XL cycle PhD Course, Academic Year 2024/2025

"MODELS AND METHODS FOR MATERIAL AND ENVIRONMENTAL SCIENCES"

Artificial groundwater recharge in the Emilia Romagna Region:
identification of suitable sites, actions and effectiveness evaluation in a climate-change scenario

University of Modena and Reggio Emilia

Mainini Alessio

PhD Abstract

Managed aquifer recharge (MAR) is a deliberate aquifer recharge for various interconnected purposes including managing water supply, and restoring aquifer or ecosystem restoration (Dillon et Al., 2022). In the last decades, several European countries have promoted MAR as a key measure to mitigate climate change effects such as drought and flooding. In this context, the Emilia Romagna region funded this scholarship to increase the knowledge about the MAR application in Emilia Romagna. The Managed Aquifer Recharge involves superficial hydrological bodies (e.g. Lakes, Rivers) and underground hydrogeological bodies (aquifers). These bodies need to respect quality parameters according to Emilia Romagna legislation, mainly contained in D.M. 100/2016 and in P.T.A. 2030 (Piano di Tutela delle Acque).

Therefore, **the first step** of PhD project is to evaluate Emila Romagna's hydrogeological bodies to understand which bodies could be involved by MAR. Particular attention should be given to the basin-margin area, the natural recharge zone for Emilia Romagna aquifers, where alluvial fans are amalgamated.

During **the second step**, a stratigraphical and hydrogeological characterization will be carried out for the hydrogeological bodies selected. Following a selection and evaluation of suitable sites above hydrogeological bodies were selected, partially using previous studies made by Emilia Romagna region during the last few years.

Suitable suites will be evaluated through evaluation parameters (resulting from stratigraphic and hydrogeological characterization) to give comparison values for each site. The foreseeable output is a suitable site ranking where Managed Aquifer Recharge technologies could be applied.

The **third step** deals with the planning of MAR technologies for one or more sites selected. The design includes the water source capture, the recharge method, and engineer solutions focused on clogging prevention. In the end, simulations about MAR applications will be carried out to understand the variations in the flow model, the volume and time of recharge, and potential risk.

Bibliography

- DILLON et Al., 2022_Managed Aquifer Recharge: Overview and Governance. IAH Special Publication.https://recharge.iah.org/ ISBN 978-1-3999-2814-4
- D.M. 100/2016. Gazzetta Ufficiale
- P.T.A. 2030 _ Piano di tutela delle acque, Regione Emilia-Romagna. Piano di Tutela delle Acque 2030 - Documento strategico.pdf