

Groundwater Protection in Europe

THE NEW GROUNDWATER DIRECTIVE – CONSOLIDATING THE EU REGULATORY FRAMEWORK



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Luxembourg: Office for Official Publications of the European Communities, 2008

ISBN 978-92-79-09817-8
DOI 10.2779/84304

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Printed in Spain



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Foreword



As we know for a long time, groundwater needs to be protected. Our efforts to do so have for many years suffered from a lack of overall planning, notably due to the lack of specific instrument to ensure concerted action across the European Union. The very first groundwater legislation (Directive 80/68/EEC) had a limited scope and focused on controlling emissions of substances from industrial and urban sources. Directives aimed at controlling diffuse pollution from agricultural and industrial sources were introduced later.

The Ministerial Seminar on Groundwater in The Hague on 26 and 27 November 1991 called for an action programme to avoid the long-term deterioration of groundwater quantity and quality across the European Union. This first led to the adoption by the Commission of a communication on a groundwater action programme in 1996 which was incorporated into the Water Framework Directive (WFD), adopted four years later (2000/60/EC). For the first time groundwater became part of an integrated water management system, a very natural context for this essential component of the environment. The WFD includes groundwater in its river basin management planning, and sets clear milestones for (ground)water bodies in terms of delineation, economic analysis, characterisation (analysis of pressures and impacts), monitoring, and the design of programmes of measures to ensure that, by the end of 2015, there is a sufficient quantity of groundwater of good chemical status.

This was then complemented by the adoption on 12 December 2006 of a daughter directive laying down additional technical specifications (Directive 2006/118/EC on the protection of groundwater against pollution and deterioration).

We are now entering the practical implementation phase of the WFD and of its groundwater daughter directive. Key milestones are expected over the next two years, the most important being the development of the first river basin management plans (2009-2015). There will also be specific features on groundwater, as Member States are notably required to establish 'threshold values' (quality standards) by the end of 2008. Sound implementation of the overall EU legislative framework will be closely dependent on improved exchanges between Member States, sectors and disciplines. As a common interpretation of the provisions of the WFD is essential to ensure its best and most effective implementation across the EU, guidance and other supporting documents are being produced. This brochure is part of that process. It explains the relevant legislative framework for groundwater protection and clarifies the main practical measures still required in order to achieve the 'good status' objective by 2015.

Stavros Dimas

MEMBER OF THE EUROPEAN COMMISSION. COMMISSIONER FOR THE ENVIRONMENT



1.

Introduction

Groundwater constitutes the largest reservoir of freshwater in the world, accounting for over 97% of all freshwaters available on earth (excluding glaciers and ice caps). The remaining 3% is composed mainly of surface water (lakes, rivers, wetlands) and soil moisture. Until recently, focus on groundwater mainly concerned its use as drinking water (e.g. about 75% of European Union (EU) residents depend on groundwater for their water supply), and recognising that it is also an important resource for industry (e.g. cooling waters) and agriculture (irrigation). It has, however, become increasingly obvious that groundwater should not only be viewed as a water supply reservoir, but should also be protected for its environmental value. Groundwater plays an essential role in the hydrological cycle and be critical for maintaining wetlands and river flows and acting as a buffer during dry periods. In other words, it provides the base flow (i.e. the water which feeds rivers all year round) to surface water systems, many of which are used for water supply and recreation. In many rivers across Europe, more than 50% of the annual flow is derived from groundwater. In low-flow periods this figure can rise to more than 90% and hence, deterioration of groundwater quality may directly affect related surface water and terrestrial ecosystems.

Since groundwater moves slowly through the subsurface, the impact of anthropogenic activities may last for a long time. This means that pollution that occurred some decades ago – whether from agriculture, industry or other human activities – may still be threatening groundwater quality today and, in some cases, will continue to do so for several generations to come.

The legacy of the past is clearly visible at large-scale contaminated sites, e.g. industrial sites or harbour areas, where it may be difficult or even impossible, with state-of-the-art technology and a proportionate use of public and/or private money, to rapidly clean up the contamination at these locations. In addition, experience with contamination remediation over the last 20 years has shown that the measures taken have in most cases not been able to completely remove all contaminants and that pollutant sources, even if partially removed, continue to release pollutants for a long period of time (i.e. several generations). Therefore, an important focus must be on preventing pollution in the first place.

Secondly, since surface water systems receive inflowing groundwater, groundwater quality will ultimately be reflected in the quality of surface waters. In other words, the effect of human activity on groundwater quality will eventually impact on the quality of associated aquatic ecosystems and directly dependent terrestrial ecosystems if so-called natural attenuation reactions such as biodegradation in the subsurface are not sufficient to remove the contaminants.

Finally, groundwater is a “hidden resource” which is quantitatively much more significant than surface water and for which pollution prevention, monitoring and restoration are more difficult than for surface waters due to its inaccessibility. This “hidden” character makes it difficult to adequately locate, characterise and understand pollution impacts. This often results in a lack of awareness and/or evidence regarding the extent of risks and pressures. Recent reports, however, show that pollution from domestic, agricultural and industrial sources is, despite the progress in some areas, still a major concern, either directly through discharges (effluents), indirectly from the spreading of nitrogen fertilisers and pesticides or through leaching from old contaminated industrial or waste disposal sites (e.g. landfills, mines, heavy manufacturing industry etc). While point sources have caused most of the pollution identified to date, there is evidence that diffuse sources are having an increasing impact on groundwater. For example, nitrate concentrations currently exceed the nitrate guideline values in around one third of groundwater bodies in Europe.





2.

Why a new Groundwater Directive?

2.1. A brief history of groundwater EU legislative development

2.1.1. The first directive (1980)

The EU regulatory framework for groundwater started life at the end of the 1970s with the adoption of the directive on the protection of groundwater against pollution caused by certain dangerous substances¹. This Directive provides a groundwater protection framework that requires prevention of the (direct or indirect) introduction of high priority pollutants into groundwater and limiting the introduction into groundwater of other pollutants so as to avoid pollution of this water by these substances. It will be repealed by 2013 under the Water Framework Directive. It will remain one of the effective EU legislative instruments for preventing or limiting pollution until this date, and then be replaced by the new Groundwater Directive (see paragraph 3).

¹ Directive 80/68/EC, OJ L20 of 26.01.1980.

2.1.2. Assessment (1982)

In 1982, the Directorate-General for the Environment, Consumer Protection and Nuclear Safety of the European Community carried out a major assessment of groundwater resources within Member States (nine at that time). It consisted of a general survey (Groundwater Resources of the European Community: synthetical report) and individual reports from each Member State. This assessment was concerned mainly with groundwater quantity. Since it was published attention in Europe (and the United States) has focussed more on quality and not only have groundwater quality monitoring programmes greatly improved but many groundwater protection schemes have been put in place.

2.1.3. A groundwater action programme (1996)

The declaration of the Ministerial Seminar on groundwater held at The Hague in 1991 recognised the need for further action to avoid long term deterioration of quality and quantity of freshwater resources. It called for a programme of actions to be implemented by the year 2000 to promote the sustainable management and protection of freshwater resources. Council resolutions in 1992 and 1995 recommended that an action programme be implemented and that the Groundwater directive be revised. This was followed by a proposal for an action programme on the Integrated Protection and Management of Groundwater, which was adopted by the European Commission on 25 November 1996². The proposal identified the need to establish procedures to regulate the extraction of freshwater and monitor freshwater quality and quantity.

The European Parliament and the Council subsequently asked the Commission to establish a framework for a European water policy. This request led to the Water Framework Directive (WFD) adopted in October 2000³.

In addition to protecting groundwater as a resource with multiple uses the WFD establishes for the first time that groundwater should be protected for its environmental

² COM 1996/0355.

³ Directive 2000/60/EC, OJ L327 of 23.10.2000.

value. In this context, the WFD put forward a challenging legislative framework by establishing environmental objectives for all waters – surface, coastal, transitional, and ground waters – to be achieved by the end of 2015. This modern piece of EU legislation establishes clear objectives but allows Member States flexibility in how they are achieved. It is based on milestones such as risk evaluation of anthropogenic pressures and impacts, monitoring programmes, development of river basin management plans (the first one to be published in 2009) and design and operation of programmes of measures. Groundwater is one of the key components of the WFD with the focus for groundwater on both quantitative and chemical status objectives. The objectives for surface waters concern ecological and chemical status.

The quantitative status objectives are clear in the WFD. The aim is to ensure a balance between extraction and recharge of groundwater, but the chemical status criteria are more complex and were not fully resolved at the time the WFD was adopted. The European Parliament and the Council therefore requested that the Commission develop a proposal for a “daughter” directive clarifying the criteria for good chemical status criteria and specifications related to the identification and reversal of pollution trends. This new Groundwater Directive was adopted in December 2006⁴.

2.2. The policy context

2.2.1. Groundwater in the Water Framework Directive

The components of the Water Framework Directive dealing with groundwater cover a number of different steps for achieving good (quantitative and chemical) status by 2015. They require Member States to:

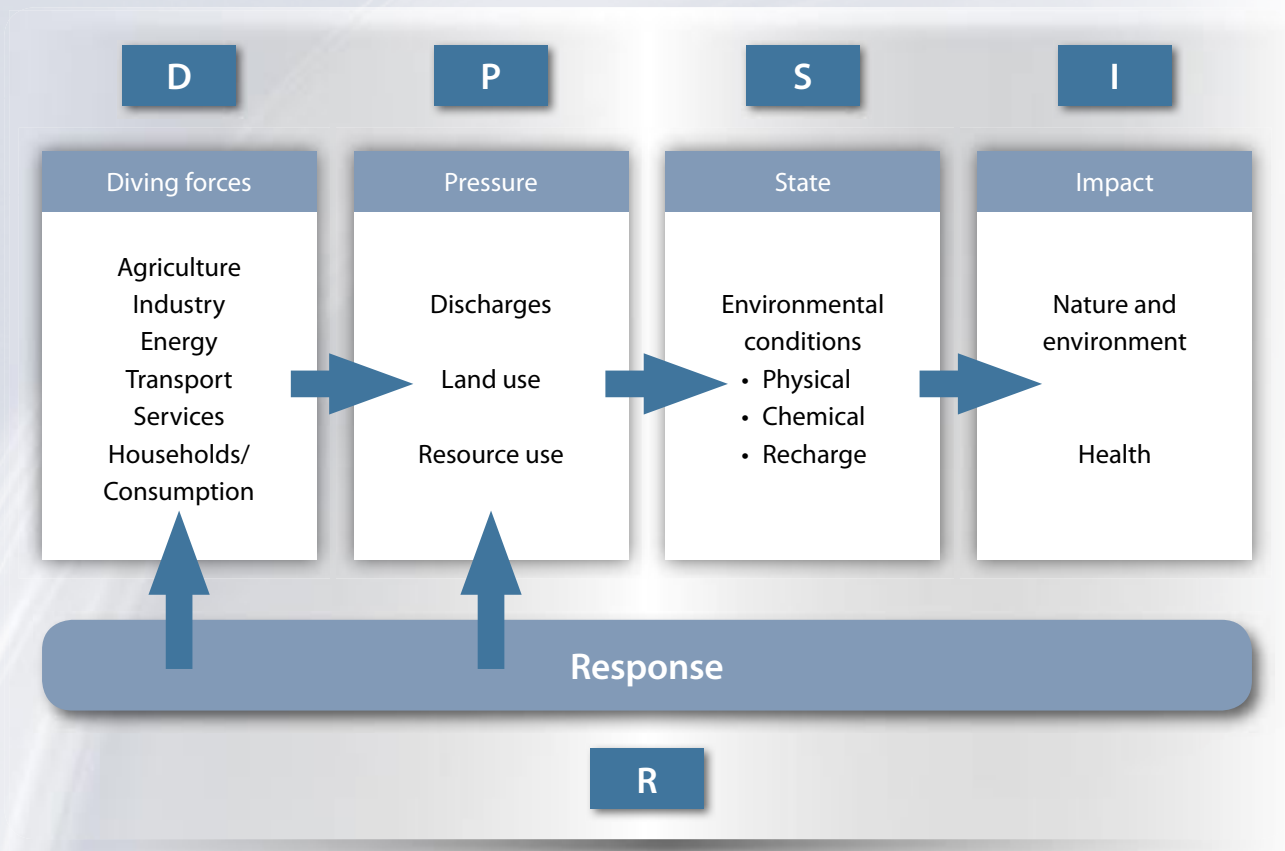
- Define and characterise groundwater bodies (management units) within River Basin Districts that must be reported to the European Commission. The characterisation relies on system understanding, in particular on the knowledge of drivers (D), pressures (P), status (S), impacts (I) and responses (R) which constitutes the backbone of river basin management planning (Figure 1). It involves analysing the



⁴ Directive 2006/118/EC, OJ L372 of 12.12.2006

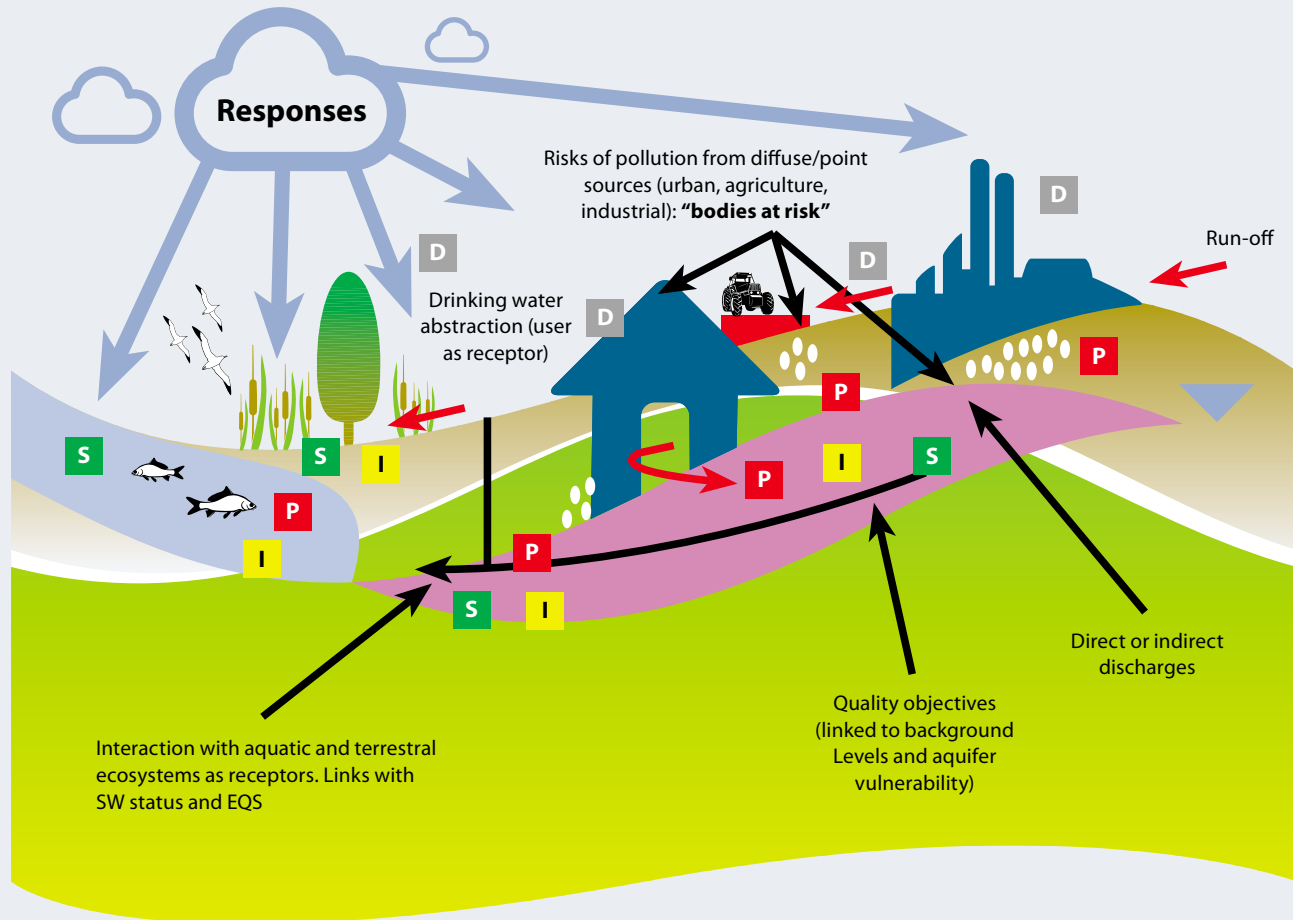
pressures and impacts of human activity on the quality of groundwater with a view to identifying groundwater bodies at risk of not achieving WFD environmental objectives. This assessment has to evaluate risks linked to water uses and interactions with associated aquatic or terrestrial ecosystems in relation to the types of pressures and aquifer vulnerability (Figure 2). Member States had to carry out this classification between 2004 and 2005 and report the results to the European Commission. A report giving a synthesis of Member States' reports was prepared by the European Commission and published in March 2007⁵.

Figure 1. The “DPSIR” principle



⁵ Commission Water Framework Directive report, March 2007

Figure 2. Main driving forces (D) and related pressures (P) affecting groundwater. The status (S) and impacts (I) concerns both the groundwater resource and the associated and dependent aquatic and terrestrial ecosystems. The responses (R) are the action programmes of relevant EU legislations (primarily the programme of measures of the Water Framework Directive)



- Establish registers of protected areas within each river basin districts, which have been designated as requiring specific protection of their surface and ground waters or for the conservation of habitats and species directly dependent on water. The registers must include all bodies of water used for the extraction of drinking water and all protected areas covered under the following directives: the Bathing Water Directive⁶, the vulnerable zones under the Nitrates Directive⁷, the sensitive areas under the Urban Wastewater Directive⁸, and the areas designated for the protection of habitats and species including relevant Natura 2000 sites designated under the habitats⁹ and wild birds¹⁰ directives. The registers are to be reviewed under the River Basin Management Plan updates.
- Establish groundwater monitoring networks based on the results of characterisation and risk assessment to provide a comprehensive overview of groundwater chemical and quantitative status. Member States had to design a monitoring programme to be operational by the end of 2006. In this context, data monitoring data constitutes an essential element of the overall management cycle (Figure 3).

Figure 3. The water management cycle



⁶ Directive 76/160/EEC, OJ L31 of 5.02.1976

⁷ Directive 91/676/EEC, OJ L375 of 31.12.1991

⁸ Directive 91/271/EEC, OJ L135 of 30.05.1991

⁹ Directive 92/43/EEC, OJ L206 of 22.07.1992

¹⁰ Directive 79/409/EEC, OJ L103 of 25.04.1979

- Produce a river basin management plan (RBMP) for each river basin district which must include a summary of pressures and impacts of human activity on groundwater status, a presentation in map form of monitoring results, a summary of the economic analysis of water use, a summary of protection programmes, and control and remediation measures. The first RBMP is scheduled to be published by the end of 2009. A review is then planned by the end of 2015 and every six years thereafter.
- Take into account by 2010 the principle of recovery of costs for water services, including environmental and resource costs in accordance with the polluter pays principle.
- Design by the end of 2009 a programme of measures for achieving WFD environmental objectives (e.g. abstraction control, prevent or control pollution measures) that should be operational by the end of 2012. Basic measures include, in particular, controls of groundwater abstraction, controls (with prior authorisation) of artificial recharge or expansion of groundwater bodies (providing that it does not compromise the achievement of environmental objectives). Point source discharges and diffuse sources liable to cause pollution are also regulated under the basic measures. Direct discharges of pollutants into groundwater are prohibited subject to a range of provisions listed in Article 11 of the WFD. The programme of measures has to be reviewed and if necessary updated by 2015 and every six years thereafter. Figure 4 summarises the main basic and supplementary measures covered by the WFD.

Figure 4. Main basis and supplementary measures under the Water Framework Directive of direct relevance to groundwater

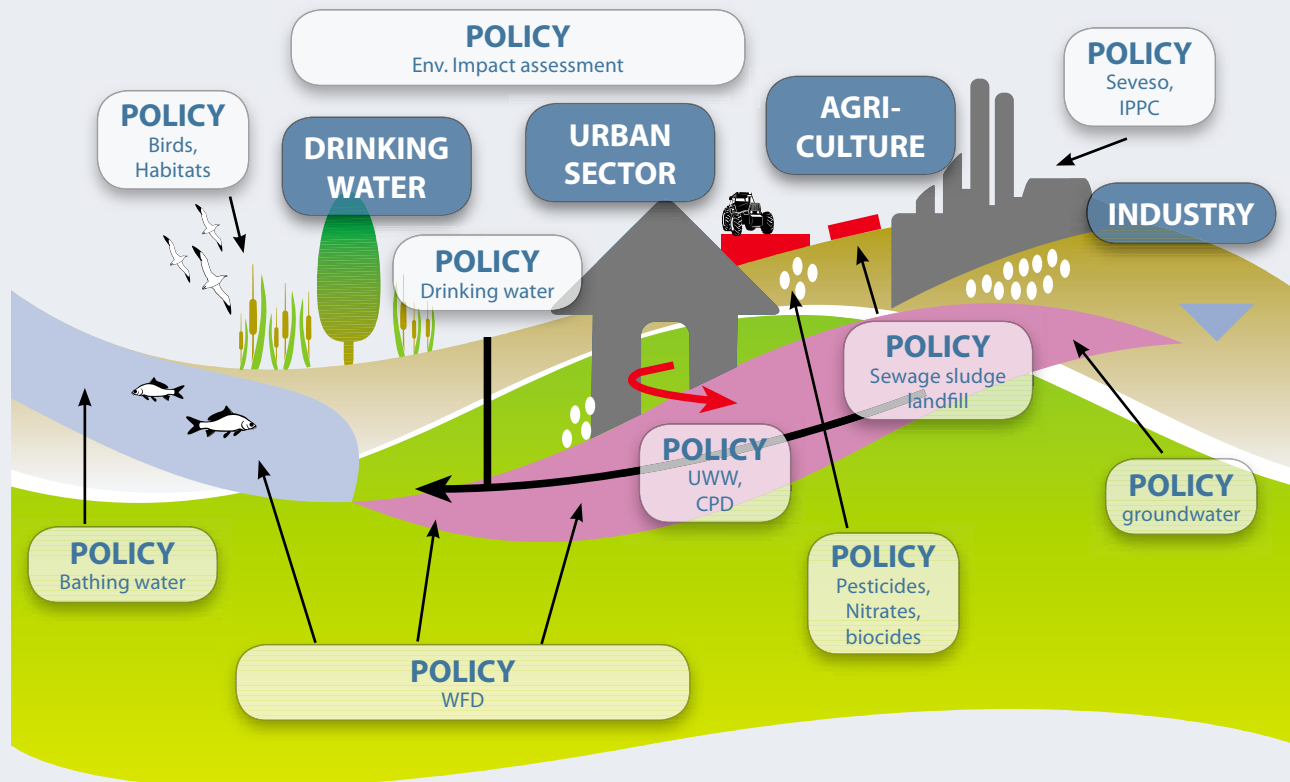


2.2.2. Other related directives

Laws designed to protect groundwater against pollution and deterioration are part of a larger regulatory framework that can be traced back to the 1990s. The concept of groundwater protection as tackled by different pieces of legislation is now fully integrated into the basic measures of the Water Framework Directive.

The need to ensure the proper integration of the various legal instruments is illustrated in the Figure 5:

Figure 5. Sectors covered by EU legal instruments that are directly or indirectly relevant to groundwater protection (UWW: urban waste water – CPD: construction products directive – IPPC: integrated pollution prevention control). This list is not exhaustive.



The different instruments are directly linked to the Water Framework Directive and to the new Groundwater Directive. They are part of a set of measures that need to be operational to achieve “good environmental status” objective by the end of 2015. They all seek to prevent or limit pollutant inputs into groundwater. Their main features are summarised below:

- The **Nitrates Directive** aims to reduce and prevent water pollution caused by nitrates from agricultural sources. It requests Member States to designate vulnerable zones of all known areas of land in their territories, which drain into the waters – including groundwater – that are, or are likely to be, affected by nitrate pollution. Such waters are those, among others, which contain a nitrates concentration of more than 50 mg/l or are likely to contain such concentrations if measures are not taken. The link with groundwater policy is clear in this respect, i.e. nitrate concentrations in groundwater should not exceed the trigger value of 50 mg/l. Action programmes under the Nitrates Directive are one of the basic measures of the Water Framework Directive (Annex VI) and a mechanism for reversing nitrate pollution trends under the Groundwater Directive (Annex IV, part B).
- The **Urban Wastewater Treatment Directive** aims to protect the environment from the adverse effects of discharges of urban waste water and waste water from certain industrial sectors. In this context, the identification of “sensitive areas” relates essentially to freshwater, estuaries or coastal waters which are found to be eutrophic, lakes and streams reaching lakes/reservoirs with poor water exchange, and surface freshwater intended for drinking water which could contain concentrations of nitrates of more than 50 mg/l. Links with the groundwater regulatory framework is mainly through obligations to prevent or limit inputs of pollutants (including from urban origin) into groundwater.
- The **Plant Protection Products Directive**¹¹ and The **Biocides Directive**¹² concerns the authorisation, placing on the market, use and control within the European Union of commercial plant protection products and biocidal products such as pesticides, herbicides, or fungicides. Regarding groundwater, authorisation is only granted if products have no harmful effect on human health or on groundwater, and that do not have undesirable effects on the environment, particularly on the contamination of water, including drinking water and groundwater. The new Groundwater Directive has set maximum permissible concentrations in groundwater as groundwater quality standards.

¹¹ Directive 91/414/EEC, OJ L230 of 19.08.1991

¹² Directive 98/8/EC, OJ L123 of 24.04.1998



- The **Integrated Pollution Prevention and Control (IPPC) Directive**¹³ lays down measures designed to prevent or reduce air, water, or ground pollution. The directive applies to a significant number of mainly industrial activities with a high pollution potential such as the energy sector, the production and processing of metals, the mineral and chemical industries, waste management facilities, food production and non-industrial activities such as livestock farming. It establishes provisions for issuing permits for existing and new installations. The permits include requirements to ensure the protection of soils and groundwater and set emission limits for pollutants. This directive, like other directives cited in this paragraph, is part of the basic measures of the WFD.
- The **Landfill Directive**¹⁴ seeks to prevent or reduce the negative effects of landfill waste on the environment, including groundwater. Like the IPPC Directive, the Landfill Directive establishes provisions for issuing permits based on a range of conditions including impact assessment studies and is part of the basic measures of the WFD. For each site, the groundwater, geological, and hydrogeological conditions in the area must be identified. The sites must be designed so as to prevent groundwater from entering landfill waste, collect and treat contaminated water and leachate, and prevent the pollution of soils, groundwater or surface water by using the appropriate technical precautions such as geological barriers and bottom liners. The directive establishes criteria for waste testing and acceptance taking into consideration the protection of the surrounding environment, including groundwater.

¹³ Directive 96/61/EEC, OJ L257 of 10.10.1996

¹⁴ Directive 99/31/EC, OJ L182 of 16.07.1999

- Other directives have indirect links to the groundwater regulatory framework. These include the **Waste Framework Directive**¹⁵ which requires waste to be recovered or disposed of without endangering the environment and groundwater and the **Construction Product Directive**¹⁶ which provides provisions for regulating construction products that could pose a threat to the health of future occupants or neighbours as a result of water or soil pollution or poisoning.

2.3. The consultation process

2.3.1. The Commission proposal

The Water Framework Directive specifically called for a daughter directive to set out detailed provisions on chemical status and other measures to identify and reverse pollution trends. A proposal for the new Groundwater Directive to protect groundwater from pollution was presented by the European Commission in September 2003. It introduced for the first time EU-wide quality objectives which require Member States to monitor and assess groundwater quality on the basis of common criteria and identify and reverse trends in groundwater pollution.

By adopting the proposal the Commission fulfilled an obligation under Article 17 of the Water Framework Directive, which requires technical specifications to complement the overall groundwater regulatory regime (covering aspects of characterisation, analyses of pressures and impacts, monitoring, and programme of measures). This includes criteria for assessing good chemical status, criteria for the identification of pollution trends and the definition of starting points for trend reversal and complementary elements of the programmes of measures (prevention and limitation of pollutant inputs into groundwater). All of these elements are linked to the development and implementation of River Basin Management plans whose aim is to achieve “good environmental status” by 2015.

2.3.2. Impact assessment

The White Paper on European Governance stresses that regulatory proposals should be considered on the basis of an effective analysis of whether it is appropriate to intervene at EU level and whether regulatory intervention is needed. This analysis should also assess the potential economic, social and environmental impact of the proposal, as well as the costs and benefits of the chosen approach. In this context, a new integrated impact assessment method has been developed by

¹⁵ Directive 2006/12/EC, OJ L102 of 11.04.2006

¹⁶ Directive 89/106/EC, OJ L40 of 11.02.1989

the Commission as set out in a Communication¹⁷ on Impact Assessment. The aim of the impact assessment is to help structure the policy-making process, identify and assess the problem and the objectives pursued. It identifies the main alternative options for achieving the objectives and analyses their likely impacts. It outlines the advantages and disadvantages of each option and the synergies and trade-offs. It should be considered as an aid to political decision-making and not a substitute for it. A two-stage impact assessment was been carried out for the Commission's proposal for a directive to protect groundwater against pollution. The two stages were:

- A short preliminary assessment, carried out in January 2003 that identified the main objectives of the proposal and the key issues to be considered as part of an extended impact assessment, and
- An extended assessment developed through consultation of other Commission departments, Member States and stakeholders during the period January-April 2003.

The impact assessment examines the main features of the proposed Groundwater Directive. In particular, it assesses the options for evaluating the chemical status of bodies of groundwater and for identifying and reversing significant upward trends in the concentrations of pollutants. It also assesses measures to prevent and control groundwater from point and diffuse sources of pollution.

This extended impact assessment addressed only the economic, social and environmental aspects of the proposal and assumed that related Directives (see § 2.2.2) are, or will be, fully implemented. It describes various options including the choices which have either been made or which are being considered. It also considers the costs and benefits of each option.

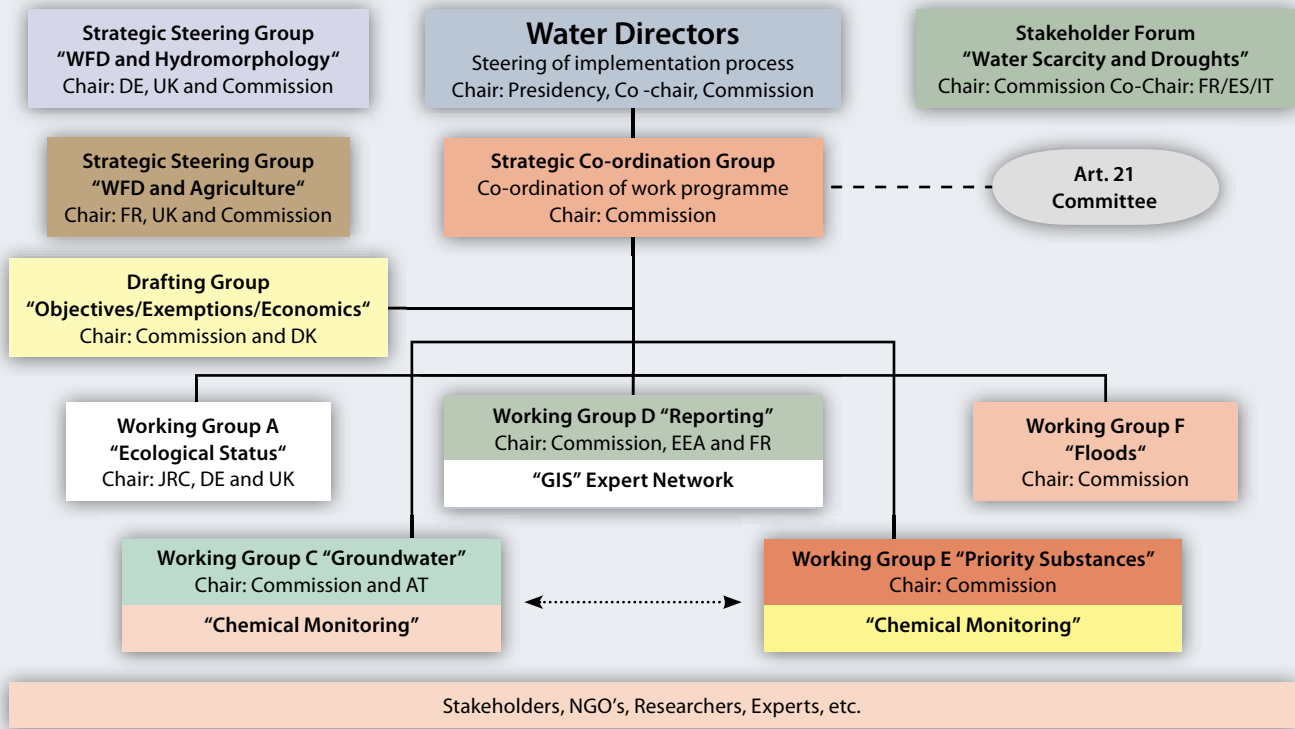
2.3.3. The CIS Working Group on Groundwater

EU Member States, Norway and the European Commission have jointly developed a common strategy for supporting the implementation of the Water Framework Directive. This directive establishes a framework for EU action in the field of water policy (hereafter referred to as the Common Implementation Strategy (CIS) for the Water Framework Directive¹⁸). 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 Commission and EU Water Directors (Figure 6).

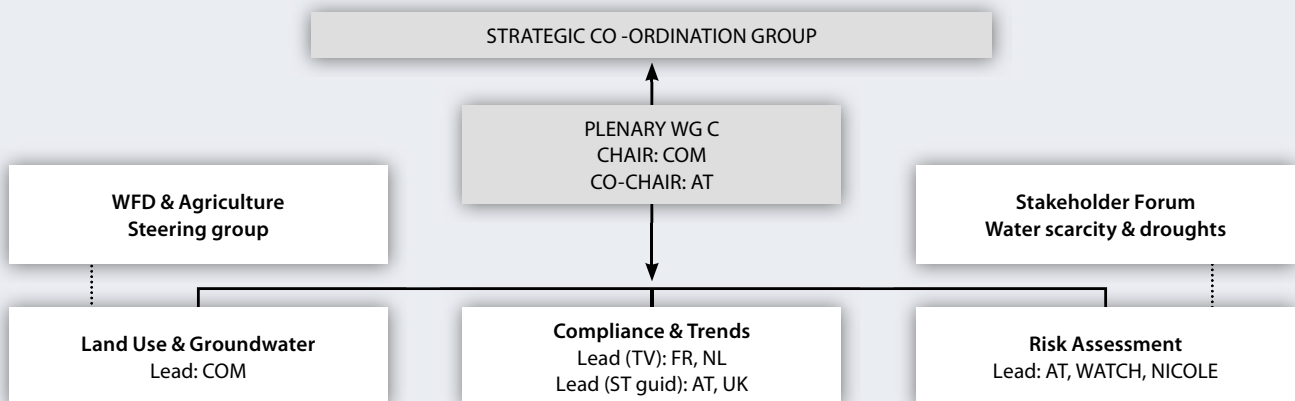
¹⁷ COM 2002/0276

¹⁸ <http://ec.europa.eu/environment/water/water-framework/implementation.html>

Figure 6. The Common Implementation Strategy (“CIS”) of the Water Framework Directive



EU Groundwater Working Group (WG C)



Within this framework a technical Working Group on Groundwater 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. The second phase of the working group (2004-2006) was successful and resulted in the publication of three technical reports (see below). The Working Group on Groundwater is now entering its third period (2007-2009). The aim is to focus on implementing the new Groundwater Directive and the groundwater elements of the WFD, in particular monitoring and the preparation of the first River Basin Management Plan.

2.3.4. The political negotiation

Following the Commission's proposal opinion papers were issued by the Committee of the Regions in December 2003 and by the European Economic and Social Committee and Committee of the Regions in March 2004. Owing to European Parliament (EP) elections, the first reading could not be completed in 2004 and the debate started again under the new EP (2004-2009) with a new Rapporteur, Mrs. Krista Klass, who managed to have the first reading adopted in April 2005. A political agreement was then reached at Council in June 2005, followed up by the adoption of a common position by qualified majority in January 2006. The second reading was adopted by the European Parliament in June 2006. The Council response to the second reading was adopted in September 2006, opening the way to conciliation negotiations as some amendments could not be accepted by Council (for more details on the political discussions, see the Commission's communication and opinion on the europa website).

Following long negotiation between the European Parliament and the Council, an agreement was reached in conciliation in October 2006. Key issues in the negotiations concerned the question of 'no deterioration of groundwater quality' and the relationship with EU legislation on water pollution by nitrates. The conciliation enabled a compromise to be reached which establishes clear requirements to prevent any deterioration of groundwater status and sets a nitrates standard of 50 mg/l as one of the criteria for good chemical status to be achieved by 2015. It also keeps the Nitrates Directive unchanged.

The new directive was formally adopted in December 2006. It complements the Water Framework Directive by clearly establishing environmental objectives for groundwater chemical status and ensures continuity with the original 1980 Groundwater Directive on the protection of groundwater against pollution caused by dangerous substances until it is repealed under the WFD by the end of 2013.



3.

Building blocks of the directive

3.1. General introduction

The new Groundwater Directive (GWD) establishes a regime which sets underground water quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater. The directive establishes quality criteria that take into account local characteristics and allows for further improvements to be made based on monitoring data and new scientific knowledge. The directive thus represents a proportionate and scientifically sound response to the requirements of the Water Framework Directive (WFD) as it relates to assessments on chemical status of groundwater and the identification and reversal of significant and sustained upward trends in pollutant concentrations. Member States will have to establish the standards (threshold values) at the most appropriate level and take into account local or regional conditions. Complementing the WFD, the Groundwater Directive requires that:

- groundwater threshold values (quality standards) be established by Member States by the end of 2008;
- pollution trend studies be carried out using existing data and monitoring data which are mandatory under the WFD (referred to as “baseline level” data obtained in 2007-2008);

- pollution trends be reversed so that environmental objectives are achieved by 2015 using the measures set out in the WFD;
- measures to prevent or limit inputs of pollutants into groundwater be operational so that WFD environmental objectives can be achieved by 2015;
- reviews of the technical provisions of the directive be carried out in 2013 and every six years thereafter;
- compliance with good chemical status criteria (based on EU standards of nitrates and pesticides and on threshold values established by Member States) be achieved by the end of 2015.



3.2. Good chemical status

The definition of good chemical status is given in the WFD. In this context, the compliance regime is based on quality objectives (compliance to relevant standards, no saline intrusion) that have to be achieved by the end of 2015. The establishment of good chemical status criteria was one of the elements of the mandate of Article 17 of the WFD which had to be set in the new Groundwater Directive. The direction chosen is based on compliance with EU-wide groundwater quality standards (nitrates and pesticides) which reinforce the parent directives. Regarding other pollutants, the adoption of numerical values at community level was not considered to be a viable option, considering the high natural variability of substances in groundwater (depending upon hydrogeological conditions, background levels, pollutant pathways, and interactions with different environmental compartments). In addition, the management of groundwater pollution should focus on actual risks identified by the analysis of pressures and impacts under Article 5 of the WFD. Consequently, the regime of the new directive requests Member States to establish their own groundwater quality standards (referred to as “threshold values”), taking identified risks into account and the list of substances given in Annex II of the directive. Threshold values should be established for all pollutants that characterise groundwater bodies at risk of not achieving the good chemical status objective and this should be done at the most appropriate level, e.g. national, river basin district or groundwater

body level. The directive provides general guidelines on how to establish threshold values (Annex II). Let us note that the list of threshold values established by Member States may be prone to regular reviews within the river basin management planning framework, which may lead to additional substances being considered (in case of new identified risks) or the deletion of substances (in case formerly identified risks no longer exist).

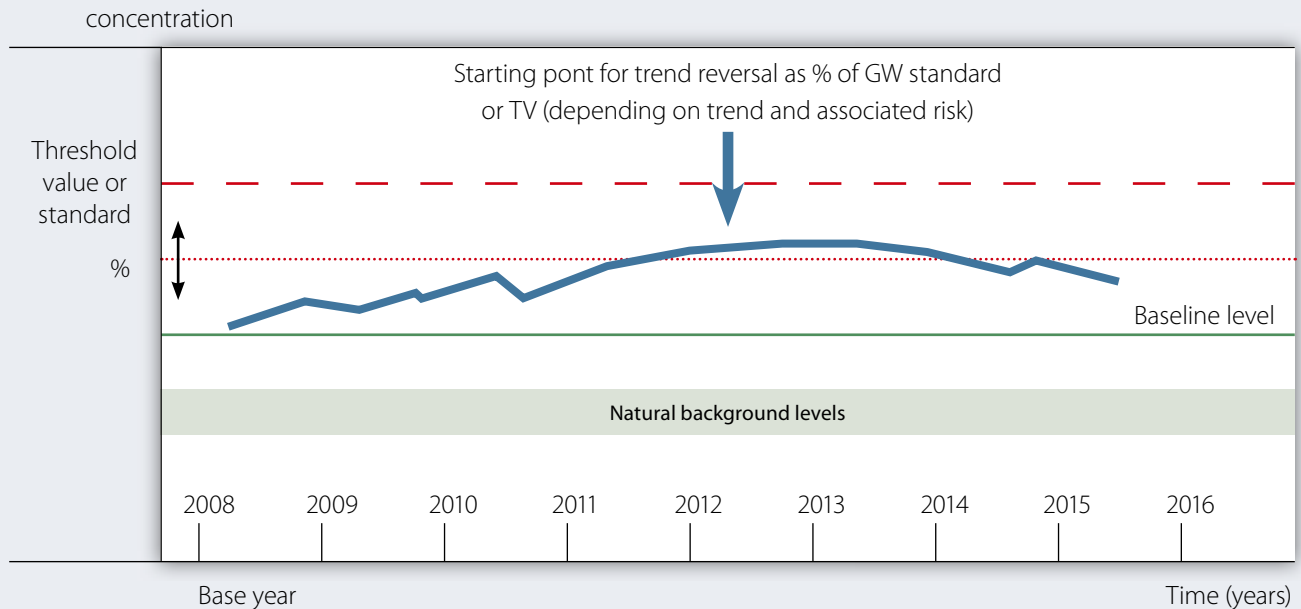
Regarding compliance, evaluation will be based on a comparison of monitoring data with numerical standard values (EU-wide groundwater quality standards and/or threshold values). In principle no groundwater body will be allowed to exceed these standard values. It is recognised that standard values being exceeded may be due to a local pressure (e.g. point source pollution) that does not endanger the status of the overall groundwater body concerned. Therefore, the directive opens the possibility to investigate the reasons why values are exceeded and decide on the chemical status classification on the basis of actual risks for the overall groundwater body (i.e. risks to human health, associated aquatic ecosystems or related terrestrial ecosystems, and legitimate uses and functions of groundwater). This means that situations might occur where standard values having been exceeded will correspond to local pressures needed to be controlled and possibly remedied without classifying the groundwater body with “poor status”. Other situations will show that one or more cases of standard value overruns may represent a serious threat to a groundwater body and thus lead it to reach “poor status” classification. Decisions will be taken on a case-by-case basis in the WFD river basin management planning framework.

3.3. Trend identification and reversal

Another element covered by Article 17 of the WFD concerns the identification of sustained upward pollution trends and their reversal. This is the second “pillar” of the new directive, which stipulates that such trends will have to be identified for any pollutants characterising groundwater as being at risk (this is linked to the analysis of pressures and impacts carried out under the WFD). The issue of “significance” is clarified in Annex IV of the directive. This is linked to statistical significance (purely mathematical) and environmental significance, which itself relates to actual risks represented by the identified upward trends.

The reversal obligation establishes that any significant and sustained upward trend will have to be reversed when reaching 75% of the values of EU-wide groundwater quality standards and/or threshold values (Figure 7). This principle rule may be adapted according to local circumstances justifying a different percentage value. In other words, situations might justify a trend reversal when values reach 50% of the standards (in case of high aquifer vulnerability) whereas values higher than 75% could be accepted in cases where the risks of exceeding the quality standards are unlikely. Trend reversals have to be undertaken through the programme of measures of the WFD where the parent legislations are the implementation tools for ensuring effective actions (e.g. Nitrates Directive, IPPC Directive, etc.).

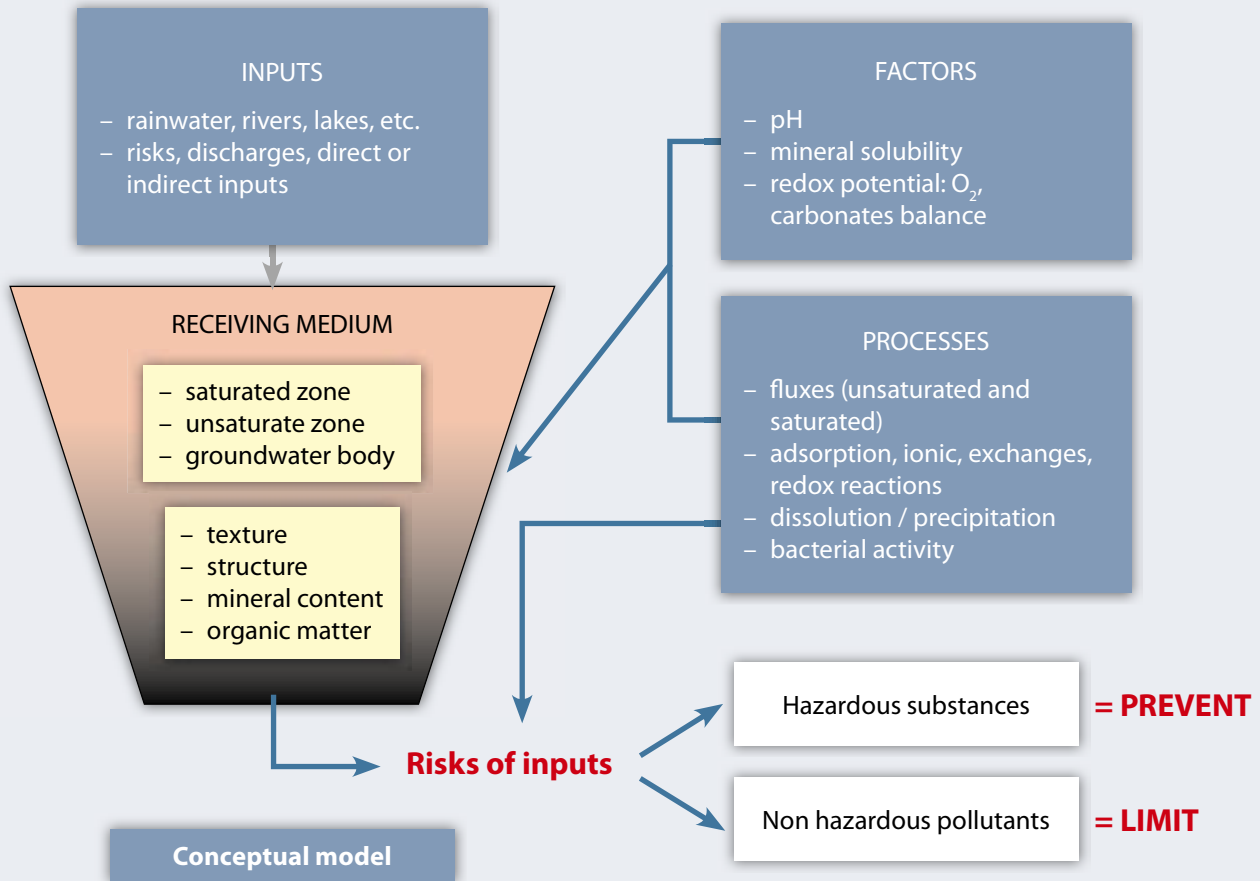
Figure 7. Principle of the identification and reversal of statistically and environmentally significant upward trends



3.4. Measures to prevent or limit pollutant inputs

This is the third core element of the directive. Measures to prevent or limit the introduction of pollutants into groundwater are covered by the existing Groundwater Directive. It contains elements which are now covered by other directives such as the Landfill Directive, which makes it redundant in some aspects in relation to the WFD programme of measures. This is why it was decided to repeal this directive under the WFD in 2013 (i.e. one year after the programmes of measures are made operational). But some provisions would have been lost without an appropriate follow-up after the directive is repealed, especially the specific requirements on the prevention of inputs of hazardous substances into groundwater and the limitation of inputs of other pollutants. Consequently, the new directive (GWD) includes legal requirements to prevent or limit inputs of pollutants into groundwater that coincide with existing provisions under the old directive while being in line with the WFD. This implies that measures to prevent or limit pollution under the GWD are those established by the WFD (which will have to be operational by 2012). This by no means implies that nothing should be done before 2012 while the old Groundwater Directive remains in place and other parent legislations remain in force. Under the new directive, the prevention and limiting provisions will be streamlined and be consistent with WFD river basin management planning. This is closely linked to conceptual modelling needs described hereafter (Figure 8).

Figure 8. The “Prevent and Limit” provisions linked to an evaluation of risks of inputs (and of the understanding of the system)





4.

Towards effective implementation

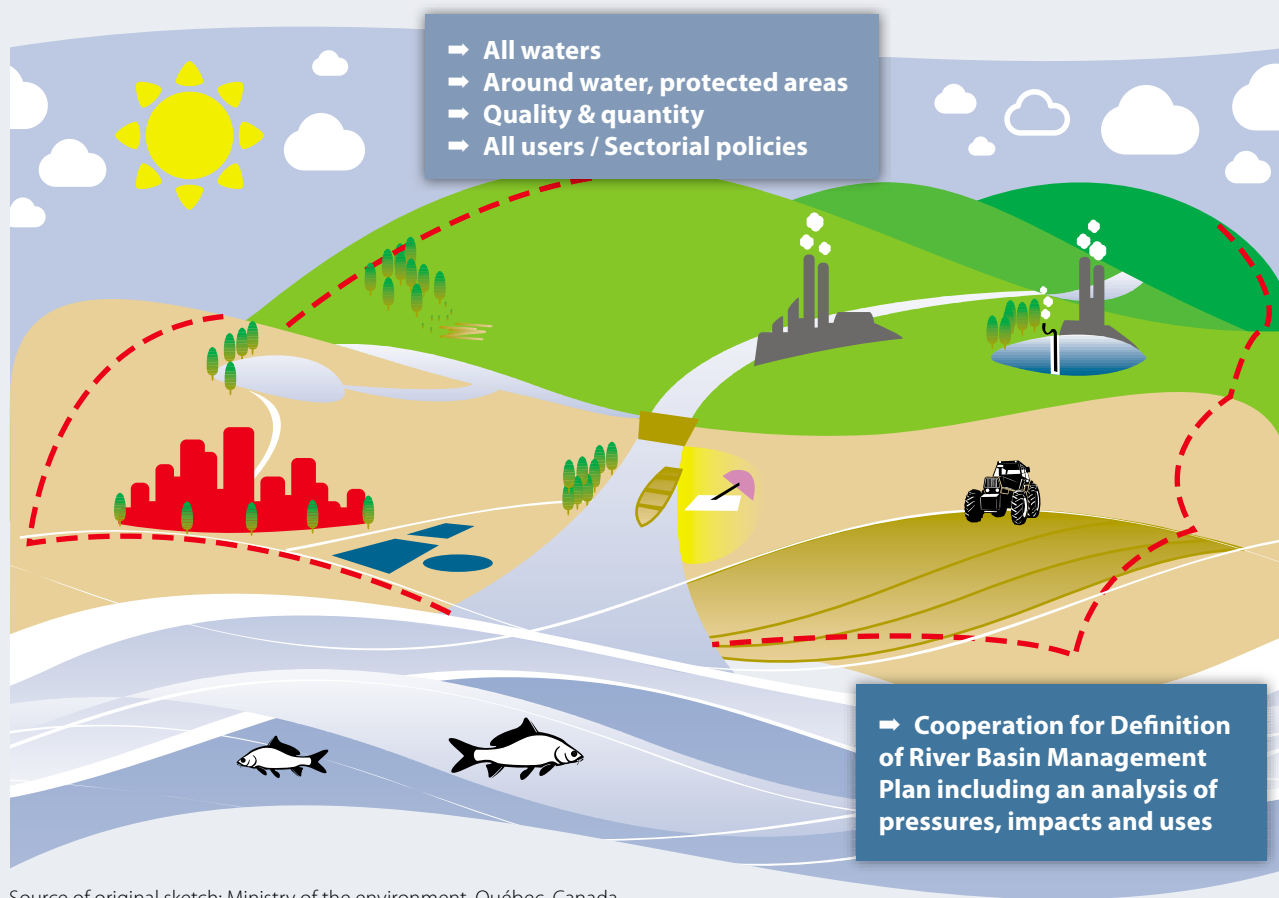
4.1. WFD milestones

The new directive on groundwater is an integral part of a comprehensive regulatory framework represented by the WFD. The success of its implementation will thus closely depend upon the effective implementation of relevant groundwater parts of the WFD as well as of parent legislations in the agricultural, industrial, urban and waste sectors. The following series of WFD milestones pave the way for further implementation steps:

- Analysis of pressures and impacts under Article 5 of the WFD: this has already been reported by Member States and used to identify groundwater bodies “at risk”. This analysis represents a key element of the new directive as it has a direct implication on the setting of threshold values and trend obligations.
- Monitoring programmes were created and made operational by the end of 2006 on the basis of the above identification. The gathering of data will also be of key importance for refining the risk assessment, thus helping to clearly identify the substances which have to be considered by Member States for establishing threshold values.
- The development of the first River Basin Management Plan is obviously a core milestone for the overall WFD, and thus also for groundwater (Figure 9). The first plan is being developed

by Member States for public consultation by the end of 2008 and will be published at the end of 2009. In this context, programmes of measures will have to be designed and made operational by 2012 in order to meet the WFD good status objectives by 2015.

Figure 9. Integration in the context of the river basin management planning



Source of original sketch: Ministry of the environment, Québec, Canada.

4.2. Specific milestones of the new directive

Specific milestones of the new directive relate to:

- The establishment of threshold values which have to be reported by Member States for the first time by the end of 2008. As highlighted below, a high level of cooperation is required to ensure that threshold values will be set in a consistent and comparable manner throughout the EU. Updates of the threshold values (substances considered and numerical values) will be possible in the framework of the RBPM reporting.
- Trend studies based on new monitoring data and existing information. Identified trends should in principle be included in the first RBMP with associated measures to reverse them, if appropriate, but it is recognised that it might be too early (with only two years worth of data) to guarantee such reporting. In practice, this means that trends will likely only be reported at the end of the RBMP in 2015. This does not infer that measures should not be operational before then since these would be likely to have a positive effect on pollution trends,
- Another specific milestone concerns the review of the directive on the basis of scientific developments scheduled to take place in 2013.

4.3. Supporting guidelines – cooperation on implementation

As highlighted above, effective implementation will depend on a high level of cooperation between Member States' environment agencies or ministries, stakeholders representing different sectors (agriculture, industry, and urban), NGOs, the scientific community and the European Commission. Awareness is thus at the heart of the Common Implementation Strategy of the WFD, which has been operational since 2001 (see paragraph 2.3.3). In this context, the Groundwater Working Group gathers more than 80 experts who meet twice a year to exchange best practices, discuss technical difficulties about implementation, and develop guidance documents. This working group has been active since 2002 in helping the Commission to develop the directive proposal published in 2003. It then focused its energy on the development of key guidance documents published in 2006, namely:

- Guidance document on groundwater monitoring, providing practical information about WFD groundwater monitoring provisions;
- Guidance document on groundwater in protected areas, clarifying the links between the WFD groundwater provisions and the drinking water regulatory framework;

- Guidance document on the clarification of the terms 'direct and indirect' inputs, aiming to provide recommendations on how to design measures for the prevention or limitation of pollutant inputs into groundwater.

Other guidance documents are being developed or planned, they concern in particular:

- Compliance issues, including recommendations on the establishment of threshold values and related compliance requirements, as well as technical specifications about trend identification and reversal. Discussions about compliance concern chemical as well as quantitative status.
- Land use and groundwater, seeking to clarify links with the agriculture regulatory framework (including cross-compliance under the CAP reform) as well as provisions concerning large-scale contaminated sites. This document will also discuss aspects of climate change and how it may affect groundwater management.

4.4. Supporting research

The Treaty establishing the European Union indicates that Research Framework Programmes have to serve two main strategic objectives. First, it provides a scientific and technological basis for industry and encourages its international competitiveness. And second, it promotes research activities in support of other EU policies. To this end, Framework Programmes are designed to help solve problems and respond to major socio-economic challenges faced by society. The Research Framework Programme (FP) is the European Union's main instrument for funding research and development. The Sixth FP ended in December 2006 and the current research programme is the Seventh FP, which started in January 2007 and will run until the end of 2013¹⁹.

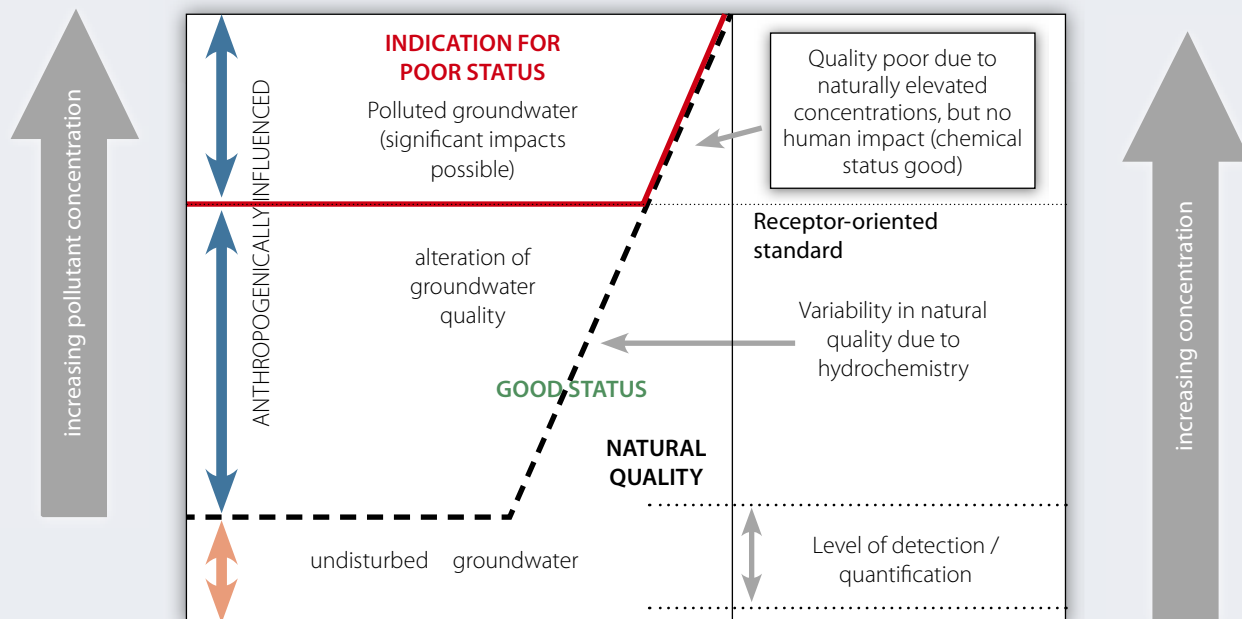
The FP6 was the Commission's response to the requirements of the Lisbon Summit in March 2000, which called for a better use of European research by creating an internal market for science and technology (the European Research area). The 6th FP opened the possibility to fund "tailor-made" projects in response to research needs formulated by policy-makers. Regarding groundwater, this resulted in the launching and development of the BRIDGE project (standing for "Background cRiteria for the IDentification of Groundwater thrEsholds"), which was designed to develop a common methodology intended to be used by Member States for establishing groundwater threshold values (thus directly supporting the newly adopted Groundwater Directive)²⁰. The knowledge gathered is at the core of the development of the guidance document referred to in paragraph 4.3 (see Figure 10). This project is only one of many other supporting RTD projects carried out un-

¹⁹ 7th Framework Programme for Research and Technological Development (2007-2013)

²⁰ BRIDGE Project, http://ec.europa.eu/research/fp6/ssp/bridge_en.htm

der the 6th Framework Programme. Information on EU-funded projects, including water-related research projects, is available on the Community Research & Development Information Service (CORDIS)²¹.

Figure 10. Elements of classification of groundwater chemical status as studied by the BRIDGE project (funded under the 6th RTD Framework Programme)



Within the Seventh Framework Programme (formally adopted by the European Parliament and the Council in December 2006), the Environment (including climate change) theme has a budget of 1890 million euros for the period 2007-2013 (in a total budget of 50 521 million euros). It covers a range of water-related research activities, some of which will either indirectly or directly support the implementation of the new Groundwater Directive. In particular, the 2008 call for proposals includes a topic on 'groundwater systems', which is tailor-made to respond to the need to gather new scientific knowledge on the functioning of groundwater systems in light of the revision of the directive in 2013.

²¹ CORDIS, <http://cordis.europa.eu/>

4.5. Links to international associations and programmes

The Working Group on Groundwater under the Common Implementation Strategy of the Water Framework Directive is collaborating with the International Hydrological Programme (IHP) of UNESCO to exchange information and ensure that the recommendations on good groundwater management practices are disseminated worldwide²². Of particular interest in this respect are the methodological guides, guidelines and reviews concerning groundwater contamination and trans-boundary aquifers which are available on the IHP-UNESCO website. These are especially relevant to the current drafting of the EU technical guidance documents on the implementation of the future groundwater directive.

Other links are being established with stakeholder organisations through the Working Group C, representing the industrial and agricultural sectors and civil society, the scientific community, and Member State's environment agencies/ministries. Active exchanges also take place with international associations such as the International Association of Hydrogeologists (IAH), Eurogeosurveys, the European Water Association (EWA), the International Groundwater Resources Assessment Centre (IGRAC) and organisations representing industrial sectors (e.g. CEFIC, EUREAU, Eurometaux, COPA-COGECA, etc.) and ecological interest groups (represented by the European Environment Bureau).



²² http://ec.europa.eu/environment/water/water-framework/groundwater/scienc_tec/links/index_en.htm

5.

Next steps

The years to come will require active multi-sectoral and multi-disciplinary cooperation to ensure the development of a sound groundwater management regime at EU level and guarantee the effective implementation of the new directive. This will strongly but not solely rely on effective integration of different environmental policies. Integration will also be crucial with respect to research inputs (effective transfer of scientific results to policy-makers), sharing practices and practical demonstration activities. The actual cooperation under the Groundwater Working Group (WG C), associated with large-scale research developments, represents a unique opportunity to build-up a knowledge-based regulatory framework for groundwater (chemical and quantitative) in the run up to 2013 when the directive is to be reviewed.

Appendix: Glossary

BRIDGE	Background cRiteria for the IDentification of Groundwater thrEsholds
CIS	Common Implementation Strategy
GWD	Groundwater Directive
RBMP	River Basin Management Plan
WFD	Water Framework Directive
WG C	Working Group C on groundwater

European Commission

Groundwater Protection in Europe

Luxembourg: Office for Official Publications of the European Communities

2008 – 35 pp. – 21 x 21 cm

ISBN 978-92-79-09817-8



Publications Office
Publications.europa.eu

ISBN 978-92-79-09817-8



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