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# APPLICATION OF REMOTE SENSING AND GIS IN WATER RESOURCE MANAGEMENT: A STUDY OF HAZARIBAG DISTRICT JHARKHAND

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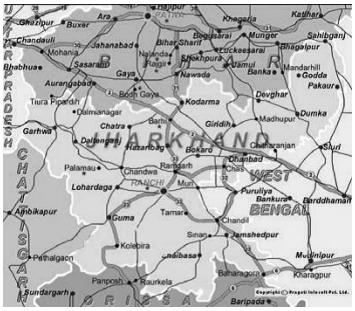
Water is the most precious gift of the nature and it must be conserved andmaintained carefully for all living things. Due to scarcity of water and increased rate ofpopulation it has become to check optimum use of available water resources, for properplanning and efficient water resources in any region it is necessary to understand thehydrological parameters of the watershed. For reliable prediction of the varioushydrology parameters including rainfall, runoff etc. for remote areas is very tough andtime consuming by conventional methods. So it is very important to search suitablemethods and techniques for quantifying the hydrological parameters. The use ofmathematical models in a watershed is the modern trend for extracting parameters withthe help of remote sensing and geographical information system. Hydrological modelingis a powerful tool to understand hydrological process within the watershed for varioustime periods. The main purpose of hydrological modeling is to understand thehydrological behavior and provide reliable information for water resources development.To understand the flow of water on surface of the earth and the amount of water availableat a particular location is very complex.

## STUDY AREA

The selected area for study is Hazaribag watershed lies between latitude 24° 12' 30" Nto 24° 17' 30" N and longitude 85° 25’ E to 85° 27' 30" E in SOI toposheet No. 72H/7/SEand 72H/8/NE of scale 1:25000 and is a part of North Chhotanagpur plateau. Thewatershed is in Tilaiya catchment of Damodar river valley in Hazaribag district ofJharkhand, eastern part of India. The watershed cover an area of about 27.41 km2and it isabout 25 km from Karso and 35 km from Tilayia reservoir. It is connected by Patna – Ranchi road (NH 33). Including Hazaribag there are about 16 villages in this watershed. Themain river is KolhuwatariNadi is a 6th order stream joining with MohaghatNadi justbeyond the outlet and than flowing down to river Barakar as NadhadwaNadi or BarhiNadi. The entire watershed lies in the catchment of Tilaiya reservoir.The area varies from almost flatland to steep hills. The range of elevation variesfrom 385 to 655 m above the mean sea level. The watershed can be divided into threemain landscapes. The first one is the southern part which is highly undulating and rollinguplands, which drains from south to north which is parallel to the Hazaribag – PatnaNational Highway. The second is gently undulating and rolling uplands, that are dissectedby narrow valley and depressions. The third is valley lands, which drains from south tonorth which is parallel to the Hazaribagh–Patna national highway. In this area sheetwash, rill erosion, shallow and medium gullies are prominent. The hilly area lies near thevillage Kundwa, Daurwa, Rola etc. The study area is shown in map.

The present paper tries to highlight water resources of Hazaribag district in Jharkhand. The available surface and ground water resources are inadequate to meet all the water requirements for all purpose. Water in the most precious gift of nature and vital for human survival.

The interpretation of satellite data in conjunction with sufficient ground truth information makes it possible to identify and outline various ground features such as geological, structures, geomorphic features and their hydraulic characters that may serve as direct or indirect indicators of the presence of ground and surface water.

Water resources are sources of water that are useful or potentially useful for agriculture, industry, drinking and good water plays a very important activities. Virtually all of these human uses require fresh water.

Remote sensing and Geographical Information system (GIS) were accepted as effective tools in water resources development and management to complement and supplement ground data. Space borne remote sensing data provides timely and reliable information on available water resources and its utilization.

## MATERIALS AND METHODOLOGY

**1. Toposheet**:-The Survey of India toposheet No. 72H/7/SE and 72H/8/NE of scale 1:25000 were usedfor delineation of the study area and preparing the drainage map.

**2. Satellite Data**:-A satellite date of LISS IV dated 1.11.2001 was used for Land use / land cover mapping.

**3. Drainage Map**:-With the help of Drainage map the longest stream length was calculated.

**4. Hydro Meteorological Data**:-Six years data Rainfall, PET, Discharge data were used in this study.For PET calculation Hargreaves Method was used. Due to unavailability of data fivemonths data i.e. June to October month's data were used.

## SOFTWARES USED

**1. ERDAS Imagine 8.6**:- The ERDAS (Earth Resources Data Analysis System) imagine processing software's wasused to Georeferencing of Toposheet and Satellite data. This software has goodcapabilities for exporting of images from one format to another, rectification ofimageries, subsetting of images etc.

**2. ArcView 3.2a and ArcGIS 9.1** :- In this study ArcView 3.2a GIS and ArcGISsoftwares developed by ESRI(Environmental Systems Research Institute) has been used extensively for digitizing allthe layers i.e. Land use/ land cover map, Soil map, Drainage map etc. and arranging allthe layers in proper sequence.

**3. ILWIS 3.3 Academic**:-In the study ILWIS 3.3 Academic was used for calculating DEM, Sink removal, Topographic index etc. for the study.

**4. Microsoft Office**:-MS Word was used for writing project and MS Excel was used for calculating Rainfalldata, Discharge data and PET data.

## METHODOLOGY:

For Topographic index calculation following methodology was used:

**DELINEATION OF THE STUDY AREA**:-The Hazaribag watershed was delineated in two survey of India toposheet No.72H/7/SE and72H/8/NE scale 1:25000. The delineation of the study area was done

based on the ridgeand contour line. After delineation of the study area contour, drainage maps weregenerated.

## CONCLUSION

Remote sensing inputs have been significantly contributing in water in water management in Hazaribag district both in its conservation and control aspects. From its modest beginning with surface water inventory, satellite remote sensing technology has progressed to more complex management in the field of hydrological studies. The use of water for irrigation assumes great significance in the country like India with a monsoonal climate and pre-dominantly agricultural economy. Irrigation is the artificial application of water to soil for crop production in dry as well as humid climates. The water resource affects the agriculture directly by increasing the water facilities for irrigation. Agriculture is by far the biggest user of water in the form of irrigation and is provided by both surface and ground water.

Remote sensing and GIS methods permit rapid and cost effective natural resources survey and management. Moreover, remotely sensed data serve as vital tool in generating water resources action plane and also identifying landform features, drainage pattern and geomorphic indicators for location of recharge and discharge area analysis.

Remotely sensed data together with field study helps in fairly accurate landform identification and water resource management analysis. Satellite remote sensing provides an opportunity for better observation and more systematic analysis of various landforms and associated water resources management. The common approach adopted in the present study is to interpret the Topographical maps and Satellite images and prepare geomorphic, and water resources management using GIS techniques, field study have been undertaken to analyze the water resource problem of each micro geomorphic terrain units

## REFERENCE

1. Anderson, M.G. and Burt, T.P., 1985. Modeling strategies.In Hydrological Forecasting.
2. Anderson, M.G. and Burt, T.P., (Eds.). New York: John Wiley & Sons.
3. Arnold, J.G., Srinavasan R., Muttiah R.S. and Williams J. E, 1988. Large AreaHydrological Modelling and Assessment Part I: Model Development. Journal of theAmerican Water Resources Association. February, 1998.
4. Beven, K.J., 1979. On the Generalized Kinematic Routing Method, Water Resource, Res.15; 1238-1242.
5. Beven, K. and Kirkby, M.J., 1979. A physically-based variable contributing area modelof basin hydrology.Hydrological Sciences Bulletin. 24:43-69.
6. Beven, K, Gilman, K, and Newson, M., 1979.Flow and Flow Routing in Upland ChannelNetworks, Bull.Hydrol. Sci. 24, 303-325.
7. Beven, K J., 1984. Infiltratioin into a class of vertically non-uniform soils.Hydrol. Sci. J.,29, 425-434.
8. Beven, K.J., 1986. Runoff production and flood frequency in catchments of order n: analternative approach. In: V.K. Gupta, I. Rodriguez- Iturbe and E.F. Wood (Eds),
9. Scale Problems in Hydrology, Reidel, Dordrecht, 107-131.
10. Beven, K.J., 1986a. Hillslope Runoff Processes and Flood Frequency Characteristics. InA.D. Abhrahams(ed.) Hillslope Processes, 187-202, Allen and Unwin, Boston.
11. Beven, K.J., 1987a. Towards a New Paradigm in Hydrology, Water for the Future:Hydrology in perspective. IASH Publication No. 164; 393-403.
12. Beven, K.J., 1987b. Towards the use of catchment geomorphology in flood frequencypredictions, Earth Surf.Process.Landf., 12, 69-82.
13. Beven, K.J., 1989a, Changing Ideas in Hydrology: The Case of Physically-BasedModels, J. Hydrol., 105; 157-172.
14. Beven, K.J., 1989b, Interflow, in H J Morel–Seytoux (Ed.) Unsaturated flow inhydrologic modeling, proc. NATO ARW, Arles, Reidel, Dordrecht, 191-219