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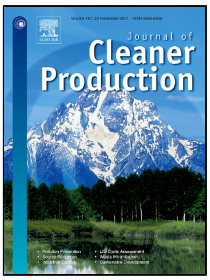


Study on sustainability of land resources in Dengkou County based on emergy analysis

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# Study on sustainability of land resources in Dengkou County based on emergy analysis

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**Abstract:** Land is one of the basic resources and it is significant for the survival of human beings and the development of society. In the arid desert area where the ecological environment is fragile, land resource often faces the pressure from ecological degradation and economic development. Therefore, it is of great significance to study the sustainability of land resource, which is beneficial for the rational operation of the regional ecology economic system. The sustainability of land resources of Dengkou County, Bayannaoer, China was studied based on the social and economic statistics data and land use data from 1998 to 2015. The result showed that from 1998 to 2015, the impact of human exploitation activities on the land resource had been intensified and the area of cultivated land and construction land increased evidently. This change led to a slow but continuous decline of the sustainability of the land resources in Dengkou. Based on the research above, land use evolution of Dengkou in a hundred years under two different development strategies—efficiency dominant strategy and ecology dominant strategy was simulated using an improved cellular automata (CA) model built in this research. Emergy analysis was also performed based on the simulation results. The results showed that under the efficiency dominant strategy the economy would grow rapidly but the sustainability of the land resources would be damaged greatly. Under the ecology dominant strategy, the development of economy would be stagnant, while the sustainability of land resources would be maintained. The results of the study indicated that the maintaining of the sustainability of land resources and the development of economy should be achieved simultaneously by industrial upgrading and technological innovation, while simple industrial expansion will lead to a decline in the sustainability of land resources.

**Key words:** Emergy analysis; Dengkou County; Land resources; Cellular Automata Model

## 1. Introduction

Land resources are one of the most basic resources for human survival and development (Banai, 2005), and they are necessary for almost all human production activities (Baja et al., 2002; Bestelmeyer, 2004). How to use the earth's finite land resources properly is becoming a matter of life or death for human kind.

In the arid desert oasis ecotone, the land resources available for human are very limited and local ecological environment makes the land resources fragile and prone to desertification (Huang et al, 2015). Moreover, a large number of industrial products including chemical fertilizers, pesticides, herbicides, mechanics and oil were input into land ecological economic system in exchange for agricultural products, livestock products and industrial products to meet the demands of the rapid increase in population and the continuous improvement of the human consumption (Chen and Chen, 2012; Wen et al, 2004; Yong et al., 2005). As a consequence, land degradation problems including land desertification, land salinization, topsoil destruction and land pollution arise and make it significant to study the sustainability of land resources in this area (Nkonya, 2011; Perkins and Thomas, 1993).

The focus of sustainability of land resources is to keep land resources available for future generation and retain its ecosystem stability in the long term (Hong et al., 2014). It emphasizes the coordination of land use (ecological sustainability), the profitability of land use (economic sustainability) and the fairness (social sustainability) of land

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