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Defining and Evaluating the Comprehensive Value of Water Resources in Yellow River Basin

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Abstract: The study on the comprehensive and sub-item value of water resources have important guiding significance for deepening the reform of water price and perfecting the method of water rights allocation. In view of the water resources characteristics in Yellow River Basin, the role of water resources in the national economy production, agriculture, social security, social stability and the healthy maintenance of ecological environment system was analyzed. Besides, the definition and connotation of comprehensive and sub-item value of water resources are discussed based on the function and utility theory, the comprehensive value of water resources is divided into economic value, social value and eco-environmental value.

Energy flow and connotation within a combined eco-economic system is analyzed, and an emergy analysis method for ecological economics is introduced for unified quantification, then put forward an emergy accounting method of the water resources comprehensive value. Collecting the water resources data of Yellow River Basin and the inputs and outputs of water resources eco-economic system is analyzed, the energy system diagram and emergy comprehensive diagram of the basin's water resources eco-economic system were constructed. The economic, social and eco-environmental value and their comprehensive value of water resources in different sub-regions or administrative regions are evaluated.

According to the time scale, using the economics, sociology, ecology research methods (e.g., marginal opportunity cost model, fuzzy mathematical models, social system theory and the energy flow analysis), the comprehensive and sub-item value of water resources is calculated, and the changing rules of the comprehensive and sub-item value in different regions or different uses are analyzed. In addition, the value conversion mechanism between different uses of water resources is discussed. This paper proposes that the comprehensive value of water is enormous, therefore, it should be considered by policy makers. Research of this type can be effective in helping to protect water resources and encourage efficient water use.

Keywords: comprehensive value of water resources; eco-economic system; contribution rate of water resources; emergy evaluation