Background

The National Technology Mission on Drinking Water, later renamed as Rajiv Gandhi National Drinking Water Mission (RGNDWM) is one of the five technology missions launched by the then Prime Minister of India in 1986. This mission is directed towards providing 40 liters per capita per day of potable water to all villages in India. It is in this context the Scientific Source Finding has become the thrust area of interest. To address this, Ministry of Rural Development, Government of India under RGNDWM has taken up a major initiative to generate the ground water resources database of the entire country. National Remote Sensing Centre, ISRO, Department of Space was given the responsibility to generate the same using Remote Sensing and GIS technology.

The database consists of Ground Water Prospects maps on 1:50,000 scale which shows:

a) prospective zones for ground water occurrence

b) tentative locations for constructing recharge structures

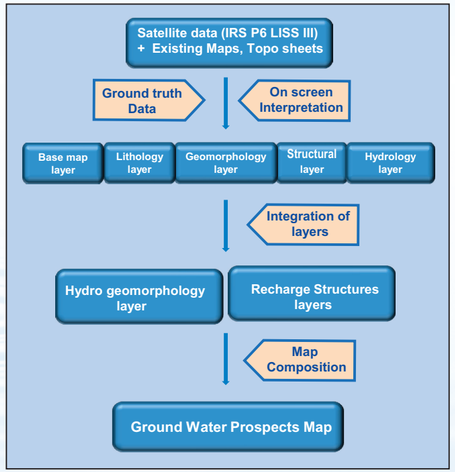
Advantages of Remote Sensing & GIS

Satellite data with limited ground truth provides information on all the parameters controlling the occurrence and movement of groundwater. The information is time and cost effective and more accurate. The satellite data provides a synoptic view of an area with exact nature of terrain condition, which is very difficult to obtain by any other means. Lithological variation in terms of spectral differences comes out clearly in satellite images. Structural information with a regional control can be easily delineated using satellite images.

Hydrological information existing in terms of drainage network, canal network, water bodies and reservoirs are easy to retrieve using satellite image.

Methodology

The methodology consists of two main parts. In the first part the hydrogeomorphic units are delineated considering parameters influencing the hydro geological properties. It consists of (a) preparation of layer wise individual thematic maps i.e. lithology, geomorphology, structures, hydrology and base map details, and (b) derivation of hydrogeomorphic units by integrating the thematic data. In the second part the ground water condition in each hydrogeomorphic unit is evaluated. It consists of (i) evaluation of ground water prospects based on hydrogeological characteristics of each and every parameter, and (ii) semi-quantification of ground water availability by taking into account the well observatory data, and (iii) selection of tentative locations for taking up artificial recharge structures.



The data thus generated at different stages, is converted into a digital database as per the specified standards. It is in the form of two out puts - (1) all the four parameters as individual thematic maps and base map also as a separate map and (2) ground water prospects map as a final out put.

Contents of the Map

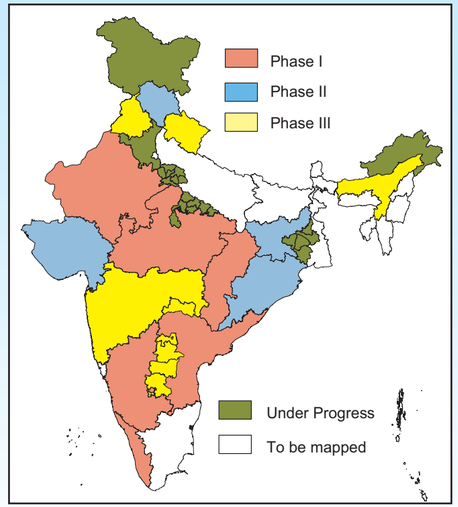
The Ground Water Prospects map contains

(a) the information pertaining to the controlling factors, i.e lithology, geomorphology, geological structures and recharge conditions in the form of different layers and forms a base, (b) the distribution of hydrogeomorphic units i.e the aquifers are shown as the derivative of these four factors and (c) the ground water prospects w.r.t. depth and yield range of the recommended wells.

For this purpose, VIBGYOR colour scheme with seven colours, i.e. violet to red, are used for depicting different yield ranges from excellent to poor. Within each yield range, three hatching patterns are used for depicting the depth range of wells

Status

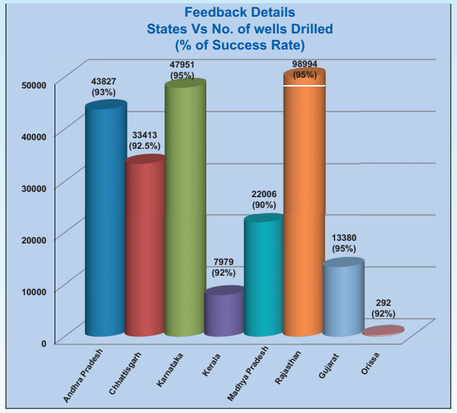
It was planned to execute the project work in different phases. Initially, in January, 1999, under Phase-I programme, six states namely - Rajasthan, Chhattisgarh, Andhra Pradesh (part), Madhya Pradesh, Karnataka and Kerala were taken up involving preparation of 1654 maps. The mapping has been completed as per the schedule in the year 2002. Subsequently, during Phase-II, Jharkhand State was taken up in October 2001 followed by Himachal Pradesh, Orissa and Gujarat States in October 2002, totally covering 650 maps. The ground water prospects maps pertaining to these states have also been prepared in different batches and submitted to the user department. In Phase III ten states covering 1629 maps were taken up, of which Andhra Pradesh (part), Assam, Punjab, Uttarakhand, Maharashtra states are completed. J&K, Haryana, Arunachal Pradesh, West Bengal (part) and Uttar Pradesh (part) are in progress. A seperate layer on ground water quality is also being generated in this phase for 4 problematic states.

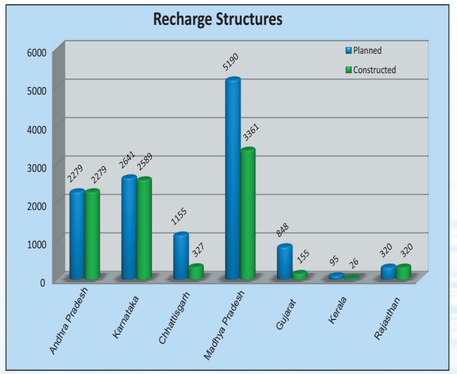


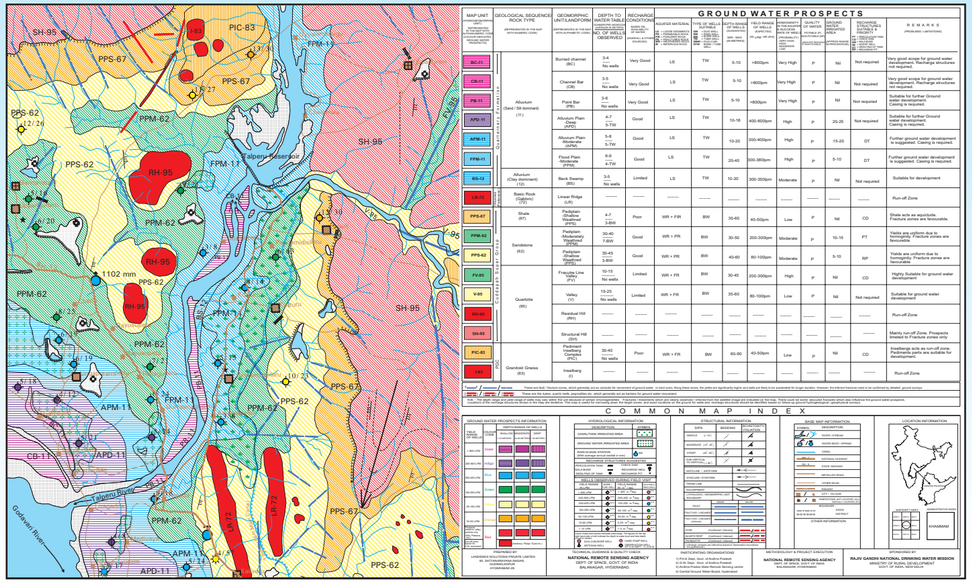
Utility of the Maps

The line departments can use these maps for narrowing down the target zones around the problem habitations for detailed ground hydrogeological and geophysical investigations, ultimately to select the sites for drilling. These maps should be used for selection of sites with follow-up ground surveys, i.e. detailed hydrogeological/ ground geophysical investigations (wherever required) in the prospective zones to obtain the exact information about the weathered zone, fractured zone, thickness of deposited material, depth and thickness of aquifers, presence of fractures in the subsurface and their subsurface configuration, information about the existing wells, etc. Subsequently, based on the confirmatory evidences obtained from ground geophysical / hydrogeological surveys, the sites have to be selected for drilling. Similarly for recharge structures also, though each unit has been evaluated for its suitability for taking up different types of recharge structures, the exact site for locating these recharge structures have to be evaluated based on the requirement, nature of underlying aquifer, site conditions, availability of water for recharge, etc. The sites shown in the map for recharge structures are indicative. Thus, these maps are useful as a guide in narrowing down the target zones for detailed ground surveys/exploration for selection of sites, both for drilling as well as for taking up recharge structures.

Overall about 90 % success rate has been reported on selection of sites for drilling. Many recharge structures are also being constructed using these maps. The feedback details received from the states are given below.







For Further Information

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Ground Water Prospects Mapping

Rajiv Gandhi National Drinking Water Mission