

Hydrological-Economic Modeling of Two Hydrographic Basins of the Coast of Peru

Authors : Julio Jesus Salazar, Manuel Andres Jesus De Lama

Abstract : There are very few models that serve to analyze the use of water in the socio-economic process. On the supply side, the joint use of groundwater has been considered in addition to the simple limits on the availability of surface water. In addition, we have worked on waterlogging and the effects on water quality (mainly salinity). In this paper, a 'complex' water economy is examined; one in which demands grow differentially not only within but also between sectors, and one in which there are limited opportunities to increase consumptive use. In particular, high-value growth, the growth of the production of irrigated crops of high value within the basins of the case study, together with the rapidly growing urban areas, provides a rich context to examine the general problem of water management at the basin level. At the same time, the long-term aridity of nature has made the eco-environment in the basins located on the coast of Peru very vulnerable, and the exploitation and immediate use of water resources have further deteriorated the situation. The presented methodology is the optimization with embedded simulation. The wide basin simulation of flow and water balances and crop growth are embedded with the optimization of water allocation, reservoir operation, and irrigation scheduling. The modeling framework is developed from a network of river basins that includes multiple nodes of origin (reservoirs, aquifers, water courses, etc.) and multiple demand sites along the river, including places of consumptive use for agricultural, municipal and industrial, and uses of running water on the coast of Peru. The economic benefits associated with water use are evaluated for different demand management instruments, including water rights, based on the production and benefit functions of water use in the urban agricultural and industrial sectors. This work represents a new effort to analyze the use of water at the regional level and to evaluate the modernization of the integrated management of water resources and socio-economic territorial development in Peru. It will also allow the establishment of policies to improve the process of implementation of the integrated management and development of water resources. The input-output analysis is essential to present a theory about the production process, which is based on a particular type of production function. Also, this work presents the Computable General Equilibrium (CGE) version of the economic model for water resource policy analysis, which was specifically designed for analyzing large-scale water management. As to the platform for CGE simulation, GEMPACK, a flexible system for solving CGE models, is used for formulating and solving CGE model through the percentage-change approach. GEMPACK automates the process of translating the model specification into a model solution program.

Keywords : water economy, simulation, modeling, integration

Conference Title : ICIWRMD 2018 : International Conference on Integrated Water Resources Management and Development

Conference Location : Paris, France

Conference Dates : June 25-26, 2018