Land use change simulation model based on MCDM and CA and its application

Qiu Bingwen

(Key Laboratory of Data Mining & Information Sharing of Ministry of Education, Spatial Information Research Center of Fujian Province, Fuzhou University, Fuzhou 350002, China)

E-mail: qiubingwen@fzu.edu.cn

Abstract: A macro-micro integrated land use change model, Grey-CA-MCDM-GIS (GCMG) based model which can simulate human decision making process was proposed. The GCMG model borrow the theory hypothesis of CLUE-S model which suppose that regional land use change is driven by its land use requirement and the land use distribution is in dynamic balance with land use demands and regional natural resources and socio-economic conditions. The GCMG model consists of both the non-spatial and spatial part. The non-spatial part, so called macro model, calculated the changes of land use demand in the future based on experiential relationship of land use and its dominating drivers using the grey model. The spatial part, also called micro model, complete the land use allocation process whose total quantity is calculated by the non-spatial part with the combined method of MCDM, GIS and CA model. In the spatial part, firstly MCDM method was used to simulate the human decision making process for land use change considering socio-economic and bio-physical conditions; the results of which was brought into conversion rule of CA model; integration was finally implemented in GIS to model the land use allocation. To illustrate the functioning of GCMG model and its validation, it is applied in Longhai County to simulate land use change in 2010. As one of the typical counties at coastal area of Fujian province, great land use changes have taken place in Longhai County over the past decades, including the expansion orchard land, town land, agricultural residuals and industry land. Firstly the GCMG simulation results are compared with map of the actual distribution of land use in 2000 for validation. The Kappa equals to 0.93 in the simulation at 10m×10m grid level and has gained satisfactory results. Then the validated model is applied to simulate the consequences of different management policy and results show that the basic farmland protection policy will determine the future land use change pattern. The application of GCMG model has shown that it can both simulate the land use demand at macro level and land suitability at micro level so that it possess the ability of studying the multi-level land use system.

Key words: CA model; GCMG model; GIS; land use; Longhai County in Fujian province