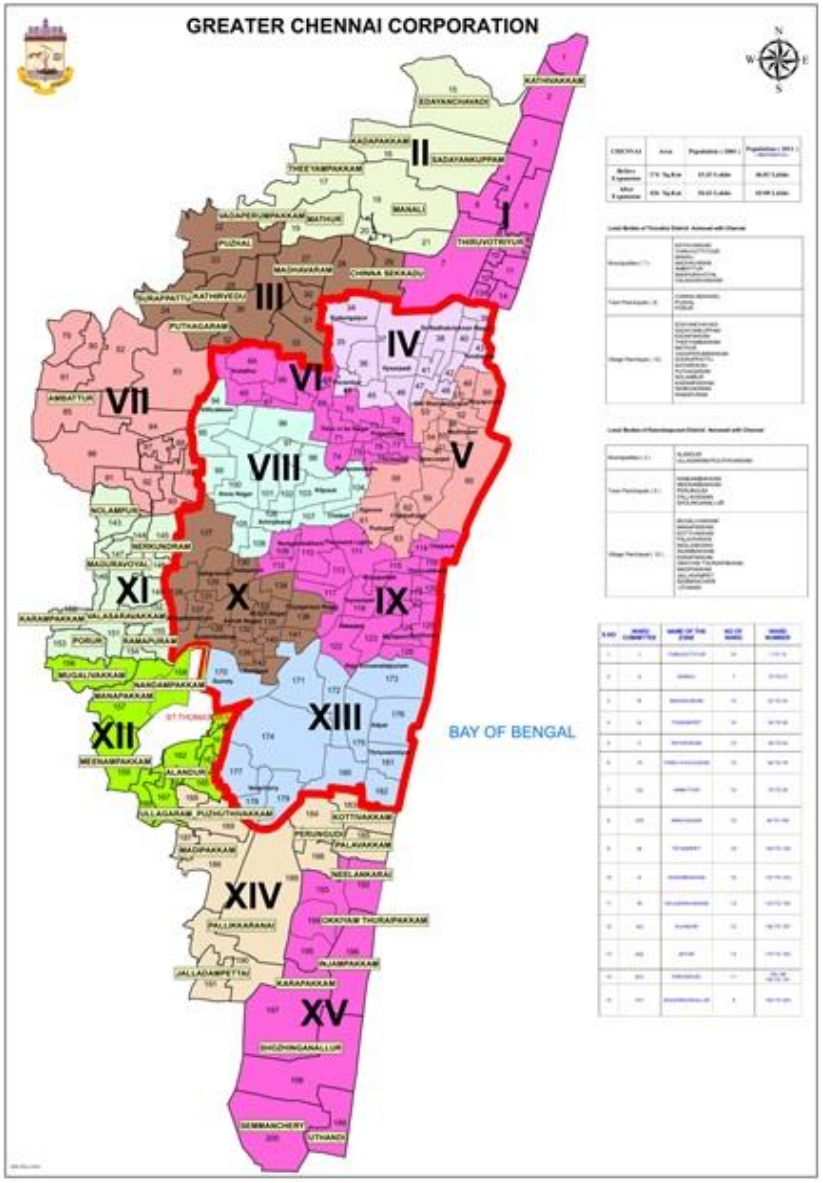
GREATER CHENNAI CORPORATION

DISASTER RISK MANAGEMENT FOR THE CITY OF CHENNAI

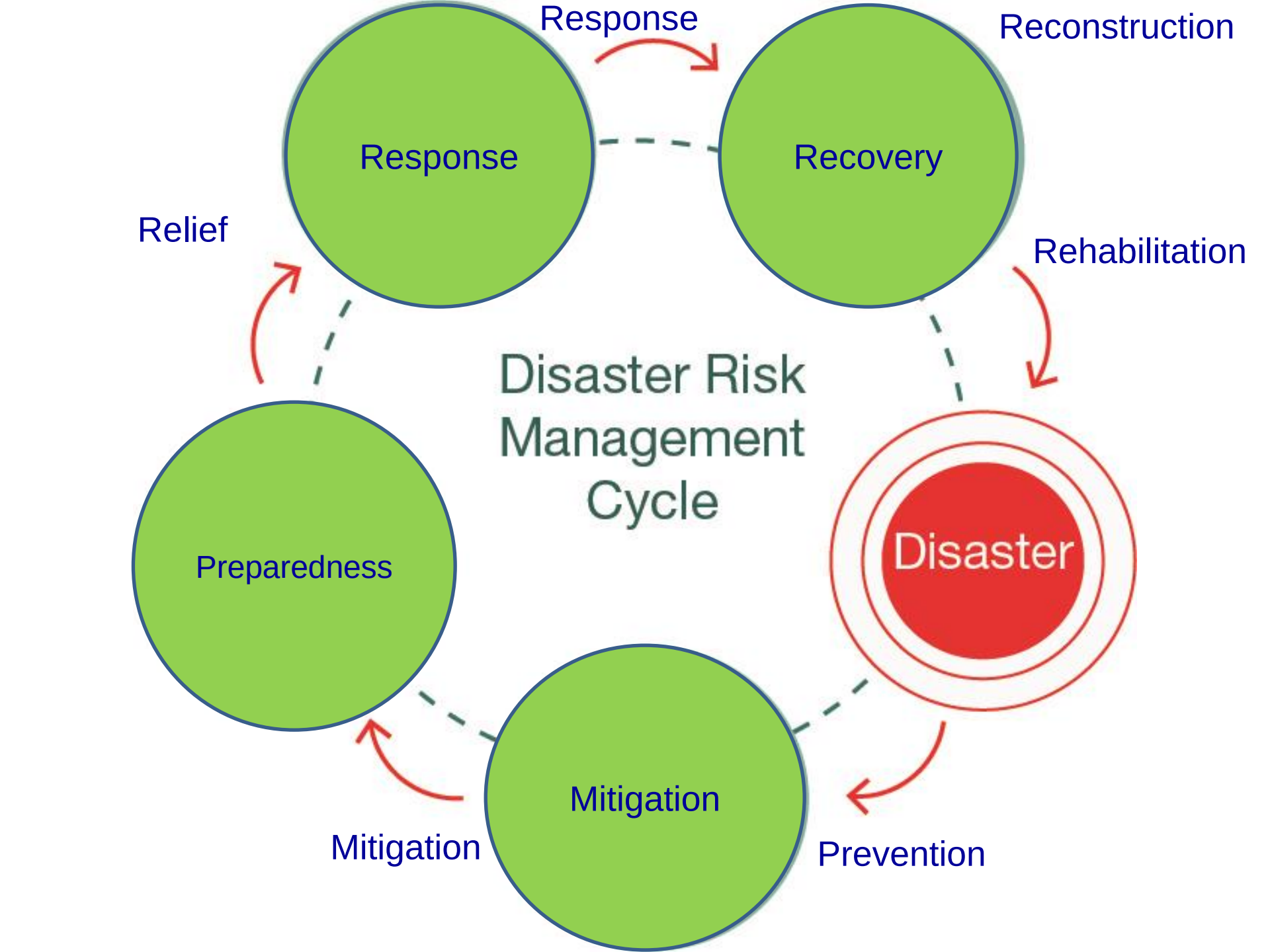
CHENNAI CITY OVERVIEW

TOPOGRAPHY OF CHENNAI CITY



- **Flat Terrain**
- **Variation in average level of land in the city is only 2m**

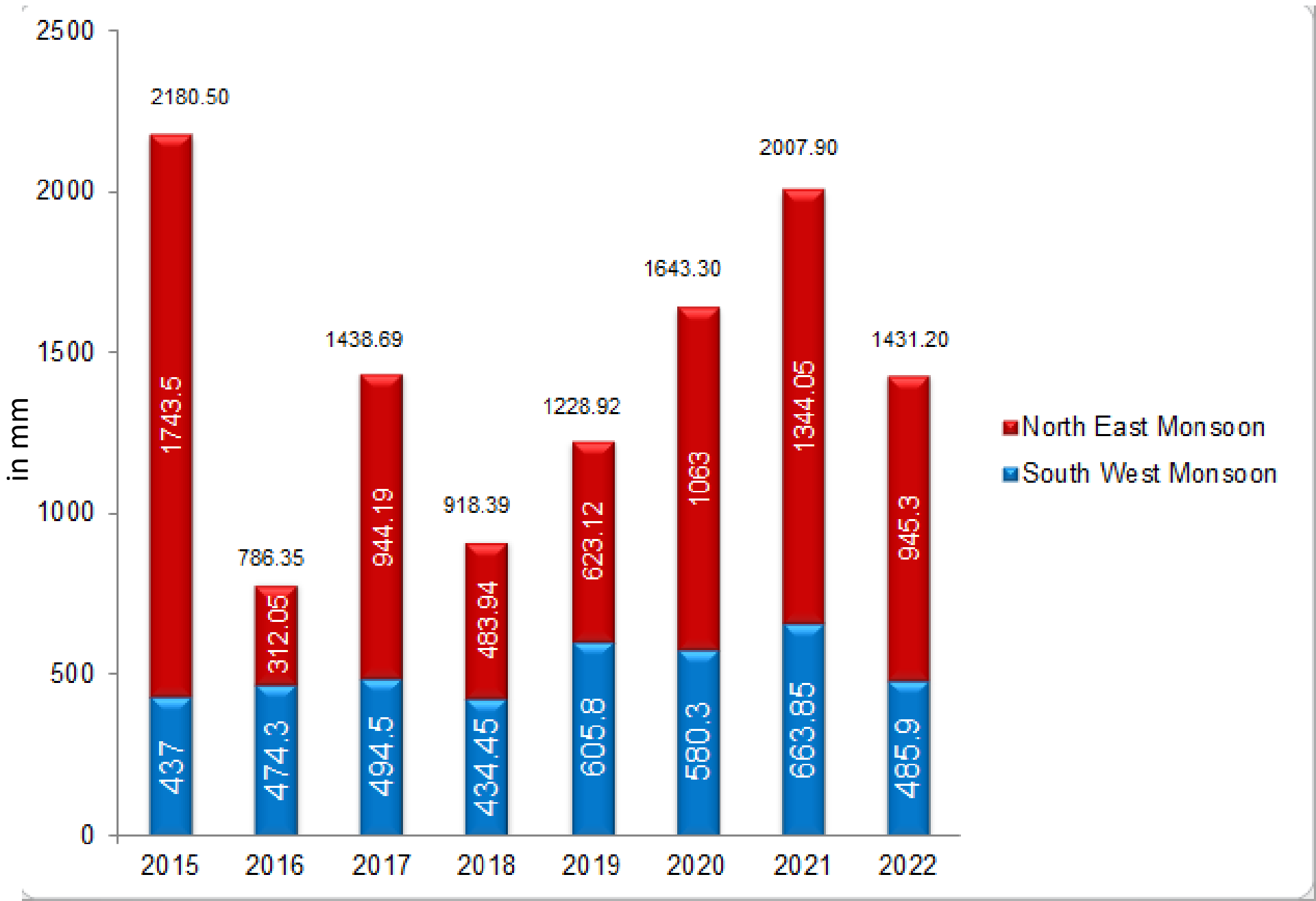
Area	: 426 sq.km
No of Zones	: 15
No of Wards	: 200
Population (as per 2011 census)	: 66.72 Lakhs* Estimated current population – 85.17 Lakhs)
Floating Population	: 10 Lakhs
House holds	: 17 Lakhs
Garbage generation	: 5,100 MT/day
Bus Route Roads	: 471 Nos (387.39 kms)
Interior Roads	: 34,640 Nos. (5,270 kms)
Storm Water Drain	: 11516 Nos(2,623.56 kms)


Response
Reconstruction
Response
Recovery
Relief
Rehabilitation
Disaster Risk Management Cycle
Preparedness
Disaster
Mitigation
Mitigation
Prevention

Impacts of Floods in Chennai Basin during 2005, 2008, 2015, 2020 & 2021

- Chennai City and its Sub-urban areas witnessed flood inundation which impacted heavily on the infrastructure and Loss of life during the years 1943, 1976, 1985, 1996, 2005, 2008, 2015, 2020 and 2021.
- Government of India declared the floods in Chennai during the year 2015 as "CALAMITY OF SEVERE NATURE"

CHENNAI RAINFALL DATA



Flood in 2015 – In the month of November 2015, Chennai has reported 1024 mm of rain, more than 300 percent of the normal rainfall according to IMD. An unrelenting deluge flood of Chennai on December 1, 2015, submerged Chennai city. The World Meteorological Organisation observed that this is the wettest December day in more than 100 years of records in Chennai with 300mm rainfall.

The heaviest rainfall and continous flow from the upper catcments worsened the situation, The flood left around three millioon people without basic services, collapsed roads and bridges and halted trains and grounded air services.

Vardah Cyclone 2016 – On December 12th 2016 a severe cyclonic storm Vardah struck Tamil Nadu leaving behind a train of severe destructions in Chennai, Thiruvallur and Kanchipuram. The Vardhah cyclone uprooted the green cover and battered the infrastructure especially power and telecommunications and plunged the districts into darkness.

NEM 2021 and 2022 – The low-pressure over Bay of Bengal in the October and November 2021brought heavy to extremely heavy rainfall in Chennai and battered Chennai caused extensive damages to life, property and other critical infrastructure.

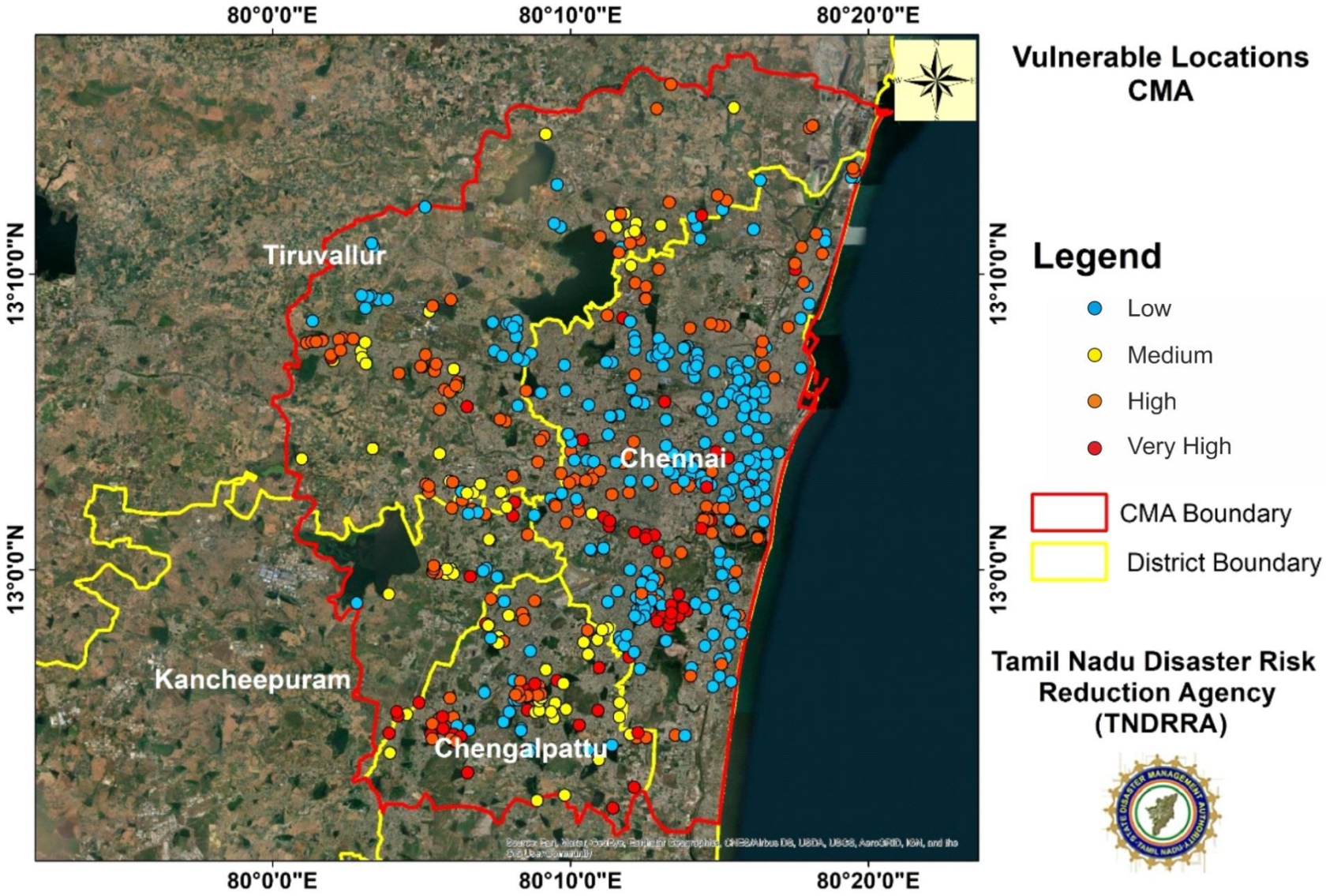
RAINFALL- MONSOON 2021

- North East Monsoon started on 25th October 2021.
- The annual average rainfall in Chennai is 132 cm and Chennai city received 200 cm in the year 2021.
- During these days, thrice the city experienced heavy rainfall of about 20 cm in various locations within a short duration viz., 07.11.2021, 10.11.2021 and 30.12.2021

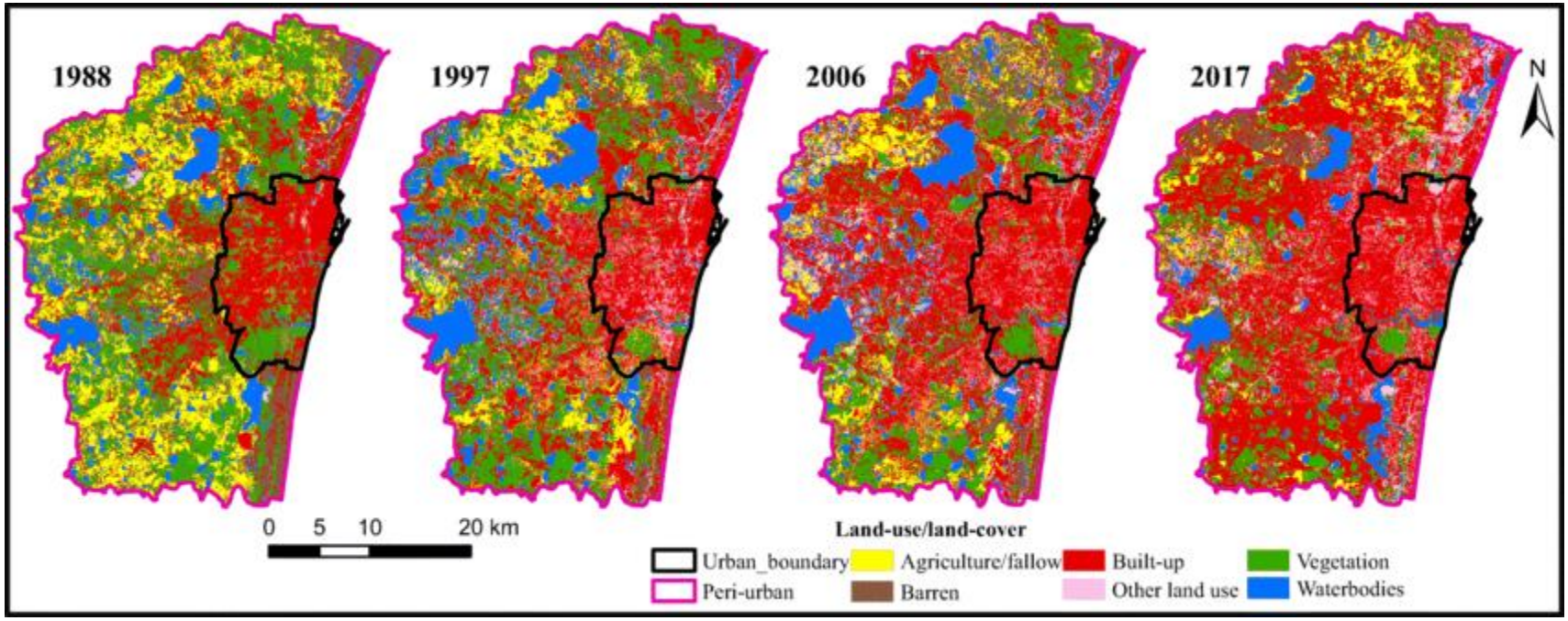
HAVOC INFLICTED IN NORTH EAST MONSOON 2021

- 561 locations inundated
- 738 avenue trees were uprooted.
- 350 km roads damaged.
- many stormwater drains were damaged.
- 1,200 street light poles and 1,400 fittings were damaged.
- Infrastructure like parks, buildings were also damaged.

Flood Inundation Hotspots in Greater Chennai Corporation & in the CMA



Why does Chennai flood?



- Flat terrain with a 2m altitude on average
- Lower altitude than the surrounding areas in the Chennai Metropolitan Area
- CMA changed from predominantly an agricultural area (42.21%) in 1988 to a built-up area (48.72%) in 2017. he agriculture/fallow land, barren/semi-barren, vegetation, and water bodies/wetlands have decreased by 53.62%, 1.45%, 58.99%, and 30.59%, respectively. This decrease has contributed to an increase of 173.83% in the built-up area
- Inadequate stormwater management infrastructure

PREVENTIVE MEASURES

RESPONSE READINESS

109 locations are identified for stationing relief boats along with contact persons details (available with fisheries department).

44 mobile and static medical teams alert and other health preparedness like fogging , spreading bleaching powder etc.

1913 complaint cell and control room to receive the complaints from the public 24X7.

Across all 15 Zones, 1000 numbers of 5HP/7.5HP/10HP/25HP/50 HP motor pumps are kept ready in all identified low lying areas.

One common kitchen center having capacity of cooking food for 1500 persons at a time will be ready.

REMOVAL OF FALLEN TREES

- Two vehicle mounted power saws, 360 Petrol / Diesel run portable power saws and 11 electrical power saws are kept ready at Zonal level.
- A night duty team will be kept ready at each zone for immediate removal of fallen trees.
- 18 mobile high mast lights will be kept ready for night works
- 14981 nos. of trees were pruned so far as monsoon preparedness.

AVAILABILTY OF MACHINERIES IN GCC

S.No	Machinery	Nos.
1	Skid Steer Loader (Bobcat)	59
2	JCB (Front end loader)	21
3	Tipper Lorries (HMV)	105
4	Tipper Lorries (LMV)	10
5	Amphibian	2
6	Robotic Excavator	4
7	Mini Amphibian	3
8	Hydraulic Excavator (Poclain)	14
9	Power Saw for Tree cutter / Pruning Machine	371
10	Vehicle Mounted Power Saw	2
11	Self propelled Tree Pruning Machine	6
12	Mobile High Mast Vehicle	18
13	Hydraulic / Ladder Vehicle	9
14	2.0 KV DG	100
15	3 KV DG	30
16	60 HP Dewatering pump	2
17	50 HP Dewatering pump	4
18	25 HP Dewatering pump	40
19	5 HP Dewatering pump	70
20	Telescopic Tree Prunner	17
21	Lawn Mover	7
22	Brush Cutter	5

- Established Integrated Command & Control center in December 2019 and a special team is formed to monitor the flood levels round the clock in critical areas of the city.
- This center has the facility to monitor the flooding situation in Chennai on a real time basis using CCTVs.
- Flood monitoring sensors are installed in critical locations such as subways, underpasses, canals, river mouths, to monitor and alert when the flood level exceeds the threshold level.
- Installed 30 rain gauges, 41 flood sensors and 58 flood cameras at subways, underpasses, river mouths and near canals. ICCC team monitors and alert when the flood level exceeds the threshold level.
- In addition to this, GCC expanded the Toll-free number of 1913 for flood related grievances. Around 57,807 calls were received during the 2021 monsoon and the grievances were settled.

STUDIES & INITIATIVES TAKEN

- Formation of Advisory Committee for the Management and Mitigation of Flood Risk in Chennai Metro.
- The project for formulation of Comprehensive Flood Control Masterplan in Urbanised River Basins in Chennai. – JICA study under implementation by Tamil Nadu Risk Reduction Agency.
- Study on Resilient Urban Mobility and Services in Chennai funded by World Bank undertaken by Chennai Smart City Limited.
- Chennai Real Time Flood Forecasting & Spatial Decision Support System project has also done preliminary analysis of flood models based on the available digital elevation models (DEM).

MITIGATION MEASURES

- Advisory Committee for Management and Mitigation of floods in Chennai.
- Advance desilting and repairs of the existing stormwater drain infrastructure.
- Construction of Integrated Stormwater drain in Kovalam and Kosasthalaiyar basins.
- Hydraulic models of watersheds and River basin
- Integrated Command and Control Center.
- Standalone projects for cases of isolated flooding
- Area level interventions where large areas were flooded

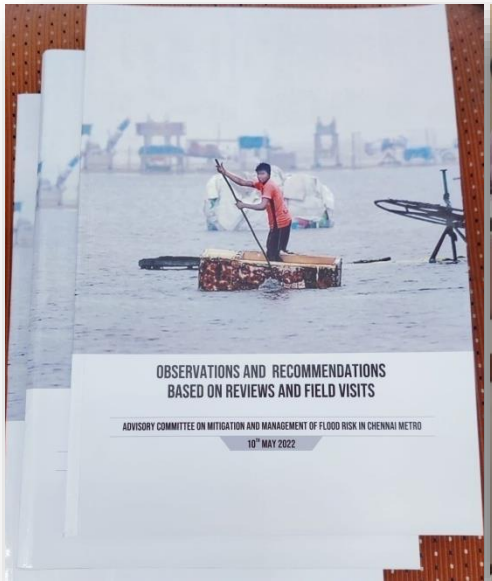
MITIGATION MEASURES

- 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 I.A.S., Retd., former Additional Secretary / Advisor, NDMA comprising of experts from IIT Bombay, IIT Madras, NRSC, Town and Country Planning Organisation, New Delhi, Anna University, WRD, CMWSSB, CRA, Department of Environment, CMDA..

- 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 of Rs.1000 crore for flood mitigation works.

- Based on the recommendations of the Committee, new projects worth Rs. 1292.15 crore are under various stages of implementation as the first phase.



New Stormwater Drain Projects in GCC

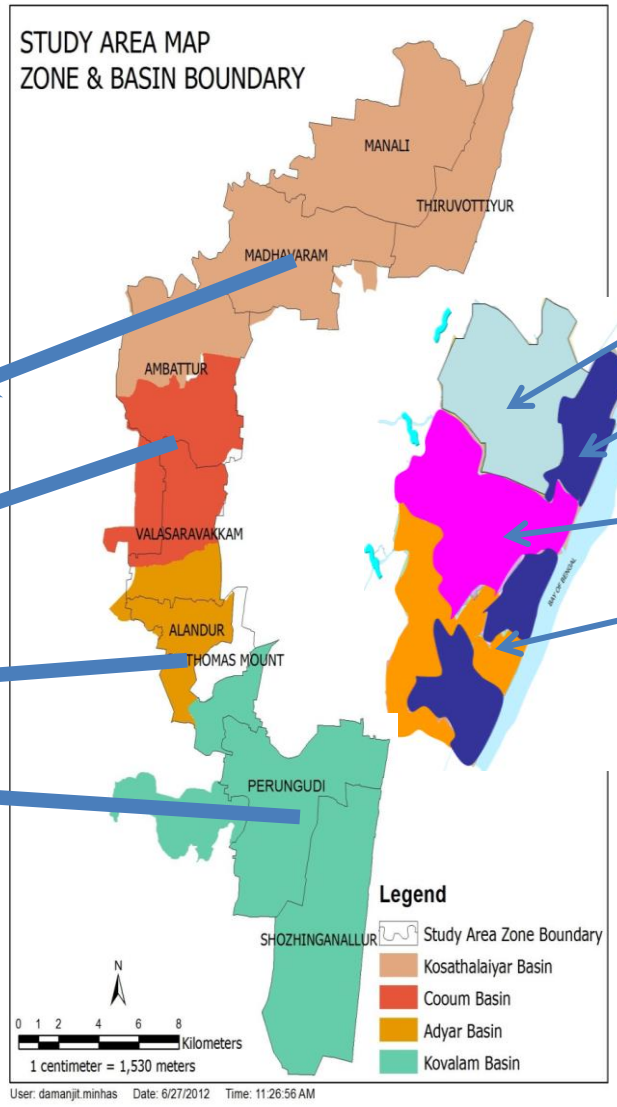
Scheme	No.of pkgs	Length (km)	Value (Rs.cr.)	Work orders awarded (Rs. cr)	Remarks
Singara Chennai 2.O Phase I	10	40.80	184.67	203.50	Physical progress 97.30%
Singara Chennai 2.O Phase II	10	20.03	70.00	73.27	Physical progress 89.83%
Flood Relief Fund	45	105.75	291.35	311.93	Physical progress 98.38%
Infrastructure & Amenities Fund	6	9.85	26.28	27.22	100% completed
Capital Grant Fund (CGF)	1	0.815	7.41	8.26	100% completed
World Bank Fund	43	39.76	120.00	128.20	100% completed
Total	115	217.005	699.71	752.38	

DRAINAGE BASINS IN GREATER CHENNAI CORPORATION

For planning and designing, the project area has been divided into Four Drainage Basins.

- **Kosathalaiyar - zone I, II, III & part of zone VII**
- **Cooum - Part of zone VII & part of zone XI**
- **Adayar - Part of zone XI & part of zone XII**
- **Kovalam - Part of zone XII, zone XIV & zone XV**

Four Drainage basins are divided into Twenty-One watersheds



North Basin

Eastern Basin

Centre Basin

South Basin

CORE CITY (JnNURM)

Expediting and Reprioritising Existing Stormwater Drain Projects in GCC

Scheme	Length (km)	Value (Rs.cr.)	Remarks
Kosasthalaiyar Basin ISWD – ADB fund	700	3220.00	Physical progress 48.50%
Kovalam Basin ISWD – KfW fund	360	1714.00	Physical progress 11.07%
Total	**1360**	**4934.00**	

Desilting and Rehabilitation of Existing SWD infrastructure in GCC

Scheme	No.of pkgs	Length (km)	Value (Rs.cr.)	Work orders awarded (Rs. cr)	Remarks
Desilting and Repairs of existing swd infrastructure.	24	1098.65	39.26	37.80	Completed
Desilting and improvement works takenup under Kosasthalaiyar Basin ISWD package 46 in Zone 5,9,10,11,12,13,14 and 15	1	148.22	30.99	30.99	Completed
Desilting work taken up under Tamil Nadu Urban Employment Scheme	3	146.63	1.03		Completed
Total	**28**	**1393.50**	**71.28**	**68.79**	

DESILTING

- ✓ Desilting of Micro and Macro canals using Amphibian & Robotic excavators.
- ✓ Desilting of Stormwater drain using Jetrodding equipment and manual by handy equipment's.
- ✓ Lining of Canals in Greater Chennai area for effective maintenance.

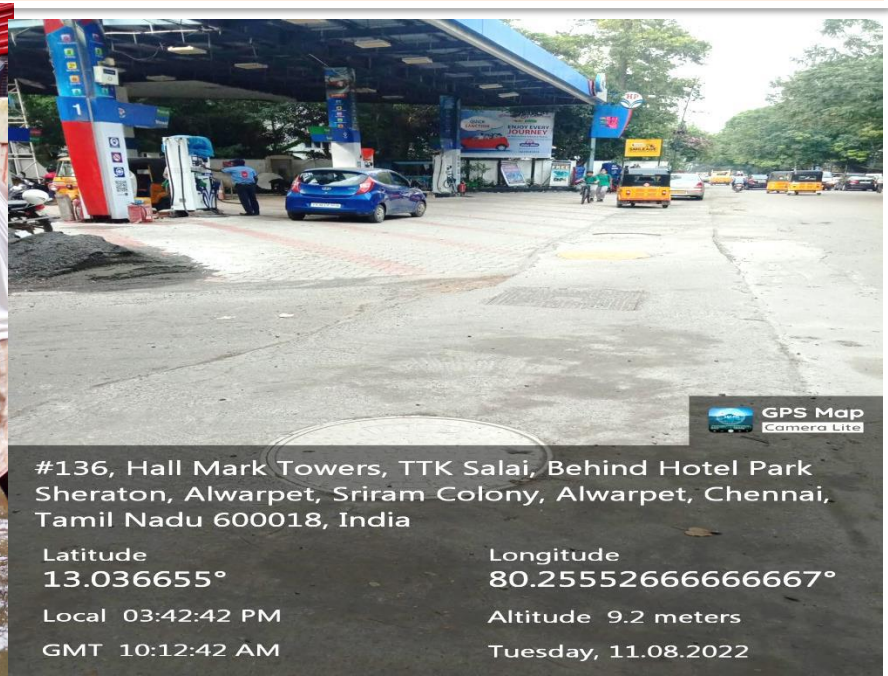
RELIEF & RESPONSE - IMPACTS OF WORKS UNDERTAKEN

Special Features of Flood Mitigation Measures undertaken by the Government

- Advance procurement without waiting for sanction to save time.
- Integrated river basin level projects are undertaken in the Kovalam basin in South Chennai and Kosasthalaiyar Basin in North Chennai, where the existing stormwater network is minimal.
- Micro watershed level reconstruction, rehabilitation and construction of new drains where area-level flooding was observed.
- Isolated projects for missing links and street-level flooding.
- Advance desilting and repairs of existing stormwater drain infrastructure.

RIPON BUILDING, ZONE 5

SEETHAMMAL COLONY, ZONE 9



HABIBULLAH ROAD, T NAGAR ZONE 9

YEAR 2021

YEAR 2022

BASULLAH ROAD, T NAGAR ZONE 10

SECRETARIAT COLONY, DN.30, ZONE 3

RESTORATION OF WATERBODIES

- Greater Chennai Corporation has taken up the restoration of the 210 waterbodies
- Restoration of 184 waterbodies have been completed under various funds such as Smart City fund, Capital fund, CSR fund,CMCDM fund and Namakku Namme Thittam.
- Restoration of 2 water bodies under CMCDM fund.
- Restoration of 12 waterbodies have been taken up under Singara Chennai 2.O fund.
- Proposed to take up 5 waterbodies for restoration under AMRUT 2.O scheme.
- Proposed to take up Eco restoration of Kadapakkam Lake under GEF grant of ADB.
- **TNUIFSL has taken up the Feasibility study in 85 ponds in the Chennai Metropolitian Area outside GCC limits for using the water for supply to the residents by CMWSSB.**

Pidari Ponniamman Kulam , Dn.84, Zone-7

Before Restoration

After Restoration

Thandukarai Pond, Dn.190, Zone-14

REHABILITATION

NEW INITIATIVES

- Sponge City Initiatives
- Eco Block
- Real Time Flood Forecasting & Spatial Decision Support System
- Rainwater Harvesting Structures

SPONGE PARK INITIATIVES

- GCC to adopt innovative water management strategies & sponge city to tackle urban flooding.

- The Mathur MMDA colony Pond and Thiruvotriyur North selected for developing the pond as a Sponge City Park that can be replicated and scaled up across Chennai.

Formation of Sponge Park inside the existing Murasoli Maran Park

Eco Block based Sustainable Urban Development Solutions (SuDs) for Storm Water & RWH Proposed

- Storm water recharge pits with silt catch pit have inbuilt rainwater harvesting arrangement.
- SuDs being practiced across the globe aim at:
  - Increasing the groundwater recharge
  - Reduce urban flooding at 15 - 20% less cost with increased design life.
  - Effective Site Control measures and can be placed with Catch pits
- One Eco block of size 1.2 x 1.2 x 3 m can store and recharge 4.3 cum (min) of runoff

Eco block based SuDs for Storm Water & RWH Proposed

By using Geo Blocks, rainwater harvesting structures are provided at Chitra Kulam, Mylapore , Zone 9

Drain connected to Chitra kulam, Dn.124, Zone 9

Chennai Real-Time Flood Forecasting & Spatial Decision Support System

Objectives

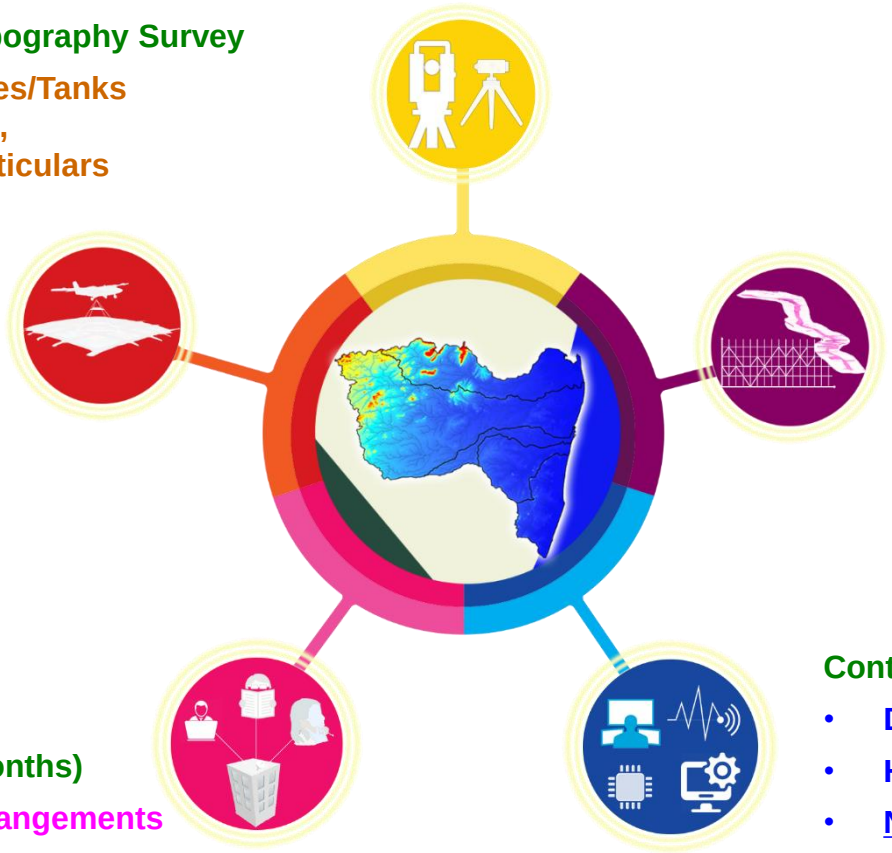
- To set up a Web-based Real Time Flood Forecasting System
- To develop a Lake and Reservoirs Operation Guidance System.
- To set up Flood Control Rooms at SEOC, Chennai, WRD HQ, Chennai and Flood Monitoring Centres (FMC) at Kancheepuram, Tiruvallur, Chengalpattu and Ranipet Collectorates and feed to GCC
- Development of Spatial Decision Support System & Dissemination of Warnings.
- Handholding and Capacity Building

Chennai RTFF & SDSS - Project Scope

Bathymetry / Topography Survey

- 125 WRD Lakes/Tanks
- 74 Waterways,
- Hydraulic Particulars

Aerial Survey
over ~5,000 sq.km
SoI Scope



Handholding (36 months)

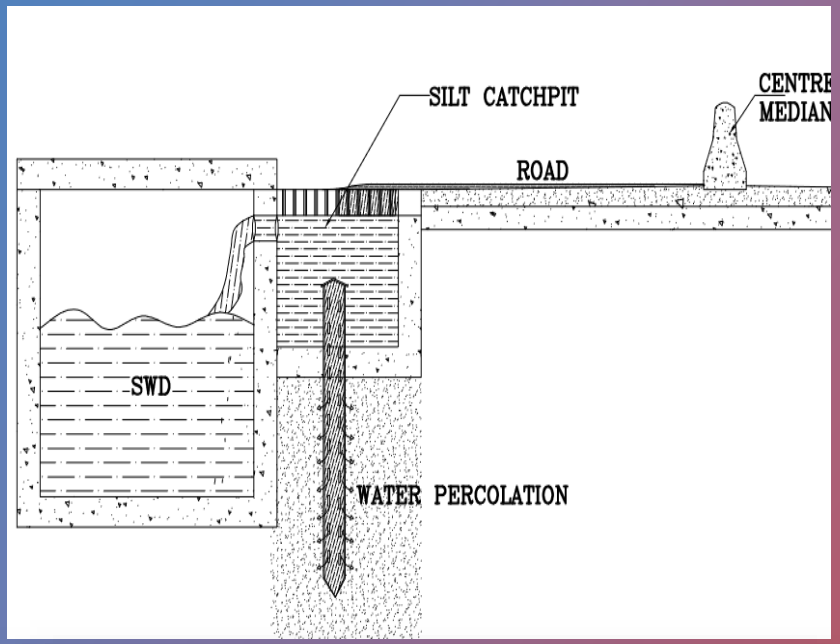
- Institutional Arrangements
- Capacity Building
- Training

Rainfall, Hydro Models

- Realtime Data Acquisition System (RTDAS)
- NWP based Rainfall Forecasting, Now casting using DWR
- Multi-tier Hydro modelling in 1D / 2D Coupled Models
- Storm Water Drain & Street level flood mapping
- Lake Operation Guidance System (LoGS)
- Flood Preventive and Mitigation Measures

Control Rooms , Web-DSS

- Dissemination of information - Web DSS
- Hydro Modelling Control Room at SEOC
- NDRC (Backup) at WRD HQ and Cloud
- Flood Monitoring Centres (FMC), Triuvallur, Kancheepuram, Changalpattu and Ranipet



RAINWATER HARVESTING SCHEME

- Rain water harvesting structures are best available installations which helps in percolation of the rain water into the ground thereby increasing the water table in the neighborhood.
- Around 22,000 numbers of Rain Water Harvesting structures are installed at the stagnation points of roads and office buildings for harnessing the rain water under various schemes.
- GCC has taken initiatives to construct Rainwater harvesting at every 30m interval along with the Integrated Stormwater drain system.

THANK YOU