RESEARCH ARTICLE

ANALYSIS OF DIGITAL ELEVATION MODEL OF RAJGARH FOREST DIVISION HIMACHAL PRADESH USING SHUTTLE RADAR TOPOGRAPHY MISSION DATA AND GIS TECHNIQUES

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Abstract: The present study highlights the use of DEM and its analysis on aspects. SRTM data and GIS techniques are helpful to analyze the Elevation characteristics of hilly terrain. The SRTM data were downloaded and used for the present study. The study area covers an area of 820.02 Km^2in parts of Rajgarh Forest Division, Himachal Pradesh. The result of elevation variation using DEM was analyzed and its classification is given below. Using this DEM output as input in ArcGIS to prepare the aspect details of the study area is attempted. This output has immense application in proper planning and management of various natural resources and also highly useful for the natural disaster management studies.

Keywords: Relief, GIS, Remote Sensing, SRTM, Aspect

INTRODUCTION

A DEM is a representation of Earth surface with latitude, longitude and altitude, i.e. X; Y horizontal coordinates and height Z. DEMs play a significant tool for the extraction of three dimensional models (Swaraj and Anji Reddy, 2013). Digital Elevation Model is a quantitative representation of terrain and is consequential for geological and hydrological applications (Gurugnanam *et al.,* 2014). Generally, DEM of an area is studied using the elevation data, which in turn, is obtained through SRTM data (Chavare, 2011).

The proposed study is taken out in Rajgarh Division of Sirmour district of Himachal Pradesh, which is located between 30° 38'40" to 31° 1'14" N latitude and 77° 01' 5" to 77° 26' 13"E longitude, at elevation from 540 m to 3500 m a.m.s.l, covering an area of about 82002 ha. (Figure1). Climate has wide range due to variability in altitude and physical land features. The temperature in Himalayan zone is milder during summer but the winters are very cold. The minimum and maximum temperature ranges from 0.3 to 42 ^{0}C. Snowfall is heavy on higher reaches of Habban and Rajgarh ranges and descends down to 1500 meters; Snow above 2150 meters lasts long as its intensity is directly proportional to elevation. Frost is common from November to February in most of the areas. There is wide inter season and inter-year fluctuations in rainfall. During the monsoon period, the amount of rainfall varied from 557.5 to 1585.5mm. The slopes are generally moderate to steep but precipitous along the ridges and in cut up areas.

MATERIAL AND METHOD

The elevation model resulting from Shuttle Radar Topography Mission (SRTM) data is used for DEM investigation. The SRTM data is provided by the international project of the U.S. National Geospatial Intelligence and NASA. The SRTM data has 30 meter resolution. The data is taken into ArcGIS software for preparation of digital elevation model (DEM), and aspect map (Goncalves *et al.,* 2008, Beijing Rabus, 2008, Rodriguez *et al.,* 2006, Smith, 2003 and Gurugnanam and Kalaivanan, 2014). For the analysis of the aspect, the surface analysis tool and 3D analysis tool were used in ArcGIS software. SRTM data is taken from the GLCF website for free.

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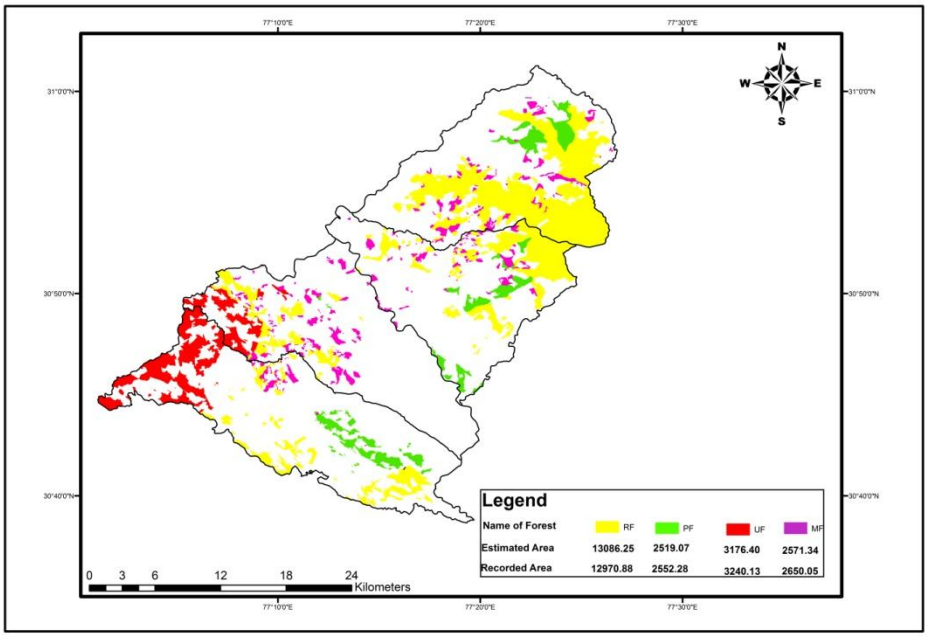

Figure 1. Location map of the study area

RESULT AND DISCUSSION

Digital Elevation Model

The digital elevation model is a three dimensional digital representation of a terrain surface. It is created using SRTM data. In the current study, the terrain elevation values are used to prepare DEM. The elevation in the study varies between 500 m to 3500 m. The DEM of the study shows that the maximum part of study area lies in elevation between 1000 m to 1500 m and minimum part lies between 3000m to 3500 m. They also showed that maximum part of Habban region of his elevation, lying between1500 m and 2000 m above mean sea level followed by 2000m to 2500m, 2500 to 3000 and minimum portion lies between 3000 m to 3500 m. Maximum part of Rajgarh region lies between 1500 m to 2000 m elevations, followed by 1000 m to 1500m, 2000 to 2500m and minimum part lies between 2500 m to 3000 m. The DEM also shows that the maximum part of Narag range lies between 1000 to 1500 m followed by 1500 m to 2000 m, 500 m to 1000 m and no area falls above 2000 m. Maximum part of Sarahan region lies between 1000 m to 1500 m elevations, followed by 500 m to 1000 m, 2000 m to 2500 m and minimum part lies between 1500 m to 2000 m. The DEM map is shown in Figure 2.

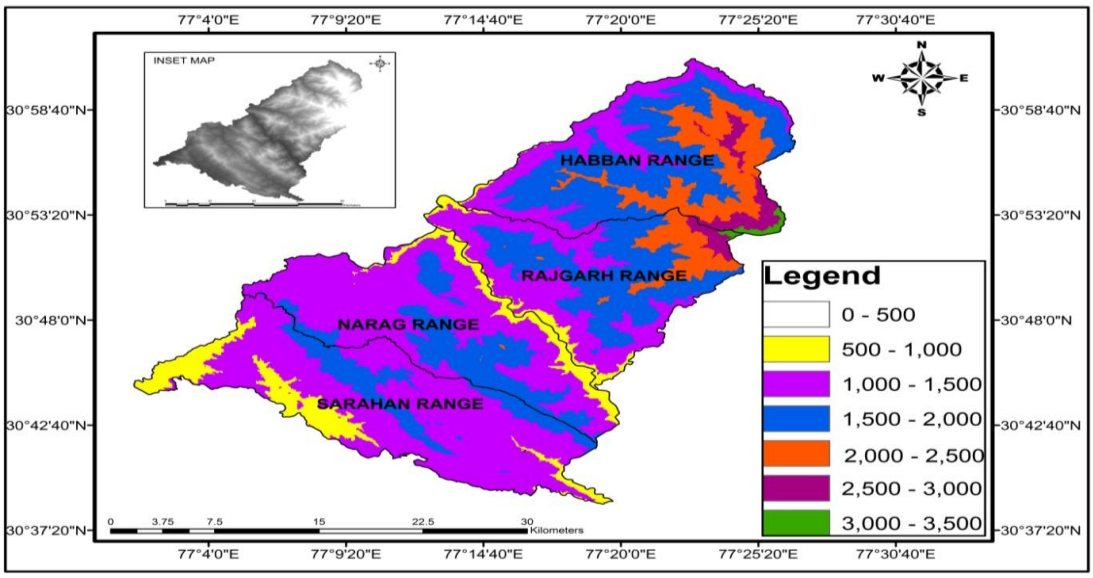

Figure 2. Digital elevation model of Rajgarh Forest Division

Aspect

Aspect is the directional measure of slope, measured in degrees and it ranges from 0 degree at the North, moves clock wise and end with 360 degrees at the North. Aspect can have large influence on temperature. The aspect of a slope can make very significant influences on its local climate. For example, because the sun's rays are in the west at the hottest time of day in the afternoon, in most cases a west-facing slope will be warmer than a sheltered east-facing slope. In the study, DEM data and slope values are used to generate the Aspect map. This map is used to identify the slope direction. The map shows that most of the slope in the study are westward, northward and northwest facing. Eastward dipping slopes occupy least area. The Aspect map is given in (Figure 3).

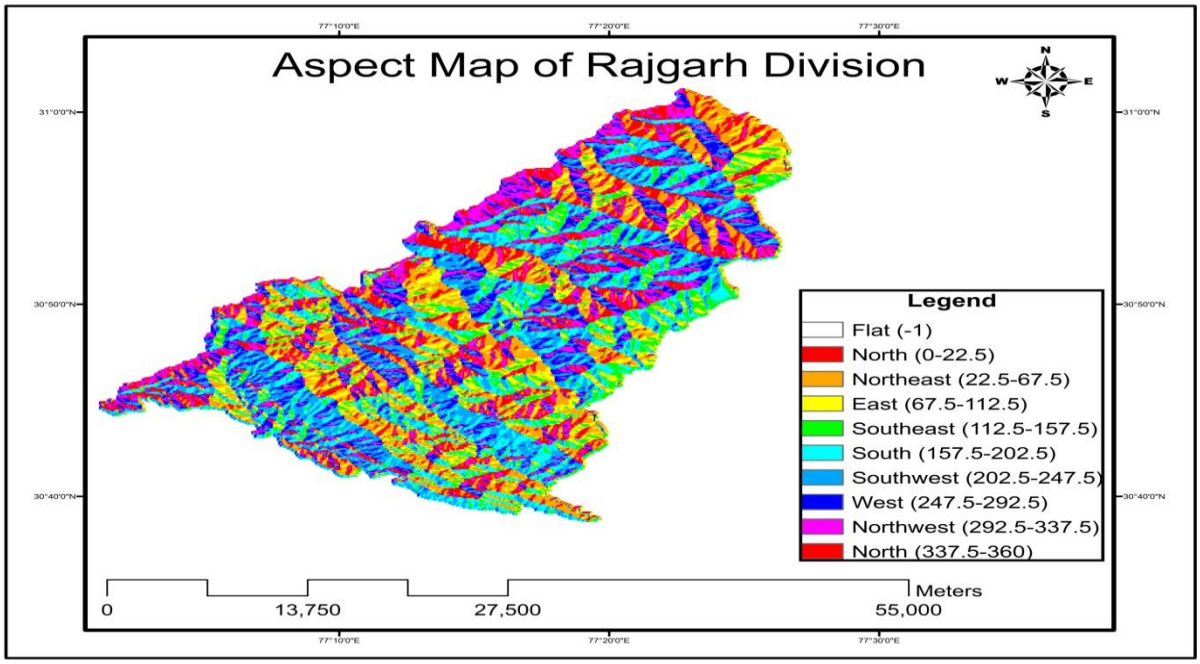

Figure 3. Digital elevation model of Rajgarh Forest Division

CONCLUSION

The terrain elevation values are used to prepare DEM. The elevation in the study varies between 500 m to 3500 m. Aspect are westward, northward and northwest facing. These maps are very essential to delineate watersheds in a particular area. Digital elevation models (DEM) are efficient and effective methods used to determine the features of drainage networks like size, length, and drainage network and to determine the characteristics of basin and sub-basin.

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