

Delineation of Torsa river basin from remotely sensed digital elevation data

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■ **ABSTRACT** : Identification, classification, and monitoring of the earth resources along with detailed topographic information for use in hydrological analysis and modelling can be easily done by using remote sensing. Present study was conducted for selection of watershed outlet, developing the watershed boundary, clipping the watershed from the entire basin and the streamline generation for Torsa river watersheds from SRTM data. Using the ERDAS IMAGINE 8.6 and ArcGIS 9.2 software the delineation was done. A total number of 163959 sinks were found to be present in the DEM data, after sink filling the numbers of sinks were reduced to 6225 that gave continuous stream network. The Torsa river watersheds boundaries were generated from the filled DEM data. Watershed catchment was delineated by superimposing this clipped stream network over watershed boundary image. Satellite imageries, soil data, land use, land cover map etc. can be generated to develop a detailed database for quick reference of the hydrologists working in the region.

■ **KEY WORDS** : SRTM Data, Geographical information system, Water-shed delineation

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Remote sensing is the science of obtaining information about an object, area, or phenomenon, through the analysis of data acquired by a sensor that is not in contact with the object. In this regard the significant areas of concern are accurate delineation of watershed and development of a hydrological database with the information like runoff, precipitation, soil, topography, stream network etc. In remote areas collection of spatial topographic data by ground surveying can be a cumbersome process. Even with the use of very accurate modern surveying techniques like total station, it remains a challenging task to capture and create database for a large river basin. The commonly used topographic data is known as Digital Elevation Model (DEM) where the elevations are recorded in digital format. Salient advantages of such DEM data are easy data acquisition over inaccessible area, data acquisition at different scales and resolutions, and analysis of the data in laboratory to reduce extensive field work.

The All India Soil and Land Survey Organization developed an interpretative data transfer technique for demarcation of priority sub-watersheds to aid selection of highly eroded and responsive watersheds for soil and water conservation programmes (Biswas, 1985). The layered approach of theme extraction and composite mapping is possible for prioritization of watersheds with respect to sediment yield (Karale, 1985). The relevance of soil reflectance,

as affected by soil texture, structure, organic matter and soil moisture contents has importance in delineating eroded land directly from satellite borne images (FCC) with field survey for natural and precise delineation (Singh, 1985). Selection of imagery is important to obtain maximum possible information about stream network and watershed geometry e.g., in tropical regions Side Looking Airborne Radar (SLAR) becomes handy to penetrate dense vegetation and produce an image that exhibits topographic features and drainage patterns (Chakraborti, 1994). Remote Sensing and GIS techniques along with natural resource survey of the watershed were used to delineate priority watersheds for soil and water conservation measures leading to sustainability of Guhiya basin, Rajasthan (Khan *et al.*, 2001).

A major portion of the floodplains of North Bengal is frequently affected by floods. Therefore, the area has a vast scope for the researchers to conduct hydrological studies. But the non-availability of relevant hydrological data for the area is a major constraint for conducting such investigations. There is an urgent need to develop a hydrologic database for the major river basins of the area as till now no such database is available with the hydrologist working in North Bengal. Keeping this in view, the present project work was undertaken to carry out raster based analysis for delineating watershed areas of Torsa river basins using ArcGIS software and generate stream network and extract DEM data for Torsa river basins of North Bengal.