



Development of water allocation Model Based on ET-Control and Its Application in Haihe River Basin

Jinjun You, Hong Gan, Zhiguo Gan, and Lin Wang
China Institute of Water Resources & Hydropower Research

Traditionally, water allocation is to distribute water to different regions and sectors, without enough consideration on amount of water consumed after water distribution. Water allocation based on ET (evaporation and Transpiration) control changes this idea and emphasizes the absolute amount of evaporation and transpiration in specific area. With this ideology, the amount of ET involved the water allocation includes not only water consumed from the sectors, but the natural ET. Therefore, the water allocation consist of two steps, the first step is to estimate reasonable ET quantum in regions, then allocate water to more detailed regions and various sectors with the ET quantum according with the operational rules.

To make qualified ET distribution and water allocation in various regions, a framework is put forward in this paper, in which two models are applied to analyze the different scenarios with predefined economic growth and ecological objective. The first model figures out rational ET objective with multi-objective analysis for compromised solution in economic growth and ecological maintenance. Food security and environmental protection are also taken as constraints in the optimization in the first model. The second one provides hydraulic simulation and water balance to allocate the ET objective to corresponding regions under operational rules. These two models are combined into an integrated ET-Control water allocation. Scenario analysis through the ET-Control Model could discover the relations between economy and ecology, farther to give suggestion on measures to control water use with condition of changing socio-economic growth and ecological objectives.

To confirm the methodology, Haihe River is taken as a case to study. Rational water allocation is important branch of decision making on water planning and management in Haihe River Basin since water scarcity and deteriorating environment fights for water in this basin dramatically and reasonable water allocation between economy and ecology is a focus. Considering condition of water scarcity in Haihe River Basin, ET quota is taken as objective for water allocation in provinces to realize the requirement of water inflow into the Bohai Sea. Scenario analysis provides the results of water evaporation from natural water cycle and artificial use. A trade-off curve based on fulfilment of ecological and economic objectives in different scenarios discovers the competitive relation between human activities and nature.