# Flood Potential Estimation of Poorly Gauged Varekhadi Watersheds Using HEC-HMS Model - A Case of Lower Tapi Basin, India



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## ABSTRACT

Varekhadi watershed is situated at downstream of Ukai dam, covers 25463.28 km2 area and consists of 30 micro watersheds. River is un-gauged and it drains out the downstream side. Present work is focused on flooding potentiality of Varekhadi micro -watersheds using the Hydrologic Engineering Centre- Hydrologic Modeling System (HEC-HMS) software water to Tapi River which is one of the responsible factors for flooding at. 7ETM + image band 2, 3, 4 [30 m] merged with PAN band 8 and Shuttle Radar Topography Mission (SRTM) 1 arc (30 m grid) data is used for preparation of various input file like land use/land cover, slope and watershed boundaries in GIS environment. Survey of India topographical maps of 1:50,000 scales are used to prepare the drainage files. The Varekhadi watersheds are delineated through HEC-GeoHMS and further divided in 30 micro watersheds. The HEC-HMS model was applied for estimation of daily run-off for each micro watershed. The lower part of the watersheds like W940, W960, W1100 micro watersheds lead the highest value of flood potentiality, where the high population is settled. The analysed map shows that WS- W640, W680, W730, W930 and W1260 are fall in the high runoff category which increases risk and venerability to flood and inundations. Present study shows the application of a HEC-HMS model to estimate the run-off to predict the flood potentiality in poorly gauged catchment.

## STUDY AREA

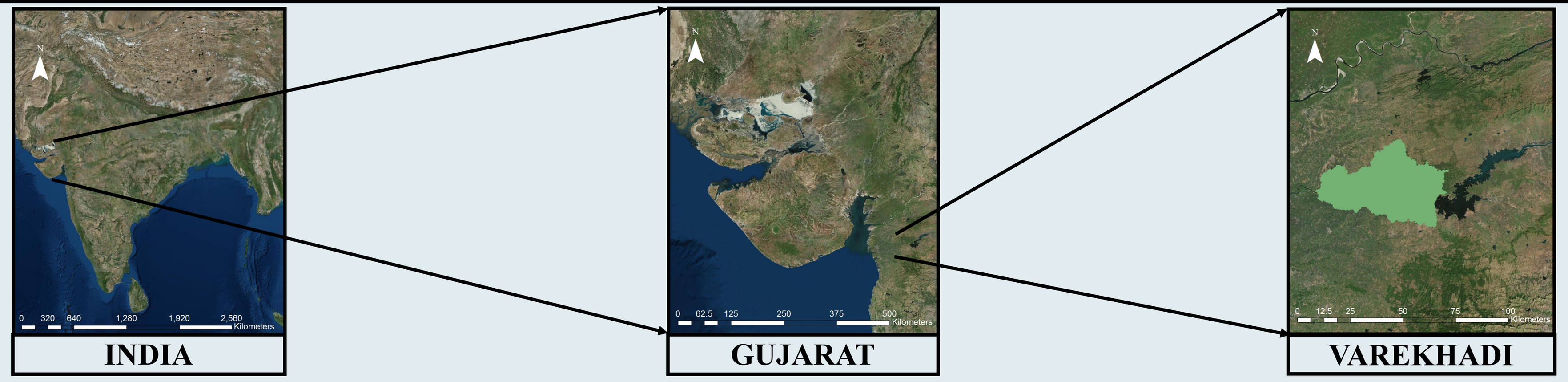


Fig.1 Location map of study area

## METHODOLOGY

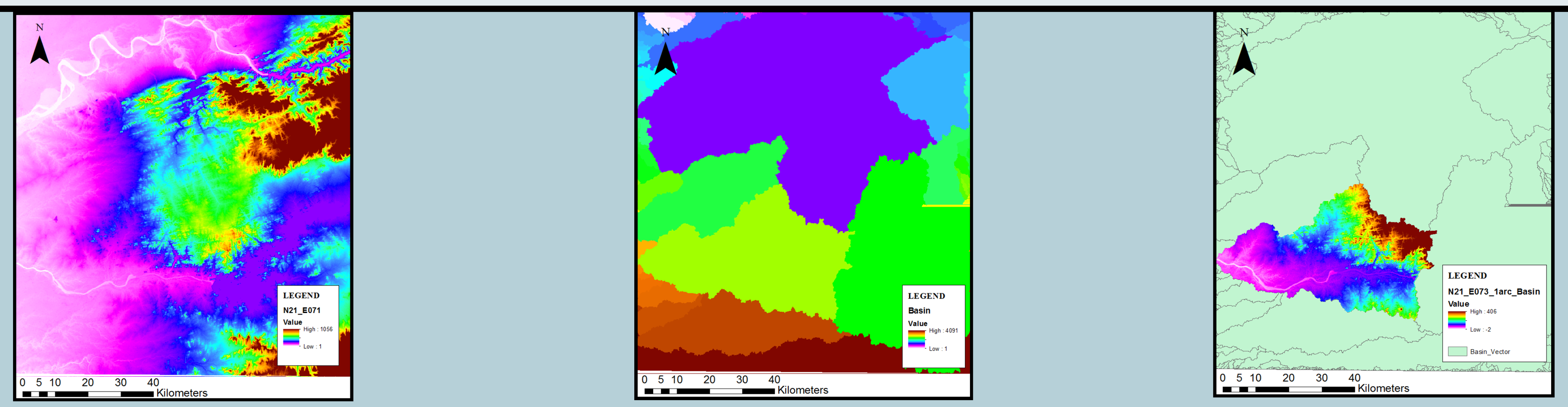

Fig.2 Extracting Basin from DEM N21_E073_SRTM

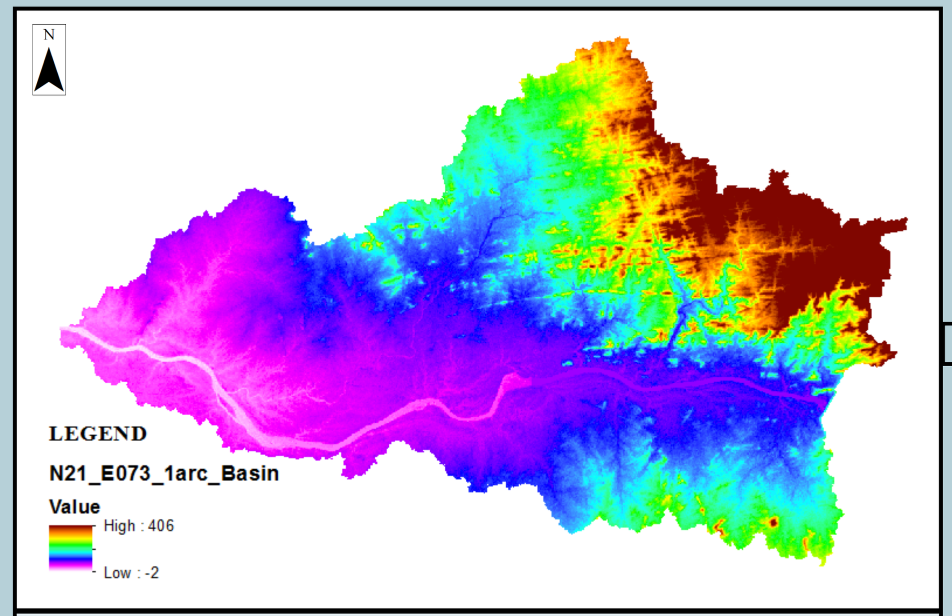


Fig.3 Catchment Area of Varekhadi

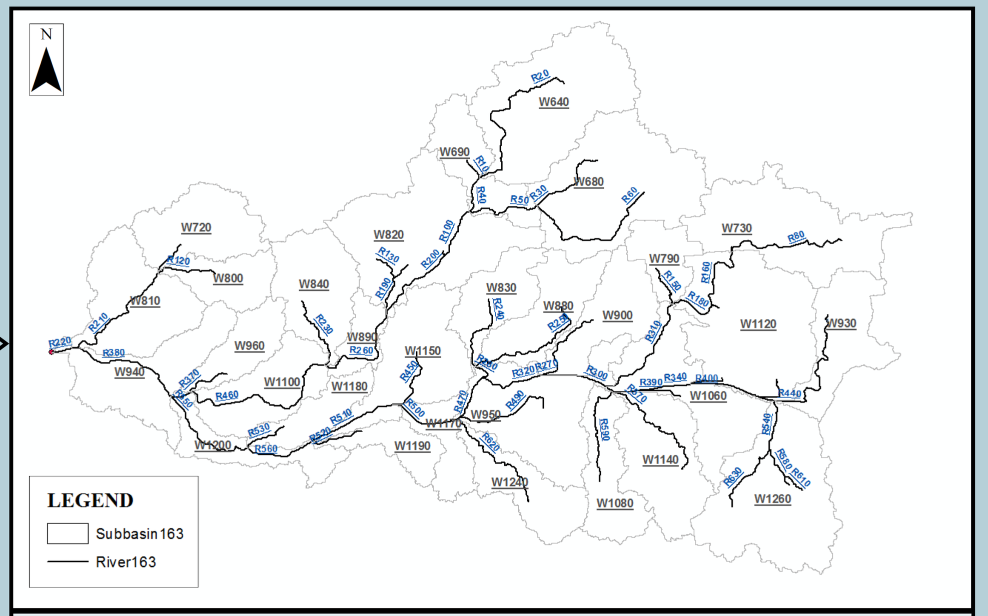


Fig.4 Sub-basins and rivers

## MODELING

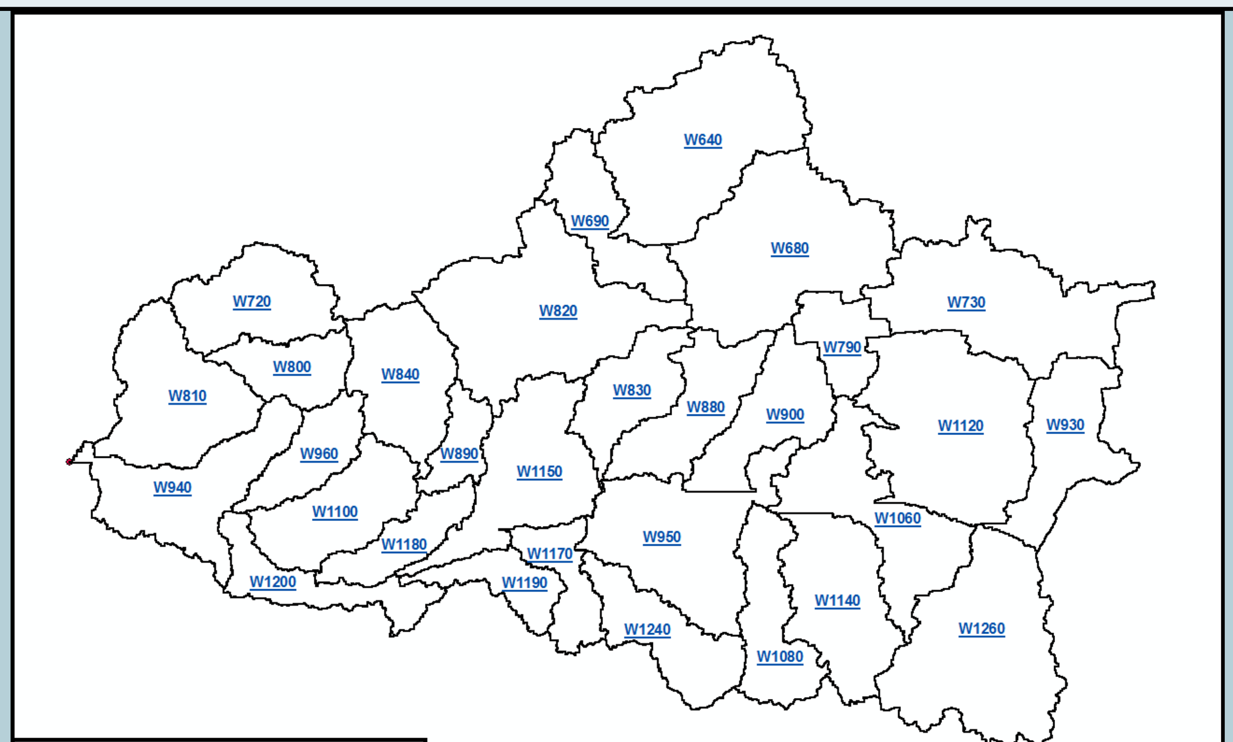

Fig.5 Sub-Basins of Varekhadi Catchment

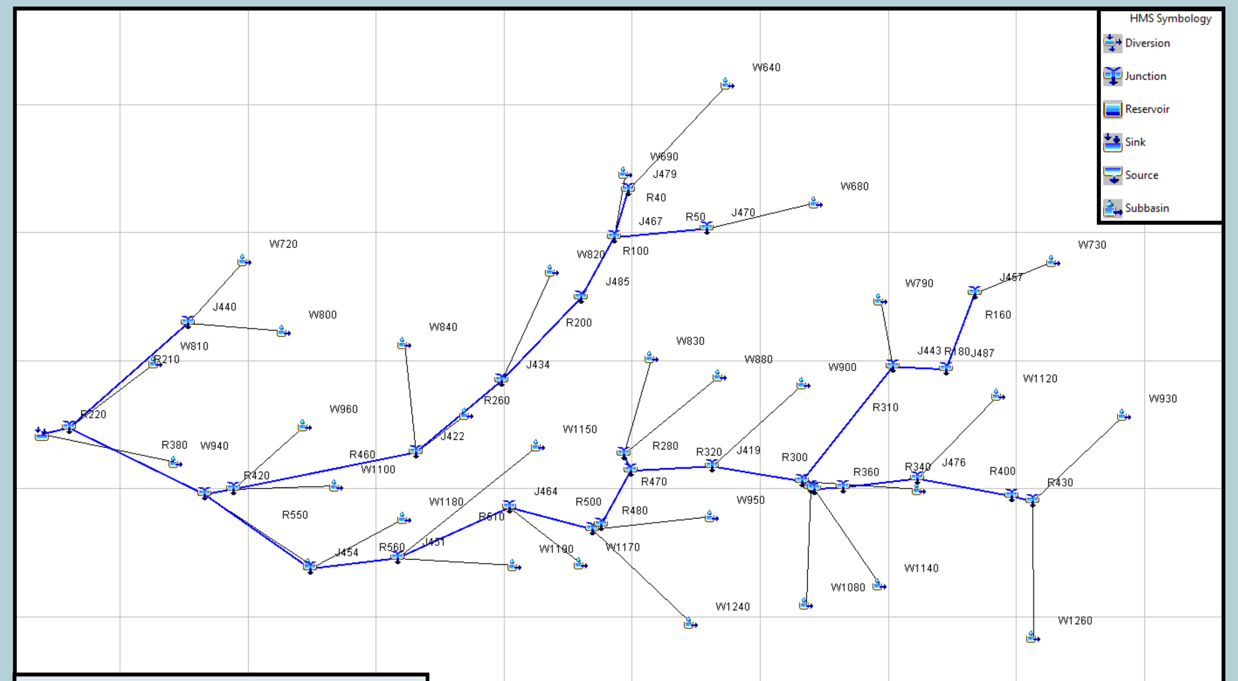

Fig.6 Schematic Diagram of Catchment

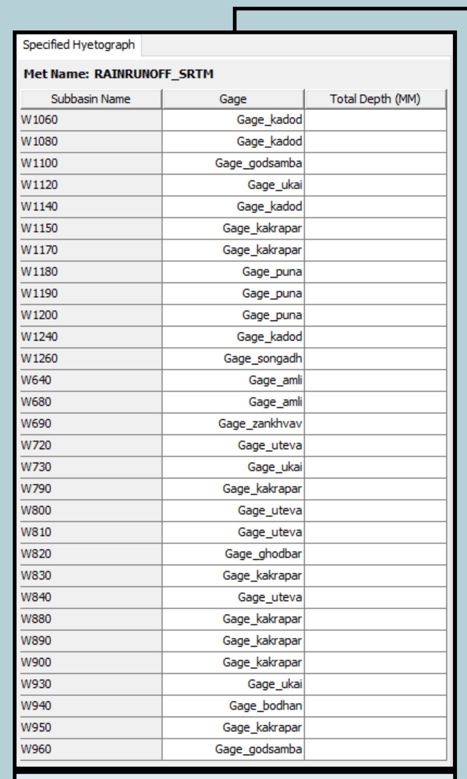

Fig.7 Gauge Distribution in Watersheds

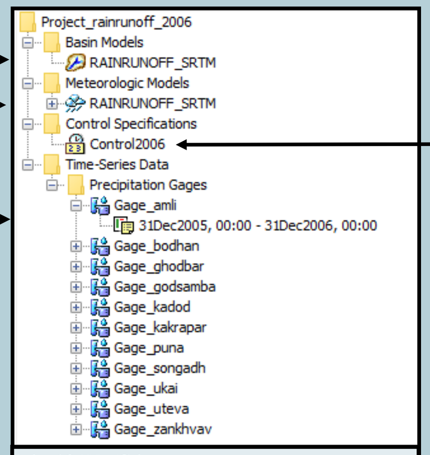

Fig.10 HMS inputs

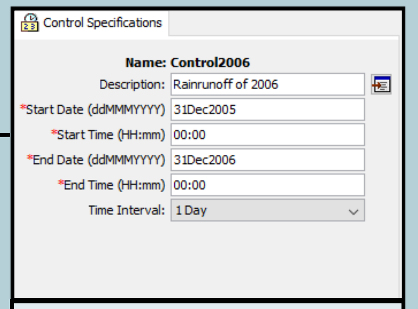

Fig.8 Control specifications

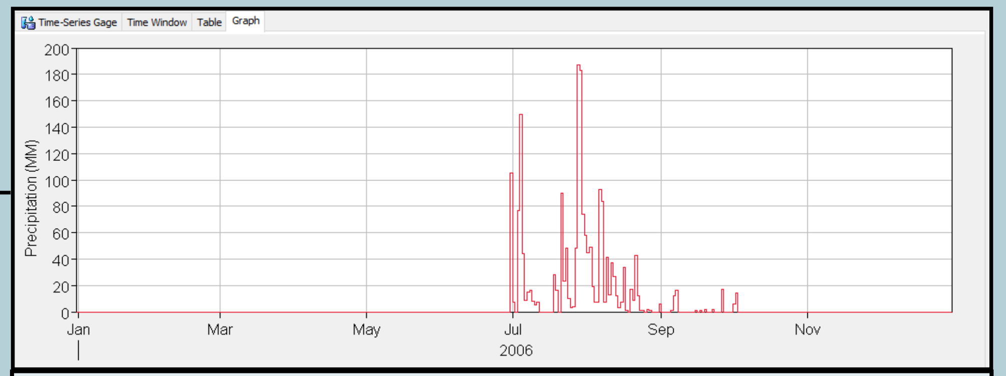

Fig.9 Hyetograph of a Gauge

## RESULTS

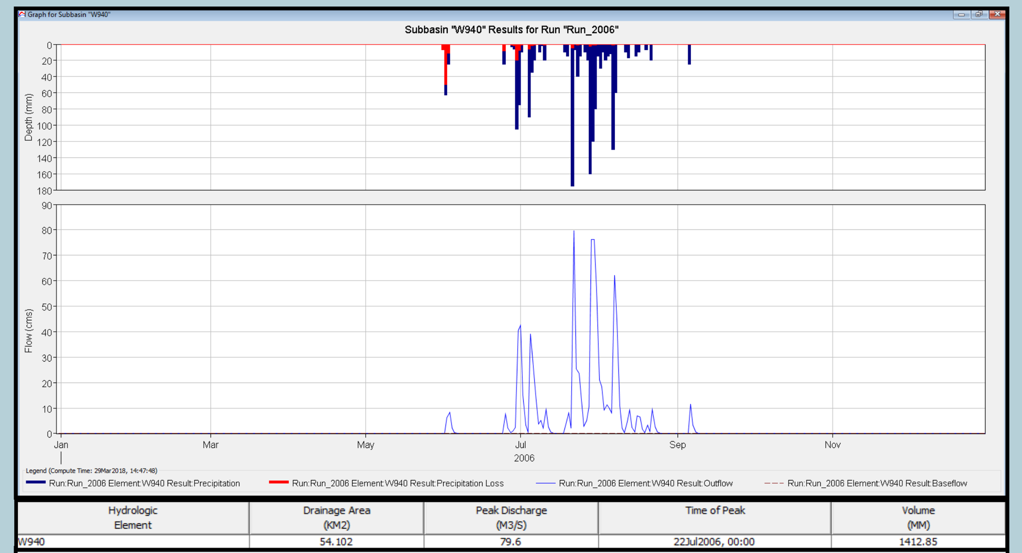

Fig.11 Hydrograph of subbasin W940

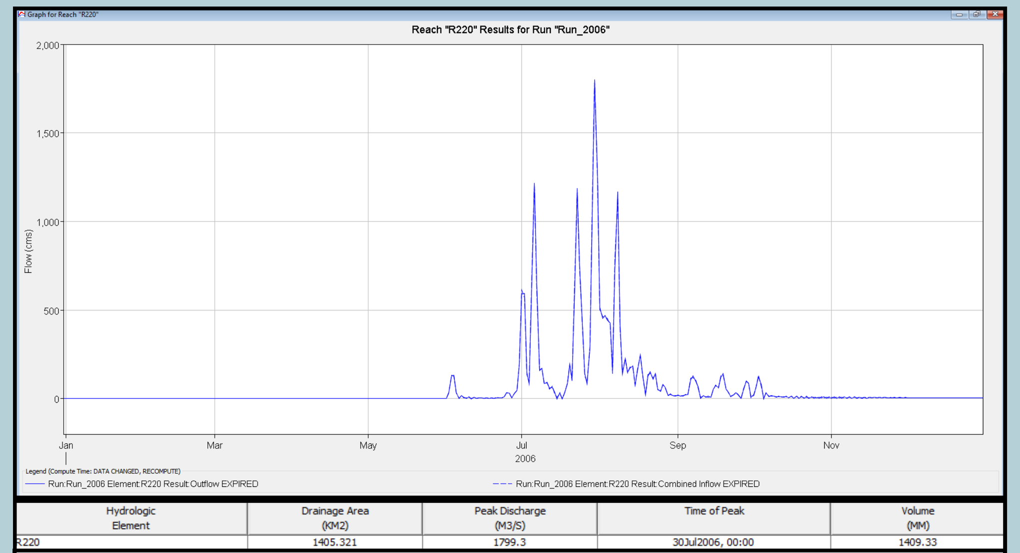

Fig.12 Hydrograph of Reach R220

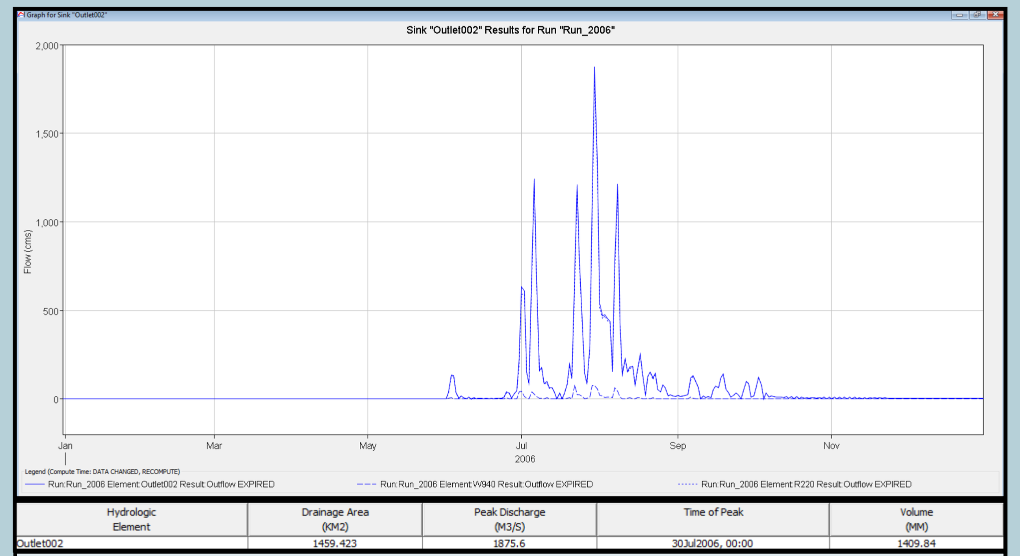

Fig.13 Hydrograph of Outlet002

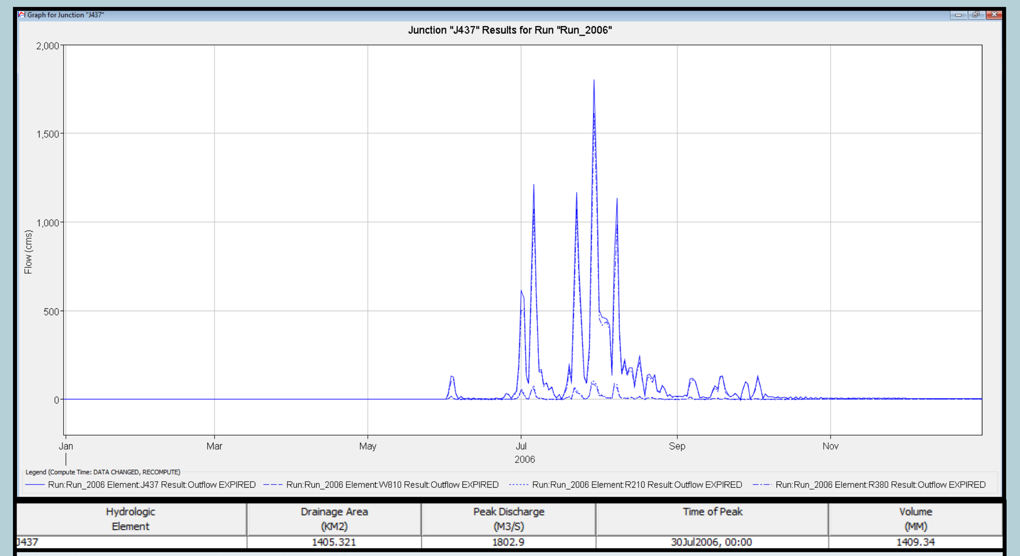

Fig.14 Hydrograph of Junction J437

## CONCLUSION

1) This study has revealed the applications of HEC-HMS in the simulation of rainfall runoff process for flood forecasting and early warnings.
2) The study has explored the application of HEC-HMS in wide range of geographic areas for solving the widest range of possible problems. This includes large river basin water supply and flood hydrology and small urban or natural watershed runoff.
3) HMS provides precipitation- specification options, loss models which can estimate the volume of runoff, and direct runoff and hydrologic routing models
4) HEC-HMS has estimated the runoff potentiality of Varekhadi micro watersheds. Hence, HEC-HMS model can be used for simulating the flood flows in lower Tapi basin.
5) By using the results, surplus amount of water in Tapi water can be gauged and will help in protecting the Surat city against the floods.
6) This model can be used effectively with limited database which is a good alternative for current Indian scenario where limited public data is available.
7) This study reveals that the use of geographical information system (GIS) and the HEC-HMS tool proves to be an easy and accurate way of modelling hydrological processes and must be encouraged in the field of water resource engineering and management.

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## ACKNOWLEDGE

First Author would like to express his sincere thanks to PDPU for providing an international travel support to attend an international conference.