Annex 1: List of participants

2nd Groundwater Workshop on WFD Implementation

May 12-13, 2003
Budapest, Hungary

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Annex 2: Program of the Workshop

2nd Groundwater Workshop on the Implementation of WFD in the DRB

May 12-13, 2003 in Budapest, Hungary

Agenda

First day: Monday 12th May 2003

09:30–09:50	Welcome address	Mr Gyula Holló (Ministry of Environment and Water, Head of Department River Basin Management)
	Introductory remarks	Mr Ivan Zavadsky, Ms Ursula Schmedtje
09:50–10:00	Introduction of participants	all

I INTRODUCTION

10:00–10:25	**Objectives of the workshop**
	Brief summary of the WFD-requirements until 2004 and further time scale. Presentation of the objectives of the workshop, which are:
	- Define information needs for the Danube River Basin Management Plan (DRBMP) Roof Report
	- Support the harmonisation amongst Danube River Basin Countries, especially regarding:
	  - Identification of GW-bodies,
	  - Initial and further characterisation of GW-bodies,
	  - Pressure and impact analysis,
	  - Monitoring of groundwater,
	  - Consideration of transboundary or important GW-bodies
		Mr. Johannes Grath and Mr. Andreas Scheidleder

II DEALING WITH GROUNDWATER IN THE DANUBE RIVER BASIN - CASE STUDIES

Presentation of case studies of transboundary GW-bodies within the Danube river basin - Current state, - Procedure with regard to harmonisation, - Lessons learned, - Gaps detected on the bi-(multi-)lateral level		
10:25–10:45	The UN/ECE pilot project on the Aggtelek (HU) - Slovak karst aquifer with special regard to WFD Hungarian part	Ms. Eszter Havas-Szilàgyi
10:45–11:05	Break for refreshments	
11:05–11:25	The UN/ECE pilot project on the Aggtelek (HU) - Slovak karst aquifer with special regard to WFD	Ms. Katarina Moziesikova

	Slovakian part	
11:25–11:45	DE-AT thermal groundwater body	Mr. Jens Jedlitschka
11:45–13:15	Lunch	

III PRESSURE AND IMPACT ANALYSIS

13:15–13:45	**Presentation of MONERIS**	Mr. Horst Behrendts
13:45–14:05	**How to deal with contaminated sites - pressure and impact analysis** - Concept of the GWD and the Risk Management Zones (RMZ) - National approach, available information, inventories, assessment	Mr. Dietmar Müller
14:05–14:20	Discussion	

IV DEALING WITH GROUNDWATER IN THE DANUBE RIVER BASIN - CURRENT STATE IN COUNTRIES

10 minutes each	**Progress with the implementation of the WFD - with main emphasis on transboundary GW-bodies** As the programme is very dense and in order to allow each country to present its progress in the implementation of the WFD with regard to transboundary GW-bodies following technical guidance to national presentations is proposed: As the key elements of the WFD implementation are already laid down in the questionnaire, the presentations should focus on the CURRENT STATE. Main emphasis shall be put on following topics: - Current state of the delimitation of GW-bodies - Current state of the description of GW-bodies and pressures - Current state of the identification and delimitation of transboundary GW bodies - present a map indicating these GW-bodies and bring a list with info on size, involved country, GW-type - Is there a WFD pilot implementation in transboundary GW bodies - which?, state? - Existing/planned bi- (multi)lateral co-operation - Summary: detected problems and gaps. presented in key words	Country representatives
14:20–14:55	**Part 1**	3 Countries
14:55–15:10	Break for refreshments	
15:10–16:15	**Part 2**	5 Countries
16:15–16:30	Break for refreshments	
16:30–17:30	**Part 3**	5 Countries
17:30–18:00	Discussion	

19:30 Dinner in the Hotel Gellért, by invitation of the Ministry of Environment and Water

Second day: Tuesday 13th May 2003

08:00–10:30	Excursion	
10:30–10:45	Break for refreshment	

V IMPLEMENTATION OF THE WFD IN THE DANUBE RIVER BASIN CONCERNING THE IDENTIFICATION AND DESCRIPTION OF GW-BODIES UNTIL 2004

10:45–11:15	**GW-Questionnaire –background, content and goals** - What was the intention of the questionnaire - Explanation of structure and desired input from the countries	Mr. Zoltan Simonffy
11:15–11:45	**GW-Questionnaire - presentation of replies** - Summary and overview of received information - Identification of crucial differences between countries (harmonisation needed) - Summary of open questions and gaps	Mr. Andreas Scheidleder
11:45–12:15	Discussion	
12:15–13:30	Lunch	

13:30–16:00	**DRBMP Roof Report - Core information on Groundwater**
	The objective of the Groundwater Workshop is to develop a core set of information (minimum requirements) to be subject of the overall DRBMP-Roof Report with special emphasis on transboundary or important GW-bodies. This goal should be reached within a discussion. Basis for discussion could be the draft lists of transboundary and important GW-bodies provided by participants.
	- Define core information relevant for the Roof Report regarding:
	  - identification of GW-bodies,
	  - initial and further characterisation of GW-bodies,
	  - pressure and impact analysis,
	  - monitoring of groundwater.
	- Detection of national gaps with regard to needed information
	- Incompatibilities in the methodology avoiding harmonised data
	- Most important open questions where guidance is needed
	- How could problems be solved on bi-(multi)lateral level
	- Proposal of solutions to support the harmonisation amongst Danube River Basin Countries
	- Time scale and responsibilities for the delivery of information needed for the Roof Report
		all

16:00–16:30	**Summary, way forward, recommendations**	

Annex 3: Objectives of the workshop

Implementation of the WFD in the Danube River Basin

Inroduction & Objectives

2nd Groundwater Workshop

Budapest, May 12-13, 2003

Grath, Scheidleder – Federal Environment Agency - Austria

Umweltbundesamt

History

Umweltbundesamt

- **Conclusions of 1st Workshop in Feb, 2002**
  (on identification, characterisation, monitoring)
  - Start/continue work on status review
  - identify transboundary GW bodies
  - prepare and send out a questionnaire
  - Follow-up Workshop 2003
    - Present experiences on the status review of GW
    - Results achieved in bilateral co-operation with transboundary groundwater bodies

Objectives of 2nd GW workshop

- Define core elements (GW) of Roof Report
- Support harmonisation amongst DRB countries
  - Identification of GW-bodies
  - Initial and further characterisation
  - Pressure and impact analysis
  - Monitoring of GW
  - Consider transboundary and important GW-bodies
- Serve as support to DRB countries to discuss and exchange experience and information

WFD-requirements until 2004

Art. 5: Characteristics of the river basin district, review of the environmental impact of human activity and economic analysis of water use

(1) Each Member State shall ensure that for each river basin district or for the portion of an international river basin district falling within its territory:

- an analysis of its characterisation
- a review of the impact of human activity on the status of surface waters and on groundwater, and
- an economic analysis of water use

is undertaken according to the technical specifications set out in Annexes II and III ….

Art. 6: Register of protected areas

WFD CIS documents (guidelines) - 1

WG	Acronym	Name	GW
	Water bodies	Horizontal guidance document on the application of the term "water body" in the context of the Water Framework Directive	yes
2.1	IMPRESS	Analysis of pressures and impacts	yes
2.6	WATECO	Economic analysis in the context of the Water Framework Directive	partly
2.7	Monitoring	Monitoring of surface and groundwaters	yes
2.8	GW Tools	Tools for assessments of groundwater trends	yes
2.9	PROCLAN	Best practices in river basin planning (including the work packages on river basin districts, planning process and public participation)	yes
3.1	GIS	Development of a Geographical Information system	yes
4.1	Pilot Testing	Integrated testing of Guidelines in pilot river basins	yes

WFD CIS documents (guidelines) - 2

WG	Acronym	Name	GW
2.2	HMWB	Heavily modified water bodies	No
2.3	REFCOND	Reference conditions in inland waters	No
2.4	COAST	Typology, reference conditions and classification of transitional and coastal waters	No
2.5	IC	Intercalibration	No

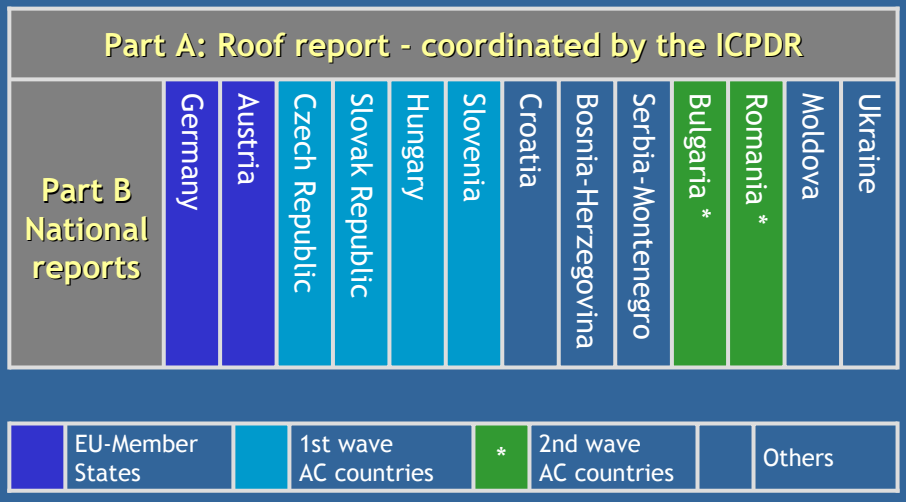
Documents are available at public CIRCA server:

http://forum.europa.eu.int/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents

DRB Management Plan

- **Part A (roof of the DRBMP)** gives relevant information of multilateral or basin-wide importance
- **Part B (national input to DRBMP)** gives all relevant further information on the national level as well as information coordinated on the bilateral level
- ICPDR has coordinating and supporting function
- ICPDR does not report on its own
- Each country will deliver the roof report (Part A) **AND** its own national report (Part B)

Structure of Reports



Structure of 2nd GW workshop

May 12, 2003

- Case studies of transboundary GW bodies
  - HU-SK karst aquifer / DE-AT thermal GW body
- Pressure and impact analysis
  - MONERIS / How to deal with contaminated sites
- WFD implementation – current state in countries

May 13, 2003

- Excursion
- Groundwater questionnaire
  - Background, content & goals / Presentation of replies
- **Discussion**
  - **Content of Roof Report / Discussion platform**

Objectives & character of workshop

- Define core elements (GW) of Roof Report
- Support harmonisation amongst DRB countries
- Discussion platform for experts
  - Serve as support to DRB countries to discuss and exchange experience and information
- Identify highlights and open issues

Lively discussion / Interrupt for clarification

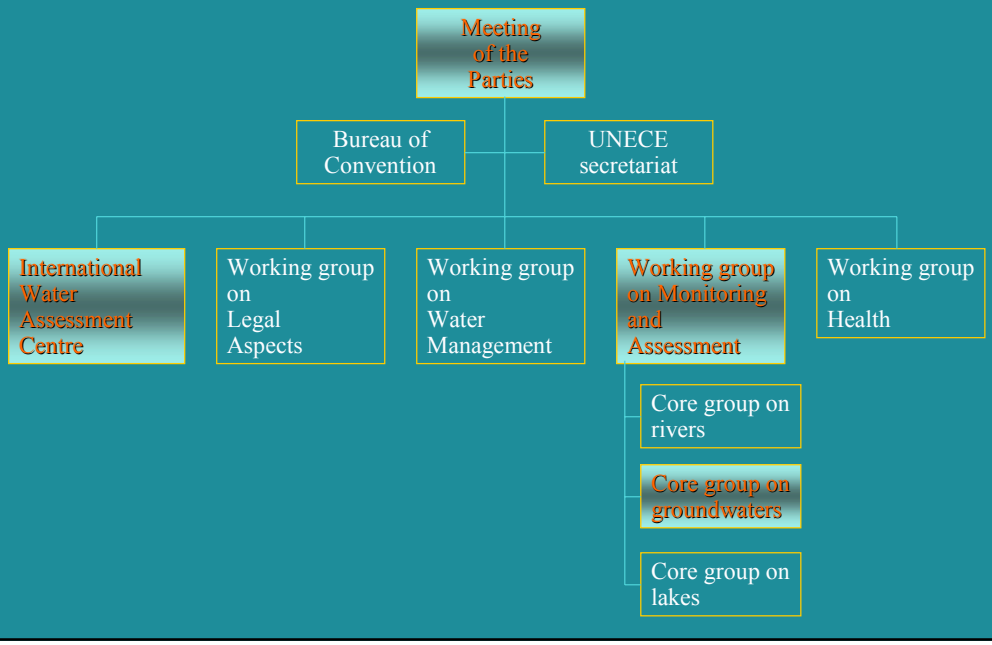
Annex 4: The UN/ECE pilot project on the Aggtelek (HU) – Slovak karst aquifer with special regard to WFD. Hungarian part.

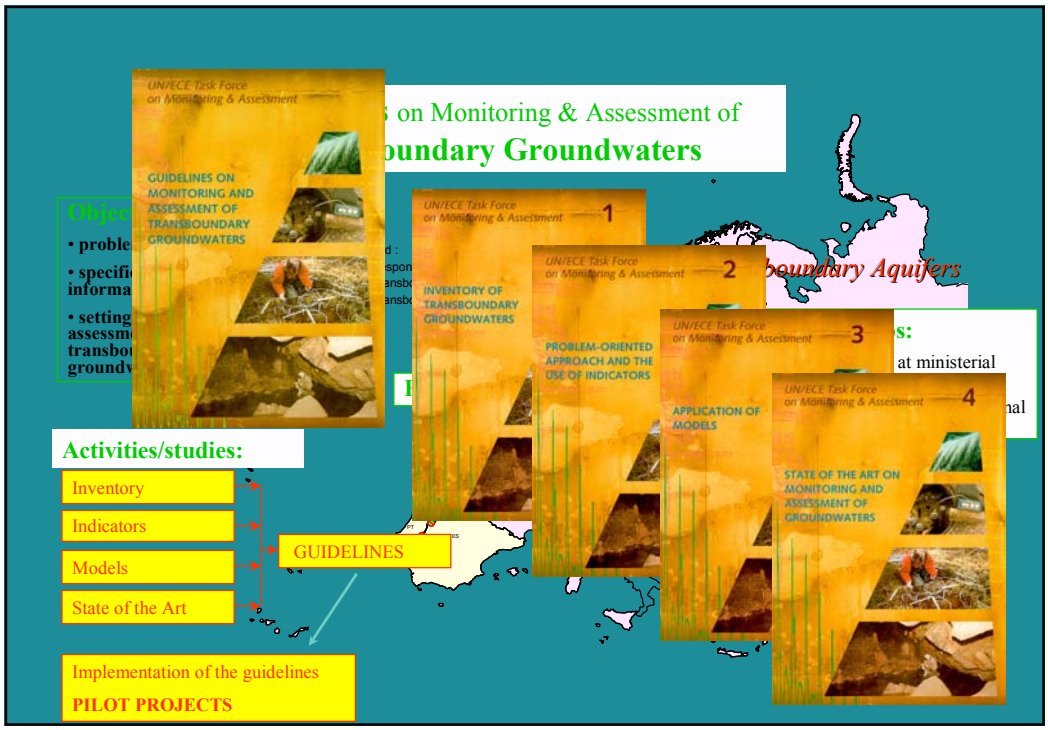
The UN/ECE pilot project on the Aggtelek (HU) - Slovak Karst (SK) Aquifer with special regard to the WFD

UN/ECE
Convention on the Protection and Use of Transboundary Watercourses and International Lakes
Working Group on Monitoring and Assessment
Core Group on Transboundary Groundwaters

E. Havas-Szilágyi, Hungary
Min. of Environment and Water,
12.May 2003

Organisation structure of WGMA and link with Helsinki Convention and Protocol





Groundwater guidelines

objectives

to assist governments and joint bodies in developing harmonised rules for the setting up and operation of systems for transboundary groundwater monitoring and assessment

character

the guidelines are more strategic than technical

structure

monitoring cycle

Definitions, specific aspects of groundwater monitoring (characterisation of aquifers), integrated approach

pilot projects

implementation of the guidelines

Objectives:

- to demonstrate application and to illustrate from experiences the process and difficulties of implementation
- to assist countries in implementation
- to identify gaps and incompleteness and to propose improvements

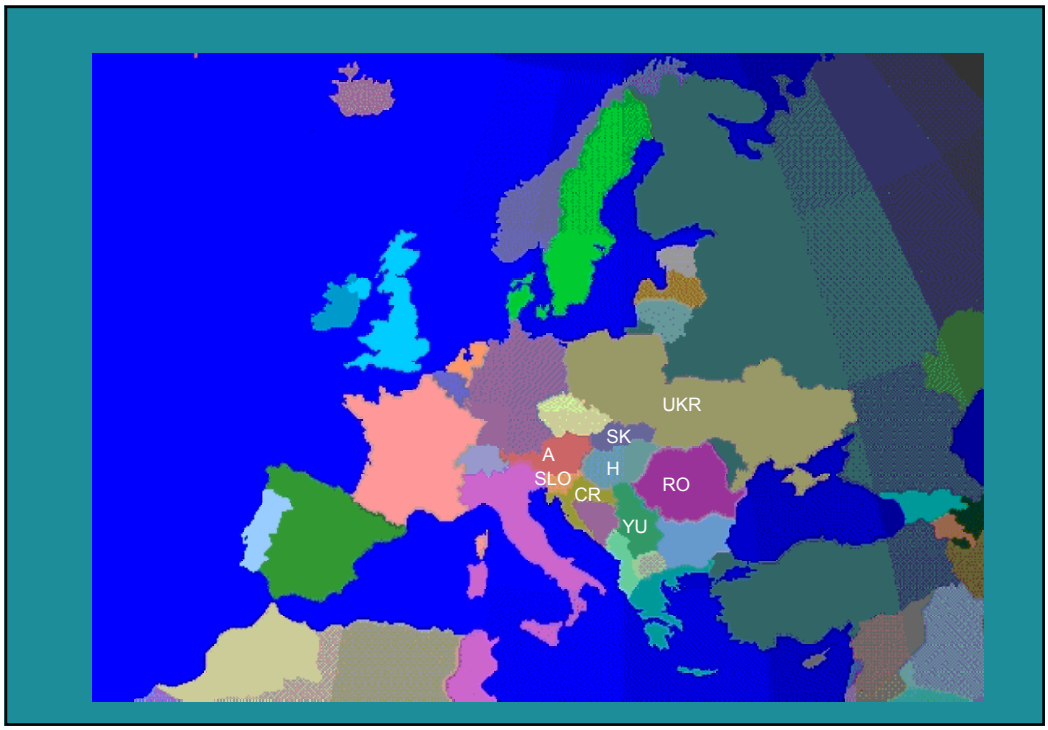
Preferences (for selection):

different types of aquifers

- groundwater and surface water interaction
- cases both in Western and Eastern European countries

Phasing and time schedule pilots

- Preparatory phase (project 1)
  - *inception study*
  - *monitoring and assessment needs analysis*
- Implementation phase (project 2)
  - *evaluation*
  - *implementation*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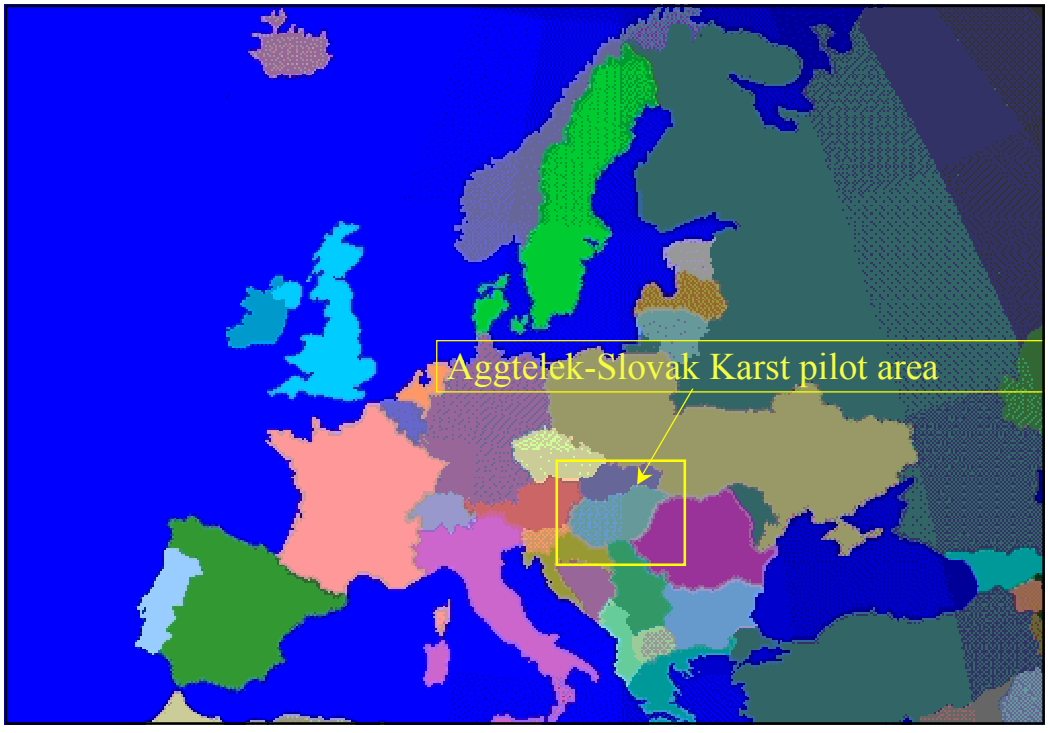
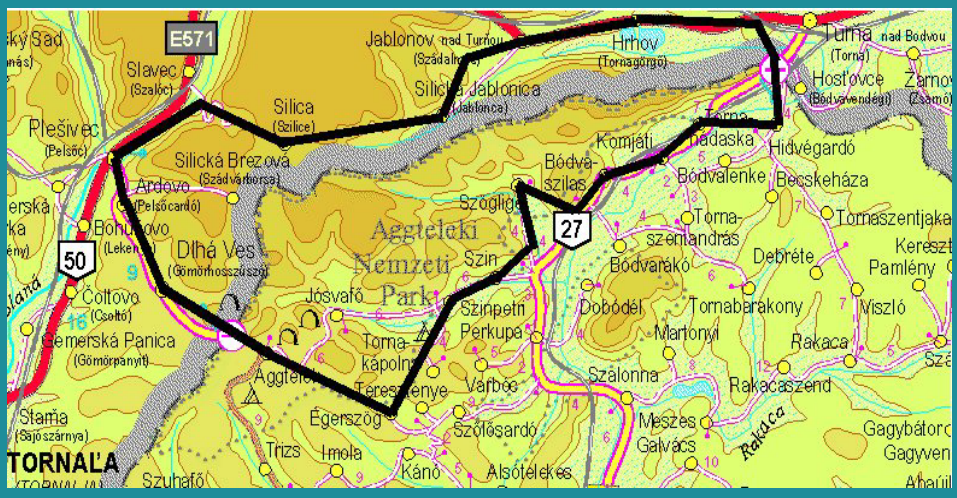

Aggtelek-Slovak Karst pilot area



Pilot project Aggtelek-Slovak Karst

Criteria for selection (1):

- groundwater body of a "manageable" size - cca 600 km^2

- existence of groundwater problem - National Parks

- monitoring network should exist - yes

Criteria for selection (2):

- participation of 2 or 3 countries
  - Hungarian Republic, Slovak Republic
- existing (i.e. signed or ratified) bilateral or multi lateral agreements, joint body yes since 1950 s

Criteria for selection (3):

willingness of countries
to implement the guidelines

- workload should be reasonable
- workload has to be borne

by riparian countries
with financial/scientific support of possible donors

Preparatory phase
1.) inception
2) monitoring and assessment needs analysis

2001. MoU

2001-2002. - organization
-nomination of project leaders
-collecting and informing the participants in both countries

1st Meeting March 2002.

Participants:

UN/ECE WGMA Core Group on Groundwater
Slovakia:
- Ministry of the Environment
- Slovak Hydrometeorological Institute
- Slovak Geological Survey
- Water Works, City of Kosice
- Slovensky Kras National Park

Hungary:
- Ministry of Environment and Water
- National Water Authority
- District Environment Inspectorate
- District Water Authority
- Aggtelek National Park
- Water Resources Research Centre Plc.
- Hungarian Geological Survey

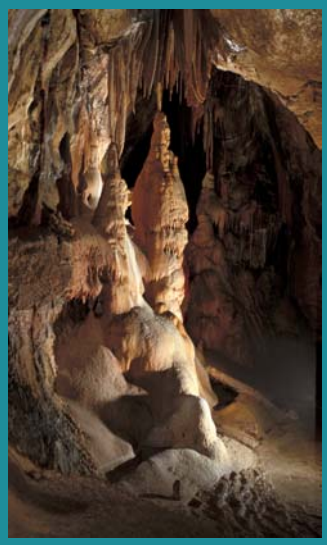
- **Objectives**
- **Workplan for 2002-2003**
- **Content of the inception report**

1. Objectives:

- **Introduction and testing of the UN/ECE guidelines**
  - Analyses of monitoring and assessment needs (report No.1.)
  - Tasks in water management (report No.2.)
  - Proposal to the development of monitoring and assessment (report No.3.)
- **Characterisation of the pilot aquifer as a groundwater body according to the WFD**
- **Vulnerability mapping of the pilot aquifer applying the European approach (COST 620 Action)**

Content of the inception report:

- objectives
- project description
- assignment of the pilot area
- general overview of the area
(geology, geomorphology,
climate, hydrology,
hydrogeology, caves, settlements,
water uses, land use, etc.)
- present monitoring activities
- database
- institutional background
- overview of the international co-operation
concerning groundwater (bilateral level,
Danube river basin level, internat. prgs, etc.)
- EU WFD implementation
- vulnerability mapping (COST 620 Action)



Activities:

meeting of the Geological Surveys
data collection
compilation of the Inception report
(Hung. - Slo.)
translation

Second Expert meeting: Bratislava, March 3-4. 2003.

Next activities - (WFD, ICPDR RBM EG):

data collection on pressures of the gw. body

information on impact

review existing groundwater monitoring data (chemical and water level) and data on dependent surface waters and ecosystems;

assess the water balance of gw. body;

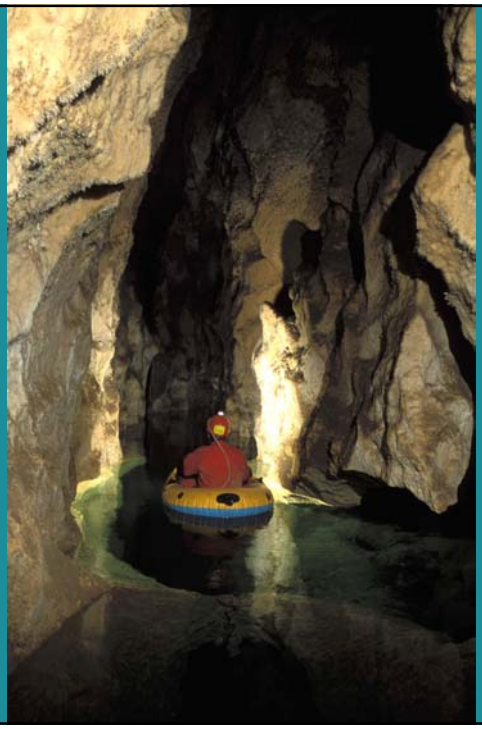
relationships between the groundwater body and connected wetlands;

Consider both chemical and quantitative status to decide whether the groundwater body is likely to be at risk…...

A review of the delineation of the groundwater body may be undertaken if the data on pressures and impacts indicates that it may be helpful to subdivide bodies for the purpose of developing a practical programme of measures;

Assess vulnerability of groundwater to pollution from recorded pollution pressure – *at present no possibility to realise exists;*

The development of a conceptual model of the groundwater flow – *at present no possibility to realise exists*



Annex 5: The UN/ECE pilot project on the Aggtelek (HU) – Slovak karst aquifer with special regard to WFD. Slovakian part.

Adonis vernalis

The UN/ECE Pilot Project on the Aggtelek – Slovak Karst Aquifer with Special Regard to WFD

part II

2nd Groundwater Workshop on the Implementation of WFD in the DRB

Budapest, Hungary

May 12 -13th 2003

Location of Pilot Project Area

Pilot Project

1. Step: Memorandum of Understanding: Co-operation endorsed by the Meeting of the Parties to the Convention in The Hague, The Netherlands, 23-25 March 2000
2. Step: 2002 March Meeting in Jósvafő, Hungary: proposal of Inception report content and chapters, responsibilities;
3. Step: 2003 March Meeting in Bratislava, Slovakia: evaluation of until meeting time activities, proposal of workplan, responsibilities

Inventory Report

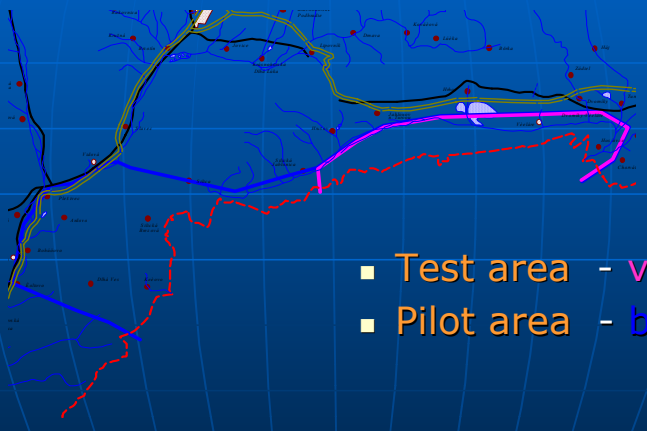
1. Objectives
2. Memorandum of Understanding
3. Establishment of project organization
4. Delineation of Pilot Area
5. General description
6. Function and Uses
7. Monitoring practices
8. Institutional background
9. International co-operation
10. Work Plan, Time Schedule, Responsibilities
11. Funding
12. Annexes

Objectives

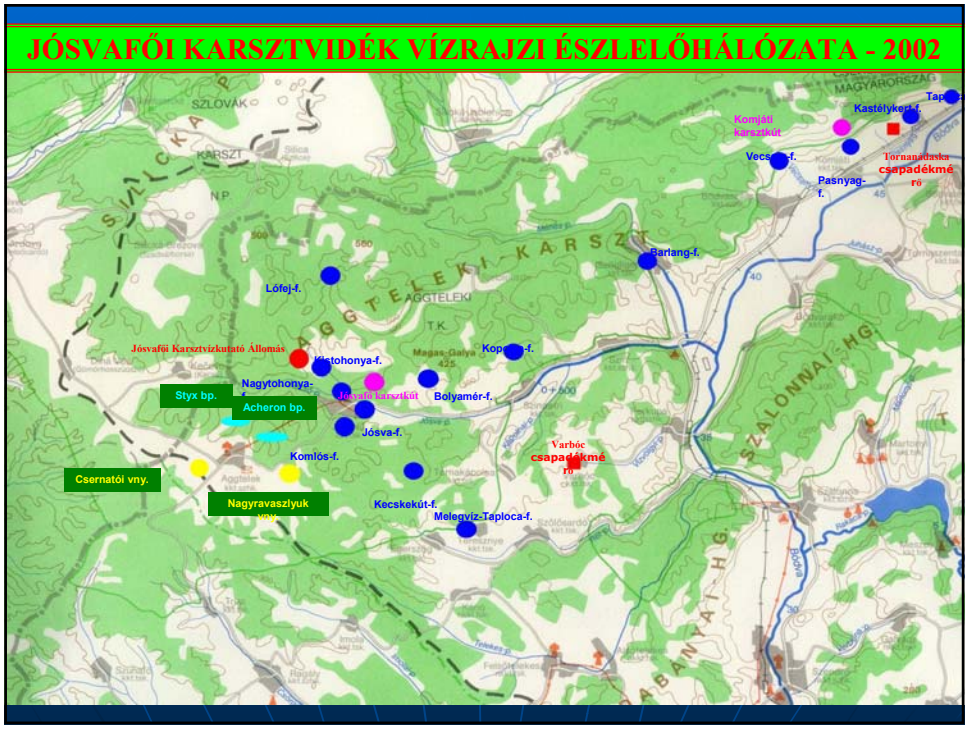
- Guidelines introduction on monitoring of transboundary groundwaters, testing the Guidelines
- Pilot area characterisation as subsurface water body according to the Water Directive of EU
- vulnerability mapping of the Aggtelek-Slovenský kras area applying the "European Method" elaborated by the EU COST 620 Action

Project Organizational Structure

Delineation of Project Area
Development of Maps Background



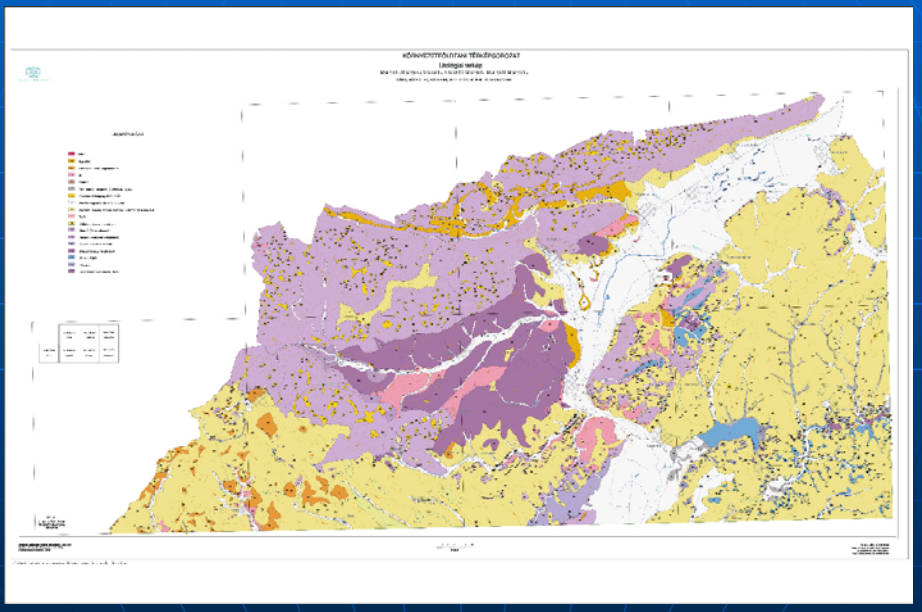
- Test area - violet
- Pilot area - blue



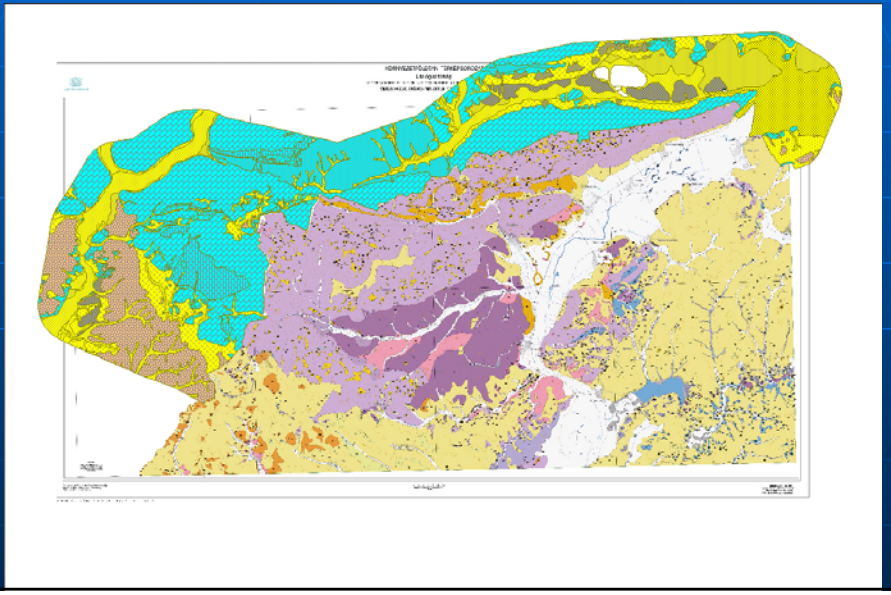
Problems of methodical approach on creating of geological maps (digitalised)

1. **Slovak Geological Survey (ŠGÚDŠ) map:**
   - tectonic units,
   - detailed stratigraphy, especially in Quaternary
2. **Hungarian Geological Survey (MÁFI) map:**
   - detailed Quaternary on the map (karst holes fillings)
   - not differenciated stratigraphy
   - tectonic units not easy to compare
3. **Result:**
   - common lithological map, slightly corrected on state boundaries
   - output in MapInfo / ArcView GIS

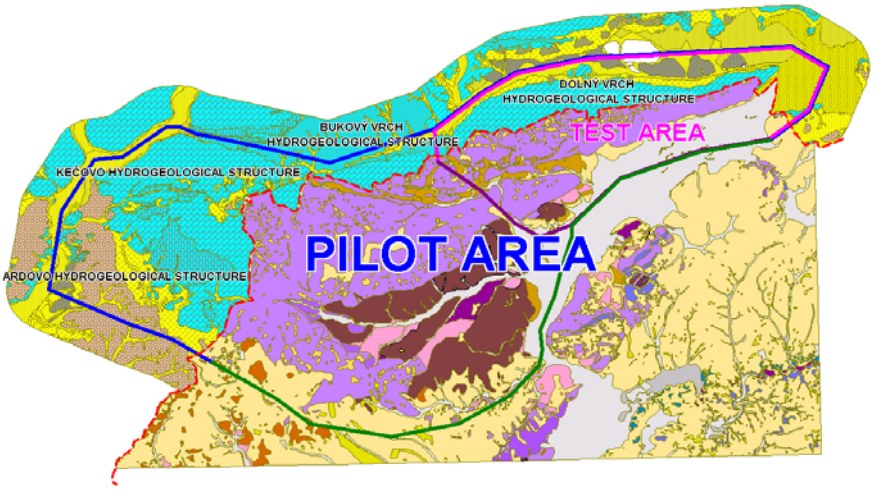
Hungarian geological map



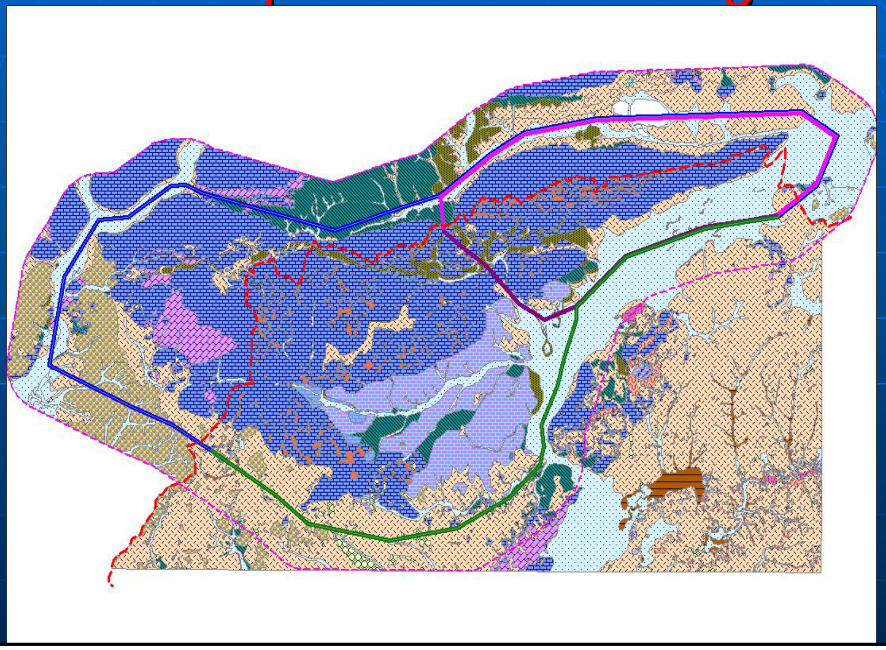
Problems of methodical approach on creating geological maps



Delineation of Project Area



Final map draft with unit legend



History of land protection

- National Park Slovenský kras declared as protected area from 1973 as a NP from 2002
- Aggtelek National Park established 1978 as NP Biosphere Reserve
- 1978 – area declared as prevention zone of UNESCO`s system of Biosphere Reserves

General description

- The most part of area are series of plateaux max. altitude ranges 400–900 m.
- Summit of Plešivecká Plateau reach 851 m, Silica Plateau 679 m.
- The highest elevation - Pipítka (1225m)
- The lowest point 150 m above see level is in the Valley of the Bodva River
- Caves: Baradla/Domica (longest 22 km), Jasov/Jászó, Gombasek/Gombaszők, Béke, deepest are 236m Vecsembukk, 203 Kunia…

Hydrogeology

- **Plešivec - Silická Brezová hydrogeological structure** that occupies southern part of the Plešivecká Planina Plateau and the Triassic karst to south from Silica, ranging from Plešivec on the west up to the Ardovo on the east.
- **Dolný vrch hydrogeological structure** as an eastward continuation of the Plešivec-Silická Brezová hydrogeological structure, separated by the anticlinal elevation of Lower Triassic slates This structure is a northern part of a structure, outcropping also in Hungary
- **Bukový vrch hydrogeological structure**, which is formed only by a smaller outcrop in Slovakia, separated also by Lower Triassic slates from the Plešivec - Silická Brezová hydrogeological structure on the east and Dolný vrch hydrogeological structure on the west
- **Kečovo hydrogeological structure**, defined in space by the line connecting Ardovo, Silica, Silická Brezová, Dlhá Ves and Domica. This structure is only a western part of a larger structure, outcropping mostly in Hungary

Geology

- Limestone complexes of territory have long been considered as autochthonous ones.
- Basement rocks are mainly of Triassic Age. Silica Nappe – comprised of Lower Triassic frustulent sediments, and Middle Upper Triassic dolomites and limestone – including coarse Wetterstein limestone
- Only carbonate sediments were deposite in the Middle Triassic – typical Gutenstein limestone, light grey limestone and dark grey dolomites were formed;
- Jurassic sediments occure in a number of sites in Silica Napp;
- There are also Cretaceous sediments on Jasovská Plateau
- Qaternary sediments – mainly accumulated at the base of plateau slopes, consolidated rock breccias, with calcareous cement mixed with terra-rossa soil, occur in many locations.

Hydrology, Climate

- Hydrology
  - ✓ Characterize by absence of surface runoff
  - ✓ Total infiltration of precipitation through numerous fissures and faulted zones into the karstic carbonate rocks
  - ✓ Water percolates rapidly and is accumulated inside carbonate massif
  - ✓ Karst spring originating from shallow circulation occur at the base of plateau and fluctuate greatly in yield
- Climate
  - ✓ situated in the humid-continental climatic zone
  - ✓ Warmest month July 16 – 20.3 °C
  - ✓ Coldest January -4 - -6 °C
  - ✓ Main annual temperature 5.7 – 9 °C
  - ✓ Mean annual precipitation 630 -990 mm

Function and Uses

Landuse

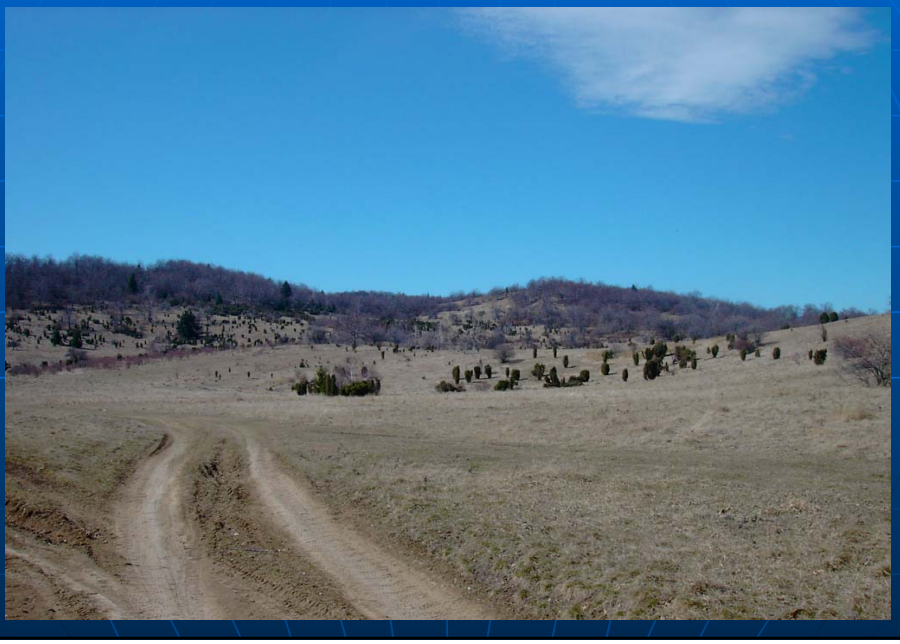
The whole pilot project area lies on the territory of National Parks Aggtelek and Slovenský kras. This is attractive due to its natural beauties, diversity of plants and wildlife. The natural conditions of the landscape determine its use. The pilot project area is agricultural or forested area with villages, without the industry.

Kečovo karren filed

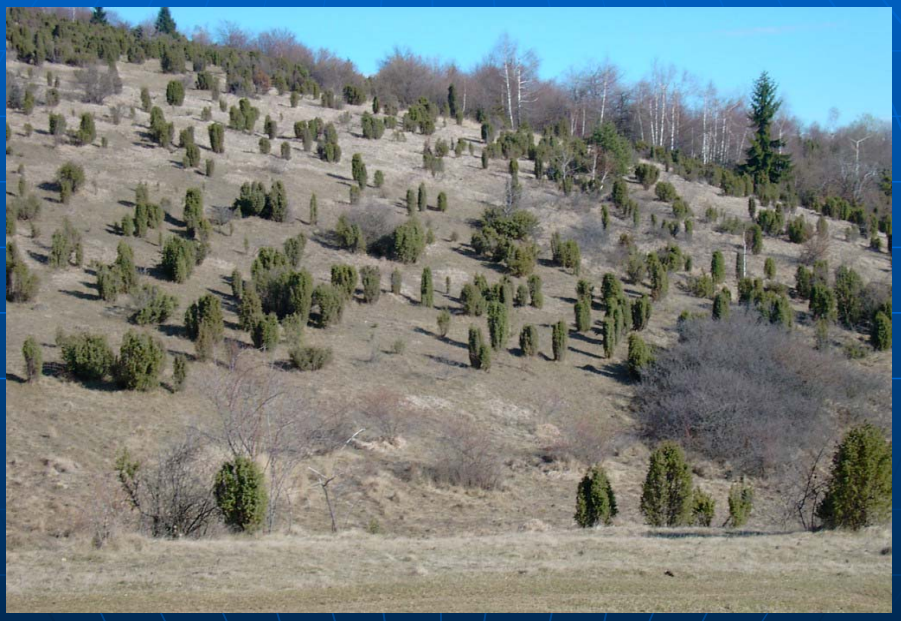
Kečovo meadow

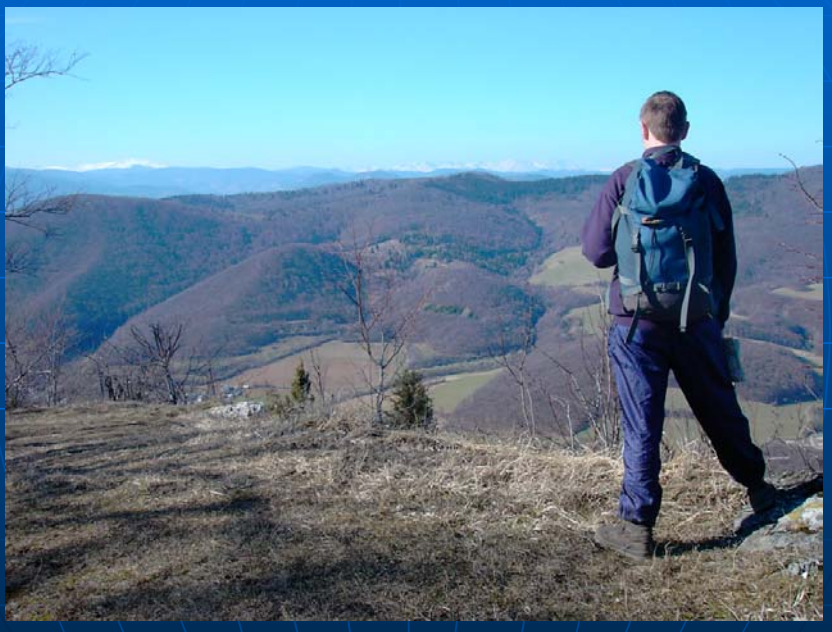
Kečovo meadow

Plešivecká Planina Plateau



Plešivecká Planina Plateau

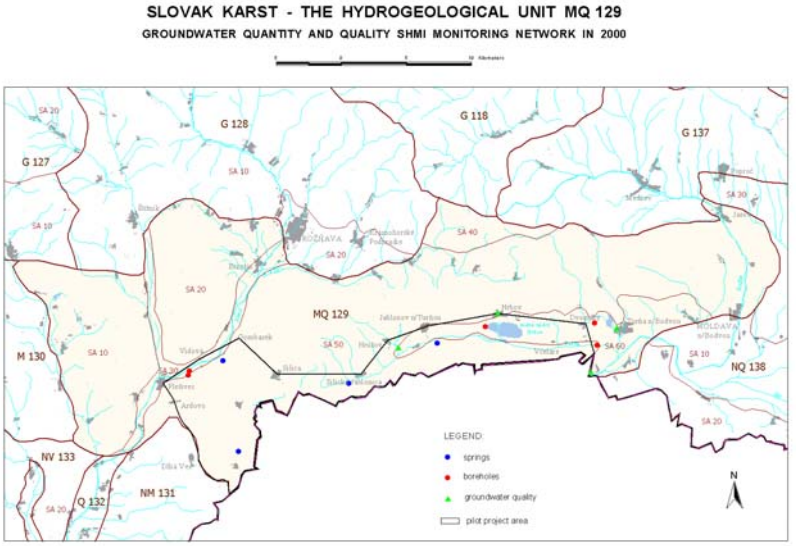




Usable groundwater amount – drinking water

- Silica–Silická Brezová struc.: 11 $l.s^{-1}$
  abstraction (2000) = 0.19 $l.s^{-1}$
- Kečovská structure: 18 $l.s^{-1}$
  abstraction (2000) = 2.65 $l.s^{-1}$
- Bukovský vrch: 8 $l.s^{-1}$
  abstraction (2000) = 0.41 $l.s^{-1}$
- Dolný vrch: 23 $l.s^{-1}$
  abstraction (2000) = 2.57 $l.s^{-1}$

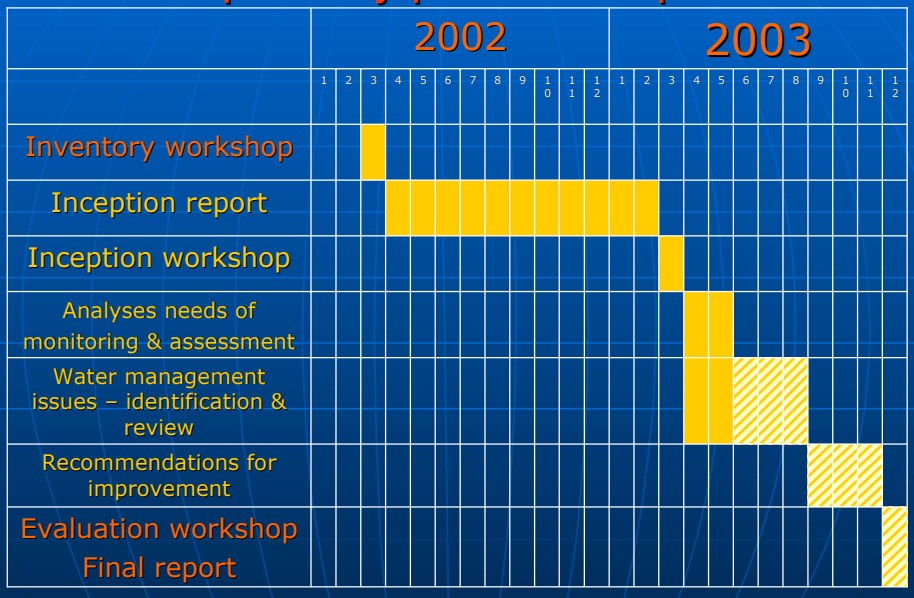
Monitoring practices



International co-operation

- Danube Basin
  - Convention on the Co-operation in the Protection and Use of the Danube River
  - Forum of the Danubian Hydrological Services
- The Bilateral Contacts on Transboundary Waters
  - The Hungarian-Slovakian Joint Committee on Transboundary Waters
  - Hungarian-Slovakian Joint Committee on the Cooperation in Environmental Protection and Nature Conservation
- The Multilateral Co-operation of UN in Water Management
  - Convention on the Protection and Use of Transboundary Rivers and International lakes (Helsinki Convention)
  - International Hydrological Programme of UNESCO
  - World Meteorological Organisation (WMO)
  - The Water Framework Directive of EU
  - EU COST Action 620

Preparatory phase workplan



Project 2

Implementation phase

Anemone

Annex 6: DE-AT thermal groundwater body

Transboundary Groundwater Bodies

German-Austrian-Cooperation in Modelling and Managing a Transboundary Thermal Groundwater Aquifer

Baudirektor K. Roth/Ministerialrat J. Jedlitschka
München, Mai 2003

1 Introduction

The Water Framework Directive (WFD) requires the determination and description of groundwater bodies in the member states of the European Union.

Usually deep groundwater – sometimes more than 1.000 meter deep – is often not taken into account, as it seems to be well protected by nature and in consequence of its depth exploitation normally is low. This is not the case with groundwater used as thermal water.

In the transboundary Lower Bavarian-Upper Austrian molasse basin thermal water is already intensively used for spa purposes and also to gain geothermal energy. The molasse basin forms the aquifer for thermal groundwater resources as a whole unit and is rather independent of the upper groundwater layer. Therefore we decided to identify this groundwater resource as a separate groundwater body, here particularly as a transboundary groundwater body following the WFD. An interesting feature is the large extension of the groundwater body from Lower Bavaria to Upper Austria. This groundwater body is intensively used especially in the region of the state border between Bavaria and Austria.
To ensure a sustainable use of these important groundwater resources, both states decided for a joint approach to protect the deep groundwater aquifer. The first step was the characterisation of the groundwater body with the help of a numeric groundwater model.

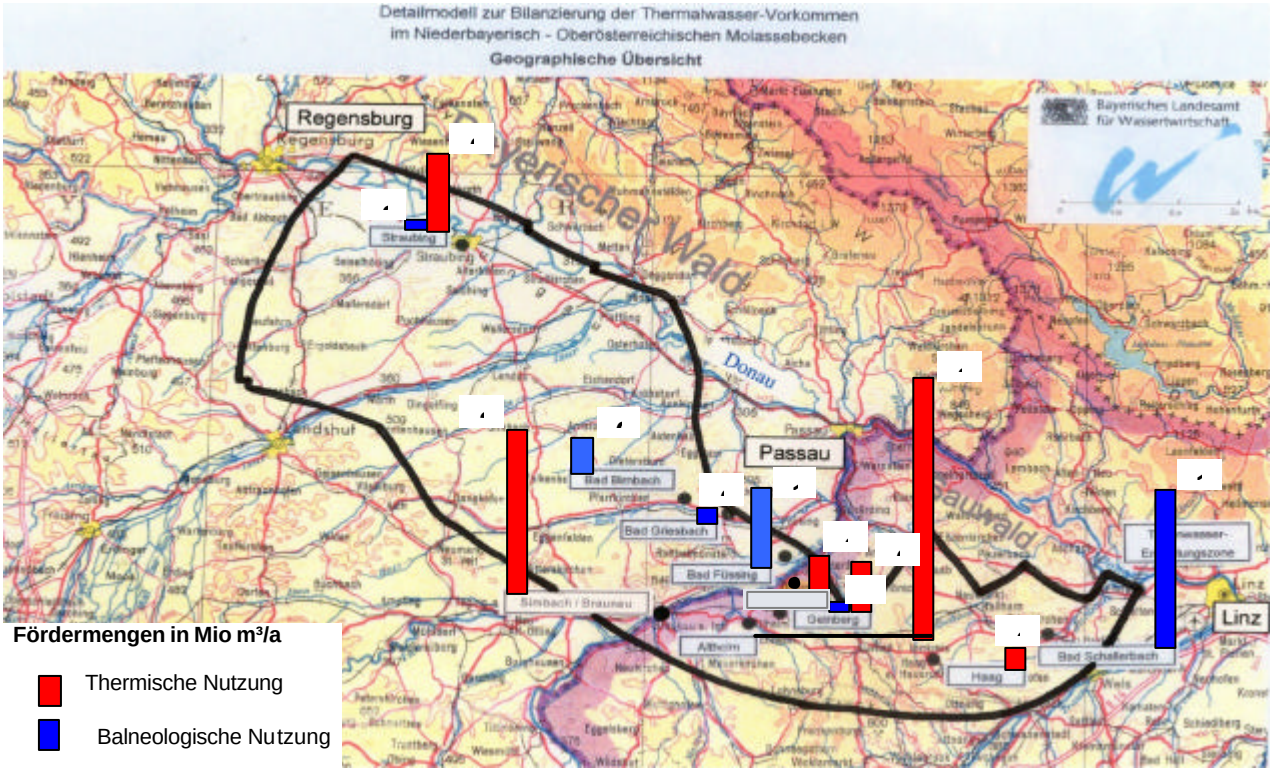
In the following I will present an overview of the further proceeding:

2 Characterisation of the groundwater body

The thermal water of the malmkarst (Upper Jurassic) in the Lower Bavarian and Upper Austrian Molasse Basin is used for spa purposes and in order to gain geothermal energy. The thermal-water use in Bad Füssing, Bad Birnbach and Bad Griesbach in the German region and

Geinberg and others in the neighbouring Austrian region, is today of increasing economical importance; this can be seen by the high number of overnight stays with a high increase during the last years.

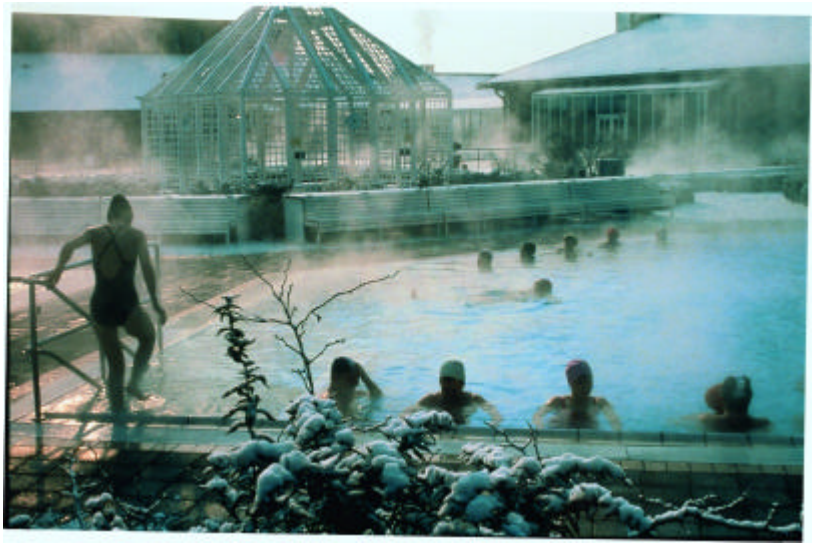
The following figure 1 gives you a survey to the model area – similar to the ground water body - with the main thermal water uses in this area.

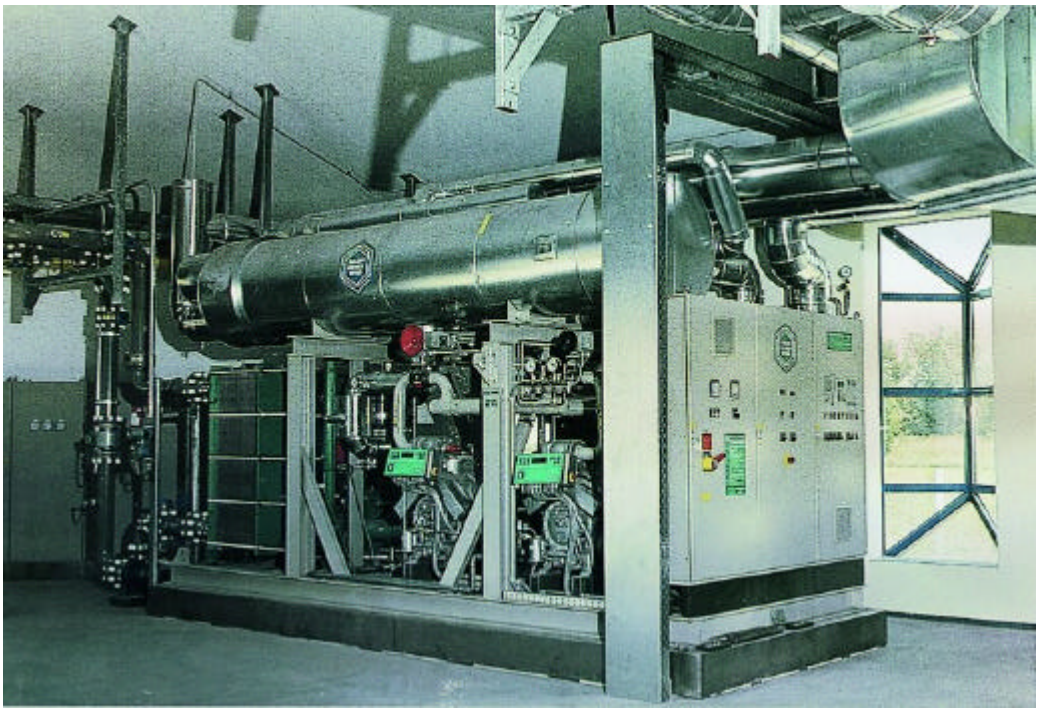


The following pictures show spas in Germany and Austria.

This picture shows a typical scene of thermal water use in a spa.
The main use for spa purposes is in

-Bad Füssing
-Bad Birnbach
-Bad Griesbach
-Bad Schallerbach
-Geinberg





This picture shows part of a geo-thermal plant.
The main use for geothermal energy is in:
-Straubing
-Simbach / Braunau
-Altheim

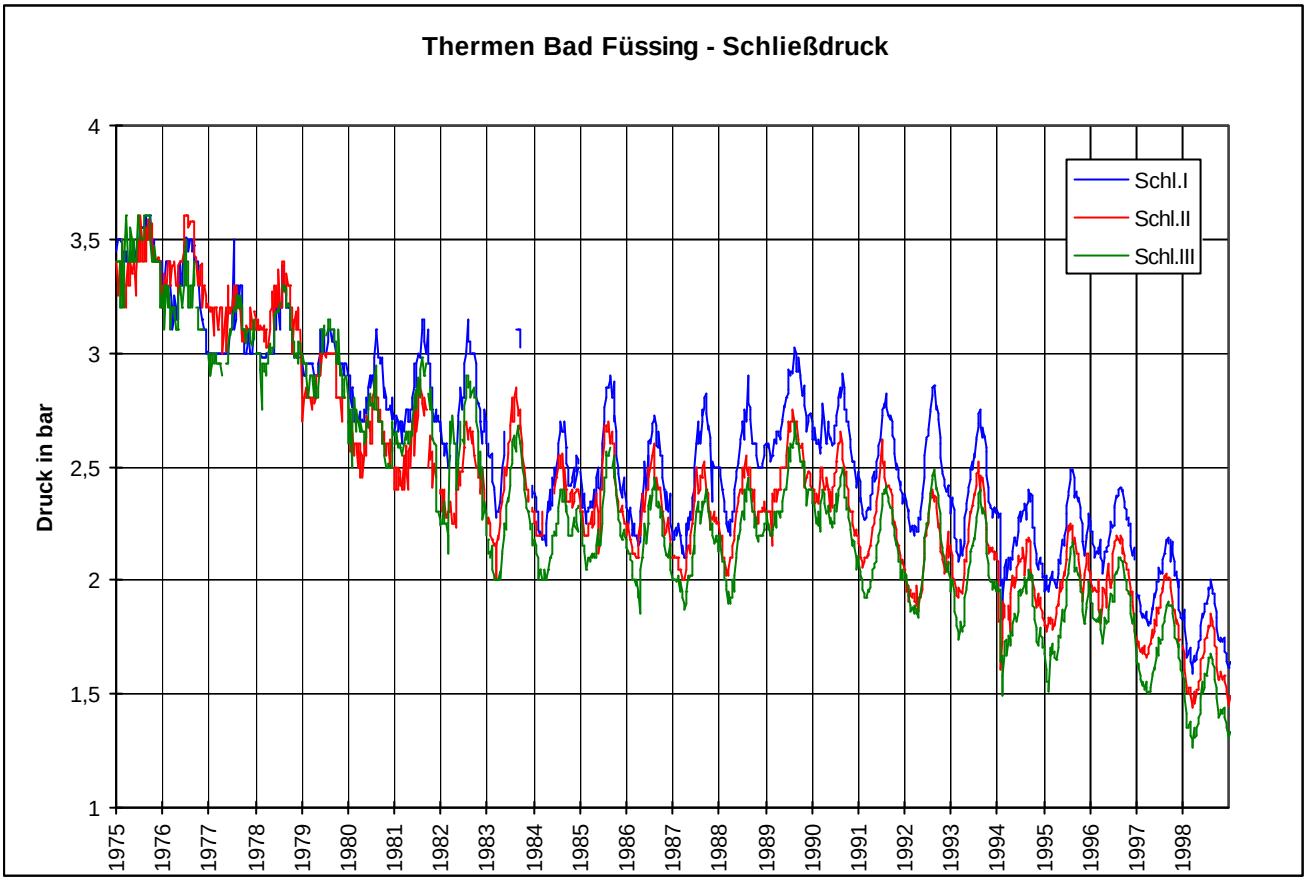


Figure 2: Decreasing closing pressure in Bad Füssing

The decreasing closing pressure of the thermal water wells in Bad Füssing was a sign that this groundwater body might be "at risk" in the sense of the WFD.

The fear that there was an overuse caused by the abstraction of thermal water out of the karstic malm limestones was already confirmed by a previous research project "Hydrogeothermal Energy Balance and Groundwater Resources of the Malmkarst in the large South German Molasse Basin" (1984 – 1989). The result of this project study was, that the natural discharge of thermal water might only be 1.5 m^3/s in the whole area.

Due to the increasing thermal water abstractions in Bavaria and Austria a new more detailed groundwater balance for the German – Austrian part of the whole large South German Molasse Basin was necessary. This was done with the help of a sophisticated groundwater model.

3 Regensburger Vertrag

Since 1987 there exists an international agreement called “Regensburger Vertrag” for border – crossing water management questions between Germany and Austria. The Regensburger Vertrag rules the water management cooperation in the catchment area of the Danube.
The „Ständige Gewässerkommission“ is the highest organ
Under this Commission there are two working groups

- Water quality protection
- Water quantity management

The working group „water quantity management“ installed an ad hoc expert group Tiefenwasser (deep groundwater) to handle common questions of deep aquifers.
This expert-group had to supervise the elaboration of the model with the objective of a better knowledge of the groundwater.

Regensburger Vertrag

International agreement from 1st December 1987
Between

- Germany
- Austria and the
- European Union

concerning the water management cooperation in the catchment area of the Danube

Organisation:

- **Ständige Gewässerkommission**
  (9 members from the BRD + EG,
  6 members from Austria)
  There are 2 expert groups installed:
- **Sachverständigen-Arbeitsgruppe „Gewässerschutz“**
- **Sachverständigen-Arbeitsgruppe**
  „Wassermengenwirtschaft, Wasserbau“
  On its suggestion the
- **ad-hoc-Expertengruppe „Tiefenwasser“**
  was installed and instructed to supervise the elaboration of the ground-water model.

Figure 3: “Regensburger Vertrag”

4 Ground Water Model

The groundwater model was necessary to characterise the groundwater body. But this model should also be a relevant instrument for the German and the Austrian authorities to evaluate the required water abstractions and the potential yield under consideration of other existing wells on a reliable basis when licensing thermal water abstractions. Taking particularly into account the required groundwater abstractions in this area, forecasts were necessary for the future thermal ground-water management as well as an exact identification and description of the existing thermal - water use.

The ground-water balance of the study area is presented in figure 4 and extends from Regensburg and Landshut in the north to Linz in the south. It is only a part of the South German Molasse Basin. The river Danube accompanies the eastern border for long distances. With a total area of 5900 km^2 the length is 150 km and the width is 55 km.

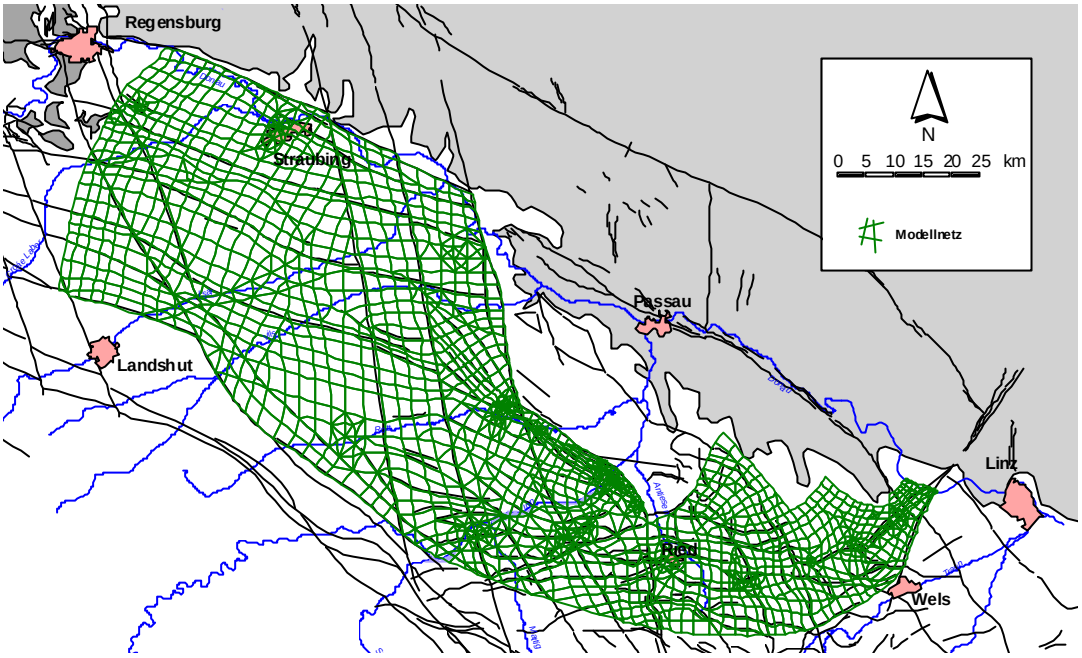


Figure 4: Survey of the water-balance area

The thermal water flows within the carbonate Malm aquifer. The Malm (Upper Jurassic) crops up near Regensburg and dips towards the south as shown in figure 5. Near the river Inn the top of the Malm reaches a depth of about 2000 m below sea level. From the Inn to the east the ascending to the river Danube west of Linz, is cut by important tectonic structures.

The following longitudinal section shows the aquifer level descending from the northwest to the southeast.

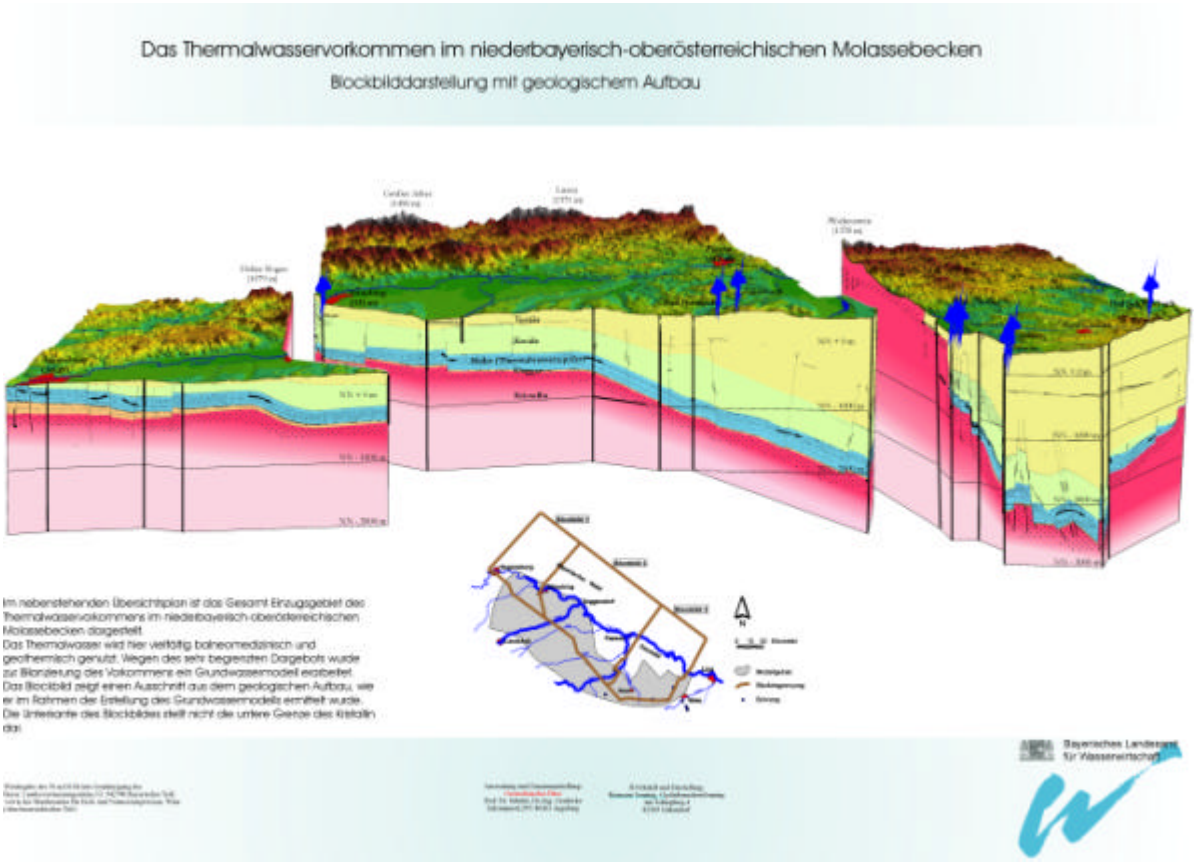


Figure 5: 3D picture – longitudinal section

The model of the thermal-water aquifer was developed in German-Austrian cooperation in the years 1995 to 1998 with the help of a consultant.

The model allows the simulation of different water abstraction– and reinjection configurations.

The main results are the following:

— Up to now an overuse of the thermal-water aquifer cannot be observed.
— Effects of future uses can be forecasted with a sufficient reliability.
— A total reinjection of hydrogeothermally used deep water is mandatory.
— The deep water with high salinity in the southern boundary area of the model can be mobilised.
— The pressure conditions should be held stable as much as possible.

The ground-water model is a reliable instrument for the German and the Austrian authorities to judge the required water abstractions. It allows

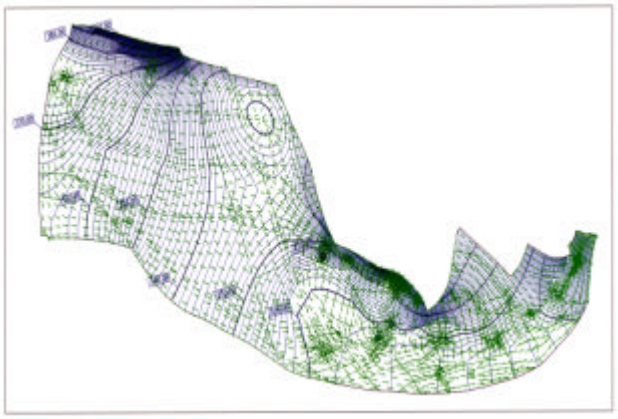
– to balance the ground-water resources in the Lower Bavarian - Upper Austrian Molasse-Basin
– a sufficient quantification of the ground-water recharge and
– a quantification of possible effects on existing neighbouring wells.

The results of the studies carried out show clearly that a further use of the thermal water resources will be only possible if the thermal water is used rationally and the existing hydrostatic conditions will in general be preserved.

5 Keynote Papers

In order to be able to manage the thermal water resources in both countries in a sustainable way and according to the best available technology, the ad hoc expert group worked out keynote papers where joint protection and utilisation strategies are laid down.

Grundsatzpapiere zur Thermalwassernutzung im niederbayerisch–oberösterreichischen Molassebecken



Ad hoc Expertengruppe „Tiefenwasser“

im Auftrag

der Ständigen Gewässerkommission nach dem Regensburger Vertrag

März 2002

The commonly elaborated keynote papers cover the following issues:

- Thermal Water Management principles.
- Dimensioning of installations for thermal water use in spas
  The determined limitations of water abstractions are obligatory for both sides (Austria and Germany) in order to protect the thermal water resources in a sustainable way against overuse.
- Principles concerning the application, maintenance and further development of the mathematical groundwater model
  - the procedure of the application of the model had to be fixed exactly
- Standardized application forms for abstraction licences
  - to ensure for both countries a standard procedure
- Catalogue of requirements
  - in order to ensure that uniform principles are applied when constructing and operating the installations and, in particular, when collecting and documenting data.
- Exchange of relevant information and data
  - an efficient management of the thermal groundwater resources is only possible, if both sides have the same status and level of information at any given time

Figure 6: Keynote Paper

6 Conclusions

The success of the ground-water model and the good results of the expert group work have finally shown, that the common efforts on both sides – German and Austrian – were worthwhile.

The most important results are the excellent cooperation and the exchange of information between the Bavarian and Austrian authorities and the gained knowledge that reinjection of thermal water for geothermal use is mandatory in order to avoid a decreasing closing pressure of the thermal water wells in the spas.

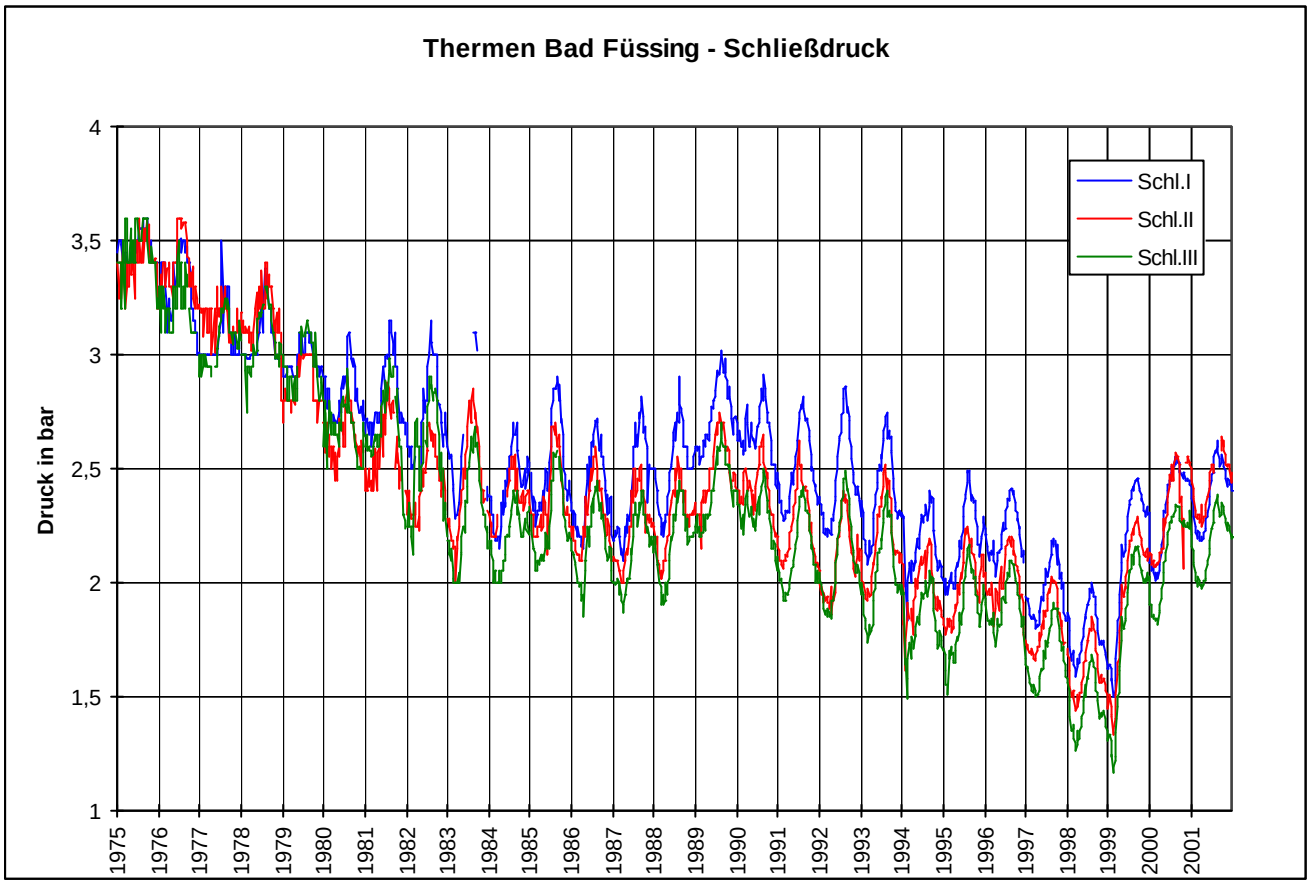


Figure 7: Increasing closing pressure in Bad Füssing since 1999

Finally the last figure shows that since 1999 the closing pressure is again increasing in this transboundary groundwater body.

We thus anticipated the WFD. Before 1995 we found that the groundwater body was "at risk" and after investigating the reasons we could start with remediation measures – in this case with limited rational water abstractions and reinjection into the deep groundwater aquifer (sustainability!). The groundwater body formerly at risk will probably be in good status in 2015.