Sustainable land use optimization for rapid urbanization region from the perspective of ecological conservation using a modified Genetic Algorithm: A case study in Shenzhen, China

Shiquan Zhao and Bo Huang

The Chinese University of Hong Kong, Faculty of Social Science, Department of Geography and Resource Management, Shatin, N.T., Hong Kong (sqzhaopku@gmail.com)

Along with rapid urbanization, regional ecosystem was challenged and environmental problems were aroused by excessive expansion of constructed lands. Such problems limit the development of cities in long term. Sustainable land use planning is an effective way to solve such a dilemma. Among different ways of sustainable land use planning, land use optimization was regarded as an effective way by searching sustainable land use plans with multiple objectives. However, current studies on sustainable land use optimization may not be sufficient to help guiding the sustainable planning accurately due to the objective functions, especially ecological ones, were usually over simplified. Ecological security modeling, which focuses on safeguarding local ecological resources from the perspective of modeling eco-system service and landscape patterns, is applicable to enrich the sustainable land use optimization by integrating its models in objective set of the optimization. This study mainly concerns on illustrating a solution of sustainable land use optimization that integrates ecological security modeling, social development and revised GA-based land use optimization to achieve a set of Pareto-optimal land use plans that could be more accurate in sustainable planning. In this study, it is proved that (1) integrating the ecological models with GA-based land use optimization is feasible to optimize spatial pattern of constructed lands and ecological lands properly for future development of the city; and (2) with the modification of Teaching-learning process, the efficiency of GA-based land use optimization was improved significantly by enhancing good results in different objectives and by filtering out bad plans in each generation.