MARGIN

Management for Groundwater Sustainability in Urban Areas
Quantifying the vulnerability of groundwater quality and quantity to climate change and urbanisation and developing adaptation measures for cities

Addressed call

Interreg Alpine Space Programme 2021-2027, Classic projects, Call 2
Deadline for submission of proposals, step 2: 8 March 2024

The challenge

Climatic changes and urbanisation affect groundwater conditions (esp. recharge and temperature) through the amount, intensity and distribution of precipitation. In urban areas, these changes overlap with other anthropogenic effects such as the urban heat island effect, increasing sealing of the surface, growing infrastructure and buildings in the subsoil, and the diverse use of groundwater. The growing demand for heating and cooling in cities also increases groundwater use as a regenerative energy source. Due to this high demand for groundwater as a resource and the dense settlement, urban areas are particularly vulnerable to projected changes due to climate change and urbanisation. Consequently, there is a risk in urban areas that i) groundwater resources are limited for the use as tap water for several purposes, ii) infrastructure like groundwater heat pumps, needed as a renewable energy source, might drop out or iii) buildings could be damaged due to shortly rising groundwater levels caused by heavy rainfall.

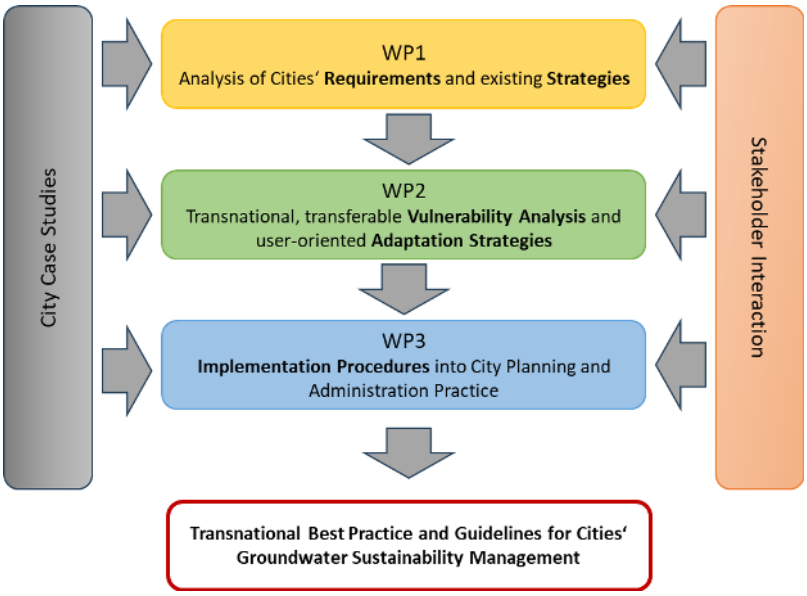
Cities and municipalities, as well as planning and engineering offices, need detailed information about expected changes in groundwater resources and tools to deal with these changes and resulting conflicts of use. This is crucial in order to enable sustainable groundwater management in the future and to plan and maintain urban infrastructure safely in the long term. Future-oriented urban development needs the integration of groundwater sustainability management into municipal planning. To achieve this, reliable quantitative forecasts of spatial and temporal distribution of groundwater recharge, of the high and low groundwater levels, and of the groundwater quality, including its temperature are essential. The topic ‘groundwater’ must be extensively integrated into city planning procedures to face future challenges.

The scope

MARGIN identifies vulnerable areas in cities concerning changes in quality and quantity due to climate change and urbanisation. It develops strategies and tools for adaptation to changing groundwater conditions and extreme levels in order to ensure a sustainable infrastructure development and management of groundwater as a resource and ecosystem in cities. The project takes quantitative (groundwater recharge, extremely low and high groundwater levels) as well as qualitative (thermal, chemical, biological) changes/vulnerabilities into account.

The project will analyse the requirements and present status of different European cities regarding the management of the groundwater resource in the Alpine Space, gather and analyse the relevant data from city and regional administrations to identify and evaluate vulnerable areas to groundwater changes in quality and quantity. Based on this evaluation user-oriented adaptation strategies and measures will be developed for the implementation in city planning and local water administration procedures. To cover this, MARGIN will conduct this approach in four cities in the Alpine region with different climate and socio-economic conditions, urbanization levels, and administration procedures to cover the variety of the Alpine space: Munich, Milano, Ljubljana, Linz.

MARGIN is structured in three work packages, addressing the relevant procedures to develop and provide transnational and country-specific best practices and guidelines for cities to implement sustainable groundwater management.



Work Plan and Outputs

- **WP 1: Requirements and present strategy analysis**: MARGIN provides a catalogue of existing practices for data acquisition and handling in cities. Most cities hardly ever deal with the primary data needed for groundwater management in an adequate way; the project will, therefore, set up a structure of necessary data and take into account the specific administrative organisation of the cities. Further, a catalogue of the status of present strategies for groundwater management in cities will be provided to outline the significant lacks, barriers and requirements for sustainable groundwater management.
- **WP 2: Vulnerability analysis, risk assessment and adaptation strategies**: the project analyses the vulnerability of the pilot area cities to quantitative and qualitative groundwater changes in the course of climate change and urbanization, demonstrates subsequent risks (high/low groundwater levels, thermal use) and impacts (ecology/infrastructure) and provides a user-oriented approach for the transnational transfer to other cities. From there it will develop spatially distributed options and concepts for adaption to the various impacts (such as infiltration patterns or integration of groundwater management into energy plans) to build resilience and ensure a sustainable use of groundwater.
- **WP 3: Implementation into administration and policies:** Using WP1/2 results, WP3 evaluates applied implementation procedures for groundwater sustainability management into city planning and water administration practice, demonstrating best practices in pilot cities. WP3 develops a toolbox with user-oriented guidelines and tools to enable cities in the Alpine space implementing groundwater sustainability management and to raise awareness for it at different policy level, supported by stakeholder interactions involving follower cities

The project consortium

Lead partner: Chair of Hydrogeology, Technical University of Munich (Kai Zosseder)

Core team: City of Munich, City of Ljubljana, City of Milano, GEOZS (Geological Survey of Slovenia), Water supplier Linz, Geosphere Austria (Geological Survey of Austria), University of Milano, University of Vienna, Climate Alliance, European Water Association.

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