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An integrated study for targetting groundwater potential zone in and around Jamankira area of Sambalpur district, Orissa

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ABSTRACT

There is an increasing dependence on groundwater for sustainable development. In recent times there has been a marked over-dependence on groundwater due to inadequate availability of potable surface water resources and vagaries of nature. Hence, an attempt has been made to delineate suitable locations for groundwater potential zones based on the remote sensing and GIS technique in Jamankira area of Sambalpur district, Orissa.

Keywords—*GIS, Ground water*

1. INTRODUCTION

There is an increasing dependence on groundwater for sustainable development. In recent times, there has been a marked over-dependence on groundwater due to inadequate availability of potable surface water resources and vagaries of nature. Hence, an attempt has been made to delineate suitable locations for groundwater potential zones based on the remote sensing and GIS technique in Jamankira area of Sambalpur district, Orissa.

2. LOCATION AND APPROACH

The area of investigation is situated in the Sambalpur district of Orissa and falls between 21^0 30' to 21^0 39'N latitudes and 84^0 18'to 84^0 26'E longitudes covering an area of approximately 234 sq. km (Survey of India toposheet no. 73C/6). The town Jamankira (NE) is situated at a distance of 65 km. from Sambalpur town on NH-6 leading to Kolkata.

3. GEOLOGY

The area is mainly covered by Eastern Ghat Group of rocks (Granite and Gneisses) intruded by NW-SE trending dolerite dykes. In general, the granitic rocks along with dolerite, hornblende schist and chlorite-biotite gneiss occupy the Jamankira area.

4. HYDROGEOMORPHOLOGY

The Jamankira area is classified as hard rock terrain. Based on interpretations of satellite imagery, toposheet and district resource map following important hydrogeomorphic units have been identified such as a residual hill, denudational hill, intermontane valley and pediment etc.

5. LINEAMENT ANALYSIS

Lineament study of the area from remotely sensed data provides important information on sub-surface fractures that may control the movement and storage of groundwater. The rose diagram for mapped lineaments indicate orientations clustered in NW-SE to NE-SW direction. The lineament frequency map of the study area has also been prepared

6. DRAINAGE ANALYSIS

The Mukteswar Nala, a tributary of Sankhabangan River, mainly drains the study area. The area is characterized by the presence of dendritic to sub-dendritic, annular, radial drainage pattern. Based on the micro level drainage pattern, 19 watershed boundaries have been initially delineated; and drainage density of each of these has been calculated.

7. SLOPE MAP

Using SOI toposheet, a slope map of the area has been prepared following general raster based operation techniques. The area, in general, is having gentle, and steep. However, the steep slope area is observed in NE, SW and SE part of the study area.

8. LAND USE AND LAND COVER MAP

Land use plays a significant role in the development of groundwater resources. The dominant land cover types in the study area are forest, degraded forest, plantation and agriculture etc.

9. GIS AND OVERLAY ANALYSIS

For delineation of groundwater prospect zones, it is, therefore, necessary to integrate the data on these terrain characteristics. This can be best achieved through a Geographic Information System.

$$\text{Ground water potential zone} = [45 \times (\text{Slope}) + 20 \times (\text{Lineament intensity}) + 20 \times (\text{Drainage density}) + 10 \times (\text{Geomorphology}) + 5 \times (\text{Landuse/landcover})] / 100$$

This exercise consists of the following four steps for identification and grading of groundwater potential zone.

Step-1: Assigning weight value to the classes of the parameter maps
Step-2: Renumbering the parameter map to weight maps
Step-3: Combining the weight maps into one single groundwater potential zone map
Step-4: Classifying the combined weight map into groundwater potential zone map

10. CONCLUSION

This study demonstrates that satellite remote sensing and GIS techniques are indeed valuable tools in assessment and mapping of groundwater potential zone following by integration of different themes. The resultant groundwater prospect map of Jamankira area shows five classes viz., Poor, moderate, good, very good and excellent.

