

GEOMORPHOLOGY AND TECTONICS OF THE PIEDMONT ZONE OF WEST GANGA PLAIN, INDIA: INSIGHTS FROM INTEGRATED REMOTE SENSING, GIS AND FIELD BASED INVESTIGATIONS

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Abstract: The piedmont zone is the least studied part of the Ganga Plain, mainly because of the fact that a large part of it is inaccessible due to dense, multistoried forest full of wildlife. The present study for the first time provides comprehensive information on the geomorphology and tectonics of the West Ganga Plain's piedmont zone between Sarada and Ganga rivers.

DTMs, prepared from relief information given in toposheets, formed the primary data for the present study. Several hydrologically correct, grid-based DEMs were prepared in a Geographic Information System (GIS) for different resolutions. 2-D profiles along a number of longitudinal and transverse sections were drawn. Several 3-D perspective views were generated by draping the enhanced IRS LISS III imagery over the DEMs, for different exaggeration factors of the z -value, Sun azimuth and Sun angles to emphasize subtle topographic variations. These DTMs were then visually analysed in conjunction with the satellite imagery to delineate the morpho-tectonic features. Throughout the analysis of DTMs, especial emphasis was placed on drainage characteristics. Subsequently, the maps were verified during extensive fieldwork, and required corrections were made by incorporating the field data.

There are six well developed alluvial fans in the studied piedmont zone, which are named, after their main feeder channels, from east to west as Kalaunia, Nandhaur, Gola, Nihal, Banaili-Phika and Malin fans. The Kalaunia, Nihal and Nandhaur fans are fed from only one drainage basin, whereas each of the Gola and Malin fans also have one subsidiary drainage basin. The Banaili-Phika Fan, on the other hand, is fed from four almost equal sized drainage basins. The dimensions of the fans vary widely. The Banaili-Phika Fan is largest with an area of 886 km² followed by Gola Fan with an area of 631 km² and Malin Fan with an area of 480 km². The Nihal Fan is smallest with an area of only 61 km². The Kalaunia and Nandhaur fans are almost equal in size, having areas of 107 km² and 103 km² respectively. Surface gradients of the fans also vary widely; the Nihal Fan is steepest and the Banaili-Phika Fan is gentlest. The interfan areas are composed of coalescing alluvium, scree cones and smaller alluvial fans.

The tectonic features of the area include active, longitudinal and transverse faults and an active fold, most of which are generally concealed below the alluvium. The Himalayan Frontal Thrust (HFT) defines the northern limit of the piedmont zone and parallel to it is the Najibabad Fault (NF). However, the latter is identifiable only in the western part of the area. The growing fold is identifiable only in the middle part of the area and its axis is also longitudinal to the basin. The transverse faults generally offset the longitudinal structures and some of them are related to the basement structures of the basin.

The geomorphic and active tectonic features identified in the area will provide vital information for development planning in the area such as accurate land use planning and land capability analysis.

Keywords: Geomorphology, Tectonics, DTM, IRS LISS III image

