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A Geospatial Approach for Groundwater Potential Assessment Using Multi Influence Factor (MIF) Technique

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ABSTRACT: The preservation of groundwater is very significant resource. Due to the intensifying demand for water to achieve the industrial and household necessities of daily life, its sources are about to dry out. We need to preserve and harvest the resource for ages to come. In this paper, depiction of groundwater potential zoning is done for Jaipur district, Rajasthan. Since, Rajasthan is being the driest state of India, and the Jaipur is the capital district of the state. We have utilized twelve influencing parameters viz. Geology, Geomorphology, Lineament Density, Slope, Elevation, Drainage Density, Land use & Land Cover, Soil Type, Depth to Bed Rock, Depth to Water Level, Rainfall and Aquifer for Multiple Influence Factors (MIF) Technique. The respective information of influencing parameters is acquired in the form of thematic layers. Each components was characterized for the weightage and rating using MIF technique to evaluate the groundwater potential zones. The outcomes achieved by using the MIF technique for the groundwater potential zoning were classified into five categories such as very high, high, moderate, low, and very low. The area statistics for groundwater prospect is found as 125 Km² (1.12%), 2399 Km² (21.54%), 5691 Km² (51.11%), 2799 Km² (25.14%) and 122 Km² (1.01%) respectively. Thereafter the governing authorities can make decisions for the exploration, conservation and harvesting of the potential zones. The outcomes of this work will be helpful for researchers and decision makers in order to sustainable management of water resources in India and around the world.

Key words: Remote Sensing, GIS, Groundwater Potential Zoning, Multiple Influence Factor (MIF) technique.

I. INTRODUCTION

Groundwater is a valuable source of freshwater. Freshwater shortage, brought about by overexploitation, contamination and environmental change is one of the essential difficulties of human culture. People rely upon water assets for daily requirements to survive. Both surface water and Groundwater is one of the most valuable and purest forms of natural resources. Groundwater with high contents occurs in many parts of the world including large parts Africa, Southern Asia, China etc.[5-6].

Groundwater is the second-most major source of freshwater available after the surface water resources and constitutes about 30% of purest water resources of the globe. More than 1.5 billion people in the world are known to depend on the groundwater for the daily drinking and domestic water requirements [1,3,23]. The groundwater is formed mainly from various forms of precipitation and then after recharging the aquifers. Usable groundwater shortage, brought about by overexploitation, contamination and environmental change is one of the essential difficulties of human culture [13-16]. Groundwater is the most perfect water sources as of now which assist for the improvement and social welfare in numerous countries and regular development of worldwide populaces over the coming decades, together with developing monetary flourishing, will additionally build water request and thus exaggerate water scarcity problems.

Due to the intensifying demand for water to achieve the industrial and household necessities of daily life, the groundwater plays a very vital role. The quality and quality of available groundwater resources are also getting affected due to the anthropogenic activity, climate change and variability of the seasonal patterns. However, overexploitation has drained groundwater accessibility impressively and furthermore prompted land subsidence at certain spots assessing the potential zone of groundwater revive is incredibly significant for keeping up the water quality and its administration. Groundwater is easiest form of water available at any place. This valuable asset is here and there lacking once in a while plentiful however unevenly appropriated, both in existence. Groundwater recharge is a type of water possessing, which takes place through the voids inside a subsoil stratum. The groundwater event in a land arrangement the likelihood for its extraction essentially relies upon the development of porosity [6,7,17]. High help and soak slants confer higher overflow, while geological despondencies increment penetration. A zone of high seepage thickness likewise raises surface spill over contrasted and a low waste thickness zone. Surface water bodies like waterways, lakes, and so on can go about as revive zones.

In India, almost 60-65 million people drink highly contaminated groundwater due to scarcity of suitable sources of drinking water, especially in hard water terrain [16-9].Almost 3 million people mainly in the state of Rajasthan, Punjab, Gujarat, Madhya Pradesh, Uttar Pradesh, Jharkhand, Andhra Pradesh, and Tamil Naidu are affected by highly contaminated water resources [15,12,21].

In Rajasthan, the scenario of availability of ground water is very adverse. The yearly precipitation is also low subsequently resulting less recharge to groundwater. It is quite important to know the potential ground water zone. So that, those resources of water can be utilised for that we need to map out the ground water potential zone using Geoinformatics [18].

II. STUDY AREA

Jaipur district, with the geographic territory of 11,061.44 sq. km and extending between north scopes 26° 25' and 27° 51' and east longitudes 74° 55' and 76° 15' frames east focal piece of the Rajasthan State for managerial accommodation, the area is partitioned into 13 tehsils and 13 squares. The locale covers about 3.23% of the complete zone of the State. As indicated by 2011 statistics, the absolute populace of Jaipur locale was 66, 26,178 with an urban populace of 34,71,847 and decennial development of 26.91% and rustic populace of 31, 54,331 (period 2001-2011)[18-7]. Jaipur is the capital city of Rajasthan and broadly perceived as "Pink City" which is situated in the focal piece of the region. Jaipur is, particularly on the world vacationer map. Indeed, Jaipur is the most visited visitor city by the outsider who visits India. Jaipur is in all respects broadly known for its customary adornments and pearls Silver and also know for Bagru and Sanganeri prints.

III. DATA USED AND METHODOLOGY

The groundwater potential zones are those zones where the availability of groundwater is there. The water above the ground surface gets percolated and recharges the subsurface. When water flow infiltrates the sub surface and reaches groundwater level, subsequently makes the saturated zone. The porosity, permeability and the water holding capacity of the intermediate layers from ground surface to the saturated zone plays a very important role to recharge the groundwater level continuously. It is an exceptionally significant constituent of the circulation of water cycle. Many factors affect the flow and the available quantification of groundwater in a region. This study uses Geology, Geomorphology, Lineament Density, Slope, Elevation, Drainage Density, and Soil Type, Land use &Land Cover, Depth to Bed Rock, Depth to Water Level, Rainfall and Aquifer. The details of the data used are given in table 1.

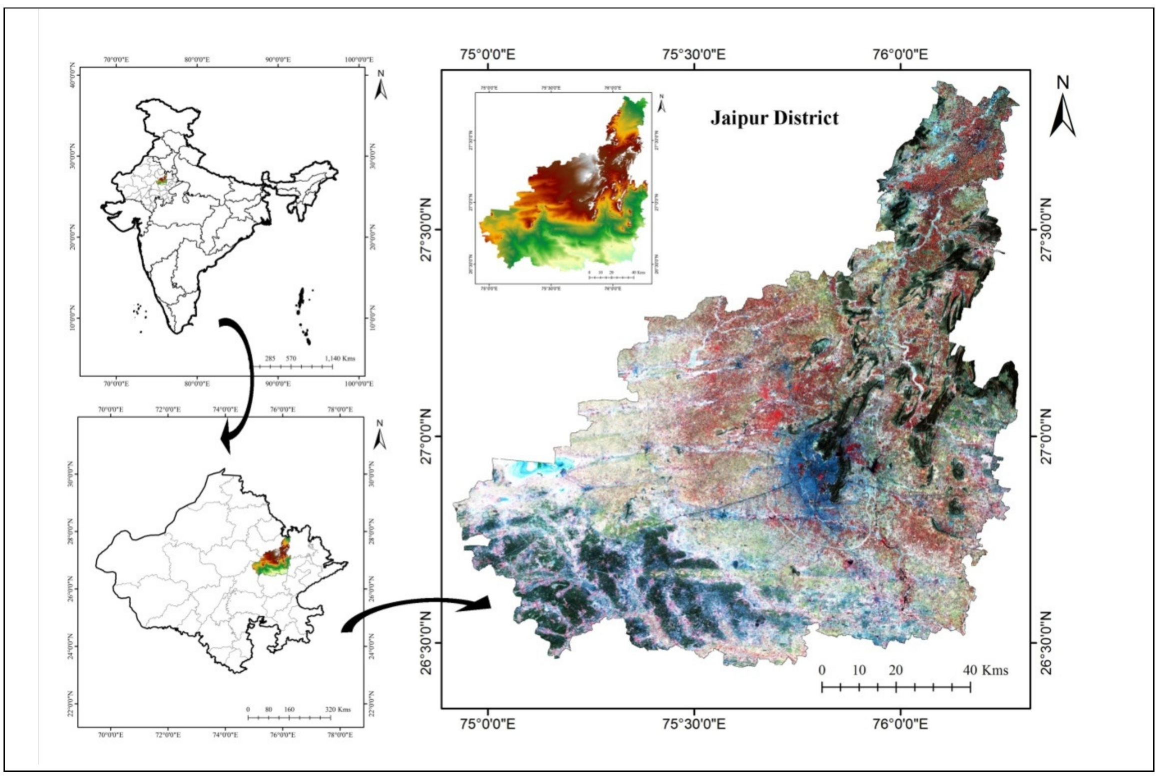


Fig. 1. Study area Map of Jaipur.

Table 1: Detailed sources of data used.

Parameter	Source
Satellite data, SRTM DEM	USGS, (https://earthexplorer.usgs.gov/).
Geology	Geological Survey of India – (GSI) (https://www.gsi.gov.in/)
Geomorphology, Aquifer, and depth to bedrock	GWD - Raj Ground Water Department, Rajasthan (http://phedwater.rajasthan.gov.in/gwd#),
Soil	National Bureau of Soil Survey and Land Utilisation Planning (NBSS) (https://www.nbsslup.in/)
Depth to Water Table	India-WRIS Ground Water Level (www.india-wris.nrsc.gov.in/)
Rainfall	India Meteorological Department (IMD) (www.imd.gov.in/)

A. Assigning Of Weights and Ranks

MIF is one of multi criteria decision making technique which is very useful for analyse unbiased decision making. For groundwater potential, here we have various influencing factor namely Geology, Geomorphology, Lineament Density, Slope, Elevation, Drainage Density, Soil Type, Land use & Land Cover, Depth to Bed Rock, Depth to Water Level, Rainfall and Aquifer. [21,2,23,14].According to MIF technique each influencing factor has some major effects and some minor effects. These effects are considered in context of groundwater prospect. The weightage for major effects are assigned as 1.0 for each factor and the weightage for minor effects are assigned as 0.5 for each factor. The assigning of major and minor influencing factors was established based on the guidance of the supervisor as well as literature review. [3,12,21,23].

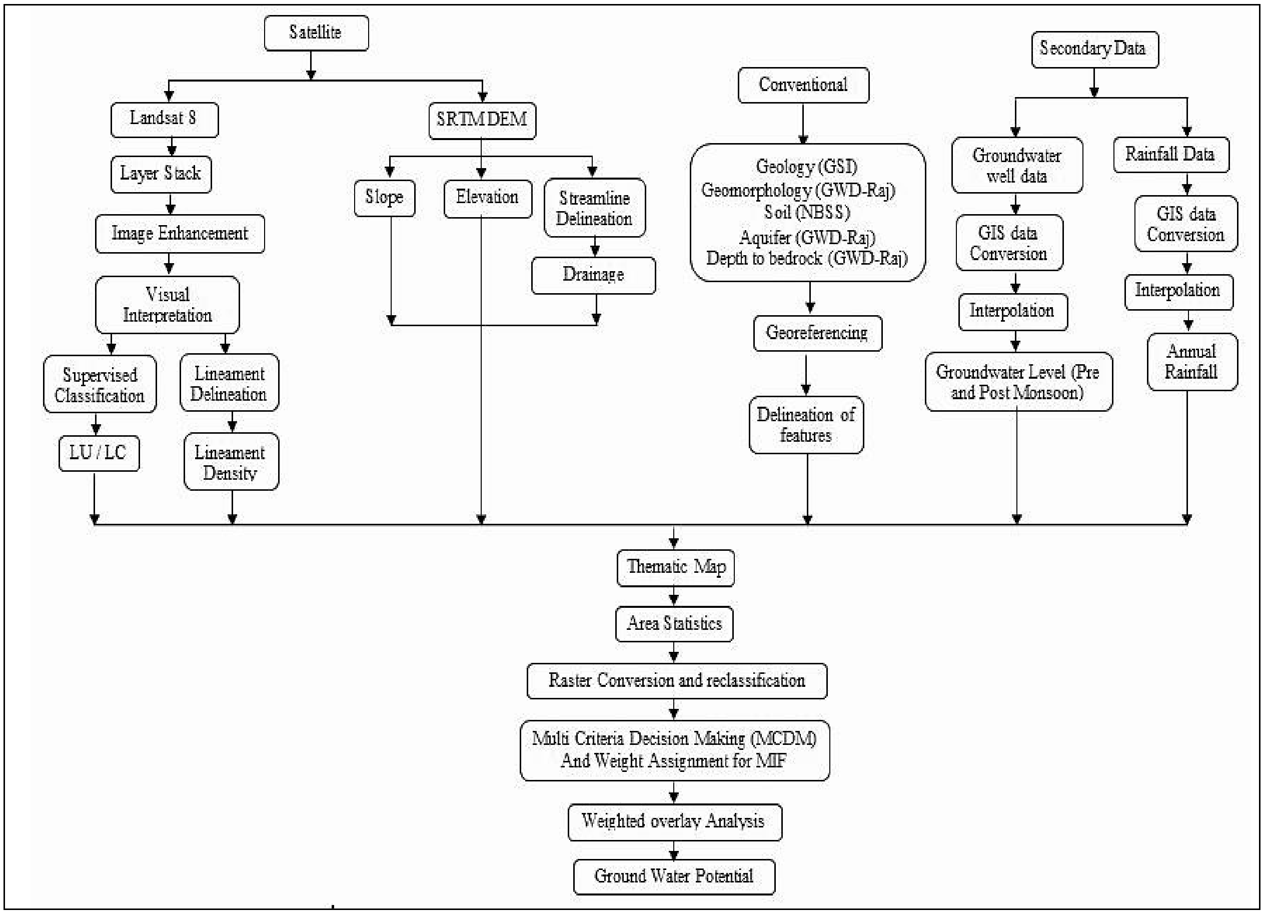


Fig. 2. Flow chart of the Methodology.

The combine proposed score of each influencing factor of the major and minor factors are computed out using Eq. no. (1)

$$\left(\frac{(A+B)}{\sum(A+B)}\right) \times 100 \quad ...(1)$$

Where A is the major effecting factors and B is the minor effecting factors, the proposed score of each Influencing Factor are the normalised score on the scale of 100. [23-25]. Once the proposed score of each Influencing Factor is computed out the sub classes of the influencing parameters are rated.

The ranking of sub classes each factor are computed in importance to the ground water prospect followed by heuristic approaches and knowledge based method for assigning ranks to each sub-classes of factor maps [3-14].

The assigning of ranks to the sub-classes of each influencing factors are established based on the guidance of the supervisor as well as literature review [3,14,23].

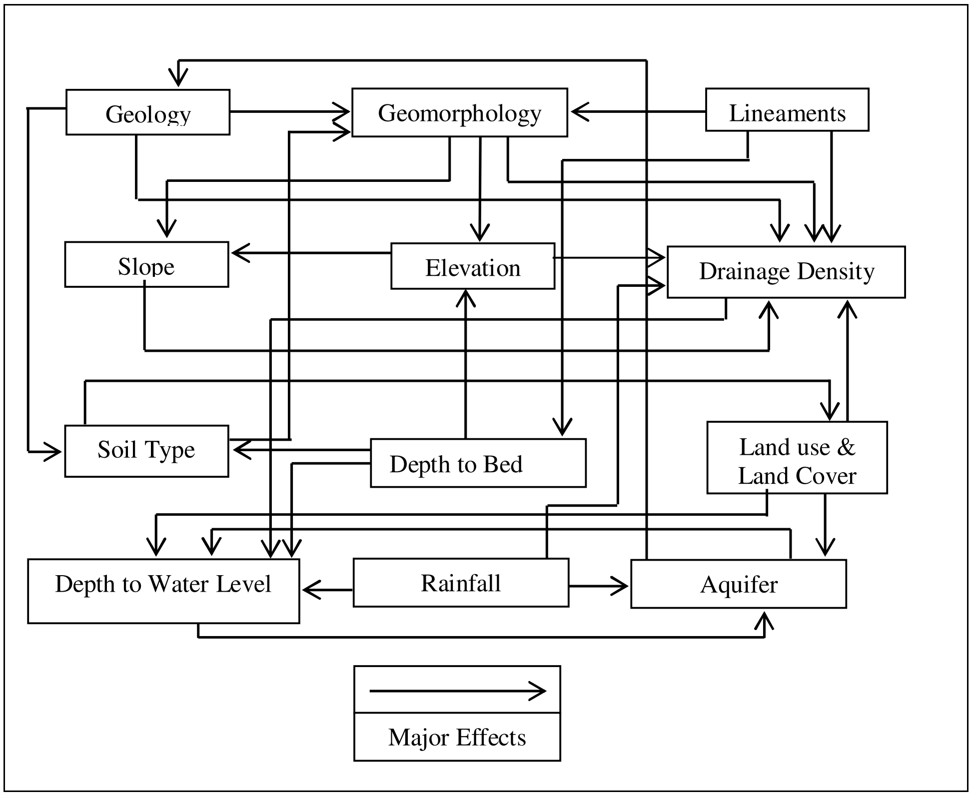


Fig. 3. Interrelationship between the influencing factors showing major effects.

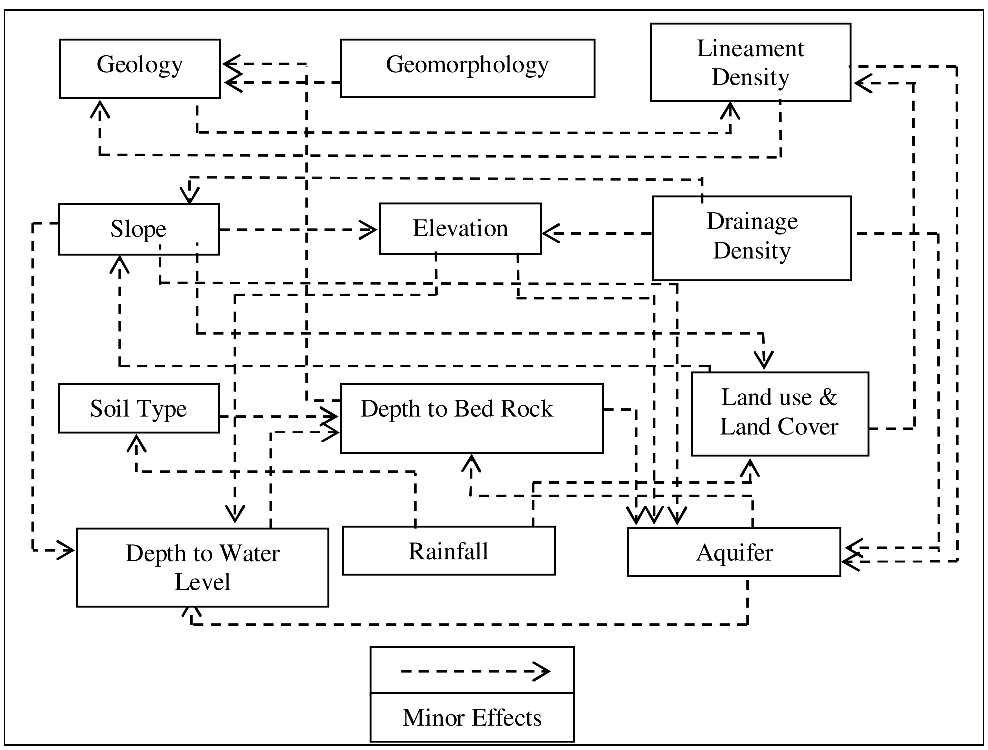


Fig. 4. Interrelationship between the influencing factors showing minor effects.

Table 2: Effect of influencing factor, relative rates and score for each potential factor.

MIF				
Factors	Major effects (A)	Minor effects (B)	Proposed relative rates (A+B)	Proposed Score of each Influencing Factor ((A+B)/Σ(A+B))*100
Geology	3	0.5	3.5	9
Geomorphology	3	0.5	3.5	9
Lineaments	3	1	4	10
Slope	1	2	3	8
Elevation	2	1	3	8
Drainage Density	1	1.5	2.5	6
Soil Type	2	0.5	2.5	6
Land use & Land Cover	3	1	4	10
Depth to Bed Rock	3	1	4	10
Depth to Water Level	1	0.5	1.5	4
Rainfall	3	1	4	10
Aquifer	2	1	3	8
			Σ 38.5	Σ 100.00

A. Weighted overlay method

Once the weights to the influencing factors and the ranking to their subclasses is worked out, then after we need to integrate the input influencing factors to find out the overall groundwater prospect in the study area. The integration of the influencing factors is done by weighted overlay analysis method using the Eq. no. (2)

$$\mathrm{GWPZ} = \sum_{1}^{n}(\mathrm{GO_x\,GO_y + GM_x\,GM_y + LD_x\,LD_y + SL_x\,SL_y + EL_x\,EL_y + DD_x\,DD_y + ST_x\,ST_y + LULC_x\,LULC_y + DB_x\,DB_y + DW_x\,DW_y + RF_x\,RF_y + AQ_x\,AQ_y}) \;\ldots\ldots (2)$$

where GWPZ stands for the groundwater potential zonation, the 'x' and 'y' represents influencing factor weightage and ranking of Subclass, respectively, GO represents the geology, GM represents the geomorphology, LD represents the lineament density, SL represents the slope, EL represents the elevation, DD represents the drainage density, ST represents the soil type, LULC represents the land use land cover, DB represents the depth to bedrock, DW represents the depth to water level, RF represents the rainfall andAQ represents the aquifer.

I. RESULTS AND DISCUSSION

A. Geology

The porosity of each types of geological formation is different which governs the infiltration and percolation of water through these types. (Magesh *et al,* 2012) [12]. referred that availability of groundwater is influenced to a greater extent by the rocks types, exposed to the surface. In the study area, the Water bodies 153.90 km² (1.38%) which obviously is the important as concerned to the groundwater prospect. Alluvium 2817.19 km² (25.30%) has the next highest, Raialo Group 123.98 km² (1.11%), Alwar Group 635.46 km² (5.71%), Ajabgarh Group 154.44 km² (1.39%) Mangalwar Complex 1535.23 km² (13.79%) and Acidic Rocks 5715.81 km² (51.33%) being the least important for groundwater prospect respectively shown in 5. (a).

Further the maps of geological types are reclassified according water retention capacity of each sub types and the groundwater prospect. The geology output map is reclassified in to very low, low, medium, high, and very high shown in Fig. 6. (a). the area of each class is computed out as 5715.82 Km² (51.33%), 1689.67 Km² (15.17%), 759.53 Km² (6.82%), 2817.19 Km² (25.30%), 153.90 Km² (1.38%) of total area respectively.

A. Geomorphology

The geomorphology is the landform and features created by physical, chemical and ecological processes above the earth surface, the porosity, and water percolation capacity of the various sub type of the geomorphology are different (Naghibi *et al,* 2018) [14]. The geomorphological units are Water Bodies 329.55 km² (2.96%), Valley 948.81km² (8.52%), Alluvial Plain 7684.19 km² (69.00%), Ravinous Land 174.89 km² (1.57%), Denudational 801.1 km² (7.19%), Palaeochannel 32.88 km² (0.30%), Sandy Plain 274.20 km² (2.46%), Burried Pediment 532.55 km ² (4.78%) and Pediment 357.83 km² (3.21%) respectively shown in Fig. 5. (b).The geomorphological units are arranged according to the groundwater prospect from high to low importance respectively.

The maps of geomorphology units are reclassified according water retaining ability of each sub types and the groundwater prospect. The geomorphology output map is reclassified in to very low, low, medium, high, and very high. The area of each class is computed out as 357.82 Km² (3.21%), 806.76 Km² (7.24%), 833.97 Km² (7.49%), 8807.88 Km² (79.09%), 329.65 Km² (2.96%) of total area respectively shown in Fig. 6. (b).

B. Lineament Density

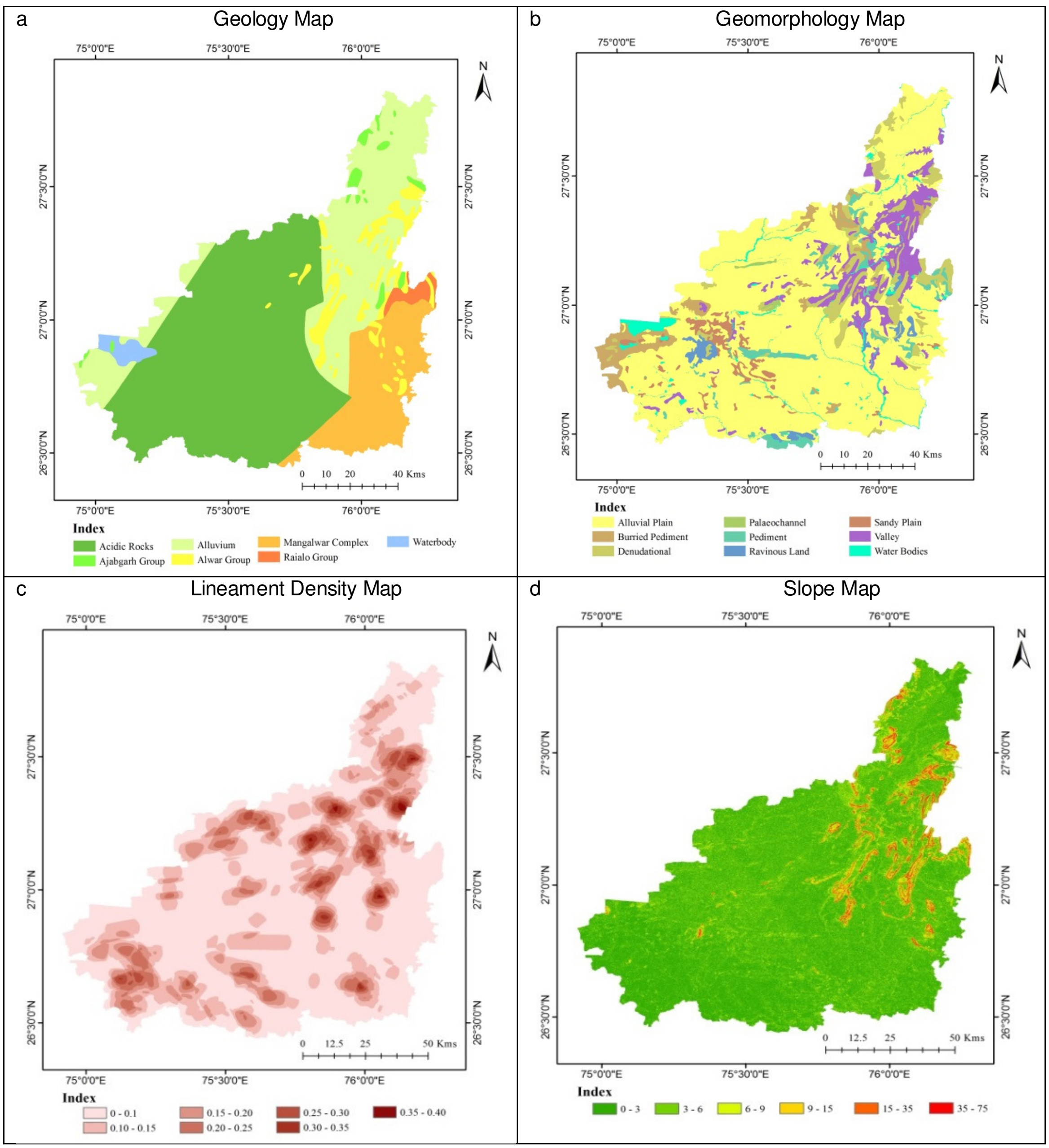
The lithology in any geographical area affects the groundwater and its movement to very extent, the large straight line features are generally the lineaments which can be identified by the straight streamline features from the satellite images. The higher the Lineament density in the area the higher will be the groundwater prospect and the lower the lineament density the lower the groundwater prospect. In the study area the lineament density varies from 0 to 0.388 km ² shown in Fig. 5. (c). which is classified into seven classes ranging from 0 – 0.1to 0.35 – 0.40 with the interval of 0.05 and the area distribution classes type consisting of 8711.49 Km² (78.23%), 1279.80 Km² (11.49%), 653.00 Km² (5.86%), 318.06 Km² (2.86%), 123.85 Km² (1.11%), 42.56 Km² (0.38%) and 7.25 Km² (0.07%) respectively of the total area.

The lineament density output map is reclassified in to very low, low, medium, high, and very high shown in Fig. 6. (c). the area of each class is computed out as 9991.38 Km² (89.72%), 653.01 Km² (5.86%), 441.92 Km² (3.97%), 42.56 Km² (0.38%), and 7.25 Km² (0.07%) of area respectively.

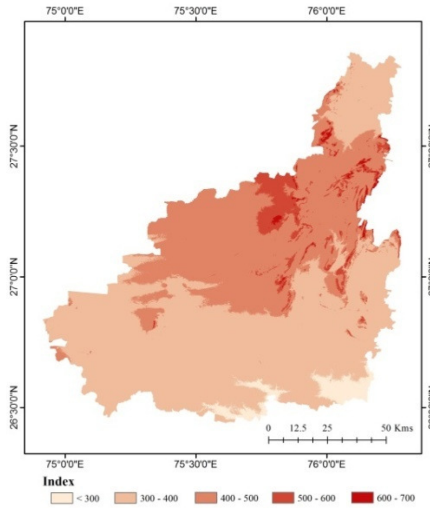
C. Elevation

The elevation is also one of deciding factor which affects the availability of the ground water in any area. Depending on the results, the elevation is categorised into five classes of the entire study area <300, 300 – 400, 400 – 500, 500 – 600 and 600 – 700 meters shown in Fig. 5. (d). the distribution of area statistics of the elevation is 346.97 Km² (3.12%), 6357.62 Km² (57.09%), 3839.00 Km² (34.47%), 532.11 Km² (4.78%), and 60.41 Km² (0.54%) respectively of the total area.

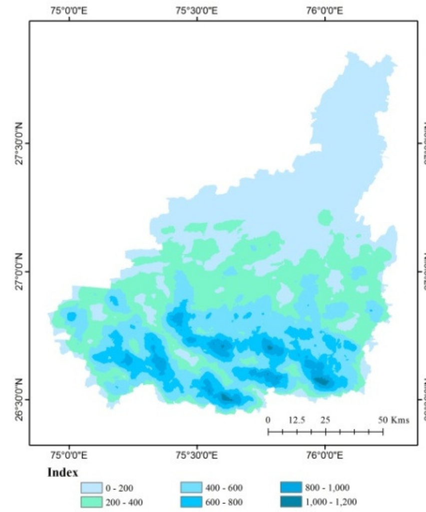
Layout maps of all the layers



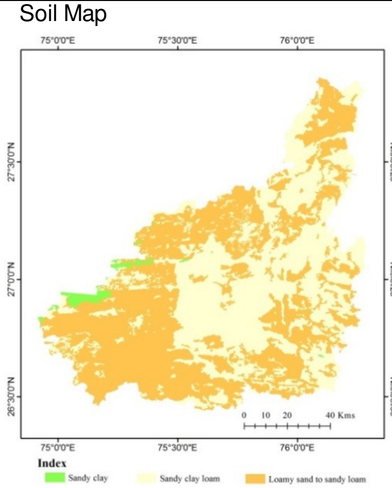
e Elevation Map



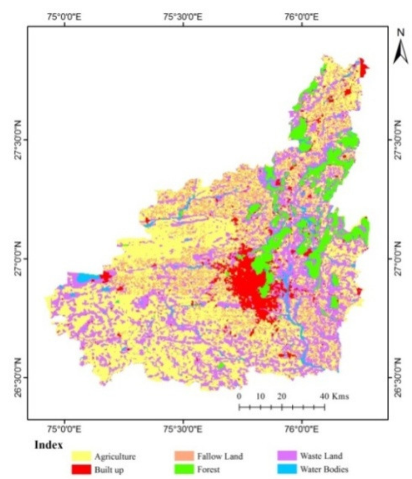
f Drainage densityMap



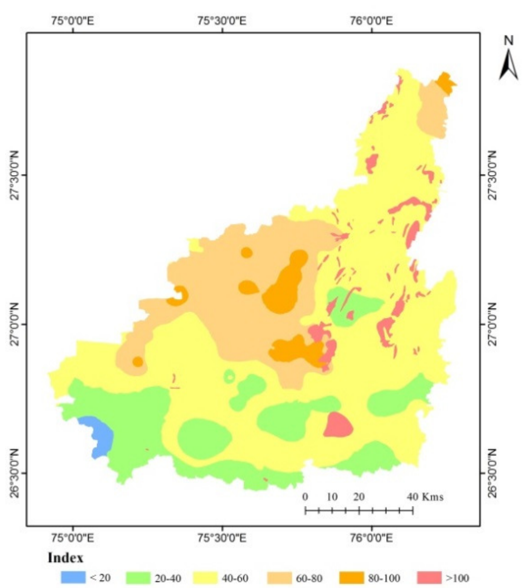
g Soil Map



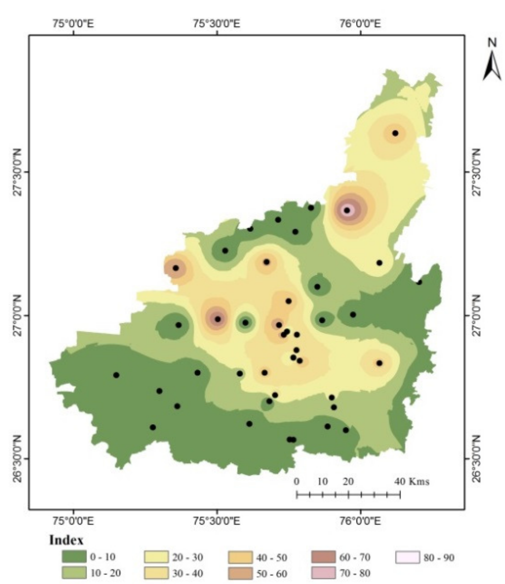
H LU/LC Map



i Depth to bedrock Map



j Depth to water level Map



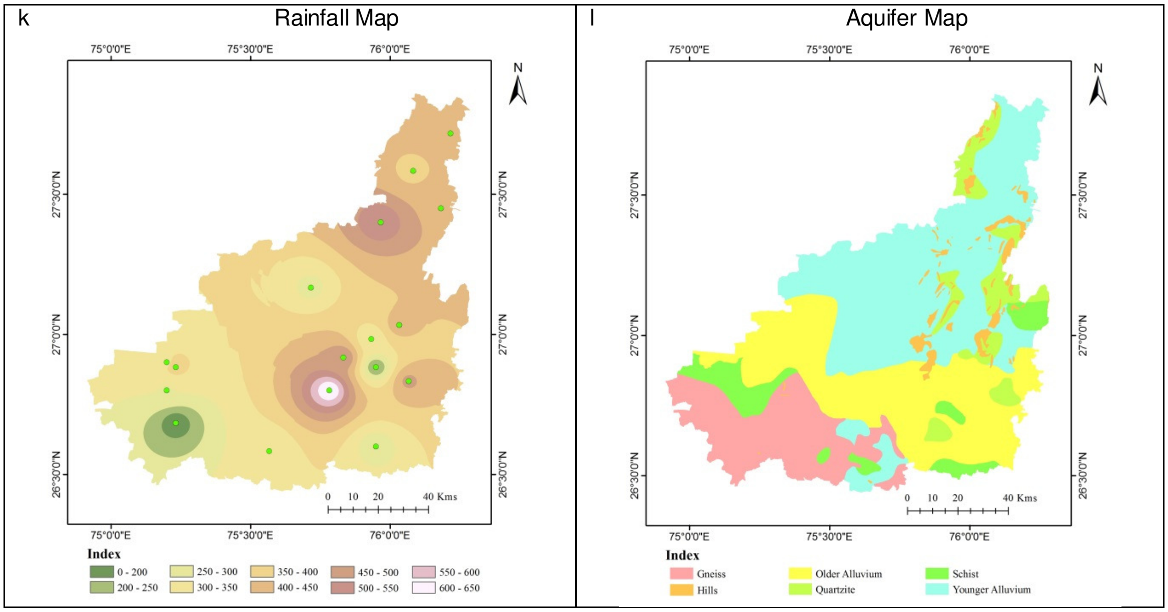


Fig. 5. Maps of influencing parameters.

The elevation output map is reclassified in to very low, low, medium, high, and very high. The area of each class is computed out as 60.41 Km² contributing as (0.54%) of area, 532.11 Km² contributing as (4.78%) of area, 3839.00 Km² contributing as (34.47%) of area, 6357.62 Km² contributing as (57.09%) of area, 346.97 Km² contributing as (3.12%) of area respectively shown in Fig. 6. (d).

D. Slope

The slope is one of the very important parameter which affects the occurrence of the ground water in any area. As the surface water flows from higher slope to the lower slope region the prospect of the availability of groundwater will be clearly higher in the lower sloped region then the higher sloped region. Depending on the results the slope of the entire study area is divided into six groups 0° – 3°, 3° – 6°, 6° – 9°, 9° – 15°, 15° – 35° and 35° – 75° shown in Fig. 5. (e). the distribution of area statistics of the slope is 8150.33 Km² (73.19%), 2141.94 Km² (19.23%), 274.44 Km² (2.46%), 212.74 Km² (1.91%), 339.61Km² (3.05%), and 17.06 Km² (0.15%) respectively of the total area.

The slope output map is reclassified in to very low, low, medium, high, and very high. The area of each class is computed out as 17.06 Km² contributing as (0.15%) of area, 339.61 Km² contributing as (3.05%) of area, 212.74 Km² contributing as (1.91%) of area, 274.44 Km² contributing as (2.46%) of area, 10292.27 Km² contributing as (92.42%) of area respectively shown in Fig. 6. (e).

E. Drainage Density

The Drainage density is the ratio of the total length of the streamlines in the study area to the total area of the study area. By definition it is clear that the drainage density is directly proportionally related to the streamline and its length. There after the greater the value of drainage density the greater the prospect of availability of groundwater. Depending on the results obtained after computing out the drainage density, the drainage density is categorised into six classes of the entire study area 0 – 200, 200 – 400, 400 – 600, 600 – 800, 800 – 1,000 and 1,000 – 1,200 km³ shown in Fig. 5. (f). the distribution of area statistics of the drainage density is 4279.35 Km² (38.43%), 3176.25 Km² (28.52%), 2184.35 Km² (19.62%), 1132.16 Km² (10.17%), 338.69 Km² (3.04%), and 25.21 Km² (0.23%) respectively of the total area.

The drainage density output map is reclassified in to very low, low, medium, high, and very high. The area of each class is computed out as 3176.24 Km² contributing as (28.52%) of area, 4279.45 Km² contributing as (38.43%) of area, 3316.55 Km² contributing as (29.78%) of area, 338.26 Km² contributing as (3.04%) of area, 25.61 Km² contributing as (0.23%) of area respectively shown in Fig. 6. (f).

F. Soil Type

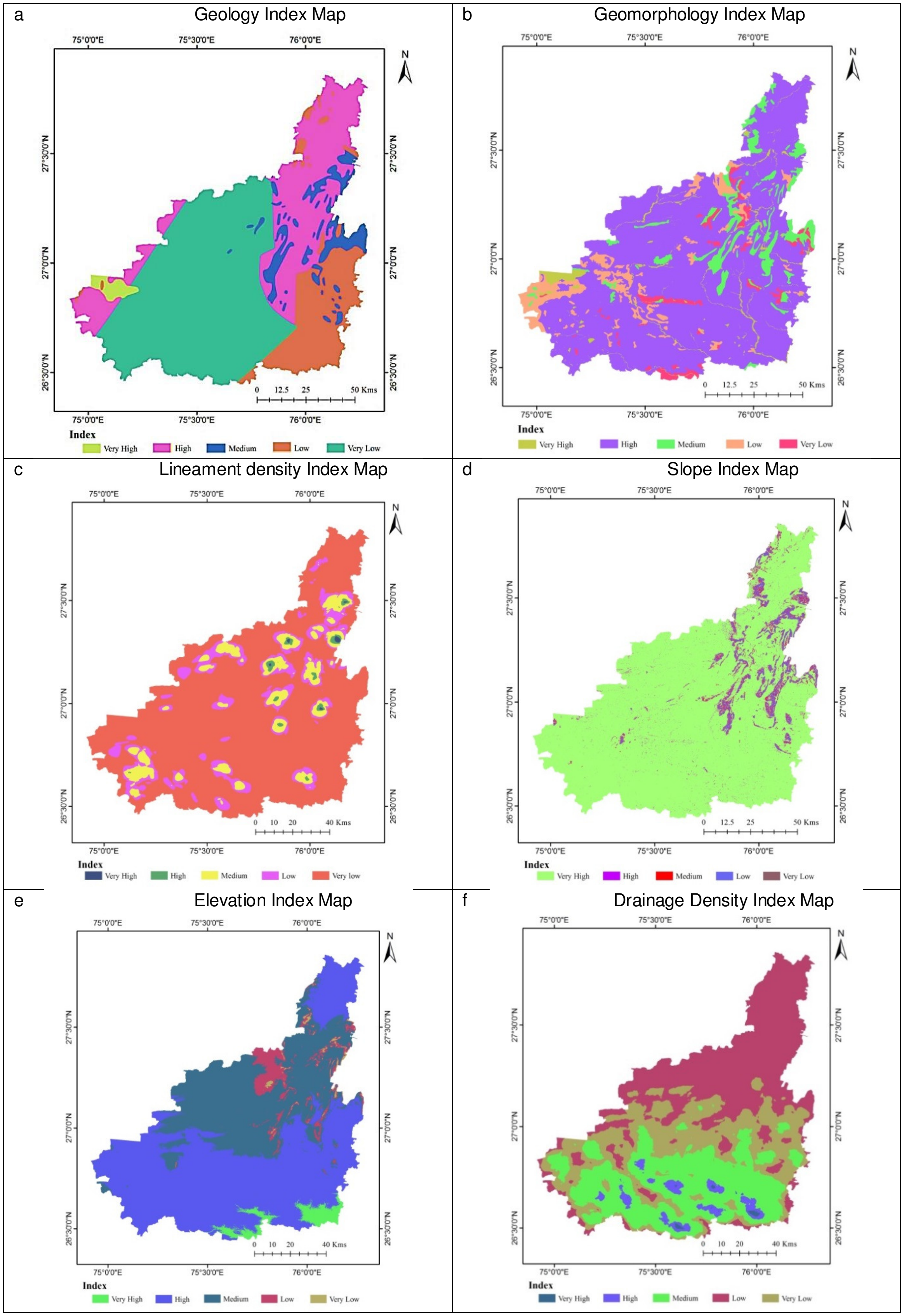
Due to availability of less water and extreme heat conditions the soil in most of the Jaipur part is of sandy nature, although the Soils in the district may be classified into three classes, Sand to sandy loam, Sandy clay loam and Sandy clay shown in Fig. 5. (g).the distribution of area statistics of the soil type is 5844.52 Km² (52.48%), 143.44 Km² (1.29%) and 5148.05 Km² (2.46%) respectively.

The soil type output map is reclassified in to low, medium, and high. The area of each class is computed out as 5145.15 Km² (46.20%), 5847.82 Km² (52.51%), and 143.15 Km² (1.29%) of area respectively shown in Fig. 6. (g).

G. Land Use/ Land Cover (LU/LC)

The (LU/LC) is among one of the important parameter for groundwater potential zoning. Each LU/LC has a certain influence on groundwater potential indirectly through infiltration, runoff and evaporation. Vegetation cover minimises evaporation and runoff while it increases infiltration.

Index Maps of all the Layers.



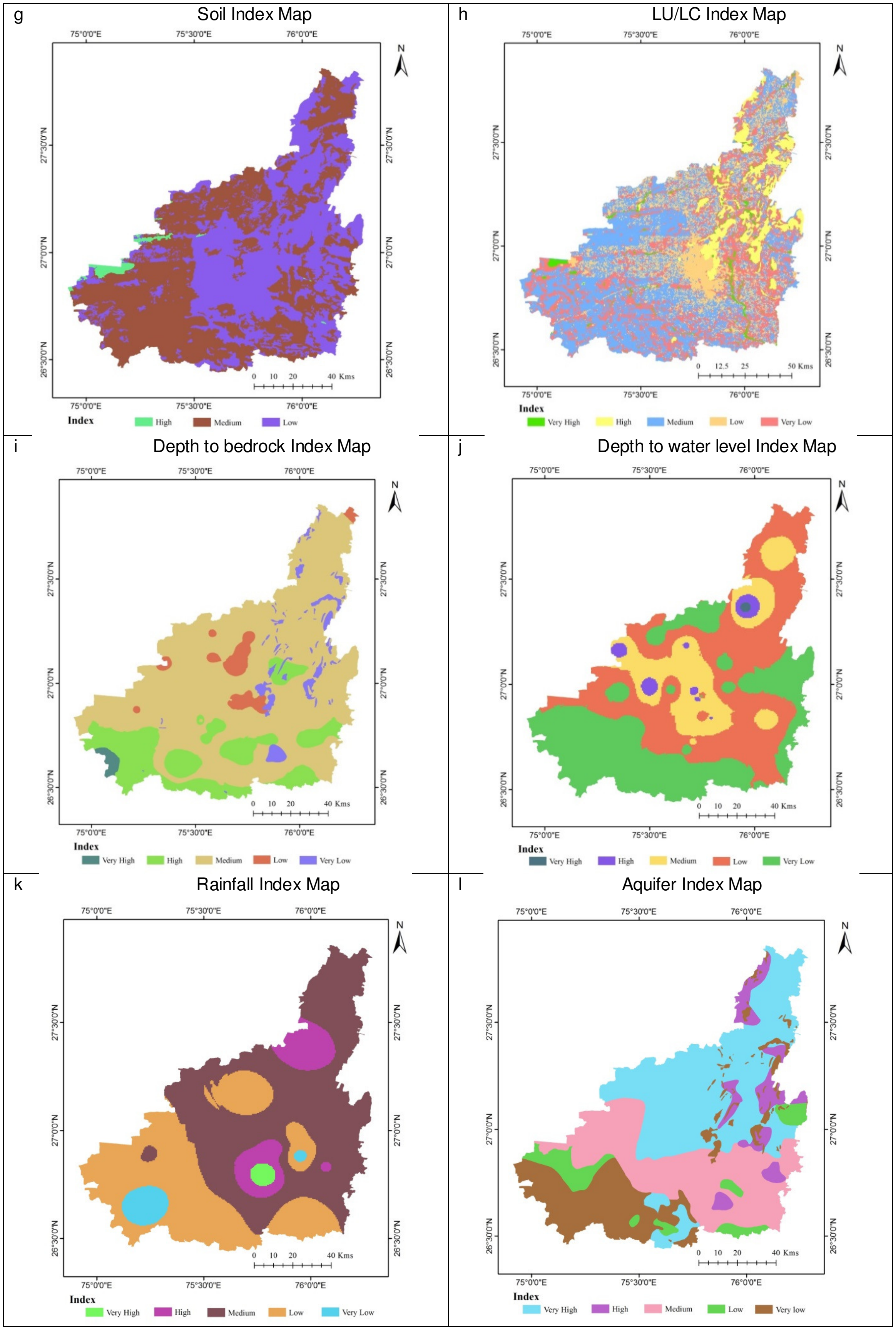


Fig. 6. Index Maps of influencing parameters.

The water table for forest and plantations indicate high groundwater potential. In built up areas, infiltration is low because of roads, pavements and buildings structures covering the soil surface and subsequently, low groundwater potentials are expected. Types of land use/ Land Cover are agriculture, built up, fallow land, forest, Waste land, and water bodies like lakes and rivers covering the area of 4749.42 km² (42.65 %), 652.53 km² (5.86 %), 1316.14 km² (11.82 %), 912.06 km² (8.19 %), 3231.72 km² (29.02 %) and 274.26 km² (2.46 %) respectively shown in Fig. 5. (h).
The LU/LC output map is reclassified in to very low, low, medium, high, and very high. The area of each class is computed out as 3231.42 Km² (29.02%), 1998.87 Km² (17.95%), 4719.49 Km² (42.38%), 912.07 Km² (8.19%), and 274.26 Km² (2.46%) of area respectively shown in Fig. 6. (h).

H. Depth to Bed Rock

The depth to bed rock is one influencing parameter which affects the availability of groundwater. The presence of massive bedrock has been considered to define top of bedrock surface. The availability of groundwater is directly proportional to depth to bed rock. The depth to bed rock is categorised into six classes of the entire study area of Jaipur < 20, 20 – 40, 40 – 60, 60 – 80, 80 – 100 and > 100 shown in Fig. 5. (i). The first two class 0 – 20 and 200 – 40 is having the high groundwater prospect, whereas the last two classes 80 – 1,000 and > 100 are very low prospect to the availability of groundwater prospect, covering the area of 94.44 Km² (0.85 %), 2042.08 Km² (0.18.34 %), 5848.05 Km² (52.63 %), 2297.61 Km² (20.63 %), 435.51 Km² (3.91 %), and 418.51 Km² (3.76 %) respectively.
The depth to bed rock output map is reclassified in to very low, low, medium, high, and very high. The area of each class is found as 417.83 Km² (3.75%), 435.37 Km² (3.91%), 8144.31 Km² (73.13%), 2044.08 Km² (18.36%), and 94.52 Km² (0.85%) of area respectively shown in Fig. 6. (i).

I. Depth to Water Level

The depth of water table is one of the significant parameter which influences the availability of groundwater prospect. Lower the value of depth to water level, the groundwater prospect is higher and higher the value of depth to water level, the groundwater prospect is lower. The depth to water level map obtained is reclassified in nine classes with the interval of 10 ranging from 0 to 90 shown in Fig. 5. (j).the area statistics of the classes are found as 4349.34 Km² (39.06 %), 2599.84 Km² (23.35 1817.24 Km² (16.32 %), 1262.13 Km² (11.33 %), 612.09 Km² (5.50 %), 333.77 Km² (3.00 %), 117.05 Km² (1.05 %), 32.10 Km² (0.29 %) 12.45 Km² area (0.11 %) respectively.
The water level output map is reclassified in to very low, low, medium, high, and very high. The area statistics of each class is found as 3421.94 Km² (30.73%), 5167.92 Km² (46.41%), 2154.57 Km² (19.35%), 364.34 Km² (3.27%), and 27.34 Km² (0.25%) respectively shown in Fig. 6. (j).

J. Rainfall

The rainfall in any area is the most important factor which affects the availability of groundwater prospect. Since the due to low rainfall the less water will get infiltrated through the sub soil. The rainfall map obtained is reclassified in ten classes with the interval of 50 ranging from 0 to 650 and staring from 0 – 200 shown in Fig. 5. (k).The area statistics of the classes are found 0 – 200 contributing 40.24 Km² (0.36 %), 155.14 Km² (1.39 %), 831.59 Km² (7.47 %), 2626.06 Km² (23.85 %), 3705.45 Km² (33.27 %), 3122.23 Km² (28.04 %), 421.48 Km² (3.78 %), 147.76 Km² (1.33 %), 33.80 Km² 0.30 %) and 22.27 Km² (0.20 %).
The rainfall output map is reclassified in to very low, low, medium, high, and very high. The area of each class is computed out as 195.38 Km² (1.75%), 3487.68 Km² (31.32%), 6827.74 Km² (61.31%), 569.25 Km² (5.11%), 56.06 Km² (0.50%) of area respectively shown in Fig. 6. (k).

K. Aquifer

The aquifer in an area is also one of the most influencing parameter which affects the availability of groundwater. All the aquifers in the district followed by Older Alluvium, younger Alluvium, Gneiss, Hills, Schist, and Quartzite. Some parts of these aquifers are saline also. The porosity and permeability of the aquifer type matter most as groundwater is concerned. The area statistics of aquifer types is as follows, gneiss 1821.31 Km² (16.36 %), 350.72 Km² (3.15 %), older alluvium 3135.76 Km² (28.16 %), quartzite contributing 759.45 Km² (6.82 %), schist contributing 729.87 Km² (6.55 %), and younger alluvium 4338.91 Km² (38.96 %) respectively shown in Fig. 5. (l).
The Aquifer output map is reclassified in to very low, low, medium, high, and very high. The area statistics of each class is found as 2172.12 Km² (19.51%), 729.87 Km² (6.55%), 3135.76 Km² (28.16%), 759.45 Km² (6.82%), and 4338.91 Km² (38.96%) respectively shown in Fig. 5. (l).

L. Assessment of Groundwater Prospect

All the use twelve thematic layers Geology, Geomorphology, Lineament Density, Slope, Elevation, Drainage Density, Land use & Land Cover, Soil Type, Depth to Bed Rock, Depth to Water Level, Rainfall and Aquifer are mapped out. The major and the minor influence of the factors are finalised in concerned with respect to the groundwater prospect.
Thereafter the sub type of each parameter is given ranking subsequently. Finally depending upon the weightage and ranking of the parameter and its sub type the final weighted overlay analysis is computed out. After the analysis the final output map is reclassified in to very high, high, medium, low, and very low. The area statistics of each class is found as 125 Km² (1.12%), 2399 Km² (21.54%), 5691 Km² (51.11%) of area, 2799 Km² (25.14%) and 122 Km² (1.01%) respectively which is shown in table 3 and fig. 4.

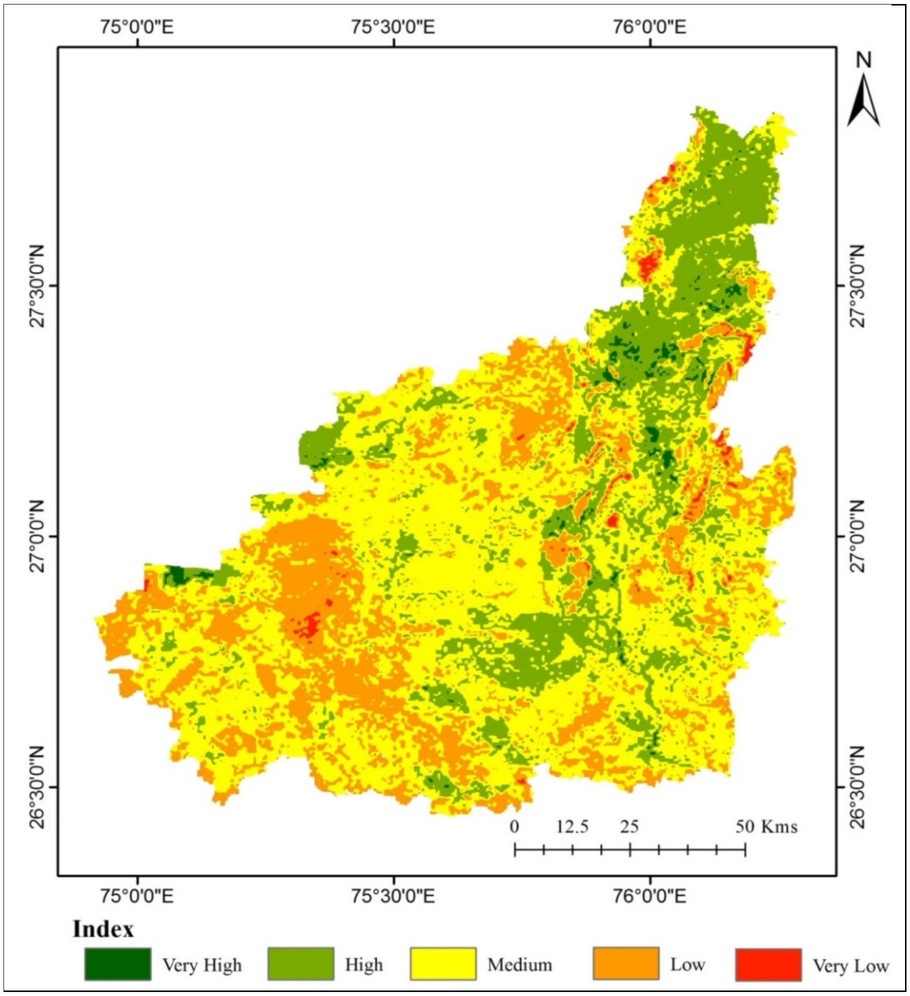


Fig. 7. Index GWPZ Map.

The distribution of area statistics of the Groundwater Prospect in the study area is represented below in table 3 where the highest percentage is of the 51.11% area medium potential and the least percentage is of 1.096% Very Low type.

Table 3: Area statistics of GWPZ.

Area stat of Final Map of GWPZ		
Index	Area (Km²)	% Area
Very High	125.00	1.122
High	2399.00	21.543
Medium	5691.00	51.105
Low	2799.00	25.135
Very Low	122.00	1.096
	11136.00	100.00

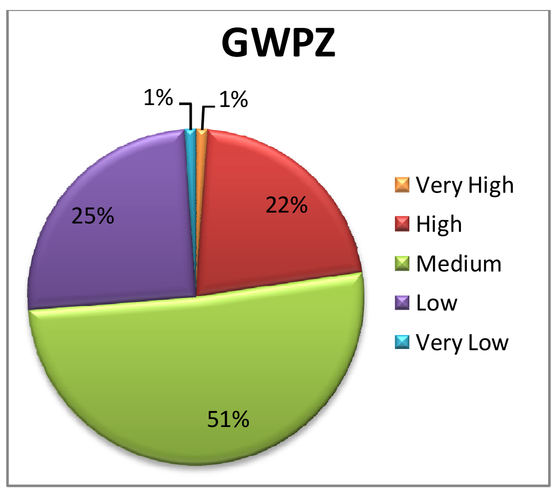


Fig. 4. Area statistics of GWPZ.

IV. CONCLUSION

The present study is carried out in the district of Jaipur, Rajasthan, India for the assessment of the availability of groundwater and its prospects. In this study, the total twelve parameters have been used which directly or indirectly affects the groundwater prospect. The affecting parameters used in the study are Geology, Geomorphology, Lineament Density, Slope, Elevation, Drainage Density, Soil Type, Land use & Land Cover, Depth to Bed Rock, Depth to Water Level, Rainfall and Aquifer. First the data for each parameter are collected from the respective sources to prepare the thematic layers. Then the Index maps had been generated for each affecting parameter to depict the groundwater prospect individually and the area analysis is also done for those types showing very low, low, medium, high, and very high groundwater prospect individually due to each parameter, which has been discussed below.

The integration of the remote sensing and GIS with decision making MIF technique comes out as a powerful tool to access the availability of groundwater in any study area. Since, In MIF technique the unlike expert based methods the pairwise weightage and ranking was given which is liable to give more accurate assessment for the availability of the groundwater prospect. Also, as many influencing factors we had consider the results improved. Moreover we have found that more than 50% areas are having medium groundwater prospect. Nearly 25% area are having low groundwater prospect. For implementation of the finding of the research work the local governing bodies has to be associated with the decision makers for planning of the groundwater exploration, conservation, and harvesting. Thus, the low potential area need different action plan than of medium and high areas.

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