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GIS and Multi-Criteria Decision Analysis for Land Use Resource Planning

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ABSTRACT

Natural resources management is indispensable in ensuring environmental sustainability and reducing the risk associated with climate change and increasing demand for ecological goods and services. Natural resources planners need to have at their disposal tools that can objectively help in prioritizing land use allocation. Traditional application of land use change model based on economic model, trend analysis, and or scenario analysis present some challenges of data availability and reliability necessary for implementation of the models. However, with the advent of information technology, GIS and remote sensing, biophysical data known for having influence on land use allocation can easily be accessed. The current study explores the application of GIS-Multi-criteria analysis in modeling future land use scenarios for resources planning and management using easy to construct biophysical parameters known for influencing future land use allocation. The decision problems in this study are to find the best spatial allocation of land to future agriculture and forest development, which are considered to present critical land use change in the study area. The afforestation scenarios are meant to offset the pressure on the native forest resources due to the increased demand for fuel and timber and also to contribute to the environmental protection and the agricultural land use scenarios are meant to increase productivity and ensure environmental protection. The land use scenarios did not consider "when" in the future the land use pattern may develop. The analyses of scenarios indicate that afforestation extent in the basin can be increased from 4.6% to 42.9% of the total basin area. However, the afforestation extent of 42.9% may be considered unrealistic, since in practice, it may not be possible to realize up to 42.9% afforestation, nevertheless, the spatial pattern of the afforestation may provide crucial insight into spatial afforestation policies and its future consequences. The agricultural land use can increase from 6.2% to 53.7% of the basin area. The agricultural land use expansion can be realised since the expansion of farm land is primarily the main option to achieve food production increase in the near future. The findings indicate potential use of the methodology in land use planning.

KEYWORDS

GIS; Multi-Criteria Analysis; Land Use

Cite this paper

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