DELINIATION OF GROUNDWATER POTENTIAL IN NORTH-EASTERN PARTS OF NAGPUR DISTRICT BY GIS TECHNIQUES

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Abstract:
Ground water prospecting and exploration has become a challenging task in India in general and certain drought prone areas in particular due to vagaries in rainfall. The digital image interpretation of satellite imageries on different MSS bands has been proved to be a very special value in providing data on parameters, which are essential in judging the ground water conditions of a region. Hydrological interpretation is accomplished with the help of geotechnical elements like landforms, drainage, lineaments, lithological units by image interpretation elements. The present study was carried out to decipher the groundwater potential zones in Nagpur district, Maharashtra, based on the remote sensing techniques. The studied area comprises parts of Nagpur district, which is mainly covered by alluvium; granitic gneiss and Deccan trap basaltic flows. For delineating the groundwater potential of the area, the (Landsat geo-coded imagery of year 2000) in conjunction with Survey of India topographic sheet no.55 0/4 of 1:50,000 scales and other ancillary data with well inventory investigations were used. In order to demarcate the ground water potential zones of the study area, different thematic maps have been generated. The groundwater potential map was prepared by overlaying the thematic layers. Weightage percentages were assigned for different parameters included under geomorphology and structural features, landuse/landcover, geology were calculated individually. The calculated weightage of different parameters with respect to their score values was used to prepare the ground water potential map of the study area. The interface generates ground water potential map with five potential classes’ viz. excellent, moderate, good and poor very poor. The excellent groundwater potential zones include Pipri and Kalamna village where alluvium exposure can be observed. The study reveals that integration of all the attributes provide more accurate results in identification of groundwater potential zones.

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Training at NRSA, Hyderabad on Remote Sensing and GIS Application.”2007-08,
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“ROLE OF GIS FOR SUSTAINABLE DEVELOPMENT”
Kumari Snehlata, Shilpa Shiwarkar, P.N.Joglekar
DTRL, DRDO, Delhi-110054)
Introduction
A geographic information system (GIS) is computerized information storage, processing & retrieval system that have hardware and software specially design to cope with geographical reference special data and corresponding attribute information (Gautam, 1996). The photo-interpretation of aerial photographs and satellite imageries of multispectral bands has been proved to be of a very special value in providing data on various parameters, which are essential in judging the groundwater conditions of a region. Hydrological interpretation is accomplished with the help of geotechnical elements like landforms, soil, soil moisture, drainage, lithological units, structural units, hydro-morphological units like runoff zone, recharge zone, landuse distribution & photo recognition elements such as tone texture, pattern, vegetation, shape, size & combination of these with associated features. The interpretative result must however be, used judiciously and verified in the field for the true condition to avoid misinterpretation. To help them to achieve results in a short time with low expenditure, the whole issue of ground water exploration needs to be based on the technique of photo-interpretations using aerial photographs and space imageries. The detailed exploration in promising areas needs to be supplemented by geophysical techniques and other ground data collected in the field (Pande, 1987; Khare, 2002; Rao and Subramanian, 1997).

Study Area
Nagpur district is the second capital of Maharashtra and is located in the Central part of the state of Maharashtra. The area is covered under survey of India Toposheet No. 55 O/4 and lies in between N 21°00’ to N 21°15’ and E 79°0’ to E79° 15’.The study area considered under the present work comprises of area near Nagpur city.

Data Used and Methodology
For the present groundwater assessment studies, three types of data sets have been used; a) Topographical map (55 O/4) of Survey of India on 1:50,000 scale, b) Remotely sensed data viz. LANDSAT (11 Nov 2000) geo-coded with scale 1:50,000. And c) Secondary data on hydrology collected in the field itself i.e. well inventory details.

Initially a base map (on 1:50000 scale) of the study area was traced out manually from the toposheet. In order to demarcate the groundwater potential zones of study area, thematic maps of lithology, structures (lineament), geomorphology, and land use/land cover on 1:50,000 scales were prepared from remote sensing data and Survey of India topographic maps. These thematic maps were subsequently digitized in GIS environment with the help of Arc Map 9.3 (ESRI 2008), ENVI 4.3 and ERDAS IMAGINE 8.7, software's. In the process, individual themes and their respective units were classified in different weightages as per the groundwater storage and recharge characteristics. The GWP map for the study area was derived by overlaying thematic maps of lithology, structures (lineament), geomorphology, land use/land cover etc.

Finally, ground check studies were carried out in the month of November, 2006. The depth of water level data (DTWL) in 22 wells of the study area was collected in the field, as a part of well inventory studies. Cross verification for the doubtful areas arising during pre-classification stage and for ground control points were also made. The well inventory details obtained through field investigations were correlated finally with GWP model developed through the GIS system.

Geology
Regional Geology
All the rock formations ranging in age from Archean to recent are exposed in the Nagpur district.
The Precambrian: The Precambrian crystalline rocks are represented mostly by orthogneiss, streaky gneisses, amphibolites, marble and pegmatite of Sausar group. Sakoli group of Mesoproterozoic age (2000-
1600 m.y.) occupies the southern parts. Sausar group of Mesoproterozoic age occupies the northern part and comprises quartz–muscovite schist, feldspar–muscovite schist and intercalated quartzite (Sitasawangi formation); calc-gneiss and manganiferous marble with pockets of Mn ore (Lohangi formation) Muscovite-biotite schist with Mn ore (Mansar formation); quartzite and quartz-muscovite schist (Chorbaoli formation) and crystalline limestone and dolomite (Bichua formation) which are repeatedly tight folded. The Sausar group is a store house of Mn ore deposits.

**Lower Gondwana Super group:**
The lower Gondwana super group comprises lower Talchir group represented by basalt boulder bed of carboniferous to Permian age (345-230 m.y.), Kampti formation of Permian to Triassic age (280-195 m.y). Former comprises of boulder bed, sandstone and shale later comprises of sandstone and ferruginous sandstone. Coal seam occurs in Barakar formation underlying the Kampti formation.

**Lameta formation (Infratrappean):**
Lameta group of cretaceous age (136-65 m.y.) is exposed between NW of Nagpur and south of Umrer as disconnected patches.

**Deccan trap and intertrappean:**
The Deccan trap comprises a series of basaltic lava flow of cretaceous to Paleocene age (60- 62 m.y.). Each flow is separated by the sedimentary parting of intertrappean beds (District Resource Map 2003).

**Local Geology**
The geology of the area has been demarcated on the basis of visual recognition elements on the satellite imagery. The studied area is covered by Basaltic flow of Deccan trap. The west & north part is covered by granitic gneiss. Alluvium is present along Kanhan River whereas the north eastern part is covered by ferruginous sandstone.

**Geomorphological Maps**
Geomorphology is broadly defined as ‘Science of landforms’. Remote sensing is widely used for geomorphology & structural studies. The various landforms discernible on satellite imagery can be broadly classified into Structural, Denudational, Fluvial units based on the major geomorphic process & agents involved in there formation.

Further, geomorphologically the area can be divided into three parts:
1) Units of structural origins like structural ridges dissected plateau which are develop on Deccan basalt.
2) Near plain to undulating topography with denudational units like pediments & pediments Pediplains.
3) Units of fluvial origin’s the valley fills & alluvial plain along the river.

The different units of geomorphology can be given as: Highly dissected plateau, Moderately dissected plateau, Slightly dissected plateau, Residual hill, Structural hill, Pediment & Pediplains and Alluvial plain.

Hills can be broadly classified as a) Denudational hills: These are isolated, low relief and generally barren in nature. b) Structural hills and Ridges: This shows definite trend lines and structural features. Lithologically, these hills/ ridges consist of quartzite, banded hematite quartzite (BHQ) and basic and ultra basic rocks of Archean age.

The structural hill/ridges, hilly dissected, residual hill, landforms possess very less intergraular porosity. It mainly forms the zones of run off and overland flow. The moderately dissected plateau landform over the basaltic terrain and pediments over gneisses and are endowed with moderate thickness of weathering. In general these landforms serve as potential recharge area with equally high capacity to facilities profile run off there suggestive of its moderate potential. The less dissected low lying gently sloping areas are defined as the pediplain. These feature exhibits undulating and dissected topography. The pediplains landforms are the extension of the pediment zone. Since, the degree & depth of weathering is relatively more as also the
additional recharge from pediment zone. The landforms viz, the slightly dissected plateau & pediplains over the Gondwana, the undulating plains valley fills & alluvial plains offer the best storage zones. The slightly dissected plateau landforms maximum storage of ground water appears to be taking place. The famous orange gardens of the Nagpur district are located in these landforms only. Lineament can be defined as a natural linear or curvilinear feature that can be correlated to fault, fractures, joints, bedding traces, lithological contacts, unconformity etc. It plays a significant role in groundwater regime of any terrain (Singh and Prakash, 2004; Rokade, 2003 and 2007) (Table 1 and Figure 1, 2).

**Table 1**

<table>
<thead>
<tr>
<th>UNITS</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly dissected plateau</td>
<td>10</td>
</tr>
<tr>
<td>Moderately dissected plateau A</td>
<td>20</td>
</tr>
<tr>
<td>Moderately dissected plateau B</td>
<td>20</td>
</tr>
<tr>
<td>Slightly dissected plateau</td>
<td>60</td>
</tr>
<tr>
<td>Residual hill</td>
<td>10</td>
</tr>
<tr>
<td>Structural hill</td>
<td>10</td>
</tr>
<tr>
<td>Pediment (Gondwana)</td>
<td>50</td>
</tr>
<tr>
<td>Pediplain (Gondwana)</td>
<td>90</td>
</tr>
<tr>
<td>Upper Pediplain (gneiss)</td>
<td>70</td>
</tr>
<tr>
<td>Lower Pediplain (gneiss)</td>
<td>80</td>
</tr>
<tr>
<td>Alluvial plain</td>
<td>100</td>
</tr>
<tr>
<td>Upper Pediment (gneiss)</td>
<td>40</td>
</tr>
<tr>
<td>Lower Pediplain (Gondwana)</td>
<td>90</td>
</tr>
</tbody>
</table>

Source: (MRSAC, 2001)

Fig: 1- Geomorphology Map

Fig: 2- Area polygons in geomorphologic details
Geology and Structural

The different lithological units can be interpreted with photographic elements like tone and texture. The common photo character of different rock units are given below,

1. **Igneous Rock**: The igneous rocks display hummocky topography dendritic drainage pattern. The acidic rocks display lighter tone while basic rocks and ultra basic rocks display darker tone.
   - **Granite**: The hummocky topography dendritic drainage lighter tone and criss-cross jointing.
   - **Basalt**: It is possible to demarked different flow due to step like features and break in slope. Vesicular basalt in valley shows good vegetation cover and can be identified by darker tone.
2. **Sedimentary rock**: The Sedimentary rock, like sandstone and shale can be identified on the photographs by the landforms, drainage pattern and structure and photographic elements.
   - **Shale**: Shale generally forms valley and drainage density higher and very fine density than sandstone shows development of deep gullies and display darker tone and smooth texture.
   - **Limestone**: The Limestone shows karst topography, sinkholes development of internal drainage with lighter tone and rough texture, sometimes limestone shows very flat topography.
3. **Metamorphic rock**: The metamorphic rock generally shows steep dip pediplains. The gneisses and quartzite can be distinguished from the sandstone by smooth texture.

**Fractures and Lineaments**: Fractures and Lineaments can be identified on the photographs by darker tone, linear pattern and drainage. These features influence the ground water condition along their alignment (Khare, 2002) (Table 2 and Figure 3 and 4).

**Table 2**

<table>
<thead>
<tr>
<th>Units</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gondwana</td>
<td>80</td>
</tr>
<tr>
<td>Alluvium</td>
<td>100</td>
</tr>
<tr>
<td>Granitic gneiss</td>
<td>20</td>
</tr>
<tr>
<td>Ferruginous sandstone</td>
<td>60</td>
</tr>
<tr>
<td>Basalt</td>
<td>40</td>
</tr>
</tbody>
</table>

**Source**: (MRSAC, 2001)

![Fig: 3- Geo-structural Map](image_url)
Landuse and Landcover
Knowledge of landuse & landcover is important for many planning & management activities, concerned with the surface of the earth. Landuse refers to anthropogenic activities and uses that are carried on land surface whereas the land cover refers to natural vegetation, water bodies, rock/soil etc. The main land use categories delineated in the study area are a) Agricultural land: These are the lands primarily used for farming and for the production of food, fiber and other commercial and horticultural crops, b) Forest land: Land area covered up by the forest area, c) Fallow land: The land area which is alternately used for the agriculture activity but currently lying unutilized hence classified as fallow land.

Image elements/ characteristics like color, tone, texture, pattern size and shape which help in the recognition of various landuse/ landcover classes systematically on the enhanced satellite imaginary during interpretation process.

The pattern of landuse i.e. vegetation covers is indicative of ground water condition of the area. The dark tone patches along the river suggest the area is potential for groundwater development & indicate presence of alluvium and valley fills. Similarly the barren plateaus which do not exhibit vegetation suggest that the thickness of weathering is very shallow, soil cover thin, thus suggest unfavorable area (Table 3 and Figure 5 & 6).

Table 3
Showing units of land use/land cover and their weight %

<table>
<thead>
<tr>
<th>Units</th>
<th>Weight (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>80</td>
</tr>
<tr>
<td>Fallow land</td>
<td>60</td>
</tr>
<tr>
<td>Forest</td>
<td>30</td>
</tr>
<tr>
<td>Barren land</td>
<td>20</td>
</tr>
<tr>
<td>Habitation</td>
<td>20</td>
</tr>
<tr>
<td>Water body</td>
<td>100</td>
</tr>
<tr>
<td>River</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: (MRSAC, 2001)
Preparation of Groundwater potential Map

In order to produce the map, a GIS model has been used to integrate thematic maps such as geology, structural, geomorphology, landuse etc. Each thematic layer consists of a number of polygons, which correspond to different features. The polygons in each of the thematic layers have been categorized, depending on the suitability/relevance to the ground water potential & suitable weights were assigned. Finally, all the thematic layers were integrated using the ground water potential model to derive the final derived layers (Singh & Prakash, 2004). The weight assigned to different classes of all the thematic layers are given below (Table 4 and Figure 7).

<table>
<thead>
<tr>
<th>Ground water categories</th>
<th>Lower/ upper weight value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>&lt;161-200</td>
</tr>
<tr>
<td>Good</td>
<td>&lt;121-160</td>
</tr>
<tr>
<td>Moderate</td>
<td>&lt;81-120</td>
</tr>
<tr>
<td>Poor</td>
<td>&lt;41-80</td>
</tr>
<tr>
<td>Very Poor</td>
<td>&lt;0-40</td>
</tr>
</tbody>
</table>

Source: (MRSAC, 2001)

In addition to the above mentioned laboratory studies, actual field data was collected in the field itself. In total 22 dugwells from the study area were studied in details. Well inventory investigations from the 22 wells were carried out individually in the post monsoon season in the month of November 2005. The details of the well inventory are given in Table 5.
# Table 5

<table>
<thead>
<tr>
<th>Well No.</th>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Diameter</th>
<th>Depth (mbgl)</th>
<th>DTWL (mbgl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Suradevi</td>
<td>N 21°14'56&quot;</td>
<td>E 79°06'58&quot;</td>
<td>4.2</td>
<td>10.8</td>
<td>3.3</td>
</tr>
<tr>
<td>2</td>
<td>Suradevi</td>
<td>N 21°14'50.4&quot;</td>
<td>E79°07'20.9&quot;</td>
<td>2</td>
<td>5.5</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>Waregaon</td>
<td>N 21°14'11.5&quot;</td>
<td>E79°09'42.3&quot;</td>
<td>3</td>
<td>&lt;30</td>
<td>5.75</td>
</tr>
<tr>
<td>4</td>
<td>Kamthi</td>
<td>N 21°12'57.5&quot;</td>
<td>E 79°12'27.9&quot;</td>
<td>1.20</td>
<td>6.3</td>
<td>6.70</td>
</tr>
<tr>
<td>5</td>
<td>Kamthi(Balaji)</td>
<td>N 21°12'10.5&quot;</td>
<td>E 79°10'34&quot;</td>
<td>2.20</td>
<td>28</td>
<td>3.30</td>
</tr>
<tr>
<td>6</td>
<td>Dighori</td>
<td>N 21°06'30.3&quot;</td>
<td>E79°08'21.3&quot;</td>
<td>1.9</td>
<td>7.5</td>
<td>4.20</td>
</tr>
<tr>
<td>7</td>
<td>Baghdua</td>
<td>N 21°05'57.4&quot;</td>
<td>E79°09'0.6&quot;</td>
<td>1.5</td>
<td>25</td>
<td>3.20</td>
</tr>
<tr>
<td>8</td>
<td>Kalamna</td>
<td>N 21°14'56&quot;</td>
<td>E79°09'54.9&quot;</td>
<td>3.8</td>
<td>6.1</td>
<td>8.3</td>
</tr>
<tr>
<td>9</td>
<td>S-W Pipri</td>
<td>N 21°14'56&quot;</td>
<td>E79°09'54.9&quot;</td>
<td>2.30</td>
<td>8.6</td>
<td>7.20</td>
</tr>
<tr>
<td>10</td>
<td>S-E Pipri</td>
<td>N 21°14'56&quot;</td>
<td>E79°09'54.9&quot;</td>
<td>2.30</td>
<td>9.86</td>
<td>7.20</td>
</tr>
<tr>
<td>11</td>
<td>S- Pipri</td>
<td>N 21°14'56&quot;</td>
<td>E79°09'54.9&quot;</td>
<td>3.30</td>
<td>6.8</td>
<td>11.10</td>
</tr>
<tr>
<td>12</td>
<td>Khalasana</td>
<td>N 21°03'3.9&quot;</td>
<td>E 79°11'46.8&quot;</td>
<td>3.73</td>
<td>27.8</td>
<td>11.10</td>
</tr>
<tr>
<td>13</td>
<td>W-Aasoli</td>
<td>N 21°02'32.9&quot;</td>
<td>E 79°10'51.7&quot;</td>
<td>5.25</td>
<td>11.6</td>
<td>13</td>
</tr>
<tr>
<td>14</td>
<td>Kapsi</td>
<td>N 21°08'31.3&quot;</td>
<td>E79°08'31.3&quot;</td>
<td>5.80</td>
<td>14.80</td>
<td>12.50</td>
</tr>
<tr>
<td>15</td>
<td>Aasoli</td>
<td>N 21°08'28.5&quot;</td>
<td>E79°12'8.3&quot;</td>
<td>1.5</td>
<td>12</td>
<td>7.30</td>
</tr>
<tr>
<td>16</td>
<td>Mahalgaon</td>
<td>N 21°08'31.7&quot;</td>
<td>E 79°13'10.7&quot;</td>
<td>2</td>
<td>9.7</td>
<td>4.40</td>
</tr>
<tr>
<td>17</td>
<td>Gorewada</td>
<td>N 21°11'12&quot;</td>
<td>E79°02'55.8&quot;</td>
<td>0.5</td>
<td>&lt;30</td>
<td>4.30</td>
</tr>
<tr>
<td>18</td>
<td>Gorewada</td>
<td>N 21°13'15.9&quot;</td>
<td>E79°02'52.2&quot;</td>
<td>2</td>
<td>28.69</td>
<td>1.80</td>
</tr>
<tr>
<td>19</td>
<td>N Gorewada</td>
<td>N 21°13'24.6&quot;</td>
<td>E79°02'39.5&quot;</td>
<td>3.5</td>
<td>7.30</td>
<td>3.15</td>
</tr>
<tr>
<td>20</td>
<td>N-E Gorewada</td>
<td>N21°14'51.3.5&quot;</td>
<td>E79°0.3'39.5&quot;</td>
<td>3.20</td>
<td>20.54</td>
<td>3.60</td>
</tr>
<tr>
<td>21</td>
<td>Gumgaon</td>
<td>N21° 43&quot;</td>
<td>E79° 32&quot;</td>
<td>6</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>22</td>
<td>Sonegaon</td>
<td>N21° 5' 45&quot;</td>
<td>E79° 21'30&quot;</td>
<td>4.5</td>
<td>20</td>
<td>11</td>
</tr>
</tbody>
</table>

# Table 6

<table>
<thead>
<tr>
<th>Well No.</th>
<th>Location</th>
<th>Score Values (%)</th>
<th>Averag e Score Value</th>
<th>Ground Water Potential (GWP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Suradevi</td>
<td>Alluvium</td>
<td>Fallow land</td>
<td>Gran.Gneiss</td>
</tr>
<tr>
<td>2</td>
<td>Suradevi</td>
<td>Alluvium</td>
<td>Fallow land</td>
<td>Gran.Gneiss</td>
</tr>
<tr>
<td>3</td>
<td>Waregaon</td>
<td>Upper Pediplain Gneiss</td>
<td>Agriculture</td>
<td>Gran.Gneiss</td>
</tr>
<tr>
<td>4</td>
<td>Kamthi</td>
<td>Gonwana Pediplain</td>
<td>Agriculture</td>
<td>Alluvium</td>
</tr>
<tr>
<td>5</td>
<td>Kamthi(Balaji)</td>
<td>Gonwana Pediplain</td>
<td>Agriculture</td>
<td>Alluvium</td>
</tr>
<tr>
<td>6</td>
<td>Dighori</td>
<td>Pediment</td>
<td>Fallow land</td>
<td>Gran.Gneiss</td>
</tr>
<tr>
<td>7</td>
<td>Baghdua</td>
<td>Pediment</td>
<td>Fallow land</td>
<td>Gran.Gneiss</td>
</tr>
<tr>
<td>8</td>
<td>Kalamna</td>
<td>Slightly Dissected</td>
<td>Fallow land</td>
<td>Basalt</td>
</tr>
<tr>
<td>9</td>
<td>S-W Pipri</td>
<td>Slightly Dissected</td>
<td>Fallow land</td>
<td>Basalt</td>
</tr>
<tr>
<td>10</td>
<td>S-E Pipri</td>
<td>Slightly Dissected</td>
<td>Fallow land</td>
<td>Basalt</td>
</tr>
<tr>
<td>11</td>
<td>S- Pipri</td>
<td>Slightly Dissected</td>
<td>Fallow land</td>
<td>Basalt</td>
</tr>
<tr>
<td>12</td>
<td>Khalasana</td>
<td>Pediment Gneiss</td>
<td>Agriculture</td>
<td>Basalt</td>
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<td>W-Aasoli</td>
<td>Pediment Gneiss</td>
<td>Agriculture</td>
<td>Basalt</td>
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<tr>
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<td>Kapsi</td>
<td>Lower Pediplain Gneiss</td>
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<td>Aasoli</td>
<td>MDP-A</td>
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<td>Mahalgaon</td>
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<td>17</td>
<td>Gorewada</td>
<td>MDP-A</td>
<td>Fallow land</td>
<td>Basalt</td>
</tr>
<tr>
<td>18</td>
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<td>Basalt</td>
</tr>
<tr>
<td>19</td>
<td>N Gorewada</td>
<td>MDP-A</td>
<td>Forest</td>
<td>Basalt</td>
</tr>
<tr>
<td>21</td>
<td>Gumgaon</td>
<td>MDP-A</td>
<td>Habitat</td>
<td>Basalt</td>
</tr>
<tr>
<td>22</td>
<td>Sonegaon</td>
<td>S.D.P</td>
<td>Agriculture</td>
<td>Basalt</td>
</tr>
</tbody>
</table>
Results and Discussion

1. North Eastern part of Nagpur district is covered by mainly granitic gneisses, Deccan trap basalt flows and younger alluvial soil cover.
2. Pipri, Kalamna shows score value between 161-200. These villages are falling under excellent GWP zone. In these villages alluvial soil cover is observed.
3. Khalasna, Asoli, Suradevi comes under good ground water potential, which mainly covered by Granitic Gneiss having total score value 121-160.
4. Moderate Ground water potentials come under Gumgoan, Dighori and Pipri village, in which Deccan trap basalt is common. The total score values shown by these areas is 81-120.
5. Poor ground water Potential is mainly in the area Khalasana, Buzurg and Bhagdura village, which shows the score value of 41 to 80.
6. Nagpur city area and the settlement surrounding it, comes under Very Poor

In addition to the above-mentioned laboratory studies, actual field check studies were also carried out. The fieldwork program was conducted in the month of November 21-27, 2006 (post monsoon season). In total, 22 wells from the study area were considered for the well inventory studies. The details of these 22 wells are given in Table 5. Inventory studies were carried out of 22 wells in the different legends around the study area.

Conclusion

Different thematic layers viz, geomorphology, geology (lithology) and structural, landuse/land cover and the other relevant associated detail give a broad idea about the groundwater prospect of the area. Groundwater potential map of an area can also be generated which may be used for groundwater development & management programme. GIS proves to a very effective tool for delineation of groundwater.

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