COUPLING RELATIONSHIPS OF LAND USE BENEFITS IN SHENZHEN CHINA

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Abstract
This study examines a certain coupling relationship between the socioeconomic and the eco-environmental benefits of land use in Shenzhen. This coupling relationship reflects the balanced state between land use benefits. A dynamic coupling model was set up in terms of the qualitative analysis of land use benefits. It was found that from 1981 to 2007, the land use benefits improved. The socioeconomic benefits rose stably and the eco-environmental benefits developed in a fluctuating manner. Land use benefits were at a low-grade symbiosis for the first two years and were coordinated for the next 25 years. The evolving processes of the coupling relationships of land use benefits can be divided into four stages. From 1981 to 1986, the land use benefits jumped from low-grade symbiosis into relative coordination. During this time, the coupling degrees increased from $-84.95^\circ$ to $53.40^\circ$. From 1987 to 1993, the land use benefits were optimum, continuous and stable and the coupling degrees were close to $45^\circ$. From 1994 to 1999, the extent of coordination decreased and the coupling degrees rapidly approached $75^\circ$. In the last eight years, land use benefits have not been very coordinated because of a high coupling degree of $80^\circ$.

Keywords
Land use benefit, coupling relationship, coordinated development, sustainable development, Shenzhen

INTRODUCTION

The Chinese economy has developed rapidly since the reforms of 1978, and the socioeconomic benefits of land use have been obvious (Qu et al., 1995; Wang and Zhang, 2001; Long et al., 2007). Problems such as less available land, degradation of land quality, tension among the numerous populations, rapid expansion of urban areas into farmland and hinterland leading to the envelopment of villages and towns, and negative impacts on air and water quality, have been documented (Tan et al., 2005; Gao et al., 2006; Whitehead et al., 2006; Deng et al., 2008; Tan et al., 2009).

Although land use benefits are well documented in literature (Peng et al., 2005; Zhou et al., 2006), the coupling relationships between the socioeconomic and the eco-environmental benefits of land use, and the interaction mechanism, are less understood. “Coupling” is a Physics term that refers to the interplay between two or more systems. Different systems influence, limit and enhance each other. In this paper, coupling refers to a balanced state between the socioeconomic benefits subsystem of land use and the eco-environmental benefits subsystem of land use. These coupling relationships are an important aspect of sustainable land use (Zinck and Farshad, 1995; Cooper et al., 2006; Walter and Stützel, 2009). Dynamic numerical modeling and simulation are valuable tools for explaining how these systems work. These tools help decision makers identify the most appropriate policy. Current research in this field is still in its infancy (Zhang et al., 2004; Zhang et al., 2005), and most of the research is either qualitative or static and lacks quantitative and dynamic analysis.