Evaluating the Operation of Dams in the Urmia Basin using System Dynamic Approach

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Extended Abstract

Introduction
During the last half-past month, the population of the Urmia catchment area has increased 10 times, which has been accompanied by the development of agricultural land in the region and a change in the pattern of water consumption, which increased water use in agriculture from 1.8 to 5.5 million cubic meters. Considering the importance of studying dams of the basin as one of the most important factors in water resource management and planning, using this dynamic approach, the effects of various scenarios on lake water level changes, focusing on the activity of 7 main dams, and the need pattern analysis, especially in the agricultural sector, has been studied.

Materials and Methods
Since a catchment area system is large, dynamic and complex with natural and human components therefor it is very important to simulate such a system that can illustrate the complexities and interactions of variables. Considering these factors, the dynamic approach of the systems was chosen to model the surface water flow into the lake of Urmia. In the modeling of surface water subsystem, 7 exploited dams (Bukan, Mahabad, Alawian, Ghalechay, Shahrchay, Zola and Nahand) were selected on the main rivers and have the largest share in basin water regulation. The variables affecting the equation of the water bill of dams are: inflow and precipitation entering the dam, evaporation from the dam reservoir, regulating dams for drinking need, industrial, agricultural and environmental needs, the amount of overflow from dams, initial volumes and maximum and minimum volumes. Also, variables such as precipitation, evaporation, and inflow for model implementation, after collection, defects and production of time series with monthly steps for 15 years (1999-2014) were introduced to the model and for other components such as the amount of overflow Of the dams, the regulated water level and the water requirement of each dams and the total supply of water from agricultural, drinking, industrial and environmental sectors, the conditional formula IF THEN ELSE was written.

Discussion and Results
The implementation of the first scenario showed that with the use of dams, the amount of runoff entering the lake decreased from 263.68 to 97.7 million cubic meters. In order to investigate the role of agricultural development in the catchment area, which was accompanied by a change in the pattern of the need for water from dams to be exploited, the second scenario was formed to give an accurate contribution to the use of dams as well as the role of developed plans at the basin level in reducing the flow of entrances to the lake was specified. To investigate the need for water in the basin, in this scenario was assumed that if operation of the seven main dam basins was exploited with an unchanged pattern of water demand, what will happen in the inflow to the lake and the water level of the lake with the changes. The results indicate an increase in the average monthly inflow into the lake from 65.53 to 96.88 million cubic meters, which will increase the flow of 16% during the entrance to the lake. In other words, the 42% reduction in inflow was based on the results of the first scenario, 16% of which was related to the increase in the need for

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water and the utilization of these seven dams had a share equivalent to 26% in the reduction of surface flow.

**Conclusions**

In this study, the role of dams and development of water plans in the catchment area of Lake Urmia with the dynamics of systems was studied and it was determined that 26 and 16 percent of the changes in lake level are explained respectively by these two factors.

**Keywords:** System dynamic, Urmia Lake, Structure projects, Vensim model, Water requirements.
References


