



**Climate
≈
water**

Bridging the gap between adaptation strategies of
climate change impacts and European water policies



Research into groundwater

Anna Molnárová
Groundwater Department, SHMI



SLOVENSKÝ HYDROMETEOROLOGICKÝ ÚSTAV

Symposium of the Project ClimateWater 13-14 October 2011 Budapest

Report on Work Package 4: Identification of research needs

**Summary report for Sub-WP 4.7:
Research into groundwater**

**Prepared by project partner:
Partner 9 SHMU**

Names of contributing partners:

E. Toth, VITUKI, P1;

J-L Rahuel, SOGREAH, P10

Climate
≈ water

Bridging the gap between adaptation strategies of
climate change impacts and European water policies



Research into groundwater



The study of effects of climate change on groundwater (on groundwater resources) is relatively immature area of scientific research. Although groundwater is the major source of drinking water across much of the world and plays a vital role in maintaining the ecological value of an area, there are relatively few studies relating to possible future effects of climate change on groundwater.

This may be partly due to the significant degree of uncertainty associated with the prediction of future climate and therefore the prediction of effects on aquifer as well as on groundwater quality.

Further work is required to identify the effects of climate change on groundwater.

Research needs I.



The potential impacts of climate change on water resources have long been recognized although there has been little research relating to groundwater. Some of the research needs related to impact of climate change on groundwater are listed below:

- ❖ Assessment of implications of changes in precipitation (volume, intensity and variability during the year) and evaporation on groundwater recharge, water levels, and base flow in shallow and deep aquifer systems
- ❖ Assessment of hydrologic interactions between ground water and surface water systems and the influence on the quantity and quality of the water in these systems (interactions are closely associated with decreased and increased river discharge and stream flow)

Research needs II.



- ❖ Assessment of the impact of increased demand for groundwater on sustainability of groundwater supply and groundwater quality
- ❖ Assessment of activities at the land surface (their affect on groundwater recharge rates and water quality)
- ❖ Assessment of impacts of climate changes on snow pack
- ❖ Assessment of changes in runoff, watershed vegetation and forest cover (to have more information about these changes)
- ❖ Assessment of monitoring activities and
- ❖ Assessment of disruptions of aquatic ecosystems

Research scope I.

Better understanding the hydrodynamic conditions, characterisation of basin (geology & hydrogeology, conceptual model)

Evaluation of the impact of climate change on groundwater is not possible only through the use of historic time-series to generate future scenarios. Generally previous impact studies have only provided information on change in average conditions - improvement of global climate change models that address precipitation and temperature changes.

sophisticated 3D models = better description of interface between surface and groundwater, unsaturated and saturated zones, groundwater retention capacity, understanding of landscape characterisations and function in connection to groundwater, horizontal and vertical flow evaluation.

- ❖ To develop climate changes scenarios and analysis system response to global changes
- ❖ To assess water supply vulnerabilities & groundwater vulnerabilities
- ❖ To improve the short term and long term forecasting tools (trends)

Research scope II.

Improvement the monitoring process and primary data



The better prediction of the effects of climate change on groundwater system will require more and detailed background information for calibration of models and for evaluation processes.

- ❖ To improve the monitoring activities in climatology & hydrology (in the groundwater preference on springs)
- ❖ Designation of national groundwater monitoring points, with special privilege, that provide data (long time series) for climate change evaluation on the national and international level (determining the criteria for selection of monitoring points, avoid anthropogenic impacts)
- ❖ Improvement of the accuracy of monitoring processes, comparability of data
- ❖ Improvement of the automatization in the monitoring processes (reduce human factor failure)

Research scope III.

Improvement of the successful adaptation and mitigation strategies for use of groundwater to promote sustainable development in response to climate change

- ❖ Research oriented on the integrated water resource management, (groundwater dynamic resources and reserves, surface water, accumulated water, optimization of abstraction, hydro-technical infrastructure improvement)
- ❖ Development of the adaptive management approaches, decision linked research, water resource planning
- ❖ Developing of new sustainable diversion limits need to be determines for surface and groundwater use,
- ❖ Developing the optimization of hydro-technical infrastructure.

To share information between EU member states, to identify needs for future work (policy and scientific perspective).



Thank you for attention