

Coupled human-water system dynamics of saltwater intrusion in the low coastal plain of the Po River, Ravenna, Italy

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Human activities affect the whole hydrological cycle with possible severe consequences on ecosystem services. Human-water interaction follows complex dynamics that can't be addressed only through the analysis of water withdrawals and contamination processes. As such, comprehensive analysis strategies based on a socio-hydrology approach may allow to deeply understand the co-evolution of human and water systems. Here, we focus on the low coastal plain of the Po river in the south of Ravenna (Italy), which is adjacent to the North Adriatic sea. In particular, our study regards a basin characterized by a land reclamation drainage system, given the low topography which reaches in some places 1 m below sea level. In this area, the thin phreatic coastal aquifer is affected by a relevant salinization process and characterized by the presence of valuable water-dependent ecosystems such as pine forests and wetlands. Groundwater salinization is mainly caused by seawater intrusion due to the hydraulic gradient landwards that is enhanced by land subsidence, land use and drainage allowing for agriculture and settlements. Such a complex scenario involves environmental, social and economic interests. We study the intricate system of relationships occurring between a set of socio-hydrological state variables of interest based on the dynamic analysis of land use changes in the study area that mainly affect groundwater recharge and the availability of freshwater for ecosystem and agriculture activities.