

Groundwater modelling as a decision support tool for implementation of the WFD, Slovakia

EVD

28 May 2006

PPA05SK81 – Inception report
(including the final work plan)

Prepared after the first mission (15-19 May 2006)
of Dutch experts to Slovakia

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1 CONTEXT

1.1 Introduction

In December 2005 the project "Evaluation of groundwater conform WFD-requirements for groundwater management in Slovakia (MAT03/SK/9/3)" has been finalised. During the execution of the project it appeared that knowledge and information is lacking about:

- Identification of interconnectivity of groundwater bodies;
- Direction and exchange of flow of water between groundwater bodies;
- Direction and exchange of flow of water between groundwater bodies and associated surface waters.

As a consequence it is not possible to assess correctly the available amount of groundwater and flow direction as basic elements for identifying of risk for groundwater bodies. Hence, good and effective measures required under article 11 of Directive 2000/60/EC cannot be identified.

Groundwater modelling is a suitable tool to determine the direction, volumes and dynamics of groundwater flow. It can support the identification and ranking of measures needed to acquire "good status" of groundwater bodies and can quantify the impacts of measures in terms of changes in flow (water quantity) and water quality.

Within the present project 'Groundwater modelling as a decision support tool for implementation of the WFD', groundwater modelling is being applied in the context of the WFD. Staff of the Slovak institutes will receive further training in modelling and through pilots the models will be applied. Through this training, the capacity of the Slovak experts in groundwater modelling will be strengthened, eventually contributing to fulfilling the requirements of the WFD. The following results are being anticipated:

- a groundwater model for 2 pilot areas
- a methodology to evaluate horizontal groundwater fluxes within and between groundwater bodies
- a methodology to evaluate the vertical flux within and between groundwater bodies
- a methodology to evaluate migration of pollution from point sources within a groundwater body

1.2 Institutional setting

The main beneficiary of the project is the Slovak Hydrometeorological Institute (SHMU). Seven experts from SHMU will participate in the training and project teams. Also the SHMU is responsible for the availability of the necessary data, including the geology. Also an expert from the Water Research Institute and an expert from the Geological Survey will participate in the training and project teams. All institutes are part of the Ministry of Environment. The Ministry will act as project counterpart

Slovak Hydrometeorological Institute (SHMU)

The basic objective of the Slovak Hydrometeorological Institute is to obtain, process, interpret and store the data on the state and regime of water and air. The SHMU acts in three areas, in the area of hydrology, in the area meteorology and climatology and in the area of monitoring of air quality. SHMU is responsible for 3 partial monitoring programmes, namely "Water", "Meteorology and Climatology" and "Natural Radiation".

Water Research Institute (WRI)

WRI provides research in hydrology, hydraulics, drinking water treatment technology, wastewater treatment, and quality of surface and groundwater and water analyses. The WRI was designated by the Slovak Government to act as the National Reference Laboratory and to function as the methodological centre for analytical water examination, determination of sediments, sludge, and chemicals which being in contact with water.

Geological Survey (GS)

The Geological Survey of Slovak Republic, as a ministerial scientific research institute, is a contributory organisation that guarantees geological research and exploration of the territory of Slovak Republic, creation of information system in geology, recording and registering of geological works performance, collects, records and makes available the results of geological works carried out within the Slovak Republic, function as a central geological library and edition and sale of maps and professional geological publications.

Ministry of Environment

Ministry of the Environment (Water Division) is the central body of the state administration for water protection and its rational utilization, water management, public water supply, wastewater collection and treatment and fishing.

2 RESULTS AND ACTIVITIES

2.1 Final project results

The anticipated project results, activities and methodology will largely correspond to the initial proposal:

- a groundwater model for 2 pilot areas
- a methodology to evaluate horizontal groundwater fluxes between two groundwater bodies
- a methodology to evaluate the vertical flux between two groundwater bodies
- a methodology to evaluate migration of pollution from point sources within a groundwater body

The pilot areas selected during Mission 1 are:

- groundwater body Zitny Ostrov
- Nitra River (partial) and Zitava River catchment (further named Nitra/Zitava)

The required data for the modelling of the two pilot areas is given in appendix 2. An outline of the model boundary for the two pilot areas is shown in appendix 3.

Based on these results, the Slovak experts will after finalisation of the project be able to

- set-up and maintain groundwater models;
- apply groundwater models as a decision support tool, i.e. validation of groundwater bodies at risk and effectiveness of measures;

Furthermore the project will contribute to the long term relationship between the Slovak and Dutch governmental bodies for a continued exchange of experience in the WFD and specifically the use of groundwater models.

2.2 Work plan

The project activities have been subdivided into four phases according to the four missions of the Dutch experts. The project has started on May the 15th and will be concluded before November the 15th 2006. Below the overall work plan is presented.

Phases		period	Activities
Phase 1	Inception	<i>15-19 May</i>	update course modelling selection modelling areas reporting final work plan
		12 May-19 June	data acquisition data preparation
Phase 2	Model initiation	<i>12 -16 June</i>	model schematisation model set up
		17 June - 1 Oct	finalisation of model
Phase 3	Model finalisation	<i>2-6 Oct</i>	sensitivity analyses Calibration Reliability evaluation tools for WFD
		7 Oct - 31 Oct	WFD evaluation of pilot areas
Phase 4	Finalisation	<i>1-3 Nov</i>	finalising results and workshop

The time periods in italic correspond to the missions of the Dutch experts. During their absence the Slovak experts will continue the modelling. However the Dutch experts provide continuous scientific support through email and telephone. Also an experienced Slovak modeller (Dr. Dana Barokova) is involved to provide local support. The required data for the models will be supplied by the SHMU

3 PROJECT TEAM

Dr. Eugen Kullman, Director of Groundwater Quantity and Quality Department, SHMU, will act as representative of the beneficiary. Ms Elena Fatulova, Deputy-director of the Water Management Division, Ministry of Environment, will act as representative of the counterpart.

Consortium composition and project team

The project is being carried out under the responsibility and project leadership of the Netherlands National Institute of Public Health and the Environment (RIVM). The following table presents of the members of the international project team, their organizations and their respective project responsibilities.

Person	Organisation	Main responsibilities
Wilko Verweij	RIVM (National Institute of Public Health and the Environment)	<ul style="list-style-type: none"> Project leader
Karel Kovar	MNP (Netherlands Environmental Assessment Agency)	<ul style="list-style-type: none"> Scientific support Resource person Assistant project leader
Casper van de Watering	CW Consulting	<ul style="list-style-type: none"> Institutional aspects Coordination/logistics/facilitation
Arjen de Vries	Acacia institute	<ul style="list-style-type: none"> Reporting Internal and external communication Project management
Jouke Velstra	Royal Haskoning	<ul style="list-style-type: none"> Overall modelling support Training WFD evaluation tools
Theo Kleinendorst	Royal Haskoning	<ul style="list-style-type: none"> Data preparation Model set up
WillemJan Zaadnoordijk	Royal Haskoning	<ul style="list-style-type: none"> Sensitivity analyses Calibration and reliability

Slovak experts

The following table gives the Slovak experts who will participate in the project. Two teams have been assigned to the two pilot areas. Katarina (Katka) Moziesikova will be responsible for the Zitny Ostrov pilot area, while Mariana Sopkova will be responsible for the Nitra/Zitava pilot area. Dana Barokova, a senior modelling expert, will be the key resource person for the Slovak experts.

Person	Organisation	Pilot area
Katka Moziesikova	SHMU	Zitny Ostrov
Lucia Kvapilova	SHMU	Zitny Ostrov
Ludo Molnar	SHMU	Zitny Ostrov
Anna Patchsova	SHMU	Zitny Ostrov - Nitra/Zitava
Mariana Sopkova	SHMU	Nitra/Zitava
Andrea Luptakova	SHMU	Nitra/Zitava
Anna Zakovicova	SHMU	Nitra/Zitava
To be named	Water Research Institute	Zitny Ostrov
To be named	Geological Survey	Nitra/Zitava
Dana Barokova	Slovak University of Technology, Bratislava	Resource person

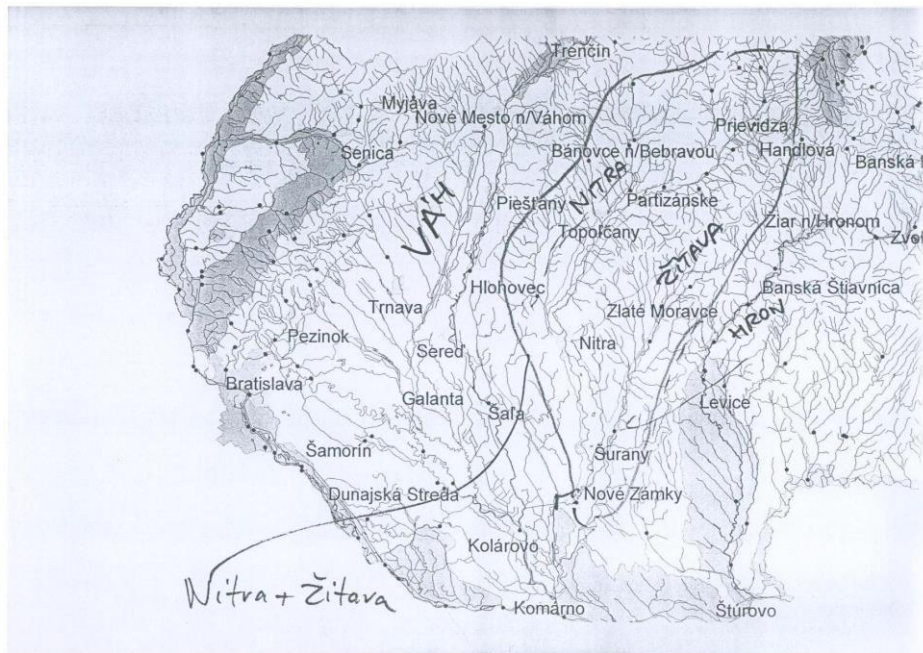
APPENDIX 1: EMAIL ADDRESSES

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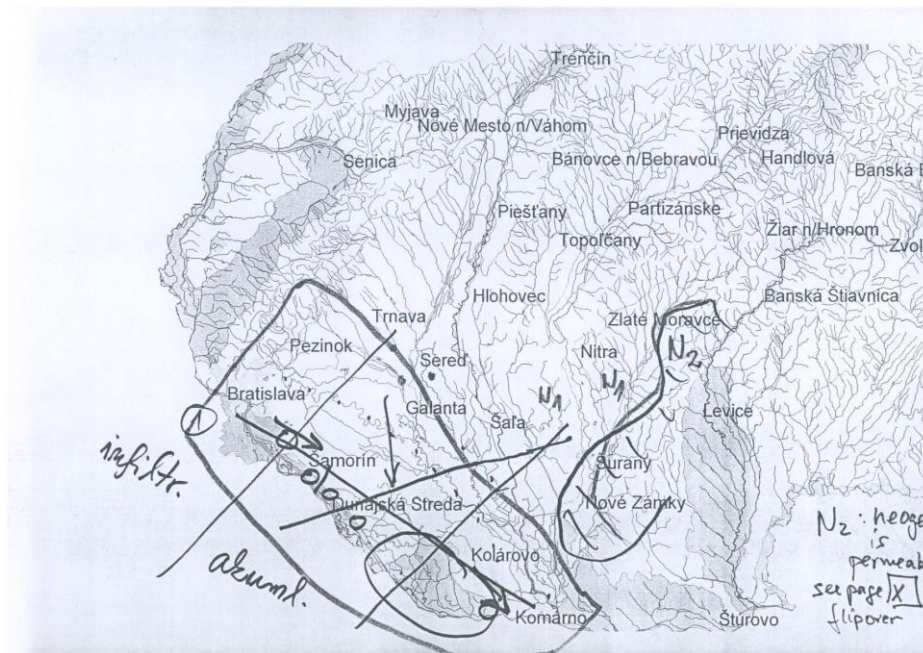
APPENDIX 2: REQUIRED DATA

DATA		time series
General	Land use (shp)	
Meteorology	Rainfall (coordinates, etc)	+
	Evapotranspiration (coordinates, etc)	+
Rivers	Water courses (shp)	
	Geometry; level, width, bottom	
	Classification; primary, secondary	
Boundary	Type of boundary conditions	
	Flux	
	Head	
Sources	Abstractions; name	
	Abstractions; coordinates	
	Abstractions; screen depth	
	Abstractions; rates	+
Hydrogeology	Surface level	
	Depth of Quaternary	
	Depth of Pre-Quaternary	
	Depth of base	
	Vertical resistance	
	K-value for every layer	
Observation wells	Name	
	Coordinates	
	Screen depth	
	Average value	+
Springs	Name	
	Coordinates	
	Surface level	
	Average flux	+

APPENDIX 3: OUTLINE OF MODEL BOUNDARY FOR TWO PILOT AREAS



Sketch of model boundary for pilot area Nitra/Zitava



Sketch of model boundary for pilot area Zitny Ostrov