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Research paper

Construction of Water Table Contour Map and Geo Hydrological Studies on Krishnagiri Using GIS Techniques

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Abstract

Geo-hydrology and groundwater exploration manner to pick out and to find the zone of recharge of groundwater in a precise river basin or a catchment .water level contour traces (or waft traces) are much like topographic strains on a map. They fully represent "elevations" in the subsurface. Water table contour lines can be used to inform which manner groundwater will glide in a given region. Plenty of wells are drilled and the hydraulic head is measured in each one. Water desk contours are drawn that be a part of areas of identical head .The ones water table contours lines are also called equipotential strains. Bear in mind: groundwater usually movements from a place of the higher hydraulic head to an area of decrease hydraulic head, and perpendicular to equipotential traces. In our challenge, we put into effect concept of water table contour map and geohydrological studies on Krishnagiri using GIS software program which plays the essential position in contemporary technology.

Keywords: *Construction, Water Table, Contour Map, Geo Hydrological and GIS.*

1. Introduction

Geological installation is installed for knowing approximately surface and subsurface nature of the terrain. Topographic and floor capabilities are mapped if you want to decide from maximum to lowest area, wherein water from specific higher places can flow and gather. These unique zones are found in diverse terrains. The identification of such locations from the complete region is accordingly decided on for groundwater exploration. Faraway sensing and GIS providing a few beneficial statistics for integrated assets development and environmental control in composition with floor truths on soils, land use, flowers, surface & groundwater, geology, landforms, topography, settlements, amongst others, in a regional attitude. Remote sensing techniques at the moment are being broadly used for land useful resource surveys like this.

1.1. Purpose and Scope

This report describes the effects of an investigation designed to signify the geohydrology and to decide the vicinity and volume of the industrialized area in Krishnagiri. Similarly to an outline of the geology and hydrology of the study vicinity, the consequences of an area-wide synoptic water-level survey are provided. The file identifies the course of floor water go with the flow, the route and velocity of vertical and horizontal floor-water flow within the hydraulic gadgets of an issue, and the nature of the ground-water interplay inside the have a look at the region for the duration of the synoptic water-degree survey. The location and thickness are measured on the water desk for the duration of are also presented.

2. Methodology

The proposed methodology of adopted which includes base map coaching, digitization and photograph processing using software and interpretation of the outputs. First level consists of improvement of spatial statistics base through the usage of survey of Krishnagiri topo sheet and satellite for data. GIS and faraway sensing technology is carried out to prepare various thematic maps almost about groundwater like drainage density, contour, and circulate length. The second degree worried training of virtual elevation version (DEM) through interpolating contour map that is digitized from SOI top sheet. DEM is used to put together slope, aspect, waft accumulation and stream order. Methodology is extensively used for making ready runoff potential map for small to medium size engaged drainage basin. Within the third stage, virtual image processing of the satellite for statistics is executed for geo-referencing & geometric correction. That is observed via advent of different thematic layers the usage of supervised type method. all the attributes from the accrued records then summed to create the buffer map for agriculture place & agreement vicinity. it's miles then observed via creation of different vital records that's used to decide the ground water ability on the later degree like land use/land cover map, geological/lineament map.

3. Study Area

Krishnagiri is a district inside the state of Tamil Nadu, india. The municipal town of Krishnagiri is the district headquarters. The district is one of the largest producers of mangoes no longer handiest in TamilNadu but at some point of India. Fig.1 shows the Location of the areas selected for the study in Krishnagiri

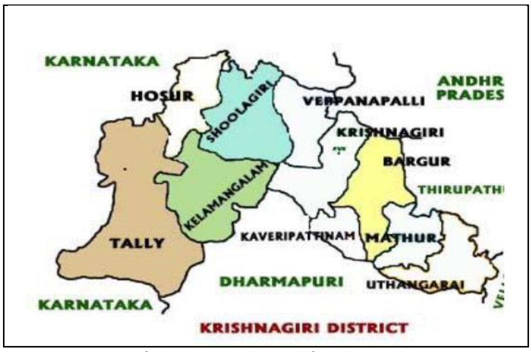

Fig.1: Location of the areas selected for the study in Krishnagiri

4. About the Software

Arc GIS is a geographic information system (GIS) for working with maps and geographic statistics. it is used for: creating and using maps; compiling all the geographic data; reading different mapped data; sharing and discovering variety of geographic data; the usage of all type of maps and geographic data in a variety of programs; and coping with geographic data in a database.

4.1. Geographical Information System

Geographic Information System (GIS) is a computer based information system as software used to totally statistics gadget used to digitally represent and analyses the geographic functions gift on the earth surface and the occasions (non-spatial attributes linked to the geography below examine) that taking vicinity on it.

5. Water Table Mapping

Groundwater degree measurements had been made at greater locations at some point of the week calculated to evaluation using GIS. Traces of equal water table elevation had been hand-contoured. The statistics had been accumulated closer to the give up of a dry season of 4 months, and the water table configuration below extensively comparable situations fairly properly. Throughout moist intervals (generally march via june), the water table may be incredibly higher than is indicated, especially beneath hills. But, the general configuration is in all likelihood to be just like that portrayed on the map. No compensation turned into made for acknowledged relative variations in aquifer permeability. many of the most crucial heterogeneities are conduits, bedding partings, and fracture strains. The probabilities of those being reflected on the water desk map are extremely low. Regionally, those functions may also account for extra groundwater waft than plenty of the encompassing location. To correctly use the water desk map, statistics on its production and capacity limitations of the information need to be considered. The information factors are in large part residential water supply wells. They may be normally shallow, so that they provide a good basis for mapping the elevation of the pinnacle of the saturated sector (i.e., the water desk). Field crews tried to accumulate calmly dispensed information. But, the residential wells have been regularly in clusters, ensuing in a few regions with sparse records. There are, on the average, fewer than two information points in line with rectangular mile. Some water degrees from high remedy regions may also have reflected limited or leaky constrained conditions. Insufficient facts had been available to test for this potential source of errors. Average, the interpolation between broadly spread data factors (places), frequently throughout aquifers of differing permeability, is probably the maximum enormous blunders to take into account whilst interpreting the water table contour map. The water desk map has been used, together with other records, to broadly interpret groundwater go with the flow styles on this section.

6. Analysis Results

Fig.2 shows the location map.

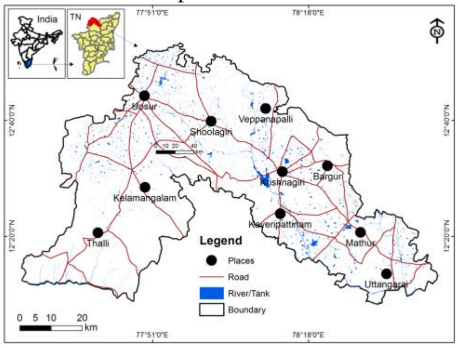

Fig.2: Location map

Fig.3 shows the artificial recharge techniques.

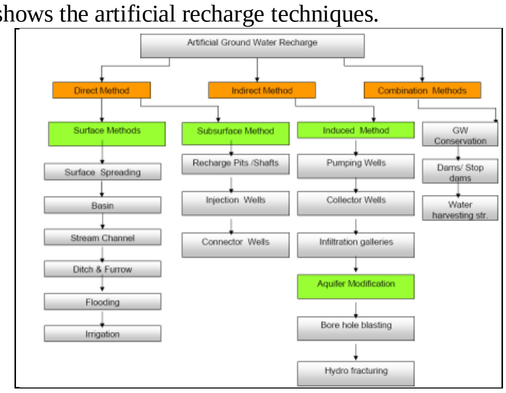

Fig.3: Artificial recharge techniques

Fig.4 shows the common patterns of ditch and furrow recharge systems

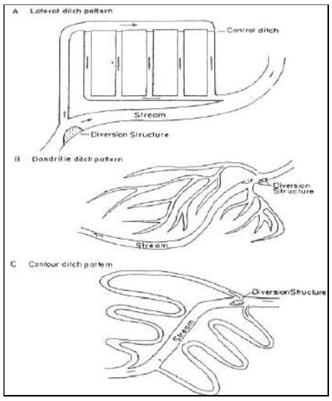

Fig.4: Common Patterns of Ditch and Furrow Recharge Systems

Fig.5 shows the schematics of a typical recharge basin.

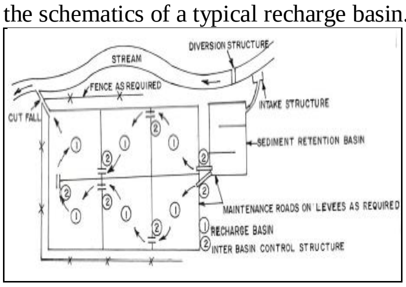

Fig.5: Schematics of a typical recharge basin

Fig.6 shows the recharge pits.

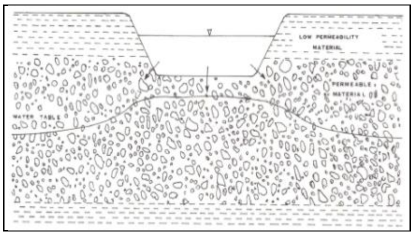

Fig.6: Recharge pits

Fig.7 shows the schematics of recharge shafts.

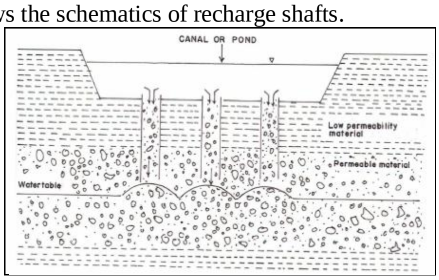

Fig.7: Schematics of recharge shafts

6.1. Suitable Sites for Artificial Recharge

6.1.1. Factors Controlling the Recharge Zones

- Geology
- Slope
- Geomorphology
- Drainage Density
- Transmissivity
- Storativity
- Available Space for Recharge

Fig.8 shows the drainage pattern of study area.

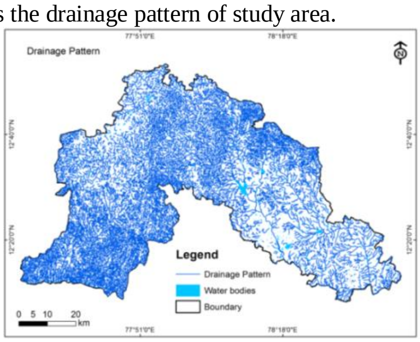

Fig.8: Drainage pattern of study area

Fig.9 shows the drainage density.

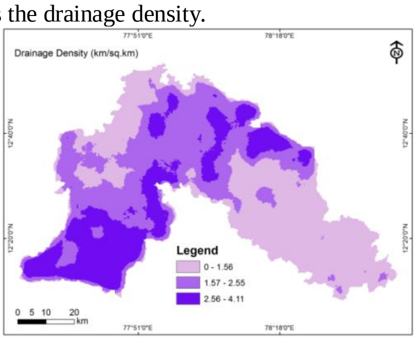

Fig.9: Drainage density

Table 1 shows the Weight age, ºrank and index assigned for different groundwater controlling parameters to derive suitable sites for artificial recharge.

Table 1: Weight age, ºrank and index assigned for different groundwater controlling parameters to derive suitable sites for artificial recharge

Sl.No	Parameter	Class	Rank	Weight	Index
1	Drainage density (km/sq.km)	0-1.57	4	15	60
		1.57-2.55	2		30
		2.55-4.10	1		15
2	Slope	<2	4	20	80
		2-5	3		60
		5-12	3		60
		12-25	2		40
		>25	1		20
3	Geomorphology	Shallow pediment	2	10	20
		Deflection slope	4		40
		Residual hills	1		10
		Pediment inselberg complex	4		40
		Moderate pediment	4		40
		Structural hills	3		30
		Upland	4		40
		Highly dissected	1		10
		Linear ridge	3		30
		Undissected	4		40
		Isenberg	1		10
		Upland plateau	2		20
		Deep pediment	2		20
4	Geology	Gneiss	2	10	20
		Charnockite	3		30
		Granitic gneiss	3		30
		Mettagabbro	1		10
		Basic rocks	1		10
		Amphibolites	1		10
		Migmatitic complex	2		20
		Granitic rocks	3		30
		Champion Gneiss	2		20
		Alkaline rocks	3		30
		Ultra basic rocks	1		10
		Quartzite	1		10
		Ultra basic complex	1		10
5	Available space	<2.1	4	15	60
		2.1-2.8	3		45
		2.8-3.7	2		30
		>3.7	1		15
6	Transmissivity	<12.1	1	15	15
		12.1-14.7	2		30
		14.7-17.4	3		45
		>17.4	4		60
7	Storativity	<0.047	1	15	15
		0.047-0.061	2		30
		0.061-0.075	3		45
		>0.075	4		60

Fig.10 shows the SRTM DEM.

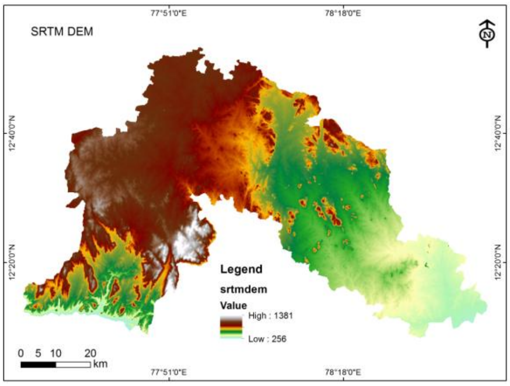

Fig.10: SRTM DEM

Fig.11 shows the slope ratio.

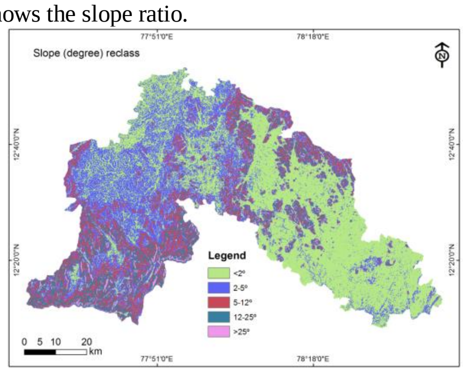

Fig.11: Slope ratio

Fig.12 shows the geomorphology.

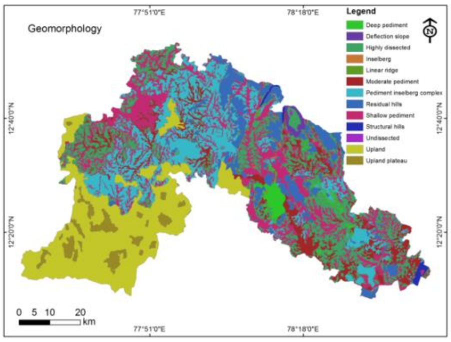

Fig.12: Geomorphology

Fig.13 shows the geology map.

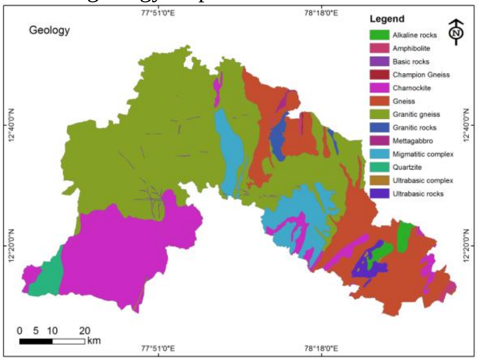

Fig.13: Geology Map

Fig.14 shows the water level fluctuation.

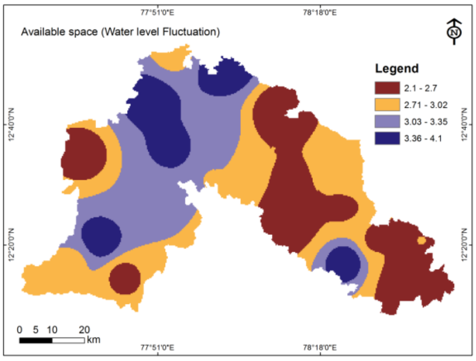

Fig.14: Water level Fluctuation

Fig.15 shows the transmissivity map.

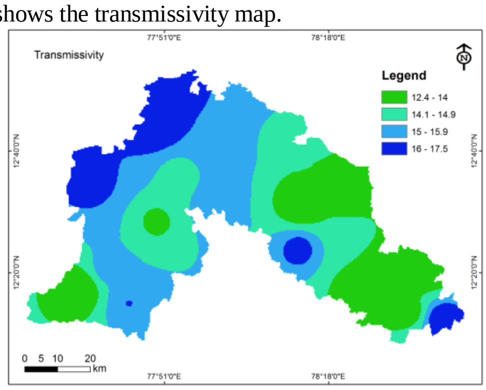

Fig.15: Transmissivity map

Fig.16 shows the storactivity map.

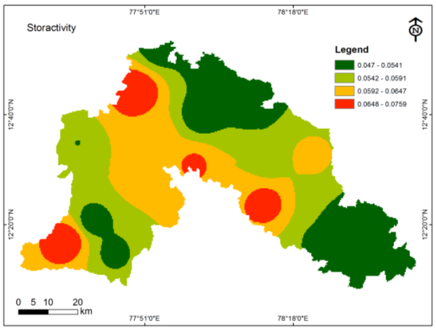

Fig.16: Storactivity map

Fig.17 shows the Site suitability in study area for artificial recharge

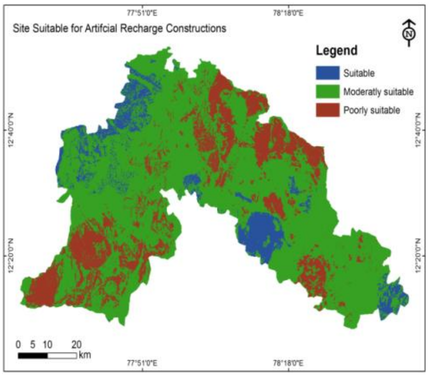

Fig.17: Site suitability in study area for artificial recharge

7. Conclusion

Geographical facts has proved to be powerful and cost powerful systems approach for identifying water table in Krishnagiri district. They have a look at exhibits that integration of all types of thematic maps together with drainage density, slope, geology, geomorphology, lineament density and land use/land cover gives firsthand facts to local government and planners approximately the areas suitable for groundwater exploration. Remote sensing and GIS techniques have been used to derive all combine diverse geo-informative thematic maps.The incorporated groundwater capacity map has been labeled on the foundation of cumulative weightage assigned to different capabilities of all thematic maps.

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