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研究报告

翁异静,邓群钊,杜磊,刘晓玉,周敏.基于系统仿真的提升赣江流域水生态承载力的方案设计[J].环境科学学报,2015,35(10):3353-3366

基于系统仿真的提升赣江流域水生态承载力的方案设计

Project design to improve water ecology carrying capacity of Ganjiang River Basin based on system simulation关键词: [水生态承载力](#) [复合生态系统](#) [系统动力学](#) [政策设计](#)基金项目: [国家自然科学基金\(No.71461019\)](#); [流域水生态功能分区与水质目标管理技术研究示范项目\(No.2008ZX07526-004\)](#); [江西省教育厅科技项目\(No.GJJ09033\)](#)

作者 单位

翁异静 浙江科技学院经济与管理学院, 杭州 310023

邓群钊 南昌大学管理学院, 南昌 330031

杜磊 浙江中医药大学学工部, 杭州 310053

刘晓玉 天津大学管理与经济学部, 天津 300072

周敏 南昌大学外国语学院, 南昌 330031

摘要: 保护和改善流域水生态环境已成为环保工作的重要内容和科学研究的重要课题.基于承载力理论和复合生态系统理论,构建了赣江流域水生态承载力系统的概念模型、主导结构模型和系统动力学模型.以2000-2030年为系统仿真区间,仿真结果表明,到2016年赣江流域水生态承载力达到上限,此时可承载人口规模为2566万人,可承载经济规模为11034亿元.赣江流域水生态承载力现状不容乐观,需采取一定的措施.以"节流"、"控污"、"治污"为问题导向,基于"供给管理↔需求管理"、"末端治理↔根源治理"、"观念调节↔行为调节"等公共政策设计的不同视角,初步提出了提升水生态承载力的27个政策干预点,通过政策干预点对系统作用的灵敏性检验,基于识别出的16个灵敏政策干预点,设计了提升赣江流域水生态承载力的综合发展方案.仿真结果表明,到2029年(推后13年)赣江流域水生态承载力达到上限,此时可承载人口规模为2702万人(提升了5.3001%),可承载经济规模为28547亿元(提升了158.7185%),降低人口增长和经济发展速度,提高技术进步和优化产业结构是提升赣江流域水生态承载力的重要途径.

Abstract: Protection and improvement of water ecological environment of a river basin have become an important subject of environmental protection and a hot topic of scientific research. Based on theories of carrying capacity and complex ecosystem, this paper established the conceptual model, dominant structure model and system dynamics model of the water ecological carrying capacity system in the Ganjiang River Basin. Simulation results in the period 2000-2030 showed that the water ecology carrying capacity of Ganjiang River Basin reaches the upper limit by 2016, with population of 25.66 million and economy amount of 1.1034 trillion RMB yuan. These illustrated that the current situation of water ecological carrying capacity is not quite optimistic, and actions are needed to improve the water ecology carrying capacity of Ganjiang River Basin. With the targets of water conservation, pollution control and pollution governance in river basin, this study proposed 27 policy intervention points preliminarily to improve the water ecology carrying capacity from different perspectives of public policy design, such as supply management and demand management, end treatment and root treatment, and idea adjustment and behavior adjustment. Through sensitivity test of policy intervention points affecting on the system and based on 16 sensitive policy intervention points identified, the comprehensive developmental project was designed for promoting the water ecology carrying capacity of Ganjiang River Basin. Simulation results showed that, Ganjiang River Basin water ecological carrying capacity would reach the upper limit by 2029 (13 years onwards), with population of 27.02 million people (up 5.3001%) and economy amount of 28,547 billion RMB yuan (up 158.7185%). Reduction of population expansion and economic development rates and promotion of advanced technologies and optimization of industrial structure are the key strategies to improve the water ecology carrying of Ganjiang River Basin.

Key words: [water ecology carrying capacity](#) [complex ecosystem](#) [system dynamics](#) [policy design](#)

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