European Commission

Common Implementation Strategy for the Water Framework Directive (2000/60/EC)

Guidance document n.° 4

Identification and Designation of Heavily Modified and Artificial Water Bodies

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

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Identification and Designation of Heavily Modified and Artificial Water Bodies

Produced by Working Group 2.2 - HMWB

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FOREWORD

The EU Member States, Norway and the European Commission have jointly developed a common strategy for supporting the implementation of the Directive 2000/60/EC, "establishing a framework for Community action in the field of water policy" (the Water Framework Directive). The main aim of this strategy is to allow a coherent and harmonious implementation of the Directive. Focus is on methodological questions related to a common understanding of the technical and scientific implications of the Water Framework Directive.

One of the main short-term objectives of the strategy is the development of non-legally binding and practical Guidance Documents on various technical issues of the Directive. These Guidance Documents are targeted to those experts who are directly or indirectly implementing the Water Framework Directive in river basins. The structure, presentation and terminology is therefore adapted to the needs of these experts and formal, legalistic language is avoided wherever possible.

In the context of the above-mentioned strategy, an informal working group dedicated to the identification and designation of heavily modified and artificial water bodies within implementation of the Water Framework Directive was set up in April 2000 and named HMWB WG 2.2. The United Kingdom and Germany (Joint Chair) have the responsibility of the secretariat and co-ordination of the Working Group that is composed of representatives from 12 Member States and Norway as well as stakeholders and a limited number of Accession Country representatives.

The present Guidance Document is the outcome of this Working Group. It contains the main output of the HMWB Working Group activities and discussions that have taken place since April 2000. It builds on 34 case studies and on the input and feedback from a wide range of experts and stakeholders that have been involved throughout the process of the Guidance development through meetings, workshops, conferences or electronic communication media, without binding them in any way to its content.

We, the water directors of the European Union, Norway, Switzerland and the countries applying for accession to the European Union, have examined and endorsed this Guidance during our informal meeting under the Danish Presidency in Copenhagen (21/22 November 2002). We would like to thank the participants of the Working Group and, in particular, the leaders, Martin Marsden (Scottish Environment Protection Agency, UK), Dr. David Forrow (Environment Agency of England & Wales, UK), Dr. Ulrich Irmer and Dr. Bettina Rechenberg (Umweltbundesamt, D), for preparing this high quality document.

We strongly believe that this and other Guidance Documents developed under the Common Implementation Strategy will play a key role in the process of implementing the Water Framework Directive.

This Guidance Document is a *living document* that will need continuous input and improvements as application and experience build up in all countries of the European Union and beyond. We agree, however, that this document will be made publicly

available in its current form in order to present it to a wider public as a basis for carrying forward ongoing implementation work.

Moreover, we welcome that several volunteers have committed themselves to test and validate this and other documents in the so-called pilot river basins across Europe during 2003 and 2004 in order to ensure that the Guidance is applicable in practice.

We also commit ourselves to assess and decide upon the necessity for reviewing this document following the pilot testing exercises and the first experiences gained in the initial stages of the implementation.

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ABBREVIATIONS

A	Austria
AWA	Artificial Water Body/Bodies
B	Belgium
COAST	WG 2.4 Typology and Classification of Transitional and Coastal Waters
CIS	Common Implementation Strategy
D	Germany
Designation test 4(3)(a) / (b)	Designation test according to Article 4(3)(a) / (b) of the Water Framework Directive
E	Spain
EC	European Commission
EEB	European Environmental Bureau
EQR	Ecological Quality Ratio
ES	Ecological Status
EU	European Union
EUREAU	European Union of National Associations of Water Suppliers and Waste Water Services
EURELECTRIC	Union of the Electricity Industry
E&W	England & Wales, UK
F	France
FFH	Fauna Flora Habitat Directive
GEP	Good Ecological Potential
GES	Good Ecological Status
GIS	WG 3.0 on Geographical Information Systems
GR	Greece
HES	High Ecological Status
HMWB	Heavily Modified Water Body/Bodies
IMPRESS	WG 2.1 Analysis of Pressures and Impacts
km	Kilometre
km²	Square-kilometres
MEP	Maximum Ecological Potential
MS	Member State
NGO	Non Governmental Organisation
NI	Northern Ireland, UK

NL	Netherlands
NO	Norway
PA	Physical Alteration
POM	Programme of Measures
RBD	River Basin District
RBMP	River Basin Management Plan
RHS	River Habitat Survey, UK
REFCOND	WG 2.3 on Reference Conditions for Surface and Inland Waters
S	Sweden
SCG	Strategic Co-ordination Group
Scot	Scotland, UK
SF	Finland
UK	United Kingdom
WATECO	WG 2.6 on Economic Analysis
WFD	Water Framework Directive
WG	Working Group
WWF	World Wildlife Fund for Nature

1 STRUCTURE OF THE DOCUMENT

- ***Section 1*** gives an introduction to the purpose and key objectives of the Water Framework Directive and describes what has been done to support the implementation of Directive. For this purpose, the Section illustrates the development of a Common Implementation Strategy and the establishment of CIS Working Group (WG) 2.2 on HMWB, the activities and outputs of the Working Group and the purpose of this Guidance Document.

- ***Section 2*** offers explanations of the importance and consequences of AWB and HMWB designation in the implementation of the WFD and gives insight into the links between the HMWB & AWB WG and other CIS working groups.

- ***Section 3*** describes the overall HMWB & AWB designation process, giving a short description of the individual steps leading to the identification of HMWB and AWB. The Section describes the function of provisional identification in the first cycle of the River Basin Management and presents some important issues of the designation process.

- ***Section 4*** gives details of the six steps leading to the provisional identification of HMWB, from water body identification (step 1) to the question as to whether the changes in the water body characteristics are substantial and result from physical alterations by human activity (step 6).

- ***Section 5*** describes the steps 7-9, leading to the designation of HMWB.

- ***Section 6*** describes the requirement to establish reference conditions and environmental objectives on which status classification is based, and presents the steps leading to the establishment of appropriate values for the quality elements of MEP and GEP. The Section also describes the appropriate timing for identification of MEP and GEP (steps 10-11).

- ***Section 7*** summarises some important issues regarding measures and related cost considerations throughout the process. It sets the HMWB and AWB process into a time and river basin planning context and gives an outlook to the HMWB process in future RBMP-cycles.

- ***Annexes*** contain a glossary of important terms used in this Guidance Document, a Section on information required for the river basin management plan, a list of WFD citations relevant to HMWB and AWB designation, a list of references used in the production of the Guidance, a list of contact details of the Working Group members and a list of case studies produced in the context of the HMWB Working Group.

2 IMPLEMENTING THE DIRECTIVE: SETTING THE SCENE

This Section introduces you to the overall context for the implementation of the Water Framework Directive and informs you of the initiatives that led to the production of this Guidance Document.

2.1 DECEMBER 2000: A MILESTONE FOR WATER POLICY

2.1.1 A long negotiation process

December 22, 2000, will remain a milestone in the history of water policies in Europe: on that date, the Water Framework Directive (or the Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy) was published in the Official Journal of the European Communities and thereby entered into force!

This Directive is the result of a process of more than five years of discussions and negotiations between a wide range of experts, stakeholders and policy makers. This process has stressed the widespread agreement on key principles of modern water management that today form the foundation of the Water Framework Directive.

2.2 THE WATER FRAMEWORK DIRECTIVE: NEW CHALLENGES IN EU WATER POLICY

2.2.1 What is the purpose of the Directive?

The Directive establishes a framework for the protection of all waters (including inland surface waters, transitional waters, coastal waters and groundwater) which:

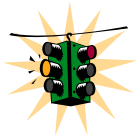
- Prevents further deterioration of, protects and enhances the status of water resources;
- Promotes sustainable water use based on long-term protection of water resources;
- Aims at enhancing protection and improvement of the aquatic environment through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances;
- Ensures the progressive reduction of pollution of groundwater and prevents its further pollution; and
- Contributes to mitigating the effects of floods and droughts.

2.2.2 …and what is the key objective?

Overall, the Directive aims at achieving *good water status* for all waters by 2015.

2.2.3 What are the key actions that Member States need to take?

- To identify the individual river basins lying within their national territory, assign them to individual River Basin Districts (RBDs) and identify competent authorities by 2003 [Art. 3, Art. 24];
- To characterise river basin districts in terms of pressures, impacts and economics of water uses, including a register of protected areas lying within the river basin district, by 2004 [Art. 5, Art. 6, Annex II, Annex III];
- To carry out, together with the European Commission, the intercalibration of the ecological status classification systems by 2006 [Art. 2(22), Annex V];
- To make operational the monitoring networks by 2006 [Art. 8];
- Based on sound monitoring and the analysis of the characteristics of the river basin, to identify by 2009 a programme of measures for achieving the environmental objectives of the Water Framework Directive cost-effectively [Art. 11, Annex III];
- To produce and publish River Basin Management Plans (RBMPs) for each RBD, including the designation of heavily modified water bodies, by 2009 [Art. 13, Art. 4(3)];
- To implement water pricing policies that enhance the sustainability of water resources by 2010 [Art. 9];
- To make the measures of the programme operational by 2012 [Art. 11];
- To implement the programmes of measures and achieve the environmental objectives by 2015 [Art. 4].



Look out!

Member States may not always reach good water status for all water bodies of a river basin district by 2015, for reasons of technical feasibility, disproportionate costs or natural conditions. Under such conditions that will be specifically explained in the RBMPs, the Water Framework Directive offers the possibility to Member States to engage into two further six- year cycles of planning and implementation of measures.

2.2.4 Changing the management process – information, consultation and participation

Article 14 of the Directive specifies that Member States shall encourage the active involvement of all interested parties in the implementation of the Directive and development of river basin management plans. Also, Member States will inform and consult the public, including users, in particular about:

- The timetable and work programme for the production of river basin management plans and the role of consultation at the latest by 2006;
- The overview of the significant water management issues in the river basin at the latest by 2007;
- The draft river basin management plan, at the latest by 2008.

2.2.5 Integration: a key concept underlying the Water Framework Directive

The central concept to the Water Framework Directive is the concept of *integration* that is seen as the key to the management of water protection within the river basin district:

Integration of environmental objectives, combining qualitative and quantitative ecological objectives for protecting highly valuable aquatic ecosystems and ensuring a general good status of other waters;

Integration of all water resources, combining fresh surface water and groundwater bodies, wetlands, coastal water resources **at the river basin scale**;

Integration of all water uses, functions and values into a common policy framework, i.e. considering water for the environment, water for health and human consumption, water for economic sectors, transport, leisure, as well as water as a social good;

Integration of disciplines, analyses and expertise, combining hydrology, hydraulics, ecology, chemistry, soil sciences, technology engineering and economics to assess current pressures and impacts on water resources and identify measures for achieving the environmental objectives of the Directive in the most cost-effective manner;

Integration of water legislation into a common and coherent framework. The requirements of some old water legislation (e.g. the Fishwater Directive) have been reformulated in the Water Framework Directive to match modern ecological thinking. After a transitional period, these old Directives will be repealed. Other pieces of legislation (e.g. the Nitrates Directive and the Urban Wastewater Treatment Directive) must be co-ordinated in river basin management plans where they form the basis of the programmes of measures;

Integration of all significant management and ecological aspects relevant to sustainable river basin planning including those which are beyond the scope of the Water Framework Directive such as flood protection and prevention;

Integration of a wide range of measures, including pricing and economic and financial instruments, in a common management approach for achieving the environmental objectives of the Directive. Programmes of measures are defined in River Basin Management Plans developed for each river basin district;

Integration of stakeholders and the civil society in decision making, by promoting transparency and information to the public, and by offering a unique opportunity for involving stakeholders in the development of river basin management plans;

Integration of different decision-making levels that influence water resources and water status, be they local, regional or national, for an effective management of all waters;

Integration of water management from different Member States, for river basins shared by several countries, existing and/or future Member States of the European Union.

2.3 WHAT HAS BEEN DONE TO SUPPORT IMPLEMENTATION?

Activities to support the implementation of the Water Framework Directive are under way in both Member States and in countries candidate for accession to the European Union. Examples of activities include consultation of the public, development of national Guidance, pilot activities for testing specific elements of the Directive or the overall planning process, discussions on the institutional framework or launching of research programmes dedicated to the Water Framework Directive.

2.3.1 May 2001 – Sweden: Member States, Norway and the European Commission agreed on a Common Implementation Strategy

The main objective of this strategy is to provide support to the implementation of the Water Framework Directive by developing coherent and common understanding and guidance on key elements of this Directive. Key principles in this common strategy include sharing information and experiences, developing common methodologies and approaches, involving experts from candidate countries and involving stakeholders from the water community.

In the context of this common implementation strategy, a series of working groups and joint activities have been launched for the development and testing of non-legally binding Guidance. A strategic co-ordination group oversees these working groups and reports directly to the water directors of the European Union and Commission who take on the role of overall decision body for the Common Implementation Strategy.

2.3.2 The HMWB Working Group

In accordance with Article 4(3), the Water Framework Directive (WFD) allows Member States to designate surface water bodies, which have been physically altered by human activity, as "heavily modified" under specific circumstances. If the specified uses of such water bodies (i.e. navigation, hydropower, water supply or flood defence) or the "wider environment" would be significantly affected by the restoration measures required to achieve good ecological status and if no other better, technically feasible and cost-effective, environmental options exist, then these water bodies may be designated as "heavily modified" and good ecological potential is the environmental objective.

As part of the EU WFD Common Implementation Strategy (CIS), a working group was established to develop Guidance on the process of HMWB and AWB designation. The CIS Working Group 2.2 on "Heavily Modified Water Bodies" (HMWB) is jointly managed by the United Kingdom and Germany and involves the participation of 12 Member States (MS),[1] Norway, some Accession Countries[2] as well as a number of Stakeholders.[3] A number of distinct "sub projects" were progressed by the Working Group:

- Production of 12 "Guidance papers" by the joint chair of the HMWB WG that were discussed at several Working Group meetings;
- thirty-four case study projects, carried out in the MS and Norway, that tested the "Guidance papers";
- a synthesis of the case study reports;
- production of this HMWB & AWB Guidance Document;
- production of a policy summary; and
- production of a toolbox supporting the Guidance Document.

Based on the main uses within the case studies, two "case study subgroups" were established, one concentrating mainly on "navigation", the other one on "hydropower" (see Annex V). The Working Group members and/or contractors responsible for these case studies exchanged their experiences during their work in extra subgroup meetings and in email discussions.

2.3.3 Production of 12 Guidance papers

The joint chair of the HMWB WG produced 12 Guidance papers covering the key aspects of the HMWB & AWB identification and designation process. Four meetings were organised involving the Working Group members and the European Commission to discuss and agree on these Guidance papers and to exchange experiences. The meetings were held on 12th April, 10th October 2000, 4th September 2001 and 18-19th June 2002 in Brussels. The Guidance papers were to help the production of the case studies which tested these papers. The Guidance papers served as the basis for this Guidance Document.

2.3.4 Case Study Project

In thirty-four case studies from different Member States and Norway a draft provisional identification and designation process for heavily modified water bodies was tested, supported by reference to the Guidance papers produced by the joint chair

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1 Austria, Belgium, Denmark, Spain, France, Germany, Greece, Netherlands, Portugal, Sweden, Finland and UK.

2 Hungary, Poland and Slovenia. The other seven Accession Countries are also members of the group but have so far not attended a working group meeting or the workshop.

3 EEB, EUREAU, Eurelectric and WWF.

of the HMWB WG. In these case studies, ecological reference conditions (maximum ecological potential) and objectives (good ecological potential) for HMWB were also defined, as far as possible. The case studies focused on the main specified uses (navigation, flood/coastal protection, hydropower generation, agriculture, forestry, urbanisation, recreation and water supply) that result in physical alterations across the MS. The case studies covered mainly rivers, only a few case studies were carried out on coastal waters (1), estuaries (2) and lakes (3). The case study projects started in October 2000 and were finalised in June 2002. For a list of case studies see Annex V.

2.3.5 European Synthesis Project

The synthesis project performed an analysis of the case studies and a synthesis of approaches taken in the individual case studies, identifying commonality and differences in approach. The analysis started in February 2002 and a first draft was distributed by the end of April 2002 (Hansen *et al.* 2002). A second draft will be produced as soon as possible and the final document will be published. The first draft of the synthesis project formed the basis for the production of this Guidance Document and the toolbox, providing examples of different designation approaches.

2.3.6 Production of the Guidance Document

Based on the draft synthesis report and on the twelve Working Group papers prepared by the Joint Chair (UK and D) and discussed during the first three meetings of this WG, a first draft Guidance on the designation of heavily modified and artificial water bodies was produced on 27th May 2002.[4] A workshop was held on the 30-31st May 2002 for Working Group members, case-study managers, and the other CIS WG members to discuss a number of outstanding issues of the draft Guidance Document. The discussions during the workshop served as a basis for the revision of the draft Guidance Document. A second draft[5] was then discussed at the last WG meeting in June 2002. A third draft[6] was produced and circulated to the WG for comments in August 2002. A final version of the Guidance[7] was produced and submitted to the Strategic Co-ordination Group meeting on 30th September 2002. It was then revised and presented to the Strategic Co-ordination Group meeting on 7-8th November 2002. This final version was agreed at the Water Directors meeting on 21st-22nd November 2002.

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4 Guidance Document on identification and designation of Heavily Modified Water Bodies, First draft, CIS Working Group 2.2 on Heavily Modified Water Bodies, 27 May 2002.

5 Guidance Document on identification and designation of [Artificial and] Heavily Modified Water Bodies, Second draft, CIS Working Group 2.2 on Heavily Modified Water Bodies, 15 June 2002. Directly after the WG meeting in June, a Second Draft dated 20 June was sent to the WG, including a different version of Section 6.

6 Guidance Document on identification and designation of Artificial and Heavily Modified Water Bodies, Third draft, CIS Working Group 2.2 on Heavily Modified Water Bodies, 2 August 2002.

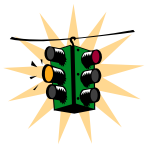
7 Guidance Document on identification and designation of Artificial and Heavily Modified Water Bodies, Final draft, CIS Working Group 2.2 on Heavily Modified Water Bodies, 13 September 2002.

2.3.7 Production of the Policy Summary

The policy summary is an executive summary of the HMWB and AWB Guidance Document, addressed to the Water Directors. The document summarises the main issues of the HMWB and AWB designation process and is derived directly from the Guidance Document. It was presented and agreed at the Water Directors meeting together with the Guidance Document in November 2002.

2.3.8 Production of the Toolbox

To support the Guidance Document with practical examples illustrating the different steps of the HMWB and AWB designation process, a toolbox has been produced, extracting examples from the case studies. Working Group members have been asked to provide additional examples that help illustrate certain steps of the Guidance Document. A first draft was produced for the WG meeting in June 2002. A second draft was sent out for comments in October 2002 and a final toolbox has been issued in January 2003. The applicability of the toolbox will depend on the examples and will differ between the Member States. The toolbox does not constitute part of the Guidance Document and has hence not been subject to the agreement of the HMWB Working Group.



Look out! You can contact the experts involved in the HMWB activities.

The list of members of the Working Group with full contact details can be found in Annex 8.5. If you need more information on specific issues and input into your own activities, contact a member of the Working Group in your country. If you need more information on specific case studies, you can also directly contact the people in charge of carrying out these studies (contacts can be found in Table 5, Annex 8.6). You can find the case study reports on the following webpage:
http://www.sepa.org.uk/hmwbworkinggroup.

2.4 INTRODUCTION - A GUIDANCE DOCUMENT: WHAT FOR?

This document aims at guiding experts and stakeholders in the implementation of the Directive 2000/60/EC establishing a framework for Community action in the field of water policy (the Water Framework Directive – "the Directive"). It focuses on the identification and designation of artificial and heavily modified water bodies in the broader context of the development of integrated river basin management plans as required by the Directive.

The purpose of this Guidance is to introduce the requirements of the WFD with respect to HMWB and AWB identification and designation and to serve as a practical implementation guide for those who will be actively involved in the implementation of the WFD including the designation of HMWB and AWB. As the WFD does not always define or describe the terms and approaches to be used, and because some parts are

ambiguous, this Guidance aims to develop a common understanding and interpretation of the WFD for the HMWB and AWB designation process and may, in part, describe pragmatic operational approaches to meet the WFD requirements.

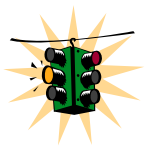
2.4.1 To whom is this Guidance Document addressed?

The Guidance Document is addressed to:

- administrative bodies responsible for implementing the WFD;
- administrative bodies influenced by the implementation of the WFD;
- planning engineers and other technical experts;
- interested public; and
- other stakeholders affected by the implementation of the WFD, especially with regards to the designation of HMWB (NGOs, water supply companies, hydropower, shipping, industry).

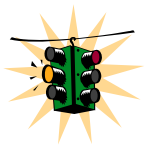
2.4.2 What can you find in this Guidance Document?

1. An introduction to the role of HMWB and AWB designation in the Water Framework Directive:
    - What are the key regulations of the Water Framework Directive concerning the identification and designation of HMWB and AWB? (see Annex III). What are the reference conditions and environmental objectives for these water bodies?
    - Links to other CIS working groups (see Section 3.2).
2. Practical Guidance on the stepwise approach of identifying and designating HMWB and AWB and setting reference conditions and environmental quality objectives:
    - Overall step-by-step approach of the HMWB and AWB identification and designation process (see Section 4).
    - Guidance on how to implement the different steps:
        - Provisional identification of HMWB (see Section 5);
        - Designation of HMWB and AWB (see Section 6);
        - Identification of reference conditions (MEP) and environmental quality objectives (GEP) for HMWB and AWB (see Section 7).
3. Cross-cutting issues and outlook (see Section 8).



Look out! The approaches and methodology in this Guidance Document must be adapted to regional and national circumstances.

The Guidance Document proposes an overall step-by-step approach. Because of the diversity of circumstances within the European Union, specific application may vary between the different water bodies across Europe. This proposed approach will therefore need to be tailored to specific circumstances.



Look out! What you will <u>not</u> find in this Guidance Document

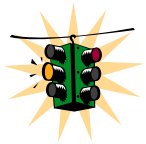
This Guidance Document is concerned with the designation of HMWB and AWB resulting from existing physical modifications. Implications from planned, new modifications [Art. 4(7)] are not considered in this document; the Guidance focuses on the first river basin management planning cycle (2008/9). The Guidance does not cover physically modified or artificial water bodies that Member States do not choose to designate. The Guidance is only concerned with water bodies where hydromorphological changes are a direct or indirect consequence of physical alterations which serve a specified use or the wider environmental interests.

3 HMWB AND AWB IN THE WATER FRAMEWORK DIRECTIVE

3.1 IMPORTANCE OF AWB AND HMWB IN THE IMPLEMENTATION OF THE WFD

For surface waters the overall goal of the Water Framework Directive (WFD) is for Member States to achieve "good ecological and chemical status" in all bodies of surface water by 2015. Some water bodies may not achieve this objective for different reasons. Under certain conditions the WFD permits Member States to identify and designate artificial water bodies (AWB) and heavily modified water bodies (HMWB) according to Article 4(3) WFD. The assignment of less stringent objectives to water bodies and an extension of the timing for achieving the objectives is possible under other particular circumstances. These derogations are laid out in Articles 4(4) and 4(5) of the WFD.

HMWB are bodies of water which, as a result of physical alterations by human activity, are substantially changed in character and cannot, therefore, meet "good ecological status" (GES). AWB are water bodies created by human activity. Instead of "good ecological status", the environmental objective for HMWB and for AWB is good ecological potential (GEP), which has to be achieved by 2015.



Look out! Purpose of Article 4(3) and its links to Article 4(4) and 4(5)

Article 4(3) is intended to be applied to major infrastructure projects associated with the listed specified uses. Such water bodies must be substantially changed in character because of hydromorphological alterations. Under these circumstances the tests specified in Article 4(3) may allow other objectives (GEP) for these waters because GES cannot be achieved

Article 4(5) deals with derogations for all waters including those concerned with hydromorphological alterations. Less stringent objectives can be set under specific circumstances. Article 4(4) allows for an extension of the deadline to achieve the environmental objective under certain conditions.

Where it is not possible to designate a water body subject to hydromorphological changes as HMWB then Article 4(4) or 4(5) derogations may apply. If a water body is designated as HMWB or AWB then Article 4(5) and/or 4(4) may be applied if GEP cannot be achieved.

The designation of HMWB and AWB is optional; Member States do not have to designate modified water bodies as HMWB or AWB.[8] The designation will not be an opportunity to avoid achieving ecological and chemical objectives, since GEP is an ecological objective which may often, in itself, be challenging to achieve.

The designation may, in some instances, help to protect wider environmental interests; e.g. when the removal of a modification would lead to the destruction of valuable environmental features. [9]

3.1.1 What is a Heavily Modified Water?

The concept of HMWB was introduced into the WFD in recognition that many water bodies in Europe have been subject to major physical alterations so as to allow for a range of water uses. Article 4(3)(a) lists the following types of activities which were considered likely to result in a water body being designated as a HMWB:

- navigation, including port facilities, or recreation;
- activities for the purposes of which water is stored, such as drinking-water supply, power generation or irrigation;
- water regulation, flood protection, land drainage;
- other equally important sustainable human development activities.

These specified uses tend to require considerable hydromorphological changes to water bodies of such a scale that restoration to "good ecological status" (GES) may not be achievable even in the long-term without preventing the continuation of the specified use. The concept of HMWB was created to allow for the continuation of these specified uses which provide valuable social and economic benefits but at the same time allow mitigation measures to improve water quality.

The designation tests can be applied when a:

- specified use results in a modification of a water body and restoration affects the specified use;
- non specified use results in the modification of a water body but restoration affects a specified use;
- non-specified or specified use results in the modification of a water body but restoration affects the wider environment.

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8 Where modified or artificial waters are not designated the objective will be good ecological status.

9 The removal of a weir or dam may, for example, impact significant ecological (e.g. biodiversity) or historical (old mill) features. By designating the water body as heavily modified, the weir or dam probably will not have to be removed.

Article 2(9)

"Heavily modified water body means a body of surface water which as a result of physical alterations by human activity is substantially changed in character as designated by the Member State in accordance with the provisions of Annex II".

According to Article 2(9), there are three components to the definition of HMWB. To be a HMWB a water body must be:

- physically altered by human activity;
- substantially changed in character;
- designated under Annex II (Art. 4(3))[10].

The definition of HMWB provided in Article 2(9) emphasises that HMWB are considered to be water bodies that have been subject to physical alteration as a result of human activity. Article 4(3)(a) indicates that the relevant physical alterations result in hydromorphological changes that would have to be restored to achieve good ecological status. Consequently, this Guidance considers that hydromorphological changes result from physical alterations to the water body.

It is important to emphasise that changes in hydromorphology must be not only significant, but also result in a substantial change in the character of a water body, as typically found when a river is extensively modified for navigation, a lake modified for water storage or a transitional water when subject to major modifications for coastal defence. Such water bodies can be seen to be obviously modified and the modifications are neither temporary nor intermittent.

Considering the specified uses given under Article 4(3)(a) it is concluded that a "substantial" change in hydromorphology is one that is:

- extensive/widespread or profound; or
- very obvious in the sense of a major deviation from the hydromorphological characteristics that would have been there before the alterations.

It is clear that a water body could be described as substantially changed in character if both its morphology and hydrology were subject to substantial changes. It is less clear that a water body should be considered as substantially changed in character if only its morphology or its hydrology is substantially changed.

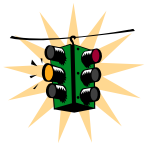
If the morphology of a water body is substantially changed in character, then the changes are likely to be long-term. Such changes in morphology are very likely to result in changes in hydrology, though these changes in hydrology may not necessarily

[10] The reference to Annex II is an error in the text. The early version of the WFD included the designation test in Annex II. The reference was not updated when the European Parliament Amendment moved the designation to Article 4(3).

be substantial. A common sense approach would suggest that such water bodies should be considered as substantially changed in character.

The situation is more difficult for water bodies subject to substantial changes in hydrology as such changes may only be temporary or short term. The water body may look substantially changed on one occasion but it may look like a normal water body on another occasion. In cases of temporary or intermittent substantial hydrological changes the water body is not to be considered substantially changed in character. Nevertheless, it may be that in some limited circumstances substantial hydrological alterations may result in long-term or permanent changes with additional substantial changes in morphology. In such specific cases, the application of the HMWB designation tests may be justified. Justification for the decision of a HMWB and AWB designation should always be provided.

Notwithstanding the agreed general approach described in the paragraph above, it was agreed that a slightly different approach could be taken for limited stretches of rivers, e.g. downstream of dams. Under these circumstances, substantial hydrological changes that are accompanied by subsequent non-substantial morphological changes would be sufficient to consider the water body for a provisional identification as HMWB.



Look out! A HMWB is substantially changed in character as a result of physical alterations

In the context of HMWB designation physical alterations mean any significant alterations that have resulted in substantial changes to the hydromorphology of a water body such that the water body is substantially changed in character. In general these hydromorphological characteristics are long-term and alter morphological and hydrological characteristics.

3.1.2 What is an artificial water body ?

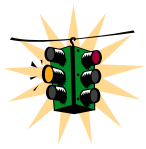
The WFD takes a very similar approach to AWB and HMWB. AWB must have been created by the same specified uses listed in Article 4(3)(a).

Article 2(8)

"Artificial water body means a body of surface water created by human activity".

A key question in order to differentiate between AWB and HMWB is the meaning of the word "created" as used in Article 2(8). More specifically, the question is whether "created" refers to creating a new water body from previously dry land (e.g. a canal), or whether it could also denote a water body that has changed in category (e.g. river into a lake as a consequence of damming, or coastal water into a freshwater lake due to reclaiming).

This Guidance interprets an AWB "as a surface water body which has been created in a location where no water body existed before and which has not been created by the direct physical alteration or movement or realignment of an existing water body". Note, this does not mean that there was only dry land present before. There may have been minor ponds, tributaries or ditches which were not regarded as discrete and significant elements of surface water. Where an existing water body is modified and moved to a new location (i.e. where previously there was dry land) it should still be regarded as a HMWB and not an AWB. The same applies to water bodies that have changed category as a result of physical modifications; such water bodies (e.g. a reservoir created by damming a river) are to be regarded as HMWB and not as AWB.



Look out! An AWB is created by human activity

An artificial water body is a surface water body which has been created in a location where no water body existed before and which has not been created by the direct physical alteration, movement or realignment of an existing water body.

3.1.3 Environmental objectives and designation of HMWB and AWB

Where a water body is substantially changed in character as a result of physical alterations by human activity, the WFD allows Member States to designate it as a HMWB. If a water body has been created by human activity then it may be designated as AWB. In order to designate a water body, it must undergo tests defined within Article 4(3). These tests require consideration of whether the restoration measures required to achieve "Good Ecological Status" (GES) have a significant adverse effect on the activity (use) and whether there are other means of undertaking the activity.

Once designated as HMWB or AWB, the environmental objectives are "good ecological potential" (GEP) and good chemical status, which also have to be achieved by 2015.

GEP is a less stringent objective than GES because it makes allowances for the ecological impacts resulting from those physical alterations that (i) are necessary to support a specified use or (ii) must be maintained to avoid adverse effects on the wider environment. This means that appropriate objectives can be set for the management of other pressures, including physical pressures, not associated with the specified use, while ensuring that the adverse ecological effects of the physical alteration can be appropriately mitigated without undermining the benefits they serve.

The objective setting process for HMWB and AWB should be in line with the same general principles as applied for natural water bodies.

The environmental objectives for natural, artificial and heavily modified water bodies are set in relation to reference conditions. For HMWB and AWB the reference

condition is the maximum ecological potential (MEP).[11] The MEP is the state where the biological status reflects, as far as possible, that of the closest comparable surface water body taking into account the modified characteristics of the water body. With regards to its biological status the GEP accommodates "slight changes" from the MEP.

The designation of HMWB and AWB, the definition of the MEP, the identification of GEP as well as the programme of measures to achieve the relevant environmental objectives will be part of the River Basin Management Plans that are to be published by 2008 as first consultation drafts and 2009 as final plans. These have to be revised every six years.

3.2 LINKS TO OTHER WORKING GROUPS OF THE COMMON IMPLEMENTATION STRATEGY

It is important to read the HMWB & AWB Guidance in the context of the Guidance produced by the other CIS working groups. This Section describes the most important links between the HMWB and other working groups within the Common Implementation Strategy (CIS) and identifies those areas where a common understanding has been developed.

3.2.1 Pressures and Impacts Working Group 2.1 (IMPRESS)

The provisional identification of heavily modified water bodies is carried out in the characterisation process as specified in Article 5 and Annex II. The WG 2.1 IMPRESS provides the guidance on the description of pressures and impacts and the identification of water bodies which are at risk of failing their environmental objectives ("risk assessment") (WFD CIS Guidance Document No. 3).

It has been agreed that the HMWB Working Group would develop Guidance on that aspect of the characterisation process which is related to physical alterations of water bodies and their possible identification as HMWB. The HMWB & AWB Guidance together with the information provided by the HMWB case studies would then be used by IMPRESS to develop an integrated approach to the entire characterisation process. Within the overall risk assessment of IMPRESS, the HMWB WG will provide guidance on the identification and description of specified uses and related physical alterations (pressures) as well as their impacts on hydromorphology and biology.

Further integration of processes developed by the HMWB and IMPRESS working groups may be required. This should be done in co-operation with WG 2.9 on "best practice in river basin planning".

[11] For natural water bodies the reference condition is the "high ecological status" (HES).

3.2.2 Freshwater reference condition Working Group 2.3 (REFCOND) & Coastal waters typology, reference and classification Working Group 2.4 (COAST)

The "status" and "potential" WFD objectives and classifications are based on similar principles. Reference conditions are identified and then similar normative definitions (Annex V) are used to define the deviation from reference for each classification category. It is clearly important to ensure that this deviation is of a similar scale for HMWB and AWB as it is for "natural" waters (WFD CIS Guidance Document No. 10 – REFCOND and WFD CIS Guidance Document No. 5 – COAST).

3.2.3 Intercalibration Working Group 2.5

The Intercalibration Working Group will ensure that the interpretation of the WFD's normative definitions of high, good and moderate (Annex V) result in comparable deviation from reference conditions (WFD CIS Guidance Document No. 6). In particular, the WG 2.5 should ensure that the sensitivity boundaries between the high/good and good/moderate borders are comparable across Europe. The reference conditions for HMWB and AWB are determined by the nearest natural equivalent to the modified water body. This means that reference conditions for HMWB and AWB will be variable depending on the degree and type of modification. Discussions between the HMWB and Intercalibration working groups have led to an agreement that in most cases intercalibration of ecological potential boundaries is not required. Nevertheless an intercalibration exercise for HMWB and AWB could be useful, if those water bodies are the dominating water types.

3.2.4 Economic Analysis Working Group 2.6 (WATECO)

Another part of the Article 5 characterisation process is the economic analysis of water use. This forms the basis of the Article 9 on recovery of costs for water services and the consideration of the Article 4(3) tests for HMWB designation and Article 4(4), (5) and (7) derogations. The HMWB and WATECO working groups have worked together to ensure that the Guidance on the HMWB & AWB designation tests is based on a common understanding which ensures consistent applications of economic terms across the WFD requirements (WFD CIS Guidance Document No. 1).

3.2.5 Monitoring Working Group 2.7

The monitoring regime forms the basis for the definition of status according to the WFD. The Guidance produced by the Monitoring Working Group will therefore assist Member States in understanding the monitoring requirements for the identification of potential HMWB (WFD CIS Guidance Document No. 7). In the first planning cycle, WFD-compliant monitoring/classification tools will not be available, so Guidance on best practice is needed to ensure that existing data/methods are used to the best effect. The monitoring group could also help to identify the appropriate monitoring approach for heavily modified and artificial waters. The HMWB & AWB Guidance will provide recommendations for the use of the most sensitive biological elements concerning physical alterations.

3.2.6 River Basin Management Best Practice Working Group 2.9

The HMWB and AWB designation process is only one aspect of the RBMP and must be fully integrated with the key components of the Plan, for example: setting environmental objectives and identification of the most cost effective combination of measures. The HMWB & AWB Guidance provides a timetable based on the Directive's requirements. However, substantial changes to this timetable will be necessary in order to ensure that the sequence of tasks required by the RBMP can be delivered (WFD CIS Guidance Document No.s 8 and 11). This revised timetable is provided within the Best Practice Guidance.

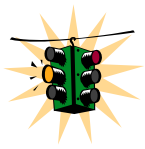
3.2.7 Geographical Information System Working Group 3.0 (GIS)

The links to the GIS Working Group are relatively straightforward and relate to the requirements to map the distribution of provisional identified HMWB and AWB (by 2004) and designated water bodies (in 2008/9) (WFD CIS Guidance Document No. 9). It may also be helpful to map the distribution of the relevant pressures which result in the designation of HMWB & AWB.

4 STEPWISE APPROACH FOR DESIGNATION OF HMWB AND AWB

A very large number of water bodies will have to be assessed for possible designation as AWB or HMWB between now and 2008/2009 (publication of the first draft/final RBMP) (for timing and RBMP see Sections 8.2, 8.3, and Annex II). It will be important therefore to ensure that the approaches and methods used for the designation process are practicable and comparable in all Member States. Moreover, it is important to develop appropriate options so that the complexity of the assessment methodology can be made proportionate to the circumstances. In the first planning cycle, there are serious practical difficulties in designating the HMWB, in defining MEP and GEP and in performing an assessment of the likelihood of not achieving the relevant environmental quality objectives in 2004 as required by Article 5 (and Annex II). The IMPRESS and HMWB working groups have therefore recommended, that for the provisional identification in 2004, the assessment for HMWB will be carried out against GES. This helps to overcome the practical difficulties of defining the MEP & GEP for HMWB at this early stage. For the assessments it might, under certain circumstances, be possible and advisable to group water bodies and assess them together.

Figure 1 illustrates the proposed overall stepwise approach to the identification and designation of HMWB and AWB as identified by HMWB-WG 2.2. In this Section, the steps of the general approach are summarised (steps 1 – 11), while the following Sections 5 - 7 describe the steps in more detail, including some proposed methods and explanations. It should be noted that step 1 and 3-5 are broader than the HMWB and AWB process. Step 1 is applicable to all water bodies and involves the application of the WFD CIS Guidance Document No. 2 on water body identification. Steps 3-5 are part of the broader Annex II (1.4 & 1.5) assessment of pressures and impacts, which is described in the IMPRESS Guidance (WFD CIS Guidance Document No. 3). **No additional work beyond that required under IMPRESS is required as part of these steps.**



Look out! Processes should be integrated to ensure consistency and avoid duplication in effort

The HMWB and AWB designation process described in this Guidance, when put into operational guidance by MS, should be integrated with other Guidance (e.g. CIS Guidance Document No. 3 - IMPRESS) to ensure consistency in approach and avoid duplication in effort.

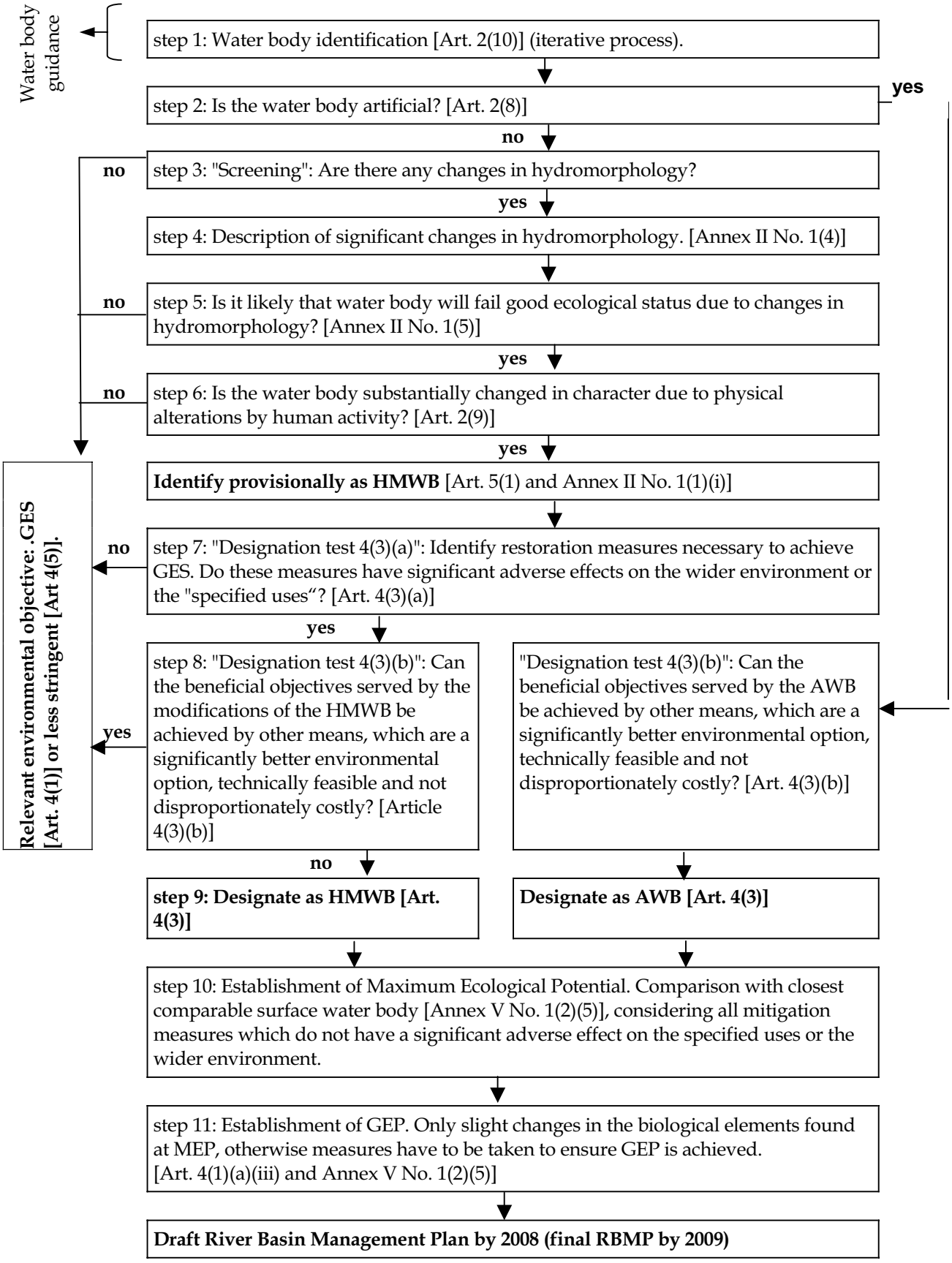


Figure 1: Steps of the HMWB & AWB identification and designation process

- **Step 1:** Distinct water bodies are to be identified and described according to the WFD CIS Guidance Document No. 2 on water body identification. Water body identification is an iterative procedure with possible adaptations in later stages of the designation process (mainly after step 6, the provisional identification of HMWB). The water body identification has to be done for all surface waters (natural, heavily modified and artificial waters), and is significant, because water bodies are the units for which status is being assessed, objectives established and achievement of objectives of the WFD checked.

- **Step 2:** The WFD gives distinct definitions for AWB and HMWB [Art. 2(8) and Art. 2(9) respectively]. In this second step it should be identified whether the water body concerned has been "created by human activity". If this is the case, Member States will have the option to identify it as AWB and consider it for designation or, in some circumstances, identify it as a natural water body. Where the intention is to designate as AWB, the first designation test (step 7) is not relevant and AWB should continue directly with the second designation test (step 8).

- **Step 3:** A screening process is proposed to reduce effort and time in identifying water bodies which should not be considered for the HMWB designation tests. This will include those water bodies that are likely to fail to achieve GES but which show no hydromorphological changes. This step is part of the Annex II (1.4) assessment of pressures.

- **Step 4:** For those water bodies which have not been "screened out" in step 3, significant changes in hydromorphology and resulting impacts should be further investigated and described. This includes the description of hydromorphological changes and the assessment of resulting impacts. This step is part of the Annex II (1.4 & 1.5) assessment of pressures and impacts.

- **Step 5:** Based on the information gathered in step 4 and an assessment of the ecological status of the water body, the likelihood of failing to achieve good ecological status (or an estimate of what GES may be, based on current knowledge) should be assessed. Within this step it has to be assessed whether the reasons for failing the GES are hydromorphological changes and not other pressures such as toxic substances or other quality problems. This step is part of the Annex II (1.5) assessment of impacts process to be completed by 22 December 2004.

The Guidance Document of IMPRESS[12] will give more explicit guidance for steps 3-5; in particular, guidance on the "risk assessment". The Monitoring Working Group will deal with the monitoring requirements for water bodies "at risk" as well as for all other water bodies.

- **Step 6:** The purpose of this step is to select those water bodies where the changes in hydromorphology result in the water body being substantially changed in character. Such water bodies can be provisionally identified as HMWB. The remaining water bodies likely to fail GES, which are not substantially changed in character, will be identified as natural water bodies. Environmental objectives for such water bodies will be GES or other less stringent environmental objectives.

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12 WFD CIS Guidance Document No. 3 - IMPRESS.

It is only necessary to collect sufficient information during steps 1, 3, 4 & 5 to demonstrate that pressures and impacts result in a failure to achieve good status (as described by the WFD CIS Guidance Document No 3. - IMPRESS) and in step 6 (first step of the HMWB process) that the water body is substantially changed in character. These requirements can be satisfied in a simple descriptive manner in clear cut cases. For example, if a water body has irreversibly and definitely changed category, then it is easy to demonstrate that pressures and impacts prevent the achievement of GES (of the original water body category) and that it is substantially changed in character.

- **Steps 7-8-9**: Where Member States wish to designate a water body as heavily modified they must then consider them for the designation tests specified under Article 4(3)(a) & Article 4(3)(b). Artificial water bodies are only considered for the test under Article 4(3)(b). In the first "designation test" (**step 7**) necessary hydromorphological changes ("restoration measures") to achieve "good ecological status" should be identified. In the first test it has to be assessed whether these "measures" have significant adverse effects on either the "specified uses" or the "wider environment". If they do, then the second designation test (**step 8**) is to be carried out.

  The second designation test consists of several sub-tests. Firstly, "other means" to achieve the beneficial objective (e.g. replacement of surface water for drinking water supply with groundwater) are to be considered. Then, it has to be assessed whether the "other means" are a) technically feasible, b) a better environmental option and c) not disproportionately costly. If any of the sub-tests a), b) or c) are negative, the water bodies may be designated as heavily modified (**step 9**). If either the mitigation measures have no significant adverse effects (see step 7) or if "other means" can be found that fulfil the criteria a), b) or c) (see step 8), the water body must not be designated as heavily modified and the relevant environmental objective would be GES or a less stringent objective.

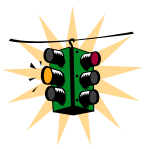
- **Steps 10-11:** These steps are not part of the designation process. However, they are relevant to AWB and HMWB only and are therefore covered in this Guidance Document. They concern the definition of reference conditions and the setting of the environmental quality objectives for heavily modified and artificial water bodies. In **step 10** the reference condition for HMWB and AWB, the Maximum Ecological Potential (MEP), is defined. Based on the MEP, the environmental quality objective, the Good Ecological Potential (GEP), is defined (**step 11**).

The information gathered in the different steps (1-11) summarised above will contribute to the RBMP. The RBMP will contain programmes of measures [Art. 11] that are required to ensure the achievement of the environmental objectives for natural, heavily modified and artificial water bodies.

In following the flow chart, it is clearly important to avoid unnecessary and superfluous administrative actions. For example, it will not always be necessary to undertake the assessment for each individual water body. Indeed in many situations it may be more effective to apply the tests to a group of water bodies where the environmental concerns and specified uses are similar. For example, for a river modified for navigation it may not be helpful to apply the process to individual water

bodies. A larger scale assessment may produce a more effective and more complete assessment.

Similarly, for a major estuarine flood protection scheme, it may be more effectively assessed at the multi-water body level than by considering each individual water body.



Look out! Information on the measures and related costs and on timing and future RBMP cycles is given in Section 7!

Throughout the entire process different measures are considered in different steps. Related to these different measures there are differing cost considerations applicable; a summary is given in Section 8.1. Timing as well as changes in the future RBMP cycles are important when dealing with HMWB and AWB; these issues are covered in Sections 8.2 and 8.3.

5 STEPS LEADING TO THE PROVISIONAL IDENTIFICATION OF HMWB

5.1 INTRODUCTION

This Section considers steps 1 to 6 which lead to the provisional identification of HMWB in more detail.

These steps are part of the characterisation of River Basin District requirements as defined in Annex II of the WFD. Consequently the steps are closely linked to the work of the IMPRESS Working Group. A summary of the process is illustrated in Figure 2.

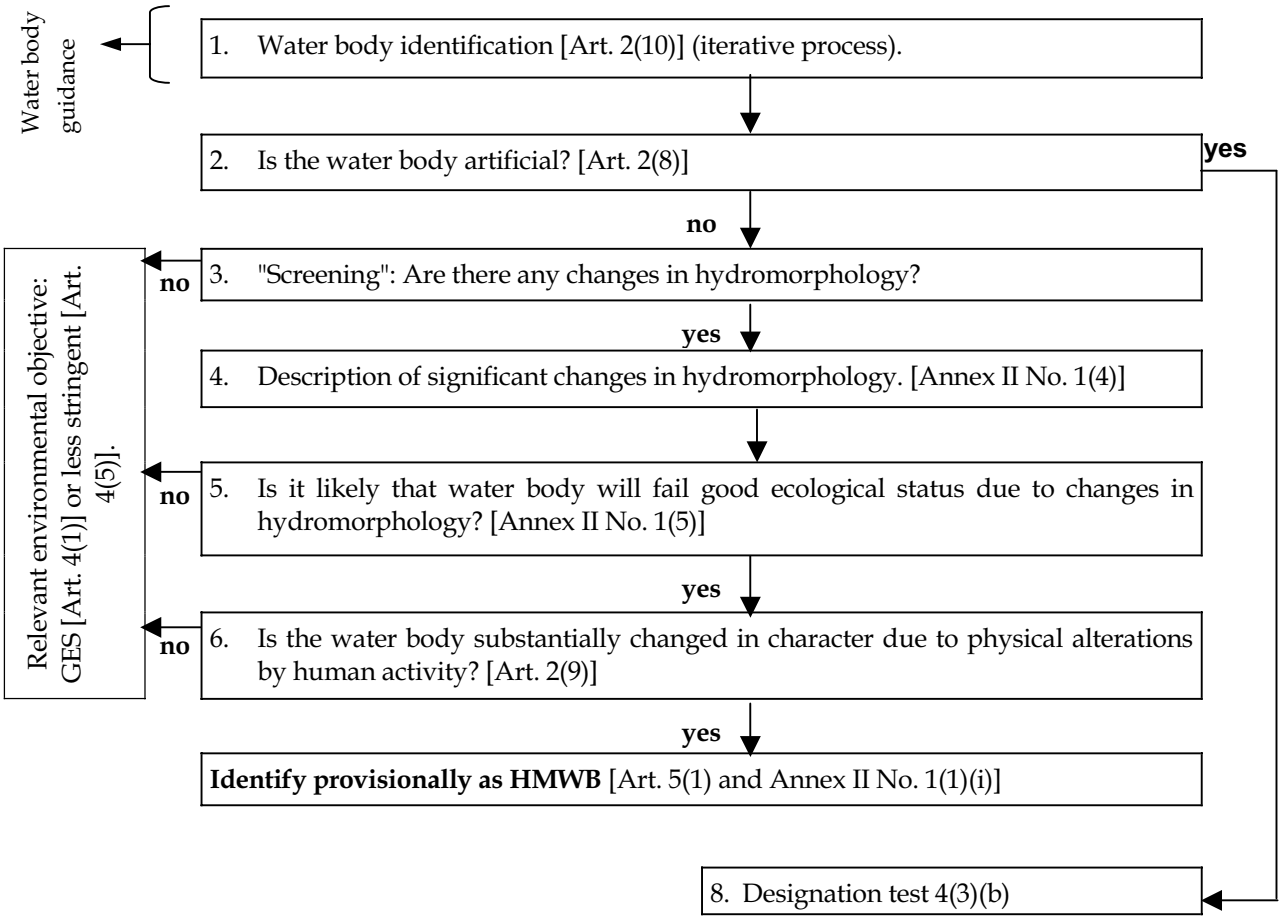
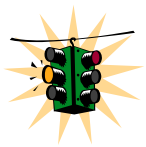


Figure 2: Steps leading to the provisional identification of HMWB

5.2 WATER BODY IDENTIFICATION (Step 1)

Water bodies have to be identified for all surface waters (natural, heavily modified and artificial waters). This step is of major importance for the implementation process, because water bodies represent the units that will be used for reporting and assessing compliance with the Directive's principal environmental objectives. Overall

recommendations on how to identify distinct water bodies are given in the WFD CIS Guidance Document No. 2 on water body identification. This Guidance Document on HMWB and AWB discusses issues specifically relevant to water body identification for "physically altered" waters, as far as these are not included in the WFD CIS Guidance Document No. 2 (Examples in the toolbox).



Look out! Possibility to group water bodies for assessment

In some cases it will be possible to group water bodies for the identification and / or designation of HMWB and AWB. This could help to reduce the overall work load. The WFD CIS Guidance Document No. 2 on water bodies will indicate under which circumstances water bodies can be grouped for the assessments.

5.3 IS THE WATER BODY ARTIFICIAL (Step 2)?

The WFD gives distinct definitions for AWB and HMWB [Art. 2(8) and Art. 2(9) respectively] (see Section 3.1). In this second step it should be identified whether the water body concerned is an AWB, i.e. has been "created by human activity".

An artificial water body is defined, in this Guidance, as a surface water body which has been created in a location where no significant surface water existed before and which has not been created by the direct physical alteration of an existing water body or movement or realignment of an existing water body. Note, this does not mean that there was only dry land present before. There may have been minor ponds, tributaries or ditches, which were not regarded as a discrete and significant element of surface water and therefore not identified as a water body.

If the above characterisation of a water body is fulfilled, Member States will have the option to identify them as AWB and consider them for designation or, in some circumstances, identify them as natural water bodies. If a Member State considers that GES can be achieved in an AWB, then the Member State may wish to consider the AWB as a natural water body. This would allow GES to be defined for the water body rather than GEP (Examples in the toolbox).

5.3.1 Examples

AWB: Examples of AWB include canals constructed for navigation, drainage channels for irrigation, man-made ponds and dug ponds, harbours and docks, constructed dredging pools, gravel pits, surface mining lakes, storage reservoir for peak demand hydropower production or waters that are directed to the reservoir via diversions, and water bodies created by ancient human activities.

Not AWB: A water body that has changed category as a result of physical modifications is not an AWB, it is considered to be a HMWB (e.g. creation of a reservoir due to the damming of a river). AWB are not water bodies that have been

moved or realigned, for example, a realigned river going through a newly developed channel on previously dry land. Such realignments involve the modification of an existing water body and consequently the new channels may be regarded as a HMWB.

Where the intention is to designate as AWB, the first designation test (step 7) is not relevant and the AWB should continue directly with the second designation test (step 8).

5.4 SCREENING (Step 3)

A screening process (step 3) is proposed to reduce effort and time in identifying water bodies which should not be considered for the HMWB designation tests. This will include those water bodies that are likely to fail to achieve GES but which show no hydromorphological changes (Examples in the toolbox).

5.5 SIGNIFICANT CHANGES IN HYDROMORPHOLOGY (Step 4)

For those water bodies which have not been "screened out" in step 3, significant anthropogenic pressures and the resulting impacts should be further investigated and described [Annex II No. 1.4]. This step 4 is part of the characterisation of surface waters as required in Art. 5(1) by December 2004.

5.5.1 This characterisation involves the identification and description of:

1. the main "specified uses" of the water body;
2. significant anthropogenic pressures [Annex II No. 1.4]; and
3. significant impacts of these pressures on hydromorphology [Annex II No. 1.5].

5.5.2 1. Identification and description of **the main "specified uses" of the water body:**

- navigation, including port facilities, or recreation;
- activities for the purposes of which water is stored, such as drinking-water supply, power generation or irrigation;
- water regulation, flood protection, land drainage; or
- other equally important sustainable development activities.

5.5.3 2. Identification and description of **significant anthropogenic pressures** [Annex II No. 1.4]:

Specified uses of water bodies generally result in pressures that might impact the status of the water body. In the context of HMWB and AWB identification and designation process, changes to hydromorphology resulting from "physical alterations" are relevant [Art. 2(9)].

Physical alterations include alterations in the morphology and hydrology of the water regime (compare glossary and step 6). For example, the most common physical alterations include dams and weirs, which disrupt the river continuum and cause alterations of the hydrologic and hydraulic regime. Physical alterations should usually serve a specified use, such as straightening for the purpose of navigation. However, physical alterations which do not serve a particular specified use any longer, should also be identified and described in the characterisation (e.g. weirs used to maintain water levels for mills which are no longer in use).

For the characterisation it is important to find out which pressures are of "significance", because only significant pressures (or physical alterations) are to be considered. Member States may use qualitative or quantitative approaches to describe the degree and level of significance of the physical alterations (Examples in the toolbox).

5.5.4 3. Identification and description of **significant impacts on hydromorphology** [Annex II No. 1.5]:

The significant impacts on hydromorphology should be further investigated. Both qualitative and quantitative appraisal techniques can be used for assessing impacts on hydromorphology resulting from physical alterations (Examples in the toolbox). The elements examined should include the elements required by the WFD [Annex V No. 1.1: river continuity, hydrological regime, morphological conditions, tidal regime], as far as data are available.

Special attention should be given to cumulative effects of hydromorphological changes. Small-scale hydromorphological changes may not cause extensive hydromorphological impacts on their own, but may have a significant impact when acting together. To assess the significant impacts on hydromorphology, an appropriate scale should be chosen (see also Guidance of the WG 2.1[13]). The following issues in scaling should be considered in assessing impacts and in the identification and designation of HMWB and AWB:

- Scaling due to impact assessment changes according to the pressure and impact characteristics, i.e. some pressures have lower thresholds for wide-scale impacts than others;

- Scaling may change according to the water body type and ecosystem susceptibility. Spatial and temporal scale (resolution of impact assessment) should be more precise in such water body types and specific ecosystems which are considered susceptible to the pressure.

[13] WFD CIS Guidance Document No, 3 "Analysis of Pressures and Impacts in the Water Framework Directive - Common Understanding", produced by the CIS WG 2.1.

5.6 LIKELIHOOD OF FAILING GOOD ECOLOGICAL STATUS (Step 5)

Based on the information gathered in step 4 and an assessment of the ecological status, the likelihood of failing to achieve good ecological status (or an estimate of what GES may be, based on current knowledge) should be assessed [Annex II No. 1.5]. This should consider whether the risk of failing GES is due to hydromorphological changes and not other pressures such as toxic substances or other quality problems. Step 5 is part of the "risk assessment"[14] process to be completed by 22 December 2004.

In order to assess the likelihood of failing to achieve GES, the ecological impacts of physical alterations on the water bodies in question should be estimated (Example in the toolbox). The effort expended in the assessments should be proportionate (i.e. a tiered assessment approach should be used). For water bodies which are likely not to achieve GES (e. g. water bodies which have changed category due to physical alterations), effort expended estimating GES should be limited and conclusions of non-achievement of GES should be rapidly reached. In these cases more effort can be expended in assessing GEP early and the risk of not achieving it could be investigated. Likewise, through risk screening, a conclusion on excluding those water bodies which are clearly going to reach GES from the HMWB or AWB identification and designation process should be reached early and with minimal effort.

5.6.1 Data requirements

For the implementation of the WFD a large amount of data is needed. The quality elements for water bodies are listed in Annex II No. 1 and include hydromorphological, chemical as well as biological data. The quality elements differ according to the water categories. For the HMWB identification and designation process data are not only necessary in step 5, but also in the different designation tests (steps 7 and 8), the establishment of MEP (step 10) and of GEP (step 11).

The assessment of the ecological status, necessary for the "risk assessment", can be based directly on biology. Alternatively indicative data (hydromorphological and physicochemical elements) can be used in situations where only these data are available (Example in Section 2.6 of the toolbox on provisional identification of regulated lakes in Finland is of relevance). According to the WFD, the biological status of a surface water is to be assessed using the appropriate elements in the different water categories [Annex V No. 1.1]. It is suggested that the preliminary assessment of the ecological status, to be completed by 2004, should be based on the most sensitive quality elements with respect to the existing physical alterations. It must be noted, however, that this procedure concentrates on the effects of physical alterations on some sensitive elements of the aquatic ecosystem.

To detect the reason for the possible failure of the environmental objective (i.e. the good status or potential) of a water body, indicative parameters differ according to the causes. The HMWB & AWB Guidance is particularly concerned with indicative data to

[14] The "risk assessment" is undertaken as part of the Article 5 characterisation process and identifies the likelihood of water bodies to fail the environmental quality objectives set under Article 4.

detect hydromorphological changes. Effects resulting from other impacts (e.g. toxic effects on macroinvertebrates, eutrophication concerning macrophytes) should be differentiated as far as possible. Some suggestions on the suitability of biological elements as indicators for physical alterations are made below:

- Benthic invertebrate fauna and fish are the most relevant groups for the assessment of hydropower generation impacts in freshwater systems;
- Long distance migrating fish species can serve as a criteria for the assessment of disruption in river continuity;
- Macrophytes are good indicators of changes in flow downstream of reservoirs as well as for the assessment of regulated lakes because they are sensitive to water level fluctuation;
- For linear physical alterations such as coastal defence work, benthic invertebrates and macroalgae might be the most appropriate indicators.

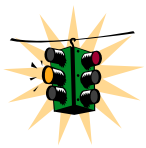
Defining the extent of ecological damage in the manner required by the WFD will not be possible until common ecological monitoring is in place by 2006. Since step 5 of the HMWB identification and designation process should be completed by 2004 (in time for the initial characterisation as in Art. 5), assessments may be estimates based on existing biological monitoring data and ecological classification systems.

Wetlands

Wetland ecosystems are ecologically and functionally parts of the water environment, with potentially an important role to play in helping to achieve sustainable river basin management. The Water Framework Directive does not set environmental objectives for wetlands. However, wetlands that are dependent on groundwater bodies, form part of a surface water body, or are Protected Areas, will benefit from WFD obligations to protect and restore the status of water. Relevant definitions are developed in the WFD CIS Guidance Document No. 2 on water bodies and further considered in the Guidance on wetlands (currently under preparation).

Pressures on wetlands (for example physical modification or pollution) can result in impacts on the ecological status of water bodies. Measures to manage such pressures may therefore need to be considered as part of the river basin management plans, where they are necessary to meet the environmental objectives of the Directive.

Wetland creation and enhancement can in appropriate circumstances offer sustainable, cost-effective and socially acceptable mechanisms for helping to achieve the environmental objectives of the Directive. In particular, wetlands can help to abate pollution impacts, contribute to mitigating the effects of droughts and floods, help to achieve sustainable coastal management and to promote groundwater recharge. The relevance of wetlands within the programmes of measures is examined further in a separate horizontal Guidance paper on wetlands (currently under preparation).



Look out! Links to other CIS working groups

Guidance on how to define reference conditions for assessing the ecological status of surface water bodies is being developed by the CIS WGs 2.3 (REFCOND) in WFD CIS Guidance Document No. 10 and WG 2.4 in WFD CIS Guidance Document No. 5 (COAST). The WFD CIS Guidance Document No. 3 of WG 2.1 IMPRESS will give more explicit Guidance for carrying out the "characterisation" and the "risk assessment". The Monitoring Working Group WG 2.7 (WFD CIS Guidance Document No. 7) will set the monitoring requirements for water bodies "at risk" as well as for all other water bodies.

5.7 IS THE WATER BODY SUBSTANTIALLY CHANGED IN CHARACTER DUE TO PHYSICAL ALTERATIONS BY HUMAN ACTIVITY (step 6)? PROVISIONAL IDENTIFICATION OF HMWB

If it is likely that the water body will fail to achieve good ecological status due to hydromorphological changes then a range of options exist for objective setting. In some cases, restoration measures can be taken before 2015, which will allow the water body to reach GES. In other circumstances, an extension of the deadline by the application of the Article 4(4) derogation will allow the water body to achieve GES later.[15] Clearly, less stringent environmental objectives can also be set if an Article 4(5) derogation is appropriate. These approaches will be required in those circumstances where a water body is subject to significant changes in hydromorphology but is not substantially changed in character.

If a water body is to be provisionally identified as heavily modified (Examples in the toolbox) the following criteria apply:

1. The failure to achieve good status results from **physical alterations** to the hydromorphological characteristics of a water body. It must not be due to other impacts, such as physico-chemical impacts (pollution);

2. The water body must be **substantially changed in character**. This is the case when there is a major change in the appearance of the water body. It is clearly a partly subjective decision as to whether a water body is (a) only significantly changed in character (e.g. water abstraction without morphological alterations) or (b) substantially changed in character when provisional identification as HMWB may be appropriate (e.g. long-term hydromorphological changes caused by a weir). Both may be likely not to achieve GES. However, the following considerations should be borne in mind:

    - When visiting a water body that is substantially changed in character, it should be very obvious that the water body is substantially changed from its natural condition;

[15] According to Article 4(4) the maximum extension of the deadline is 2027.

- The change in character must be extensive/widespread or profound. Typically this should involve substantial change to both the hydrology and morphology of the water body;
- The change in character must be permanent and not temporary or intermittent;
- Many alterations to the hydrological characteristics of water bodies, such as abstractions and discharges, are not associated with morphological changes, and may therefore often be easily reversible, temporary or short-term. Consequently, such alterations would not constitute substantial changes in the character of water bodies and hence the application of HMWB designation would not be considered;
- The modification must be consistent with the scale of change that results from the activities listed in Article 4(3)(a): a canalised river, a harbour, a river constrained for flood protection or a dammed river or lake.

3. The substantial change in character must be the result of the **specified uses**. It must have been created by uses listed in Article 4(3) or uses which represent equally important sustainable human development activities (either singly or in combination).

In Table 1, an overview of the main specified uses and the connected physical alterations and impacts on hydromorphology as well as on biology is given. A more extensive list of physical alterations and impacts on hydromorphology and biology can be found in the HMWB synthesis report (Hansen *et al*., 2002).

Table 1: Overview of the main specified uses, physical alterations and impacts

Specified Uses	**Navigation**	**Flood protection**	**Hydro-power generation**	**Agriculture/ Forestry/ Fish farms**	**Water supply**	**Recreation**	**Urbanisation[16]**
Physical Alterations (pressures)							
Dams & weirs	X	X	X	X	X	X	
Channel maintenance/dredging/ removal of material	X	X	X	X		X	
Shipping channels	X						
Channelisation/straightening	X	X	X	X	X		X
Bank reinforcement/fixation/ embankments	X	X	X		X		X
Land drainage				X			X
Land claim				X			X

[16] Urbanisation is not mentioned in Article 4(3)(a), but has been identified as an important use in the HMWB case studies. Therefore it presumes that it is an important sustainable human development activity.

Specified Uses	**Naviga-tion**	**Flood protection**	**Hydro-power generation**	**Agriculture/ Forestry/ Fish farms**	**Water supply**	**Recreation**	**Urbani-sation[16]**
Creation of back waters through embankments	X					X	X
Impacts on hydromorphology and biology							
Disruption in river continuum & sediment transport	X	X	X	X	X	X	
Change in river profile	X	X	X	X			X
Detachment of ox-bow lakes/wetlands	X	X	X	X	X		X
Restriction/Loss of flood plains		X	X				X
Low/reduced flows			X	X	X		
Direct mechanical damage to fauna/flora	X		X			X	
Artificial discharge regime		X	X	X	X		
Change in groundwater level			X	X			X
Soil erosion/silting	X		X	X			X

If a water body is not designated and it becomes apparent later on that it probably is heavily modified, provisional identification as HMWB and application of the designation tests is still possible after 2004. Similarly if a water body is provisionally identified as HMWB, Member States do not have to complete designation. They can at any time consider it as a non-heavily modified water body and set appropriate objectives under Article 4(1)(a)(ii), 4(4) or 4(5).

5.7.1 Scope, scale and extent of provisional identification

Within the provisional HMWB identification, the scale, scope and extent of water body identification should be considered. It may be necessary to adapt the boundaries of the initially identified water bodies (step 1) according to the substantial changes in hydromorphology. More specifically, where the hydromorphogical changes do not coincide with the boundaries of a surface water body, it may be appropriate to subdivide the water body in order to separate heavily modified stretches from the unaffected areas of the water body.

The following three examples may be helpful for the decision on whether to subdivide water bodies or not under different circumstances (Figure 3 - Figure 5):

- In Figure 3, two physically altered areas cover a major percentage of the absolute length/area of the original water body (8 km out of 10 km). The water body is, to a large extent, impacted by the same pressure and it would therefore be suggested **not to split** the original water body, but to apply provisional HMWB identification to the whole water body;
- In Figure 4, the original water body is modified by a physically altered area (6 km) covering a major percentage of the entire length/area of the original water body. In

this case it would be recommended **to split** the original water body into two distinct water bodies (1a & 1b). Water body 1b, impacted by the physical alteration, would be provisionally identified as heavily modified. The water body 1a would be regarded as a natural water body;

- In Figure 5, a series of small physically altered areas each covering < 1 km are present at a small stretch of the entire water body length. Here the question occurs, whether those < 1 km stretches should be identified as distinct water bodies and be provisionally identified as HMWB, or whether the overall impact is low and therefore the whole water body should be regarded as a natural water body. It is suggested **not to split** the water body and regard the entire water body as natural.

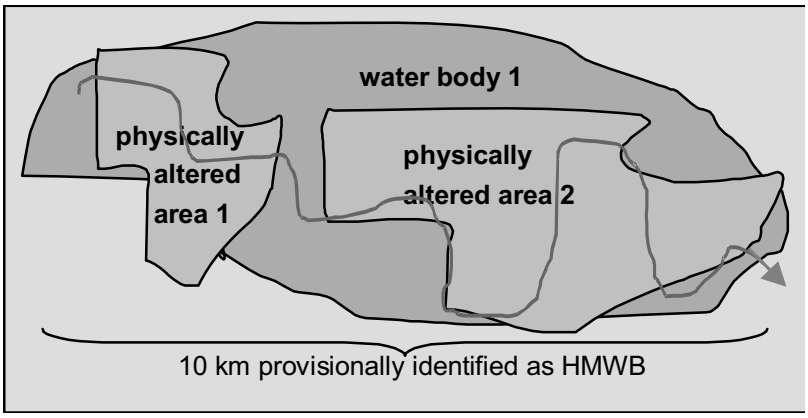


Figure 3: Example 1, no subdivision of the water body

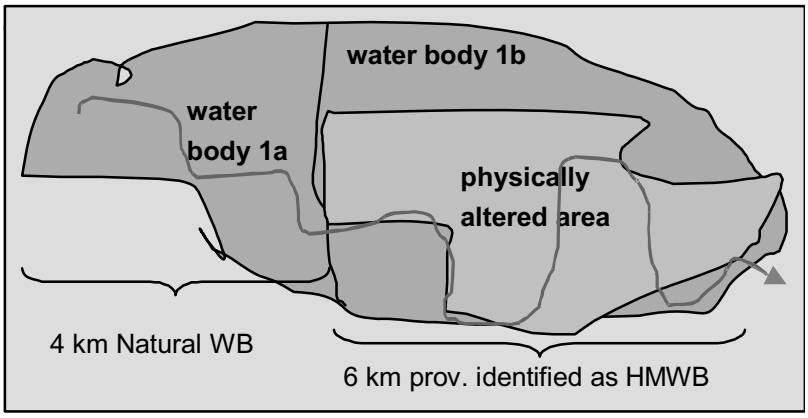


Figure 4: Example 2, subdivision of the water body

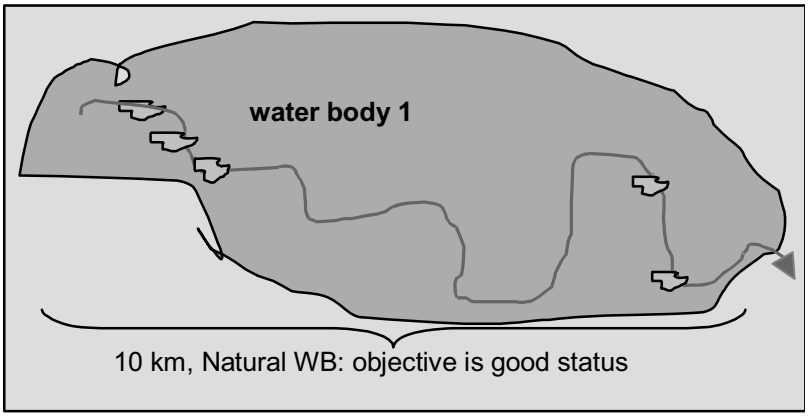


Figure 5: Example 3, no division of water body

Note: The provisional identification of HMWB refers to river stretches and not to the catchments or sub-catchments. In the three figures above the catchments are marked because it is difficult to only mark river stretches; the latter would be more appropriate.

Another important issue is that only water bodies which are substantially changed in character (due to physical alterations) themselves, may be provisionally identified as HMWB. If a physical alteration (e.g. dam) impacts the biological quality elements in the upstream part of a river system (for example fish migration is hindered), this upstream part may not be considered for provisional HMWB identification. If the GES cannot be achieved in this water body upstream of a physical alteration, the environmental objective may be less stringent.

6 TESTS LEADING TO THE DESIGNATION OF HMWB (Steps 7 - 9)

6.1 TIMING FOR DESIGNATION TESTS

Water bodies that have been provisionally identified as heavily modified (cf. Section 5) may be considered for designation.[17] The designation process must be completed in time for the consultation of the draft RBMP in 2008 and final publication of the RBMP in 2009. The designation process should be undertaken as soon as possible after the provisional identification. In addition it will be important to co-ordinate the designation process with the other requirements of the RBM planning process. In particular, the links to the following requirements should be considered:

- The designation process helps to identify which "restoration measures" or "other means" may be required to meet the environmental quality objective. Additionally, "mitigation measures" will be identified in the reference condition and objective setting process (cf. Section 7). These "mitigation measures" must be identified in time to allow for the assessment of the most cost effective programmes of measures for the draft RBMP in 2008 and for ensuring that the programmes of measures are operational by 2012 [Art. 11(7)];

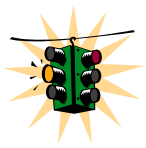
- It may be efficient to undertake the designation process at the same time as the setting of less-stringent environmental objectives [Art. 4(5)] for both natural and HMWB which include similar tests (e.g. consideration of disproportionate costs).

6.2 DESIGNATION IS OPTIONAL AND ITERATIVE

It is stressed that Member States **may** designate a water body as artificial or heavily modified.

Provisionally identified HMWB do not, therefore, necessarily have to be considered for the designation tests, in this Section 6. Member States may decide not to proceed with the designation process at any stage, and may decide to consider the water body as natural, having to achieve GES. This decision may be influenced by additional information that may have become available since the identification process was performed.

[17] Also other water bodies that have not been provisionally identified as HMWB may additionally be considered if evidence shows that they are at risk to fail the GES due to physical alterations (see Section 6.2).



Look out! Designation is optional!

The designation of HMWB and AWB is optional. Member States can choose not to designate a water body as a AWB or HMWB. The designation tests can be stopped at any point in the process. In this case the water body would be treated as a natural water body and the environmental quality objective would be GES.

For several reasons, water bodies designated as heavily modified in the first cycle may be regarded as natural water bodies in future cycles and vice-versa (Section 8). Designation is hence an iterative process. It should also be pointed out that new data or information may reveal water bodies, which have not been provisionally identified (in steps 1-6), as heavily modified, that should be considered for the designation tests. In future RBMP cycles, the designation of HMWB must be reviewed (cf. Section 8).

6.3 THE DESIGNATION TESTS

A water body may be designated as heavily modified if it has passed through the designation procedure involving both designation tests as specified under Article 4(3)(a) & (b) (steps 7 and 8). In some cases both tests do not have to be carried out entirely, see Figure 6.

For AWB only the designation test 4(3)(b) applies (see Section 6.8).

The designation tests are designed to ensure that HMWB are only designated where there are no reasonable opportunities for achieving good status within a water body. They are therefore water body specific. However, where the designation tests are applied at a regional or national scale it may be appropriate to apply the test to groups of water bodies, to reduce the overall work load involved in the designation tests. For example, if the main stem of a river was being considered for designation as a series of HMWB because it is used for navigation, it should be possible to consider the tests for groups of water bodies within the affected stretch. If water bodies are grouped, there must be no differences in the characteristics of the water bodies or the specified uses which could affect the outcome of the designation tests. Justification for grouping water bodies should be provided.

A step-wise approach for the identification and designation of HMWB and AWB which includes the designation tests is presented in Section 4. Figure 6 is based on Figure 1 but identifies more detail on the "Designation test 4(3)(a)" (step 7) and "Designation test 4(3)(b)" (step 8), which consist of several sub-steps.

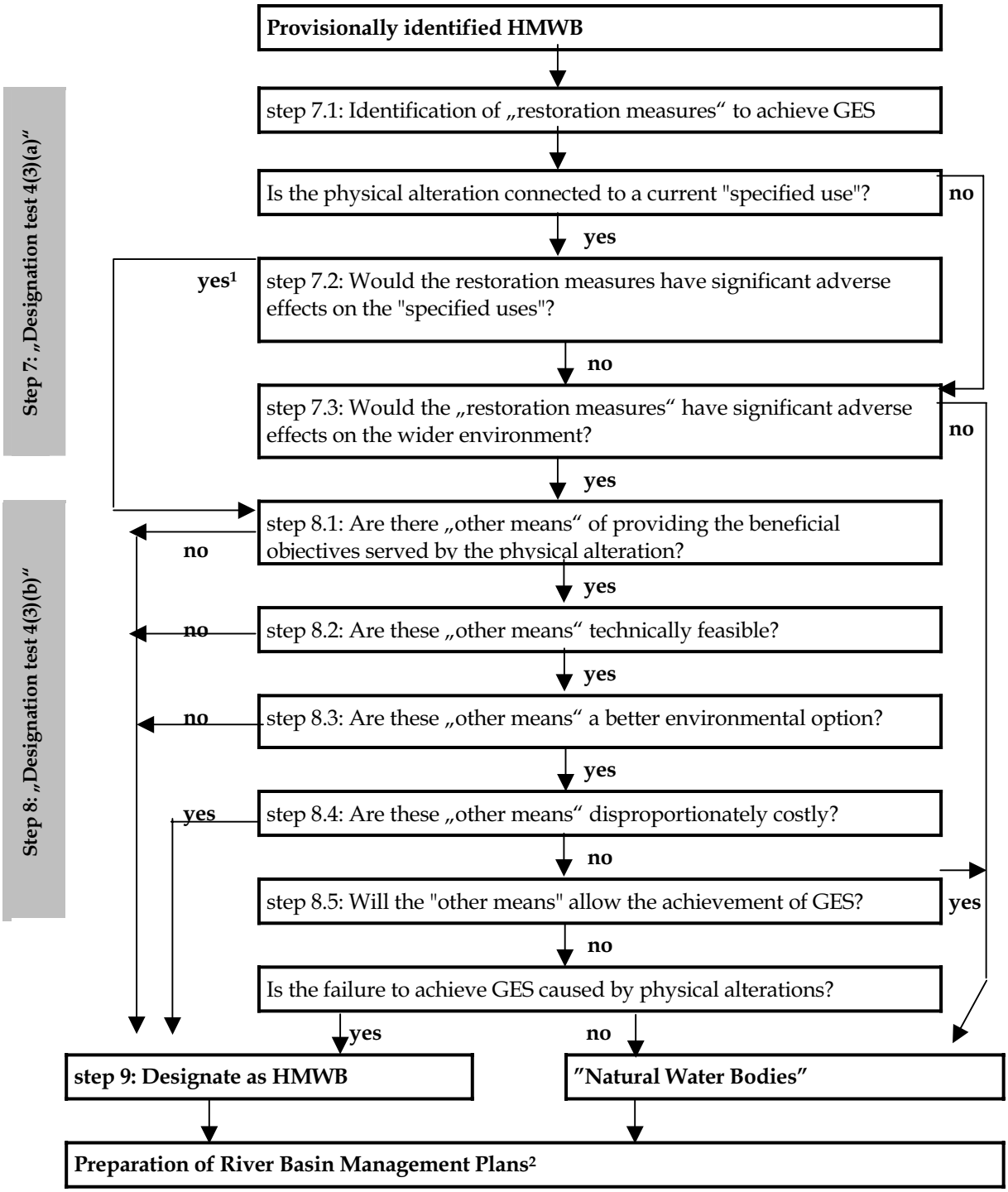


Figure 6: Steps leading to the designation of HMWB (steps 7-9)

Note 1: Step 7.2: If the restoration measures would have significant adverse effects on the "specified uses" you could directly proceed to the "Designation test 4(3)(b)", step 8.1. But for a better justification for designation you may also want to apply step 7.3.

Note 2: Preparation of River Basin Management Plans including: identifying objectives, identifying programmes of measures (POM), cost effectiveness analysis, derogation for an extended timetable and less stringent objective, consideration of Article 4(8), to ensure no deterioration of other water bodies.

6.4 DESIGNATION TEST 4(3)(a) (Step 7)

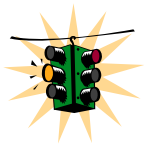
The designation test 4(3)(a) has three components, and is divided into sub-steps 7.1-7.3, accordingly (see Figure 6):

- First, the "restoration measures" for achieving GES are to be identified (step 7.1, see Section 6.4.1);
- Then, the adverse effects of these restoration measures on the specified uses have to be assessed (step 7.2, see Section 6.4.2); if the adverse effects on the specified uses **are significant**, you may go directly to step 8 (see Section 6.5), but you could also proceed to step 7.3 (see Note 1 to Figure 6). If they are **not significant** you proceed with:
- step 7.3 and assess whether the application of restoration measures would have significant adverse effects on the wider environment (see Section 5.4.3).

6.4.1 Identification of "restoration measures" to achieve GES (Step 7.1)

The first sub-step 7.1 of the designation test 4(3)(a) is to identify the hydromorphological changes which could lead to the achievement of GES. This process is complicated by the fact that water bodies will frequently be impacted by different pressures. Consequently, it will be necessary (but not always possible) to separate:

- measures to change hydromorphology;
- measures to improve the physico-chemical status; and
- direct measures to improve the biological status (such as manipulation of fish population or planting macrophytes).[18]



Look out! Hydromorphological conditions!

The Guidance Document for HMWB and AWB is dealing with hydromorphological conditions that result from physical alterations and with "restoration measures" which improve these hydromorphological conditions. The non-hydromorphological measures will not be considered in this Guidance Document but will be part of the programmes of measures (POM) to be set up for the RBMP.

The hydromorphological changes for achieving GES (hereafter called restoration measures) may range from measures aimed at reducing the environmental impact of

[18] All measures (including hydromorphological and physico-chemical improvements) ultimately aim to improve the biological status.

the physical alteration (e.g. increased compensation flows or fish passages) to measures resulting in the complete removal of the physical alteration. Measures can be directly related to the physical alteration (e.g. changing the physical alteration) or enhance the general ecological conditions (e.g. creation of habitats). In this sub-step the contribution that an individual measure could make towards achieving GES needs to be predicted. It should also be assessed whether an overall package of proposed restoration measures could lead to GES (Examples in the toolbox).

The measures should be well-defined (e.g. exact percentage of compensation flow) and should include an assessment of whether GES status will be delivered (full or partial delivery) (Example in the toolbox). Combinations of "partial" measures may allow GES to be achieved. The identification of suitable measures can be difficult, because information on the cause-effect relationship of measures is often not sufficient.

The costs of restoration measures are not considered here (see substep 7.2 and Section 8.1).

A list of examples for restoration measures for different specified uses ("navigation" and "hydropower") is given in the toolbox. This list can be used as an initial check list.

6.4.2 Significant adverse effects on specified uses (Step 7.2)

The second sub-step 7.2 of the designation test 4(3)(a) requires an assessment of whether the necessary "restoration measures" to achieve GES will have significant adverse effects on the specified uses (e.g. on navigation, on hydropower, on recreation, or on other specified uses).

It should be emphasised that the application of the test should consider the full range of possible restoration measures. For example, in a river, which has been modified for navigation that has artificial vertical embankments, it may be possible to create more natural banks which may allow GES to be achieved without causing significant adverse effects upon the use.

This sub-step 7.2 can only be applied to water bodies that have a current specified use-related physical alteration. If the physical alteration to the water body is due to a historic specified use which no longer exists, then you may directly proceed to step 7.3 (see Figure 6 and Section 6.4.7). Clearly, the specified uses of a water body may also change over time. For example, an abandoned drinking water supply reservoir may develop an important new specified use as a recreational resource (e.g. sailing). Then, the possible adverse effects on this changed specified use should be assessed in this sub-step 7.2.

6.4.3 What effects are to be considered?

Adverse effects on the specified uses are losses of/in important services (e.g. flood protection, recreation or navigation) or production losses (e.g. hydropower or agricultural goods) (Examples in the toolbox). In assessing "significant adverse effects" on the specified uses, economic effects will play an important role, but also social

aspects may need to be considered (e.g. removal of flood defences may lead to displacement of population).

6.4.4 What aspects are not relevant in this sub-step?

In assessing whether the restoration measures have "significant adverse effects" on the specified use not all aspects are relevant. For example, when considering an estuary used for navigation, the focus of the test should be on the effect of restoration measures upon the movement of ships. The ability of the user to pay is not relevant at this stage as this would potentially discriminate against efficient and profitable enterprises. Similarly, at this stage disproportionate costs cannot be used as an additional consideration beyond the assessment of significant adverse effects on the specified use (see Section 8.1).

6.4.5 What is significant?

It is not considered possible to derive a standard definition for "significant" adverse effect. “Significance” will vary between sectors and will be influenced by the socio-economic priorities of Member States.

It is possible to give an indication of the difference between “significant adverse effect” and “adverse effect”. A significant adverse effect on the specified use should not be small or unnoticeable but should make a notable difference to the use. For example, an effect should not normally be considered significant, where the effect on the specified use is smaller than the normal short-term variability in performance (e.g. output per kilowatt hour, level of flood protection, quantity of drinking water provided). However, the effect would clearly be significant if it compromised the long-term viability of the specified use by significantly reducing its performance. It is important to undertake this assessment at the appropriate scale. Effects can be determined at the level of a water body, a group of water bodies, a region, a RBD or at national scale. The appropriate scale will vary according to the situation and the type of specified use or sector. It will depend on the key spatial characteristics of the adverse effects. In some cases it may be appropriate to consider effects at more than one scale in order to ensure the most appropriate assessment. The starting point will usually be the assessment of local effects (Examples in the toolbox).

If the adverse effects are considered to be significant, the water body should be considered for the designation test 4(3)(b) (cf. Section 6.5). If there was no significant adverse effect on specified uses, the measures have to be checked as to whether they would have significant adverse effects on the wider environment (see Section 6.4.7, step 7.3).

6.4.6 If there is no specified use

Although the use for which the physical alteration was intended might not be there any more, in almost all cases the modified characteristics of the water body serve a specified use of some form (e.g. a dam originally built for water supply might alternatively be used for recreation).

In the rare cases where no uses whatsoever are served by the modified characteristics of the water body any more, step 7.2 of the designation test 4(3)(a) does not apply, since no specified uses exist upon which a restoration measure could have a significant adverse effect.

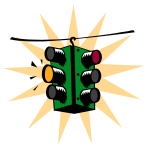
Proceeding to step 7.3, the possibility of the significant adverse effects of restoration measures on the wider environment needs to be assessed. If the restoration measures have a significant adverse effect on the environment, then the water body normally should be considered for the "designation test 4(3)(b)". However, without a specified use, "other means" for delivering the beneficial objectives of the specified use cannot be defined. Consequently, under these circumstances, if the wider environment is significantly affected by the restoration measures, the steps 8.2-8.5 are of no relevance and the water body can directly be designated as a HMWB.

6.4.7 Significant adverse effect on the wider environment (step 7.3)

The intent of this sub-step 7.3 of the designation test 4(3)(a) is to ensure that restoration measures required to achieve GES do not deliver environmental improvements for the water body whilst creating environmental problems elsewhere (Example in the toolbox).

6.4.8 What is the wider environment?

Article 4(3)(a) refers to the wider environment. Consequently a restricted definition of environment would not be appropriate and the environment is considered to include the natural environment and the human environment including archaeology, heritage, landscape and geomorphology.



Look out!

In general, a significant adverse effect on the wider environment would exist, if the damage to the wider environment caused by restoration measures exceeds the benefits for the improved water status itself (such as significantly increased $C0_2$ emissions or the generation and disposal of large quantities of demolition waste).

6.4.9 Examples of "restoration measures" that have an adverse effect on the wider environment

- Normally the restoration of flood plains increases the biodiversity of the environment. However, there may be some limited circumstances where the restoration of flood plains threatens a specific landscape and biodiversity that has developed over the years as a result of the elimination of the floods in riparian zones and former floodplains;
- The removal of a dam may lead to the elimination of wetlands that have developed in connection to the water storage;
- Building a channel around a physical obstacle to improve ecological continuum (see Section 7.2 MEP) to allow fish migration, may use considerable energy, damage an archaeological site and produce waste materials. It may therefore, in some circumstances, not be appropriate in relation to the benefit;
- A historical modification, such as a mill or a weir which no longer has a current specified use, may now have aesthetic or historical value. This feature should not necessarily be removed and some may wish to designate the affected water body as HMWB.

In general it has to be prevented that such adverse effects on the wider environment are significant.

This test also has links to Article 4(8) and 4(9) that require measures under the WFD to be consistent with the requirements of existing Community Environmental legislation. For example, where the modified water body or its floodplain is (or is to be) designated under another directive such as the Fauna Flora Habitat or the Birds Directive, the requirements for these directives must be taken into account. "Restoration measures" that would result in conflicts with these directives should be considered as having a "significant effect on the environment".

The importance of the improvement which would be delivered by the restoration measures relative to the impact on the wider environment has to be considered here. It would, for example, not be appropriate if a large environmental improvement programme was prevented because of a significant adverse effect on a small component of the wider environment (e.g. a reservoir that serves no current purpose which results in a valuable (local) wetland; removing the dam would result in losing the wetland, but it would allow fish migration for a large river length (region). In this example, the fish migration would probably represent a larger improvement to the environment than the loss of wetland, but it strongly depends on the circumstances).

If there are no significant adverse effects upon the specified use or the wider environment, the provisional HMWB should be regarded as a natural water body and restoration measures should be undertaken to ensure that the GES can be reached. In some circumstances, Article 4(4) or 4(5) derogations will be appropriate and less stringent environmental objectives may be set.

If there are significant adverse effects on either the specified use or on the wider environment then the water body should proceed to designation test 4(3)(b).

6.4.10 Significant adverse effect and timing

The WFD requires Member States to achieve good status by 2015. Timing is therefore a relevant consideration in the Art.4(3)(a) test. The selection of measures should allow for the achievement of GES by 2015, or if derogations under Art. 4(4) apply, by 2021 or 2027. The assessment should therefore first consider whether there is a significant adverse effect on the specified use or environment up to 2015. If there is a significant adverse effect then the time period up to 2021 and then 2027 should be considered.

6.5 DESIGNATION TEST ACCORDING TO ARTICLE 4(3)(b) (Step 8)

The designation test 4(3)(b) considers whether the beneficial objectives served by the modified characteristics of the water body can reasonably be achieved by "other means" (step 8.1), which are:

- technically feasible (cf. Section 6.5.2, step 8.2);
- significantly better environmental options (cf. Section 6.5.3, step 8.3); and
- not disproportionately costly (cf. Section 6.5.4, step 8.4).

Water bodies for which "other means" can be found that fulfil these three criteria and can achieve the beneficial objectives of the modified characteristics of the water body may not be designated as HMWB. The existing specified use may, in some cases, be abandoned and the physical alterations removed so that good status can be achieved.

6.5.1 Identification of "other means" for achieving the beneficial objectives (Step 8.1)

In considering the Article 4(3)(b) test it is important to distinguish between:

- "restoration measures", which are covered under the "designation test 4(3)(a)" (step 7), and involve changes to the existing specified use in order to achieve GES; and
- "other means" which will deliver the beneficial objectives of the modified characteristics of the water body and involve the replacement or displacement of the existing specified use.

The Article 4(3)(b) test should only consider the potential for "other means" of delivering the beneficial objectives of the modified characteristics of the water body, including the benefits of specified uses and the wider environment. Other means may include the following options:

- Displacement of the specified use to another water body. For example, the replacement of a hydropower station with a new one (in another water body) where it causes less environmental damage. Another example would be stopping

navigation in one river because a canal connection would provide alternative transport links (Example in the toolbox);

- Replacement of the existing specified use with an alternative option to deliver the beneficial objectives. For example, replacing hydropower with other energy sources, or replacing navigation with rail and road transport at lower environmental costs, alternative flood defence strategies such as restoration of upstream flood-plains to remove flood defence hard engineering downstream, i.e. soft-engineering as opposed to hard-engineering solutions (Example in the toolbox).

The partial replacement or displacement of the beneficial objectives of the specified use should also be considered, while not necessarily allowing the achievement of GES.

6.5.2 Assessment of "technical feasibility" of "other means" (Step 8.2)

It then has to be assessed whether these "other means" are technically feasible. Technical feasibility is put here as the first check as it represents a relatively simple test and there is clearly no value in assessing the environmental impact of options that are not technically feasible.

"Technical feasibility" considerations include the practical, technical and engineering aspects of implementing the "other means". It addresses the question of whether "other means" of delivering the beneficial objectives of an existing specified use exist. It should not include consideration of disproportionate costs; these will be assessed as part of the later component of the test (step 8.4) (Example in the toolbox).

There may be some circumstances where it is appropriate to consider social issues which constrain the development of "other means". The use of such social constraints should be fully explained within the RBMP.

6.5.3 Assessment of whether "other means" are better environmental options (Step 8.3)

The purpose of this sub-section 8.3 of the Article 4(3)(b) test is to ensure that proposed "other means" do represent a better environmental option and that one environmental problem is not replaced with another. The test is, therefore, similar in concept to the earlier Article 4(3)(a) test, which assessed whether possible measures have a "significant adverse effect on the wider environment" (step 7.3).

When assessing other means as better environmental options, the following issues should be considered:

- Scope of "environment" in better environmental option: It is suggested that in order to ensure a consistent approach with the Article 4(3)(a) test, the assessment should include - where appropriate - consideration of the "wider environment" such as archaeology and urban and other landscapes;

- Issue of scale: There is a range of scales at which the question of "better environmental options" can be assessed: local, regional, RBD, national or

international level. Clearly it may be appropriate to consider the impacts and benefits just on the water environment or on the wider environment (water, land, air). In the first instance it is suggested that the assessment should focus on local options. Further considerations should then be considered where appropriate.

An example for this is the possible replacement of navigation on a large river system. In this instance it may be appropriate to include an assessment at a regional, national or international level taking into account increased road or rail traffic and the potential impact on $C0_2$ emissions.

It is clear that the most appropriate scale used to assess "better environmental option" will depend on the kind of "other means" under consideration. Where there is uncertainty about the appropriate scale an assessment should be carried out at different scales (Examples in the toolbox).

6.5.4 Assessment of disproportionate costs of "other means" (Step 8.4)

Those "other means" which are considered to be "technically feasible" and which represent a "significantly better environmental option" should be subject to an assessment of whether they are "disproportionately costly".

This assessment is likely to focus on financial/economic costs. However, there may be some circumstances where it may be appropriate to consider social issues as part of the assessment of disproportionality of costs.

In undertaking this assessment it is important to take account of likely or planned capital expenditures associated with the existing specified use; this should include planned expenditures up to 2027, where appropriate. This is particularly appropriate (and important) in cases where the existing specified use is associated with large scale engineering works which are subject to regular maintenance, replacement or upgrading.

This represents a key baseline, against which the incremental costs and benefits of the alternative 'other means' are to be analysed and presented.

The following two options are recommended for assessing disproportionate cost :

6.5.5 a) Comparison of cost alternatives

Disproportionate costs can be determined by assessing the incremental costs and environmental impacts of the "other means". The benefits of the existing specified use and the alternative are assumed to be the same. The main cost elements to be considered are:

- For the existing situation: operational and maintenance costs, and capital costs for necessary replacements (including investment and interest costs);
- For each option/alternative ("other means"): capital costs (including investment and interest costs), operational and maintenance costs, and possible foregone benefits from changes in economic activities (e.g. reduction in agricultural

production resulting from the development of a retention area as an alternative to dikes for preventing floods).

6.5.6 b) Comparison of overall costs and benefits

Disproportionate costs can be determined by comparing the overall costs and benefits of the existing modification and the alternative ("other means"). In this assessment the overall net benefit to society of the modification and of the alternative are compared. The main elements that are to be considered include:

- Costs as listed in a);
- benefits of the existing specified use; and
- benefits of the alternative, especially benefits gained from the higher ecological status (e.g. angling, recreation).

In order to ensure that the environmental impacts of the existing specified use are properly compared with the "other means", it is recommended to consider the:

- existing specified use; and
- "other means", subject to typical sector-specific best environmental practice.

It will be important to ensure that the economic and environmental appraisal of the "other means" are in line with the best practice techniques customarily used for each type of modification (e.g. flood defence, navigation etc.) to ensure that the "other means" thereby identified can actually be financed and implemented.

After having assessed the costs (and in case b) also the benefits) of the existing specified use and the "other means" it has to be decided whether the costs are disproportionate. To pass this test it is not sufficient to demonstrate that the costs exceed the benefits. The costs must be disproportionately greater than the benefits. Clearly it is not possible to define by how much the costs must exceed the benefits before they become disproportionate (Example in the toolbox).

In the context of economic assessments, the WFD CIS Guidance Document No. 1 produced by the CIS-WG 2.6 on WATECO should be considered.

Examples on the assessment of disproportionate costs are provided within the toolbox.

6.5.7 Will the "other means" allow the achievement of GES? (Step 8.5)

Under some circumstances the "other means" may represent only a **partial** replacement/displacement of the use. In these cases "other means" would fulfil all relevant criteria (steps 8.2 - 8.4) but GES still cannot be achieved due to physical alterations. This will result in those circumstances where a "better environmental option" should be realised, but GES still cannot be achieved. In the following, some examples are given:

- Example (a) If a water body is modified by two uses and it is possible to find "other means" of delivering the beneficial objective of one of the uses. The second use may still require physical alterations that prevent the water body from achieving GES;

- Example (b) If a water body is modified by a single use and it is possible to find "other means" of delivering a proportion of the beneficial objective of the use. For example, if "other means" are available that would supply 50% of the drinking water (for example from groundwater) then the variation in water levels will be reduced. This may still not allow the water body to achieve GES but it may represent a "significantly better environmental option". The result may be an improvement in the environmental quality of the reservoir and the river downstream and it may allow new additional uses of the reservoir for example recreation. Such "other means" which offer "better environmental options" but do not achieve GES should be undertaken as part of the programme of measures.

If GES is not achieved by the other means, and this is caused by the physical alterations, the water body may be designated as HMWB.

If GES can be achieved by the other means, the water body must be regarded as natural.

6.5.8 "Other means" and timing

The WFD requires Member States to achieve good status by 2015. Timing is also a relevant consideration in step 8 [the Article 4(3)(b) test]. The selection of "other means" (i.e. alternative options in the sense of displacement or replacement) should allow for the restoration of the site by 2015, or, if derogations under Article 4(4) apply, by 2021 or 2027. In particular, the time constraint may influence the decision as to whether the "other means" are technically feasible or disproportionately expensive as part of this step 8 [Article 4(3)(b) test].

The assessment should therefore firstly consider, whether the "other means" are technically feasible and not disproportionately expensive during the period up to 2015. If this is not the case, then it should be considered until 2021 or 2027.

6.6 DESIGNATION OF HMWB IN 2008 (Step 9)

A water body may be designated as HMWB if it has passed through the designation procedure involving, if applicable, both designation tests (steps 7 & 8).

After applying the designation tests, Member States may still decide that they do not wish to designate the water body as a HMWB.

If there are no significant adverse effects neither on the specified uses nor on the wider environment, or there are "other means" of delivering the beneficial objectives then the water body should be regarded as natural.

6.7 GUIDANCE ON METHODS FOR APPLYING THE DESIGNATION TESTS 4(3)(a) & (b) (for Steps 7 and 8)

A very large number of water bodies will have to be assessed for possible designation as HMWB until 2008/9. Consequently, the methods used to comply with the requirements of the designation tests must be proportionate and pragmatic. The purpose of this Section is to identify appropriate methodological options so that the complexity of the assessment methodology can be made proportionate to the circumstances.

In order to reduce the workload for the designation tests, the possibility exists to group the water bodies for the assessment (see Section 6.3). It should be stressed that water bodies should only be grouped if they require similar levels of assessment, for example, if purely descriptive methods are to be used because the water body is obviously substantially changed in character. However, it would be entirely inappropriate to group water bodies which are obviously substantially changed in character with others where a more detailed assessment would be necessary to decide whether they are HMWB.

The designation of HMWB will be undertaken as part of the RBM planning process and is therefore subject to the requirements for the provision of public information and consultation as defined by Article 14. Information provided by the assessment methods must be sufficient to ensure that the process of decision-making associated with the Article 4(3) designation tests is transparent allowing for the active participation of the public in the planning process based on the provision of necessary appropriate information. In addition it is clearly important that the information is sufficient to demonstrate compliance.

Four potentially complementary types of appraisal methods are suggested.

1. **Descriptive (qualitative) methods** - can be applied where the position is clear-cut and detailed analysis is unnecessary. Descriptive methods may also be necessary where environmental or social impacts cannot be quantified;

2. **Simple quantitative measures for assessing the impact or benefit** – involves the description of relative change. For example, the percentage reduction in the beneficial output of a specified use. This can be expressed as a function of the output (for example kilowatt/hours for hydropower or tonnes transported p.a. for navigation). However, the preferred output is percentage change expressed in terms of EUROs as this allows a comparison between different sectors as well as temporal comparison within sectors. Ideally the absolute value of the output should also be included so that the scale of the change can be put into context;

3. **Benchmarking information** – where standard costs and/or benefits can be derived for individual sectors or types of measures. In some cases the benchmark will most

appropriately be considered in terms of the measure[19], in other cases it can be expressed in terms of cost-effectiveness (i.e. as a cost per unit of benefit achieved)[20];

4. **More in-depth economic assessment methods** – includes a range of tools of varying complexity. These may be used for marginal cases and for situations requiring high levels of investment.

The extent to which it will be necessary to move down this list of methods will depend on the costs and contentiousness of the options in question. It is considered that the first two types of methods will be most frequently used.

6.7.1 Methods for determining significant adverse effects (for Step 7)

Table 2 provides guidance on the type of analyses that may be considered. Simple qualitative descriptive methods are appropriate where the following situations apply:

- The adverse effects on specified uses are relatively small in relation to the specified use (clearly not significant); or
- The adverse effects on specified uses are very large and prejudice their viability (clearly significant). This is particularly relevant when the necessary "measures" imply the cessation of specified uses, functions and related human activities. For example, where the removal of flood defences would lead to widespread flooding of an urban area.

Where the situation is not clear-cut, a simple quantitative assessment should be carried out using relative assessment of impact.

Table 2: Preliminary guidance on the selection of methods for Article 4(3)(a) test.

INCREASING COMPLEXITY (move in this direction only when necessary, i.e. when a decision cannot easily be made with methods on the left of the table).

Test	Descriptive (qualitative) methods	Simple quantification	Benchmarking information	Economic assessment
Significant adverse effect on specified use (step 7.2)	If abandonment of, or very major change in, specified use/function/activity If very limited change in specified use /function/activity	When partial change in specified use/ function		Where significance of change in specified use/function is uncertain
Significant adverse effect on environment (step 7.3)	Description of scale of impacts relative to benefits provided by restoration measures		National / local scale benchmarking may be of assistance	

[19] e.g. annualised costs of a fish ladder in X Euros pa.

[20] Y Euros per fish passing etc.

It may be appropriate to consider the adverse effects at a local level, or at a local level in relation to regional or national significance. A locally significant adverse effect may become insignificant when considered in a regional or national context.[21] But it could also be vice versa. [22]

It is difficult to assess the "significance" of adverse effects on the environment, because there is a lack of methods to quantify or cost such effects. It may be appropriate to list the environmental impacts/benefits of the restoration measures together with a subjective estimate of the scale (e.g. large, moderate, small) (Example in Section 3.1.3 of the toolbox is of relevance).

To assist the assessment of the "significance" of adverse effects, a standard format is provided in the toolbox. This table lists the range of issues and information that may be considered.

6.7.2 Methods for evaluating "other means" (Step 8)

Table 3 indicates that technical feasibility and better environmental option would normally be dealt with the use of descriptive methods. In the case of "better environmental options" a simple table may be prepared comparing the existing specified use and the proposed alternatives with regards to their environmental impacts. In some cases, the quantification of the physical impacts of the existing specified use and alternatives may be possible.

Table 3: Preliminary guidance on the selection of methods for Article 4(3)(b) test.

INCREASING COMPLEXITY (move in this direction only when necessary, i.e. when a decision cannot easily be made with methods on the left of the table).

Test	Descriptive (qualitative) methods	Simple quantification	Benchmarking information	Economic assessment
Technically feasible (step 8.2)	Description of practical difficulties			
Better environmental options (step 8.3)	Qualitative assessment for impact on different media if conclusion is clear	If uncertain about which option is best	National / local scale benchmarking may be of assistance	
Disproportionate costs (step 8.4)	Description of scale of costs and also benefits if conclusion is clear	N.A.	National / local scale benchmarking may provide sufficient clarity for good judgement	Where local situation significantly different from benchmark case or where other reasons for uncertainty exist

[21] The reduction of power production within one particular hydropower station might be regarded as significant but on a regional scale it might be negligible.

[22] If the power production of a hydropower plant is reduced by a small percentage, it might be regarded as not significant locally; but if the energy supply of a region depends mainly on hydropower and the production is reduced in each hydropower plant, it might be regarded as significant.

In many cases, the assessment of disproportionate costs may be quite straightforward and the qualitative description of the specified use and the consequences of its removal are sufficient to decide on whether the "other means" are disproportionately costly or not.

Where this is not the case, an economic assessment of the costs and benefits (listed in Section 6.5.4) should be undertaken.

To ensure that data on costs can be compared between existing modifications and "other means", and because of likely different life-times and temporal distribution of costs, all costs have to be annualised using standard discounted cash flow analysis and appropriate discount rates (Example in the toolbox).

6.7.3 Consultative mechanisms

Many of the designation tests may involve a subjective process involving a descriptive approach to the tests. In order to ensure a transparent approach and improve decision making it may be appropriate to use formal consultative mechanisms for decision making.

- Consultative for a - involving a participatory approach to identify whether the foreseen impacts on uses are considered as significant. This approach should take social issues and cultural/local perceptions into account[23] These fora would operate within the wider RBM stakeholder engagement and public participation process;

- Representative committees – involving the authorities responsible for water management;

- Expert group panels - technical assessment of the options by a multi-disciplinary team of experts. The selection of this "expert group" is subjective but should be well-justified and transparent. The group should include stakeholder experts.

6.8 DESIGNATION OF ARTIFICIAL WATER BODIES (Step 9)

The designation process, in relation to artificial water bodies, is difficult to understand. Therefore this Section has been introduced to consider how to operate the designation process for AWB. The suggested approach should be applied to AWB (see Figure 1). It aims to:

- minimise the amount of work involved in the designation of AWB; and

- ensure that the purpose of the WFD in protecting and enhancing the water environment is delivered.

[23] It is clearly in line with the requirements of Article 14 of the WFD to involve all interested parties.

6.8.1 Do all artificial water bodies have to be designated?

Article 4(3) states that Member States may designate a water body as artificial. This suggests that it may not always be necessary to consider designating waters which have been created by man as artificial. There may be some circumstances where long established water bodies, which are subject to little or no pressures, are indistinguishable from natural waters. Under such circumstances it may be appropriate to consider their current biological condition as HES or GES.

6.8.2 Application of "Designation test 4(3)(a)"

It is clear from the text of the Directive that the designation tests of Article 4(3) apply to AWB as well as to HMWB. However, the interpretation of Article 4(3)(a) in relation to AWB is problematic.

> ***Article 4(3)(a)***
>
> *the changes to the hydromorphological characteristics of that body which would be necessary for achieving good ecological status would have significant adverse effects on:….*

In order to undertake the Article 4(3)(a) designation test, the restoration measures necessary to deliver GES must be identified. This is not possible for AWB because they were created in a location where no significant water existed before and therefore the HES natural condition would be "dry land" and a sensible GES could not be derived. Consequently, it should be assumed that test 4.3(a) does not apply to AWB. However, it is considered that the intent of Article 4.3(a) should apply to the process of AWB designation. This requires that restoration measures which result from the application of the designation process should not have a significant adverse effect on the specified use or on the wider environment.

6.8.3 Application of Article 4.3(b) test

The second "designation test 4(3)(b)" does not impose interpretation difficulties when applied to most AWB and should be used as a designation test. Consequently, when designating AWB, it should be considered whether there are “other means” which can deliver the beneficial objectives of the AWB.

It should be noted that the application of the "designation test 4(3)(b)" for AWB does not aim at considering whether water bodies are artificial or natural (or HMWB). The designation test is applied in order to see whether there are "other means" to achieve a significantly better environmental option for example resulting in an improvement of the condition of the water body.

7 REFERENCE CONDITIONS AND ENVIRONMENTAL OBJECTIVES FOR HMWB & AWB (Steps 10 & 11)

7.1 INTRODUCTION

In the HMWB and AWB identification and designation process it is necessary to identify the appropriate reference conditions and environmental objectives for AWB and HMWB (see steps 10 and 11 in Figure 1).

For HMWB and AWB the reference conditions on which status classification is based are called "Maximum Ecological Potential (MEP)". The MEP represents the maximum ecological quality that could be achieved for a HMWB or AWB once all mitigation measures, that do not have significant adverse effects on its specified use or on the wider environment, have been applied. HMWB and AWB are required to achieve "good ecological potential" (GEP) and good surface water chemical status. GEP accommodates "slight" changes in the values of the relevant biological quality elements at MEP. Member States must prevent deterioration from one status class to another, and aim to achieve GEP by 22nd December 2015 unless grounds for derogation to a less stringent objective under Article 4(5) or to an extended timescale under Article 4(4) are demonstrated. For the timing of establishing MEP and GEP see Sections 8.2 and 8.3.

7.2 ESTABLISHING THE MAXIMUM ECOLOGICAL POTENTIAL - MEP (Step 10)

A series of sub-steps are required to establish appropriate values for the quality elements at MEP (see Figure 7). In this process it is important to differentiate between "closest comparable surface water category" and "closest comparable surface water body type". The appropriate quality elements are chosen from the closest comparable categories, whereas closest comparable water body types are used to help determine the value of these elements for HMWB and AWB.

Step 10 - substep 1 (s 10.1): Choose the appropriate **quality elements** for MEP. Identify the closest comparable natural surface water category. This will either be a "river", "lake", "transitional water" or "coastal water". The appropriate quality elements are those of the closest comparable natural surface water category and are identified in Annex V No. 1.1.1- 1.1.4.

Step 10 - substep 2 (s 10.2): Establish the **hydromorphological conditions** required for MEP. The values for the biological and general physico-chemical quality elements at MEP depend on the MEP hydromorphological conditions. Establishing the MEP hydromorphological conditions is one of the first steps in defining MEP since it is these conditions which are impacted by the physical alterations and which will, primarily, dictate the ecological potential of a HMWB or AWB.

Step 10 - substep 3 (s 10.3): Establish the MEP **physico-chemical conditions**. Identify the closest comparable surface water body type. Physico-chemical conditions at MEP should be based on the conditions of this comparable type taking account of the MEP hydromorphological conditions. The physico-chemical conditions will be an important influence on the values for the biological quality elements at MEP.

Step 10 - substep 4 (s 10.4): Establish the MEP **biological conditions** that shall reflect, as far as possible, those associated with the closest comparable water body type (cf. S 10.3 above). The biological conditions at MEP will be influenced by the MEP hydromorphological and physico-chemical conditions.

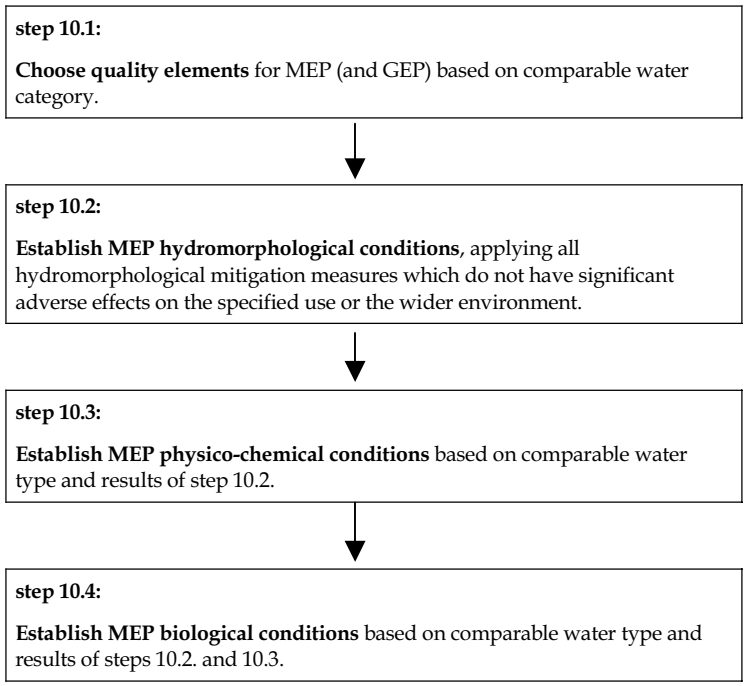


Figure 7: Process for defining MEP (Steps 10.1 – 10.4)

The following example shows how the establishment of MEP can be achieved according to Figure 7.

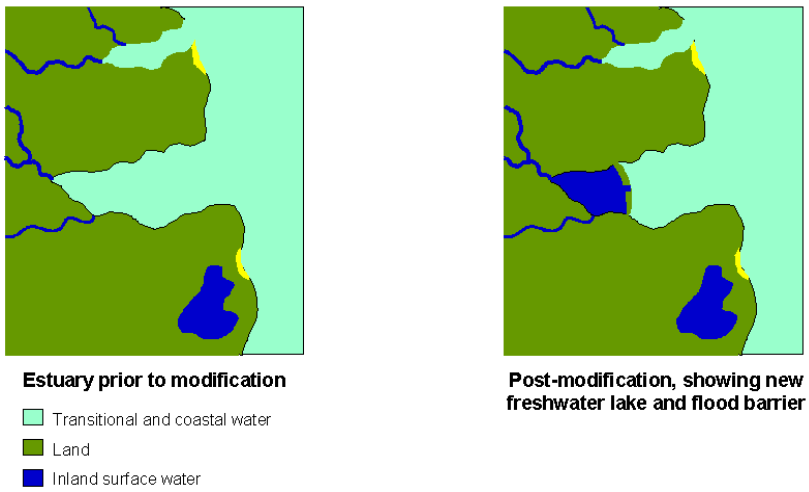


Figure 8: Example showing an estuary turned into a freshwater lake

The estuary was altered for flood protection (see Figure 8). It is clearly a substantial change in the character of the water body due to physical alterations. It is also an Article 4(3) specified use (flood defence).

Substep 10.1: The closest comparable natural water category in the present situation is a lake. The relevant biological, hydromorphological and physico-chemical elements of the lake category should be used to establish MEP (see Section 7.2.1

Substep 10.2: It is clear that the hydromorphological elements required for MEP **do <u>not</u> reflect the historical situation (estuary)** but should reflect the theoretical improvements which could be undertaken by hydromorphological mitigation measures (which have no significant adverse effect upon the use (flood protection)). The closest comparable lake type should be used to choose the values for those elements as far as possible (see Section 7.2.2).

Substep 10.3: The MEP physico-chemical conditions are those values found under the given circumstances of step 10.2 but reflect in general the condition at high ecological status for the most comparable lake water bodies (see Section 7.2.3).

Substep 10.4: The MEP biological conditions are those values found under the given circumstances of step 10.2 and 10.3 (see Section 7.2.4).

7.2.1 Choosing the appropriate quality elements for MEP (Step 10.1)

<u>Annex V No. 1.1.5</u>

"The quality elements applicable to artificial and heavily modified surface water bodies shall be those applicable to whichever of the four natural surface water categories above most closely resembles the heavily modified or artificial water body concerned".

The relevant hydromorphological, biological and physico-chemical quality elements are those for the most closely comparable water <u>category</u> (River, Lake, Transitional Water or Coastal Water) [cf. Annex V No. 1.1.1-1.1.4]. For example, if a river has been modified (e.g. impounded) to closely resemble a lake, the relevant quality elements will be those specified in the Directive for lakes [Annex V No. 1.1.2], rather than those for rivers [Annex V No. 1.1.1] (see Figure 9).

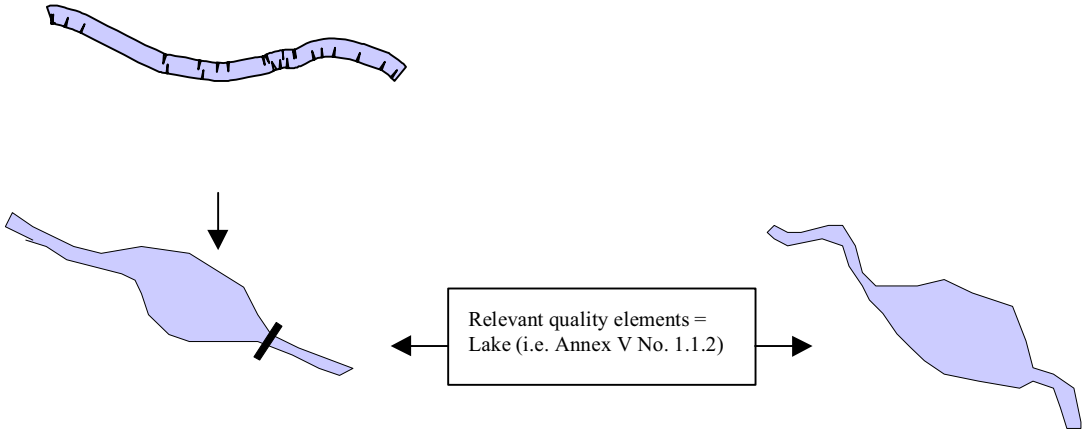


Figure 9: Example for choosing quality elements for MEP (s 10.1)

7.2.2 Establishing MEP hydromorphological conditions (Step 10.2)

Annex V No. 1.2.5

"The hydromorphological conditions [of a HMWB or AWB at MEP] are consistent with the only impacts on the surface water body being those resulting from the artificial or heavily modified characteristics of the water body once all mitigation measures have been taken to ensure the best approximation to ecological continuum, in particular with respect to migration of fauna and appropriate spawning and breeding grounds."

The hydromorphological conditions at MEP are the conditions that would exist if all hydromorphological mitigation measures were taken to ensure the best approximation to the ecological continuum. The mitigation measures for defining MEP should:

(a) not have a significant adverse effect on the specified use (including maintenance and operation of the specified use; see Section 6.4.2). This consideration includes an assessment of possible economic effects incurred by mitigation measures but not an assessment of disproportionate cost of the measures themselves or on the wider environment (see Section 6.4.7); and

(b) ensure the best approximation to ecological continuum, in particular with respect to migration of fauna and appropriate spawning and breeding grounds (Examples in the toolbox).

For the purpose of this guidance 'best approximation to ecological continuum, in particular with respect to migration of fauna and appropriate spawning and breeding grounds' is interpreted as having the following requirements:

(a) An adequate quantity and quality of usable habitat to ensure that the structure and function of the ecosystem is maintained over space and time;

(b) Longitudinal and lateral continuity/connectivity of water bodies (e.g. river continuity, aquatic – semi-aquatic - terrestrial habitat connectivity) to enable biota access to the habitats on which they depend.

The best approximation to ecological continuum therefore requires consideration of all hydromorphological mitigation measures that could reduce any obstacles to migration and improve the quality, quantity and range of habitats affected by the physical alterations. This could include connectivity to groundwater and to riparian, shore and intertidal zones. However, the WFD emphasises migration in particular. Priority should therefore be given to reducing any obstacles that significantly inhibit longitudinal and lateral migration of biota.

The technical feasibility and the financial costs (i.e. capital costs) that would be incurred if the mitigation measures were implemented is not a consideration in setting the standards for the hydromorphological quality elements at MEP. Such cost considerations are relevant when deciding whether the achievement of GEP or a less stringent objective under Article 4(5) is appropriate for the HMWB or AWB. However, the mitigation measures should not have a significant adverse effect on the specified use (including economic effects), or the wider environment according to the designation test 4(3)(a). This can include an assessment of the economic effects on the specified use or the wider environment. Although all mitigation measures should be identified, it would not be useful to further consider measures that were impractical. Such impractical measures should be excluded from any detailed assessment.

The combination of considering only measures which do not have a significant adverse effect upon the use/environment and of excluding clearly impractical measures will result in the definition of reasonable values for MEP.

In designating and setting objectives for HMWB and AWB, Member States must ensure consistency with the implementation of other Community legislation [cf. Art. 4(8)], such as the Fauna Flora Habitat Directive (FFH) Directive (92/43/EEC) and the Birds Directive (79/409/EEC). At the same time, the requirements of the WFD need to be respected in the implementation of these directives. The definition of MEP must ensure that the achievement of GEP is compatible with the achievement of the objectives established under such legislation. In the case of the FFH and Birds Directives, the mitigation measures used to define MEP hydromorphological conditions must consider the needs of those flora, fauna and habitats for which the Directives have set objectives.

7.2.3 Establishing MEP physico-chemical conditions (Step 10.3)

Annex V No. 1.2.5

"The [general] physico-chemical quality elements correspond totally or nearly totally to the undisturbed conditions associated with the surface water body type most closely comparable to the artificial or heavily modified water body concerned.

Concentrations [of specific non-synthetic pollutants] remain within the range normally associated with undisturbed conditions found in the surface water body type most closely comparable to the artificial or heavily modified body concerned. (background levels = bgl)".

The general physico-chemical conditions and the values for specific non-synthetic pollutants should correspond to those of the most closely comparable water body type, given the MEP hydromorphological conditions (see above) (Example in the toolbox).

For some AWB and HMWB, the values for some of the physico-chemical quality elements in the closest comparable water body type may be significantly different from the values that could be achieved in the HMWB or AWB, given the MEP hydromorphogical characteristics (see above). The following examples illustrate how HMWB may have different physico-chemical conditions than the nearest equivalent natural water body:

- The hydromorphological characteristics of impoundment created for hydropower and water supply can dictate the oxygen and temperature conditions in the impounded water and in the downstream river. These may be different from those in a natural water body;
- The hydromorphological characteristics of a freshwater impoundment created from a dammed estuary may result in different levels of turbidity. These may be different from those in a natural water body.

These differences can be taken into account when defining MEP.

Since the values for these physico-chemical quality elements would not correspond "totally or even nearly totally to those for the closest comparable water body type" at high ecological status (HES), such AWB and HMWB would never achieve MEP. In some cases they would also be unable to achieve GEP and therefore would require derogation to a less stringent objective under Article 4(5). Where these physico-chemical conditions are directly connected to physical alterations necessary to sustain the specified use, it is suggested that these differences be taken into account when setting MEP. These considerations are only applicable to certain physico-chemical elements such as oxygenation, temperature and turbidity, and should not be applied to general pollutants which are not connected to the hydromophological alterations.

The requirements for specific synthetic pollutants at MEP are the same as those for unmodified, non-artificial water bodies with "concentrations close to zero and at least

below the limits of detection of the advanced analytical techniques in general use" [cf. Annex V No. 1.2.5]. CIS WG 2.3 REFCOND and CIS WG 2.4 COAST will provide further guidance.

7.2.4 Establishing MEP biological requirements (Step 10.4)

Annex V No. 1.2.5

[Maximum Ecological Potential (MEP) is defined as the state where] "the values of the relevant biological quality elements reflect, as far as possible, those associated with the closest comparable surface water body type, given the physical conditions which result from the artificial or heavily modified characteristics of the water body."

MEP is intended to describe the best approximation to a natural aquatic ecosystem that could be achieved given the hydromorphological characteristics that cannot be changed without significant adverse effects on the specified use or the wider environment. Accordingly, MEP biological conditions should reflect, as far as possible, those associated with the closest comparable water body type given the hydromorphological and resulting physico-chemical conditions at high ecological status to those established for MEP (see steps 10.2 and 10.3).

The Directive allows a number of methods to be used in establishing MEP values for the biological quality elements. The range of methods should also be used in establishing MEP values for the general physico-chemical quality elements and specific non-synthetic pollutants (see above). The methods are the same as those permitted in establishing the values for quality elements at HES.

They consist of:

(i) Spatial networks of sites meeting MEP criteria (Example in the toolbox);

(ii) Modelling approaches (Example in the toolbox);

(iii) A combination of (i) and (ii); or

(iv) Where it is not possible to use the above methods, expert judgement (Example in the toolbox).

7.2.5 Most comparable water body

A "comparable water body" can be one or more similar water body(s) that is/are, amongst other things, most similar in terms of category, type and other characteristics to the modified water body and from which spatial or temporal (i.e. hindcasting) data can be derived to support the establishment of MEP. The "comparable water body" helps to:

- choose quality elements to be regarded (derived from most comparable water body category); and

- set values for physico-chemical and biological quality elements regarded (derived from most comparable water body type).

The first priority is to look for a comparable natural water body (or a modelled or historical situation) (Example in the toolbox).

In many cases, the HES hydromorphological and sometimes also the physico-chemical conditions in the closest comparable water body type will be significantly different from the MEP hydromorphological and physico-chemical conditions. In establishing the MEP biological values, it will therefore be necessary to adjust the HES biological values of the closest comparable water body type to take account of the heavily modified or artificial characteristics.

In special cases, comparable natural water bodies will not be available. In these cases, which have to be justified, information from closely comparable HMWB and AWB at MEP (i.e. best possible rather than best available) should be used where it is available (Example in the toolbox). Information from best available sites could be used as long as best possible conditions can be extrapolated through modelling or expert judgement.

The following example shows how MEP can be established by reference to another HMWB.

If a series of large reservoirs were created in a mountainous region where large natural lakes did not exist, it may not be possible to identify a comparable natural water body within the ecoregion. Under these circumstances, it may be possible to identify a reservoir which is already close to MEP. A reservoir would be close to MEP if "all mitigation measures" to improve the hydromorphological characteristics of the reservoir had been undertaken. If "all mitigation measures" had not been undertaken, then the effect of undertaking "all mitigation measures" could be modelled and then used as the definition of MEP.

7.3 ESTABLISHING THE GOOD ECOLOGICAL POTENTIAL – GEP (Step 11)

Annex V No. 1.2.5

[The good ecological potential (GEP) is defined as the state where] "There are slight changes in the values of the relevant biological quality elements as compared to the values found at maximum ecological potential".

The good ecological potential (GEP) is the environmental quality objective for HMWB and AWB. Risk of failure of the ecological objective for AWB and HMWB is assessed against GEP (see Annex II No. 1.4).

The hydromorphological conditions at GEP must be such as to support the achievement of the GEP biological values. The values for the general physico-chemical quality elements at GEP also need to support the achievement of the GEP biological values. However, it is also required that the values for the general physico-chemical quality elements at GEP are such as to ensure the functioning of the ecosystem. The

role of physico-chemical elements in the classification of water bodies is defined within the WFD CIS Guidance Documents No.'s 10, provided by the WG 2.3 (REFCOND) and No. 5, WG 2.4 (COAST). GEP also requires compliance with environmental quality standards established for the specific synthetic and non-synthetic pollutant quality elements in accordance with the procedure set out in Annex V No. 1.2.6 of the Directive.

The following substeps (s 11.1 – s 11.4) are necessary to establish GEP:

Step 11 - substep 1 (s 11.1): The establishment of the good ecological potential for HMWB and AWB is principally based on the **biological quality** elements (derived from MEP). GEP accommodates "slight changes" in the values of the biological elements from the MEP (Examples in the toolbox). The meaning and interpretation of the term "slight changes" is dealt with in the WFD CIS Guidance Document No. 10 - REFCOND and WFD CIS Guidance Document No. 6 - Intercalibration.

Step 11 - substep 2 (s 11.2): The **hydromorphological conditions** at GEP must be such as to support the achievement of the GEP biological values (Example in the toolbox).This will require the identification of the hydromorphological conditions necessary to support the achievement of the GEP values for the biological quality elements, and in particular the achievement of the values for those biological quality elements that are sensitive to hydromorphological alterations.

Step 11 - substep 3 (s 11.3): The values for the **general physico-chemical** quality elements at GEP are such as to support the achievement of the GEP biological values (Example in the toolbox). It is also required that the values for the general physico-chemical quality elements at GEP are such as to ensure the functioning of the ecosystem [Annex V No. 1.2.5]. The role of physico-chemical elements in the classification of water bodies is defined within the WFD CIS Guidance Document No.'s 10 and 5 provided by the WG 2.3 (REFCOND) and WG 2.4 (COAST).

Step 11 - substep 4 (s 11.4): GEP also requires compliance with environmental quality standards established for the **specific synthetic and non-synthetic pollutant** quality elements in accordance with the procedure set out in Annex V No. 1.2.6 (Example in the toolbox).

7.4 REPORTING AND MAPPING FOR HMWB AND AWB

The classification of HMWB and AWB requires the development of monitoring systems capable of estimating the values of the biological quality elements in AWB and HMWB and comparing those estimates with the values established for those elements at MEP. The ratio of the measured values of the biological parameters and the values for these parameters at MEP [the "ecological quality ratio"; cf. Annex V No. 1.4] will be used in classifying the status. Member States must establish values of the environmental quality ratio that correspond to the boundaries between the status classes. Some of the work of the EU Common Implementation Strategy working groups 2.3 (REFCOND) and 2.4 (COAST) may possibly help in establishing boundaries between ecological potential classes.

The classification of the ecological potential of HMWB and AWB is principally based on the degree of anthropogenic alteration away from the MEP values for the biological quality elements (see Section 7.2.4). For reporting purposes and mapping, MEP and GEP are combined in a single class [Annex V No. 1.4.2 (ii)], see following Figure 10.

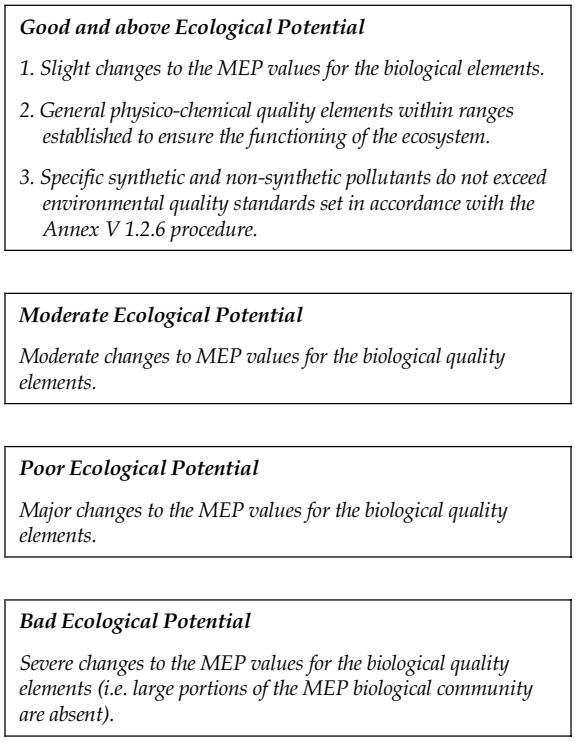


Figure 10: Reporting System

7.4.1 Programme of measures

HMWB and AWB are required to achieve "good ecological potential" (GEP) and good surface water chemical status. Member States must prevent deterioration from one status class to another, and aim to achieve GEP by 22nd December 2015 unless grounds for derogation are demonstrated.

Where the results of the monitoring programmes achieved on the Annex II risk assessments indicate that a HMWB or AWB is likely to fail to achieve GEP, Member States must establish an appropriate set of measures to improve the ecological potential of a water body with the aim of achieving GEP by 2015 (Examples in the toolbox).

This requires a good understanding of how measures will improve the ecological potential of the water body. For example, the identification of the relevant GEP hydromorphological conditions will require an understanding of the relationships between hydromorphological and biological elements; this knowledge is still relatively limited. It would also be advantageous to understand biological response lag times within any particular water body.

For the design of effective and efficient programmes of measures (POMs), better information is likely to be collected over time. In the meantime, Member States will have to base the design of POMs on the best available knowledge and judgements.

If it is technically infeasible or disproportionately expensive to achieve GEP by 2015, Member States may extend the deadline for achieving GEP in accordance with Article 4(4) or establish a less stringent objective for the water body under Article 4(5). In this context the WFD CIS Guidance Document No. 10 produced by the CIS-Working Group WATECO for the assessment of disproportionate costs should be considered.

8 CROSS-CUTTING ISSUES AND OUTLOOK

8.1 OVERVIEW OF MEASURES AND THEIR COSTS IN THE HMWB AND AWB PROCESS

There are some issues within the designation process that are not particularly unique to one single step of the identification and designation process. These are summarised below.

Different kinds of **measures** are to be considered at different stages (steps) of the process. These include restoration measures in the designation test 4(3)(a) and mitigation measures for establishing MEP and GEP. For reaching the environmental quality objectives, a programme of measures needs to be set up for each RBD. This includes not only (mitigation) measures for AWB or HMWB, but also measures for natural water bodies.

When (restoration or mitigation) measures are being identified and their impacts assessed, the scale becomes important. It has to be taken into account that measures upstream might influence the conditions downstream and vice-versa. The identification of suitable measures can be difficult, because information on the cause-effect relationship of measures is often insufficient. Related to the identification (and at some points realisation) of different measures, considerations of **costs** and benefits as well as technical feasibility are relevant at several stages of the process to different extents, as shown in Table 4.

The following Table 4 gives an overview of the types of measures (second column) that are to be considered in the different steps (first column) of the designation and objective setting processes for HMWB and AWB. In the third column the related cost (and benefit) considerations are listed, and it is indicated where the consideration of technical feasibility is relevant.

Table 4: Overview of measures and cost considerations in the overall HMWB and AWB identification and designation process

Step	Measures to be considered	Costs (and benefits) related to measures /other means
1-6: Up to provisional identification	None.	Not considered.
7: Designation test 4(3)(a)	**Restoration measures** necessary to achieve GES.	• When assessing the adverse effects on the specified uses and on the wider environment, **costs** need to be considered. • The **benefits** of achieving GES must be considered, other benefits may be considered. • Costs of restoration measures (including disproportionality of costs) are **NOT** considered.
8: Designation test 4(3)(b)	Not "measures" but "**other means**" are considered.	• Comparison of current benefits with benefits of **other means**. • Disproportionality of costs of other means should be considered. • Technical feasibility of other means should be considered.
9: Designation	None.	Not considered.
10: Establishing MEP	All **mitigation measures**[24] that: • do not significantly adversely affect the specified uses or the wider environment; and • ensure the best approximation to ecological continuum.	• When assessing the adverse effects on the specified uses and on the wider environment, **costs** need to be considered. • The benefits to the water body of applying the mitigation measures should be considered. • Costs of mitigation measures (including disproportionality of costs) are **NOT** considered. • Technical feasibility of mitigation measures **NOT** to be considered.
11: Establishing GEP	**Mitigation measures** that: • do not significantly adversely affect the specified uses or the wider environment; and • improve water body to slight deviation of MEP.	• When assessing the adverse effects on the specified uses and on the wider environment, **costs** need to be considered. • The benefits to the water body of applying the mitigation measures should be considered. • Costs of mitigation measures (including disproportionality of costs) are **NOT** considered. • Technical feasibility of mitigation measures **NOT** to be considered.
For all water bodies (natural, artificial and heavily modified):		
POM for reaching the environmental quality objectives (EQO)	All **measures** according to Article 11 WFD (including other means and mitigation measures considered in the designation process)..	• Costs of measures (including disproportionality of costs) should be considered. • Select the most cost-effective combination of measures to achieve the EQO. • Technical feasibility of the measures should be considered.

[24] According to Annex V 1.2.5 WFD, all hydromorphological mitigation measures should be theoretically considered in order to define the MEP. However, it would not be useful to consider impractical measures. For further explanation please see Section 7.2.2.

Within the first steps up to provisional HMWB identification (steps 1-6), no measures or cost and feasibility estimations are considered.

In the first designation test (step 7) all "restoration measures" necessary to achieve the GES are to be considered, regardless of their costs or technical feasibility. In this test it has to be assessed whether these restoration measures have a significant adverse effect on the specified uses or the wider environment. In assessing this, cost considerations are relevant (e.g. loss of revenue). In the second designation test (step 8), no measures are considered but "other means" (including displacement or replacement of current specified use),[25] that serve the same beneficial objective, are considered. These other means have to be assessed with regard to their technical feasibility and their disproportionality of costs.

In defining MEP (step 10) and GEP (step 11) conditions, all mitigation measures that do not have significant adverse effects neither on the specified uses nor on the wider environment are to be considered. The capital costs that would be incurred if the mitigation measures were implemented and disproportionality of costs are not relevant considerations in this context. The mitigation measures only define the reference conditions for the classification of HMWB and AWB. Setting this standard does not require the measures to be implemented. Again only cost in the context of impact on specified uses is relevant. When setting up the RBMP, the feasibility and costs play a major role and might lead to derogations.

8.2 TIMING IN THE FIRST RIVER BASIN PLANNING CYCLE

The first draft RBMP should be available for public consultation by December 2008 [Article14(1)(c)], while the final version is due one year later, in December 2009 [Article13(6)]. The RBMP shall be reviewed and updated at the latest in December 2015 and every 6 years thereafter [Article13(7)].

This Guidance Document provides advice on how the HMWB and AWB identification and designation process should be undertaken during the first RBMP cycle. An overview of the step-wise identification and designation process for the first planning cycle is given in Section 4. In this Section we describe the timetable for when particular process activities have to be completed within this first cycle. It will be important that the timing of these activities is considered within other relevant WFD Common Implementation Strategy working group Guidance Documents. Figure 11 identifies the major deadlines in the timetable of the HMWB and AWB identification and designation process in the first planning cycle.

As identified in Section 5.7 the provisional identification of HMWB and AWB will be complete by Dec 2004. For physically modified water bodies an assessment of the likelihood of failing to meet the "GES" objective (step 5) must be complete by Dec 2004 to determine whether a water body is to be provisionally identified as HMWB (step 6).

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[25] For example: replacing a particular hydropower station with a new hydropower station in a different water body, or replacing hydropower with wind power.

For AWB an assessment of the likelihood of failing to meet a "GEP" objective must be complete by Dec 2004. Determination of "GES" and "GEP" prior to the Dec 2004 deadline will only be first estimations of these objectives based on available knowledge, data and tools. It is expected that further refinement of these objectives will be made later in the planning process as new tools and data become available, particularly as a result of further monitoring.

For provisionally identified HMWB, designation (or not; step 7-9), determination of GEP (step 10-11) and an assessment of the risk of failing to meet the "GEP" objective must be complete by Dec 2008. For identified AWB it is expected that between 2004-8 the water body will be designated as AWB, the estimate of GEP will be refined and the risk of failing to meet the refined GEP will be reassessed. If a designated HMWB or AWB does not meet the GEP objective, then a programme of measures or a case for derogation has to be developed by Dec 2008. This allows one year for consultation of the draft RBMP before publication of the final RBMP in 2009.

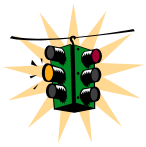
For some provisionally identified HMWB, Member States may wish to move the designation steps (steps 7-9), the first estimation of GEP and the assessment of the likelihood of failing the GEP objective forward. This may be particularly appropriate for modified water bodies that have changed category (e.g. river to reservoir). Here the assessment of the likelihood of failing the GES objective will be straightforward (comparing a reservoir with a river) as there will be little uncertainty over the identification of the water body as a provisional HMWB. Consequently, steps 5 & 6 should not involve complex assessments and steps 7-11 can start sooner.

As a general rule steps 7-11 and the assessment of the risk of failing the GEP objective should occur as soon as possible before Dec 2008.

By when?	**What major task?**	**What needs to be done for HMWB and AWB?**
2004	Characterisation of river basin district [Art. 5]	steps 1-6: Including: identification of water bodies (step 1); identification of AWB (step 2); description of hydromorphological changes (step 3); description of significant changes in hydromorphology (step 4); estimation of GES (non-AWB); likelihood of failing GES objective (Step 5; non-AWB); estimation of GEP (AWB); likelihood of failing GEP (AWB); and provisional HMWB identification (step 6).
2008/9	River basin management plan & public consultation [Art. 13 & 14]	steps 7-11: Including designation tests (steps 7 and 8), designation (step 9), identification of reference conditions (step 10) and environmental quality objective (step 11) for HMWB and AWB.

Figure 11: Major deadlines in the timetable for the identification and designation of HMWB and AWB in the first planning cycle

8.3 HMWB & AWB IN FUTURE RBMP CYCLES



Look out! The view of future RBMP cycles has some implications for the first process of designation

It is important to appreciate that the identification and designation of HMWB and AWB is not a "one off" process and the Directive provides for the flexibility to modify designations to take account of changes over time in environmental, social and economic circumstances.

The designation process in the second RBMP cycle will be different in several important aspects. Clearly it is not appropriate to give a detailed assessment of the designation process for future cycles here as it is likely to change as a result of experiences during the first planning cycle. We can, however, give an indication of the key differences that will be encountered.

8.3.1 Characterisation in the second cycle

The second characterisation of River Basin District (RBD) in the second RBMP cycle (first review) has to be finished by 2013 [Article5(2)]. The main difference with the first characterisation will be that water bodies (natural, HMWB & AWB) will already have been identified and a fully compliant monitoring programme should be in place.

Characterisation is likely to start with a review of monitoring data which will define the current (ca 2013) status of waters. On the basis of this information, water body definitions could be at least partly changed. This will ensure that water bodies can be used to correctly describe the status of surface waters. For example, if monitoring has demonstrated that the status of half a water body has changed, then the water body could be split in two, whereas if the status of two adjacent water bodies were now the same then they could be combined into a single water body.

The risk assessment process in the second RBMP cycle will be based on a better understanding of GES and GEP. Consequently, the risk assessment process will identify the risks of failure of good status for natural water bodies and GEP for HMWB and AWB.

8.3.2 Designation tests in the second cycle

In the second RBMP cycle the Article 4(3) designation tests will be applied in three circumstances: (i) (ii) and (iii) below:

(i) Suspected HMWB and AWB which were, possibly, mistakenly not designated in the first RBMP. For instance water bodies which were historically modified but which were mistakenly not identified and designated during the previous planning cycle (they have not deteriorated);

(ii) Newly modified water bodies. For instance water bodies that have become substantially changed in character as a result of the application of the Article 4(7) derogation.

Water bodies from situations (i) and (ii) will in general proceed in the same manner as in the first RBMP cycle, but without provisional identification of HMWB.

(iii) As part of the review of existing HMWB and AWB. The designations of HMWB and AWB must be reviewed every six years. It is assumed that these reviews will be undertaken as part of the production of the RBMP which will be complete in 2015. It is assumed that a review of HMWB and AWB will involve a reconsideration of the designation tests. This is likely to include a screening process which will assess whether the situation has changed since the original designation [Annex VII (B)]. Only where changes have occurred will the water body be considered for the designation tests in the second cycle. A review may be necessary if there has been a change in the:

- technical circumstances of the use (including operation and maintenance) or the disappearance of the use;
- use itself;
- available restoration measures, so that they may no longer have a significant adverse effect on the use or the environment;
- "other means" available to deliver the same beneficial objective of the use, so that they may no longer be disproportionately expensive or technically infeasible.

In future planning cycles existing HMWB and AWB may be "de-designated" and new HMWB and AWB being designated.

8.3.3 Review of MEP (and GEP) values in the second cycle

The values established for MEP in step 10, sub-steps 10.1-10.4, must be reviewed every six years (Annex II No. 1.3(ii)). This will mean that GEP also has to be revised every six years, as GEP is a "slight deviation" from MEP. This would involve a similar screening process as for the review of the designation tests.

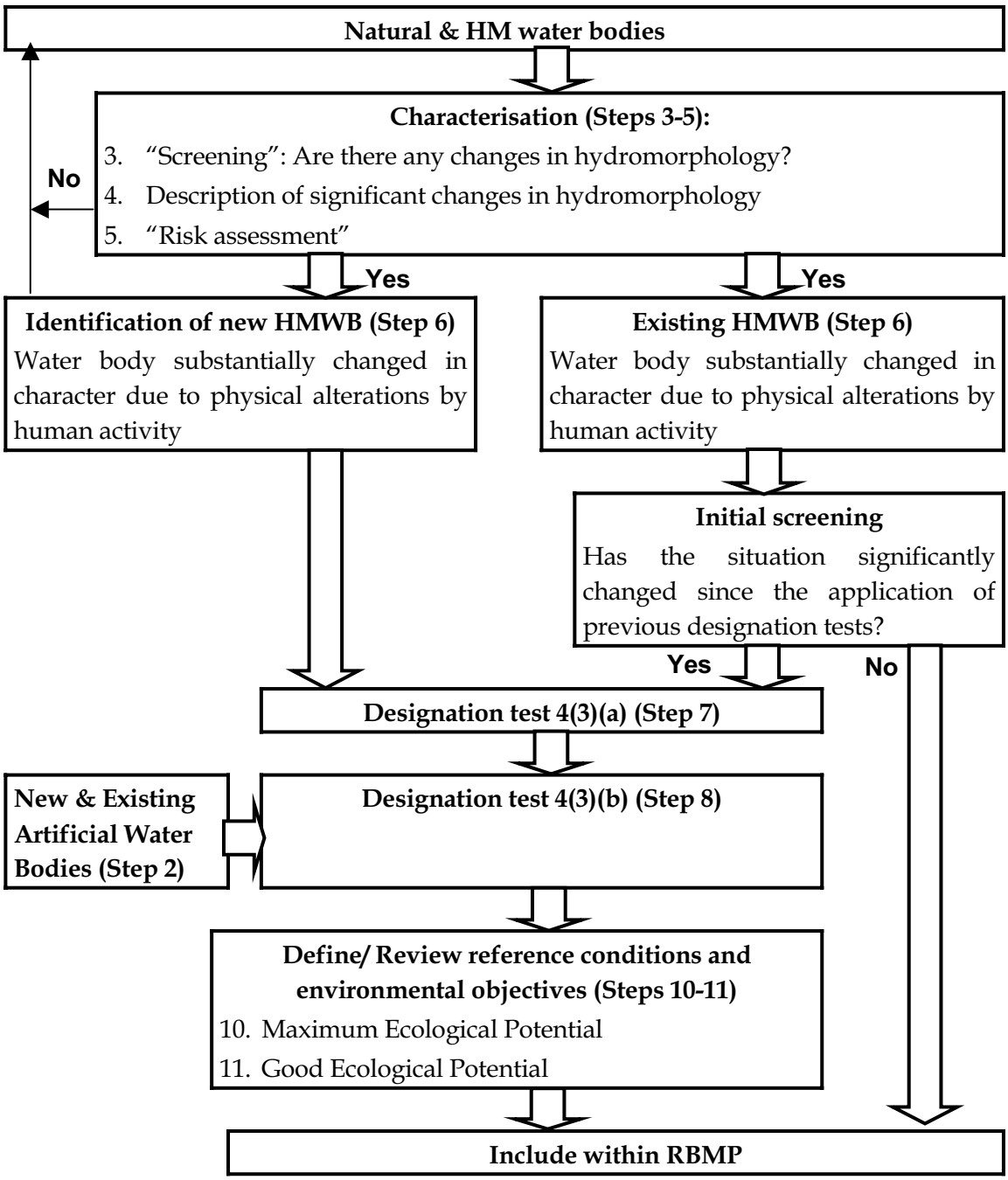


Figure 12: Consideration of HMWB during the second River Basin Management Plan

8.4 CONCLUSION AND OUTLOOK

This Guidance Document provides advice on how the HMWB and AWB identification and designation process should be undertaken during the first RBMP cycle (2008/2009). The designation process in the second and in subsequent RBMP cycles will be different in several aspects. It is important to appreciate that the identification and designation of HMWB and AWB is not a "one off" process and that the WFD provides for the flexibility to modify designations to take account of changes over time in environmental, social and economic circumstances.

This Guidance Document is based on the experiences of thirty-four case studies. It should, therefore, be applicable to most circumstances. However, further experiences in implementing the provisions relevant to HMWB and AWB in Member States will shed new light on the interpretation of the HMWB and AWB requirements of the Directive and the approach suggested in the Guidance and the accompanying toolbox. In the pilot river basins as well as in other river basins across Europe the Guidance will be applied in the coming months and years. This HMWB and AWB Guidance Document will require adaptations as a result of these new experiences and, as all other CIS Guidance Documents, the HMWB and AWB Guidance will remain a "living document".

9 LIST OF REFERENCES

Hansen, Wenke, Eleftheria Kampa, Christine Laskov and R. Andreas Kraemer (2002), Synthesis Report on the Identification and Designation of Heavily Modified Water Bodies (draft), Ecologic (Institute for International and European Environmental Policy), Berlin, 29th April 2002.

Owen, Roger, Willie Duncan and Peter Pollard (2002), Definition and Establishment of Reference Conditions, Scottish Environment Protection Agency, April 2002.

WFD CIS Guidance Document No. 1 (Aug 2002). *Economics and the Environment – The Implementation Challenge of the Water Framework Directive*. Published by the Directorate General Environment of the European Commission, Brussels, ISBN No. 92-894-4144-4, ISSN No. 1725-1087.

WFD CIS Guidance Document No. 2 (Dec 2002). *Identification of Water Bodies*. Published by the Directorate General Environment of the European Commission, Brussels, ISBN No. 92-894-5122-X, ISSN No. 1725-1087.

WFD CIS Guidance Document No. 3 (Dec 2002). *Analysis of Pressures and Impacts*. Published by the Directorate General Environment of the European Commission, Brussels, ISBN No. 92-894-5123-8, ISSN No. 1725-1087.

WFD CIS Guidance Document No. 4 (Jan 2003). *Identification and Designation of Artificial and Heavily Modified Waterbodies*. Published by the Directorate General Environment of the European Commission, Brussels, ISBN No. 92-894-5124-6, ISSN No. 1725-1087.

WFD CIS Guidance Document No. 5 (Feb 2003). *Transitional and Coastal Waters – Typology, Reference Conditions and Classification Systems*. Published by the Directorate General Environment of the European Commission, Brussels, ISBN No. 92-894-5125-4, ISSN No. 1725-1087.

WFD CIS Guidance Document No. 6 (Dec 2002). *Towards a guidance on establishment of the intercalibration network and the process on the intercalibration exercise*. Published by the Directorate General Environment of the European Commission, Brussels, ISBN No. 92-894-5126-2, ISSN No. 1725-1087.

WFD CIS Guidance Document No. 7 (Jan 2003). *Monitoring under the Water Framework Directive*. Published by the Directorate General Environment of the European Commission, Brussels, ISBN No. 92-894-5127-0, ISSN No. 1725-1087.

WFD CIS Guidance Document No. 8 (Dec 2002). *Public Participation in Relation to the Water Framework Directive*. Published by the Directorate General Environment of the European Commission, Brussels, ISBN No. 92-894-5128-9, ISSN No. 1725-1087.

WFD CIS Guidance Document No. 9 (Dec 2002). *Implementing the Geographical Information System Elements (GIS) of the Water Framework Directive*. Published by the Directorate General Environment of the European Commission, Brussels, ISBN No. 92-894-5129-7, ISSN No. 1725-1087.

WFD CIS Guidance Document No. 10 (Mar 2003). *Rivers and Lakes – Typology, Reference Conditions and Classification Systems*. Published by the Directorate General Environment of the European Commission, Brussels, ISBN No. 92-894-5614-0, ISSN No. 1725-1087.

ANNEX I - GLOSSARY

Terms used within the Guidance (excluding terms already defined in Article 2 of the Directive).

Term	Definition
Beneficial objectives	The benefits that result from the artificial or heavily modified characteristics of a water body. These can include "specified use"-related or environmental benefits.
Common Implementation Strategy	The Common Implementation Strategy for the Water Framework Directive (known as the CIS) was agreed by the European Commission, Member States and Norway in May 2001. The main aim of the CIS is to provide support in the implementation of the WFD, by developing a common understanding and guidance on key elements of this Directive. Experts from the above countries and candidate countries as well as stakeholders from the water community are all involved in the CIS to: • Raise awareness an exchange information; • Develop Guidance Documents on various technical issues; and, • Carry out integrated testing in pilot river basins. A series of working groups and joint activities has been developed to help carry out the activities listed above. A Strategic Co-ordination Group (or SCG) oversees these working groups and reports directly to the Water Directors of the European Union, Norway, Switzerland, the Candidate Countries and Commission, the engine of the CIS. For more information refer to the following website: http://europa.eu.int/comm/environment/water/water-framework/index_en.html.
Impact	The environmental effect of a pressure (e.g. fish killed, ecosystem modified).
Modification	Change (or changes) made to the surface water body by human activity (which may result in failing to meet good ecological status). Each modification will have a current or historical "specified use" (such as straightening for navigation, or construction of flood banks for flood defence).

Term	Definition
Physical alterations	Modifications of the hydromorphology of a water body by human activity.
Pressure[26]	The direct effect of the driver (for example, an effect that causes a change in flow or a change in the water chemistry of surface and groundwater bodies.
Restoration measures	Necessary hydromorphological changes to achieve GES (e.g. re-meandering of a straightened channel and introduction of "natural" pool-riffle sequences using references to historical channel form). Associated with "Designation test 4(3)(a)".
Specified use	Water uses as described in Article 4(3)(a)(ii)-(v).
WFD, The Directive	Directive 2000/60/EC establishing a framework for Community action in the field of water policy.
Wider environment	The natural environment and the human environment including archaeology, heritage, landscape and geomorphology.

[26] Interim working definition. Discussions in the context of the WFD implementation are ongoing

ANNEX II - HMWB AND RIVER BASIN MANAGEMENT PLANS (FIRST CYCLE)

The RBMP must be produced for each river basin district [Article 13(1)], covering the information detailed in Annex VII [Article 13(4)]. The information detailed in Annex VII relevant for HMWB and AWB in the first cycle concern at least the following points A1, A2, A4 and A7 of Annex VII:

A1 requires a general description of the characteristics of the river basin district [Article 5 and Annex II No. 1.1/2/3], i.e. the identification of boundaries of water bodies, a mapping of types and an identification of reference conditions. Guidance on the identification of HMWB and AWB as well as the identification of the maximum ecological potential (MEP) have to be given by this HMWB and AWB Guidance Document. The process should be in line with the general identification of water bodies and the identification of reference conditions (REFCOND and COAST Guidance Documents).

A2 requires a summary of significant pressures and impacts of human activity [Article 5 and Annex II No. 1.4/5], i.e. an overall description of significant pressures such as important hydromorphological changes and an assessment of those surface waters being at risk of failing the environmental objectives. Guidance on the overall description of significant pressures and the assessment of impacts will be provided by the IMPRESS Guidance, the identification of significant physical pressures and their impact on hydromorphology and biology as well as the designated HMWB and AWB being at risk of failing the environmental quality objective (GEP) should be covered by the HMWB & AWB Guidance. The process of HMWB and AWB identification and designation should be in line with the general approach of IMPRESS.

A4 requires a map of the monitoring networks and a presentation, in a mapped format, of the results of the monitoring programmes [Article 8 and Annex V]. It is assumed that the Guidance on the monitoring requirements for HMWB and AWB will be provided by the Monitoring Working Group. Some advice for the selection of the most sensitive indicators for the operational monitoring of HMWB and AWB identified as being at risk will be provided by this HMWB Guidance Document.

A7 requires a summary of the programmes of measures [Article 11], including information on how the established environmental quality objectives [Article 4] are to be achieved. The HMWB & AWB Guidance and toolbox should assist in identifying those measures which could improve the status of HMWB and AWB resulting from physical impacts. Not only measures for the designation tests [Article 4(3)] will be provided, i.e. examples for restoration measures to achieve GES, but also mitigation measures - which have no adverse effects on "specified uses" or the wider environment - to identify MEP and to achieve GEP. The measures will consider all important specified uses and focus on the improvement of the hydromorphological circumstances.

ANNEX III - ELEMENTS OF HMWB IN THE WFD (ORIGINAL TEXT)

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

Title	Specification	Provision
Article 2	**Definitions**	
	4.	'River' means a body of inland water flowing for the most part on the surface of the land but which may flow underground for part of its course.
	8.	'Artificial water body' means a body of surface water created by human activity.
	9.	'Heavily modified water body' means a body of surface water which as a result of physical alterations by human activity is substantially changed in character, as designated by the Member State in accordance with the provisions of Annex II.
	10.	'Body of surface water' means 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.
	23.	'Good ecological potential' is the status of a heavily modified or an artificial body of water, so classified in accordance with the relevant provisions of Annex V.
Article 4	**Environmental objectives**	
	1.	In making operational the programmes of measures specified in the river basin management plans:
		(a) for surface waters
		(i) Member States shall implement the necessary measures to prevent deterioration of the status of all bodies of surface water, subject to the application of paragraphs 6 and 7 and without prejudice to paragraph 8;

Article 4 Environmental objectives

(ii) Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status at the latest 15 years after the date of entry into force of this Directive, in accordance with the provisions laid down in Annex V, subject to the application of extensions determined in accordance with paragraph 4 and to the application of paragraphs 5, 6 and 7 without prejudice to paragraph 8;

(iii) Member States shall protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status at the latest 15 years from the date of entry into force of this Directive, in accordance with the provisions laid down in Annex V, subject to the application of extensions determined in accordance with paragraph 4 and to the application of paragraphs 5, 6 and 7 without prejudice to paragraph 8;

(iv) Member States shall implement the necessary measures in accordance with Article 16(1) and (8), with the aim of progressively reducing pollution from priority substances and ceasing or phasing out emissions, discharges and losses of priority hazardous substances;

without prejudice to the relevant international agreements referred to in Article 1 for the parties concerned.

3. Member States may designate a body of surface water as artificial or heavily modified, when:

(a) the changes to the hydromorphological characteristics of that body which would be necessary for achieving good ecological status would have significant adverse effects on:

(i) the wider environment;

(ii) navigation, including port facilities, or recreation;

(iii) activities for the purposes of which water is stored, such as drinking-water supply, power generation or irrigation;

(iv) water regulation, flood protection, land drainage; or

(v) other equally important sustainable human development activities.

(b) the beneficial objectives served by the artificial or modified characteristics of the water body cannot, for reasons of technical feasibility or disproportionate costs, reasonably be achieved by other means, which are a significantly better environmental option.

Article 4 Environmental objectives

Such designation and the reasons for it shall be specifically mentioned in the river basin management plans required under Article 13 and reviewed every six years.

4. The deadlines established under paragraph 1 may be extended for the purposes of phased achievement of the objectives for bodies of water, provided that no further deterioration occurs in the status of the affected body of water when all of the following conditions are met:

   (a) Member States determine that all necessary improvements in the status of bodies of water cannot reasonably be achieved within the timescales set out in that paragraph for at least one of the following reasons:

      (i) the scale of improvements required can only be achieved in phases exceeding the timescale, for reasons of technical feasibility;

      (ii) completing the improvements within the timescale would be disproportionately expensive;

      (iii) natural conditions do not allow timely improvement in the status of the body of water.

   (b) Extension of the deadline, and the reasons for it, are specifically set out and explained in the river basin management plan required under Article 13.

   (c) Extensions shall be limited to a maximum of two further updates of the river basin management plan except in cases where the natural conditions are such that the objectives cannot be achieved within this period.

   (d) A summary of the measures required under Article 11 which are envisaged as necessary to bring the bodies of water progressively to the required status by the extended deadline, the reasons for any significant delay in making these measures operational, and the expected timetable for their implementation are set out in the river basin management plan. A review of the implementation of these measures and a summary of any additional measures shall be included in updates of the river basin management plan.

5. Member States may aim to achieve less stringent environmental objectives than those required under paragraph 1 for specific bodies of water when they are so affected by human activity, as determined in accordance with Article 5(1), or their natural condition is such that the achievement of these objectives would be infeasible or disproportionately expensive, and all the following conditions are met:

   (a) the environmental and socioeconomic needs served by such human activity cannot be achieved by other means, which are a significantly better environmental option not entailing disproportionate costs;

Article 4 Environmental objectives

(b) Member States ensure:

- for surface water, the highest ecological and chemical status possible is achieved, given impacts that could not reasonably have been avoided due to the nature of the human activity or pollution.

8. When applying paragraphs 3, 4, 5, 6 and 7, a Member State shall ensure that the application does not permanently exclude or compromise the achievement of the objectives of this Directive in other bodies of water within the same river basin district and is consistent with the implementation of other Community environmental legislation.

Article 5 Characteristics of the river basin district, review of the environmental impact of human activity and economic analysis of water use

1. Each Member State shall ensure that for each river basin district or for the portion of an international river basin district falling within its territory:

   - an analysis of its characteristics;
   - a review of the impact of human activity on the status of surface waters and on groundwater; and
   - an economic analysis of water use.

   is undertaken according to the technical specifications set out in Annexes II and III and that it is completed at the latest four years after the date of entry into force of this Directive.

2. The analyses and reviews mentioned under paragraph 1 shall be reviewed, and if necessary updated at the latest 13 years after the date of entry into force of this Directive and every six years thereafter.

Article 8 Monitoring of surface water status, groundwater status and protected areas

1. Member States shall ensure the establishment of programmes for the monitoring of water status in order to establish a coherent and comprehensive overview of water status within each river basin district:

   - for surface waters such programmes shall cover:

(i) the volume and level or rate of flow to the extent relevant for ecological and chemical status and ecological potential, and

(ii) the ecological and chemical status and ecological potential.

2. These programmes shall be operational at the latest six years after the date of entry into force of this Directive unless otherwise specified in the legislation concerned. Such monitoring shall be in accordance with the requirements of Annex V.

Article 11 Programme of measures

3. 'Basic measures' are the minimum requirements to be complied with and shall consist of:

(i) for any other significant adverse impacts on the status of water identified under Article 5 and Annex II, in particular measures to ensure that the hydromorphological conditions of the bodies of water are consistent with the achievement of the required ecological status or good ecological potential for bodies of water designated as artificial or heavily modified. Controls for this purpose may take the form of a requirement for prior authorisation or registration based on general binding rules where such a requirement is not otherwise provided for under Community legislation. Such controls shall be periodically reviewed and, where necessary, updated.

7. The programmes of measures shall be established at the latest nine years after the date of entry into force of this Directive and all the measures shall be made operational at the latest 12 years after that date.

Article 13 River basin management plans

4. The river basin management plan shall include the information detailed in Annex VII.

6. River basin management plans shall be published at the latest nine years after the date of entry into force of this Directive.

7. River basin management plans shall be reviewed and updated at the latest 15 years after the date of entry into force of this Directive and every six years thereafter.

Article 14 Public information and consultation

1. Member States shall encourage the active involvement of all interested parties in the implementation of this Directive, in particular in the production, review and updating of the river basin management plans. Member States shall ensure that, for each river basin district, they publish and make available for comments to the public, including users:

   (c) draft copies of the river basin management plan, at least one year before the beginning of the period to which the plan refers.

Annex II

1. Surface Waters

1.1. Characterisation of surface water body types

Member States shall identify the location and boundaries of bodies of surface water and shall carry out an initial characterisation of all such bodies in accordance with the following methodology. Member States may group surface water bodies together for the purposes of this initial characterisation.

(i) The surface water bodies within the river basin district shall be identified as falling within either one of the following surface water categories - rivers, lakes, transitional waters or coastal waters - or as artificial surface water bodies or heavily modified surface water bodies.

(v) For artificial and heavily modified surface water bodies the differentiation shall be undertaken in accordance with the descriptors for whichever of the surface water categories most closely resembles the heavily modified or artificial water body concerned.

1.3. Establishment of type-specific reference conditions for surface water body types

(ii) In applying the procedures set out in this Section to heavily modified or artificial surface water bodies references to high ecological status shall be construed as references to maximum ecological potential as defined in table 1.2.5 of Annex V. The values for maximum ecological potential for a water body shall be reviewed every six years.

1.4. Identification of Pressures

Member States shall collect and maintain information on the type and magnitude of the significant anthropogenic pressures to which the surface water bodies in each river basin district are liable to be subject, in particular the following.

Estimation and identification of significant point source pollution, in particular by substances listed in Annex VIII, from urban, industrial, agricultural and other installations and activities, based, *inter alia*, on information gathered under:

(i) Articles 15 and 17 of Directive 91/271/EEC;

(ii) Articles 9 and 15 of Directive 96/61/EC;

and for the purposes of the initial river basin management plan:

(iii) Article 11 of Directive 76/464/EEC; and

(iv) Directives 75/440/EC, 76/160/EEC, 78/659/EEC and 79/923/EEC.

Estimation and identification of significant diffuse source pollution, in particular by substances listed in Annex VIII, from urban, industrial, agricultural and other installations and activities; based, inter alia, on information gathered under:

(i) Articles 3, 5 and 6 of Directive 91/676/EEC;

(ii) Articles 7 and 17 of Directive 91/414/EEC;

(iii) Directive 98/8/EC;

and for the purposes of the first river basin management plan:

(iv) Directives 75/440/EEC, 76/160/EEC, 76/464/EEC, 78/659/EEC and 79/923/EEC.

Estimation and identification of significant water abstraction for urban, industrial, agricultural and other uses, including seasonal variations and total annual demand, and of loss of water in distribution systems.

Estimation and identification of the impact of significant water flow regulation, including water transfer and diversion, on overall flow characteristics and water balances.

Identification of significant morphological alterations to water bodies.

Estimation and identification of other significant anthropogenic impacts on the status of surface waters.

Estimation of land use patterns, including identification of the main urban, industrial and agricultural areas and, where relevant, fisheries and forests.

1.5. Assessment of Impact

Member States shall carry out an assessment of the susceptibility of the surface water status of bodies to the pressures identified above.

Member States shall use the information collected above, and any other relevant information including existing environmental monitoring data, to carry out an assessment of the likelihood that surface waters bodies within the river basin district will fail to meet the environmental quality objectives set for the bodies under Article 4. Member States may utilise modelling techniques to assist in such an assessment.

For those bodies identified as being at risk of failing the environmental quality objectives, further characterisation shall, where relevant, be carried out to optimise the design of both the monitoring programmes required under Article 8, and the programmes of measures required under Article 11.

Annex V

1.1. Quality elements for the classification of ecological status

1.1.5. The quality elements applicable to artificial and heavily modified surface water bodies shall be those applicable to whichever of the four natural surface water categories above most closely resembles the heavily modified or artificial water body concerned.

1.2. Normative definitions of ecological status classifications

1.2.5. Definitions for maximum, good and moderate ecological potential for heavily modified or artificial water bodies

Element	Maximum ecological potential	Good ecological potential	Moderate ecological potential
Biological quality elements	The values of the relevant biological quality elements reflect, as far as possible, those associated with the closest comparable surface water body type, given the physical conditions which result from the artificial or heavily modified characteristics of the water body.	There are slight changes in the values of the relevant biological quality elements as compared to the values found at maximum ecological potential.	There are moderate changes in the values of the relevant biological quality elements as compared to the values found at maximum ecological potential. These values are significantly more distorted than those found under good quality.

Element	Maximum ecological potential	Good ecological potential	Moderate ecological potential
Hydromorpho-logical elements	The hydromorphological conditions are consistent with the only impacts on the surface water body being those resulting from the artificial or heavily modified characteristics of the water body once all mitigation measures have been taken to ensure the best approximation to ecological continuum, in particular with respect to migration of fauna and appropriate spawning and breeding grounds.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Physico-chemical elements			
General conditions	Physico-chemical elements correspond totally or nearly totally to the undisturbed conditions associated with the surface water body type most closely comparable to the artificial or heavily modified body concerned. Nutrient concentrations remain within the range normally associated with such undisturbed conditions. The levels of temperature, oxygen balance and pH are consistent with those found in the most closely comparable surface water body types under undisturbed conditions.	The values for physico-chemical elements are within the ranges established so as to ensure the functioning of the ecosystem and the achievement of the values specified above for the biological quality elements. Temperature and pH do not reach levels outside the ranges established so as to ensure the functioning of the ecosystem and the achievement of the values specified above for the biological quality elements. Nutrient concentrations do not exceed the levels established so as to ensure the functioning of the ecosystem and the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.

Element	Maximum ecological potential	Good ecological potential	Moderate ecological potential
Specific synthetic pollutants	Concentrations close to zero and at least below the limits of detection of the most advanced analytical techniques in general use.	Concentrations not in excess of the standards set in accordance with the procedure detailed in Section 1.2.6 without prejudice to Directive 91/414/EC and Directive 98/8/EC. (< EQS)	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Specific non-synthetic pollutants	Concentrations remain within the range normally associated with the undisturbed conditions found in the surface water body type most closely comparable to the artificial or heavily modified body concerned (background levels = bgl).	Concentrations not in excess of the standards set in accordance with the procedure detailed in Section 1.2.6 (1) without prejudice to Directive 91/414/EC and Directive 98/8/EC. (< EQS)	Conditions consistent with the achievement of the values specified above for the biological quality elements.

1.4. Classification and presentation of ecological status

1.4.1. Comparability of biological monitoring results

(i) Member States shall establish monitoring systems for the purpose of estimating the values of the biological quality elements specified for each surface water category or for heavily modified and artificial bodies of surface water. In applying the procedure set out below to heavily modified or artificial water bodies, references to ecological status should be construed as references to ecological potential. Such systems may utilise particular species or groups of species which are representative of the quality element as a whole.

1.4.2. Presentation of monitoring results and classification of ecological status and ecological potential

(i) For surface water categories, the ecological status classification for the body of water shall be represented by the lower of the values for the biological and physico-chemical monitoring results for the relevant quality elements classified in accordance with the first column of the table set out below. Member States shall provide a map for each river basin district illustrating the classification of the ecological status for each body of water, colour-coded in accordance with the second column of the table set out below to reflect the ecological status classification of the body of water:

Ecological status classification	Colour Code
High	Blue
Good	Green
Moderate	Yellow
Poor	Orange
Bad	Red

(ii) For heavily modified and artificial water bodies, the ecological potential classification for the body of water shall be represented by the lower of the values for the biological and physico-chemical monitoring results for the relevant quality elements classified in accordance with the first column of the table set out below. Member States shall provide a map for each river basin district illustrating the classification of the ecological potential for each body of water, colour-coded, in respect of artificial water bodies in accordance with the second column of the table set out below, and in respect of heavily modified water bodies in accordance with the third column of that table:

Ecological potential classification	Colour code	
	Artificial Water Bodies	Heavily Modified
Good and above	Equal green and light grey stripes	Equal green and dark grey stripes
Moderate	Equal yellow and light grey stripes	Equal yellow and dark grey stripes
Poor	Equal orange and light grey stripes	Equal orange and dark grey stripes
Bad	Equal red and light grey stripes	Equal red and dark grey stripes

(iii) Member States shall also indicate, by a black dot on the map, those bodies of water where failure to achieve good status or good ecological potential is due to non-compliance with one or more environmental quality standards which have been established for that body of water in respect of specific synthetic and non-synthetic pollutants (in accordance with the compliance regime established by the Member State).

Annex VII River basin management plans

A. River basin management plans shall cover the following elements:

1. a general description of the characteristics of the river basin district required under Article 5 and Annex II. This shall include:

1.1. for surface waters:

- mapping of the location and boundaries of water bodies;
- mapping of the ecoregions and surface water body types within the river basin;
- identification of reference conditions for the surface water body types.

2. a summary of significant pressures and impact of human activity on the status of surface water and groundwater, including:

- estimation of point source pollution;
- estimation of diffuse source pollution, including a summary of land use;
- estimation of pressures on the quantitative status of water including abstractions;
- analysis of other impacts of human activity on the status of water.

4. a map of the monitoring networks established for the purposes of Article 8 and Annex V, and a presentation in map form of the results of the monitoring programmes carried out under those provisions for the status of:

4.1 surface water (ecological and chemical);

4.2 groundwater (chemical and quantitative);

4.3 protected areas;

7. a summary of the programme or programmes of measures adopted under Article 11, including the ways in which the objectives established under Article 4 are thereby to be achieved.

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PIO	Simone	PORTUGAL	Ministerio do Ambiente e do Ordamento do Territorio	Av. Almirante Gago Coutinho 30; PT-1049-066 Lisbon	[351] 21 8430093	[351] 218473571	simonep@inag.pt
PUNCOCHAR	Pavel	CZECH REPUBLIC	Ministry of Agriculture/Department of Water Management Policy	Tes.Nov. 17 CZ-11705 Prague 1	[42] 02 2181 2362	[42] 02 2181 2983	puncochar@mze.cz
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WARMOES	Thierry	BELGIUM	Flemish Environment Agency	Bondgenotenlaan 140 B-3000 Leuven	[32] 1623 21 38	[32] 16-22 89 77	t.warmoes@vmm.be
WALCYKIEWICZ	Tomasz	POLAND	Ministry of Environment, Department of Water Resources	52/54 Wawelska St. PL-00-922 Warsaw	[48] 22 5792331	[48] 22 5792294	tomasz.walcykiewicz@mos.gov.pl
ZAVADSKY	Ivan	SLOVAKIAN REPUBLIC.					zavadsky.ivan@flora.lifeenv.gov.sk

ANNEX V – LIST OF CASE STUDIES AND CONTACTS

The case studies have been carried out for the work of the HMWB WG and can be downloaded from http://www.sepa.org.uk/hmwbworkinggroup.

List of case study contacts

Country	Name of Case Study	Name	Institution	Email	Tele-phone
A	Bregenzerach R.	Konecny, Robert	Umweltbundesamt Österreich	Konecny@ubavie.gv.at	[43]131304 3581
	Danube R.	Konecny, Robert	Umweltbundesamt Österreich	Konecny@ubavie.gv.at	[43]131304 3581
	Wienfluss	Konecny, Robert	Umweltbundesamt Österreich	Konecny@ubavie.gv.at	[43]131304 3581
B	Dender R.	Vandaele, Karel	SORESMA	Karel.vandaele@soresma.be	[32] 3-2215540
D	Elbe R.	Frey, Michaela	University of Kassel	m.frey@bauing.uni-kassel.de	[49] 561-804 3949
	Seefelder Aach R.	Funke, Markus	University of Kassel	Funkem@hrz.uni-kassel.de	[49] 561-8043912
	Lahn R.	Kuellmar, Ingrid	University of Kassel	Ingrid.kuellmar@uni-kassel.de	[49] 561-8043991
	Ruhr R.	Podraza, Petra	University of Essen	Petra.podraza@uni-essen.de	[49] 201-1833868
	Mulde R.	Podraza, Petra	University of Essen	Petra.podraza@uni-essen.de	[49] 201-1833868
	Dhünn R.	Borchardt, Dietrich	University of Essen	Dietrich.Borchardt@uni-kassel.de	[49] 561-8043912
E	Lozoya R.	Diaz, Jose-Antonio	Ministerio del Medio Ambiente	Joseantonio.diaz@chtajo.es	[34] 91- 53 50 500
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F	Authie R.	Aubert, Geraldine	Agence de l´Eau Artois-Picardie	G.Aubert@eau-artois-picardie.fr	
	Sarre R.	Demortier, Guillaume	Agence de l´Eau Rhin-Meuse	DEMORTIER.G@Eau-Rhin-Meuse.fr	[33] 3-87344841
	Rhone R.	Stroffek, Stéphane	Agence de l´Eau Rhone-Mediterranée-Corse	Stephane.STROFFEK@eaurmc.fr	
GR	Nestos R.	Kouvopoulos, Yannis	Public Power Corporation	Tsmys3@daye.gr	
NL	Haringvliet Est.	Backx, J.J.G.M.	RIZA	J.Backx@riza.rws.minvenw.nl	[31] 78-6332736
	Hagmolenbeek-Hegebeek R.	Lorenz, C.M.	Witteveen & Bos	c.lorenz@witbo.nl	[31] 570-697272
	Loosdrecht L.	Lorenz, C.M.	Witteveen & Bos	c.lorenz@witbo.nl	[31] 570-697272
	Veluwerandmeren	Lorenz, C.M.	Witteveen & Bos	c.lorenz@witbo.nl	[31] 570-697272

Country	Name of Case Study	Name	Institution	Email	Tele-phone
NO	Suldalslagen R.	Pedersen, Tor Simon	Norwegian Water Researches and Energy Dir/Hydrology Dept	tsp@nve.no	[47] 22-959 205
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S	Eman R.	Weichelt, Ann-Karin	County Administrative Board Jönköping	Lansstyrelsen@f.lst.se	[46] 36-395000
	Daläven R.	Beier, Ulrike	National Board of Fisheries, Institute of Freshwater Research	Ulrika.Beier@fiskriverket.se	[46] 8- 7590338
	Ume R.	Jansson, Roland	Swedish Environmental Protection Agency/Department of Environmental Assessment	Roland@eg.umu.se	[46] 90-7869573
	Archipelago, Baltic Sea	Tullback, Klara	County Administrative Board	Klara.tullback@ab.lst.se	[46] 8-7854103
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	Tame R.	Dunbar, Michael	Centre for Ecology and Hydrology	Mdu@ceh.ac.uk	[44] 1491-838800
	Sankey Brook	Dunbar, Michael	Centre for Ecology and Hydrology	Mdu@ceh.ac.uk	[44] 1491-838800
	Great Ouse R.	Dunbar, Michael	Centre for Ecology and Hydrology	Mdu@ceh.ac.uk	[44] 1491-838800
UK (Scot)	Forth Estuary	Black, A. R.	Geography Department, University of Dundee	a.z.black@dundee.ac.uk	[44] 1382-344434
	Tummel R.	Black, A. R.	Geography Department, University of Dundee	a.z.black@dundee.ac.uk	[44] 1382-344434
	Dee R.	Black, A. R.	Geography Department, University of Dundee	a.z.black@dundee.ac.uk	[44] 1382-344434
UK (NI)	Lagan R.	Corbelli, David	SEPA	David.corbelli@sepa.org.uk	[44] 17-86457700

The sub-groups and water body categories of the HMWB case studies

Country	Name of Case Study	Navigation subgroup (lead: D)	Hydropower subgroup (lead: A)	River	Lake	Transitional waters	Coastal waters
A	Bregenzerach R.		+	+			
	Danube R.	+	+	+			
	Wienfluss			+			
B	Dender R.	+		+			
D	Elbe R.	+		+			
	Seefelder Aach R.		+	+			
	Lahn R.	+	+	+			
	Ruhr R.		+	+			
	Mulde R.			+			
	Dhünn R.			+			
E	Lozoya R.		+	+			
SF	Kemijärvi L.		+		+		
F	Authie R.			+			
	Sarre R.			+			
	Rhone R.			+			
GR	Nestos R.		+	+			
NL	Haringvliet Est.	+				+	
	Hagmolenbeek-Hegebeek R.			+			
	Loosdrecht L.				+		
	Veluwerandmeren				+		
NO	Suldalslagen R.		+	+			
	Beiarn R.		+	+			
S	Eman R.		+	+			
	Daläven R.		+	+			
	Ume R.		+	+			
	Archipelago, Baltic Sea						+
UK (E&W)	Kennet R. (Thames)	+		+			
	Tame R.			+			
	Sankey Brook	+		+			
	Great Ouse R.	+		+			
UK (Scot)	Forth Est.					+	
	Tummel R.		+	+			
	Dee R.		+	+			
UK (NI)	Lagan R.	+		+			

Case studies and the specified uses

Country	Name of Case Study	Navigation	Flood/coastal protection	Hydro-power	Water supply	Agriculture / forestry	Urbanisation	Industry	Recreation	Other specified uses
	Notes: (*** : Specified use of high intensity, ** : Specified use of intermediate intensity, * : Specified use of lower intensity)									
A	Bregenzerach R.			***						
	Danube R.	**	***	***				**		
	Wienfluss		***				**			
B	Dender R.	***	*			*	*	**		
D	Elbe R.	***	***			**	*		*	Fishing
	Seefelder Aach R.		**	***		***		*	*	
	Lahn R.	**	**	***		*	*	*		
	Ruhr R.	*	**	**	***	*	***	**	***	
	Mulde R.		**	***	**	**	**	**		
	Dhünn R.		**	**	***	*	***		**	
E	Lozoya R.			**	***	*	*		*	
SF	Kemijärvi L.		**	***		*	*	*	*	Fish farms
F	Authie R.		**	**		***	**	*	*	Fish farms
	Rhone R.	***	***	***		*	**			
	Sarre R.	*	**			**	*			
GR	Nestos R.		**	***		**				
NL	Haringvliet Est.	***	***		**	*				
	Hagmolenbeek-Hegebeek R.	**	**			***				
	Loosdrecht L.	**	**		*	**	*		**	Fisheries
	Veluwerandmeren	*	**		*	**	*	*	*	Fisheries
NO	Suldalslagen R.			***		*	*	*	*	
	Beiarn R.		*	***		*			*	
S	Eman R.			***		*	*			Fishing

Country	Name of Case Study	Navigation	Flood/coastal protection	Hydro-power	Water supply	Agriculture / forestry	Urbanisation	Industry	Recreation	Other specified uses
	Notes: (*** : Specified use of high intensity, ** : Specified use of intermediate intensity, * : Specified use of lower intensity)									
	Dalalven R.			***		**				
	Ume R.		*	***		**	*	*	*	Fishing
	Archipelago,Baltic coastal	***	***			**	***	*	***	Fish farms
UK (E&W)	Kennet R. (Thames)	***	**		*	**	**	**		
	Tame R.	**	***			*	***	**		
	Sankey Brook	*	**		**	**	***	**		
	Great Ouse R.	**	***		*	***	**	**		
UK (Scot)	Forth Est.	**	***			**	***	***	*	Agricultural land take, industrial land take
	Tummel R.			***					*	
	Dee R.			***	*	*			*	Fish farms
UK (NI)	Lagan R.		**			***	***	*	*	

ANNEX VI - CASE STUDY REPORTS

Austria

Konecny, Robert, Arno Aschauer, Andreas Chovanec, Johann Waringer, Reinhard Wimmer and Stefan Schmutz (2002), Heavily Modified Waters in Europe - Case Study Danube, Federal Environment Agency, Vienna.

Konecny, Robert, Arno Aschauer, Andreas Chovanec, Reinhard Wimmer, Stefan Schmutz (2002), Heavily Modified Waters in Europe - Case Study Bregenzerach, Federal Environment Agency, Vienna.

Konecny, Robert, Arno Aschauer, Andreas Chovanec, Reinhard Wimmer and Hubert Keckeis (2002), Heavily Modified Waters in Europe - Case Study Wienfluss, Federal Environment Agency, Vienna.

Belgium

Vandaele, Karel, Ingrid De Bruyne, Gert Pauwels, Isabelle Willems and Thierry Warmoes (2002), Heavily Modified Waters in Europe - Case Study on the Dender river, the Mark river and Bellebeek river in Flanders, Soresma environmental consultants and Flemish Environmental Agency, Leuven and Antwerp.

Finland

Marttunen, Mika and Seppo Hellsten (2002), Heavily Modified Waters in Europe - Case Study on the Lake Kemijärvi, Finland, Finnish Environment Institute, Helsinki.

France

Agence de l'Eau Artois Picardie (2002), Heavily Modified Water Bodies – Case study on the River Authie , France.

Agence de l'Eau Rhin-Meuse (2002), Heavily Modified Water Bodies – Case Study on the River Sarre, France.

Agence de l'Eau Rhone Mediterranée Corse (2002), Heavily Modified Water Bodies – Case Study on the River Rhone, France.

Germany

Borchardt, Dietrich and Petra Podraza (2002), Heavily Modified Waters in Europe – Case Study on the river Dhünn, Institute for Water Resources Research and Management, University Kassel, Kassel.

Funke, Markus, Dietrich Borchardt, Michaela Frey and Ingrid Schleiter (2002), Heavily Modified Waters in Europe - Case Study on the Seefelder Aach River, Institute for Water Resources Research and Management, University of Kassel, Kassel.

Frey, Michaela, Dietrich Borchardt, Markus Funke and Ingrid Schleiter (2002a), Heavily Modified Waters in Europe - Case Study on the Elbe River, Institute for Water Resources Research and Management University Kassel, Kassel.

Müller, Andreas, Dirk Glacer, Martin Halle, Petra Podraza and Thomas Zumbroich (2002) Heavily Modified Waters in Europe - Case Study on the River Zwickauer Mulde, Buero fuer Umweltanalytik, Bonn, Essen.

Podraza, Petra, Dirk Glacer, Martin Halle, Andreas Müller and Thomas Zumbroich (2002) Heavily Modified Waters in Europe - Case Study on the River Ruhr, University of Essen, Institute of Ecology, Department of Hydrobiology, Essen.

Schleiter, Ingrid, Dietrich Borchardt, Markus Funke and Michaela Frey (2002), Heavily Modified Waters in Europe - Case Study on the River Lahn , Institute for Water Resources Research and Management, University Kassel, Kassel.

Greece

Paraskevopoulos, Alexis (2001), Heavily Modified Waters in Europe - Case Study on the River Nestos, Paraskevopoulos-Georgiadis EPE.

Netherlands

Backx, J.J.G.M., G. v.d. Berg, N. Geilen, A. de Hoog, EJ. Houwing, M. Ohm, M. van Oirschot and M. van Wijngaarden (2002), Heavily Modified Waters in Europe - Case Study on the Haringvliet Estuary, RIZA, Dordrecht.

Lorenz, C.M. in association with DWR and RIVM (2001), Heavily Modified Waters in Europe - Case Study on Lake Loosdrecht, Witteveen+Bos (W+B), DWR and RIVM, Deventer.

Lorenz, C.M. in association with RDIJ and RIZA (2001a), Heavily Modified Waters in Europe - Case Study on the Veluwerandmeren, Witteveen+Bos (W+B), RDIJ and RIZA, Deventer.

Lorenz, C.M. (2001b), Heavily Modified Waters in Europe - Case Study on the Hagmolen-Hegebeek, Witteveen+Bos (W+B), Deventer.

Norway

Bjørtuft, Sigurd K., Jan-Petter Magnell and Jan Ivar Koksvik (2002), Heavily Modified Waters in Europe - Case Study on the Beiarelva watercourse, Statkraft Grøner and Norwegian University of Science and Technology (NTNU), Lysaker and Trondheim.

Johansen, Stein W., Jan-Petter Magnell, Svein Jakob Saltveit and Nils Roar Saelthun (2002), Heavily Modified Waters in Europe - Case Study on the Suldalslågen River, Statkraft-Grøner, NIVA and LFI, Lysaker.

Spain

Diaz, Jose-Antonio and Montserrat Real (2001), Heavily Modified Waters in Europe - Case Study on the river Lozoya (Tajo, Spain), Confederación Hidrográfica del Tajo, Calidad de Aguas and Limnos, S.A., Barcelona, Madrid.

Sweden

Beier, Ulrike (2002), Heavily Modified Waters in Europe – Case Study on the River Daläven, National Board of Fisheries, Institute of Freshwater Research, Drottingholm.

Jansson, Roland (2002), Heavily Modified Waters in Europe: Case Study on the Ume River in northern Sweden, Landscape Ecology Group, Department of Ecology and Environmental Science, Umeå University, Umeå.

Weichelt, Anna-Karin (2001), Heavily Modified Waters in Europe - Case Study on the Emån river, Sweden, County Administrative Board Jönköping, Jönköping.

Tullback, Klara and Cecilia Lindblad (2001), Heavily Modified Waters in Europe - A Case Study of the Stockholm Archipelago, Baltic Sea, County Administrative Board of Stockholm, Environment and Planning Department and Department of Botany Stockholm University, Stockholm.

UK, Northern Ireland

Hale, Peter, David Corbelli, Claire Vincent, Meg Postle, Teresa Venn and John Ash (2002), Heavily Modified Waters in Europe - Case Study on the River Lagan, the Tidal Lagan Transitional Water & the Port of Belfast Coastal Water, Northern Ireland, Environment and Heritage Service and Risk & Policy Analysts, Lisburn, London.

UK, England and Wales

Dunbar, Michael, Douglas Booker, Charlie Stratford, Peter Latimer, Helen Rogerson, Jonathan Bass, Hugh Dawson, Rodolphe Gozlan, Stewart Welton, John Ash, Teresa Fenn and Meg Postle (2002), Heavily Modified Waters in Europe – Case Study on the Great Ouse Catchment, submitted by the Environment Agency of England & Wales and the UK Government Department for Food, Environment and Rural Affairs, England and Wales.

Dunbar, Michael, Douglas Booker, Charlie Stratford, Peter Latimer, Helen Rogerson, Jonathan Bass, Hugh Dawson, Rodolphe Gozlan, Stewart Welton, John Ash, Teresa Fenn and Meg Postle (2002), Heavily Modified Waters in Europe – Case Study on the Tame Catchment, submitted by the Environment Agency of England & Wales and the UK Government Department for Food, Environment and Rural Affairs, England and Wales.

Dunbar, Michael, Douglas Booker, Charlie Stratford, Peter Latimer, Helen Rogerson, Jonathan Bass, Hugh Dawson, Rodolphe Gozlan, Stewart Welton, John Ash, Teresa Fenn and Meg Postle (2002), Heavily Modified Waters in Europe – Case Study on the Sankey Catchment, submitted by the Environment Agency of England & Wales and the UK Government Department for Food, Environment and Rural Affairs, England and Wales.

Dunbar, Michael, Douglas Booker, Charlie Stratford, Peter Latimer, Helen Rogerson, Jonathan Bass, Hugh Dawson, Rodolphe Gozlan, Stewart Welton, John Ash, Teresa Fenn and Meg Postle (2002), Heavily Modified Waters in Europe – England and Wales Case Studies, Guidelines on identification, assessment and designation of rivers, Final Draft (Version 4), submitted by the Environment Agency of England & Wales and the UK Government Department for Food, Environment and Rural Affairs, England and Wales.

Dunbar, Michael, Douglas Booker, Charlie Stratford, Peter Latimer, Helen Rogerson, Jonathan Bass, Hugh Dawson, Rodolphe Gozlan, Stewart Welton, John Ash, Teresa Fenn and Meg Postle (2002), Heavily Modified Waters in Europe – Case Study on the River Kennet, submitted by the Environment Agency of England & Wales and the UK Government Department for Food, Environment and Rural Affairs, England and Wales.

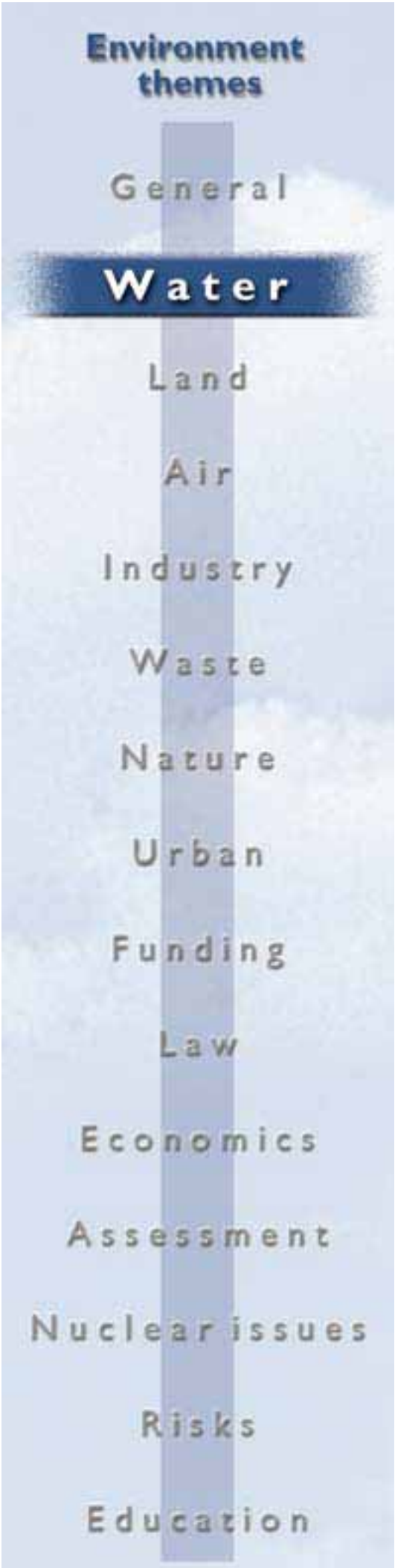
UK, Scotland

Black, A. R., O.M. Bragg, R.W. Duck, A.M. Findlay, N.D. Hanley, S.M. Morrocco, A.D. Reeves and J.S. Rowan (2002), Heavily Modified Waters in Europe - Case Study on the River Tummel, Geography Department, University of Dundee, and Department of Economics, University of Glasgow, Dundee, Glasgow.

Black, A. R., O.M. Bragg, C.M. Caudwell, R.W. Duck, A.M. Findlay, N.D. Hanley, S.M. Morrocco, A.D. Reeves and J.S. Rowan (2002a), Heavily Modified Waters in Europe - Case Study on the Forth Estuary, Geography Department and Biological Sciences Institute, University of Dundee, and Department of Economics, University of Glasgow, Dundee, Glasgow.

Black, A. R., O.M. Bragg, R.W. Duck, A.M. Findlay, N.D. Hanley, S.M. Morrocco, A.D. Reeves and J.S. Rowan (2002b), Heavily Modified Waters in Europe - Case Study on the River Dee (Galloway, Scotland), Geography Department and Biological Sciences Institute, University of Dundee, and Department of Economics, University of Glasgow, Dundee, Glasgow.

14 KH-51-03-188-EN-N



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