



**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY**

**ASSESSING DISASTER IN TANK COMMAND AREAS OF COOUM
BASIN USING IRS DATA**

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ABSTRACT

Chennai has a metropolitan population of 8.24 million as per 2011 census and Chennai lacks a perennial water source. Meeting need of water requirements for the population is an arduous task. Although three rivers flow through the metropolitan region and drain into the Bay of Bengal, Chennai has historically relied on annual monsoon rains to replenish its Tanks and Reservoirs as the tanks are silted up or encroached and the river banks are invaded by building activity, drying up due to neglect of tank bunds and loss of their capacity to store rain water, rivers have only source from sewerage water from the buildings and establishments which polluted the river and made it a big surface water sewage system. The area covering Cooum and allied interlinked Kusatalai, Palar and Adayar basins should be considered as Chennai Water supply basin for planning and implementing projects for the future demands by harvesting the monsoon rains in these basins. The concept of watershed delineation in to micro watersheds, use of satellite data like IRS III(Indian Remote Sensing) and new generation high resolution satellite data has been illustrated in this paper. This paper will make one to understand the past glory of cooum maintained by ancient living people from 5000 years and how our greed to expand without proper hydrological modeling. Now we are gifted with High resolution satellite data for creation of GIS(Geographic Information System) and Plans and monitoring the climate research and disasters with Kalpana and other Weather satellite data to arrest disasters and manage the basins and make it a surplus by Rain water harvesting programmes with hydrological computer modeling.

KEYWORDS: IRS, GIS, Rain Water Harvesting, Hydrological Computer Modeling

INTRODUCTION

Cooum River

Cooum River originates from Cooum Tank of Cooum village of Tiruvallur district, at about 72 km away from Chennai. Its main course starts at Sattarai village, around 65 km from Chennai. Flowing through Poonamallee, it enters the Chennai District at Arumbakkam after meandering for about 54 km. It then passes through some of the oldest residential areas for another 18 km such as Choolaimedu, Chetpet, Egmore and Chintadripet, where the river channel is about 30 m wide.[Aishwarya.S,2009]. Close to Egmore, the river forks into two—the northern and the southern arms— both of which join again near the Napier bridge, thus forming delta island, known as the Island Grounds. The northern part of the Buckingham Canal joins the Cooum near the old Central Jail while the southern part of the same canal emerges from the river, just behind the University of Madras campus. The river finally joins the Bay of Bengal south of the Fort St George, just below the Napier Bridge[Suresh.S,2012].

With the population increasing over the decades, the metro has acute water supply shortages.

And its ground water levels have been depleted. The degradation of Tanks and water bodies due to urbanization in Cooum and allied rivers basins has affected the City water supply and made it prone to disasters due to flooding and health hazards even for little higher intensity of rainfall causing surface flow. When the tanks and reservoirs have lost their capacity to store 1000 to 1500 rainfall gifted every year from monsoon rains for augmenting the city's water supply, we have to depend on projects like New Veeranam project, which is operational from September 2004, which are distant sources from Neyveli and Veeranam tank of Cauvery and the interstate projects like the Telugu Ganga project, which transfers water from rivers such as Krishna River

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Basin of Maharashtra, Karnataka and Andhra Pradesh, to ease water shortages. The city has to construct a couple of sea water desalination plants to further increase the water supply, with the two functioning since 2010 and 2013.

1.2. Once a fresh water river

Once a fresh water river, it is now a drainage course inside Chennai metro, collecting surpluses of 75 small tanks of a minor basin. The river is considered to be the shortest classified river draining into the Bay of Bengal. It passes through three corporation zones—Kilpauk, Nungambakkam and Triplicane.

1.3 Capacity of river

The capacity of the river is 19,500 m³/s, and the anticipated flood discharge is around 22,000 m³/s. Once a fishing river, it has borne the brunt of the city's unplanned explosion. The Kesavaram dam diverts the flow from Kusasthalai river after Cooum village before Thiruvallur. At Puduchatram between Poonamallee and Thiruvallur the river water is diverted into the Chembarambakkam Lake from which water is utilized for the supply of drinking water to the city of Chennai. Thereafter, the flow of water in the river is much reduced.

RECENT HISTORY

Cooum was earlier known as the Triplicane river which appears to be derived from Tamil literature. The name Cooum may have been derived from the Tamil term cooum meaning 'well' or 'deep pit'. The word *coovalan* denotes a person who is well versed in the science of ground water, well water and stagnant water. Once this river was said to have its origin in Dharmapuri district, but now due to Tectonic earth table changes, it has shortened its course at Thiruvallur district. Ancient documents from the nearby temples states that anyone will 'reaching salvation' on having a dip in the Cooum. The Cooum River was then clean and unpolluted.

2.2. Port of Manarpha or Mylapore

When it was a clean river, this river is the most suitable way for navigation. In ancient times, it played a pivotal part in the far-flung maritime trade between the Roman empire, South India and Sri Lanka. Cooum's proximity to the ancient port of Manarpha or Mylapore added to the river's strategic importance. Manarpha was frequented by Roman merchants who came here to buy Indian textiles, gemstones and spices. In return, India procured gold, silver, copper and high-quality wine from the Romans. Archaeologists have discovered ancient wine jars, Roman and Chinese coins on the banks of the river. In the late eighteenth century, Pachaiyappa Mudaliar, the renowned philanthropist, bathed in this river before offering prayers at the Komaleeswaranpet Temple in Chintadripet [Suresh.S, 2012]

2.3. Chola period history *Kashta budhyot pathihi and padhinaru nattham*

Three ancient Shiva temples are located at the source of the river. The first is Tiruvirkolam, in Cooum village, and the other is at Ilambaiyankottur. The third is Thiruverkadu Shiva temple. Koyambedu temple is also in its banks. These temples have been featured in the Thevaram poems of Saivite saint Thirugnanasambandar. There is one more temple called the Veerebathrasami temple with the deity of the god 'Akoramoorthy' at Pillayarkuppam about 2 km from Cooum village. In ancient Tamil Nadu, under the Chola Empire, the river Cooum was referred to as *Kashtabudhyotpathihi*. They all form a group of villages called 'padhinaru nattham'.

FLOOD CONTROL IN 1700AD

Cooum River and the nearby Elambore or Egmore River (or North River), which flows into the Cooum at its mouth, were running very close to each other near the former Central Jail area opposite Chennai Central. During floods in 1700 AD, both water courses inundated the whole area. Then these two rivers were linked by a cut to equalize the floods in both the rivers and a bridge was constructed between these rivers in 1710 across the cut [Structure of Chennai, 2013]. The 2004 tsunami cleaned the mouth of the river; however, the river returned to its usual polluted self within a short period. During this Indian Ocean tsunami of 2004, the empty waterway enabled it to absorb the energy of incoming Tsunami waves and dampen the energy ocean water and protected the uplands like Triplicane, Mylapore and Raja Anna malaipuram between the Bay of Bengal and Buckingham canal. But some view this would not have been possible had the river been in full flow. In November 2005, three days of torrential rains flushed out the waste and cleaned up the river, and the river was clear for a brief period. Egrets and cormorants too were cited flocking the river to feast on fish [Kumar.K. et al., 2011]. The river discharged the floodwater at a rate of about 21,500 C/s [session 3 River, 2012].

The **Cooum River** is now a polluted river which ends in the city of Chennai (formerly Madras) draining into the Bay of Bengal. Along with the Adyar River running parallel to the south, the river trifurcates the city and separates Northern Chennai from Central Chennai. Owing to intensive use of surface water upstream for agriculture, indiscriminate pumping of groundwater leading to reduced base flow in the river, formation of sand bar at the mouth of the river, discharge of untreated sewage and industrial effluents and encroachment along the banks, the river. Especially the downstream, has been highly polluted[Ramakrishnan.T,2009].

ORIGIN AND COURSE

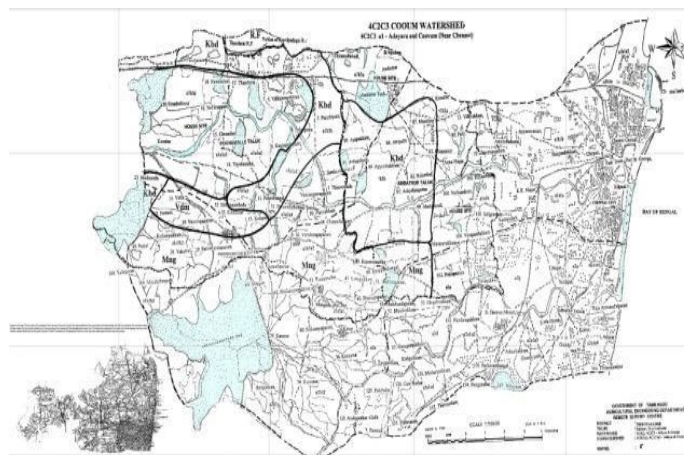
Cooum river is in a inter fluvial river basin linked to Palar river at Kaveripakkam in Vellore District, to divert excess drainage and Kusasthalai Aru in Thiruvallur, Adayar, Chembrampakkam lake in Kancheepuram district and drains in Bay of Bengal at Chennai Metro water. As Yerra River of Melbourne Australia or Thames of London in UK this Metro river Hydrological and Hydro ecological management to return to the glory of clean river fit for swimming or to restore the in land navigation facility and serving ports at the coast from Mylapore to Chennai

coast as in 1 Centaury AD. The Tanks in These interfluvial basin act as storage reservoirs from Cooum and drains excess storage to Kusasthalai River again to fill Poondi Drinking Water reservoir as well as Tanks to use the water from these river to irrigate the lands in Thiruvallur District and Tanks which are serving as drinking water storage.

Rivers draining in Bay of Bengal and Catchment between Catchment of Cauvery and Krishna .Cooum is in reservoirs by harvesting the 1500 to 2000 mm annual rainfall in this coastal district. The major rivers like Cooum is a Mini Watershed considering is a Mini All India Drainage Pattern . The Thiruvallur District is in 4 zone Rivers draining in Bayof Bengal and C catchment between catchment of Cauvery and Kirshna Cooum is in 4C2 Catchment.

No	Catchment Code No	Rivers covered by catchment	Area Sq.Km	Districts Covered
1	4C2	Between Pennaiyar and Pennar	15997.551	Tiruvallore, Kancheepuram Vellore Dists of Tamil Nadu. and Chittur and Nellur Districts of Andhra Pradesh.

District:THIRUVALLUR



IRS AND OTHER SATELLITE DATA FOR FLOOD AND DISASTER MANAGEMENT

The first Indian satellite of the **IRS** programme was the IRS-1C, launched in December 1995. The last one of them, IRS-P6 –also called Resourcesat-1- was launched in October 2003. IRS LISS-III data are well suited for agricultural and forestry monitoring tasks. Because of their simultaneous acquisition with IRS PAN data and the availability of a synthetic blue band, LISS-III data are ideal for colouring IRS PAN products.

The Linear Imaging Self Scanning Sensor (**LISS-III**) is a multi-spectral camera operating in four spectral bands, three in the visible and near infrared and one in the SWIR region, as in the case of IRS-1C/1D. The new feature in LISS-III camera is the SWIR band (1.55 to 1.7 microns), which provides data with a spatial resolution of 23.5 m unlike in IRS-

1C/1D (where the spatial resolution is 70.5 m). The Data products are categorized as Standard and have a system level accuracy. LISS-III Standard Products comprise Path/Row Based products, Shift along Track product, Quadrant products and Geo- referenced products. Path/Row Based products are generated based on the referencing scheme of each sensor. Shift Along Track applies to those products covering a user's area of interest which falls in between two successive scenes of the same path, then the data can be supplied by sliding the scene in the along track direction. LISS-III full scene is divided into four nominal and eight derived quadrants. LISS- III photographic quadrant products are generated on 1:125,000 scale. Geo-referenced products are true north oriented products. These products are supplied on digital media only. The IRS LISS III Satellite image below shows the three tanks fed by Coom in Coom water shed and Thiruttani river sub watershed of Kusasthalai Aru watershed. The Micro watersheds map with soil data can be used for estimation of flood discharge and estimation of area affected. These images show the command areas affected by surface run off from the poorly maintained tank bunds which allowed the fields to have standing water for number of days and affected the crop yield. Now the tanks are abandoned due to urbanization and affect the lands even during heavy occasional rains and also causes drought as the rain water is not harvested.

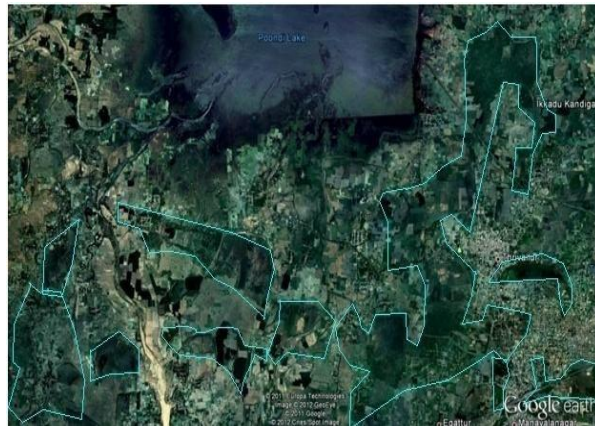


Image 1 :Tanks near Poondi Reservoir



Image 2: Cooum river fed tanks

In Southern part of Poondi Reservoir, Kakkalur Tank, Thirupachur Tank, Tanks in Thiruvallur area and Kusasthalai Aru may be Image Satellite image of water bodies near Thiruvallur seen in this image. The Tanks are degraded and silted up. The green colour in next image indicates shows the degraded areas due to silting up of tanks and encroachments



Image 3 :The area affected by disasters like flood

The 4a covers the Vellavedu canals area which links Cooum with Chembrampakkam lake which water drains in Adyar river. This explanation details the complex nature of the inter fluvial Chennai basin covering Cooum in Vellore and Thiruvallaur districts which serves as drainage basin of all tanks which are harvesting about 1500 mm rain fall part annum. We have to appreciate the skills of the ancient kingdoms in these area who have built the number of tanks we see now about 2000 years ago and the wisdom of Nawab of Arcot to link Kaveripakkam tank to Cooum and the skills of British who have taken meticalas hydrological design and planning to keep the Ancient port town of Mylapore to Fort St George and Santhome at the confluence of Cooum and Adayar with

Bay of Bengal to keep Cooum, Adayar and Buckingham canal fit for inland navigation water ways with clean water in Cooum and Adayar fit for taking bath till 1950s. The maps of these four watersheds are given here. The Chennai Cooum micro watershed table details the names of villages covered, area of Micro watershed etc. It is denoted as 4d Mini watershed.

Flood Control Investigation T Surveys

The tanks and channels should be restored to their original level by desilting and opening original level by removing encroachments and desilting in a six months programme using machinery remote sensing and GPS survey.

The land use and soil GIS layers have to be created based on LISS III IRS data for the district in 1:50000 scale. The command area and catchment GIS Layers may be created in 1:1000 scale with 3D aquifer and surface drainage mapping for creation of 3D Hydrological modeling of study area. The bore well and open wells lithological data. This will help us to create a 3D aquifer model to which the rainfall intensity, climate information can be fed to estimation of runoff sediment yield and identify the areas prone to flood.

CONCLUSION

This paper helps to understand the past glory of Cooum by the ancient living people from 5000 years and how our greed to expand without proper hydrological modeling. Now with the High resolution satellite data for creation of GIS (Geographic Information System) and plans for monitoring the climate research and disasters with weather satellite data to arrest disasters and manage the basins and make it a surplus by Rain water harvesting programmes with hydrological computer modeling are dealt. This Paper proposes as future work remote sensing and GIS surveys using satellite creating computer tools for assessing disasters in tank command areas in Thiruvalluvar district.

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