ASSESSMENT OF GROUND WATER POTENTIAL ZONES BY GIS – PERUNDURAI TALUK

R.VIMAL[1], P.SASIDHARAN[2]

[1]Assistant Professor, *Department of Civil Engineering, SSM College of Engineering.*
[2]*PG Scholar, Department of Environmental Engineering, Erode Sengunthar Engineering College*

Abstract: *Geographical Information System (GIS) for the exploration of groundwater resources has become a breakthrough in the field of groundwater research, which assists in assessing, monitoring and conserving groundwater resources. In the present paper, various groundwater potential zones for the assessment of groundwater availability in perundurai taluk have been delineated using GIS techniques. survey of India topo sheets are used to prepare various thematic layers viz .lithology, land-use, lineatment, drainage, soil, and rainfall were transformed to raster data using feature to raster converter tool in ArcGIS. The raster maps of these factors are allocated a fixed score and weighted thematic layers is statically computed to get groundwater potential zones. The groundwater potential zones thus obtained were divided into five categories, viz very high potential zones, high potential zones and moderately potential, low potential , very low potential zones . the result depicts the groundwater potential zones in the study area and found to be helpful in better planning and management of groundwater resources*

Key words: Groundwater, satellite remote sensing, geographic information system.

INTRODUCTION:

GENERAL

Groundwater is said to be vitally important for drinking, irrigation, and domestic use. Groundwater is a form of water occupying all the voids within a geological stratum. water bearing formations of the earth's crust act as conduits for transmission and as reservoirs for storing water. The ground water occurrence in a geological formation and the scope for its exploitation primarily depends on the formation of porosity. High relief and the steep slopes impart higher run-off, while topographical depression increase infiltration. An area of high drainage density also increases runoff compared to a low drainage density area. Surface water bodies like rivers, ponds, etc., can act as recharge zones, enhancing the ground water potential in the neighbourhood.

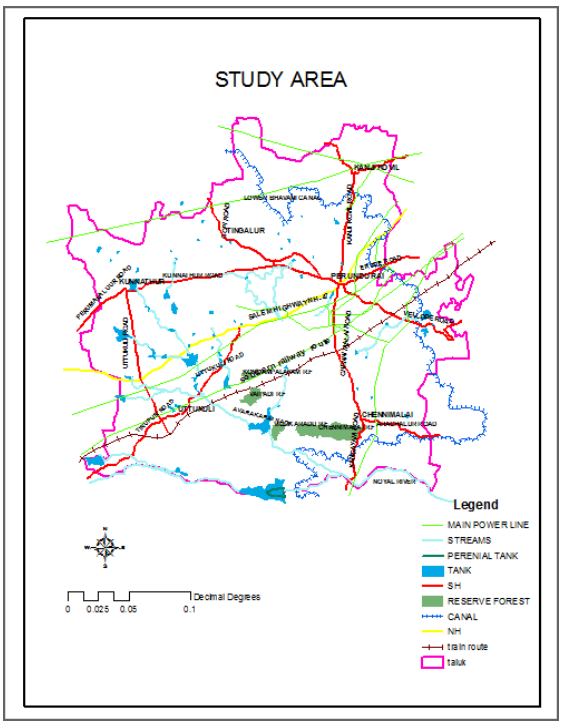
GIS is a database system in which most of the data are spatially indexed, and upon which a set of procedures operated in order to answer the quires about spatial entities in the database. GIS is an automated set of function that provides professionals with advanced capabilities for the storage retrieval, manipulation, and display of geographically referenced data. Now, GIS has wide application in myriad of physical and human endeavours like crime and disease analysis, routing of vehicle in case of traffic jams, business and industrial location, analysis urban and regional planning, military simulation etc.

MATERIALS AND METHOD

LOCATION OF THE STUDY AREA:

It is situated between 77 °33'36" N and 77 °41' 24 " N latitude and 11° 6' 14 " E and 11° 24' 46 " E longitude . It has an average elevation of 292 meters (958 feet) above mean sea level. The river noyal flows through the southern borders Perundurai .

Perundurai Taluk is located in the Erode district, in the state of Tamil Nadu. It has a population of about total population 2,66,106 (census in 2011) in that rural area having population of about 1,41,367 and urban area having population of 1,24,739.



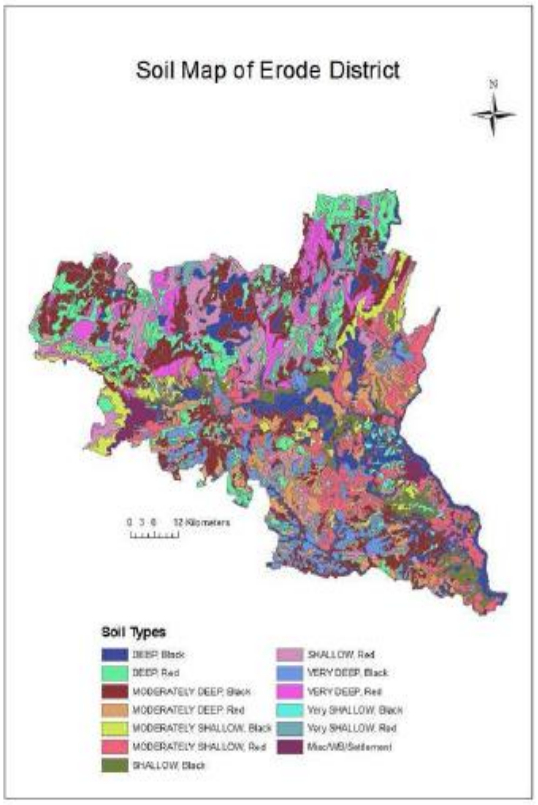
SPATIAL DATA:

Survey of india topomaps, village wise map, soil map, geology map, land use and landcover map were used in the analysis.

PHYSIOGRAPHIC CHARACTERSTICS:

SOIL

Soil characteristics of a terrain are more important aspects since they play a major role in ground water recharge and meet the needs of people. Agricultural departments indicates the six different types of soil in study area, as below Red soil, Calcareous soil, Red non calcareous soil, Black Soil, Alluvial soil.

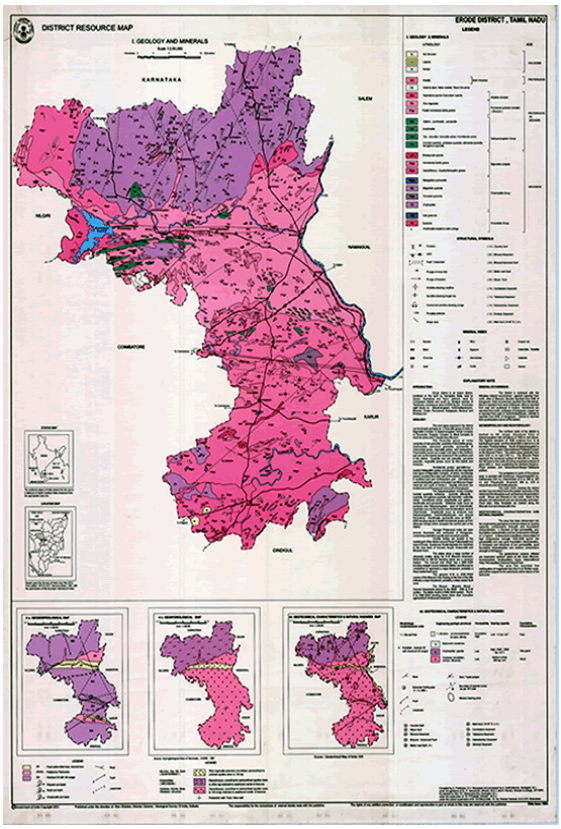


LAND USE AND LANDCOVER:

As per the revenue records ,the total geographical records of perundurai taluk is 806.1 sq.km. In these taluk, Perundurai block having area of 29234(Ha), Chennimalai block having area of 28495 (Ha), Uttukuli block having area of 22892(Ha). Canals are the major source of water for irrigation in the district, accounting for about 57.00 percent of the total area irrigated in the talukDug wells, and bore wells are the accounting for about 32.55 and 9.09 percent of the total area irrigated respectively. Other sources and tanks accounting for about 1.21, and 0.14 percent respectively . Less than 9.2% of the total area is put to non-agricultural use (53,004 hectares). 14.5% is accounted for by fallow lands. Trees, crops, groves, Orchards etc. together account for about 0.6% of the total area in the taluk perundurai taluk having 57 mining & quarries

GEOLOGY AND GEOMORPHOLOGY

Perundurai taluk is underlain by wide range of metamorphic rocks.The geological formation found in study area are Quartzites, Micaceous ,fuchsitic quartzites, Sillimanite quartzites, Garnet-sillimanite quartzites, Pyroxenite, Trap rock, Augite-diopside-g ranulites, Garnet-pyroxene-granulites, Garnetiferous granite gneiss Magnetite-quartzites.The mineral formation are beryl, feldspar, gypsum ,limestone, mica and magnesite.



The prominent geomorphic units identified in the district through interpretation of Satellite imagery are 1) Structural hills, 2) Inselberg, 3) Ridges, 4) Valley fill, 5) Pediments, 6) Shallow Pediments. The region is filled with naturally diverse ecosystem such as hills, plains, rivers, forests, evergreen fields, drought prone areas, tanks etc. Geomorphological maps helps to identify the various geomorphic units and groundwater occurrence in each unit. Geomorphological map is prepared with help of satellite imageries and subsequent checks are being carried out in the field for verification of the features identified.

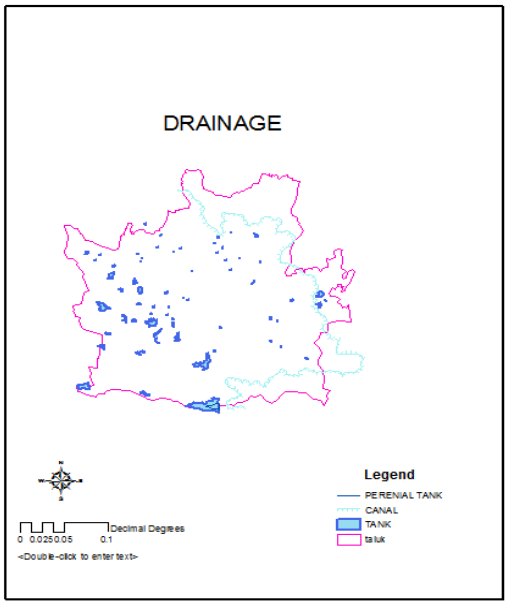
RAIN FALL

It receives the rain under the influence of both southwest and northeast monsoons. The northeast monsoon chiefly contributes to the rainfall in the taluk. The southwest monsoon is also reasonable. During the winter and hot seasons, the rainfall is scanty. The normal annual rainfall varies from about 575 mm to about 704 mm.

DRAINAGE

The study area has natural topography, sloping from the noth towards south and west towards east. The Noyil River draining the southern part of the district has its origin in the

Boluvampatty valley of the Vellingiri hills of Western Ghats flowing through the southern border of Perundurai taluk. Most of the tanks are used for irrigation purposes. The tanks in Perundurai taluk are Palatholavu tank, Kodumanal tank, Atiyur, China kavunda palayam, Anaipalayam, Tottiyampalyam, Kunnathur, Kurichi, Periya kattu valavu. Avaraikarai streams flows from western part is mixed in noyal river. Lower bhavani canal is the main source used for irrigation purpose which enters from northern border of taluk flows through the eastern side of the Perundurai.



METHODOLGY

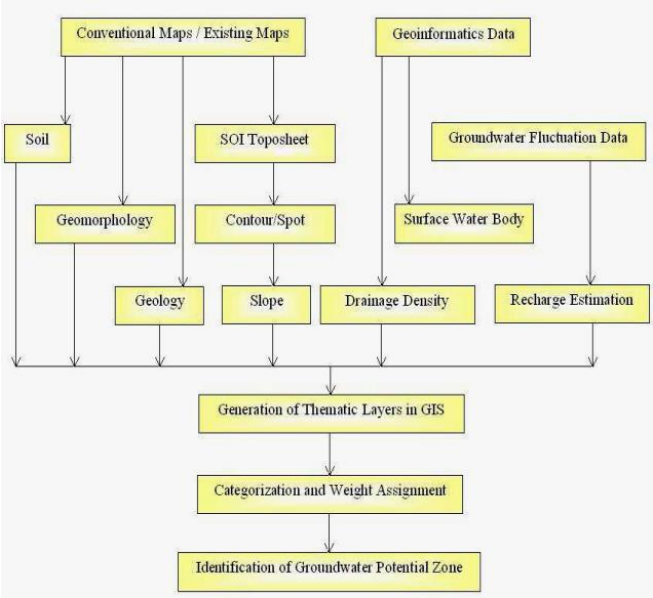
The ground water identification involves many different procedures among these remote sensing and GIS are important technologies to identify the ground water potential zones. Because the underground structure of geology can be mapped from the certain surface expression. The satellite images are also used to map the geomorphology and landuse landcover for the study area analyzed with suitable techniques. In this study multy criterion analysis method adopted, the relevant layers are slope, geology, lineament, soil, geomorphology, landuse landcover, drainage density are used.

SATELITE DATA ANALYSIS

The main task in this stage is to do an analysis and interpretation of satellite data, in order to produce basic maps such as structural and land use map in digital form. Basically, satellite data registration, correction and other image processing

ASSIGN THE WEIGHTAGE AND RANKS OF PARAMETER

The weightage of the themes are determined by their close contribution to the identification of groundwater potential zones. The rank represent the importance of the subclasses of the particular theme. The values are given according the suitability nature of the particular theme.



METHODOLOGY:

4.8 DATA INTEGRATION

The aim of the study is to identify the groundwater potential zones. groundwater suitability index is the sum of the product of weightage and rank of the schemes given below.

$$GWP = \sum W \times R$$

Where GWP- Groundwater potential, W-Weightage, R- Rank

The formulae of the groundwater potential zones (GPZ) as shown below:

GPZ = Sp +Geo +Ld +S+ Geom +Lu +Dd

Where,

Sp-slope, Geo-geology, Ld-lineament density, S-Soil, Geom- geomorphology, Lu-land use, Dd-drainage density

RESULT AND DISCUSSION

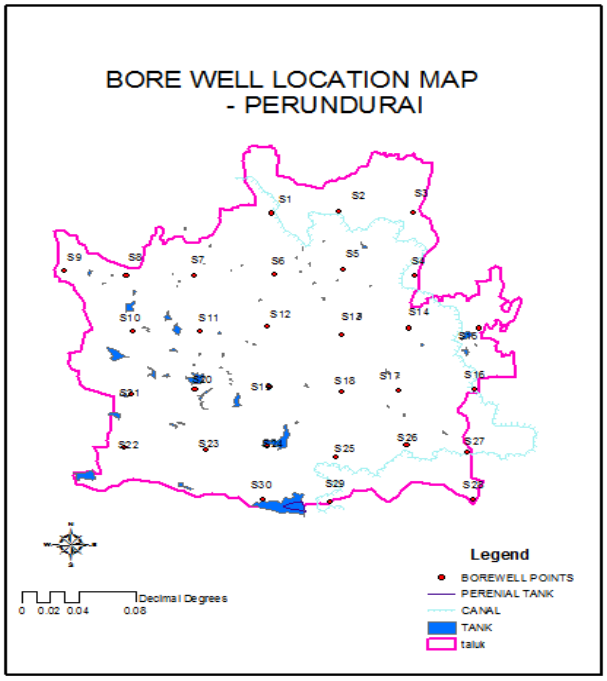
RAINFALL

It receives the rain under the influence of both southwest and northeast monsoons. The average rainfall of perundurai taluk is 700.4 from four distinct seasons viz. Winter, hot weather period, south west monsoon and north east monsoon. The rain fall datum for 5 years was collected from the meterological department which is shown table 5.2.

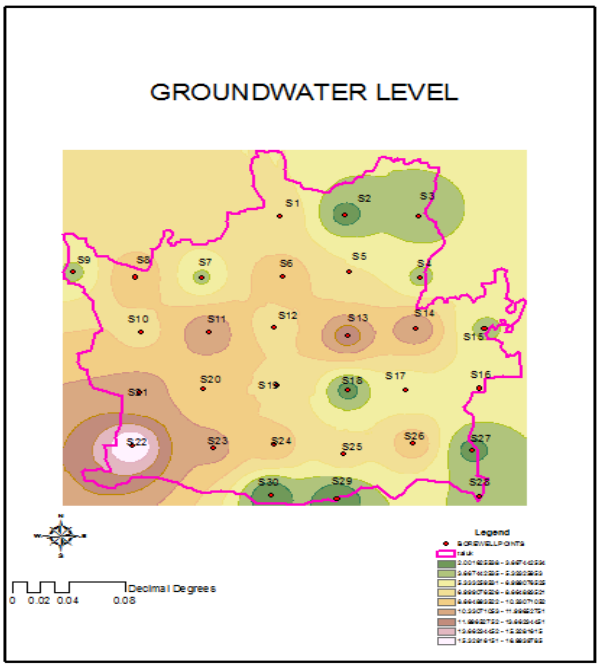
FIELD STUDY

Results of the field survey includes selection of 30 borewells points in the study area such that minimum distance the sample collection point is atleast 5 km, by using the Perundurai taluk map. The bore well points were investigated for the depth, water level, its geographical position i.e., latitude and longitude. The borewell location map and its data is detailed below fig and in table .

Sample id	Latitude (N)	Longitude(E)	Borehole depth (ft)	Water level (ft)
S1	77° 31' 1.2''	11 ° 21' 21.6''	400	4
S2	77° 33' 50.4''	11 °21' 28.8''	250	3
S3	77° 36' 57.6''	11 °21' 25.2''	450	8
S4	77° 37' 1.2''	11 °18' 10.8''	40	5
S5	77° 34' 1.2''	11 °18' 28.8''	30	7
S6	77° 31' 8.4''	11 °18' 14.4''	260	10
S7	77° 27' 14.4''	11 °18' 10.8''	45	5
S8	77° 24' 50.4''	11 °18' 10.8''	600	10
S9	77° 22' 12''	11 ° 18 28.8''	37	8
S10	77° 25 ' 8.4''	11 ° 15' 21.6''	500	12
S11	77° 27' 57.6''	11 °15' 21.6''	42	8
S12	77 ° 30' 43.2''	11 °15' 36''	300	13
S13	77° 30' 57.6''	11 °15' 7.2''	500	12
S14	77° 36' 50.4''	11° 15' 28.8''	25	5
S15	77° 39' 46.8''	11 °15' 28.8''	38	6
S16	77° 39' 32.4''	11 ° 12' 21.6''	300	5
S17	77° 36' 25.2''	11 ° 12' 18''	280	8
S18	77° 33' 57.6''	11 °12' 3.6''	360	12
S19	77° 30' 5.4''	11° 12' 32.4''	600	15
S20	77° 27' 46.8''	11 ° 12'	400	13
S21	77° 25' ' 1.2''	11 °12' 10.8''	350	16
S22	77° 24' 43.2''	11 ° 9' 25.2''	300	10
S23	77° 28' 12''	11 ° 9' 18	200	10
S24	77° 30' 50.4''	11 ° 9' 18	680	13
S25	77° 33' 43.2''	11 ° 8' 56.4	280	8
S26	77° 36' 43.2''	11 °9' 28.8	50	7
S27	77° 33' 50.4''	11 ° 9' 10.8	250	11
S28	77° 39' 32.4''	11° 6' 46.8	150	9
S29	77° 30' 50.4''	11° 6' 46.8	170	6
S30	77° 30' 40.2''	11 ° 6' 46.7	320	5



BOREWELL LOCATION MAP



GROUNDWATER PROSPECT LEVEL

CONCLUSION:

We established successfully in this study that remote sensing and GIS can provide the appropriate platform for convergent analysis of large volume of multi-disciplinary data and decision making for groundwater studies. These techniques have been successfully used and demonstrated for evaluation of groundwater potentiality of the area. The Weighted index overlay model has been found very useful in the mapping of groundwater prospective zones.

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