

FLOOD FIGHTING AND POOR URBAN PLANNING

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Abstract

Tamil Nadu is a coastal state prone to droughts. The climate of this state ranges from dry sub humid to semi arid. (Sub-humid regions are those regions where moisture is normally less than under humid conditions but still sufficient for the production of many agricultural crops without irrigation or dry lands farming. Tamil Nadu has 3 distinct period of rainfall. Tamil Nadu has its share of problems with groundwater quality. The main problem it faces are of salinity (inland salinity as well as coastal salinity) and Fluoride content in its ground water resources, because ground water levels have declined sharply in most areas. Catchments areas have been paved and reclaimed for constructions, where result is shown in Chennai from the past few days, in urban areas like Chennai, rainwater is unable to seep in to the ground, because the land is sealed for miles with concrete buildings and a network of roads and other impervious surfaces. Instead, this precious rainwater rushes out through drains, nallas and flows out into rivers and to the sea. Billions of litres of fresh water are lost each season. It thus becomes important and vital to address the issue of water. Considering that water can only be managed and cannot be produced, it becomes important to catch, store and manage water intelligently. Though the Tamil Nadu Government has provided various programmes to save ground water but it botched to achieve it. Unplanned and ill-thought construction, especially on river, tank and lake beds, has led to the choking of water bodies that accommodated flood waters in the past and storm water channels. Rivers, natural outlets for flood waters, are choked with garbage, sewage and silt. Drainage is non-existent in the newer areas of the city while civic bodies go slow over routine pre-monsoon municipal works. Crippling floods in the city have caused huge losses to the IT industry. IT insiders have pegged the losses at \$5-10 million for mid-size firms and \$40-50 million for large companies. Cognizant, Infy, TCS and other IT firms have been organizing buses every hour to send employees to Bangalore. Around 2000 employees of each of these companies have already left to work out of Bangalore, which mark as Chennai has come to a virtual standstill and is in the grip of fear and panic.

Keywords: droughts, dry lands farming, inland salinity, Catchments areas , storm water channels, geo-environmental influences

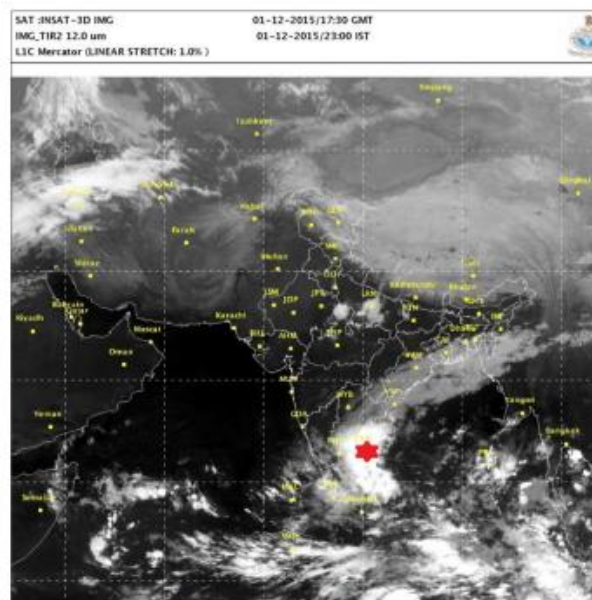
Introduction

Flood is the result from the overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions, deposition of materials in stream channels during flood recession, rise of ground water coincident with increased stream flow, and other geo-environmental influences. Hazards of flood could be from heavy rains, dam failures, tides or cyclonic surges. India's fourth largest city, Chennai was battled by unprecedented floods, which led to extreme weather change where it also paved way to climate change. Chennai and Cuddalore floods in Tamil Nadu were not only the result of global warming and but it was also warning to all improperly planned

government infrastructural projects. The December 2, 2015 floods in the city have raised many questions since – about official apathy, delays in taking crucial decisions, reservoir management and lack of coordination amongst rescue agencies. Urban planners agree that all of these were failures of the state government, but the more pertinent issue that has steered Chennai towards a disaster of this magnitude is the utter lack of political leadership for decades.

History of Chennai Floods

Chennai, having a plain terrain is bounded by Bay of Bengal in the East with an average elevation 6.7 m from them mean sea level. Chennai experiences most of its rainfall during October to December associated with Depressions & frequent cyclones during this period. Average annual rainfall is about 1200 mm - 1300 mm being situated on the coastal side. Chennai frequently experiences flooding due to heavy rain associated with depressions & cyclones. Of which few catastrophic floods during 1976, 1985, 1996, 1998, 2005, 2008 and 2010 caused heavy damages. Now-a-days, unexpected holidays due to heavy downpour are quite common especially during October - December. In short, Chennai is not starving for rain; it is starving for water which is due to mis-management of water storage. In 2010, Chennai received about 760 mm rainfall only during October- December period. Highest rainfall in a day was 423 mm on 27.10.2005 but on 02.12.2015 it was similar to that. All these shows whether Chennai is prepared to drain this flood without having hindrances in their day- today life.



Satellite image of weather pattern affecting southeast India and Sri Lanka as of December 1, 2015. Chennai City marked. Source: India Meteorological Department



Growth of Chennai City (Source: Chennai Municipal Area Corporation)

Closing of schools due to flooding every year is common in parts of Chennai. Since it is more frequent every year why effective management is not so happened?

Flood Fighting in Chennai

Chennai city is prone to flooding. It is a flat city, with altitude ranging from 2 metres to 15 above sea level. Four rivers run from west to east into the sea cutting through the city. Of this, two rivers - Cooum and Adayar - are within the main city area. Since the city is otherwise water-deficient, these rivers are blocked with bunds upstream of the city and their flow stored in four reservoirs. Catchments areas have been paved and reclaimed for constructions, where result is shown in Chennai from the past few days, in urban areas like Chennai, rainwater is unable to seep in to the ground, because the land is sealed for miles with concrete buildings and a network of roads and other impervious surfaces. Instead, this precious rainwater rushes out through drains, nallas and flows out into rivers and to the sea. Billions of litres of fresh water are lost each season. It thus becomes important and vital to address the issue of water. Considering that water can only be managed and cannot be produced, it becomes important to catch, store and manage water intelligently. Though the Tamil Nadu Government has provided various programmes to save ground water but it botched to achieve it.



Reasons Responsible for Chennai to Float

Chennai - is not an exceptional one from other metros which is suffering due to rapid urbanization. It is also contributing with the increase in floating population every year as it is a hub of all major economical activities. With Chennai seeing its worst rainfall in 100 years, while officials at the Indian Meteorological Department have said the exceptionally strong El Nino, along with a rare “coincidence of various factors”, has resulted in the heavy rain, there’s no denying that Chennai has failed in maintaining an effective storm water drainage system. In times when the city, and its suburbs, is being pounded with rainfall exceeding normal limits by over three times, a drainage system that isn’t functional, creeks and culverts that are blocked due to excessive dumping of garbage as well as the administration’s failure to ensure timely desilting Cooum River, Adyar River and Buckingham Canal, which serve as the main rain water drain for the city, have all seen encroachments. In fact, only in September 2015, the Madras High Court threatened to summon state’s chief secretary over differences in opinion between the government’s own departments. But reason for catastrophe flooding lie beyond, excessive rains pushed authorities to release massive 30,000 cusec water from Chambarambakkam reservoir into the Adyar river over two days causing it to flood its banks and submerge its neighbourhoods on both sides. Similar flooding triggers were in action in Poondi and Puzhar reservoirs and the Cooum River that finds its way through city and became one of the reasons of Chennai flood. Causes of increased flooding identified are:

(a) Uncontrolled urban sprawl and loss of natural drainage. Drainage channels have been blocked and urban lakes filled and encroached, canals degraded and polluted, heavily

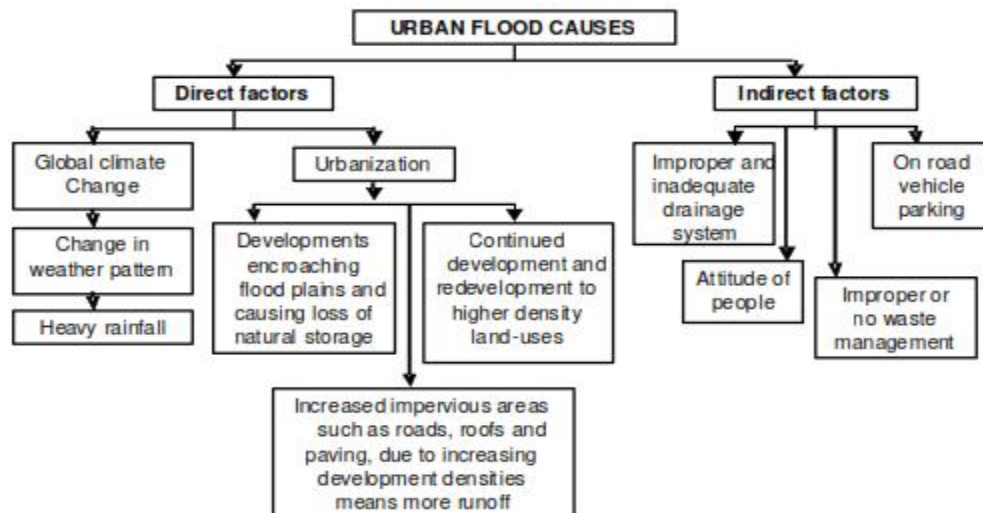
silted and narrowed. A 1994 survey revealed waterways contamination and anaerobic digestion led to sludge accumulation causing hydraulic hindrances.

(b) Inadequacy of storm-water drainage system and lack of maintenance. The city has only 855 km of storm drains against 2847 km of urban roads. Plastic and poly then constituents to the storm-water stream along with poor or no maintenance aggravates flood.

(c) Increase in impervious surfaces. Paving of road sides, parks and open are as causing flood severity and conditions for drought to follow.

(d) Lack of coordination between agencies. Lack of unified flood control implementing agency that integrates the functions of the Corporation, Development Authority, Public Works Department, Slum Clearance Board, Housing Board, etc.

Urban planning of city over the last two decades has made matters worse, poor urban planning in Chennai has three aspects to it Illegal constructions Choking of water exits Badly planned or unimplemented projects According to a report submitted by Chennai Metropolitan Development Authority to the Madras High Court, there are over 1.5 lakh illegal structures in the city responsible for disappearance of over 300 water bodies. Across Chennai, illegal construction has been making neighbourhoods unrecognizable – what may have been a tank, lake, canal or river 20 years ago, is today the site of multi-storey residential and industrial structures. (Arun Janardhanan, Indian Express, Dec 4 2015). Low lands have been filled and concept of storm water drains abandoned, which was the fundamental of flood fighting turned into reasons of Chennai flood.



Poor and incomplete Projects as Reasons of Chennai Flood

Ironically neighbourhoods that saw expensive storm water drain projects are also under water, experts say that most of these projects have been executed without incorporating crucial data on the topography or the flood character of these sites. The

catastrophic flooding in Chennai has raised several questions over its urban planning and role of the state government towards implementing policies to prevent unplanned constructions and preserving the wetlands.

So on the one hand these badly planned projects and on the other those that haven't seen the light of the day such as Early Warning System to understand the run off pattern of rain water and Laser Terrain Maps.

It is not correct to state that the flood was inevitable because of heavy rains as above facts suggests that it was just one of the factor along with other many man made reasons of Chennai flood. (IAS Times). Since the beginning of the 20th century, Chennai has witnessed a steady deterioration of and decrease in water bodies and open spaces. It is estimated that in Chennai city more than half of the wetlands have been converted for other uses. Chennai had about 150 small and big water bodies in and around the city, but today the number has been reduced to 27. The important water bodies include Adyar Estuary, Adambakkam lake, Ambatturlake, Chitlapakkam lake, Ennore creek, Korattur swamp, Madhavaram and Manali Jheels, Pulicat lake, Vyasarpadi lake, besides Buckingham Canal, Coovum and Otteri nullah. Ownership of water bodies is scattered among various government departments and is the root cause for lack of proper management. The Protection of Tanks and Eviction of Encroachment Act came into effect on 1 October 2007. However, there has been lack of implementation of this law. Meteorologically, there is no major upward or downward trend of rainfall during 200 years, and a decrease in the last 20 years with a contrast record of increasing floods has been experienced in Chennai.

Before the deluge in Chennai earlier month of December, after being warned of heavy rainfall, the civic authorities decided to release water from the Chembarambakkam reservoir on the outskirts into the Adyar River.

Since more than 500 mm rainfall was predicted over 1 and 2 December, bringing down the level of water in the reservoir from 22 to 18 feet – so that it could absorb the downpour – appeared to be a viable solution. Since the Adyar was also comparatively dry because of scanty rainfall before November, the authorities were convinced that the water could be successively diverted with this pre-emptive measure. When it began to rain, the reservoir overflowed within hours. Panicking officials opened the sluice gates, hoping Adyar would absorb the gushing water. But soon its embankments were overrun. The swollen river soon inundated the city.

According to *The Indian Express*, by around 10 pm (1 December), the water was being released at 29,400 cusec into the Adyar River, which was already in spate as engineers feared a breach of Chembarambakkam's boundary. It took three to four hours for the water to reach the city from the reservoir 25 km away, but by midnight on 2 December, land in a more than four-km radius around Adyar, which flows through the heart of Chennai, had gone completely under. To add to Chennai's misery, the gates were opened at around midnight, and without warning. The city and its citizens went under overnight.

Not acting on time, neglecting advance notice of possible flooding, and overburdened drains, reservoirs, rivers and rivulets has blighted Chennai for years. In a detailed report titled Chennai City Development Plan-2009, a group of experts had suggested rehabilitation of Chennai's waterways to ward off future threats. But the report, submitted to the CoC (Corporation of Chennai) on its request in September 2009, was dumped.

“The urban waterways in Chennai were reasonably healthy and pollution free until the middle of the last century. However, their condition deteriorated because of severe pollution and reduced carrying capacities. This can be attributed to the urban pressures on the waterways,” former IAS officer MG Devasahayam, mentioned. Chennai has two major rivers criss-crossing it: The Adyar and Cooum. Another river, Kosasthalayar, traverses a small distance through the Chennai Metropolitan Area.

The report revealed a heavy inflow of waste from municipalities and town panchayats into water bodies feeding the Adyar, which, ultimately, bore the brunt of the pollution. In the CoC area, which is densely populated, both treated and untreated sewage is let out into Adyar and Cooum rivers from various outlets.

Kosasthalayar River joins the Ennore estuary, which too is highly polluted by industrial effluents and domestic sewage from urban local bodies. Another important water body, the 48.3-km-long Buckingham Canal, has been destroyed. “The effect of urbanisation and industrialisation in and around the city and inflow of waste has converted the canal into a virtual open sewer,” Devasahayam said.

In addition, waterways are encroached at many places constricting the width of the rivers and limiting their ability to carry floodwaters without overtopping their banks and embankments and entering into habited areas. “Construction of bridges and causeways without sufficient vents to carry water and without hindrance under changed catchment conditions had led to formation of afflux at many places in the river courses and causing inundation in adjacent areas during high-flood conditions,” said Devasahayam, who is the national consultant to Sustainable Chennai Project.

Overall conditions of these waterways, the report says, can be rated “very poor because of high loads of sediment and nutrients, high turbidity, highly obnoxious odours and very low levels of dissolved oxygen”. But, no action was taken.

Nonexistent drainage systems

Storm water drainage infrastructure, according to Devasahayam, in most of the municipalities is “either nonexistent or inadequate. Only a few municipalities have functional drainage systems. Planning and design of drainage systems are deficient and typically not integrated with the drainage in the surrounding catchment areas, More importantly, there is no data on where the drains are. “There is no correct map. It is also unknown what the lifecycle of the drain is. If we do not have the lifecycle of the drains, we cannot actually know when it is supposed to be maintained,” said environmentalist

Satyarupa Shekhar, director, government outreach and advisory services, of (Chennai-based) Citizen Consumer and Civic Action Group. At many places, sewer lines have been illegally connected to the drains. "When we have intersections with the sewer networks, complete flooding of the city becomes inevitable. It is actually sewage water which is flooding it," Shekhar said. (First Post)

Economic Impact of Flood

Chennai hosts over 165 BSE (Bombay Stock Exchange)-listed companies (registered in the city) with an aggregate market capitalization of over Rs 285,000 crore. The northeast monsoon in Chennai this year – the severest in over a hundred years – has wreaked unprecedented havoc. When the rain returned after a lull over the weekend, the city, which had already taken a pounding in November, could not cope. Chennai's airport, railway stations and bus stations had closed. The city's two main rivers, the Adyar and Cooum, are flooded and reservoirs and tanks in the outskirts are overflowing. There has been no electricity in large parts of the city for over 24 hours, 18 patients died in one of the private hospitals due to insufficient power supply for medical instruments. Business has reported losses of over Rs 500 crore and at least 21 work days have been lost. The navy and disaster management teams are undertaking rescue missions as the threat of a food and water and health crisis looms.

The heavy rain has exposed the creaking public infrastructure in Chennai – like the 2005 deluge did in Mumbai or the 2014 floods in Srinagar. One of the largest manufacturing and commercial hubs in the country, Chennai, understandably, has been expanding at a fast pace. From heavy industries like automobiles and auto components to software, BPOs, education and healthcare, the city has built a wide economic base and is home to a cosmopolitan workforce. Yet, the administration has been slow to augment the infrastructure to take the extra load of people and vehicles. Unplanned and ill-thought construction, especially on river, tank and lake beds, has led to the choking of water bodies that accommodated flood waters in the past and storm water channels. Rivers, natural outlets for flood waters, are choked with garbage, sewage and silt. Drainage is non-existent in the newer areas of the city while civic bodies go slow over routine pre-monsoon municipal works. Crippling floods in the city have caused huge losses to the IT industry. IT insiders have pegged the losses at \$5-10 million for mid-size firms and \$40-50 million for large companies. Cognizant, Infosys, TCS and other IT firms have been organizing buses every hour to send employees to Bangalore. Around 2000 employees of each of these companies have already left to work out of Bangalore, which mark as Chennai has come to a virtual standstill and is in the grip of fear and panic.

The well-established presence of the automobile industry around the city include factories of Hyundai, Ford, BMW, Nissan, TVS, Renault-Nissan and Ashok Leyland, most of which were forced to shut production. TVS Motor Company, which is based in Chennai, had reported that over the last three weeks, the company suffered sales loss of approximately

15,000 units due to inclement weather. Software exporters have invoked Business Continuity Plans, which in tech parlance is intimation to the company's other centres across the country to lend a hand to projects handled from Chennai. Moreover, insurance claims for damage to property, automobiles and other goods following the devastating floods in Tamil Nadu could rise to well over Rs 1,000 crore, general insurance companies estimate. (One India online paper) While the earlier deluge in the state, which started on November 8, has already resulted in claims of around Rs 500-600 crore, the recent torrential rains could cause far more damage, insurers point out. The public sector United India Insurance has the biggest exposure to the state. What is worrying, according to a report submitted by CMDA to the Madras High Court, is that there are over 1.5 lakh illegal structures in the city. A big automobile manufacturing and IT hub, the floods have badly derailed the business activity in the city as companies stopped their production activity and shut down offices with instruction for employees to stay home or work from home. (India Times, Dec 4 2015.)

Need for New Chennai Project

As the flood water recedes in Chennai, serious questions are being raised about reservoir management in the city. Much of the flooding and subsequent water logging was a consequence of the outflows from major reservoirs into swollen rivers and into the city following heavy rains. The release of waters from the Chembarambakkam reservoir in particular has received much attention. Announcements by political masters have been glorious and plenty. The First Master Plan for Chennai city was formulated by the CMDA and approved in 1976. The Second Master Plan has been in force since 2008. Satellite townships, industrial parks, IT corridors and Special Economic Zones have been announced by both the DMK and the AIADMK governments. Development plans, however, remain on paper, with unauthorized structures sprouting with abandon, blocking the natural drainage course of the water bodies in and surrounding Chennai. The first step Government has to take, once rescue and relief operations are complete, is to set up a task force that reviews all on-going construction activity in the city and its suburbs. As alarming as it may sound to the real estate industry, given the magnitude of the floods, the Chennai Metropolitan Development Authority must review permissions that have been granted given that it operates as the green channel for commercial constructions in the city and it reviews plans in accordance with the city's master development plan.

Construction of infrastructure which is blocking waterways needs to be looked at very seriously. Ban change of land use in low-lying areas, do not allow construction there. As for the long term, the state should go in for satellite townships located 40-50 km away from Chennai and link them to the main city with excellent infrastructure. A relook at the land-use in the master plan should also be among the top priorities for Government of Tamil Nadu. How much land has been allotted to development projects, Is it commercial or settlement, Is there a need to increase no-go eco-sensitive zones that can serve as

catchment areas, especially in low lying areas and as a common man said in a TV Interview Government has to stop giving freebies and start providing the basic needs i.e. proper infrastructure which means dismissing all catchments and encroachments, good road, tap water, quality bridge, Government dispensaries and clinics to each area...etc. which really facilitates human needs. If there was proper infrastructure, well planned urban project Chennai would not have faced such disaster.

Chennai is getting back to normalcy, one of the gargantuan tasks on hand will now be to claim insurance for lives lost, property, medical treatments, cars damaged and homes destroyed. Chennai floods have flooded the prospering economy of not alone Chennai but whole Tamil Nadu. Despite being the most urbanized state in the country, with 48.5% urbanisation, the state and its capital city have paid a huge price in the recent floods. Political leadership of various parties in the state would now need to come together, setting aside differences, to work towards salvaging what remains of ravaged Chennai. Generations to come will never have to experience floods if the existing rules are simply implemented in letter and spirit.

Both humans and nature put together the ground for the perennial flood tribulations. The immediate need is to create a scientific inventory of water bodies and delineate flood zones within the city. The flood zone will have to be identified based on the location of the water bodies, natural drains, water shed area and it has to be made as a no building zone. More campaigns have to be conducted at the local level in order to create awareness to the public about the causative factors for the flood disasters. In addition to the above, the wide-ranging management measures will help Chennai to be relieved from the recurrent flood menaces almost every monsoon. An integrated approach, therefore, needs to combine waters shed and land-use management with development planning, engineering measures, flood preparedness, and emergency management in the affected low lands, while taking into account the social and economic needs of communities in both the highland source areas, and also the lowland flood-prone areas.

Sequence of Actions to hurl out from the Flood Hazard (Both structurally & Non-Structurally)

- An integrated approach in Flood control and Management: It can be done by creating an unified flood management agency which acts as a nodal group to carry out the function of planning, co-ordination and monitoring of all the existing bodies like CMDA, Corporation of Chennai, Slum Clearance Board, CMWSSB, etc., in addition to the Disaster management agency
- Preparation of Topographical Map: Accurate topographical map (at least for the flood prone areas immediately) should be prepared by the local authority using GIS through digital elevation and terrain mapping.
- Distinguished Chennai River Restoration programme: It will support to alleviate the flood issues to a considerable level in addition to the Lake conservation programme

- Prevention of Pollution: Impeding the disposal of untreated sewage, sullage and solid wastes will reduce the problem of choking the waterways which magnifies the flood crisis.
- Clearing off the encroachments near the water bodies: All encroachments in and around the water bodies and floodplains should be cleared off and they have to be rehabilitated in other areas will subsequently reduce the flood crisis
- Scientific study about flood pattern: There is an immediate requirement about the study of flood pattern at least for 5 years using hydrological and hydraulic modeling techniques which guides us with a strategic planning collectively.
- River-front water development plans will help the stakeholders in managing the flood control plan effectively and also creates awareness to the public also about the advantages in maintaining the water resources.
- A rapid assessment of flood inundation mapping is required before the monsoon starts so as to effectively alleviate the flood risks.
- Flood Mitigation Programmes: Construction of raised platforms, Flood walls, town protection works should be carried out and monitored for effective mitigation of flood menace.
- Water shed management: Timely cleaning, desalt inland deepening of natural water reservoirs and drainage channels (both urban and rural) have to be taken up.
- Increasing Green cover: It requires more of planning and regulatory control over the open space and ground cover.
- Public Awareness: People should be made aware about the flood preparedness, response and mitigation measures.
- The above list of strategies is an illustrative and not an exhaustive but once implemented effectively will reduce the flood risks efficiently. Finally the approach in implementing the above said strategies should be at the micro to macro level approach for a fruitful result.

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