The Study of Hydrogeomorphologic Features in Buldhana District using IRS DATA

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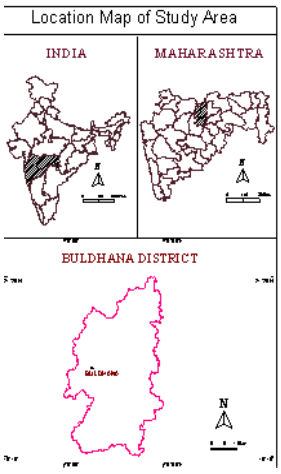
Introduction

Hydrogeomorphic features play very important role in determining ground water resources. Ground water is nation's most important natural resources. It provides drinking water to urban and rural communities, supports irrigation and industry, sustains the flow of stream and river and maintain wetland ecosystem. The study area is facing the problem of fresh water deficit. Therefore, it is necessary to study hydrogeomorphic features in the study area. In order to get ideas regarding the geomorphic processes and availability of ground water resources, potential zones for recharge of water in the study area is divided into number of geomorphic units. For the advent of Remote Sensing has opened up new vistas in geological, geomorphological and structural mapping for the ground water exploration.

Objective

1.To prepare hydrogeomorphological map on 1:50000 scale using SOI toposheet and NRSA geocoded imagery IRS ID - PAN and LISS III on 1:50000 scale Landsat TM 15 Oct. 1988. 2. To delineate ground water potential zones by assessing the hydrogeomorphic units on 1:50,000 scale.



Study Area

Buldhana district lying between 19o51' and 21o17' North latitudes and 75o57' and 76o59' East longitudes (Fig.1). The total area of the district is 9661 sq. kms. comprising 1427 village. An unnamed peak (920 meter) is the highest peak located in Gawilgarh ranges. The average annual rainfall is 750 millimeters mostly from the south west monsoon. Large part of the district belongs to the drought prone area. Wells are the important source of irrigation. Last few years water table is rapidly decreasing. By identifying potential ground water zones -

Fig. 1

Database and Methodology

The present work carried out with survey of India toposheets from which the information like contours, spot heights, drainage was gathered. Identification of different geomorphic units and lineaments was carried out with the help of IRS - ID - LISS III based satellite imagery. Interpretation of satellite imagery is done with the help of photo elements like tone, texture, drainage pattern etc. which is supported number of field visits. Ground water survey agency data is also used for identifying potential ground water zone.

Lineaments

In ground water study it is very important to identify lineaments and fractures first. It may be joints faults, dyke or stream bed. (Fig. 2) They are identified on imagery by certain indications of displacement and abrupt tractions of rocks, marked variation in foliation trend, long and straight stream courses, the alignment of gullies and linear sharp tonal variation. (Usha Chirala, 2003). Such features were identified from the imagery and a lineament map of district was prepared. Several lineaments run through the piedmont zone of Satpuda which charge the ground water table in the Purna alluvial plain. The density of lineament is more in Gavilgarh ranges. (Satpuda). A fault plane runs almost straight with WSW - ENE direction to Satpuda hill ranges.

Hydrogeomorphological units

Hydrogeomorphological study of Purna basin in Buldhana district shows that there is a close relationship between the hydrogeomorphic units and ground water resources. A systematic study of various landforms and geomorphic units help to demarcate the potential zones of ground water in the study area.

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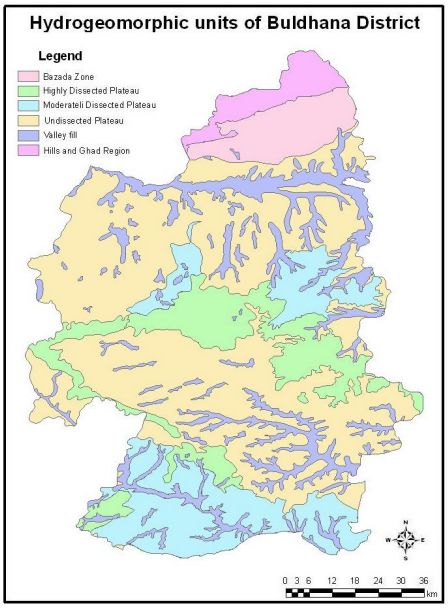

The important geomorphic units are Alluvial Valley fill. Bazada zone, Western Ghat and Satpuda hill ranges, undessected basaltic plateau, moderately dissected plateau and highly dissected plateau.

1) Alluvial plain (Valley Fill) - The alluvial tract is marked by the gullies along the major rivers and their tributary streams by the fluvial erosion on the loose soil. The banks of deep streams and their lower reaches in the alluvial tracts are experiencing the rill erosion that is the early stage of gulley formation. It is gently sloping plain on the banks of river Purna and Dnyanganga, Vishvaganga, Man, Mas, Penganga, Karadi, Katepurna, Khadakpurna are clearly marked in the study area. On the south of Purna large area is covered with alluvium. Particularly Malkapur, Nandura, Khamgaon, Shegaon talukas and southern part of Jalgaon Jamod and Sangrampur, Mehkar, Shindkhedraja, Deulgaon Raja, Raj Taluka

The alluvial plains have lovered on area of 4850 kms. Which is about 50% of total area of the Purna basin. Valley fills are formed by fluvial deposition. They are composed of loose sediments like pebbles, gravels, sand and silt. Valley fills are located along Purna river and along the major tributary of river Purna. Because of coarser material they have high permeability. They have covered an area of 1313 sq.kms. which is about 13% of the study area. The eroded lands are outcome of the work of fluvial erosional processes. Small streams have the land convered into eroded lands. Such features are located along the banks of Purna river in Jalgaon Jamod, Sangrampur, Khamgaon and Malkapur tahsils.

Weathered Zones and Water Resources

Weathered rocks zone forms the most potential ground water reservoir. The depth of weathering is more important for determining the availability and potentials of water resources. This zone contributes 63% of the study area. For the detail study weathered zones are subdivided into three categories such as a) undessected plateau b) moderately dissected plateau and c) highly dissected plateau..

a) Undessected Plateau (UDP) - Most part of the study area covered with basaltic terrain. Some part of the plateau are undessected by the work of weathering and erosional process. Which occupies the undulating areas of having moderate slopes. Particularly to the south of river Purna in parts of Malkapur, Motala, Buldhana, Nandura, Mehkar, Lonar, Shindkhed Raja, Deulgaon Raja, Shegaon and in small portion in Jalgaon Jamod and Sangrampur talukas. It covers3767 sq.km. areas which is about 39 % of the total area of the study area. The thickness of the weathered zone is less in this area. Therefore the prospects of ground is moderate to poor. This area is also not suitable for artificial recharge as well as storage of ground water reservoir. But this zone is moderately to very good for water potnetial along the fractures and joints.

b) Moderately dissected plateau (MDP) - It is basaltic plateau with moderate dissection along moderately high hills with medium weathering and occasional soil cover which occupies eastern part of Malkapur and Motala. Major part of Khamgaon, Deulgaon Raja , Shindkhed Raja and Lonar talukas. It covers 1370 sq.km. area which is 15% of total area of the district. This is also has moderate to good ground water potential along fractures.

c) Highly dissected plateau (HDP) - This is the zone of basaltic plateau with severe dissection forming high hills and narrow valleys without much weathered mantle or soil cover. It is highly dissected part of pediment. It is found in the western and northern part of Buldhana, northern part of Mehekar, some part of Chikhali and Motala, southern part of Nandura tehsils. Mostly it is found in southern part of river Purna. It is a highly weathered zone covered with boulders and eroded material. It covers 1155 sq. km. area which is 12% of the total area of the district. Besides these areas deep weathering are also observed in near Chikhali, Buldhana, Mehekar, Shikdkhed Raja talukas where weathered zones is observed upto the depth of

30 meter. This zone is poor in ground water potential except along the fractures. Occurrence of ground water in Deccan basaltic terrain depends upon the characteristics of basalt such as weathering, joints and fractures and occurrence of pore spaces. The main source of ground water in the study region is secondary porosity developed in the rocks due to fractures / joints and weathering.

Concluding Remarks

The interpretation of Landsat imageries and the topographical maps provides an important information regarding the hydrogeomorphology of the study area. With the help of the geohydrological map and lineament map. It is possible to locate the favourable ground water potential zone. This analysis leads to identify the nature and ground water potentiality of different hydrogeomorphological units. The alluvial plains, valley fills are the units with thick alluvial and weathered material so the rate of percolation is high and ground water recharge is also more. This alluvial deposits upto 300 meters occurs at several places along both sides of river Purna including southern part of Jalgaon Jamod, Sangrampur and northern part of Malkapur, Nandura, Shegaon tahsils. The alluvial deposits are also found along the banks of Penganga and Koradi river but thickness is less. The alluvial deposits in the study areas are mainly silty, clayey in nature with some prominent sand lenses generally the alluvial deposits are mianly composed of sands, gravels, cobbles and boulders. This material have very high permeability. Silt and clay are also having very high porosity. There are alluvial plains and valley fills weathered zone forms very good aquifers, with having good ground water potential. These areas are also favourable for artificial recharing of ground water. The deccan traps are poor for ground water potential but the traps are deeply weathered along joints and fractures. Thus it provides pore spaces for accumulation, percolation and movement of ground water. Deeply weathered zone have good potential of ground water. The above study proved that there is a close relationship between geomorphic processes, hydroge omorphological units and availability of ground water. The study area is facing the problem of lowering down of ground water table of wells and tubewells. It is necessary to complete the recharge projects like percolation tanks, village ponds, vanarai bandharas, K. T. Weirs, injection well, recharge shaft, storage of water in major, medium and minor projects and interlinking of rivers of the study are

Table - Hydrogeomorphic units of Buldhana District

Sr. No.	Hydrogeomorphic Units	Area in sq.km.	Percentage
1.	Western ghats of Satpuda ranges (WGS)	303.489	3%
2.	Bajada Zone (BZ)	670.207	7%
3.	Valley Fill (VF)	1313.865	13%
4.	Undissected plateau (UDP)	4850.613	54%
5.	Moderate Dissected Plateau (MDP)	1370.139	15%
6.	Highly Dissected Plateau	1155.687	12%
		9661.000	100%

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