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Research paper

Study of Hydrological Parameter with Respect to DEM Using GIS & RS in Nelliampathy Hill, Kerala

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Abstract

Digital elevation models (DEMs) represent the total topography, surface flow is one of the more important data sources for deriving variables used by numerous hydrologic models. A lot of research has been directed to address vulnerability related with error in digital height models (DEMs) and the spread of blunder to determined terrain parameters. This audit unites a discourse of research in major topical regions identified with DEM vulnerability that influence the utilization of DEMs for hydrologic applications. The work is to give some understanding into the characterization of elevation data quality and the relationship amongst topography and water assets models. A key characteristic of circulated displaying is the spatially factor portrayal of the watershed as far as topography, vegetative, or land use/cover, soils and impenetrable territories and the subordinate model parameters that represent the hydrologic procedures of infiltration, evapotranspiration, and runoff. In our study, application of DEM and deriving hydrological parameters using remote sensing and GIS technology at Nelliampathy hill, Kerala.

Keywords: *Hydrological, Parameter, DEM, GIS and Nelliampathy Hills.*

1. Introduction

DEMs are generally used in hydrologic and geologic examinations, risk checking, characteristic assets investigation, farming administration and so on. Hydrologic utilizations of the DEM incorporate groundwater demonstrating, estimation of the measure of proposed stores, deciding avalanche probability, surge inclined territory mapping etc.DEM is created from the elevation data from a few focuses, which can be standard or unpredictable inside the space. In the principal days, DEMs was already created from the contours mapped in the topographic maps or stereoscopic areal pictures. With the headway of innovation, today top quality DEMs for a sizable territory of the globe can be gotten from the radars on board the area shuttle.

Architects are routinely required with urban hydrologic thinks about. Oftentimes the focal point of such examinations is to discover the expanded storm water overflow expedited by human exercises, for example, for example urban and rural advancement. Once the building concerned just with data at the outlet of the watershed, and after that rearranged hydrologic models can be used to supply the vital information. One band of such models are named lumped parameter models, because they choose input data derived by spatially averaging hydrologic parameters over the region of interest.

1.1. Objectives

The objectives of the study,

- To provide the strategy of GIS analysis to delineate HRUs on the basis of the hydrological systems analysis.
- To utilize the HRUs in PRMS/MMS to simulate the hydrology for a 20-year data set.
- To recognize further research needs to enhance the modeling strategy presented.

2. Methodology

Fig.1 shows the methodology.

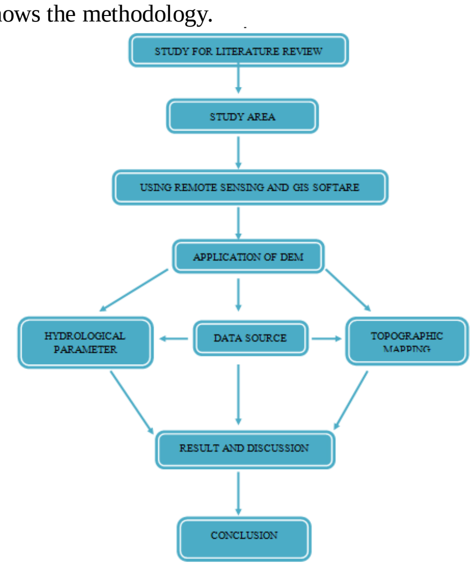


Fig.1: Methodology

3. Study Area

3.1. General

Computerized Elevation Model is extremely a quantitative portrayal of terrain and is significant for geographical and hydrological applications. For the most part, DEM of an area is examined using the elevation information, which regularly, is acquired through SRTM information.

3.2. Nelliyampathy Hills, Palakkad

The tallness of the slopes ranges from roughly 467 m to 1572 m and it accompanies a to a great degree quieting sway on all who see it. To achieve Nelliyampathy, you need to take the road starting with Nenmara that returns to the Pothundy Dam. Also it supplies a marvelous perspective of the Palakkad Gap, which truly is a land wonder in the Western Ghats development in this district, bringing into see, territories of the adjoining State of Tamil Nadu. Fig.2 shows the study area.

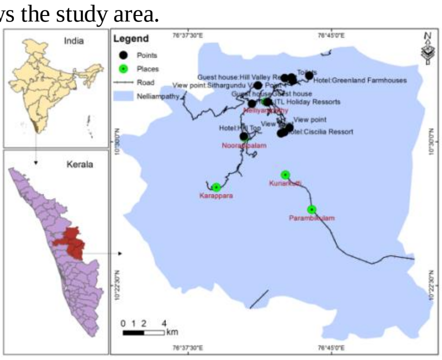


Fig.2: Study Area

Fig.3 shows the SRTM DEM.

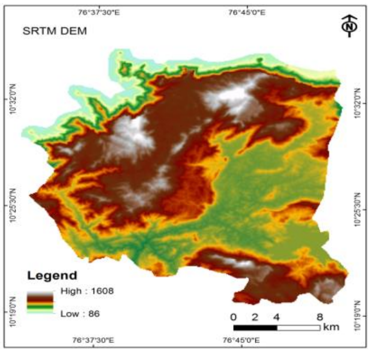


Fig.3: SRTM DEM

4. Remote Sensing and GIS

4.1. Remote Sensing

Remote sensing can be characterized as the quantity of information about a thing from the separation. Human and a large number of different sorts of creatures attempt undertaking with the guide of eyes or by the feeling of smell or hearing. Geographers utilize the method of remote detecting to screen or method for estimating wonders exhibit in the world's lithosphere, biosphere, hydrosphere and air. Remote of the surroundings by the geographers is by and large finished with the guide of mechanical gadgets called remote sensors. These devices have an extraordinarily enhanced capacity to get and record data regarding a thing with no physical contact.

4.2. Geographic Information System (GIS)

A geographic information system (GIS) is a important computer based software tool for mapping and analyzing all geographic appearance or occurrence that exist, and events that occur on Earth.

5. GIS Results

5.1. Criteria 1: Lineament Density

Fig.4 shows the lineaments map.

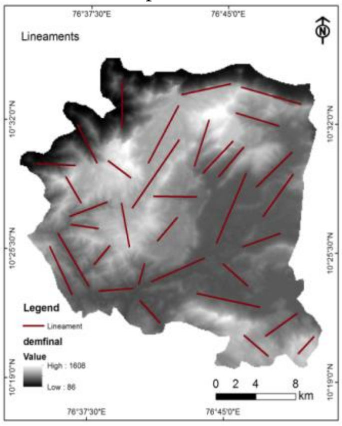


Fig.4: Lineaments map

Fig.5 shows the lineaments density map.

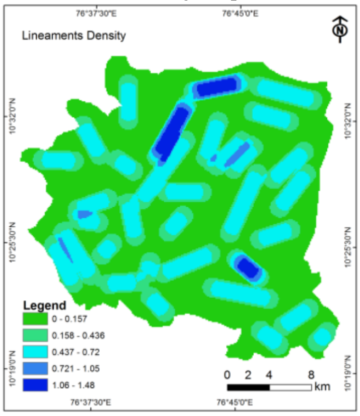


Fig.5: Lineaments Density map

5.2. Criteria 2: Drainage Networks Density

Fig.6 shows the stream order map.

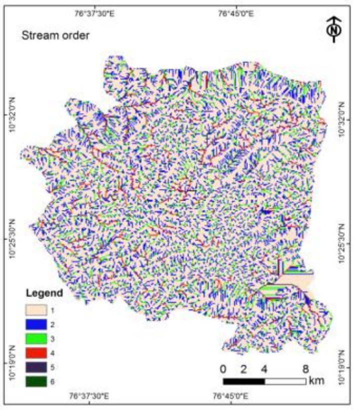


Fig.6: Stream order map

Fig.7 shows the stream density map.

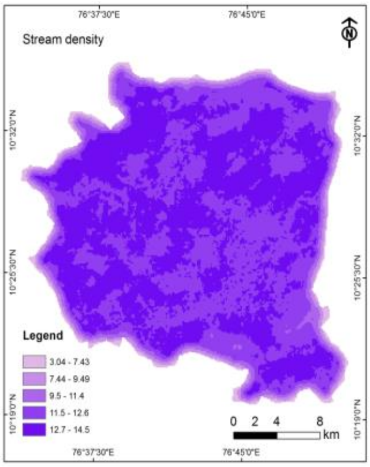
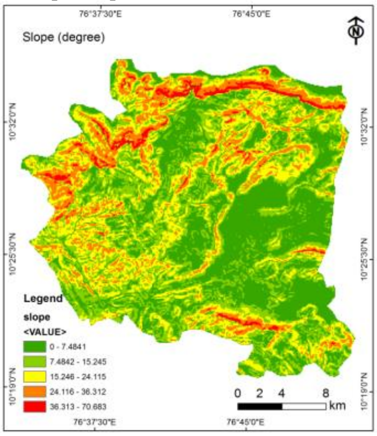


Fig.7: Stream density map

5.3. Criteria 3: TWI (Topographic Wetness Index)

Fig.8 shows the slope map.



Fig,8: Slope map

Fig.9 showsthe flow direction map.

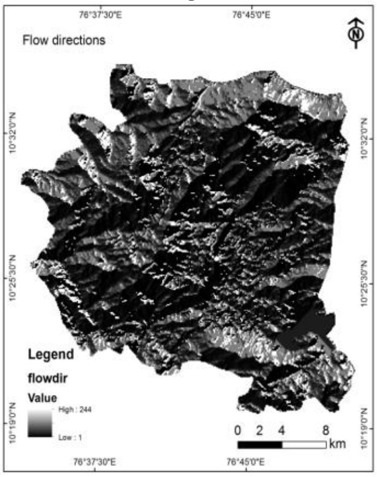


Fig.9: Flow direction map

Fig.10 shows the flow accumulation map.

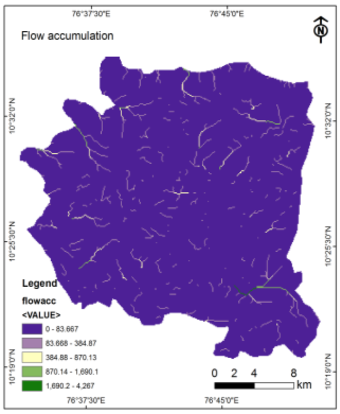


Fig.10: Flow accumulation map

Fig.11 shows the TWI map.

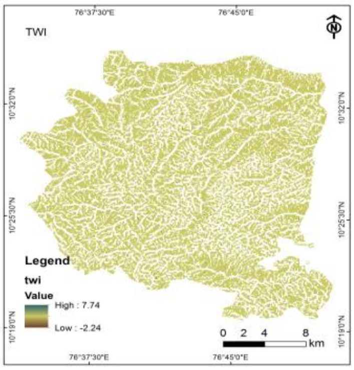


Fig.11: TWI Map

5.4. Criteria 4: Relief

Fig.12 shows the relief map.

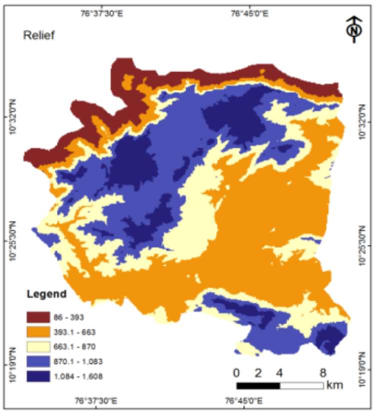


Fig.12: Relief map

5.5. Criteria 5: Convergence Index

Fig.13 shows the a) convergence index calculation; (b) CI equals -90°with θ is 0°;(c) CI equals 90°with θ is 180°; (d) CI equals 0°with θ is 90°

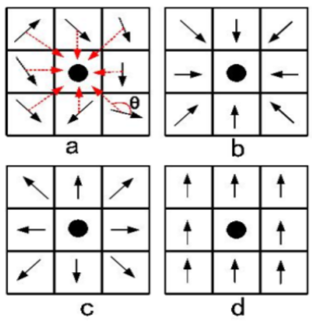


Fig.13: (a) convergence index calculation; (b) CI equals -90°with θ is 0°;(c) CI equals 90°with θ is 180°; (d) CI equals 0°with θ is 90°

Fig.14 shows the aspect map.

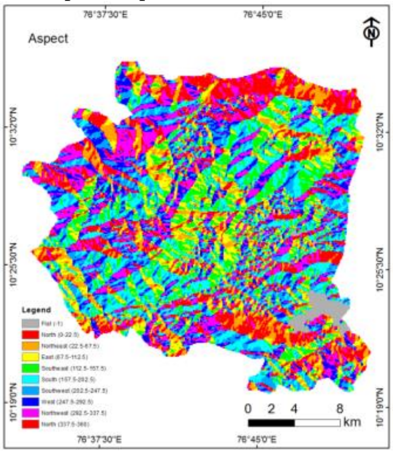


Fig.14: Aspect map

Fig.15 shows the CI map.

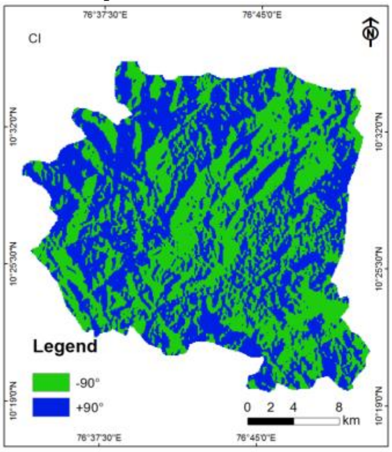


Fig.15: CI Map

5.6. Weight Assignment

Table 1 shows the main potential ground water factors and cumulative effect matrix.

Table 1: Main potential groundwater factors and cumulative effect matrix

Factors	Ld	TWI	Re	Dd	CI	Σ	Weight
Ld	1	1	0	1	1	4	31%
TWI	0	1	0	1	1	3	23%
Re	0	0	1	0	0	1	8%
Dd	0	0	0	1	1	2	15%
CI	0	1	0	1	1	3	23%

Fig.16 shows the groundwater potential map.

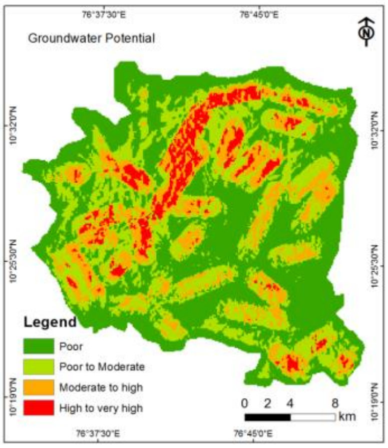


Fig.16: Groundwater potential map

6. Conclusions

In this examination, an inherent approach for evaluating the attributes of groundwater recharge utilizing GIS procedure was proposed for the Nelliampathy slope, Kerala. This investigation delivered a groundwater recharge potential guide of the hilly bowl. This examination is imperative for sustainable use of the groundwater asset along these lines upgrading groundwater recharge by appropriate administration. The outcomes show that utilization of GIS methods help for groundwater exploration in narrowing down the objective regions for leading itemized hydrogeological overviews on the ground. The outcomes demonstrate that the absolute best groundwater recharge potential zone is arranged in the Nelliampathy slope. In this locale, the gravelly stratum and the centralization of drainage likewise encourages the stream flow to recharge the groundwater system. Furthermore, the grouping of drainage likewise demonstrates the capacity of stream flow to recharge the groundwater system. This examination sets up the interrelationships including the groundwater recharge potential components and the groundwater recharge potential scores from the general hydrology qualities of Kerala.

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