



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

Applied geoscience for our
changing Earth



2nd Workshop on Groundwater Bodies

held in Berlin 15/16 December 2011

Rob Ward

22nd WORKING GROUP C PLENARY MEETING

21st March 2012

Brussels

Meeting held under the Danish EU Presidency

Introduction

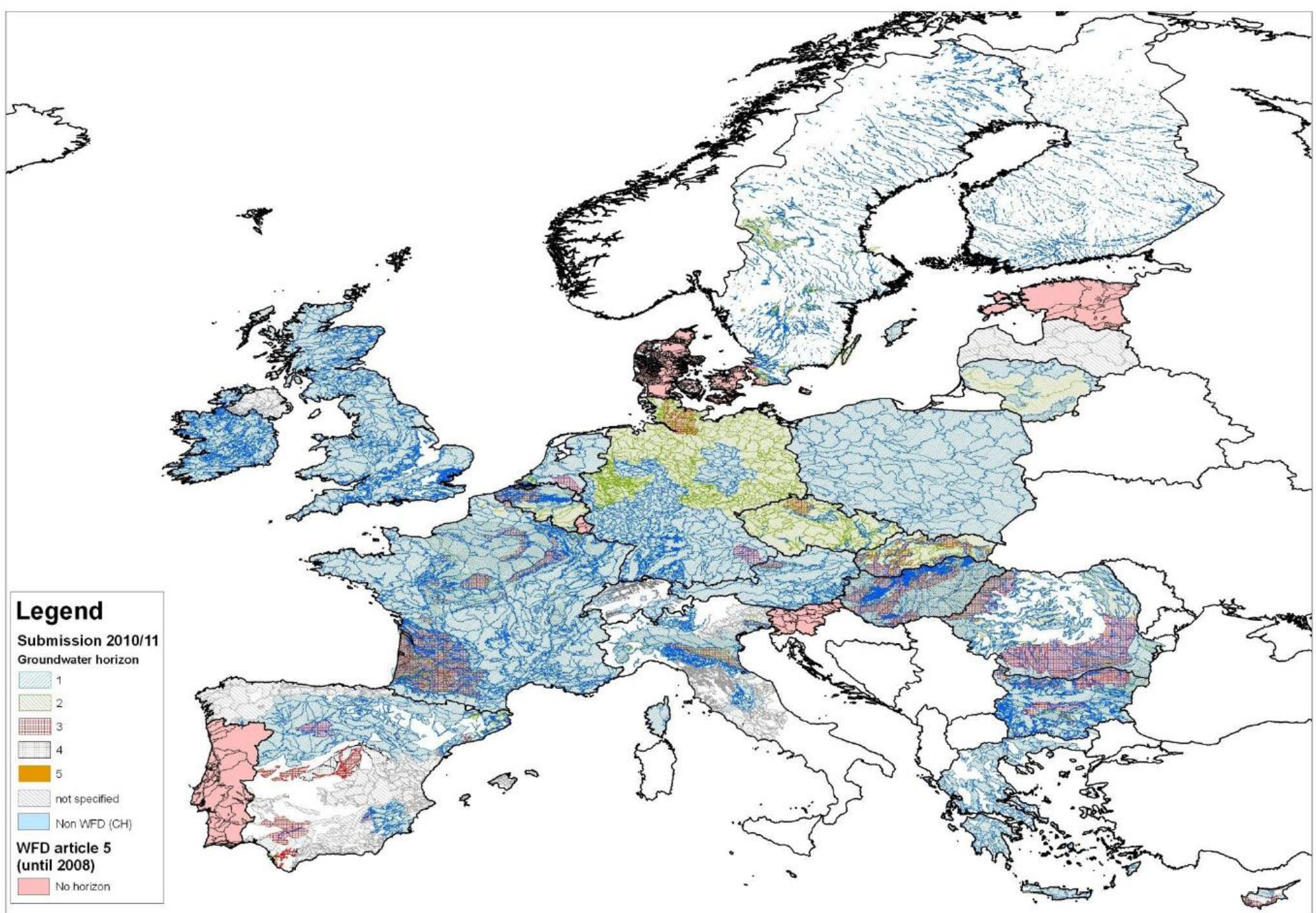
- Background
- Objectives of workshop
- Structure and content of workshop
- Outcomes from the workshop



Workshop objectives

- Follow on from 1st workshop on GWB in 2005
- EuroGeoSurveys (EGS) and the Federal Institute for Geosciences and Natural Resources (BGR) invited experts to review the approaches used to delineate GWBs across Europe
- Opportunity to discuss/agree recommendations for harmonising methodologies, in view of need for a coherent GIS-layer of GWBs for Europe
- Develop recommendations to improve future delineation and reporting of GWBs





Structure of workshop

- 50 attendees over 2 days bringing together scientists, managers, end-users
- Oral presentations (15) and posters (12)
- Introductions – EGS and BGR
- Themed sessions:
 1. Status of GWB reporting and data availability
 2. Analysis of reported GWBs
 3. GWB delineation and reporting - case studies
 4. Towards a harmonised GWB layer for Europe
 5. Options to improve the European GWB dataset
- Conclusions and recommendations



Theme 1 – Status of GWB reporting and data availability

- ETC/ICM and EEA perspectives - Why a harmonised approach is needed:
 - To analyse and present national information on groundwater bodies and status in a comparable way across Europe
 - To be able to link groundwater data to other spatial information
 - To avoid searching for groundwater maps on 170 RBDs on more than 27 national websites in national languages
 - A European level GIS reference layer on groundwater bodies is needed as basis for analysis, assessment and presentation of results



WFD reporting of GWBs

- Guidance docs for WISE reporting (produced by WGD and EEA etc)
- Logical consistency required for GIS:
 - GWBs must be assigned to only one RBD (even if they have parts outside the respective RBD)
 - Associated monitoring stations must be located within the boundaries of the respective GWB**
- Topological consistency:
 - GWBs need not to cover the entire territory of a country**
 - GWBs can overlay one another (if at different depth ranges)
 - Overlaying GWBs must not intersect if GWB laying upon each other are delivered within one file -> horizon/3D issue
- GWBs are 3D - needs to be considered when delineating but not easily represented in GIS

Theme 2 - GWB delineation 1st cycle

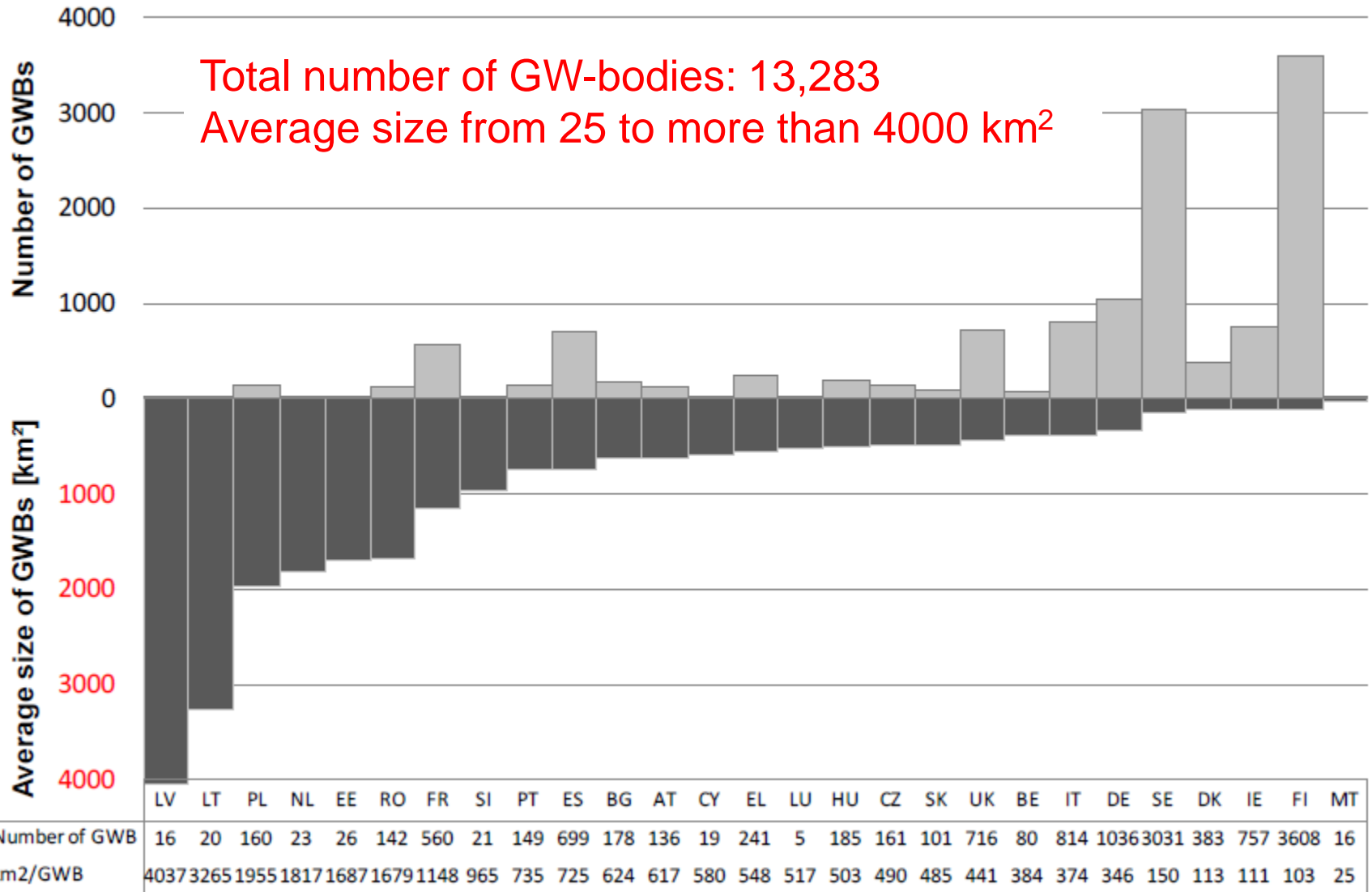
- **Groundwater body = Management Unit**
 - For adequate description of status
 - For comparing to environmental objectives and
 - For implementing measures
 - Definition given in WFD and guidance provided
- **Experience** - Most Member States started with:
 - identification of geological and hydrogeological boundaries;
 - vulnerability maps, subsoil properties, risk potential, utilisation and protection need, economic importance and water management aspects
- Aim to achieve efficient and practical management units considering administrative burden and financial efforts
- Size depends on variation of characteristics and pressures
- An iterative and on-going process
- Grouping of bodies supports efficiency



3D GWBs

- Depth of GW-body depends on
 - GW within an aquifer or aquifers which needs to be protected and,
 - the risks according to the objectives of WFD
 - MS can decide
 - Based on their assessments of GW characteristics and the risks identified
 - According to GWB can be defined separately within different strata overlying each other or be a single body spanning different strata
- Flexibility required to allow MS for most effective means of achieving Directive's objectives

Total number and average size of GWBs in EU 27



GWB – Data issues/attributes

- 230 GWBs consist of several polygons
- GWBs extend over several horizons (layers)
- Overlying GWBs within same horizon
- Inconsistency in reporting of attributes for GWBs

→ Assessment and EU reporting complications

MS	Total	%	AT	BE	BG	CY	CZ	DE	ES	FI	FR	GR	HU	IE	IT	LT	LV	MT	NL	PL	RO	SE	SK	UK
GWB MS CD	11951	100.00	136	38	126	20	173	989	644	3603	574	235	176	756	284	20	16	1	23	161	142	3021	90	723
Quantitative StatusValue	11951	100.00	136	38	126	20	173	989	644	3603	574	235	176	756	284	20	16	1	23	161	142	3021	90	723
Chemical StatusValue	11951	100.00	136	38	126	20	173	989	644	3603	574	235	176	756	284	20	16	1	23	161	142	3021	90	723
UpwardTrend	11951	100.00	136	38	126	20	173	989	644	3603	574	235	176	756	284	20	16	1	23	161	142	3021	90	723
TrendReversal	11951	100.00	136	38	126	20	173	989	644	3603	574	235	176	756	284	20	16	1	23	161	142	3021	90	723
Associated_Protected_Area	11951	100.00	136	38	126	20	173	989	644	3603	574	235	176	756	284	20	16	1	23	161	142	3021	90	723
Area	11345	94.93	136	38	125	20	173	989	150	3603	574	192	176	756	283	20	16	1	23	161	142	3021	90	656
Layered	10082	84.36	0	38	125	20	173	989	150	3603	97	0	176	756	267	20	16	1	23	161	142	3021	0	304
Geological Formation	8737	73.11	136	0	63	20	170	0	21	3603	71	0	176	756	283	20	3	1	0	161	142	3021	90	0
Out of RBD	8178	68.43	136	0	126	20	173	989	439	3603	574	235	176	756	217	20	16	1	23	161	142	0	0	371
Transboundary Scale	7346	61.47	136	38	126	20	173	0	457	3603	574	235	176	756	228	20	16	1	23	161	142	0	90	371
LinkSurface WaterBodies	5440	45.52	0	0	91	20	173	0	57	0	285	192	176	756	238	20	16	1	0	0	0	3021	90	304
LinkTerrestrial Ecosystems	5044	42.21	0	0	125	20	173	0	21	0	286	192	176	756	214	20	16	1	23	0	0	3021	0	0
DepthRange	3829	32.04	54	38	35	20	0	4	20	0	71	0	176	0	209	20	0	0	0	161	0	3021	0	0
Vertical Orientation	3589	30.03	0	37	36	20	0	0	0	0	53	0	176	0	209	20	16	1	0	0	0	3021	0	0
AverageDepth	3507	29.34	58	0	27	7	0	0	2	0	0	0	165	0	179	20	16	0	11	1	0	3021	0	0
Average Thickness	3550	29.70	69	0	48	2	0	0	0	0	7	0	165	0	170	20	15	0	23	10	0	3021	0	0
Capacity	3242	27.13	0	0	0	19	0	0	0	0	5	104	0	0	54	0	16	0	23	0	0	3021	0	0
OtherPressure Description	300	2.51	0	0	0	0	33	0	0	0	5	0	85	0	11	0	1	0	0	0	0	165	0	0
OtherImpactDescription	176	1.47	3	0	0	0	0	0	43	0	0	0	85	0	0	0	3	1	0	0	0	0	0	41

Six mandatory attributes marked as blue rows, reporting of 15 remaining characteristics related to GWBs is optional

Insufficient entries for evaluation of several attributes (< 50 % of total datasets - red coloured)

Agreed to consult workshop attendees on attributes



Recommendations for attributes

Attribute	Mandatory	Optional	No
EUGroundWaterBodyCode	15	0	0
GWB_MS_CD	11	1	2
GWB_Name	9	5	0
LAT	8	4	2
LON	8	4	2
Quantitative StatusValues	11	2	0
Chemical StatusValue	11	2	0
UpwardTrend	10	2	1
TrendReversal	9	3	1
Associated_Protected_Area	11	1	0
Horizon	13	1	0
Area	7	6	1
Layered	8	4	1
Geological Formation	10	3	0
Out_of_RBD	8	6	1
Transboundary	13	1	0
Scale	5	8	2
LinkSurface WaterBodies	9	1	2
LinkTerrestrial Ecosystems	7	3	2
DepthRange	5	6	3
AverageDepth	0	9	5
Average Thickness	2	8	4
Vertical Orientation	1	9	3
Capacity	0	6	7
OtherPressure Description	3	8	2
OtherImpact Description	1	8	4

Theme 1 and 2 – conclusions

- We need to learn from 1st RBMP period for the 2nd period, which starts in 2012 with reporting in 2016.
- GWB are management units that should be hydrogeologically sensible (based on scientific knowledge) and have conceptual model
- Delineation should be driven by WFD requirements not GIS requirements
- Not all groundwater has to be delineated as a GWB
- Consultation recommended on refinement to attribute requirements
- Transboundary GWBs – greater consistency in reporting needed
- Recommendations should be communicated to WGC/D

Theme 3-case studies and experience

- Invited case studies from: UK, CZ, F, DE
- Demonstrated the practical challenges of delineation and management of 3D GWBs and illustrated the challenges for an EU GIS layer
- Discussion mainly on sizing of GWBs and whether pressures should be used to delineate or not. Conclusion – only if key principles still met



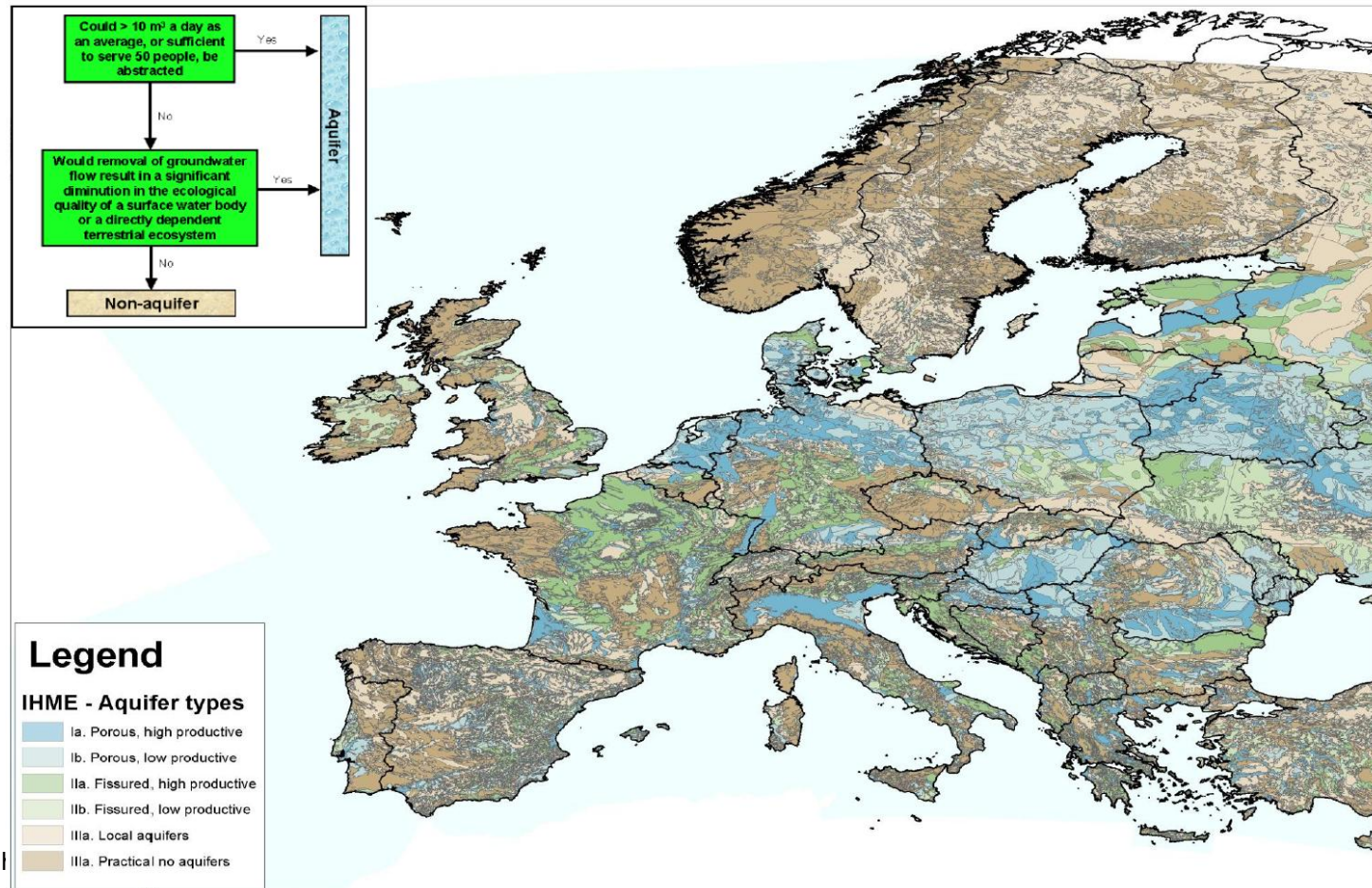
Theme 4 – towards a harmonised GWB Layer

- Improvement of current GWB GIS Layer is needed
- Multiple criteria for delineation have led to variation/inconsistency – often reflects hydrogeological complexity
- Correction of some deficiencies requested by ETC (QA issues)
- EU wide harmonisation and common standards required – must avoid being just for convenience of GIS
- Better EEA, WGD and WGC cooperation/communication needed
- Greater clarity on definitions/reporting of transboundary GWBs
- Attribution of ‘horizons’ to GWBs is a big contributing factor to difficulties with GIS representation:
 - Different approaches
 - GWBs are 3D



IHME – GIS Layer Aquifer type

- IHME could provide a basis for a harmonised GIS layer (?)
 - IHME → International Hydrogeological Map of Europe
 - Several GIS themes are in preparation



Theme 5 - Options to improve GIS layer

- IHME comprises 25 individual data 'sheets', scale 1:1500000
- Challenge is to combine and simplify detailed information by keeping it as informative as possible
- Validation required
- Potential for IHME to be used as a reference layer or base layer for the more consistent delineation of GWBs among the Member States
- OneGeology approach may be a model to follow
 - Has tackled many of the issues around interoperability, semantic harmonisation, geometric harmonisation



Conclusions

- Successful workshop with mix of participants
- Clear message that GIS cannot dictate GWB delineation
- MS need to learn from 1st RBMP cycle
- There needs to be a review of GWB attributes and reporting obligations
- Case studies demonstrated the differences between MS and the challenges
- Transboundary GWBs – greater consistency in reporting needed
- GWB horizon designation is an issue that needs to be resolved





Thank you



