基于能值分析的山西省生态经济系统可持续发展评价

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摘 要: 运用能值理论与方法, 对山西省 1980—2008 年的净能值产出率、能值投入率、人均能值用量、能值货币比率、能值使用强度、环境负荷率、可持续发展能值指数(ESI)和人口承载量等 8 个指标 29 a 来的变化趋势进行了分析, 并对各项能值指标 2012 年的数值进行了预测。结果表明, (1) 29 a 来山西省的能值投入率、人均能值用量、能值使用强度不断上升, 能值货币比率则持续下降, 表明山西省经济得到了巨大的发展; (2) 29 a 来山西省净能值产出率、可持续发展能值指数不断下降, 环境负荷率不断升高, 说明山西省经济的发展是以大量消耗资源和破坏环境而取得的; (3) 按各项能值指标的变化趋势曲线对 2012 年山西省能值指标预测的结果表明, 若按以往发展模式, 山西省产品竞争力将下降, 资源环境和生态经济系统的功能将逐步退化或散失。

关键词: 能值分析; 生态经济系统; ESI; 山西省
文献标识码: A 文章编号: 1000-288X(2011)03-0175-05 中图分类号: F301.2

Assessment of Sustainability in Eco-economic System in Shanxi Province Based on Energy Analysis

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Abstract: Based on the energy theory and its analysis methods, the changing trends of the 8 energy indices [energy yield ratio(EYR), energy investment ratio(EIR), energy used per person(EUPP), energy dollar ratio(EDR), energy density(ED), environment loading ratio(ELR), energy-based sustainability index(ESI) and population carrying capacity(PCC)] in Shanxi Province from 1980 to 2008 were analyzed, and the numerical values of the eight indices were also predicted for the year 2012. The results were summarized as follows. (1) The EIR, EUPP, ED increased continuously, while the EDR decreased during the past 29 years, indicating that the economic system of Shanxi Province have been highly developed. (2) The EYR and the ESI decreased continuously, while the ELR continued rising during the past 29 years, indicating that the quick development of the economic system in Shanxi were at the expense of substantial resources consumption and environmental damage. (3) The energy indices predicted for Shanxi in 2012 according to the changing trends showed that if Shanxi continues with the same development model, the competitiveness of production will decline and the pressures to the environment will increase, leading to the irreversible degradation or loss of function in the eco-economic system.

Keywords: energy analysis; eco-economic system; ESI; Shanxi Province

20 世纪 70 年代以来, 以美国 H. T. Odum 为首发展起来的能值分析(emergy analysis, EMA)理论, 克服了传统经济统计方法和能量分析中不同类别能量难以在统一尺度上比较的缺陷, 将生态学与经济学相结合, 日益成为研究区域生态经济系统可持续发展的重要手段[1]。能值是从体现能发展的度量标准, 定义为某种类别能量包含的另一种能量之量, 称为该能的能值。生态系统和复合的生态系统中各种不同性质的能量均来自太阳, 故可用同一标准的太阳能值来衡量和表达; 能值为系统的定量分析提供了共同的数量标准, 是生态学与经济学交叉联系的桥梁。

20 世纪 80 年代, 关于能值分析理论和方法的介绍被引入我国, 蓝盛芳等[2]对其进行了一系列的研究, 许多学者已将其运用到了不同的领域[3-4], 但对矿

收稿日期: 2010-08-13 修回日期: 2010-11-22
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