National Institute
for Public Health
and the Environment

Report 734301035/2010

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This investigation has been performed by order and for the account of the Ministry of Housing, Spatial Planning and the Environment, within the framework of research questions related to the Drinking Water Act

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Abstract

Drinking water in the river basin management plans of EU Member States in the Rhine and Meuse river basins

The river basin management plans (RBMPs) of member states in the Rhine and Meuse river basins contain few additional measures for the improvement of the quality of drinking water resources during the first planning period (2009-2015). Consequently, it is unlikely that the Netherlands will meet the objective of Article 7.3 of the European Water Framework Directive (WFD) for managing the resources of surface water destined for use as drinking water. The aim of this article is to achieve improvements in water quality, thereby enabling the level of purification treatment to be reduced. This is the conclusion of the RIVM based on its assessment of these plans as ordered by the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM).

The WFD requires member states to formulate RBMPs. These plans must be able to secure a good status for ground and surface waters through the implementation of programmes of measures and monitoring. Specific objectives have been set for drinking water. The quality of surface waters in the Netherlands is strongly determined by the feed from other countries, such as Germany, Belgium and France. The realization of measures by upstream states in the Rhine and Meuse river basins is therefore indispensable for the improvement of surface water quality in the Netherlands and, thereby, for a reduction in the level of treatment required for its purification.

The Netherlands uses both surface water and ground water as a resource for drinking water. It is unclear whether the implementation of the RBMPs will resolve existing bottlenecks in the quality management of ground-water resources. These issues, such as the presence of point source pollution, are mainly on a local scale and are scarcely, or not at all, affected by neighbouring countries.

VROM requested that the RIVM also compare the ambition level of the Netherlands with that of other member states. The Dutch approach to tackling the protection of drinking water resources appears to be comparable to that of other member states in the Rhine and Meuse river basins.

Key words:
Water Framework Directive, river basin management plan, Rhine, Meuse, drinking water

Rapport in het kort

Drinkwater in stroomgebiedbeheerplannen Rijn- en Maasoeverstaten

De stroomgebiedbeheerplannen (SGBP'en) van de Rijn- en Maasoeverstaten bevatten in de eerste planperiode (2009-2015) weinig specifieke maatregelen om de kwaliteit van bronnen voor drinkwater te verbeteren. Het is daardoor waarschijnlijk dat Nederlandse oppervlaktewaterbronnen voor drinkwater niet zullen voldoen aan het streefdoel van de Europese Kaderrichtlijn Water (KRW) zoals dat is geformuleerd in artikel 7.3. Met dit artikel wordt ernaar gestreefd om de waterkwaliteit te verbeteren waardoor minder inspanning nodig is om het te zuiveren tot drinkwater. Dit concludeert het RIVM bij de beoordeling van deze plannen in opdracht van het ministerie van VROM.

De KRW draagt lidstaten op om SGBP'en op te stellen. De plannen moeten een goede toestand van grond- en oppervlaktewater zeker stellen door middel van meet- en maatregelenprogramma's. Voor drinkwater gelden specifieke doelstellingen. Maatregelen van de Rijn- en Maasoeverstaten zijn noodzakelijk om in Nederland de kwaliteit van het oppervlaktewater te verbeteren en daarmee de zuiveringsinspanning te verminderen. De kwaliteit van dit water wordt namelijk sterk bepaald door de aanvoer uit landen als Duitsland, België en Frankrijk.

Nederland gebruikt naast oppervlaktewater ook grondwater als bron voor drinkwaterproductie. Voor grondwaterbronnen voor drinkwater is het onduidelijk of met de uitvoering van de SGBP'en de bestaande kwaliteitsknelpunten worden opgeheven. Deze knelpunten, zoals niet-verwijderde bodemverontreinigingen, zijn vooral lokaal van aard en worden niet of nauwelijks beïnvloed door de buurlanden.

Ten slotte heeft VROM gevraagd hoe het ambitieniveau van Nederland zich verhoudt tot andere lidstaten. De aanpak van Nederland bij de bescherming van drinkwaterbronnen blijkt vergelijkbaar met die van andere Rijn- en Maasoeverstaten.

Trefwoorden:
Kaderrichtlijn Water, stroomgebiedbeheerplan, Rijn, Maas, drinkwater

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Contents

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List of abbreviations

BREF	Description of best available techniques based on IPPC-Directive
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
DDWA	Dutch Drinking Water Act
DQOMW	Decree on Quality Objectives and Monitoring in Water (in Dutch: *BKMW*)
DQOMSW	Decree on Quality Objectives and Monitoring in Surface Water (in Dutch: *BKMO*)
DWPA	Drinking Water Protection Areas
EC	European Committee
GWB	Groundwater Body
GWDD	Groundwater Daughter Directive (2006/118/EC)
KWR	Dutch Water Research Institute
MS	EU Member State
NGMN	Netherlands Groundwater Monitoring Network
RIVM	National Institute for Public Health and the Environment
PAH	Polycyclic aromatic hydrocarbons
REACH	Registration, Evaluation en Authorisation of Chemical Substances
RIWA	Association of River Water Supply Companies
RBMPs	River Basin Management Plans
STP	Sewage Treatment Plant
SWB	Surface water body
VROM	Ministry of Housing, Spatial Planning and the Environment
V&W	Ministry of Transport, Public Works and Water Management
WFD	Water Framework Directive (200/60/EC)
WFD CIS	WFD Common Implementation Strategy
WB	Water body, also addressed as surface water body (SWB)
WTP	Water Treatment Plant

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Summary

The implementation of the Water Framework Directive (WFD, 2000/60/EC) influences the protection and availability of drinking water resources, now and in the future. The WFD aims to ensure the sustainability of water systems and requires that bodies of water used for the abstraction of water for human consumption are included in the 'Register of protected areas'. Member States are also required to take appropriate measures to treat water abstracted for human consumption, in accordance with the Drinking Water Directive (98/83/EC), initially using the existing treatment system and, in time, with a reduction in the level of purification treatment required.

The majority of Member States published their river basin management plans (RBMPs) at the end of 2008, and in doing so, the ambitions of neighbouring countries were made clear. RIVM has been asked by the Dutch Ministry of Housing, Spatial Planning and the Environment to assess the drinking water-relevant aspects of the river basin management plans of the Member States in the Rhine and Meuse river basins based on two questions:

- How are the WFD drinking water objectives (Article 7 and Article 11, Paragraph 3, Section d) addressed in the plans?
- How do the plans of neighbouring countries contribute to fewer quality issues regarding the production of drinking water from surface water in the Netherlands?

Fifteen RBMPs were analysed.

This assessment had two purposes:

- To identify gaps regarding the realisation of the drinking water objectives set out in the current river basin management plans. The national drinking water policy document (in Dutch, *Beleidsnota Drinkwater*, in preparation under the new Dutch Drinking Water Act) could also be based on this information (please also refer to the *ontwerp-Nationaal Waterplan*, 2008 – in Dutch).
- To compare the Dutch approach with that of other Member States: how does the ambition level of the Netherlands compare with that of other Member States in the Rhine and Meuse river basins: is it higher, similar or lower?

Gaps

The following gaps were discovered during the assessment process:

1. The drinking water function is only indirectly addressed in the inventory of relevant substances.
   Before analysing the RBMPs, the intended procedure for the inventory of relevant substances with regard to drinking water objectives was defined, based on the European Commission Guidance Documents. Until now, this procedure has not been followed for drinking water objectives in any of the RBMPs. Although the substance list used by the Netherlands in the DQOMW fully implements Directive 75/440/EEC, it only includes a limited number of pollutants that currently present a problem to the Dutch drinking water supply.

2. There is no specific approach for substances relevant to drinking water.
   An inventory of relevant substances for one abstraction site has been made in this report, based on available monitoring data (RIWA). This list was intended as a framework for the assessment of the RBMPs in terms of the approach to drinking water-relevant substances. However, these substances

are not addressed in any of the RBMPs. During the characterisation, a national inventory is made of the pressures on and risks to the water system in all the sub-basin districts, but quickly set within the framework of emissions of those substances considered relevant; primarily nutrients, priority substances and a number of pesticides.

3. Drinking water objectives seem to be unrelated to WFD objectives.
   The drinking water function is, certainly as far as surface water is concerned, treated separately and not as part of the water system. This omission is partly the result of the WFD assessment system: drinking water is not an integral part of the status assessment of bodies of surface water. This does not apply to groundwater: through the drinking water test this function is included in the status assessment of bodies of groundwater. However, it is unclear from the RBMPs whether this is fully implemented. No agreements have yet been made in the Netherlands regarding how and when an exceedance in a trend or standard (75%) at an abstraction site affects the assessment of a groundwater body.

   However, in addition to other objectives, the WFD aims to ensure the sustainability of the drinking water supply by ensuring a good water quality (Recital 24, WFD). The river basin approach means that all relevant pressures and functions and the relationships between them within the water system are taken into account. The assessment system should be tailored to this approach.

4. The discussion concerning temperature primarily takes place in the Netherlands.
   The discussion regarding the temperature standard plays a prominent role in the Dutch RBMPs. However, temperature is not identified as critical parameter in the RBMPs of neighbouring countries. Two explanations are given for this:
   - the direct treatment of surface water is very limited in neighbouring countries;
   - drinking water is not chlorinated in the Netherlands and is therefore more susceptible to the regrowth of micro-organisms in the distribution network.

5. The concept ‘no deterioration’ is defined differently for groundwater and surface water.
   The Dutch interpretation of the concept ‘no deterioration’ for surface water is different from the approach described for groundwater (WFD CIS, 2007). The implications and desirability of this difference should be further investigated.

6. The effect of measures is not made clear in the RBMPs.
   In most RBMPs, the programme of measures consists mainly of the implementation of existing EU guidelines. No mention is made of the effects that may be expected from implementing these measures. The programmes of measures consist mainly of tables of change for legislation and cost summaries; the relationship with the effect is missing. This also applies to the effects on downstream functions named below.

7. The concept *no shifting* is not addressed in the RBMPs.
   The effects of upstream measures on downstream water quality are named in a few RBMPs as a subject requiring further development. Shifting is therefore not addressed in any more detail. This is also seen in the Dutch RBMPs: extensive regional packages of measures are described, but no estimate is made of the effects on the quality of national waters.

8. The reservation of future water-collection areas is included in some RBMPs.
   Future water collection areas are named and included in the register of protected areas in a few management plans, including the Dutch RBMPs. It is not clear from most RBMPs whether this is taken into account.

Ambition level

The ambition level in the Dutch RBMPs regarding Article 7 is generally comparable with the ambition level of the other Member States in the Rhine and Meuse river basins:

- Registers of protected areas have been/are to be produced (Article 7.1).
- It is stated that the drinking water quality meets the requirements of the Drinking Water Directive (98/83/EC – Article 7.2).
- Furthermore, it is usually stated that existing protection policies are sufficient for meeting the requirements of Article 7.3. Several sub-basin districts use the WFD to narrow the gap where this is concerned.

The registers do look different: groundwater protection areas are usually included, but sometimes bodies of groundwater. The content of the protection policies is not described in the RBMPs and can therefore not be compared. Of note is that groundwater protection areas are mostly larger than in the Netherlands (usually the catchment area).

Specific measures for the drinking water function of groundwater are not included in any of the RBMPs.

The focus on *surface water* used for drinking water production is minimal in all the RBMPs, as is therefore the identification of and procedure for dealing with problem substances. In this too, the Dutch RBMPs are comparable with the plans of the other Member States in the Rhine and Meuse river basins. It should be noted that the selection of drinking water-relevant substances in both the Netherlands and Flanders has been identified as a knowledge gap.

Consultation meeting

The results of this report were presented and discussed during a meeting attended by representatives of the Dutch provinces, drinking water companies, water managers, Directorate for Public Works and Water Management/Water Service and the Ministries of Housing, Spatial Planning and the Environment and of Transport, Public Works and Water Management. The findings of this report were endorsed, and a number of suggestions were made regarding future activities with regards to discussion at an international level, the production of a list of substances and data availability, the production of drinking water protection files and the implementation of existing policy such as the Diffuse Source Implementation Programme and general pollutants policy.

Recommendations

A number of gaps have been identified in the RBMPs of the Rhine and Meuse concerning the drinking water objectives (Article 7). These can be defined and addressed as following:

- The substances and their sources relevant to the production of drinking water from surface water should be identified in accordance with the procedure described in Guidance Document No. 3 (WFD, 2003). The steps involved in this procedure are shown in Box 9.1.
- This analysis is well suited to the creation of drinking water protection files for surface water abstraction sites used for the production of drinking water, and may also serve as an input to the following WFD planning cycle. Considering the significant public interest attributed to drinking water sources in the Dutch Drinking Water Act, this process should be started soon.
- Should pollutants be seen to be relevant at several abstraction sites, the decision must be made as to whether general policy measures should be taken.

- The monitoring method (maximum, 90th, 92nd, percentile or arithmetic average) and trend assessment partially determine whether measures need to be taken for particular substances. This needs to be clarified in the yet to be drawn up ministerial decree.
- The resulting drinking water-relevant pollutants selected should also be discussed internationally in relation to the concept *no shifting*.
- The temperature standard should also be discussed at international level. Various values are applied for this standard in the RBMPs. In addition, each surface water abstraction site should be analysed for regional issues that may be better served using a tailored approach.

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1 Introduction

The implementation of the European Water Framework Directive (WFD, 2000/60/EC) influences the protection and availability of drinking water resources, now and in the future. The WFD aims to ensure the sustainability of water systems and requires that bodies of water used for the abstraction of water for human consumption are included in the *Register of protected areas*. Member States are also required to take appropriate measures to treat water abstracted for human consumption, in accordance with the Drinking Water Directive (98/83/EC), initially using the existing treatment system and, in time, with a reduction in the level of purification treatment required.

The majority of Member States published their river basin management plans (RBMPs) at the end of 2008, and in doing so, the ambitions of neighbouring countries were made clear. The Dutch Ministry of Housing, Spatial Planning and the Environment (VROM) has asked RIVM to assess drinking water-related aspects of the river basin management plans of Member States in the Rhine and Meuse river basins. The discussion of these plans in this report is based on the following two questions:

- How are the WFD drinking water objectives (Article 7 and Article 11, Paragraph 3, Section d) addressed in the plans?
- What contribution do the plans of neighbouring countries make to a reduction in quality issues in the production of drinking water from surface waters in the Netherlands?

The second question specifies surface water, as upstream activities and ambitions have a large influence on the quality of surface water and river bank groundwater. Groundwater quality, however, is determined by activities and circumstances that take place on a different spatial scale, that is, within the catchment area which, for most abstraction areas in the Netherlands lies within the country's borders. The activities of neighbouring countries therefore only influence the abstraction of groundwater in areas near the border with other countries.

In this report, the river basin management plans of the Member States in the Rhine and Meuse river basins are collated and broadly assessed in terms of the already-mentioned drinking water-relevant aspects. The plans themselves form the basis of this assessment; supporting background documentation is not used.

1.1 Objectives

The analysis carried out in this report has two objectives:

- To identify knowledge gaps regarding the realisation of the drinking water objectives set out in the current river basin management plans. The national drinking water policy document (in Dutch, *Beleidsnota Drinkwater*, in preparation under the new Dutch Drinking Water Act) could also be based on this information (please also refer to the *ontwerp-Nationaal Waterplan*, 2008 – in Dutch).
- To compare the Dutch approach with that of other Member States: how does the ambition level of the Netherlands compare with that of other Member States in the Rhine and Meuse river basins: is it higher, similar or lower?

1.2 ACT*eon*/Ecologic analysis

ACT*eon*/Ecologic (Grandmougin et al., 2009) compared the implementation of the WFD in various Member States, in parallel with this project and commissioned by the Dutch Ministry of Transport, Public Works and Water Management (V&W). The drinking water objectives were however not included in the comparison, which was conducted based on nine questions:

1. Does the size of a body of water influence the way in which the WFD is implemented?
2. How is a body of water delineated?
3. What are the most significant pressures on the water system?
4. What is the current status of the bodies of water and, therefore, the benchmark for the RBMPs?
5. How are the environmental objectives defined?
6. How are improvement programmes developed?
7. What are the costs?
8. Who pays the costs?
9. Are improvement programmes and the related ambition level a source of political debate?

These questions were answered based on the RBMPs, interviews and expert knowledge. The questions are also partly relevant to the assessment carried out in this report, in particular:

- the delineation of bodies of water (Section 4.1);
- the development of improvement programmes (Chapter 8);
- objectives related to temperature (Section 6.2.1);
- ambition levels and the decision-making process concerning the implementation of measures (Section 7.2.1 and Chapter 8).

Where applicable, comparisons made with the findings of Act*eon*/Ecologic are shown in *italics*, with the relevant sections of this report shown between brackets.

The general conclusion drawn in the report is that the RBMPs examined lack detail, making it impossible to derive explanations for processes from the plans alone. It was therefore decided to extend the analysis to include interviews and expert input. This conclusion is also emphasised in this report. It also means that it is difficult for the European Commission to assess the extent to which the RBMPs meet WFD objectives.

1.3 Report plan

Whilst going through the river basin management plans, it became evident that it was still not absolutely clear which pollutants can present a problem to the drinking water supply in the Netherlands. On the one hand, there is the legislative framework formed by the Decree on quality objectives and monitoring in water (DQOMW, in preparation, in Dutch *Besluit Kwaliteitseisen en Monitoring Water*) that directly implements Directive 75/440/EEC on the quality required of surface waters used for the abstraction of drinking water in Member States. The pollutants included in Directive 75/440/EEC were chosen based on the situation in the 1970s and the analysis techniques available at the time. This list of pollutants is therefore dated and its relevance, in terms of the pollutants that currently form a problem for the drinking water supply, is limited. On the other hand, drinking water companies have drawn up lists of pollutants that currently cause problems, based on their own monitoring data (De Rijk et al., 2009; RIWA, various annual reports), with a simple purification process as their quality objective.

Questions that arise from these studies are:

- Is there any assurance that the most relevant pollutants are monitored?
- Is it realistic to aim for a simple water purification process in a sediment delta area?

This last question refers to the quality risk from accidental spillages and the microbiological safety of the drinking water produced.

A summary is therefore first given in Chapter 2 of this report on the approach proposed by the European Commission for the selection of relevant pollutants for the purpose of the WFD. This is followed in Chapter 3 by a description of the application of this approach to the specific drinking water objectives set out in Article 7 of the WFD. In Chapter 4, the procedure followed by the Netherlands in the selection of drinking water-relevant pollutants is described and compared with the proposed approach of the European Commission. This exercise resulted in the discovery of a number of knowledge gaps. A proposal is therefore made in Chapter 5 for a procedure to document drinking water-relevant pollutants in the Netherlands, which would also provide an assessment framework for the river basin management plans. Drinking water-relevant aspects of the river basin management plans of the Member States in the Rhine and Meuse river basins are then described in Chapters 6 and 7. Chapters 8 and 9 describe the results and general conclusions and recommendations, respectively.

2 Water Framework Directive

2.1 Quality objectives

The WFD (2000/60/EC) aims to achieve a good chemical, ecological and hydromorphological status for surface waters and a good quantitative and qualitative (chemical) status for groundwater (Figure 2.1). Groundwater forms part of the hydrological system in a river basin. Groundwater aspects are further defined in the Groundwater Daughter Directive (GWDD, 2006/118/EC). The WFD 'good status' can be described as a water quality standard, and a quality standard is, under European law, considered an obligation to achieve a result (Van Rijswick, 2001).

The WFD recognises many instruments to enable this good status to be achieved, including prohibitions, quality standards, emission limit values, permits, 'supplementary' measures, river basin management plans, financial provisions, and so on. Some instruments are obligatory under the WFD; others are optional. Compared with the previous directive, the new directive provides Member States with improved consistency (such as coordination with upstream sub-basins) and flexibility in the application of the various instruments. This flexibility also applies to the definition of national objectives for good ecological status or good ecological potential. On the other hand, the ultimate objective, a good status for waters in the European Community, is a fixed requirement.

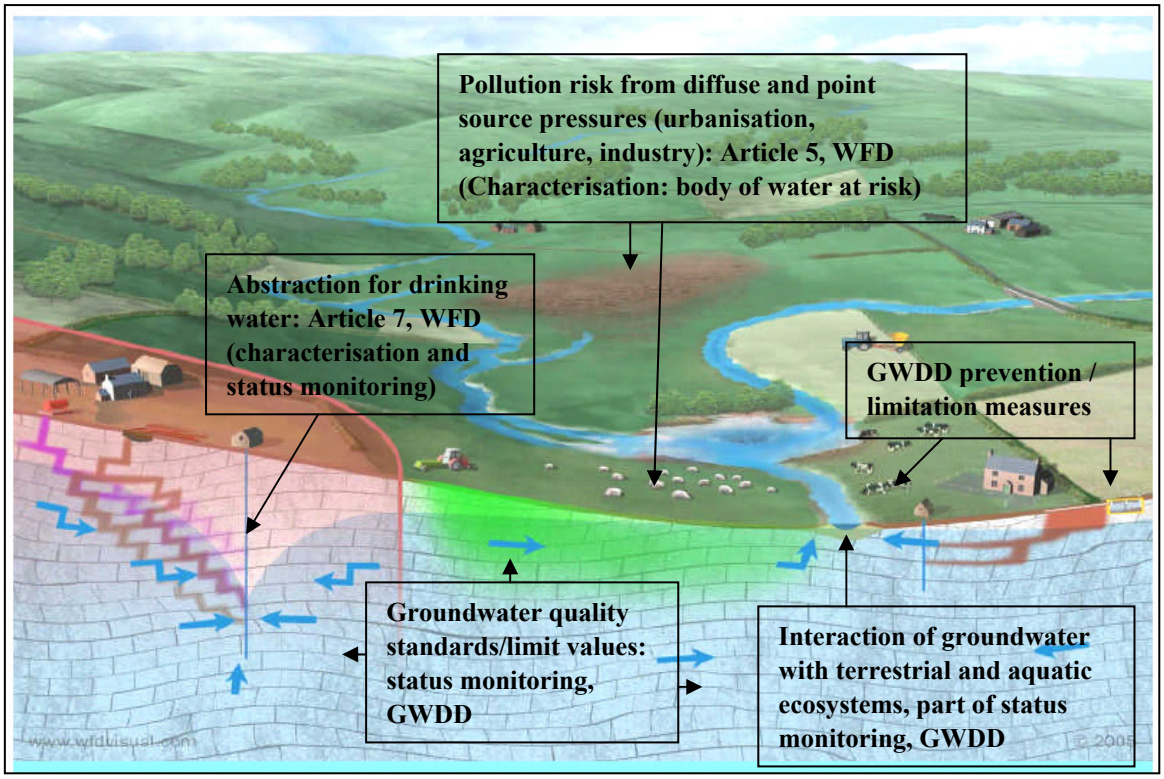


Figure 2.1 **WFD and GWDD objectives in the groundwater system (source: www.WFDVisual.com).**

2.2 System for the selection of relevant pollutants

The selection of pollutants for which quality standards must be defined takes place at the river basin level, as different pollutants may be relevant for meeting quality standards in different river basins. In addition, the Priority Substances Directive (2008/105/EC) contains a list of pollutants and standards that apply to all Member States (please also refer to Section 2.3).

The European Commission (EC) has also prepared Guidance Documents on various elements in the Water Framework Directive (WFD, Directive 2000/60/EC) and the Groundwater Daughter Directive (GWDD, Directive 2006/118/EC), to support their implementation in the Member States. Guidance Document No. 3, Analysis of Pressures and Impacts in accordance with the Water Framework Directive (WFD, 2003), provides guidance in translating the 'general' objectives of the WFD concerning achieving a 'good status' into specific chemical quality objectives. The relevant passages from this guidance document are given in this section. Together, these passages give an idea of the path to be followed in selecting pollutants relevant to achieving a 'good status'.

The selection of relevant pollutants is part of the characterisation of a body of water (also called 'at risk' determination), which involves estimating whether a body of water will have achieved a good status by the end of the coming planning period. If not, the body of water is labelled 'at risk'. According to the guidance document, characterisation broadly involves the following steps:

- the identification and description of river basins, sub-basins and bodies of water;
- the identification of emission sources and resulting pollutants released into the water;
- an estimate of whether these pollutants could be responsible for meeting or not meeting the objectives (relevance);
- an estimate of the uncertainty in the assessment;
- the definition of a body of water is 'at risk' or not.

Top-down and bottom-up

This characterisation process is called the top-down approach in the guidance document. This means that the approach starts with the pressures (top), which are translated into the impact on the receptors (down). The second approach described is the bottom-up approach, in which an observation of an impact on a receptor (bottom, for example a trend in a drinking water well or an effect in a bioassay) is translated back to the pressures (up). The guidance document does not however address this approach in detail. Both methods are used in combination to achieve the best possible understanding possible of what the relevant pollutants are in a sub-basin or river basin.

Criteria for the selection of pollutants

A pollutant is considered relevant for the purposes of the WFD if the presence of the pollutant is thought to result in the objectives not being met, or if there are many uncertainties involved in the estimate (please also refer to Box 2.1 and Figure 2.2). The status of the body of water is assessed and improvement measures developed for these pollutants within the river basin management plan.

Various sources of information are described for the identification of pollutants that may be released during emissions:

- The list of pollutants in Annex VIII of the WFD. This includes an indicative list of the main pollutants, though it should not be considered exhaustive.
- An analysis of all available information on pollution sources, the production and uses of pollutants and the impact the discharge of these pollutants has on the environment.

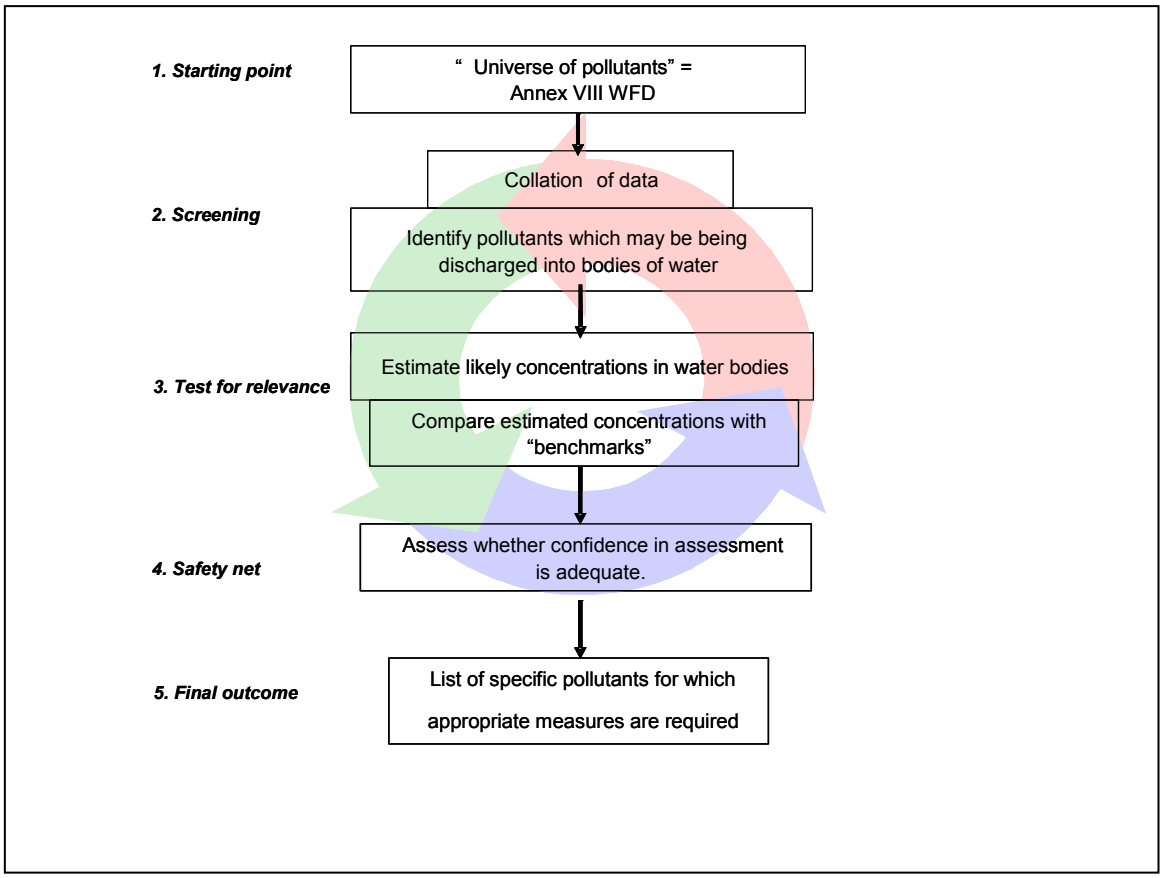


Figure 2.2 **A step-by-step approach to the selection of relevant pollutants based on emission source research (Guidance Document No. 3, Analysis of the Pressures and Impacts in accordance with the Water Framework Directive, page 41, 2003).**

Box 2.1 **The selection of relevant pollutants (Guidance Document No. 3, Analysis of Pressures and Impacts in accordance with the Water Framework Directive, 2003).**

page 37, 3.5 Selecting relevant pollutants on river basin level
It will be necessary to follow a three (or more) stage approach in order take account of the different scales of pollution problems in the aquatic environment:

- European level: the 'priority substances' (Annex X) represent a list of European relevance.
- River basin (district) level: a list of those relevant pollutants may be established which are likely to have a 'risk of failing the objectives' in a large number of water bodies within that basin and where downstream effects (including the marine environment) may need to be considered.
- Sub-river basin and water body level: pollutants which cause an impact through a significant regional and local pressure, for example in one or few waterbodies.

The starting point in the WFD is the list of 'main pollutants' mentioned in annex VIII.
The challenge is to develop an iterative approach which narrows the endless list of substances down to a manageable number of pollutants in a pragmatic and targeted step-by-step way (from coarse to fine).
First, a list of pollutants needs to be established for which the pressure and impact analysis is carried out (completed by 2004).
Second, the selection of those pollutants is required for which additional information is gathered through 'surveillance monitoring' (by 2006).
Finally, the list of relevant pollutants must be identified for which measures are prepared (by 2007/2008).

page 39, 3.5.2 Generic Approach
The generic approach to the identification of specific pollutants:

- The indicative list of the main pollutants set out in Annex VIII of the Directive. Only those pollutants under points 1 to 9 need further consideration as potential specific pollutants.
- A screening of all available information on pollution sources, impacts of pollutants and production and usage of pollutants in order to identify those pollutants that are being discharged into water bodies in the river basin district.
- Collation of information
  Data:
  - Source/sectoral analyses: production processes, usage, treatment, emissions;
  - Impacts: change of the occurrence of pollutants in the water body (water quality monitoring data, special surveys;
  - Pollutants: intrinsic properties of the pollutants affecting their likely pathways into the water environment.

  Information from existing obligations and programmes:
  Priority substances, 76/464, UNEP POPs list, EPER, COMPPS, Results of 793/93, users lists, etc.
- Pollutants will be selected by the combination of a top-down and bottom-up approach. …

2.3 Standards

Standards are set at four levels in the WFD – at European, river basin, national and water body level.

European level

Standards are set at European level for pollutants that are relevant to most Member States. These standards are defined for surface water in the Priority Substances Directive (2008/105/EC). This directive contains a list of 33 priority substances. Annex III of the directive contains an additional list of 13 pollutants for which it needs to be established whether or not they should be identified as priority substances. The community standards for groundwater are defined in Annex I of the GWDD. These standards do not take into account the objectives for special functions such as abstraction for the production of drinking water; this is left up to the Member States. The WFD also states that the level of protection should be at least equivalent to that provided by other earlier acts (2000/60/EC, Recital 51 and Article 4, Paragraph 9). Though Member States may set more stringent standards for the protection of drinking water than those defined in the Priority Substances Directive, it is only possible to set less stringent standards under certain conditions (2000/60/EC, Article 4, Paragraph 5). It is also possible to define stricter limit values for the substances included in Annex I of the GWDD.

National and river basin level

The Netherlands has implemented each of the standards contained in the Priority Substances Directive in the draft Decree on quality objectives and monitoring in water (DQOMW, published in the *Staatscourant* (Government Gazette), 6 November 2008). As far as the river basin level standards are concerned, the Netherlands takes the approach that it aims to reach agreement with neighbouring countries where possible and to make the standards uniform across the various river basin districts. This approach is based on the lists of substances included in the Dutch Regulations on the Environmental Quality Requirements for Hazardous Substances in Surface Waters (in Dutch, *Regeling milieukwaliteitseisen gevaarlijke stoffen oppervlaktewateren*, *Staatscourant* (Government Gazette) 2004, no. 247, p. 34), the Dutch Decree on quality objectives and monitoring in surface waters (DQOMSW, 1983, in Dutch *Besluit Kwaliteitsdoelstellingen en Metingen Oppervlaktewater*), Annex D of the Dutch Drinking Water Directive (in Dutch, *Waterleidingbesluit*) and the Directive concerning the quality required of surface water intended for the abstraction of drinking water (75/440/EEC). This is addressed further in Section 4.3.

Water body level

Environmental objectives can be defined for both individual bodies of surface water and individual bodies of groundwater. For groundwater, threshold values can be set for each body of groundwater. This means that the level of the threshold value for a pollutant, as well as the type of pollutant selected for the definition of a threshold value, may vary according to groundwater body. As far as bodies of surface water are concerned, ecological objectives differ for some parameters.

3 Drinking water in the Water Framework Directive

3.1 Drinking water objectives (Article 7)

The WFD sets three obligations regarding drinking water (please also refer to Appendix I):

- Article 7, Paragraph 1 of the WFD states that bodies of water used for the abstraction of water intended for human consumption or intended for such future use must be identified. These bodies of water are to be included in a register of protected areas (Article 6, Paragraph 2). Article 2, Paragraph 10 defines a 'body of surface water' as follows: 'a discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water or a stretch of coastal water'. According to this definition, a body of surface water has a certain size, and therefore a defined limit within the river basin and so cannot be characterised as a point.
- Article 7, Paragraph 2 then states that Member States are to ensure that the ecological and chemical objectives (quality standards) are achieved so that drinking water can be produced that meets the requirements of Directive 98/83/EC.
- Article 7, Paragraph 3 states that Member States shall ensure the necessary protection of bodies of water, with the aim of avoiding deterioration in their quality, to be able to reduce the level of purification treatment required in the production of drinking water. Safeguard zones may be established for these bodies of water.

The WFD states that measures that need to be taken to achieve the drinking water objectives belong to the 'basic measures'. These basic measures form the minimum requirements that Member State programmes must satisfy in their RBMPs (Article 11, Paragraph 3, Section d). There is still much discussion concerning the interpretation of Article 7, Paragraph 3, which focuses on the question whether:

- a reduction in the level of purification treatment should be regarded as the physical removal of purification processes or the observation of significant downward trends in raw water quality;
- a reduction in the level of purification treatment should be regarded as an objective to perform to the best of one's ability or to achieve a result.

The interpretation of Article 7, Paragraph 3 for *groundwater* was discussed in *Dutch guidance for assessing the chemical status of groundwater bodies* (Zijp et al., 2009). For bodies of groundwater, Article 7, Paragraph 3 is evaluated during the characterisation process and in the appropriate research carried out when assessing the groundwater body status.

If a threshold value is exceeded at a monitoring location in the WFD groundwater quality monitoring network, appropriate research is to be conducted into the extent of the pollution, possible intrusions and the effect of the pollution on various receptors. This is detailed in five tests. One of the tests concerns compliance with Article 7, Paragraph 3 of the WFD and Article 4, Paragraph 2, Section c of the GWDD.

Two approaches have emerged from the discussion:

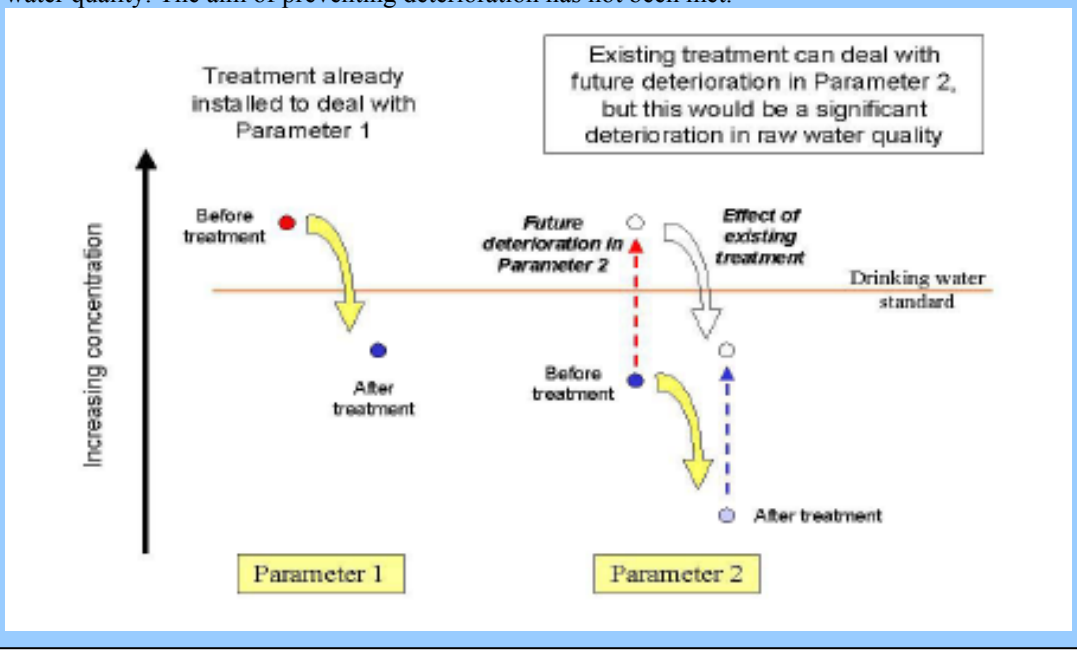
1. The reduction in the level of purification treatment required is due to the prevention of a decline in raw water quality. This means that the focus is primarily on preventing a decline in raw water quality, and that a reduction in the level of purification treatment required may then follow. Assessment takes place based on trends.
2. The realisation of a 'simple purification process' becomes an objective in itself and assessment takes place based on target values (in Dutch: *streefwaarden*) set for this purpose.

Article 7, Paragraph 3 is interpreted as follows in Guidance Document No. 16 *Groundwater Aspects of Protected Areas under the Water Framework Directive* (WFD CIS, 2007):

- Member States must ensure that they avoid a deterioration in the quality of a groundwater body, to prevent an increase in the level of purification treatment required.
- The risk of deterioration in quality is to be assessed for all the individual parameters listed in the Drinking Water Directive. If treatment is implemented to deal with a certain parameter, this does not mean that the quality may deteriorate for other parameters (see Box 3.1).
- Member States must take measures (including protection), that aim for a future improvement in groundwater quality can be expected. Ideally, they would also result in a reduction in the level of purification treatment required.

Box 3.1 Interpretation of Article 7, Paragraph 3 (Guidance No. 16, WFD CIS, 2007).

page 13 … In practice, avoiding deterioration in the quality of a groundwater body would not in itself necessarily result in the reduction in the level of purification treatment that may be required to produce drinking water. An improvement in quality would be needed to reduce treatment. However, it is clear that there is an intention to avoid deterioration in groundwater quality, as a minimum. Ideally, the protection should be sufficient that, through time, purification treatment can be reduced. […]
Figure 2 illustrates a case where treatment is already installed to deal with an existing water quality problem (which may arise from natural or anthropogenic contamination), so that the drinking water standard can be met for contaminant 1. This treatment could also deal with a future deterioration in contaminant 2. However, this disguises the fact that there has been a significant deterioration in raw water quality. The aim of preventing deterioration has not been met.



The guidance document therefore focuses on an improvement in groundwater quality, which possibly also results in a reduction in the level of purification treatment required. The *Dutch guidance for assessing the chemical status of groundwater bodies* has the same focus. Article 7, Paragraph 3 is assessed using a trend analysis of the raw water quality.

Surface waters have not yet been discussed to the same extent as groundwater. Based on Annex II of the WFD, water abstracted from surface waters for human consumption should also be included in the characterisation process (Paragraph 1.4 *Identification of Pressures* and Paragraph 1.5 *Assessment of Impact*; Annex II, WFD; 2000/60/EC).

3.2 Selection of drinking water-relevant pollutants

Pollutants that are relevant in terms of meeting the objectives set out in Article 7 are selected based on the list of substances in the Drinking Water Directive (98/83/EC) and, in the Netherlands, in the Dutch Drinking Water Directive (in Dutch, *Waterleidingbesluit*). The Dutch Drinking Water Directive indicates that it is neither practicable nor advisable to define standards for every anthropogenic pollutant found in the environment. However, some kind of framework is required, to ensure the safety of and consumer confidence in drinking water. A table of indicator parameters (Table IIIc) is therefore included in the Dutch Drinking Water Directive. These groups of substances are in fact indicators for undesirable anthropogenic pollutants in drinking water. Should any new substance be found in water that is intended for treatment, this is further investigated and appropriate measures are taken (Box 3.2). The selection of drinking water-relevant pollutants should therefore not only be based on existing drinking water legislation, but the contribution from emissions should also be documented, as described in Section 2.2.

Box 3.2 Implementation of drinking water standards (Dutch Drinking Water Directive, 2001).

Standards for pollutants listed in the Dutch Drinking Water Directive are defined based on the following three considerations:

- the health risk (the substance is relevant from a human toxicology point of view);
- organoleptic problems (odour, taste or colour of drinking water);
- consumer confidence (precautionary principle for drinking water).

Frequently, new substances are reported that cannot be removed using existing water treatment techniques (for example, some medicines). Evidence for these substances is found, for example, in publications or in screening tests. There are often no standards available for these substances. In such cases, further research into the occurrence and nature of the substance is carried out at the request of the regulator (Ministry of VROM Inspectorate) and a standard *may* be defined based on the findings of this research. As it is unrealistic (feasible/enforceable) to define standards for every pollutant, a risk assessment is made (chance of incidence, effect of exceedance) and the precautionary principle applied.

3.3 Effect of drinking water objectives on water body status

Drinking water objectives are linked to the Drinking Water Directive (98/93/EC) and apply to the point of abstraction. Pollutants that present a problem for the production of drinking water from groundwater and surface water should be revealed during the characterisation of sub-basins or river basins. Standards may then be defined or measures implemented. *Only in the case of groundwater* does the status of the abstraction site influence the assessment of the status of the groundwater body, through the application of the drinking water test (please also refer to Figure 3.2), though this only applies to the pollutants for which a limit value has been defined. The WFD and the GWDD therefore differ in terms of the implications of the drinking water function.

During the characterisation process carried out under the WFD (Article 5 – reporting), *groundwater* abstracted for human consumption is assessed against the Drinking Water Directive (98/83/EC) and/or Dutch Drinking Water Directive standards and for the development of trends that may in the future result in these standards being exceeded (Article 5 – reporting). Should there be a significant increasing trend at the abstraction site and/or should the drinking water standard be exceeded by 75%, the next step is to determine whether the groundwater body as a whole is at risk (Figure 3.1) and whether a threshold value needs to be defined for the pollutant, to apply to the groundwater body as a whole. No agreements have yet been made in the Netherlands regarding how and when an exceedance in a trend or standard (75%) at an individual abstraction site would result in a groundwater body being defined as 'at risk'.

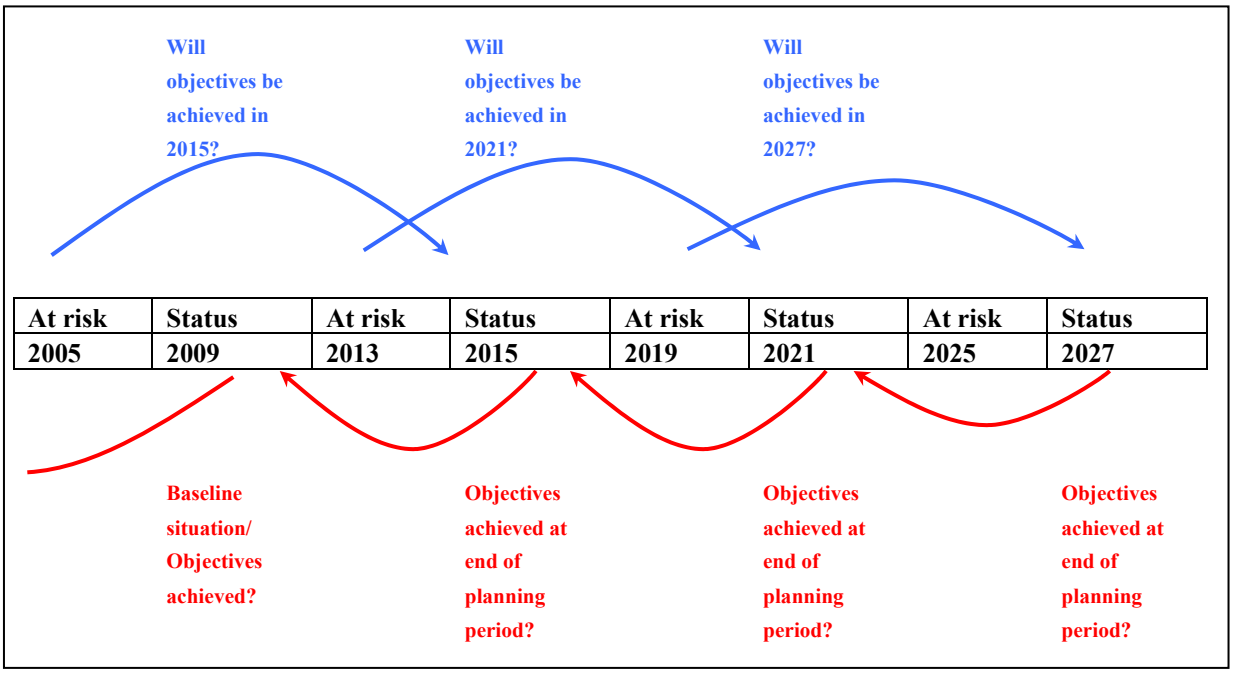


Figure 3.1 **Timetable for assessment of WFD objectives, status and 'at risk' assessment, with focus on drinking water objectives.**

Threshold values are used to assess groundwater body status and the effect of implemented measures taken during the WFD planning period. Should a threshold value be exceeded at one or more monitoring locations, five function-related tests are carried out; the drinking water test is one of these. This assesses whether there is an increasing trend in the pollutant concerned at each individual abstraction site (Figure 3.2).

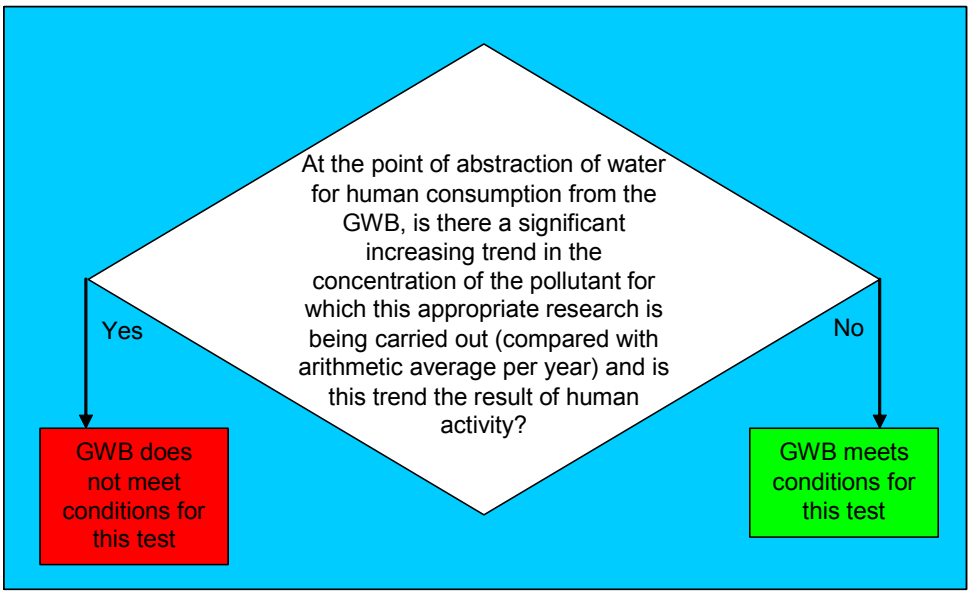


Figure 3.2 **Drinking water test as part of the 'appropriate research' for pollutant limit values under the Groundwater Daughter Directive (2006/118/EC) (Zijp et al., 2009).**

4 WFD-implementation for drinking water in the Netherlands

The previous chapters summarised the approach proposed by the European Commission for selecting relevant substances for the purpose of the WFD and described the implications of this approach for the specific drinking water objectives set by the WFD in Article 7 (Chapter 3). In this chapter, this approach is compared to the Dutch implementation of characterisation of the sub-basins and the formulation of quality objectives and programmes of measures.

4.1 National implementation of drinking water objectives

Article 7, Paragraph 1

Figures 4.1 to 4.4 show the register of protected areas for groundwater and surface water in the Netherlands. These registers are comprised of bodies of water used for the abstraction of water for human consumption.

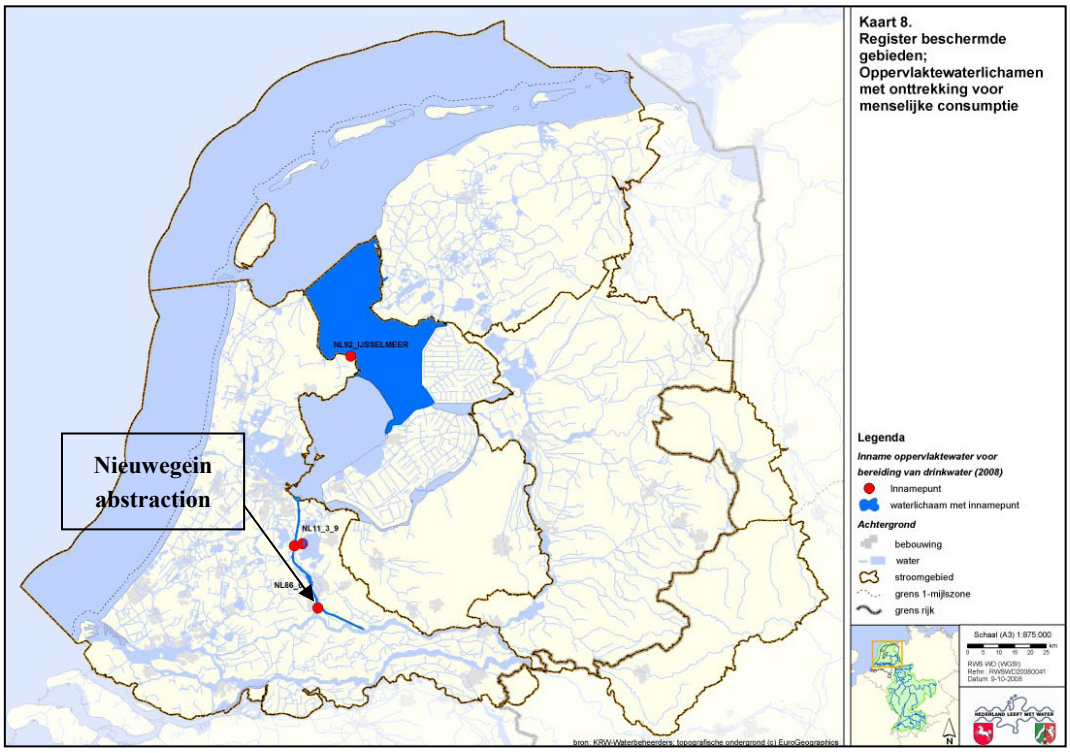


Figure 4.1 **Register of protected areas in the Rhine sub-basin; bodies of surface water used for the abstraction of water for human consumption (draft Rhine RBMP, December 2008).**

The following criteria must be applied when delineating *bodies of surface water* (in accordance with Annex II of the WFD, as described in the Rhine Delta Basin District Report, 2005 – in Dutch, *Karakterisering Werkgebied Rijndelta*):

- the body of surface water must be made up of surface water;
- over 80% must be of the same surface water type, for example lakes, rivers, transitional waters or coastal waters;
- the body of surface water must have a single status (natural, artificial or heavily modified) and a single, ecological, objective;
- the body of surface water must be situated within a single sub-basin or river basin district.

Delineation is primarily determined by the ecological objectives, as well as the hydrological characteristics of the body of surface water. The spatial distribution of anthropogenic pressures in a body of surface water, the boundaries of protected areas (safeguard zones) and the dynamics near abstraction sites of water for human consumption are not taken into account. As a result, an abstraction site may lie upstream of a body of surface water. An example of this is the Heel abstraction site in the Netherlands (Figure 4.3), which lies almost directly upstream of a body of surface water. In general, only protective measures taken upstream of an abstraction site can improve the water quality at the point of abstraction. The bodies of surface water as included in the register of protected areas primarily serve an administrative function.

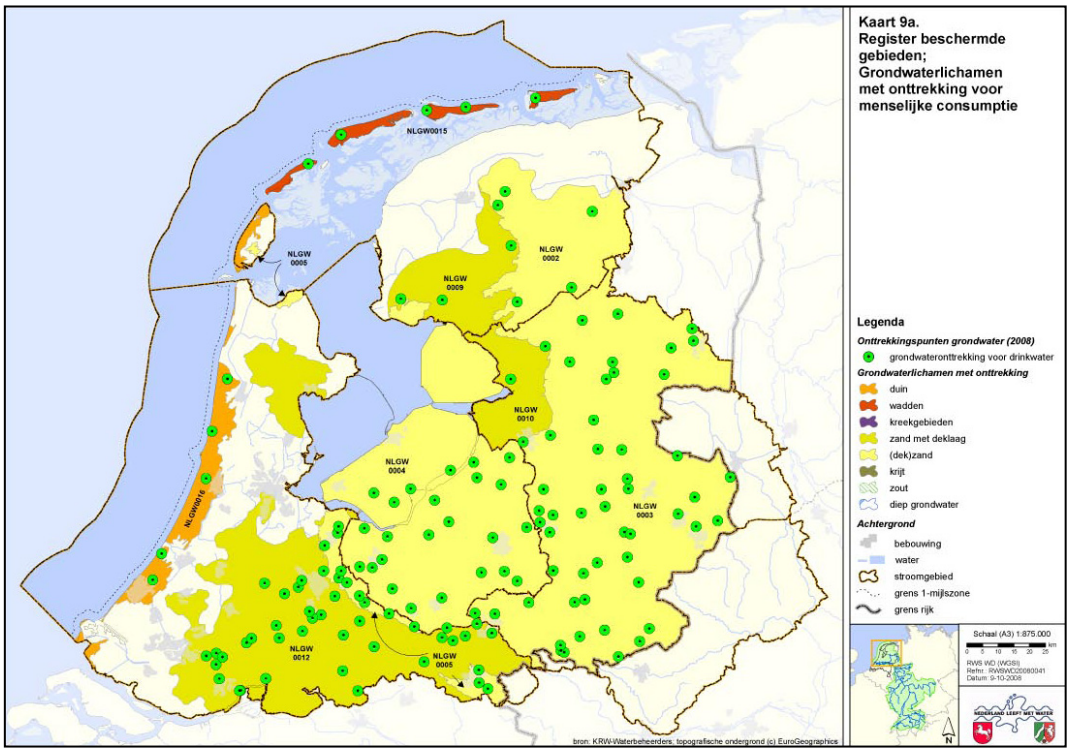


Figure 4.2 **Register of protected areas in the Rhine sub-basin; bodies of groundwater used for the abstraction of water for human consumption (draft Rhine RBMP, December 2008).**

ACTeon/Ecologic (Grandmougin et al., 2009) has found that Member States differ greatly in their delineation of bodies of water, mainly due to the methodology applied; the geography of the area is of limited influence. The size of a body of water is directly related to the level of detail of the RBMPs and the extent to which quality issues are apparent in the body of water.

For groundwater abstraction, the catchment area almost always lies within the boundaries of a single groundwater body. Only one catchment area in the Netherlands used for the abstraction of water for human consumption is spread over two bodies of groundwater (Valtherbos, over Zand Rijn Oost and Zand Eems). The volume of a groundwater body is a multiple of the volume of the catchment area of an abstraction site.

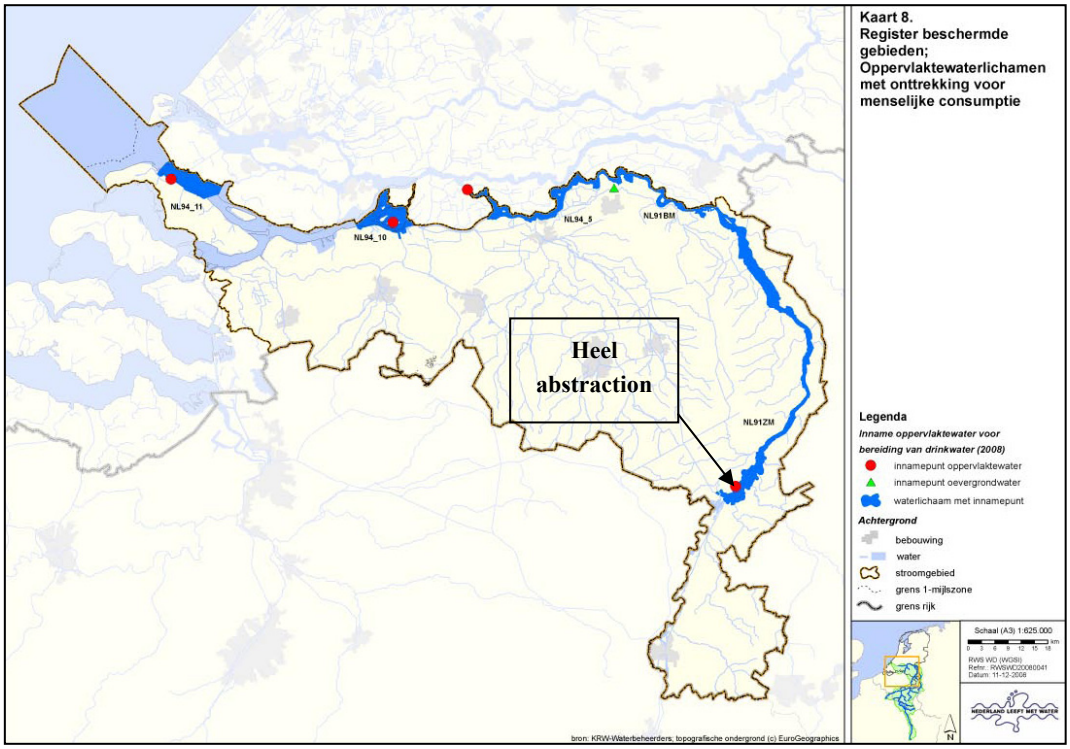


Figure 4.3 **Register of protected areas in the Meuse sub-basin; bodies of surface water used for the abstraction of water for human consumption (draft Meuse RBMP, December 2008).**

Article 7, Paragraph 2

The quality of drinking water in the Netherlands is good (Versteegh et al., 2007). This means that the quality of the abstracted groundwater or surface water, together with the purification system used, is sufficient to be able to produce healthy and safe drinking water that satisfies the standards set in the Dutch Drinking Water Directive.

About half of the groundwater abstraction sites in the Netherlands have a good status (Rhine Delta RBMP, 2008). Increasing trends that could result in an increase in the future level of treatment required have been detected in about a quarter of the abstraction sites[1] where further monitoring is required. Drinking water standards have been exceeded in one or more abstraction wells in the other quarter of the abstraction sites, resulting either in operational changes or developments in the water treatment process to ensure the continued production of good quality drinking water. The percentage of abstraction sites that does not have a good status can vary by sub-basin district.

[1] When formulating the RBMPs, it became clear that there are regional differences in approach. The national basin area coordinator therefore decided to harmonise the assessment of the abstraction sites for the final version of the RBMPs.

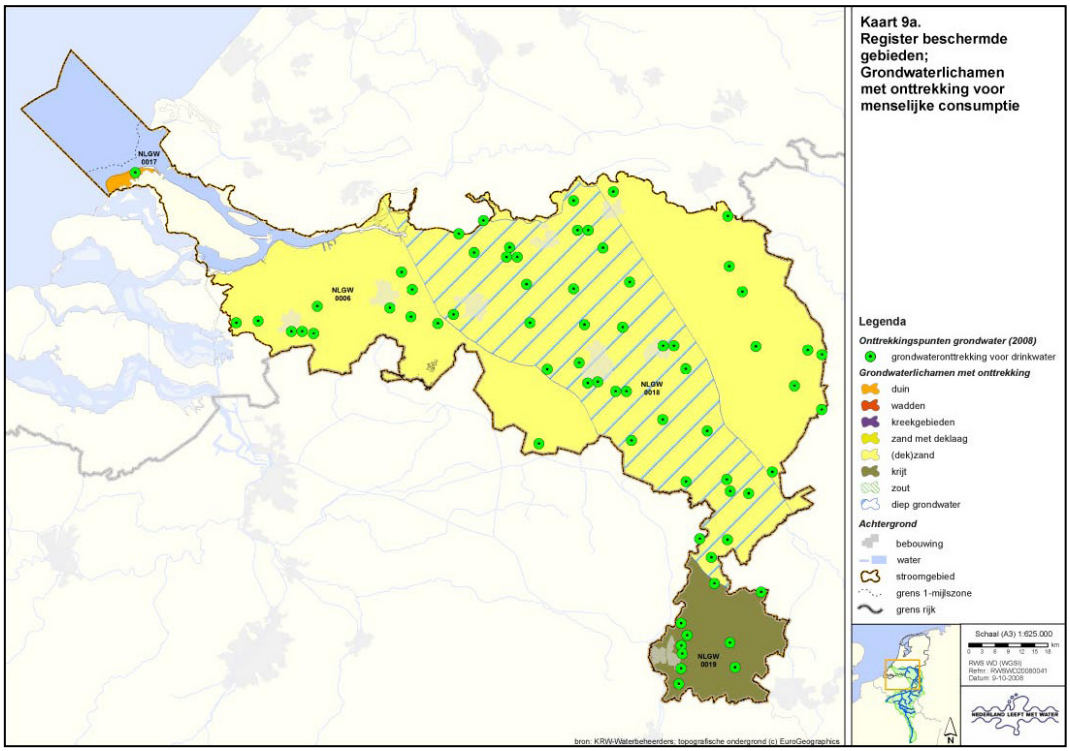


Figure 4.4 **Register of protected areas in the Meuse sub-basin; bodies of groundwater used for the abstraction of water for human consumption (draft Meuse RBMP, December 2008).**

As far as surface water abstraction is concerned, the quality can at times (a few days to a few weeks) become so poor that it is no longer possible to abstract surface water (please also refer to Appendix III). Water companies have alternative sources available for the production of drinking water, though usually with a lower production capacity. The capacity of these emergency sources is also limited in time, from a week to a few months, though this varies by location.

The Dutch situation with reference to Directive 75/440/EEC was reported on in the 'last' EU Water Report[2] (*Europese Unie-Waterrichtlijnen*, Reporting Period 2002-2004, 2006). The report discussed the locations used for the direct abstraction of surface water for drinking water production and not the water quality of river bank groundwater abstraction. The report has the following to say about monitoring: […] (H6 A.1b) No standards were exceeded in the period 2002-2004 and all parameters satisfied the category III[3] standard. The category II-I standard was however exceeded in seven cases: in 2002 for total water vapour volatile phenols at the locations Andijk and Brakel and total Borneff 6 PAHs at the location Nieuwegein, and in 2004 for total water vapour volatile phenols at the locations Andijk, Keizersveer and Nieuwegein and total Borneff 6 PAHs at the location Nieuwegein. Other than in the period 1999-2001, the location Andijk does satisfy the standard for chloride in the period 2002-2004 […].

[2] These reports have now been replaced with the reports based on the Water Framework Directive (2000/60/EC).

[3] Standards for a complex level of water treatment. Other levels are simple (category I) and normal (category II). Please also refer to Footnote 4.

Article 7, Paragraph 3

In the Dutch RBMPs, the preventative, protective policy for *groundwater abstraction* is considered to guarantee drinking water quality, thereby implementing Article 7, Paragraph 3 – the avoidance of deterioration and the objective of future improvement. However, trend reversals at sites at which water is abstracted for human consumption are also taken into account when conducting appropriate research to assess groundwater body status, though this only concerns those pollutants relevant at groundwater body level and for which threshold values have been defined.

The concept of quality improvement is not defined in any more detail for the abstraction of water for human consumption from surface waters. According to the draft Dutch plan for the management and development of the waters and waterways for 2010-2015 (in Dutch, *Beheer- en Ontwikkelplan voor de Rijkswateren 2010-2015*, December 2008), this concept should be developed using the drinking water protection file (DWPF). This is not mentioned in the RBMPs, though it is mentioned in the National Water Plan (p. 122).

4.2 Selection of drinking water-relevant pollutants in the Netherlands

Selection of the relevant pollutants takes place during characterisation of the river basins. Bodies of water and their pressures, for example, are described in the *Rhine Delta Basin District Report* (in Dutch, *Karakterisering Werkgebied Rijndelta*, Main Report, 2005). A similar approach is taken for the other Dutch sub-basin districts of the Meuse, Eems and Scheldt.

The following emission sources are described for surface waters:

- point sources:
  - STPs;
  - WTPs.
- diffuse sources:
  - traffic (run-off from roads and water);
  - run-off from natural ground surfaces;
  - agricultural emissions;
  - atmospheric deposition.
- pollutants from upstream.

The pollutants that could result in exceedance were selected for these sources. The ‘top 12’ pollutants were selected, based on expert opinion and the availability of monitoring data. This top 12 includes indicator parameters for pesticides, a number of priority substances and a few other substances (Table 4.1). The sources identified were investigated for the presence of these top 12 substances. The following were not included in the selection:

- substances for which it is not yet known whether they might be released during certain activities;
- substances which probably do not result in exceedance;
- substances for which no standards are available.

It was found, based on monitoring data from the Rhine for the period 2004-2008, that these substances are of limited relevance to the production of drinking water from surface water, given the current water quality.

Table 4.1 **Top 12 river basin-relevant pollutants for the Rhine Delta (Characterisation Main Report, 2005) and an indication of whether these substances present a problem for the abstraction of water for drinking water production (based on monitoring data 2004-2008).**

Substance	Notes	Forms problem for drinking water according to monitoring data (2004-2008)?
Benzo(a)pyrene	Priority substance (WFD Annex X)	No
Fluoranthene	Priority substance (WFD Annex X)	No
Benzo(k)-fluoranthene	Priority substance (WFD Annex X)	No
Nickel	Priority substance (WFD Annex X)	No
Copper	Specific parameter for ecological status evaluation	No
Total N	To support ecological status	No
Total P	To support ecological status	No
Zinc	Specific parameter for ecological status evaluation	No
PCBs	Specific parameter for ecological status evaluation	No
Carbendazim	Pesticide indicator as most commonly applied, most damaging to the environment and exceedance in drinking water standards	No
Primicarb		No
MCPA		No

A list of river basin-relevant pollutants has been similarly drawn up for the Dutch river basin district of the Meuse (Table 4.2).

Table 4.2 **Relevant pollutants for the Meuse river basin (Dutch Meuse Basin District Report – in Dutch, *Karakterisering Nederlands Maasstroomgebied*, 2005) and an indication of whether these substances present a problem for the abstraction of water for drinking water production (WFD, 2008).**

Substance	Notes	Forms problem for drinking water according to monitoring data (WFD, 2008)?
Cadmium	Priority substance (WFD Annex X)	No
Lead	Priority substance (WFD Annex X)	No
Diuron	Priority substance (WFD Annex X)	Yes
Isoproturon	Priority substance (WFD Annex X)	Yes
PAHs	Priority substance (WFD Annex X)	No
Chlorpyrifos	Priority substance (WFD Annex X)	No
Total N	To support ecological status	No
Total P	To support ecological status	No
Copper	Specific parameter for ecological status evaluation	No
Zinc	Specific parameter for ecological status evaluation	No
PCBs	Specific parameter for ecological status evaluation	No

Based on the Groundwater Daughter Directive (2006/118/EC), Member States may set threshold values for each body of *groundwater*. A threshold value is set for a pollutant if the presence and quantity of the substance means that the 'good status' of the body of groundwater is threatened. A good status is based on two protection objectives, which are:
1. the aquatic and terrestrial ecosystems dependent on the body of groundwater;
2. the use of groundwater for human consumption.

The relevant pollutants emerge during characterisation of the river basins, which includes the description of the pressures and effects on the groundwater system (please also refer to Section 2.2). Threshold values are determined by the receptor requiring the highest level of protection (Verweij et al., 2008). Until now, the selection of pollutants requiring threshold values has been based on a pragmatic approach, using monitoring data from the Netherlands Groundwater Monitoring Network (NGMN, Verweij et al., 2008) and not data from drinking water abstraction sites or based on pressures on the groundwater system. This selection could be extended to include other drinking water-related substances for the following planning period.

4.3 National standards for drinking water sources

Standards are defined in the DQOMW (draft Decree on quality objectives and monitoring in water, published in the *Staatscourant* (Government Gazette), 6 November 2008) for *surface water* used for drinking water production. The DQOMW links these standards to the level of treatment. For surface water, the principle of no deterioration is defined as a shift to a lower status (please also refer to Box 4.1).

The presence of new substances, even if no standards have been set for them, can influence the required level of treatment. The DQOMW states that: '…In that case deterioration does not necessarily take place, because the increase in treatment level is not directly linked to an increase in the concentration of these substances in the water, but to the discovery of the substance in question. On the other hand, there are other substances which are known to be present in surface waters and which are undesirable for drinking water production, but for which no standards are available and for which there is as yet no intention to derive such standards…' The concept 'no deterioration' for surface water is therefore approached differently than that for groundwater (Guidance DWPAs, 2007; please also refer to Box 3.1). The implications and desirability of this difference should be further investigated.

The DQOMW is compared with the current DQOMSW in Table 4.3. The DQOMSW applies quality objectives rather than guide values (in Dutch: *richtwaarden*) and target values (*streefwaarden*); these objectives are compared with the guide values and target values from the DQOMW. An indication is given of whether this implies a stricter or less strict interpretation for the substance concerned. An indication is also given of which quality class from Directive 75/440/EEC[4] the guide values and target values fall under. The guide values are higher than current standards for the parameters pH, odour, nitrates, phosphates, COD and PAHs, and lower for BOD, iron and chrome. The lower standard for PAHs means that, under new legislation, standards will be met at abstraction sites (please also refer to section 4.1), but that an incentive to take measures to improve water quality will possibly be lost.

[4] Directive 75/440/EEC applies the following categories when setting standards: the permitted threshold values increase with the complexity of the treatment process to be applied.

I: 'Simple': rapid filtration and disinfection.

II: 'Normal': coagulation, rapid filtration and disinfection.

III: 'Complex': coagulation, rapid filtration, activated carbon and disinfection.

Box 4.1 **Assessment of surface water for drinking water production (DQOMW, published in the Government Gazette, 6 November 2008).**

p.36 *...Surface water used for the preparation of drinking water*
The special function of bodies of groundwater and surface water used for the preparation of drinking water is regulated by the requirement that the level of purification treatment required may not increase (Article 7, Paragraph 3, WFD). This is set in Article 16, Paragraph 2, Section d of this decree. For surface water, an increase in the level of purification treatment required is evaluated in accordance with the classification in the Dutch Drinking Water Directive. Should an increase in the level of purification treatment conflict with the principle of no deterioration, then there must be a consistent increase in the level of purification treatment (therefore not for a few days per year, but for the majority of the year) and this increase must be the direct result of an actual deterioration in the quality of the abstracted water. For example, there are currently no standards set for concentrations of antidepressants in water. There is however an increasing focus on antidepressants, which could result in standards being set which then influence the required level of purification treatment. In that case, deterioration does not take place because the increase in treatment level is not directly linked to an increase in the concentration of the substance in water, but to the discovery of the substance in question...

page 46… Additional environmental quality requirements mean that surface waters with a quality that complies with purification class I or II may not fall into the lower purification class II or III, respectively. In summary, this means that surface water intended for human consumption must always satisfy the environmental quality requirements of purification class III at a minimum, but that surface water which already has a better quality must continue to meet the requirements of the higher purification class I or II. For groundwater, the requirements of Article 7, Paragraph 3, WFD mean that the actual water quality, related to the purification class, must be maintained. Article 7, Paragraph 3 of the WFD also requires that Member States aim to improve water quality so that the level of purification treatment required can be reduced. This clause is implemented in this decree in Article 12, Paragraphs 3 and 4. The aim is satisfied if the water quality meets the requirements for purification class I; these requirements are included in Appendix IV of this decree as target values. The measures taken to meet the target value in Article 7, Paragraph 3 of the WFD must, under the Dutch Water Management Act, be included in the relevant plan. This is stipulated in Article 12 of this decree...

Table 4.3 **Guide values and target values for surface water used for the production of water for human consumption (Appendix IV, Tables 1 and 2, the Dutch Decree on quality objectives and monitoring in water, public participation version, November 2008) compared with the current DQOMSW (Dutch Decree on quality objectives and monitoring in surface waters, 1983). Bold highlighting means the guide values are stricter compared with the DQOMSW, cursive/underlined highlighting means they are less strict. The quality class (I, II, III)[4] (75/440/EEC) corresponding to the set guide/target value is given in brackets.**

Parameter	Unit	DQOMW Guide value (quality class)	DQOMSW (1983)	DQOMW Target value (quality class)
pH	pH units	**7.0-9.0 (I-II)**	6.5-9.0	7.0-8.5 (I-I)
Colour intensity	mg/l	50 (II)	50	- (II)
Suspended solids	mg/l	50 (II)	50	25 (I)
Temperature	°C	25 (O) (I)	25	- (I)
Electrical conductivity	mS/m at 20°C	100 (I)	100	100 (I)
Odour dilution factor at 20 °C	-	*20 (III)*	16	3 (I)
Chloride	mg/l Cl	200 (II)	200	150 (I)
Sulphate	mg/l SO_4	100 (I)	100	100 (I)
Fluoride	mg/l F	1 (I)	1	0.7 (<I)
Ammonium	mg/l N	1.2 (II)	1.2	0.2 (I)
Organically bound nitrogen	mg/l N	2.5 (II)	2.5	1 (I)
Nitrate	mg/l NO_3	*50 (II)*	44	25 (I)
Phosphate	mg/l P	*0.3 (>III)*	0.2 (I-III)	-
Dissolved oxygen	mg/l O_2	≥ 5 (II)	5	>6 (I)
Chemical oxygen demand	mg/l O_2	*40 (III)*	30	30 (II)
Biochemical oxygen demand	mg/l O_2	**6 (II)**	7	3 (I)
Sodium	mg/l Na	120 (II)	120	90 (I)
Dissolved iron	mg/l Fe	**0.3 (I)**	0.5	0.1 (<I)
Manganese	µg/l Mn	500 (II)	500	50 (I)
Copper	µg/l Cu	50 (O) (I)	50	20 (<I)
Zinc	µg/l Zn	200 (I)	200	200 (I)
Boron	µg/l B	1000 (I)	1000	1000 (I)
Arsenic	µg/l As	20 (I)	20	10 (<I)
Cadmium	µg/l Cd	1.5 (I)	1.5	1 (<I)
Chromium (total)	µg/l Cr	**20 (I)**	50	20 (I)
Lead	µg/l Pb	30 (I)	30	30 (I)
Selenium	µg/l Se	10 (I)	10	10 (I)
Mercury	µg/l Hg	0.3 (I)	0.3	0.3 (I)
Barium	µg/l Ba	200 (II)	200	100 (I)
Cyanide	µg/l CN	50 (I)	50	50 (I)
Surface-active substances that react with methylene blue	µg/l	200 (I)	200	200 (I)
Water vapour volatile phenols	µg/l C_6H_5OH	5 (II)	5	5 (II)
Mineral oil	µg/l	200 (II)	200	50 (I)

Parameter	Unit	DQOMW Guide value (quality class)	DQOMSW (1983)	DQOMW Target value (quality class)
Polycyclic aromatic hydrocarbons	µg/l	*1 (III)*	0.2	0.2 (I)
Total pesticides	µg/l	0.5	0.1*	0.5
Pesticides by individual pollutant	µg/l	0.1	0.05*	0.1
Choline-esterase inhibitors	µg/l	1 (II)	-	1 (II)
Coli group bacteria (total)	number/100 ml	2000 (>III)	2000	50 (>I)
Thermotolerant coli group bacteria	number/100 ml	2000 (II)	-	20 (I)
Fecal streptococci	number/100 ml	1000 (II)	1000	20 (>I)
Algae biomass	µg/l chlorophyll-α	100 (-)	100	100 (-)

* The Pesticides Directive has led the standardisation of pesticides in the DQOMW. The DQOMW and 75/440/EEC only regulate the presence of a few organochlorine pesticides.

Threshold values are included in the DQOMW for *groundwater* and defined for a limited number of pollutants: boron, chloride, nickel, arsenic, cadmium, lead, total nitrogen and phosphate. In addition, environmental quality requirements from the GWDD apply to nitrates, pesticides and the relevant metabolites.

4.4 Monitoring and assessment

Monitoring

Additional monitoring requirements for protected areas are described in Annex V, Section 1.3.5 of the WFD:

> […] Bodies of surface water designated in Article 7 which provide more than 100 m^3 a day as an average shall be designated as monitoring sites and shall be subject to such additional monitoring as may be necessary to meet the requirements of that Article. Such bodies shall be monitored for all priority substances discharged and all other substances discharged in significant quantities which could affect the status of the body of water and which are controlled under the provisions of the Drinking Water Directive. […]

The required frequency of sampling corresponds to the size of the population served. In the Netherlands, this means the maximum sampling frequency of 12 times a year must be applied to surface water abstraction sites used for drinking water. The current Dutch Decree on quality objectives and monitoring in surface waters (DQOMSW, Government Gazette 606, 1983) requires a sampling frequency of between 4 and 12 times a year (independent of the capacity of the abstraction) for the parameters included. It is noted that the sampling frequency could be reduced for each parameter from 12 to 4 and from 4 to 1, if:

- monitoring data from the two previous years show that the standard concerned has never been exceeded, except as a result of extreme weather conditions or extreme hydrodynamic circumstances as may be concluded from high levels of suspended matter, *and*;
- it is reasonable to assume that the standard will not be exceeded.

The DQOMSW is the Dutch implementation of Directive 75/440/EEC concerning the quality required of surface water intended for the production of drinking water. The DQOMSW will soon be replaced by the DQOMW. Directive 75/440/EEC states that the frequency of sampling is to be defined based on the volume of water abstracted, the extent of the abstraction, the population served, the degree of risk engendered by the quality of the water and seasonal variations in the water quality (Article 5, Paragraph 2). The Drinking Water Directive (98/83/EC) sets requirements for the sampling frequency of drinking water at the tap and is therefore not relevant here. The sampling frequencies required by the DQOMSW have largely been incorporated into the Dutch Drinking Water Directive (2001) and standard monitoring programmes carried out by the relevant water companies. The WFD therefore requires a higher sampling frequency than the current DQOMSW and the Dutch Drinking Water Directive. No sampling frequencies are defined in the DQOMW; these, together with the assessment procedure, are to be defined in a yet to be drawn up ministerial decree.

Assessment

Article 13, Paragraph 2 (Monitoring) of the DQOMW states that:

> [...] it is possible to require in the monitoring programme compliant with Annex V, Section 1.3.4 of the WFD that statistical methods be applied, including a percentile calculation, to maintain an acceptable level of reliability and accuracy when checking the compliance of a parameter with a guide value. The statistical methods satisfy the regulations set in accordance with the procedure in Article 21, Paragraph 2 of the WFD. […]

The notes to the DQOMW (Section 6.2 Drinking Water – Monitoring, p. 46) state:

> […] in accordance with current national and European legislation, the assessment procedure regarding whether or not the environmental quality requirement is satisfied is to be further determined for drinking water in the ministerial decree based on this decree (DQOMW). This will be done as far as possible in accordance with the current assessment methodology, which partly depends on the parameter concerned. For example, general chemical parameters are assessed based on 92nd percentile values (P92)[5], whilst annual averages are used for suspended matter, biochemical oxygen demand and phosphate. […]

Under the current DQOMSW (1983), a standard may be exceeded for one of the 12 samples a year (92nd percentile value) when monitoring measured concentrations. The level of this exceedance may be no higher than 50% of the indicator value. As may be expected, this is in line with Directive 75/440/EEC which states that, within a category (A1, A2 or A3), 90% of the sample values must satisfy the 'guide values'[6] and, for a limited number of substances, 95% must satisfy the imperative values. The maximum exceedance is 50% of the standard.

The notes to Table 1 in Appendix 1 of the DQOMW (Guide values for the good chemical status of surface water bodies, page 9) state that:

> […] When applying the guide values, the arithmetic average of the concentrations measured in the water body at various times throughout the year at each representative sampling point may not exceed the standard. Calculation of the arithmetic average and the applicable analysis procedure should take place in accordance with the Commission's Technical Specifications for the Chemical

[5] In practical terms this means that, if sampling every four weeks (13 times a year), it is possible to ignore a single momentary maximum concentration.

[6] The comparison in Table 4.3 is conducted using these 'guide values'.

Analysis and Monitoring of Water Status in accordance with the Water Framework Directive, including the method for the application of an environmental quality standard (EQS) if there is no suitable analysis method that satisfies the minimum performance characteristics. […]

The procedure to be followed when assessing the status of bodies of surface water is described in the 'Protocol for operational monitoring review and assessment and status and trend monitoring, assessment year 2007' (Torenbeek and Pelsma, 2008, in Dutch *Protocol toetsen en beoordelen voor de operationele monitoring en toestand- en trendmonitoring, toetsjaar 2007*). The analysis results are aggregated for each parameter into a single value for a single sampling point (arithmetic average for priority substances, 90th percentile for other relevant substances) and this value is compared with the standard. This procedure is carried out for every substance in the monitoring programme. The chemical status is considered to be good if all calculated yearly-averaged concentrations meet the standard for priority substances. The ecological status is considered to be good if the ecological standards *and all* the individually calculated 90th percentile concentrations for the other relevant substances are met. Assessment of 'no deterioration' takes place over a complete planning period and is not further discussed in the protocol. The assessment of protected area objectives is also not addressed in this protocol.

The conclusion can therefore be drawn that various assessment methods are used, which may result in different conclusions being drawn regarding the status of bodies of water and bodies of water with special functions in particular (Article 6, WFD). Some substances (such as PAHs and pesticides) are included in both the general assessment and the assessment of the drinking water objectives. It is therefore important to clearly describe the possible differences and their explanations (please also refer to Table 4.4).

Table 4.4 **Number of substances that exceed the DQOMW (surface water abstracted for drinking water production) guide and target values, using different assessment methods. Assessment is conducted for the parameters included in the DQOMW (public participation version, November 2008) using data series for 2008 from the Association of River Water Supply Companies (RIWA).**

Abstraction site	Annual average (priority substances)		92nd percentile (current DQOMSW assessment method)		Max. concentration (RIWA assessment)	
	Guide value	Target value	Guide value		Guide value	Target value
Nieuwegein	3	8	9	**Nieuwegein**	3	8
Andijk	2	5	3	**Andijk**	2	5
Nieuwersluis	2	6	4	**Nieuwersluis**	2	6

The assessment method has a significant effect on whether or not substances are considered relevant in terms of drinking water production and therefore whether measures need to be taken. This can also be seen in Tables 4.4 and 4.5, which show the results of tests using the annual average, 92nd percentile and maximum value for the substances included in the current DQOMW.

The design of drinking water treatment installations is based on expected developments in water quality and assumes maximum concentrations. In addition, water abstraction is based on current, therefore also maximum, concentrations. It is therefore logical that the assessment of drinking water objectives should take place based on maximum concentrations. This is in line with the procedure described in 75/440/EEC and the method applied in the DQOMSW (1983).

Table 4.5 Parameters that exceed DQOMW standards in the assessment of maximum concentrations in 2008 for the Nieuwegein abstraction site.

Nieuwegein	Guide value exceeded	Target value exceeded
	Suspended solids	Suspended solids
	Odour dilution factor	Odour dilution factor
		Manganese
	Coli group bacteria (37 °C, confirmed)	Coli group bacteria (37 °C, confirmed)
		Enterococci
	Chlorotoluron	Chlorotoluron
	Dicofol	Dicofol
	Isoproturon	Isoproturon
	Mecoprop (MCPP)	Mecoprop (MCPP)
	Metoxuron	Metoxuron
	Aminomethylphosphonic acid (AMPA)	Aminomethylphosphonic acid (AMPA)
	Butocarboxim sulfoxide	Butocarboxim sulfoxide
	Azoxystrobin	Azoxystrobin

5 Proposal for selection of drinking water-relevant pollutants

Knowledge gap

It has been established in the previous chapters that the production of drinking water plays a very limited role in the selection of river basin-relevant pollutants. In addition, various studies have shown (for example, Van den Berg, 2008; Van den Berg et al., 2007; Berbee and Kalf, 2006a and b; Van der Aa et al., 2008 and Heugens et al., 2008) that in fact it is pollutants other than those included in the DQOMW that form a problem for the production of drinking water from surface water.

Second planning period inventory proposal

The 'Rhine Delta Basin District Report' (in Dutch, *Karakterisering Werkgebied Rijndelta*, Main Report, 2005) provides insufficient information on the possible problem pollutants in terms of drinking water production that may be released from the identified emission sources. In the Rhine Delta RBMP (version 22, December 2008), drinking water-relevant pollutants are also named as a knowledge gap that needs to be addressed in the next RBMP (page 116).

Proposals for the identification of drinking water-relevant substances are:

- To analyse discharge permits (what kind of activities, which pollutants are discharged). To what extent are downstream activities taken into account in the permit process?
- To analyse environmental information from various registration procedures, such as REACH, on plant protection products, biocides, medicines and veterinary medicines (Heugens et al., 2008).
- [1] Many pollutants are registered in these areas. Possible selection criteria could be:
  - calculated concentration is higher that standard/indicative value in Dutch Drinking Water Directive;
  - toxicological risk (relationship between exposure and toxic effects);
  - pollutant properties (low molecular weight, high solubility in water, high mobility in soil, low decomposition rate, diffuse emission).
- The results of various Dutch Water Research Institute (KWR), Waterdienst (Dutch Water Service), RIWA and RIVM monitoring programmes regarding the quality of emission sources and drinking water sources (Berbee and Kalf, 2006a and b; Van den Berg et al., 2007 and 2008; Versteegh et al., 2007).

Assessment of river basin management plans

To be able to assess river basin management plans in terms of their approach to drinking water-relevant pollutants, a choice was made to select other drinking water-relevant substances in addition to those legally required under the DQOMW. For now, this has only been done for the Rhine river basin. Selection is based on the RIWA Rhine monitoring programme. RIWA collates raw water sampling data from drinking water companies that abstract water from the Rhine for the production of drinking water and exchanges data with the Directorate for Public Works and Water Management Water Service

[1] Much of the available information gathered during the registration of substances is not freely accessible. However, the Aarhus Convention (Traktatenblad 2001, 73) and the Dutch Government Information (Public Access) Act state that environmental information must be made available to third parties.

(*Waterdienst-Rijkswaterstaat*). Water companies that abstract water from the Meuse also monitor raw water quality and input this data into a collective database (RIWA Meuse). Until recently, the Meuse monitoring programme was less detailed than that for the Rhine, but has now been expanded. This means that there are a limited number of data series that span several years, making it impossible to derive trends for all the pollutants found. Due to the limited time available in this project it was decided, in consultation with the Ministry of Housing, Spatial Planning and the Environment, only to select drinking water-relevant pollutants for the Rhine. The same exercise should also be carried out for the Meuse.

Trend analysis was carried out on the data series from the RIWA Rhine database using a linear regression test for data series with a normal probability distribution or a test of Mann Kendall for the other data series. This takes into account seasonal effects and autocorrelation (RIWA Rijn, 2005). These tests were used to assess whether the data shows an increasing, decreasing or constant trend over the last five years. A similar trend analysis is being worked on for the Meuse data.
The data and trends produced by RIWA are applied as follows to the current project:

- the sampling results are assessed against the DQOMW guide and target values and the Dutch Drinking Water Directive standards and indicative values;
- the next step is to assess whether significant increasing trends can be seen for the monitored pollutants that may result in exceedance;
- new substances are tested according to the precautionary principle (in drinking water), unless it has been proven that they are irrelevant (please also refer to Box 3.2) in terms of the production of healthy and safe drinking water.

An assessment is also made of whether the statistical methods applied by RIWA are endorsed by the European guidance documents. It should be noted that, for groundwater, the reversal of increasing trends is explicitly included as one of the objectives. For drinking water produced from surface water, the reversal of increasing trends is included in Article 7.3 – a deterioration in water quality must be avoided and an effort made for future improvement. Trend assessment is not included in the current protocol for the assessment of surface water (Torenbeek and Pelsma, 2008). Guidelines for trend assessment in groundwater are therefore considered as a comparison with the RIWA methodology in this report.

A statistical treatment of groundwater trend assessment for the WFD is given in the report *The EU Water Framework Directive: Statistical aspects of the identification of groundwater pollution trends, and aggregation of monitoring results* (Grath et al., 2001). A two sections test is proposed for the calculation of the trend reversal in Annex V of this report. The trend is first calculated over a time interval using a simple linear regression model. The time interval is then split into two and the trend calculated for each part. A test is then performed to check whether the two-sections model is better than the simple linear regression model. The procedure can also be carried out using the test of Mann-Kendall but this is not done in the report (Annex V). The procedure described by Grath et al. (2001) is very similar to that followed by RIWA to calculate trends. An important difference between groundwater and surface water is time: surface water quality is very much influenced by large and relatively rapid variations in river discharge. As a result, these data series are more likely to show a skewed distribution than groundwater data, and the test of Mann-Kendall therefore applied. This procedure results in a list of pollutants relevant to water abstraction now, and possibly in the future. The pollutant list is shown in Appendix II for the Nieuwegein abstraction site in the Netherlands.

It is possible, based on the selection of relevant substances and an analysis of the pressures on and risk to the water system (please also refer to Chapter 3), to define the relevant measures, for example in the form of a drinking water protection file. Should pollutants be seen to be consistently relevant at several

abstraction sites, the decision must be made as to whether general policy measures should also be taken as, for example, in the Dutch diffuse source pollution implementation programme (in Dutch, *Uitvoeringsprogramma Diffuse Bronnen*).

6 RBMPs of Member States in the Rhine river basin

The river basin management plans of the Member States in the Rhine river basin are assessed in this chapter, based on two questions:

- How are the Article 7 objectives of the WFD addressed in the plans?
- What contribution do the plans of neighbouring countries make to a reduction in quality issues for the production of drinking water from surface water in the Netherlands?

6.1 Part A: Common section

Article 13.3 of the WFD states that a single coordinated management plan must be produced for international river basin districts. To protect waters in the international Rhine district, the Member States in the Rhine river basin have decided to coordinate their activities for the coherent implementation of the WFD. Due to the large size and complexity of the Rhine river basin, it was decided to organise the management plan into a common part A and nine separate sub-basin-specific part Bs (draft management plan for the international Rhine river basin district, ICBR, December 2008). Part A provides a general outline of the characterisation of the system, the defined objectives and programmes of measures. The focus in Part A is on the quantitative aspects of the drinking water supply (page 11, RBMP A). The qualitative aspects do not, as far as *surface water* is concerned, specifically focus on the drinking water supply. The relevance of discharges is assessed for nutrients, river basin-relevant substances (please also refer to Table 4.1) and the priority (hazardous) substances named in Annex X and IX of the WFD. In assessing the chemical status of *groundwater*, meeting the provisions of Article 7 is specifically named as a part of the appropriate research (page 28, RBMP A), but this concerns the monitoring of substances for which quality requirements and/or threshold values apply. These may however also be relevant to drinking water production (for example the presence of pesticides).

A register of protected areas has been produced for the Rhine river basin district as a whole. A summary of the programmes of measures for the river basin is also included in Part A. The measures included in RBMP A that may have a positive effect on drinking water-relevant substances are shown in Table 6.1. As may be expected, this concerns a general description. Further detail should be provided in the separate RBMPs of the sub-basins, though these too do not provide much more concrete information. The supporting documents may provide more specific information concerning the nature and effect of the measures to be taken, but are not included in this analysis. Specific information is provided in Part A on use values such as drinking water and environmental objectives (page 56, RBMP A). These have been shaped in recent years through the organisation of conferences and workshops attended by the various stakeholders. The objective of these workshops was to increase the level of knowledge and understanding regarding the issues faced by the different parties and to search for common solutions. For example, a workshop on ‘micro-pollution’ (Bonn, 2007) was held regarding drinking water. The knowledge gap identified in this workshop is reflected in some of the RBMPs. The concept of not passing upstream water quality issues onto downstream use values (*no shifting*) is not quantitatively defined in the form of a standard, though it is identified as a reason for the further reduction of nutrient emissions (to achieve objectives for the North Sea).

Table 6.1 **Rhine RBMP Part A measures for drinking water-relevant substances that influence the chemical quality of groundwater and surface water (2009-2015 planning period).**

Parameter	Measure
Biocides Plant protection products	• clean up leaching river bank protection structures; • improve advice on usage; • use drift-reduction nozzles; • reassessment based on enforcement policy.
Point sources	• implement community water protection legislation, such as Urban Waste Water Treatment Directive (91/271/EEC); • reduce industrial emissions through permit system based on BREFs (best available techniques); • prevent accidental spills (safety zones and warning system).
Temperature	• further research, also in relation to climate change.
Historical pollution of groundwater (organic micro-pollutants, metals)	• investigate and clean up/control severe and emergency soil and groundwater pollution.
PAHs	• ban use of PAHs in ship coating products (tar) and rubber tyres; • rainwater treatment.

6.2 Part B: Sub-basin management plans

Nine sub-basins have been defined within the Rhine river basin, based on geographical characteristics:

- Alpenrijn/Bodensee;
- High Rhine;
- Upper Rhine;
- Neckar;
- Main;
- Middle Rhine;
- Mosel/Saar;
- Lower Rhine;
- Rhine Delta.

With the exception of Rhineland-Palatinate, the German sub-basin management plans (RBMPs) are based on state rather than sub-basin boundaries. This is also reflected in the section numbering (see Figure 6.1). Reference is made to the different sub-basins within the individual RBMPs.

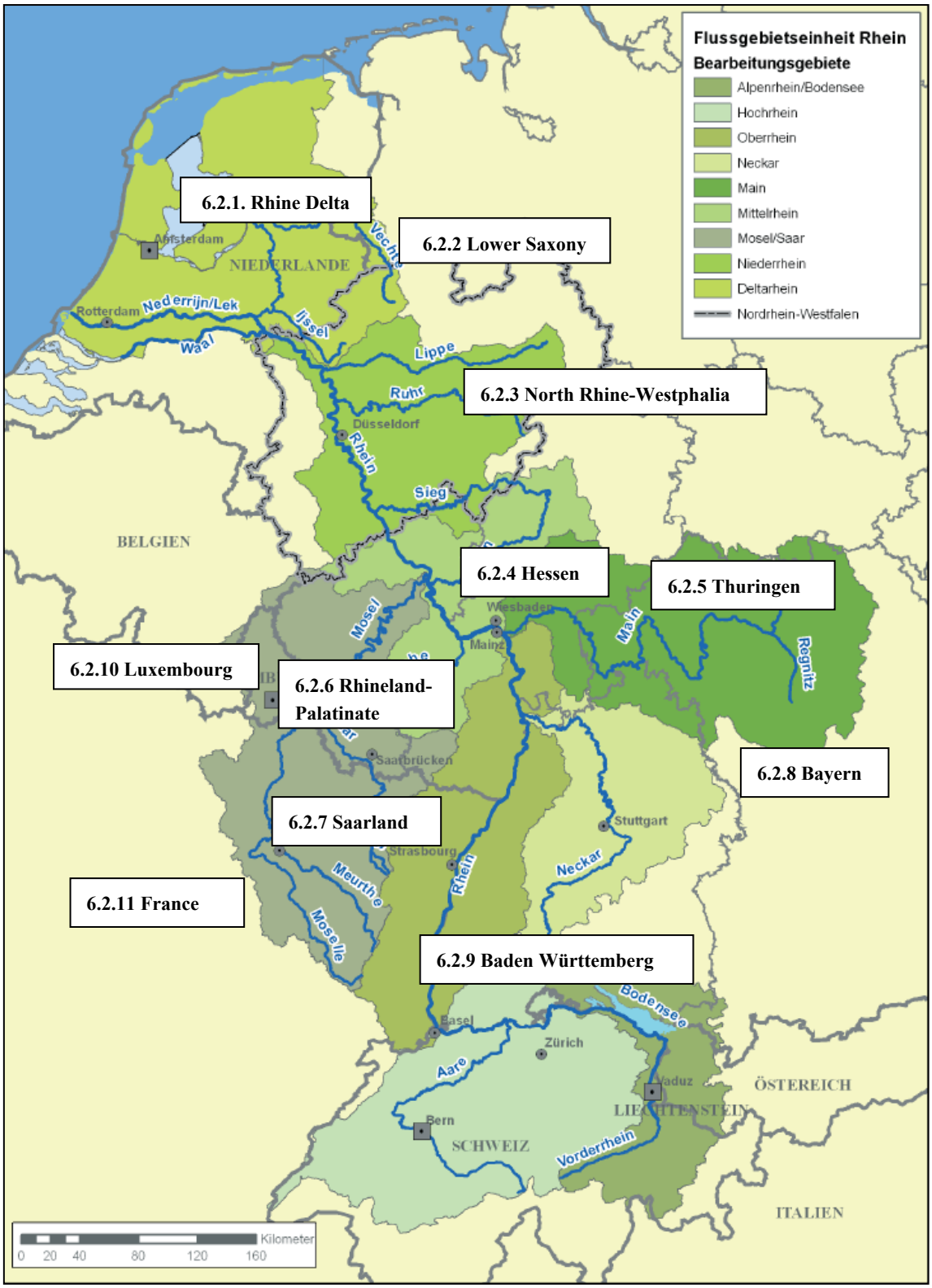


Figure 6.1 Rhine river basin showing relevant sections for sub-basin district/state RBMPs.

6.2.1 Rhine Delta

The Rhine Delta sub-basin includes 26 bodies of surface water, 3 of which are used to abstract water for human consumption. Nine of the eleven bodies of groundwater also include drinking water abstraction sites. Of the 262 drinking water abstraction sites identified, 164 are used for the public water supply, though various figures are given in the RBMP: 164 (page 32), 152 (page 163) and 149 (page 164). The table on page 163 contains the most accurate information. The number of industrial drinking water abstraction sites as defined in the WFD is yet to be determined.

The bodies of groundwater and surface water used for the production of water for human consumption are included in the register of protected areas. The Rhine Delta RBMP states that:

> '… Every body of surface water used for the production of drinking water (75/440/EEC) is included in the register of protected areas. In the case of river bank infiltration and artificial infiltration, surface water infiltrates the groundwater through soil aquifer passage. These abstractions are therefore not used in the identification of bodies of surface water, but in the identification of bodies of groundwater from which water is abstracted for human consumption (see 'groundwater', below). The government will assess in the first half of 2009 whether this is a correct interpretation of the Water Framework Directive. If not, the bodies of surface water from which river bank infiltration takes place will also be included in the register of protected areas…'(Rhine Delta RBMP, Section 1.4.2, page 31).

This approach does not take into account the fact that the abstracted water mostly originates from infiltrated surface water[2]. Surface water quality issues will later also manifest themselves in the quality of the abstracted river bank groundwater (Wuijts et al., 2007).

Dune infiltration water is included as groundwater abstraction in the register of protected areas and some dune infiltration areas are also labeled as bodies of surface water (page 25), though the criterion of 50 ha is not reached. This is not applied consistently to all dune infiltration areas.

The RBMP states that Articles 7.2 and 7.3 of the WFD are satisfied by the implementation of existing groundwater protection policy:

> '[…] Apart from their inclusion in the register of protected areas, the importance of groundwater and surface water used for the preparation of drinking water is expressed in Article 7.3 of the WFD (no further deterioration to enable a future decrease in the level of water purification treatment). Furthermore, national protection policy is also applicable […] The WFD does not affect the existing policy […]' (Rhine Delta RBMP, page 32).

[2] River bank groundwater is composed of infiltrated surface water mixed with 10-90% local groundwater. This definition is applied in the ABIKOU classification system (Stuyfzand, 1996) and is used by the Dutch Ministry of VROM in the assessment of the intrinsic sensitivity of water abstraction areas to microbiological pollution (Inspectierichtlijn 5138, 2006).

Drinking water protection measures are included in Appendix K of the RBMP and are derived from existing legislation in the Netherlands, such as the Soil Protection Act, the Fertilizers Act, the Plant Protection Products and Biocides Act, the Surface Water Pollution Act, the Environmental Management Act and wastewater policy.

The DQOMW quality requirements apply to the abstraction of surface water. Other drinking water-relevant substances are identified as a knowledge gap that needs to be addressed in the next RBMP (page 116):

> '[…] Furthermore, greater insight is required into the pressures and effects of environmentally hazardous substances such as brominated flame retardants, plasticisers and other hormone disrupting substances, in particular in relation to the use of surface water and groundwater for human consumption (especially drinking water production). […]'

However, the current RBMP does not address how this knowledge gap is to be remedied.

Safeguard zones have also been identified for surface water abstraction sites used for the production of drinking water. These zones are described as 'emergency zones': risks to the drinking water supply especially are to be taken into account when dealing with an incident within the zone. However, the RBMP (page 161) does not make a link with existing emergency structures and procedures based on the Major Accident Hazards Decree (in Dutch, *Besluit Risico's Zware Ongevallen-BZRO*). The proper integration with these existing structures and plans is important for the effective use of these zones.

The effect of upstream activities on downstream water quality has not yet been addressed. It is identified as a knowledge gap to be addressed in the next RBMP (page 116) '[…] important in the following river basin management plan is the better identification of the pressures of pollutants and the effects on downstream bodies of surface water (upstream influence) […].' It is noted that the International Rhine Commission has identified management issues for the Rhine district, on which measures taken in other Member States of the Rhine river basin are also based. The reduction of pollutants focuses on:

- Diffuse discharges that pressure the surface water and groundwater. This concerns nutrients, plant protection products, metals and hazardous substances produced by historical pollution.
- The further reduction of traditional pressures from industrial and local pollution sources. In the international Rhine district, the focus is primarily on phthalates (DEHP), phenols, brominated diphenyl ethers, diuron, isoproturon, HCB, PAHs and TBT, zinc, copper and PCBs.

The discussion concerning the temperature standard is regularly mentioned in the RBMP, and various points of view seem to be described (for example, pages 48, 59 and 136). Although both the drinking water supply and the energy supply are placed in Category 2 in the national displacement series (Figure 6.2), drinking water prevails over energy at times of drought. It seems as though this prioritisation system is not endorsed throughout the RBMP. Both the water and energy sectors devote much attention to possible operational risks. Given the distribution of power stations and abstraction sites, the question arises as to whether every power station and abstraction site in the Netherlands presents a problem, or whether the situation can be characterised as a number of regional issues that may be better served using a tailored approach. Both sectors need to be asked which locations present a problem, either now or in the coming decades.

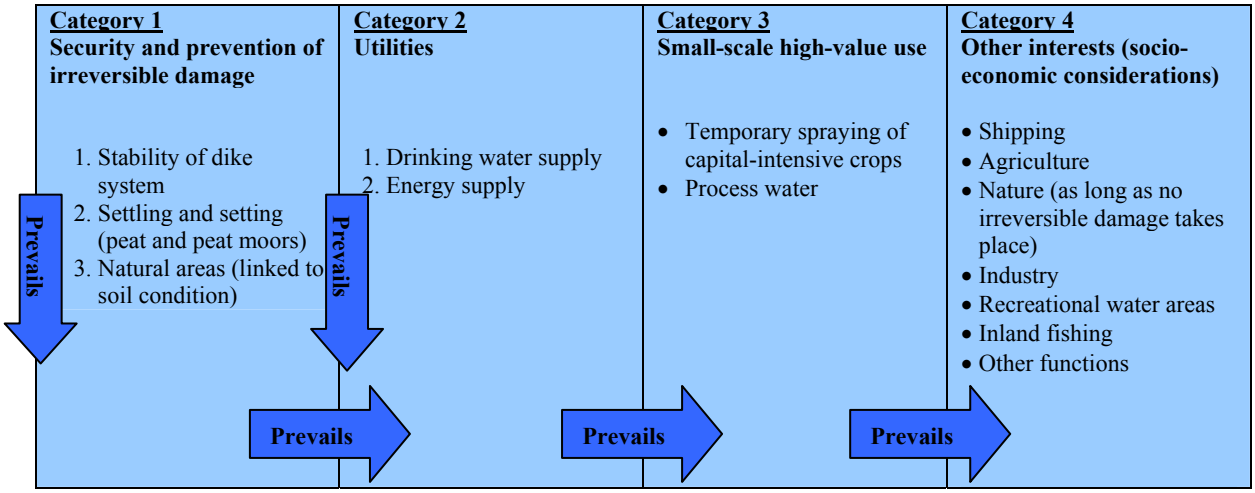


Figure 6.2 **Prioritisation of fresh water distribution in times of drought (Rhine Delta RBMP, Version 22 December 2009, page 61).**

ACTeon/Ecologic (Grandmougin et al., 2009) researched the extent to which temperature is a quality issue in Member States outside the Netherlands; they found that it was not. The discussion concerning temperature seems to be a problem particular to the Netherlands. Two explanations can be given for this:

(1) the direct treatment of surface water is very limited in neighbouring countries;

(2) drinking water is not chlorinated in the Netherlands and is therefore more susceptible to the re-growth of micro-organisms in the distribution network.

A summary is given in Appendix K (page 82) of the RBMP of the measures implemented under current legislation to protect drinking water. Measures are categorised as basic measures (measures taken based on existing policy and legislation) and additional measures. Additional measures are only attributable to the requirements made by the WFD. The RBMP does not include any additional measures that specifically focus on the chemical quality of surface waters as far as drinking water production is concerned, though measures are identified that also have a positive effect on drinking water-relevant substances in surface waters. These measures are shown in Table 6.2. A number of measures are however included for *groundwater* that focus on drinking water production (RBMP, pages 163 and 164):

- the production of a drinking water protection file for the most sensitive abstraction sites;
- extra groundwater monitoring;
- research into sites at risk from soil contamination and the implementation of cost-effective measures (clean-up or control).

Results

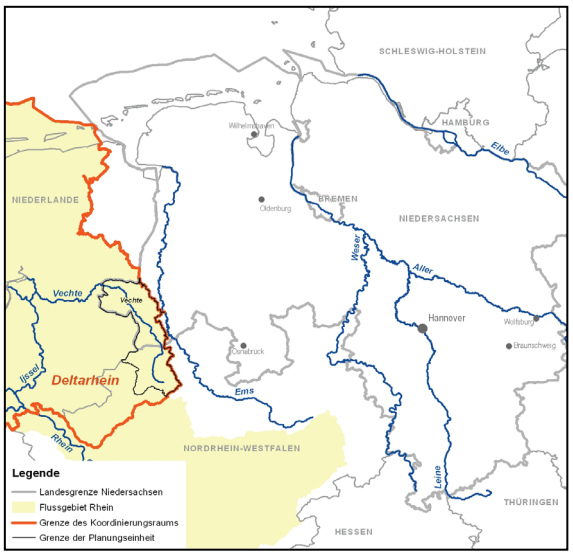
- The Rhine Delta RBMP addresses all Article 7 provisions for all the drinking water sources within its administrative area. The conclusion is drawn that the continued enforcement of existing groundwater protection policy will ensure a sufficient effort is made to meet future quality improvement targets. How the provisions of Article 7.3 for surface waters are to be met is not discussed.
- Various figures are given in the RBMP for the number of abstraction sites.

- Bodies of groundwater used for the abstraction of river bank groundwater are included in the register of protected areas; the corresponding bodies of surface water are not. Because river bank groundwater is composed primarily of infiltrated surface water that has undergone soil aquifer passage, and because pollutants in the infiltrated surface water directly influence the quality of the abstracted groundwater, inclusion of the bodies of surface water in the register should also be considered.
- Various conclusions are drawn concerning the inclusion of bodies of surface water with dune infiltration in the register of protected areas.
- Different conclusions are also drawn in the RBMP concerning how to approach temperature standards for surface water. Considering the locations of cooling water discharge sites and abstraction sites for drinking water production, it would seem useful to document the specific risks at each abstraction site, for example in the drinking water protection file. It may then be possible to tackle the problem, based on the drinking water protection file, with targeted measures.
- The identification of environmentally hazardous substances that may threaten the drinking water supply is named as a knowledge gap that needs to be addressed.
- The effect of upstream water quality issues on downstream use values must also be further investigated. The RBMP states that management issues have been identified together with the other Member States of the Rhine river basin. These focus primarily on the reduction of priority substances.
- The RBMP does not include any additional measures that specifically focus on the chemical quality of surface water as far as drinking water production is concerned, though measures are identified that also have a positive effect on drinking water-relevant substances in surface water, such as the implementation of spray-free zones and other emission control measures. These measures are not linked to a target result.

Table 6.2 **Rhine Delta RBMP measures for drinking water-relevant substances that influence the chemical quality of groundwater and surface water (2009-2015 planning period).**

Parameter	Measure
Plant protection products Biocides	• clean up leaching river bank protection structures; • implement drinking water assessment where application of plant protection products and biocides allowed; • introduce additional regulations; • Dutch plant protection policy measures; • control and enforce compliance with measures; • implement fertilisation-free/spray-free zones.
Point sources	• change treatment process at 37 STPs; unclear whether, in addition to N/P reduction, improvements in other substances also to be expected; • stop 350 untreated discharges (cooling water, domestic water and industrial wastewater); • other emission-reducing measures, such as permit system based on BREFs (best available techniques) and emission-immission assessment, diffuse source implementation programme (medicines); • adapt 78 sewerage overflows.
Historical pollution of groundwater (organic micro-pollutants, metals)	• investigate and clean up/control severe and emergency soil and groundwater pollution.
MTBE/ETBE/PAHs	• reduced emissions from traffic/shipping (diffuse source implementation programme); • disconnect paved area from sewerage system, both positive and negative effects.
Objective unclear	• adapt/move groundwater abstraction site.

6.2.2 Lower Saxony (Rhine Delta)



The area of the German state of Lower Saxony in the Rhine river basin district (the River Vecht) falls within the Rhine Delta sub-basin district (East Rhine) and therefore is included in the Rhine Delta RBMP. This also applies to part of North Rhine-Westphalia, where the River Vecht rises. Abstractions in the German part of the sub-basin are not included in the Rhine Delta RBMP register of abstractions for human consumption. The Rhine – Lower Saxony RBMP is therefore also assessed in this report. The area is dominated by agriculture and has a surface area of about 1,000 km^2 (total area of Rhine Delta 34,000 km^2) and a population of about 133,000. No surface water is directly abstracted for drinking water production in the area; drinking water is produced from groundwater. In addition to the abstraction of water for drinking water production, the area also contains mineral sources (the 'Heilquellen'). Seven water protection areas are identified, with a total surface area of 126.2 km^2 (about 12% of the administrative area).

As far as the chemical quality of the surface water is concerned, the main pressures described are the agricultural emissions of N, P and plant protection products. Priority substance monitoring programmes show that Priority Substances Directive standards are also exceeded for PAHs, tributyltin, C_{10}-C_{13}-chloroalkanes and various pesticides. The influence of agriculture can also be seen in the chemical status of bodies of groundwater. The nitrate standard is exceeded in 56% of the groundwater bodies. No exceedances are reported for any other substances in groundwater bodies. It is reported that there is a limited amount of data available for groundwater quality assessment.

Regarding the status of bodies of groundwater and surface water used for the abstraction of water for drinking water production, such abstractions are said to not exist (page 25 and page 28). This would seem to contradict the table summarising the permitted capacities (page 16) and describing the water protection areas (page 18). The report also states that Drinking Water Directive 98/83/EC objectives (Article 7.2 WFD) are met in the administrative area (page 31). The objectives related to Article 7.3 (future improvement) are not specifically named, though measures taken in groundwater protection areas are included (page 84 – Programme of Measures). These measures focus on reducing nutrient pressures from agriculture in groundwater protection areas and enforcing such a reduction. Measures that affect the chemical quality of downstream surface water in terms of drinking water-relevant substances are shown in Table 6.3. No conclusion is drawn concerning the expected effect of the proposed measures.

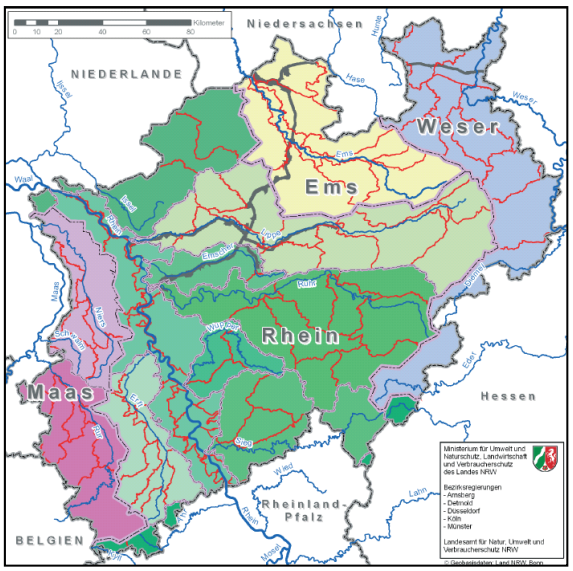
Table 6.3 Lower Saxony RBMP measures that affect the chemical quality of downstream surface water for drinking water-relevant substances.

Parameter	Measure
Plant protection products	• stimulate reduced agricultural use; • good agricultural practice, increased control.
Industrial substances	• reduce spillage risk; • reduce emissions through discharges; adapt/optimise WTPs.
PAHs	• rainwater treatment.
Diffuse sources	• optimise wastewater treatment (STPs, WTPs, rainwater treatment), however primarily focused on reduction of N and P and not drinking water-relevant substances.

Results

- The Rhine – Lower Saxony RBMP addresses all Article 7 provisions for all the drinking water sources within its administrative area.
- Bodies of groundwater used for the abstraction of water for human consumption are not yet included in the Rhine Delta RBMP.
- There are inconsistencies in the Rhine – Lower Saxony RBMP concerning the presence of drinking water sources (pages 16, 18, 25, 28 and 31).
- The concept of *no shifting* is addressed through the documentation of measures for N and P reduction (improvements to STPs and rainwater treatment): without N and P reduction upstream, quality objectives for the North Sea will not be achieved. Downstream functions are not addressed for the other substances.

6.2.3 North Rhine-Westphalia (Lower Rhine)



Part of the Rhine, Weser, Meuse and Eems river basin lies in the German state of North Rhine-Westphalia (NRWF). As far as the Rhine river basin is concerned, almost the whole of the Lower Rhine sub-basin lies in NRWF, as well as a small part of the Rhine Delta, Middle Rhine and Mosel sub-basin. The Rhine river basin district of NRWF has a population of 13 million (74% of NRWF as a whole and 22% of the total Rhine river basin district). 20% of the administrative area (Rhine-NRWF) consists of urban development, 30% is arable land, 17% grassland, 30% woodland and 3% 'other'. Drinking water is supplied by both groundwater and surface water; mostly groundwater in the lower-lying areas (Lippe and Erft river basins) and mostly surface water in the Rhine and Ruhr river basins. A register of protected areas (Articles 6 and 7.1, WFD) has been produced for bodies of water used for the abstraction of water for human consumption. Protected areas have also been identified for *future* use. Most abstractions from surface water take place via river bank infiltration and 23 reservoirs form part of the drinking water supply. There are 179 bodies of groundwater in Rhine-NRWF, 119 of which are used for the abstraction of drinking water.

The RBMP states that the water quality of the sources is such that drinking water is produced that satisfies the Drinking Water Directive (98/83/EC – Article 7.2) using the existing treatment system at all locations. Intensive industry and agriculture in the area impose a large pressure on the water system from both diffuse and point pollution sources. Improvements in agricultural legislation and a separate programme of measures (*Landlicher Raum*) must better safeguard water protection areas against agricultural pollution (nutrients and pesticides). A strategy is being developed to manage new substances in water protection areas. Prohibitions and measures comparable with the Dutch groundwater protection policy apply to agriculture in water protection areas in NRWF. Policy therefore focuses primarily on preventative protection at ground level.

Chemical objectives for surface water are directly linked to the Priority Substances Directive and other relevant guidelines. Specific programmes of measures have been developed to reduce problem substances (trace elements) in surface water intended for use in drinking water production. As far as can be deduced from the RBMP, downstream functions are not taken into account in the assessment of water quality. Mention is made of the fact that surface water flowing into the Netherlands is used for drinking water production and that upstream areas are also responsible for the quality of water further downstream. However, the link with downstream status assessment and the influence this may have on the programme of measures in the local area, is not made. A distinction is made between basic measures and additional measures in the programme of measures. Basic measures are measures that are required by other guidelines. Water quality improvement measures mainly concern nutrients and pesticides. The RBMP states that metals and other chemical substances are primarily a local problem. Measures that affect the chemical quality of surface water in terms of drinking water-relevant substances are shown in Table 6.4. The plan states that all bodies of water that do not currently have a

good status (mainly due to the exceedance of nutrient and pesticide standards) must have achieved good status by 2027.

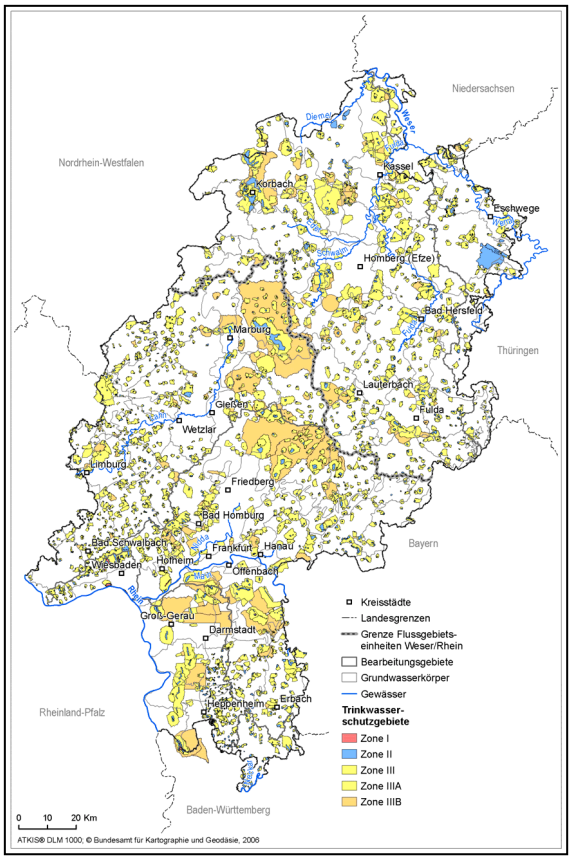
Table 6.4 NRWF RBMP measures that affect the chemical quality of downstream surface water in terms of drinking water-relevant substances.

Parameter	Measure
Agricultural products (e.g. biocides) Traffic (PAHs)	• rainwater treatment.
New substances	• develop strategies; • pilot Ruhr programme – detection of trace elements for drinking water function followed by reduction measures ('Clean Ruhr' Programme).
Diffuse sources	• optimise wastewater treatment (STPs, WTPs, rainwater treatment (separate sewerage system), however primarily focused on reduction of N and P and not drinking water-relevant substances; • reduce nutrients and plant protection product emissions in surface water and groundwater through Landlicher Raum programme; part of this programme involves further restriction of use of these substances in drinking water protection areas; • implement programmes of measures based on Plant Protection Products Directive (91/414/EEC) and Nitrates Directive (91/676/EEC); • three million euros is reserved for the implementation of plans for protection areas threatened by excessive concentrations of nutrients, pesticides and, in some areas, copper.

Results

- The NRWF RBMP addresses all Article 7 provisions for all the drinking water sources within its administrative area.
- Programmes of measures have been developed to improve the raw water quality of surface water and groundwater intended for drinking water abstraction.
- As far as can be deduced from the RBMP, downstream functions are not taken into account in the assessment of water quality.
- The measures cited for diffuse sources and the pilot project in the Ruhr river basin (Clean Ruhr) may be relevant to Dutch drinking water abstraction.
- The NRWF RBMP aims to achieve a good status for all bodies of water by 2027.

6.2.4 Hessen



The state of Hessen is surrounded, clockwise, by the states of Niedersachsen, Thüringen, Bayern, Baden Württemberg, Rhineland-Palatinate and North Rhine-Westphalia. The Rhine river basin covers 57% (12,119 km^2) of the total surface area of Hessen and has about 4.8 million inhabitants: a population density of 394/km^2. Land use consists of woodland (43%), agriculture (43%), urban development (12%), water (1%) and 'other' (1%). Also important in terms of surface water quality are the potassium mines in the east of Hessen. Drinking water is produced from groundwater in Hessen, partly through river bank infiltration. Abstraction catchment areas are included in the register of protected areas (Articles 6 and 7.1, WFD). Naturally infiltrated surface water is not included in the register.

Water protection areas have been defined for the protection and conservation of drinking water production supplies, within which certain activities and uses are limited or prohibited as a precautionary measure. In theory, a water protection area covers the complete catchment area for the abstraction. Because the risk of pollution decreases with increasing distance to the water abstraction site, through processes such as decomposition and mixing, the protection requirements also decrease with increasing distance to the abstraction site. Three zones are therefore identified in the protection areas in Hessen: a water collection area and two safeguard zones (page 34). Protection policy focuses primarily on the preventative safeguarding of groundwater quality.

The Hessen water management act prohibits discharges, unless specifically exempted. Permission is required for every discharge into groundwater, which is only allowed if the general interest, in particular the public drinking water supply, is not disadvantaged and if distribution requirements are taken into account. The existing statutory guideline therefore achieves the objective of the WFD. A total of 1,757 water protection areas had been identified in 2008 in Hessen, of which 1,734 concerned drinking water abstraction and 23 mineral sources (*Heilquellen*). A procedure for the definition of a further 236 water protection areas, 6 of which are for mineral sources, is currently in operation. The water protection areas (drinking water and mineral sources) cover a total surface area of 7,958 km^2; 38% of the state of Hessen.

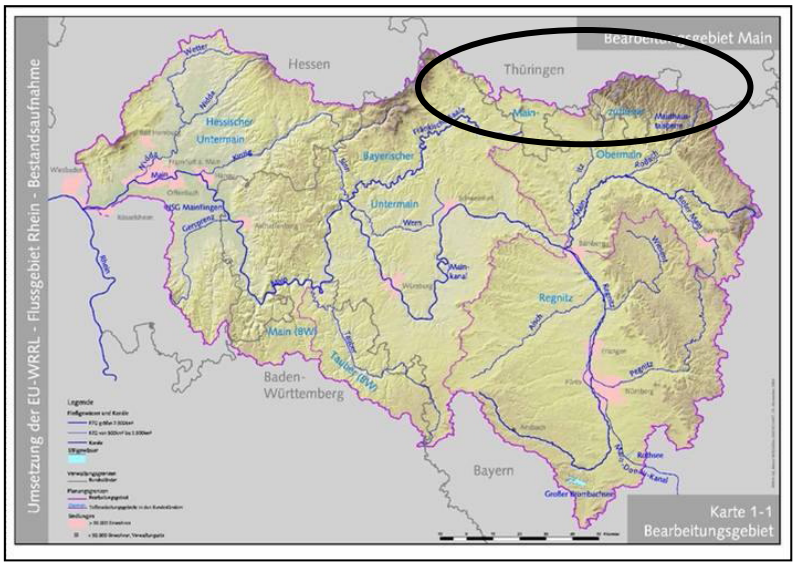
The RBMP states that, based on Article 7.2 of the WFD for bodies of water used for the abstraction of drinking water, it is necessary to show that the environmental objectives and WFD standards are taken into consideration. Furthermore, the abstracted water must meet the requirements of the Drinking Water Directive (98/83/EC, page 54), taking into account the applied water treatment method. This is the case for all bodies of groundwater in Hessen used for the abstraction of drinking water (Map 21, Appendix 1 of the RBMP). About 3% of the groundwater used is obtained through the artificial

filtration of treated surface water. The quality of drinking water is guaranteed at all times through the implementation of an extensive water treatment process and action plans in the case of failure. The RBMP also states that implementation of other EU guidelines such as the Plant Protection Products Directive (91/414/EEC), Nitrates Directive (91/676/EEC) and the Urban Waste Water Directive (91/271/EEC) have already resulted in significant improvements in groundwater and surface water quality. The only additional measures necessary to achieve a good status are for phosphate. The ecological status requirement for phosphate concentrations is however much stricter than the standard for surface waters intended for drinking water production.

Results

- The Hessen RBMP addresses all Article 7 provisions for all the drinking water sources within its administrative area. The preventative protection policy is considered to address Article 7.3.
- Few chemical groundwater and surface water quality problems are reported in the RBMP for this area of the Rhine river basin.
- Only P is identified as a problem substance requiring additional measures; however this is not a drinking water-relevant pollutant.
- As far as can be deduced from the RBMP, downstream functions are not taken into account in the assessment of water quality.

6.2.5 Thüringen



A relatively small part (816 km^2) of the Main sub-basin district of the Rhine lies in the German state of Thüringen. The area has a population of 91,000 (112 inhabitants/km^2). Only groundwater is used as a source of drinking water in Thüringen. A register of protected areas (Articles 6 and 7.1, WFD) has been produced for bodies of groundwater used for the abstraction of water for human consumption. The Main sub-basin in Thüringen contains 61 water protection areas, with a total surface area of 25 km^2. Annual abstraction for the public water supply totals 3.9 million m^3 of water, supplying 85% of the residents with drinking water. Prohibitions and measures comparable with the Dutch groundwater protection policy apply to agriculture in water protection areas in Thüringen. Policy therefore focuses primarily on preventative protection at ground level.

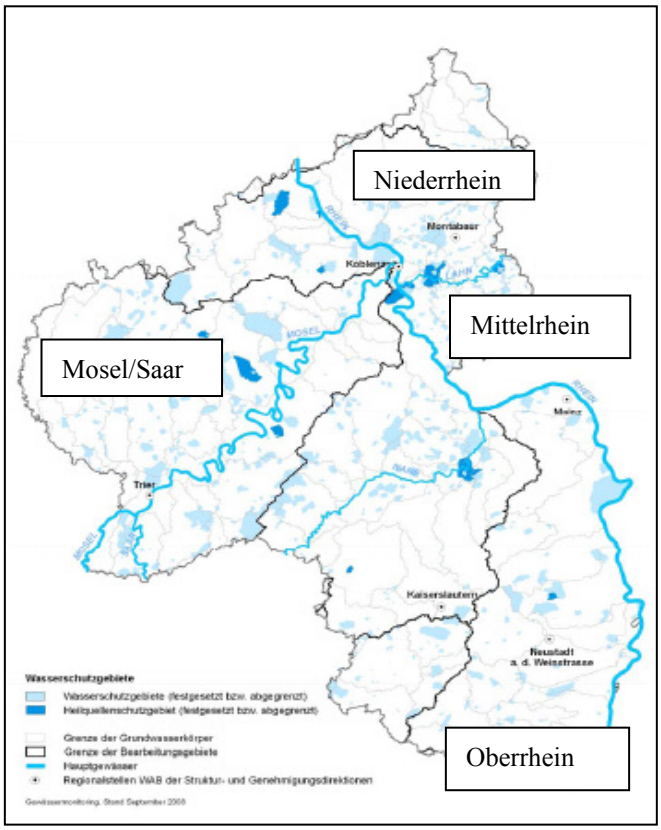
Chemical objectives for surface water are directly linked to the Priority Substances Directive and other relevant guidelines. The RBMP states that industrial point discharges are insignificant in the area, though nutrients are a quality issue in 2 of the 14 bodies of surface water. Problems are only found with N and P. Measures focus primarily on improvements in collecting and treating wastewater and

therefore reducing nutrient emissions. As far as can be deduced from the RBMP, downstream functions are not taken into account in the assessment of water quality.

Results

- The Thüringen RBMP addresses all Article 7 provisions for all the drinking water sources within its administrative area.
- Few problems are found with chemical groundwater and surface water quality in this area of the Rhine river basin.
- The only problem substances identified are N and P; however, these are not drinking water-relevant pollutants.
- As far as can be deduced from the RBMP, downstream functions are not taken into account in the assessment of water quality, though, based on the industrial activities named, their contribution is probably insignificant.

6.2.6 Rhineland-Palatinate



The German state of Rhineland-Palatinate has produced river basin management plans for the sub-basin districts of Niederrhein, Mittelrhein, Mosel/Saar and Oberrhein, which fall within its administrative area. Figures for the sub-basin districts are given in Table 6.5. The population density varies in the sub-basin districts from 120 inhabitants/km^2 (Mosel/Saar) to 360 inhabitants/km^2 (Oberrhein). Much industrial activity takes place in the more densely populated areas. Drinking water is produced from deep groundwater and river bank filtration water (about 246 million m^3/year). About 1,500 water protection areas have been defined in Rhineland-Palatinate. Spatial restrictions are in place in these areas to protect groundwater quality. The water protection areas cover about 11% of the total surface area of the state.

Initial characterisation of the area (2004) assessed 67% of bodies of surface water and 35% of bodies of groundwater as being ‘at risk’. With the exception of the groundwater bodies (GWB) in the sub-basin district of Niederrhein, concentrations of nitrates and plant protection products prevent a good status being achieved. It is explicitly stated that abstraction for human consumption also takes place in GWBs with quality issues (pages 145, 149 and 153), though not whether it is possible to produce drinking water from the abstraction sites in accordance with the Drinking Water Directive (98/83/EC– Article 7.2). It is possible that this analysis will be included in the as yet incomplete Sections 9.1.3

(*Richtlinie 98/83/EG über die Qualität von Wasser für den menschlichen Gebrauch – Trinkwasserrichtlinie*) and 9.3 (*Gewässer für die Entnahme von Trinkwasser*). Preventative protection policies are in place around abstraction sites in Rhineland-Palatinate. This policy is not, as it is in other RBMPs, linked to achieving Article 7.3 objectives (avoid deterioration and aim for future improvement). Standards were exceeded in the period 2004-2007 for a number of plant protection products, nitrates, zinc, cadmium, lead, nickel, PAHs and PCBs in 69 of the 362 surface water bodies. This assessment was carried out for priority substances (chemical status assessment) and environmental quality standards (*Ländesgewässerbestandsaufname- und -zustandsüberwachungsverordnung (LWBÜVO)*, 6-10-2004, page 74 RBMP – part of the ecological status assessment).

A distinction is made between basic measures and additional measures in the programme of measures. Basic measures are measures that are required by other guidelines (page 178 RBMP) and include measures that must be taken based on the Drinking Water Directive (98/83/EC). This is mentioned in the RBMP but the relevant section needs further development. Measures based on the Drinking Water Directive include measures that ensure that drinking water is healthy and clean, measures that set quality requirements and measures that implement controls.

Table 6.5 Figures for Rhineland-Palatinate sub-basin.

	Area [km^2]	Population [*1,000]	# Water bodies		Land use [%]			
			WB	GWB	Woodland	Agriculture	Urban development	Water
Mosel/Saar	6,981	831	125	38	45	47	7	1
Oberrhein	4,164	1,488	89	21	37	49	12	2
Mittelrhein	8,039	1,585	137	42	43	46	10	1
Niederrhein	709	141	23	16	51	37	11	1

The RBMP focuses on the interpretation of specific EC guidelines and the resulting measures. Additional measures that are implemented only for the WFD are barely mentioned. The intended quality improvement is specified in no more detail than to achieve good status. A 'register of phases for achieving the objectives' is also included in the RBMP. Should a good status not be achieved with implementation of the existing guidelines, a number of measures are described that could be taken (page 195, RBMP). It is unclear from the plan whether and when these measures are to be implemented. Examples are:

- rainwater treatment;
- additional wastewater treatment (industrial and public);
- reduced emissions from plant protection products;
- measures regarding pollutant enforcement policy;
- reduced deposition from the air.

The effects of measures on downstream functions are not addressed, with the exception of the effect of nutrient-reducing measures on objectives for the North Sea.

Results

- The Rhineland-Palatinate RBMP has produced a register for drinking water sources in its administrative area (Article 7.1). A preventative protection policy is implemented in the area surrounding the abstraction sites. No further details are given concerning meeting the objectives set in Articles 7.2 and 7.3.

- There is much industrial and agricultural activity in the Rhineland-Palatinate area. It is not possible to determine the effects of the implementation of existing legislation from the RBMP, though this is likely to be relevant to Dutch drinking water abstraction.
- The concept of *no shifting* is addressed through the documentation of measures for N and P reduction (improvements to STPs and rainwater treatment): without N and P reduction upstream, quality objectives for the North Sea will not be achieved. Downstream functions are not addressed for the other substances.

6.2.7 Saarland (Saar)

The German state of Saarland has over one million inhabitants and a surface area of 2,500 km^2. Land use is composed largely of woodland (39%), plus mining (11%), agriculture (31%) and grassland (16%). The only source of drinking water is groundwater. Both groundwater bodies in the state are included in the register of protected areas (Articles 6 and 7.1, WFD) as they are both used for the abstraction of drinking water. The RBMP states that no quality risks have been identified in water intended for human consumption and that all the drinking water supplied meets the requirements (Articles 7.2 and 7.3, WFD). Apart from coal mining, there is little industrial activity in the area. Of the 24 businesses in the area, 8 discharge warm water, 7 discharge salt water and 6 use a significant amount of surface water.

Prohibitions and measures comparable with the Dutch groundwater protection policy apply to agriculture in water protection areas (safeguard zones) in Saarland. Policy therefore focuses primarily on preventative protection at ground level.

The greatest problem for surface water quality is the presence of nutrients in concentrations that exceed standards. An 'agricultural toolbox' has been included in the programme of measures to reduce emissions to surface water through more efficient fertilisation; however, this does not concern drinking water-relevant pollutants. Measures that affect the chemical quality of surface water further downstream in terms of drinking water-relevant substances are shown in Table 6.6. Of note is that the RBMP does not address the effect of coal mining on the water quality, but that the table of measures in the appendices includes the measure to treat coal mine discharges as wastewater.

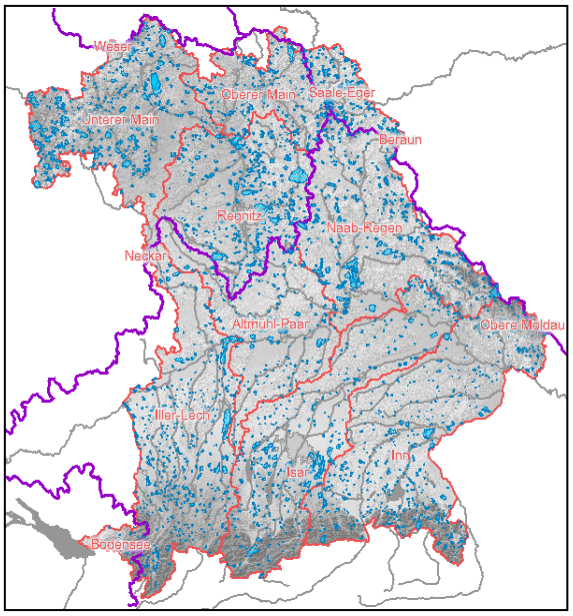
Table 6.6 Saarland RBMP measures that affect the chemical quality of surface water in terms of drinking water-relevant substances.

Parameter	Measure
Agricultural products (leaching of biocides, metals)	• rainwater treatment.
Diffuse sources	• optimise wastewater treatment (STPs, WTPs, rainwater treatment, however primarily focused on reduction of N and P and not drinking water-relevant substances; • connect coal mine discharge to wastewater system.

Results

- The Saarland RBMP addresses all Article 7 provisions for all the drinking water sources within its administrative area.
- As far as can be deduced from the RBMP, downstream functions are not taken into account in the assessment of water quality, although the discharge of warm water and salt water may be relevant to the downstream drinking water supply.
- It is not possible to assess from the report what the intended effect of treating discharges from coal mines in the area is.

6.2.8 Bayern (Main)



The Rhine river basin in the German state of Bayern is composed primarily of the Main sub-basin and a small part of Bodensee. The total area has 3.9 million inhabitants. The drinking water supply comes from both groundwater and surface waters (Main: 80% and 20% respectively; Bodensee: 60% and 40% respectively). A register of protected areas (1,102 drinking water protection areas) has been produced for bodies of water used for the abstraction of water for human consumption. There are 18 bodies of groundwater in the Rhine river basin district of Bayern, ranging in size from 100 to 2,000 km^2. All these groundwater bodies contain one or more abstraction sites for water for human consumption. About 154 million m^3 of groundwater are abstracted from the Rhine river basin district in Bayern each year for the public drinking water supply and industrial uses. The RBMP states that, using the existing treatment system, the water quality of the sources is such that drinking water is produced at all locations that satisfies the Drinking Water Directive (98/83/EC – Article 7.2). The RBMP also states that Article 7.3 is satisfied through the implementation of safeguard zones.

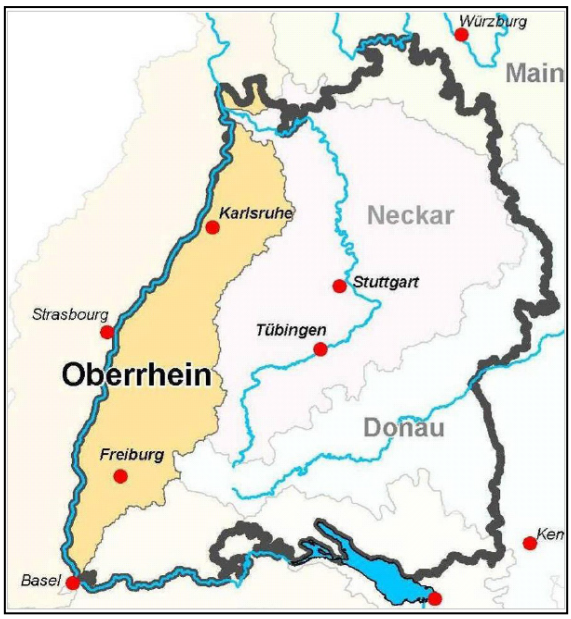
The RBMP shows that the main problem substances in surface water are nutrients and, in places, pesticides. Groundwater protection areas are currently safeguarded through changes made to the current land-use policy using specific groundwater protection regulations, such as the siting of businesses, urban development and other land uses. This approach is comparable with Dutch groundwater protection policy and focuses primarily on preventative protection at ground level. Chemical objectives for surface water are directly linked to the Priority Substances Directive and other relevant EU guidelines. No mention is made of standards or problem substances in surface water intended for drinking water production. As far as can be deduced from the report, downstream functions are not taken into account in the assessment of water quality.

A distinction is made between basic measures and additional measures in the programme of measures. Basic measures are measures that are required by other European guidelines and national legislation. The Bayern programme of measures does not include any additional measures that address the chemical quality of surface water in terms of drinking water-relevant substances.

Results

- The Bayern RBMP addresses all Article 7 provisions for all the drinking water sources within its administrative area.
- No mention is made of standards or problem substances in surface water intended for drinking water production; neither can these be derived from the identified emission sources.
- As far as can be deduced from the RBMP, downstream functions are not taken into account in the assessment of water quality.
- No noteworthy measures are named in the RBMP that would have a positive effect on downstream surface water quality in terms of drinking water-relevant substances.

6.2.9 Baden Württemberg (Oberrhein)



The Oberrhein sub-basin district has a population of 10.8 million. The drinking water supply comes from both groundwater and surface waters (75% and 25% respectively). A register of protected areas has been produced for bodies of water used for the abstraction of water for human consumption. Surface water abstraction takes place in the immediate surroundings of the Bodensee, where there is little pressure from industrial discharge. Most surface water abstraction takes place through river bank infiltration. About 180 million m^3 of groundwater are abstracted from the river basin annually for the public drinking water supply and 250 million m^3 for industrial uses.

The Oberrhein RBMP states that, using the existing treatment system, the water quality of the sources is such that drinking water is produced that satisfies the Drinking Water Directive (98/83/EC – Article 7.2) at all locations. Baden Württemberg intends to reduce the level of water purification treatment required by addressing protection policy (Article 7.3) (page 89). There are 557 water protection areas (*Wasserschutzgebiete*), covering 26% of the total surface area (1,417 km^2), each with an average surface area of 2.5 km². These protection areas are delineated based on geohydrological and geochemical parameters and hygiene considerations[3] within the catchment area. The plan shows that water protection areas may include both groundwater and river bank groundwater abstraction sites. The presence of plant protection products, nitrates and chloride (through salt discharge) and the infiltration of surface water are mentioned as problem areas.

The following groundwater protection area objectives are named:

- protect water intended for use in the public drinking water supply from harmful influences;
- adapt current land-use policy through specific regulations for groundwater protection areas, such as the siting of businesses, urban development and other land uses.

[3] The soil aquifer passage must be sufficient to satisfy the microbiological drinking water requirements.

This approach is comparable with Dutch groundwater protection policy and focuses primarily on preventative protection at ground level.

Chemical objectives for surface water are directly linked to the Priority Substances Directive and other relevant guidelines. No mention is made of standards or problem substances in surface water intended for drinking water production. As far as can be deduced from the RBMP, downstream functions are not taken into account in the assessment of water quality.
A distinction is made between basic measures and additional measures in the programme of measures. Basic measures are measures that are required by other guidelines. Many of the measures for surface water concern restructuring to benefit the ecological status. Measures that affect the chemical quality of surface water in terms of drinking water-relevant substances are shown in Table 6.7. No conclusion is drawn concerning the expected effect of the proposed measures.

Tabel 6.7 Oberrhein RBMP measures that affect the chemical quality of downstream surface water in terms of drinking water-relevant substances.

Parameter	Measure
Plant protection products	• implementation of the Plant Protection Products Directive (91/414/EC); • implementation of spray-free zones around bodies of surface water; • stimulate reduced agricultural use; • provide training and instruction on all aspects of plant protection product application; • good agricultural practice, increased control.
PAHs	• rainwater treatment; • stop application of STP slurry on land.
Diffuse sources	optimise wastewater treatment (STPs, WTPs, rainwater treatment), however primarily focused on reduction of N and P and not drinking water-relevant substances.

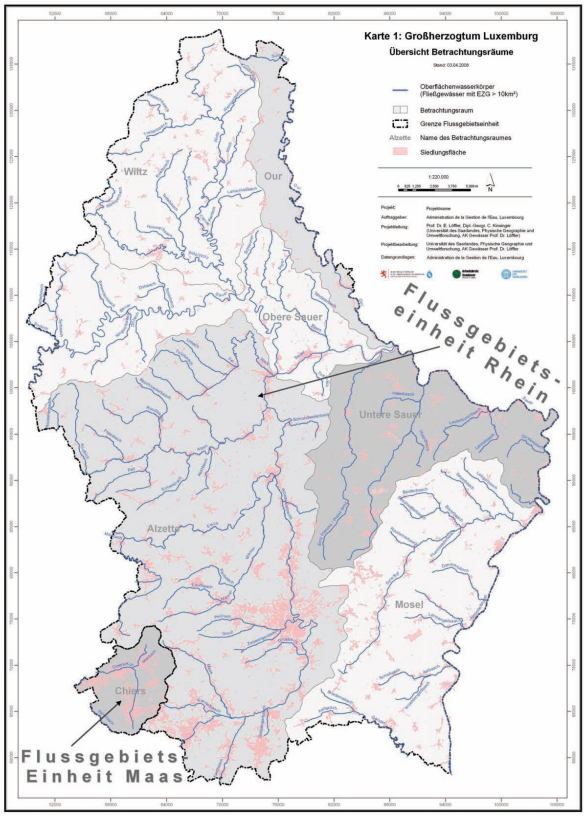
Results

- The Oberrhein RBMP addresses all Article 7 provisions for all the drinking water sources within its administrative area.
- No mention is made of standards or problem substances in surface water intended for drinking water production; neither can these be derived from the identified emission sources.
- As far as can be deduced from the RBMP, downstream functions are not taken into account in the assessment of water quality.
- The measures named for PAHs and plant protection products are possibly relevant to Dutch drinking water abstraction sites. These measures are not linked to a target result.

6.2.10 Luxembourg

The Grand Duchy of Luxembourg has a surface area of 2,597 km^2; 2,527 km^2 of this is situated in the Rhine sub-basin district and 70 km^2 in the Meuse sub-basin district. The population of Luxembourg is about 483,000. Land use is 35% woodland, 33% grassland, 18% arable land, 8% urban development and 6% water and other natural areas (not woodland). Two major industrial companies are mentioned in the Luxembourg RBMP: a copper processing company and a chemical manufacturer. There are 98 bodies of surface water defined in the Rhine sub-basin and 3 in the Meuse sub-basin. All the groundwater bodies (6) are assigned to the Rhine sub-basin.

Drinking water is produced from groundwater and surface water. About 39 million m³ are abstracted each year. Safeguard zones have been created for a number of highly vulnerable groundwater abstraction sites, in which three sub-zones are defined (*zone de protection immédiate*, *zone de protection rapprochée* and *zone de protection éloignée*). Spatial restrictions apply to land use in these subzones. According to the programme of measures, all groundwater abstraction safeguard zones must be in place by 2015. The procedure for the definition of safeguard zones is similar to that described for France (see Section 7.2.4). Only those areas which are currently already defined as safeguard zones are included in the RBMP. It is unclear how many abstraction sites still need to be included. It is not possible to deduce from the RBMP whether measures have been or will be taken to protect surface water abstraction sites, for example through the implementation of zones with specific standards. The report does state that the Drinking Water Directive (98/83/EC) is satisfied (p.19-20 RBMP). The status of protection areas is to be included as a separate map in the final version of the RBMP (not yet available in the draft version of November 2008). In defining pressures on the system, a distinction is made between point sources and diffuse sources. Not all homes in Luxembourg have yet been connected to the wastewater treatment system; this process should be completed by 2015. Pressures on the system are expressed in COD, N, P, copper and zinc. Groundwater is polluted with PAHs and tetrachloroethylene in four places. Groundwater and surface water quality are also influenced by the leaching of nitrates and plant protection products from arable land.



The RBMP describes the programme of measures as a catalogue of many standard measures from which the appropriate measures for each body of water can be selected. This catalogue is not included in the RBMP. A factsheet has been produced for each body of water identifying the problem areas and the measures taken. However, the measures are described in very broad terms in the RBMP, so that it is unclear what is expected. It does however seem that measures have been taken to reduce industrial discharges (improvements to treatment plants) and the agricultural application of pesticides.

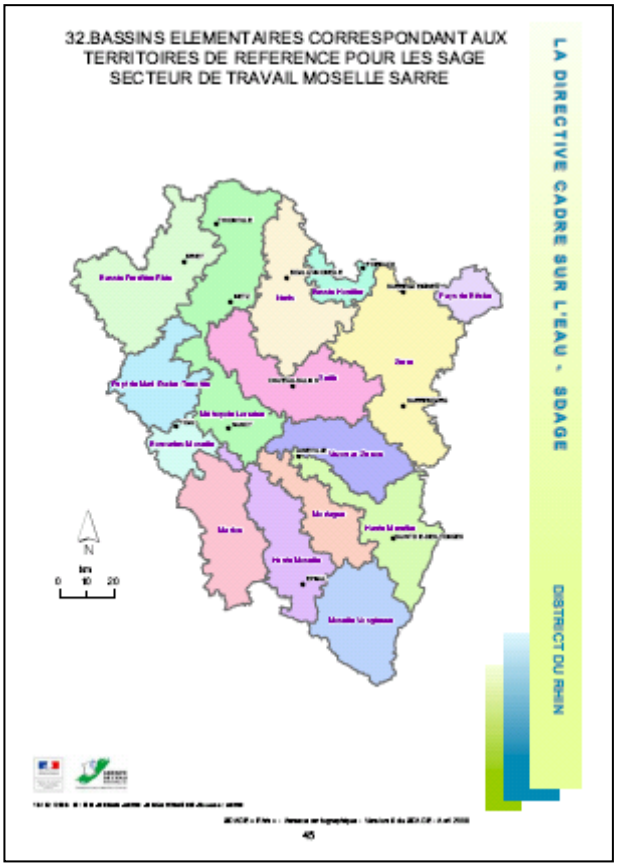
Results

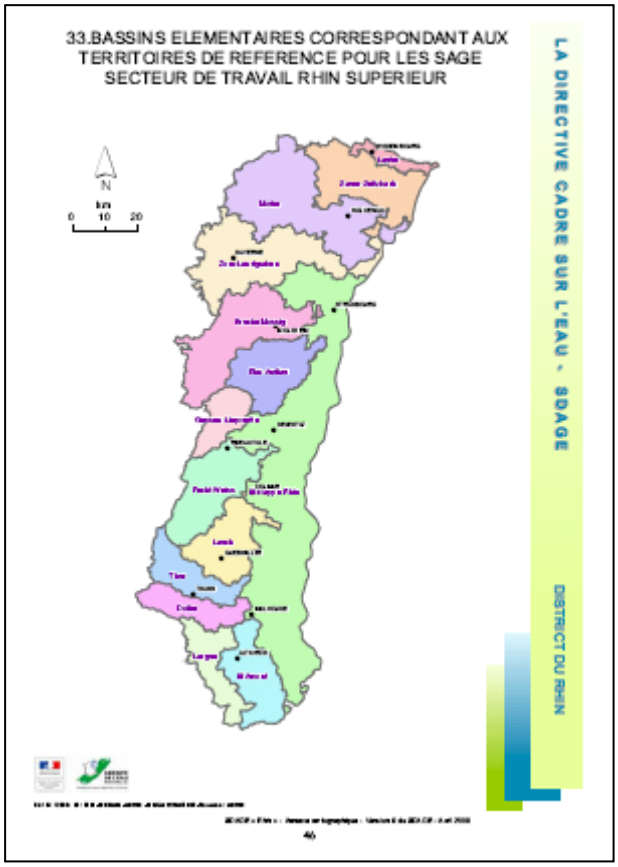
- Luxembourg has included a register in the RBMP for some of its drinking water sources (Article 7.1, WFD). It is explicitly stated that the Drinking Water Directive is satisfied (Article 7.2). Article 7.3 is not named as a separate objective, but the implementation of safeguard zones, along with the corresponding preventative spatial protection policy, is described in detail in the RBMP.
- No mention is made of standards or problem substances in surface water intended for drinking water production; neither can these be derived from the identified emission sources.
- As far as can be deduced from the RBMP, downstream functions are not taken into account in the assessment of water quality.
- The measures named for plant protection products are possibly relevant to Dutch drinking water abstraction sites. These measures are not linked to a target result.

6.2.11 France (Rhine)

The Rhine sub-basin district (Saar, Meuse and Oberrhein) that lies in France covers a surface area of about 4,000 km² and includes a population of about 2 million.

The aim and implementation of the French Rhine RBMP with respect to WFD Article 7 objectives are described in Section 7.2.4. The objectives, approach, identified problem substances and programme of measures are the same for the Rhine and the Meuse sub-basins, though their implementation may differ at individual water body level.





7 RBMPs of Member States in the Meuse river basin0

The river basin management plans of the Member States in the Meuse river basin are assessed in this chapter based on two questions:

- How are the Article 7 objectives of the WFD addressed in the plans?
- How do the plans of neighbouring countries contribute to fewer quality issues regarding the production of drinking water from surface water in the Netherlands?

7.1 Part A: Common section

Article 13.3 of the WFD states that a single coordinated management plan must be produced for international river basin districts. To protect waters in the international Meuse river district, the five Member States in the Meuse river basin have decided to coordinate their activities through the International Meuse Commission (IMC), for the coherent implementation of the WFD. Due to the large size and complexity of the Meuse river basin, the decision was taken to divide the management plan into a common part A and separate region-specific part Bs. Other than the Rhine river basin, the Meuse river basin is not divided into sub-basins, but separate management plans are produced for each country (such as the French Meuse and the Dutch Meuse) or region (the Flemish Meuse and the Wallonian Meuse).

The Meuse river basin provides 8.8 million residents living in the river basin district with water from surface water or groundwater. In addition, water intended for human consumption is transported to about 6 million people living outside the Meuse river basin district (Meuse RBMP Part A, 2008).

Table 7.1 Important properties of the Meuse river basin (Meuse Part A, 2008).

	Surface area [km^2]	Population [* 1,000]	# Water bodies		# Groundwater bodies
			'Lakes'	'Water courses'	
France	8,919	671	5	149	12
Luxembourg	65	43	0	3	1*
Belgian Wallonia	12,300	2,189	12	245	21
Belgian Flanders	1,596	416	3	17	10
The Netherlands	7,700	3,500	127	188	5
Germany	3,968	1,994	1	227	32
TOTAL	**34,548**	**8,808**	**150**	**840**	**82**

*The groundwater body in Luxembourg is included in and managed by the Rhine IRBD.

The KWR (Dutch Watercycle Research Institute) has conducted an analysis for RIWA Meuse into the river basin management plans of the Meuse river basin district (De Rijk et al., 2009), in which an estimate is made of the effects of measures on water quality in the Meuse, in particular with regard to drinking water-relevant substances. The Dutch and Belgian plans are analysed, although the French plan is not. This report uses the results of the KWR study as well as own observations taken from the

RBMPs, such as the way in which Belgium addresses Article 7 of the WFD concerning its own extraction sites (groundwater and surface water) used for human consumption.

Figure 7.1 **The Meuse river basin district (Meuse Part A, 2008).**

Part A provides a general outline of the characterisation of the system, the defined objectives and programmes of measures. A list of river basin-relevant substances was produced for the characterisation (Table 4.2). Some of these substances are taken from the Priority Substances Directive (2008/105/EC) and some are relevant in terms of achieving and assessing good ecological status. Only the pesticides named are relevant to drinking water production (De Rijk et al., 2009). The regions involved have also conducted a joint analysis of the candidate substance[1] fluoride for which, in addition to the ecological approach taken under the WFD, the importance to drinking water production is investigated. The analysis shows that although fluoride is an important parameter, the production of drinking water from the Meuse is not at risk, with the exception of extreme circumstances. Only France considers fluoride to be a relevant substance (Meuse RBMP Part A, 2008, page 14), though this does not justify fluoride being considered a relevant substance for the river basin district as a whole. Furthermore, the RBMP states that some substances not included in the list, for example dichlorvos and pyrazon, as well as a number of drinking water-relevant substances, will be monitored 'for the time being'. The RBMP does not say which substances this applies to and for how long the monitoring is to take place.

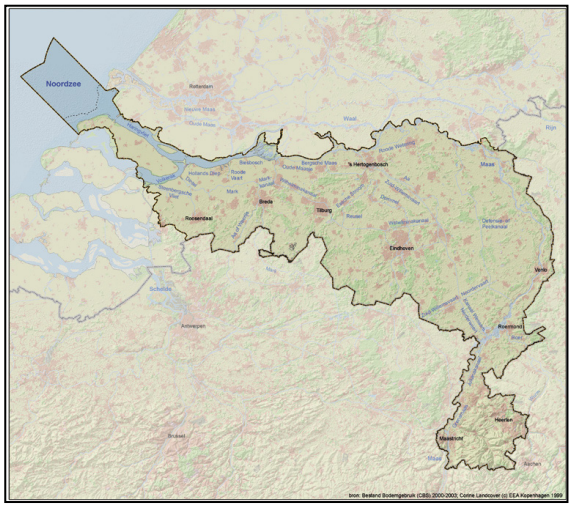
Part A does not include a register of protected areas, but instead refers to the supporting documents (see Section 7.2 of this report); neither does the report address Articles 7.2 and 7.3 of the WFD. Also, no mention is made in Part A of passing upstream water quality issues onto downstream use values (*no shifting*). Mention is made just once in the Appendices of the fact that the leaching of nutrients has a negative effect on communities in the North Sea.

A summary of the river basin programme of measures is provided in Part A, though the Meuse RBMP Part A is even less specific than its equivalent for the Rhine river basin. As far as surface water quality is concerned, most measures focus on a reduction in nutrients. The drinking water function is not mentioned in relation to measures for good chemical quality, though it is named in the assessment of the quantitative status of bodies of groundwater. Appendix 28 of Part A includes a summary of the measures taken by Member States in the Meuse river basin. Joint measures include improvements in the collection and treatment of domestic and industrial wastewater and the reduction of diffuse pollution from agriculture. The measures are to be elaborated in the RBMPs of the separate Meuse Member States/states.

[1] Fluoride is a candidate substance for inclusion in the Priority Substances Directive list of substances (2005/105/EEC).

7.2 Part B: sub-basin districts

7.2.1 The Netherlands



The aim and policies are the same for the Dutch Meuse river basin management plan as for the Rhine Delta RBMP. A number of elements from Section 6.2.1 therefore recur here, in the discussion of the Dutch Meuse RBMP.

The Dutch part of the Meuse river basin has a surface area of 7,700 km^2 (22% of the total Meuse river basin area) and a population of about 3.5 million. Most land is used for agriculture (70%) and nature (15%); the other 15% consists of recreation, housing and industry. The Meuse is a typical rainwater river, with high flows in the winter, little flow in the summer and rapid changes in discharge. Drinking water is produced from groundwater and surface water in the Dutch Meuse river basin. Of the 89 drinking water abstraction sites identified, 68 are used for the public drinking water supply. The Meuse is also used as a source of drinking water for areas outside the river basin.

The bodies of groundwater and surface water used for the production of water for human consumption are included in the register of protected areas (page 27, RBMP), regarding which the following comments can be made:

- There is one riverbank groundwater abstraction site in the Dutch Meuse river basin – Roosteren. Surface water from which infiltration takes place is not yet included in the register.
- The body of surface water in which the Heel abstraction lies is almost completely downstream of the point of abstraction (please also refer to Section 4.1 and Figure 4.3). In general, only protective measures taken upstream of an abstraction site can improve the water quality at the point of abstraction.

The protection policy for *groundwater* is considered to guarantee drinking water quality. The RBMP states that drinking water can be produced from groundwater that satisfies the requirements of the Dutch Drinking Water Directive (Article 7.2, WFD) (page 83). This is not explicitly stated for *surface water*. The quality requirements of the DQOMW apply to surface water abstraction for drinking water. The identification of other drinking water-relevant substances is identified as a knowledge gap that needs to be addressed in the next RBMP (page 114 – please also refer to Section 6.2.1).

The chemical status of the Dutch Meuse is assessed in terms of the priority substances. A number of PAHs, tributyltin, copper, zinc and a number of pesticides are identified as problem areas. It is noted that the ability to achieve good status is influenced by measures taken upstream (75% of the system load). To include this effect in the assessment, the evaluation of achievability of the objectives within the WFD timeframe will be addressed in the following planning period. Other substances are included in the assessment of the ecological status.

Sources are identified using national emission registration data. An activity is defined as significant if the pressure contributes more than 10□% to a substance that exceeds standards. As in the Rhine Delta RBMP, the selection of substances is linked in the Dutch Meuse RBMP to the exceedance of standards. Substances for which no standards are available are not included in the assessment.

The discussion regarding the temperature standard also takes a prominent place in the Dutch Meuse RBMP (RBMP, page 55 and page 132 – please also refer to Section 6.2.1 of this report).

A summary is given in Appendix K (page 74) of the RBMP of the measures implemented under current legislation for the protection of drinking water. Measures are categorised as basic measures (measures taken based on existing policy and legislation) or additional measures. Additional measures are only attributable to the requirements of the WFD. The RBMP does not include any additional measures that specifically focus on the chemical quality of surface water for drinking water production, though measures are identified that also have a positive effect on drinking water-relevant substances in surface waters (shown in Table 7.2).

ACTeon/Ecologic (Grandmougin et al., 2009) has found that, in general, RBMPs contain limited plans to implement measures to reduce concentrations of hazardous (priority) substances. The focus is primarily on hydromorphological interventions and tackling diffuse sources. No reduction measures for polluting sectors are included in the Dutch Meuse RBMP for the first planning period. Interesting in this respect is the initiative taken in the Seine sub-basin district, in which local interest groups have decided to include and finance additional measures for particular substances in the programme of measures. This is made possible through application of the chosen bottom-up approach.

A number of measures that focus on the drinking water function are however included for groundwater (RBMP, pages 160-162):

- an information campaign concerning the use of pesticides in 10 groundwater protection areas in the Dutch province of Brabant and 11 in Limburg;
- research into at-risk soil pollution sites in groundwater protection areas and, where necessary, the implementation of extra clean-up activities;
- research into the problems related to and the desirability of measures regarding the industrial abstraction of groundwater for human consumption;
- the Mergelland research measure based on the Nitrates Directive (91/676/EEC; see Section 6.2.9, RBMP).

Results

- The Dutch Meuse RBMP addresses all Article 7 provisions for all the drinking water sources within its administrative area. The conclusion is drawn that the continued enforcement of existing groundwater protection policy will ensure a sufficient effort is made to meet future quality improvement targets. How the provisions of Articles 7.2 and 7.3 for surface waters are to be addressed is not discussed.
- The body of groundwater used for the abstraction of river bank groundwater (Roosteren) is included in the register of protected areas; the corresponding body of surface water is not. Because river bank groundwater is composed primarily of infiltrated surface water that has undergone soil aquifer treatment, and because pollutants in the infiltrated surface water directly influence the quality of the abstracted groundwater, the inclusion of the bodies of surface water in the register should also be considered.
- Various statements are made in the RBMP regarding the approach to be taken to the temperature standard for surface water. Considering the locations of cooling water discharge

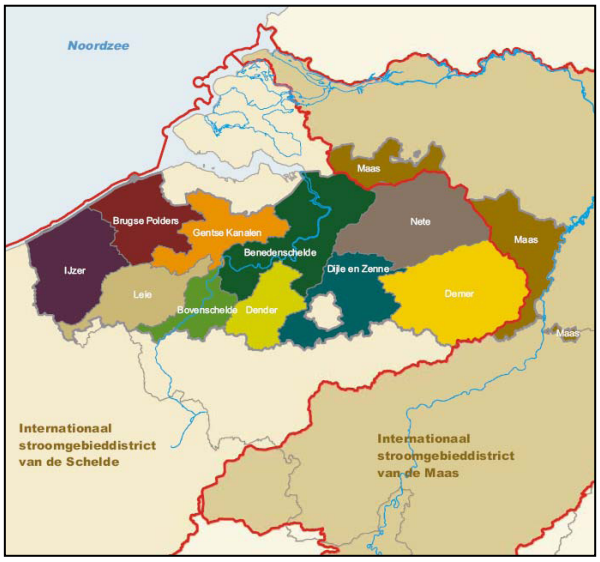
sites and abstraction sites for drinking water production, it would seem useful to document the specific risks for each abstraction site, for example in the drinking water protection file. It may then be possible to tackle the problem through targeted measures.

- The identification of environmentally hazardous substances that may threaten the drinking water supply is named as a knowledge gap that needs to be addressed.
- The effect of shifting must also be further investigated. Whether or not objectives for Meuse-relevant substances can be met are reported to depend on this.
- The RBMP does not include any additional measures that specifically focus on improving the chemical quality of surface water in terms of the drinking water function, though measures are identified that have a positive effect on drinking water-relevant substances in surface waters, such as the implementation of spray-free zones and other emission control measures.
- Measures are included to improve the quality of groundwater at abstraction sites, though these measures are not linked to a target result.

Table 7.2 Dutch Meuse RBMP measures that affect the chemical quality of groundwater and surface water in terms of drinking water-relevant substances.

Parameter	Measure
Plant protection products Biocides	• implement drinking water monitoring if application of plant protection products and biocides permitted; • local projects to stimulate reduced agricultural use; • implement fertilisation-free/spray-free zones.
Point sources	• improve/change treatment process at 19 STPs, focused on reducing N/P and priority substances; • clean-up untreated discharges (9) and sewerage overflows (74); • disconnect rainwater discharge (287 ha) from wastewater system, may also have negative influence on groundwater/surface water quality; • other emission-reducing measures, such as permit system based on BREFs (best available techniques) and emission-immission assessment; • diffuse source implementation programme (medicines).
Historical groundwater pollution	• investigate and clean up/control severe and emergency soil and groundwater pollution.
MTBE/ETBE/PAHs	• reduced emissions from traffic/shipping (diffuse source implementation programme); • disconnect paved area from wastewater system, both positive and negative effect.
Unclear	• changes to groundwater abstraction sites (3).

7.2.2 Flanders (Belgium)



The Flemish part of the Meuse river basin has a surface area of 1,600 km^2 – about 5% of the total Meuse river basin area. The area is highly urbanised and has a population of about 416,000.

Drinking water is supplied by both groundwater and surface water (a ration of 1:2). A register of protected areas has been produced for bodies of water from which water is abstracted for human consumption. For groundwater abstractions, the safeguard zones are included rather than the groundwater bodies themselves.

Three types of safeguard zone have been established for groundwater in Flanders:

I the immediate surroundings of the abstraction site (retention time 24 hours), the water collection area;

II the bacteriological zone: groundwater travel time of 60 days, a maximum of 150 m (artesian abstraction sites) to 300 m (other abstraction sites), comparable with the water collection area in the Netherlands;

III the chemical zone: for phreatic abstractions, a maximum of 2,000 m around the abstraction site. This is comparable with the groundwater protection area in the Netherlands.

Abstraction for drinking water is used as one of the distinguishing functions when characterising bodies of surface water. […] All bodies of water adapted with the aim to supply reservoirs for drinking water production have been selected based on *expert judgement* and in consultation with the water companies […] (page 33) and designated heavily modified bodies of surface water (the Albert Canal and Nete Canal).

Groundwater is abstracted for the public drinking water supply from five of the ten bodies of groundwater. There are a large number of abstraction sites (3,000 permits) in the Meuse river basin district in Flanders, most of which are for agriculture (2,269). However, in quantitative terms, most abstraction is for the production of drinking water (85 million m^3/year of a total of 111 million m^3/year, spread over 23 sites).

A distinction is made between point sources and diffuse sources when identifying emission sources and the resulting substances that may be released into the water. Relevant substances selected for *surface water* are oxidising substances, nutrients and hazardous substances (metals, PAHs, plant protection products and volatile organic matter). As far as oxidizing substances and nutrients are concerned, the greatest pressure on surface water from diffuse sources is from agriculture. The pressure from homes has decreased due to the increase in collective wastewater treatment – in 2005, 84% of domestic wastewater was treated at an STP. This decrease applies to N, P, COD and BOD, rather than other substances such as medicines. The most significant emission sources for the hazardous substances selected are named as: leaching and run-off from arable land, leaching of agricultural materials,

atmospheric deposition, the use of wood preservation products, traffic (rubber tyre wear), soil erosion and industrial point discharges.

For groundwater, a distinction is also made between point sources (historical, large-scale (> 1 million m^3) groundwater pollution[2]) and diffuse sources (plant protection products). The standard for pesticides was exceeded at less than 20% of the monitoring sites in the seven groundwater bodies investigated.

In Flanders, a distinction is made between groundwater quality standards (page 95) and threshold values (page 99). Groundwater quality standards[3] are generally applicable, whereas threshold values are only determined for groundwater bodies in which the parameter concerned may indicate a disturbance in the naturally good status. The standards based on Directive 75/440/EEC apply to protected areas of surface water used for the production of drinking water (page 103). The RBMP states that these standards need to be brought up to date in order to satisfy Article 7, Paragraph 3. Examples given are pesticides and other chemical substances for which drinking water standards, but no environmental quality standards, exist. No mention is made of new, as yet unknown, substances such as medicines. For this reason, a special measure is included in the programme of measures for the preparation of new standards and targeted measures in drinking water abstraction areas (page 103).

A distinction is made between basic measures and additional measures in the programme of measures. Basic measures are taken based on existing legislation. Additional measures are taken in order to achieve WFD objectives. Although attention is paid to upstream cross-border issues in the programme of measures, it mainly focuses on quantity aspects. The effects of upstream measures on downstream water quality are not known in Flanders (page 176). The pressures on the Meuse in Flanders and the effects on downstream (cross-border) water quality are not specifically identified.

The following measures are named as being important within protected groundwater and surface areas:

- The establishment and enforcement of restrictions by decree, for example regarding the use of plant protection products;
- The obligatory production of drinking water safety plans (page 159). These are also reflected in the proposed Dutch drinking water protection file.

No conclusion is drawn concerning the expected effect of groups of measures.

Results

- Drinking water sources in the administrative area are included in a register of protected areas. The RBMP does not mention to what extent the provisions of Article 7.2 are met. As far as Article 7.3 is concerned (future quality improvement), a knowledge gap is identified regarding standards and measures for surface water. This needs to be addressed in the next planning period.
- As far as can be deduced from the RBMP, downstream functions are not taken into account when assessing water quality.
- The measures named for emissions from point sources and plant protection products may be relevant to Dutch drinking water abstraction.
- The effects of measures are qualitatively described.

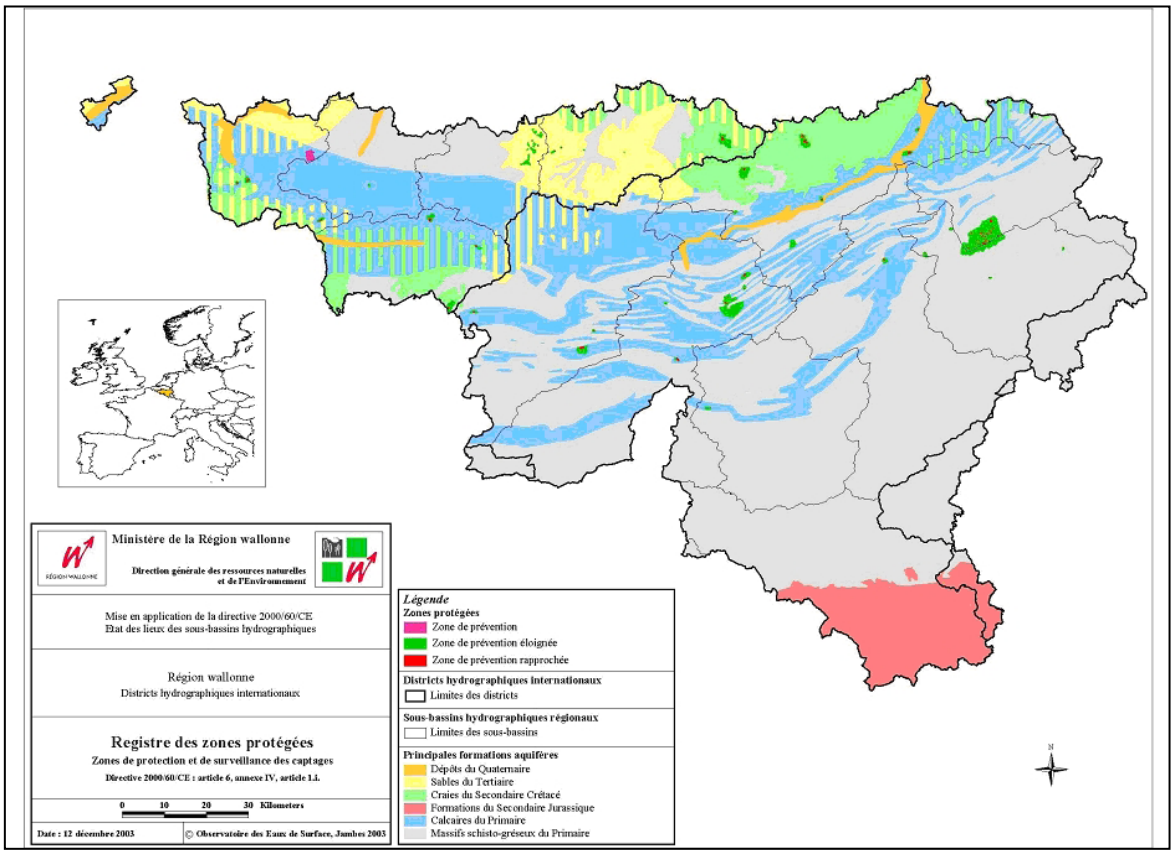
[2] One relevant point source was identified in the initial characterisation process (the Overpelt non-ferrous industry).

[3] Groundwater quality standards were in place in Flanders before the introduction of the WFD (Flemish environmental licence regulation – Vlarem) and are based, amongst other things, on drinking water standards and background values.

Table 7.3 **Flemish Meuse RBMP measures that affect the chemical quality of downstream surface water in terms of drinking water-relevant substances.**

Parameter	Measure
Plant protection products	• implementation of spray-free zones around bodies of surface water; • use of drift-reduction nozzles; • reduced application by local authorities on hard surfaces; • public information dissemination (www.waterloketvlaanderen.be); • good agricultural practice, increased control.
Diffuse sources	• increase connection to sewerage system, however primarily focused on removing N and P and not on drinking water-relevant substances.
Point sources	• stricter permit system for industrial discharges; • reduce sewerage overflows.

7.2.3 Wallonia (Belgium)



The Wallonian area of the Meuse river basin covers a surface area of 12,283 km^2 and has a population of about 2.1 million. About 36% of the sub-basin district is woodland, 39% arable land (with a roughly equal ratio of livestock farming and arable fields) and 7% urban areas. About 1,000 businesses in the area are required to own a permit. Thirty of these businesses are responsible for 72% of the emissions:

these are chemical, metal, artificial fertiliser, energy and paper manufacturers. Of the industrial emissions, 7% are treated (page 71, *Tome 1: État des lieux en Région wallone*, 2005).

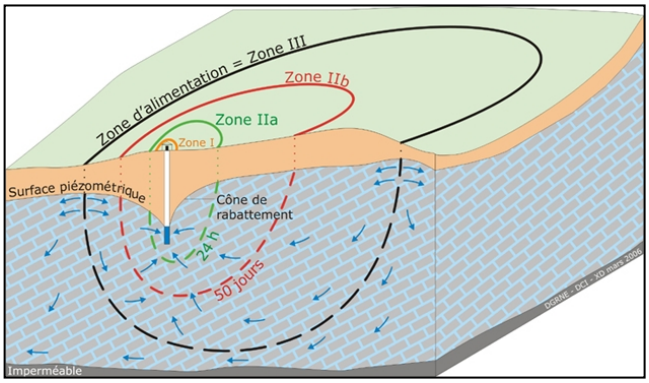
According to the information provided, drinking water is only produced from groundwater. Specific quality issues are not addressed, though attention is paid to the need to preventatively protect groundwater to ensure its continued good quality.

Three types of safeguard zone are established for groundwater in Wallonia:

I the immediate surroundings of the abstraction site: *zone prise d'eau*;

IIa/b the bacteriological zone: groundwater travel time of 50 days, comparable with the water collection area in the Netherlands: *zone rapprochée en éloignée*;

III the safeguard zone: *zone d'alimentation*.



Water companies must produce a file establishing the required size of the safeguard zone, based on the hydrogeological properties of the abstraction and the risks. The necessary measures to be taken are also to be included in the file. A safeguard zone III will then be established, based on these files, and this zone included in the register of protected areas. Restrictions apply within the safeguard zone to prevent the pollution of groundwater, in particular regarding nutrients and pesticides and the establishment of certain industries. This zone III is comparable with the groundwater protection area in the Netherlands and the file with the drinking water protection file (pages 4 and 5 *Tome I: État des lieux en Région wallonne; Registre des zones protégées*, 2005). About 800 abstraction sites are potentially eligible for such protection. Meanwhile (June 2008; http://environnement.wallonie.be/directive_eau/pg/7/75/754.asp?x=95&y=25), 268 files have been produced by the water companies, based on which 141 safeguard zones have been officially established. Eight safeguard zones have also been identified for the abstraction of spring water for sale as bottled water. Increased monitoring and enforcement in the protection areas is also included in the programme of measures.

When identifying pressures on the water system, distinction is made between:

- domestic wastewater;
- diffuse agricultural emissions;
- diffuse emissions resulting from paving;
- industrial discharges;
- recreation.

N, P and a number of priority substances receive particular attention when translating these emissions into effects on water quality. An important contributor to the improvement of downstream surface water quality is the increasing number of homes (new connections and expansion) and businesses connected to wastewater treatment plants. However, it is not clear from the RBMP which substances will be positively influenced by these measures. Creation of a 'Register of sensitive objects/functions and sites', at which hazardous discharges take place, is also mentioned. This would enable targeted measures to be taken to counteract the effects of an emergency.

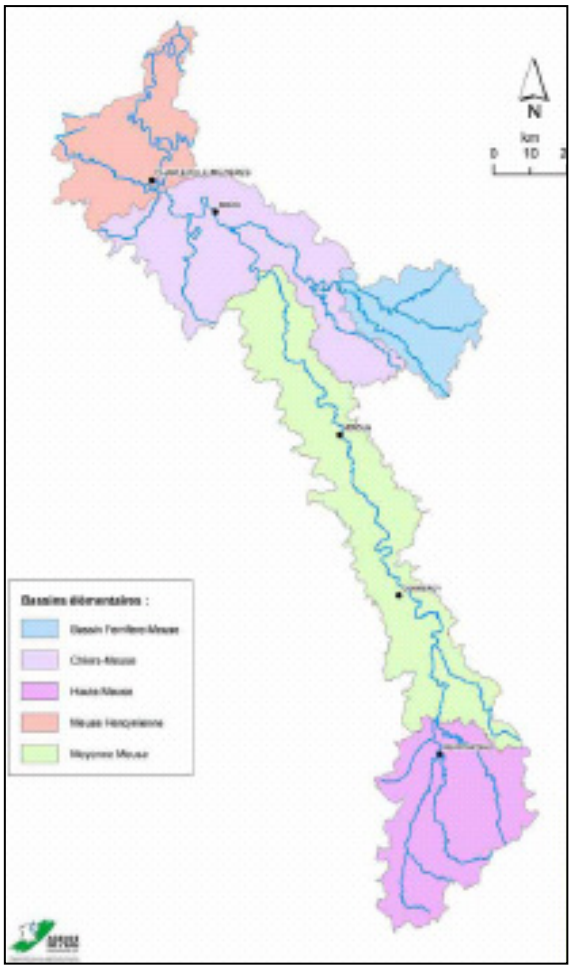
Table 7.4 **Wallonia RBMP measures that affect the chemical quality of downstream surface water in terms of drinking water-relevant substances.**

Parameter	Measure
Plant protection products	• information campaign – industry and general public; • registration professional purchase/use; • reduce application on paved surfaces by local authorities; • develop alternative techniques, share best practises; • use drift-reduction nozzles; • increase enforcement in abstraction areas; • where necessary, implement restricted application areas.
Industrial substances	• register of hazardous discharges/vulnerable objects: reduce effect of emergencies; • reduce emissions through discharges; adapt/optimise WTPs, unclear which substances will be affected; • modify WTPs taking into account best available techniques; • monitor emissions to enable tracing of polluters.
Diffuse sources	• optimise wastewater treatment (STPs, WTPs), unclear which substances will be affected.

Results

- Only those drinking water sources in a protection area are included in the register of protected areas. The RBMP does not mention to what extent the provisions of Article 7.2 are met, though it is stated that the current status of groundwater is good. No specific assessment is made against Drinking Water Directive (98/83/EC) standards.
- As far as can be deduced from the RBMP, downstream functions are not taken into account when assessing water quality.
- The measures named for emissions from industrial and domestic sources and plant protection products are possibly relevant to Dutch drinking water abstraction. It is unclear which substance concentrations would be reduced as a result.

7.2.4 France (Meuse)



The French area of the Meuse river basin covers a surface area of 8,919 km^2 and has a population of about 671,000. Woodland, agriculture, urban areas, industry and heavy industry are found in the sub-basin area. Pressures are described qualitatively for each body of surface water, but these are not translated into pressures by substance. The bodies of water are then assessed against physical-chemical standards for the ecological status (nutrients) and the priority substances. The most important problem substances identified are nitrates, plant protection products, PAHs and a number of heavy metals. Reduction objectives therefore focus on these substances. Should other substances be found that form a problem downstream, they may be added later (Tome 2/page 43, Rhin, Agence de l'eau, 2008) following international consultation.

It is unclear how much drinking water is produced from groundwater and surface water. Of note is that not all abstraction sites used for the production of water for human consumption are identified as a public supply in France: 2,290 (60%) had been identified as such in 2007. The safeguard zone is also described in the *déclaration d'utilité publique*. This is included in the RBMP as national policy (ready for implementation in 2012). For now, both the unidentified and identified abstractions are included in the register of protected areas (Figure 7.2). Possible future abstractions are also included. Responsibility for implementation and enforcement of protection policy lies with the mayor. This prevents conflict with spatial planning. Also noteworthy in the RBMP is the explicit focus on the quality of drinking water from the tap. Objectives are given regarding change in quality during distribution and the use of water purification systems (Tome 4/page 19 ff). These objectives are no longer reflected in the programmes of measures for the Rhine and Meuse. The focus on drinking water can possibly be explained by the fact that this also falls under the responsibility of the mayor in France.

The description of the objectives states that the objectives must be met for protected areas by 2015 (described as a 'reduction in treatment level required', Tome 2/page 11) and that the standards from 75/440/EEC also apply to surface water. The presence and risks of new substances (*pollutants émergents*, Tome 4/page 16), the effects of combinations of substances and the use of bioassays are named as research objectives.

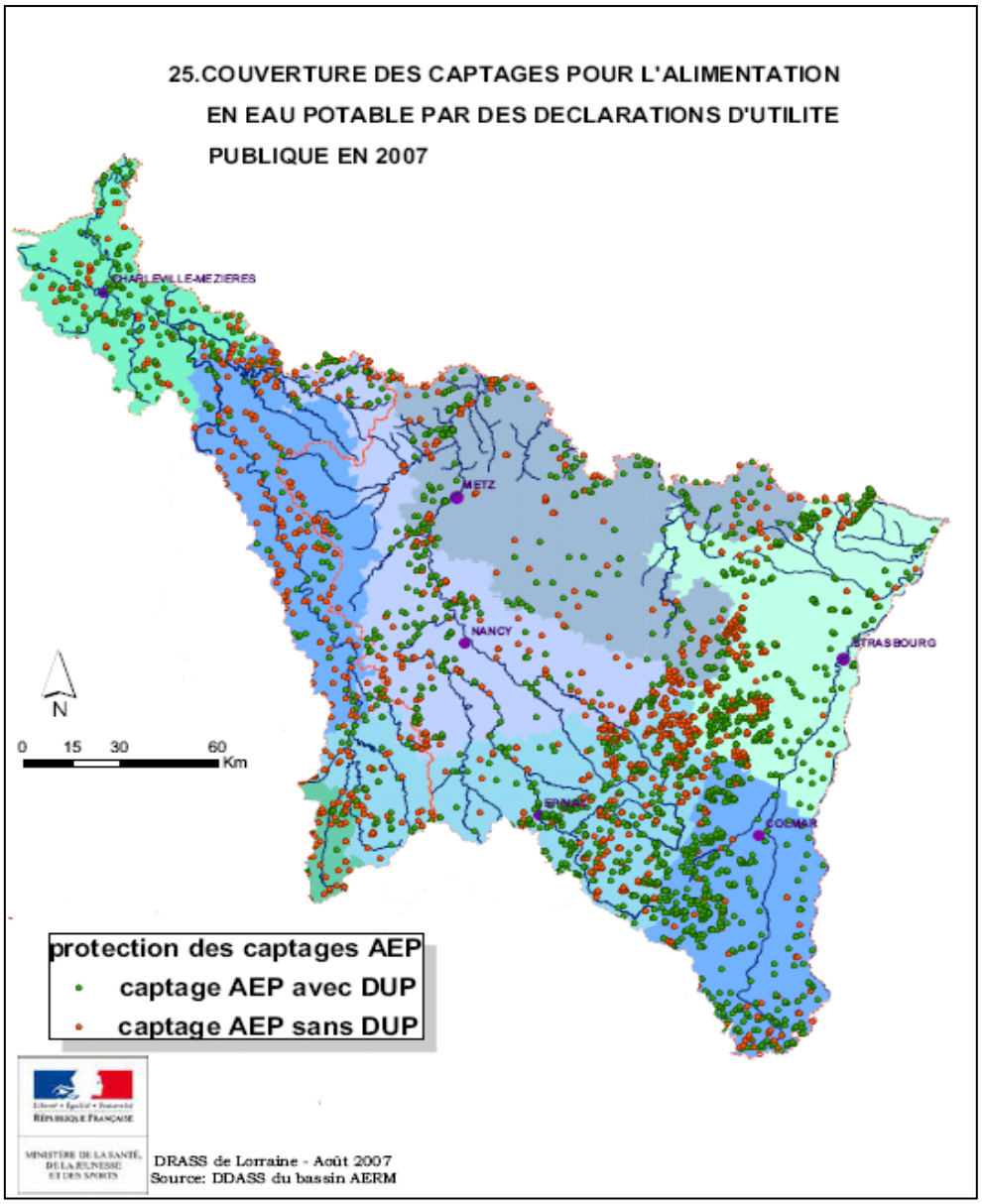


Figure 7.2 **Abstractions (groundwater and surface water) for human consumption (France).**

Programmes of measures are based on the identified pressures on the water system:

- wastewater treatment;
- industry and trade;
- agriculture;
- morphology.

Depending on the body of surface water, one, several or all the programme measures will be implemented. Though the measures do not aim to improve the drinking water function, they can have a positive effect on it. Measures that affect the chemical quality of surface water in terms of drinking water-relevant substances are shown in Table 7.5. The Rhine and Meuse programmes of measures report that in a significant proportion of groundwater bodies (60% in the case of the Rhine; 35% in the

case of the Meuse), the status is influenced by the presence of plant protection products in concentrations that exceed standards (*mediocre* status). Extension of the timeframe and objective reductions are included to address this problem. The assessment of the achievability and affordability of measures forms an important part of the programme of measures. A *fiche* (file) is produced for each body of surface water describing the objectives, measures and investments. These files form part of the programme of measures. A list of exemptions is also included.

Table 7.5 French RBMP measures that affect the chemical quality of downstream surface water in terms of drinking water-relevant substances.

Parameter	Measure
Plant protection products	• construction of buffer zones; • improve spillage prevention; • make alternative techniques available to local authorities and the general public; • information and awareness raising campaign – professionals and general public.
Industrial substances	• reduce industrial discharge through leaching or overflow; • improve spillage prevention; • reduce emissions of toxic substances from small businesses such as printers and garages; • clean-up severely polluted industrial areas; • water treatment using best available techniques, improve water collection; • research and implement measures to improve awareness.
Diffuse sources	• improve the collection (more homes and businesses connected to system) and treatment (optimise existing processes and develop treatment) of wastewater (STPs and WTPs), unclear which substances will be affected.

Results

- Abstraction sites of water for human consumption (present and future) are included in a register of protected areas. No safeguard zone has yet been identified for 40% of abstractions. The implementation timetable for protection policy is also unclear. The RBMP does not mention to what extent the provisions of Article 7.2 are met, and it is unclear whether a specific assessment is made against Drinking Water Directive (98/83/EC) standards. Plant protection product concentrations affect the status in 35% to 60% of the groundwater bodies. A map is also included showing the abstractions at which the quality is influenced by anthropogenic factors, though it is unclear which substances are involved.
- As far as can be deduced from the RBMP, downstream functions are not taken into account when assessing water quality. This is named as a possible development in the selection of problem substances.
- The measures named for emissions from industrial and domestic sources and plant protection products are possibly relevant to Dutch drinking water abstraction. It is unclear which substance concentrations would be reduced as a result.

8 Findings of the RBMPs

The findings of the RBMPs in relation to the objectives of Article 7 are summarised in Tables 8.1 and 8.2. The description of these findings follows the recommended stepwise approach of the European Commission concerning the selection of relevant substances and the development of measures (Guidance No. 3, 2003):

- objectives (Article 7);
- selection of drinking water-relevant substances;
- drinking water standards;
- measures (within own administrative area and downstream).

8.1 Objectives (Article 7)

1. Article 7 is considered in all the RBMPs. A register is included in the plans, though the registers of France, Wallonia and Luxembourg are incomplete (Article 7.1). France, Wallonia and Luxembourg have indicated that they are still identifying safeguard zones.
2. Member States/states/regions sometimes include groundwater protection areas and sometimes bodies of water in the register of protected areas.
3. It is often specifically stated that drinking water can be produced that satisfies the Drinking Water Directive (98/83/EC – Article 7.2).
4. Article 7.3 is addressed differently in different management plans, but preventive protection policy is usually named as a measure that should improve water quality. This protection policy is usually limited to groundwater.
5. None of the RBMPs include measures that specifically address Articles 7.2 and 7.3 for bodies of surface water used for the abstraction of water for human consumption.
6. River bank groundwater is also abstracted in some German states. No special protection measures for infiltrating surface water are included in the relevant RBMPs.
7. In Flanders (Belgium), surface water is also abstracted that is taken from reservoirs and immediately purified to produce drinking water. The Flemish Meuse RBMP is the most explicit in its approach to bodies of surface water used for drinking water: these are included in the register of protected areas. This function is also taken into account in the delineation of the water body, in contrast to the Dutch approach.

8.2 Selection of drinking water-relevant pollutants

1. The procedure for the selection of substances relevant to achieving the WFD objectives is described in Guidance Document No. 3, *Analysis of Pressures and Impacts in accordance with the Water Framework Directive*. This selection takes place during characterisation of the river basins, not in the RBMPs. It is therefore not possible to determine directly from the RBMPs whether Article 7 objectives are taken into account in the assessment of pressures and their effects on water quality. Most RBMPs take this information from the characterisation process. In the Wallonia Meuse RBMP, the characterisation report is even included as a separate chapter. This information shows that, for surface water, the pressures on the system have been determined, but that no specific assessment has been carried out regarding whether or not the drinking water objectives have been achieved. Translating from pressures to substances, the focus is primarily on priority

substances and nutrients. This also partly applies to drinking-water relevant substances. This is named in some RBMPs (Flanders, North Rhine-Westphalia and the Netherlands) as a knowledge gap to be addressed in the next planning period. It is also included as a research measure in the North Rhine-Westphalia RBMP.

2. *ACTeon/Ecologic (Grandmougin et al., 2009) observe that, although legislative frameworks are in place, a full status assessments of bodies of surface water has not yet been conducted by the Member States.*

8.3 Drinking water standards

1. Guide values and target values derived from Directive 75/440/EEC apply to the abstraction of surface water for drinking water production in the Netherlands. However, as a shift has taken place, due to improvements in surface water quality, the emission of new substances and improved analysis techniques, these substances are only some of those that currently present a problem to the drinking water supply. Addressing the impact of new substances on the environment in the Netherlands is therefore included as one of the research areas for the next planning period.
2. Apart from the Dutch RBMPs, only the Flemish Meuse RBMP includes standards for water bodies used for the abstraction of drinking water. This RBMP observes that this substance and standard list, based on 75/440/EEC, is outdated and needs to be brought up to date. Direct surface water abstraction for human consumption takes place at a few abstraction sites in the Oberrhein sub-basin district (German state of Baden Württemberg). The relevant RBMP does not state whether the standards for surface water used for the production of drinking water apply.
3. The concept of *no shifting*[4] is mentioned in a number of plans, though not in relation to drinking water. In a few German RBMPs, reduction measures for N and P are justified based on ecological objectives to be achieved in the North Sea. Although Belgian and French RBMPs do recognise that quality issues and measures have an influence on downstream water quality, this observation is not developed any further.

8.4 Measures (within own administrative area and downstream)

1. A qualitative estimate of the effect of measures is made in France and Flanders. No estimate is made in the other RBMPs studied.
2. Measures focusing on emission reductions are not taken to address drinking water objectives; ecological and chemical objectives are usually the driving force behind the measures. However, some measures also have a positive effect on the potential to achieve the drinking water objectives. Examples are a reduction in the emission of plant protection products and improved rainwater and industrial and domestic wastewater collection and treatment.
3. *ACTeon/Ecologic (Grandmougin et al., 2009) found that including measures in the RBMPs is no guarantee of their implementation. Only the Netherlands (Meuse river basin area) has indicated that it is in a position to implement all the measures in the first planning period.*

[4] '*No shifting*' is defined here as taking into consideration downstream use values when developing standards and measures.

8.5 Consultation meeting 30 September 2009

The results of this report were presented and discussed during a meeting attended by representatives of the Dutch provinces, drinking water companies, water managers, Directorate for Public Works and Water Management/Water Service and the Ministries of Housing, Spatial Planning and the Environment and of Transport, Public Works and Water Management. The participant list is included in Appendix IV.

Three guest speakers presented their responses to the report and made suggestions for possible follow-up activities. Finally, both the results and the responses were discussed by the group, using a number of propositions based on the findings of this report (Chapter 9).

The first guest speaker, Willem Mak (Ministry of Transport, Public Works and Water Management, River Basin Coordination Agency of the Netherlands – in Dutch, *Coördinatiebureau Stroomgebieden Nederland*), endorsed the view that, in the case of surface waters, drinking water-relevant substances are still insufficiently defined in the first series of RBMPs. He called for the drinking water sector to consult surface water managers on this issue. The suitability of surface water for drinking water should not only be determined by comparing the quality of surface water with drinking water standards based on a 'simple purification process', but should also be based on the risks that apply in the current situation. He emphasised that it is important from an international point of view to clearly define any problems, to ensure a readiness to talk about solutions. Particular attention is also required for new substances.

As far as groundwater is concerned, Mr Mak pointed out that the system for the assessment of groundwater bodies for the first RBMPs is applied in such a way that problem substances for drinking water have not yet been signalled. He suggested that a possible solution may be to also include the drinking water function in the definition of threshold values and to use the drinking water protection file to obtain a good overview of quality issues. He identified a reluctance in the drinking water sector to make information available, which makes it difficult to identify quality issues and, in particular, to obtain government support for improvement measures.

The second guest speaker, Job Verheijden (RIWA Meuse), identified a lack of government policy concerning the presence of actual or potential drinking water pollutants. RIWA has extensively monitored and studied these pollutants in recent years. He argued that drinking water should be considered an integral part of the water system and envisages the following improvement measures:

- rehabilitate and prioritise the Diffuse Source Implementation Programme (*Uitvoeringsprogramma Diffuse Bronnen*) by translating objectives into concrete measures;
- enforce regulations and standards;
- take preventative source measures (prevent emissions by implementing drinking water assessment for permits);
- awareness/communication campaign regarding sustainable methods/systems, for example regarding weed control on road surfaces;
- apply innovations in water quality and emissions management;
- strengthen Dutch input regarding drinking water in international river committees.

The third guest speaker, Wennemar Cramer (Ministry of Housing, Spatial Planning and the Environment), believes the report makes an important contribution to the joint analysis of the protection of drinking water sources. He argued that, as far as the protection of drinking water sources is concerned, although the WFD does not imply new policy for the Netherlands, extra effort must be

made in the implementation of existing policy instruments. According to Mr Cramer, the RIVM report shows that this is neglected in the RBMPs. He also stated that the obligations of Article 7.2 in the WFD show that Drinking Water Directive 98/83/EC applies to all substances that may present a risk to drinking water quality – a broader approach than that chosen in the RBMPs. The recently passed Dutch Drinking Water Act (July 2009) names the drinking water supply for 'imperative reasons of overriding public interest'. According to Mr Cramer, this concept will be further addressed in the yet to be drawn up Drinking Water Policy Document (expected in 2011), in which the protection of drinking water sources must also be further addressed. A need for additional policy measures may be the result. These must then be addressed in the preparation of the next generation of RBMPs. Mr Cramer believes the drinking water protection file to be a good instrument for obtaining a better idea of quality risks at each abstraction site. He is pleased to see that this now receives wide support. It is also important, in the review of the Priority Substances Directive list of substances, to focus on drinking water substances relevant to the drinking water supply.

Discussion

Reactions made during the plenary discussion are grouped according to the four propositions discussed:

1. The concept *no shifting* should be implemented in cooperation with upstream Member States and must focus on specific functions.
    - The Ministry of Housing, Spatial Planning and the Environment must take a more prominent role in this process, to focus attention on the drinking water function.
    - An important point is how to present a balanced view of drinking water issues, to make all parties aware of the necessity of taking action. The following suggestions were made: to use specific problems, to identify whether problems apply to more than one country, to discuss monitoring data and not to try to base everything on the WFD. Opinions were varied regarding this last point.

2. Drinking water-relevant substances should be systematically defined.
    - This requires a 'healthy' risk approach. A point of discussion is which monitoring point to use for this assessment and the applicable criteria.
    - Care should be taken that it is not necessary to make continuous 'adjustments' to the objectives. However, it is not realistic to expect objectives to be defined for all substances in water. This would also result in enforcement difficulties. This must be resolved through registration policy (Heugens et al., 2008).
    - Communication regarding the quality of drinking water sources and the drinking water itself is a critical point in obtaining support to deal with quality issues. Water companies have different ways of dealing with this. Drinking water protection files may also be used to encourage openness through a balanced approach.
    - A shift from general policy to more specific policy for each abstraction site is identified. Care must be taken not to emphasise the small risks whilst failing to address large quality issues (nitrates, pesticides).
    - Water companies would like the production of drinking water protection files to be made compulsory, to remove the current uncertainty surrounding their implementation. However, government policy is to implement fewer regulations.

3. The influence of water quality on the drinking water function should be included in the status assessment of bodies of surface water.
    - This must also apply to river bank groundwater.

- A national or international framework must be drawn up for surface water standards and with regard for drinking water production, such as the DQOMW.
- The enforceability of the temperature standard was also discussed: the highest temperatures are measured at Lobith. Unfortunately, water cooling alternatives are not easily realised. Innovations in the development of cooling systems are required.

4. The concept 'no deterioration' should be addressed in a similar manner for both groundwater and surface water.
    - This should also be the aim of Dutch policy.

Finally, the conclusion is drawn that the findings of this report are endorsed, and that a number of suggestions are made during the workshop for future activities regarding discussion at international level, the production of a list of substances and data availability, the production of drinking water protection files and the implementation of existing policy such as the Diffuse Source Implementation Programme and general pollutants policy.

Table 8.1 Article 7 WFD and Rhine river basin RBMPs.

Rhine Basin MS/State	**Objectives (Article 7)**	**Selection of drinking-water-relevant substances**	**Drinking water function standards**	**Measures**
General	*Preventative protection policy considered sufficient. However, only concerns groundwater.*	*Unclear from RBMP.*	*Unclear from RBMP. Downstream functions not taken into account.*	*Focus on ecology and chemistry (nutrients, pesticides and priority substances). Measures do not primarily address drinking water function.*
The Netherlands	GWB included in register. SWB for river bank groundwater not included in register.	Identified as a knowledge gap. To be addressed in following planning period.		
Germany	Protection areas usually included in register (catchment areas). SWB for river bank groundwater not included in register.			
Baden Württemberg	GWB with abstractions for human consumption included in register.			
Bayern				
Hessen				
Nedersaksen				
North Rhine-Westphalia	GWB with abstractions included in register. Future use also considered.	Identified as a knowledge gap. To be addressed in following planning period.		Inventory of drinking water-relevant substances named as research measure.
Rhineland-Palatinate				
Saarland				
Thüringen	GWB with abstractions for human consumption included in register.			
Luxembourg	Register partly complete, with protection areas.			
Austria	River basin management plans not yet available (May 2009).			
France	Register partly complete, with protection areas.			Qualitative estimate of effect of measures.

Rhine Basin MS/State	Objectives (Article 7)	Selection of drinking-water-relevant substances	Drinking water function standards	Measures
Switzerland	WFD objectives included in sub-basin plans. Switzerland does not have its own RBMP.			

Table 8.2 Article 7 WFD and Meuse river basin RBMPs.

Meuse Basin MS/State	Objectives (Article 7)	Selection of drinking water-relevant substances	Drinking water function standard	Measures
General	*Preventative protection policy considered sufficient. However, only concerns groundwater.*	*Unclear from RBMP.*	*Unclear from RBMP. Downstream functions not taken into account.*	*Focus on ecology and chemistry (nutrients, pesticides and priority substances). Measures do not primarily address drinking water function.*
The Netherlands	GWB included in register.	Identified as a knowledge gap. To be addressed in following planning period.		Inventory of drinking water-relevant substances named as research measure.
Belgium				
Flanders	SWB with drinking water function included in register. Delineation of SWB also partly determined based on drinking water function.	Identified as a knowledge gap. To be addressed in following planning period.		Inventory of drinking water-relevant substances named as research measure.
Wallonia	Register partly complete, with protection areas.			Qualitative estimate of effect of measures.
Luxembourg	Register partly complete, with protection areas.			
Germany	Protection areas included in register (sometimes catchment areas, sometimes whole GWBs).			
France	Register partly complete, with protection areas.			Qualitative estimate of effect of measures.

9 Conclusions and recommendations

Analysis of the river basin management plans of Member States in the Rhine and Meuse river basins regarding the drinking water function must answer two questions:

1. What are the gaps regarding the realisation of the drinking water objectives in the current river basin management plans?
2. How does the Dutch approach compare to that of other Member States: is the ambition level of the Netherlands higher, similar or lower?

The conclusions are discussed based on these questions.

9.1 Conclusions

Gaps

Fifteen RBMPs were analysed and the following gaps noted:

1. The drinking water function is only indirectly addressed in the inventory of relevant substances.
   Before analysing the RBMPs, the intended procedure for the inventory of relevant substances with regard to drinking water objectives was defined, based on the European Commission Guidance Documents. Until now, this procedure has not been followed for drinking water objectives in any of the RBMPs. Although the substance list used by the Netherlands in the DQOMW fully implements Directive 75/440/EEC, it only includes a limited number of pollutants that currently present a problem to the Dutch drinking water supply. The inventory of drinking water-relevant substances is identified as a knowledge gap in the Dutch RBMPs. According to the draft Dutch plan for the management and development of the waters and waterways for 2010-2015 (in Dutch, *Beheer- en Ontwikkelplan voor de Rijkswateren 2010-2015*, December 2008), this should be developed using the drinking water protection file. However, this is not reflected in the Dutch RBMPs.

2. There is no specific approach for substances relevant to drinking water.
   An inventory of relevant substances for one abstraction site has been made in this report, based on available monitoring data (RIWA). This list was intended as a framework for the assessment of the RBMPs in terms of the approach taken to drinking water-relevant substances. However, these substances are not addressed in any of the RBMPs. An inventory is made of the pressures on and risks to the water system in all the sub-basin districts, but quickly set within the framework of emissions of those substances considered relevant; primarily nutrients, priority substances and a number of pesticides.

3. Drinking water objectives seem to be unrelated to WFD objectives.
   The drinking water function is, certainly as far as *surface water* is concerned, treated separately and not as part of the water system. This omission is partly the result of the WFD assessment system: drinking water is not an integral part of the status assessment of bodies of surface water. This does not apply to groundwater: through the drinking water test this function is included in the status assessment of bodies of groundwater. However, it is unclear from the RBMPs whether this is fully implemented. No agreements have yet been made in the Netherlands regarding how and when a trend or an exceedance in a standard (75%) at an abstraction site affects the assessment of a

groundwater body. However, in addition to other objectives, the WFD aims to ensure the sustainability of the drinking water supply by ensuring a good water quality (Recital 24, WFD). The river basin approach means that all relevant pressures and functions and the relationships between them within the water system are taken into account. The assessment system should be tailored to this approach.

4. The discussion concerning temperature primarily takes place in the Netherlands.
   The discussion regarding the temperature standard plays a prominent role in the Dutch RBMPs. However, temperature is not identified as critical parameter in the RBMPs of neighbouring countries. Two explanations are given for this:
   (1) the direct treatment of surface water is very limited in neighbouring countries;
   (2) drinking water is not chlorinated in the Netherlands and is therefore more susceptible to the regrowth of micro-organisms in the distribution network.

5. The concept 'no deterioration' is defined differently for groundwater and surface water.
   The Dutch interpretation of the concept 'no deterioration' for surface water is different from the approach described for groundwater (Guidance DWPAs, 2007). The implications and desirability of this difference should be further investigated.

6. The effect of measures is not made clear in the RBMPs.
   In most RBMPs, the programme of measures consists mainly of the implementation of existing EU guidelines. No mention is made of the *effects* that may be expected from implementing these measures. The programmes of measures consist mainly of tables of change for legislation and cost summaries; the relationship with the effect is missing. This also applies to the effects on downstream functions named below.

7. The concept *no shifting* is not addressed in the RBMPs.
   The *effects* of upstream measures on downstream water quality are named in a few RBMPs as a subject requiring further development. Shifting is therefore not addressed in any more detail. This is also seen in the Dutch RBMPs: extensive regional packages of measures are described, but no estimate is made of the effects on the quality of national waters.

8. The reservation of future water-collection areas is included in some RBMPs.
   Future water collection areas are named and included in the register of protected areas in a few management plans, including the Dutch RBMPs. It is not clear from most RBMPs whether this is taken into account.

Ambition level

The ambition level in the Dutch RBMPs regarding Article 7 is generally comparable with the ambition level of the other Member States in the Rhine and Meuse river basins:

- Registers of protected areas have been/are to be produced (Article 7.1).
- It is stated that the drinking water quality meets the requirements of the Drinking Water Directive (98/83/EC – Article 7.2).
- Furthermore, it is usually stated that existing protection policies are sufficient for meeting the requirements of Article 7.3. Several sub-basin districts use the WFD to narrow the gap where this is concerned.

The registers do look different: groundwater protection areas are usually included, but sometimes bodies of groundwater. The content of the protection policies is not described in the RBMPs and can therefore not be compared. Of note is that groundwater protection areas are mostly larger than in the Netherlands (usually the catchment area).

Specific measures for the drinking water function of groundwater are not included in any of the RBMPs.

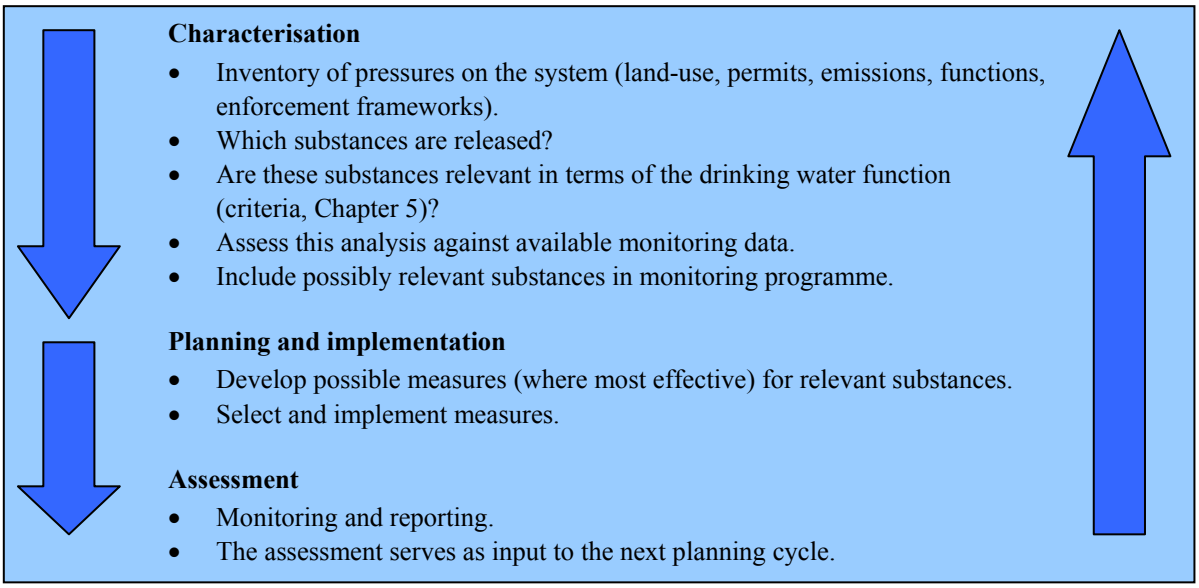
The focus on *surface water* used for drinking water production is minimal in all the RBMPs, as is therefore the identification of and procedure for dealing with problem substances. In this too, the Dutch RBMPs are comparable with the plans of the other Member States in the Rhine and Meuse river basins. It should be noted that the selection of drinking water-relevant substances in both the Netherlands and Flanders has been identified as a knowledge gap.

9.2 Recommendations

A number of gaps have been identified in the RBMPs of the Rhine and Meuse concerning the drinking water objectives (Article 7). These can be defined and addressed as following:

- The substances and their sources relevant to the production of drinking water from surface water should be identified in accordance with the procedure described in Guidance Document No. 3 (WFD, 2003). The steps involved in this procedure are shown in Box 9.1.
- This analysis is well suited to the creation of drinking water protection files for surface water abstraction sites used for the production of drinking water, and may also serve as an input to the following WFD planning cycle. Considering the significant public interest attributed to drinking water sources in the Dutch Drinking Water Act, this process should be started soon.
- Should pollutants be seen to be relevant at several abstraction sites, the decision must be made as to whether general policy measures should be taken.
- The monitoring method (maximum, 90^{th} or 92^{nd} percentile or arithmetic average) and trend assessment partially determine whether measures need to be taken for particular substances. This needs to be clarified in the yet to be drawn up ministerial decree.
- The resulting drinking water-relevant pollutants selected should also be discussed internationally in relation to the concept *no shifting*.
- The temperature standard should also be discussed at international level. Various values are applied for this standard in the RBMPs. In addition, each surface water abstraction site should be analysed for regional issues that may be better served using a tailored approach.

Box 9.1 Steps in the identification procedure for drinking water-relevant substances.



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References

Aa, N.G.F.M. van der, Kommer, G.J., Groot, G.M. de, Versteegh, J.F.M., 2008. Geneesmiddelen in bronnen voor drinkwater, Monitoring, toekomstig gebruik en beleidsmaatregelen (in Dutch). RIVM Bilthoven. RIVM-rapport 609715002. www.rivm.nl (March 2009).

Agence de l'eau, 2008. SDAGE Rhin et Meuse – Objet et portée (1), Objectifs de qualité et de quantité des eaux (2 en 3), Orientations fondamentales et dispositions (4), Programme de mesures Meuse et Sambre, Programme de mesures Rhin (in French). France. http://www.eau2015-rhin-meuse.fr/dce/site/documents_bassin_rm.php (June 2009).

Baden-Württemberg, 2008. Bewirtschaftungsplan Bearbeitungsgebied Oberrhein. Umweltministerium Baden-Württemberg, Regierungspräsidien Freiburg, Karlsruhe, Stuttgart und Tübingen, Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg (LUBW), Germany (in German). www.kaderrichtlijnwater.nl (June 2009).

Bayern, 2008. Entwurf Bewirtschaftungsplan für die bayerischen Anteile der Flussgebiete Donau und Rhein; Dokument zur Information und Anhörung der Öffentlichkeit gemäß Artikel 14 WRRL und Artikel 71b Abs. 4 BayWG (in German). Bayerisches Staatsministerium fur Umwelt und Gesundheit, Germany. www.wasserrahmenrichtlinie.bayern.de/ (May 2009)

Berbee, R.P.M., Kalf, D.F., 2006a. Risicovolle lozingen op de Maas – deel 1 (in Dutch). RWS RIZA-rapport 2006.014, ISBN 903695729X, www.riza.nl (July 2007).

Berbee, R.P.M., Kalf, D.F., 2006b. Risicovolle lozingen op de Maas – deel 2 (in Dutch). RWS RIZA-rapport 2006.032, ISBN 9036913705, www.riza.nl (July 2007).

Berg, G.A. van den, Rijk, S. de, A. Abrahamse and Puijker, L., 2007. Bedreigende stoffen voor drinkwater uit de Maas (in Dutch). Kiwa Water Research (thans: KWR), Nieuwegein. KWR 07.043.

Berg, G.A. van den, 2008. Zorgstoffen voor de drinkwatervoorziening in Rijn en Maas; substances of concern for the drinking water supply from the rivers Rhine and Meuse. KWR, Nieuwegein. KWR 08.081.

Grandmougin, B., Mattheiss, V., Kervarec, F., Strosser, P., Dworak, T., Fleischmann, N., Thaler, T., 2009. International comparison of the implementation of the WFD in EU Member states. Version July 24th 2009. ACT*eon*/Ecologic ordered by the Ministry of Transport, Public Works and Water Management.

Grath, J. Scheidleder, A., Uhlig, S., Weber, K., Kralik, M., Keimel, T., Gruber, D. 2001. The EU Water Framework Directive: Statistical aspects of the identification of groundwater pollution trends, and aggregation of monitoring results. Final Report. Austrian Federal Ministry of Agriculture and Forestry, Environment and Water Management (Ref.: 41.046/01-IV1/00 and GZ 16 2500/2-I/6/00), European Commission (Grant Agreement Ref.: Subv 99/130794), in kind contributions by project partners. Vienna, Austria.

Hessen, 2008. Umsetzung der Wasserrahmenrichtlinie in Hessen, Bewirtschaftungsplan und Massnahmenprogramm (in German). Hessisches Ministerium für Umwelt, ländlichen Raum und Verbraucherschutz. http://www2.hmuelv.hessen.de/umwelt/wasser/wrrl (June 2009).

Heugens, E.H.W., Rila, J.P., Linders, J.B.H.J., Montforts, M.H.M.M., Vermeire, T.G., Wuijts, S., 2008. Probleemstoffen bij de drinkwaterbereiding (in Dutch). RIVM Bilthoven. RIVM-rapport 601024001. www.rivm.nl (March 2009).

ICBR, 2008. Ontwerp-beheerplan internationaal Rijndistrict (in Dutch, available in English). www.kaderrichtlijnwater.nl (April 2009).

Luxemburg, 2008. Bewirtschaftungsplan für das Großherzogtum Luxemburg (in German). http://www.eau.public.lu/actualites/2008/12/plan_de_gestion/plan_de_gestion.pdf (June 2009)

Maas deel A, 2008. Ontwerp van het overkoepelend deel van het beheersplan voor het internationale stroomgebiedsdistrict van de Maas. Luik, 22 december 2008 (in Dutch, available in English). Internationale Maas Commissie. www.kaderrichtlijnwater.nl (June 2009).

Ministry of Transport, Public Works and Water Management, 2008 (1). Stroomgebiedbeheerplan Maas, Hoofdrapport, bijlagen en kaarten. (in Dutch). www.kaderrichtlijnwater.nl (June 2009).

Ministry of Transport, Public Works and Water Management, 2008 (2). Stroomgebiedbeheerplan Rijndelta, Hoofdrapport, bijlagen en kaarten (in Dutch). www.kaderrichtlijnwater.nl (June 2009).

Ministry of Housing, Spatial Planning and the Environment, 2008. Besluit van …, houdende regels ter uitvoering van de milieudoelstellingen van de kaderrichtlijn water (Besluit kwaliteitseisen en monitoring water) (DQOMW) (in Dutch). Staatscourant 476, November 6th, 2008.

Niedersachsen, 2008 (1). Entwurf des niedersächsischen Beitrags für den Bewirtschaftungsplan für die Flussgebiedseinheit Rhein (in German). Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz, Germany. www.kaderrichtlijnwater.nl (June 2009).

Niedersachsen, 2008 (2). Entwurf des niedersächsischen Beitrags für das Massnahmenprogramm in der Flussgebiedseinheit Rhein (in German). Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz, Germany. www.kaderrichtlijnwater.nl (June 2009).

Nordrhein Westfalen, 2008. Entwurf Bewirtschaftungsplan Nordrhein-Westfalen (in German). Ministerium für Umwelt und Naturschutz, Landwirtschaft und Verbraucherschutz des Landes Nordrhein-Westfalen, Germany. www.flussgebiete.nrw.de/Dokumente/NRW/Anhoerung/Bewirtschaftungsplan/index.jsp (May 2009).

Rheinland Pfalz, 2008. Bewirtschaftungsplan für die internationale Flussgebietseinheid Rhein nach der Europäischen Wasserrahmrichtlinie für die Gewässer in Rheinland-Pfalz (in German). Wasserwirtschaftsverwaltung Rheinland Pfalz, Germany. http://www.wrrl.rlp.de/ (June 2009).

Rijk, S. de, Berg, G. van den, Puijker, L., 2009. Nieuwe ontwikkelingen in het Maasstroomgebied; Drinkwater in het stroomgebiedbeheerplan Maas (in Dutch). KWR ordered by RIWA Meuse. Nieuwegein. KWR 09.002.

Rijswick, H.F.M.W. van, 2001. De kwaliteit van water, Europese en nationale instrumenten voor de bescherming van oppervlaktewater (in Dutch). Kluwer, Deventer.

RIWA Rijn, 2005. Jaarrapport 2005, De Rijn (in Dutch, available in English). RIWA – Association of River Water Supply Companies. ISBN 13 978-90-6683-117-9. www.riwa.org (May 2009).

Saarland, 2008. Bewirtschaftungsplan für das Saarland, Entwurf Dezember 2008 (in German). Ministerium für Umwelt, Germany. www.saarland.de/46834.htm (May 2009).

Stuyfzand, P.J., 1996. Salinization of drinking water in the Netherlands: anamnesis, diagnosis and remediation. SGU Rapporter och Meddelanden 87, Proc. 14th SWIM, 16-21 June 1996, Malmö, Geol. Survey Sweden, Uppsala, 168-177.

Thüringen, 2008. Entwurf des Bewirtschaftungsplans fur den Thüringer Anteil am Bearbeitungsgebiet Main der internationalen Flussgebietseinheit Rhein (FGE) (in German). Ministerium für Landwirdschaft, Naturschutz und Umwelt, Germany. www.thueringen.de/de/tmlnu/themen/wasser/flussgebiete/oea/anhoerung/content.html (May 2009)

Torenbeek, R., Pelsma, T.A.H.M., 2008. Protocol toetsen en beoordelen voor de operationele monitoring en toestand- en trendmonitoring toetsjaar 2007 (in Dutch). LBOW-wgMIR 200701. ISBN 9789036914338. www.kaderrichtlijnwater.nl (March 2009).

Versteegh, J.F.M., Aa, N.G.F.M. van der, Dijkman, E., 2007. Geneesmiddelen in drinkwater en drinkwaterbronnen, Resultaten van het meetprogramma 2005/2006 (in Dutch). RIVM Bilthoven. RIVM-rapport 703719016. www.rivm.nl (May 2009).

Verweij W., Reijnders, H.F.R., Prins H.F., Boumans L.J.M., Janssen M.P.M., Moermond C.T.A., Nijs A.C.M. de, Pieters B.J., Verbruggen E.M.J., Zijp M.C., 2008. Advies voor drempelwaarden (in Dutch) RIVM, Bilthoven. RIVM-rapport 607300005. www.rivm.nl (november 2009).

Vlaanderen, 2008. Het stroomgebiedbeheerplan voor de Maas (in Dutch). CIW Vlaanderen, Belgium. http://www.volvanwater.be/stroomgebiedbeheerplan-maas (June 2009).

Wallonië, 2005 en 2008. État des lieux en Région wallonne (Tome 1), Plan de gestion et programme de mesures (in French). Belgium http://environnement.wallonie.be/directive_eau/homepage.asp (June 2008).

WFD CIS, 2007. Guidance No. 16; On the Groundwater aspects of Protected Areas under the Water Framework Directive. www.circa.eu (juni, 2009).

WFD, 2003. Guidance No. 3; Analysis of Pressures and Impacts in accordance with the Water Framework Directive. www.circa.eu (April 2009).

WFD CIS, 2008. Guidance No. 18; On Groundwater Status and Trend Assessment. www.circa.eu (June 2009).

Wuijts, S., Rijswick, H.F.M.W. van, en Dik, H.H.J., 2007. Gebiedsdossiers voor drinkwaterbronnen; Uitwerking van risico's en ontwikkeling van maatregelen (in Dutch). RIVM, Bilthoven. RIVM-rapport 734301032. www.rivm.nl (January 2009).

Zijp, M.C., Beelen, P. van, Boumans, Ek, R. van, L.J.M., Nijs, A.C.M. de, Verweij, W., Wuijts, S. (2009). Voorlopig protocol voor de beoordeling van grondwaterlichamen (in Dutch). RIVM and Deltares. www.kaderrichtlijnwater.nl. (August 2009).

Zwolsman, J.J.G. en van den Berg, G.A., 2006. Bescherming drinkwaterfunctie oppervlaktewater door KRW en Nederlands beleid (in Dutch). Kiwa Water Research (currently: KWR) Nieuwegein. KWR 06.094.

Appendix 1 WFD, Article 7 (2000/60/EC)

Article 7

Waters used for the abstraction of drinking water

1. Member States shall identify, within each river basin district:

- all bodies of water used for the abstraction of water intended for human consumption providing more than 10 m^3 a day as an average or serving more than 50 persons;

- those bodies of water intended for such future use.

Member States shall monitor, in accordance with Annex V, those bodies of water which according to Annex V, provide more than 100 m^3 a day as an average.

2. For each body of water identified under Paragraph 1, in addition to meeting the objectives of Article 4 in accordance with the requirements of this Directive, for surface water bodies including the quality standards established at Community level under Article 16, Member States shall ensure that under the water treatment regime applied, and in accordance with Community legislation, the resulting water will meet the requirements of Directive 80/778/EEC as amended by Directive 98/83/EC.

3. Member States shall ensure the necessary protection for the bodies of water identified with the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water. Member States may establish safeguard zones for those bodies of water.

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Appendix 2 Drinking water relevant pollutants – Nieuwegein (2008)

Kiwacode	Parameter	Dimension	Number of samples	Minimum	Maximum	Average	Exceedance (max) target value DQOMW	Exceedance (max) guide value DQOMW	Exceedance (max) indicator value DDWA	Significant rising trend
0128	Suspended matter	mg/l	13	9.90	68.1	28.35				
0170	Odour (dilution factor)	-	13	3	23	8.62				
0614	Coliform bacteria (37 °C)	n/100 ml	13	290	4100	842				
1098	Methylbenzene	µg/l	16	0.01	1.30	0.10				
1528	3-Chlorophenol	µg/l	14	0.01	0.01	0.01				
1529	4-Chlorophenol	µg/l	14	0.01	0.01	0.01				
1531	2,3-Dichlorophenol	µg/l	14	0.01	0.01	0.01				
1533	2,6-Dichlorophenol	µg/l	14	0.01	0.01	0.01				
1534	3,4-Dichlorophenol	µg/l	14	0.01	0.01	0.01				
1535	3,5-Dichlorophenol	µg/l	14	0.01	0.01	0.01				
1538	2,3,4,6-Tetrachloro-phenol	µg/l	14	0.01	0.01	0.01				
1539	2,3,5,6-Tetrachloro-phenol	µg/l	14	0.01	0.01	0.01				
1541	2,3,4-Trichlorophenol	µg/l	14	0.01	0.01	0.01				
1542	2,3,5-Trichlorophenol	µg/l	14	0.01	0.01	0.01				
1543	2,3,6-Trichlorophenol	µg/l	14	0.01	0.01	0.01				
1544	3,4,5-Trichlorophenol	µg/l	14	0.01	0.01	0.01				
1683	Aniline	µg/l	13	0.02	0.16	0.06				
1700	N-Methylaniline	µg/l	13	0.02	0.02	0.02				
1717	2,4,6-Trichloroaniline	µg/l	13	0.02	0.02	0.02				
1794	Ethylenediaminetetra-acetic acid (EDTA)	µg/l	13	1.00	9.70	6.76				
1862	N,N-Diethylaniline	µg/l	13	0.02	0.02	0.02				
1979	2,4,6-Trimethylaniline	µg/l	13	0.02	0.02	0.02				
2003	Diethylenetriaminepenta-acetic acid (DTPA)	µg/l	13	1.50	8.70	5.50				
2028	2,3-Dimethylaniline	µg/l	13	0.02	0.02	0.02				
2033	4-Methoxy-2-nitroaniline	µg/l	13	0.05	0.05	0.05				
2039	1,3- and 1,4-Dimethylbenzene (sum)	µg/l	16	0.01	1.30	0.10				
2043	Methyl-tert.-butylether (MTBE)	µg/l	16	0.05	6.00	0.70				

Kiwacode	Parameter	Dimension	Number of samples	Minimum	Maximum	Average	Exceedance (max) target value DQOMW	Exceedance (max) guide value DQOMW	Exceedance (max) indicator value DDWA	Significant rising trend
2056	2-Methoxyaniline	µg/l	13	0.02	0.02	0.02				
2058	2-(Trifluoromethyl)-aniline	µg/l	13	0.05	0.05	0.05				
2076	17α-Ethinylestradiol	µg/l	13	0.25	0.25	0.25				
2156	Bis(2-methoxyethyl)ether (Diglyme)	µg/l	13	0.12	1.70	0.49				
2157	Hexamethoxymethylmelamine (HMMM)	µg/l	106	0.19	1.40	0.48				
6029	Sulphadiazine	µg/l	4	0.50	0.50	0.50				
6031	Sulphamerazine (6100)	µg/l	4	0.50	0.50	0.50				
6045	Metoprolol	µg/l	12	0.00	0.13	0.08				
6051	Diatrizoic Acid	µg/l	13	0.10	0.84	0.34				
6053	Iohexol	µg/l	13	0.05	0.19	0.12				
6054	Iomeprol	µg/l	13	0.05	0.62	0.40				
6055	Iopamidol	µg/l	13	0.02	0.45	0.27				
6057	Iopromide	µg/l	13	0.07	0.35	0.21				
6095	Sulphacetamide	µg/l	4	0.50	0.50	0.50				
6096	Sulphadoxine	µg/l	4	0.50	0.50	0.50				
6097	Sulphapyridine	µg/l	4	0.50	0.50	0.50				
6098	Sulphaphenazole	µg/l	4	0.50	0.50	0.50				
6099	Sulphaguanidine	µg/l	4	0.50	0.50	0.50				
6101	Sulphamethoxy-pyridazine	µg/l	4	0.50	0.50	0.50				
6102	Sulphathiazole	µg/l	4	0.50	0.50	0.50				
6103	Sulphatroxazole	µg/l	4	0.50	0.50	0.50				
6104	Sulphisoxazole	µg/l	4	0.50	0.50	0.50				
6106	trans-4,4-Dinitro stilbene-2,2-disulphonate	µg/l	4	0.25	0.25	0.25				
8094	2-Chloroaniline	µg/l	13	0.05	0.05	0.05				
8104	2-Chlorophenol	µg/l	14	0.01	0.01	0.01				
8117	Chlorthal	µg/l	13	0.01	0.01	0.01				
8122	Chlortoluron	µg/l	13	0.00	0.15	0.02				
8150	2,4-Dichlorophenoxy-acetic acid (2,4-D)	µg/l	13	0.01	0.01	0.01				
8188	Dicamba	µg/l	13	0.01	0.01	0.01				
8196	2,6-Dichloroaniline	µg/l	13	0.05	0.05	0.05				
8204	2,4-Dichlorprop (2,4-DP)	µg/l	13	0.01	0.01	0.01				
8215	Dicofol	µg/l	13	0.12	0.12	0.12				
8222	2,6-Diethylaniline	µg/l	13	0.02	0.02	0.02				

Kiwacode	Parameter	Dimension	Number of samples	Minimum	Maximum	Average	Exceedance (max) target value DQOMW	Exceedance (max) guide value DQOMW	Exceedance (max) indicator value DDWA	Significant rising trend
8354	Glyphosate	µg/l	27	0.02	0.10	0.06				
8382	Isoproturon	µg/l	13	0.00	0.17	0.04				
8402	4-(4-Chloro-2-methyl-phenoxy)butanoic acid (MCPB)	µg/l	13	0.01	0.01	0.01				
8404	Mecoprop (MCPP)	µg/l	13	0.01	0.19	0.03				
8436	Metoxuron	µg/l	96	0.05	0.13	0.05				
8491	Pentachlorophenol	µg/l	14	0.01	0.01	0.01				
8551	2,4,5-Trichlorophenoxy-acetic acid (2,4,5-T)	µg/l	13	0.01	0.01	0.01				
8602	2,4,5-Trichlorophenol	µg/l	14	0.01	0.01	0.01				
8603	2,4,6-Trichlorophenol	µg/l	14	0.01	0.01	0.01				
8634	Butocarboxim-sulfoxide	µg/l	12	0.05	0.12	0.06				
8690	Difenoconazole	µg/l	13	0.12	0.12	0.12				
8699	Azoxystrobin	µg/l	13	0.12	0.12	0.12				
V581	Sulphanilamide	µg/l	4	0.50	0.50	0.50				
V596	Activity related to 17β-Estradiol	µg/l	4	0.00	0.11	0.07				

Appendix 3 Disruptions of the Nieuwegein abstraction

Table 3.1 **Disruptions or stops of the Nieuwegein abstraction site, period 1969-2007 (Jaarrapport 2007, RIWA Rijn).**

Year	Parameter	Days
1969	Endosulphan	14
1970-1979		None
1980	Styrene	6
1981		None
1982	Chloronitrobenzene	10
1983	Dichloroisobutylether Chloride	7 35 d. limited abstraction
1984	Phenetidine / o-isoanisidine	5
1985	Chloride	17 3rd quarter: limited abstraction
1986	'Sandoz' Fatty acids/ terpentine 2,4-D herbicide Chloride	9 3 5 1st quarter: limited abstraction
1987	Neopentylglycol	3
1988	Isophoron Dichloropropene Mecoprop	5 12 4
1989	Nitrobenzene Chloride	4 4th quarter: limited abstraction
1990	Metamitron	6
1991-1993		None
1994	Isoproturon	36
1995-1997		None
1998	Isoproturon	7
1999	Isoproturon	7
2000		None
2001	Isoproturon/ chlortoluron	34
2002	Isoproturon/ chlortoluron	19
2003		None
2004	MTBE	5 d. limited abstraction
2005		None
2006	Low water level/ discharge	Frequent consultation Public Works concerning continuation production as usual
2007	Xylene/ benzene	2 d. limited abstraction

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