

Site Suitability Analysis for Urban Expansion and its Development of a Hill Town Using GIS Based Multicriteria Evaluation Technique: A Case Study of New Shillong Township, Meghalaya, India

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Abstract

The study highlights the importance of Geographic Information System (GIS) tools and numerical Multi-Criteria Evaluation (MCE) techniques for selection of suitable sites for urban expansion of a hill town. This study was conducted to pin point suitable lands for urban expansion and development of New Shillong Township using GIS-based multi-criteria evaluation of slope, road proximity, land use, land values, factors. Merged and Pansharpened spatial data (Cartosat-1 & Komsat) and six thematic information layers were analyzed using ArcGIS 10.8 software to identify suitable areas in New Shillong Township. It focuses on GIS based Overlay Weight age Average (OWA) Sum and Weighted Linear Combination (WLC). The undulating topography, slope, and high land cost give the impression to find out suitable sites for urban expansion and development of New Shillong Township

In this study six factors (slope, road proximity, land use, land cost, drainage and aspect) were identified for criteria evaluation and weightage. Different thematic information layers were generated using visual interpretation of satellite data for each variable displaying site suitability measured on an ordinal scale. With the different criteria, maps were standardized using the pair wise comparison matrix method. Weights for each criterion are generated by comparing with each other according to their importance.

Criteria weights and maps were combined using OWA and WLC. Pair wise comparison matrix indicates weights for slope (=0.34), road proximity (=0.16), landuse (=0.23), land cost (=0.12), Drainage (=0.09), aspect (=0.07).

Consistency Ratio, (CR =0.0117) <0.10 indicated a reasonable level of consistency in the pair wise comparisons.

The final suitability map was obtained from both weighted sum overlay and Spatial Analyst Tools covering an area of 40.8 sq. km. After suitability analysis it was found that from the available area 0.03 sq km falls under not suitable.

1.18 sq km under low suitable, 3.68 sq.km under moderately suitable, 12.77 sq. km under high suitable and 25.26sq. Km under very highly suitable. The result shows that highly suitable areas for urban development is either agricultural or mostly forest type.

Keywords: Geographic Information System (GIS); Multi-criteria Evaluation (MCE); Overlay Weightage Average (OWA); Weighted Linear Combination (WLC); Analytic Hierarchy Process (AHP); Urban Development; Spatial Analysis