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COMMON IMPLEMENTATION STRATEGY FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC)

Policy Summary of Guidance document No. 23 ON EUTROPHICATION ASSESSMENT IN THE CONTEXT OF EUROPEAN WATER POLICIES

EUROPEAN COMMISSION

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Note: This Policy Summary has been agreed by the Strategic Co-ordination Group in November 2009 and summarises the policy relevant findings of the guidance document endorsed at the Water Directors' meeting on 28-29 May 2009 in Brno. The document should be regarded as presenting an informal consensus agreed by all partners. However, the document does not necessarily represent the official, formal position of any of the partners.

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FOREWORD

One of the major pollution problems facing European waters is eutrophication, a process whereby water bodies, such as lakes, open seas, estuaries, or slow-flowing rivers receive an excess of nutrients, such as nitrogen and phosphorus compounds that stimulate excessive plant growth. In June 2004 the Water Directors agreed to start an activity on eutrophication assessment under the CIS process with the aim of developing a guidance document for the harmonisation of assessment methods and criteria in the field of European water policy. The guidance was to cover all water categories (inland waters, coastal and marine) and all existing European policies, and was to be firmly based on the methodological concepts of the Water Framework Directive.

An interim version of the guidance document was adopted by the Water Directors in November 2005 and a policy summary of the interim guidance was approved in March 2006. The main issues addressed in the interim document were a unified conceptual framework to understand eutrophication in all water categories, a conceptual read across the relevant EC Directives (mainly Water Framework Directive, Urban Wastewater and Nitrates Directives) and international policies (e.g. OSPAR) addressing eutrophication and a more-in-depth understanding of eutrophication in the context of WFD ecological status assessment.

While it was recognised that the document already provided useful guidance, the Water Directors concluded that any attempt to harmonise classification criteria should be informed by the results of the at the time ongoing intercalibration of ecological assessment methods, some key research projects in the field of ecological assessment as well as the developments that were ongoing within OSPAR and HELCOM.

The Eutrophication Guidance was updated accordingly by the Eutrophication Steering Group, a group chaired by the European Commission with participation of experts from Finland, Germany, the Netherlands, Spain and the UK. The Guidance was adopted by the Water Directors in Brno in May 2009. The policy relevant elements of the updated Eutrophication Guidance are summarised in this Policy Summary. Both the Eutrophication Guidance Document and the Policy Summary can be found in the public part of WFD CIRCA:

http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents&vm=detailed&sb=Title

November 2009

POLICY SUMMARY OF THE "GUIDANCE DOCUMENT ON EUTROPHICATION ASSESSMENT IN THE CONTEXT OF EUROPEAN WATER POLICIES"

1. INTRODUCTION

Eutrophication is the accelerated production of organic matter, particularly algae and higher forms of plant life, in a water body usually caused by an increase in the amount of nutrients being discharged to the water body. As a result of accelerated algal production (primary impact), a variety of impacts may occur, including nuisance and toxic algal blooms, depleted dissolved oxygen, and loss of submerged aquatic vegetation (secondary impacts), undesirable disturbance of the balance of organisms present in the water, and deterioration of the quality of the water concerned. These primary and secondary impacts are interrelated and usually viewed as having a negative effect on water quality and ecosystem health. Eutrophication has been recognised as a problem in freshwater systems for many years, but only in the past three decades has concern grown about the widespread occurrence of eutrophic conditions in transitional, coastal and marine systems. Due to the complexity of the phenomena, the lack of consistent data sets, and the lack of a harmonised approach to assess eutrophication, the severity and extent of the problem had not been adequately characterised at national level and not harmonised on a European scale in the past.

European policy has consistently identified eutrophication as a priority issue for water protection. Substantial progress has been made in combating eutrophication but there remain several issues where co-ordination is necessary to achieve a harmonised result for different policy areas. Thus an activity was initiated under the Common Implementation Strategy of the Water Framework Directive and the European Marine Strategy to provide guidance on:

- the harmonisation of assessment methodologies and criteria for agreed eutrophication elements/ parameters/ indicators for rivers, lakes, transitional, coastal and marine waters;
- the use of type-specific objectives for biological and general physico-chemical elements;
- the co-ordination of monitoring and reporting.

There is general agreement that the CIS eutrophication guidance should be based on the methodological concept of the WFD, exploring the extent to which this can be used in the context of other directives and policies. The guidance should inform the implementation of these policies and the preparation of the River Basin Management Plans. This guidance should assist in answering the following key questions:

- What are severity and extent of eutrophic conditions exhibited within surface waters of Europe?
- To what extent are eutrophic conditions caused by human activities?
- How is eutrophication understood in the context of ecological status?
- Which are the conditions and criteria to use when assessing the risk of water bodies to become eutrophic in the future?
- Which data gaps and monitoring needs are most critical in terms of improving the ability to assess and respond to eutrophication symptoms?

- Where should management efforts be targeted to achieve greatest benefit toward remediation and protection from degradation?

2. CONCEPTUAL FRAMEWORK FOR EUTROPHICATION ASSESSMENT

Based upon the OSPAR conceptual framework, the common conceptual framework of eutrophication presented in Figure 1 was developed. This diagram represents the eutrophication process and the ecological impacts which may arise for the purpose of guiding eutrophication assessment in all water categories. It does not extend to (use-related) impacts upon man, either directly or indirectly, which is part of what constitutes an undesirable disturbance.

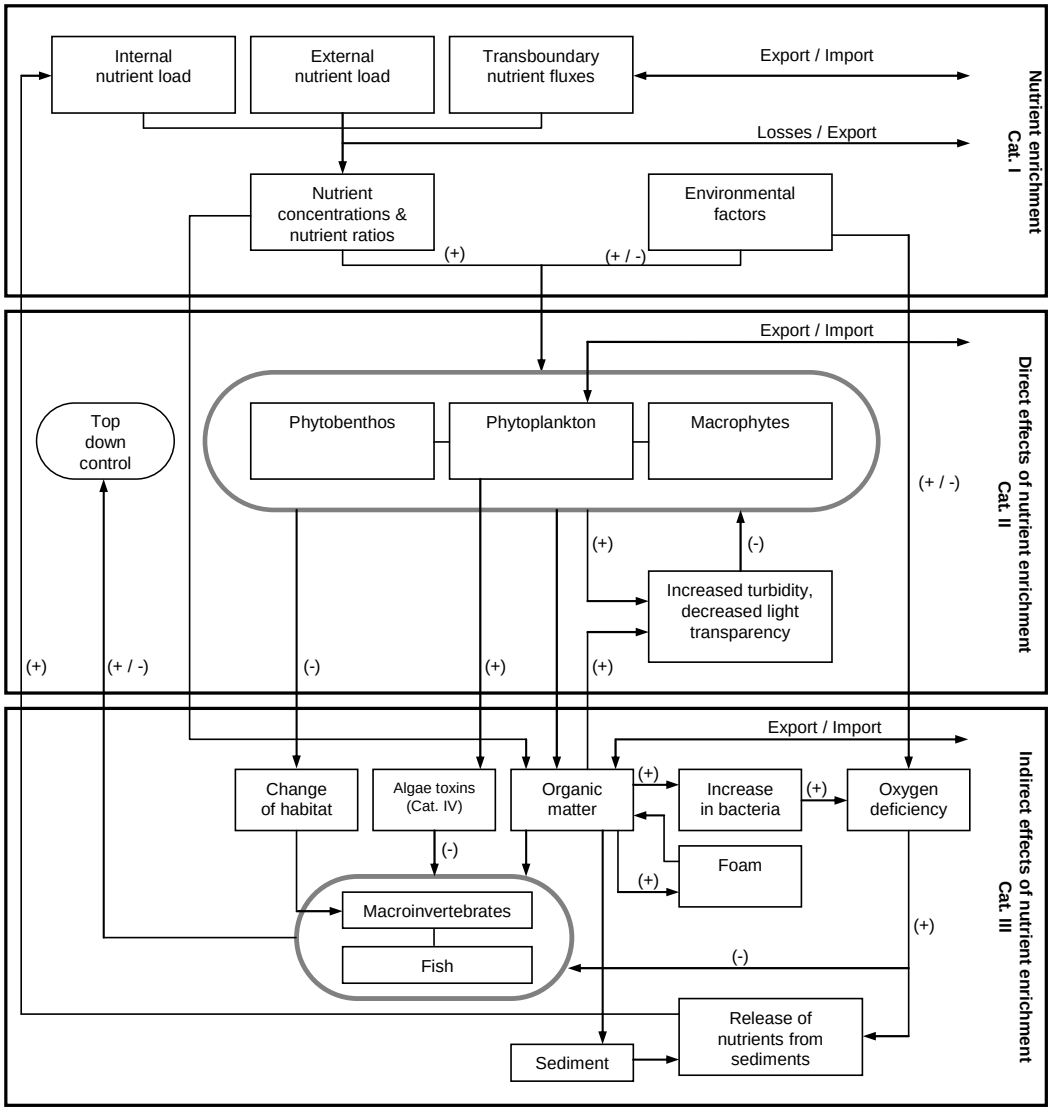

Figure 1. General conceptual framework to assess eutrophication in all categories of surface waters. (+) indicates increase; (-) indicates decrease; round boxes indicate biological quality elements of WFD.

The conceptual framework for eutrophication assessment can be linked to the general DPSIR assessment framework[1] as follows: Category I in the framework corresponds to pressures and state whereas Categories II and III refer to impacts. The focus of this guidance document is on state and impact assessment. Responses are not covered by the mandate to develop this guidance document although Chapter 8 of the guidance outlines possible future work in this area.

3. OVERVIEW AND COMMON UNDERSTANDING OF EUTROPHICATION IN EC AND INTERNATIONAL POLICIES

Overview of policy instruments

Eutrophication is addressed in several EU policies such as the Urban Waste Water Treatment (UWWT; 91/271/EEC), Nitrates (91/676/EEC) and Water Framework Directives (WFD; 2000/60/EC). A number of international conventions address eutrophication in marine waters including OSPAR (North East Atlantic), HELCOM (Baltic Sea), the Barcelona Convention and the Black Sea Convention.

In 2000, the WFD introduced, amongst other requirements, a comprehensive ecological quality assessment for all waters, which describes the quality of waters with a number of biological, hydromorphological and physico-chemical quality elements. The WFD provides a basis for a clear and detailed assessment of eutrophication, and provides the potential for a more consistent and integrated approach to managing nutrient inputs to waters taking fully into account the requirements of previous EU legislation.

Concepts and definitions of eutrophication

For the purpose of this guidance, it has been agreed, that the definition of eutrophication as laid out in the UWWT Directive is adequate:

Eutrophication is "the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned".

The term “eutrophic” is used in the guidance to refer to the situation, when the natural trophic status (including the biology) is out of balance because of anthropogenic interventions. This understanding of “anthropogenic” eutrophication corresponds with how the WFD classifies surface water ecological status in relation to type-specific reference conditions. A pressure (in this case nutrient enrichment) causes an adverse change in biological quality elements (e.g. ‘composition, abundance and biomass of phytoplankton’). This in turn might cause indirect effects on physicochemical quality elements (e.g. transparency, oxygenation conditions), and other biota (e.g. macro-invertebrates). Water bodies that fail to achieve Good Ecological Status due to the effects of human induced nutrient enrichment can be considered to be adversely affected by eutrophication.

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[1] DPSIR assessment framework has been developed in the past to understand environmental policy and related evaluation and assessment: driving forces (D), pressures (P), states (S), impact (I) and responses (R). In the WFD context, P is addressed in the article 5 reports when assessing pressures, S and I are addressed by the work on classification, intercalibration and monitoring, and R is addressed in the programmes of measures (see guidance document for a more detailed discussion and further references).

Table 1 compares different terms used in different European policies on eutrophication like "water body at less than good status" (WFD), "sensitive area" (UWWTD), "polluted water" (Nitrates Directive) and "problem area" (OSPAR).

Table 1. Comparison of key terms used in relevant European policies in relation to eutrophication

	Water Framework Directive	UWWT Directive	Nitrates Directive	OSPAR	HELCOM
Assessment result (not fulfilling the objective and requiring measures)	Water body at less than good status based on eutrophication-related biological quality elements or judged at risk of deterioration	Sensitive area (= sensitive water body) due to eutrophication	"Polluted waters" [2]	Problem area and potential problem area	Areas affected by eutro-phication
Location of pressures (other than those directly on the water body)	River basin or sub-basin	Catchment area of sensitive area	Nitrate vulnerable zone (areas which drain into identified waters and which contribute to pollution)	Any location that is relevant, directly or indirectly influenced by nutrient pressures	Coastal waters relevant to WFD and open sea

In this guidance, it is recognised that the process of eutrophication may occur in water bodies regardless of their natural status, but that water bodies are not considered to be "eutrophic" or to fall in the "may become eutrophic" category unless the nutrient enrichment causes, or could cause in the near future, the ecological status to be moderate or worse. This ensures the same level of protection in all EC directives as far as nutrient enrichment is concerned.

Assessment results under various policies

A key element of the guidance (Chapter 3) is the comparison of assessment results under various European water policies responding to nutrient enrichment (see **Table 2**).

WFD moderate, poor and bad status, compared with the eutrophication categories

The terms "eutrophic" and "in the near future may become eutrophic" in the Nitrates and UWWT Directives are interchangeable from the legal point of view and both have similar consequences (identification/designation of nitrate vulnerable zones or of sensitive areas). However, in order to establish a consistent link with the WFD status classes, they can be interpreted as the result of different degrees of ecological deviation from reference conditions.

[2] For the purposes of this guidance the term "polluted waters" is taken, for the sake of brevity, to mean "waters affected by pollution and waters which could be affected by pollution if action is not taken" in line with Article 3 of the Nitrates Directive. Specifically, it refers to waters that are eutrophic or in the near future may become eutrophic if action is not taken, as per the criteria in Annex IA3 of the Directive.

The term "eutrophic" can be identified with a situation where undesirable disturbances are common, whereas the term "in the near future may become eutrophic" corresponds with a situation where undesirable disturbances[3] are not necessarily present, but the degree of ecological change is such that they are likely. Therefore, based on the text of normative definitions for the algal/plant quality elements, moderate status under the WFD corresponds broadly with the "in the near future may become eutrophic" situation, particularly if there is increasing nutrient pressure. As the degradation of water quality increases, so does the likelihood of undesirable disturbances, and from a certain point in the moderate class and beyond into poor and bad, the conditions would correspond with "eutrophic". The moderate class is interpreted as a transition class between good status, where no undesirable disturbances are present, and poor or bad, where they are increasingly common and severe.

WFD good and high status compared with the eutrophication categories

As well as assessing current status, the WFD also requires Member States to assess the risk of future deterioration of status, linked to the WFD objective of preventing such deterioration. This means water bodies that are currently in good or even high status and that may deteriorate in the future due to increasing pressures will need to be part of the Programme of Measures under the WFD. This forecasting of future breaching of the prevent deterioration principle equates well with the forecast/estimation of "may become eutrophic in the near future" of the UWWT and Nitrates Directives, at least if the deterioration may result in a moderate or worse status due to eutrophication. In order to assess whether undesirable disturbances are likely to occur, nutrient pressures/concentrations, data on the effects of eutrophication (e.g. large phytoplankton blooms, mats of green algae, oxygen deficiency) and other environmental factors that influence eutrophication should be taken into account, for example light availability/turbidity, hydrodynamic conditions, temperature, etc.). The following WFD activities should be considered:

i. ecological status assessment – whether there is a trend/development in the recent past from high to good status or in values for individual quality elements that determine eutrophication, indicating movement towards moderate/poor/bad and thus "eutrophic";

ii. risk assessment to estimate future status and prevent deterioration – using information on expected change in pressures that are likely to result in a water body becoming eutrophic in the near future (predictive analysis).

The initial results of the Article 5 analysis under WFD will be further refined with the information from the monitoring networks, and by further characterisation and classification. The status assessment of water bodies is part of the River Basin Management Plans (RBMP) which are due by December 2009. Along this process from the Article 5 analysis to the RBMP, increasing certainty will be attained on the evaluation of future status of water bodies. At any point, designation under UWWT and/or Nitrates Directives must take place if sufficient certainty is attained that a water body may become eutrophic in the near future.

[3] On the definition of undesirable disturbances see Eutrophication Guidance, Annex 1, section 1.2.4 Relevant Case Law.

Table 2. Comparison of assessment results under various policies for waters responding to nutrient enrichment (based on the assumption that the WFD classification is the starting point and that the different sources of pollution are relevant).

ASSESSMENT OF CURRENT STATUS						
Ecological status	**WFD normative definition**	**UWWT Directive[4]**	**Nitrates Directive[4]**	**OSPAR**	**HELCOM**	**MSF Directive**
High	Nearly undisturbed conditions	Non-eutrophic, designation of sensitive area is **not required**[5]	Non-eutrophic, not a polluted water [2], designation of nitrate vulnerable zone is **not required**	Non-problem area	Area not affected by eutrophication	-
Good	Slight change in composition, biomass	Non-eutrophic, designation of sensitive area is **not required**	Non-eutrophic, not a polluted water [2], designation of nitrate vulnerable zone is **not required**	Non-problem area[6]	Area not affected by eutrophication	Human induced eutrophication is minimised[7]
Moderate	Moderate change in composition, biomass	Eutrophic or may become eutrophic in the near future, designation of sensitive area is **required**	Eutrophic or may become eutrophic in the near future, polluted water [2], designation of nitrate vulnerable zone is **required**	Problem area[6]	Area affected by eutrophication	Human induced eutrophication is not minimised[8]
Poor[9]	Major change in biological communities	Eutrophic, designation of sensitive area is **required**	Eutrophic, polluted water [2], designation of nitrate vulnerable zone is **required**	Problem area	Area affected by eutrophication	Human induced eutrophication is not minimised[8]
Bad	Severe change in biological communities	Eutrophic, designation of sensitive area is **required**	Eutrophic, polluted water [2], designation of nitrate vulnerable zone is **required**	Problem area	Area affected by eutrophication	Human induced eutrophication is not minimised[8]

4 If Member States have chosen to apply the whole territory approach, there is no obligation to designate sensitive areas under the UWWT Directive or nitrate vulnerable zones under the Nitrates Directive.

5 In coastal zones, with good water exchange and other conditions described in the Directive 91/271/EEC, Annex II.B, even less sensitive areas can be designated.

6 If insufficient data is available, 'good' or 'moderate' Ecological Status could correspond to a potential problem area. Nevertheless, in the case of potential problem areas with regard to eutrophication, preventive measures should be taken in accordance with the Precautionary Principle. Furthermore, there should be urgent implementation of monitoring and research in order to enable a full assessment of the eutrophication status of each area concerned within five years of its being characterised as a potential problem area (see OSPAR Strategy to Combat Eutrophication § 3.2b.).

7 Human induced eutrophication is minimised, especially effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters (MFSD Ann. 1 (5))

8 Work on the development of the respective descriptor is under way.

9 Indirect effects of eutrophication (e.g. decline in dissolved oxygen) will be evident at poor Ecological Status.

Summary of links between WFD status and eutrophication categories

In summary, it is proposed that in terms of WFD status classification and environmental objectives, the term "eutrophic" relates to situations where undesirable disturbances are common or severe and equates primarily to poor or bad status, whereas "in the near future may become eutrophic" of the UWWT and Nitrates Directives can be interpreted in two complementary ways:

- in the context of **current status** assessment, as corresponding to moderate status (undesirable disturbances are not necessarily present, but the degree of ecological change is such that they are likely, particularly if there is increasing nutrient pressure) or,
- in the context of **future status** evaluation especially for waters of high or good status as corresponding to a risk of breaching the Water Framework Directive prevent-deterioration principle.

As discussed in Chapter 8 of the guidance, information on confidence/uncertainty in classification is important for informing decisions on the appropriate follow-up actions.

Further considerations

Table 2 provides a general comparison but has to be interpreted with care. The following aspects should be considered in more detail, in particular:

a. In general, the designation of many sensitive areas (under the UWWTD), the identification of "polluted waters"[2] requiring designation of nitrate vulnerable zones (under the Nitrates Directive), and the first designation of problem areas (2003) under the OSPAR Common Procedure has taken place before the WFD entered into force. All existing designations will be unchanged by the WFD independent of the ecological status of the water bodies concerned, although that status will be important in determining what nutrient control measures will be required. Sensitive areas and nitrate vulnerable zones will become protected areas under Article 6 and Annex IV of the WFD. After 2006, any classification of the status of these water bodies under the WFD will not change this designation, but will affect decisions on the range and extent of control measures required to achieve WFD objectives[10].

b. After 2006, however, when the monitoring programmes under the WFD will have become operational, the results of the ecological status assessment should be considered in reviews of the identification of sensitive areas and the designation of nitrate vulnerable zones in accordance with the UWWT and Nitrates Directives, respectively. Where these directives apply, a complementary approach to eutrophication assessment under the WFD is desirable as these two directives are basic measures under the WFD. In considering any read across from WFD classes to identification of waters as "sensitive" or "polluted" under the UWWT or Nitrates Directives, the advice on checking procedures and accounting for uncertainty in eutrophication assessment (Chapter 6.2 of the guidance), should be taken into account.

c. Designation of sensitive areas or nitrate vulnerable zones is only necessary when pressures covered by the UWWT or Nitrates Directives are significant (regarding the latter see paragraph 35 of Judgement Case C-293/97). Recent ruling by the Court of

[10] The requirements on review of sensitive areas and designation of vulnerable zones every four years remains unchanged according to Art. 5(6) of 91/271/EEC and Art. 3(4) of 91/676/EEC.

Justice helps to interpret this concept of significant contribution (see paragraphs 40, 52, 77 and 87 of Judgement Case C-280/02 and paragraphs 81 to 88 of the Case C-221/03).

d. Water bodies may still be in moderate-bad status for a long time after pressures have been reduced, due to delayed soil leaching/run-off response, internal loading and/or time-lagged response in the biological quality elements. In such cases, the clause on "natural processes" in the exemption of the WFD (Article 4.4 WFD) may be checked to see whether it is applicable. Alternatively, other internal restoration measures (e.g. bio-manipulation or sediment dredging) may be required to speed up the recovery back to good status.

e. Finally, also other criteria (independent from eutrophication of surface water) may lead to designation of nitrate vulnerable zones and identification of sensitive areas (for example high nitrate concentrations in surface and groundwater)[11]. However, these are not part of the deliberations in this guidance.

It should be recalled, that if Member States have chosen to apply the whole territory approach, there is no obligation to designate sensitive areas under UWWT Directive or polluted waters/vulnerable zones under Nitrates Directive. Therefore, as regards designation, **Table 2** is not applicable to those Member States. Member States may decide to apply the whole territory approach without taking into consideration the status of water bodies. Therefore, the fact that Member States have chosen to apply in their whole territory the control measures mentioned in the previous two paragraphs does not prejudge the result of the status assessment under WFD.

The pressures causing eutrophication may originate a long way from the water body being affected. In accordance to UWWT and Nitrates Directives, measures have to be taken in the relevant catchment areas of sensitive areas and which contribute to the pollution of these areas (Art. 5(5) of Directive 91/271/EEC), or in all known areas of land which drain into "polluted waters"[2] and which contribute to pollution (Art. 3(1), 3(2) and 5(1) of Directive 91/676/EEC). However, from the WFD perspective, this does not mean that all the water bodies upstream will need to be classified as less than good status.

Moreover, there may be situations where the nutrient pressures on affected water bodies may be located in another river basin (district) or adjacent areas of the marine waters (e.g. different parts of the Baltic Sea). This situation mainly occurs in transitional and coastal waters, where nutrient loads and/or eutrophication effects may be transported from one coast to another (e.g. North Adriatic Sea or German Bight, parts of the Baltic Sea, etc.) or from estuaries to coastal waters. The assessments needed in this type of situation can be complex.

In comparing class boundaries used by the WFD and OSPAR it is helpful to describe the criteria for assessing Ecological Status in terms of primary and secondary impacts of eutrophication (see also **Table 3**). Environmentally significant undesirable disturbances are expected to start at moderate Ecological Status (see also **Table 4**).

[11] See section A of Annex II of Urban Waste Water Treatment Directive 91/271/EEC, and Section A of Annex I of Nitrate Directive 91/676/EEC.

Table 3. Examples of qualitative criteria for assessing WFD Ecological Status in terms of primary and secondary eutrophication impacts.

Ecological Status	WFD normative definition	Primary impacts (e.g. phytoplankton biomass)	Secondary impacts (e.g. O_2 deficiency)
High	Nearly undisturbed conditions	None	None
Good	Slight change in abundance, composition or biomass for relevant biological quality elements.	Slight	None or only slight
Moderate	Moderate change in composition or biomass for relevant biological quality elements.	Change in biomass, abundance & composition begins to be environmentally significant, i.e. pollution tolerant species more common.	Occasional impacts from increased biomass.
Poor	Major change in biological communities.	Pollution sensitive species no longer common. Persistent blooms of pollution tolerant species	Secondary impacts common & occasionally severe.
Bad	Severe change in biological comm.	Totally dominated by pollution tolerant species	Severe impacts common

The interpretation set out in the preceding paragraphs ensures a coherent action against eutrophication across the various policies. Action requirements under the various Directives should be considered together in order to produce the final outcome of the RBMP in December 2009, as well as subsequent plans due in 2015 and 2021. Therefore, whenever pressures addressed by UWWT and Nitrates Directives are present, the list of water bodies subject to WFD Programme of Measures should be coherent with the designation of sensitive areas and polluted waters under UWWT and Nitrates Directives. It should be recalled that measures under these Directives are part of the Programme of Measures foreseen in Article 11.3 and Annex VI part A of the WFD.

4. THE WFD CONCEPT OF ECOLOGICAL STATUS IN THE CONTEXT OF EUTROPHICATION

Chapter 4 of the guidance document sets out a proposed common understanding of the Water Framework Directive's normative definitions in the context of nutrient enrichment and eutrophication effects. Chapter 6 provides further interpretation. This underpins the ecological status classification in the context of eutrophication and thus the intercalibration exercise and the design of monitoring programmes.

Identification of sensitive quality elements

As a general rule, aquatic flora quality elements will have an earlier response to nutrient conditions than benthic invertebrates or fish fauna. The relative 'sensitivity' of different aquatic flora to nutrient enrichment may vary, depending on local circumstances. The type-specific conditions defined for good and for moderate ecological status in rivers, lakes, transitional and coastal waters represent equivalent stages in the process of eutrophication in the different water categories, even if the conditions are sometimes expressed in the Annex V normative definitions using different wording.

Phytoplankton, phytobenthos and macroalgae derive their nutrients from the water column and, under the right conditions, can colonise, grow and reproduce quickly. As a consequence, they tend to respond rapidly to changes in nutrient concentrations. Rooted macrophytes and angiosperms derive their nutrients from sediments or from a combination of sediments and the water column. Their responses to nutrient enrichment tend to be slower than that of phytoplankton, phytobenthos and macroalgae, and therefore may enable reliable assessments to be achieved more easily. However, this relative stability means that assessments based solely on macrophytes and angiosperms may in some situations fail to detect the early onset of eutrophication.

Significant undesirable disturbances

The condition of aquatic flora quality elements (phytoplankton, phytobenthos, macroalgae, macrophytes and angiosperms) would be consistent with good status if there is no accelerated algal or higher plant growth resulting in a significant undesirable disturbance to the aquatic ecosystem (see **Table 4**).

Table 4. Significant undesirable disturbances that may result from accelerated growth of phytoplankton, macroalgae, phytobenthos, macrophytes or angiosperms[12]

a. Causes the condition of other elements of aquatic flora in the ecosystem to be moderate or worse (e.g. as a result of decreased light availability due to increased turbidity & shading)
b. Causes the condition of benthic invertebrate fauna to be moderate or worse (e.g. as a result of increased sedimentation of organic matter; oxygen deficiency; release of hydrogen sulphide; changes in habitat availability)
c. Causes the condition of fish fauna to be moderate or worse (e.g. as a result of oxygen deficiency; release of hydrogen sulphide; changes in habitat availability)
d. Compromises the achievement of the objectives of a Protected Area for economically significant species (e.g. as a result of accumulation of toxins in shellfish)
e. Compromises the achievement of objectives for a Natura 2000 Protected Area
f. Compromises the achievement of objectives for a Drinking Water Protected Area (e.g. as a result of disturbances to the quality of water)
g. Compromises the achievement of objectives for other protected areas, e.g. bathing water.
h. Causes a change that is harmful to human health (e.g. shellfish poisoning; toxins from algal blooms in water bodies used for recreation or drinking water)
i. Causes a significant impairment of, or interference with, amenities and other legitimate uses of the environment (e.g. impairment of fisheries)
j. Causes significant damage to material property

[12] See also pts. 18 and 23 of the ECJ judgement for the case C-280/02, where undesirable disturbances are referred to as causing a loss of ecosystem biodiversity, occurred nuisances due to proliferation of opportunistic macroalgae and severe outbreaks of toxic and harmful phytoplankton.

A significant undesirable disturbance is a direct or indirect anthropogenic impact on an aquatic ecosystem that appreciably degrades the health or threatens the sustainable human use of that ecosystem (see **Table 4**). Such disturbances as a result of human activity are not present for a water body to be at good status.

In addition to disturbances due to accelerated algal/plant growth, undesirable changes in the balance of aquatic flora taxa should also be considered. The condition of phytoplankton, phytobenthos, macrophytes, macroalgae or angiosperms would not be consistent with good ecological status where, as a result of anthropogenic nutrient enrichment, changes in the composition of organisms are likely to adversely affect the functioning or structure of the ecosystem (see **Table 5** for examples).

Table 5. Examples of ecologically significant undesirable changes to the composition of taxa

Moderate conditions	**Poor or bad conditions**
The composition of taxa differs moderately from type-specific reference conditions such that:	
• nutrient-tolerant taxa or a functional group[13] of taxa that are absent or rare at reference conditions is no longer rare	• communities are dominated by nutrient-tolerant functional groups normally absent or rare under reference conditions
• moderate number of taxa are absent or rare compared to reference conditions such that a functional group of taxa is in significant decline; or • the condition of the functional group of taxa is exhibiting clear signs of stress such that there is a significant risk of localised extinctions at the limits of its normal distributional range	• one or more functional groups of taxa normally present at reference conditions has become rare or absent • the distribution of a functional group of plant taxa is so restricted compared to reference conditions that a significant loss of function has occurred (e.g. invertebrates or fish are in significant decline because of the loss of habitats normally provided by functional groups of macrophyte; macroalgal or angiosperm taxa)
• a group of taxa normally present at reference conditions is in significant decline	• a group of taxa normally present at reference conditions has become rare or absent

Nitrogen and phosphorus enrichment

The relative significance of nitrogen and phosphorus enrichment in different surface water categories and types of surface waters will vary. In transitional and coastal waters anthropogenic nitrogen enrichment could be the most important cause of eutrophication whereas in many fresh surface waters, phosphorus enrichment is likely to be more important.

According to the CIS Classification Guidance, a water body may be classified as less than good ecological status under the WFD, because values for physico-chemical quality elements (in the context of eutrophication, notably nutrients) exceed levels established so as to ensure the functioning of the ecosystem and the achievement of the biological quality required for good status. Scientific understanding of the causal link between the levels of physico-chemical quality elements in a water body and the condition of the biological quality elements

[13] Functional groups of taxa are different groups of taxa within a biological quality element that serve particular ecological roles.

is incomplete. Chapter 4 of the CIS Classification Guidance proposes a checking procedure designed to ensure that the type-specific values established for the general physico-chemical quality elements are no more or no less stringent than required by the WFD. The checking procedures apply only in relation to values for the good-moderate status/potential boundaries and where Member States are confident that the mismatch between the monitoring results for the biological and general physico-chemical quality elements does not occur as a result of uncertain monitoring. This will usually require evidence that there is a consistent mismatch from a significant number of water bodies in the type.[14] Accordingly it may be appropriate for Member States to relax the nutrient standards established for a type, subject to specific provisions, if there is evidence from a significant number of water bodies that the nutrient status is less than good but the biological status is good. The opposite situation, where the biology is not good and the supporting elements are good, may follow a similar procedure to determine whether the type-specific nutrient standard is sufficiently tight. It should be noted that adjustments to type-specific nutrient levels will reduce the extent of mismatches but will not eliminate them. This is because the characteristics of water bodies within a type are never identical.

In some cases it may be more appropriate to revise the status of an individual water body to good if (a) the nutrients are less than good, (b) the biology complies and the biological assessment is confident and precise, and (c) delayed impacts are unlikely, rather than revising the type-specific nutrient level. Before revising the status of a water body and/or the nutrient standards, it is considered important to undertake checks to confirm the absence of biological impacts (including delayed impacts) and of upward trends in nutrient concentrations. As regards the absence of biological impacts, such checks should be done using biological assessment methods that are fully WFD-compliant[15].

5. ASSESSMENT CRITERIA AND MONITORING REQUIREMENTS

Information on existing eutrophication classification methodologies and criteria used by Member States is set out in Chapter 5 of the guidance document, for all WFD surface water categories and marine waters.

In Chapter 6, guidance is provided on the use of nutrient standards as well as on how best to combine assessment results from different quality elements when assessing ecological status. An example of the Rhine River Basin District illustrates how river basin management can address measures to mitigate eutrophication at the basin scale. A look beyond the river basin district is given in an overview of the coherence of current eutrophication assessment schemes in inland and marine waters.

Chapter 7 of the guidance document covers monitoring of eutrophication, outlining the requirements of the main policy drivers and promoting harmonisation of monitoring programmes.

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[14] CIS Guidance Doc. No. 13 Overall approach to the classification of ecological status and ecological potential, p. 14

[15] The ECOSTAT Classification Workshop (March 2008) recommended to understand the Checking Procedure in this way.

6. FROM ASSESSMENT RESULTS TO MEASURES

Chapters 6 and 8 of the guidance discuss issues relating to the links between the assessment of eutrophication and decisions on follow-up actions including control measures.

Accounting for uncertainty in eutrophication assessment

Uncertainty in classification, particularly for water bodies close to the good-moderate boundary, is an important issue for river basin management planning. Information on confidence and precision of classifications is important for informing decisions about the appropriate follow up action. To start with the acceptable level of confidence and precision should be decided beforehand, and the sampling/monitoring should be appropriately designed (sampling sites, frequency, sampling and analysis methods, etc.) to be able to reliably classify the water bodies. Depending on the level of confidence, this information can inform, as appropriate, decisions on exemptions[16], prioritising water bodies for improvement, and/or prioritising further monitoring and investigation to improve confidence. Being clear on the level of confidence achieved and on the follow up action where confidence is insufficient to justify expensive measures is considered important: Appropriate follow-up action in such cases includes (a) further targeted monitoring and assessment to try to improve confidence and to assess the risk of deterioration, and (b) action to assess the risk of, and prevent deterioration.

A lack of monitoring should not be an excuse for inaction although it is recognised that in the first cycle of river basin planning, when the new classification tools and monitoring plans have not been in place for long, uncertainties will be greater than in subsequent cycles. Investigative monitoring should be introduced as a priority, where needed, to improve the evidence base and inform decisions on programmes of measures.

In water bodies where there is insufficient confidence in the assessment of eutrophication, the appropriate action will generally be to undertake further monitoring and investigation to improve confidence, rather than to move to immediate control measures under the WFD or through "read across" to UWWT or Nitrates Directive designations. This may apply when, for example, the nutrients appear less than good but we are not confident that the relevant biological quality elements are less than good. Confidence should then be improved in the biological assessments and, where necessary, the nutrient thresholds should be reviewed. In any case, Member States can not wait until all symptoms of eutrophication are present before taking action. If sufficient certainty is attained that the water body is likely to become eutrophic in the near future, then protective measures need to be undertaken (application of the precautionary principle).

[16] See also Section 6 of the Policy Paper "Exemptions to the environmental objectives under the Water Framework Directive; Article 4.4 (extension of deadlines), 4.5 (less stringent objectives) and 4.6 (temporary deterioration)": http://circa.europa.eu/Members/irc/env/wfd/library?l=/framework_directive/thematic_documents/environmental_objectives/final_policy_44-45-46/_EN_1.0_&a=d

Steps in the development of programmes of measures

Chapter 8 of the guidance document describes the steps in the development of measures for a water body (or part of marine area) that is eutrophic or may become eutrophic in the near future. It has to be decided which (combination of) measures at source and in the water body is most appropriate and cost-effective to reduce and eliminate eutrophication in a water body or part of marine area. At this stage, a balanced division of costs between upstream and downstream areas and between the various sectors has to be decided upon, taken into account the principles of polluter pays and proportionality. The quality of the information gathered on the various measures will be crucial in acceptance of the justification of measures in upstream water bodies/countries where no eutrophication exists but where nutrient loads contribute to eutrophication in downstream water bodies/marine areas. The mechanism for the decision making is laid down in the WFD by preparing river basin management plans and agreement on this at the (international) catchment area level.

In general, all the necessary tools, guidance and mechanisms are available to develop and decide upon the measures aiming at elimination of eutrophication in water bodies/catchments/marine areas. The challenge will be to apply all the tools in practice and to integrate these with measures in other policy areas.

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