

Research Article

Delineation of groundwater potential zones in the hilly topographic region of Serchhip, Mizoram, using Geospatial and analytical hierarchy process

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Abstract

Groundwater is the most important source of freshwater next to the surface water. Delineation of groundwater potential is critically essential, particularly in hilly complex topographic regions, where the surface water dries up during the dry season. The present study aimed to delineate groundwater potential areas to address the issue of water scarcity in the Serchhip district, Mizoram. The integration of different thematic layers such as lithology, Normalized Difference Vegetation Index (NDVI), rainfall, slope, soil texture, geomorphology, drainage density, lineament density and Topographic Wetness Index (TWI), the groundwater potential zone layers was prepared by Analytical Hierarchy Process (AHP) method. The groundwater potential zones (GWPZ) were classified into five: poor, fair, moderate, good, and excellent. The study revealed that the moderate-good zone occupied about 79.27 % (1126.77 km²), and the fair zone covered an area of about 9.52 % (135.3 km²), while the poor area was only 5.30 % (75.3 km²) out of the total study area (1421.5 km²). The demarcation of groundwater potential zones in Serchhip, Mizoram, served to combat water scarcity in mountainous areas. The amalgamation of geospatial data and AHP methodologies offered pivotal insights for the sustainable management of water resources, facilitating informed decision-making and conservation endeavours amidst the challenges posed by climate fluctuations and population expansion.

Keywords: Analytical hierarchy process (AHP), Geographical information system (GIS), Geospatial, Groundwater potential zone (GWPZ), Serchhip

INTRODUCTION

Groundwater is the second largest reservoir of freshwater on Earth (Arabameri *et al.*, 2019). It is essential for proper planning and management of commercial projects. Mapping groundwater potential zones is crucial to developing and maintaining groundwater tables with conservation plans using remote sensing techniques (Alharbi *et al.*, 2023). Various approaches were used to delineate groundwater potential zones globally. Some

of the advanced methods are Shannon entropy and TOPSIS approach (Barman and Biswas, 2022), GIS weighted overlay approach (Lalbiakmawia, 2015), support vector machine (Miraki *et al.*, 2019), and logistic regression (Nguyen *et al.* 2020). After 21st century, Geographic information system (GIS) and remote sensing (RS) techniques are more popular, as compressive tools are used for groundwater delineation, conservation, evaluation and various resources on the ground surface (Ajay Kumar *et al.*, 2020; Lawmchullova *et al.*,

2024b).

Risk assessment and groundwater vulnerability mapping studies widely employ GIS-based methods (Mondal *et al.*, 2018). Remote sensing data like geology, geomorphology, soils, land use and land cover (LULC), lineaments, drainage density, rainfall distribution and satellite imagery provide the components of groundwater occurrence and its movement (Adualem and Demeke, 2019). However, the assigning weightage is still complicated among the parameters of the groundwater potential zone. To address this issue, multi-criteria decision analysis (MCDA) of the analytical hierarchy process (AHP) (Saaty, 1980) was developed based on the relative importance of the parameters (Dikshit *et al.*, 2020).

AHP is a widely used robust technique to delineate groundwater potential zones worldwide. Many research works were successfully performed using this method. Some of the studies conducted are Raipur city, Chhattisgarh (Jhariya *et al.*, 2021), Anantapur district of Andhra Pradesh (Rajasekhar *et al.*, 2022), Vamanapuram river basin of Kerala (Arulbalaji *et al.*, 2019), Sivagangai district of Tamil Nadu (Vellaikannu *et al.*, 2021), Lower Kushi basin of Assam (Thakuria, 2023) and Aizawl district, Mizoram (Barman *et al.*, 2023) in India. Besides India, other countries like Nepal, Siwalik of the Kankai River Basin (Silwal *et al.*, 2023) in Asia and Baringo County, Kenya from Africa continent (Ombasa *et al.*, 2022) conducted groundwater delineation practically using AHP method. However, these studies were mostly performed in plain and plateau regions. Whereas various topographic structures such as coastal areas (Swetha *et al.*, 2017), well-drained river basins (Sarkar *et al.*, 2022) and semi-arid regions

(Kassa *et al.*, 2023) are found to be more conducted on groundwater zonation. However, the study conducted in hilly topographic areas is limited.

The state of Mizoram is a hilly topographic region. Although it has been receiving a high degree of rainfall during the monsoon season (June - October), it has led to the excessive run-off on a steep slope. However, rainfall declines in winter (November - February) and continues to decrease until the warm season (March-May). For instance, the shortage of surface water for drinking and irrigational purposes has been faced in two consecutive seasons: winter and warm. The delineation of groundwater zones is crucial to addressing the issue of insufficient water for irrigation and household consumption. The Serchhip district is one of the leading vegetable producers among the eleven districts of Mizoram. Identifying groundwater potential zones is essential to continue agricultural practice during the winter and warm seasons. Given the above, the present study aimed to delineate groundwater potential areas to address the issue of water scarcity using the AHP method in the Serchhip district of Mizoram

MATERIALS AND METHODS

Study area

Serchhip district is one of the districts of Mizoram, it lies between 23°35'N and 23°00' N latitudes and between 92°41'E and 93°10'E longitudes (Fig.1). The total geographical cover of the Serchhip district is 1421.5 km². The study area is bounded by five districts, namely Saitual and Aizawl on the north and north-west, East by Champhai, Hnahthial and Lunglei districts to the west and southwestern, respectively. The average ground

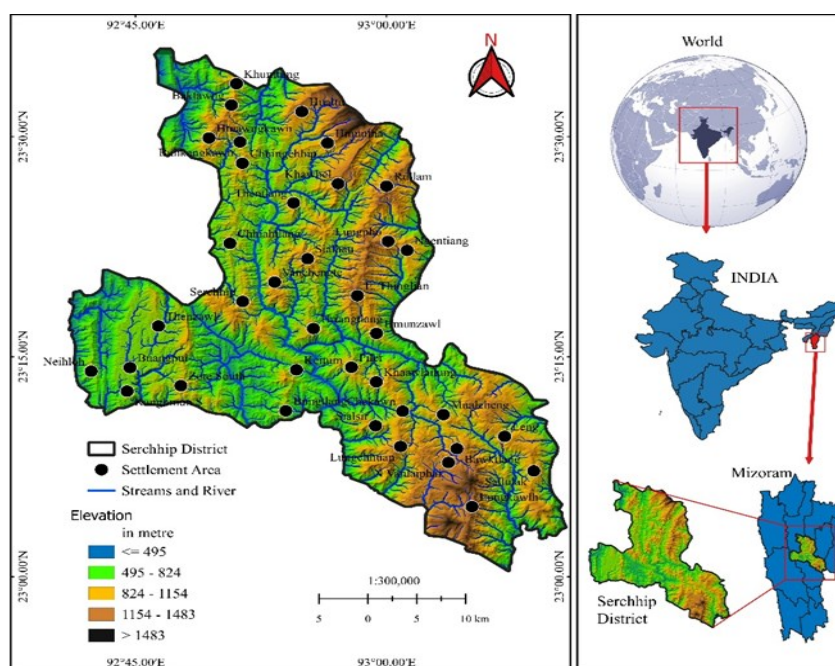


Fig. 1. Map of the study area Serchhip District

elevation of Serchhip district is about 1044 metres above mean sea level. The Serchhip district receives a good amount of rainfall of 1345.8 mm in 2022, with an average temperature of about 24.74°C to 26.43 °C.

Selection of indicators

The indicators like slope, NDVI, lithology, geomorphology, rainfall, soil, drainage density, lineament density and topographic wetness index (TWI) were employed to delineate groundwater potential zones in Serchhip. Because these parameters are widely used globally, each indicator is of relative importance to groundwater. These parameters were important for identifying the groundwater zones to meet people's requirements during water scarcity in cold and hot weather seasons. The methodology employed for demarcating groundwater prospecting zones within the Serchhip district is elucidated through a workflow diagram, as presented in Fig. 2.

Construction of thematic layer

ALOS PALSAR'S dem at 12.5 metres spatial resolution was acquired from Copernicus open access to generate thematic layers like curvature, slope direction, slope in degree, and drainage density. Landsat 8 (TM and OLI) was downloaded from USGS to generate a topographical wetness index (TWI) and normalized difference

vegetation index (NDVI). Lithology and geomorphology data was acquired from the Geological Survey of India, whereas soil data was obtained from the North Eastern Space Applications Centre (NESAC). Lineament density was generated from ALOS PALSAR Dem using Geomatica software. After generating the thematic map, each raster layer was reclassified into equal divisions to uniform spatial resolution.

Analytical Hierarchy Process (AHP)

Multi-Criteria Decision Analysis (MCDA) has been used successfully for a year in various environments (Ghosh *et al.*, 2020; Saġabun *et al.*, 2020; Karmakar *et al.*, 2021). The most popular and well-known GIS-based approach for identifying groundwater potential zones is MCDA utilising AHP (Saaty, 1988). Based on Saaty's 1–9 scale, which reflects the equal influence of the two layers at 1 and the maximum impact of a row layer compared to a column layer at 9, the significance of a layer on groundwater potentiality connected to another layer was graded (Saaty, 1988). Saaty's scale of relative importance value reveals that a value of 9 indicates extreme importance, 8 very strong, 7 very to extreme importance, 6 strong plus, 5 strong importance, 4 moderate plus, 3 moderate importance, 2 weak and 1 equal importance. The nine parameters such as lithology,

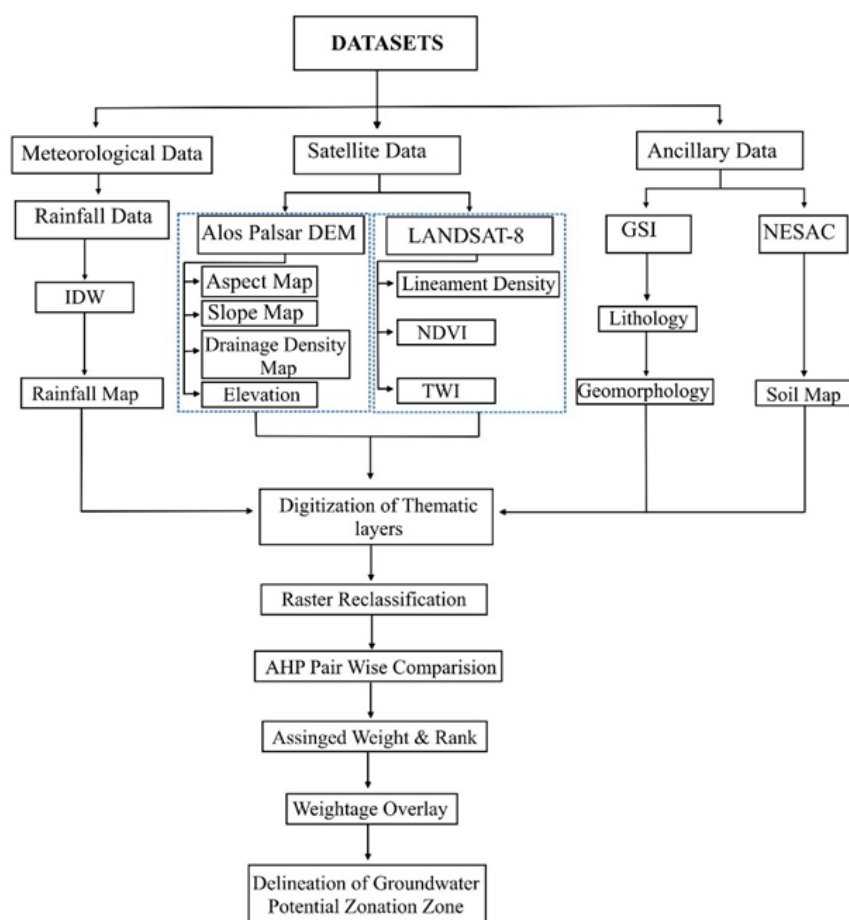


Fig. 2. Flow chart of the identifications of GPZs for Serchhip district

NDVI, rainfall, drainage density, soil, geomorphology, lineament density, slope and TWI were assigned different values based on the relative importance of Saaty's scale (Table 1).

Weights were allocated to the theme layers by the classification based on their significance and water-holding capacity. As a result, a pair-wise comparison matrix was used to compare all of the thematic layers (Table 2). The ranked and weighted thematic layers are shown in Table 3. The following procedures are used to calculate the consistency ratio (CR): Principal Eigenvalue (PE) was determined using the Eigenvector approach (Table 4), and the consistency index (CI) was determined using the following equation 1 - 2:

$$\lambda_{\max} = \frac{\sum_{i=1}^n \frac{E_i}{n}}{9} = 12.20 \quad \text{Eq. 1}$$

$$CI = \frac{\lambda_{\max} - n}{n - 1}$$

where λ is max the Principal Eigen value of the pair-wise comparison matrix, n is the number of factors used in the analysis.

$$CR = \frac{CI}{RI} \quad \text{Eq. 2}$$

According to Saaty (1988), the CR is acceptable if the consistency ratio is 0.10 or below. If the consistency value is more than 0.10, the judgement must be revised to identify the main reasons for the inconsistency and make the necessary corrections. Since the calculated CR is 0.10, the assigned values can be accepted for GWPZs delineation.

RESULTS AND DISCUSSION

Descriptive of Parameters

The present study revealed nine variables significantly impacted the Serchhip district GWPZ delineation. Assigned rankings and weights for each parameter's impact were as follows:

Lithology

The lithology was categorized into eight classes as shown in Fig. 3. The Grey Sandy Splintery Shale, Siltstone and Mudstone covered the largest part in terms of area and percentage of various litho-units in the current study area covering 645.13 km² or 45.38%, Olive-green splintery shale with minor sandstone was found in the southeastern part occupying 164.23 km² which is 11.55% of the study area. Sandstone with intercalation

Table 1. Saaty's scale used for pairwise comparisons of variables

Lithology	NDVI	Rainfall	Drainage Density	Soil	Geomorphology	Lineament Density	Slope	TWI
9/7	9/7	9/6	9/5	9/5	9/4	9/4	9/3	9/3

Table 2. Random Inconsistency (RI) values (Source: Saaty et al., 1980)

n	2	3	4	5	6	7	8	9
RI	0	0.52	0.9	1.12	1.24	1.32	1.41	1.45

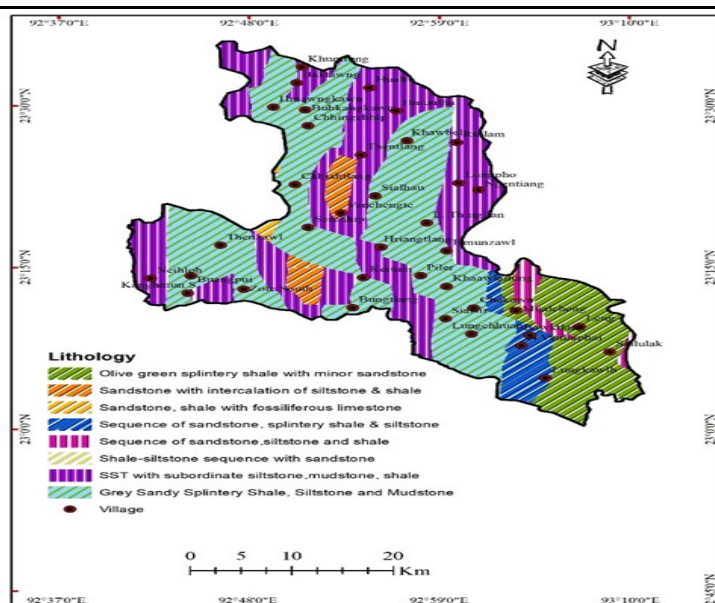


Fig. 3. Map of Lithology showing Serchhip District

of siltstone and shale occurred in the middle and southern part of the study area, covering 46.85 km² or 3.30 %. In contrast, Sandstone, shale with fossiliferous limestone occupying 6.2 km² or 0.44%, was found in the small portion of the western corner of the study area. The southeastern portion falls under a sequence of sandstone, splintery shale and siltstone, accounting for 78.78 km² or 4.14% of the study area. A sequence of sandstone siltstone and shale with an area of 27.99 km² or 1.97% also occurred in the eastern part, Shale-siltstone sequence with sandstone occupied 0.8 km² or 0.06%, SST with subordinate siltstone, mudstone with shale accounts of 471.5 km² or 33.17% of the present study area covering the central, western and southern part of the study area.

The total weight assigned for lithology is 0.29, 30% influencing the groundwater prospects in the investigation region (Table 6). The structure and composition characteristics of litho-units control the occurrence of groundwater (Dwivedi *et al.* 2016; Silwal *et al.*, 2023). The litho-units were reclassified into three groundwater prospect zones: low (473.15 km² or 33.29%), medium (803.49 km² or 56.52%) and high (144.86 km² or 10.19 %) (Table 6). The area where subordinate silt and mudstone were given the least weightage, whereas sandstone, siltstone and shale stone ranked high. Similarly, the litho-unit found in the Siwalik of Nepal, the rating of the litho-units is similar (Silwal *et al.*, 2023).

Normalized Difference Vegetation Index (NDVI)

The NDVI primarily assesses vegetation health and density by analyzing the difference between the near-infrared (NIR) reflectance and red-light bands captured by remote sensing satellites or sensors. The second-most significant parameter, NDVI was divided into three categories of groundwater prospect classes; the low potential occupied 51.2 km² or 10.3 %, was mostly found around the built-up areas, water bodies, rock and

sandstone, whereas the medium potential (occupied 518.3 km² or 35.5%) was mostly confined in sparse vegetation. Dense vegetation was under high potential (occupied 790.5 km² or 54.2 %). The weightage rating is similar to the study conducted in the hilly topographic area of Aizawl district (Barman *et al.*, 2023). The NDVI had a normalized weight value of 0.18, influencing 19% of the GWPZs in the area of interest (Table 6 and Fig. 4).

Rainfall

Rainfall is the third most important parameter and is classified into three groundwater prospect values. In the southeast part of the study area, where mean annual rainfall was less than 2000 mm, there was moderate potential (occupied 169.3 km² or 11.6%), the high potential concentrated in some parts of the southeastern and eastern occupying 302.2 km² or 20.7% of the study area. The excellent potential area of groundwater prospects was found in more than half of the study area, covering 988.5 km² or 67.7 % (Table 6 and Fig. 5). Infiltration rate depends on the duration and intensity of rainfall. The area where a high degree of rainfall resulted in severe run-off with low infiltration, whereas the low intensity of rainfall with longer duration implies a high rate of infiltration (Arulbalaji *et al.*, 2019; Lawmchullova *et al.*, 2023). The rainfall had a normalized weightage of 0.13, which influenced 13% of the factors the present study considered when establishing GWPZs.

Drainage density

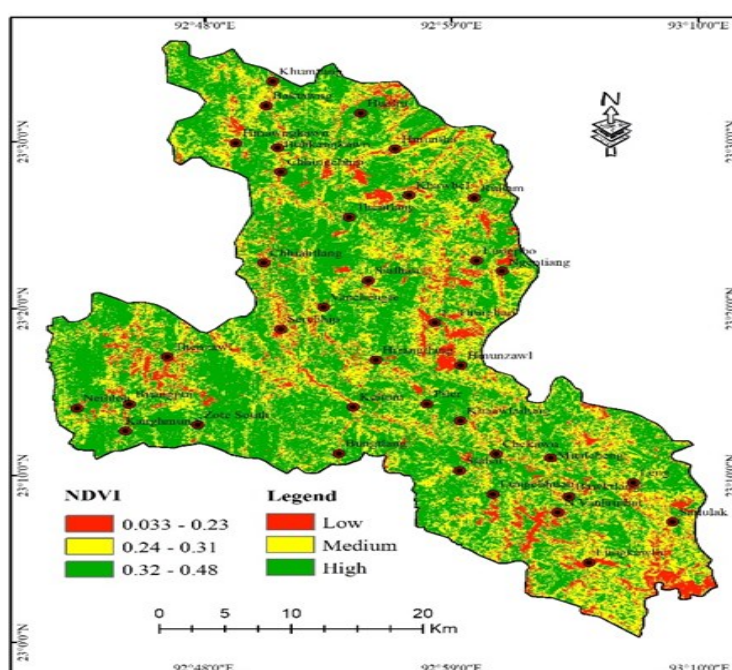
A geomorphological term, drainage density, was used to characterise the organisation and effectiveness of a river or stream network within a certain area. It gauges how well drainage channels (rivers, streams, and other watercourses) are connected and dispersed throughout a landscape. The drainage density was divided into four groundwater prospects as depicted in Fig. 6; a

Table 3. Pair-wise comparison matrix table of nine thematic layers for the Serchhip District

Factors	Lithology	NDVI	Rainfall	DD	Soil	Geomorphology	LD	Slope	TWI
Lithology	1	7	7	6	5	5	4	3	3
NDVI	0.143	1	7	6	5	5	4	3	3
Rainfall	0.143	0.143	1	6	5	5	4	3	3
Drainage Density (DD)	0.167	0.167	0.167	1	5	5	4	3	3
Soil	0.2	0.2	0.2	0.2	1	5	4	3	3
Geomorphology	0.2	0.2	0.2	0.2	0.2	1	4	3	3
Lineament Density (LD)	0.25	0.25	0.25	0.25	0.25	0.25	1	3	3
Slope	0.333	0.333	0.333	0.333	0.333	0.333	0.333	1	3
TWI	0.333	0.333	0.333	0.333	0.333	0.333	0.333	0.333	1
Total	2.769	9.626	16.483	20.317	22.117	26.917	25.667	22.333	25

Table 4. Categorization of Factors Influencing Groundwater Potential Zones of Serchhip District

Factors	Lithology	NDVI	Rainfall	DD	Soil	Geomorphology	LD	Slope	TWI	Total Wgt	Nor. Wgt
Lithology	0.361	0.727	0.425	0.295	0.226	0.186	0.156	0.134	0.12	2.630	0.294
NDVI	0.052	0.104	0.425	0.295	0.226	0.186	0.156	0.134	0.12	1.697	0.189
Rainfall	0.052	0.015	0.061	0.295	0.226	0.186	0.156	0.134	0.12	1.244	0.139
Drainage Density (DD)	0.060	0.017	0.010	0.049	0.226	0.186	0.156	0.134	0.12	0.959	0.107
Soil	0.072	0.021	0.012	0.010	0.045	0.186	0.156	0.134	0.12	0.756	0.084
Geomorphology	0.072	0.021	0.012	0.010	0.009	0.037	0.156	0.134	0.12	0.571	0.064
Lineament Density (LD)	0.090	0.026	0.015	0.012	0.011	0.009	0.039	0.134	0.12	0.458	0.051
Slope	0.120	0.035	0.020	0.016	0.015	0.012	0.013	0.045	0.12	0.397	0.044
TWI	0.120	0.035	0.020	0.015	0.015	0.012	0.015	0.015	0.04	0.248	0.028
Total										8.961	1.000


Fig. 4. Map of NDVI showing the variation of vegetation health of Serchhip District

very high drainage density was categorized under a very low groundwater potential zone covering 43.34 km² or 2.96 %, high drainage density was categorized under low groundwater potential having an area of 462.04 km² or 31.7 %, 772.15 km² or 52.84% of the medium density fell inside the medium groundwater potential zone, a 163.3 km² (11.2%) region was considered a high groundwater potential zone with poor drainage density and very low drainage density categorized under very high groundwater potential zone having an area of 19.17 km² or 1.3% (Table 6). Another study

conducted in India also said that higher drainage density had a low infiltration rate and vice versa (Thakuriah, 2023; Lawmchullova *et al.*, 2024a). The drainage density was ranked 4th in the normalized weight, having a value of 0.107006, influencing 11% of the groundwater potential zone (Table 6).

Soil

Soil is the 5th rank-influencing parameter, having a normalized weight value of 0.08, influencing 9% of the total GWPZs in the study area (Table 6). There were 11 types of soil found in the study area (Fig. 7), which was

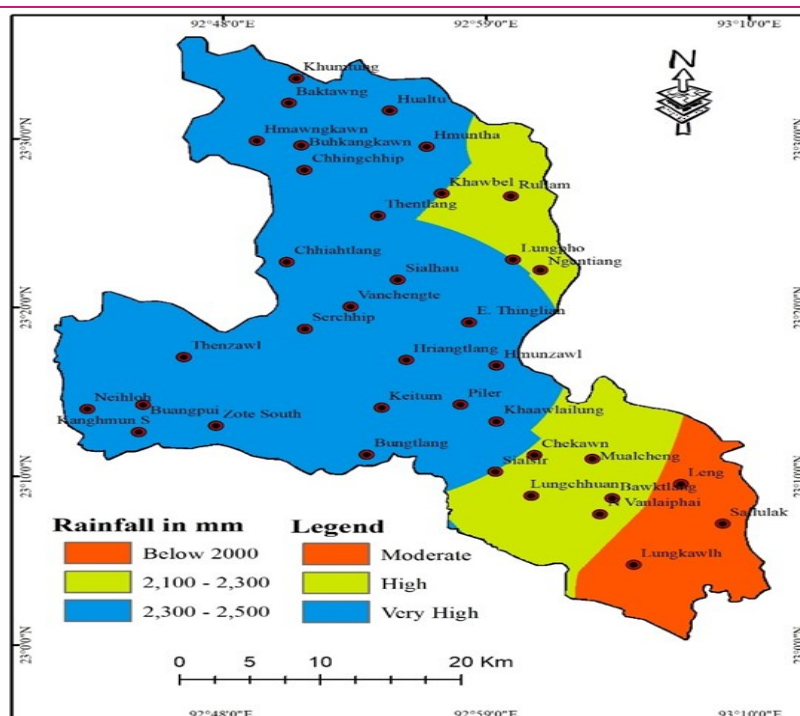


Fig. 5. Rainfall distribution in Serchhip District

Table 5. Highest eigenvalue of the matrix used for pairwise comparisons (λ_{max}), coherence index (CI), random coherence index (RI), and coherence ratio (CR) are considered in this study to predict the GWPZs map of Serchhip District

Vp	Cp	D-A*Cp	E=D/Cp	λ_{max}	CI	CR
4.0041	0.325	4.309	13.243	12.200	0.147	0.10
2.5984	0.211	2.763	13.086			
1.6862	0.137	1.760	12.844			
1.1718	0.095	1.183	12.417			
0.8708	0.071	0.846	11.950			
0.6090	0.049	0.591	11.944			
0.5066	0.041	0.472	11.476			
0.4807	0.039	0.441	11.287			
0.3766	0.031	0.354	11.557			
12.304	1.000		109.804			

further reclassified into three groundwater prospect classes: the low permeability forms of soil such as clay, clay loamy, and clay skeletal are under low potential zone (Rajasekhar *et al.*, 2022) with an area of 558.04 km² or 38.33%, whereas fine and fine loamy types of soil fall under moderate potential zone (Vellaikannu *et al.*, 2021) covering 627.5 km² or 43% and the loamy and loamy skeletal were found to have higher porosity (Kassa *et al.*, 2023) and hence categorized under high groundwater potential zone covering 274.46km² or 18.78% of the area of study.

Geomorphology

The geomorphology layer was classified into three groundwater prospect zones as shown in Fig.8. Highly dissected hill, anti-formal hill and ridges are rating low,

whereas valley areas have high potential (Ombasa *et al.*, 2022) The low potential zone covering the study area of about 631.1 km² or 43.3%, the highly dissected hills and anti-formal hills falls in this group. The ridge and hills were considered a moderate potential zone extending 763.4 km² or 52.3 % of the study area, whereas the valley areas were under a high potential zone covering 65.5 km² or 4.5% of the current study area. The geomorphology layer was assigned a normalized weighting value of 0.06, contributing 6% of the GWPZs in the study area (Table 6).

Lineament density

The lineament density is the seventh-ranked in the criteria, with a normalised weighted value of 0.05 used to create GWPZs (Table 6). Most of the lineaments in the

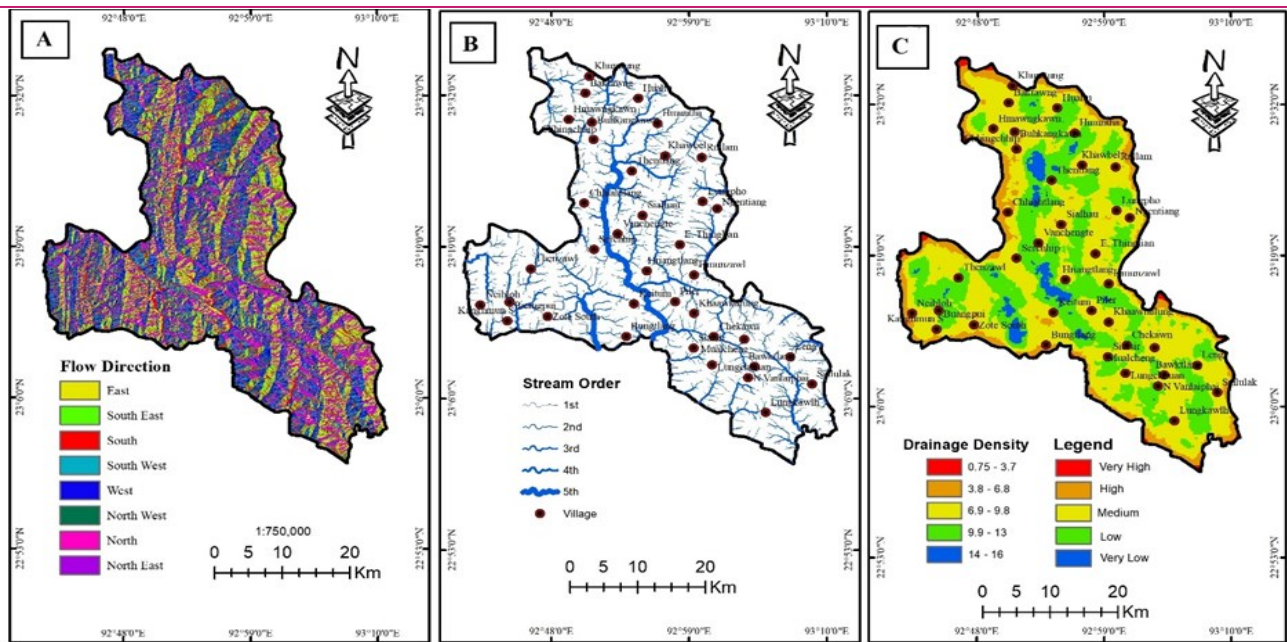


Fig. 6. (A) Flow direction (B) Drainage streams Strahler order (C) Drainage Density of Serchhip District

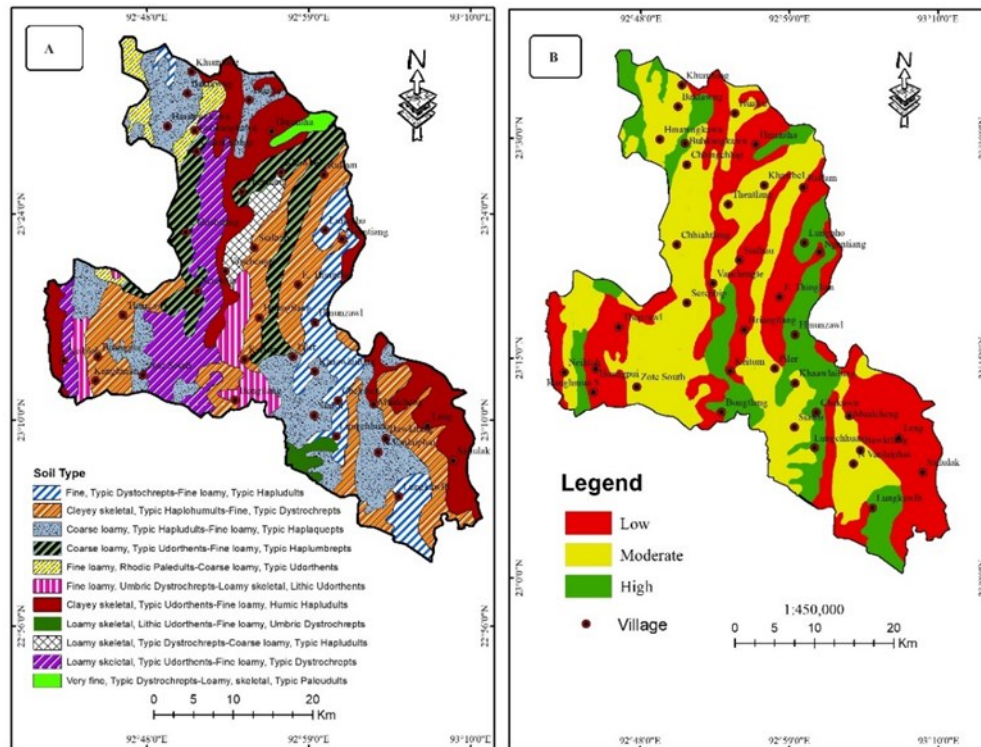


Fig. 7. (A) Map of Soil types (B) Ranking map of Soil of Serchhip District

study area are faults that generally run NW–SE and NE –SW (Fig. 9). The lineament features such as fault, fracture, joint, and bending planes are highly associated with groundwater potential zone (Jhariya *et al.*, 2021). The more occurrences of lineament featured a high potential zone and vice versa. The lineaments layer was reclassified into four groundwater prospects zones; the very low potential zone was found at the western and southern part of the study area covering 809.1 km² or 55.41 % of the study area, the low poten-

tial zone occupied 361.2 km² or 24.73% of the study area, the moderate potential zone covered 176.3 km² or 12.1% of the total area, whereas the high groundwater potential zone occupied 113.4 km² or 7.76% of the total study area (Table 6). Among the variables, the lineament density contributed 5% of the GWPZs of the current study area.

Slope

Slope was given as eight-ranked in the parameter that

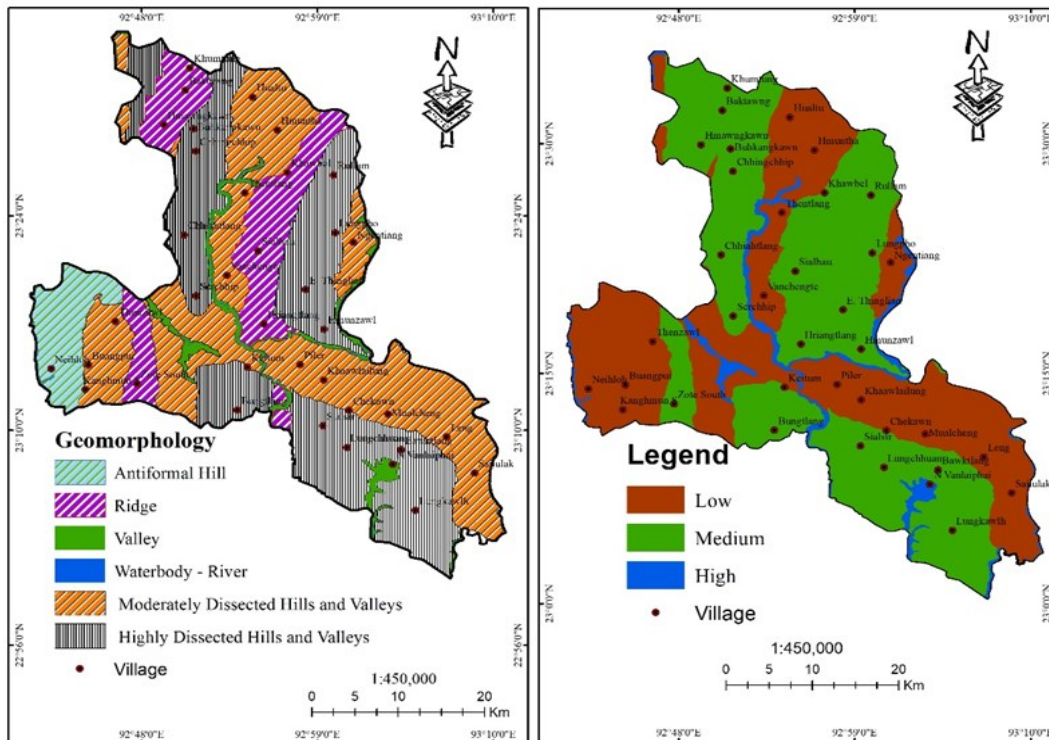


Fig. 8. (A) Map of Geomorphology (B) Reclassify thematic layer of Ranking Geomorphology, Serchhip District

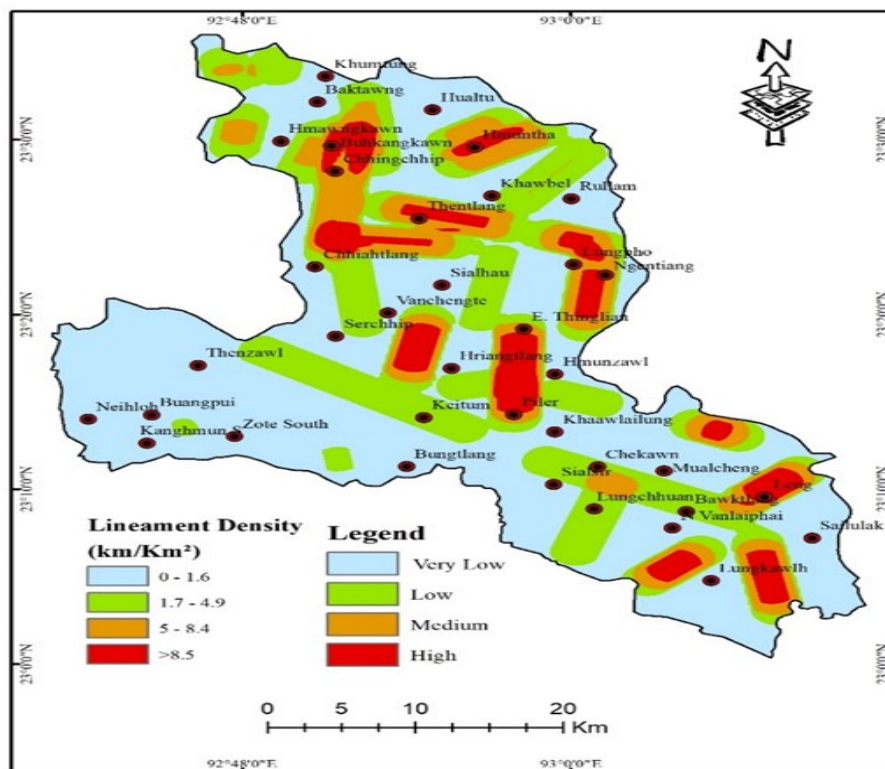


Fig. 9. Map of Lineament density of Serchhip District

was classified into five groundwater potential zones was taken into consideration by the slope (Fig.10). Higher slope indicated severe surface run-off resulted in a low potential groundwater zone, whereas gently slope and plain area signified moderate and good potential groundwater zone, respectively (Lawmchullova

and Rao, 2024). The very high degree of slope angle (>40) considered as a very low potential zone occupied 102.5 km² or 7.12% of the study area, and the high degree of slope angle (30–40) fell under low groundwater prospect zone covering 300.6 km² or 20.52% of the study area, the medium degree of slope angle (20–30)

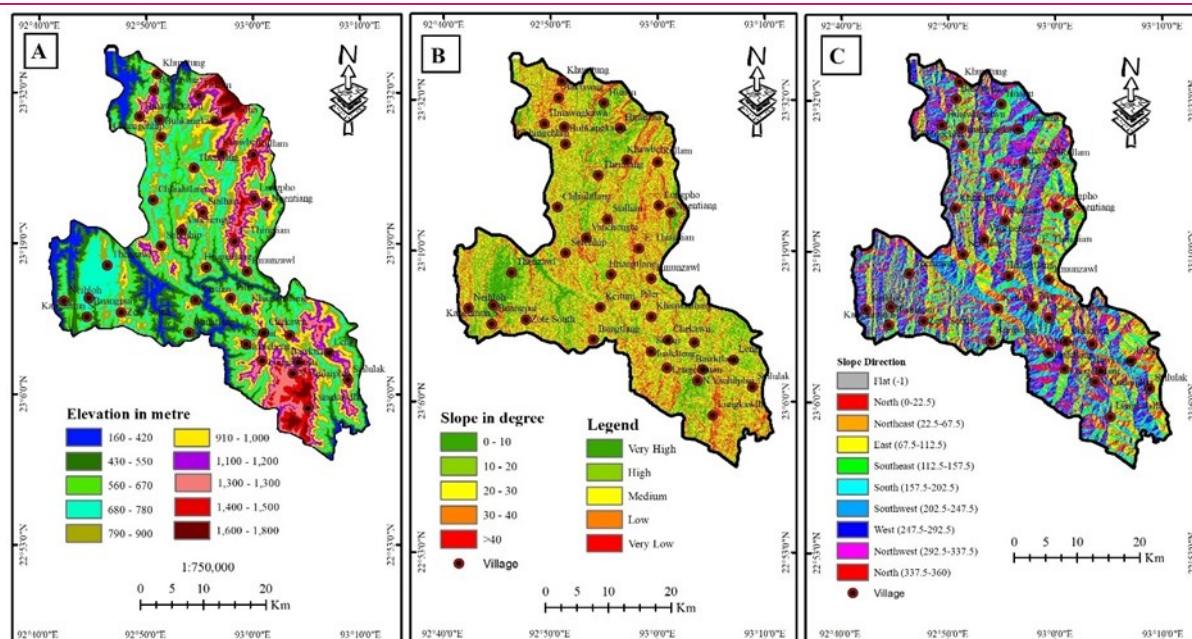


Fig. 10. (A) Map of Elevation (B) Map of Slope ranking of GWPZs (C) Slope direction of Serchhip District

was also considered as the moderate groundwater potential zone, whereas the low degree of slope angle (20-10) was classified under the high potential zone covering 397.5 km² or 27.33% and the very low degree slope angle considered as very high groundwater potential zone occupying 225.4 km² or 15.43 % of the total study area (Table 6). The slope had a normalized weighting value of 0.044289, contributing 4% of the GWPZs in the present study area.

Topographic Wetness Index (TWI)

The ninth parameter TWI was categorized into five groundwater prospect zonation zones. The lowest TWI value was considered as the lowest potential zone. In contrast, the highest TWI values fell under the highest GWPZs (Fig.11). The ridges and high elevation with steep slopes indicate low TWI and poor groundwater. In contrast, the valley with low areas was considered a high TWI and high potential zone (Silwal *et al.*, 2023). The very low potential zone covered 435.41 km² or 29.8% of the study area, whereas 623.6 km² or 42.7% of the study area was classified as a low potential zone, the moderate potential zone occupies 88.72 km² or 6.2%, the high potential zone having an area of 88.72 km² or 6.2% of the study area and the highest potential zone occupied 24.89 km² or 1.7% of Serchhip District. The TWI had a normalized weight of 0.027633, influencing 3% of the total GWPZs (Table 6).

Groundwater Potential Zone (GWPZ)

The GWPZs were determined dependent on the thematic layers' normalized weightage value from the nine parameters (lithology, NDVI, rainfall, slope, soil properties, geomorphology, drainage density, lineament density and TWI) (Table 6). The ArcGIS weightage overlay

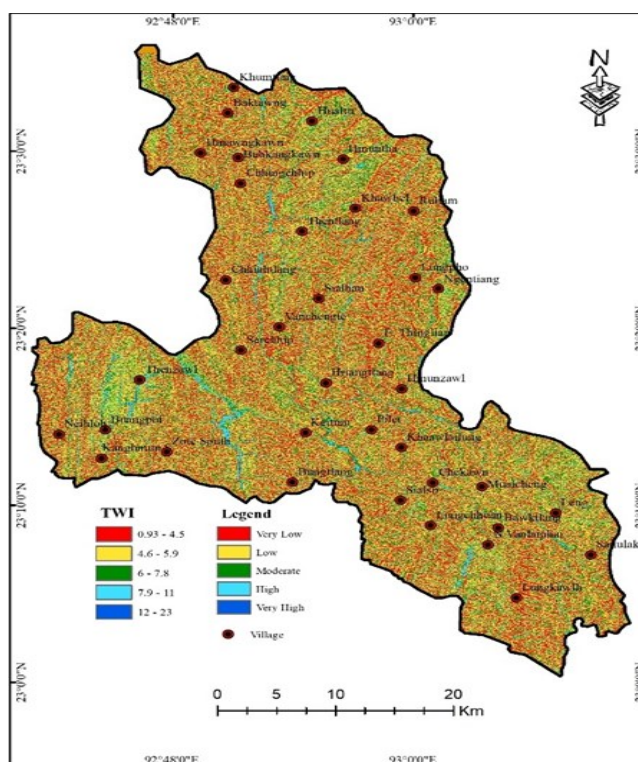


Fig. 11. Map of Topographical Wetness Index of Serchhip District

method was employed to delineate the GWPZs in the study area. The groundwater potential zone has been categorized into five categories: poor, fair, moderate, good and excellent (Fig. 12).

The areas such as built-up areas, mountain ridges, extreme slope angles, and high drainage density with siltstones and mudstones are considered poor groundwater potential zone. The poor GWPZs covering 75.3 km² constituted 5.30% of the total study area. Almost

Table 6. Weight factors categorization of influencing potential groundwater zone of Serchhip District

Factors	Assigned Weight	Influence in %	Ground Water Prospect	Area in sq. km	Area in %
Lithology	0.29	30	Low	473.15	33.29
			Medium	803.49	56.52
			High	144.86	10.19
NDVI	0.18	19	Low	151.2	10.3
			Medium	518.3	35.5
			High	790.5	54.2
Rainfall	0.13	13	Moderate	169.3	11.6
			High	302.2	20.7
			Very High	988.5	67.7
Drainage Density	0.10	11	Very High	19.17	1.3
			High	163.3	11.2
			Medium	772.15	52.84
Soil	0.08	9	Low	462.04	31.7
			Very Low	43.34	2.96
			Low	558.04	38.22
Geomorphology	0.06	6	Medium	627.5	43
			High	274.46	18.78
			Low	631.1	43.2
Lineament Density	0.05	5	Medium	763.4	52.3
			High	65.5	4.5
			Very Low	809.1	55.41
Slope	0.04	4	Low	361.2	24.73
			Medium	176.3	12.1
			High	113.4	7.76
TWI	0.02	3	Very Low	102.5	7.12
			Low	300.6	20.52
			Medium	434	29.6
			High	397.5	27.33
			Very High	225.4	15.43
			Very Low	435.41	29.8
			Low	623.6	42.7
			Medium	287.38	19.6
			High	88.72	6.2
			Very High	24.89	1.7

all the villages in the study area were under this category. The fair GWPZs comprising 135.3 km² sparsely distributed in the study area, the southeastern parts near Sailulak, Lungkawih, Mualcheng, and Ngentiang villages were under this category, extending Hmuntha

village in the northern part and in and around Thenzawl village and Buangpui in the Southwestern part of Serchhip district. The moderate potential zone occupying the largest groundwater prospect zone comprising 589.2 km² or 41.45% of the study area extending the

Table.7. Groundwater potential zone for Serchhip district

GWPZ	Area in Sq.km	Area in %
Poor	75.3	5.30
Fair	135.3	9.52
Moderate	589.2	41.45
Good	537.57	37.82
Excellent	84.13	5.92
Total	1421.5	100

ed by employing GIS and AHP techniques. The nine parameters, lithology, NDVI, rainfall, drainage density, soil, geomorphology, lineament density, slope and TWI were utilized and assigned different weightage values. The raster reclassifications were overlayed based on the values assigned. The study revealed that 84.13 km² was under the excellent potential zone, which accounted for over 5.92% of the total area of Serchhip district, the good potential zone occupied 537.57 km² represented 37.82%, 589.2 km² or 41.5% were under moderate groundwater potential zone, whereas fair potential zone occupied 135.3 km² representing 9.52% and the poor category occupied 75.3 km² or 5.30% out of the total area of 1421.5 km². The GWPZ thematic map of the study area revealed that the areas of dense vegetation with gentle slopes that receive a good amount of rainfall played a vital role in the occurrence of good to excellent GWPZs. In contrast, the built-up area with high drainage density and steep slope falls under the

The GWPZs in the Serchhip District were demonstrat-

moderate to poor category.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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