

Environmental protection of the Dojran Lake catchment area

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Abstract: This paper points out the need of solving the ecological problems of the Dojran Lake and its catchment area, which mainly result from the overexploitation of water sources. The most important results of hydrogeological and hydrological investigations are presented and the vulnerability of the territory is characterized.

Key words: Dojran lake, water sources, overexploitation, ecological problems

INTRODUCTION

The Dojran Lake and its catchment area are very important sources for the public, industrial and, especially, agricultural water supply. The Dojran Lake is located in the south-eastern part of Macedonia on the border with Greece (Figure 1) at 148 m of the altitude.

The water resources of the Dojran Lake catchment area have been overexploited, which resulted in numerous ecological problems. The lake fauna and flora has been changed - many species disappeared, but some new ones appeared that had not been typical for that environment before. The surface of the lake occupied 42.5 km² in the past, from which 27.1 km² belonged to Macedonia and 15.8 km² to Greece^[1]. The length of the lake was 9 km, its width was 7 km, while the maximum depth was 10 m. Because of the many years' overexploitation the surface of the Dojran Lake and its maximum depth reduced to 30.3 km² and 3 m respectively^[1]. Hence it follows that the shore of the lake was enlarged. The new dried shore surfaces are covered by numerous shells and mud peloid sediments^[2].

This paper points out the need of solving the ecological problems of the Dojran Lake catchment area. It presents

- a) the most important results of hydrogeological and hydrological studies, and
- b) the vulnerability characterisation of the territory that is a prerequisite for its sustainable development.



Figure 1. Location of the study area

RESULTS AND DISCUSSION

The Dojran Lake was formed in the Neogen-Quaternary, on the main tectonic structure that represents a border between the Serb-Macedonian Mass and the Vardar zone^{[3], [4]}. The surface water and the groundwater that springs out on its bottom recharge the lake^{[1], [5]}. The hydrogeological characteristics of groundwater reservoirs depend on regional natural factors of the Dojran basin, such as geological-tectonic, weathering and climatic conditions, as well as on human activities. The level of the lake oscillates according to the climate conditions and, particularly, the water exploitation.

The exploitation of the lake started in 1808, during the Otoman Empire, when a 1300-m long canal was dug out for irrigation purposes, which made it possible for the Dojran Lake water to flow into the catchment area of the Vardar river (Figure 1). Afterwards, the pumping wells were made in the catchment area of the Dojran Lake for groundwater supply.

The oldest data on the Dojran Lake level is from 1810^[1]. At that time it was registered at 150 m a.s.l. Owing to the overexploitation of the Dojran Lake catchment area, the level of the lake has begun to decrease drastically. It reached 148 m a.s.l. in 1952, which caused alarm between Macedonian and Greek authorities^[1]. Consequently, the ecological minimum level of the lake was fixed to 147.34 m a.s.l. in 1956^[1]. Unfortunately this ecological minimum was ignored, especially in the period 1974-1988 and later on, which led to an ecological catastrophe (Figures 2 and 3). In 1988 the level of the lake was 0.66 m below the ecological minimum^[1], while the further overexploitation resulted in the level decrease to 2.5 meters below the ecological minimum^[6].

The project Salvation of the Dojran Lake began on 8 September 2002 (Macedonia national day) with an obvious view to protection the Dojran Lake catchment area. It is planned with that project to supply the water from 15 wells in the Gjavato Pole area to the Dojran Lake^[6]. The hydro-system, which includes 20 km of pipelines and 3 water basins, will be used for that purpose. This system could additionally supply 1000 l/s of water to the Dojran Lake,

which is 10 times more than the recharge of the lake in 2002^[6]. It is provided that at these conditions the Dojran Lake should be fully replenished in 8 years^[6]. However, it was estimated that without the described enrichment the lake could dry up within 15 years^[6].

CONCLUSIONS

The main facts related to the ecological problems of the Dojran Lake catchment area are discussed in short. The overexploitation of the lake is brought into the focus. Hence, the most important results of hydrogeological and hydrological investigations are presented and some directives are submitted that should define the optimum criteria for management and protection of the investigated region, which should provide sufficient quantities of quality water.



Figure 2. Dojran lake with a fisherman hut

The performance of additional hydrogeological investigations is recommended in the catchment area of the Dojran Lake in the future in order to determine the present conditions of the surface water and groundwater reservoirs. It is essential to propose a project, which should provide cooperation between Greek and Macedonian experts. Concerning that it should be stressed that Macedonia and Greece governments still have not sign an official agreement on protection of the Dojran Lake^[6].



Figure 3. Dojran lake in 1998 in a state of ecological devastation with a fisherman hut in the grassy lake beach

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