

Morphometric Studies Using Remote Sensing and GIS Techniques in Bah Tehsil, Agra District, Uttar Pradesh

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Abstract: Morphometric analysis of four sub-watersheds namely Pidhaura, Batesar, Balapur and Pariar forming parts of Yamuna River around Bah Tehsil of Agra district have been carried out using Geocoded FCC of bands 2, 3 and 4 of IRS-1D, LISS-III, SOI toposheets number 54 J/5 and 54 J/9 and GIS softwares - ArcGIS, Arcview and 3Dem software for preparation of DEM. The present study shows that the terrain exhibits dendritic to sub-dendritic drainage pattern, stream order ranges from third to fourth order; drainage density varies slightly and has very coarse to coarse texture in Pidhaura and Balapur sub-watersheds and fine drainage texture in Batesar and Pariar sub-watersheds. The other parameters determined and discussed include bifurcation ratio, elongation ratio, stream frequency, infiltration number, length of overland flow and relief aspects of the watersheds. The mean bifurcation ratio depicts that the basin falls under normal basin category. The elongation ratio shows that Balapur sub-watershed mark elongation pattern, whereas, Pidhaura, Batesar and Pariar sub-watersheds possess circular shape. The present study concludes that remote sensing techniques proved to be a competent tool in morphometric analysis of drainage basin and channel network.

Keywords: Morphometric study, Remote sensing, GIS, Agra, Uttar Pradesh.

INTRODUCTION

The morphometric analysis of the drainage basin and channel network play a vital role in order to understand the hydrogeological behavior of drainage basin and expresses the prevailing climate, geology, geomorphology and structure etc. The relationship between various drainage parameters and the aforesaid factors are well recognized by Horton (1945), Strahler (1957), Melton (1958), Pakhmode et al. (2003) and Gangalakunta et al. (2004). Recently many workers have used remote sensing data and GIS generated more precise data on morphometric parameters (Srivastava, 1997; Agarwal, 1998; Nag, 1998; Das and Mukherjee, 2005) and concluded that remote sensing has emerged as a powerful tool and useful in analyzing the drainage morphometry. The objective of the present study is to analyze the morphometric attributes of Yamuna river basin for the first time and no systematic work has been carried out so far around Bah Tehsil of Agra district.

Bah Tehsil is a part of Indo-Gangetic plains lies between the Yamuna and Chambal rivers in the south-eastern part of Agra, located at a distance of 70 km from Agra city and about 55 km from Etawah district (Fig.1). The major part of the area is covered by Indo-Gangetic alluvial deposit of the Quaternary period, overlying the rocks, belonging to the

Vindhyan Super Group. The study area is included in the Survey of India toposheet number 54 J/5 and 54 J/9 between the parallels of 27°00' and 26°50' N latitudes and 78°25' and 78°45' E meridians of longitudes.

Physiographically, Agra district is divided into five distinct regions viz. Khadar Lowland, Trans-Yamuna Plain, Yamuna upland, Southwest upland and Yamuna Chambal ravines. The study area is having a long irregular land, narrow towards the extremities and fairly wide in the centre. Its physical character differs greatly from the others. The level land between Yamuna and Chambal consists of mere ridges and narrow strips flanked on either side by ravines leading to the river.

The climate of the area is semi-arid and characterized by hot summer and temperature reaches as high as 47 °C during summers (April to June). The monsoon months (July to September) receive about 69 cm of rainfall annually. During winters (November to February) Agra district goes through comfortably warm, but temperatures below freezing point is also noted at many places during the night. Agra is also prone to dense fog during the winter months of December and January.

Geologically the area is characterized by alluvium which is an admixture of gravel, sand, silt and clay in various

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Remote Sensing and GIS Application in Hydrogeomorphological Study of Agra District, Uttar Pradesh

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Introduction

The available surface water resources are inadequate to meet all the requirements for almost all the purposes. Therefore, the demand for groundwater has increased over year and year. The groundwater resources assessment of a region involves a detailed study of the surface water including geology and hydrogeology monitoring and production of well data. Exploration and utilization of groundwater requires proper understanding of its origin, occurrence and movement etc. which are directly or indirectly controlled by the terrain characteristics (Khan and Moharana, 2002).

The interpretation of satellite data in conjunction with sufficient ground truth information makes it possible to identify and outlines various ground features such as geological structures, geographic features and their hydraulic characters (Das et.al., 1997,) and in many sense as direct or indirect indicators of the presence of groundwater (Ravindra and Jayram 1997, Saraf, et. al., 2004).