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System-Dynamic models for groundwater management in SW Messinia, Greece.

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The EUs Water Framework Directive, was adopted on October 2000, and it has been the basis for water management in all the EU countries since then (EU-WFD, 2000). According to the EUs-WFD, the use of groundwater bodies can be considered as sustaibale only when the portion of the overall recharge not needed by the ecology is abstracted (EU-WFD, 2000). Nonetheless, there are still cases where the implementation of the EUs-WFD faces challenges, and there is a need to better communicate the above message to water users. But how can we achieve this at a local scale?

In this work, we present the example of SW Messinia, Greece, an interlinked coastal-inland area in the Eastern Mediterranean region. In this case study, the water supply for all water uses (agriculture, tourism, domestic use) depends on groundwater resources which are also the main freshwater provider to a coastal wetland with high ecological and commercial value (Birds directive 2009/147/EC; Habitats Directive 92/43/EEC). Due to man-made interventions over the last 70 years, the wetland has passed the tipping point of being brackish (Maneas et al., 2019), and at present it is characterized as saline with hypersaline conditions for nearly 30% of the year (Manzoni et al., 2020). Unless freshwater inputs are enhanced by restoring hydrologic connectivity between the wetland and the surrounding freshwater bodies, salinity in the lagoon is expected to increase even more under future drier and warmer conditions (Manzoni et al., 2020). But how can we balance between societal and ecological groundwater needs, and how future decision making can get a broader acceptance by the society?

Under COASTAL EU project (COASTAL, 2019), we use System Dynamic (SD) models for communicating with local stakeholders towards improving land-sea interactions. In this work, we present a model which describes how inland groundwater abstraction has impacts to the wetland's salinity. The model is used as a basis for a discussion with stakeholders and the co-creation of sustainable decision making with broader acceptance.

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