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Conceptualization of a Brackish Coastal Karst System: Implications For Resilience of a Groundwater Dependent Wetland

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The Gokova wetland located on the coast of the Aegean Sea in western Turkey is dependent on groundwater and is under protection by the Ministry of Environment. The wetland occurs along a brackish springs zone discharging from a karstified carbonate rock aquifer. The coastal springs are situated along fault located at the northern side of the Gokova graben. The spring outlets are located in the allocthonous carbonate rocks. Hydrogeological studies revealed that the recharge area extends far beyond the outcrops of the allocthonous units and includes a large portion of the authocthonous karstic rocks. The total discharge rate of the springs is measured as about 10 m^3/sec. The spring water is slightly brackish with an average total dissolved solids of 3000 mg/l. The mean values of the temperature, specific electrical conductivity, pH and salinity were measured to vary between 14-17 ^oC, 1800-11000 μS/cm, 7.3-7.6 and % 0.09-0.6, respectively.Water scarcity in the region leads the authorities to develop projects toward desalination of this brackish water for use. However, dependence of the wetland on the groundwater requires assessment of resilience of the wetland ecosystem. An accurate assessment of resilience of groundwater dependent wetland requires first a thorough understanding of the hydrodynamic interactions between the wetland and the groundwater supplying aquifers. This can be achieved by hydrogeological conceptualization on the basis system approach. The Gokova wetland constitutes as system interacting with a karstic aquifer, in alluvial aquifer and the sea water. The complex hydrodynamics makes the problem more complicated. It is important to assess the impact of natural (such as climate change) and anthropogenic (such as derivation of some of the water for desalination) effects on the wetland ecosystem, prior to any development of the brackish springs. The amount of brackish water that can be diverted should be calculated on the basis of how resilient the ecosystem is against this change. It should be noted that distance from the sea does not control the salinity of individual springs. The sea water ratio of each spring was calculated based on chloride balance. The fresh water ratio of about 28% of the sea water in the Gokova Bay indicates that a significant volume of fresh water is discharging into the bay. Temporal change of sea water ratio in the Azmak stream is depicted in terms of chloride content and percentage of sea water. As concluded from the budget calculations approximately 55% of the coastal fresh water discharge is supplied from the authocthonous carbonate rocks, while 35 % and 10 % is discharged from the allocthonous carbonate rocks and alluvium respectively.

This paper outlines the hydrogeological, hydrochemical and isotopic studies carried out to understand. The salinization mechanism and to conceptualize this complex ecohydrologic system.