

FUZZY BASED DECISION ANALYSIS IN LAND USE PLANNING

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Appropriate land use decisions are vital to achieve optimum productivity of the land and to ensure sustainable land use and environment. From a land use planning perspective, identification of suitable locations for a given type of land use is necessary for decision makers to formulate land use alternatives in different locations, based on existing land potential and constraints. To achieve this, it requires an effective management of spatial information on the land on which such decisions should be based. For a region where complex land use occurs, use of a simple method that implements a categorical system and considers only limited land characteristics in the planning analysis is often inadequate to arrive at an optimal spatial decision. The primary aim of this paper is to develop spatial modeling procedures for land use analysis using a fuzzy set approach within a geographical information systems (GIS) environment. The main sources of data bases used include digital topographic map, soil map and soil characteristics derived from available data at reconnaissance level and semi detailed survey, climate data, and satellite imagery (LANDSAT and ALOS), as well as local spatial planning data. A semantic import model of fuzzy set (SIM) was used to generate land suitability index in a continuous form (from 0 to 1.0). Local spatial planning regulation data were transformed to an index related to the degree of possible change in the future (also from 0 to 1.0). Spatial matching was then performed to identify the degree of match between the quality of land in terms of its potential for a given type of land use and the degree of possible land use change in the future. The results of analysis show that quite a large area of the region currently identified as high degree for possible change to non-agricultural uses match land with good quality (high land suitability index) for agricultural development. This reveals that within the timelines of spatial planning regulation (20 years), a large area of built-up area will occur in the forest and agriculture zones. The spatial based method as demonstrated in this study can be further used at a micro scale assessment where the spatial data are available with a good mapping accuracy.

Keywords: land use change, fuzzy set, spatial planning, remote sensing, GIS