

An Integrated Decision Support System for Developing Rural Eco-Environmental Sustainability in the Mountain-River-Lake Region of Jiangxi Province, China



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EXECUTIVE SUMMARY

Sustainable development has been widely recognized across the world as an optimum means for harmonizing human society and natural systems. It is being extensively examined in China to mitigate the intensive conflict between economic development and environmental protection. In the past two decades, most of the ecosystems in China have been impaired along with the accelerating economic development. Numerous events and studies have proved that the destruction of natural resources and deterioration of the environment could be disastrous for future eco-society development. In the Mountain-River-Lakes (MRL) project area in Jiangxi Province, China, the population growth and economic development have exerted significant pressure on the local ecosystem. Since a large number of counties in this area are among the poorest regions in China, to boom the local economy has become the priority in the provincial strategic plan. The accelerating development could bring potential threats to the deteriorating ecosystem if there is a lack of more effective management for protecting the environment. However, satisfying the socio-economic needs of the area without compromising the environmental quality or ecological health is a challenging task. It is thus desired that more studies on the links between economic development, poverty alleviation, and environmental protection be advanced for supporting rural sustainability development.

Over the past decades, many efforts have been made to clarify the concept of sustainable development and to develop related theoretical and practical options. Most of these efforts focused on developing well-designed decision support system to facilitate planning and decision-making of maintaining rural economic and environmental sustainability. However, there is still a lack of effort in developing effective tools that can integrate simulation of the social-economic behaviors and environmental processes, optimization of resources allocation, visualization of spatial and temporal dimensions of socio-economic and environmental interactions, and analysis of associated uncertainties into a general framework. This leads to difficulties for decision makers to gain an in-depth insight into complicated interrelationships between economic development, poverty alleviation and environmental protection. Therefore, this project aims to develop

a GIS-aided dynamic distributive database and a multi-objective decision-making system to balance the conflicts between rural economic growth and environmental protection for supporting the local sustainable development. The Yongxin County was selected as the pilot demonstration area. In detail, the major tasks of the project include:

- (1) Characterizing the study system through public involvement, field surveys, and data acquisition, as well as analyzing the collected data through multi-parameter methodologies.
- (2) Exploring water resource availability through distributed hydrological modeling.
- (3) Developing an integrated optimization system that comprehensively considers socio-economic and environmental factors to support decision making for local sustainable development.
- (4) Developing a GIS-aided database system to dynamically integrate various information and data to graphically interpret the planning alternatives and the proposed decisions.
- (5) Designing a user-friendly interface to realize the participation of stakeholders and the public during planning and decision-making processes; this helps achieve the goal of economic and environmental sustainability for the area.

The system coordinates economic development and environmental protection in an effort to promote poverty alleviation. Through the use of information collection and management, public participation, process simulation, and system optimization, a variety of scenarios are compared. The basis of this system relies on the integration of a number of methodologies and techniques in order to provide an important framework for the realization of poverty alleviation, environmental protection and economic development. The case study in the Yongxin County provides a good opportunity to study the conflicting relationship between socio-economic and ecological development. The developed system provides effective solutions to address the above issue and generate reliable and feasible supports for the related decision making processes, in order to harmonize the future development of the local economy and ecosystem.

This report consists of 7 chapters. Chapter 1 is an introduction. Chapter 2 provides the background of this project and the study area. Chapter 3 presents the project framework. A distributed hydrological modeling system for supporting the planning is

given in Chapter 4. Chapter 5 describes optimization approaches for rural eco-environmental planning. Chapter 6 provides an integrated decision support system for supporting rural sustainable development in the Yongxing County. Finally, Chapter 7 is devoted to a summary of this project and some recommendations based on the study efforts.

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