

Morphometric analysis of mansi-wakal river basin of western India, using remote sensing and GIS techniques

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■ **Abstract** : The study area of wakal river basin covers 1914.32 km² and divided in to 7 sub-basins range from 203.46 to 360.22 km² for the analysis. The drainage network of 7 sub-basins were delineated using remote sensing data (LISS III) on 1:50,000 scale and SOI toposheets were used as reference. The morphometric parameters were computed using ArcInfo and ArcView softwares. The drainage pattern of the study area is dendritic to sub-dendritic with stream orders of sub-basins ranging from VI to VII orders and lower streams order mostly dominated in the basin. The stream length ratios are changing haphazardly at sub-basin indicating differences in slope and topographic conditions. The values of mean bifurcation ratio ranging from 3.12 to 4.56 indicate that all the sub-basins fall under normal basin category. Drainage density varies between 3.08 to 4.20 km/km² has a mountainous relief and fine drainage texture. The values of form factor and circulatory ratio of sub-basins indicate that they are sub-circular and elongated in shape. Elongation ratio indicates that the sub-basins in a region of strong relief and steep ground slopes. The values of length of overland flow of the basin indicate that the areas associated with more run-off and less infiltration. The ruggedness number of the basins indicates that the area is extremely rugged with high relief and high stream density. Hence, it is concluded that remote sensing and GIS techniques proved a competent tool in morphometric analysis.

■ **Key words** : Morphometric analysis, Mansi-wakal river basin, Remote sensing, GIS techniques

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Morphometric analysis of a watershed provides a quantitative description of the drainage system, which is an important aspect of the characterization of watersheds (Strahler, 1964). Morphometric analysis requires measurement of linear features, aerial aspects, gradient of channel network and contributing ground slopes of the drainage basin. Identification of drainage networks within basins or sub basins can be achieved using traditional methods such as field observations and topographic maps or alternatively with advanced methods using remote sensing and GIS. In traditional methods, it is difficult to examine all drainage networks from field observations due to their extent throughout rough terrain and/or vast areas. Drainage characteristics of many river basins and sub basins in different parts of the globe have been studied using conventional methods (Horton, 1945; Strahler, 1952, 1957, 1964; Morisawa, 1959; Krishnamurthy *et al.*, 1996). Morphometric analysis using remote sensing technique has emerged as a powerful tool in

recent years. Remote sensing has the ability of obtaining synoptic view of the large area at one time and very useful in analysing the drainage morphometry. In India, some of the recent studies on morphometric analysis using remote sensing technique were carried out by Kumar *et al.* (2000), Vittala *et al.* (2004) and Chopra *et al.* (2005). More recently, Sharma *et al.* (2010) have carried out morphometric analysis of sub-watersheds of Uttala river, which is a tributary of Son river in central India. Evaluation of morphometric parameters necessitates the analysis of various drainage parameters such as ordering of the various streams, measurement of basin area and perimeter, length of drainage channels, drainage density (D_d), stream frequency (F_s), bifurcation ratio (R_b), basin relief (H) and Ruggedness number (R_N). The main objective of this study is using remote sensing and GIS technology to compute various parameters of morphometric characteristics of the basin.