地理学报(英文版) 2004年第14卷第3期

Geographical distribution of ecological footprint and sustainability analysis for Liaoning Province

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This paper presents the detailed results and analyses on the ecological footprints and bio-capacities of the individual cities and the province as a whole for the year 2001, providing a clear picture of sustainability for the province. Results show that the ecological footprints of most cities in Liaoning exceeded their respective bio-capacities, incurring high ecological deficits. The ecological deficit of the province as a whole was 1.31 ha/cap. Those cities with resources extraction and/or primary material-making as their major industries constitute the "ecologically black band", whose ecological deficits ranged from 2.45 to 5.23 ha/cap, the highest of all cities in the province. Fossil energy consumption was the major source of footprint amounting to 1.63 ha/cap at the provincial level, taking up 67.3% of the total. For cropland, modest ecological surpluses occurred in Jinzhou, Tieling, Huludao, and Panjin while modest ecological deficits in Dalian, Benxi, Fushun, and Dandong, resulting in an overall surplus for the province. Liaoning had a certain level of surplus in fishing ground (water area), mainly distributed in the coastal cities of Dalian, Panjin, Huludao, Yingkou, Jinzhou, and Dandong. Most cities had a small ecological deficit in pasture and all had a small ecological surplus in forest. The eco-efficiency, expressed as GDP value per hectare of footprint, exhibits high variations among the cities, with the highest (Shenyang) more than 10 times the lowest (Fuxin). Cities with manufacture, high-tech, and better developed service industries had high eco-efficiency, while those with resources extraction, primary material-making, and less developed service industries had low eco-efficiency. Based on the components and geographical distribution of ecological footprint, strategic policy implications are outlined for Liaoning´s development toward a sustainable future.

Paper（PDF）

关键词： Liaoning; sustainable development; ecological footprint; bio-capacity doi: 10.1360/gs040306