

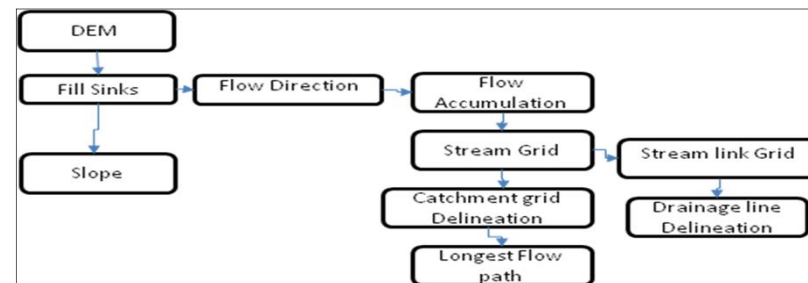


Effect of DEM Resolution on Hydrological Characterisation

ABSTRACT

- ❖ The focus of the study is on delineating the hydrological characteristics from flat terrain as well as from moderately undulating terrain using Digital Elevation Models (DEMs) of various resolutions namely, 5m generated from airborne (LiDAR DEM), 10m generated from Cartosat-2 satellite (CARTODEM) and 30m (SRTM DEM). Two study areas which are frequently affected by flood are selected for the study
- ❖ In this study, D8 algorithm was used to compare the effect of 3 different DEM resolutions on the delineation of the micro-watersheds, stream network and the location of the drainage junctions.
- ❖ Fine resolution DEM gives accurate results in low relief terrain, while coarse resolution DEM can be used for moderately undulating areas depending on the accuracy requirement of the modelling.

METHODOLOGY & RESULTS



STUDY AREA

- The case study areas are two small sub catchments. One area is located along Sabari River, which is a tributary of Godavari in Khammam district of Telangana State, and has a moderately uneven terrain. The other area is a sub catchment of Bagmati River in Muzaffarpur district of Bihar State, which predominantly consists of a flat terrain located along Bagmati River.
- Figure 1 shows the Case Study-1 region, a part of Sabari River tributary. The area is 1747 ha and has elevations ranging from 39.27m to 184.45m.
- Figure 2 shows the Case Study-2 region. The area is 12,400 hectares located along Bagmati River and has elevations ranging from 44.97 m to 111.529 m., which is a tributary of Ganga Basin in Bihar State. Bagmati river lies between the much larger Gandak basin to the West and the Kosi Basin to the east. Topography of the catchment is very flat.

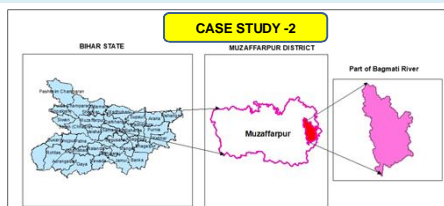
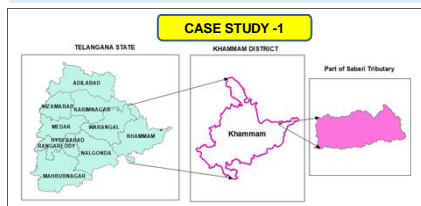
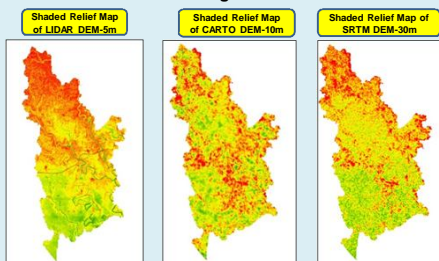
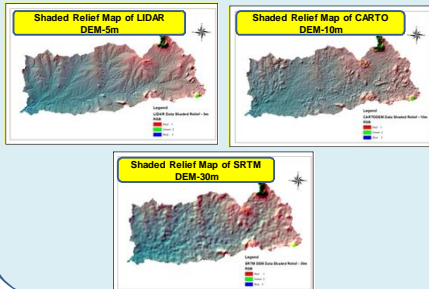


Figure 1

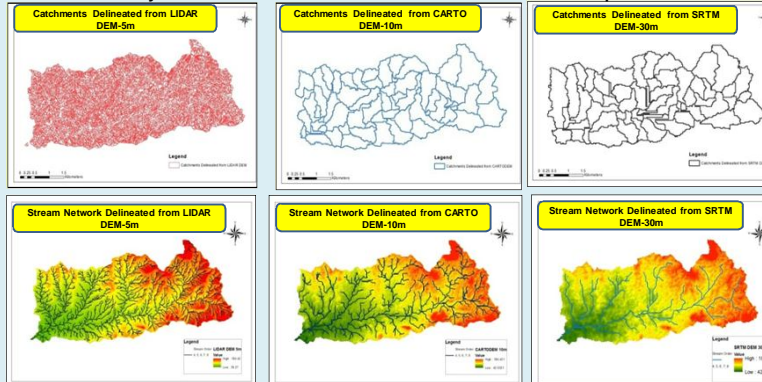
Figure 2

Case Study-1- Shaded Relief Map for a Part of Sabari River

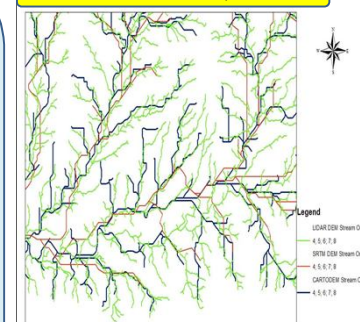
Case Study-2- Shaded Relief Map for a Part of Bagmati River



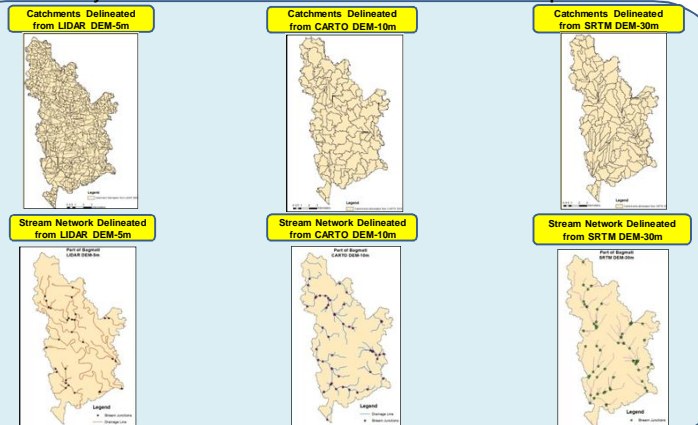
Case Study-1: Watershed and derived Stream Network from the respective DEMs



Detail view of Stream order from LIDAR, CARTO and SRTM



Case Study-2: Watershed and derived Stream Network from the respective DEMs



CONCLUSION

- The results of this study indicate that coarser-resolution DEMs result in a significantly lower number of streams, stream order counts, and position of stream junctions thus affecting the watershed delineation.
- High resolution DEMs can better represent the stream network and related details, hence water resources modellers should use the best fine resolution DEM available especially in flat areas LiDAR data better represents the drainage network than moderate to coarse resolution DEMs. However, CARTO and SRTM DEM can be used to extract the drainage characteristics for moderately uneven terrains.