Geophysical Research Abstracts, Vol. 9, 08723, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08723

Assessing the marginal water values in multireservoir systems

A. Tilmant (1), D. Pinte (2) and Q. Goor (2)

(1) UNESCO-IHE, Delft, The Netherlands, (2) Université catholique de Louvain, Louvain-la-Neuve, Belgium

The International Conference on Water and the Environment held in Dublin in 1992 emphasized the need to consider water as an economic good. Although this principle is becoming more and more accepted by the international community, there is not a unified method for assessing the value of water yet, nor is there a consensus on how the water value concept should be used for decision-making purposes. This paper addresses the first issue. Most efforts have focused on measuring the value of water in certain water-using sectors, so that only the part of the water cycle nearest to the end user is recognized as an economic good. But this approach suffers from its inability to consider the valuation problem in an integrated manner. Since water is a fugitive resource, the valuation method should combine hydrological models with socio-economical models. As a matter of fact, the value of water at a certain point in space and time is equal to its value in situ plus its contribution to downstream benefits generated at later stages. This paper presents a methodology based on systems analysis for assessing the marginal value of water in multireservoir systems. The multireservoir operation problem is formulated as a large-scale optimization problem which seeks to maximize a given welfare function over a given planning period and takes the governing equations of the hydrological processes as constraints. In the absence of a water market, the Lagrange multipliers correspond to shadow prices and the marginal water values are the Lagrange multipliers are associated with the mass balance equations of the reservoirs. These water values can then be traced back in space and time as each reservoir is considered as a production unit which is connected to the other reservoirs through the system's topology, i.e. through the hydrologic connectivity. The methodology is illustrated with a cascade of reservoirs in the Sao-Francisco river basin in Brazil.