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研究论文

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低碳生态城市发展水平评价的新模型及应用——以天津市为例

Development evaluation model of low-carbon eco-city and its application: A case study in Tianjin关键词: [天津市](#) [低碳生态城市](#) [最大信息熵\(MIE\)](#) [\$\xi\$ 值](#)基金项目: [国家自然科学基金\(No.71071110, 71273185\)](#)

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摘要: 把低碳生态城市考虑成一个包含众多相互耦合的组元的非线性复杂系统,建立起一个评价低碳生态城市发展水平的最大信息熵(MIE)模型,计算了 ξ 参量及系统演化动力学方程,其中, ξ 参量是低碳生态城市系统组元间相互耦合形成的结构模式,表征系统发展水平的高低.同时,对2007—2011年间天津市低碳生态城市发展水平进行了评价.结果表明,2007—2011年天津低碳生态城市发展水平逐渐提高,而以 ξ 值来度量的环比增长速度在2008年达到最大值6.96%. ξ 值各分量的雷达图表明,交通系统的完善、第三产业的发展 and 固定资产投资规模的增大是5年间这一低碳生态城市系统发展的主要推动因素. ξ - x_t 的拟合结果显示,指标的实际值与理论预测值间的误差比较小,证实了MIE模型可以用于低碳生态城市发展水平的预测;与灰色预测法的比较表明,MIE模型可以更准确地对低碳生态城市的发展水平进行评价.本文最后讨论了MIE模型在低碳生态城市发展水平评价上的特点及优势.

Abstract: By considering low-carbon eco-city system as a nonlinear complex system coupled with numerous indexes, Maximum Information Entropy (MIE) model was established to evaluate the development level of low-carbon eco-city. Parameter ξ and system evolutionary dynamics equation were calculated. ξ was the system structure pattern coupled with low-carbon eco-city indexes that characterized system development level. Then development level of Tianjin low-carbon eco-city in 2007—2011 was evaluated. Results showed that the development level of this system increased gradually in 2007—2011, with the maximum growth rate of 6.96% measured by ξ values in 2008. Based on the radar chart partial ratio of ξ values, we concluded improvement of the traffic system, development of the third industry and investment in fixed assets were the major factors driving the development of the complex system during the five years. ξ - x_t fitting results showed that the error of actual index value and theoretical prediction value was small which confirmed MIE model could be used for predicting low-carbon eco-city development level. Comparison with grey prediction method indicated that MIE model evaluated low-carbon eco-city development level more accurately. It was concluded that MIE model was advantageous in the development level evaluation of low-carbon eco-city.

Key words: [Tianjin](#) [low-carbon eco-city](#) [maximum information entropy \(MIE\)](#) [\$\xi\$ value](#)

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