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Options for managed aquifer recharge of karst aquifer of Vis island (Croatia)

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Vis, a small remote island in the Adriatic Sea, inhabited since the time of ancient Greeks and Romans, exhibits a unique historical and natural environment. With an area of 89.7 km^2, the island is mostly composed of karstified carbonate rocks and belongs to Dinaric karst region, locus typicus for karst landforms. Its distance from the mainland is around 50 km from the city of Split, 147 km from the Italian coastline and 18 km from neighbouring Hvar island. The climate on the island is Mediterranean with dry and hot summer and mild, rainy and humid winter (Csa). Vis island, due to its remote location, is not connected to the mainland by submarine water pipeline so it has autonomous water supply due to favourable geological and hydrological conditions which enabled the formation of excellent karst aquifers. The majority of water is abstracted from drilled wells in the central part of the island (Korita extraction site), around 40 l/s, while additional quantities are obtained from coastal spring of Pizdica. Although predominantly of good quality, existing groundwater quantities on Vis are extremely vulnerable to the effects of climate change, namely increase in temperature, quantitative and temporal variability in precipitation trends as well as seawater intrusion. Moreover, Vis island is an attractive location for summer bathing tourism which causes the highest pressure on drinking water resources precisely during the hydrological minimum. An idea to apply artificial recharge of karst aquifer on Vis emerged during the 1970s, however, only on the theoretical level.

Through the scope of the DEEPWATER-CE project, funded by Interreg Central Europe Programme, the aim is to develop implementation frame for managed aquifer recharge (MAR) solutions. Simplified, MAR is a process by which excess surface water is directed into the ground — either by spreading on the surface, by using recharge wells, or by altering natural conditions to increase infiltration to replenish an aquifer (DILLON et al., 2019). Globally, various designs of MAR schemes have successfully been implemented in unconsolidated aquifers, but there is little experience with artificially recharging karst aquifers (ROLF, 2017). A particular challenge for the technical implementation and operation of MAR is posed by strong hydraulic anisotropy and heterogeneity of karst aquifers and by their high vulnerability to contamination (XANKE, 2017). To investigate whether a MAR operation is feasible and suitable for karst aquifer on Vis, a detailed field and laboratory investigations were carried out. Field investigations included in-situ measurements of physicochemical parameters on water samples from springs and boreholes, groundwater monitoring (conductivity, temperature and water levels), geophysical methods (ERT,

magnetotellurics, and seismic refraction) and structural measurements. Laboratory analyses included measurements of stabile water isotopes, and principal cations and anions. Hence, by conducting extensive investigations, coupled with historical data and previous research, a foundation for implementing efficient and sustainable management of karst aquifer through MAR on Vis island will be provided.