



PROJECT SUDEHSTRA

SUMMARY OF THE ACTION

The project “Sustainable development of Hungarian – Serbian transboundary aquifer (SUDEHSTRA)” started in June 2007 and was completed in August 2008. It is one of the Cross-border cooperation programmes ERDF / Interreg IIIa (Community Initiative) and CARDS 2000 – 2006 fully funded with the support of the European Agency for Reconstruction (EAR). Experts from leading national institutions of the two countries--the Faculty of Mining & Geology (FMG), University of Belgrade, Serbia and ATIKOVIZIG, Directorate for Environmental Protection and Water Management of Lower Tisza District, Szeged, Hungary--have jointly drafted and worked on this important “mirror” project aimed at improving the management of common groundwater resources. Work by 10 experts from FMG continued for 14 months, 12 as initially contracted plus 2 additionally approved by EAR (June 2007 – August 2008).

Groundwater (GW) resources are vital for the economy and the society, as well as for the development of large flat areas with very thick Tertiary deposits between the Danube and Tisza Rivers in both countries: that is, the southern part of the Great Hungarian Plain and the northern part of the Republic of Serbia, the province of Vojvodina. Groundwater is in fact either the most stable or the sole resource within the study area and almost 100% of drinking water comes from the ground. However, until this project was started, no relevant study had been conducted to assess groundwater potential on a regional scale and the sustainability of common transboundary aquifer. In addition, neither adequate assessment of recharge of this aquifer nor a mutual strategy for its common use and management has yet been developed. Despite the impossibility of providing answers to and details concerning all the above-mentioned problems, the results of the SUDEHSTRA project would benefit the local waterworks and end-users as well as the water managers and decision-makers of the two countries, including the experts that regularly cooperate under the bilateral Hungarian – Serbian Sub-commission for water management.

The initiative behind this SUDEHSTRA project and its content are fully in line with the EU Water Frame Directive (EC2000/60) and EU Groundwater Daughter Directive targets, two very important documents aiming to improve the water situation in Europe, introduce new standards and establish a common approach to regional water management. These two documents are followed by many concrete projects under the frame of the EU Interreg and Neighborhood programme, including transboundary water issues. But this is the first project of this type ever undertaken on territories of a central Balkan and a central Europe country.

For this project numerous activities have been undertaken, such as local waterworks inquiry, field survey and measurements, the establishment of a GW monitoring network, the creation of a GW initial database, common workshops and seminars for local capacity building, and water-saving promotional activities. As a final result of the project, a common conceptual hydrogeological and hydrodynamical model has been created and tested. It is intended to be an important tool for transboundary water management and future sustainable water use and monitoring.

For groundwater modeling Processing Modflow has been used to forecast the effects of groundwater extraction under different scenarios for the next 15-20 years. The regional model



covers the studied area of 135 km x 145 km. Discretization of the flow field is generated by primal cell dimensions of 1000m x 1000m, which are reduced in zones of groundwater sources to 125m x 125m. The hydrodynamical model was conceived and built as a multi-layer model with ten layers (five water-bearing and five semi-permeable). Hydraulic parameters are approximated on the basis of provided documentation as representative values for the whole layer. Several problems had to be solved before completing the model: different reference systems, different geological nomenclature, missing transboundary aquifer maps, different well density, materials in native languages, deficient hydraulic parameters, absence of monitoring data out of the main sources, etc.

Three main workshops, numerous technical meetings with Hungarian partners, and work with local professionals enabled the exchange of opinions as well as a collaborative effort to evaluate the existing situation and hydrogeological properties and to trace a common approach towards future sustainable water utilization in the region. All planned procurements are also conducted following PRAG procedures, thus the donation of EAR and equipment supplied will be of great benefit to further works of FMG in this and adjacent areas.

PROJECT BACKGROUND AND OBJECTIVE

In the most northwestern part of Vojvodina (Backa region) the aquifer system is commonly shared with neighbouring Hungary and it is still not sufficiently studied. It covers a large area: the total surface is assumed to be around 27000 km² of which 17200 km² are in Serbia (Fig. 1). The studied aquifer system is located between the Danube and Tisza Rivers and extends to the vicinity of Kiskunfelegyhaza on the Hungarian side (North) and to Vrbas in Serbia (South).

The exploitation rate in the two regions on the Serbian side within this transboundary aquifer was assessed according to the Water Master Plan of Serbia for the year 1995 as follows: Western Backa 600 l/s; North Backa 750 l/s. The main groundwater (GW) consumers are cities and industries of Subotica, Sombor, Backa Topola, Bajmok, Kanjiza (in total 16 municipalities or large- to medium-size settlements). Evidence of over-exploitation is the decline of the hydraulic head to several meters below the ground surface, in areas where historically conditions were artesian (free outflow from drilled wells to the surface). In addition to extraction for municipal and industrial water supply, GW is also used for irrigation purposes, but to a lesser extent.

In many cases a high groundwater level within phreatic intergranular aquifer during winter and spring causes flooding, and dewatering is necessary (mostly through a constructed channel net) before agricultural activities are undertaken. On the other hand, there are also some years with such reduced rainfall that conditions are near to drought, and this particularly affects the central plateau (Subotica, i.e. Telek). The phreatic aquifer during low water periods drains into watercourses and primary channels of the drainage system as main recipients. These courses are sometimes far from main consumers, thus deeper groundwater remains the principal water source in the region.

The idea to conduct the SUDEHSTRA project is an important step towards sustainable groundwater use, including flood prevention and protection of the environment. Therefore, an overall project objective is to **create a base for sustainable and environmentally friendly groundwater development**. Numerous activities are planned aiming to achieve targets and create the necessary basic tools for transboundary water management and monitoring.



Table 1. Four tasks and numerous linked activities that had been planned and executed within the frame of this project:

No	Task	Activities
1.	Preparatory activities	Collect and evaluate previous investigation data, Assess status of water consumption and demands, Select representative water points, Provide necessary equipment for field survey.
2.	Data collection	Complete water point inventory, Evaluate results of in-field measurements and tests, Evaluate results of laboratory analyses, Assess GW resources and their quality.
3.	Monitoring network	Select representative water points for GW network, Provide and install monitoring equipment, Define monitoring methodology and parameters, Evaluate preliminary data.
4.	Hydrodynamical model	Define conceptual hydrogeological model, Create hydrodynamical model, Calibrate and test model, Propose measures for GW sustainable use, Transfer knowledge.

Although a transboundary aquifer system is currently commonly used, available groundwater reserves, their quality and dependent eco-systems have not been appropriately explored and monitored. Therefore, the project concept is planned in such way so as to contribute to the improvement of water practice in Serbia, to establish the groundwater network and to develop the managerial tools aiming to achieve “good status” concerning both GW quantity and quality.

In agreement with the Hungarian experts and in accordance with the hydrogeological entity on both border sides, the areas that should be explored are defined. Because of the concern that a mutual influence on exploited waters exists, and that the study area should be considered a unique hydrogeological entity, it was accepted that the hydrogeological model – as one of the main goals of this project - should include terrains of the border zone between the Tisa River on the east and the Danube on the west, and in the vertical section should also comprise the deeper aquifer layers to an approximate depth of 2000-2500m. In the northern and southern directions the terrain is extended to the vicinity of Kiskunfelegyhaza on the Hungarian side (North) and to Vrbas in Serbia (South).

The University of Belgrade, Faculty of Mining & Geology and its Department of Hydrogeology conducted the project together with local partners from the region: 1. JKP Vodovod i kanalizacija, Subotica, as the major waterworks system, 2. Provincial Secretariat of Vojvodina for Energy and Mineral Resources (with financial support) and 3. JVP “Vode Vojvodine”, Novi Sad (without financial support and requests) as the major public enterprise responsible for water management.



STAFF OF FMG WORKING ON SUDEHSTRA PROJECT

No	Name and surname	Title	Position on project
1	Zoran Stevanovic	Dr Prof.	Project manager
2	Milojko Lazic	Dr Prof	Project coordinator
3	Sasa Milanovic	MSc	Project secretary
4	Dusan Polomcic	Dr Assoc. Prof	Team member
5	Petar Pasic	Dr Assoc. Prof	Team member
6	Zeljko Kljajic	BSc Collaborator	Project assistant
7	Stanko Sorajic	BSc Collaborator	Team member
8	Bojan Hajdin	MSc	Team member
9	Srdjan Parlic	BSc Collaborator	Team member
10	Slobodan Siljanovski	Financial Adviser	Accountant



Participants of the Workshop held on Palic, March 2008



Visit of Subotica waterworks



SUDEHSTRA - an EU funded project managed by European Agency for Reconstruction



Serbian and Hungarian experts



Chairman Petar Kozak (ATIKOVIZIG) and Zoran Stevanovic (FMG)



Project presentation in Szeged, May 2008