DATASET

Groundwater salinization and leaching assessment tool: a holistic approach for coastal areas.

Water4All
Water security for the planet

Abstract

Coastal areas are invaluable ecosystems with pivotal resources for economic and societal development. Salinization processes of freshwater resources from both natural and anthropogenic sources are the most alarming and widespread issues in coastal areas, in Europe and worldwide. Recent studies show that these issues will be further exacerbated due to the ongoing climate changes and more frequent hydroclimatic extreme events. Moreover, increasing urban sprawl in coastal area, where 2.15 billion people are already living, triggered radical changes generating a severe demand for natural resources, exacerbated by a lack of planning and management.

The overall goal of DATASET is to develop an efficient tool to assist in protection and regulation of water resources use and management in coastal aquifers. To do so DATASET aims at achieving the following objectives:

- Develop and apply a method to create vulnerability maps throughout a holistic assessment of coastal aquifers coupling the evaluation of agricultural leaching and salinization processes in a single methodology to improve water governance aimed at early warning, prevention, and mitigation of groundwater quality degradation in the present and future conditions, accounting for impacts of climate change and hydroclimatic extreme events.
- Promote a paradigm shift in water management, through internet access to data and models, dissemination of management tools for planning and societal implication and their transfer to stakeholders.
- Promote social awareness on the importance of groundwater and its sensitivity to climate change and hydroclimatic extreme events from stakeholders and decision makers to end users.

DATASET deals with the "Topic 2. Tools for water management - in the context of hydroclimatic extreme events" and specifically with the subtopic 2.2: Generating new methodologies, tools, and models for water resources assessment/modelling for water bodies in scarcely monitored/data scarce areas. A combination of physical and digital solutions is expected, and opportunities provided by citizen science should be seized. DATASET relies on five pillars:

- Easy: To ensure DATASET easy applicability, the methodology will retain the GIS overlay index structure with parameters, rates, and weights. The key features of the aquifer system will be represented through thematic maps in GIS using raster format and then overlaid producing vulnerability maps representing the spatial aggregation of weighted parameters.
- Open: Data availability is a major drawback in building a groundwater vulnerability assessment map. However, over the past 20 years, several continental and global scale models have been developed. DATASET aims to evaluate the suitability of these models' products as potential input to the implementation of groundwater vulnerability assessment, through a deep quality check of input data and datasets, reducing the dependence on local data.
- Reliable: To address model reliability and uncertainties, the weights and rates classification will be achieved using artificial intelligence algorithms trained and tested using water quality data.
- Flexible: The operator will be able to choose whether to produce a vulnerability/risk map only for salinization processes, only for agricultural leaching, or considering both processes in a single assessment. Operators will have the opportunity to turn specific parameters on/off and choose the correct sets of weights and rates based on the final evaluation objective.
- Dynamic: The possibility to access climate data including precipitation, temperature, and evapotranspiration from freely available datasets, both for historical or future period, will allow to forecast the impacts of climate change and hydrological extreme events on groundwater resources which could negatively influence water availability and quality. Then, the possibility to model different land use scenarios will offer the chance to easily identify those areas where to apply specific remediation actions to counteract negative impacts.

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