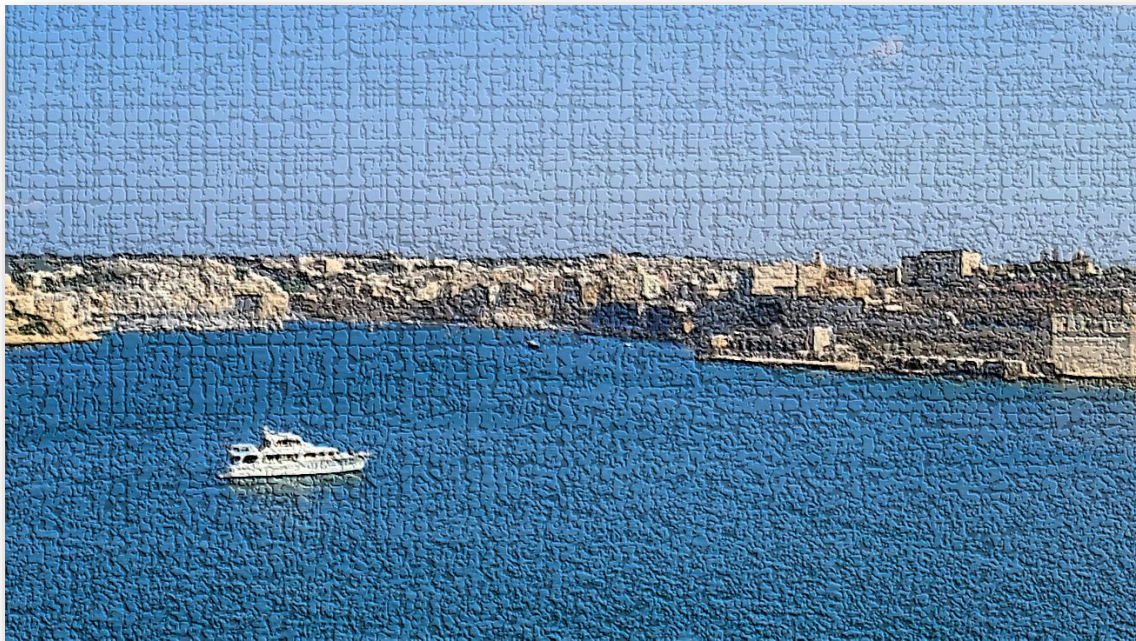




14th – 16th June
National Meeting on Hydrogeology



6th Edition of FLOWPATH
the National Meeting on Hydrogeology

Malta, 14th – 16th June 2023

Conference Proceedings Book

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Preface

The Italian Chapter of the International Association of Hydrogeologists (IAH) is pleased to present you the proceedings of the abstracts submitted to the 6th Edition of FLOWPATH, the National Meeting on Hydrogeology. The congress take place on 14th-16th June 2023 in Malta. Following the tradition of the previous editions of FLOWPATH, the conference is an opportunity for hydrogeologists and professionals to exchange ideas and discuss different issues on groundwater resources.

The objectives of the conference are:

- ✓ To ensure that hydrogeology can play an important role in supporting the development of groundwater management and protection policies.
- ✓ To strengthen knowledge and research initiatives on emerging challenges to the groundwater environment
- ✓ To update all the stakeholders, researchers and professionals on recent challenges in the hydrogeological sciences;
- ✓ To encourage researchers, professionals and administrators to contribute to the improvement of a sustainable water resources management;
- ✓ To highlight research initiatives undertaken in the Maltese islands, and improve technical cooperation between Maltese and Italian hydrogeologists.

The congress has been structured into four sessions, i.e.:

Session 1: Policies and Practices to Protect Groundwater

Session 2: Special Session on Hydrogeological Studies in Malta

Session 3: Emerging Challenges to Groundwater Quantity and Quality

Session 4: Groundwater Dependent Ecosystems

Each session starts with a Keynote lecture, held by international experts. The members of the Scientific Committee and the Chairs of the four sessions actively contributed to this successful Congress.

This Conference Proceedings book, including one keynote lecture for each session and 90 total abstracts, represents the final step of this Congress. All these abstracts underwent a rigorous peer-review process by the Scientific Committee members and were assigned to oral (45) or poster (45) presentation. The Authors come from Universities, Public Bodies, Private Companies of Italy and some other countries.

In summary, this congress, with more than 150 participants, testified the interest in groundwater resources and their protection with a view to future challenges in the hydrogeological sciences.

Potential and limits of the Po Plain for the development of open-loop Groundwater Heat Pump Systems (GWHPs) in Italy, the case study of Milan and Turin.

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Key Words: Geothermal energy, GWHPs, Shallow aquifer, Italian regulatory

Italy plans to pursue the target of obtaining 30% of final consumption of energy from renewable energy sources (RES) in 2030, by defining a pathway of sustainable growth for RES and the full integration thereof into the system. In this context, Groundwater Heat Pump systems (GWHPs) represent one of the most suitable technologies to be applied in the heating and cooling of buildings in densely urbanised areas, reducing CO₂ emissions and environmental pollution. Currently, the share of geothermal heat production, out of the total thermal production from Renewable Energy Sources (RES) in Italy, is limited to 2.1%. It is, therefore, necessary to incentivise and encourage the deployment of geothermal solutions in order to increase the RES percentage and reach the European targets. However, different environmental aspects must be considered to minimize the impact of GWHP systems on the subsurface and shallow aquifers. Therefore, urban planning tools must pursue a rapid deployment of GWHP and ensure adequate long-term protection of the groundwater bodies, through an understanding of the subsoil in the decision-making process. A proper geological and hydrogeological characterization is fundamental and required by regulatory authorities for allowing the correct development of GWHPs. To date, the numerical model is the most powerful predictive tool, and a model calibration is required to perform uncertainty analyses, by connecting the performed model to the real world. For developing realistic numerical models, a set of data is necessary to properly define the fundamental hydrogeological parameters, such as horizontal hydraulic conductivity (K_x , K_y), porosity (η), longitudinal dispersivity (α), and storativity (S). Two case studies were considered: Turin City (Piedmont Region), where more than 50 authorisations for geothermal discharges have been submitted, and Milan City (Lombardy Region), where there are more than 200 geothermal plants. Despite the similar hydrogeological contexts (presence of unconfined, highly productive aquifer), the analysed cities are characterized by different open-loop diffusion rates. The in-force regional and municipal regulatory references to which a new geothermal project must comply (i.e., authorization requests and plant final testing operations) were taken into consideration, highlighting the potential connected to the diffusion of GWHPs and understanding the causes of the different diffusion rate in the mentioned contexts.

End of Volume