报告 5

基于大数据的湘江流域环境质量动态评价与影响因素分析

Environmental Quality Dynamic Assessment and Influencing Factor Analysis of Xiangjiang River Basin Based on Big Data

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报告摘要 Abstract

随着湘江流域经济社会的高速发展，水环境污染、水生态破坏以及由此造成的对人体健康的影响等问题日益突出。本团队利用湘江流域近 10 年来的环境监测和经济社会、气候水文数据，开展了基于大数据的湘江流域环境质量动态评价和影响因素研究。提出了基于证据推理的水质综合评价方法，利用水质监测大数据对湘江干流和支流水质进行了综合动态评估；应用聚类分析和主成分分析，找出流域水质中的主要污染物构成；运用空间面板回归模型，研究了经济发展对水质环境的影响。研究结果表明，湘江流域「十二五」期间水质优于「十一五」期间，国控断面优于省控断面；不同断面主要污染物以重金属镉、砷、铅和有机物氨氮、总磷氧为主；水质综合评估结果与人均 GDP 显著正相关，与城市化率、人均粮食产量等显著负相关。本研究为湘江等流域的水环境保护与治理提供了重要的决策依据。下一步的研究将进一步采用大数据的研究方法，综合考虑环境、生活习惯、遗传等因素对人体健康的影响，分析环境污染动态时空特征及其对慢性疾病的影响机制，并对面向环境致慢病的个性化健康风险评估与干预机制、基于大数据的慢病医疗推荐方法以及精准慢病医疗保险产品设计进行研究。最后，结合实际对相关成果进行应用。

With the rapid development of economy and society in Xiangjiang river basin, water environmental pollution and ecological destruction, as well as its resulting impact on human health are becoming more and more severer. By using environmental monitoring data and social economy, climate and hydrological data of nearly 10 years in Xiangjiang river basin, our team carried out dynamic evaluation and influencing factors analysis in Xiangjiang river basin based on big data. Adopted evidential reasoning method, we proposed water quality comprehensive evaluation method, made comprehensive dynamic evaluation on the water quality of main stream and tributaries of Xiangjiang river using water quality monitoring big data. Through cluster analysis and principal component analysis, we found out the main pollutants that influence the river water quality. Using space panel regression model, we studied the impact of economic development on water quality. The research results show that the water quality in Xiangjiang river basin during the "twelfth five-year plan" is better than that of "11th five-year plan" period, the water quality at state controlling sites are better than that of provincial controlling sites. The main pollutants in different section are heavy metal cadmium, arsenic, lead, and ammonia nitrogen and total phosphorus organic matter. Water quality comprehensive assessment results are significantly positive correlated with GDP per capita, and significantly negative correlated with the urbanization rate, grain output per capita. This study provided important decision making basis for water environmental protection and governance in Xiangjiang river basin. Further research will continuously adopt big data research method, fully considering the influence of environment, living habits, and genetic factors on human health, analyze dynamic temporal-spatial characteristic of environmental pollution and its impact mechanism on chronic diseases, environmental affecting personalized health risk assessment and intervened mechanism, chronic diseases medical recommendation and precision chronic disease medical insurance product design based on big data, and finally, combine related research work with actual application.