	
11	1	4	Shanmugapuram 2nd Street			Yes		
12	1	6	Shanmugapuram 12th Cross Street				Yes	
13	1	6	Rajashanmugapuram 2nd Street				Yes	
14	1	7	Annamalai Nagar				Yes	
15	1	7	Ramasamy Nagar				Yes	
16	1	11	Kanakar Street				Yes	
17	2	15	Ediyan Chavadi				Yes	
18	2	16	Jenifer Nagar			Yes		
19	2	17	Saraswathi Nagar				Yes	
20	2	19	Bala Subramaniam Nagar		Yes			
21	2	20	New MGR Nagar				Yes	
22	2	21	Neducheziyan Salai				Yes	
23	3	22	Thiruneelakandar 4th St				Yes	
24	3	22	Valluvar St				Yes	
25	3	22	K.S. Nagar 27th St				Yes	
26	3	22	K.S. Nagar 26th St				Yes	
27	3	22	K.S. Nagar 2nd St			Yes		
28	3	23	Division Office 23		Yes			
29	3	23	NSK Street				Yes	
30	3	23	Warehouse				Yes	
31	3	24	Kamarajar Street		Yes			
32	3	24	Sriram Nagar			Yes		
33	3	24	Sarathy Nagar				Yes	
34	3	24	Venkat Sai nagar 8th street				Yes	
35	3	24	Venkat Sai nagar 11 th street				Yes	
36	3	25	Mahalakshmi Nagar				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
37	3	25	David Jeyarel St				Yes	
38	3	25	GNT Road				Yes	
39	3	26	Sami Nagar				Yes	
40	3	26	Thirumazhai nagar			Yes		
41	3	26	Parimalam nagar				Yes	
42	3	26	Thanikachalam 3rd main road				Yes	
43	3	26	Ponnamman medu				Yes	
44	3	27	Padma nagar				Yes	
45	3	28	AVM Nagar			Yes		
46	3	28	Susilammal St				Yes	
47	3	28	Rajeshwari Ammal St				Yes	
48	3	28	Sasthi nagar				Yes	
49	3	28	Padavattamman Koil St				Yes	
50	3	28	Ayyavu Garden				Yes	
51	3	28	Kumaran street				Yes	
52	3	28	Papathi street				Yes	
53	3	29	Velu Street				Yes	
54	3	29	Vazhuthigaimedu St.,(near amma unavagam)				Yes	
55	3	29	Kannabiran Koil Street				Yes	
56	3	29	Devarajan Street			Yes		
57	3	29	Vedagiri street			Yes		
58	3	29	Mahatmagandhi street				Yes	
59	3	29	Perumal Koil(gandhi nagar)			Yes		
60	3	29	Perumal koil Extn				Yes	
61	3	29	Krishna Street			Yes		
62	3	29	Adhiraj Street			Yes		
63	3	30	Masilamani Nagar				Yes	
64	3	30	Pandakulam				Yes	
65	3	30	VRB nagar				Yes	
66	3	30	Roja nagar				Yes	
67	3	32	Teacher's Colony 4th street				Yes	
68	3	32	Teacher's Colony 5th street				Yes	
69	3	32	Teacher's Colony 7th street				Yes	
70	3	32	Sarathy Nagar Extn.				Yes	
71	3	32	Narmadha Nagar				Yes	
72	3	32	Venkateshwara Nagar				Yes	
73	3	32	Mookambikai Nagar				Yes	
74	3	33	Dr.Abdul kalam Road				Yes	
75	3	33	Elizabeth Nagar				Yes	
76	3	33	Ganapathy jeeva Thootam				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
77	3	33	Cement godown factory				Yes	
78	3	33	Kasiammal nagar				Yes	
79	3	33	Bharathiyar nagar				Yes	
80	3	33	Ramalinga Colony				Yes	
81	3	33	Annapurana nagar				Yes	
82	3	33	200 ft.road (opp Prasath Hospital)				Yes	
83	4	34	Durga Avenue 1st Main Road				Yes	
84	4	34	Sastri Nagar				Yes	
85	4	34	Thendral Nagar 8th Street				Yes	
86	4	35	Muthamiz 8th Block 191				Yes	
87	4	35	Muthamiz 8th Block 197			Yes		
88	4	35	Muthamiz 8th Block 207			Yes		
89	4	36	Sharma nagar 1st main road				Yes	
90	4	38	Nehru 14th St				Yes	
91	4	38	New Venba Nagar 3rd St				Yes	
92	4	38	Ilaya Mudali Street				Yes	
93	4	39	A.E Koil St (Thiruvalluvar Nagar)				Yes	
94	4	39	Poondithabgammal Street				Yes	
95	4	39	MPT Quarters				Yes	
96	4	40	VOC Nagar			Yes		
97	4	40	Thiuruvaluvar Nagar		Yes			
98	4	40	TP Scheme			Yes		
99	4	40	Madha Koil Street		Yes			
100	4	40	Jeeva Nagar		Yes			
101	4	40	Vaidhiyanathan Road			Yes		
102	4	41	Ennore High Road, MGR Nagar				Yes	
103	4	41	MGR Nagar 6th St				Yes	
104	4	41	MGR Nagar 7th St				Yes	
105	4	41	MGR Nagar 8th St				Yes	
106	4	42	Kailasam St				Yes	
107	4	42	Jeeva Street				Yes	
108	4	42	Veera Kutty Street				Yes	
109	4	44	Palaniandavar street				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
110	4	44	Manicka vinayagar koil street				Yes	
111	4	44	Nattal garden				Yes	
112	4	44	Raniammaie st				Yes	
113	4	45	Ganesa puram Subway			Yes		
114	4	45	Ganesan Main Road				Yes	
115	4	45	Stephenson Road				Yes	
116	4	45	Chinna Thambi Street				Yes	
117	4	45	Gramiya Street				Yes	
118	4	45	Stephenson Lane				Yes	
119	4	46	Palla Street				Yes	
120	4	46	Ponnappan St				Yes	
121	4	46	Balakrishnan St				Yes	
122	4	46	Moorthy St				Yes	
123	4	47	Thiyagappa street				Yes	
124	4	47	Kannan Road				Yes	
125	4	47	Sigirintha Palayam				Yes	
126	4	47	K.H Road				Yes	
127	4	47	Egambaram Street				Yes	
128	4	48	Muthaiya Mudali St				Yes	
129	4	48	Nanayappan St				Yes	
130	4	48	Subbammal St				Yes	
131	4	48	Ramanujam St				Yes	
132	4	48	Soolaiappan Street				Yes	
133	5	49	Kappal polu street				Yes	
134	5	49	Dhandavarajan St			Yes		
135	5	49	Venkatachalam street				Yes	
136	5	50	S.N.Chetty street				Yes	
137	5	51	Ramanjagam St				Yes	
138	5	53	Kathbada main road				Yes	
139	5	53	Nagappa nagar				Yes	
140	5	53	Kannan roundana				Yes	
141	5	53	Srinivasapuram				Yes	
142	5	53	Bojaraja nagar				Yes	
143	5	53	Pensioners lane				Yes	
144	5	53	P.P.Amman koil 1st street				Yes	
145	5	53	P.P.Amman koil 2nd street				Yes	
146	5	53	P.P.Amman koil 3rd street				Yes	
147	5	53	P.P.Amman koil 4th street				Yes	
148	5	53	P.P.Amman koil 5th street				Yes	
149	5	53	P.P.Amman koil 6th street				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
150	5	53	P.P.Amman koil 7th street				Yes	
151	5	53	P.P.Amman koil 8th street				Yes	
152	5	53	Ramdoss nagar				Yes	
153	5	53	Kathivakkam high road				Yes	
154	5	53	N.N.Nagar 6th street				Yes	
155	5	53	New Labour Lane				Yes	
156	5	53	Kadpada St				Yes	
157	5	53	Stanley 6th Street				Yes	
158	5	55	Prakasam Salai				Yes	
159	5	57	Raman road				Yes	
160	5	57	Adhiyappa street				Yes	
161	5	58	Veppery high road				Yes	
162	5	58	Alagappa road				Yes	
163	5	58	Jothi venkatachalam street				Yes	
164	5	58	General colins road				Yes	
165	5	58	Vetinary hospital				Yes	
166	5	59	Wallaja road				Yes	
167	5	59	Ellis road				Yes	
168	5	60	Sembu Doss Street				Yes	
169	5	60	Moor Street				Yes	
170	5	60	Thacker Street				Yes	
171	5	61	Egmore Musium				Yes	
172	5	61	Ayya swamy street				Yes	
173	5	61	Velyutham street				Yes	
174	5	61	Thiruvengkadam street				Yes	
175	5	61	Gengu reddy street				Yes	
176	5	61	Arumuthu garden				Yes	
177	5	61	Thambu reddy street				Yes	
178	5	62	Pumping station road				Yes	
179	5	63	Pillayar Kovil St				Yes	
180	5	63	Velayutham street				Yes	
181	5	63	Chella Pillaiyar Koil St				Yes	
182	5	63	Goyathoppu				Yes	
183	5	63	Adhithanar salai				Yes	
184	5	63	Cattle depot				Yes	
185	5	63	Narayana naicken street				Yes	
186	6	64	Perumdeviammal				Yes	
187	6	64	Ashoka Avenue				Yes	
188	6	64	Sivasakthi Nagar				Yes	
189	6	66	Jawahar nagar 1st main road			Yes		

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
190	6	66	Kumaran Nagar 4th street			Yes		
191	6	66	Jawahara Nagar 70 feet road			Yes		
192	6	66	70 feet Road			Yes		
193	6	66	SRP Colony 8th street				Yes	
194	6	66	SRP Colony 7th street				Yes	
195	6	66	SRP Colony 11th street				Yes	
196	6	67	GKM way street 70 feet road				Yes	
197	6	65	Kasturi Bai Chetty 5th street			Yes		
198	6	76	Angalamman Koil			Yes		
199	6	78	Astapujam Road			Yes		
200	7	80	Backthavachalm Street			Yes		
201	7	80	Prakasam Salai			Yes		
202	7	82	VOC Street				Yes	
203	7	82	Patravakkam service road				Yes	
204	7	82	TNEB Colony 3rd Street				Yes	
205	7	83	NRS Road				Yes	
206	7	86	Manurpet				Yes	
207	7	86	Indra Street			Yes		
208	7	86	Ethiraj street			Yes		
209	7	90	Golden Jubilee flats			Yes		
210	8	94	North Mada Street				Yes	
211	8	94	Sidco Nagar 4th Main Road				Yes	
212	8	94	Baba Nagar			Yes		
213	8	94	North Jaganathan Nagar			Yes		
214	8	94	Valliammal Nagar			Yes		
215	8	95	Moorthy Nagar				Yes	
216	8	95	Thirumalai Nagar North				Yes	
217	8	95	Thirumalai Nagar South				Yes	
218	8	95	Thirumalai Nagar East				Yes	
219	8	98	V.P Colony				Yes	
220	8	98	Parthasarathy Street				Yes	
221	8	96	Duraiswamy Street				Yes	
222	8	96	Gandhi Nagar				Yes	
223	8	97	Chakravathi nagar				Yes	
224	8	97	Muthuamman nagar				Yes	
225	8	97	Periyar Salai				Yes	
226	8	97	P.E Koil North Mada street				Yes	
227	8	100	Radha Krishnan Nagar				Yes	
228	8	101	BoganVilla Park Inside				Yes	
229	8	102	G Block 10th Street				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
230	8	102	RV Nagar 4th Street				Yes	
231	8	102	D Block 8th Street				Yes	
232	8	102	Shenoy Nagar 4th Cross street				Yes	
233	8	104	Thideer Nagar				Yes	
234	8	105	Indira Gandhi street			Yes		
235	8	105	Water tank road			Yes		
236	8	105	Ashoka Street				Yes	
237	8	107	Gurusamy Bridge				Yes	
238	8	107	MMC School				Yes	
239	8	108	Periyar pathai				Yes	
240	8	108	Annaswamy Street				Yes	
241	8	108	NGO Colony				Yes	
242	8	108	Vinobaji Street				Yes	
243	9	110	School Road				Yes	
244	9	110	Kamdar Nagar 1st Street				Yes	
245	9	110	40 Feet Scheme Road				Yes	
246	9	111	Gopalapuram Play Ground				Yes	
247	9	112	Vellalar Street				Yes	
248	9	112	Sivan Koil Cross Street				Yes	
249	9	113	Habibullah Road				Yes	
250	9	113	Sarathy Street				Yes	
251	9	113	North Ushman Road				Yes	
252	9	113	Sivasailam Street				Yes	
253	9	114	Lock Nagar				Yes	
254	9	116	Beach Service Road				Yes	
255	9	116	Dr.Besant Road				Yes	
256	9	117	Dr.Sadasivam Road				Yes	
257	9	117	Arulambal Street				Yes	
258	9	117	Thilak Street				Yes	
259	9	117	Thilak Street Extn				Yes	
260	9	117	Rajan Street			Yes		
261	9	117	Sarangabani Street				Yes	
262	9	117	Thirumoorthi Street				Yes	
263	9	117	Lakshmi Colony				Yes	
264	9	117	Giri Road				Yes	
265	9	117	Giriappa Road				Yes	
266	9	117	Dr.Thomas Road				Yes	
267	9	117	G.N Chetty Road		Yes			
268	9	117	Sarathy Street				Yes	
269	9	117	Sivasilam Street				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
270	9	117	Valmiki Street				Yes	
271	9	118	Venkat Rathinam Salai				Yes	
272	9	118	Kasthuri Estate 2nd Street				Yes	
273	9	119	Saiva Muthai 6th Street				Yes	
274	9	120	Dr.Natesan Road				Yes	
275	9	121	Marina Service Road				Yes	
276	9	121	Ganesapuram Rettai Kozhai				Yes	
277	9	121	Avvai Shanmugam Salai				Yes	
278	9	122	K.B Dasan Road				Yes	
279	9	122	Seethammal Colony 4th Cross Street			Yes		
280	9	122	Seethammal Colony 3rd Cross Street			Yes		
281	9	122	Crescent Street				Yes	
282	9	122	Ganesapuram			Yes		
283	9	123	Seethammal Colony			Yes		
284	9	123	CP Ramasamy Road				Yes	
285	9	122	Chamiers Road				Yes	
286	9	123	Thiruvalluvar Street				Yes	
287	9	123	Ramalinga Eswarar Koil				Yes	
288	9	123	Nageswarao Park				Yes	
289	9	123	Rangan Lane				Yes	
290	9	124	VC Garden 1st Street				Yes	
291	9	124	VC Garden 2nd Street			Yes		
292	9	124	Rakkiyappa Street				Yes	
293	9	126	Devanathan Street				Yes	
294	9	126	Srinivasan Street				Yes	
295	9	126	Chockalingam Street				Yes	
296	9	126	Thiruvengadam Street				Yes	
297	9	126	Vinayagam Street				Yes	
298	9	126	Chandrasekaran Street				Yes	
299	9	126	Sivaraman Street				Yes	
300	9	126	Pattammal Street				Yes	
301	10	128	Krishna Nagar 3rd Street			Yes		
302	10	128	Saratha Nagar			Yes		
303	10	128	Lambert Nagar				Yes	
304	10	128	Annai sathya Nagar				Yes	
305	10	128	Vembuki amman koil st		Yes			
306	10	128	Pillayar koil st				Yes	
307	10	128	East Vaniyar St.				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
308	10	128	Tharachand Nagar				Yes	
309	10	131	Ramaswamy Salai			Yes		
310	10	131	Raja Mannar Salai			Yes		
311	10	134	Parankusampuram				Yes	
312	10	133	Subramaniam Street				Yes	
313	10	132	18th Avenue				Yes	
314	10	132	16th Avenue				Yes	
315	10	132	19th Avenue				Yes	
316	10	132	47th Avenue				Yes	
317	10	132	48th Avenue				Yes	
318	10	132	9th Avenue				Yes	
319	10	132	Kamaraj Salai				Yes	
320	10	132	Natesan Salai				Yes	
321	10	132	Kannappar Salai				Yes	
322	10	135	Postal Colony 4th Street				Yes	
323	10	135	Mahadevan Street				Yes	
324	10	135	Murthy Street				Yes	
325	10	135	Brindavan Street				Yes	
326	10	135	Rajaji Street				Yes	
327	10	135	Lake view road				Yes	
328	10	135	Thambaih Road				Yes	
329	10	135	Ramakrishna Puram				Yes	
330	10	135	Lakshmi Street				Yes	
331	10	135	Babu Rajendra Prasath Road				Yes	
332	10	135	Postal Colony 2nd Street				Yes	
333	10	136	Bazullah Road				Yes	
334	10	138	K.K.Nagar ESI Hospital				Yes	
335	10	139	Ragava Reddy Colony 4th St & 1st Cross St Junction				Yes	
336	10	141	Kamaraj Colony				Yes	
337	10	141	South Dhadabai St				Yes	
338	11	143	Goodwil Road Govt School				Yes	
339	11	143	Pada Salai				Yes	
340	11	143	Phase 1 Nagar 13th Cross street				Yes	
341	11	143	Gajalakshmi nagar 3rd street				Yes	
342	11	144	P.H. Road				Yes	
343	11	144	Bharathiyar Street				Yes	
344	11	144	T.N.H.B Sector II				Yes	
345	11	147	Alapakkam Main Road Near Burial Ground				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
346	11	147	Ganesh Nagar				Yes	
347	11	147	Valli street				Yes	
348	11	147	Chokkanathan Nagar				Yes	
349	11	148	Kamarajar High Road Thangalkarai				Yes	
350	11	148	Anbu Nagar 10th street				Yes	
351	11	149	Saravanabhavan Nagar				Yes	
352	11	152	Thiruvalluvar Salai			Yes		
353	11	152	S.V.S Annex				Yes	
354	11	152	Kadambadi Amman Koil st				Yes	
355	11	150	Arcot Road (Mahalakshmi Nagar)				Yes	
356	11	151	Arcot Road Near A1 Mutton Stall				Yes	
357	11	151	Chenna Porur Bajanai kovil street				Yes	
358	11	153	Ambal Nagar Mullai Street				Yes	
359	11	154	Kurinji Nagar				Yes	
360	11	155	Karpagambal 2nd Street				Yes	
361	11	155	Thirumalai Nagar Angel Street				Yes	
362	11	155	Royal Nagar I main Road				Yes	
363	11	155	Royal Nagar II main Road				Yes	
364	11	155	Tamil Nagar				Yes	
365	12	156	MCS Nagar				Yes	
366	12	156	Santhosh Nagar Extn.				Yes	
367	12	156	Kaveri Street				Yes	
368	12	156	Gowri street				Yes	
369	12	156	VGN Lakshmi Nagar Main Road				Yes	
370	12	156	AGR Garden				Yes	
371	12	156	Thiruvalluvar Nagar				Yes	
372	12	156	Arumugam Street				Yes	
373	12	156	VGN Royal Court			Yes		
374	12	157	Dharmarajapuram				Yes	
375	12	160	Lawyer Jaganadhan street				Yes	
376	12	160	Madhvapuram(East,West,South, North)				Yes	
377	12	161	Sanjay Gandhi Nagar				Yes	
378	12	161	Jeevan Nagar 2nd Street				Yes	
379	12	162	Kannan Colony				Yes	
380	12	163	shanthi nagar 5th street				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
381	12	163	shanthi nagar 7th street				Yes	
382	12	164	Nanganallur 21st street				Yes	
383	12	165	Bharathidasan Nagar				Yes	
384	12	165	Vallalar Street				Yes	
385	12	167	East main road				Yes	
386	13	170	Samy nathan Street				Yes	
387	13	170	Dhanakotti Street				Yes	
388	13	171	Gandhi mandapam Road				Yes	
389	13	171	Sardar Patel Road				Yes	
390	13	173	Srinivasapuram				Yes	
391	13	173	Dharmampal Park				Yes	
392	13	174	Cart Track Road				Yes	
393	13	174	Ranganathan Street				Yes	
394	13	174	Five Furlong road				Yes	
395	13	175	Dhanalakshmi Avenue				Yes	
396	13	175	Nehru Nagar 1st main road				Yes	
397	13	175	Anna Avenue				Yes	
398	13	175	KB Nagar 3rd Cross street jn of 2nd main road				Yes	
399	13	175	KB Nagar 3rd main Road				Yes	
400	13	175	Dr Muthulakshmi Salai				Yes	
401	13	176	Parameshwari nagar 2nd Street				Yes	
402	13	176	Sastri Nagar 1st Avenue				Yes	
403	13	176	Karpagam Garden 1st link road				Yes	
404	13	176	Karpagam Garden 2nd link road				Yes	
405	13	177	Lakshmi Nagar 3rd Cross St		Yes			
406	13	177	Srinagar Colony				Yes	
407	13	177	Brindhavan nagar 3rd Extn				Yes	
408	13	177	TNHB 3rd Avenue				Yes	
409	13	177	Nethaji Road				Yes	
410	13	177	Ambedkar nagar				Yes	
411	13	177	AGS Colony				Yes	
412	13	177	Bhashiyam Layout				Yes	
413	13	177	Venkateshwara Nagar 2nd cross street				Yes	
414	13	178	Kalki Nagar		Yes			
415	13	178	Srinivasapuram			Yes		
416	13	178	ACS Colony			Yes		
417	13	178	Orandiamman Avenue		Yes			

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
418	13	179	Dhandeeshwaram 7th main road				Yes	
419	13	179	Udayam Nagar				Yes	
420	13	180	Anjukammal street		Yes			
421	13	180	Ramasamy Street		Yes			
422	13	180	Kennedy Street		Yes			
423	13	180	Raniammal Street		Yes			
424	13	181	Arundal Beach				Yes	
425	13	181	Kalachetra main road				Yes	
426	13	181	Valmiki Street				Yes	
427	13	181	East Kamarajar 2nd St				Yes	
428	13	181	East Kamarajar 3rd St				Yes	
429	13	181	Dr.Radhakrishinan road				Yes	
430	13	182	Kannapper Nagar				Yes	
431	13	182	Kamarajar Nagar				Yes	
432	13	182	Journalist Colony				Yes	
433	13	182	Ganesh Nagar				Yes	
434	14	168	Epr Nagar				Yes	
435	14	168	Thilagar street				Yes	
436	14	168	Lakshmi Nagar 5th Street				Yes	
437	14	168	Sai ram street				Yes	
438	14	169	Ram nagar 1st to 8th Street			Yes		
439	14	169	Ram nagar 11th street				Yes	
440	14	169	Maheshwari Avenue				Yes	
441	14	169	Jaya Nagar				Yes	
442	14	169	Sundarrajan Salai				Yes	
443	14	169	Arivoli street				Yes	
444	14	169	Sivasubramaniyam Salai				Yes	
445	14	169	Annaitheresa Nagar				Yes	
446	14	169	Vallal Athiyaman Street				Yes	
447	14	169	Vallal Kari Street				Yes	
448	14	169	Vallal Pari Street				Yes	
449	14	169	J K Salai				Yes	
450	14	169	Brindhavan Salai				Yes	
451	14	169	Sadhasivam Nagar				Yes	
452	14	169	Thirunana Sambandhar Street				Yes	
453	14	169	Sivaprakasam nagar				Yes	
454	14	183	Lakshmana Perumal 4th street		Yes			
455	14	183	Lakshmana Perumal 5th street		Yes			
456	14	183	Judges colony				Yes	
457	14	183	Baywatch road			Yes		

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
458	14	183	Nehru nagar 10th, 12th & 14th Street				Yes	
459	14	183	Jaganathan Street		Yes			
460	14	183	Kaveri Nagar 5th Street				Yes	
461	14	183	Kaveri Nagar 6th Street				Yes	
462	14	183	Kaveri Nagar Main Road				Yes	
463	14	184	Ramappa nagar				Yes	
464	14	184	Telephone nagar 11th street				Yes	
465	14	185	Jayshankar Nagar				Yes	
466	14	185	Kandasamy Nagar 4th St				Yes	
467	14	185	Govindhan Nagar				Yes	
468	14	185	Palkalai Nagar				Yes	
469	14	185	Mayana Salai				Yes	
470	14	185	VGP 2nd cross street				Yes	
471	14	185	Boss Avenue				Yes	
472	14	185	Kandhasamy Nagar 7th street				Yes	
473	14	185	Anna Salai 2nd cross street				Yes	
474	14	186	Senthil Nagar				Yes	
475	14	186	Rathna mani nagar				Yes	
476	14	186	Kamaraj nagar				Yes	
477	14	186	Kumaran Nagar				Yes	
478	14	186	Maruthi Nagar Main Road				Yes	
479	14	187	Karthikeyapuram 12th street				Yes	
480	14	187	Karthikeyapuram 7th street				Yes	
481	14	188	Anna Nagar west 7th street				Yes	
482	14	188	Anna Nagar west 8th street				Yes	
483	14	188	Thirumurugan street				Yes	
484	14	188	Ram nagar 6th main road				Yes	
485	14	188	Ram nagar 5th & 7th Street				Yes	
486	14	188	Arumugam Nagar				Yes	
487	14	188	Kubera Nagar 8th & 9th Street			Yes		
488	14	188	Kubera Nagar 11th Street			Yes		
489	14	188	Kamarajar Street				Yes	
490	14	188	Krishnaveni Ammal Nagar				Yes	
491	14	188	Sadhasivam Nagar 3rd Main Road				Yes	
492	14	188	Sadhasivam Nagar 3rd Cross Street				Yes	
493	14	188	Mahalakshmi nagar main road				Yes	
494	14	188	Mylai kabaleeswarar nagar 2nd street				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
495	14	188	Veeramani street				Yes	
496	14	188	Perumal Street				Yes	
497	14	189	Sathyamurthy Colony				Yes	
498	14	189	Meenachipuram 1st street				Yes	
499	14	189	Vimala Nagar				Yes	
500	14	189	Varadharajan Nagar				Yes	
501	14	189	Sengazhani amman koil street			Yes		
502	14	190	Chettinadu Enclave			Yes		
503	14	190	Chittibabu 4th Cross Street				Yes	
504	14	190	Chittibabu 8th Cross Street				Yes	
505	14	190	Veerasamy Nagar				Yes	
506	14	190	Sree Nagar				Yes	
507	14	190	Pasumpon Nagar				Yes	
508	14	190	Pandiyan Nagar				Yes	
509	14	190	Sai Balaji Nagar				Yes	
510	14	191	Jaladan Pettai 3rd main road				Yes	
511	14	191	Jayachandran nagar 3rd main road				Yes	
512	14	191	Jaganathapuram main road				Yes	
513	15	192	CLRI 3rd Cross street			Yes		
514	15	192	CLRI 2nd Main road				Yes	
515	15	192	Ruby complex				Yes	
516	15	192	Kabaleeshwarar Nagar 5th Cross street				Yes	
517	15	192	Chinna Neelangarai Kuppam				Yes	
518	15	192	Madha Kovil street				Yes	
519	15	193	MCN Nagar				Yes	
520	15	193	Sri Sai Nagar				Yes	
521	15	193	Ellaimman Nagar				Yes	
522	15	194	Raju Nagar 1st Street				Yes	
523	15	194	Raju Nagar 2nd Street				Yes	
524	15	194	Srividhya Avenue				Yes	
525	15	194	Eswaran Street				Yes	
526	15	195	Kannagi Nagar 19th Cross street				Yes	
527	15	196	Barathi Avenue				Yes	
528	15	196	Ashok Street Bharat Avenue				Yes	
529	15	196	Royal Enclave				Yes	
530	15	196	Anna Eclave				Yes	
531	15	196	Vettuvankeni 2nd Avenue, 2nd Main Road				Yes	

Sl.No	Zone	Ward	Location	Very High Vulnerability Above 5 feet	High Vulnerability 3 to 5 feet	Medium Vulnerability 2 to 3 feet	Low Vulnerability less than 2 feet	Vulnerability Status
532	15	196	ISCKON Temple				Yes	
533	15	196	Hanuman Colony				Yes	
534	15	196	Raja Nagar 1st Cross Street				Yes	
535	15	196	Royal Enclave Extension				Yes	
536	15	196	Vettuvankeni 2nd Avenue, 7th street				Yes	
537	15	197	Ganesh Nagar				Yes	
538	15	197	Annai Fathima Child Welfare				Yes	
539	15	197	Karapakkam Service Road				Yes	
540	15	197	DevaraJ Nagar				Yes	
541	15	198	Semmozhi Nagar			Yes		
542	15	198	Copper Beach				Yes	
543	15	198	Village High Road				Yes	
544	15	198	Sea Cliff High Road			Yes		
545	15	198	Seashell Avenue			Yes		
546	15	199	MG Jeevarathinam Street				Yes	
547	15	199	Mazhavarayar Street				Yes	
548	15	199	Neelathirai Street				Yes	
549	15	199	Rajaji Street				Yes	
550	15	199	vallalar Street				Yes	
551	15	199	Karlmark Street				Yes	
552	15	199	Juhu Beach Road				Yes	
553	15	199	Gangai Amman Colony				Yes	
554	15	199	MGR St				Yes	
555	15	199	VGP 1st, 2nd, 3rd Main Road				Yes	
556	15	199	D.P. Rajan Road				Yes	
557	15	199	VGP Gandhi Street				Yes	
558	15	199	Nainar Kuppam				Yes	
559	15	200	Ezhil Mugha Nagar				Yes	
560	15	200	Jawahar Nagar				Yes	
561	15	200	Nookamplalayam Link Road, TSUNAMI Nagar				Yes	

4.2.1 Scene During Flood 2015

All the residential areas including encroached areas along with water bodies were totally marooned for more than 10 days.

280 boats and choppers were used for rescuing people and supplied relief materials to the low lying areas such as Kargil Nagar, Manali, Madhavaram, Villivakkam, Kolathur, Tondiarpet, Mambalam, K.K.Nagar, Jafferkhanpet, Ashok Pillar, Ekkatuthangal, Guindy Industrial Estate, Defence colony, Ramapuram, Sri Nagar colony, Saidapet, Valasaravakkam, Manapakkam, Kotturpuram, Madhya kailash, Velachery, Pallikaranai, Thiruvanmiyur, Neelangarai, Perungudi, Madipakkam, Ram Nagar, Karapakkam, Sholinganallur, etc.,

Some of the areas were also experienced road “CAVE-INS” at Sardar Patel Road near Madhya Kailash, P.S.Sivasamy Salai, T.T.K Road, Rajaji Salai, VIlth Avenue in Anna Nagar, Anna Salai in Teynampet, Dr. Nair Road in T. Nagar, Devanathan Road in Mylapore.



**Flooded Area****Velachery flooded area****Chennai Flood Relief Army Force****Pump set deployed in subways****Residences shifted through Boats****Fire Service vehicle****Medicine Distribution**

The mobile communication network was down/off in various parts of Chennai. Major inter city and inter state roads were cutoff during flood and severely affected the public movement. The city was totally cut off from other cities due to disconnection of roads, city was severely affected and the supply of basic commodities like vegetables, milk and bread etc., were stopped. The train services were stopped and the operation of airport was closed was more than a week. Due to failure of continuous power supply in Chennai city, it was difficult to rescue the people at night time.

4.2.1.1 Government Response

Due to the severity of rain and excess flow of water in the rivers and canals, the Government has appointed 15 senior level IAS officers as Monitoring Officers one for each zone. These officers headed relief and rehabilitation works in each zone in a planned and systematic manner. The involvement of these officers was very effective because they have co-ordinated with various head of departments for speedy execution of relief works.

4.2.1.2 Mitigation

Flood water was cleared by using 470 Pumpsets, 82 JCB and Poclains, 49 Fire Service machines and 75 super suckers of CMWSSB. In addition 6 heavy duty pumps having capacity of 250 HP each were supplied by Confederation of Indian Industry (CII), New Delhi and 4 from Neyveli Lignite Corporation Ltd. (NLC) were used in heavily inundated areas. In flooded/marooned areas 280 boats and choppers were used for rescuing people and supplying relief materials to the low lying areas.





About 176 relief centres were opened in Chennai city by GCC and more than 1.2 lakhs individuals were sheltered in these relief centres for more than 20 days. Necessary relief materials like mat, bed sheets and food materials were supplied promptly. In addition to this, donors and NGO's themselves distributed food and relief materials to the affected people in pockets. Apart from inhouse kitchens in some relief centers, food was also prepared and distributed from Amma Canteen and from all four common kitchens of Greater Chennai Corporation.



Sheltered in relief center



Distribution of food

4.2.1.3 Centralised Relief Material Center

A centralised Relief Material Distribution Center for Chennai, Thiruvallur, Kanchipuram and Cudalore was opened at Jawaharlal Nehru Indoor Stadium for prompt and speedy distribution of relief materials to flood affected people.

The relief materials were received from the Districts Collectors, Co-operative Societies, Aavin, MTC and Southern Railways, Indian Navy, various Public Sector Undertakings, Indian Military, NDRF, NSS and NGOs includes 1,99,244 General food packets, 32,992 Mats, 2,07,433 Bed sheets, 12,500 liters of Milk, 54,448 Water Bottles, 2,122 Rice Bags, 10,390 Dress Material Packs, 3,004 Medicine Boxes and 2,38,568 liter of water totalling 1577.65 tonnes over a period of 15 days.





More than 250 MT of bleaching powder for sanitation of the flood affected areas was received from Government and NGO's. Supply of bleaching powder was very much useful to clean the sumps, over head tanks etc., to control infections and diseases out break. The NGO's and volunteers have not only contributed for door to door distribution of relief materials but also for applying bleaching powder in the flood affected areas. The services of residential welfare associations were also fully utilised to spread the bleaching powder in their areas.

All these relief materials were sorted out and packed for each families at Nehru Indoor Stadium by the volunteers. These sorted materials were taken to the affected areas and distributed door to door. This was done with the help of NGO's, volunteers, GCC staff, Police, Army, NDRF, SDRF, Homeguards, NCC and NSS. The distribution of relief materials including perishable items like fruits and vegetables were distributed to victims without delay and wastages are to be appreciated.

4.2.1.4 Distribution of relief materials and role of NGOs / Volunteers

Previous day the GCC was informed to be ready to receive and distribution of huge quantity of relief materials from various agencies. GCC's entire team was already preoccupied in doing relief works in the field. So we have decided to appeal to NGO's and volunteers to assist GCC for disbursing relief materials. Over night we have sent message through various social medias, radio channels for NGO's and volunteers services.



It was surprise to see more than 1,000 volunteer/NGO's turned out on the next day at Nehru Indoor Stadium. It is very interesting to mention some foreigners, school children and families with the kids were whole heartedly participated in the operation. Many of them took much risk to travel to Nehru Stadium with restricted road accessibility. Initially we had problem to arrange food for volunteers. In the first two days they managed with biscuits., snacks came along with relief materials. Later GCC was able to arrange food for them. Nearly around 4,000 volunteers and NGO's turned up and played key role for smooth distribution of relief materials at door step. After flood relief work GCC has sent appreciation letter to all the Volunteers/NGO's through e-mail.

4.2.1.5 Clearing of Garbage

Greater Chennai Corporation owns 115 HMV Lorries, 122 LMV Lorries, 15 HMV Tipper, 29 LMV Tipper, 21 Front end loaders for Garbage removal and 80 HMV lorries, 45 Bobcats for debris removal, for clearing the city. GCC's average

daily collection of garbage is between 4,500 MT and 5,000 MT.

The biggest challenge to GCC after receding flood water was to remove the garbage with sludges from the roads and streets. And every day the residents were throwing huge quantity of damaged house hold articles/debris on roads/streets. The GCC could not handle the situation with its own conservancy labours due to less strength and continuous restless work. To come out of the situation 16,111 sanitary workers and labours with 675 lorries and 100 JCB were mobilized from other local bodies. Necessary safety gears like gumboots, masks, gloves, raincoats were given to all the sanitary workers. GCC has arranged accommodation and food for sanitary workers who have come from outside city.

The entire team along with 2,500 labours of GCC were deployed for cleaning the debris throughout the city on war foot manner. It is worth to mention that between 7.12.2015 and 2.01.2016 GCC has cleared 2.2 Lakhs MT of garbage/debris at 8,148 MT per day.

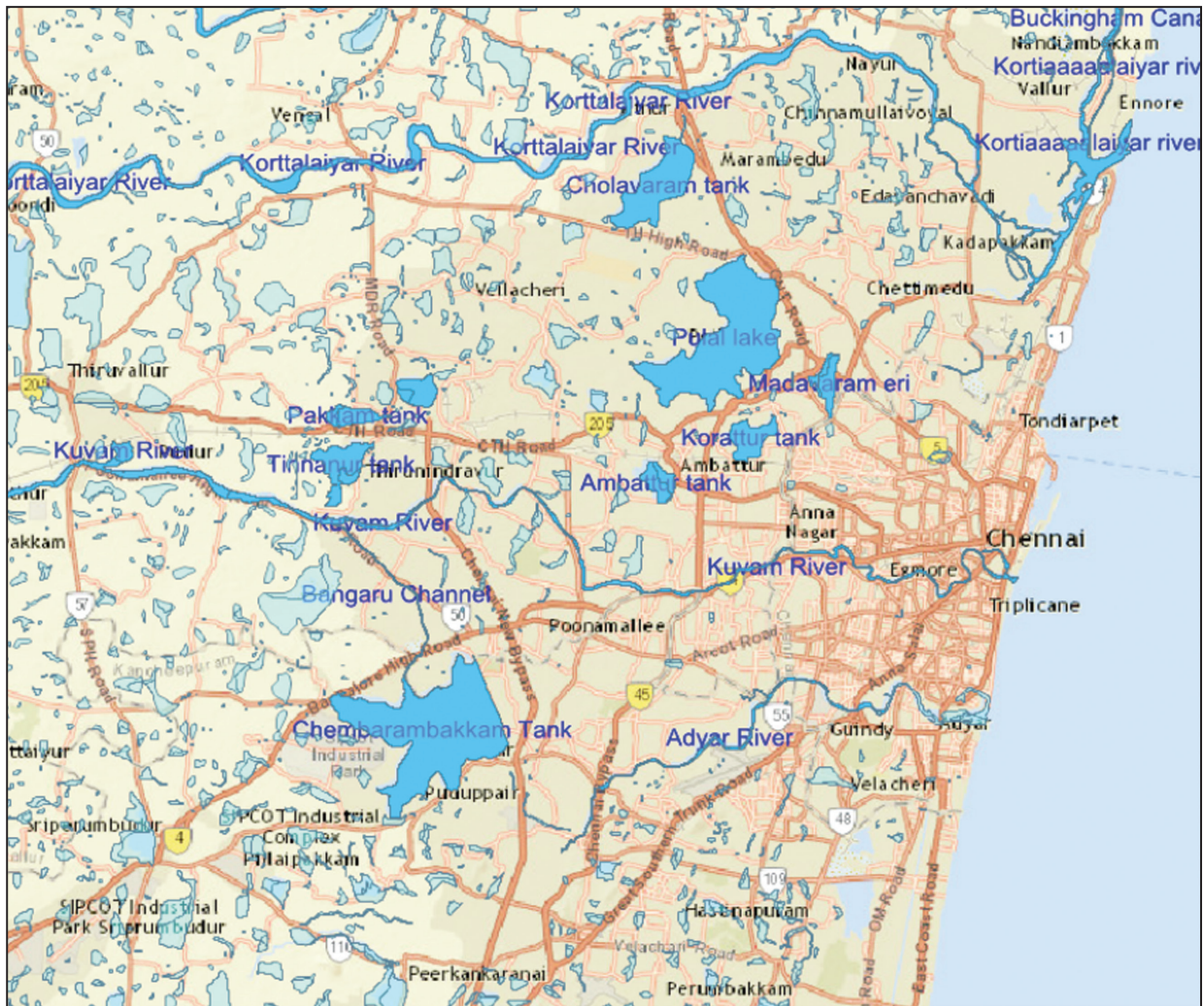
4.2.2 Causes of Flood

Chennai is the only drainage basin for all the water bodies located in 2 adjoining districts around Chennai. Over the years, the water bodies have shrunk due to various reasons in Chennai Metropolitan Areas. Furthermore, rapid urbanization and industrialization has led to large scale encroachment in the water bodies.

The old map of 1909 which shows the locations of several water bodies, comparing this with recent map is a clear evident that many water bodies have shrunk and several have completely disappeared.



The City of Chennai in 1909



The City of Chennai in 1981.

Chennai has experienced many floods during the last three decades. The reasons for flood in the city shall be narrowed down as follows

1. Plain terrain of Chennai with an average altitude of 7m height.
2. Sand bar formation at the mouths of rivers, which slow down the discharge rate.
3. Clogging of the drains due to indiscriminate dumping of solid waste and construction debris.
4. Inadequate design capacity of storm water drain in Highways and other roads.
5. Lack of continuous connectivity of storm water drainages with macro drainage and absence of storm water drain network in added areas.
6. Encroachments.
7. Influence of high and low tide.
8. Flow of excess surplus water than the designed carrying capacity into minor water bodies through the tanks in upstream.
9. Construction of less number of cross culverts/vents with inadequate sizes wherever the road is passing across the water flow.

5.0 EARTHQUAKES AND TSUNAMIS

Chennai City has its boundaries facing the Bay of Bengal thereby susceptible to various natural disturbances like floods, cyclone, sea surge, and tsunami, among others. The city has also been classified as moderately susceptible to earthquakes.

Chennai is not seismically as active as compared with the northern and western parts of the country. Small to moderate earthquakes have occurred in the state of Tamil Nadu. The frequency of earthquakes is low i.e. the gap between moderate sized events is fairly long and therefore, this plan concentrates more on floods and cyclones.

However, an earthquake in the Indian Ocean occurred on 26 December 2004 with the epicentre off the west coast of Sumatra, Indonesia. The shock had a moment magnitude of 9.1–9.3 and a maximum Mercalli intensity. The undersea megathrust earthquake was caused when the Indian Plate was subducted by the Burma Plate and triggered a series of devastating tsunami waves along the coasts bordering the Indian Ocean. Inundated coastal communities with waves up to 30 metres (100 ft) high affected 25 kuppams in 4 coastal revenue villages affected 73,000 people, 30,000 people evacuated, 206 human loss, 9 injured and damaged 17,000 houses and other properties in Chennai city.

5.1 Earthquake

Earthquake is a sudden and violent shaking of ground causing great destruction as a result of movement of earth's crust. An earthquake has the potential to tsunami or volcanic eruption.

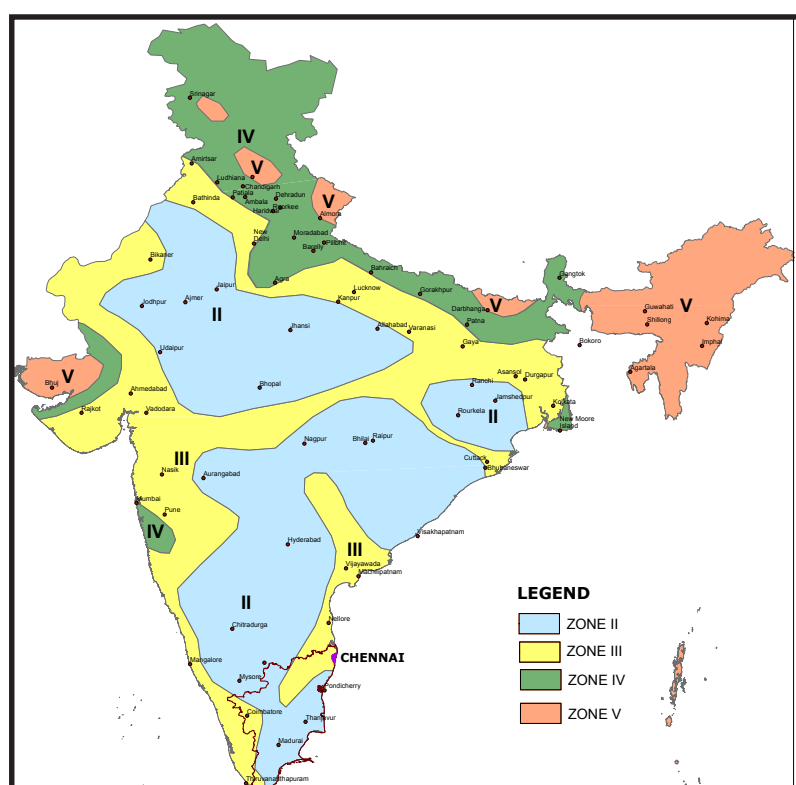
Chennai has not witnessed a serious earthquake so far although Chennai lies in high-risk seismic zone III as per Bureau of Indian Standards 1893 criteria for earthquake resistant design of structures IS 1893(Part 1) :2002 . The biggest earthquake 5.2 magnitude earthquake has occurred 15 years ago at 14:56 September 25, 2001 UTC with Epicenter at 11.956, 80.214 at 39.2 km from Marakkanam (24.2 miles) with close proximity to Chennai and 4.6 magnitude earthquake has occurred 29 years ago at 18:15 December 03, 1987 UTC with Epicenter at 15.525, 80.246 21.2 km from Ongole (13.2 miles). Mild tremors were felt in some part of the cities in 2012, 2015.

The probability of an earthquake can be roughly estimated, there is no

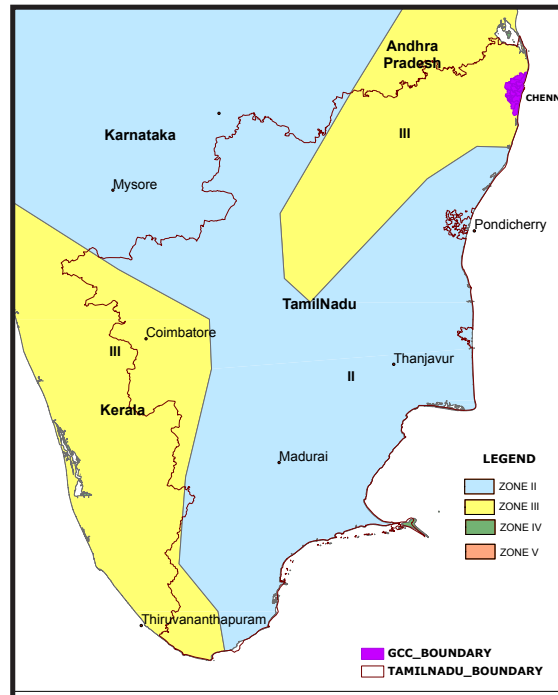
accepted method at present to predict the time and intensity of earthquake. The following table illustrates the maximum intensity expected in different seismic zones and probable impact.

Seismic zone	Magnitude	Probable max. intensity	Probable Impact
II	Below 4.5	VI	Felt by all many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight
III	4.5 - 5.5	VII	Damage negligible in buildings of good design and Construction; slight to moderate in well built ordinary structures; Considerable damage in poorly built or badly designed structures; some chimneys broken.
IV	5.5 - 6	VIII	Damage slight in specially designed structures; Considerable damage in ordinary substantial building with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stocks, columns monuments, walls, Heavy furniture overturned
V	6 or Higher	IX or Higher	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial building, with partial collapse. Buildings shifted off foundations.
Maximum intensity Expected in Different seismic Zones			

Seismic Zones in India



Seismic Zones in Tamilnadu



5.1.1 Impact of Earthquake

Earthquakes results in primary, secondary and tertiary impacts.

Primary impacts include surface vibration, surface rupture and displacement along the fault plane, total or partial damage and collapse of buildings, dams, tunnels, pipelines and other rigid structures.

Secondary impacts of earthquake include liquefaction, landslides, fire, tsunami and floods, regional subsidence or emergence of landmass, change in course of river, changes in ground water level, etc. Most of the deaths by earthquake are caused mainly due to building collapse, falling debris, broken glass panes. Earthquakes also lead to minor and severe injuries, loss of limbs, etc. Apart from these, earthquake impacts routine services due to the damage caused to lifeline buildings, roads, railway tracks, bridges, highways, disruption of traffic, large amount of debris, disruption of water supply and electricity, etc.

Tertiary impact of earthquake includes Post Trauma Stress Disorder (PTSD), long term psychological issues, loss of livelihood, disruption of social capital due to relocation related issues, etc.

5.1.2 Earthquake Mitigation Strategies

- Existing critical facilities built on reclaimed land should be inspected and retrofitted if necessary to ensure earthquake resistance.
- Future critical facilities should not be located on reclaimed land because of the high potential for liquefaction.

- Older unreinforced masonry buildings should be inspected and retrofitted if necessary to increase earthquake resistance.
- Older unreinforced masonry buildings should not be used for critical functions.
- Ensuring all the Government building & GCC buildings are constructed as per IS 1893(Part 1) : 2002.
- Motivating public to construct building as per IS 1893(Part 1) : 2002.

5.1.3 Earthquake preparedness measures

- Organise camps in school, colleges and public for awareness of do-s and do n'ts for earthquakes.
- Ensure preparation of disaster management plans and first aid kits in all schools, colleges and all offices.
- Identify safe schools and colleges which can be used as relief shelters for short duration of time in aftermath of any earthquake.
- Ensure that all critical life saving equipment are maintained and ready to use.
- Ensure that open and safe places in the corporation area, vacant land like roads, parks & play grounds for mass evacuation are identified.
- Ensure that safe buildings in the corporation area are identified for purpose of relief camps in post disaster.
- Develop plan for hospital preparedness and mass casualty management.
- Prepare a database of registered private hospitals, clinics, diagnostic labs, blood banks, etc. along with their capacities and facilities provided.
- Ensure availability of adequate supply of life saving equipments and drugs, portable supplies like portable oxygen cylinders, portable x-ray machines, triage tags, etc.
- Prepare for quick deployment of rescue teams including volunteers for providing safety to affected population and evacuated structures/ houses.

5.1.4 Assembly Points

Open and safe places in the corporation for mass evacuation during disaster are identified as vacant land like parks, playgrounds and roads. The location of parks is mentioned in each zone shall be utilized as buffer zone during disasters and the list of playgrounds which will also serve as assembly points during earthquake is given below.

Zo ne	Ward	Name/Location of Play Ground
1	10	Poonthottam School play ground
2	15	Manali New Town, Eday-anchavadi Chennai Primary School
2	16	Manali TNHB Phase - 2, Sadayankuppam
2	16	Burma Nagar
2	17	Kathakuzhi Near Perumal Koil Street
2	17	Chettimeedu
2	19	Chinna samy Nagar, Periya mathur
2	19	MMDA 4th Main Cross Street
2	20	Periya thoppu
2	21	Ambedkar Playground
3	27	ASSISI Nagar 10th Street
3	28	Krishna Nagar Play Ground, Periyasekkadu
3	29	Chandramman Koil Street, Chinnasekkadu
3	30	Thiruvalluvar 2nd St
3	23	Thanthai Sivaraj Foot Ball Ground EMS Street
4	36	Sharma Nagar 9 th street
4	36	Sharma Nagar Ist main road
4	36	16 th West Cross Street MKB Nagar
4	36	18 th West Cross street MKB nagar
4	36	Vasugi nagar
4	37	3 rd Crsoss street, MKB nagr
4	37	4 th Cross Street, MKB Nagar
4	37	Central Avenue road
4	37	East avenue road
4	37	18 th Central cross street
4	37	KKD Nagar7th Block
4	37	Srinivasan Street
4	37	SM nagar
4	40	Chelliamman Koil Street
4	46	Kalyanapuram Ground

Zo ne	Ward	Name/Location of Play Ground
4	46	Sathyamoorthy naagr main road
4	48	Kanni Koil street
5	52	Cementry Road Near Metro Water Office Area-5
5	52	OSH Road, Royapuram, Near Stanly Hospital
5	55	Barracks 1 st Lane Near Stanly Hospital
5	58	Thirunarayanaguru salai
5	61	Vengu street
5	61	Sami (R) Puram - Ran-gachari park
6	64	V.V Nagar
6	64	TNHB Play Ground
6	66	Ram Nagar 2nd Main Road
6	66	Jawahar Nagar 2nd Circular Road
6	66	Jawahar Nagar 2nd Cross Street
6	67	Rangasayee Street
6	67	Parthasarathy Play Ground
6	67	Loco Scheme 2nd Street
6	68	Thiru-Vi-Ka Nagar
6	68	Madurai Samy Madam
6	72	Kannigapuram
6	72	VOC Nagar
6	72	Kasthuri Bai Colony
6	74	Barackka Road
6	74	AK Samy Nagar 1st Street
6	74	Reddy Colony
6	74	SVM Nagar
6	76	KM Garden 1st Street
6	77	Sundarapuram
6	77	Old Slaughter House
7	84	Korattur TNHB 2nd street
7	89	Officers colony main Road, Anna nagar West extension
7	91	Mogapair Eri Scheme 1st main road , Ambedkar nagar
8	94	North Jaganathan Nagar 3rd Street

Zone	Ward	Name/Location of Play Ground
8	94	Rajamangalam 2nd Main Road Chennai Primary School
8	94	Redhills Road 4th Street Chennai Primary School
8	94	Baba Nagar 3rd Cross Street
8	95	I-Block 7th Street, Vallalar Kudiuruppu
8	95	I-Block 28th Street, Kambar Kudiuruppu
8	95	I-Block 18th Street, Thiruvalluvar Kudiuruppu
8	95	I-Block, 34th Street, Iswarya Colony
8	95	Mullai Nagar 6th street
8	95	Vasantham Colony 1st Street
8	95	Vasantham Colony 2nd Street
8	95	Agathiyar Nagar N-Block 3rd Street
8	95	Agathiyar Nagar O-Block 9th Street
8	95	Agthiyar Nagar O-Block 12th Street
8	95	Thirumangalam Road, Puspphanjali Appartments
8	95	Thendral Colony 2nd Street
8	96	K.K. Nagar 10th Street
8	97	Solai Street
8	97	Vellala Street
8	97	Pachaikal veeraswamy Street
8	98	Dr. Ambetkar 2nd Street
8	98	Solai Amman Koil Street
8	98	Aspiran Garden 1st Street
8	98	Lockma Nagar Main Street Chennai Primary School
8	99	J-Block 10th Street
8	99	H-Block 14th Street
8	99	H-Block 16th Street, Brinley Garden
8	99	A.F.-Block 1st Street

Zone	Ward	Name/Location of Play Ground
8	99	N.V.N. Nagar 6th street Junction of 8th Street
8	99	N.V.N. Nagar 14th street
8	99	Temple Colony 15th Main Road
8	99	Kathiravan Colony Main road
8	99	Appu Colony, Ponni Colony Main Road
8	99	Thiriveni Flat Belli Area
8	99	Sangam Apartments Belly Area
8	99	G-Block 2nd Street, Forest Department
8	100	AE-Block Play Ground
8	100	AL-Block Play Ground 3rd & 4th Street
8	100	7th Main Road Near Foot bridge at HIG Flats
8	101	VI Cross Street
8	101	Crescent Play Ground
8	101	N-Block 24th Street
8	101	O-Block
8	101	K-Block Tennis Court
8	102	L-Block
8	102	1st Cross Street, East
8	102	Shenoy Nagar Park and Play Ground
8	102	Big Street Childrens Play Ground
8	102	Canal Road Children Play Ground
8	102	V.S.Puram
8	105	E-Block, M.M.D.A.Colony, Arumbakkam
8	105	D-Block, M.M.D.A.Colony, Arumbakkam
8	105	Kalki Nagar Main Road, Arumbakkam
8	106	Rajaram Metha Nagar
8	106	Collectrate Colony Main Road
8	107	Mayor Sathyamurthy Salai

Zo ne	Ward	Name/Location of Play Ground
8	107	Mayor Ramanathan Salai
8	107	Brindavanam 1st Street
8	108	R-Block, Elango Street, M.M.D.A.Colony, Arumbakkam
8	108	P-Block MMDA Colony, Arumbakkam
9	109	Gil Nagar
9	110	Lake area IV cross street, Nungambakkam Village
9	111	Conron Smith Road, Gopalapuram Play Ground
9	111	Greems Road
9	111	Model School Road, 1000 light Play ground
9	112	Varadarajanpet Main Road
9	112	Ganga nagar
9	112	Puliyur 1st Main Road
9	112	Trustpuram 10th Cross Street
9	115	Mirza Hyder Ali Khan Street, Childrens Play Ground
9	117	Ramakamathupuram Play Field O & Q Block
9	117	Ramakamathupuram Play Field R & T Block
9	120	Iloyeds Colony, Childrens Park
9	120	Nadukuppam, Childrens Park
9	121	Kamarajar Salai, Scating ground
9	121	Thiruveethiamman Koil Street
9	122	Turnbulls Road
9	122	Nandanam Play Ground
9	122	S.M.Nagar, Near A Block
9	123	Pallakumaniyam
9	123	St.Mary's road
9	124	Ramakrishnapuram

Zo ne	Ward	Name/Location of Play Ground
9	125	14, Papa Nasam Sivan Salai
9	125	Rosary Church Street
9	126	4th Trust Link Street
9	126	South Canal bank Road
10	132	9th Avenue , Ashok nagar
10	132	6th Avenue , Ashok nagar
10	132	14TH SECTOR, 102 STREET
10	133	Ashok Nagar 17Th Street Play Gorund
10	134	Corporation Colony 1St Main Road Play Ground
10	135	Bakthavatchalam Street Play Ground
10	136	Venkat narayana road
10	136	Somasundharam play ground
10	137	10th Sector Play Ground
10	138	Parinagar Kannagi Street
10	138	Thiru Nagar VOC Street
10	138	Thiru Nagar Ganaolivu Street
10	138	Thirunagar Valluvar Street
10	138	Bharathidasan Colony Main Road
10	138	Bharathidasan Colony 4th Street
10	138	VM Balakrishnan Street
10	138	Annai Sathiya Nagar
10	139	Ragava reddy colony
10	140	Palmore Street
10	141	CIT Nagar 4 th Main Road
10	142	Godhamedhu
11	144	MMDA Colony 6th Block
11	144	MMDA Colony 7th Block
11	147	Alappakkam Main Road, Thanthai Periyar
11	149	Ramakrishna Nagar
11	149	Palaniappa Nagar
11	151	Lakshmi nagar 5th cross street

Zo ne	Ward	Name/Location of Play Ground
11	151	Lakshmi nagar Extn. 4th Main Road
11	152	Veerappa nagar 2nd Street
11	152	Bharathi colony
11	152	Kadamban Street
11	152	Sairam avenue, Hospital Road
11	152	Chowdry Nagar Main Road
11	150	Rajeswari Nagar 2nd cross street
13	171	Subbupillai thottam
13	171	Venkatapuram
13	172	Lake view road
13	172	Kottur garden II cross street
13	172	Kotturpuram II main road
13	172	Kotturpuram III main road
13	172	Kottur garden IV main road
13	172	Ambadi road
13	173	Kamaraj salai
13	173	Kamaraj salai
13	173	Kamaraj salai
13	173	D.G.S. Dhinakaran salai
13	173	Karpagam avenue IV street
13	173	Karpagam avenue IV street – indoor stadium
13	174	Annagarden, end of IIT gate
13	174	Velachery main road, opposite to kannigapuram
13	175	Kottur canal bank road
13	175	Venkatarathinam nagar
13	175	Induira nagar VIII cross street
13	175	Thiruvengadam street
13	175	Indira nagar XI lane
13	176	Sastri nagar XI cross street
13	176	Besant nagar XXI cross street
13	176	Besant nagar XXXII street
13	176	Besant nagar IV main road
13	176	SBI Colony
13	177	Mahalakshmi nagar I main road

Zo ne	Ward	Name/Location of Play Ground
13	177	L.H.nagar III cross street
13	177	Sastri nagar IV cross street
13	177	Ramakrishna nagar I main road, Erikarai road
13	177	Indra Gandhi nagar III street
13	177	Telephone colony II main road
13	177	Kakkan nagar II cross street
13	177	Shawwalace colony II street
13	177	Andal nagar II main road
13	177	New NGO colony, II main road
13	177	Dr.Ambedkar nagar I main road
13	178	Ram nagar north extn. I street
13	178	Ram nagar VII main road
13	178	Padmavathy nagar extn. main road
13	178	Ram nagar I street
13	178	Bhel sakthi nagar main road
13	178	A.G.S. Colony VI main road
13	178	Jaganathapuram I main road
13	178	AGS colony V cross street
13	179	Seethapathy nagar III cross street
13	179	Tansi nagar VI street
13	179	Baby nagar II main road
13	179	Seetharam nagar I street
13	179	Pillayar koil street, Annai Indra nagar
13	179	Sachidanantha nagar, Sanjay garden
13	179	SPIC Nagar
13	179	Shanthi I cross street
13	179	VGP selva nagar I main road
13	179	Bethal avenue
13	179	Ramagiri nagar II street
13	179	VGP selva nagar, Bethel avenue main road
13	180	Nehru street, Kanagam

Zo ne	Ward	Name/Location of Play Ground
13	181	Lakshmi puram, Muthulakshmi salai
13	181	Rukmani street, Kalakshetra main road
13	181	Vaigai Street
13	181	Thirumurugan II Street
13	181	Thirumurugan III Street
13	181	C.G.E Colony
13	181	Besant Nagar XXIX Cross Street
13	182	Thiruvalluvar Nagar VII Cross Street
13	182	Thiruvalluvar Nagar 44th Cross Street
13	182	Thiruvalluvar Nagar VI Main Road
13	182	Thiruvalluvar Nagar VII Main Road
13	182	Valmigi Nagar 69 th Street
13	182	Valmigi Nagar Extn., IV Seaward Road
13	182	Kurunji Appartments
14	169	Balaji Nagar 24th street

Zo ne	Ward	Name/Location of Play Ground
14	169	Sheela Nagar 1st street
14	183	AGS Colony, Beach
14	183	Jaganathan Street
14	183	A.G.S. Colony, ECR 2nd street
14	187	Sendhuran Colony 3rd Street
14	189	Kamakotti Nagar 5th Street, Junction of 4th Street
14	189	V.G.P Shanthi Nagar Santhosh Street
14	189	Kamakoti Nagar 6th cross street, North side
14	189	Kamakoti Nagar 6th cross street, South side
14	189	Kamakoti Nagar 9th cross street, South side
14	190	Kovalan street
14	191	Gandhi Street, Jalladianpet
14	191	Pallavan nagar

5.2 Tsunami

Tsunami is a giant waves, initiated by a sudden change, usually in relative position of underwater tectonic plates or in other words a tsunami is a series of waves with a long wavelength and period (time between crests) and time between crests of the wave can vary from a few minutes to over an hour. The sudden jerk is enough to propagate the wave; however, its power can be enhanced and fed by lunar positioning and boundaries that focus its energy.

5.2.1 Tsunami in Bay of Bengal

The Indian coastal belt has not recorded many severe tsunamis in the past. Waves accompanying earthquake activity have been reported over the North Bay of Bengal. During an earthquake in 1881 which had its epicenter near the Andamans in the Bay of Bengal, tsunamis were reported. The earthquake of 1941 in Bay of Bengal caused some damage in Andaman region. This was unusual because most Tsunamis are generated by shocks which occur at or near the flanks of continental slopes. During the earthquakes of 1819 and 1845 near the Rann of

Kutch, there were rapid movements of water into the sea. There is no mention of waves resulting from these earthquakes along the coast adjacent to the Arabian sea, and it is unlikely that Tsunamis were generated.

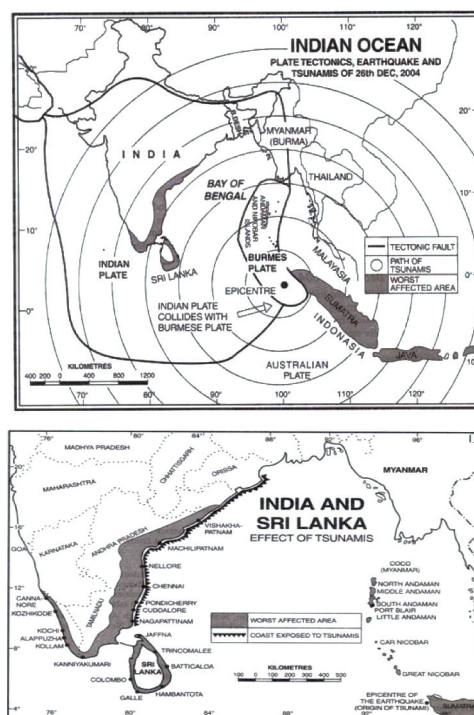
A list showing the Tsunami that affected Indian coast in the past is given in Table. The information given in the Table for the first three events is sketchy and authenticity cannot be confirmed except the Tsunami of 26th December 2004. Above facts indicate the coastal region of Gujarat is vulnerable to Tsunamis from great earthquakes in Mekran coast. Earthquake of magnitude 7 or more may be dangerous. It may be noted that all earthquake do not generate Tsunami.

5.2.2 Tsunami Hits in India

S.No	Year	Affected area / locations
1	April 12, 1762	1762 Eq. in the Bay of Bengal generated tsunami wave of 1.8 m in coastal Bangladesh
2	August 19, 1868	Earthquake Mw 7.5 in the Bay of Bengal. Tsunami wave run-up level at Port Blair, Andaman Island 4.0 m
3	December 31, 1881	Earthquake of magnitude Ms 7.9 in the Bay of Bengal, reported tsunami run-up level of 0.76m at Car Nicobar, 0.3m at Dublat, 0.3 m at Nagapattinam and 1.22 m at Port Blair in Andaman Island
4	1883	Karakatau, volcanic explosion in Indonesia. 1.5 m tsunami at Chennai, 0.6 m at Nagapattinam.
5	1884	Earthquake in the western part of the Bay of Bengal. Tsunamis at Port Blair & mouth of Hoogly River
6	June 26, 1941	Earthquake of magnitude MW 8.1 in the Andaman Sea at 12.90 N, 92.50 E. Tsunamis on the east coast of India with amplitudes from 0.75 to 1.25 m. Some damage from East Coast was reported.
7	November 27, 1945	Mekran Earthquake (Magnitude Ms 8.3). 12 to 15 M wave height in Ormara, 13 m at Pasni, and 1.37 m at Karachi (Pakistan). In Gulf of Cambay of Gujarat wave heights of 11.0 m was estimated, and 2 m at Mumbai, where boats were taken away from their moorings
8	December 26, 2004	An earthquake of magnitude (MW9.3) generated giant tsunami waves in North Indian Ocean. Tsunami made extensive damage to many coastal areas of Indonesia, India, Malaysia, Maldives, Sri Lanka and Thailand. A trans-oceanic tsunami, observed over areas beyond the Ocean limit of origin. More than 2,00,000 people lost their lives in above countries which is a record.

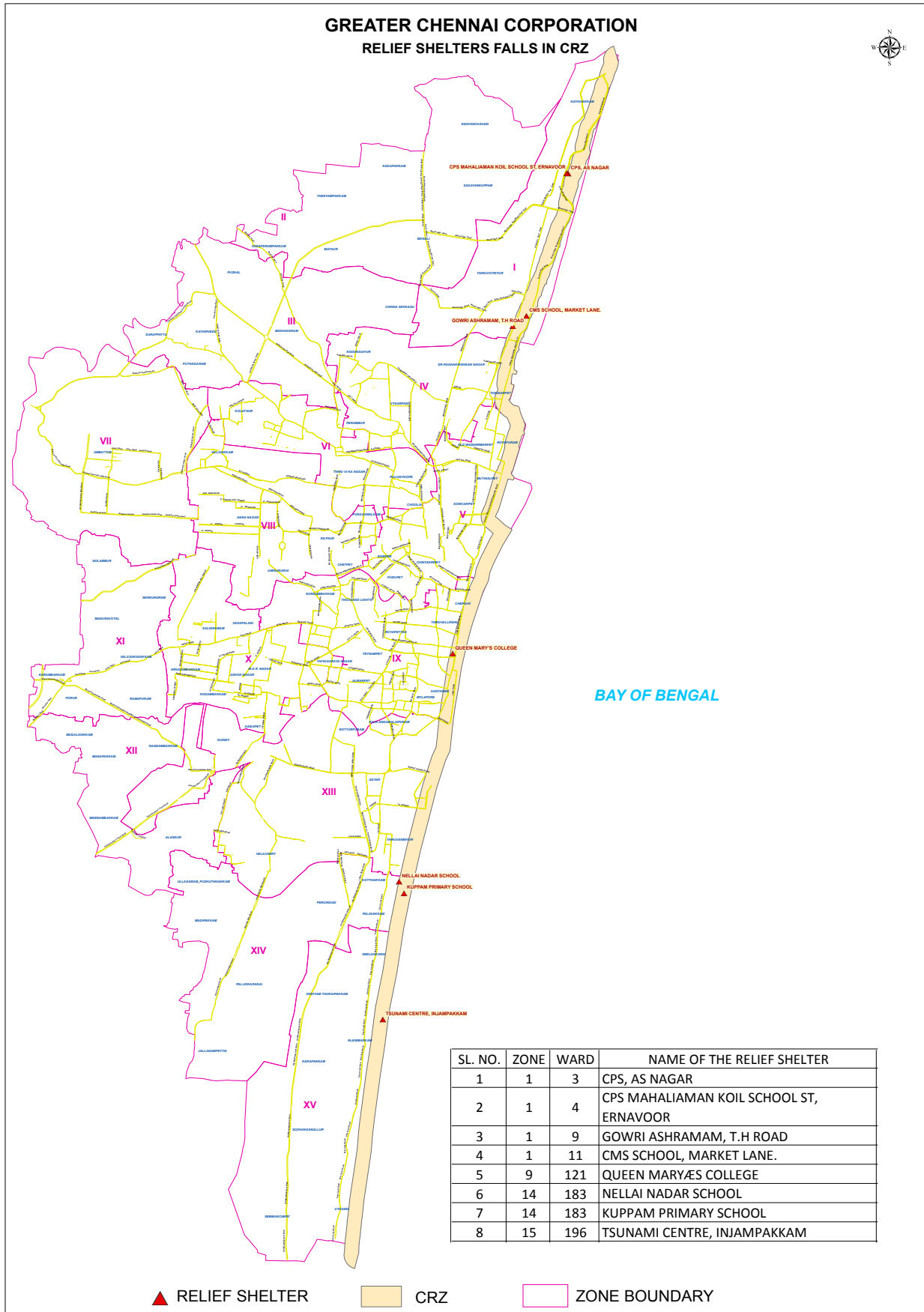
5.2.3 Tsunami in Chennai

Earthquake of magnitude 9.2 on the Richter's scale in 2004 in Indonesia is the second largest earthquake ever recorded which caused tsunamis which are considered to be the most catastrophic in the living memory of the inhabitants of the coastal areas of India. This earthquake had its epicenter off the coast of Sumatra in Indonesia at 3.5° north latitude and 95° east longitude.



This place happens to be at the tri-junction of the Indian, Australian and Burmese (Myanmarese) plates. Tsunami attack coastal areas of mainland of India including Tamil Nadu, Andhra Pradesh and Kerala after travelling more than 2,000 km in a short span of about three hours. Of these three states, Tamil Nadu suffered the most. The largest number of deaths was reported from Nagapattinam, Kanniyakumari, Cuddalore and Chennai districts.

The location of relief shelters within Coastal Regulation Zone in Chennai city are shown in the following map. These relief centres should be avoided to house the tsunami victims.



5.2.4 Tsunami preparedness measures

- Organise camps in schools, colleges and public for awareness of do-s and don't s for earthquakes.
- Ensure availability of disaster management plans and first aid kits in all schools, colleges and public buildings.
- Identify safe schools and colleges located atleast 500 m away from High Tide Level which can be used as relief shelters.
- Ensure that all critical life saving equipment are maintained and ready to use.
- The open places alike parks, playgrounds may be identified for assembling the people.
- Ensure that safe buildings in the corporation area are identified for purpose of relief camps.
- Develop plan for hospital preparedness and mass casualty management.
- Prepare a database of registered private hospitals, clinics, diagnostic labs, blood banks, etc. along with their capacities and facilities provided.
- Ensure availability of adequate supply of life saving equipments and drugs, portable supplies like portable oxygen cylinders, portable x-ray machines, triage tags, etc.
- Prepare for quick deployment of home guards, relief teams and volunteers for providing safety to affected population and evacuated structures/ houses.

Greater Chennai Corporation is increasingly taking a proactive approach to deal with disaster risk reduction. Based on the State Disaster Management Perspective Plan 2018-2030, and in addition to the measures highlighted in chapters of this document, GCC is outlining its priorities and actions moving forward which will be modified/updated annually.

6.0 UNDERSTANDING DISASTER RISK

“Disaster risk management needs to be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment”

- Sendai Framework for Disaster Risk Reduction 2015-2030

Understanding disaster risk is the first priority of the Sendai Framework. Risk assessment, risk mapping, alert systems and risk communication play a very important role in understanding the risks caused by different disasters. Better understanding of the risks strengthen the efforts of different stake holders to be better prepared to avoid the risks and in cases where avoidance is not feasible, mitigation measures can be targeted with precision to reduce the impacts of the risks as well as enhance the resistance of the community to risks. Greater Chennai Corporation is working to strengthen the capacity of different stakeholders for understanding the risks.

6.1.1 Risk Assessment and Mapping

Risk Assessment and mapping play a very critical role in enhancing preparedness during pre-disaster phase, strengthening response measures during the disaster phase as well as in undertaking preventive and mitigation measures during post disaster phase. The Government of Tamil Nadu aims to strengthen current Risk Assessment efforts with GIS based tools, advanced 3D models generating systems and Big Data analytics along with digital mapping of vulnerable areas as detailed below.

6.1.1.1 Real Time Flood Forecasting and Spatial Decision Support System for Adyar, Cooum, Kosasthalaiyar Rivers and Kovalam Basins

In order to address the recurrent urban floods in Chennai and its peri-urban areas, the Government of Tamil Nadu will be undertaking a study and implement a “Real Time Flood Forecasting and Spatial Decision Support System for Greater Chennai Corporation and the river basin areas of Adyar, Cooum, Kosasthalaiyar Rivers and Kovalam” to forecast flooding and help prepare various stakeholders and government agencies involved in risk reduction as well as prepare the community. The entire basins of Kovalam, Adyar, Cooum and Kosasthalaiyar will be studied

for their hydrology along with street flooding patterns in urban local bodies such as GCC, Tambaram, Pallavaram, Sembakkam, Pammal, Anakaputtur, Poonamallee, Avadi, Ambattur, Thiruvallur and Thirverkadu Municipalities.

Real-time Telemetry / GPRS network of stations such as Automatic Weather / Automatic Rain Gauge stations, Online lake inflow and outflow meters, River flow level meters will be installed in the entire basin areas of Cooum (489.32 Sq.km), Adyar (1162.46 Sq.km), Kosasthalaiyar (1949.32 Sq.km) and Kovalam (472.75 Sq.km) etc. The project envisages over 100 Automatic weather station (AWS) / Automatic Rain Gauge (ARG) as per the National Disaster Management guidelines of 1 in every 4.0 sq.km within the Greater Chennai Corporation. The estimated cost for this hardware as well as setting up of Control Rooms will be around Rs.15.00 to 20.00 crores, which is proposed to be funded under World Bank assisted Tamil Nadu Sustainable Urban Development Project (TNSUDP). As per the State Disaster Management Perspective Plan, the project will be completed within a period of 30 months.

6.1.1.2 Mapping of Flood Prone River Basins by Unmanned Aerial Vehicle

Tamil Nadu Government in association with Anna University has launched an Unmanned Aerial Vehicle (UAV) for Photogrammetric Mapping of flood affected districts at a cost of Rs. 7.01 crore. UAV will perform efficient surveys for disaster-prone or physically inaccessible areas by providing aerial images and accurate pictures of the water courses in the River Basins. In addition separate studies involving LIDAR systems will generate Digital Evaluation Models of the major rivers of the State Viz., Cauvery, Adyar, Kosasthalaiyar, Cooum and Kovalam. These studies will be carried out by PWD and Greater Chennai Corporation.

The UAV will undertake Aerial Photogrammetric mapping of the river basins in Chennai and adjoining districts along with 0.5km to 1km areas on either side of the main river course and its tributaries and distributaries. River basins in Thiruvallur and GCC include Araniyar, Kosasthalaiyar and its tributaries, and Cooum in Chennai; while in Kancheepuram and GCC the river basins include Adyar, Kovalam in Chennai, Palar and its tributaries in Palar, and Ongur in Varahanadhi.

The study will provide inputs for identifying the location of dams, missing links of canals and ensure possible opportunities for interlinking of watercourses. Using

UAV, the images captured will be pre-processed, stitched and converted into useful maps for the understanding of river basins and watercourses to initiate flood and drought mitigation measures.

6.1.1.3 Storm Surge Model

Chennai has a coastline of 19 KM and it faces lower storm surge heights (around 3m) compares to the southern parts of Tamil Nadu which have faced storm surges exceeding 6m above the current sea level. Storm surges are a major threat to the fishing community damaging their livelihood support.

In order to predict storm surges on real-time basis, the Government of Tamil has proposed to develop Storm Surge and Tsunami Modelling for Tamil Nadu with the help of IIT Madras. The real-time simulation model will identify the areas that are likely to be inundated during the storm surges and provide effective visualization models taking into account IMD forecast so as to strengthen early warning and response systems during the disaster phase and develop mitigation strategies during post-disaster and pre-disaster phases in subsequent years. The storm surge model will also assist in the development of appropriate structures to reduce risks and non-structural measures to avoid the risks, reduce the risks as well as enhance resistance of the community and the state to storm surges.

6.1.1.4 Integrated Coastal Zone Management plan for Tamil Nadu

Integrated Coastal Zone Management (ICZM) is a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. It takes into account the full cycle of information collation, planning, decision making, management and monitoring and evaluation of implementation. ICZM refers to the integration of a wide variety of objectives depending on the stakeholder and also to the integration of the many instruments needed to meet these objectives. The key deliverables for the Government of Tamil Nadu of the project are:

6.1.1.4.1 Land Use Mapping of the Entire Coastal Stretch of Tamil Nadu

The land use features are mapped from the merged product of CARTOSAT - I and RESOURCESAT (IRS P6 LISS IV) data duly supported by ground truth and Cadastral maps (at 1: 5,000 scale) from Survey and Land Records Department of Government of Tamil Nadu. The land use classification followed the Coastal

Land Use classification scheme developed by Space Application Center (SAC), Ahmedabad and Ministry of Environment, Government of India.

6.1.1.4.2 Coastal Vulnerability Mapping

The combination of the wave and storm surge often inundate the coastal zone, especially when the coastal area is low lying. The conditions worsen under tsunami conditions. Wave and hydrodynamic modelling were carried out to arrive at highest water level which may be expected at the various locations along the coastline of Tamil Nadu. The MIKE 21 SW model has been used for wave transformations studies under the fair weather as well as cyclonic conditions. The 30 to 40 years of data will be used to identify 'flood level' and that was superimposed on the digital elevation data of the coast to find out the degree of inundation/ flooding under such adverse condition. Based on these flood levels coastal vulnerability maps are prepared.

6.1.1.5 Tamil Nadu System for Multi-Hazard Potential Impact Assessment and Emergency Response Tracking (TN -SMART)

The Government of Tamil Nadu will put in place a System for Multi-Hazard Potential Impact Assessment and Emergency Response Tracking (SMART). TN SMART is being developed in collaboration with the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) an Inter-Governmental Organization registered with the United Nations based in Bangkok. This system will be integrated with the other systems being developed with the help of GIS technology. TN-SMART will offer following services to strengthen risk governance.

- A dynamic risk assessment system to assess the potential impacts of the weather forecast issued by India Meteorology Department.
- An ensemble forecasting platform comprising of forecast products from various global and regional center for reference purposes.
- A robust verification mechanism (metaanalysis) platform to critically evaluate the performance of all the forecast products and forecast based impact scenarios, a "real-time system of evaluating the predictions with reference to the actual situations".

TN-SMART initiative is in line with World Meteorological Organization's Global

Framework for Climate Services, i.e. development and application of climate services to assist decision-making for addressing climate-related risks.

Risk assessment and impact assessment components are driven by the forecast and site-specific thresholds derived from the historical records of extreme events and hazards. The tool would capture the risk and the corresponding potential impact. NDEM (National Database for Emergency Management) developed by the National Remote Sensing Center (NRSC) which has inbuilt national level GIS datasets will be integrated with State Data Base for Emergency Management (SDEM) & TN-SMART. TN-SMART will assist in forecast and analysis, risk mapping and assessment, also act as a data management system for managing and processing weather, disaster risks and emergency response resources data for use during the different phases of disasters.

6.1.1.6 GIS Cell

Geographical Information System (GIS) technology is extensively used for generation of pre-monsoon preparedness maps for mitigation and management of floods during northeast monsoon. The maps showing waterbodies, vulnerable locations, evacuation & relief shelters, evacuation area, NDRF Team & boat locations had been created and published in GCC's Disaster Management Plan.

In addition to the monsoon preparedness maps, the real time inundation maps were created during northeast monsoon in coordination with GCC Control Room which is also available as archives in the web applications.

At present, the GIS Cell of Greater Chennai Corporation has developed an exclusive GIS web portal and mobile application for visualizing the pre-monsoon preparedness related data in addition to maps created for preparing GCC's Disaster Management Plan. The mobile application has the facility to collect the data from the field and the same can be visualised in the map view of web application for better management for officials of GCC. The collected data is being used for data analytic and decision making aspects to aid in solving the disaster related challenges of Chennai city in a smarter way.

The web and mobile application user credentials have been provided to the respective officers of GCC.

6.1.1.7 Data Analytics for Risk Assessment

Big Data Analytics can play a significant role in strengthening management during different phases of the disaster. Data analytics enables real-time data analysis not only to map the most disaster affected areas, but also to uncover hidden patterns, unknown correlations and other vital information to make decisions and issue alerts before disaster onset and thereby help in effective preparedness, risk communication, response, relief & build back better strategies. The descriptive, predictive and prescriptive analytics will be used in multiple ways to handle disaster management more effectively.

6.1.1.8 Leveraging Technology to Enhance the Efficiency of Disaster Risk Management Efforts

Technology will be leveraged as a key to planning sustainable and disaster resilient infrastructure and systems. Satellite based/aerial photogrammetry based GIS system and computer simulation for vulnerability mapping will be the basis for strengthening disaster preparedness and response. State Disaster Response Network, a State wide electronic inventory of specialist and essential resources for disaster response will be established by the Government of Tamil Nadu to strengthen the efforts during preparedness and response.

6.2 Risk Communication

Communicating risks to the community plays a very critical role in minimising the risk of loss of lives and moveable properties. Dissemination of information in time is a major challenge requiring investments in state of the art technologies. Government of Tamil Nadu being committed to minimize loss of lives and damages to public and private properties will strengthen risk communication by embracing new technologies besides strengthening existing technologies as noted below. Greater Chennai Corporation will also advance risk communication.

Currently, a Flood Control Room (District Emergency Operations Centre or DEOC) is setup at Greater Chennai Corporation which is coordinating with the State Emergency Operations Centre (SEOC). New tools for risk assessment will be utilized for generating vital information during pre-disaster and during disaster phases to effectively communicate the risks to community as early as possible. The SEOC and DEOC are equipped with multi communication facilities like VHF,

mobile telephony etc. The Government of Tamil Nadu has provided support to GCC to ensure that operations will be disaster proof by adding wireless communication sets, internet telephony, Ham radios, satellite radio etc., so that communication is uninterrupted even during power outages. In addition, a dedicated Public Relation Officer/Assistant Public Relation Officer will be posted in the Control Room for media management. The Officer will collect data and details of relief operations from the field for press release as detailed earlier.

6.2.1 Early Warning System

Tamil Nadu has made tremendous progress during post Tsunami period in terms of getting real time information on weather events and seismic activities. The State has a well-equipped SEOC that gets information on significant events from various agencies and presently disseminates information through multiple channels to the DEOs which in turn inform to various line departments and first responders and the communities. However limitation of the present system of information is that while gathering of critical information at State level and its dissemination to the districts is very fast, the dissemination from district level to the community in remote location gets delayed due to absence of an integrated information dissemination system. Therefore a State of the Art End-to-End Early Warning System is being implemented in Tamil Nadu.

In addition, the National Centre for Coastal Research and the Government of Tamil Nadu has signed an MoU for the operationalization of the Coastal Flood Warning System for Chennai (CFLOWS-Chennai), which has been developed for Chennai. The Chennai Flood Warning System, a project initiated by the office of the Principal Scientific Advisor (PSA) was developed as a multi-institutional project involving IIT-Bombay, IIT-Madras, IRS-Anna University, and the Ministry of Earth Sciences institutes IMD, National Centre for Medium Range Weather Forecasting (NCMRWF) and Indian National Centre for Ocean Information Services (INCOIS). It is a WebGIS based decision support system developed for the Greater Chennai Corporation (GCC) area and is a first of its kind in the country for urban flood mitigation operations. All the thematic datasets such as administrative boundaries, flood locations, boat locations, relief shelters, evacuation areas, water bodies, etc. were provided by GCC and were invaluable in developing the decision support system. CFLOWS-Chennai is an excellent example of utilization of science and technology for disaster mitigation operations.

The integrated system involves coupling models of regional weather forecast, hydrological/catchment, hydraulic regime of rivers, urban drainage/overland flow, tide and storm surge. The developed expert flood forecasting system has six major components, which are connected to each other and all the connections are automated through real-time forecast, monitoring and data sharing. The components are: A) Regional Weather Forecasting and Modelling B) Tide and Storm-Surge Modelling C) Monitoring of flows using sensors D) Upstream Hydrologic Modelling E) Flood Modelling F) Integration, Data Bank Generation and Forecasting of Flood Inundation with Visualization.

6.2.2 Satellite Telephony

Satellite connections do not depend on land-based telephone wires or cellular towers and are capable of providing a full range of communications services, including voice, video and broadband data. Even when disasters strike, these networks can be used to provide seismic and flood sensing data to government agencies, to enable early warning of an impending situation and broadcast disaster-warning alerts and facilitate general communication and information flow between government agencies, relief organizations and the public. Satellite telephony in Greater Chennai Corporation is active.

6.2.3 Internet Telephony

Internet telephony allows voice calls and other services like fax, SMS and other voice messaging applications to be transmitted using the internet as a connection medium. The Government of Tamil Nadu has a state-wide area cable network offering internet facilities. Internet telephony connectivity will be established to ensure that during disasters communication is disseminated without interruption.

7.0 INVESTING IN DISASTER RISK REDUCTION FOR RESILIENCE

“Public and private investment in disaster risk prevention and reduction through structural and non-structural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment. These can be drivers of innovation, growth and job creation. Such measures are cost-effective and instrumental to save lives, prevent and reduce losses and ensure effective recovery and rehabilitation”

- Sendai Framework for Disaster Risk Reduction 2015-2030

Investing in disaster risk reduction for resilience is the third priority area of the Sendai Framework. The Government of Tamil Nadu will create a Disaster Mitigation Fund for undertaking disaster risk prevention and reduction through structural and non-structural measures to enhance the economic, social, health and cultural resilience/resistance of persons, communities and the state's assets, as well as the environment. The Government of Tamil Nadu will further encourage the involvement of the community, civil societies and the private sector to partner with the government in its efforts to transform vulnerable areas to resilient areas. The government will also promote-

- Tools for incorporating disaster risk considerations in cost-benefit analysis, budgetary tools and information systems.
- Sector based guidelines for the implementation of disaster risk management policies for public investment.
- Guidelines for the evaluation of investment projects, including tools and requirements for disaster risk management and climate change adaptation analysis in addition to Environmental Impact Analysis and compliance to regulatory requirements in fragile ecosystems and other general regulations.
- Tools for analyzing natural hazards in public investment projects.
- Developing and enforcing risk analysis criteria in private and public investment system regulations.
- Compendium of best practices

Greater Chennai Corporation is allocating necessary resources, including finance and logistics for the development and the implementation of disaster risk reduction strategies policies, plans and regulations in all relevant sectors with the active participation of the community and collaboration with different stakeholders. GCC has made investments in integrated storm water drain networks, recharge wells, and in our waterbodies, among others. The details are explained in Chapter 9.

7.1 Involvement of Private Sector

The private sector will be brought together on a common platform to strengthen disaster resilient investments, particularly through: structural, non-structural and functional disaster risk prevention and reduction measures in vulnerable areas and in critical facilities and building better from the start to withstand hazards through proper design and construction, including the use of the principles of design innovation and the standardization of Building Codes and materials; retrofitting and rebuilding; and taking into account economic, social, structural, technological and environmental impact assessments. Greater Chennai Corporation has been working with the private sector to restore waterbodies. GCC has signed MoUs with various NGOs and the private sector.

7.2 Non-Structural Measures

As part of the non-structural measures the Government of Tamil Nadu will promote the mainstreaming of disaster risk assessments into land use policy development and implementation, including urban planning, land degradation assessments and housing for the poor and the use of guidelines taking into account anticipated demographic and environmental changes. The Government of Tamil Nadu will also encourage the adoption of National Building Codes and Standards, rehabilitation and reconstruction practices.

7.3 Social Inclusion

Government of Tamil Nadu is known for welfare policies and is a pioneer in protecting and promoting the interests of the vulnerable sections be it women, weaker sections, children or differently abled. The design and implementation of inclusive policies and social safety-net mechanisms will be further strengthened, including community involvement, integration of livelihood enhancement programmes, access to basic health care services, including maternal, newborn and child health, sexual and reproductive health, food security and nutrition, housing and education

and find durable solutions in the post-disaster phase to empower and assist people (currently) disproportionately affected by disasters to be resistant to risks. Greater Chennai Corporation will continue its efforts to ensure the welfare of the vulnerable sections of our society.

7.4 Mainstreaming Disaster Risk Concerns

Mainstreaming disaster risk reduction into development plans strengthens risk reduction strategies by ensuring that new projects will incorporate measures to reduce existing risks and will ensure that new risks do not arise due to implementation of the new projects.

- On-going schemes and projects of the Ministries and Departments of Government of India and Government of Tamil Nadu as well as of all Government agencies and Institutions, including Public Sector Undertakings, will be mandated to mainstream disaster risks into the schemes and projects for ensuring that they address the disaster risk and vulnerabilities of the local areas and enhance the capacity of the community to resist disaster risks.
- At conceptualization or funding stage itself, the developmental schemes will be designed taking into consideration potential hazards associated with it and incorporate measures for mitigation of the same.

Greater Chennai Corporation will partner with relevant stakeholders and work toward mainstreaming disaster risk reduction.

Major areas identified for mainstreaming risk concerns into developmental plans

During the period 2017-2030, the Government of Tamil Nadu will focus on major thrust areas for mainstreaming risk concerns into development plans taking into account risk reduction as an essential investment to promote sustainable and inclusive development.

The major thrust areas identified are as follows.

1. Natural Resources Conservation,
2. Comprehensive River Basin development,
3. Restoration & Sustainable Management of Ecosystems,
4. Social Inclusion.

The convergence and mainstreaming of risk concerns into these major thrust areas will enhance resilience/resistance of the community and the city to different disasters. GCC is already advancing efforts to address the relevant thrust areas. Some of the efforts include desilting of waterbodies, tree planting, rainwater harvesting, artificial recharging of groundwater, and rainwater harvesting audits, among others.

Mainstreaming concerns of disaster into development plans will be undertaken by the District Disaster Management Agency in Chennai and by the Commissioner of Revenue Administration & the State Relief Commissioner at the State level to ensure participation of relevant stakeholders and full engagement of all state institutions. The overall direction of mainstreaming of risk concerns into development will be provided by the Tamil Nadu State Disaster Management Authority.

8.0 STANDARD OPERATING PROCEDURES

The City starts its preparedness in the month of September every year. This includes clearing of water bodies, storm water drains, removal of floating materials, strengthening the bunds, preparing relief centres, common kitchen, stopping road cut works, pruning of trees etc. A detailed discussion on each areas are discussed in the following paras.

8.1 Preparedness of water ways and water bodies

GCC will remove water hyacinth and floating materials from canals maintained by them periodically, using floats on annual maintenance basis well in advance to maintain un hindered water flow and to control the mosquito menace.

Sl.No	Measures before Monsoon	Actions to be taken during rain
1	Chute Pipe Cleaning.	Examine manhole cover to be in good condition.
2	Inlet chamber cleaning of sands / Debris near the chute pipe.	Continuous cleaning of garbage in chute pipe / inlet chamber / vertical gratings.
3	Missing link of storm water drain to be constructed and covered with precast slab.	Ensure the flow of water from road to SWD to monitor periodically by inspection.
4	Ensuring the network connection of SWDs	Pump / Motor can be used to maintain
5	Every year SWD to be cleaned	Block in SWDs to be cleared by motor / sucker lorry if necessary
6	Tools materials like, cow-bar, Manhole lifting hook, rope, FRC door cover slab, kept ready for use.	Keep open the manhole cover of SWDs so as to drain water more with safety precaution sign around the manhole cover.
7	Repair in SWD structure to be attended.	Make temporary kutchra drain to drain out water from higher level to lower level on emergent situation.
8	Street joints of SWD to be ensured.	If needed enlarge the chute pipe.
9	Garbage removal around bins to be done.	Providing Barricade, sign board for diverting traffic in the above places.
10	Manhole cover to be in good condition, damaged one to be replaced.	Flow of water inside the SWD is periodically monitored to ensure that the water is running full capacity inside the SWD.

Sl.No	Measures before Monsoon	Actions to be taken during rain
11	Removal of Debris / silt inside the SWDs.	The SWD at its joining point with canals and rivers is frequently checked for removal of any blocks at the draining point with rivers and canals.
12	Streets where SWD require cleaning	Diesel / Submersible pumps are provided in the needed location to drain out water in SWDs.
		Road cut may be done in order to drain more water with safely sign boards.

8.2 Water stagnation locations

In city various water stagnation locations were identified in all zone 1 to 15. The list of mild, moderate, heavily inundated area, streets likely to be inundated and the areas where the people are to be evacuated are given in detail in each zone chapters. Strict vigil is maintained in these areas. From those areas stagnated water to be disposed to the particular disposal points like storm water drain and canal. The table shows the preparedness of Water stagnation locations in pre monsoon and during rain.

Sl.No	Measures to be taken before rain
1	RWH structures to be cleaned and refilled.
2	Chute pipe should be cleaned.
3	De-silting of disposal points and Storm water drains/canals.
4	Keep JCB, Bulldozers, cranes, pumps and super sucker Lorries ready.
5	Provide inlet chambers and pipe connections to the existing nearest drain.
6	De-silt storm water drains.
7	Break the top slabs and desilt the SWD where chronic obstruction is noted and cover with precast slab.
8	Missing link of storm water drains to be constructed and covered with precast slabs.
9	Available machineries/pumps to be checked and kept in ready condition. A log book to be maintained by AEE regarding the same.

8.3 Preparedness of Relief Centers

The GCC has identified and notified around 169 relief centers across the city keeping in mind the vulnerability of areas prone for inundation and need for eviction. The community halls, schools and public buildings are identified to act as relief centers. The details of relief centers locations, contact persons are given in there respective zonal chapters.

The relief centers are to be provided with safe drinking water, toilet facilities, lighting arrangements, food packets, bread and Aavin milk for children, senior citizens, differently abled persons are also to be kept in readiness in the relief centers. The action plan for relief centers before and during rain is discussed in the following table.

Measures before Monsoon	Actions to be taken during rain
Clean the relief centre	Ensure regular supply of water by CMWSSB
Surrounding area should be cleaned	Ensure adequate water available in sump and water tank
Necessary arrangement of water facilities by deploying CMWSSB 3000 Ltrs tanks.	Ensure the Toilets are cleaned regularly
Clean sump and water tank	Cooking should be done regularly and food supplied
Clean Toilets	Ensure the sufficiency of cooking gas.
Clean Vessels/Gas Stove	Groceries & vegetables to be purchased.
Ensure supply of Cooking gas.	Vehicle arrangements with sufficient labourers for food distribution to all required places.
Availability of lights/ fans to be ensured.	Light and fan to be operated
Medical facilities	Spraying of disinfectant.
Cooking staff should be arranged	Supplying food to affected people.
List of provision materials/ vegetables to be purchased during rain to be kept ready.	Receive VVIP's / VIP's / NGO's at relief centre and explain to them.
Identification of place for storage of provision materials/ vegetables	
Keep ready Vehicle arrangements with sufficient labourers for food Distribution to all required places.	

• Light, Fan Switches to be tested	• Be polite towards the people.
• Generator to be provided.	• Garbage removal must be continuous.
• Assessing the requirements of food / Bread / Milk	• Station ambulances where ever possible.
• Instruction should be given to all staff at the relief centre to ensure the quantity and quality of food etc.	• Distribute relief material in a systematic manner
• Ensure temporary electric arrangements to be kept always ready to operate during power failure.	• Ensure police bond bust
• Ensure good sanitation in and around the relief centre by fogging, cleaning etc.	
• Inform police and Fire and Health, Metro water about the location of relief centre.	• Keep record of food distribution and relief material distribution.
• Deploy Police	

8.4 Common kitchen

The Corporation maintains 1 dedicated common kitchen centers with a capacity to cook 5000 food packets per hour, at Chintadripet.

The common kitchens were stacked with required quantities of rations / provisions and cooking materials well before on set of monsoon. The vehicles will be kept ready in all these kitchens to transport the food to the affected areas and relief centers.

In each common kitchen one Sanitary Inspector will be posted round the clock to monitor food preparation & food hygiene. Temporary food centres will also be set up in private marriage halls depending on the gravity of situation. Assistant Revenue Officers are put in charge to prepare the required quantity of food for common kitchen/relief centre kitchen.

To supplement above arrangements the food from Amma Unavagam also will be lifted to the affected areas. Aavin will be requested to supply milk to the flood affected children and aged persons. Supply of Bread will be arranged from modern food industries. The supply of drinking water will be arranged from Amma Kudineer and by CMWSSB.

8.5 Subways

There are 22 subways in Chennai city of which GCC maintains 16 subways (Sl.No. 1 to 16) and 6 subways (Sl.No. 17 to 22) are maintained by Highways department. The details of locations of subways are given in the respective zonal

chapters. The 16 subways maintained by GCC are running for surpass for the passenger in different location and the subways in Chennai are given below.

1. Ganesapuram subway, at Dr.Ambedkar College Road to the East of Vyasarpadi Jeeva Railway Station.
2. Reserve Bank Subway at RajajiSalai Near Reserve Bank of India.
3. Stanley Nagar Subway 1 along Cochrane Basin Bridge Road South of Stanley Nagar near Post Office.
4. Stanley Nagar Subway 2 along Cochrane Basin Bridge Road South of Stanley Nagar near Post Office.
5. Perambur Subway at Perambur High Road to the West of Perambur Railway Station.
6. Gengu- Reddy Road Subway at Egmore near Nehru Park.
7. In Redhills Road at Villivakkam LC-2.
8. Nungambakkam Subway near Nungambakkam Rly. Station.
9. Harrington Road Subway near Pachaiyappa's College.
10. Dheeran Sivalingam Subway connecting Doraisamy road and BrindavanRaod.
11. Madley Subway connecting Madley road and EaswaranKoil Street on Southern Side of Mambalam Railway Station.
12. Thyagi Aranganathan Subway connecting Kannammamet and Reddikuppam Road.
13. Saidapet Bazaar Road Subway.
14. C.P. Pavalavannan Bridge in Jones Road.
15. In Monegar Choultry Road near stanley hospital.
16. Pedestrian cum two wheeler subway at Rangarajapuram level crossing.
17. St. Thomas Mount Subway.
18. Thillai Ganga Nagar Subway.
19. Palavanthangal Subway.
20. Jain College, Meenambakam Subway.
21. Viyasarpadi Subway.
22. Kathivakkam High Road Div- 2 Subway.

These subways are equipped with pump sets to bail out water from the subways. Depending upon the necessity, pump sets from Agriculture Engineering

Department, Fire Service Department and Private Sources will be deployed. The preparedness of subways before monsoon and steps to be taken during the monsoon are described in the following tables.

Measures before Monsoon	Actions to be taken during rain
• Clearance of garbage and sand in the subway and surrounding areas	• The Diesel engines/electric pumps to be kept at an elevated level/platform.
• Remove rank vegetation.	• Ensure that all regular and stand by pumps are kept in working condition
• Cleaning of chute pipes/inlet chambers in the subway.	• Keep sufficient stock of diesel, petrol, oil, grease.
	• Keep GENSET in ready condition.
Measures before Monsoon	Actions to be taken during rain
• De-silting collector well.	• Ensure Starting handle availability.
	• Check condition of foot valve /suction valve.
• Disposal channel to be de-silted and free flow in its route to be ensured	• Check the metallic rope in pump.
	• Carryout trial run of pumps.
• Service lanes in subway to be cleaned.	• Mark danger water levels in red paint on both sides of subway above which the subway should be closed for traffic.

Preparedness of Manpower in the Subway

Action to be taken during rain	
• Operate the pumps as and when required.	• Ensure stock of POL.
• Closely watch the inlet /chute pipe.	• Continuously operate the pumps.
• Remove choking if any found.	• Check the water disposal at the outlet.
• Check the hose pipe and ensure that it is intact.	• Ensure the movement of traffic in the subway.
• Ensure the traffic movement without hindrance.	• Caution the two wheelers riding in subway.
• Monitor the water level and to inform the higher level officer and submit a report every two hours.	• Do not to allow senior/ disabled people to cross the subway.

- | | |
|--|---|
| <ul style="list-style-type: none"> Photograph the subway to ascertain its status and to ensure traffic movement and share through WhatsApp. | <ul style="list-style-type: none"> Close the subway if water in the subway is above the danger mark normally more than 3 feet at the lowest level. |
|--|---|

Action if Subway is flooded to the brim

- Operate reserve pumps and submersible pumps to control water level in the subway.
- Put heavy duty pumps to suck out water.
- Have two (or) three disposal points.
- Keep sufficient lorries, JCBs, dozers and men for removal of silt, garbage and floating materials etc., in the subway once rain stops.

Action if Subway is flooded to the brim

- Keep sufficient lorries, JCBs, dozers and men for removal of silt, garbage and floating materials etc., in the subway once rain stops.
- Supervisory Officer to monitor the water level and to inform the status to the higher official.
- Keep de-silting the outlet points in case of block.

8.6 Tree fall

The Preparedness of tree falls includes pruning of trees, anticipation of the uprooting of trees during cyclone etc. Vehicle mounted saws and power saws are kept ready in all zones 1 to 15 to cut and remove the fallen trees on the roads and the following measures to be taken before rain and during rain.

- Keep sufficient labourers to attend tree falls in wards.
- Sensitize the conservancy labourers to report the tree fallen in streets to Assistant Engineer.
- Keep private contractors with tree cutting tools and vehicles for removal of dead trees and slanting trees if regular staff is not available.

Preparedness of Tree Fall in City.

Measures before Monsoon	Actions to be taken during rain
Inspect BRR and other roads to assess the stability of trees and low branches	Keep in close contact with Control Room, traffic, law & order, fire dept. and TANGEDCO to know about the tree falls.
Form teams with Park overseers, vehicles, labours & equipments & deploy them	Immediately reach the spot with vehicles.
- Keep the following equipment with specific area jurisdiction - Manual Saw. - Power Saw. - Vehicle Mounted Saw. - JCB, Open lorry, Crane etc., - Sufficient stock of POL, - Finalise Private contractor. - Ropes - sufficient length - Temporary Barricades - Temporary lighting arrangements.	Electric lines to be switched off
Conduct trial run of manual and Power operated saws	Make use of conservancy, road and malaria labourer to cut the branches
Attend complaints for removal of trees and branches.	Deploy JCB, Crane, Bobcat and Open Lorry to remove the branches and trunks
Trees at low level touching overhead TANGEDCO line to be reported	First priority is to restore traffic movements
	Deploy Private Contractors where ever required to clear fallen trees
	Providing suitable barricades to protect the unstable trees
	Report the road blocks and tree removal to the Head Office with WhatsApp Photos stage wise

8.7 Transport equipment /Lorries

Measures before Monsoon	Actions to be taken during rain
Inspect lorry stations and keeping it ready for operation.	Ensure 100% march out for conservancy
Instruction to be given to the time keeper and other field staff to maintain reserve of diesel, oil and spare materials related to repair works and maintain 24 x 7 operation.	Tree cutting and debri clearance
Have contact details and address of Lorry driver and Mechanic.	Clear garbage without accumulation.
Engage private contractor if needed.	Deploy JCB / Lorries & Bobcat wherever necessary.
Necessary purchase of important items like tyres, spare parts etc to be done in advance.	Ensure continuous fuel supply
Lorries / JCBs / Bobcats to be kept in good condition	Send water tanker lorry to suck out water stagnation.
Instruction to be given to Lorry station A.E to monitor the vehicle condition and to inform the higher official to plan for shifting the Vehicles from Low Lying Area to high land.	Procure POL to supply to Health dept vehicle and for fogging Machine.
Planning of lighting arrangements and mobilisation of DG Set	Keep drivers at Night time also.
Keep reserve drivers.	Engage contractors to attend repair works immediately.
Planning of lighting arrangements and mobilisation of GENSET	Engage private contractors if necessary.
Sufficient mechanic / helpers for vehicle repair and maintenance.	Drivers allocation plan to be prepared and informed proactively to drive the vehicles
Inspect lorry stations and keeping it ready for operation.	High capacity HP pumps to be kept at ready state
	Contact RTO in case of more lorry required.

8.8 Preparedness of Streets

8.8.1 Preparedness of Streets do not require evacuation

During every monsoon GCC will identify vulnerable spots in all zones and action will be initiated to dispose the rain water through storm water drain into river, canal etc. The precautionary measures to be taken are as follows.

- i. Stock sand bags in Ward offices and in important streets.
- ii. Keep ready pumps with required capacity to pump out water entering in to houses.
- iii. Instruct public to clean the RWH structures in the private premises and GCC to clear RWH structures within their jurisdiction.
- iv. Advising house owners to increase the height of low lying area within their compound to match with road level and their basement.
- v. Identify dilapidated buildings and alert people who are living there.
- vi. Identification of place for dumping Debris.
- vii. Engaging the Private Contractor with necessary machineries to remove debris in case of building collapse.
- viii. Mobile Super Sucker & Pumps to pump out water.
- ix. Identify the location and route through which water can be pumped out.

8.8.2 Preparedness of Streets require evacuation

During heavy flood occurred in the year 2015, people evacuated from various locations were accommodated in relief centres/public buildings provided with basic amenities in all the zones. The following section gives the detailed action plan for evacuation in different circumstances

a) Streets where Rivers/ Lakes/ over flow and need evacuation:

- i. Monitor river levels and releases from upstream
- ii. Arrange mobile public address system for announcement of evacuation, inform media and through other possible sources.
- iii. Making necessary transport arrangements to evacuate.
- iv. Stock sand bags along the canal, lake and river bunds.
- v. Mobilize mobile lighting system.

- vi. Heavy (giant) pumps to be kept ready.
- vii. Identify Relief Centres for street wise evacuation.
- viii. Keep the relief centres ready with water supply, toilets, sanitation, medicines, food& lighting facilities.
- ix. Make arrangements for cooking food.
- x. Supply from Ammaunavagam
- xi. Assess numbers to be evacuated at R.C.
- xii. Ambulance, boats with life jacket medical team, Police escort, NDRF to be kept ready.
- xiii. Sufficient staff and labourers to be trained and posted.
- xiv. JCB /Cranes /Bulldozers and other machineries to be procured and kept ready.

b) Air Lifting Operations:

- Deployment plan for airlifting in the whole area
- Food supplies through Air craft
- Necessary fuel to be kept at RC
- Gas operated emergency lights to be rented / procured.
- Necessary financial arrangements to be made to meet out unforeseen expenditure.
- Prior information to nearest UPHC / private hospitals to handle casualties during rain .
- Burial grounds to be equipped with fuel and labourer arrangements and approaches. Gas burners / Gen sets to be kept ready.
- Divers and swimmers team to be made available.
- Sufficient rain coats to be made available.
- Special team of conservancy to clean the floating garbage / debris / etc round the clock.
- Fire service to be alerted.

c) Inundated Streets

- i. Chute pipes / water table to be de-clogged regularly & water to be kept flowing.
- ii. De-silting the disposal point periodically.

- iii. Use brush to clear water
- iv. Ensuring the sufficient number of super sucker/sewer lorries and pumps are mobilized and deployed to drain water.

d) Streets where water entering houses

- i. Power should be disconnected.
- ii. Piped water to be stopped
- iii. Mobile water supply to be arranged
- iv. Prior announcement to be made to safeguard household materials and to move upstairs.
- v. Manpower for relief material distribution.
- vi. Alerting people in dilapidated buildings
- vii. Deployment of Fire service, SDRF and NDRF to evacuate people through boats regularly. Arrange food to those who are stranded upstairs.
- viii. Garbage cleaning to be done
- ix. Cleaning of sumps with Bleaching powder and filling fresh water before starting same.
- x. Applying of lime and bleaching powder
- xi. Snake catchers to be put into job.
- xii. Silt, debris/rubbish etc., removal in the streets.

e) Streets where Rivers/ Lakes/ over flow and Need evacuation

- i. Use sand bags to prevent overflow.
- ii. Issue warning to evacuate low lying areas as soon as you anticipate overflows.
- iii. Deployment of rescue teams to help the public evacuate.
- iv. JCB/ bulldozers/ cranes/ lorries to be deployed to spot immediately.
- v. Fumigation and application of disinfectants / powders in the affected area.
- vi. Continuous monitoring of materials available.
- vii. Alternate substitute staff / labourers to be kept ready with prior training.
- viii. Medical camps to be available round the clock.
- ix. Deploy boats to evacuate and distribute food and water for people.
- x. Deploy helicopter for air dropping of supplies and evacuation

8.9 Lighting facilities

At the time of disaster most of the operation will be taken place on 24x7 as like war period. Therefore establishing alternate sources of lighting is a prerequisite in all areas. Eighteen mobile high mast lights are deployed in all zones in case of power cut during flood and cyclone, these light shall be used. The following table shows the preparedness of lighting facilities in monsoon period.

Preparedness of Lighting Facilities

Measures before Monsoon	Actions to be taken during rain
• Inspection of all street lights.	• Check street lighting at nights and attend in case failure.
• Replace the damaged street light poles and report.	• Check lighting in parks and public convenience
• Ensure lighting facilities in streets, relief centres, UPHC & officers.	• Ensure the operation of substation in wards.
	• Electrician labourers to be kept ready during night times
• Details of one of more private contractors for providing temporary power supply and lights to be maintained.	• Night patrolling of street lights.
	• Instruction to be given to electrical in-charge for preparing duty arrangement.
	• Engaging private contractor for arrangements of DG set .
• Keep sufficient labourers to attend complaints regarding lighting.	• Power Supply.
	• Run DG set in case of power failure in Relief campus/ UPHC/ govt offices/ schools.
• Cables on the streets to be checked	• Keep sufficient bulbs/ tube lights ready.
• Rectify low lying TANGEDCO cables.	• Keep stock of emergency lights.
• Rectify open broken TANGEDCO pillar boxes.	• Put up emergency lights to rescue operation in high time.
• Rectify open broken TANGEDCO pillar boxes.	• Keep ready candles in bulk.
• Keep POL in ward / Zonal Offices.	• Plan for utilization of solar panels.
• Inspection of all street lights.	• Keep Gen-set in BG's to operate lighting arrangement also.

8.10 National Disaster Response Force/ State Disaster Response Force

The relief teams from National Disaster Relief Force (NDRF) are also pressed into service for urgent relief operations. The services of coast guard are requested in the event of very heavy flooding.

NDRF

The Commandant, 04, Battalion (NDRF), Suraksha Campus, Takkolam, Arakkonam, Vellore District – 631 152 : **Contact. 04177 – 246594/246269**

The State Disaster Response Force (SDRF) has been constituted and stationed at Commando Force Head Quarters, Adyar. The Commissioner, Greater Chennai Corporation will request for the assistance of SDRF/NDRF in case of any disaster.

The NDRF to be stationed in the designated locations & deployed to needy points for commencing evacuation operations. A detailed mention about housing of NDRF/SDRF and pre positioning locations are discussed in each zone. The following are the precautionary measures to be taken before rain:

- i. Identified vulnerable places should be informed to NDRF for pre positioning the force. Contact with commandant to deploy in vulnerable areas in case needed.
- ii. Identify station place to accommodate them.
- iii. Procure fuel for them.
- iv. Joint inspection with NDRF / SDRF/ QRT
- v. Accommodate NDRF in chosen place. Deploy them in selected location for evacuation and supply of food to victims.

8.11 Health Department Support

At the time of any disaster preparedness medical facilities is more important to save the people from various infections and diseases. In GCC there are 238 Medical Officers and 1,043 Paramedical Staff working at 152 health centers and a Communicable Diseases Hospital. 3 Medical Teams focused in each zones to give medical care during the flood emergency period round the clock. Whenever flood relief camps are opened, Medical officer, Paramedical Staff and Sanitary Inspector will be posted round the clock to ensure Health, Hygiene and sanitation of the affected population. The following Preparedness are given to control the disease at the time of disaster.

1. Essential medicines have to be stocked in adequate quantity in all the Urban Primary Health Centers and Communicable Disease Hospital. At Present 2 month's stock of disinfectants and medicines are available in each zone. At any moment procurement of necessary requirement of disinfectants and medicines can be purchased from TNMSC within a week's time.
2. All the diarrheal infected patients in the Communicable Diseases Hospital are to be intimated to the respective Zonal Health Officers to take appropriate preventive and control measures immediately in their residential areas.
3. Adequate quantity of bleaching powder, chlorine tablets and phenyl are stocked at Unit Offices and Stores. Adequate resources are available for maintaining hygiene and sanitation in a flood situation in the flood prone areas.
4. Spraying with MLO is being carried out in all the water stagnation places once in a week. The frequency of this should be increased depends on the ground reality. 568 sprayers are engaged for this activity.
5. The potential sources of contamination of water such as sewage overflow is being identified and it will be intimated to the Metro water engineers for appropriate action. Joint inspection with Zonal Health Officers and Metro water officials are being conducted regularly.
6. Both during and after any disaster, outbreak of epidemics is a major fall out. A strong health support system would largely mitigate this situation. Considering the fact, the respective Sanitary Inspectors are to take up the anti mosquito fogging in all the streets and anti larval spraying for storm water drain networks and canals periodically.
7. The concerned sanitary officers and sanitary inspectors will ensure residual chlorine of 0.2 to 0.5 ppm in drinking water supply in co-ordination with CMWSSB staffs. Distribution of bleaching powder to individual houses to clean the overhead tanks and sumps to avoid water contamination.
8. Vector control activities will be carried out by the Entomologist in all the zones.
9. The zonal health officers are to supervise the Medical officers, Entomologist, Sanitary officers, Veterinary officers are to co-ordinate with conduction of health camps at required habitations.

The following table shows the Preparedness of action taken for disease control in monsoon period.

Measures before Monsoon	Actions to be taken during rain
Assess the streets where spraying of disinfectant needed.	Sector ALO work to be done
Keep sufficient lime/ bleaching powder in S.I Office.	- Fogging to be done - Spray disinfectant in water logged streets.
UPHCS to be kept ready	- Supervise sector programme. - Chlorine level to be maintained. - Fogging operation to be intensified.
Sector ALO work to be strangled.	- Analysing the trend of diseases in UPHCS – op - Administer DT Vaccination to employees.
Intensify fogging activities.	- Give bleaching powder to each family. - Spray disinfectant to all streets.
Clean SWD blocks	- Check chlorine level in all water lorries. - Put up medical camps in relief centre, low laying areas, disease prone areas.
Procure drugs for UPHC	- Mobilize doctors to the needed location with vehicles. - Arrange food for the medical team,
Distribute Mask hand clothes / boot to labours.	- Keep the BGs in open and ensure labourers availability there. - Give masks, hand clothes, boots to sanitation employees.

The Health Department in GCC will be geared up with the following activities.

- i. Intensify Activities for control against Dengue and Other Communicable Diseases
- ii. Source Reduction activities to be intensified mainly in Hospitals, Schools, Colleges, Railway Yards, Vacant plots, New Construction sites, domestic sources, etc.
- iii. IEC Activities to be carried out by audio and video measures at all Hot spot areas, Hospitals, Schools, Colleges, Government institutions, Slums and places where people gather.
- iv. Distribution of Nilavembu Kudineer to the General Public.
- v. Protective gears like Gloves, Mask, Shoes, Over Coat to be provided for workers who are involved in anti – mosquito activities.
- vi. Health application to be developed for fever notification, patient details for follow activities and treatment, control centre.

8.12 Veterinary Support

The GCC conducts Mass Veterinary Camps in collaboration with Tamil Nadu University for Veterinary and Animal Sciences 30 Camps (two per Zone) will be conducted. The following activities are undergone for veterinary support.

- i. Treatment of Large Animals and Small Animals
- ii. Anti-rabies Vaccination and Deworming
- iii. Distribution of Nutritional supplements for pet animals
- iv. Distribution of Nutritional supplements for large animals
- v. Distribution of free mineral mixture/ salt licks
- vi. Distribution of green fodder
- vii. Distribution of Paddy Straw at subsidized rate of Rs. 2/Kg @ Perambur and Pudupet Cattle depots

The GCC will form Animal Rescue Teams, one for each zone to support the animals at the time of disaster. The composition of rescue teams are as follows.

1. One Veterinarian
2. Two Animal Attendants

These rescue teams with the help of Dog Catching Vehicles and Cattle Catching Vehicles will conduct animals health camps. The dead animals found on roads, streets, water bodies will be disposed by carcass and buried at Kodungaiyur

and Perungudi dumping yards following sanitary measures.

The GCC have arranged the Emergency Animal Rescue stations for the purpose of treatment. Table shows the details of Cattle and horse Rescue Stations.

Rescue Station for Cattle & Horses (Domestic Animals)

Sl. no	Hospital Name	Place	Contact No.
1.	Greater Chennai Corporation 'G' Cattle Depot	Perambur	9445197444
2.	Greater Chennai Corporation 'D' Cattle Depot	Pudupet	9445026046
3.	Government Veterinary Hospital	Saidapet	04424352478
4.	Government Veterinary Hospital	Tondiarpet	04424892536
5.	TANUVAS Veterinary Hospital	Vepery	04425304000
6.	Blue Cross Animal Rescue Centre	Velachery	04422300666

Rescue Station for Dogs, Cats & Birds (Pet Animals)

Sl. no	Hospital Name	Place	Contact No.
1.	Greater Chennai Corporation Pet Clinic	Thiru .Vi.Ka.Nagar	9445026042
2.	Greater Chennai Corporation Pet Clinic	Nungambakkam	9445194747
3.	Greater Chennai Corporation Pet Clinic	Kannammampet	9445026049
4.	Greater Chennai Corporation Animal Rescue	Centre Lloyds Road	9445194746
5.	Greater Chennai Corporation Animal Rescue	Centre Basin Bridge	9445026047
6.	Government Veterinary Hospital	Saidapet	04424352478
7.	TANUVAS Veterinary Hospital	Vepery	04425304000
8.	TANUVAS Peripheral Veterinary Hospital	Madhavaram	04425551586

8.13 Role of Financial Advisor

Arrangements shall be made to disburse advance amounts to the Zonal Officers, Head of the Departments, Officer in charge of the Relief Centres and other officers for carrying out relief works.

Arrangements shall be made to function the Treasury of Greater Chennai Corporation, including holidays, to disburse advance amounts, to the Zonal Officers, who are involved in the flood relief works.

8.14 Role of Public Relations Officer

On receipt of warning message from the Control Room, all arrangements shall be made to warn the people living in the low-lying areas to move to relief centres in advance.

Arrangements shall be made to communicate the messages of the Commissioner to the public through medias. PRO shall also publish press release about the relief activities that are under taken by GCC to build confidence and subdue panic among the public.

8.15 Ward Committee

The ward committee is formed for each ward by drawing officials from various departments to work in close coordination. The objective of forming such ward committee is to ensure co-ordinated mitigation work in the field without lapse of time.

Defining the role of line departments is very essential and should play a supportive role to ensure smooth functioning of the Entire Disaster Management Operation. The duties and responsibilities of staffs/ officials of ward committee are described as below. Table shows the responsibilities for the various designation in the ward committee. The composition of ward committees with contact details mentioned in detail in the respective zones.

Responsibilities of Officials

Designation	Responsibilities
Assistant Engineer/Junior Engineer, GCC	Removal of water stagnation on roads & subways, desilting SWD and cleaning chute pipes, arranging pumps for dewatering, evacuating people at times of flood and providing them food
Assistant Engineer/Junior Engineer, GCC– Electrical,	Inspecting & replacing the non-burning street lights, alternate arrangement for lighting during power failure
Sanitary Inspector, GCC	Ensuring the proper sanitation for the zone, Anti mosquito fogging on all the streets and anti-larval spraying for storm water drains and canals, spraying disinfectant on streets
Veterinary officer, GCC	Animal health issues and disposal of dead animal carcass
Conservancy Inspector, GCC	Clearing of garbage and spreading the lime powder around the bins debris
Assistant Revenue Officer, GCC	Ensuring the readiness of common kitchen, food materials and drinking water in the relief centres during evacuation at time of flood
Park Overseer, GCC	Removal of fallen trees/branches and pruning of trees.

Assistant Engineer, TANGEDCO	Proper maintenance of the electric cables, ensuring 24x7 power supply, attending to cable faults
Assistant Engineer/Junior Engineer, CMWSSB	Ensuring proper water supply and removing sewer blocks.
BSNL	Assuring uninterrupted communication & attending to faults
Fire Service	Rescuing people from burning and from collapsed buildings
Police	Maintaining law & Order, patrolling the areas for protecting people & property
PWD	Desilting of canals and rivers
TNSCB	Providing the basic amenities to the slum tenements

These ward committees have to look after any kind of emergency or disaster occurrence in the ward. The preparedness of ward committee during the disaster time is show in the table below.

Preparedness for Inter department coordination

Measures before Monsoon	Actions to be taken during rain
Conduct co-ordination meeting at Zonal / Regional / Ward level.	Assemble at one point and monitor it.
Familiarize with line departments.	Inspect jointly the vulnerable areas.
Discuss the issues with line departments	Deploy machineries at required location.
Conduct co-ordination meeting with line departments.	Joint inspection
Inspect jointly the vulnerable areas	Deploy JCBs. dozers to clear garbage in canals and culverts.
Request the service departments to keep the logistics in good condition	Communicate the need to service department
Request PWD, Highways department to clean SWDs/ Canals and De-silting it.	Co-ordinate with service dept.

8.16 Other Departments Mitigation Plan

The civic and essential services to the public in Chennai city is being provided by various departments independently. Unless there is effective coordination plan with other departments preparedness, relief and rehabilitation of affected people

will not be done effectively. The Commissioner, GCC will conduct regular meetings with the Head of Departments before monsoon. The role of each department with regards to monsoon preparedness is described in the following table.

S. NO	DEPARTMENT	MITIGATION PLAN
1	Meteorological Department	To issue periodical weather warning before 24 or 48 hours and cyclone alert at the appropriate time. The rainfall details, wind speed and duration will be periodically updated for the city. GCC will also discuss with Meteorological Department well before monsoon to assess the intensity of forthcoming monsoon.
2	Chennai Metropolitan Water Supply and Sewerage Board	To avoid major road cuts during monsoon period and the road cuts done hitherto to be restored well in advance before commencement of monsoon. To replace all the missing sewer manhole covers. To display sign boards incase of unavoidable road cuts are made with a view to prevent pedestrians and vehicles from falling into the sewer and barricade the areas wherever necessary To ensure working conditions of sewerage pumping stations and to keep generator sets in pumping stations. Injection of necessary quantity of chlorine into drinking water supply line. Announcement to the public through Mass Media regarding the need for chlorination in private wells. Erection of water tanks at relief camps and flooded areas where the regular supply is stopped.
3	Director of Information and Public Relation	To disseminate the forecast and publish periodically about mitigative actions under taken by Greater Chennai corporation.
4	Public Works Department	Removal of sand bars at river mouth of Cooum, Adyar and Muttukadu to ensure free flow of flood water into sea from water ways. To procure adequate quantity of sand bags and to be kept ready. Desilting of water bodies, clearing of debris /floating materials/ garbage/ hyacinth maintained by PWD. Clearing of culverts, vents under the bridges. The level and discharge from Chembarambakkam Tank, Puzhal tank, Redhills shall be updated to GCC Control Room. The flow level of rivers and discharge quantity at mouth shall be intimated to Control Room. Perennial issues like debris under MRTS bridge along Central Buckingham Canal, widening mouths of Coovum, Adyar, Kosasthalaiyar and B canal at Muttukadu shall be addressed in advance. One representative shall be nominated to work in the Control Room of GCC during monsoon period for coordination.
5	Highways & Rural Works Department	Blockages below the culverts/ Bridges along the water ways has to be removed. Storm water drain in highways road to be de-silted. Manholes, chute pipes should be checked. Patch works should be attended. Footpaths shall be rectified. Pruning of trees shall be carried out.

S. NO	DEPARTMENT	MITIGATION PLAN
6	Tamil Nadu Electricity Board	To attend the faults, check transformers and pillar boxes to avoid electrocution. To vigil open LT lines in extended areas of GCC. Power supply to be cut off during flooding, if required.
7	Fire Service Department	To keep rescue teams with necessary machineries, tools, equipments, boats etc at designated locations. Readiness to commence evacuation and rescue operations in case of marooning of people.
8	Telephone Services	To ensure disruption of free service of important telephones of Greater Chennai Corporation and other Departments. Immediate temporary installation of connectivity facility may be made on request at certain important places like relief camps etc. The generators within their premises shall be kept in an elevated location to avoid submergence.
9	Chennai Metropolitan Transport Corporation	To keep buses on road in good condition for transportation of essential commodities of food packets to the inundated and marooned areas. If necessary the vehicles may be provided to evacuate the marooned people preferably high chased vehicles.
10	M.R.T.S. / Railways	To clear the blockade in rivers, canals beneath the tracks to ensure free flow of water.
11	Chennai Metro Rail Limited (CMRL)	Clearing the blockage of earth and concretes at canals, rivers and beneath of track line.
12	Indian Air Force	Indian Air Force shall get prepared with latitudes and longitudes of marooned areas for dropping food packets and air lifting.
13	Director of Medical Services	To keep ready medicines and ambulances at all Government Hospitals. To spare health personnel for mass inoculation, if required by Greater Chennai Corporation.
14	Director of Public Health	To work in close coordination with GCC for preventive measures have to be taken in advance before the outbreak of epidemics.
15	Tamil Nadu Civil Supplies Corporation Limited	To stock required commodities in all PDS shops.
16	Tamil Nadu Agro Industries Corporation	To supply tractor mounted pump sets with complete suction and lengthy delivery hose pipes.
17	Tamil Nadu Housing Board / Tamil Nadu Slum Clearance Board	To look after relieving of stagnant water, desilting of storm water drain within slum tenements area, clearing debris & garbage.

S. NO	DEPARTMENT	MITIGATION PLAN
18	Fisheries Department	To provide boats and catamarans as and when required by Fire Service Department, Police Department etc. To keep ready the contact details of boat operators engaged in rescue operation.
19	General Officer Commanding Head Quarters	To consider the suggestions made.
20	Director of Veterinary Service	To consider the suggestions made.
21	Greater Chennai Police	The communication equipment shall be installed in the Control Room of Ripon Building. To share informations like traffic clogging due to water stagnation, tree fall, status of traffic flow in subways etc.
22	Army Commandant	Will deploy Army personnel and other resources as and when the situation arises at their command.
23	Director of Ex-Servicemen	They will render assistance in the flood affected areas in the rescue operations.
24	Coast Guard	To render assistance in flood affected areas using their resources in the rescue operations.
25	Red Cross Society	For assisting in the flood affected areas with vehicles, men and materials.
26	Blue Cross, NGO, Volunteers	To render assistance with men and materials.
27	Chennai Metropolitan Development Authority	To consider the suggestions made.
28	Collectors of Chennai, Thiruvallur & Kancheepuram	Flood warning message shall be propagated to public if necessary in cooperation with GCC. Distribution of relief materials incase of huts damages, diseased cases etc. To identify and clear the encroachments.

9.0 ENHANCING DISASTER PREPAREDNESS

“Experience indicates that disaster preparedness needs to be strengthened for more effective response and ensure capacities are in place for effective recovery. Disasters have also demonstrated that the recovery, rehabilitation and reconstruction phase, which needs to be prepared ahead of the disaster, is an opportunity to «Build Back Better» through integrating disaster risk reduction measures. Women and persons with disabilities should publicly lead and promote gender-equitable and universally accessible approaches during the response and reconstruction phases”

- Sendai Framework for Disaster Risk Reduction 2015-2030

Enhancing disaster preparedness for effective response and “Build Back Better” in recovery, rehabilitation and reconstruction comprises is the fourth priority area of the Sendai Framework. Resilience of community, resistance to risks and avoidance of risks requires strengthening and enhancement of preparedness to ensure that the response to different disasters is effective through multistakeholder involvement. It also involves mitigation measures following systems approach.

9.1 Data Analytics for Strengthening Preparedness and Response

Big Data Analytics can play a significant role in strengthening management during different phases of the disaster. Data analytics enables real-time data analysis not only to map the most affected disaster areas, but also to uncover hidden patterns, unknown correlations and other vital information to make decisions and issue alerts before disaster onset and thereby help in effective preparedness, risk communication, response and relief & build back better strategies. The descriptive, predictive and prescriptive analytics will be used in multiple ways to handle disaster management more effectively during different phases of disaster.

9.2 Build Back Better for Rehabilitation and Reconstruction

Though all disasters pose multiple challenges, each disaster throws up new challenges and provides insights into the vulnerabilities even in areas that are considered to be safe. Systems approach sees opportunities in these challenges to build resistance of the communities and transform areas resilient to disasters through innovation, redesigning, retrofitting, capacity building and social inclusion. Government of Tamil Nadu has been facing these challenges and each time

responds by adopting build back better philosophy in the rehabilitation and reconstruction projects. Taking into account the vulnerabilities being faced by Tamil Nadu the build back better strategies through systems approach will focus on different vulnerabilities such as urban floods.

9.3 Collaboration with International and Domestic NGOs

Greater Chennai Corporation has established partnerships through MoUs with international NGOs such as the Rockefeller Foundation funded 100 Resilient Cities, C40 and GIZ, the German Development Agency. These organizations have been supporting GCC's efforts to strengthen resilience building efforts across various projects. Most recently, GCC and 100 Resilient Cities launched the Chennai City Resilience Strategy in June 2019 which features over 80 actions and recommendations that address vulnerable communities, disaster preparedness and planned urbanization, among other issues. GCC has also been collaboratively working with Chennai City Connect, a local NGO, on restoration of waterbodies.

9.4 Command and Control Centre

Command Control Centre is an integrated place for analysing, planning and decision making to deliver secure & healthy environment to citizens. Smart governance through Command and Control Centre (CCC) will improve delivery of services to citizens, businesses and will engage citizens in the process of governance through interaction.

CCC aims to provide a comprehensive view of all the smart initiatives undertaken by Authority with the focus to serve as a decision support engine for city administrators in day-to-day operations, and during disaster management situations. Major components part of the Command and Control Centre implementation are as follows.

- Command and Control Centre in Ripon Building
- Smart Data Centre Solution – Hosted on Cloud
- Smart Sensors for rainfall, environment and flood monitoring across Chennai
- Variable Messaging Board
- City Surveillance System & Disaster Management System
- Mobile Command & Control Centre
- Smart Poles with Public Announcement Systems and Emergency Call Box

- ICT based Smart Solid waste/bin management system
- Integration of Smart Parking system
- Laying & Commissioning of Fibre Network for connecting sensors

9.5 Storm Water Drains

In order to prevent flooding in the city, Greater Chennai Corporation maintains the storm water drain network to a total length of 2071 km comprising of 8835 storm water drain structures. Besides, this, the Greater Chennai Corporation also maintains 31 canals for a total length of 49 km, which include Kodungaiyur Canal, Captain Cotton Canal, Padikuppam Canal.

In accordance with the policy of Greater Chennai Corporation to provide infrastructure facilities to the extended areas on par with the core Chennai city, for avoiding water inundation by safe disposal of rainwater, integrating the available tanks and lakes for disposal of the rainwater, rainwater harvesting and recharging of ground water and improvement in overall hygiene for sound health, the Greater Chennai Corporation has prepared a Detailed Project Report for Kosasthalaiyar, Cooum, Adyar and Kovalam Basin for the length of 1069.40 km of Integrated Storm Water Drain network.

In first phase, Construction of Integrated Storm Water drain in Adyar and Cooum basins, have been completed to a length of 406 Km under World Bank fund under Tamil Nadu Sustainable Urban Development Project (TNSUDP). 7 lakhs people living in Ambattur, Valasaravakkam and Alandur areas have been benefitted.

As far as Construction of Integrated Storm Water Drain in Kovalam basin in M1,M2 & M3 components has to be taken up for a length of 360 Km under KfW fund the German Development Bank. Peoples living in Thoraipakkam, Perungudi, Pallikaranai, Palavakkam, Injambakkam, Karapakkam and Madipakkam Palavakkam, Kottivakkam, Neelangarai, Injambakkam, Sholinganallur, Kanathur and Uthandi are benefitted.

The construction of Integrated Storm water Drain Network in Kosasthalaiyar Basin to a length of 769 km in Greater Chennai Corporation under Asian Development Bank (ADB) have been taken up and work is in progress. Peoples living in Ambattur, Manali ,Madhavaram and Thiruvotriyur are benefitted.

Further as per the suggestions made by flood monitoring IAS Officers and as per DPR prepared by the consultant appointed by TNUISL storm water drain works have been taken up in core Chennai City in 527 locations under CMCDM and Smart City Fund, for prevention of stagnation of rain water.

Further Government of Tamil Nadu has allocated Rs.25 crore under TURIP fund for demolition and reconstruction of the major dilapidated Arch drains of Konnur High Road and Egangipuram canal and for the construction of storm water drain in the surrounding areas to a total length of 4.18 km and all the storm water drain works have been completed after carrying out the resettlement of the 370 slum families encroached over the Arch drain in the TNSCB tenements.

Government has Constituted an Advisory Committee for the management and mitigation of floods in Chennai metro on 21.06.2021 headed by Dr. V. Thiruppugazh IAS. Retired, Former Additional Secretary / Advisor, NDMA comprising of experts from IIT Bombay, IIT Madras, NRSC, Town and Contry planning organisation, New Delhi, Anna University, WRD, CMWSSB, CRA, CMDA, Department of Environment.

The Advisory Committee submitted the first interim report to Government on 03.01.2022 and second interim report on 17.05.2022.

As per the recommendations in interim report, Government of Tamil Nadu has announced the special fund for flood mitigation works. Based on the recommendation of the committee new projects are taken up for flood mitigation works under various funds such as Singara Chennai 2.0 phase I, Singara Chennai 2.0 phase II, I and A fund, Flood relief fund, etc.,

9.6 Rainwater Harvesting

A critical resilience solution, rainwater harvesting is the accumulation and storage of rainwater for reuse on-site, rather than allowing it to run off. Tamil Nadu is a pioneer in implementing the rainwater harvesting programme in the country. The state was one of the first states in India to make installation of rainwater harvesting structures mandatory for both old and new buildings. This success story of Chennai can be replicated throughout the country as the city's residents have ensured that rainwater is stored rather than adding to the storm water drains. Greater Chennai Corporation and Chennai Metropolitan Water Supply and Sewerage Board have

taken steps to strengthen rainwater harvesting across the city.

Restoration and Rejuvenation of Mambalam Canal

Restoration and rejuvenation of Mambalam Canal with retaining walls at required places, landscaping on the vacant lands available on both sides of the canal and provision of interventional modular STPs at various vantage points, adopting new initiatives like floating wetlands etc., will benefit the adjoining area, will give an appealing look to Chennai City.

9.7 Maintenance of Waterbodies and Urban Lakes

There are 210 waterbodies in Chennai city.

Waterbodies / Urban lakes are an intrinsic part of the urban ecosystem. They have traditionally served the function of meeting water requirements of the people for recharging of ground water, preventing water logging and flooding in neighbourhood. For centuries, these waterbodies played a vital role in ensuring water security to Chennai and its surrounding areas. Now, there is an urgent need to review these waterbodies and rejuvenate their ecosystem, thereby ensuring sustainable water security.

Out of the 210 waterbodies, Restoration of 173 Waterbodies have been completed under various funds such as smart city fund, Capital fund, CSR fund, and CMCDM fund. Restoration of 11 waterbodies are in progress under CMCDM fund. Restoration of 2 waterbodies are in progress under Namakku namme thittam. Restoration of 12 waterbodies have been taken up under Singara Chennai 2.0 fund and estimates prepared for 6 waterbodies to be taken up under Singara Chennai 2.0 fund. Proposed to take up 5 waterbodies for restoration under AMRUT scheme. Proposed to take up Eco restoration of Kadapakkam lake under GEF grant of ADB. Villivakkam Tank which is of 25.5 acres is being taken up for eco restoration and rejuvenation at a cost of Rs. 24 crore. This will serve as big water holding tank for Villivakkam and also will house lots of recreational activities apart from relieving water stagnation at Sidco Nagar area. This is taken up with Smart City Fund.

On completion of all these projects additional 1 TMC of water would be stored in these waterbodies and shall recharge the groundwater table and also relieve the water stagnation in neighbourhoods.

9.8 Maintenance of Canals

Greater Chennai Corporation is maintaining 30 canals for a length of 49 kms. 2 Amphibian Vehicle is used to clean the major canals and 4 robotic excavators and 3 mini Amphibian are used to clean the canals by removing water hyacinth, rank vegetation, floating materials and de silting. All canals are being cleaned twice in a year. The carrying capacity of the canal has been increased thereby storm water flow capacities of canals are enhanced.

9.9 Urban Floods – A Comprehensive Plan for Chennai

A comprehensive plan for Chennai and peri-urban areas to address the recurring water stagnation, vulnerability in these areas is being prepared. The various mitigation measures that will be implemented are detailed below:

9.9.1 Comprehensive Flood Protection to Minimize Risks in Greater Chennai and its Peri-urban Areas

The rapid urbanisation of Greater Chennai and peri-urban areas falling in the neighbouring Districts of Kancheepuram and Thiruvallur has created huge stress on the existing urban infrastructure and also necessitated the creation of infrastructure anew in the pockets of urbanisation. One of the adverse consequences of the rapid urbanisation is the change in land use pattern resulting in a situation where new colonies have sprung up on a massive scale in the erstwhile farmlands and waterways of the innumerable waterbodies, that dot the landscape of Chennai, Kancheepuram and Thiruvallur Districts. Greater Chennai and its peri-urban areas are spread over an almost flat terrain along the coastal plains, having an average altitude of only 4.00m to 6.00m above Mean Sea Level. The entire surface runoff drains into the Bay of Bengal only through the outlets namely, Ennore creek on the north, Cooum and Adyar river mouths in the centre and Kovalam creek in the south. The drainage network behind the above outlets formed with natural flood bowls like Ennore backwaters, Pallikaranai marshland and Muttukadu backwaters spread over tidal flats and vast areas of floodplains along the natural rivers, are no longer able to render their functions due to the changes in the land use induced by rapid urbanisation and industrial needs resulting in inundation in the upstream areas. The discharging capacities of the abovedischarging outlets are also under severe stress due to shrinking of the width of the creeks/river mouths and inlets that pass through the marshlands, as a consequence of multiple factors that include

1. Encroachments,
2. Siltation,
3. Change in land use pattern,
4. Existence of naturally formed ecologically sensitive shoals within the creek,
5. Sedimentation due to littoral movements,
6. Accumulation of garbage along the waterways and
7. Increased tide level during extreme weather condition.

The new land use pattern has not only thrown up several challenges for the urban planners but also threw new challenges for disaster management. These new challenges get pronounced during the monsoonal periods since several

buildings have been established in the many of the waterbodies, waterways, floodplains and farmlands. Coupled with the rapid urbanisation, the emergence of industrial establishments in the flood bowls and floodplains resulted in disruption of the erstwhile drainage system in the watersheds of the four major rivers traversing the three districts of Chennai, Kancheepuram and Thiruvallur. The disruption of the drainage system has compounded the fragility of the ecosystems such as creeks and marshlands impacting the flood mitigating service rendered by these ecosystems. The mitigation measures proposed to avert flooding problems in the newly developed areas include

1. Delineation of the flood-prone areas in the fringes of flood bowl and in the flood plains and evolving suitable method for draining the run-off from these areas by constructing flood walls on the boundary of flood bowl /rivers and collection wells for storm water with suitable pumping mechanism to drain the water into the river system.
2. Forming link canals and diversion canals for discharging surplus of tanks into the river system wherever feasible.
3. Where roads have been formed in the erstwhile waterways, cut and cover conduit system will be adopted to ensure proper drainage.
4. Installing decentralized incinerators to dispose the generated garbage effectively instead of the routine practice of dumping those (landfills) in the waterbodies.

The Greater Chennai city and its urban neighbourhoods are spread over the river basins of Kosasthalaiyar, Cooum, Adyar and Kovalam which are connected through the Buckingham Canal formed parallel to the coast in the tidal flats. This system also functions as a unique system for draining surface run off from the isolated water sheds sandwiched in the above 4 basins through the river mouths viz., Ennore creek, Cooum river mouth, Adyar river mouth and Kovalam creek. All these systems will be treated holistically to mitigate the risks for which detailed estimates are being prepared and taken up in a phased manner. The financial requirement is expected to be about Rs.2800 crores.

9.9.2 Integrated Cooum River Eco-Restoration Plan

The Eco-restoration activities (60 subprojects) for a 27.33 km stretch of the

river between Paruthipattu and the river mouth are under progress. The stretch of Cooum River in the urban and peri-urban areas of Chennai is being rehabilitated and restored by implementing Cooum River Eco-Restoration Project in which the following works are under progress through the line departments namely PWD, GCC, CMA, DRD, CMWSSB and TNSCB under the coordination of CRRT:-

1. Desilting, demarcation and fixing boundary stones and bio-metric survey and improvements to the river like forming inner canal, providing rip rap cover for the inner canal with Geo textile fabric base, providing coconut blanket on the river banks to prevent erosion.
2. Solid waste removal, fencing, boom deployment for collecting and removing floating and suspended debris, developing parks, cycle tracks and walkways
3. Solid waste removal, fencing and developing parks
4. Laying interceptors, installing modular sewage treatment plants and UGSS
5. Resettlement and Rehabilitation Plan
6. Mangrove development, flora plantation, community education programmes and monitoring of project implementation.

By implementing the above scheme flood risk mitigation, environmental enhancement and ground water potential improvement are assured. The restoration works were started in 2016 and the Government has accorded Administrative Sanction of Rs 604.77 crores for the short-term phase of the project.

9.9.3 Adyar Basin

9.9.3.1 Ecological Restoration of Adyar Creek and Estuary – 358 acres (Phase I & Phase II)

The Government of Tamil Nadu conceived an ambitious and pioneering project in wetland conservation for the restoration of 358 acres of Adyar creek and estuary. Phase I included restoration activities such as removal of solid waste, increase in tidal interaction and planting of native species of plants which were undertaken in 58 acres of Adyar creek. This area is called Adyar Eco Park. After the completion of restoration activities, this wetland has undergone a remarkable transformation with a sizeable increase in faunal diversity and tidal interaction. The Eco Park

today functions as a Centre for Environmental Education and Research Activities. To impart knowledge on the environment to the community, particularly for school children, regular environmental education programmes are being conducted in Adyar Eco Park. The restoration of the Phase II Adyar Creek and Estuary (300 acres) was initiated in 2014. To enhance the tidal interaction and to increase the water spread in the degraded creek debris and sludge were removed along with the removal of exotic and invasive species like *Prosopis juliflora*, followed by bund stabilization. About 35,000 mangroves and 50,000 terrestrial saplings have been planted. All the project activities have now been completed in total and regular maintenance work is being carried out.

9.9.3.2 Phase III Adyar River Restoration from Origin to Mouth

The Adyar River has been under heavy anthropogenic disturbance for a very long duration and is highly degraded. The Eco-restoration plan for the entire 42 km stretch of the river from Adhanur lake to the River mouth has been prepared and the major components proposed are sewage management, solid waste management, river channel improvement, rehabilitation and resettlement, biodiversity management and riverfront development. The Government has accorded Administrative Sanction of Rs 555.46 crores in July 2017 for the short-term phase of the project.

9.9.3.3 Interlinking of Adyar River and Palar Basin

2015 December floods revealed that the stretch of Adyar River within Chennai urban limits is incapable of discharging the flood of magnitude exceeding 10-year return period. In order to, minimize the risk due to the floods of higher return period, it is being examined the possibility of diverting the flood waters from the upper reaches of the Adyar River through a flood carrier canal with regulatory arrangements from the surplus channels of Sriperumbudur tank to Palar river by connecting the surplus courses of Pillaipakkam tank and Thenari tank (Neenjal madavu) for which investigations are in progress.

9.9.3.4 Restoration / Formation of the Disrupted Links for the Connection of Minor Irrigation Tanks

The watershed of Pallikaranai marsh land situated in South Chennai Metropolitan limits is having a drainage area of about 225 sq. km. in which 60 and more no. of medium and minor irrigation tanks are situated. Due to the changes

in land use pattern for residential and industrial needs, the channels draining the surplus water of these tanks got disrupted. Hence, in order to convey the surplus water of the tanks safely into Pallikaranai marsh land a proposal for restoration / formation of the disrupted surplus channels with open channels, or closed conduits under the roads or combination of both depending upon the present land use is under consideration at a cost of about Rs.1000 crores. In order to avoid inundation in the low lying areas of Tambaram, Mudichur, Perukalathur areas in Adyar Basin, construction of storm water drain for 4400 meters at an estimated cost of Rs.14.5 crores is in progress under CRIDP 2016 – 2017 scheme through Highways and Minor Ports department. Similarly, in other urban areas in Adyar & Kovalam Basin adjoining Chennai, a proposal for forming storm water drains in areas under the jurisdiction of Highways, Rural Development, Municipal Administration and Town Panchayats is contemplated by the respective departments at an estimated cost of Rs.230 crores. The Greater Chennai Corporation will develop integrated storm water drains in the extended areas.

9.9.3.5 Integrated River Restoration for Buckingham Canal, Kovalam & Ennore

To ensure that the river restoration is holistic and comprehensive three separate studies have been commenced for the preparation of DPR for plugging of outfalls, interception and diversion of sewerage, solid waste management and R&R in the major drains draining into the Adyar River and Buckingham Canal. The Ennore and Kovalam Creeks are highly sensitive ecosystems which play a very important part in the ecological, hydrological and social security of the local inhabitants. Due to the burgeoning population in the Chennai Metropolitan Area, the Ennore and Kovalam Creeks are highly degraded by the disposal of wastewater from surrounding ULBs and industries. In this connection, Detailed Project Report (DPR) for Restoration of Ennore Creek and Kovalam Creek has also been initiated.

9.9.3.6 Master Plan for Waterways and Waterbodies in Chennai Metropolitan Area

The Government of Tamil Nadu has announced in the Assembly its plan to restore 42 waterbodies in CMA. Out of 42 waterbodies planned to be restored, CRRT has already completed the preparation of restoration plans for four lakes, namely Chetpet Lake, KilkatallaiEri, ZaminPallavaramPeriyaEri and Pallikaranai

Narayanapuram Eri. Therefore, the remaining 38 waterbodies are being identified for restoration. To this end, an inventory of tanks and lakes lying within the boundary of Greater Chennai Corporation and those lying outside the boundary of GCC, but within CMA was taken up. This survey identified 200 waterbodies within this area. For the 38 identified lakes, detailed conceptual plans have been prepared. For the remaining waterbodies, baseline data has been collected and detailed conceptual plans will be developed soon and the projects executed in the years to come.

9.9.4 Flood Mitigation measures in Urban areas of Kancheepuram and Thiruvallur Districts

Flood mitigation interventions in both districts will reduce the flood risk in Chennai.

The coastal district of Kancheepuram lies on the western and southern side of Chennai city which spreads over the river basins of Cooum, Adyar, Kovalam, Palar and Ongur. It's entire surface run of drains through rivers namely Cooum, Adyar, Kovalam creek, Ongur and Palar with its tributaries like Vegavathi, Cheyyar, Killiyar, Neenjal Maduvu and isolated independent water sheds of Pallikaranai and Perumbakkam Maduvu draining into sea through Buckingham canal. The rivers in Kancheepuram District are seasonal having floods during the period of heavy rainfall in Northeast Monsoon since the areas close to the coast in the river basins of Kancheepuram like Pallikaranai, Perumbakkam, Tambaram and the urban areas adjoining the rivers are highly prone to inundation during floods due to flat terrain with very low elevations.

The coastal district of Thiruvallur District lies on the western and northern parts of Chennai city which is spread over the river basins of Cooum, Adyar, Araniyar and Kosathalaiyar with its tributaries namely Nandhiyar, Nagariyar and isolated independent water sheds like OtteriNalla, Captain Cotton canal, Kodungaiyur, Redhills etc. draining into Kosathalaiyar through Buckingham canal. The rivers in Thiruvallur District are seasonal having floods during the period of heavy rainfall in Northeast Monsoon since the areas close to the coast in the above isolated water sheds like Manali, Madhavaram, Kolathur, Korattur, Ambattur, Redhills adjoining north Chennai and the urban areas adjoining the rivers are highly prone to inundation during floods due to flat terrain with very low elevations. In order to reduce the flood risk the following intervention in Kosasthalaiyar basin is being implemented and contemplated, among other interventions.

Poondi reservoir, Redhills and Cholavaram tank in Kosasthalaiyar basin are being rehabilitated for an estimated cost of Rs. 10.46 crores under Dam Rehabilitation Improvement Project with World Bank assistance which will also minimise flood risk in North Chennai besides formulating emergency action plan for their flood regulation. It is proposed to desilt to a depth of 1.5 meters in about 50% of the water spread area of the three water model which will minimise flooding problems in the peri-urban areas of North Chennai and also improve the Chennai water supply position during the drought periods. It is also proposed to form sub-surface storage structures in the peri-urban areas of Chennai in Kancheepuram, Thiruvallur and other Districts to reduce flooding problems and also to improve the Ground Water potential by desilting 34 nos. of tanks deeply below the sill level of their sluices for an amount of Rs.20.51 crore.

9.10 Prioritizing Afforestation

The Vardah Cyclonic Storm which made landfall on 12.12.2016 with a wind speed of 120-130kmph, created a sea of devastation. 17,157 trees were uprooted on the roads and 1,478 trees were uprooted in 304 parks. Greater Chennai Corporation has taken sincere efforts to improve the green cover in Chennai City.

GCC had appointed a technical consultant M/s Care Earth Trust Private Ltd., to prepare a plantation strategy. The main scope of this work was to identify the methodology and evolve strategies to increase the green cover in Chennai City and also to identify species which can survive in the local environmental conditions (Native Trees). As part of this strategy, 23000 tree saplings were planted in Chennai City during the financial year 2018-19 at an estimated cost of Rs. 5.29 Crore.

While restoring the tree cover, priority is accorded to the native species that are known to withstand high gusting winds, along with species that have been indigenized several centuries back. Exotic species that are easily uprooted during high winds will be avoided. Further during the current financial year 2019-20 it is proposed to plant 50,000 tree saplings Chennai City

9.11 Fire Accidents

Chennai is at a very high risk category for fire accidents. The analysis was borne out of assessing the population density, residential built-up area and

Industrial areas in these districts. In order to enhance the preparedness of the Fire & Rescue Services Department, the Government of Tamil Nadu has been strengthening the department by procuring modern equipment which can play a significant role in dousing the fires quickly. The Fire Services Training Institute will also be strengthened in the years to come to build the capacity of personnel of the department, as well as act as a nodal agency for building the capacity of First Responders in collaboration with Red Cross and other NGOs.

9.12 Bioshields

Natural disasters like cyclone, tsunami cannot be prevented, but its adverse impacts can be mitigated to a great extent by raising bioshields along the Coast. Bioshields are barriers raised perpendicular to the direction of the wind that is capable of protecting the coastal environment by absorbing the energy from wind, tide and wave action. The coastal sand dunes formed by the action of coastal wind have been stabilized by raising shelter belts. These natural barriers act against coastal disasters and thus protect lives and properties within the coastal zone. It was observed that the intensity of Tsunami was snapped up by a belt of green vegetation and some locations in the path of the 2004 “Indian Ocean Tsunami” escaped almost without damages.

Taking into account the potential of bio-shields in mitigating the risks of nature’s fury, the Government of Tamil Nadu will adopt an integrated approach in restoration and conservation of coastal ecosystems, to promote sustained livelihood and effective coastal protection. Coastal bio-shields besides offering long-lasting solutions are also cost effective. Ennore Creek and Adyar Estuary serve as bioshields.

Furthermore, rapid population increase and urbanization have resulted in increased levels of pollution in cities, towns and the surrounding sub-urban areas. Tree plantations are being raised in the urban and surrounding areas under Chennai’s Plantation Strategy with the objectives of controlling the adverse effects of air, water and noise pollution and improving the aesthetic appearance of these areas and create more lung spaces.

9.13 Climate Change Adaptation Programme

Global warming and consequent climatic change will have deleterious impacts on a host of sectors and climate change induced disasters will be a major

challenge for mankind in the years to come. The vulnerability is expected to be very substantial in coastal ecosystems and coastal communities requiring multi-sectoral interventions and multi stakeholder involvement. The Tamil Nadu State Action Plan on Climate Change (TNSAPCC) has identified inter alia, the following seven major vulnerable sectors,

- Agriculture
- Water Resources
- Coastal Ecosystems
- Forest Ecosystems & Biodiversity
- Habitat – Human as well as Animal
- Health
- Public infrastructure

Greater Chennai Corporation is already restoring waterbodies to adapt to the impacts of climate change. In the coming years, climate change adaptation will be one of the major focus areas.

9.14 Green Climate Fund (GCF)

The Green Climate Fund (GCF) was adopted as a financial mechanism of the UN Framework Convention on ClimateChange (UNFCCC) to assist developing countries in adaptation and mitigation practices to counter adverse effects of climate change. The Department of Environment, the nodal agency for implementing the TNSAPCC in Tamil Nadu, will coordinate efforts with the concerned line Departments in consultation with the National Bank for Agriculture and Rural Development (NABARD) to submit proposals under GCF. GCC is considering the submission of a project for GCF funding.

9.15 Protection and Restoration of Ecosystems

Ecosystems besides providing essential service of maintaining bio-geo-chemical cycles are also extremely important due to the services rendered by them in flood, drought and other disaster mitigation. All the diverse ecosystems are vital for sustainable development. The Government of Tamil Nadu will endeavour to restore the different ecosystems that have been damaged and restore their vibrancy.

9.16 Conservation of Coastal and Marine Ecosystems

The marine and coastal ecosystems of Chennai are of utmost importance for the overall wellbeing of the region including supporting activities such as fishing, shrimp farming, saltpans, shipping and tourism. The most important ecosystems are the mangroves, estuaries, wetlands, marshes, etc. Despite their immense significance, these ecosystems are being rapidly degraded as a result of high population growth, unsustainable development, over-exploitation of natural resources, loss of habitat, loss of biodiversity, pollution and climate change. Therefore, there is an urgent need to conserve, protect and restore coastal and marine ecosystems, to secure back the multiple ecosystem services rendered by them. The Government of Tamil Nadu proposes to continue schemes for protection and conservation of important wetlands like Pallikaranai in 2017-18 and the coming years.

9.16.1 Eco-Restoration of Interface Ecosystems

The interface ecosystems are very heterogeneous and include macrotidal estuaries, marsh lands, mangrove dominated wet lands, creeks, beach sands etc. These ecosystems play a vital role ecologically through the multiple services rendered by them. They also help in flood mitigation and water absorption to recharge the aquifer. The State Government is committed to protecting the estuaries, wetlands, creeks & marshlands.

Pallikaranai Marsh Land a unique freshwater swamp located within the Chennai Metropolitan area situated in parts of Perungudi, Pallikaranai and Thoraipakkam villages of Kancheepuram districts will be reclaimed & restored. An area of 690.65 ha is under the control of Tamil Nadu Forest Department and a comprehensive scheme will be implemented over for a period of five years from 2017-18 with an outlay of about Rs.250 crores, for taking up various restoration activities like habitat improvement, protection, research, monitoring, publicity and awareness. Conservation Authority Pallikaranai Marshland has been constituted to monitor all the activities.

The Government will also launch special programmes for restoration and protection of Ennore Creek.

9.17 Integrated Development of Vulnerable Areas

Disasters can wipe out years of development within minutes or even seconds as is the case during tsunami and earthquakes, within hours / days as in the case

of cyclonic storms and over a prolonged period as in the case of as in the case of a creeping disaster like drought. The risks get accentuated in view of the extreme weather events, unplanned urban development, indiscriminate over exploitation of various ecosystems. Therefore, the integrated development of vulnerable areas will be achieved through special mitigation measures, mainstreaming disaster risk concerns into the sectoral schemes and convergence of different structural & non-structural schemes.

APPENDIX - I

Contacts

Control Rooms

Sl.No.	Office	Contact No.
1	Chief Secretary Control Room	25671388/25670372
2	Secretariat EPABX	25665566
3	Revenue Department	25671821
4	State Relief Commissioner	28593990/28593988/1070(Toll free)
5	Director General of Police	28447777
6	Commissioner of Police Control Room	23452359 - 362
7	Home Guards	9443312255/25385740(R)/28441617(O)
8	Collectorate, Chennai	1077(Toll Free)/25268320,21,22
9	Public Works Department	28410402 – 10/Ext. 194
10	Highways Department	28544370
11	Fire & Rescue Services Department	28294132,30,35,65
12	IMD, Chennai	28271951/28230091/28230092/28230094
13	Indian Coast Guard	25395016/23460404
14	Fisheries	24341757
15	Greater Chennai Corporation Satellite Phone	8991119501
16	Commissionerate of Revenue Administration and Disaster Management Department Satellite Phone	81742, 81743

State Emergency Operation Center in CRA office

Toll Free	1070
Land Line	044 - 28414513 044 - 28593990
Fax	28410577 28414512
E-mail	tnstateeoc@gmail.com

NAME/DESIGNATION	OFFICE PHONE NO.
Hon'ble Mayor	044-25384438 044-25619300
Deputy Mayor Office	044-25382979 044-25619210

NAME/DESIGNATION	MOBILE NO.	OFFICE PHONE NO.
COMMISSIONER	9940067508	044-25381330 044-25619200
Joint / Deputy Commissioner (Works)	9445190998	044-25384231 044-25619351
Joint / Deputy Commissioner (Health)	9445190996	044-25619336 044-25386386
Joint / Deputy Commissioner (Education)	9445190997	044-25383693 044-25619205
Deputy Commissioner (R&F)	9445190995	044-25384231 044-25619306
Assistant Commissioner(GA&P)	9445190300	044-25619231 044-25303633
Chief Engineer (General)	9445190734	044-25383692 044-25619317
Chief Engineer(Buildings / Bridges)	9445190016	044 - 25619369 044-25619899
Chief Engineer(Parks)	9445190500	044-25303279
Chief Engineer(Planning)	9499956219	044-25619371

NAME/DESIGNATION	MOBILE NO.	OFFICE PHONE NO.
Chief Engineer (Mechanical / SWM)	9445190200	044-25383781 044-35619260
City Health Officer(i/c)	9445190744	044-25303665 044-25619330
Senior Law Officer	9445190222	-
Revenue Officer	9445190742	044-25383614 044-25619370
Council Secretary	9445190226	044-25382357 044-25619320
Accountant Officer (H.O.)	9445026005	044-2533801
Veterinary Medical Officer	9445190746	044-25303657
City Medical Officer	9445190857	044-25619338 044-25619334
Addl.City Medical Officer	9445190858	044-25619653
Education Officer	9445190747	044-25619462 044-25619425
Superintending Engineer(Buildings / Roads)	9445190735	044-25619281
Superintending Engineer(Spl.Project / Bridges)	9445190852	044-25619302 / 824
Superintending Engineer (PH, & SWM)	9499956220	044-25619228 044-25303910
Superintending Engineer(SWD)	9445190732	044-25619315 044-25619720
Superintending Engineer (CRRT & Parks)	9445026061	-
Superintending Engineer(Electrical) / T.P	9445190739	044-25619745 044-25619371
Superintending Engineer (Mechanical / SWD)	9445190738	044-25619838

Office Regional Deputy Commissioner (North)

NAME/DESIGNATION	CONTACT NUMBERS
RDC (North)	9445025800, 044-25200025, 9445477695
Deputy Collector (Administration)	9445477657, 044-25201076
Deputy Collector(Revenue)	9445467336, 044-25201076
Addl. GCC. Health Officer	9445026001
Head Accountant Officer	9445026063
Superintending Engineer	9445467372

Regional Deputy Commissioner Office (Central)

NAME/DESIGNATION	MOBILE NO.
RDC (Central)	9445190150 9445190698 044-26640224
Deputy Collector(Administration)	9445477660
Deputy Collector (Revenue)	9443019915
Addl. GCC. Health Officer	9445026002
Head Accountant Officer	9445026037
Superintending Engineer	9445190736

Regional Deputy Commissioner Office (South)

NAME/DESIGNATION	MOBILE NO.
RDC (South)	9445190100 9445190830 044-24425981 044-24425982
Deputy Collector (Administration)	9445191439 044-24425982
Deputy Collector(Revenue)	9445477653
Addl. GCC. Health Officer	9445026003
Head Accountant Officer	9445026036
Superintending Engineer	9445190737

Emergency Contact Numbers

Institution	Contact Number
Police	100
Traffic Police	103
Ambulance	108
Fire Control	101
Ambulance of Fire Services Dept.,	102
Child Line	1098
Women Help Line	1091
Lions Blood Bank	28415959

Institution	Contact Number
Apollo Ambulance	1066
St. Johns Ambulance Association	28194630
Trauma Care Consortium	28150700
Government General Hospital	25305000
Government Kilpauk Hospital	28364951
Govt. Kasturba Hospital for Women	28545449
Institute of Child Health & Hospital	28191135
Government Royapettah Hospital	28483051
Government Stanley Hospital	25281347
Child Trust Hospital	42001800
Voluntary Health Service	22541972
Red cross	044-28554548
Blue cross	044-22354959 / 22300666 / 22300655

Contact details of the Officials at the Zonal level

Zone	Zone Office	Zonal officers	Executive Engineers	Assistant Health officers	Assistant Revenue Officers
Zone 1	04425993494, 9445190201	9445190001	9445190021, 9445194727	9445190061	9445190081, 9445467332
Zone 2	04425941079, 9445190202	9445190002	9445190022,	9445190062	9445190082
Zone 3	04425530427, 9445190203	9445190003	9445190023 9445190482	9445190063	9445190083
Zone 4	04425951083, 9445190204	9445190004	9445190024, 9445190940	9445190064	9445190084, 9790797999
Zone 5	04425206655, 9445190205	9445190005	9445190025, 9445190461	9445190065	9445190085, 9445071039

	City Disaster Management Plan					GCC
Zone	Zone Office	Zonal officers	Executive Engineers	Assistant Health officers	Assistant Revenue Officers	
Zone 6	04426741802, 9445190206	9445190006	9445190026, 9445190038	9445190066	9445190086,	
Zone 7	04426253331, 9445190207	9445190007	9445190027, 9445194759	9445190067	9445190087, 9444576365	
Zone 8	04426412646, 9445190208	9445190008	9445190028, 9445467320	9445190068	9445190088,	
Zone 9	04428170738, 9445190209	9445190009	9445190029, 9445190864	9445190069	9445190709	
Zone 10	04424838968 , 9445190210	9445190010	9445190030, 9445191466	9445190070	9445190090, 9841534974	
Zone 11	04424867725, 9445190211	9445190011	9445190031, 9445190853 9445477702	9445190071	9445190091	
Zone 12	04422342355, 9445190212	9445190012	9445190032, 9445190037	9445190072	9445190092	
Zone 13	04424425961, 9445190213	9445190013	9445190033, 9445190926	9445190073	9445190093	
Zone 14	04422420600, 9445190214	9445190014	9445190034, 9445026083	9445190074	9445190094	
Zone 15	04424500923, 9445190215	9445190015	9445190035, 9555191480	9445190075	9445190095	

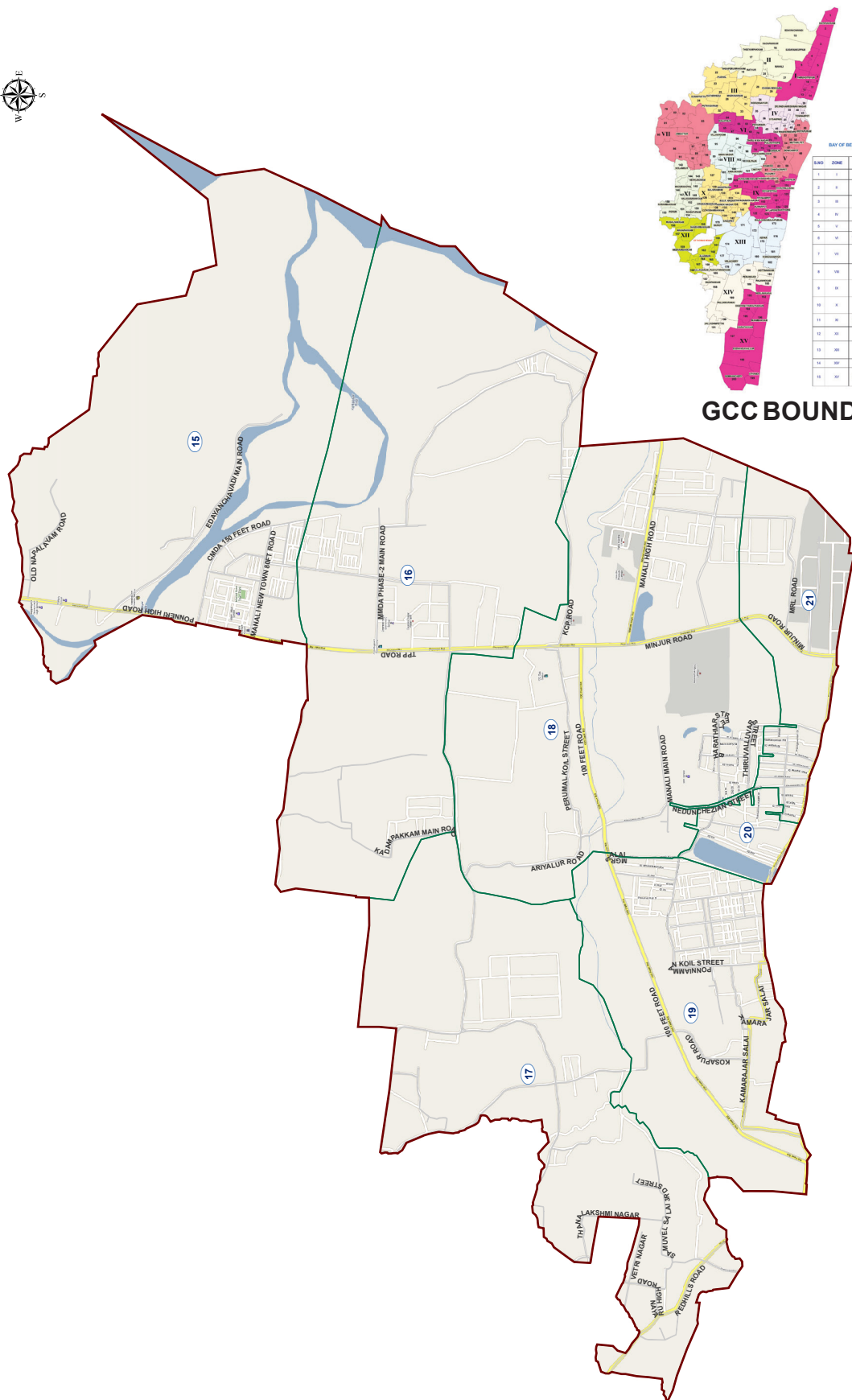
Other Contact Numbers

Institution	Contact Number
Highways Directorate	044 - 22351066
TANGEDCO	1912 / 044 - 28514955 Whatsaap - 9445850829
CMWSSB	044 - 45674567
Chennai Metro Rail	044 - 23792000 1860 - 425 - 1515

ZONE - II

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BAY OF BENGAL			
S.NO	ZONE	NAME OF THE ZONE	WARD NUMBER
1	I	MAHESHWARHULU	1 TO 34
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3	III	MAHESHWARHULU	35 TO 53
4	IV	TONGKALPETA	34 TO 48
5	V	ROCHAMPUR	49 TO 63
6	VI	THIRUVAANANTHURUPURAM	64 TO 78
7	VII	MAHESHWARHULU	79 TO 93
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GCC BOUNDARY

NAME OF THE ZONE	WARD NUMBER
Manali	15 TO 21

Profile

The Manali zone have 8 divisions 15 to 22 lies in Latitude 13.166779°, Longitude 80.258308° and covering to an area of **43.93 Sq.km**

There are 1157 roads, out of which 1147 roads to a length of 182.96 Km are Interior Roads, 10 Roads to a length of 8.20 Km are Bus Route Roads which are maintained by GCC and the remaining 6 roads are under the maintenance of Highways department and 3 roads are under TNRDC

The population is about 1.66 lakhs that has Male population of 52.23% and Female population of 47.77 % in this zone, the most densed area in the zone is MMDA Mathur with a population of 49230 and the least in Vadaperumbakkam with a population of 7550. The Ward wise population of the zone is given below.

SI.No.	Ward. No/Name	Total House Holds	Total Population
1	15 Edayanchavadi	3915	32634
2	16 Andarkuppam	4111	23876
3	17 Vadaperumbakkam	2903	7550
4	18 Manali	3165	14474
5	19 MMDA Mathur	10923	49230
6	20 Manali	3127	14202
7	21 Manali	2465	11460
8	Old Dn – 29 New Dn - 22 Chinnasekkadu	3800	12800
TOTAL		34409	166226

Zone Administration

The Zone is headed by the Zonal Officer who is assisted by one Executive Engineers, Assistant Revenue Officers and Zonal Health Officers. They are equipped with supporting sub-ordinate staff. The following are contact details of the officials/elected members. The responsibilities of each officers are well described in the page number 141 of this booklet. The respective officers/staff may be taken on board to address the issues pertaining to them.

Sl. No.	Designation	Unit/ Ward.No.	Office Mobile Number
1.	Chairman	15 to 22	9444332834
2.	Zonal Officer	15 to 22	9445190002

Engineering Wing

The Engineering Wing handles subjects like maintenance of roads, SWD, street lights, bridges, subways, flyovers, water bodies etc. The designation and jurisdiction with contact details are given below.

Sl. No.	Designation	Unit/ Ward.No.	Office Mobile Number
1	Executive Engineer-1	U-4 & U-5	9445190022
2	Assistant Executive Engineer	U-4 (15,16,17)	9445190104
3	SWD Assistant Executive Engineer (Additional)	U-5 (19, 22)& SWD U-4 & U-5	9445036584
4	Assistant Executive Engineer	U-5 (18, 20, 21)	9445190105
5	Additional Divisional Engineer	15-22	9445190042
6	Assistant Executive Engineer Mechanical	15 - 22	9445190481

Solid Waste Management

There is a dedicated team in each zone that looks after the clearing garbage, maintenance of conservancy vehicles, dump yard and garbage transit stations.

Sl. No.	Designation	Unit/ Ward.No.	Office Mobile Number
1.	Conservancy supervisor	Unit-4	9445191404
2.	Conservancy supervisor	Unit-5	9445191405

Public Health & Disease Control

The Public Health department is headed by Zonal Health Officer at zonal level who handles running of UPHC, spraying for vector control and dog menace reporting to Deputy Commissioner (Health) through respective Regional Deputy Commissioners.

The Zonal Health Officer is to supervise the Medical officers, Entomologist, Sanitary officers, Veterinary officers and co-ordinate with them for general maintenance of health in the zone.

The contact details of the officials/staff to report on complaints on any such issues is given below.

Sl. No.	Designation	Zone/ Unit/ Ward.No.	Office Mobile Number
1	Zonal Health Officer	Zone II	7904132423
2	Zonal Medical Officer	Zone II	9962623876
3	Veterinary Surgeon	Zone II	9445026042
4	Junior Entomologist	Zone II	6380072987
5	Sanitary Officer	Unit-4	6381741865
6	Sanitary Officer	Unit-5	9444090150

Parks

There are 24 Parks available in Edayanchavadi, Andarkuppam, Vadaperumbakkam, Manali & MMDA Mathur. These parks may serve as buffer zone to assemble and alight the victims to the relief centers during disaster. Park Overseer is equipped with power saws and will ensure pruning of tree branches, proper lighting and to prevent inundation inside the parks. The contact details of the Park overseer and the location of parks available in the zone is given below,

Sl. No.	Team member contact No	Equipment available	Area of operation
1	9445071064 Park Overseer	5 - Petrol operator tree cutting Saw 1 - Telescopic Tree Pruner	Manali

S.No	Ward	Name Of Park	Location of the Park
1	15	CPS-6	CPS-6 PARK AT MANALI NEW MANALI NEW TOWN BLOCK 54
2	15	CPS-7	MANALI NEW TOWN BLOCK NO 63 CPS-7
3	15	CPS-8	MANALI NEW TOWN BLOCK NO 65 CPS-8
4	15	CPS-9	MANALI NEW TOWN BLOCK NO 29 & 30 CPS-9
5	15	CPS-10	MANALI NEW TOWN BLOCK NO 26 CPS 10
6	16	TNHB Phase II Park	Park at TNHB Phase 2 Block 3
7	16	CPS-1	Manali New Town Block 134 &135 CPS-1
8	16	CPS-2	Manali New Town Block 100 &101 CPS-2
9	16	CPS-3	Manali New Town Block 90 CPS-3
10	16	CPS-4	Manali New Town Block 52 CPS-4
11	16	CPS-5	Manali New Town Block 78 CPS-5
12	16	Kanniammanpet Park	Kanniammanpet Park (New park)
13	17	Thirupathi Devasthanam Park	Thirupathi Devasthanam Park
14	18	Vimalapuram park	PARK AT VADAPERUMBakkam
15	18	Nedunchezhiyan Street Park	Nedunchezhiyan Street
16	18	Vimalapuram Park	Vimalapuram 2nd Street
17	18	CPCL Park	CPCL 4th Street
18	18	CPCL Layout Park	CPCL Layout
19	18	Andarkuppam Park	Andarkuppam Redhills High Road
20	19	Lake View Park	Lake View Park
21	19	MMDA 34th Street Park	MMDA 34th Street
22	19	MMDA 2nd Main Road Park	MMDA 2nd Main Road
23	20	Chinna mathur Salai park	Chinna mathur Salai
	21	Jalagandamariamman koil street park	Jalagandamariamman koil street

Sewage Pumping Stations

The sewer and drinking water services are being provided by the CMWSSB in Chennai city. There are three pumping stations available in Manali Zone with average capacity of 1.5MLD for each pumping station. These sewage pumping stations are maintained by CMWSSB. All the sewage pumping stations are equipped with different capacity of pumps in working condition. The details of the sewage pumping station are given below,

Sl.No.	Pumping Station	Capacity MLD	No. of pumps – condition
1	Sewage Pumping Station, Manali New Town	1.3 MLD	20HP sub - 1 15HP sub – 2 15Hp sub (spare) - 1
2	Mathur, MMDA Sewage Pumping Station	1.6 MLD	50HP Centrifugal pumpset - 1 20HP Centrifugal pumpset – 2 10HP Centrifugal pumpset - 1
3	Mathur, MMDA Sewage Pumping Station	1.6 MLD	20HPSubmersible pumpset-1
Total		4.5 MLD	

Tamil Nadu Slum Clearance Board tenements

There is no TNSCB tenements in Manali Zone.

Water Bodies and Waterways

There are 2 rivers passing in this zone **(1) Kosasthalaiyar River** which originates from Old napalayam travels about 7.00 Km and disposes via Sadayankuppam B' canal **(2) Puzhal Surplus Water Way** which originates from Sumangali nagar travels about 6.00 Km and disposes via Chittar Sadayankuppam B' canal.

Rivers

Sl. No.	Name of the Canal	Wards Covered	From	To	Length of Canal (Km)
1	Kosathalaiyar River	15,16	Old napalayam	Sadayankuppam B' canal	7.00
2	Puzhal Surplus Water Way	16,17 , 18	Sumangali nagar	Sadayankuppam B' canal	6.00
Total					13.00

There are 11 Canals passing in this zone **(1) Thulasi nagar canal** maintained by GCC which originates from Thulasi nagar travels about 2.2 Km in the zone and disposes via Chittar connection old Nappalayam to Edayanchavadi **(2) Old Nappalayam canal**

maintained by GCC which touches the zone at Vellivoyalchavadi travels about 2.7 Km in the zone and disposes through Kosasthalaiyar river **(3) CMDA canal** maintained by GCC which touches the zone at Vichur travels about 1.2 Km in the zone and disposes through the Kosasthalaiyar river **(4) Periya Eachankuzhi canal** maintained by GCC which touches the zone at Kulakkarai travels about 1.6 Km in the zone and disposes through Kosasthalaiyar river **(5) Ambedkar canal** maintained by GCC which touches the zone at Vembuli amman kulam travels about 1.10 Km in the zone and disposes through Puzhal Surplus water **(6) Kosapur canal** maintained by GCC which touches the zone at Vilankadupakkam travels about 1.0 Km in the zone and disposes through Puzhal Surplus water and **(7) CPCL canal** maintained by GCC which touches the zone at CPCL layout connecting Chinnamathur travels about 0.75 Km in the zone and disposes through Puzhal Surplus water. **(8) Canal from police quarters to 100 feet road** maintained by GCC maintained by GCC which originates from Police quarters travels about 1.8 Km in the zone and disposes via 100 feet road **(9) Canal from tpp salai (cpcl company) to 100 feet road junction** maintained by GCC which originates from tpp salai (cpcl company) travels about 2.0 Km in the zone and disposes via 100 feet road **(10) Canal from police quarters to tpp salai** maintained by GCC which originates from Police quarters travels about 0.55 Km in the zone and disposes via tpp salai **(11) police quarters canal** maintained by GCC which originates from Police quarters travels about 0.15 Km in the zone and disposes via police station.

Greater Chennai Corporation is doing a massive work to remove hyacinth and de-silting work is done by GCC in the canal maintained by them. Cleaning and de-silting of storm water drain & lakes are periodically done by GCC as a pre monsoon preparedness measure. Storm Water Drains were constructed by GCC for a distance of 52.431 km to ease the flow of rain water.

The details of various water bodies in this zone are listed below,

Canals

Sl. No.	Name of the Canal	Wards Covered	From	To	Length of Canal (Km)
1	Thulsi nagar canal and Chittar (connection old Nappalayam to Edayanchavadi)	15	Thulasi Nagar	Chittar	2.2
2	Old Nappalayam canal	15	Vellivoyalchavadi	Kosasthalaiyar River	2.7

3	CMDA Canal (along 80 feet road)	15	Vichur	Kosasthalaiyar River	1.2
4	Periya Eachankuzhi canal		Kulakkarai	Kosasthalaiyar river	1.6
5	Ambedkar Canal	17	Vembuli Amman Kulam	Puzhal Surplus Water	1.1
6	Kosapur Canal	17	Vilankadupakkam	Puzhal Surplus Water	1
7	CPCL canal (CPCL Layout connecting Chinnamathur road to 100' road)	18	Chinnathoppe	Puzhal Surplus Water	0.75
8	Canal from police quarters to 100 feet road	18	Police quarters	100 feet road	1.80
9	Canal from tpp salai (cpcl company) to 100 feet road junction	18	tpp salai (cpcl company)	100 feet road	2.00
10	Canal from police quarters to tpp salai	20	Police quarters	tpp salai	0.55
11	police quarters canal	21	Police quarters	police station	0.15

	Total	15.05
--	--------------	--------------

Other water bodies

(a) Ponds

SI No	Ward No	Name of other water bodies	Length / Area
1	15	Edayanchavadi Pond	1200 m ²
2	16	Elanthanoor - Pond	1320 m ²
3	16	Andar kuppam burial ground - Pond	600 m ²
4	16	Andar kuppam - Pond	720 m ²
5	16	Kulakarai - Pond	1710 m ²
6	16	Kanniamman pettai, Kanniamman Koil st - Pond	1800 m ²
7	16	Kamarajapuram - Pond	750 m ²
8	16	Burma Nagar Pond	300 m ²
9	17	Vinayagapuram Burial Ground - Pond	3082 m ²
10	17	Vadaperumbakkam Samuvel nagar Burial Ground - Pond	2381 m ²

11	17	Kathakuzhi Burial Ground - Pond	5683 m ²
12	17	Kosapur Sree Vempuliamman koil kulam - Pond	6381 m ²
13	17	Kosapur Sree Chelliamman koil kulam - Pond	4382 m ²
14	17	Theeyambakkam - Pond	1632 m ²
15	17	Theeyambakkam Gandhinagar - Pond	4834 m ²
16	17	Chinna thoppu - Pond	4632 m ²
17	17	Chettimedu (Gnayiru Road) Near Sakthiamman koil - Pond	1362 m ²
18	17	Vadaperumabakkam – Pond	2482 m ²
19	18	Harikrishnapuram - Pond	1950 m ²
20	19	Kulakarai - Pond	2760 m ²
21	19	Teachers Colony - Pond	1311 m ²
22	19	Omakulam - Pond	6025 m ²
23	19	Masillamani Nagar - Pond	3595 m ²
24	19	Ellatharasi Street , Manjambakkam	2689.05 m ²
25	19	Pillayara Koil Street, Manjambakkam	1263.6 m ²
26	19	Manjambakkam- Pond	9800 m ²
27	20	Chockammalkulam - Pond	6881 m ²
28	21	Vaniyankulam Pond (Under Court Case)	1440 m ²
29	21	Jalakandamaraimman Koil Street - Pond	2300 m ²
30	22	Devaraj Street Ramalinga Kulam	540 m ²

(b) Lakes

SI No	Ward No	Name of other water bodies	Length / Area
1	16	Sadayankuppam - Lake	PWD
2	16	Kadapakkam - Lake	PWD
3	17	Ariyalur - Lake	PWD
4	20	Manali Lake	TANUVAS

ZONE II - WATER BODIES

OTHER WATER BODIES

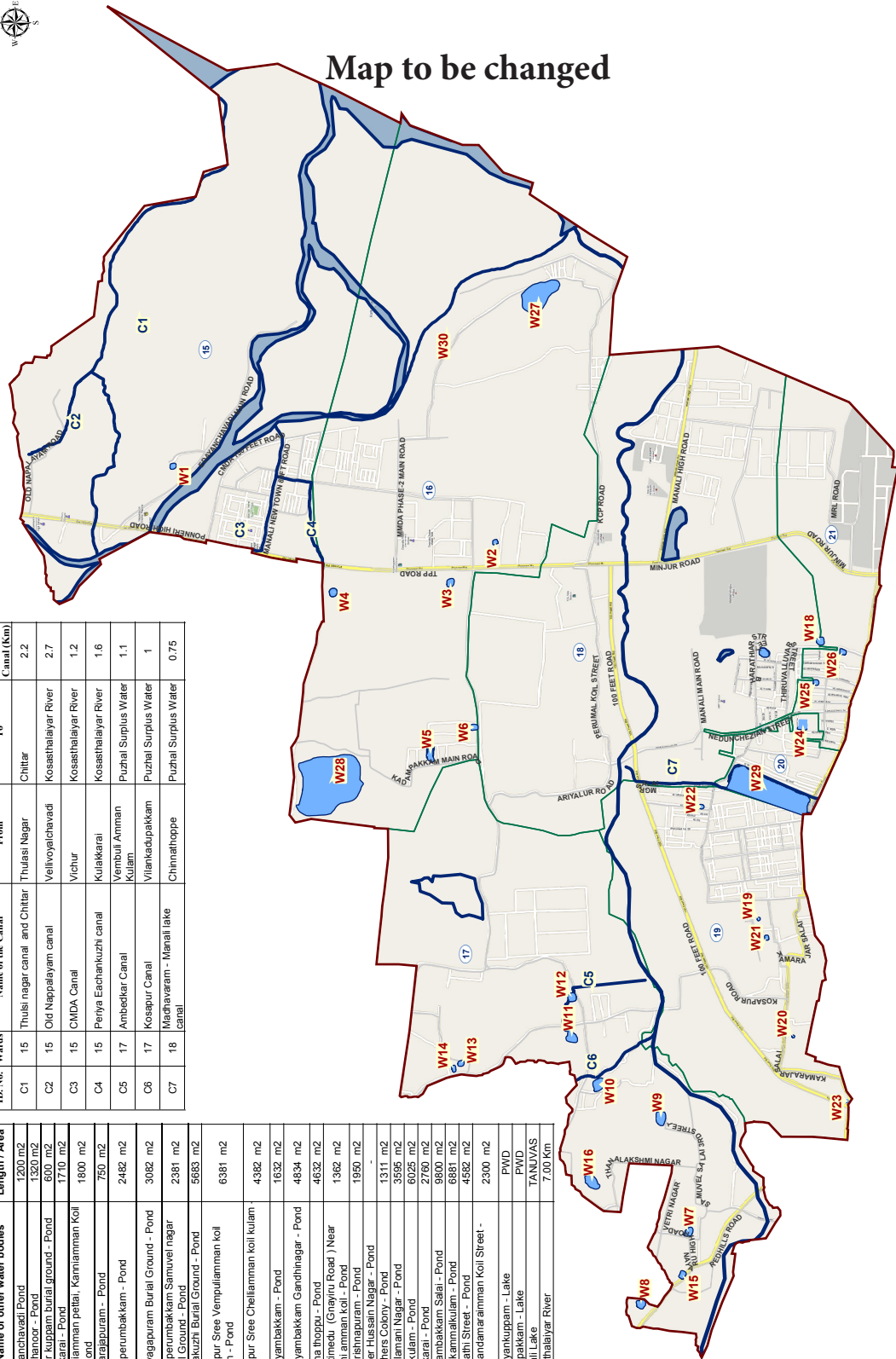
ID. No.	Ward	Name of other water bodies	Length / Area
W1	15	Edavanchavadi Pond	1200 m2
W2	16	Elanthanoor - Pond	1300 m2
W3	16	Andar kuppam burial ground - Pond	600 m2
W4	16	Kulakeral - Pond	1710 m2
W5	16	Kamiamman pettai, Kamiamman Koll - Pond	1800 m2
W6	16	Kanarajapuram - Pond	750 m2
W7	17	Vadaperumbakkam - Pond	2482 m2
W8	17	Vinayagapuram Burial Ground - Pond	3082 m2
W9	17	Vadaperumbakkam Samuvel nagar Burial Ground - Pond	2381 m2
W10	17	Kathakuzhi Burial Ground - Pond	5683 m2
W11	17	Kosapur Stee Vempuliamman kollulam - Pond	6381 m2
W12	17	Kosapur Stee Chelliamman kollulam - Pond	4382 m2
W13	17	Theyanbakkam - Pond	1632 m2
W14	17	Theyanbakkam Gandhinagar - Pond	4834 m2
W15	17	Chinna thoppu - Pond	4632 m2
W16	17	Chettimedu (Gnayiru Road) Near Sakthi amman koll - Pond	1382 m2
W17	18	Harkrishnapuram - Pond	1950 m2
W18	18	Zaneer Hussain Nagar - Pond	-
W19	19	Teacher's Colony - Pond	1311 m2
W20	19	Masilanani Nagar - Pond	3595 m2
W21	19	Onakulam - Pond	6025 m2
W22	19	Kulakeral - Pond	2760 m2
W23	19	Manjambakkam Salai - Pond	9800 m2
W24	20	Chockammakulam - Pond	6881 m2
W25	21	Sannathi Street - Pond	4582 m2
W26	21	Jalekandaraman Koll Street - Pond	2300 m2
W27	16	Sadayankuppam - Lake	PWD
W28	16	Kadapaikkam - Lake	PWD
W29	20	Manali Lake	TANUVAS
W30	16	Kosathalayar River	7.00 Km

CANAL

ID. No.	Wards	Name of the Canal	From	To	Length of Canal (Km)
C1	15	Thulasi nagar canal and Chittar	Thudasi Nagar	Chittar	2.2
C2	15	Old Nappalayan canal	Vellivoyalchavadi	Kosathalayar River	2.7
C3	15	OMDA Canal	Vichur	Kosathalayar River	1.2
C4	15	Periya Echchakuzhi canal	Kulakeral	Kosathalayar River	1.6
C5	17	Ambedkar Canal	Vembul Amman Kullam	Puzhal Surplus Water	1.1
C6	17	Kosapur Canal	Vilankadupakkam	Puzhal Surplus Water	1
C7	18	Madhavaram - Manali lake Canal	Chinnathoppe	Puzhal Surplus Water	0.75



Map to be changed



Storm water drain

The SWD network of any urban centre is a vital network that plays a critical part during the monsoon by facilitating draining of run off rain water from roads etc. The speed at which the rain water is drained obviating inundation depends on the extent of the network as well as in its merit.

This is one of the newly added zones, there is no integrated storm water drain network available in this zone. However there are Katcha drain and in few places SWD are available. Construction of SWD in this area is covered under Kosasasthalaiyar Basin for which fund tie up is under study from JICA.

263 storm water drains to a length of 56.57 Km were constructed to ease the flow of rain water in Manali zone. The details of SWD and instructions to be followed before and during rain are given below.

Sl. No.	Ward	Total No. of SWDs	Length of SWDs in 'Km'
1	15	12	2.175
2	16	6	4.87
3	17	2	2.90
4	18	95	11.76
5	19	21	12.50
6	20	50	8.52
7	21	35	8.185
8	22	42	5.66
	Total	263	56.57

Water stagnated streets in the previous monsoon - heavy rain fall

During the last monsoon, 4 inundated spots in this zone were identified and actions were taken to bale out the rain water. Most of the locations were flooded during the North-East Monsoon 2015 due to heavy rain and overflow of upstream water in the canals and water bodies in this Zone. The identified vulnerable spots and the actions taken to dispose the rain water in each location are as below,

S.No	Ward	Streets where inundation seen	Capacity of pumps	Location of pumps	Disposal point
1	15	Manali New Town 29, 28, 30 and 31 st Street	5 HP	At the Street Corner	Near by SWD
1	15	EDAYANCHAVADI	25HP-1NO 10HP-1NO 7.5HP-1NO 7HP-1NO	Edayanchavadi 2nd cross street and near by pond	Kosasthalaiyar river
2	15	CHINNA EACHANKUZHI	25HP-1NO	Near Thulukat-hamman koil	Thulasi nagar canal to Kosasthalaiyar river
3	15	NEW NAPALAYAM	7HP-1NO	Adjacent side of the kossasthalaiyar river bund	Kosasthalaiyar river
4	15	OLD NAPALAYAM NEW COLONY	25HP-1NO	Junction of TPP salai	Disposal to tulasi nagar canal through swd
5	15	Manali NEW TOWN 53, 54 & 55TH BLOCK	-	Natural flow	Natural flow to Kosasthalaiyar river
6	15	Manali NEW TOWN 63, 65, 66, 67, 68, 69, & 70TH BLOCK	25HP-1NO 7HP-1NO 5HP-2NOS	Junction of 49th steet and Junction of 51st steet	Pumped into swd and cmda canal then disposed to Kosasthalaiyar river
7	15	MAHALAKSHMI NAGAR KUDISAI PAGUTHI	-	Natural flow	Natural flow to Kosasthalaiyar river
8	16	TNHB Phase-I Block –I	25HP	TNHB Phase1 block2 20feet road 1st &2nd street	Vacant land & SWD 80feet main road then Kosasthalaiyar river
9	16	TNHB Phase –II Block –II	25HP	TNHB Phase1 block2 20feet road 2nd street	Vacant land & Manali new town swd 80feet main road then Kosasthalaiyar river
10	16	RL Nagar	No pump	Natural flow	Natural flow to Kosasthalaiyar river
11	16	Rajiv Gandhi Nagar	25HP	Rajiv Gandhi main road	Highways 200feet main road swd
12	16	Sadayankuppam Irular Colony	No pump	Natural flow	Natural flow to Kosasthalaiyar river

S.No	Ward	Streets where inundation seen	Capacity of pumps	Location of pumps	Disposal point
13	16	Manali New Town 20th Main Road 80feet road	25HP	Manali new town 20th main road	Manali new town 80feet main road swd to Kosasthalaiyar river
14	16	Kulakarai Vichur Main Road	65HP	Junction of kulakarai vichur main road	Highways 200feet main road swd to Kosasthalaiyar river
15	16	Elanthanur Perumal Kovil Street	50HP	Elanthanur perumal koil street	Highways 200feet main road swd to Kosasthalaiyar river
16	17	Thiyakiviswanadhadas Nagar	50HP 35HP	Thiyakiviswanadhadas nagar	Open land to Puzhal surplus river
17	17	Chettimedu	5HP	Mari amman koil street	Vadaperumbakkam kosapur link road to Puzhal surplus river
18	17	Puzhal union Road	-	Natural flow	Puzhal surplus river
19	17	Balaji Nagar	5HP	Balaji nagar	VCN salai to Puzhal surplus river
20	17	Kosapur Bridge Apporach	-	Natural flow	Puzhal surplus river
21	17	Saraswathi Nagar		Natural flow	When Puzhal surplus water level decrease stagnation of water Naturally drain.
22	17	Dr. Ambedkar Nagar (Burial ground)	5HP Diesel	Ambedkar nagar	andarkuppam redhills road
23	17	Thanikachalam Nagar Vadaperumbakkam	50HP	Thanikachalam nagar	VCN salai
24	18	KALAIgnar NAGAR	10HP-1NOS 25HP-1NOS	Kalaignar nagar 3rd lane	Pumped into vaccant land disposal to Puzhal surplus
25	18	CPCL NAGAR	-	Natural flow	Puzhal surplus river
26	18	HARIKRISHNAPURAM	25HP-1NOS 10HP-1NOS 3HP-1NOS	Near perumal koil	Pumped into swd eswaran koil street then disposed to zahieer hussain canal

S.No	Ward	Streets where inundation seen	Capacity of pumps	Location of pumps	Disposal point
27	18	ZAHIEER HUSSAIN 2ND STREET	10HP-1NOS 3HP-1NOS	Junction of zahieer hussain cross lane	Zahieer hussain canal to Puzhal surplus river
28	19	KAVITHENDRAL KALYANA SUNDHARAM NAGAR(VACANT LAND)	100HP-2NOS	Kavithendral kayana sundharam nagar(near narachimman land)	200ft highways road culvert point to bala subramaniam nagar to Puzhal surplus river
29	19	BALASUBRAMAN NAGAR	NO PUMP USED	Natural flow	Puzhal surplus river
30	19	KAMARAJAR NAGAR,CHINNASAMY NAGAR,PONNIAMMAN KOIL STREET (VACANT LAND)	50HP-5NOS 10HP-1NOS 5HP-2NOS	1) 50hp-kamaraj nagar, 2) 50hp- kamaraj nagar (near nadar chatharam) 3)50hp-2nos- kamarajar nagar, 4)50hp-kamarajar nagar 5)10hp-kamarajarnagar, 6)5hp- kamarajar nagar	swd drain at ponniamman koil street then to thanuvas lake and cpcl canal
31	19	APOLLO ARMSTRONG NAGAR	50HP-2NOS	Apollo armstrong nagar	200ft road culvert point then to Puzhal surplus river
32	20	NEW MGR NAGR 1st STREET	40HP-1NOS	New mgr nagr 1st street	JJ nagar
33	20	BALARAMAN STREET	40HP-1NOS	Balaraman street	Chinnamathur salai swd
34	20	KAMARAJAR SALAI	40HP-1NOS	Kamarajar salai	Sathakadu lake
35	20	KALTHOTTAM MGR STREET	5HP-1NOS	Kalthottam mgr street	CPCL Drain
36	20	JJ NAGAR	NO MOTOR	Natural flow	Mathur Lake
37	20	OTTRAIVADAI STREET	NO MOTOR	Natural flow	Puzhal surplus river
38	21	JALAKANDA MARIAMMAN KOIL STREET- (3RD LANE)	10HP-1NOS 5HP- 1NOS	Jalakanda mariamman koil street	Via side drain to zahieer hussain canal
39	21	NEDUNCHEZHIAN STREET	100HP-1NOS	Nedunchezhan street	Puzhal surplus river
40	22	Perumal koil Extension	50HP - 1, 25HP - 1	Gandhi nagar perumal koil street	Futura Layout
41	22	Devarajan street	25HP - 2	Raji street	Gandhi nagar perumal koil street

S.No	Ward	Streets where inundation seen	Capacity of pumps	Location of pumps	Disposal point
42	22	Vazhuthalaimedu main road	25HP - 1, 50HP - 1	Balji palayam perumal koil street	Velu street
43	22	Velu street	25HP - 2	Kanapiran koil street	Futura Layout
44	22	Kannapiran koil street	25HP - 1	Kanapiran koil street	Futura Layout
45	22	Vedhagiri cross street	25HP - 2	Vedhagiri cross street	Karunanidhi street
46	22	Mahatma Gandhi street	25HP - 2	Mahatma Gandhi Street	Devarajan street
47	22	Adhiraj street	10HP - 1	Adhiraj street	Lakshmi Nagar

Anna university has mapped the areas inundated in this Zone during 2005 flood by crowd source method. The RISAT Microwave satellite map showing inundation extent on 3rd December 2015 and 7th December 2015 taken by Institute of Remote Sensing, Anna University is matching more or less with the inundation locations identified by GCC. The flood water due to increased water level in canal was receded within 4 days and the other stagnated locations were cleared immediately by GCC using pumpsets. The RISAT satellite maps and GCC map are given below for clarity and understanding.

[illegible]

Water stagnated streets in the previous monsoon - Mild Rainfall – Nil***Water stagnated streets in the previous monsoon - Moderate Rainfall***

S.No.	Ward	Name of the Street
1	15	EDAYANCHAVAD,
2	16	Irular Colony
3	17	Puzhal Union Road
4	18	Salaima Nagar
5	19	Apollo Armstrong Nagar
6	20	New MGR Street
7	21	Poongavanam Street and Jalakanda mari amman koil Street
8	22	Chinna sekkadu

Stagnation of water in streets due to sewer blocks

There are no sewer block in Manali

Relief Centres

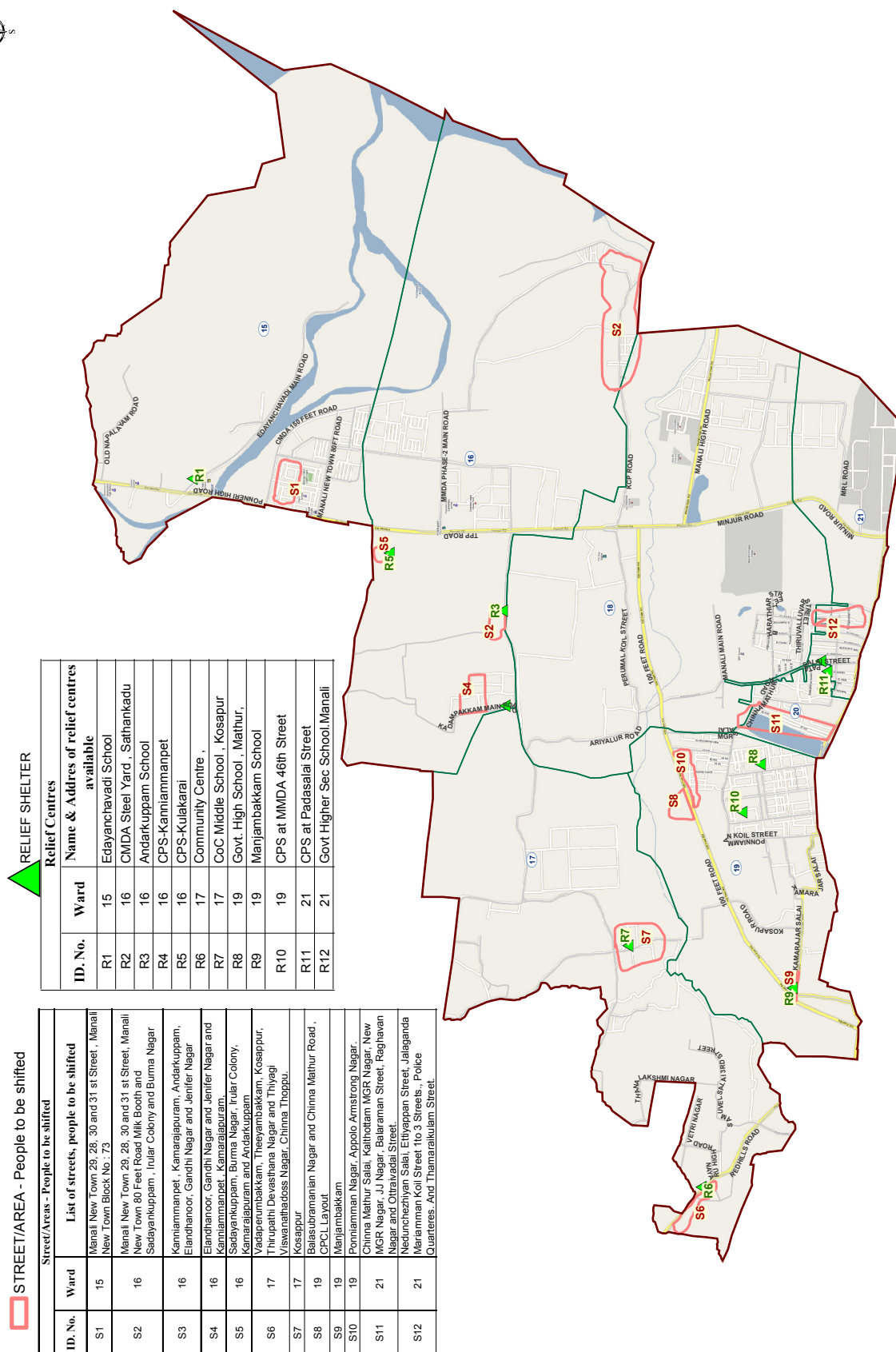
There are 13 relief centres to a total capacity of 3040 that are readily available with Cooking, Drinking water and toilet facilities, to be utilized during the evacuation period to accommodate the affected people. The list of relief centres are given below.

Sl. No.	Dn. No	Capacity	Name & Address of relief centres available	List of streets people to be shifted	Drinking water	Toilets	Cooking facilities	Responsibilities	Officer in-charge (Designation/)	Contact No.
1	15	230	Edayanchavadi School	Manali New Town 29, 28, 30 and 31 st Street , Manali New Town Block No : 73	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025817
								Evacuation	Junior Engineer	9445190315
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190104
2	16	500	CMDA Steel Yard , Sathankadu	Manali New Town 29, 28, 30 and 31 st Street, Manali New Town 80 Feet Road Milk Booth and Sadayankuppam , Irular Colony and Burma Nagar	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025817
								Evacuation	Assistant Engineer	9445190316
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190104

Sl. No.	Dn. No	Capacity	Name & Address of relief centres available	List of streets people to be shifted	Drinking water	Toilets	Cooking facilities	Responsibilities	Officer in-charge (Designation/)	Contact No.
3	16	300	Andarkuppam School	Kanniammanpet, Kamarajapuram, Andarkuppam, Elandhanoor, Gandhi Nagar and Jenifer Nagar	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025817
								Evacuation	Assistant Engineer	9445190316
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190104
4	16	150	CPS-Kanniammanpet	Elandhanoor, Gandhi Nagar and Jenifer Nagar and Kanniammanpet, Kamarajapuram,	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025817
								Evacuation	Assistant Engineer	9445190316
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190104
5	16	350	CPS-Kulakarai	Sadayankuppam, Burma Nagar, Irular Colony, Kulakkarai, Kamarajapuram and Andarkuppam	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025817
								Evacuation	Assistant Engineer	9445190316
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190104
6	17	100	Community Centre, Vadaperumbakkam	Vadaperumbakkam, Theeyambakkam, Kosappur, Thirupathi Devasthanam Nagar and Thiyagi Viswanathadoss Nagar, Chinna Thoppu.	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025817
								Evacuation	Assistant Engineer	9445190317
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190104

Sl. No.	Dn. No	Capacity	Name & Address of relief centres available	List of streets people to be shifted	Drinking water	Toilets	Cooking facilities	Responsibilities	Officer in-charge (Designation/)	Contact No.
7	17	340	CoC Middle School, Kosapur	Kosappur	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025817
								Evacuation	Assistant Engineer	9445190317
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190104
8	19	200	Govt. High School , Mathur,	Balasubramanian Nagar and Chinna Mathur Road , CPCL Layout	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025818
								Evacuation	Assistant Engineer	9445190319
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190105
9	19	120	Manjambakkam School	Manjambakkam	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025818
								Evacuation	Assistant Engineer	9445190319
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190105

Sl. No.	Dn. No	Capacity	Name & Address of relief centres available	List of streets people to be shifted	Drinking water	Toilets	Cooking facilities	Responsibilities	Officer in-charge (Designation/)	Contact No.
10	19	100	CPS at MMDA 46th Street	Ponnamman Nagar, Appolo Armstrong Nagar.	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025818
								Evacuation	Assistant Engineer	9445190319
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190105
11	21	200	CPS at Padasalai Street	Chinna Mathur Salai, Kalthottam MGR Nagar, New MGR Nagar, JJ Nagar, Balaraman Street, Raghavan Nagar and Ottraivada Street.	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025818
								Evacuation	Assistant Engineer	9445190321
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190105
12	21	450	Govt Higher Sec School.Manali	Nedunchezhiyan Salai, Ettiyappan Street, Jalaganda Mariamman Koil Street 1to 3 Streets., Police Quarteres. And Thamaraiikulam Street.	Yes	Yes	No	Sanitation, Medicine & Drinking water	Sanitary Inspector	9445025820
								Evacuation	Assistant Engineer	9445190321
								Food	Assistant Revenue Officer	9445190082
								Relief Materials	Asst. Exe. Engineer	9445190105



Subway

There is no subway as of now available in this zone.

Tree fall

During the last monsoon, in Manali zone totally 6 tree branches were fallen and cleared. The following tree fall locations in this zone were noticed and in these places special precautionary steps like pruning of tree branches shall be done in advance. The details are as follows,

S.No	Ward	Name of the Street
1	15	Manali New Town
2	16	Andarkuppam
3	22	Parthasarathy street

Streets - where water entered houses - do not require evacuation

During the last monsoon, 8 inundated spots where water entered houses but don't require evacuation were identified and actions were taken to bale out the rain water. During NEM 2015 the under mentioned 8 locations were inundated for more than a day by which the normal day to day activity of 3500 people were stand stilled. Flood water from these areas was cleared by using 15 pumps ranging from 5 HP to 7.5 HP capacity. The identified vulnerable spots is as below,

Sl.No.	Ward/Name	Name of the area/ streets
1	15 Edayanchavadi	Lakshmi Nagar
2	16 Manali New Town	Irular colony
3	17 Kosapur Vadaperumbakam	Saraswathi Nagar Kosapur
4	18 Manali	Kalaingar Nagar CPCL Layout
5	19 MMDA Mathur	Apollo Arm strong Nagar Balasubramaniam Nagar Kavithendral kalyana sundaram Nagar
6	20 Manali	New MGR Street Balaraman Street
7	21 Manali	Poongavanam Street, Padasalai street and Jalakanda mariamman koil Street
8	22 Chinnasekkadu	Velu street, Devarajan street, Adhiraj street

Streets that require evacuation

During the heavy flood that occurred in 2015, in Manali zone there were 1565 people were evacuated from Edayanchavadi Andarkuppam and they were accommodated in CMDA Steel Yard, Sathankadu, Manali and MMDA Mathur are accommodated in CPS at Padasalai Street and Govt. High School , Mathur. They were provided with basic amenities like accomodation, food and relief materials for 25 days. The details and locations of relief centers are given below.

Sl. No.	ward /Name	Streets	No. of persons	Year	Relief centre
1	15 Edayanchavadi	Manali New Town 29, 28, 30 and 31 st Street	42	2015	CMDA Steel Yard , Sathankadu
2	15 Edayanchavadi	Manali New Town Block No : 73	63	2015	Edayanchavadi School
3	15 Edayanchavadi	Manali New Town 80 Feet Road Milk Booth	120	2015	CMDA Steel Yard , Sathankadu
4	16 Andarkuppam	Sadayankuppam , Irular Colony and Burma Nagar	101	2015	CMDA Steel Yard , Sathankadu
5	16 Andarkuppam	Kanniammanpet , Kamarajapuram, Andarkuppam, Elandhanoor, Gandhi Nagar and Jenifer Nagar	86	2015	CPS- Kanniammanpet, Andarkuppam School
6	17 Vadaperumbakkam	Vadaperumbakkam, Chettimedu, Kosappur	136	2015	Community Centre, Vadaperumbakkam and CoC Middle School , Kosapur
7	18 Manali	Kalaiginner Nagar	122	2015	CPS at Padasalai Street
8	18 Manali	Harikrishnapuram	356	2015	CPS at Padasalai Street and Govt Higher Sec School. Manali
9	18 Manali	Salaima Nagar	321	2015	CPS at Padasalai Street
10	19 MMDA Mathur	Balasubramanian Nagar	123	2015	Govt. High School , Mathur,
11	19 MMDA Mathur	Ponnamman Nagar, Chinna Samy Nagar	53	2015	CPS at MMDA 59th Street
12	20 Manali	Govt. High school at Padasalai street	42	2015	Govt. High School , Mathur
		Total	1565		

Lighting Facilities

Establishing alternate sources of lighting is a prerequisite. There are 1 battery powered lights available in the zone and the details are given below with contact numbers. Issues like non burning of street lights, electrocution shall be addressed to the following officials/staff.

Sl. No.	Ward	Contact person	
		Designation	Phone number
1	15 to 17	Assistant Engineer	9445190907
2	18,20,21	Assistant Engineer	9445190905
3	19	Assistant Engineer	9445190906
4	15 to 21	Additional divisional Engineer (Zone)	9445190042
5	15 to 21	Divisional Engineer (HQ)	9445190752

National Disaster Response Force (NDRF)

In Manali zone, the NDRF to be stationed locations and precautionary measures to be taken before the rain is given below,

S.No	Ward. No.	Where NDRF to be stationed and deployed
1	15	Manali New Town 80ft Road, Aavin Booth
2	16	Near Unit Office , Andarkuppam
3	17	Near Division Office , Vadaperumbakkam
4	18	Near Division Office , Nedunchezhiyan Street
5	19	Near Division Office, MMDA 2nd Cross Street
6	20	New MGR Nagar 1st street
7	21	Near Unit Office , CPS Padasalai Street

NDRF

The Commandant
04, Battalion(NDRF)
Suraksha Campus
Takkolam, Arakkonam
Vellore District – 631 152
Phone No. 04177 – 246594/246269

Rescue Boats

Rescue operations during flood require the services of boats in the form of Catamaran/ rubber inflatable dinghies/FRP both powered and manually operated. Availability of boats in vicinity of flooded areas plays an important part in rescue operations. When the situation arises to evacuate the people from the affected area the respective Assistant Engineers are responsible to locate the boat at needy places, to guide the boat man, to navigate around marooned areas and to arrange shelters & food for the rescue teams. The details of boats required along with the stationed locations are given below

Sl.No.	Ward	Number of boats required with location / evacuation areas	Boats stationed Locations	Contact person & Number AE
1	15	Manali New Town 80 Ft Road , 4 Nos.	Manali New Town near Milk booth	9445190315
2	16	Andarkuppam , Sadayankuppam, Burma Nagar, 4 Nos.	Opposite to CMDA Steel yard	9445190316
3	17	Near Division Office, 2 Nos.	Division Office Vadaperumbakkam	9445190317
4	18	Division Office, Nedunchezhiyan Street, 1 No.	Division Office , Nedunchezhiyan Street	9445190318
5	19	Balasubramaniam Nagar , 1 No.	Chinna mathur Road	9445190319
6	20	1 No. New MGR Nagar Ist street	Division - 20 Office , New MGR Nagar Ist street	9445190320

Transport Equipment & Lorries

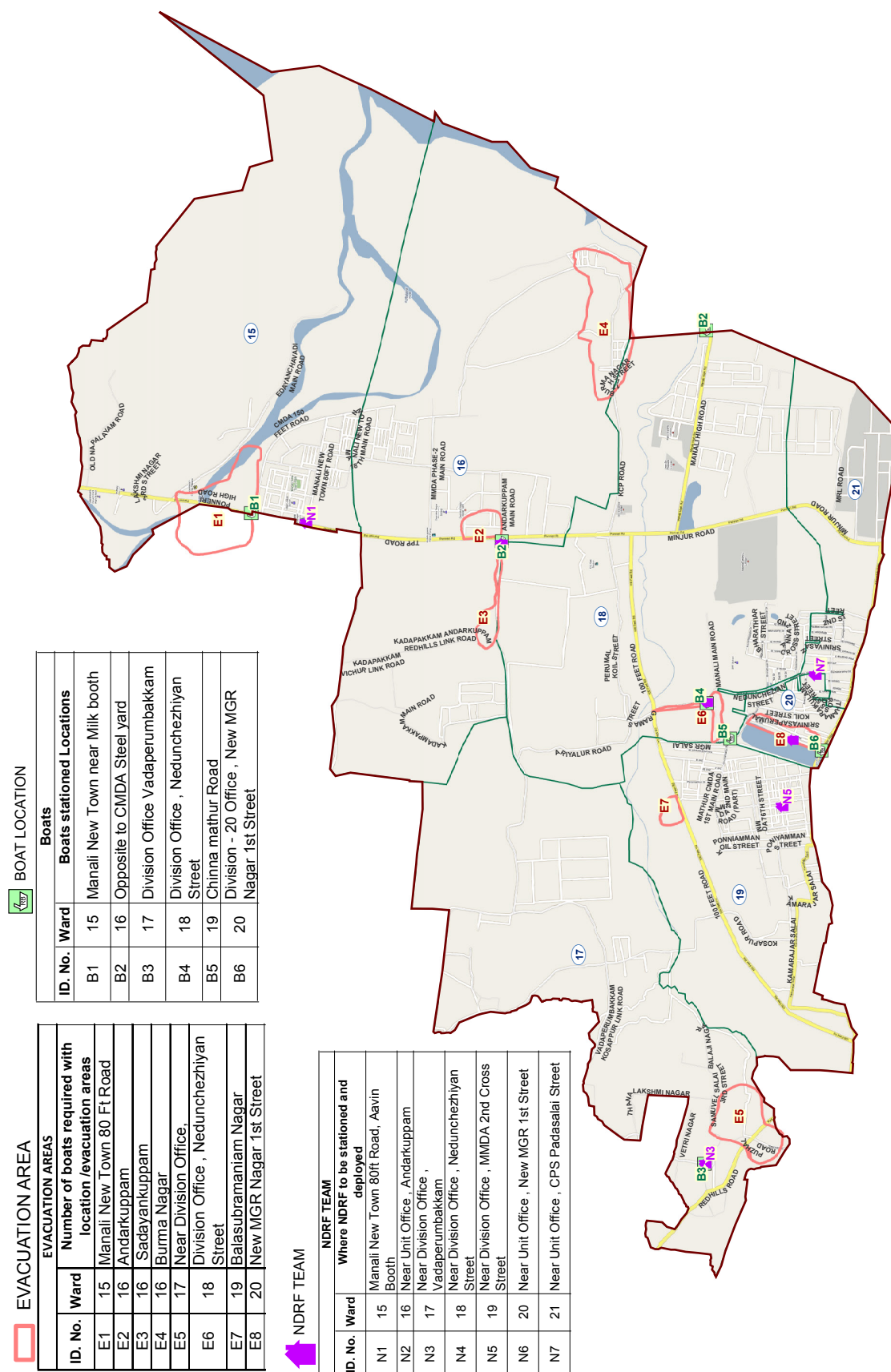
For carting men and materials, removing garbage/debris lorries were deployed. There were 2 open lorries and 2 Bob cat are stationed for performing the job. The details of the Lorries available in the zone are given below

No. of lorries and type kept in readiness
Debris lorry - 2
Skid steer loaders (Bob cat) - 2

Assistant Engineer contact No.	JCB	Bobcat	Open lorry	Water tanker Lorry
9445190403	-	2	10-LMV	-

Less than 2.5m streets / lanes that cannot be accessed by Vehicles

Sl.No	ward /Name	Street Names
1	18 Manali	Ekambaram Street 3rd , 4 th , 6 th , 7 th , 8 th Lane and Kalaigner Nagar 2 nd , 9 th Street
2	19 MMDA Mathur	MMDA 18,22,25,30,31,33,34,39,41,42,49,61,65,66,70,71,73,74 ,90,93,110 & 114Street 1st Cross Street
3	20 Manali	Srinivasa perumal koil 5th , 6 th and 8 th cross lane
4	20 Manali	S.P Koil melandai 2nd lane
5	20 Manali	S.P koil kelandai 2 & 3rd lane
6	20 Manali	Lalbaghadhur Shasthri 2 nd , 3 rd and 4th cross lane
7	20 Manali	Balaraman 4th lane
8	20 Manali	Srinivasaperumal koil 7th lane
9	20 Manali	Balaraman 5th lane
10	20 Manali	Kamaraj salai cross lane Lane
11	20 Manali	Thamaraikulam 2nd Street 1st
12	21 Manali	Poongavanam Cross Lane
13	21 Manali	Thir.Vi.Ka. Street 1 st , 2 nd , 3 rd , 4 th and 6 th Lane
14	21 Manali	Thir.Vi.Ka. Street to Jalagandamariamman Koil Street Link
15	22 Chinna sekkadu	Kumariananthan street, Parthasarathy 2nd street, Parthasarathy 5th cross street, Perumal koil Extn, 1st lane, 2nd lane, Munusamy street



Ward Committee

It is to be noted that the responsibilities of each officers are well described in the page number 141 of this booklet. The respective officers/staff may be taken on board to address the issues pertaining to them.

The contact details ward committee and other line departments are as follows.

Ward committee –15

Ward councillor - 9445467015

Name of the department	Designation	Contact Number
GCC - Engineering	Assistant Engineer	9445190315
GCC - Electrical	Assistant Engineer	9445190907
GCC- Health	Sanitary Inspector	8122543148 7092970710
GCC - Veterinary	Veterinary Assistant Surgeon	9445026042
GCC - Solid waste management	Conservancy Inspector	9445190515
GCC - Revenue	Tax Collector	9841825880
Revenue	Revenue Inspector	9962131483 9445284639
GCC - Park overseer	Park Supervisor	8608914685
CMWSSB	Assistant Engineer	9092668318
TANGEDCO	Junior Engineer	9445850906
BSNL	Assistant Engineer	9445011428
Fire service	Inspector	044-25224266
Police station	Inspector	9498100211
PWD	Assistant Engineer	9486693837
TNSCB	Assistant Engineer	8056464868
Highways	Divisional Engineer	9841702398 9940012048

Ward committee – 16**Ward councillor - 9445467016**

Name of the department	Designation	Contact Number
GCC - Engineering	Assistant Engineer	9445190316
GCC - Electrical	Assistant Engineer	9445190907
GCC- Health	Sanitary Inspector	9445025817
GCC - Veterinary	Veterinary Assistant Surgeon	9445194746
GCC - Solid waste management	Conservancy Inspector	9445190516
GCC - Revenue	Tax Collector	8072710825
Revenue	Revenue Inspector	9884667114
GCC - Park overseer	Park Supervisor	9445194752
CMWSSB	Assistant Engineer	8144930016
TANGEDCO	Junior Engineer	9445850907
BSNL	Assistant Engineer	9445011428
Fire service	Inspector	044-25224266
Police station	Inspector	044-25931299 / 9498100241
PWD	Assistant Engineer	7200027050
TNSCB	Assistant Engineer	9445074734
Highways	Divisional Engineer	9841702398 9940012048

Ward committee – 17**Ward councillor – 9445467017**

Name of the department	Designation	Contact Number
GCC - Engineering	Assistant Engineer	9445190317
GCC - Electrical	Assistant Engineer	9445190907
GCC- Health	Sanitary Inspector	8012722105
GCC - Veterinary	Veterinary Assistant Surgeon	9445194746
GCC - Solid waste management	Conservancy Inspector	9445190517
GCC - Revenue	Tax Collector	9551023190
Revenue	Revenue Inspector	9884667114
GCC - Park overseer	Park Supervisor	9445194752
CMWSSB	Assistant Engineer	8144930017
TANGEDCO	Assistant Engineer	9445850875
BSNL	Assistant Engineer	9445693926
Fire service	Inspector	044-25224266
Police station	Inspector	9498100241, 9498100240 044-25555085
PWD	Assistant Engineer	7200027050
TNSCB	Assistant Engineer	9445074734
Highways	Divisional Engineer	9841702398 9940012048

Ward committee – 18**Ward councillor – 9445467018**

Name of the department		Designation
GCC - Engineering	Assistant Engineer	9445190318
GCC - Electrical	Assistant Engineer	9445190905
GCC- Health	Sanitary Inspector	9445025818 9786495474
GCC - Veterinary	Veterinary Assistant Surgeon	9445194746
GCC - Solid waste management	Conservancy Inspector	9445190518
GCC - Revenue	Tax Collector	9841825880
Revenue	Revenue Inspector	7010022739
GCC - Park overseer	Park Supervisor	9445194752
CMWSSB	Assistant Engineer	8144930018
TANGEDCO	Junior Engineer	9445850905
BSNL	Assistant Engineer	9445122121
Fire service	Inspector	9445086020
Police station	Inspector	9444174153
PWD	Assistant Engineer	7200027050
TNSCB	Assistant Engineer	9445074734
Highways	Divisional Engineer	9840547160

Ward committee –19**Ward councillor – 9445467019**

Name of the department		Designation
GCC - Engineering	Assistant Engineer	9445190319
GCC - Electrical	Assistant Engineer	9445190906
GCC- Health	Sanitary Inspector	9445025818 7708931877
GCC - Veterinary	Veterinary Assistant Surgeon	9445194746
GCC - Solid waste management	Conservancy Inspector	9445190515
GCC - Revenue	Tax Collector	9840655487
Revenue	Revenue Inspector	7010022739
GCC - Park overseer	Park Supervisor	9445194752
CMWSSB	Assistant Engineer	8144930019
TANGEDCO	Junior Engineer	9445850877
BSNL	Assistant Engineer	9445011428
Fire service	Inspector	9445086020
Police station	Inspector	9498143642
PWD	Assistant Engineer	7200027050
TNSCB	Assistant Engineer	9445074734
Highways	Divisional Engineer	9840547160

Ward committee – 20**Ward councillor – 9445467020**

Name of the department	Designation	Contact Number
GCC - Engineering	Assistant Engineer	9445190320
GCC - Electrical	Assistant Engineer	9445190905
GCC- Health	Sanitary Inspector	9445025818
GCC - Veterinary	Veterinary Assistant Surgeon	9445194746
GCC - Solid waste management	Conservancy Inspector	9445190520
GCC - Revenue	Tax Collector	9840655487
Revenue	Revenue Inspector	7010022121
GCC - Park overseer	Park Supervisor	9445194752
CMWSSB	Assistant Engineer	8144930019
TANGEDCO	Junior Engineer	9445850905
BSNL	Assistant Engineer	9445122121
Fire service	Inspector	9445086020
Police station	Inspector	9498143642
PWD	Assistant Engineer	7200027050
TNSCB	Assistant Engineer	9445074734
Highways	Divisional Engineer	9840547160

Ward committee – 21**Ward councillor – 9445467021**

Name of the department	Designation	Contact Number
GCC - Engineering	Assistant Engineer	9445190321
GCC - Electrical	Assistant Engineer	9445190905
GCC- Health	Sanitary Inspector	9445025818 9047309390
GCC - Veterinary	Veterinary Assistant Surgeon	9445194746
GCC - Solid waste management	Conservancy Inspector	9445190521
GCC - Revenue	Tax Collector	8015785460 866805541
Revenue	Revenue Inspector	7010022739
GCC - Park overseer	Park Supervisor	9445194752
CMWSSB	Assistant Engineer	8144930019
TANGEDCO	Junior Engineer	9445850905
BSNL	Assistant Engineer	9445122121
Fire service	Inspector	044-25941147
Police station	Inspector	9498143642
PWD	Assistant Engineer	7200027050
TNSCB	Assistant Engineer	9445074734
Highways	Divisional Engineer	9840547160

Ward committee – 22**Ward councillor – 9445467022**

Name of the department	Designation	Contact Number
GCC - Engineering	Assistant Engineer	9445190329
GCC - Electrical	Assistant Engineer	9445190905
GCC- Health	Sanitary Inspector	9445025818 9047309390
GCC - Veterinary	Veterinary Assistant Surgeon	9445194746
GCC - Solid waste management	Conservancy Inspector	9445190521
GCC - Revenue	Tax Collector	8015785460 8668055341
Revenue	Revenue Inspector	7010022739
GCC - Park overseer	Park Supervisor	9445194752
CMWSSB	Assistant Engineer	8144930019
TANGEDCO	Junior Engineer	9445850905
BSNL	Assistant Engineer	9445122121
Fire service	Inspector	044-25941147
Police station	Inspector	9498143642
PWD	Assistant Engineer	7200027050
TNSCB	Assistant Engineer	9445074734
Highways	Divisional Engineer	9840547160



Government Museum, Egmore

Principal Secretary / Commissioner

Ripon Building
Greater Chennai Corporation
Chennai - 600 003

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