

Real-time Flood Forecasting in Adyar and Cooum Rivers to Monitor the Cyclone Impact

1.0 Introduction

Chennai is a coastal city, where the two rivers, namely Adyar and Cooum, flow through. The Chennai Metropolitan Area (CMA) can broadly be divided into three parts. The northern part lies above the Cooum River, middle region is between Cooum and Adyar Rivers and the southern portion is below Adyar River (figure 1).

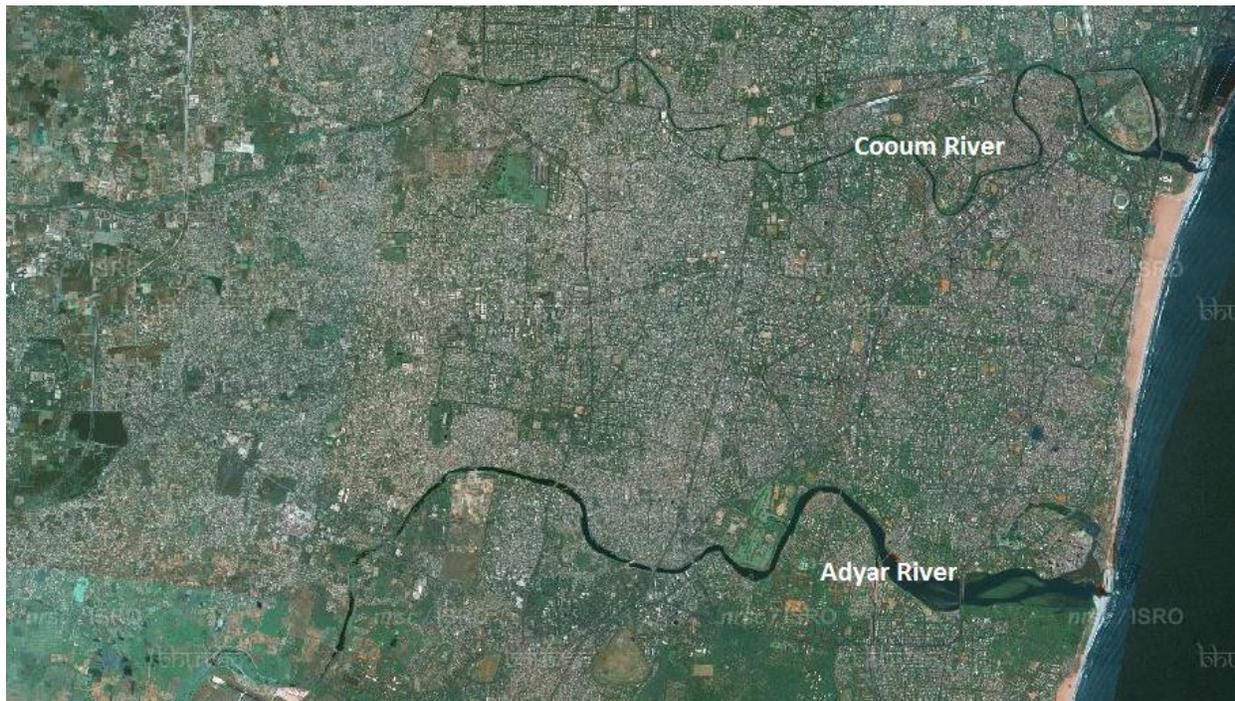


Fig 1. Adyar and Cooum Rivers in the Chennai City

Flood situation in these two rivers due to depression in the Bay of Bengal being monitored using the best available topographic and meteorological data.

2.0 Spatial and non-spatial Data:

2.1 Topographic Data: Landuse/landcover of the two catchments derived from IRSP6, Soil textural map (NBSS&LUP), 30m CARTO DEM for hydrological modeling.

2.2 Meteorological Data: Daily rainfall data from IMD (AWS+ARG), GEFS forecast rainfall data. Forecast rainfall data was used for forecasting the flood and it was replaced with the CPC/IMD rainfall as and when the data was available during the continuous simulation period.

3.0 Rainfall scenario:

Satellite based rainfall data products are used in the hydrological modeling in absence of field rainfall data. Daily rainfall data from IMD (AWS+ARG) for the period 16 to 19th May , GEFS-forecast rainfall products for the period 20 & 21st May 2016 were obtained, analysed and used in the hydrological model. Rainfall distribution in the Adyar and Cooum catchments is shown in the figure 2.

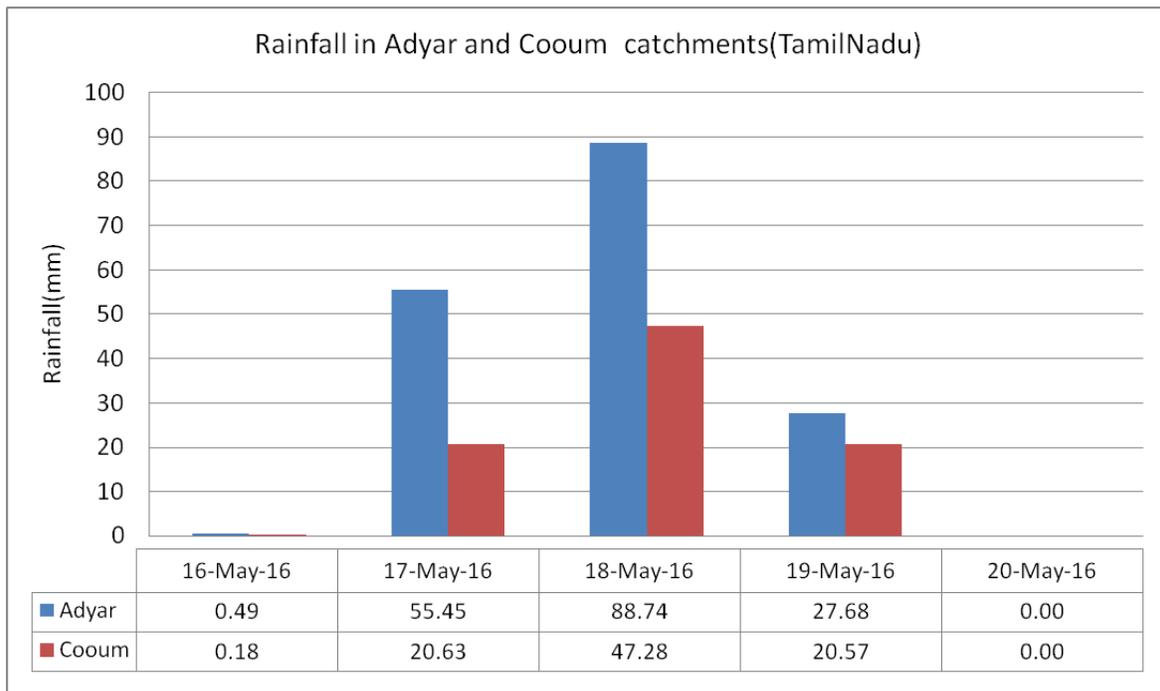


Fig. 2 Rainfall Pattern in the Adyar and Cooum River Catchments

(IMD Rainfall:16 to 19th May; GEFS Forecast Rainfall: 20& 21st May, 2016)

4.0 The Hydrological Model

Hydrological modeling was done to compute the runoff using space based inputs. CARTO DEM, landuse land cover grid (derived from IRS P6 satellite data) of the study area, soil textural maps were used in deriving the input parameters for the study. All the topographic and hydraulic parameters like; catchment slopes, lag-time, channel slopes, roughness parameters are computed (Boundaries of the river catchments are approximate near coast). Rainfall during the mentioned period was extracted from the rainfall images and fed in to the hydrological model. Basin model setup of the Adyar and Cooum Rivers are shown in the figure 3 and 4 respectively.

Real-time flood forecasting being done on continuous simulation mode on everyday starting from 17th May 2016 with the rainfall forecast (GEFS) lead time of 2 days.

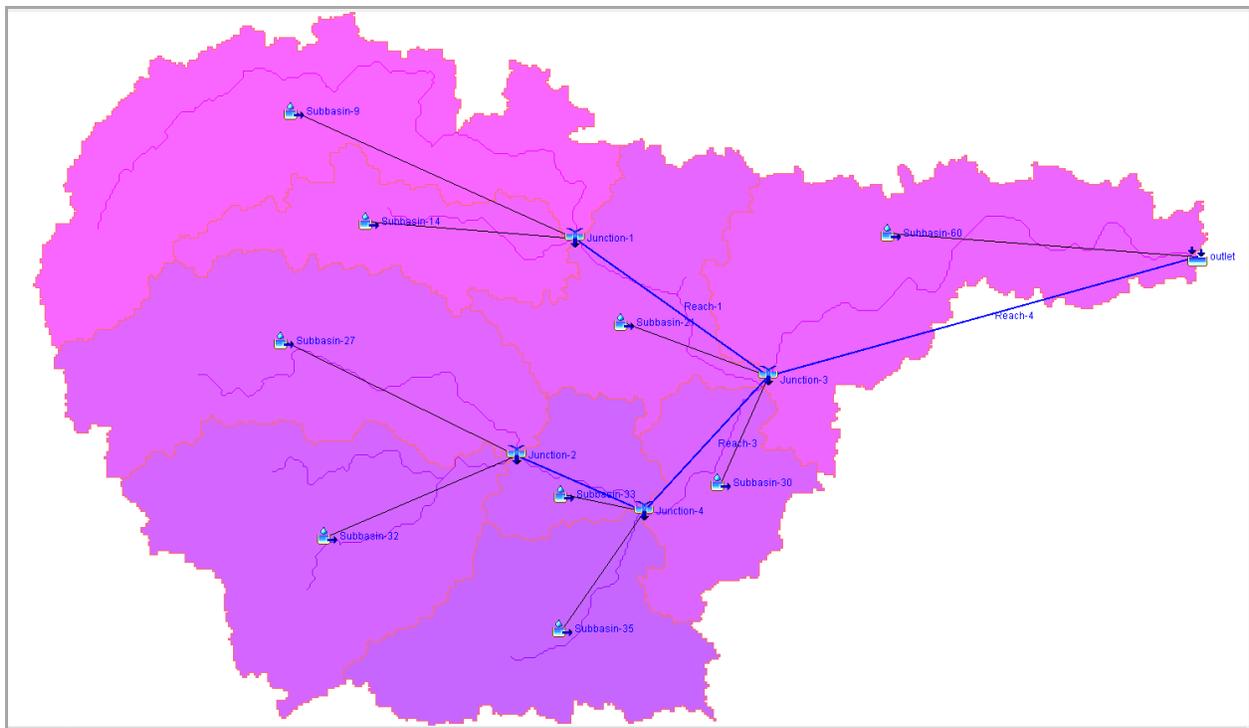


Fig. 3 Basin Model Setup of the Adyar River Catchment

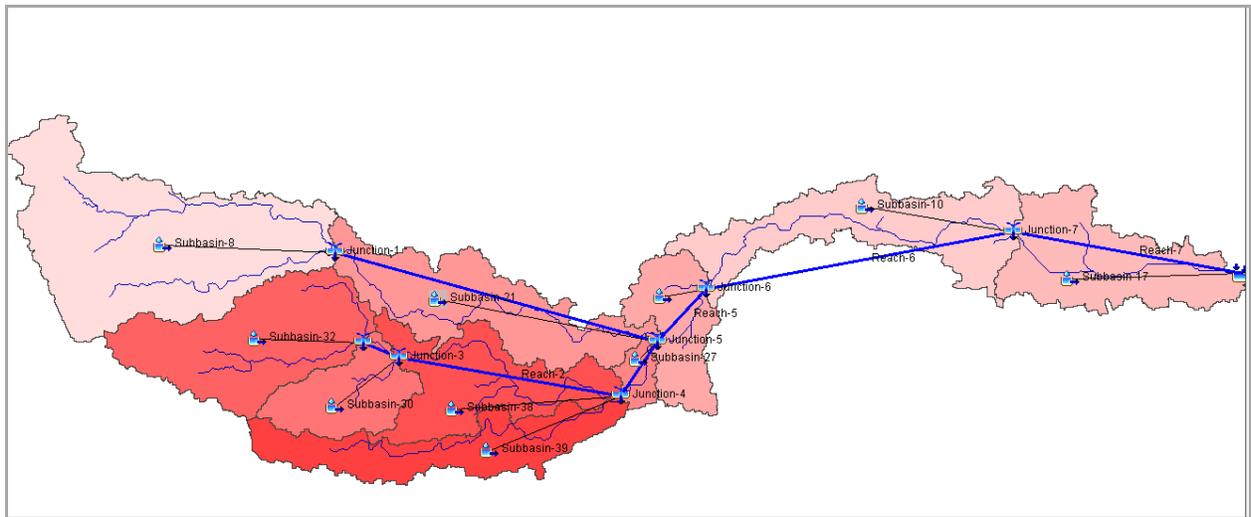


Fig. 4 Basin Model Setup of the Cooum River Catchment

Flood hydrograph at the outlet was computed using the developed models for both the Adyar and Cooum Rivers for the period 16th to 22nd May 2016 and shown in the figures 5 and 6 respectively. As there is no discharge data available in the downstream side, calibration could not be done in the modelling.

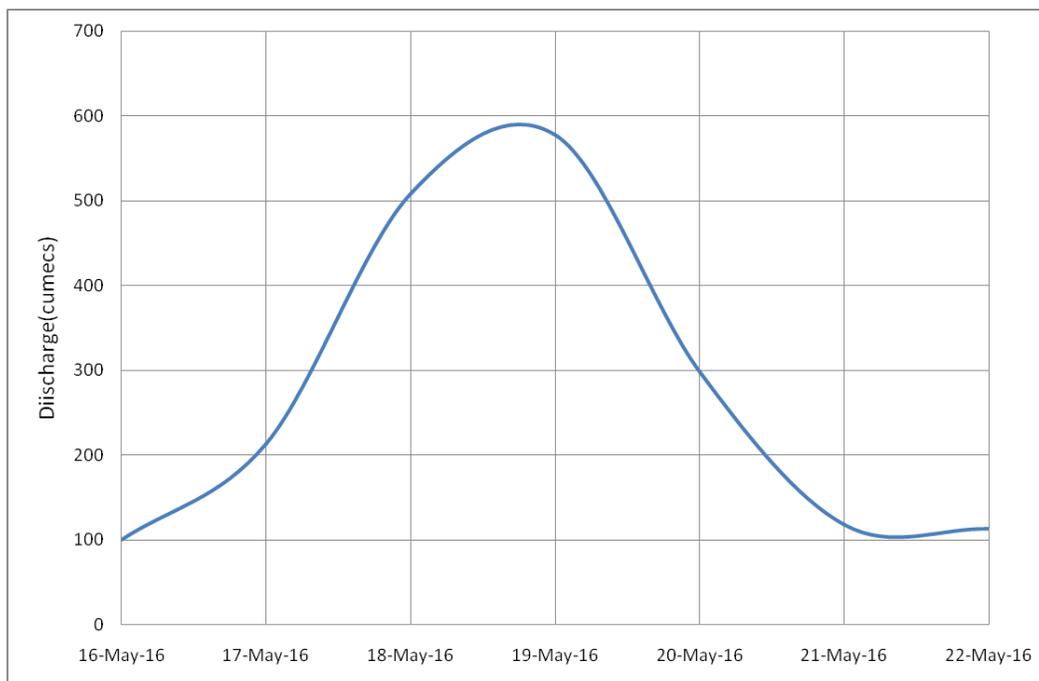


Fig. 5 Computed flood hydrograph of Adyar River in M³/Sec (computed as on 19th May 2016)

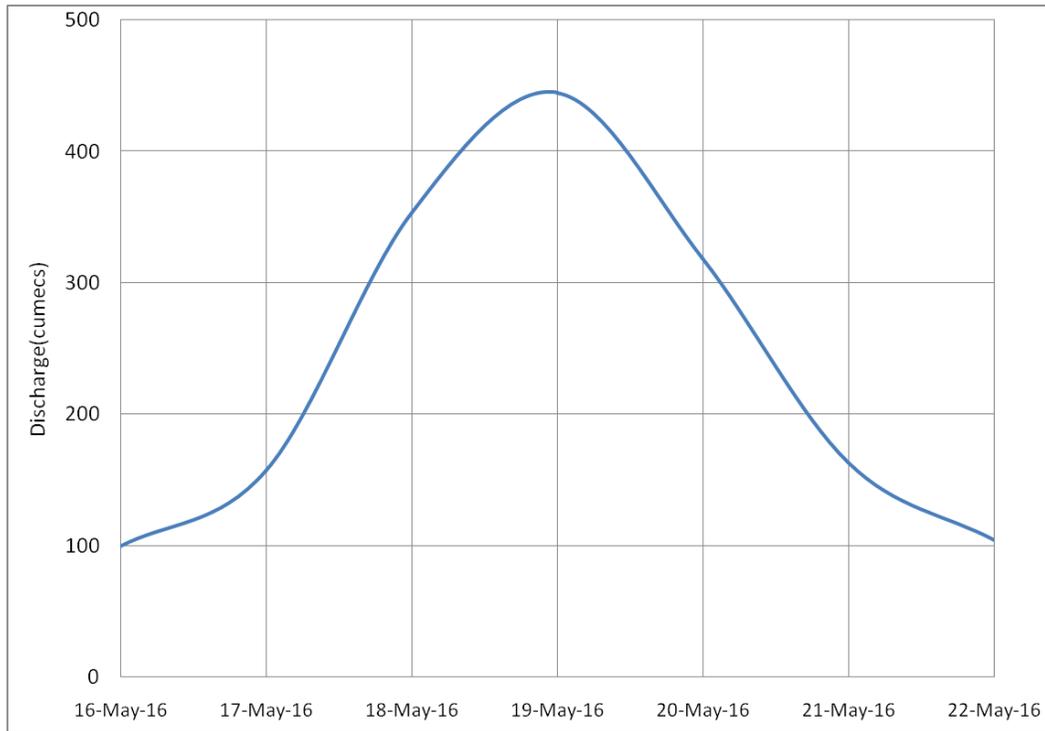


Fig. 6 Computed flood hydrograph of Cooum River in M³/Sec (computed as on 19th May 2016)

Computed peak flood in Adyar and Cooum Rivers at final outlets are found to be 580 and 445 m³/sec (approximately). These simulations are to give approximate flood situation in these two rivers in absence of any field rainfall and discharge data. As the computed discharge is low, it may not cause any river floods in the Chennai City with the present set of rainfall information.

Note: These flood hydrographs will be updated as and when the rainfall data is updated (both the current and forecast rainfall).