SWIM and Horizon 2020 Support Mechanism

Working for a Sustainable Mediterranean, Caring for our Future

Groundwater Management

GW-Body delineation/characterisation/risk assessment

Presented by:

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Topics

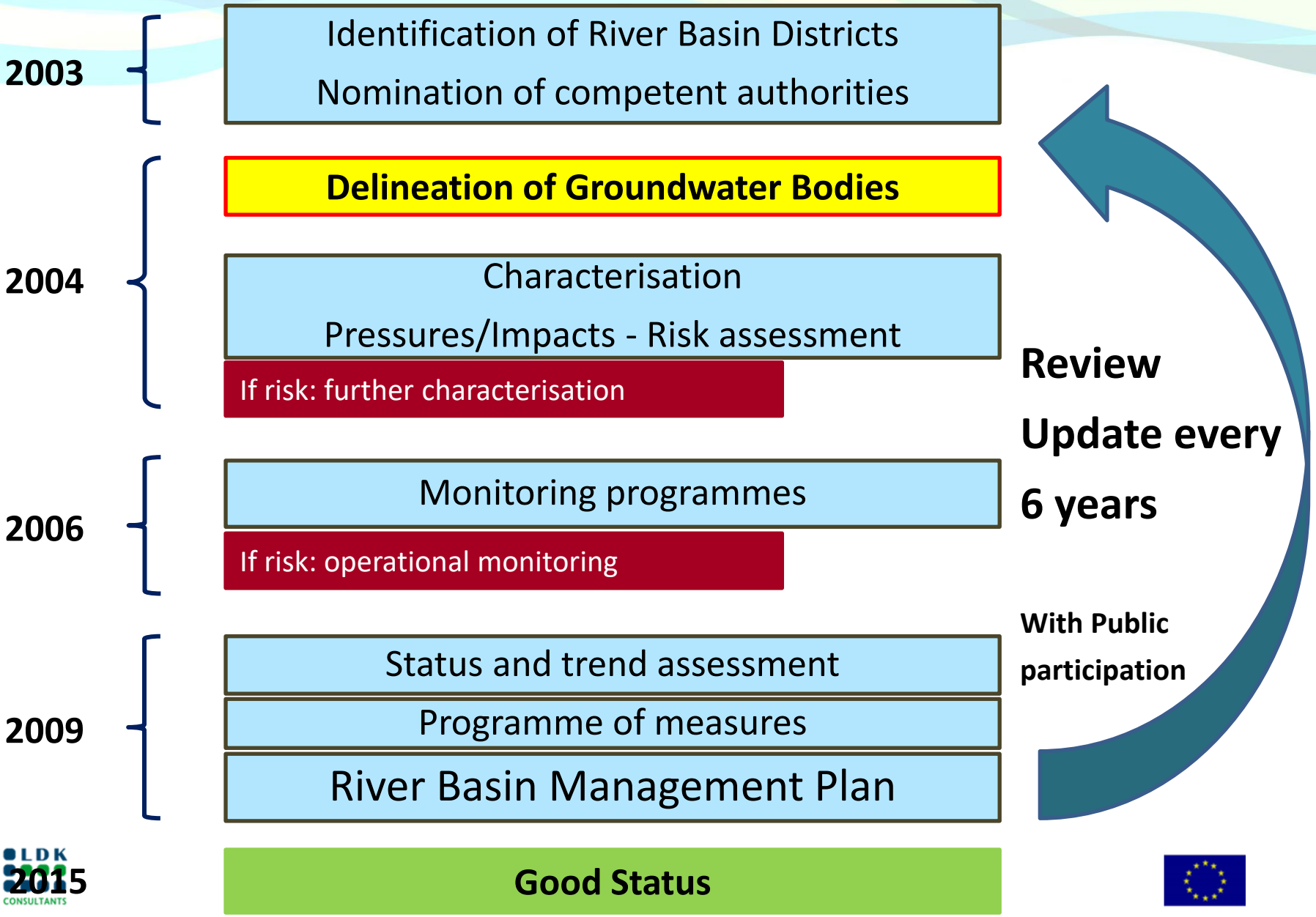
❖ Groundwater body delineation

- Brief background
- Experiences in EU Member States

❖ Characterisation and risk assessment

- Brief background
- Experiences in EU Member States

Procedure according EU Water Framework Directive



Groundwater body delineation

Principle

- A groundwater body (GWB) is a coherent management unit which has to meet the environmental objectives.
- The identification of GWBs is a tool and not an objective in itself.

Main purpose of groundwater bodies

- to enable accurate description of (quantitative and chemical) status and comparison to environmental objectives.
- To implement the measures necessary for achieving the objectives.

Groundwater body delineation

Definition of GWB in the Water Framework Directive

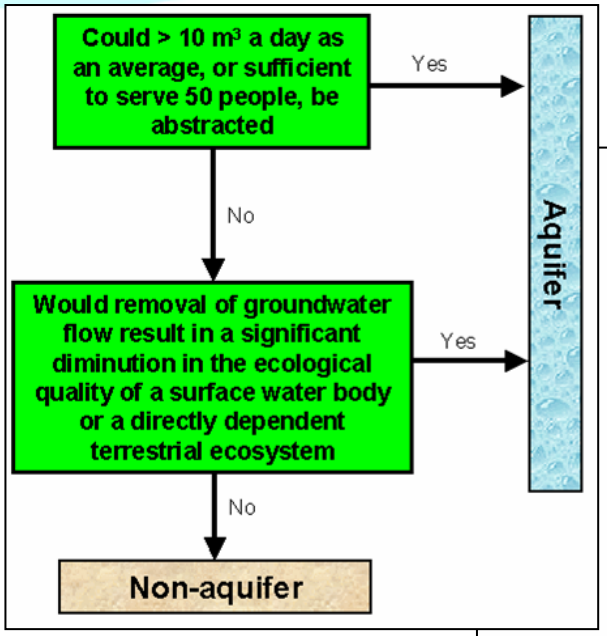
GWB means "a distinct volume of groundwater within an aquifer or aquifers" (Article 2.12)

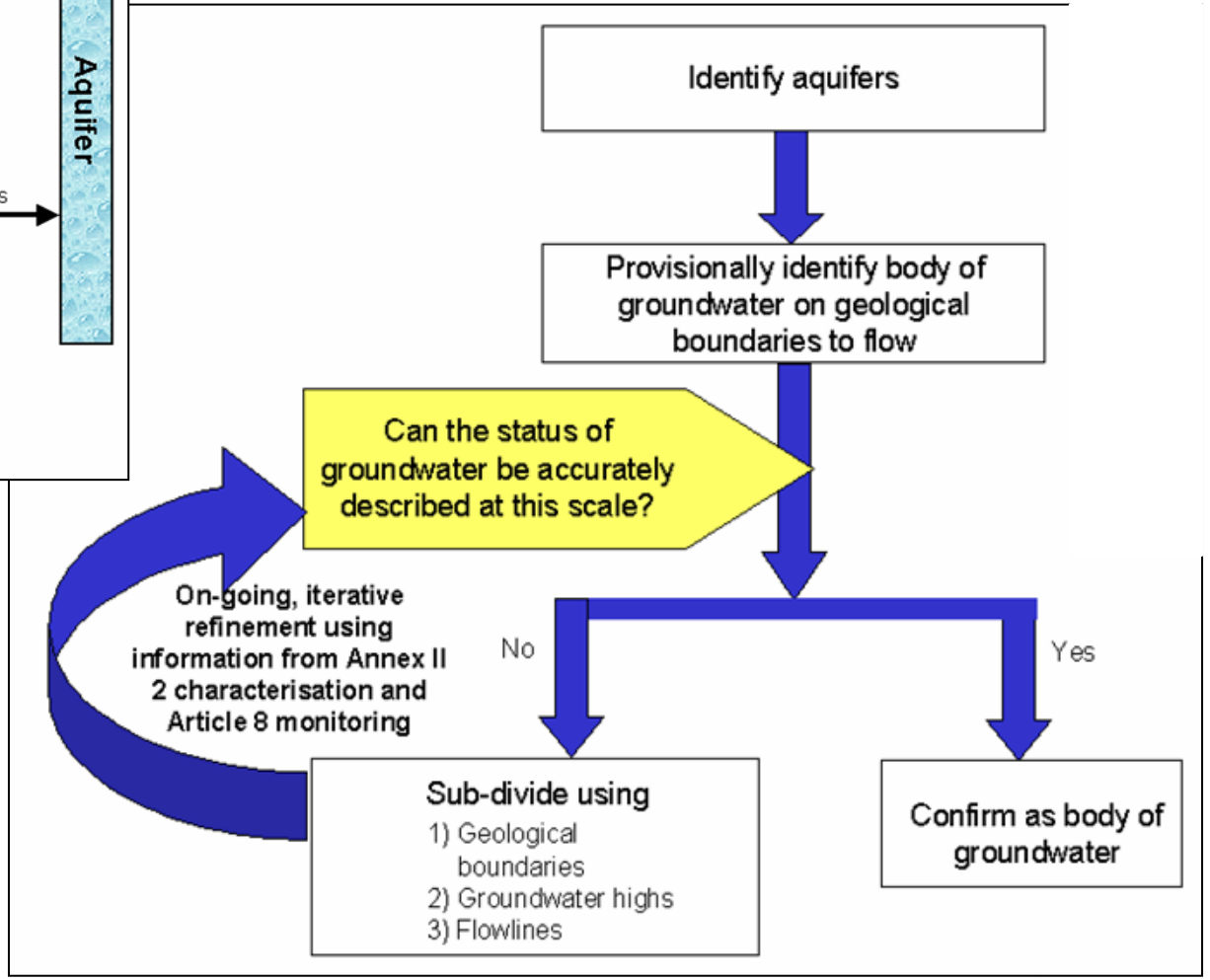
*"a subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of **significant** quantities of groundwater" (Article 2.11)*

Total average abstraction from the whole aquifer >10 m³ per day or provides sufficient quantities to serve 50 people.

"all water, which is below the surface of the ground in the saturated zone and in direct contact with the ground or sub-soil" (Article 2.2)

Groundwater body delineation





An iterative approach

Source: CIS Guidance Document No. 2 on Identification of water bodies

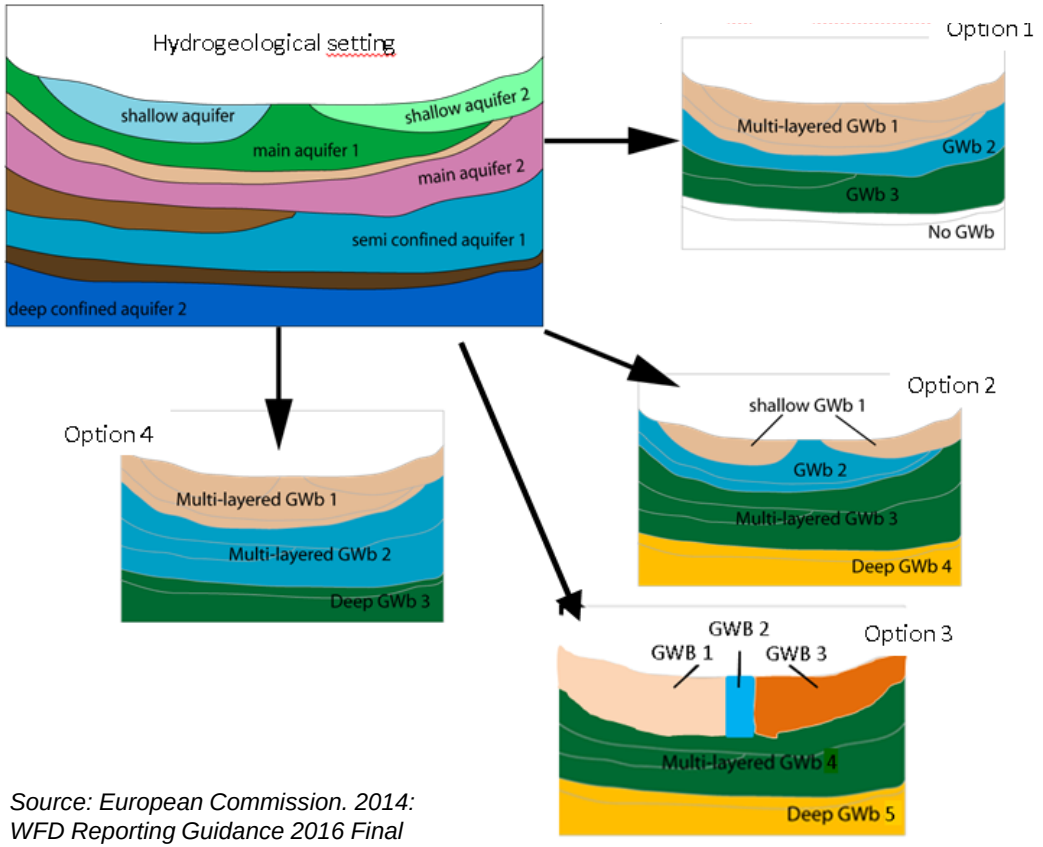
Groundwater body delineation

Challenges for delineation

- GWB is a 3-D body → delineation comprises both, the horizontal and vertical dimension
- Efficient and practical management units
- Variation of characteristics and pressures
- Appropriate administrative burden.
- Grouping of bodies can support efficiency

Hydrogeological setting

Options for GWB delineation



Source: European Commission. 2014: WFD Reporting Guidance 2016 Final V6.0.6

Groundwater body delineation

Most Member States started with:

- Geological and hydrogeological boundaries;

and they considered further aspects:

- Vulnerability maps, Risk potential
- Variations in natural background levels
- Variations of human pressures
- Utilisation and protection needs,
- Economic importance
- Surface water catchments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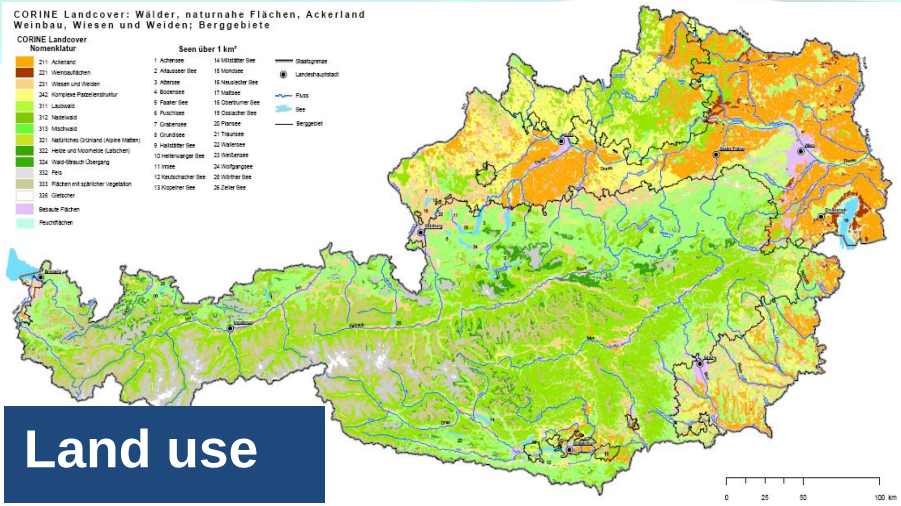
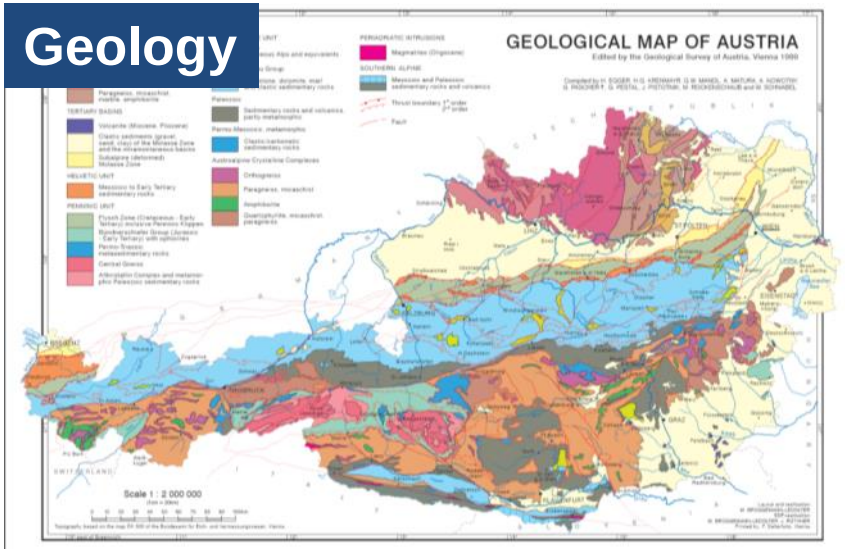
GWB delineation - AUSTRIA

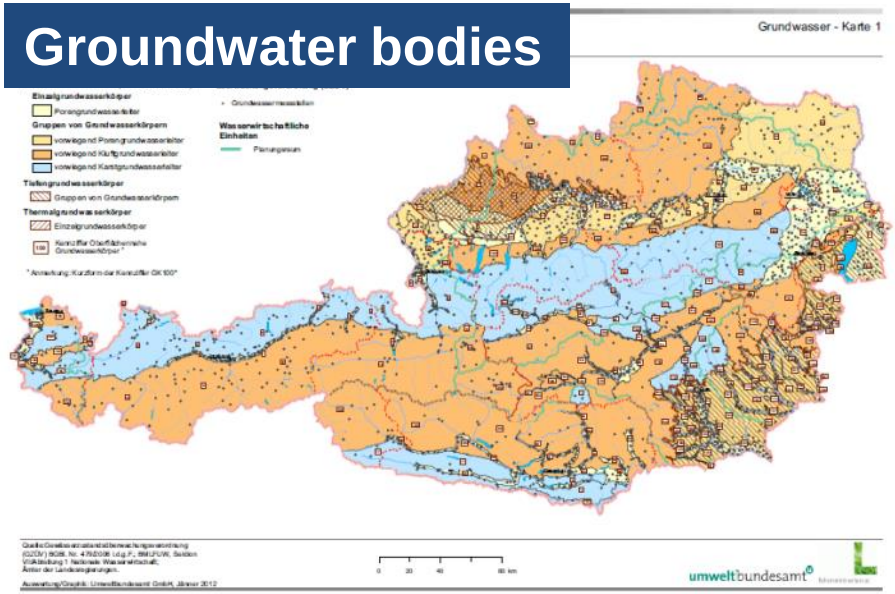


Land use

Geology



Groundwater bodies



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GWB delineation - AUSTRIA

129 shallow GWBs – covering the whole territory of Austria

Drinking water = 100% Groundwater. (Self-supply: 8% of population)

9 Deep GWBs - only delineated where they are utilised.

Delineation of individual GWBs

Size : > 50 km²

Important because of:

- Used for drinking water,
- Significant amount of water,
- Transboundary,
- Significant pressures.

	AT coverage	Shallow GW (100 % of AT)	Deep GW (12 % of AT)	sum
Individual GWBs	10 %	63	1	64
Groups of GWBs	90 %	66	8	74
TOTAL		**129**	**9**	**138**
Transboundary	With DE, SI, HU	16	4	20

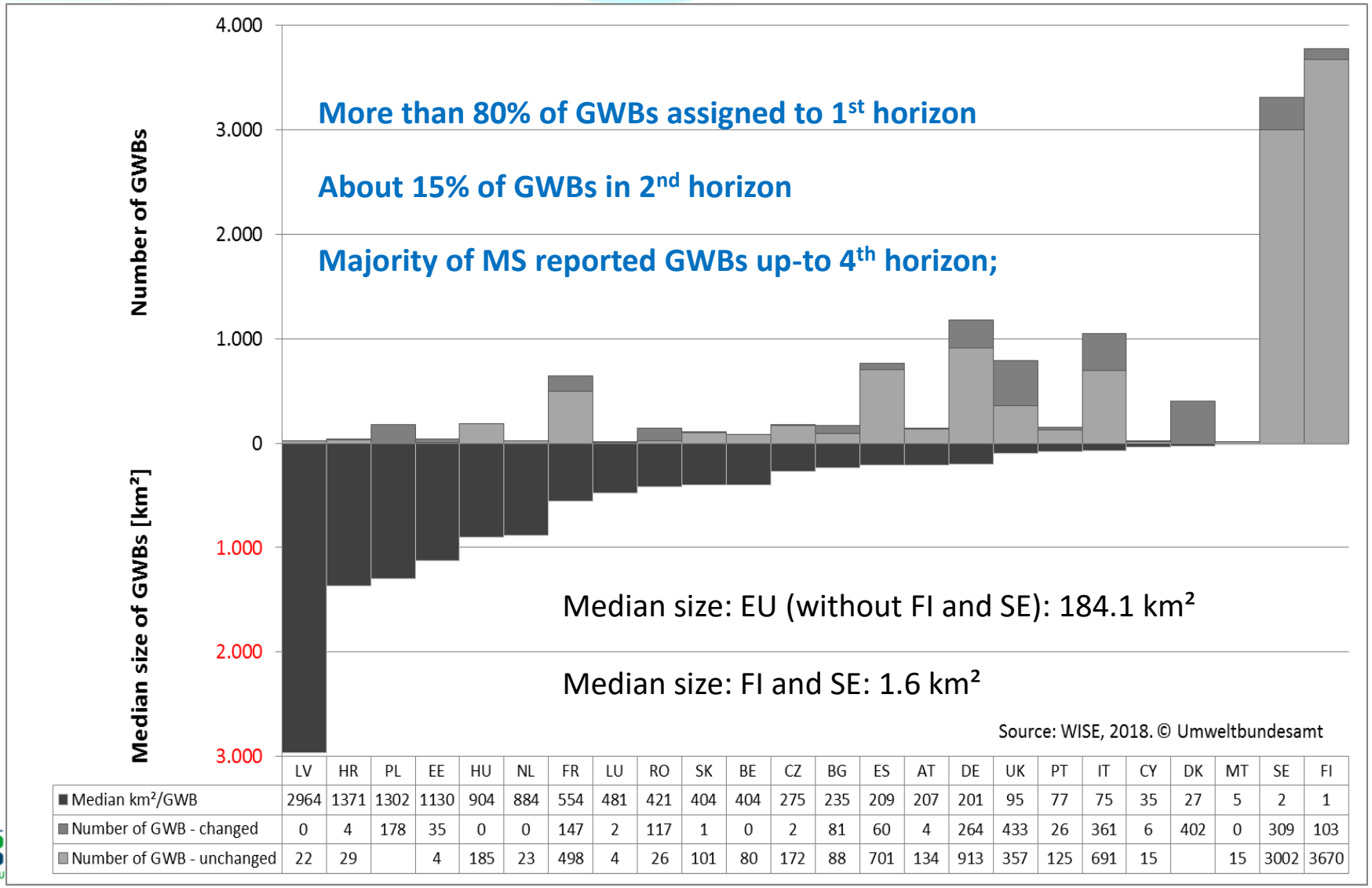
NGP 2015, BMLFUW

Delineation of Groups of GWBs

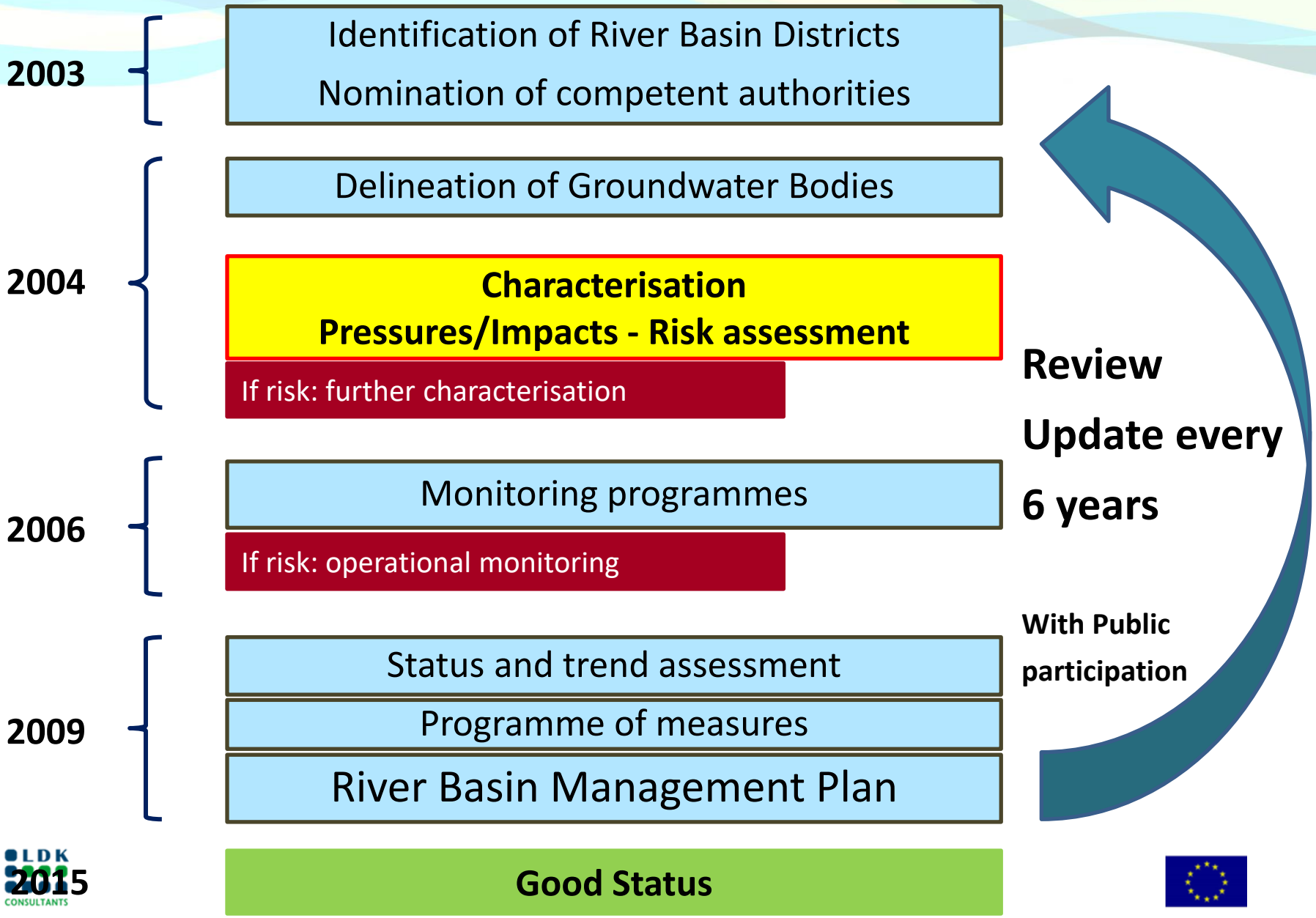
Delineation according to hydrogeological and sub-basin boundaries.

13,390 GW-bodies in Europe, 2nd RBMP

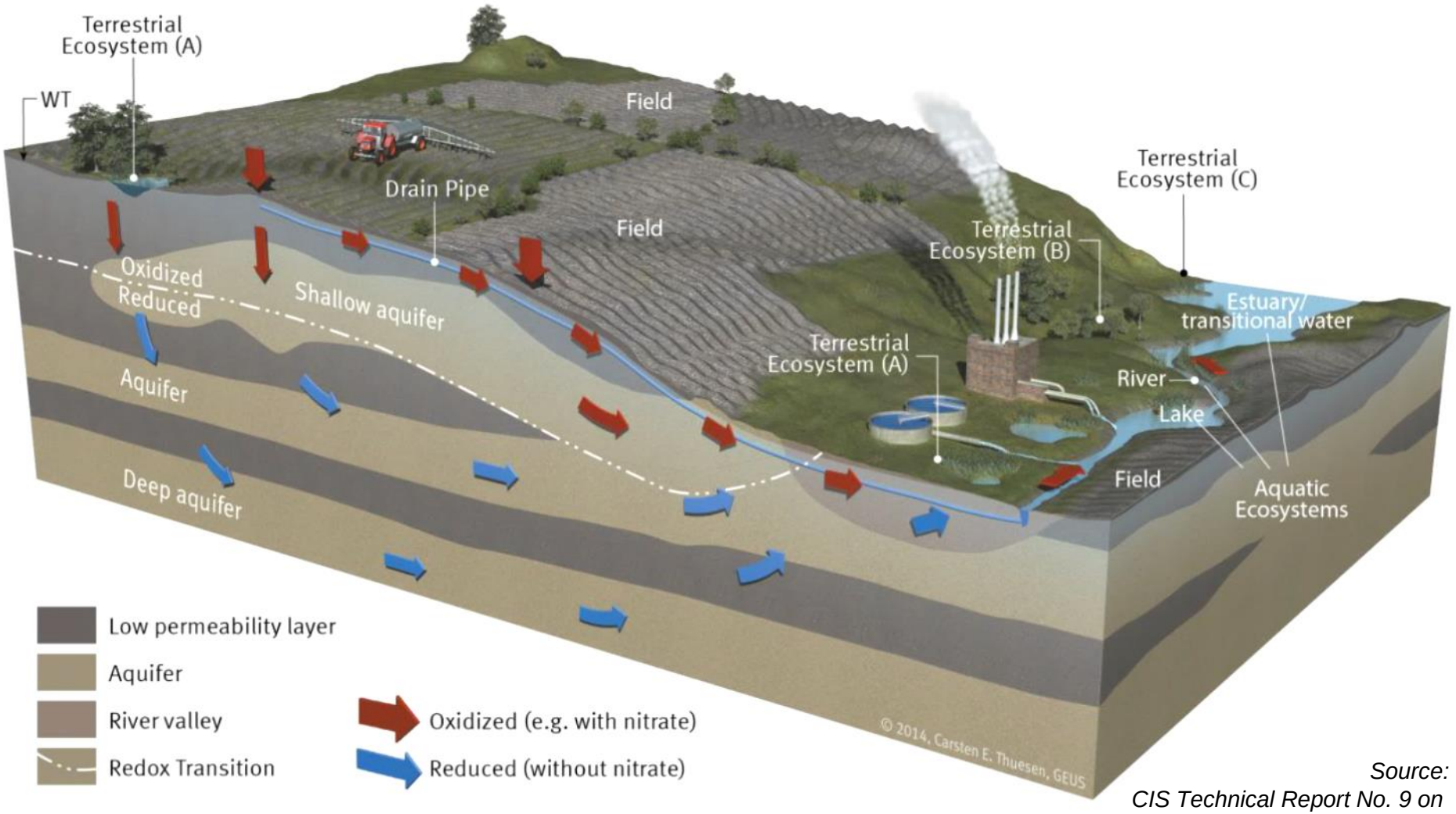
Total number and median size of GWBs in EU-27



	LV	HR	PL	EE	HU	NL	FR	LU	RO	SK	BE	CZ	BG	ES	AT	DE	UK	PT	IT	CY	DK	MT	SE	FI
Median km²/GWB	2964	1371	1302	1130	904	884	554	481	421	404	404	275	235	209	207	201	95	77	75	35	27	5	2	1
Number of GWB - changed	0	4	178	35	0	0	147	2	117	1	0	2	81	60	4	264	433	26	361	6	402	0	309	103
Number of GWB - unchanged	22	29		4	185	23	498	4	26	101	80	172	88	701	134	913	357	125	691	15		15	3002	3670

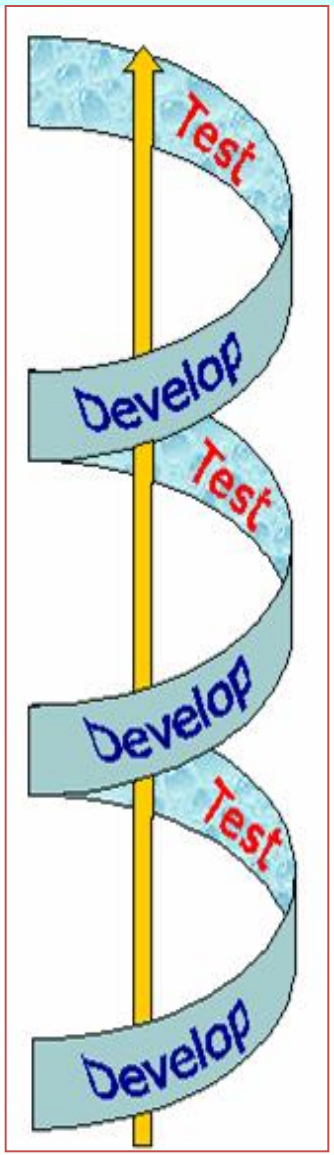

2003
Identification of River Basin Districts
Nomination of competent authorities
2004
Delineation of Groundwater Bodies
Characterisation
Pressures/Impacts - Risk assessment
If risk: further characterisation
2006
Monitoring programmes
If risk: operational monitoring
2009
Status and trend assessment
Programme of measures
River Basin Management Plan
2015
Good Status
Review
Update every
6 years
With Public
participation

Conceptual model



Source:
CIS Technical Report No. 9 on groundwater associated aquatic ecosystems, modified Hinsby et al., 2008, 2012

The Conceptual Model/Understanding
Key element for WFD implementation



Geology
Precipitation
Overlying strata
Hydraulic properties
Natural characteristics of groundwater body
Associated surface ecosystems
Conceptual Model
Understanding of
1. flow system;
2. natural quality variation and
3. vulnerability to pressures
Understanding of potential effects of pressures
Abstraction
Artificial recharge
Information on pressures
Point sources
Effects on recharge
Diffuse sources
Monitoring data
Existing monitoring data
Implications of errors in conceptual model
Confidence required in conceptual model
Monitoring design
What, where and when
Requirements of environmental objectives

Source: CIS Guidance Document No. 7 on monitoring under the Water Framework Directive

Characterisation & Review of impacts

Initial characterisation for all GWBs

- Location and boundaries of GW-bodies
- Human pressures (diffuse & point pollution, abstraction, recharge)
- General character of overlying strata
- Groundwater associated aquatic & dependent terrestrial ecosystems (wetlands)

Basis for Risk Assessment

Further characterisation for all GWBs at risk & for all transboundary GWBs

where relevant information on

- Geological characteristics, …..
- Hydrogeological characteristics, conductivity, ….
- Points for abstraction
- Abstraction rate, …

Review/update every 6 years

Sources of information in Austria

General characterisation

National Hydrological Atlas (Precipitation, Hydrogeology …),
Geological Surveys,
Expert judgement

Diffuse sources

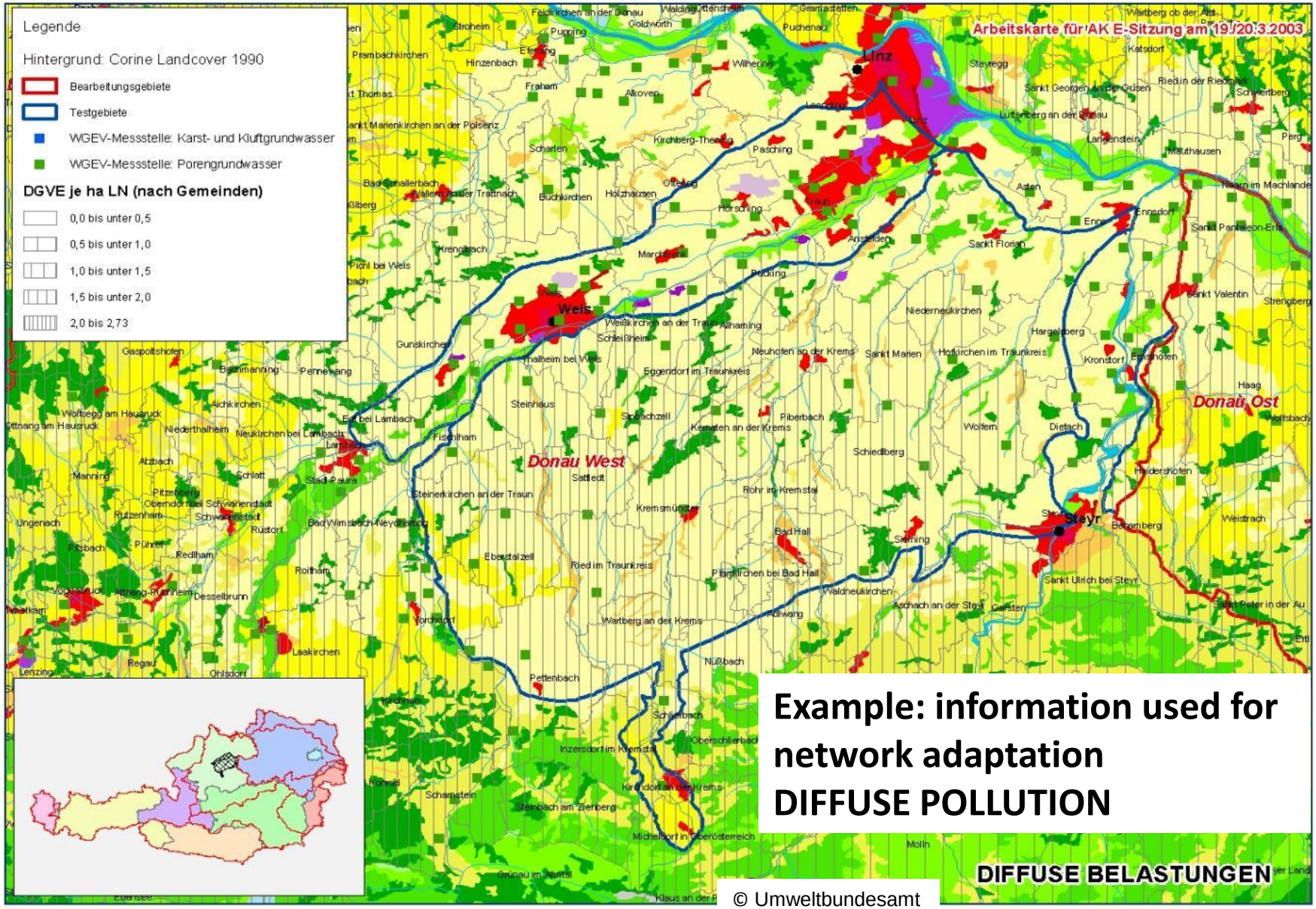
Austrian statistics (Live stock units, land use, settlements…)
CORINE Landcover

Point sources

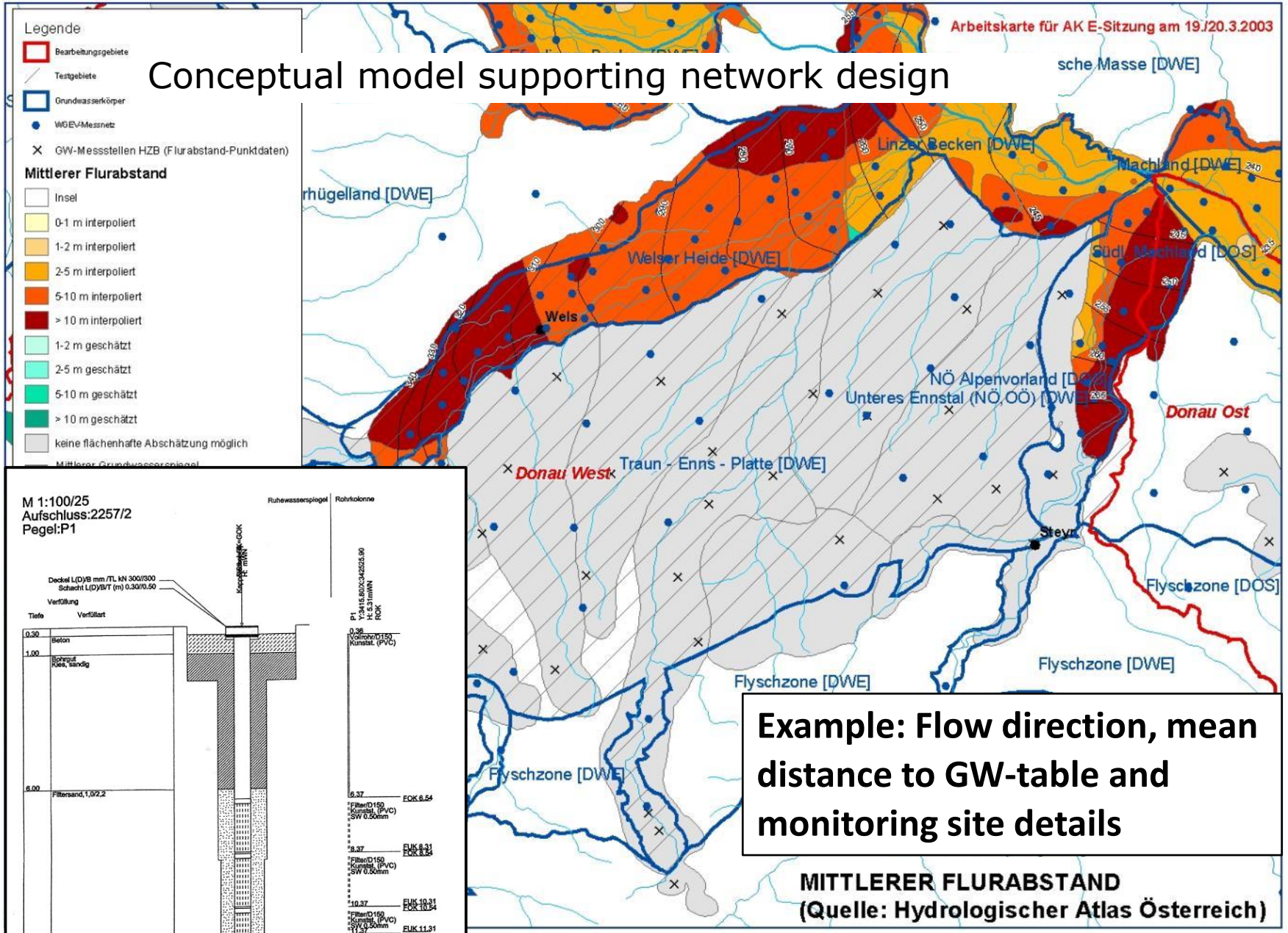
Register on contaminated sites,…

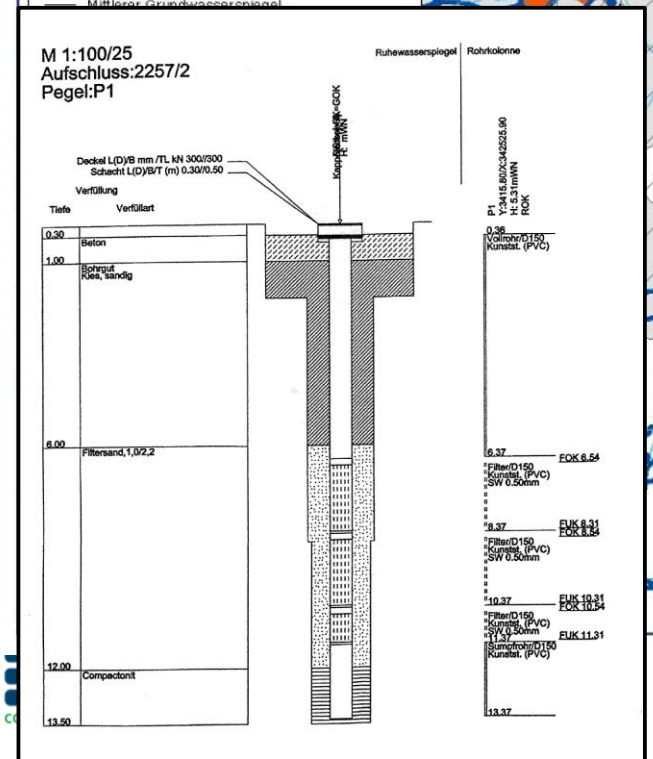
Overlying strata

FAO soil map,
Austrian soil map
Surveys and expert judgement for confining layers



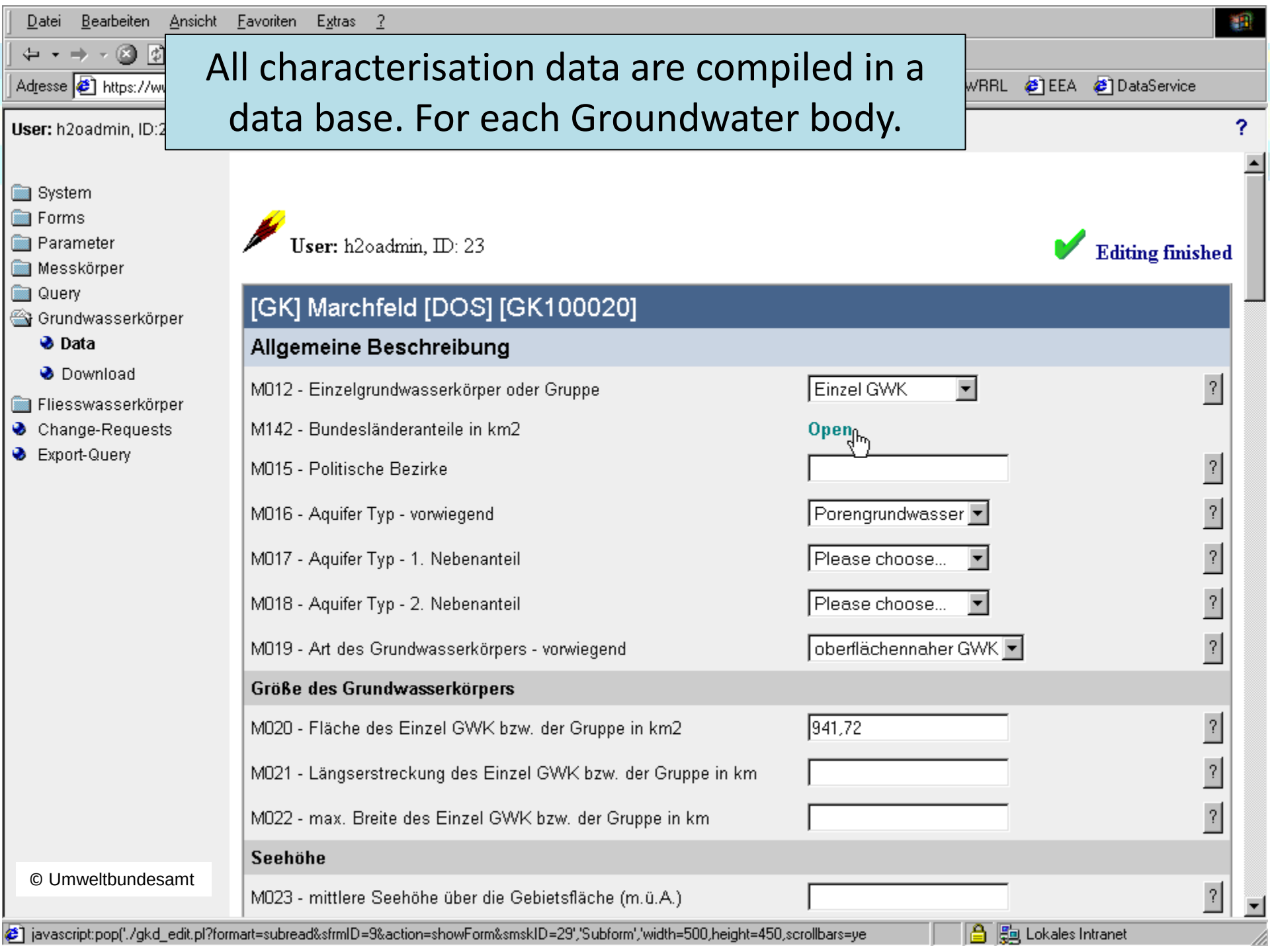
Conceptual model supporting network design





Example: Flow direction, mean distance to GW-table and monitoring site details

All characterisation data are compiled in a data base. For each Groundwater body.

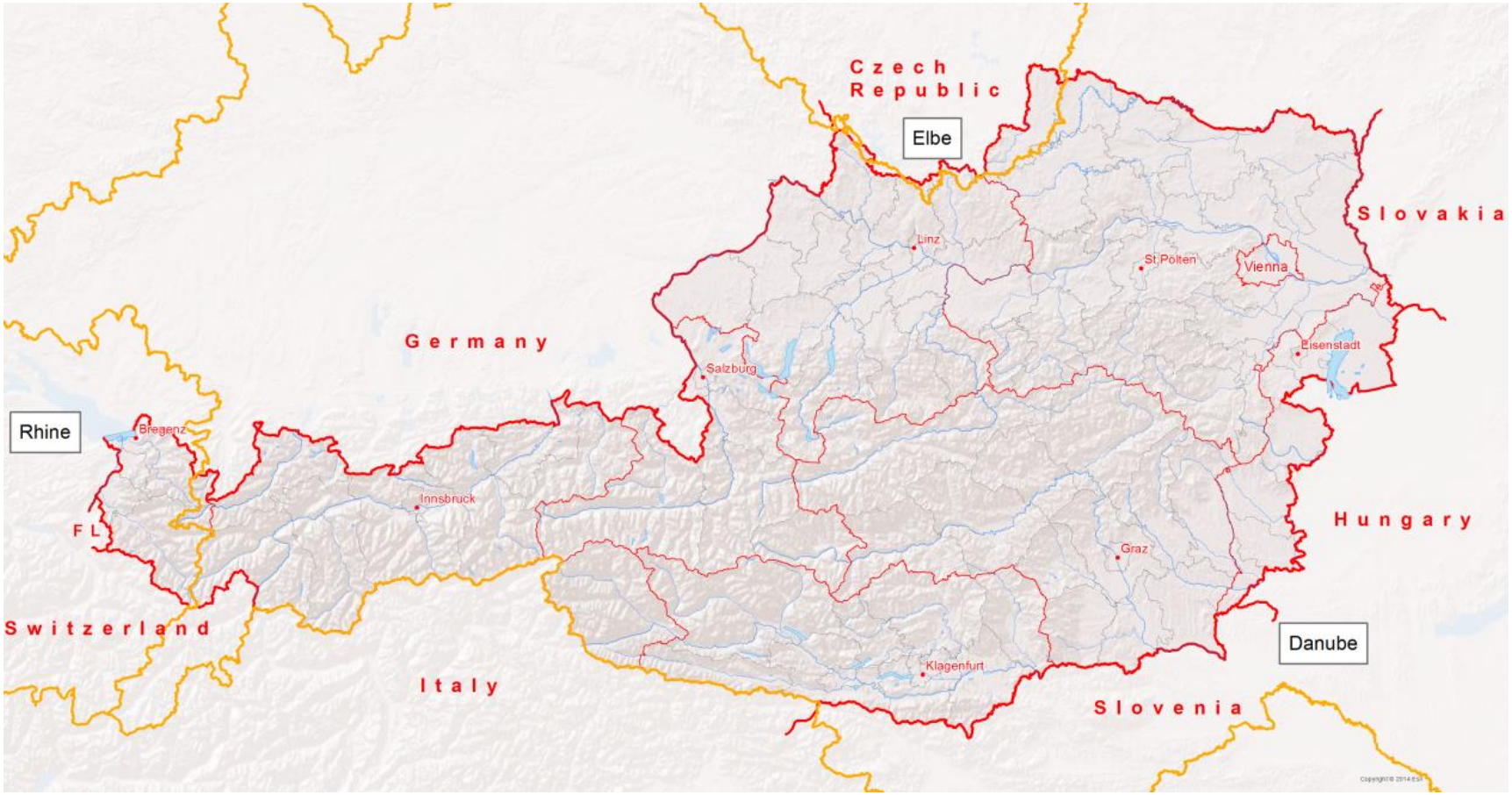


River Basin Management Plan and Implementation of Measures

Administrative Structure in Austria:

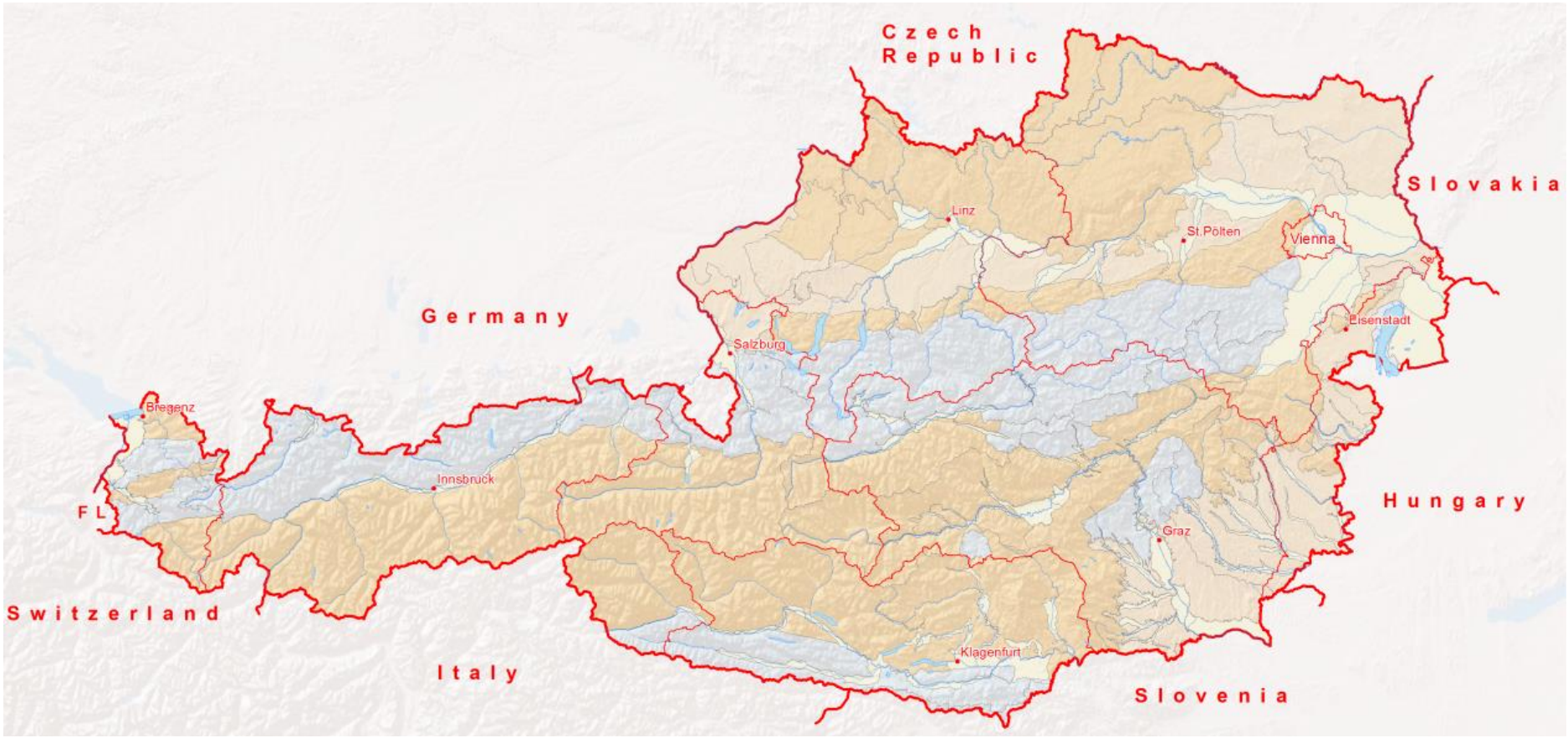
- Federal level: Federal Ministry for Sustainability and Tourism – responsible Authority for the implementation of WFD
  - 9 Provinces (Bundesländer) – Provincial Authorities
    - ~ 100 District Authorities
      - ~ Around 2300 Municipalities (Majors)
  - Water Act (Federal legal gazette No. 215/1959 – in the current version) = legal Basis for water management in Austria
    - Complemented by Ordinances e.g. concerning monitoring of water status, chemical status assessment for groundwater, …..

River Basin Districts and Provinces in Austria



Source: Federal Ministry for Sustainability and Tourism (BMNT)
Bundesamt für Eich- und Vermessungswesen (BEV)
Water Information System for Europe (WISE)

Groundwater Bodies and Provinces in Austria



Source: Federal Ministry for Sustainability and Tourism (BMNT)
Bundesamt für Eich- und Vermessungswesen (BEV)

GW-bodies – share in different Provinces selected examples

			Share of Province in %								
GW-Body Code	GW-Body	Share (no provinces)	1	2	3	4	5	6	7	8	9
GK100186	Zentralzone [DRA]	4		76,45%			0,14%	2,72%	20,68%		
GK100187	Hügelland Raab West [LR	2	7,58%					92,42%			
GK100188	Flyschzone [DUJ]	4			58,27%	38,27%	0,01%				3,44%
GK100189	Nördliche Kalkalpen [DUJ]	5			34,69%	33,19%	2,81%	29,26%			0,04%
GK100190	Böhmische Masse [DUJ]	2			52,26%	47,74%					

River Basin Management Plan and Implementation of Measures

Basis: Federal Water Act

Draft RBMP elaborated by Federal level – submitted to Provincial Authorities – complemented/amended

Final RBMP – published by the responsible authority Federal Ministry for Sustainability and Tourism

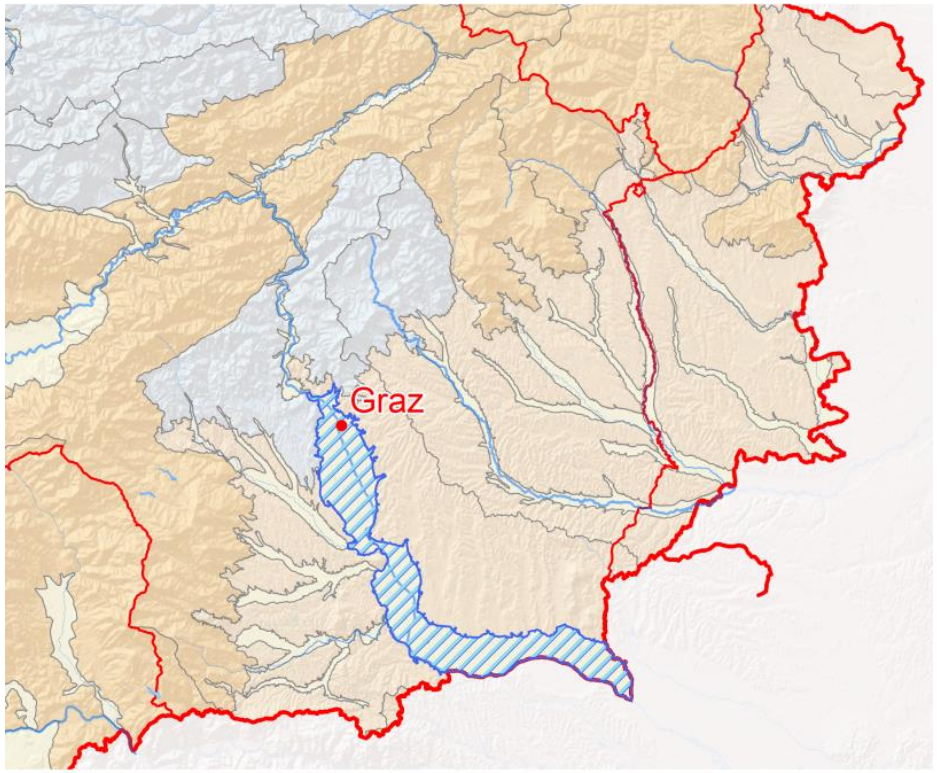
RBMP covers overall Austrian Territory – divided according the shares of international river basin districts (Rhine, Elbe, Danube)

- Programme of measures – integral part of the RBMP
- Implementation of measures

- by responsible authorities (federal-, provincial-, district level)

- supported by “Regional Programmes” developed by Provincial Authorities at surface- or GW-body level

Regional Programme Graz – Bad Radkersburg for the protection of three Groundwater Bodies (Ordinance by the Province Styria Nr. 39/2015)



Source: Federal Ministry for Sustainability and Tourism (BMNT)
Government of the Province of Styria
Bundesamt für Eich- und Vermessungswesen (BEV)

Regional Programme Graz – Bad Radkersburg
for the protection of three Groundwater Bodies (Ordinance by the Province Styria Nr. 39/2015)

Objective: maintain good chemical status of the three GW-bodies

Example for measures – complementary to RBMP:

- More stringent provisions concerning fertilisation
- Documentation by farmers (e.g. date and amount of fertilizer, type of pesticides applied, …)
- Additional need for permits in particular sections of the GW-bodies
  - Storage of substances – which are dangerous to water
  - Drilling and digging
  - New infrastructure like roads, railway lines, …
  - Storage of manure under certain conditions
  - …..

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For further information

Website

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