

Sustainable development-oriented industrial restructuring modeling and analysis: a case study in Leshan

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Abstract This article proposes a sustainable, low-carbon development-oriented industrial restructuring model for developing countries, which balances of environmental protection and economic growth. A case study for Leshan, a representative traditional industrial city in South West China, is given to illustrate the difficulties in accommodating economic and ecological development needs. Multi-objective planning techniques under a fuzzy random environment are used to calculate optimum industrial structure ratios, and a system dynamics-based industrial restructuring optimal model is designed to predict sustainable relationships between the environment, the economy, and society. The possible paths can take to achieve this target are presented and discussed using scenario analysis, after which the simulation results are discussed. Then, integrated policy proposals are suggested to meet the sustainability demands. This research provides more options for researchers and government policy makers in traditional industrial cities of developing countries.

Keywords Sustainable development · Industrial restructuring · System dynamics · Integrated policy proposal · Low-carbon development

Introduction

Industrial sustainable development is becoming more critical as concerns about global climate change and pollution increase. This is especially true in developing countries, where unreasonable industrial structures are severely hindering low-carbon sustainable development. In 1987, the United Nations Brundtland Commission defined sustainable development as meeting the needs of the present without compromising the ability of future generations to meet their own needs (UNBC 1987). In industrializing countries, the share of industrial production in their GNP is rapidly increasing (Peter et al. 2006). Therefore, it is not surprising that this accelerated industrialization, which requires a dramatic transformation of the industrial sector, has given rise to some serious environmental problems (JEC 2003).

For most developing countries, modernization is considered a primary aim and, therefore, rapid economic growth is necessary to meet these goals, but this increased growth has resulted in an equal growth in carbon emissions, mainly because energy technologies are significantly underdeveloped. However, protecting the global environment is the duty of all people, it is impractical to require developing countries to reduce carbon emissions by sacrificing economic development (Zhang 2009; Ma et al. 2012). Therefore, to find a practical method for developing countries to take part in protecting the global ecological environment while continuing to develop their economies, it is important that they develop their own specific ecological economics (Shi 2002).

China, as one of the economically most expanding countries in the world, has dramatically improved its living standards (Jin 2011; Liu et al. 2010). China's economy has enjoyed average growth rates close to 9 % over the last

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