

SWIM and Horizon 2020 Support Mechanism

Working for a Sustainable Mediterranean, Caring for our Future

Groundwater Management

GW-Body delineation/characterisation/risk assessment

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SWIM and Horizon 2020 SM REG-5: Regulatory and organizational issues of decentralized water management

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ATKINS

Topics

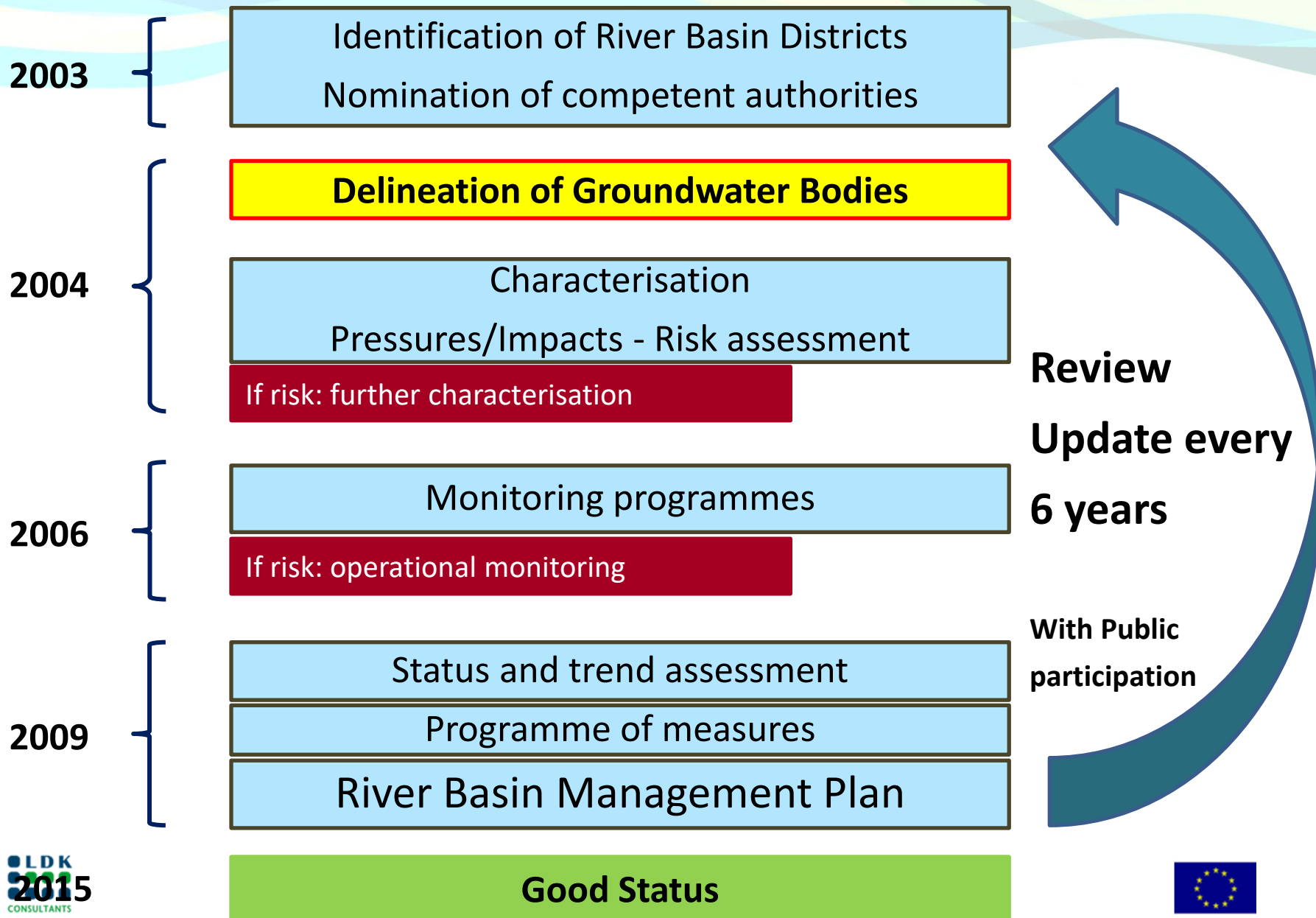
❖ Groundwater body delineation

- 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)*

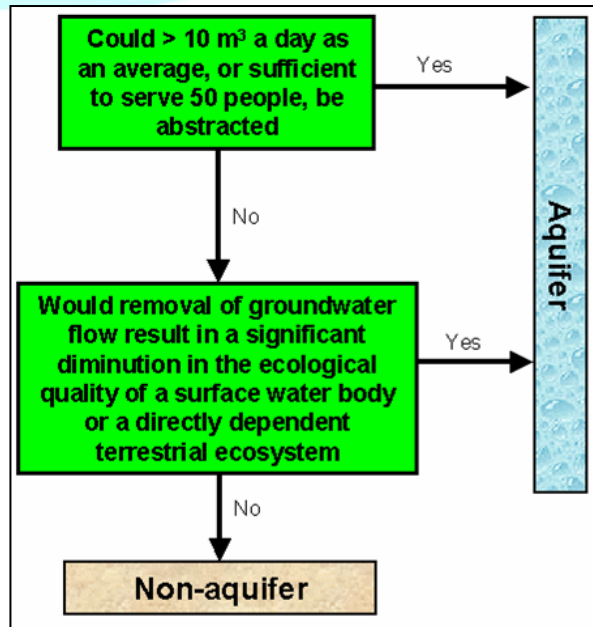
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“all water, which is below the surface of the ground in the saturated zone and in direct contact with the ground or sub-soil” (Article 2.2)

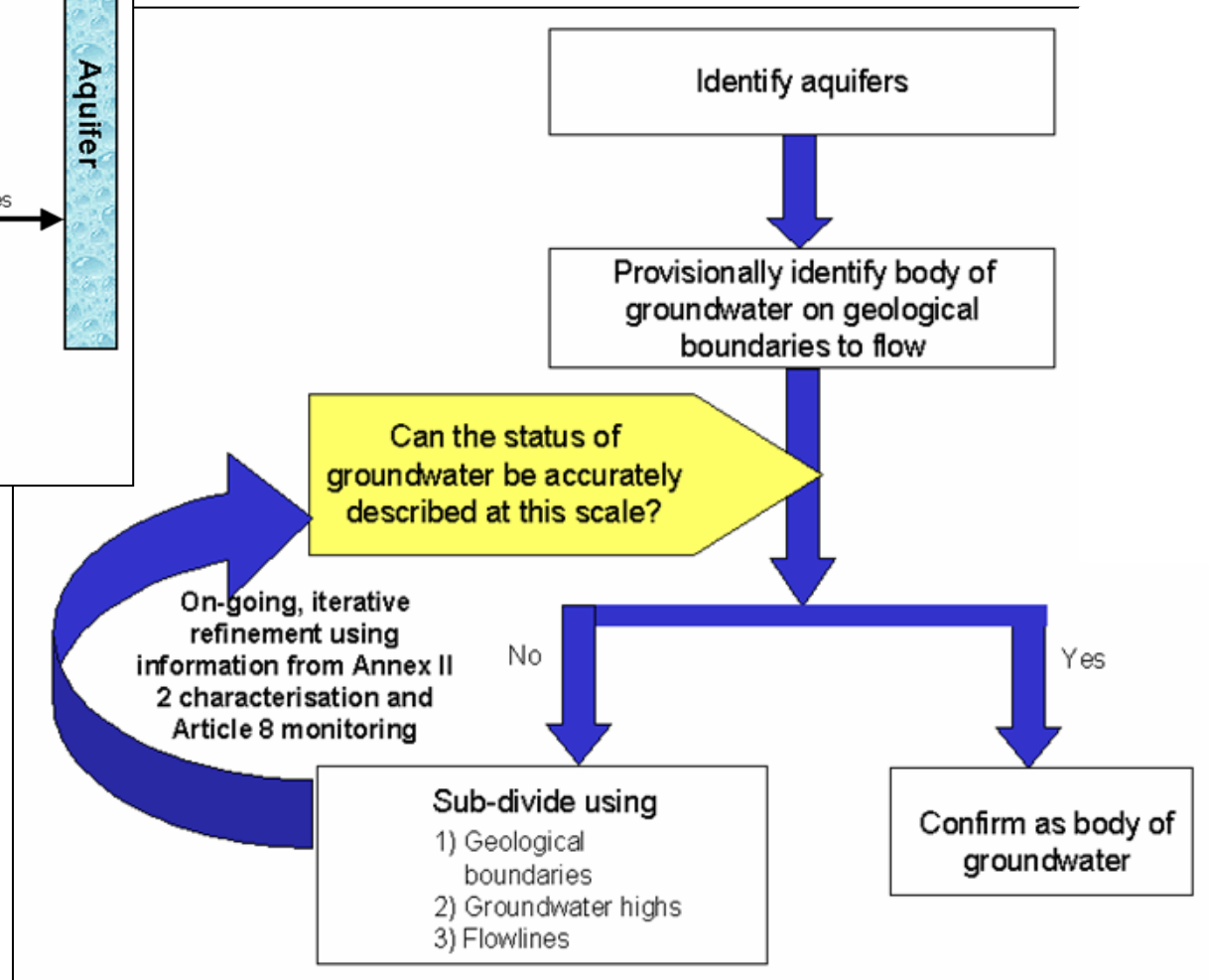
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Total average abstraction from the whole aquifer >10 m³ per day or provides sufficient quantities to serve 50 people.

Groundwater body delineation



An iterative approach

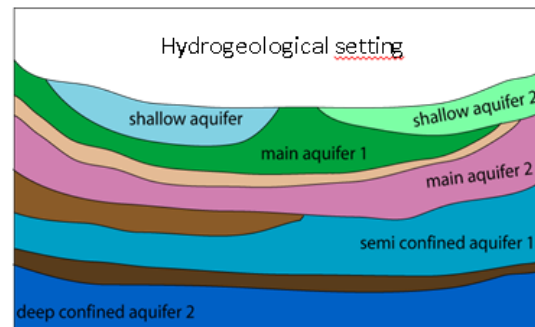


Groundwater body delineation

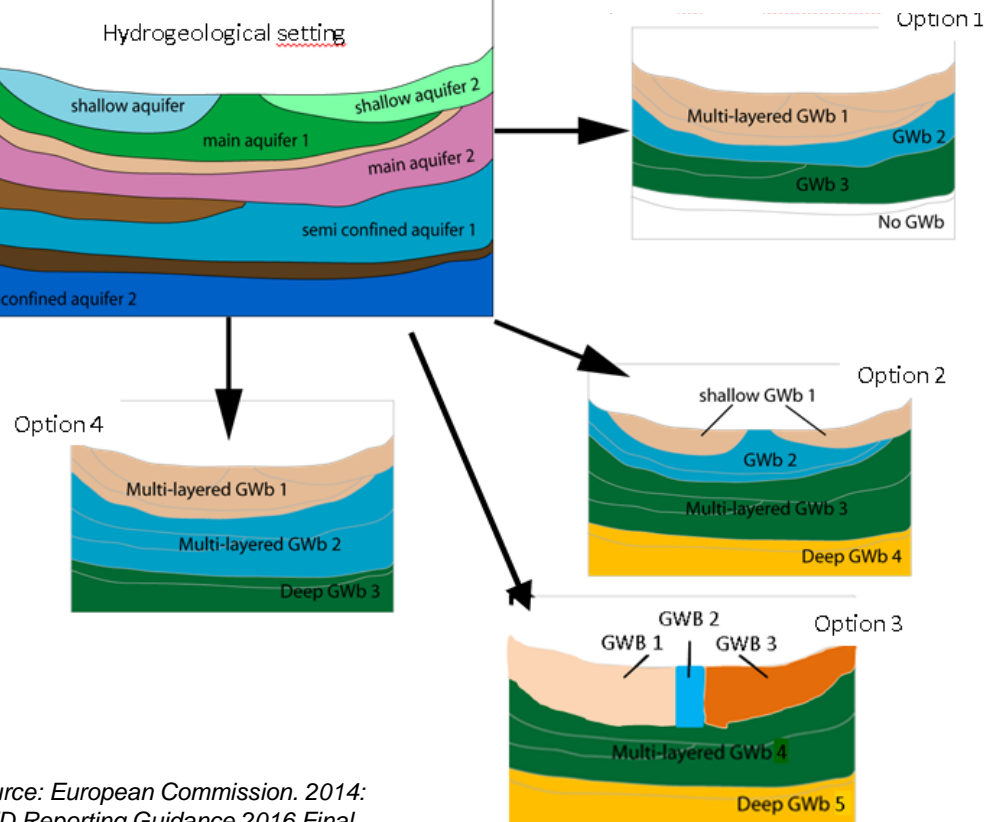
Challenges for delineation

- 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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© Umweltbundesamt/Bernhard Groeger



© Deweis Maria

CORINE Landcover: Wälder, naturnahe Flächen, Ackerland
Weinbau, Wiesen und Weiden; Berggebiete

CORINE Landcover

Nomenklatur

213 Ackerland	14 Waldster See	Landesgrenze
221 Wiesen und Weiden	15 Waldster See	Landesdurchschnitt
222 Wälder und Gärten	16 Waldster See	Fluss
242 Komplexer Pflanzenschutz	17 Waldster See	See
211 Laubwald	18 Waldster See	Berggipfel
312 Nadelwald	19 Waldster See	
313 Mischwald	20 Waldster See	
321 Naturnaher Grünland (Wiese und Weiden)	21 Waldster See	
322 Heide und Naturnaher (Landschaft)	22 Waldster See	
323 Waldster Übergang	23 Waldster See	
324 Pflanz	24 Waldster See	
325 Waldster und naturnaher Vegetation	25 Waldster See	
326 Gärten	26 Waldster See	
327 Naturnaher Flächen		
328 Pflanzflächen		

Seen über 1 km²

1 Ackerland	14 Waldster See
2 Ackerland	15 Waldster See
3 Ackerland	16 Waldster See
4 Waldster	17 Waldster See
5 Waldster	18 Waldster See
6 Waldster	19 Waldster See
7 Waldster	20 Waldster See
8 Waldster	21 Waldster See
9 Waldster	22 Waldster See
10 Waldster	23 Waldster See
11 Waldster	24 Waldster See
12 Waldster	25 Waldster See
13 Waldster	26 Waldster See

[illegible]

Grundwasser bodies

Grundwasser - Karte 1

Einzelgrundwasserkörper

- Prädominanz von Grundwasser aus dem
- vollständig aus Grundwasser aus dem
- vollständig aus Grundwasser aus dem
- vollständig aus Grundwasser aus dem

Gruppen von Grundwasserkörpern

- Gruppen von Grundwasserkörpern

Themenbezogene Grundwasserkörper

- Einzelgrundwasserkörper
- Gruppen von Grundwasserkörpern

Wasserrechtliche Einheiten

- Flussgewässer

Grundwasserressourcen

- Grundwasserressourcen

Anmerkung: Karte ist eine Vereinfachung der Karte 100.

Quelle: Österreichische Bundesregierung, Umweltbundesamt, 2019. Karte ist eine Vereinfachung der Karte 100. Karte ist eine Vereinfachung der Karte 100.

Umweltbundesamt

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

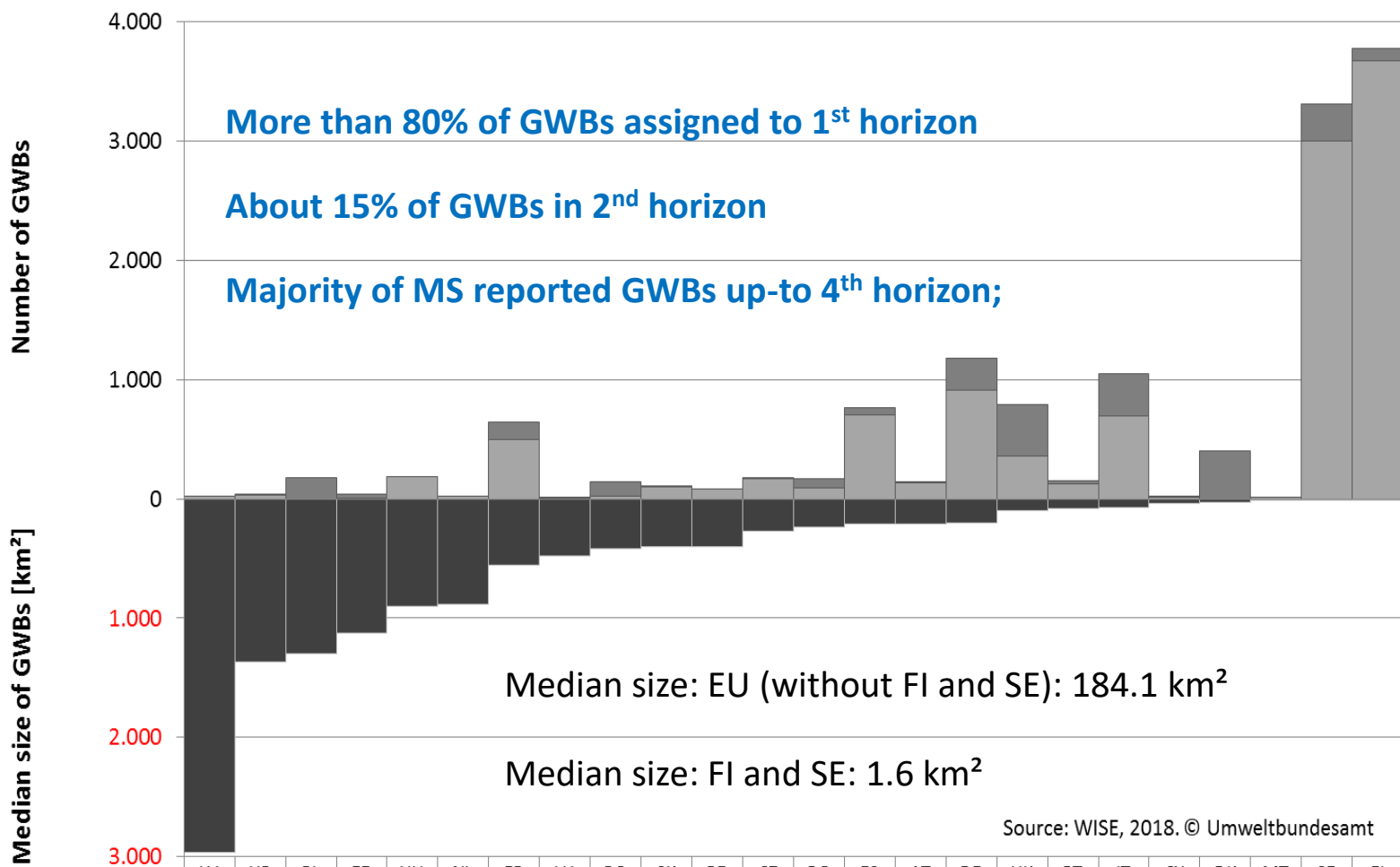
NGP 2015, BMLFUW

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



Source: WISE, 2018. © Umweltbundesamt

	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 km ² /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

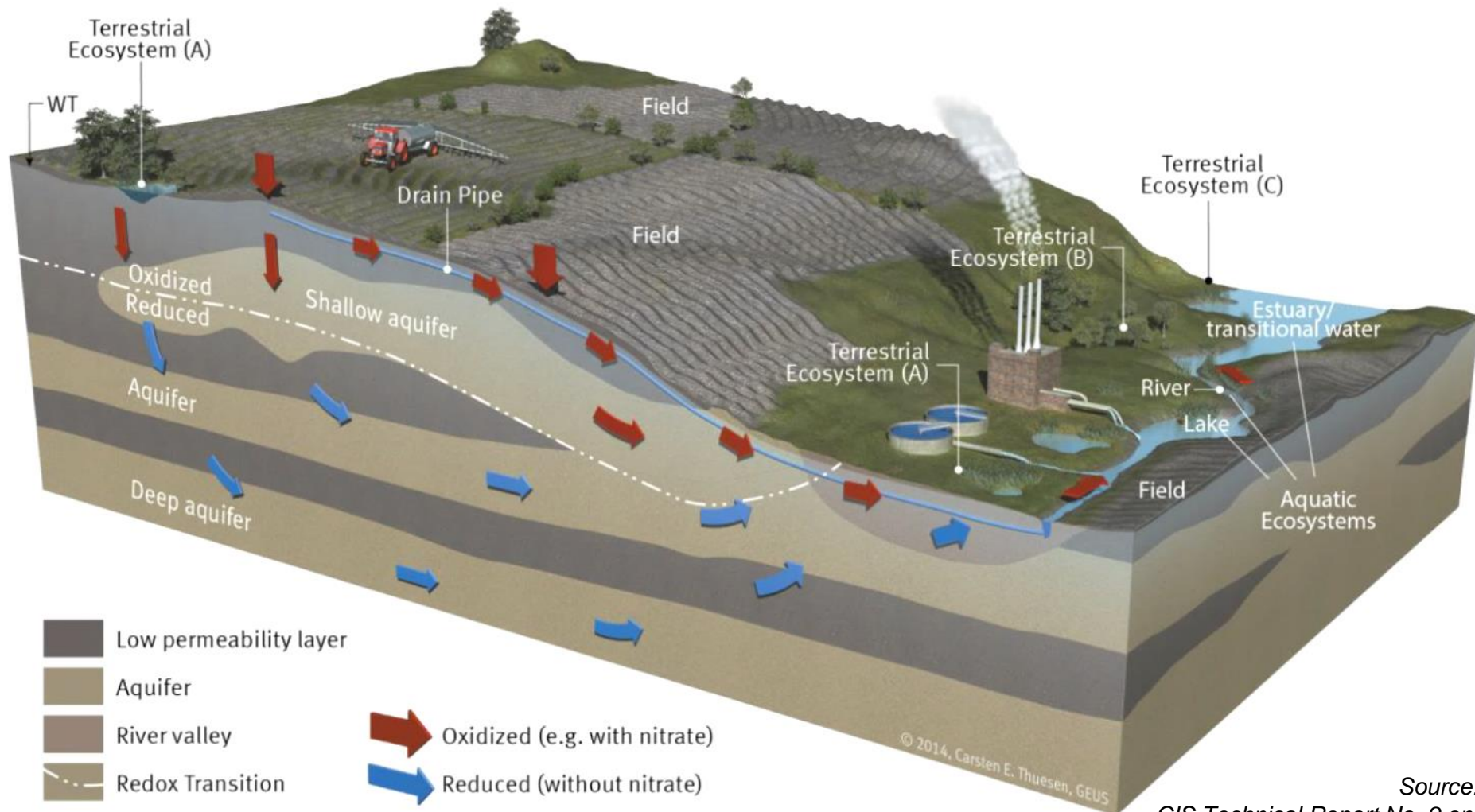
Programme of measures

River Basin Management Plan

Review
Update every
6 years

With Public
participation

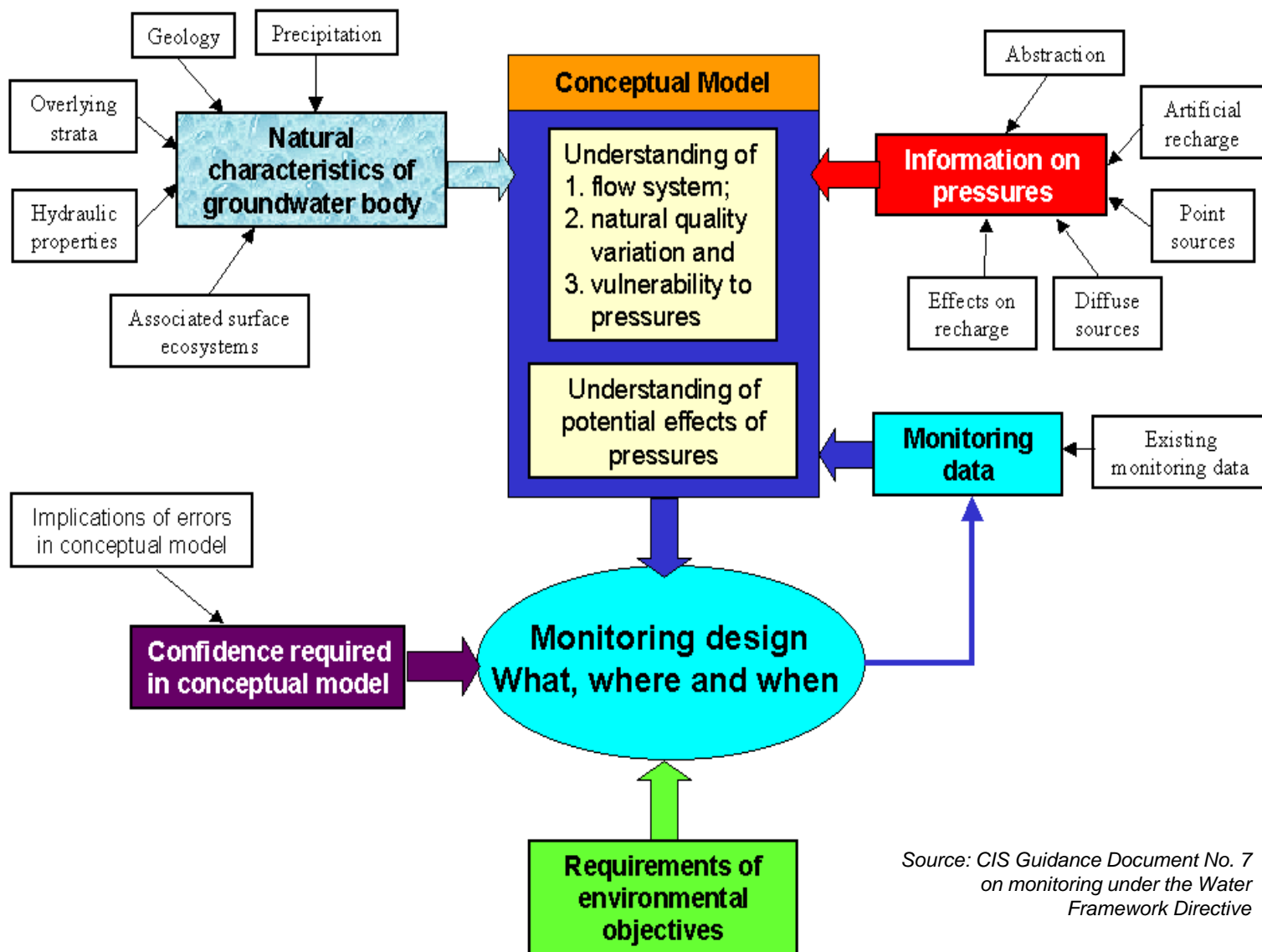
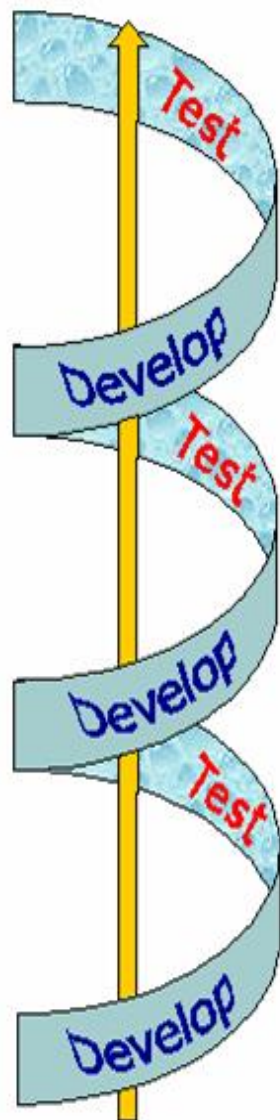
Conceptual model



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



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

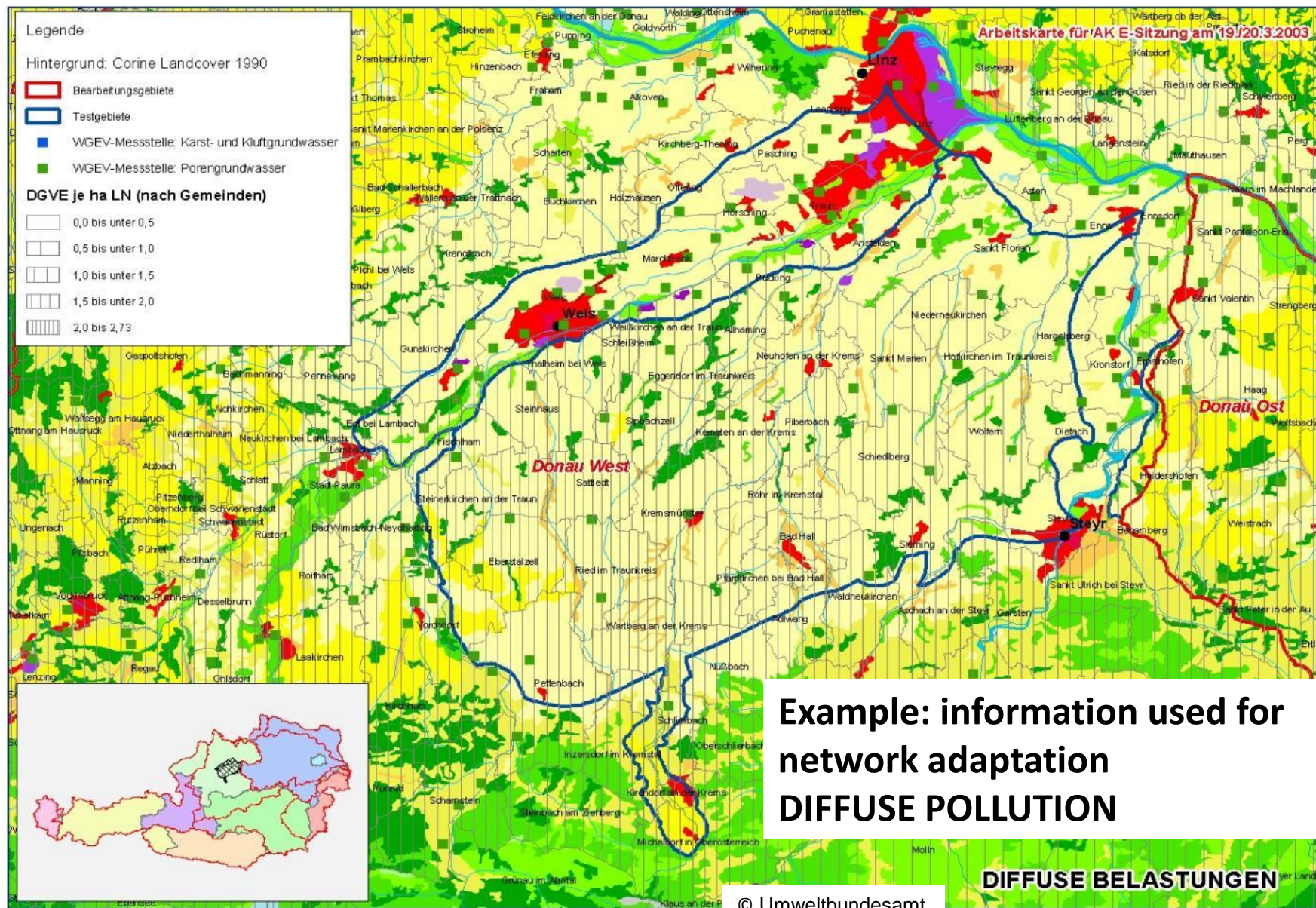
Austrian statistics (Live stock units, land use, settlements...)
CORINE Landcover

Point sources

Register on contaminated sites,...

Overlying strata

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



Legende

Concept

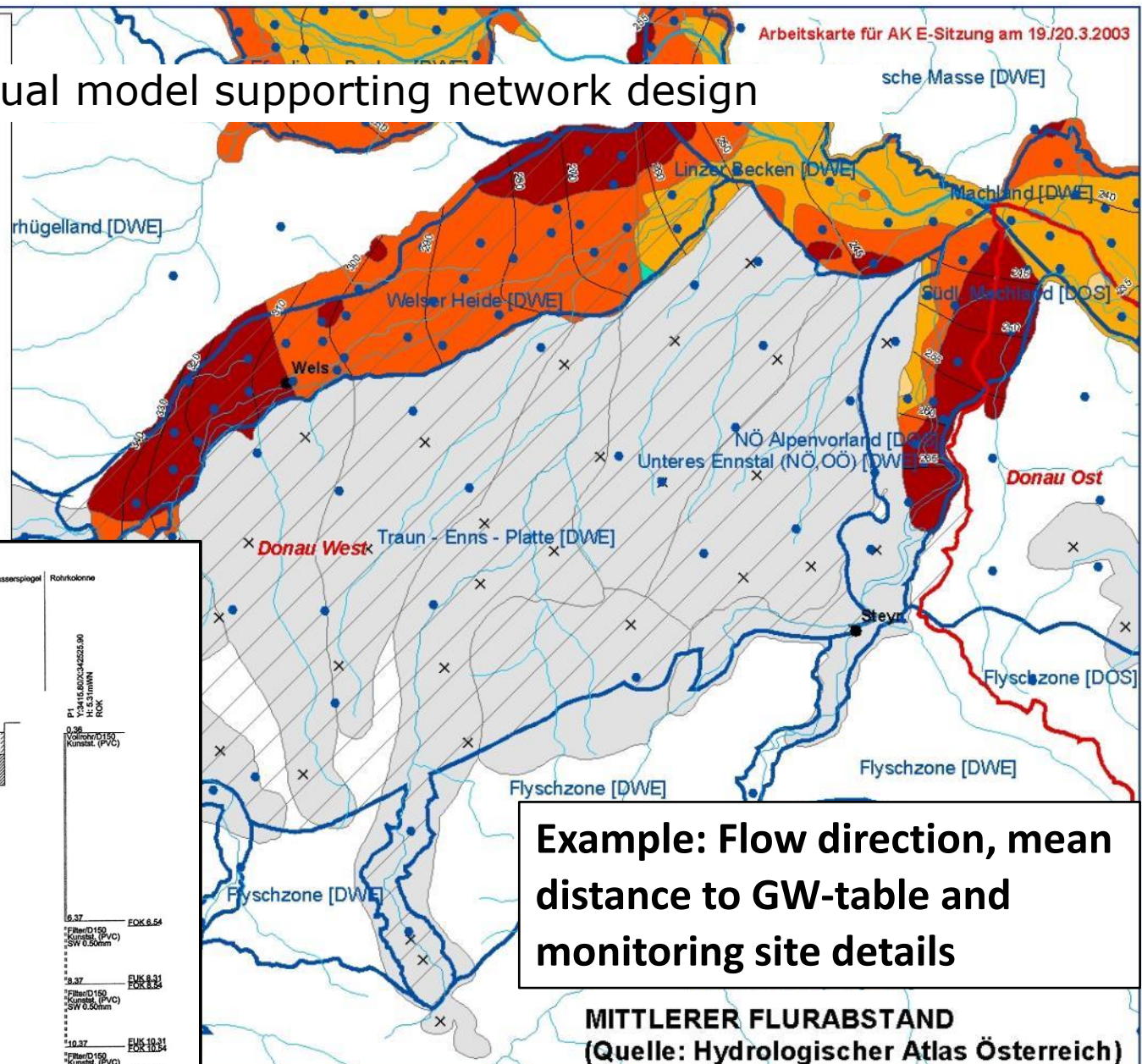
-  Bearbeitungsgebiete
-  Testgebiete
-  Grundwasserkörper
-  WGEV-Messnetz
-  GW-Messstellen HZB (Flurabstand-Punktdaten)

Mittlerer Flurabstand

Insel
 0-1 m interpoliert
 1-2 m interpoliert
 2-5 m interpoliert
 5-10 m interpoliert
 > 10 m interpoliert
 1-2 m geschätzt
 2-5 m geschätzt
 5-10 m geschätzt
 > 10 m geschätzt
 keine flächenhafte Abschätzung möglich

Mittlerer Grundwasserpegel

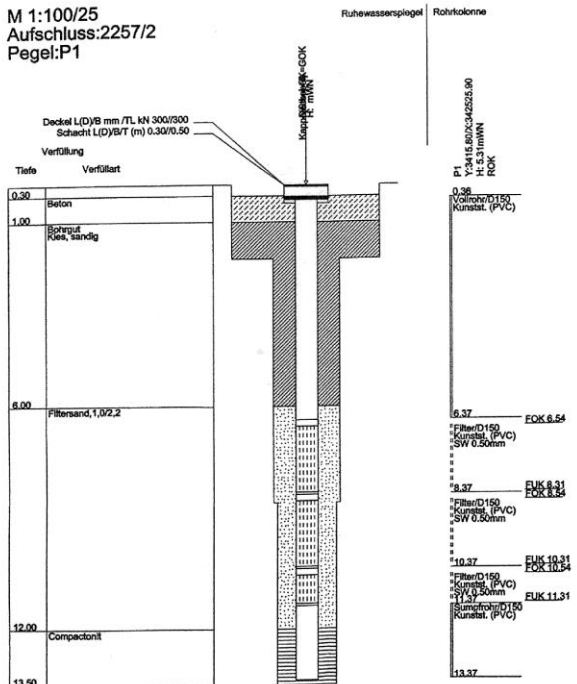
Conceptual model supporting network design



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

MITTLERER FLURABSTAND
(Quelle: Hydrologischer Atlas Österreich)

M 1:100/25
Aufschluss:2257/2
Pegel:P1



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

File Bearbeiten Ansicht Favoriten Extras ?

Adresse https://www.wrrl.eeaDataService

User: h2oadmin, ID: 23

System
Forms
Parameter
Messkörper
Query
Grundwasserkörper
Data
Download
Fließwasserkörper
Change-Requests
Export-Query

Editing finished

[GK] Marchfeld [DOS] [GK100020]

Allgemeine Beschreibung

M012 - Einzelgrundwasserkörper oder Gruppe	Einzel GWK	?
M142 - Bundesländeranteile in km2	Open	?
M015 - Politische Bezirke		?
M016 - Aquifer Typ - vorwiegend	Porengrundwasser	?
M017 - Aquifer Typ - 1. Nebenanteil	Please choose...	?
M018 - Aquifer Typ - 2. Nebenanteil	Please choose...	?
M019 - Art des Grundwasserkörpers - vorwiegend	oberflächennaher GWK	?

Größe des Grundwasserkörpers

M020 - Fläche des Einzel GWK bzw. der Gruppe in km2	941,72	?
M021 - Längserstreckung des Einzel GWK bzw. der Gruppe in km		?
M022 - max. Breite des Einzel GWK bzw. der Gruppe in km		?

Seehöhe

M023 - mittlere Seehöhe über die Gebietsfläche (m.ü.A.)		?
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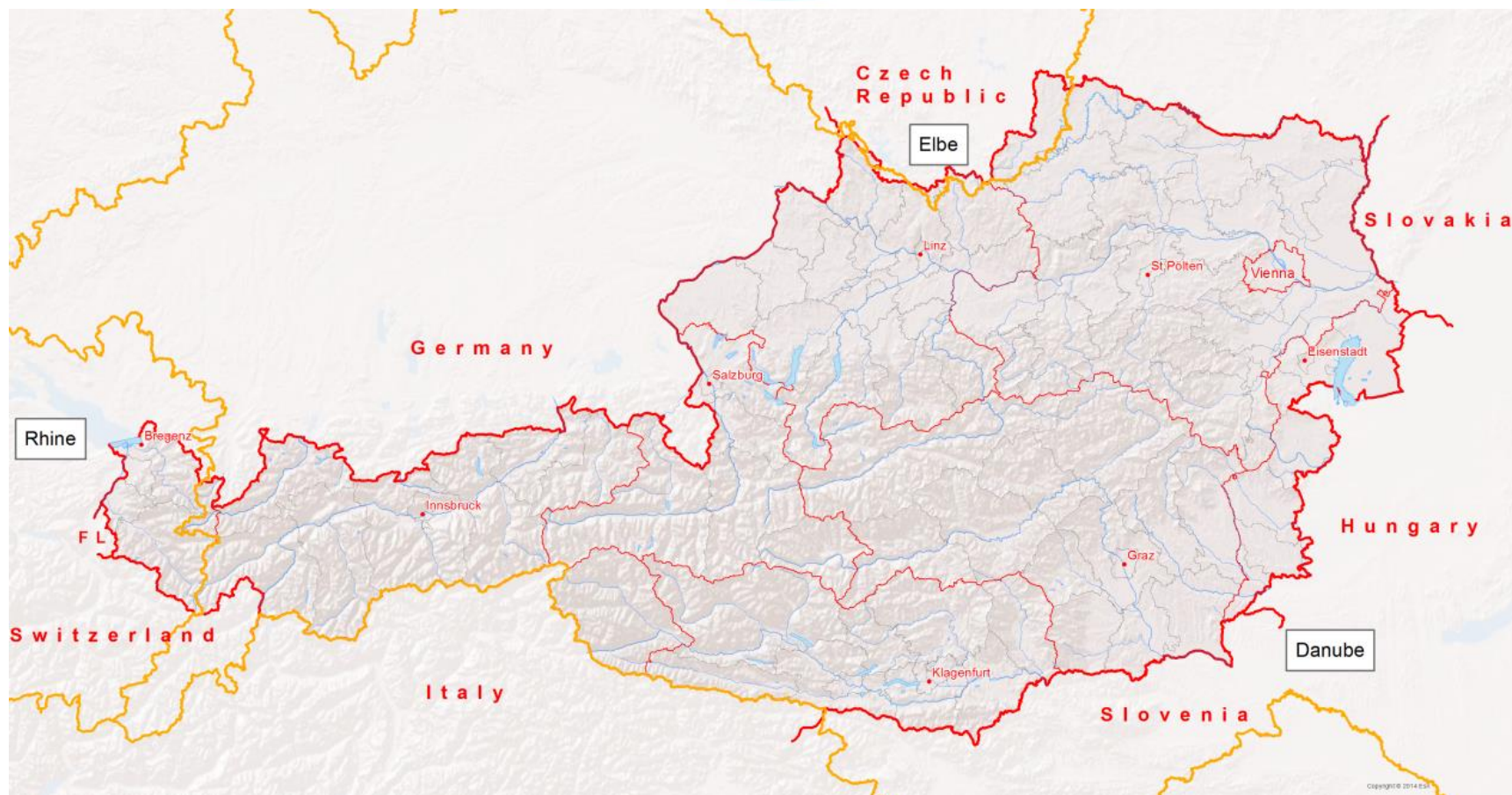
javascript:pop('/gkd_edit.pl?format=subread&sfrmID=9&action=showForm&smskID=29','Subform','width=500,height=450,scrollbars=yes') Lokales Intranet

River Basin Management Plan and Implementation of Measures

Administrative Structure in Austria:

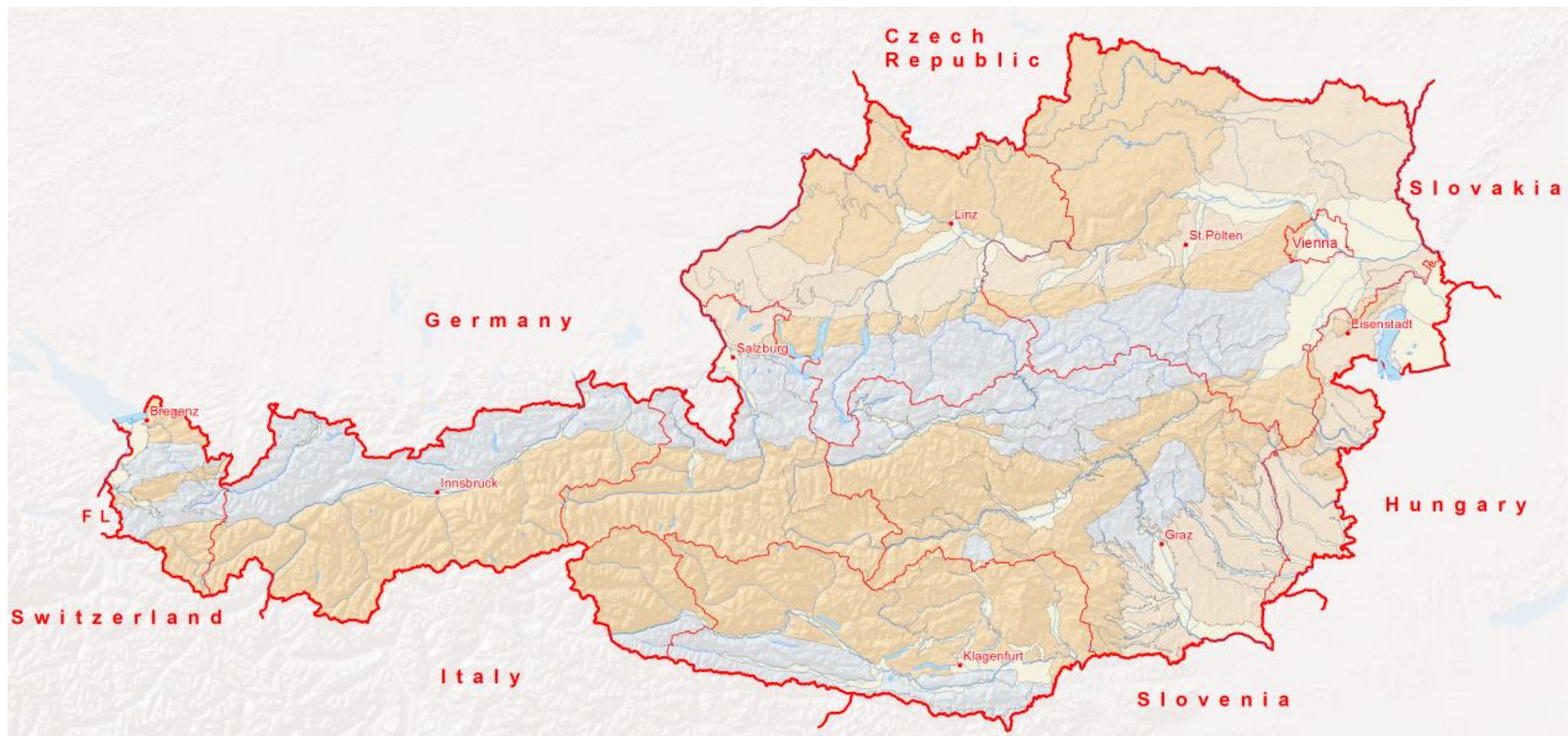
- Federal level: Federal Ministry for Sustainability and Tourism – responsible Authority for the implementation of WFD
 - 9 Provinces (Bundesländer) – Provincial Authorities
 - ~ 100 District Authorities
 - ~ Around 2300 Municipalities (Majors)
- Water Act (Federal legal gazette No. 215/1959 – in the 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

GW-Body Code	GW-Body	Share (no provinces)	Share of Province in %								
			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

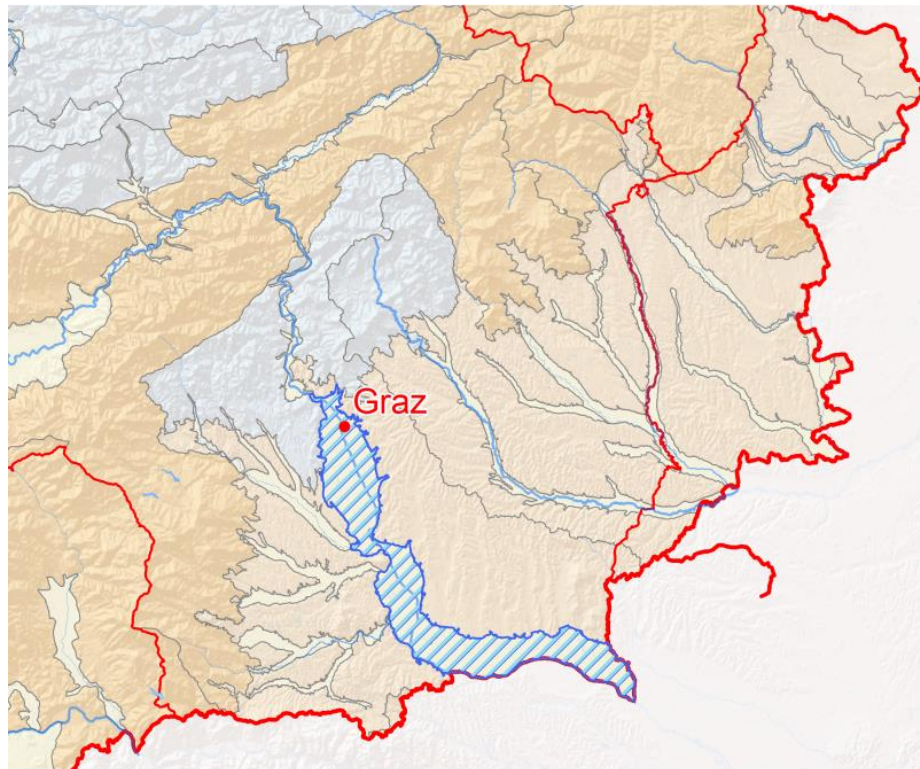
Draft RBMP elaborated by Federal level – submitted to Provincial Authorities – complemented/amended

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)



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
 -

SWIM-H2020 SM

For further information

Website

www.swim-h2020.eu

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<https://www.facebook.com/Swim-H2020-SM-Project-517590438434444/>

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Thank you for your attention.

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