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EUROPEAN COMMISSION

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REPORT FROM THE COMMISSION

**in accordance with Article 3.7 of the Groundwater Directive 2006/118/EC on the
establishment of groundwater threshold values**

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1. LEGAL BACKGROUND

The Water Framework Directive (WFD, 2000/60/EC¹) establishes the objective of reaching good groundwater chemical and quantitative status across Europe by 2015. In order to reach this aim the Groundwater Directive (GWD, 2006/118/EC²) lays down detailed quality criteria for the assessment of groundwater chemical status in Europe. These include groundwater quality standards set at Community level (Annex I of GWD) and threshold values. Threshold values are quality standards that have to be set by Member States for pollutants causing a risk of not meeting WFD requirements, in accordance with Article 3 of GWD.

According to Article 3.5 of the GWD, Member States were obliged to establish those threshold values for the first time by 22 December 2008 and to publish them in the WFD river basin management plans by 22 December 2009.

This Report responds to Article 3.7 of the GWD which requires the Commission to publish a report on the basis of the information provided by Member States on the above mentioned threshold values.

2. DATA COLLECTION

In order to collect the necessary information for this report, the Commission sent a questionnaire to the Member States in February 2009.

This report represents the situation as of March 2009³. Some Member States indicated that the information submitted was not yet final, as work on the finalisation of the WFD river basin management plans was still ongoing.

3. FLEXIBLE APPROACH

The GWD establishes EU-wide groundwater quality standards for 2 pollutants (nitrates and pesticides). If these groundwater quality standards are not adequate for achieving the environmental objectives set out in WFD, more stringent values have to be established by Member States (GWD Annex I.3).

¹ OJ L 327, 22.12.2000, p.1

² OJ L 372, 27.12.2006, p.19

³ Malta reported in October 2009. Member States had the opportunity to check and update the relevant data in October 2009

Regarding other pollutants, the establishment of numerical values at Community level has not been considered a viable option, due to the high natural variability of substances in groundwater (depending upon hydrogeological conditions, background levels, pollutant pathways, and interactions with different environmental compartments). In addition, the management of groundwater pollution should focus on actual risks identified by the analysis of pressures and impacts under Article 5 of the WFD. Consequently, the GWD requests Member States to establish their own groundwater quality standards (threshold values), taking into account identified risks and the list of pollutants/indicators given in Annex II of the GWD. Article 3 and 4 of the GWD establish detailed criteria and a procedure for the assessment of chemical status of groundwater bodies, in particular for the application of quality standards and threshold values. In principle no groundwater body is allowed to exceed these standard values, however the GWD also recognises that standard values may be exceeded due to a local pressure that does not endanger the status of the overall groundwater body concerned and this can be taken into consideration (GWD Article 4.2 (c)).

4. REVERSAL OF SIGNIFICANT AND SUSTAINED UPWARD POLLUTION TRENDS IN GROUNDWATERS

According to GWD Article 5 significant and sustained upward pollution trends must be identified and reversed for any pollutants characterising groundwater as being at risk in the context of the analysis of pressures and impacts carried out in accordance with WFD Article 5 and Annex II. Article 5 of the GWD establishes detailed criteria for the identification of significant and sustained upward trends and the definition of starting points for trend reversal.

Threshold values (or quality standards) have an important role in this context as they are the basis for establishing the starting point of the trend reversal.

5. CRITERIA FOR ESTABLISHING GROUNDWATER THRESHOLD VALUES

Article 3.1 (b) of the GWD requires Member States to derive threshold values for relevant parameters causing groundwater bodies to be at risk of not meeting the WFD objectives. General guidelines for the establishment of threshold values are set out in GWD Annex II Part A. In addition, the FP6 research project BRIDGE⁴ also assisted by developing a methodology for the identification of threshold values.

As defined in Article 2.2 of the GWD, these threshold values will become Member State defined quality standards. Member States need to take into account at least the list of pollutants/indicators in Annex II Part B which are:

- ‘Substances or ions or indicators which may occur both naturally and/or as a result of human activities’: Arsenic, Cadmium, Lead, Mercury, Ammonium, Chloride, Sulphate
- ‘Man-made synthetic substances’: Trichloroethylene, Tetrachloroethylene
- ‘Parameters indicative of saline or other intrusion’: Conductivity or Chloride and Sulphate (to be decided by Member States)

⁴ <http://nfp-at.eionet.europa.eu/irc/eionet-circle/bridge/info/data/en/index.htm>

As laid down in Annex II Part A of the GWD, the determination of threshold values should also be based on the extent of interactions between groundwater and associated aquatic and dependent terrestrial ecosystems, the interference with actual or potential legitimate uses or functions of groundwater and the hydro-geological characteristics including information on background levels and water balance. Depending on which basis they are set, there are different types of threshold values for e.g. protecting drinking water use, protecting aquatic and/or terrestrial ecosystems, handling saltwater intrusion.

The threshold values should be set at the most appropriate scale (national level, river basin district level, or groundwater body level) (Article 3.2 GWD). In case of transboundary groundwater bodies, coordination on the establishment of threshold values among Member States concerned is required (Article 3.3 GWD). Member States should also endeavour coordination in case of groundwater bodies shared with non-EU countries (Article 3.4 GWD).

The list of threshold values established by Member States should be prone to regular reviews within the river basin management planning framework, which may lead to additional substances being considered (in case of new identified risks) or the deletion of substances (in case formerly identified risks no longer exist) (Article 3.6 GWD).

6. COMMUNICATION AND COMPLETENESS OF THE REPORTS

To date, all Member States except Greece have reported on the establishment of threshold values in the agreed format. Denmark provided incomplete information as it reported on the process of establishing threshold values but neither on the substances concerned nor on the numerical values. Portugal did not establish any threshold values as no groundwater body was identified as being at risk for pollutants other than nitrates.

In addition to the required reporting four Member States (Belgium, Finland, Netherlands and Spain) provided additional background documents with more details related to the methodology / establishment process.

7. THRESHOLD VALUES ESTABLISHED

7.1. Overview

The first Commission report on the analysis of the river basin districts published in 2007⁵ showed that 30% of groundwater bodies across the European Union were at risk of failing to meet the objective of good chemical status by 2015 and for other 45% the result of the risk assessment is not conclusive due to insufficient data. On the basis of this information, it was expected that most Member States would establish threshold values for the pollutants of concern.

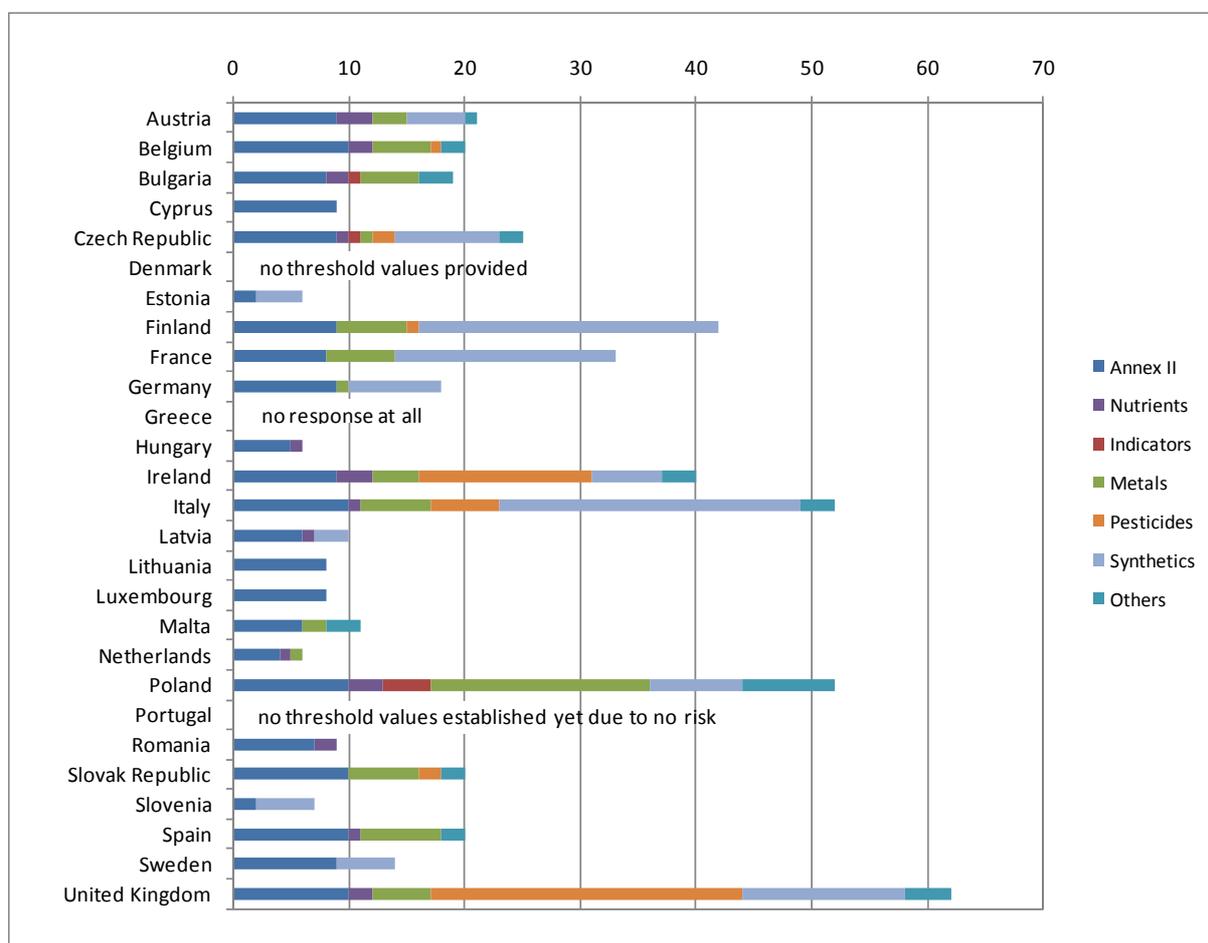
Indeed, 24 out of the 25 Member States which provided information, established threshold values for substances. In total threshold values have been established for 158 different pollutants/indicators, of the following groups:

⁵ Reference COM(2007)128
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007DC0128:EN:NOT>

- 12 Core substances (10 substances of GWD Annex II part B together with ammonium as nitrogen and with the sum of Trichloroethylene and Tetrachloroethylene)
- 39 Pesticides
- 8 Nutrients (e.g. nitrate, nitrite, phosphorus etc.)
- 21 Metals
- 62 Synthetic substances
- 10 Other substances (e.g. Boron, Calcium, Bromate, Cyanide etc.)
- 6 Indicators (e.g. acid capacity, hardness, pH etc.)

The number of threshold values established by each Member State varies between zero (Portugal) and 62 (United Kingdom). Figure 1 ranks Member States according to the number of threshold values established for each type of pollutant.

Figure 1: Number of pollutants/indicators for which threshold values have been established by each Member States (pollutants/indicators grouped)



7.2. GWD Annex II pollutants

The 10 pollutants/indicators listed in Annex II of the GWD are the most commonly reported as being subject to threshold value setting. Table 1 shows the pollutants/indicators which were reported by at least 10 Member States.

The table also shows the ranges of threshold values established in Europe which is very broad for many substances. The reason for this could be that different aspects of GWD Annex II were considered by the Member States within the establishment process as the GWD provides certain flexibility to the Member States in the establishment of threshold values by requiring the consideration of the different receptors of the groundwater body as well as the risks and functions, the characteristics and behavior of the pollutants and the hydrogeological characteristics represented by the background levels (Annex II Part A of the GWD).

For naturally occurring substances the main elements causing differences in the threshold values are the individual background levels and the different receptors (ecosystems and uses) and risks which also need to be considered individually.

For synthetic substances the background levels are not relevant and the elements causing the differences are the different receptors (ecosystems and uses) and the risks.

The consideration of these different requirements, potentially adapted to each individual groundwater body, demonstrates the different approaches followed by the Member States. As a consequence the established threshold values might not be fully comparable within Europe.

Table 1: Pollutants/indicators for which at least 10 Member States have established threshold values, including the range of threshold values

Substance/Indicator	Group of substances	Number of Member States	Range of threshold values		Unit
			From	To	
Chloride	Annex II	22	24	12,300	mg/l
Arsenic	Annex II	21	0.75	189	µg/l
Sulphate	Annex II	21	129.75	4,200	mg/l
Ammonium	Annex II	21	0.084	52	mg/l
Lead	Annex II	20	5	320	µg/l
Cadmium	Annex II	19	0.08	27	µg/l
Mercury	Annex II	18	0.03	1	µg/l
Conductivity	Annex II	14	485	10,480	µS/cm
Nickel	Metal	11	10	60	µg/l
Copper	Metal	10	10.1	2000	µg/l
Tetrachloroethylene	Annex II	10	1.1	50	µg/l
Trichloroethylene	Annex II	10	1.5	50	µg/l
Sum of Trichloroethylene and Tetrachloroethylene	Annex II	10	5	40	µg/l

7.3. Nitrates and pesticides

Five Member States reported more stringent threshold values for nitrates than the groundwater quality standard established in Annex I.1 of the GWD (50 mg/l). The values range from 18 mg/l to 50 mg/l – see following Table 2:

Table 2: Threshold values established for nitrates

Member State	Single threshold value	Range of threshold values		Unit	Comment
		From	to		
Austria	45			mg/l	
Ireland	37.5			mg/l	

United Kingdom		18	42	mg/l	
Hungary		25	50	mg/l	
Latvia	48.7			mg/l	Established as 11 mg/l NO ₃ -N

Six Member States established threshold values for 36 different active substances in pesticides which are below the quality standard of 0.1 µg/l. The threshold values range from 0.0001 µg/l to 0.1 µg/l. One Member State reported a stricter threshold value (0.375 µg/l) than in GWD for total pesticides (0,5 µg/l).

7.4. Other pollutants

20 Member States established threshold values in total for 106 substances which do not belong to the Annex I (nitrates and pesticides) and II substances of the GWD. Nearly two thirds (62) belong to the group of synthetic substances.

7.5. Pollutants responsible for groundwater bodies at risk or in poor status

According to WFD Annex II Member States had to carry out in 2004 an initial characterisation of all groundwater bodies to assess their uses and the degree to which they are at risk of failing to meet the objectives. 'Being at risk' does not necessarily mean that the given groundwater body is in poor status. Unfavourable pollution trends in water bodies which are in good status can also result in potential deterioration of the water body.

Nearly all reported pollutants/indicators are responsible for groundwater bodies being at risk in one or another Member State. However, based on the information reported, 18 Member States established groundwater threshold values for in total 68 pollutants and indicators of pollution that are not related to any groundwater body identified as being at risk in these Member States.

In 2007 30% of the groundwater bodies across Europe were identified as being in poor status. Measures for the improvement of the status of these groundwater bodies have to be established in the river basin management plans due at the end of 2009, with good status of these bodies being achieved by 2015 according to WFD.

Only half of the reported pollutants/indicators are responsible for groundwater bodies being of poor status in Europe.

The following Table 3 gives an overview of those substances which are responsible for more than 100 groundwater bodies being identified as at risk or which are responsible for more than 50 groundwater bodies being in poor status. Nitrates are posing risk to at least 478 groundwater bodies in Europe and cause poor status of at least 504 groundwater bodies. 'At least' means that information on the number of groundwater bodies being at risk due to nitrates was not explicitly requested from Member States within this data collection, and therefore the information is partial (18 Member States reported fully or partly on the related numbers).

Table 3: Pollutants posing risk to more than 100 groundwater bodies or causing poor status to more than 50 groundwater bodies in Europe

Pollutants	posing risk		poor status	
	GWBs	Member States	GWBs	Member States
Nitrate*	478	17	504	14

Ammonium	276	14	147	13
Chloride	256	18	117	13
Sulphate	216	16	117	15
Molybdate Reactive Phosphorus (as P)	210	1	102	1
Arsenic	128	13	42	11
Benzene	124	7	58	6
Benzo(a)pyrene	110	4	51	3
Cadmium	101	11	55	5
Tetrachloroethylene	96	6	62	6
Lead	90	10	51	5

*partial information

8. METHODOLOGIES APPLIED FOR THE ESTABLISHMENT OF THRESHOLD VALUES

Most of the groundwater threshold values were established at Member State level (126) and groundwater body level (79). Only few substances were established at the level of river basin districts. Germany and Belgium established threshold values also on administrative level (region) which is an additional level than those listed in GWD Article 3.2.

Fifteen Member States established all their threshold values at the same level, nine Member States established their threshold values at different levels.

In most of the Member States the procedure for establishing threshold values considered both the protection of associated aquatic and dependent terrestrial ecosystems (15 Member States) and the uses and functions of groundwater – mainly drinking water use (23 Member States). Some Member States took regard of saltwater intrusion (4 Member States), where this problem was relevant. Other uses mentioned as being considered in the threshold value establishment process are mineral water, industrial water uses and irrigation use.

Fifteen Member States reported that their threshold values are based on environmental quality objectives - international or national - as far as relevant. Four Member States explicitly mentioned Directive 2008/105/EC⁶ establishing environmental quality standards as the basis for derivation. Two Member States reported that they did not consider environmental objectives due to no risk or non-substantial impact; in two other Member States this is due to limited knowledge about groundwater-surface water interactions.

Only few Member States reported explicitly for which pollutants/indicators environmental quality objectives and other standards were considered within the threshold value establishment.

Although this information was not requested, one Member State reported on transboundary cooperation within the establishment of threshold values.

⁶ OJ L 348, 24.12.2008, p.84

9. CONCLUSIONS

In total 26 Member States reported that threshold values have been established for 158 different pollutants/indicators across Europe. Pollutants in Annex II GWD are nearly comprehensively covered when establishing threshold values, all those 10 substances cause risk in a considerably high number of Member States.

Five Member States established more stringent threshold values for nitrate than the quality standard of 50 mg/l as laid down in Annex I GWD. The values range from 18 mg/l to 50 mg/l. From all the pollutants considered nitrate is posing risk to and cause poor status of the highest number of the groundwater bodies in Europe.

Threshold values for 36 individual pesticides below the quality standard of 0.1 µg/l were established by 6 Member States. The threshold values range from 0.0001 µg/l to 0.1 µg/l. 1 Member State reported a threshold value for total pesticides of 0.375 µg/l which is below the quality standard of 0.5 µg/l as laid down in Annex I GWD. 106 pollutants not listed in GWD were also considered by Member States when establishing threshold values, 62 of them are synthetic substances.

Drinking water standards were most frequently reported as basis of threshold values, either laid down in the EU Drinking Water Directive (98/83/EC⁷) or respective international (e.g. WHO) or national standards. 15 Member States also considered environmental quality objectives – international (e.g. EQS Directive 2008/105/EC) or national – as far as relevant.

There is a huge variability in the ranges of threshold values across Europe. The reason behind this could be that the GWD provides certain flexibility to the Member States in the establishment of threshold values by requiring the consideration of the different receptors of the groundwater body as well as the risks and functions, the characteristics and behavior of the pollutants and the hydrogeological characteristics represented by the background levels. The consideration of these different requirements, potentially adapted to each individual groundwater body, leads to the different approaches followed by the Member States. The reasons for the differences can be assessed in detail only after seeing the threshold values in the context of the river basin management plans (e.g. the pressure and impact analysis).

Article 10 of the GWD foresees a review of Annex I and II in 2013 which provide an opportunity to look at the river basin management context. The Commission is starting the preparatory work for this review. The identification of substances for setting EU standards will be taken into consideration during this review. The FP7 research project on groundwater and dependant ecosystems (GENESIS⁸) is contributing to the review following the recommendation of Recital 20 WFD.

This report could assist Member States in the next steps of the implementation of the WFD and GWD in terms of the identification and reversal of significant and sustained upward trends of pollution and inclusion of appropriate measures into river basin management plans for groundwater bodies at risk.

⁷ OJ L 330, 5.12.1998, p.32

⁸ www.thegenesisproject.eu