

Abstract

Integrated water resources management is a process that promulgates the development and coordinated management of water, soil and related resources in order to improving social and economic welfare. At the present study, given the criticality of Ghargum plains, integrated water resources management of Ghargum catchment considered using particle swarm optimization algorithm. Particle swarm optimization is one of the metaheuristic algorithms in optimization problems solution. Needed data as monthly time series for the years 1987-2013 was collected from Khorasan Razavi Regional Authority. Principle data was forecasted using artificial neural network and ARIMA models and the results were compared. Results of artificial neural network method were used based on the related criteria. Results showed that the most conveyance of surface water is from Sarakhs to Mashhad plain. Also, for satisfying social, economic and environmental objectives, conveyance of water must do from Torbat-e-Jam to Shahre-No-Bakhezh plain, and from Tybad to Abrah-e and Karat plains. It is notable that conveyance of water from Torbat-e-Jam and Tybad plains to Shahre-No-Bakhezh and Abrah-e and Karat plains was for consuming the inedible, and groundwater extraction should be increased for compensation the shortage of edible water in Shahre-No-Bakhezh, Abrah-e and Karat. In addition, there was not the conveyance of treated wastewater among the plains. Decreasing of 20 and 40% of Doosti dam water will not considerable effect on the conveyance of water to Mashhad city, but more than 40%, decreased. In this situation, the integrated water resources management model showed for compensation of Mashhad agriculture water, water from Fariman should be transfer to Mashhad plain, and for Mashhad edible, increasing of groundwater extraction was necessary to more than of allowable limit in the model. For achieving to this aim, water demand management in domestic consumption and changing kind of water for public consumptions suggest in Mashhad plain. Results of study in future status scenario showed that the most conveyance of wastewater should be from northeast areas of Mashhad to Narimani plain. Also the most conveyance of surface water should be from Sarakhs to Gonbadli plain, of course the most amount of this conveyance will be in June. The surface water should be conveyed from Fariman to Shahre No Bakhezh plain, and from northwest areas of Mashhad and Chenaran to southwest areas of Mashhad. In part the most conveyance of surface water is from Sarakhs plain to southwest and southeast areas of Mashhad, the most amount of this conveyance is in July, August and September. Conveyance of surface water must be from Kalat-e Naderi to Dargaz plain, the most amount of this transfer will be in August. Also, water should convey from northwest areas of Mashhad and Chenaran to northeast areas of Mashhad. Also In this study, positive mathematical programming was used to assess the scenarios of change in the amount of available irrigation water. Result showed that future status scenario with introducing new water and wastewater resources would decrease consumption of subsurface water.

Keyword: Optimization, Particle swarm algorithm, Positive mathematical programming, Artificial Neural Network, Ghargum catchment