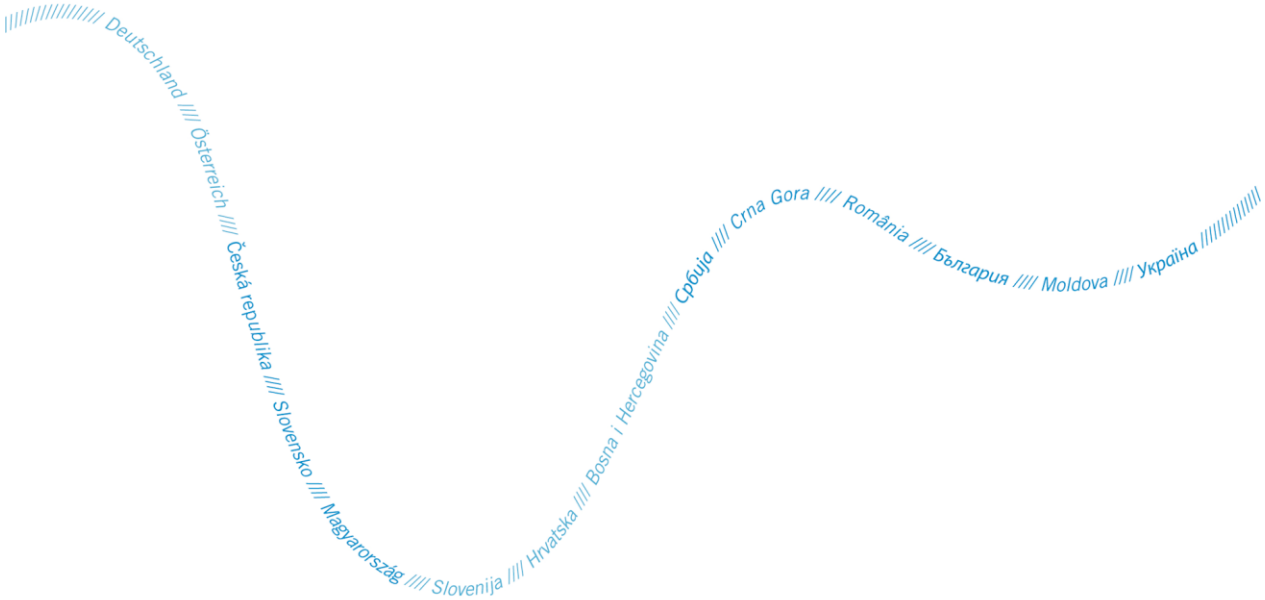
Groundwater Guidance

ICPDR IKSD

International Commission for the Protection of the Danube River

Internationale Kommission zum Schutz der Donau

Final Draft of 3rd Edition of 2016
Date: 8. 5. 2017



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LIST OF USED ABBREVIATIONS

CIS	EU Common Implementation Strategy of the WFD
DBA	Danube Basin Analysis (WFD Article 5)
DG	Directorate General of the European Commission
DPSIR	Driver, Pressure, State, Impact and Response
DRB	Danube River Basin
DRBD	Danube River Basin District
DRBM Plan	Danube River Basin Management Plan
DRPC	Danube River Protection Convention
EC	European Commission
GIS EG	GIS Expert Group (of the ICPDR)
GW	Groundwater
GWB	Groundwater Body or group of bodies of groundwater
GWD	Groundwater Directive (2006/118/EC)
GW TG	Groundwater Task Group (of the ICPDR)
ICPDR	International Commission for the Protection of the Danube River
JDS	Joint Danube Survey
JPM	Joint Programme of Measures (WFD Article 11)
MS	Member State
QA, QC	Quality assurance, Quality control
RBD	River Basin District
RBMP	River Basin Management Plan
RBM EG	River Basin Management Expert Group (of the ICPDR)
RTD	Research and Technological Development
SWMI	Significant Water Management Issues (WFD Article 14)
TNMN	Transnational Monitoring Network
TV	Groundwater Threshold Value
WFD	Water Framework Directive (2000/60/EC)
WG GW	CIS Working Group Groundwater (of the EC)

1. Introduction

1.1. ICPDR Groundwater Task Group

In October 2000 the EU Water Framework Directive (2000/60/EC, WFD) was adopted and came into force in December 2000. EU Member States (EU MS) should aim to achieve 'good status' in all bodies of surface water and groundwater by 2015, respectively by 2027 at the latest and to implement measures to prevent deterioration of the status of each water body. In the year 2006 the EU Groundwater Directive (2006/118/EC, GWD) entered into force, establishing a regime which sets groundwater quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater. Currently not all Danube countries are EU MS and therefore not legally obliged to fulfil the WFD requirements. However, when the WFD was adopted in the year 2000, all countries cooperating under the Danube River Protection Convention (DRPC) decided to make all efforts to implement the Directive throughout the whole basin

The contracting parties of the DRPC, EU Member States and non-Member States, committed to make all efforts to draw up a co-ordinated international River Basin Management Plan (RBMP) for the Danube River Basin District (DRBD) and that the International Commission for the Protection of the Danube River (ICPDR) should serve as a common coordinating platform for the implementation of the WFD on a basin-wide scale.

During the data and information collection for the WFD Roof Reports for the DRBD many technical questions arose especially concerning the identification of transboundary groundwater bodies (GWBs) of basin-wide importance, bilateral agreements and harmonisation of the activities. Member countries of the ICPDR stated their need for a Drafting Group Groundwater to deal with groundwater related issues of basin wide concern.

The Groundwater Task Group[1] (GW TG) was established in 2004 and provided essential groundwater related input to WFD key products and prepared Danube-basin related assessments up to now. A lot of work on harmonisation has already been done and is still needed in the coming years, which should be covered and assisted by this guidance. Within the GW TG groundwater bodies of basin-wide importance were identified and the characterisation of GWBs, monitoring, status assessment and the joint programme of measures were coordinated and harmonised. Data and information relevant for the preparation of the reports required by the WFD have been collected and analysed and respective chapters for the reports were prepared. Experiences and best practice have been exchanged and relevant discussions at European level have been followed.

[1] Groundwater Task Group at the ICPDR (restricted area)

So far, the main outputs of the GW TG can be summarised as follows:

- Definition of criteria and identification of transboundary GWBs of basin wide importance;
- Development of guidelines for harmonised characterisation and data collection and accomplishment of the data collection itself;
- Drafting of the groundwater related chapters and annexes to the:
  - Danube Basin Analysis Report (DBA) 2004 (WFD Article 5);
  - Significant Water Management Issues (SWMI) in the DRBD 2007 (WFD Article 14)
  - Roof Report 2008 on monitoring (WFD Article 8);
  - Danube River Basin Management Plan (DRBM Plan) 2009 (WFD Article 13);
  - Interim report on the implementation of the Joint Programme of Measures (JPM) 2012
  - Update of the SWMIs in the DRBD 2013;
  - Update of the DBA 2013;
  - Update of the DRBM Plan 2015.
- Compilation and assessment of TNMN GW quality data;
- Contributions to the TNMN Yearbooks 2008 and 2009;
- Data collection and analysis to underpin the importance of groundwater in drinking water supply in the DRB;
- Data collection and analysis to highlight the importance of bank filtered water along the Danube;
- Contribution to JDS-3 (parallel monitoring of emerging substances in the Danube and in adjacent drinking water wells);
- Preparation of the ICPDR leaflet *Groundwater – the river's invisible twin*;
- Regular exchange of experience and best practice in the Danube countries (e.g. on status and trend assessment, groundwater dependent terrestrial ecosystems, groundwater associated aquatic ecosystems, priority and emerging substances).
- Regular exchange of information on bilateral activities on GW management.
- Presentations of achievements of the GW TG and groundwater management under the ICPDR at various conferences and workshops (e.g. IWA Groundwater Specialists Conferences in Belgrade 2007, 2011 and 2016; 5th Regional Consultation under UNESCO-IHP on Groundwater Governance 2013)

Generally, there are two meetings a year on expert level, dealing with up-to-date groundwater issues according to the work programme of the GW TG. Depending on the work programme, the frequency of meetings can be reduced to once per year (like in 2016).

1.2. Scope of the Guidance

The GW TG decided that a guidance document, summarising the particular groundwater related activities according to the needs within the ICPDR framework, should further strengthen cooperation within the DRB by assisting in the harmonisation of the applied approaches. This document provides technical guidance on the selection and characterisation of GWBs of basin wide importance, on monitoring, on data reporting and aggregation procedures, on the presentation of risk, status and trends and on the reporting of the programmes of measures. This guidance documents the ways and forms of data exchange within the ICPDR TransNational Monitoring Network (TNMN) Groundwater, either when fulfilling the WFD reporting requirements or when contributing to the specific needs of the ICPDR e.g. for contributing to the TNMN Yearbook.

Due to the cyclic process of the WFD and GWD implementation and due to the increase of knowledge in time, this guidance is a living document being updated and completed according to the further development and agreements within the GW TG. Each edition – this is the third – is reflecting still valid and most recent developments, agreements and templates. Aspects which are no longer valid or have been revised are now longer included but can still be found in previous editions of the

guidance. The first edition was published in 2008 (https://danubis.icpdr.org/document/7762) and the second, the previous guidance of 2010 is accessible via Danubis, the ICPDR Information System. (https://danubis.icpdr.org/document/9795).

The guidance intends to contribute to the following issues of coordination, harmonisation and exchange of experience:

- Bilateral coordination and bilateral agreements on approaches and principles in the transboundary GWBs and their continuous refinements.
- The (update of the) delineation of GWBs and the development of common conceptual models for each transboundary GWB (as a whole).
- Characterisation and assessment of impacts of human activities on the achievement of the environmental objectives (risk assessment, DBA).
- Coordination of monitoring activities including the exchange of related information and data (TNMN Groundwater).
- Approaches for considering groundwater associated aquatic ecosystems (GWAAE) and groundwater dependent terrestrial ecosystems (GWDTE) in the groundwater status assessment.
- Coordination of status and trend assessment for transboundary GWBs. Coordination in the establishment of groundwater threshold values.
- Establishment of a data flow of groundwater data to the ICPDR and data exchange between the member countries sharing a transnational GWB of basin-wide importance. At all stages emphasis should be put on QA and QC aspects.

This document is based on best practice gathered in the past and already existing information which are: the outcome of discussions, developed templates and products by the GW TG, ICPDR documents and reports, Common Implementation Strategy (CIS) guidance documents and technical reports, the WFD and the GWD. Moreover, further documents dealing with transboundary groundwater issues were considered e.g. UN/ECE-Report on Guidelines on Monitoring and Assessment of Transboundary Groundwaters. Since the process within ICPDR is among others driven by the implementation of the WFD across Europe, some issues may also be discussed at the European Commission (EC, DG Env) level in the CIS Working Group Groundwater (WG GW) in parallel. Hence, respective results and other helpful information are taken into account in this guidance.

The guidance document shall support the achievement of the underlying ICPDR visions for groundwater quality and quantity which are as follows (ICPDR, 2013):

- *The ICPDR's basin-wide vision is that the emissions of polluting substances do not cause any deterioration of groundwater quality in the Danube River Basin District. Where groundwater is already polluted, restoration to good quality will be the ambition.*
- *The ICPDR's basin-wide vision is that the water use is appropriately balanced and does not exceed the available groundwater resource in the Danube River Basin District, considering future impacts of climate change.*

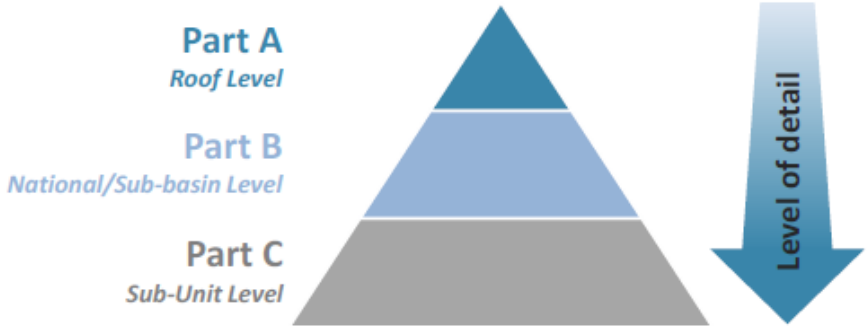
This guidance documents the results of the continuous harmonization and coordination process of groundwater management at the ICPDR level (level A, international river basin district) in the Groundwater Task Group as well as the data and information exchange between the countries and the ICPDR. This guidance document also serves as a starting kit to get familiar with the work of the Groundwater Task Group already performed and the goals achieved and it provides a good demonstration of tools and approaches towards groundwater management in an international river basin.

2. WFD Implementation at DRBD level

Due to reasons of efficiency, proportionality and in line with the principle of subsidiarity, the management of the DRBD is based on the three levels of coordination (see Figure 1). According to this the WFD Article 5 analysis (river basin district characterisation and risk assessment), the RBM Plans and the programmes of measures are developed at three levels in the DRB. The information increases in detail from Part A to Part B and to Part C. The A-level reports are highlighting all relevant issues of basin-wide importance and are strongly based on findings and actions on the national/sub-basin level. Adverse overlaps and duplication of work are prevented; hence, the DRBM Plans should be read and interpreted in conjunction with the national RBM Plans.

1. Part A – International, basin-wide level, the Roof Level;
2. Part B – National level (managed through the competent authorities) and/or the international coordinated sub-basin level for selected sub-basins (Tisza, Sava, Prut, and Danube Delta);
3. Sub-unit level, defined as management units within the national territory.

Figure 1: Three levels of management for WFD implementation in the DRBD showing the increase of the level of detail from Part A to Part B and C



The reporting under the WFD follows a 6-year cycle. The first DBA was accomplished in 2004 and updated in 2013 with further updates foreseen every 6 years. From the year 2009 onwards RBM Plans are to be updated and published (after public consultation) every 6 years and the interim report on the status of the implementation of the Joint Programme of Measures (JPM) which is due from 2012 every 6 years.

Table 1: Reporting milestones of WFD River Basin Management Planning

	DRBM Plan	DRBM Plan update 2015	DRBM Plan update 2021
Danube Basin Analysis (DBA)	2004	2013	2019
Danube River Basin management Plan (DRBMP)	2009	2015	2021
Interim report on the Joint Programme of Measures (JPM)	2012	2018	2024

2.1. Need for transboundary coordination

As river basin management under the WFD is focusing on river basins, transboundary aspects are of utmost importance. Hence, transboundary coordination is explicitly requested by the WFD in terms of the delineation of international river basins and river basin districts, the delineation and characterisation of transboundary GWBs, monitoring, the establishment of quality standards (groundwater threshold values) and the development and implementation of the programmes of measures. This chapter provides the relevant passages in the WFD and the GWD concerning transboundary coordination.

2.1.1. Coordination within RBDs (WFD)

WFD, Preamble

> *(35) Within a river basin where use of water may have transboundary effects, the requirements for the achievement of the environmental objectives established under this Directive, and in particular in all programmes of measures, should be **coordinated for the whole of the river basin district**. For river basins extending beyond the boundaries of the Community, Member States should endeavour to ensure the appropriate **coordination with the relevant non-member States**. This Directive is to contribute to the implementation of Community obligations under international conventions on water protection and management, notably the United Nations Convention on the protection and use of transboundary water courses and international lakes, approved by Council Decision 95/308/EC and any succeeding agreements on its application.*

WFD, Article 3 - Coordination of administrative arrangements within river basin districts

Article 3 of the WFD clearly expresses the need of coordination between Member States sharing an RBD and even with non-Member States coordination should be endeavoured to be established.

> *4. Member States shall ensure that the requirements of this Directive for the achievement of the environmental objectives established under Article 4, and in particular all programmes of measures are coordinated for the whole of the river basin district. For international river basin districts the Member States concerned shall together ensure this **coordination** and may, for this purpose, use existing structures stemming from international agreements. At the request of the Member States involved, the Commission shall act to facilitate the establishment of the programmes of measures.*
>
> *5. Where a river basin district extends beyond the territory of the Community, the Member State or Member States concerned shall endeavour to establish appropriate **coordination** with the relevant non-Member States, with the aim of achieving the objectives of this Directive throughout the river basin district. Member States shall ensure the application of the rules of this Directive within their territory.*

2.1.2. Characterisation (WFD)

Annex II, 2.3. - Review of the impact of human activity on groundwaters

> *For those **bodies of groundwater which cross the boundary** between two or more Member States or are identified following the initial characterisation undertaken in accordance with paragraph 2.1 as being at risk of failing to meet the objectives set for each body under Article 4, the following information shall, where relevant, be collected and maintained for each groundwater body: […]*

2.1.3. Groundwater Monitoring (WFD, GWD)

GWD, Preamble

*(16) In order to ensure consistent protection of groundwater, Member States sharing bodies of groundwater should **coordinate** their activities in respect of monitoring, […].*

WFD, Annex V, 2.2. - Monitoring of groundwater quantitative status

2.2.2 Density of monitoring sites

*[…] - for groundwater bodies within which groundwater flows **across a MS boundary**, ensure sufficient monitoring points are provided to estimate the direction and rate of groundwater flow across the Member State boundary.*

2.2.3. Monitoring frequency

*[…] - for groundwater bodies within which groundwater flows **across a MS boundary**, ensure sufficient frequency of measurement to estimate the direction and rate of groundwater flow across the Member State boundary.*

WFD, Annex V, 2.4. - Monitoring of groundwater chemical status

2.4.2 Surveillance monitoring

[…] Sufficient monitoring sites shall be selected for

- ***bodies which cross a MS boundary***

*[…] **Transboundary water bodies** shall also be monitored for those parameters which are relevant for the protection of all of the uses supported by the groundwater flow.*

2.1.4. Groundwater threshold values (GWD) and chemical status assessment

Common principles for establishing groundwater threshold values (TVs) and harmonization and coordination at setting such values within transboundary GWBs are the basis for comparable and harmonised assessments of groundwater chemical status and trend reversal.

GWD, Preamble

*(16) In order to ensure consistent protection of groundwater, Member States **sharing bodies of groundwater** should **coordinate** their activities in respect of monitoring, the setting of threshold values, and the identification of relevant hazardous substances.*

GWD, Article 3 –Criteria for assessing groundwater chemical status

2. Threshold values can be established at the national level, at the level of the river basin district or the part of the international river basin district falling within the territory of a Member State, or at the level of a body or a group of bodies of groundwater.

*3. MS shall ensure that, for bodies of groundwater shared by two or more MS and for bodies of groundwater within which groundwater flows across a MS's boundary, the establishment of threshold values is **subject to coordination between the MS** concerned, in accordance with Article 3(4) of Directive 2000/60/EC.*

*4. Where a body or a group of bodies of groundwater extends beyond the territory of the Community, the MS(s) concerned shall endeavour to **establish threshold values in coordination** with the non-MS(s) concerned, in accordance with Article 3(5) of Directive 2000/60/EC.*

At the 6th Groundwater Task Group Meeting[2] it was agreed that in the DRBM Plan for each transboundary GWB the status will be reported for each national part separately, applying relevant national groundwater threshold values. The process of future coordination/harmonization of TVs and of the status assessment is still mentioned in the Update 2015 of the DRBM Plan.

2.1.5. River Basin management Plans (WFD)

WFD, Article 13 – River basin management plans

> *2. In the case of an international river basin district falling entirely within the Community, Member States shall ensure coordination with the aim of producing a single international river basin management plan. Where such an international river basin management plan is not produced, Member States shall produce river basin management plans covering at least those parts of the international river basin district falling within their territory to achieve the objectives of this Directive.*
>
> *3. In the case of an international river basin district extending beyond the boundaries of the Community, Member States shall endeavour to produce a single river basin management plan, and, where this is not possible, the plan shall at least cover the portion of the international river basin district lying within the territory of the Member State concerned.*

2.1.6. Programme of measures (WFD)

WFD, Preamble

> *(33) The objective of achieving good water status should be pursued for each river basin, so that measures in respect of surface water and groundwaters belonging to the same ecological, hydrological and hydrogeological system are* ***coordinated****.*

[2] Minutes of the 6th Groundwater Task Group Meeting, Vienna, 10–11 April 2008

2.2. Transboundary Groundwater bodies of Danube Basin-wide importance (ICPDR GWBs)

According to Article 2 of the WFD the term *groundwater* refers to all water that is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. An *aquifer* is 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. Finally, a *body of groundwater* means a distinct volume of groundwater within an aquifer or aquifers.

Already in 2002[3] and 2003[4] workshops were dealing with questions concerning GWBs of basin-wide importance to be dealt with at ICPDR level. An important recommendation of these workshops was the proposed setup of a Drafting Group "Strategy for the implementation of the WFD regarding transboundary groundwater issues". Finally in 2004 on the 13th of February the 1st meeting of the Drafting Group 'Groundwater' of the RBM EG of the ICPDR took place in Vienna[5] and the selection criteria for transboundary GWBs of basin-wide importance were defined and agreed.

Definition: An ICPDR GWB is a **transboundary GWB** of Danube basin-wide importance. Importance is defined as:

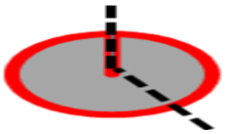
1. Important due to the size of the GWB which means an area > 4,000 km²; or
2. Important due to various criteria e.g. socio-economic importance, uses, impacts, pressures, interaction with aquatic eco-system.
3. The above mentioned criteria and the nomination of a GWB need to be agreed bilaterally.

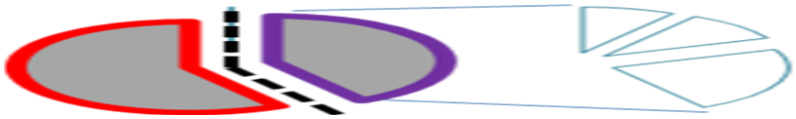
Other GWBs, even those with an area larger than 4,000 km², that are fully situated within one country of the DRBD are dealt with at the national level. The link between the GWBs of the ICPDR reports and the GWBs of the national reports is established by the national codes of the GWBs.

Bilateral and partly multilateral discussions resulted in the nomination of **11 transboundary GWBs of basin-wide importance**. The characterisation of GWBs was updated in 2015 for the draft 2nd DRBM Plan and the 11 GWBs were reconfirmed (listed in Table 2 and illustrated in Figure 2).

Definition

Transboundary GWBs of basin wide importance (ICPDR GWBs) are divided into "**National Parts".** Only ICPDR GWBs and national parts of ICPDR GWBs are under the focus of the GW TG and TNMN Groundwater.





ICPDR GWB	National parts of an ICPDR GWB (also referred to as "Aggregated GWBs")	Individual national GWBs
Transboundary GWBs of basin wide importance (ICPDR GWBBs) are divided into → *national parts of ICPDR GWBs*	The part of an ICPDR GWB which falls under the territory of a member country is called *national part of an ICPDR GWB.* If it consists of a number of individual national GWBs (or groups of GWBs) it is also called *aggregated GWB.*	The individual national GWBs are **not dealt with at ICPDR level**.

[3] 1st Workshop on Identification, Characterisation and Monitoring of GWBs for the Danube Countries, February 4-5, 2002 in Budapest.

[4] 2nd Groundwater Workshop on the Implementation of WFD in the Danube River Basin. May 12 and 13, 2003 in Budapest.

[5] Summary Report of the 1st Drafting Group Meeting

Table 2: Nominated transboundary GWBs of Danube basin-wide importance (ICPDR GWBs)

GWB	Nat. part	Area [km²]	Aquifer characteristics		Main use	Overlying strata [m]	Criteria for importance
			Aquifer Type	Confined			
GWB-1	AT-1	1,650	K	Yes	SPA, CAL	100–1,000	Intensive use
	DE-1	4,250					
GWB-2	BG-2	12,844	F, K	Yes	DRW, AGR, IND	0–600	> 4000 km²
	RO-2	11,340					
GWB-3	MD-3	9,662	P	Yes	DRW, AGR, IND	0–150	> 4000 km²
	RO-3	12,646					
GWB-4	BG-4	3,225	K, F-P	Yes	DRW, AGR, IND	0–10	> 4000 km²
	RO-4	2,187					
GWB-5	HU-5	4,989	P	No	DRW, IRR, IND	2–30	> 4000 km², GW resource, DRW protection
	RO-5	2,227		Yes			
GWB-6	HU-6	1,034	P	No	DRW, AGR, IRR	5–30	GW resource, DRW protection
	RO-6	1,459		Yes			
GWB-7	HU-7	7,098	P	No	DRW, AGR, IND, IRR	0–125	> 4000 km², GW use, GW resource, DRW protection
	RO-7	11,355		Yes			
	RS-7	10,506		Yes			
GWB-8	HU-8	1,152	P	No	DRW, IRR, AGR, IND	2–5	GW resource, DRW protection
	SK-8	2,211					
GWB-9	HU-9	750	P	Yes	DRW,IRR	2–10	GW resource
	SK-9	1,466					
GWB-10	HU-10	493	K	No	DRW, OTH	0–500	DRW protection, dependent ecosystem
	SK-10	598	K, F	Yes			
GWB-11	HU-11	3,178	K	No	DRW, SPA, CAL	0–2,500	Thermal water resource
	SK-11	563	F, K	Yes			

[Source/Status: DRBM Plan Update 2015]

GWB	ICPDR GWB code which is a unique identifier and the name
Nat. part	Code of national part of ICPDR GWB
Area [in km²]	Area of the ICPDR GWB covering all countries concerned / Area of national shares in km²
Aquifer characterisation	Aquifer Type: Predominantly: **P** = porous/ **K** = karst/ **F** = fissured. Multiple selections possible. Main type should be listed first. Confined: **Yes** / **No** / **Partly**
Main use	**DRW** = drinking water / **AGR** = agriculture / **IRR** = irrigation / **IND** = Industry / **SPA** = balneology / **CAL** = caloric energy / **OTH** = other. Multiple selections possible.
Overlying strata	Indicates a range of thickness (minimum and maximum in metres)
Criteria for importance	If size < 4 000 km², criteria for importance of the GWB have to be named, they have to be bilaterally agreed upon.

Figure 2: Transboundary Groundwater Bodies of Basin-Wide Importance (DRBM Plan – Update 2015 – Map 4)

2.3. Danube Basin Analysis (DBA) Report – WFD Article 5

Article 5 of the WFD requires the characterisation of each RBD, a review of the impact of human activity on the status of surface waters and on groundwater and an economic analysis of water use.

According to the technical specifications set out in Annex II of the WFD, an initial characterisation has to be carried out for all GWBs to identify their uses and to identify the degree to which they are at risk of failing to meet the environmental objectives under Article 4 of the WFD (Annex II 2.1). Surveillance monitoring shall supplement and validate the impact assessment procedure. Sufficient monitoring points are needed in GWBs identified at risk and in GWBs which cross a Member State boundary (Annex V 2.4.2).

Following this initial characterisation, Member States have to carry out further characterisation of all GWBs identified as being at risk to establish a more precise assessment of the significance of such risk and to identify any measures required under Article 11 (Annex II 2.2). Additionally, for all GWBs at risk and for all GWBs which cross the boundary between two or more Member States, there is a need to collect, where relevant, additional information focusing mainly on quantitative aspects such as the location of groundwater abstraction points serving more than 10 m^3 a day or more than 50 persons, the abstraction rates, direct discharges to groundwater etc. (Annex II 2.3).

For each GWB at risk of failing to meet the objectives the cause of this failure (i.e. the pressure or combinations of pressures) must be investigated, operational monitoring is needed, groundwater threshold values have to be established and appropriate measures need to be implemented.

At EU level, guidance is available (EC 2004 and EC 2010) on the generic elements of risk assessment for groundwater and on tools to assist and contributing to a harmonization of approaches and procedures like the use of conceptual models and their specific implementation under the WFD.

2.3.1. Presentation at ICPDR level

According to the stratified approach of 3 level reports which supplement each other (see beginning of chapter 2), the results of the characterisation and risk assessment at Danube level is presented in the Danube Basin Assessment (DBA) Report. The most recent DBA Report was published in 2014 (ICPDR 2014). It comprises i.a.:

- the characterisation of all nominated ICPDR GWBs,
- the identified significant pressures and
- the results of the impact and risk assessment

In addition, the DBA report of 2014 highlights the changes since the previous, first assessment. A brief summary of these elements is also included in the DRBM Plan Update 2015.

The recent impacts and risk assessment was elaborated for the time horizon 2021, which is the target date for the 2nd WFD management cycle and therefore of key relevance for the elaboration of the Joint Programme of Measures which is part of the DRBM Plan Update 2015.

Note

The risk assessment is performed on national criteria both for quality and quantity, hence the approaches are different. As a consequence the result of the risk assessment may differ for the national shares of an ICPDR GWB.

The detailed information is to be found in the Part B (national level) reports.

2.3.2. Procedures for data provision and data exchange

For the preparation of a DBA Report a series of templates was developed within the GW TG to allow for collecting data in a harmonised way. The tables/templates are usually discussed at the GW TG meetings at the beginning of each data collection period and adjusted based on the lessons learned.

As far as possible, the tables are pre-filled by information from the most recent DRBM Plan and DBA Report. Information might need to be updated as size of GWBs, characteristics, pressures and methodologies might have changed and countries are asked to check, update or add the requested data and information in track change mode.

The most up-to-date templates for data collection are attached in the Annex and links are given in brackets.

Most of the templates need to be completed for each individual national part of an ICPDR GWB. The update of a DBA Report needs information on the following topics:

- **GWB characterisation**
  - Nominated GWBs and initial characterisation (Table 4)
  - Further characterisation of GWBs including the methodology of risk assessment (changes since the previous report) (Table 5)
- **Groundwater risk assessment**
  - Reasons for risk of failing good groundwater CHEMICAL status in the reference year of the assessment for the ICPDR GWBs (Table 7)
  - Reasons for risk of failing good groundwater QUANTITATIVE status in the reference year of the assessment for the ICPDR GWBs (Table 9)
  - Identified pressure types – related to the risk (with prefilled information from the recent DRBM Plan. (Table 14)

2.3.3. GIS data

In addition to the templates prepared by the GW TG, the ICPDR Information Management and GIS Expert Group (IMGIS EG) prepares GIS templates for data collection. The collection of data via the GIS templates allows for automatic display of the data in the maps of the DanubeGIS and for the preparation of the maps used in the ICPDR reports.

The GIS Server is located at: http://www.danubegis.org/expert/ where all the templates, the submitted GIS data and maps are accessible for authorized experts.

The templates relevant for collecting data and information on GWB characterisation, monitoring, pressures, impacts, risk, status and exemptions are called ‘GWBody’, ‘GWBodyAggr’ and ‘GWStn’. The detailed content of the templates is explained in the related code list.

Note

In case of an update of GIS data, close cooperation between the national GW expert (GW TG members) and the national IMGIS expert (IMGIS EG member) is needed.

In general, the respective data need to be prepared by the GW expert and forwarded to the national IMGIS expert who is responsible for the upload of the respective templates to the ICPDR GIS Server.

2.4. Danube River Basin Management (DRBM) Plan – WFD Article 13

According to the WFD, every 6 years a River Basin Management Plan is to be produced for each RBD. In the case of an international RBD, Member States shall ensure coordination with the aim of producing a single international river basin management plan. In case a river basin is extending beyond the boundaries of the Community, Member States shall endeavor to produce such a report. The content of a RBM Plan is laid down in Annex VII.

At EU level, groundwater specific guidance is available on monitoring (EC 2007) and on status and trend assessment (EC 2009).

2.4.1. Presentation at level A

According to the stratified approach of 3 level reports which supplement each other (see beginning of chapter 2), the content of the DRBM Plan is giving relevant summary information on:

- the significant pressures causing poor status of the GWBs,
- the WFD monitoring networks and the chemical and quantitative status of the GWBs,
- the related impacts on these GWBs,
- the joint measures implemented in order to reach good status.

Detailed information is to be found in the Part B (national level) reports.

In order to comply with these requirements and by considering the reporting sheets developed by the EC, the GW TG discussed about the scope and the details of reporting, about harmonising the provided information and on templates that should be used for information collection and exchange within the group (see chapter 2.4.2).

2.4.1.1. Groundwater status presentation

As decided by the GW TG, the result of the status assessment is solely given for the whole national part of an ICPDR GWB.

If a national part of an ICPDR GWB consists of several individual national-level GWBs then *poor status* in one national-level GWB (aggregated GWB) is decisive for characterising the whole national part of an ICPDR GWB as having *poor status* (one out all out).

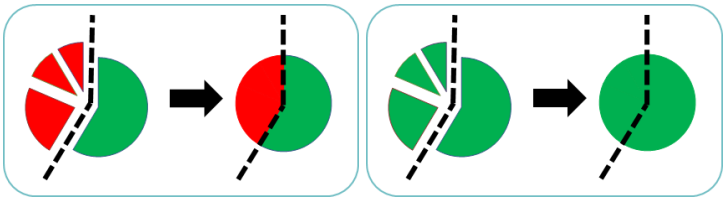
2.4.1.2. Confidence in the status presentation – aggregation confidence

At the 7th Meeting of the GW TG in October 2008 the issue of confidence was discussed. To indicate the diversity of different status results of individual GWBs within *aggregated GWBs* a concept of *aggregation confidence levels* was developed by the ICPDR. The reason of introducing these specific confidence levels for the DRBM Plan was the need to distinguish between the cases where all individual GWBs in an *aggregated GWB* have the same status (high confidence) or not (medium confidence) or whether the assessment is based on the risk assessment data (low confidence) – the concept is illustrated in Figure 3. Information about the WFD-related confidence levels of status assessment for the individual national (non-aggregated) GWBs can be found in the national plans and in WISE. The *aggregation confidence* for the whole national part of an ICPDR GWB is illustrated in maps.

Figure 3: Aggregation confidence levels for groundwater

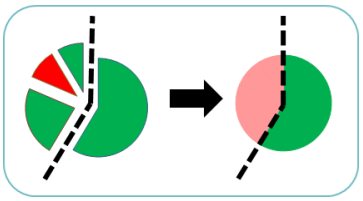
High confidence
Good or poor status

1.) Status assessment is based on WFD compliant monitoring data.
2.) If the national part of an ICPDR GWB (the aggregated GWB) is formed by more than one GWB or groups of GWBs, **all** have the same status.



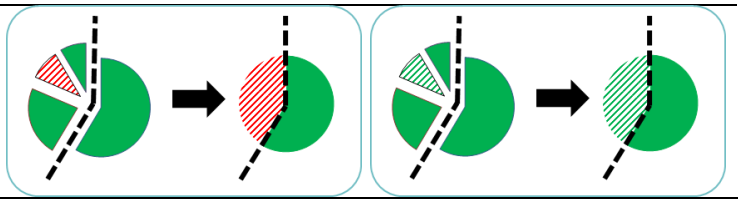
Medium confidence
Poor status

1.) Status assessment is based on WFD compliant monitoring data.
2.) If the national part of an ICPDR GWB is formed by more than one GWB or groups of GWBs, **not all** have the same status.



Low confidence
Good or poor status

- The status assessment of at least one individual GWB is based on risk assessment data.



Poor Status | Good Status | Poor/Good Status based on Risk Assessment

[Status of discussion: 7th Meeting of the GW TG in October 2008, slightly reworded at the 20th GW TG meeting in March 2015]

2.4.2. Procedures for data provision and data exchange

For the preparation of a DRBM Plan a series of templates was developed within the GW TG to allow for collecting data in a harmonised way. The tables/templates are usually discussed at the GW TG meetings at the beginning of each data collection period and adjusted based on the lessons learned.

As far as possible, the tables are pre-filled by information from the most recent DRBM Plan and DBA Report. Information might need to be updated as size of GWBs, characteristics, pressures and methodologies might have changed and countries are asked to check, update or add the requested data and information in track change mode.

The update of a DRBM Plan needs information on the following topics. The most up-to-date templates for data collection are attached in the Annex and links are given in brackets.

Most of the templates need to be completed for each individual national part of an ICPDR GWB.

- GWB characterisation
    - Nominated GWBs and initial characterisation (Table 4)
    - Further characterisation of GWBs (changes since the previous report) (Table 5)
- Groundwater status assessment
    - Description of status methodologies (Table 15)
    - Chemical and quantitative status (Table 6)
    - Reasons for the failure – significant pressure types and substances/indicators causing poor status; (Table 8, Table 10)
    - Reasons for the failure – significant pressures in detail (Table 14)
    - Status exemptions and date of achievement of good status. (Table 6)
- Trend assessment
    - Description of trend and trend reversal methodologies (Table 15)
    - Results of trend and trend reversal assessment, starting points of trend reversal. (Table 6)
- Monitoring
    - Number of sampling sites (Table 12)
    - Parameters and monitoring frequency (Table 13)
- Risk assessment
    - Risk and pressures – **taken from recent DBA report**. (Table 6, Table 14)
    - Groundwater threshold values and basis of establishment (DW standards, EQS, NBL, relationships). (Table 11, Table 15)
- Joint Programme of measures
    - The measures for the GWBs identified at risk. (Table 17)

2.4.3. GIS data

In addition to the templates prepared by the GW TG, the IMGIS Expert Group also elaborated GIS templates for data collection. The collection of data via the GIS templates allows for automatic display of the data in the maps of the DanubeGIS and for the preparation of the maps used in the ICPDR reports.

The GIS Server is located at: http://www.danubegis.org/expert/ where all the templates, the submitted GIS data and maps are accessible for authorized experts.

The templates relevant for collecting data and information on GWB characterisation, monitoring, pressures, impacts, risk, status and exemptions are called ‘GWBody’, ‘GWBodyAggr’ and ‘GWStn’. The detailed content of the templates is explained in the related code list.

Note

In case of an update of GIS data, close cooperation between the national GW expert (GW TG members) and the national IMGIS expert (IMGIS EG member) is needed.

In general, the respective data need to be prepared by the GW expert and forwarded to the national GIS expert who is responsible for the upload of the respective templates to the ICPDR GIS Server.

2.5. Interim Report on progress in the implementation of the Joint Programme of Measures

Joint Programmes of Measures (JPM) are part of each RBMP. As the DRBM Plan is focusing on the "roof level" of the DRB only, the JPM therein is focusing on measures of basin-wide importance.

According to Article 11(7) of the WFD measure had to be made operational by December 2012 the first time and an interim report to the EC is due within three years of the publication of the RBMP describing progress in the implementation of the planned programme of measures.

Even though the WFD does not require an internationally coordinated interim report for the whole basin (Level A), the Ministers of the Danube countries asked the ICPDR in the Danube Declaration of 2010 to coordinate such an interim report in hand (2012 Interim Report), describing progress in the implementation of the Joint Programme of Measures (JPM) and the national programmes of measures by the end of 2012.

The objective of the Interim Report is to provide an overview on the status of measures implementation as included in the JPM of the DRBM Plan. Reference date is a best estimate of the situation towards the end of a three year period after the publication of an RBMP. Therefore, any reference to the following progress categories

- Not started,
- Ongoing,
- Completed,

is to be understood as referring to the estimated situation towards the end of a three year period after the publication of an RBMP.

2.5.1. Presentation at level A

The Interim Report on the JPM comprises chapters on groundwater quality and groundwater quantity, referring to the ICPDR visions and briefly summarising the status of the measures implemented in the individual countries. Details are attached as an annex to the main report.

For each of the national parts of ICPDR GWBs information on the type of measure, either

- basic measures according Article 11(3)a or
- other basic measure under Article 11(3)b-l or
- supplementary pressures under Article 11(4) and (5)

and the status of implementation of all key measures is requested in the following way:

- MC…Measure implementation Completed,
- MO…Measure implementation On-going,
- PO…Construction Measure - Planning On-going,
- CO…Construction Measure - Construction On-going,
- MN…Measure implementation Not started.

Furthermore, measures are described in more detail, information is given on the responsible authority and quantitative information by appropriate indicators (number of measures/projects and costs).

Finally a summary table on the characteristics of the GWBs, their pressures, status, measures and exemptions is given.

2.5.2. Procedures for data provision and data exchange

For the preparation of the JPM report a series of templates was developed within the GW TG to allow for collecting information on the status of measures in a harmonised way. The tables/templates are usually discussed at the GW TG meetings at the beginning of each data collection period and adjusted based on the lessons learned.

As far as possible, the tables are pre-filled by information from the most recent DRBM Plan and JPM report and there is a request for information update. The most up-to-date templates for information and data collection are attached in the Annex and links are given in brackets below.

The following templates need to be completed for each individual national part of an ICPDR GWB.

- GWBs at poor status and implemented measures (Table 16)
- Detailed description of groundwater measures (Table 17)
- Overview of GWBS, pressures, status and measures (Table 18)

2.6. Data gaps – Differences – Need for harmonisation

The Danube countries use a broad spectrum of different methodologies for the delineation and characterisation of GWBs; monitoring; the assessment of the chemical and quantitative *status*; the establishment of threshold values; trend and trend reversal assessment. Despite there being overall coordination facilitated by the ICPDR Groundwater Task Group, further harmonisation of the national methodologies is still needed. Data gaps and inconsistencies are still available in the collected data, resulting in uncertainties in the of data interpretation.

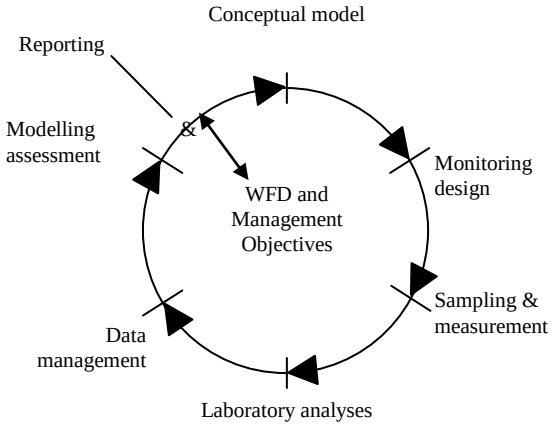
To achieve a harmonisation of data sets for transboundary GWBs, there is a need for intensive bi- and multilateral cooperation. In addition, the interaction of groundwater with surface water or directly dependent ecosystems needs further attention for which technical guidance is elaborated at European level.

3. TNMN Groundwater

The "Transnational Monitoring Network" (TNMN) of the ICPDR was launched in 1996, primarily focussing on surface waters. The transnational groundwater management activities in the DRBD started in February 2002 and were triggered by the WFD. Finally 11 transboundary GWBs were identified as being of basin-wide importance. In 2009, monitoring of these selected GWBs was decided to be an integral part of the TNMN and therefore all WFD monitoring sites in these GWBs are TNMN sites.

For reporting of groundwater monitoring data under the TNMN a six-year cycle is foreseen, which is in line with the reporting requirements under the WFD. The TNMN has to meet the requirements of the WFD and the ICPDR. Monitoring networks should be at high standards.

Regarding the WFD, reporting on the monitoring network is foreseen according to Article 8 and the results of monitoring are essential components within the RBMP. The monitoring programme includes both quantitative and chemical (quality) monitoring and shall provide the necessary information to assess groundwater status, to identify trends in pollutant concentrations, to support GWB characterisation and the validation of the risk assessment, to assess whether drinking water protected area objectives are achieved and to support the establishment and assessment of programmes of measures and the effective targeting of economic resources. WFD monitoring programmes had to be operational since 22nd December 2006.



Monitoring follows a cyclic procedure and each step in this process needs proper attention and the consideration of integrated and verifiable quality assurance and quality control in order to produce reliable and comparable monitoring data.[6]

Monitoring results reported to ICPDR will be the basis for the preparation of the TNMN Yearbook.

The initial round of TNMN groundwater data collection happened in 2009 and it is foreseen to perform the second round in 2016, after the publication of the 2nd DRBM Plan.

3.1. Monitoring strategies and network design – following the requirements of the WFD

To design a monitoring network different criteria have been applied by the countries to select appropriate sites. Important criteria are aquifer type and characteristics (porous, karst and fissured, confined and unconfined groundwater) and the depth of the GWB since deep GWBs are more difficult and costly accessible than shallow GWBs. For deep GWBs the flexibility in the design of the monitoring network is very limited. The flow direction was also taken into consideration by some

[6] Guidance Document No. 15: Groundwater Monitoring. (2007).

countries as well as the existence of associated drinking water protected areas or ecosystems (aquatic and/or terrestrial).

The monitoring sites must be reviewed on a regular basis to ensure that they provide representative information and data on groundwater quality and quantity and fully support the risk and status assessment process.

3.1.1. Transboundary aspects of groundwater monitoring

With respect to groundwater the WFD requests information on the chemical and quantitative status of groundwater. Specific provisions concern those bodies of groundwater, which cross the boundary between two or more Member States (see also chapter 2.1.3). For the ICPDR this concerns the identified 11 ICPDR GWBs.

With the view of establishing a basin wide coherent monitoring approach, bilateral agreements should be reached on monitoring strategies (i.e. sampling procedures, network design etc.) and principles, which require coordination of conceptual model development, the exchange of data and QA and QC aspects (in line with the requirements of Article 13(2) WFD).

According to Annex V 2.4 WFD the provisions for surveillance monitoring require sufficient monitoring sites to be selected for bodies which cross a Member State boundary and transboundary GWBs to be monitored for those parameters, which are relevant for the protection of all uses, supported by the groundwater flow.

Data from the surveillance monitoring programme are also useful for characterising GWBs, validating the risk assessment, defining natural background and assessing trend developments within the GWB. This will enable future changes in conditions to be assessed, reference data to be acquired and typologies to be investigated.

According to Annex V 2.2 WFD the quantitative monitoring network shall be designed so as to provide a reliable assessment of the quantitative status of all GWBs or groups of bodies of basin-wide importance including an assessment of the available groundwater resource. For GWBs within which groundwater flows across a Member State boundary, it has to be assured that sufficient monitoring points and sufficient frequency of measurement are provided to estimate the direction and rate of groundwater flow across the Member State boundary.

3.1.2. Selection of parameters

3.1.2.1. Chemical monitoring

In addition to the mandatory parameters listed in the WFD, the selection of parameters depends on the characterisation of a GWB and on the results of the risk assessment - considering existing water quality data and local expert knowledge. In special cases very specific parameters might need to be monitored, depending on the particular characteristics of the groundwater body (e.g. deep thermal artesian groundwater bodies).

Parameters such as temperature and a set of major and trace ions are not formally requested by the WFD but may be helpful to validate the risk assessment and the development/validation/improvement of conceptual models. Generalised land use and land cover categories can be used as a basis for the initial selection of parameters. An in-depth analysis of land use/cover and the nature and approximate amounts of chemicals being used should be made in cooperation with competent local administrations/experts in order to identify potential pollutants.

Additional indicators of anthropogenic contaminants typical of land use activities in the area and with a potential to impact groundwater might also be required on an infrequent basis for validating the WFD risk assessments and to check for any new identified pressure turn up to be relevant.

For the selection of parameters, also the provisions of Annexes I and II of the GWD have to be considered. Selective determinants (e.g. heavy metals and relevant basic radio nuclides) would be needed for assessing natural background concentrations.

Transboundary water bodies shall also be monitored for those parameters, which are relevant for the protection of all of the uses supported by the groundwater flow (see chapter 2.1.3).

In addition it is recommended to monitor the water level at all chemical monitoring points in order to describe (and interpret) the 'physical status of the site' and to help interpreting (seasonal) variations or trends in chemical composition of groundwater.

Helpful information can be found in the CIS Guidance Document No 15 (EC, 2007) which was elaborated within WG GW.

The following core set of determinants was agreed by the GW TG[7] to be monitored and reported within TNMN groundwater:

- Mandatory by the WFD
    - dissolved oxygen,
    - pH-value,
    - electrical conductivity,
    - nitrate,
    - ammonium,
- Further recommended:
    - temperature and
    - a set of major (trace) ions.

[7] 3rd Meeting of the ICPDR Groundwater Task Group on September, 25–26 2006 in Vienna.

3.1.2.2. Quantity monitoring

The WFD requires only GW-levels but it was recommended by the GW TG to monitor the following parameters for the purposes of quantitative assessment of groundwater:

- Groundwater levels in boreholes or wells (only this parameter is mentioned in the WFD, the other parameters are recommended as supportive);
- Spring flows;
- Flow characteristics and/or stage levels of surface water courses during drought periods (i.e. when the flow component directly related to rainfall can be neglected and discharge is sustained substantially by groundwater);
- Stage levels in significant groundwater dependent wetlands and lakes.
- Optional: water abstraction

3.1.3. Frequency of groundwater monitoring

The amount and frequency of monitoring should be determined by the data needed to determine risk and status, and where necessary to support the design and assessment of the programme of measures.

3.1.3.1. Chemical monitoring

The selection of appropriate monitoring frequency should generally be based on the conceptual model and, in particular, the characteristics of the aquifer and its susceptibility to pollution pressures. Sampling for operational monitoring must be continued until the GWB is determined with adequate confidence, to be no longer at poor status or at risk of being at poor status and there is adequate data to demonstrate a reversal of trends.

Sampling frequency and sample timing at each monitoring location should furthermore consider:

- Requirements for trend assessment;
- Whether the location is up-gradient, directly below, or down-gradient of the pressure. Locations directly below a pressure may require more frequent monitoring;
- The level of confidence in the Article 5 risk assessments, and changes in the assessments over time;
- Short-term fluctuations in pollutant concentrations, e.g. seasonal effects. Where seasonal and other short-term effects are likely to be encountered, it is essential that sampling frequencies and timings are adjusted (increased) accordingly and that sampling takes place at the same time(s) each year, or under the same conditions, to enable comparable data for trend assessment, accurate characterisation and status assessment; and
- Land use management patterns, e.g. the period of pesticides or fertilizer application. This is especially important for rapid flow systems like karstic aquifers and/or shallow GWBs.

3.1.3.2. Quantity monitoring

Frequency of monitoring predominantly depends of the characteristics of the water body and the monitoring site respectively. Sites with significant annual variability should be monitored more frequently than sites with only minor variability. In general monthly monitoring will be sufficient for quantity monitoring where variability is low but daily monitoring would be preferred (particularly when measuring flows). The frequency should be revised as knowledge of the aquifer response and behaviour improves and in relation to the significance of any changes in pressures on the GWB. This will ensure that a cost-effective programme is maintained.

3.1.4. Procedures for data aggregation and reporting - for the purpose of the TNMN Yearbook

Reporting of monitoring data is not foreseen under the WFD.

For the purpose of reporting to the ICPDR for the TNMN Yearbook the GW TG agreed[8] to collect aggregated data for each national part of ICPDR GWBs. The agreed six-year reporting cycle which is foreseen under the TNMN is in line with the reporting requirements under the WFD. This will allow for making any relevant statement on significant changes of groundwater status for the ICPDR GWBs. A possibility of annual reporting of groundwater status was considered (as part of future TNMN Yearbooks) but it was concluded that the slow character of changes in groundwater quality in response to the emerging pressures makes the added value of annual reporting questionable. Moreover, an informative note on the regular reporting on the groundwater status within the DRBM Plan can be included in each TNMN Yearbook to provide public with a complete overview of the ICPDR monitoring activities.

As discussed in the GW TG[9], reporting for TNMN purposes covers information and data on:

- Information on groundwater chemical and quantity risk and status and in case of poor status or risk, the particular reason for failure (taken from the most recent DBA or DRBM Plan).
- Aggregated quality data on the level of GWBs for selected parameters e.g.:
    - Electrical conductivity, ammonium, nitrate;
    - Parameters characterising the GWB; and
    - Parameters causing risk/poor status

All aggregated data are based on the arithmetic mean values per monitoring point for a reference year. The following statistical key-values are collected: Minimum, Mean, Maximum, Standard deviation, 10-, 25-, 50-, 75-, 90-Percentile.

The procedure for aggregating data is:

1. calculate the annual arithmetic mean for each monitoring point for the reference year; and
2. calculate the statistics for each national part of an ICPDR GWB, based on these site values.

For collecting monitoring data a template (Table 19) was developed within the GW TG. The template is usually discussed at the GW TG meetings at the beginning of each data collection period and adjusted based on the lessons learned. The template needs to be completed for each individual national part of an ICPDR GWB.

[8] 3rd Meeting of the ICPDR Groundwater Task Group on September, 25–26 2006 in Vienna

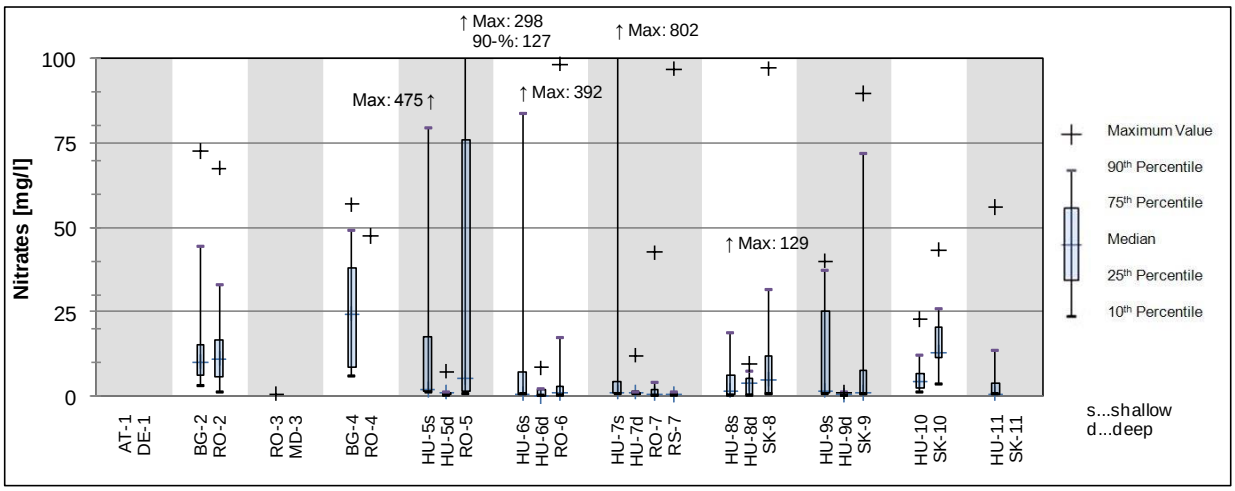
[9] 11th Meeting of the ICPDR Groundwater Task Group on October, 21–22 2010 in Budapest

3.1.5. Presentation at ICPDR level

The collected data are compiled and presented in the TNMN Yearbook in the form of box-plots, grouping the single national parts of ICPDR GWBs together. Figure 4 shows an example assessment for nitrate. In future, the assessment will not only present the status but also the temporal development since the first assessment in 2009.

These results are accompanied by an overview of status and risk which is taken from the most recent either DBA or DRBM Plan.

Figure 4: EXAMPLE: ICPDR GW-bodies – Nitrate concentrations in groundwater in 2009



3.2. GW contribution to TNMN Yearbook

GW TG decided to prepare and provide contributions to the TNMN Yearbook in order to highlight the importance respectively even the existence of groundwater in the Danube River Basin and to provide public with a complete overview of the ICPDR monitoring activities. The contributions consist of both thematic highlights which need to be selected by the GW TG and the presentation of the status of groundwater by aggregated data which are reported to the ICPDR every six years according to the provisions laid down in chapter 3. However, in case that any significant changes in status of monitored GWBs will occur, the GW TG will consider publishing this in the TNMN Yearbook. Similarly, the results of targeted studies on groundwater quantity and quality will be published therein.

4. Importance of GW in the DRB

4.1. Importance of GW in drinking water production

In 2009[10], the GW TG agreed to collect information on the share of groundwater for drinking water production in the DRB. The main objective of this activity is to compare and highlight the importance of groundwater in the DRBD by the example of drinking water production.

4.1.1. Procedures for data provision and data exchange

The following principles were agreed:

- Data on total drinking water abstraction from fresh surface water and fresh groundwater is collected at the national level and at the level of the DRBD - main emphasis lies on the DRBD level. Additionally, data on percentage/amount of population served by drinking water from groundwater or surface water should be provided, as far as available.
- It was decided that - in contradiction to the OECD questionnaire - bank filtered water is considered as groundwater, which better reflects the current practice of accounting in the Danube member countries.

The template for harmonized data collection is attached in the Annex as Table 20.

Data collection and assessment is a living process. Updates, corrections and additional data/countries are always welcome which is reflected by a respective agenda point at each GW TG meeting.

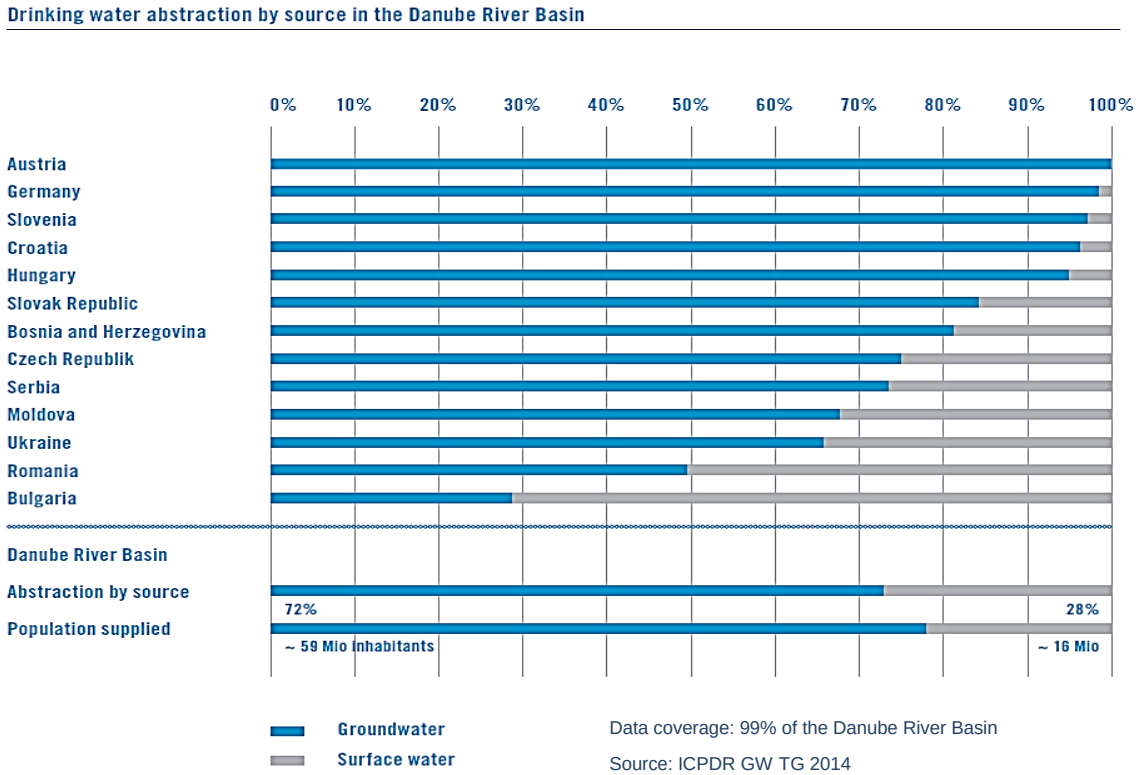
4.1.2. Presentation at ICPDR level

Since 2014 the data collection is almost complete, as data currently cover 13 Danube countries and about 99% of the whole DRBD in terms of area. Figure 5 shows the share of groundwater for drinking water production in the country parts which belong to the DRBD. Figure 6 indicates the distribution of shares on a map and Figure 7 gives a comparison in Europe by considering further data from EUREAU and WISE.

It was agreed by the GW TG that the underlying figures are not going to be published, except the displayed percentages.

[10] 8th Meeting of the ICPDR Groundwater Task Group on March, 19–20 2009 in Zagreb

Figure 5: Share of groundwater for drinking water production in the Danube River Basin



Data coverage: 99% of the Danube River Basin

Source: ICPDR GW TG 2014

Figure 6: Share of groundwater for drinking water production in the Danube River Basin

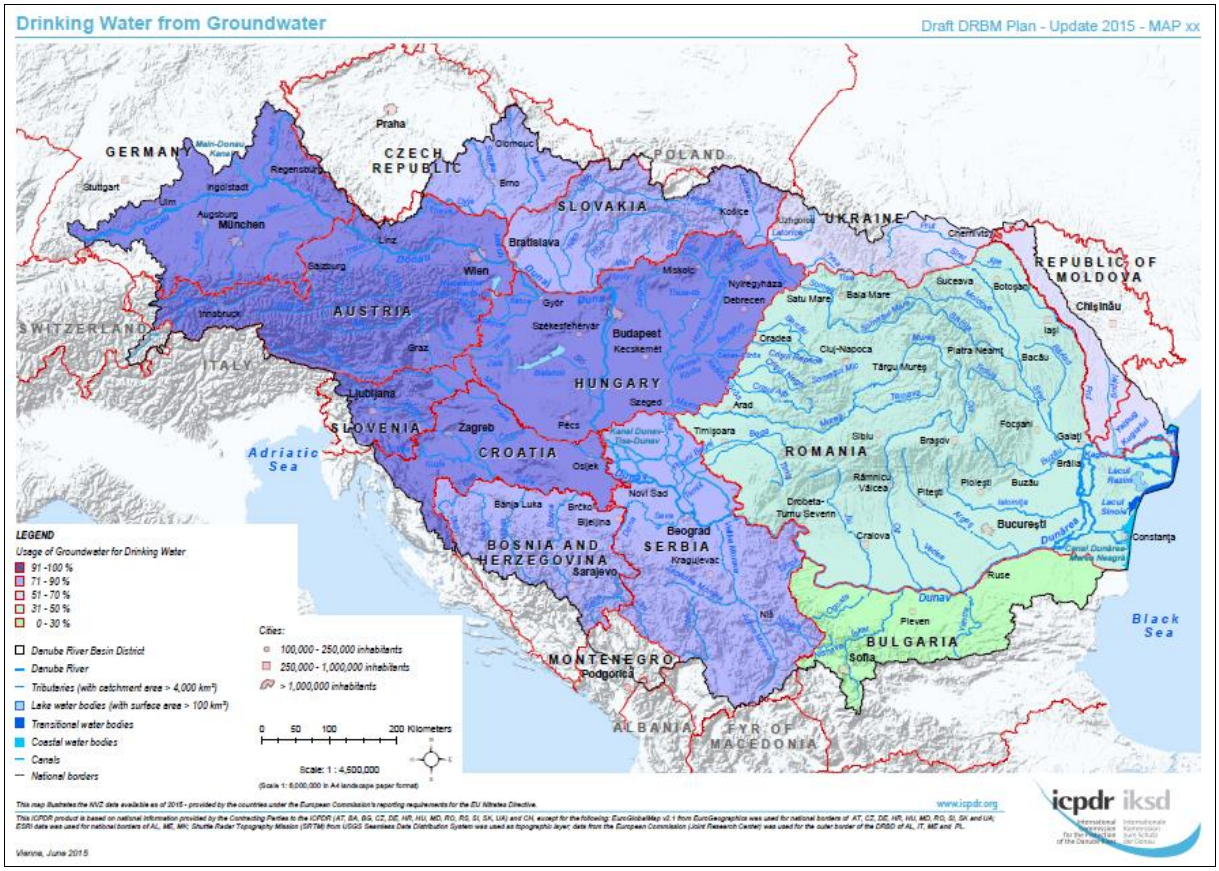
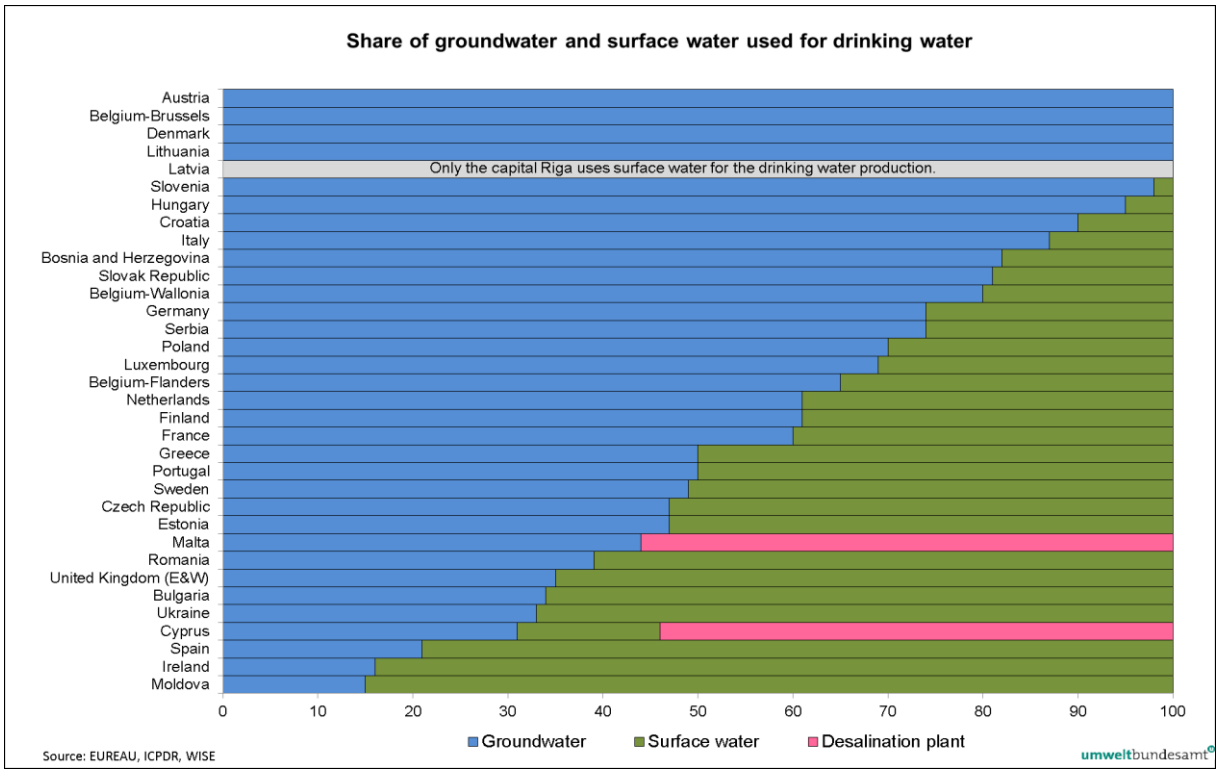


Figure 7: Share of groundwater for drinking water production in Europe



4.2. Abstraction of bank-filtered water

The connection between surface water and groundwater is frequently utilised in the form of abstracting bank filtered water for drinking water purpose, making use of the natural purification and filtration properties of the underground along the pathway from the river to the abstraction well.

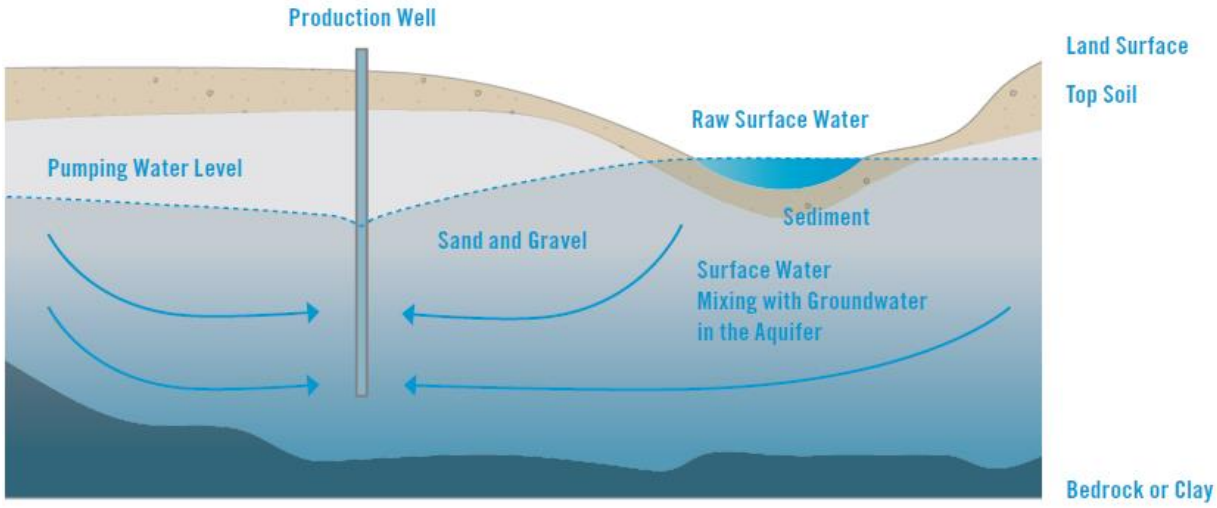
Hence, the GW TG agreed to collect information about the most important locations of abstractions of bank filtered water in the Danube River Basin.

4.2.1. Procedures for data provision and data exchange

Agreed definition of bank filtered water

Bank filtered water source: groundwater source close to the surface water from which the rate of the abstracted water produced by the water production wells originates significantly from the surface water recharge

Figure 8: Schematic sketch of a river bank filtration abstraction



It was agreed to follow a step-wise approach and in the first step, the **focus of the inventory** shall be:

- along the river Danube only,
- abstracted water is also used for drinking water purposes, and
- either at least 50.000 inhabitants (or 3.65 Mio m³/year) are supplied (see key-value for recalculation), or
- the 5 largest abstractions of bank filtered water in a country.

The **key value** for re-calculation between the number of consumers and the amount of consumption was agreed with **200 l/capita/day** as an average specific value.

Only existing data should be provided, no new data have to be generated.

The data collection happened in 2011/2012 with the template which is attached as Table 21.

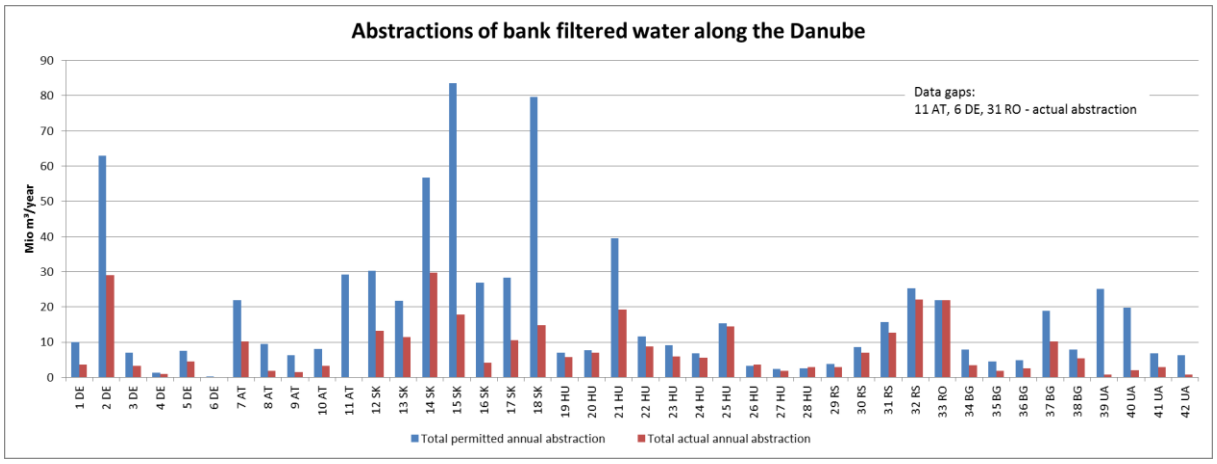
Based on the experience gathered in this first step, the GW TG might agree extending this inventory in a second step to the whole Danube River Basin.

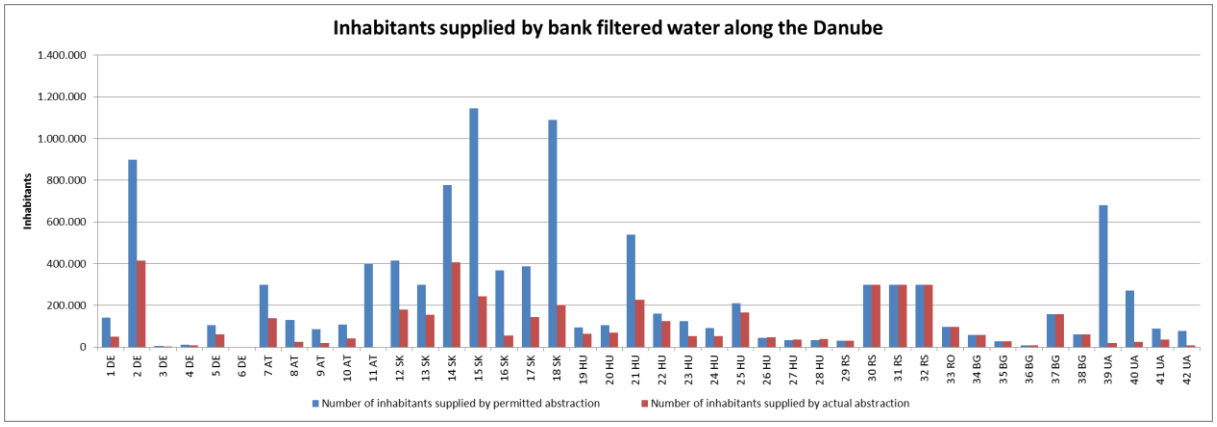
4.2.2. Presentation at ICPDR level

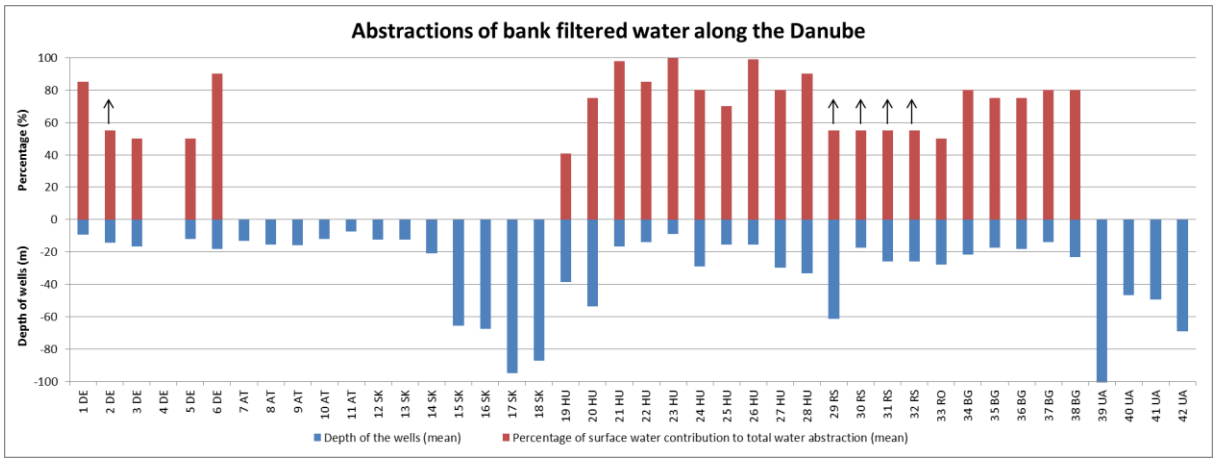
Eight Danube countries reported in total 42 most important and largest bank filtration abstractions along the Danube River. The compiled data demonstrate that about four Mio inhabitants are actually served and an additional five Mio people could be served (considering the permitted annual abstractions).

Due to security reasons Romania provided only summary data for their most important bank filtration abstractions.

It was agreed in the GW TG that the detailed figures are not going to be published, but only aggregated, compiled information.







5. Link to European Legislation and EC-activities

The comprehensive website of the DG Environment of the European Commission (http://ec.europa.eu/environment/water/index_en.htm) provides abundant information about all aspects of EU water legislation and its implementation.

The most important sites regarding River basin Management are:

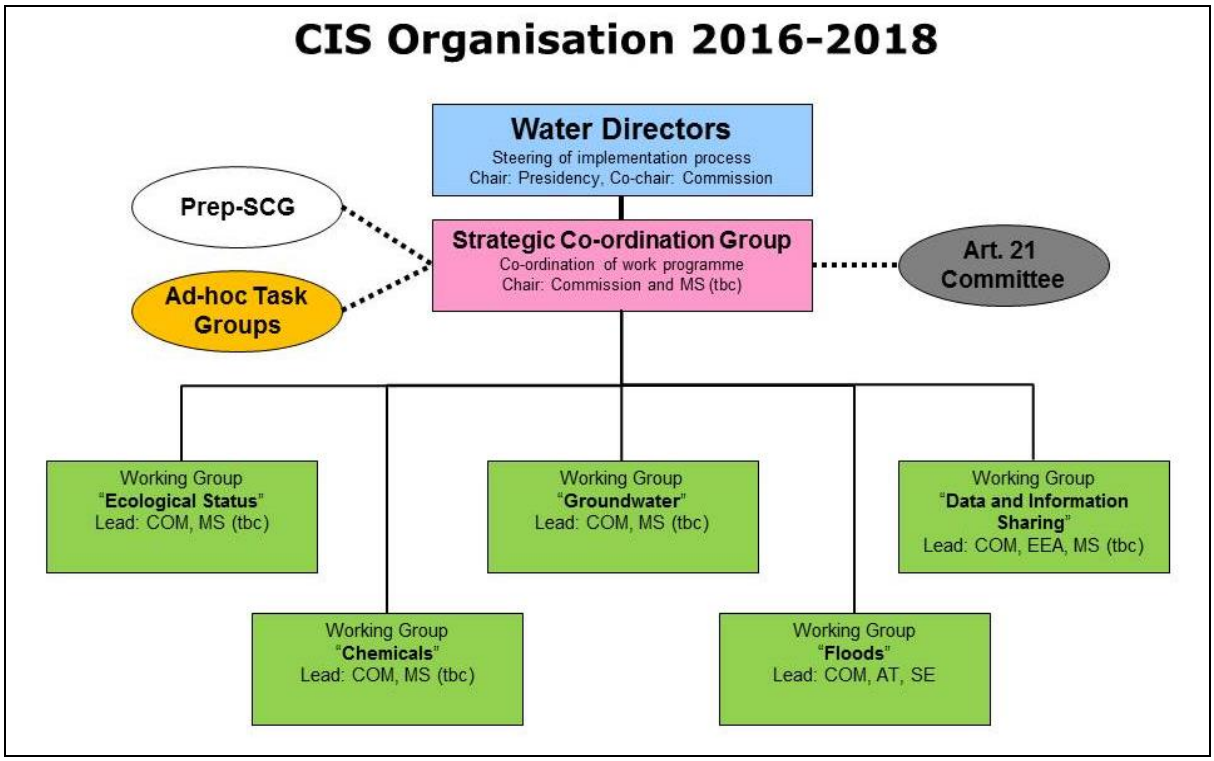
- Water Framework Directive (http://ec.europa.eu/environment/water/water-framework/index_en.html)
- Groundwater Directive http://ec.europa.eu/environment/water/water-framework/groundwater/framework.htm
- Common Implementation Strategy http://ec.europa.eu/environment/water/water-framework/objectives/implementation_en.htm
- CIS Guidance Documents http://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm https://circabc.europa.eu/w/browse/a3c92123-1013-47ff-b832-16e1caaafc9a
- CIRCABC http://ec.europa.eu/environment/water/water-framework/iep/index_en.htm
- European Commission reports on the implementation of the WFD and the GWD http://ec.europa.eu/environment/water/water-framework/impl_reports.htm
- A Blueprint to Safeguard Europe's Water Resources http://ec.europa.eu/environment/water/blueprint/index_en.htm
- WISE – Water Information System for Europe http://water.europa.eu/

5.1. Common Implementation Strategy

In order to address the challenges of the WFD in a co-operative and coordinated way, the MS, Norway and the Commission agreed on a Common Implementation Strategy (CIS) for the WFD. Furthermore, the Water Directors stressed the necessity to involve stakeholder, NGOs and the research community in this joint process as well as to enable the participation of Candidate Countries in order to facilitate their cohesion process. The main aim of this strategy is to ensure the coherent and harmonious implementation of the directive through the clarification of a number of methodological questions enabling a common understanding to be reached on the technical and scientific implications of the Water Framework Directive. In this framework, working groups or ad hoc expert groups carry out activities under the umbrella of a Strategic Coordination Group (SCG) composed of Member States and representatives of stakeholder organisations under the supervision of the European Commission and EU Water Directors (see Figure 9).

Since the first phase of this joint process, a number of guidance documents were prepared and these documents were tested in Pilot River Basins across Europe. All guidance documents are available for download at the EC website.

Figure 9: Common Implementation Strategy (CIS) of the WFD



[Source: WFD CIS Work programme for 2016–2018]

5.2. Working Group 'Groundwater' – WG GW

Within the framework of the CIS a technical Working Group on Groundwater (WG GW) was established. Its original mission was to help the European Commission in the development phase of the Groundwater Directive proposal, which took place in 2002–2004. The aim of the group then evolved in exchange of information and experiences on groundwater issues as they related to the WFD (e.g. characterisation, risk assessment, monitoring, chemical status and trends, programmes of measures). The members of the working group share information and experiences via different means such as workshops, technical reports and guidance documents which gather participants' experiences.

All documents prepared under WG GW are publicly accessible at CIRCABC:

https://circabc.europa.eu/w/browse/b1a3fb16-0308-479a-8b6d-0c056b6890e4

5.2.1. Groundwater relevant CIS Guidance Documents

The following CIS Guidance Documents and Technical Reports are strongly related to groundwater and provide help and best practice experiences in the implementation of the WFD and GWD (http://ec.europa.eu/environment/water/water-framework/groundwater/activities.htm):

CIS Guidance Documents:

- Guidance Document N° 15 on Groundwater Monitoring
- Guidance Document N° 16 on Groundwater in Drinking Water Protected Areas
- Guidance Document N° 17 on Direct and indirect inputs in the light of the Directive 2006/118/EC
- Guidance Document N° 18 on Groundwater Status and Trend Assessment
- Guidance Document N° 26 on Risk Assessment and the Use of Conceptual Models

Technical Reports:

- Technical Report N° 1 on Groundwater Trends
- Technical Report N° 2 on Groundwater Characterisation
- Technical Report N° 3 on Groundwater Monitoring
- Technical Report N° 4 on Groundwater Risk Assessment
- Technical Report N° 5 on Groundwater Management in the Mediterranean
- Technical Report N° 6 on Groundwater Dependent Terrestrial Ecosystems
- Technical Report N° 7 on the Recommendations for the Review of Annexes I- II of the Groundwater Directive 2006/118/EC
- Technical Report N°8 on Methodologies used for Assessing Groundwater Dependent Terrestrial Ecosystems
- Technical Report N°9 on Groundwater Associated Aquatic Ecosystems

6. Literature

EC (2003): Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 2. Identification of Water Bodies.

EC (2003): Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 3. Analysis of Pressures and Impacts.

EC (2003): Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 7. Monitoring under the Water Framework Directive.

EC (2004): Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Groundwater risk assessment. Technical report on groundwater risk assessment issues as discussed at the workshop of 28th January 2004.

EC (2007): Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 15. Guidance on Groundwater Monitoring.

EC (2007): Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 16. Groundwater in Drinking Water Protected Areas.

EC (2007): Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 17. Preventing and Limiting Direct and Indirect Inputs.

EC (2008): Groundwater Protection in Europe. The new Groundwater Directive – Consolidating the EU regulatory framework. Groundwater Brochure.

EC (2009): Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 18. Groundwater Status and Trend Assessment.

EC (2010): Common Implementation Strategy for the Water Framework Directive (2000/60/EC) Guidance Document No. 26. Risk Assessment and the Use of Conceptual Models for Groundwater.

ICPDR (2005): The Danube River Basin District. River basin characteristics, impact of human activities and economic analysis required under Article 5, Annex II and Annex III, and inventory of protected areas required under Article 6, Annex IV of the EU Water Framework Directive (2000/60/EC). Part A – Basin-wide overview, (WFD Roof Report 2004), 18 March 2005.

ICPDR (2007): Summary Report to EU on monitoring programmes in the Danube River Basin District designed under Article 8 of the EU Water Framework Directive (2000/60/EC). Part II: Status report: Towards the development of groundwater monitoring in the Danube River Basin – Basin-wide overview, (WFD Roof Report 2007), 18 March 2007.

ICPDR (2009): Danube River Basin Management Plan. Part A – Basin-wide overview.

ICPDR (2013): Interim Overview: Significant Water Management Issues in the Danube River Basin District. Document number IC 178.

ICPDR (2014): The 2013 Update of the Danube Basin Analysis Report. Document number IC 183.

UN/ECE Task Force on Monitoring & Assessment (2000): Guidelines on Monitoring and Assessment of Transboundary Groundwaters. Work Programme 1996 – 1999. Lelystad, Netherlands. http://www.unece.org/env/water/publications/documents/guidelinesgroundwater.pdf

UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes *done at Helsinki on 17 March 1992:*
http://www.unece.org/env/water/partnership/part63.htm#632

7. Templates for data collection and data exchange

7.1. Templates MS Word and MS Excel based

For the preparation of the DBA Report and the DRBM Plan various templates were developed, discussed and agreed within the GW TG. They are used for both, collecting and exchanging information and data between the member countries and the ICPDR and for presenting the information in the related reports. The following Table 3 indicates which of the attached templates was used for which WFD report.

Red entries in tables are only examples!

Table 3 Templates used for the related WFD reports

Template	Content	DBA	RBMP	JPM
Table 4	List of nominated ICPDR GWBs and initial characterisation			
Table 5	Further characterisation of the ICPDR GWBs			
Table 7	Chemical and quantitative status, results of trend and trend reversal assessment, starting points of trend reversal			
Table 7	Reasons for risk of failing good groundwater CHEMICAL status in the reference year of the assessment for the ICPDR GWBs			
Table 8	Reasons for the failure – significant pressure types and substances/indicators causing poor status			
Table 9	Reasons for risk of failing good groundwater QUANTITATIVE status in the reference year of the assessment for the ICPDR GWBs			
Table 10	Reasons for the failure – significant pressure types and substances/indicators causing poor status			
Table 11	Groundwater threshold values and basis of establishment (DW standards, EQS, NBL, relationships			
Table 12	Number of monitoring stations and density per GWB			
Table 13	Parameters and frequency for the surveillance monitoring program			
Table 14	Significant pressure types on the ICPDR GWBs			
	GIS data			
Table 16	Description of status methodologies and trend and trend reversal methodologies			
Table 16	GWBs at poor status and implemented measures			
Table 17	The measures for the GWBs identified at risk			
Table 18	Overview of GWBS, pressures, status and measures			

Table 4: TEMPLATE: List of ICPDR GWBs and initial characterisation

Transboundary GWB	Nat. part	National GWB Codes	Area [km²]	Area [km²]	Aquifer characterisation		Main use	Overlying strata	Criteria for importance
					Aquifer Type	Confined			
GWB-1: Deep Thermal	AT-1	ATGK100158	5,900	1,650	K	Yes	SPA, CAL	100–1000	Intensive use
	DE-1	DEGK1110		4,250					

Red entries are examples

Explanation to Table 4

Transboundary GWB	ICPDR GWB code which is a unique identifier and the name
Nat. part	Code of national shares of ICPDR GWB
National GWB Codes	National codes of the individual GWBs forming the national part of an ICPDR GWB.
Area [in km²]	Area of the ICPDR GWB covering all countries concerned / Area of national shares in km²
Aquifer characterisation	Aquifer Type - Predominantly: **P** = porous/ **K** = karst/ **F** = fissured. Multiple selections possible. Main type should be listed first. Confined: **Yes** / **No / Partly**
Main use	**DRW** = drinking water / **AGR** = agriculture / **IRR** = irrigation / **IND** = Industry / **SPA** = balneology / **CAL** = caloric energy / **OTH** = other. Multiple selections possible.
Overlying strata	Indicates a range of thickness (minimum and maximum in metres)
Criteria for importance	If size < 4 000 km², criteria for importance of the GWB have to be bilaterally agreed and listed.

Table 5: TEMPLATE: Further characterisation of the ICPDR GWBs

GWK-1	National shares	**AT-1** **DE-1**	At risk for each national GWB? (yes/no)	
			Quality (substance)	Quantity
List of individual GWBs forming the national share (national code incl. country code)	AT	ATGK100158		
	DE	DEGK1110		
Description/Characterisation of the ICPDR GWB	***Please consider:*** *Criteria for delineation, geological overview, GW use, impacts, pressures, interaction with aquatic ecosystems, criteria for selection as 'important'*			
Description of methodology for estimating the risk of failure to achieve the good status in 2021.	***Please consider:*** *approach and criteria for both quality and quantity Information on how far trend assessments were considered Information whether changes of pressures (incl. climate change) were considered.*			
Description how climate change was considered as pressure in the risk assessment.				
Description of the significant pressures and polluting substances				
GW-body identified as being at risk of failing to meet the objectives under Art. 4 – and comments Which individual GWB is at risk?				
Lower objectives identified according to Art. 4 and Annex II 2.4 and 2.5				
Gaps and uncertainties in the underlying data				

[Source/Status: DBA 2013], Red entries are examples

Table 6: TEMPLATE: Risk and Status Information of the ICPDR GWBs (over a specific period e.g. between 2009 and 2021)

GWB	Nat. part	QUALITY												QUANTITY								
		Status 2009	Status Pressure Types 2009	Risk →2015	Exemptions from 2015	Status 2015	Status Pressure Types 2015	Significant upward trend (parameter)	Trend reversal (parameter)	Risk →2021	Risk Pressure Types →2021	Exemptions from 2021 (Date of achievement)		Status 2009	Status Pressure Types 2009	Risk →2015	Exemptions from 2015	Status 2015	Status Pressure Types 2015	Risk →2021	Risk Pressure Types →2021	Exemptions from 2021 (Date of achievement)
GWB-8	HU-8	Poor	DS	Risk	Yes	Poor	DS			Risk	DS	2027		Poor	WA	Risk	Yes	Poor	WA	-	-	-
	SK-8	Good		Risk	-	Good	-	NH_4, NO_3, Cl, As, SO_4	-		PS, DS	-		Good	-	-	-	Good	-			

'-' means 'no' or 'not applicable'

Explanation to Table 6

GWB	ICPDR GWB code which is a unique identifier.
Nat. part	Code of national shares of ICPDR GWBs
QUALITY / QUANTITY	
Status 2009	**Good / Poor**
Status Pressure Types 2009	Indicates the significant pressures causing poor status in 2009. **AR =** artificial recharge**, DS** = diffuse sources**, PS** = point sources**, OP** = other significant pressures**, WA** = water abstractions
Risk →2015	**Risk** / - (which means 'no risk')
Exemptions from 2015	Indicates whether there are exemptions for the GWB from achieving good status by 2015 at the latest.
Status 2015	**Good / Poor**
Status Pressure Types 2015	Indicates the significant pressures causing poor status in 2015. **AR =** artificial recharge**, DS** = diffuse sources**, PS** = point sources**, OP** = other significant pressures**, WA** = water abstractions
Significant upward trend (parameter)	Indicates for which parameter a significant sustained upward trend has been identified.
Trend reversal (parameter)	Indicates for which parameter a trend reversal could have been achieved.
Risk →2021	**Risk** / - (which means 'no risk')
Risk Pressure Types →2021	Indicates the significant pressures causing risk of failing to achieve good status in 2021. **AR =** artificial recharge**, DS** = diffuse sources**, PS** = point sources**, OP** = other significant pressures**, WA** = water abstractions
Exemptions from 2021	Indicates the year by when good status is expected to be achieved.

Table 7: TEMPLATE: Reasons for risk of failing good groundwater CHEMICAL status in YYYY for the ICPDR GWBs.

GWB	Name	National part	Year of risk assessment	'at risk'	Which parameters cause risk	Failed general assessment of GWB as a whole	Saline or other intrusions	Failed achievement of WFD Article 4 objectives for associated surface waters	Significant damage to GW dependent terrestrial ecosystem	WFD Art 7 drinking water protected area affected	Increasing trend exceeding starting points of trend reversal

Table 8: TEMPLATE: Reasons for failing good groundwater CHEMICAL status in YYYY for the ICPDR GWBs.

GWB	Name	National part	Year of status assessment	Chemical Status	Which parameters cause poor status	Failed general assessment of GWB as a whole	Saline or other intrusions	Failed achievement of WFD Article 4 objectives for associated surface waters	Significant damage to GW dependent terrestrial ecosystem	WFD Art 7 drinking water protected area affected	Increasing trend exceeding starting points of trend reversal
				good / poor	*parameter*	*Yes / - / Unknown (parameter)*	*Yes / - / Unknown (parameter)*	*Yes / - / Unknown (parameter)*	*Yes / - / Unknown (parameter)*	*Yes / - / Unknown (parameter)*	*Yes / - / Unknown (parameter)*
GWB-1	Deep GWB – Thermal Water	AT-1	2014	Good	-	-	-	-	-	-	-
		DE-1	2014	Good	-	-	-	-	-	-	-

'-' means 'No'

Table 9: TEMPLATE: Reasons of risk of failing good groundwater QUANTITATIVE status in YYYY for the ICPDR GWBs.

GWB	Name	National part	Year of risk assessment	'at risk'	Exceedance of available GW resource	Failed achievement of WFD Article 4 objectives for associated surface waters	Significant damage to GW dependent terrestrial ecosystem	Uses affected (drinking water use, irrigation etc.)	Intrusions detected or likely to happen due to alterations of flow directions resulting from level changes

Table 10: TEMPLATE: Reasons of failing good groundwater QUANTITATIVE status in YYYY for the ICPDR GWBs.

GWB	Name	National part	Year of status assessment	Quantitative status	Exceedance of available GW resource	Failed achievement of WFD Article 4 objectives for associated surface waters	Significant damage to GW dependent terrestrial ecosystem	Uses affected (drinking water use, irrigation etc.)	Intrusions detected or likely to happen due to alterations of flow directions resulting from level changes
				good / poor	*Yes / - / Unknown*	*Yes / - / Unknown*	*Yes / - / Unknown*	*Yes / - / Unknown If yes, which?*	*Yes / - / Unknown*
GWB-1	Deep GWB – Thermal Water	AT-1	2014	Good	-	-	-	-	-
		DE-1	2014	Good	-	-	-	-	-

'-' means 'No'

Table 11: TEMPLATE: Groundwater threshold values

		GWB-2	GWB-3	GWB-4	GWB-5		GWB-6		GWB-7		GWB-8		GWB-9		GWB-10	GWB-11
Parameter	**unit**	**RO-2**	**RO-3**	**RO-4**	**RO-5**	**HU-5**	**HU-6**	**RO-6**	**HU-7**	**RO-7**	**HU-8**	**SK-8**	**HU-9**	**SK-9**	**HU-10**	**HU-11**
Ammonium	mg/l	0.5	6.4	0.7	0.5–1.9	2–5	2–5	0.5–1.3	2–5	6.4	0.5–2	0.255–0.26	2–5	0.295	0 .5	0 .5
AOX	µg/l					20	20		20		20		20		20	20
Arsenic	µg/l	10	10–40	10	40	10		10				6				
Benzene	µg/l	10	10	10	10			10		10						
Cadmium	µg/l	5	5	5	5	5	5	5	5	5	5		5		5	5
Chloride	mg/l	250	250	250	250	250	250	250	250	250	250	60.75–62.3	250		250	250
Chromium	µg/l		500		50			500		50						
Conductivity	µS/cm					2500	2500		2500		2500		2500		2500	2500
Copper	µg/l		100		100			100		100						
Lead	µg/l	10	10–70	10	10–20	10	10	30–70	10	10	10		10		10	10
Mercury	µg/l	1	1	1		1	1	1	1	1	1		1		1	1
Nickel	µg/l		200	20	20			20		20						
Nitrates	mg/l					50	50		50		50		50		50	50
Nitrites	mg/l	0.5	0.5	0.5	0.5			0.5		0.5						
Phenols	µg/l				2			2		4						
Phosphates	mg/l	0.5–1.4	1.4	0.5	0.5–0.6			0.5		1						
Sulphates	mg/l	250	250	250	250	250–500	250	250	250–500	250	250	148.9–157.6	250		250	250
Tetrachloroethylen	µg/l	10	10	10	10	10	10	10	10	10	10		10		10	10
Trichlorethylene	µg/l	10	10	10	10	10	10	10	10	10	10		10		10	10
Zinc	µg/l		5	5	5			5		5						

Table 12: TEMPLATE: Number of monitoring stations and density per GWB

Transboundary GWB	Nat. part	Area [km²]	QUALITY			Associated to		QUANTITY			Associated to	
			Sites	km²/ site	Sites bilaterally agreed for data exchange	Drinking water protected areas	Eco-systems	Sites	km²/ site	Sites bilaterally agreed for data exchange	Drinking water protected areas	Eco-systems
GWB-1	AT-1	1,650	4	413	-	-	-	3	550	-	-	-
Deep	DE-1	4,250	4	1063	-	-	-	4	1063	-	-	-
Thermal	Σ	**5,900**	**8**	**738**				**7**	**843**			

[Source/Status: draft DRBM Plan Update 2015], Red entries are examples

Explanation to Table 12

Transboundary GWB	ICPDR GWB code which is a unique identifier and the name
Nat. part	Code of national shares of ICPDR GWB
Area	Area of the whole transboundary ICPDR GWB covering all countries concerned and of the national shares of the ICPDR GWB in km².
QUALITY / QUANTITY	
Sites	Number of monitoring sites – Reference year 2012/2013
km²/site	Area in km² represented by each site – Reference year 2012/2013
Number of sites bilaterally agreed for data exchange	Number of monitoring sites for which transboundary data exchange is bilaterally agreed.
Associated to	
Drinking water protected areas	Number of monitoring sites associated to drinking water protected areas
Ecosystems	Number of monitoring sites associated to ecosystems

Table 13: TEMPLATE: Parameters and frequency for the surveillance monitoring program

	AT/DE	BG	RS	HU	MD	RO	SK
Transboundary GWB	1	2, 4	7	5, 6, 7, 8, 9, 10, 11	3	2, 3, 4, 5, 6, 7	8, 9, 10, 11
QUALITY (with estimation of frequency)							
Oxygen				1/6; <1/a			
pH-value				>1/a*			
Electrical conductivity				>1/a*			
Nitrate				>1/a*			
Ammonium				>1/a*			
Temperature				>1/a*			
Further parameters, e.g. major ions				x			
operational				x			
QUANTITY (with estimation of frequency)							
GW levels/well head pressure				x			
spring flows				x			
Flow characteristics							
Extraction (not obligatory)							
Reinjection (not obligatory)							

[Source/Status: draft DRBM Plan Update 2015], Red entries are examples

Remarks:

Transboundary GWB:	Code of transboundary GWB of Danube basin wide importance
>1/a:	More than 1 per year
x:	Parameter is measured
*…	In the starting year
**…	A yearly program and a five year monitoring program were established. Further parameters in DE are chloride, sulphate and total hardness

Table 14: TEMPLATE: Significant pressure types on the ICPDR GWBs

This template is used for information collection for both reports, for the DBA report and for the DRBM Plan. It intends to compare current situation with the previous one and depending on the report for which this template is used, the previous information is prefilled, either from the DBA or the DRBM Plan. (Red entries are examples)

Code of ICPDR GW-body		*GWB-11*
National share of ICPDR GWB (nationally aggregated part)		*HU-11, SK-11*

Significant Pressures for Groundwater	**Status pressure types** [YEAR]				**Risk pressure types** [YEAR]			
	Chemical Yes/-		**Quantity** Yes/-		**Chemical** Yes/-		**Quantity** Yes/-	
	HU	SK	HU poor	SK	HU	SK	HU risk	SK risk
Point sources								
Leakages from contaminated sites								
Leakages from waste disposal sites (landfill and agricultural waste disposal)								
Leakages associated with oil industry infrastructure								
Mine water discharges								
Discharges to ground such as disposal of contaminated water to soak ways								
Other relevant point sources (specify below)								
Diffuse Sources								
due to agricultural activities								
due to non-sewered population								
Urban land use								
Other significant diffuse pressures (specify below)								
Water abstractions								
Abstractions for agriculture								
Abstractions for public water supply								
Abstractions by industry								
IPPC activities								
Non-IPPC activities								
Abstractions by quarries/open cast coal sites								
Other major abstractions (specify below)								
Artificial recharge								
Discharges to groundwater for artificial recharge purposes								
Returns of groundwater to GWB from which it was abstracted (e.g. for sand and gravel washing)								
Mine water rebound								
Other major recharges (specify below)								
Other significant pressures								
Saltwater intrusion								
Other intrusion (specify below)								

Description of other significant pressures than those selected above.	

Table 15: TEMPLATE: Methodology for status assessment of the transboundary GWBs

GWB-1	National share	**AT-1** **DE-1**	Status 2015 for each national GWB?	
			Quality (substance)	Quantity
List of individual GW-bodies forming the whole national share (national code incl. country code)	AT	ATGK100158	Good	Good
	DE	DEGK1110	Good	Good

Description/Characterisation of the ICPDR GW-body	*Pre-filled from DBA Report*
Description of **status** assessment methodology.	***Chemical Status:*** *Description of methodology for assessing chemical status. How were exceedances of Quality Standards or TVs taken into account?* ***Quantitative Status:*** *Description of methodology for assessing quantitative status.* *Changes since 2009?*
Groundwater threshold value relationships	*Which receptors were considered (e.g. drinking water, terrestrial ecosystems…).* *How were NBL and EQS (environmental quality standards, drinking water standards) considered in the TV establishment?*
Verbal description of the **trend** assessment methodology	
Verbal description of the **trend reversal** assessment methodology	

Threshold values per GWB

	Pollutant / Indicator	*TV (or range) [unit]*	*NBL (or range) [unit]*	*Level of TV establishment (national, RBD, GWB)*	*Related to risk in this GWB [yes/-]*
RO	*Chlorides*	*250 mg/l*	*73,87 mg/l*	*GWB*	-

(Red entries are examples)

Table 16: TEMPLATE: GWBs at poor status and implemented measures

(Red entries are examples)

DRBD-GWB		5-RO-HU		…
National part / Status		**5-RO / Quality**	**5-HU / Quality**	…
Basic Measures (BM) – Article 11(3)(a)				
BM-01	BathingWater			
BM-02	Birds			
BM-03	DrinkingWater			
BM-04	Seveso			
BM-05	EnvironmentalImpact			
BM-06	SewageSludge			
BM-07	UrbanWasteWater			
BM-08	PlantProtectionProducts			
BM-09	Nitrates			
BM-10	Habitats			
BM-11	IPPC			
Other Basic Measures (OBM) – Article 11(3)(b-l)				
OBM-20	CostRecoveryWaterServices			
OBM-21	EfficientWaterUse			
OBM-22	ProtectionWaterAbstractions			
OBM-23	ControlsWaterAbstraction			
OBM-24	RechargeAugmentationGroundwater			
OBM-25	PointSourceDischarge			
OBM-26	PollutantsDiffuse			
OBM-27	AdverseImpact			
OBM-28	PollutantDirectGroundwater			
OBM-29	SurfacePrioritySubstances			
OBM-30	AccidentalPollution			
Supplementary Measures (SM) – Article 11(4)&(5)				

Please insert: MC…Measure implementation completed by end of YYYY, **MO**…Measure implementation on-going after the end of YYYY, **PO**…Construction planning on-going after end YYYY, **CO**…Construction on-going after end YYYY, **MN**…Measure implementation not started by end YYYY

Table 17: TEMPLATE: Detailed description of groundwater measures

This template is to be completed for all national parts of ICPDR GWBs at poor status.

Following details on all relevant measures are requested:

- description of the measure,
- responsible authority,
- quantitative information by appropriate indicators (number of measures/projects and costs).

GWB Code	Size [km²]	Pressures		Status		Measures		Exemptions
		Quality	Quantity	Quality	Quantity	Quality	Quantity	
5-HU-RO	7,212	DS	No	Poor	Good	BM, SM	No	2027
Measure completed = Implementation is estimated to be completed by the end of YYYY (reference to the measures codes) (MC)								
Measure implementation on-going = Measure implementation is estimated to be on-going (reference to the measures codes (MO)								
Construction measure planning on-going = Planning of construction measure is estimated to be on-going (reference to the measures codes)								
Construction of measure on-going = Construction of measure is estimated to be on-going (reference to the measures codes) (CO)								
Measure not started = Implementation is estimated of not being started by end of 2012 (reference to the measures codes)								

(Red entries are examples)

Status of implementation of all key measures is indicated in the following way:

MC **Measure** implementation **Completed**
Implementation of measure is estimated to be ***completed by the end of YYYY***

MO **Measure** implementation **On-going**
Implementation of measure is ***on-going after the end of YYYY***.
(Involving administrative acts, diffuse pollution, advisory services, research etc.)

PO **Construction** Measure - **Planning On-going**
Planning *of construction measure is* ***on-going after the end of YYYY***.
(Involving construction or building works)

CO **Construction** Measure - **Construction On-going**
Construction *of measure is* ***on-going after the end of YYYY***.
(Involving construction or building works)

MN **Measure** implementation **Not started**
Implementation of measure is estimated of ***not having started by the end of YYYY***

Table 18: TEMPLATE: Groundwater bodies of Danube river basin wide importance – Status and Measures (DRBM Plan YYYY)

Code	Size [km²]	Aquifer characterisation		Main use	Overlying strata [m]	Criteria for importance	Pressures		Status		Measures		Exemptions
		Aquifer Type	Confined				Quality	Quantity	Quality	Quantity	Quality	Quantity	
1-DE-AT	5,900	K	Yes	SPA, CAL	100-1000	Intensive use	No	No	Good	Good	No	No	No

(Red entries are examples)

Explanation to Table 18:

Code	GWB code which is a unique identifier.
Size: km²	Whole area of the transboundary GWB covering all countries concerned in km².
Aquifer characterisation	[Aquifer Type: predominately **P** = porous/ **K** = karst / **F** = fissured]. Multiple selection possible: predominantly porous, karst, fissured and combinations are possible. Main type should be listed first. [Confined: **Yes** / **No**].
Main use	[**DRW** = drinking water / **AGR** = agriculture / **IRR** = irrigation / **IND** = Industry / **SPA** = balneology / **CAL** = caloric energy / **OTH** = other]. Multiple selection possible.
Overlying strata	Range in metres. Indicates a range of thickness min., max. in metres.
Criteria for importance	If size <4000 km², criteria for importance of the GWB have to be named and bilaterally agreed upon.
Pressures	Indicates the significant pressures. [**AR =** artificial recharge**, DS** = diffuse sources**, PS** = point sources**, OP** = other significant pressures**, WA** = water abstractions].
Status	[**G =** good**, P** = poor].
Measures	[**BM** = basic measures**, OBM** = other basic measures**, SM** = supplementary measures].
Exemptions	Indicates whether there are exemptions for the GWB.

Table 19 : TEMPLATE: Groundwater Chemical Data

CODE of national part of ICPDR GWB	reference year	Parameter & unit	Number of sites	Minimum	Arithmetic mean value	Standard deviation	Maximum	10 Percentile	25 Percentile	50 Percentile	75 Percentile	90 Percentile
	YYYY is preferred	e.g. nitrates (mg/l)										
Example HU-5	YYYY	nitrates (mg/l)	70	0.8	57.5	32.9	133.8	18.3	36.1	53.6	76.8	104.2

Name of column / row	Description
CODE of national part of ICPDR GWB	
reference year	The reference year of monitoring data should be YYYY
Parameter & unit	**Provide the name of the parameter (in English) together with the unit e.g.:** nitrates (mg/l) **Please provide data for the following parameters** - Nitrates (mg/l) - Ammonium (mg/l) - Electrical Conductivity (µS/cm) - Parameters causing risk or poor status - Parameters necessary for characterising the GWB
Number of sites	Number of groundwater monitoring points in the GWB
Minimum	Basis of the assessment are the annual arithmetic mean values per sampling site
Arithmetic mean	Basis of the assessment are the annual arithmetic mean values per sampling site
Standard deviation	Basis of the assessment are the annual arithmetic mean values per sampling site
Maximum	Basis of the assessment are the annual arithmetic mean values per sampling site
10 Percentile	Basis of the assessment are the annual arithmetic mean values per sampling site
25 Percentile	Basis of the assessment are the annual arithmetic mean values per sampling site
50 Percentile	Basis of the assessment are the annual arithmetic mean values per sampling site
75 Percentile	Basis of the assessment are the annual arithmetic mean values per sampling site
90 Percentile	Basis of the assessment are the annual arithmetic mean values per sampling site

Table 20: TEMPLATE: Collection of data on the share of groundwater in the drinking water production.

DRINKING WATER	Annual drinking water abstraction by source (Mio. m³) Population served with drinking water by source (Mio. inhabitants)					
Country:	Country Level			DRB Level		
Austria	Mio m³ abstracted	Mio inhabitants supplied	reference year of data/estimation	Mio m³ abstracted	Mio inhabitants supplied	reference year of data/estimation
Total drinking water abstraction **from fresh surface water** (Public water supply + Private households)						
Total drinking water abstraction **from fresh groundwater** (Public water supply + Private households)						
Total drinking water abstraction **from surface and groundwater** (Public water supply + Private households)						

Definitions and tables are based on the OECD / Eurostat Questionnaire on Inland Waters 2008
Definitions were amended according to the recent TG GW Meeting in Regensburg (river bank infiltration)

FRESH SURFACE WATER

Water which flows over, or rests on the surface of a land mass, natural watercourses such as rivers, streams, brooks, lakes, etc., as well as artificial watercourses such as irrigation, industrial and navigation canals, drainage systems and artificial reservoirs. Sea-water, and transitional waters, such as brackish swamps, lagoons and estuarine areas are not considered fresh surface water and so are included under NON FRESHWATER SOURCES.

FRESH GROUND WATER

Fresh water which is being held in, and can usually be recovered from, or via, an underground formation. All permanent and temporary deposits of water, both artificially charged and naturally, in the subsoil, of sufficient quality for at least seasonal use. This category includes phreatic water-bearing strata, as well as deep strata under pressure or not, contained in porous or fracture soils. For purposes of this questionnaire, ground water includes springs, both concentrated and diffused, which may be subaqueous. For purposes of this ICPDR TG GW questionnaire (based on agreement in Regensburg), bank filtration (induced infiltration of river water through bankside gravel strata (by pumping from wells sunk into the gravel strata to create a hydraulic gradient) with the intention of improving the water quality) is included under fresh groundwater.

MIO INHABITANTS SUPPLIED

Approximate number of inhabitants (in Mio) supplied with drinking water by the different sources - by fresh surface water, fresh groundwater and total.

Table 21: TEMPLATE: Abstractions of bank filtered water along the Danube

No.	Element	Unit	Code	Example	
1	Code of location			ATBF42135L	
2	Name of location			Linz	
3	Country			Austria	
4	River			Danube	
5	River km	[km] (from–to)		2135.17	
6	Side of river bank	L = left, R = right, B = both, I = island		L	
7	Code of associated GWB			ATGK100038	
8	Reference year of data	[YYYY]		2010	
9	Total **permitted** annual abstraction	[Mio m³/year]	Fo…original figure, Ca…calculated, Es…estimated, U…unknown.	3.65	Fo
10	Total **actual** annual abstraction	[Mio m³/year]	Fo…original figure, Ca…calculated, Es…estimated, U…unknown.	2.847	Fo
11	Number of inhabitants supplied by **permitted** abstraction		Fo…original figure, Ca…calculated, Es…estimated, U…unknown.	50,000	Ca
12	Number of inhabitants supplied by **actual** abstraction		Fo…original figure, Ca…calculated, Es…estimated, U…unknown.	39,000	Ca
13	Number of production wells/galleries			3	
14	Depth of the wells (or range)	[m] (from–to)		7.2–9.5	
15	Percentage (or range of %) of surface water contribution to total water abstraction	[%] (from–to)	Es…estimated, Mo…modelled, Is…isotope data, U…unknown.	45	Es
	Travel time between river and abstraction [days] (or range)	[days] (from–to)	Es…estimated, Mo…modelled, U…unknown.		U
16	Parameters in raw water not in compliance with national DW standards			E-coli, ammonium	
17	Treatment			Yes, ozonisation	
18	Type of abstraction	Pe…Permanent, Oc…Occasional		Oc	

Explanation to Table 21

Name of column / row	Description
Code of location	A unique identifier for the identification of a bank filtered water abstraction. The code should start with the **ISO country code** (e.g. AT, DE, HU, etc) and **BF** for bank filtered water. [E.g. ATBF…….].
Name of location	A unique name of the location of the bank filtered water abstraction.
Country	Name of the country
River	Identification of the river where the abstraction is situated. For this data collection the river is the **Danube** and the template is pre-filled.
River km	Identification of the river km (internationally agreed) where the abstraction is situated. This can also be indicated as a range (from–to). E.g.: the river km of the Danube starts counting at the mouth to the Black Sea.
Side of river bank	At which side of the river bank is the abstraction located. [L = left, R = right, B = both, I = island].
Code of associated GWB	In the case, that the abstraction is located in an associated (WFD) groundwater body. The code of the GWB should start with the ISO country code.
Reference year of data	Reference year of the information/data.
Total **permitted** annual abstraction [Mio m³/year]	Can be calculated by applying the key value of 200 l/capita/day. Please indicate whether this is 'original' figure or calculated from supplied capita by key value, estimated or unknown. [Fo…original figure, Ca…calculated, Es…estimated, U…unknown].
Total **actual** annual abstraction [Mio m³/year]	Can be calculated by applying the key value of 200 l/capita/day. Please indicate whether this is 'original' figure or calculated by from supplied capita key value, estimated or unknown. [Fo…original figure, Ca…calculated, Es…estimated, U…unknown].
Number of inhabitants supplied by **permitted** abstraction	Can be calculated by applying the key value of 200 l/capita/day. Please indicate whether this is 'original' figure or calculated from abstraction data by key value, estimated or unknown. [Fo…original figure, Ca…calculated, Es…estimated, U…unknown].
Number of inhabitants supplied by **actual** abstraction	Can be calculated by applying the key value of 200 l/capita/day. Please indicate whether this is 'original' figure or calculated from abstraction data by key value, estimated or unknown. [Fo…original figure, Ca…calculated, Es…estimated, U…unknown].
Number of production wells/galleries	The number of production wells or galleries where water is abstracted.
Depth of the wells (or range)	Depth of the well(s) in m. Could be indicated as a single figure or as a range.
Percentage (or range of %) of surface water contribution to total water abstraction	Percentage (or a range of percentages) of the surface water contributing to the overall water abstracted. Please indicate whether this % is based on estimations or result of model calculation or isotope measurement (deuterium, oxygen 18 etc.). [Es…estimated, Mo…modelled, Is…isotope data, U…unknown].
Travel time between river and abstraction [days] (or range)	Travel time is a decisive factor for the assessment of the vulnerability of the abstraction and the need for treatment. [Es…estimated, Mo…modelled, U…unknown].
Parameters in raw water not in compliance with national DW standards	Which quality parameters **in the raw water** do not comply with the national drinking water standards?
Treatment	Is treatment implemented? [yes/no] If yes: which kind of treatment?
Type of abstraction	Type of abstraction [Pe…Permanent, Oc…Occasional]

7.2. GIS Templates

The respective GIS templates relevant for GW issues were elaborated by the GIS Expert Group:

- GWBody
- GWBodyAggr
- GWStn

The templates are available for download at http://www.danubegis.org (after login) under "Templates"

The detailed content of the templates is explained in the related code lists.

The templates need(ed) to be submitted to DANUBIS by the national GIS experts in close cooperation with the groundwater experts (GW TG members) who are mainly responsible for the groundwater related content.

GIS data should be sent in the reference system of WGS84/ETRS89 or at least information about: 1. Name of Reference System, 2. Projection, 3. Ellipsoid must be added.