Heavily Modified Water Bodies:

“Information Exchange on Designation, Assessment of Ecological Potential, Objective Setting and Measures"

Common Implementation Strategy Workshop
Brussels, 12-13 March 2009

Updated Discussion Paper

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Abbreviations

AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
CIS	Common Implementation Strategy
DE	Germany
DK	Denmark
EE	Estonia
EQR	Ecological Quality Ratio
ES	Spain
FR	France
GEP	Good Ecological Potential
GES	Good Ecological Status
HMWB	Heavily Modified Water Bodies
IE	Ireland
HU	Hungary
LT	Lithuania
LU	Luxembourg
LV	Latvia
MEP	Maximum Ecological Potential
MS	Member States
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SI	Slovenia
SK	Slovak Republic
SE	Sweden
UK	United Kingdom
WB	Water body(s)
WFD	Water Framework Directive

1 Background

The European Water Framework Directive (WFD) aims to bring all water bodies to a good ecological status by 2015. Measures have to be identified and implemented for impaired water bodies to improve their quality. Not all water bodies, however, can be brought to a good ecological status (GES) which refers to a nearly natural undisturbed condition. Many water bodies have been heavily modified in their physical structure to serve various uses including navigation, flood protection, hydropower, and agriculture. In many cases, it is not viable or desirable from a socio-economic perspective to abandon such uses and to remove the physical modifications which affect the water bodies. Member States can, thus, designate such water bodies as heavily modified water bodies (HMWB) whose environmental objective is good ecological potential (GEP) instead of GES.

Under the Common Implementation Process (CIS) of the WFD, the European Commission in cooperation with Member State experts and stakeholder organisations started early to provide guidance to ensure that the HMWB designation process would be practicable and comparable in all Member States. Especially the following four working groups and activities established under the CIS process are relevant to the designation of HMWB, the definition of their environmental objective GEP and setting objectives and measures:

- **The CIS HMWB Working Group** drafted the CIS-Guidance No 4 “Identification and Designation of Heavily Modified and Artificial Water Bodies” providing guidance on identifying and designating HMWBs, defining maximum ecological potential (MEP) and good ecological potential (GEP). This Guidance proposes to establish GEP as a slight deviation from the MEP based on biological quality elements.
- **The CIS ECOSTAT Working Group** drafted the CIS-Guidance No 13 “Overall approach to the classification of ecological status and ecological potential”. It provides guidance on how to derive ecological status and potential of a water body. Two workshops under this activity focussed on the use of the “one-out-all-out” principle for biological status elements.
- **The CIS Activity on Hydromorphology and WFD** (HYMO Activity) produced a technical paper on good practice in managing the ecological impacts of significant water uses (hydropower, navigation, flood protection). This technical paper contains a compilation of restoration and mitigation measures that are considered good practice case studies with the potential to improve ecological status and potential of water bodies. Moreover, the paper presented an alternative approach to establishing GEP based on mitigation measures, as developed during the WFD & Hydromorphology Workshop in Prague (17-19 October 2005).
- Under the CIS a drafting group has produced a consolidated Guidance Document giving a full overview on the issue of **environmental objectives and exemptions**. This document compiles previously agreed interpretations on issues related to environmental objectives and exemptions**.**

2 Aims of the workshop

The workshop on Heavily Modified Water Bodies (HMWB) on 12-13 March 2009 in Brussels was jointly organised by Germany, UK and the European Commission, in cooperation with the CIS ECOSTAT-group and the CIS Hydromorphology-activity.

In the current stage of the WFD implementation process, this workshop aimed to allow European information exchange on the following topics:

- **Designation of HMWB**: Exchange of experiences on practical application of HMWB designation processes in the Member States related to Art. 4(3) (a) on the application of "significant adverse effects" of hydromorphological characteristics and to Art. 4(3) (b) on checking any "significantly better environmental options".
- **Establishing Good Ecological Potential (GEP)**: Exchange experiences with the practical application of different approaches for deriving GEP, including both the HMWB Guidance No 4 approach based on biological quality elements and the "Prague" approach based on mitigation measures.

  The EC argued whether the alternative “Prague” approach for defining GEP is WFD compatible. For this reason, it is of interest to discuss at the workshop whether applying the two approaches leads to comparable results.
- **Objective setting and measures**: Discuss experiences of Member States on objective setting for HMWB, including the application of exemptions, and exchange information about planned mitigation measures.

About 110 delegates participated in this event, including nominated representatives from the Member States, the European Commission, relevant European-level organisations and stakeholder groups.

3 Aims of the discussion paper

The purpose of this discussion paper is to provide up-to-date information on the status of WFD implementation on HMWB designation and GEP definition issues in the Member States in order to stimulate the workshop discussions.

The content of the paper is mainly based on Member State replies to a EU questionnaire on selected HMWB topics identified by the organisers as important for this workshop. In total, 24 countries (23 Member States and Norway) completed the HMWB questionnaire (comprising a total dataset of 35 questionnaires): AT, BE (3 questionnaires), BG, CY, CZ, DE (9 questionnaires summarised into 1), EE, ES, FI, FR, HU, IE, LT, LU, LV, NL, NO, PL, PT, RO, SE (questionnaires from 2 RBDs), SI, SK and UK.

21 Member States and Norway completed the HMWB questionnaire before the HMWB workshop. After the workshop, questionnaires were delivered by 2 additional Member States: FI and PL. All questionnaires are available online at: http://www.ecologic-events.de/hmwb/background.htm.

The discussion paper summarises key information provided by the Member States on the following topics of the workshop:

- Designation of heavily modified water bodies (section 4 of paper)
- Definition of good ecological potential (section 5 of paper)
- Measures & objectives setting (section 6 of paper)

Section 7 of the paper proposes questions for discussion at the workshop.

4 Designation of Heavily Modified Water Bodies (HMWB)

Once a water body has been identified as HMWB (provisional identification), it may be designated as such if according to the WFD Art. 4(3)(a) and (b):

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

(i) the wider environment;

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

(iii) activities for the purpose of which the 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.

AND

(b) The beneficial objectives served by 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.

The following sections i) recall the results of HMWB provisional identification in the 2005 Article 5 reports, ii) give an overview of the extent of HMWB designation in the surveyed Member States (MS) and key water uses for designation, and iii) summarise and discuss MS criteria on “substantial changes in the character of water bodies”, “significant adverse effects of measures” and “better environmental options”.

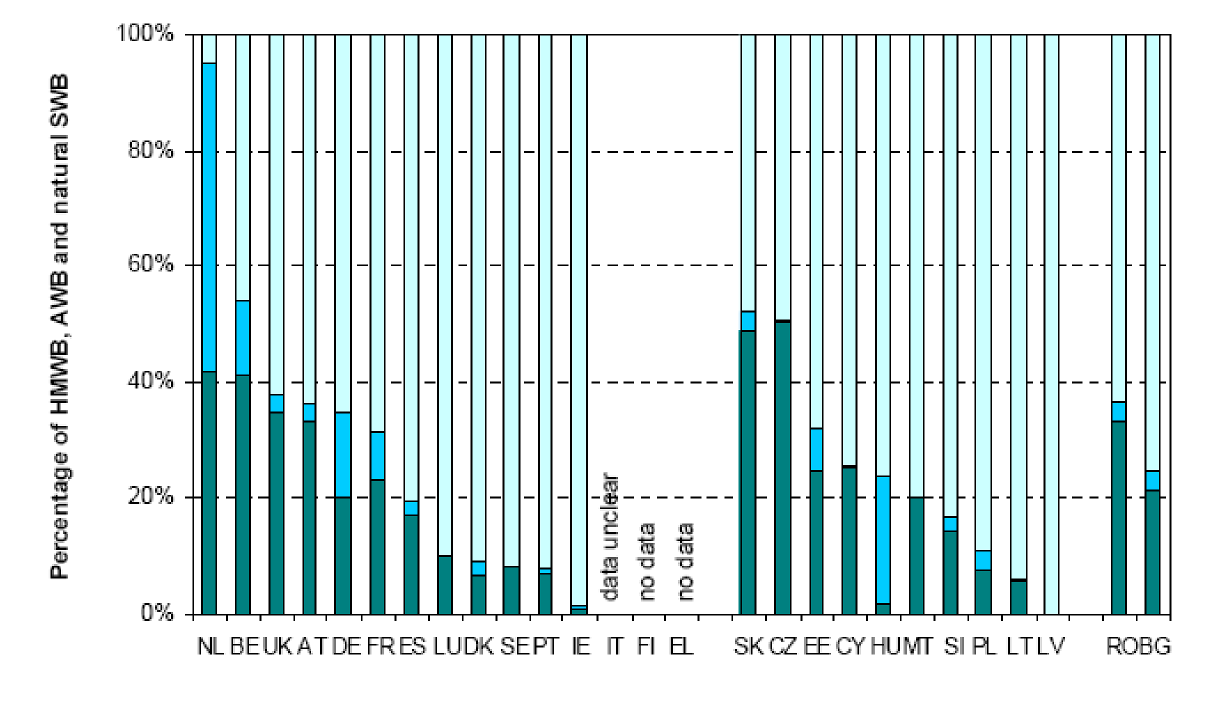
4.1 Recalling the HMWB provisional identification

In the 2005 Article 5 reports, the percentage of provisionally identified HMWB or artificial water bodies varied greatly from country to country (see Figure 1 below).[1]

More than 50% of the water bodies of following MS were provisionally identified as heavily modified or artificial: NL, BE, SK, CZ and parts of EE and the UK. The other MS had on average provisionally identified around 16% of their water bodies as heavily modified and artificial. IE and LV had provisionally identified less than 2% of their water bodies as heavily modified or artificial. When interpreting this data, one should bear in mind the differences of methodologies and assessment criteria which may have led to differences in ambition.

[1] Commission Staff Working Document (SEC(2007) 362 final): "First report on the implementation of the Water Framework Directive 2000/60/EC". Brussels, 22/3/2007. Available online: http://ec.europa.eu/environment/water/water-framework/implrep2007/pdf/sec_2007_0362_en.pdf.

Figure 1 Percentage of provisional HMWB (green), artificial water bodies (dark blue) and natural SWB (light blue) per MS



4.2 Extent of HMWB designation

At the current stage of WFD implementation (first RBMPs), provisionally identified HMWB are finally designated as HMWB on the basis of the conditions set in WFD Article 4(3). This section gives a snapshot of the extent of HMWB designation based on data provided in the MS questionnaires. It should be noted that in several MS, the HMWB figures reported in the questionnaires are at this stage incomplete or preliminary.

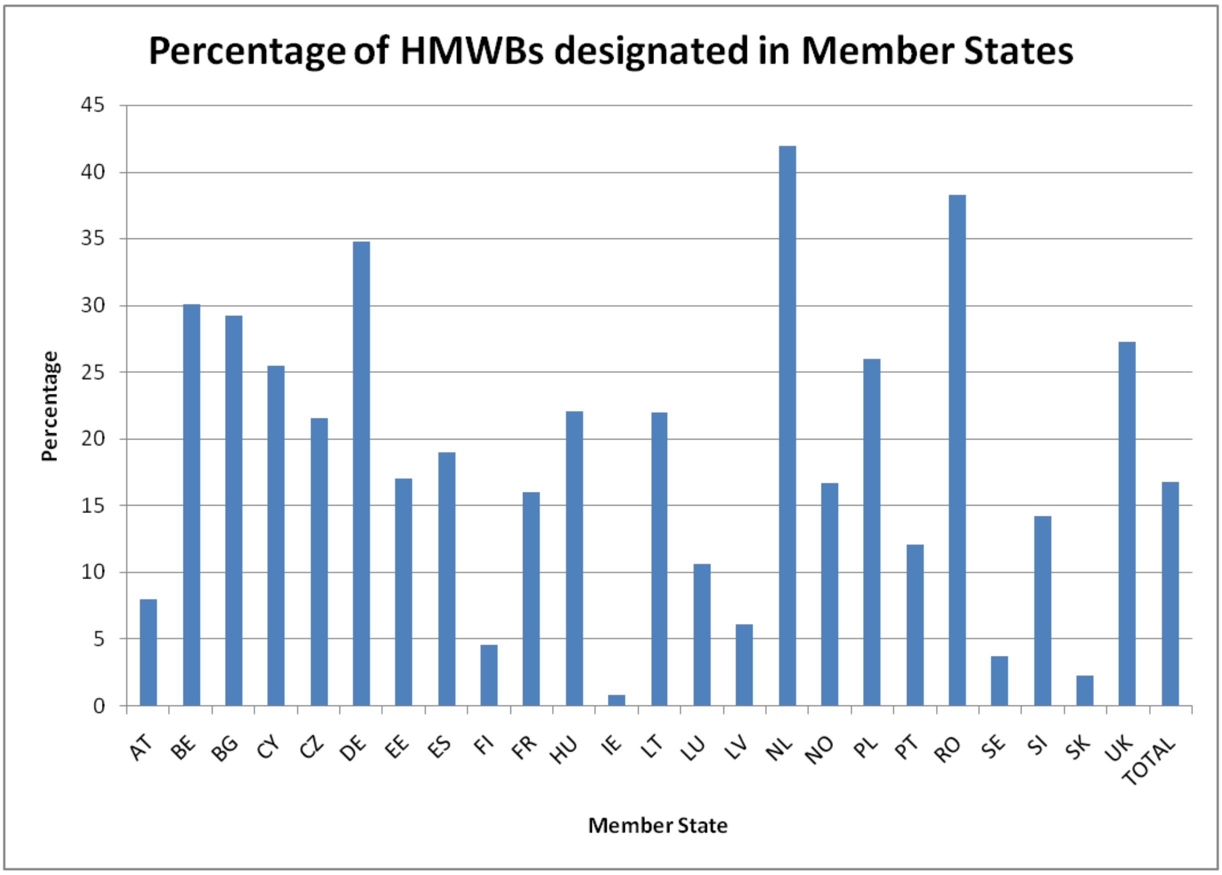
Figure 2 gives an overview of designated HMWB in relation to the number of total surface water bodies. From this overview, some conclusions can be drawn:

- The total (EU) percentage of designated HMWB in 24 surveyed countries is 16.7 % (range between 0.8% and 42%).
- NL and RO[2] have the highest percentage of designated HMWB.
- SK[3] and IE have the lowest percentage of designated HMWB.

[2] The RO percentage of designated HMWB refers only to main rivers where the highest number of HMWB is recorded (water bodies from river basins with catchment areas>1000 km² for the RO tributaries which are part of the Tisza river basin and water bodies from river basins with catchment areas>4000 km²).

[3] In SK, the final designation of HMWB is still an ongoing process. The current percentage of designated HMWB is based on the assessment of mainly large rivers (basin area>100 km²), while the assessment of small and middle water bodies has not been completed yet.

Figure 2 Total percentage of HMWB per MS of survey



Note 1: Data reported by CY and HU is based on their Article 5 reports. Note 2: Data reported by SE are not representative for the whole country (only data from 2 out of 5 RBDs were reported). Note 3: Total numbers of SWB (used for the calculations) include AWBs in some MS, while in others they exclude AWB. For most MS, no statement was made on this issue in the questionnaires.

Figure 3 gives an overview of HMWB designation per MS on the level of different water categories. Percentages are related to total number of water bodies per MS within each water category. Figure 4 is a similar representation of HMWB but it relates to the total length or area within each water category per MS.[4]

Table 1 indicates the percentage of total HMWB per water category, with reference to both WB numbers and length/area. The figures reveal that the extent of HMWB designation may differ between the length/area perspective and the WB number perspective.

On the basis of these figures and table, the following observations can be made:

- The highest proportion of HMWB in the category of rivers is found in the NL.
- Lakes are in some cases designated to 100% as HMWB. This can be explained by the fact that reservoirs are often proposed to be categorised as HMWB lakes (as explicitly reported by PT, RO and CZ).
- In the case of lakes and transitional waters, the extent (%) of HMWB designation is higher in terms of length/area than in terms of WB numbers.

[4] In some countries, no data on length/area of HMWB could be reported.

Figure 3 Percentage of HMWB in each water category (reference to WB number)

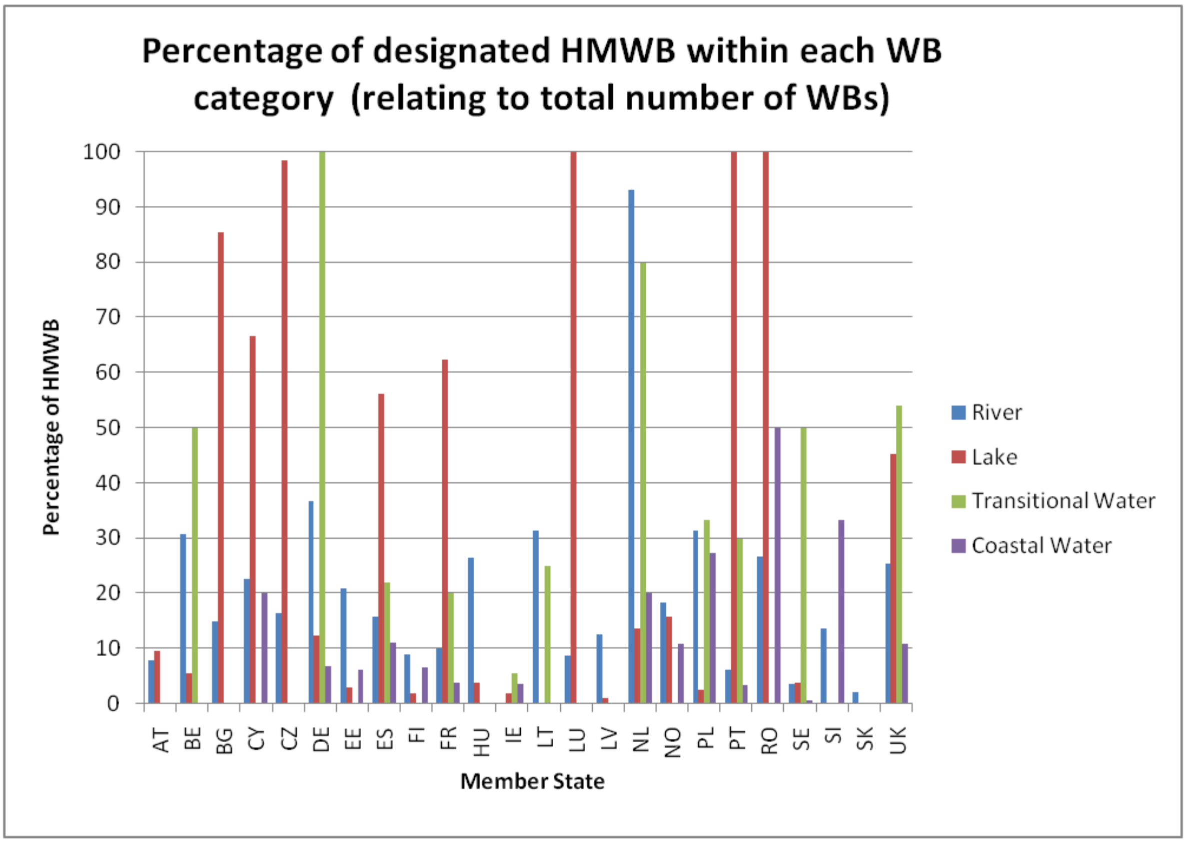


Figure 4 Percentage of HMWB in each water category (reference to length/area)

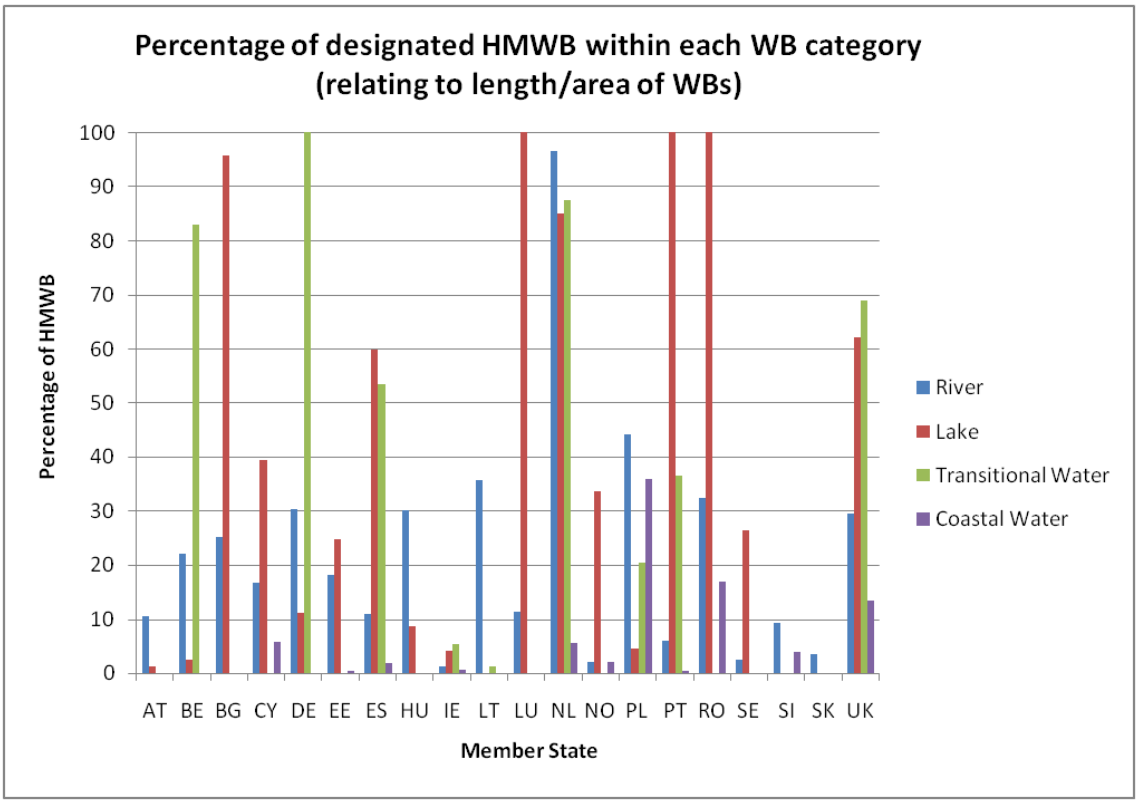


Table 1 Percentage of total HMWB per water category (reference to WB numbers and length/area within each category)

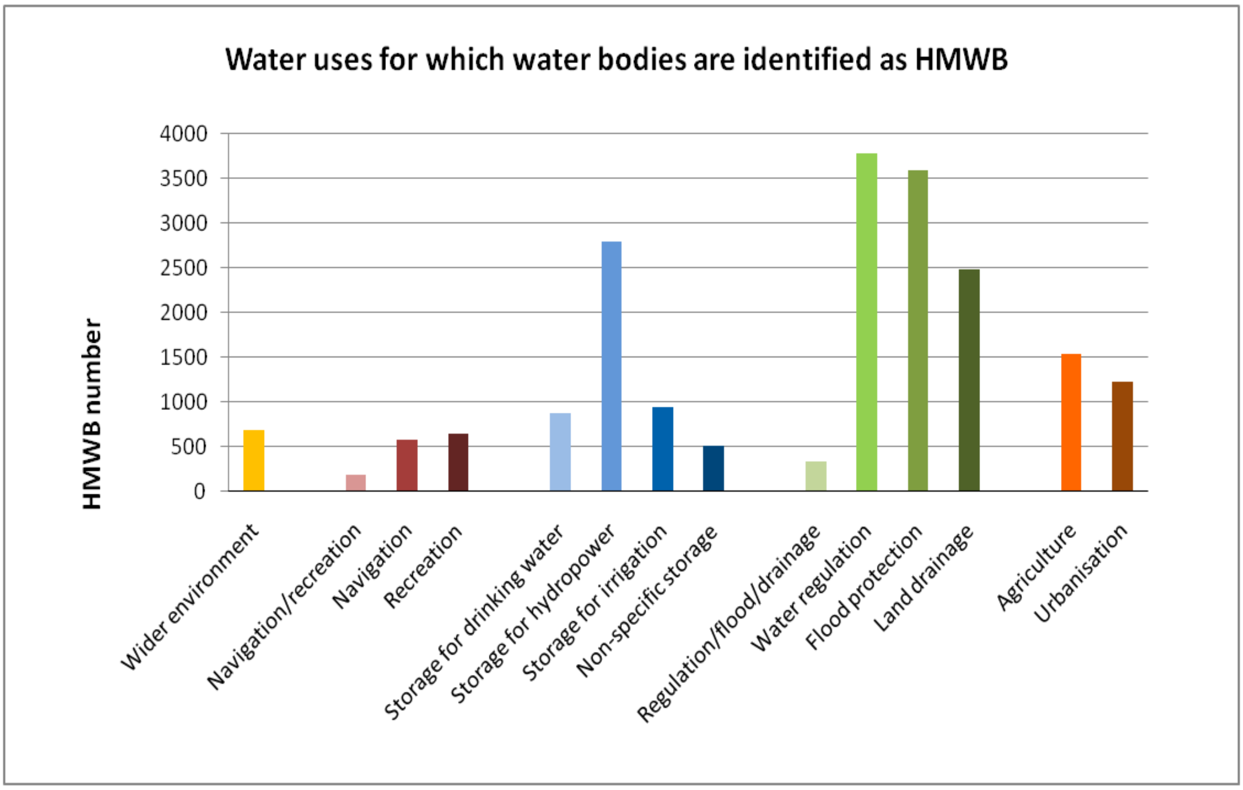
Rivers			Lakes		
Total length [km]	HMWB [km]	% HMWB	**Total area** [km^2]	HMWB [km^2]	% HMWB
1065123	*160316*	***15.05***	*44727*	*16015*	***35.81***
Total number	HMWB	% HMWB	**Total number**	HMWB	% HMWB
68362	*11949*	***17.48***	*17991*	*2680*	***14.90***
Transitional			**Coastal**		
Total length [km]	HMWB [km]	% HMWB	**Total area** [km^2]	HMWB [km^2]	% HMWB
10885	*5154*	***47.35***	*248322*	*11827*	***4.76***
Total number	HMWB	% HMWB	**Total number**	HMWB	% HMWB
767	*202*	***26.34***	*3595*	*349*	***9.71***

4.3 Water uses of designated HMWB

4.3.1 Overview of water uses

Figure 5 summarises the absolute HMWB numbers per water use of WFD Article 4(3)(a)(i)-(v) in the 24 surveyed countries. Annex I includes a table with numbers per use and country.

Figure 5 Absolute numbers of designated HMWB per water use (23 MS plus NO)



Note 1: If a water body was designated for more than one use, each use was counted.

Note 2: The bars "navigation/recreation" and "regulation/flood/drainage" summarise only those WBs which are not reported in the bars navigation, recreation, regulation, flood protection, drainage (reported as use-groups).

From the above, the following may be concluded:

- Water regulation, flood protection, and land drainage are the most common uses for designating HMWB.
- Water storage for power generation follows in terms of importance as water use for HMWB designation.
- Agriculture and urbanisation, which have been defined as equally important sustainable human development activities, follow in the order of importance as uses related to HMWB designation.
- Navigation (including port facilities), recreation and the wider environment are the uses with the lowest number of designated HMWB.

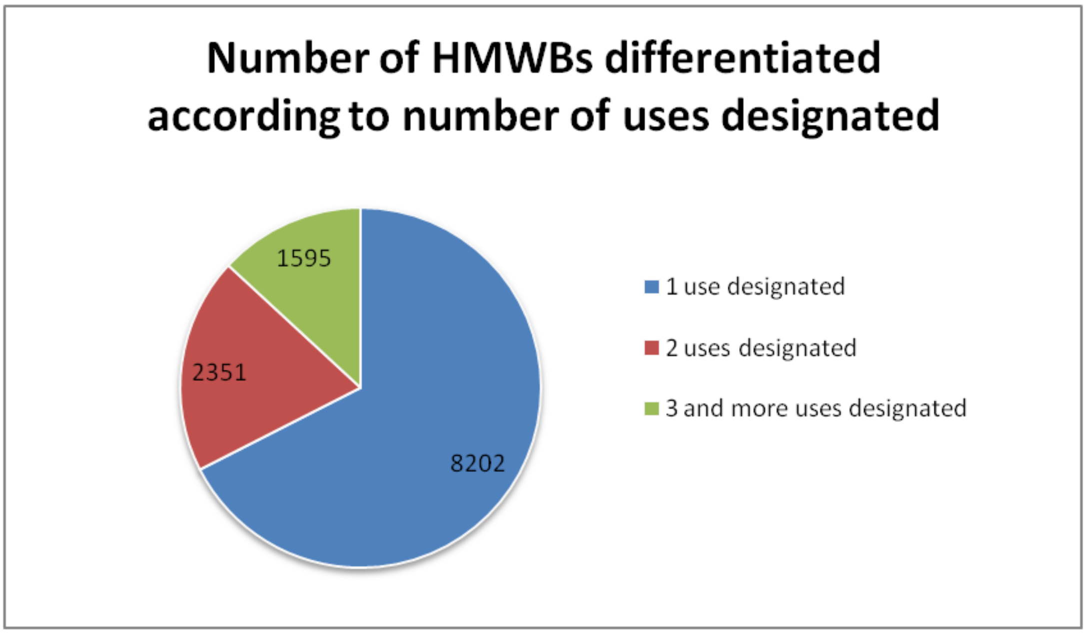
In terms of regional variation, the following may be noted:

- **Navigation (total 583 WBs)**: The 3 MS which reported the highest numbers of HMWB for navigation (UK, DE, ES) account for about 57% of all navigation-HMWBs;
- **Recreation (total 642 WBs):** The 5 MS which reported the highest numbers of HMWB for recreation (DE, UK, PL, CZ, LT) account for about 66% of all recreation-HMWBs;
- **Storage for drinking water (total 874 WBs)**: The 4 MS which reported the highest numbers of HMWB for drinking water storage (UK, NO, ES, FR) account for about 70% of all drinking-water-storage-HMWBs;
- **Storage for power generation (total 2793 WBs)**: The 5 MS which reported the highest numbers of HMWB for hydropower (NO, SE, DE, AT, UK) account for about 70% of all hydropower-HMWBs;
- **Storage for irrigation (total 941 WBs)**: The 5 MS which reported the highest numbers of HMWB for irrigation storage (PL, BG, CY, ES, PT) account for about 82% of all irrigation-storage-HMWBs;
- **Water regulation (total 3784 WBs)**: The 3 MS which reported the highest numbers of HMWB for water regulation (NO, DE, PL) account for about 79% of all water-regulation-HMWBs;
- **Flood protection (total 3598 WBs)**: The 4 MS which reported the highest numbers of HMWB for flood protection (UK, DE, AT, PL) account for about 72% of all flood-protection-HMWBs;
- **Land drainage (total 2488 WBs)**: The 4 MS which reported the highest numbers of HMWB for land drainage (DE, UK, LT, EE) account for about 96% of all land-drainage-HMWBs;
- **Agriculture (total 1222 WBs)**: DE alone accounts for 96% of the HMWB designated due to agriculture including forestry (defined as equally important sustainable human development activity);

- **Urbanisation (total 1543 WBs)**: DE and UK account for 91% of the HMWB designated due to urbanisation (defined as equally important sustainable human development activity).

It should also be noted that water bodies can be designated as heavily modified for more than one uses. Figure 6 illustrates the share of HMWB that have been designated for one use, for two uses and for three or more uses. Although a considerable number of HMWB (3946 in total) are designated for more than one use, the majority of HMWB have been designated for a single use.

Figure 6 Multiple water uses of HMWB



4.3.2 Equally important sustainable human development activities

As already mentioned, the two "equally important sustainable human development activities" most frequently used for HMWB designation are urbanisation (mainly in DE and UK) and agriculture including forestry (mainly in DE).

In addition to these two uses, Member States have categorised a very broad range of other uses under "equally important sustainable human development activities", each of which is used for the designation of only few HMWB (in terms of numbers). These other "equally important sustainable human development activities" include among others fishing industry, industry, coastal protection, transportation and infrastructure, non-drinking water supply, several mining and production activities. A full list is provided in the following table:

"Equally important sustainable human development activity" for which HMWB are to be designated [Art.4(3)(a)(v)]	Total number of HMWBs
Urbanisation	1543
Agriculture including forestry	1222
Fishing industry	175
Industry	172

"Equally important sustainable human development activity" for which HMWB are to be designated [Art.4(3)(a)(v)]	**Total number of HMWBs**
Other (not defined)	140
Coastal protection (incl. flood protection in one MS)	119
On-shore transportation	117
Non-drinking water supply	98
Infrastructure, transport (highways, railways)	86
Canalisation	71
Urban residential and commercial land use	63
Fisheries, aquaculture, agriculture (as a group)	56
Reservoirs on hilly and mountainous territories (with often more activities: flood defense, recreation, fish pond)	47
Land consumption / obtaining the land cultivatable	38
Marine shell/fin fisheries	37
Succession of alterations in rivers and transitional water	31
Disposal of communal waste	21
Mining	19
Morphological alterations	12
Gravel extraction (affects ground water bodies)	9
Salt production	5
Supply of channel system	5
Water storage for industry	4
Flood protection	3
Modified shores in cities	3
Water mills	3
Products extraction	2
Transfer of water	2
Sanitary reasons	1
Production of healing mud	1
Coal abstraction from opencast	1
Drinking water supply by wells (not storage)	1
Riverbed covering	1
Dredging	1
Occupation of intertidal areas	1
Protection of route	1

4.3.3 Wider environment

The surveyed MS used various definitions for the term "wider environment" in the context of HMWB designation, including among others definitions related to:

- *The natural environment*: Protected areas under the Habitats and Birds Directive; Wetlands; River ecosystems; Landscape, nature, geomorphology; International or national important conservation areas that could fail natural conservation objectives due to improvements on the hydromorphological characteristics.

- *The human environment*: Historical heritage landscapes; (Archaeological) monuments (e.g. ancient water mills); Sites with patrimonial interest; Regional tradition; Buildings; Social problems in case people might be affected by floods; Sanitary protection areas around water supply intakes; Water intakes for industry and fire protection.

Six MS which used “wider environment” for HMWB designation have not provided a definition of the concept in the questionnaires. One MS explicitly stated that “wider environment” is not totally clear yet and different approaches/interpretations should be discussed.

4.4 Substantial changes in character of water bodies

MS use different types of criteria in order to decide whether a water body is “substantially changed in character” to be considered for designation as heavily modified.

The types of criteria most frequently used are impact-related (17 MS replies) and pressure-related criteria (20 MS replies) followed by use-related criteria (13 MS replies). In practice, most MS do not use a single type but several types of criteria in their assessments. For instance, several MS use pressure-related criteria as a first screening step and, in a second step, they examine the biological and hydromorphological impacts in the water body.

In Table 2, it is only possible to present a small selection of criteria per type group, due to the great diversity of criteria being used by the MS. For details on the specific criteria used in each MS, please refer to the MS questionnaires.

The following are some key observations on the set of criteria reported by the MS:

- Several approaches refer to simple presence of certain structures as criterion for “substantial changes in character”, e.g. the presence of dams, dikes or ports.
- Criteria are frequently connected to specific thresholds or ranges of values for a certain pressure or impact.

  For example, in the case of impact-related criteria, MS set given annual erosion/sedimentation rates as well as % of WB length with altered morphology or water flow regime affected by impoundments as thresholds.

  In the case of pressure-related criteria, thresholds often relate to the surface of reservoirs and impoundments or the % of river channelized for different uses, e.g. for urbanisation or navigation.
- In some MS, scoring systems or methods have been developed to take the effect of combined pressures into account. One approach (from UK-EW) is displayed in more detail in Annex III.
- In other MS, hydromorphological structure class systems exist to assess physical alterations (e.g. the German Stream Habitat Survey) and substantial changes in character of water bodies are defined as failure of a specific class.
- Impact-related and pressure-related criteria are not clearly separated in all cases. E.g. pressure-related criteria such as presence of ports and channelization are in few cases used also as impact-related criteria.

Table 2 Selected criteria to assess substantial changes in character

Impact-related criteria			
Rivers	**Lakes**	**Transitional**	**Coastal**
• Failure of good biological status due to hydromorphological alterations • % of length/area expected to be worse than good status • Historic analysis showing degree of modification			
• Change in discharge fluctuations • Change in sediment regime • Major alteration of species and/or life stages composition and abundance of river benthos or fish populations • Introduction of migration barriers • Channelisation	• Change in water flow/level • Erosion of lake shore due to traffic • Changes in riparian vegetation, species and/or life stages composition and abundance of benthos or fish populations	• Modified morphology due to constructions or dredging of sea bottoms • Significant and irreversible morphological alteration • Port facilities	• Significant and irreversible morphological alteration • % of area of modified bottoms, % of length of modified shores • Major alteration of key species and/or life stages composition and abundance of benthos

Pressure-related criteria				
Rivers	**Impoundments**	**Lakes**	**Transitional**	**Coastal**
• Presence of multiple pressures on one water body				
• Number of transversal in-stream structures • Height of transversal in-stream structures • Length of modified river segments • Area of modified river segments (reservoirs) • Percentage of catchment effected by urbanisation • Change of hydrological regime after dams • Intensity of flow & level alteration	• Length or area of impounded area • Percentage of total river length • Regulated volume • Height of dam • Extent of alteration of flow velocity and water level • Number of transversal structures within one WB	• Area of impoundments • Change in water flow/level • Changes in lake morphology	• Area covered by ports and other navigation facilities • Length of modified segments	• Area covered by ports and other navigation facilities • Area of modified segments • Thresholds of extraction of gravel or sand

Use-related criteria				
Wider environment	**Navigation/ recreation**	**Water storage**	**Water regulation, flood protection, land drainage**	**Equally important activities**
• Feasibility of implementing measures				
• Sites with patrimonial interest	• Use as national/federal waterway (usually of a specific category) • Presence of ports/ quays • High touristic interest/frequency	• All reservoirs for hydropower • % of produced energy • All reservoirs for drinking water supply • Number of people provided with drinking water	• Percentage of natural inundation area urbanised • Percentages of diking leading to loss of floodplains • Number of protected people • All main ditches of the drainage systems • Land drainage and urban areas as % of river basin area	• Urbanisation

Overall criteria
• Expert judgement • Combination of all types of criteria

4.5 Significant adverse effects of measures on water uses or the wider environment

According to WFD Article 4(3)(a), MS may designate a heavily modified water body only, if the changes to the hydromorphological characteristics of that water body which would be necessary for achieving good ecological status would have significant adverse effects on its uses or the wider environment.

The majority of the surveyed MS responded that they have not developed specific criteria on significant adverse effects to help prepare the draft river basin management plans. Only 9 countries replied positively to the development of such criteria (AT, DE, EE, ES, HU, LV, NL, PT, RO). In four other countries (CZ, SI, UK, PL), expert judgement was used, while in two countries (LU, SK), such criteria are still under development.

Most countries with developed criteria used a mixture of pressure-specific, measure-specific and use-specific criteria. Table 3 summarises the principal criteria reported by MS to determine whether measures would have significant adverse effects on a specific use or the wider environment.

In general, significant adverse effects included:

- Endangering aspects of the natural or human environment included under “wider environment” in the context of HMWB designation, e.g. endangering environmental status of protected areas or national heritage and cultural monuments.
- Complete loss of use, especially in the case of water use for storage.
- Significant reduction of use, e.g. loss of cargos and reduction of passenger traffic, reduction of bathing sites, loss of energy generation (peak load and base load).

- Production losses or socioeconomic losses (with % thresholds), e.g. reduction of flood protection levels and loss of production from agricultural land.

Table 3 Criteria on significant adverse effects in surveyed MS

Water use	Examples of principal criteria used to judge the significant adverse effects of measures
[Art.4(3)(a)(i)]	
Wider environment	• Reduce area of protected habitats, so that the favorable conservation status in the Natura 2000 site is endangered • Endanger environmental status of RAMSAR site or national park • Endanger the environmental objective set in any other environmental EU-Directive • Endanger national heritage or historical/cultural monument • Release of dangerous substances • Decrease in water quality • Flooding some urban areas • Increasing the level of groundwater • Losses of wetlands • Jobs reduction (with more than 2%/yr)
[Art.4(3)(a)(ii)]	
Navigation, including port facilities	• Significant reduction of shipping /transport (e.g. reduction of depth/width of fairway) • % of loss of cargos or reduction of passengers traffic, respectively • Impossible to change the current hydromorphological condition: port facilities are completely consolidated in an urban area • Decreased sea transportation due to restoration measures is replaced by road transportation which according to LCA have a significantly higher CO2 emission/ton
Recreation	• Significant loss/reduction of bathing sites and water sport possibilities • If the water body (mainly impounded lakes) is used for recreation or it has an aesthetic value (landscape looks better) it was decided that there is a public interest to preserve the impoundment and dismantling of dams is not justified. When appropriate, the fish passes should be constructed
[Art.4(3)(a)(iii)]	
Storage for drinking water supply	• Complete loss of use
Storage for power generation	• Complete loss of use • Any reduction of peak load production including loss of ancillary services • Any reduction of security of electricity supply on regional level or national level • Stop of base load electricity production • Loss of hydropower energy (% of total energy production of power plant) and value of lost energy production (€) • Hydro-power reduction (with more than 2%/yr) • In one MS, hydropower plants are small (<1 MW) and the share of hydro-power is about 0.1-0.2%. Therefore it was considered that the loss of power generation is insignificant and power generation is not needed for national or local interest. When appropriate, the fish passes should be constructed despite the loss of power generation • Decreased regulating possibility decreases the option to add effect to the grid by hydro power which has to be replaced by other regulating power production facilities,

Water use	Examples of principal criteria used to judge the significant adverse effects of measures
	such as condense gas fired facilities with very high CO2 emissions.
Storage for irrigation	• Complete loss of use
[Art.4(3)(a)(iv)]	
Water regulation	• % loss of agricultural lands, % loss of production, unknown consequence • Agricultural production reduction (with more than 30-50%/yr)
Flood protection	• Reduction of protection level (HQ 100) of settlements • Reduction of protection level for agriculture (leading to a significant loss of production) • Endangering of infrastructure (railway, highways etc) • Maintain necessary flood protection (considering effect of future climate change) • No flood control • Increasing of flood risk (damages increasing with more than 30%/yr)
Land drainage	• % loss of agricultural lands, % loss of production, unknown consequence • Land drainage still needed and rising of water level is impossible
[Art.4(3)(a)(v)]	
Equally important sustainable human development activity	• Endangering high quality drinking water supply (no storage)

4.6 Better environmental options

The second condition which has to be fulfilled before a water body can be designated as HMWB is the assessment whether the benefits served by the modified characteristics of the water body cannot reasonably be achieved by other means, which are a significantly better environmental option (WFD Article 4(3)(b)).

Table 4 provides an overview of environmental options that have been considered in the surveyed MS per water use. In general, other environmental options considered included:

- *Replacement of the existing use with a better alternative*, such as replacement of navigation with other environmental friendly transport options, replacement of hydropower with other renewable energy (national level decisions), supply of irrigation water from groundwater sources or seawater desalination.
- *Displacement of the existing use to another water body*, such as relocation of properties (under flood protection), movement of recreation activities to other water bodies, displacement of navigation to an alternative port/harbour.
- *Reduction of environmental impact of existing use*, such as reduction of impact of water storage by compensatory and ecological discharges.

In addition to the specific options listed in the table, some MS assessed the significance of adverse effects on certain uses on the basis of expert judgment.

In one MS (BE), no other considered environmental options were reported. In other MS, it was explicitly reported that for certain uses, no other environmental options could be found, e.g. for navigation in SI, for hydropower and navigation in CZ, for land drainage in EE.

Table 4 Other environmental options considered in surveyed MS

Water use	Other environmental options considered
[Art.4(3)(a)(i)]	
Wider environment	• Transfer of protected habitats/species within a Natura 2000 area ensuring the favourable protection status nevertheless • Maintenance of wetlands by re-using waste water • If the conservation interest(s) made up a significant part of the water body, it was considered there was no significantly better environmental option for achieving an international or national conservation objective other than by maintaining the modified hydromorphological characteristics on which the conservation interests depend
[Art.4(3)(a)(ii)]	
Navigation, including port facilities	• Other environmental friendly transport possibilities • Railway, road, air traffic (in other MS, transport by rail, road or air were not considered due to the energy consumption and the air emissions) • The availability of an alternative port/harbour nearby with spare capacity was considered if the transfer of functions would not cause deterioration in status or prevent achievement of good status in another water body
Recreation	• Move to other water body • Substitute places (e.g. swimming pools) • Diminishment of recreation in some locations at a certain time • Eco-tourism
[Art.4(3)(a)(iii)]	
Storage for drinking water supply	• Supply through groundwater sources or seawater desalination • Use of groundwater wells • Water supply from other river basin • Diminishment of impact by compensatory and ecological discharges • Presence of obvious alternative drinking water supply source that is capable of providing the drinking water supply with less impact
Storage for power generation	• Replacement by other renewable energy (national level) • Replacement of peak load production/ ancillary services /security of electricity supply by other renewable energy • Power generated by wind mills or other renewable energy sources. • Building of NPS, other renewable resources (small HPP) • National studies show that hydropower has a) the lowest cost per unit among renewable energy sources today and b) the lowest environmental costs as compared with energy production based on biomass, gas production and coal-fired power • Due to the Government policy objective of increasing renewable energy generation capacity in Scotland, it was not normally considered that the closure of an existing hydropower scheme and its replacement with an alternative comparable renewable energy scheme would be a significantly better environmental option unless the adverse impacts of the hydropower scheme were substantial and obviously much greater than those of hydropower schemes of a comparable scale.
Storage for irrigation	• Supply through groundwater sources or seawater desalination • Change of land use • Modification in irrigation technology

Water use	Other environmental options considered
[Art.4(3)(a)(iv)]	
Water regulation	• Obvious alternative schemes that can be used for purposes of water regulation
Flood protection	• Buy out properties for which the flood protection was made; relocation of properties • Exchange of areas along the rivers with areas which need no flood protection • Analysis of impoundment areas and reestablishment of natural river courses as an alternative option to river channelling and reservoirs for flood protection • Polders, dry and wet retention areas, portable dykes (e. g. aqua barriers), better water runoff management, alternative measures • Development of wash land that would provide at least the equivalent level of flood protection.
Land drainage	• Change of land use, agricultural production
[Art.4(3)(a)(v)]	
Equally important sustainable human development activity	• Urbanisation: Displacement of urbanised areas and the related uses • Agriculture: Compensation of the loss of agricultural areas and the related revenues • Storage for industry: Groundwater • Change in production technology, extensive fish farming

5 Definition of Good Ecological Potential (GEP)

Within the WFD implementation, the status of HMWB needs to be assessed in terms of achieving at least Good Ecological Potential (GEP) as this is defined in Annex V of the Directive. A water body shows a GEP when there are slight changes in the values of the relevant biological quality elements as compared to the values found at Maximum Ecological Potential (MEP). The MEP is considered as the reference conditions for HMWB, and 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.

5.1 Introduction to the two approaches for establishing GEP

As mentioned in the introduction of this paper, two approaches have been put forward and discussed on EU level for the definition of Good Ecological Potential (GEP).

Approach based on biological quality elements

The first approach is based on biological quality elements as illustrated in CIS Guidance No 4 (see Figure 1, right). The MEP for HMWBs relates to the values of biological quality elements after all mitigation measures have been implemented that do not have a significant adverse effect on the use. GEP is defined as only slight changes from those values at MEP. GEP represents a state in which the ecological potential of a water body is falling only slightly short of the maximum it could achieve without significant adverse effects on the wider environment or on the relevant water use or uses. An assessment of disproportionate costs of the mitigation measures should not be considered.

Alternative Prague approach (based on mitigation measures)

The alternative Prague approach takes a different route and bases the definition of GEP on the identification of mitigation measures (see Figure 1, left). Starting from all measures that do not have a significant adverse effect on the water use, those measures are excluded that, in combination, are predicted to deliver only slight ecological improvement. GEP is then defined as the biological values that are expected from implementing the remaining identified mitigation measures. As in the first approach, an assessment of disproportionate costs of the mitigation measures should not be considered.

A key difference to the first approach is that the GEP is derived directly from the mitigation measures, and not indirectly from the specification and prediction of biological quality elements at MEP.

It is argued that the Prague approach leads to comparable results as the approach based on biological quality elements, while in the same time, it leaves less room for errors due to predictive modelling.

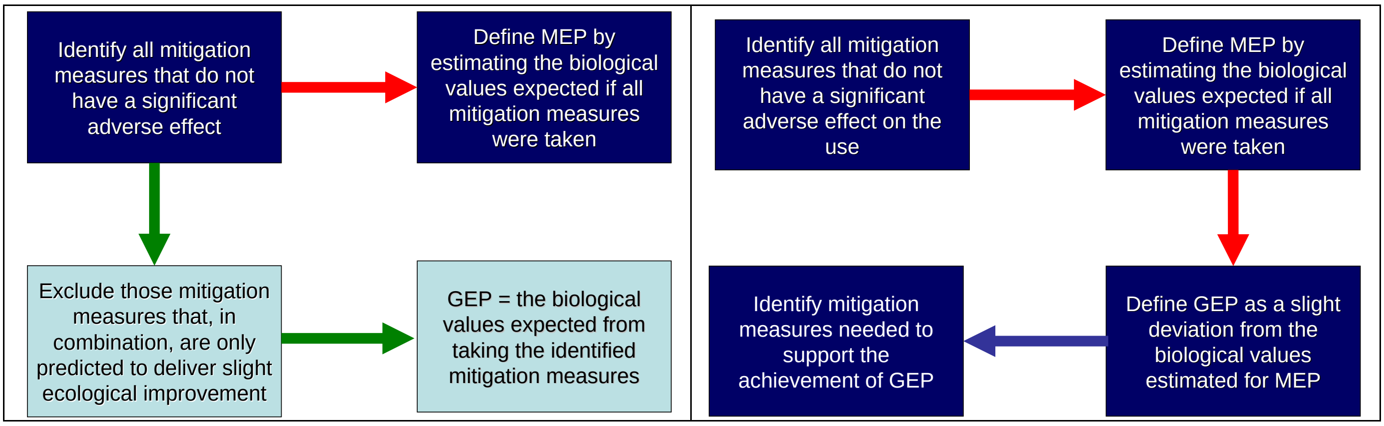


Figure 6 Steps involved in defining GEP using the alternative "Prague" approach (left side of figure) compared to the relevant steps in the approach described in CIS Guidance Document No. 4 (right side of Figure); red arrows: steps following CIS method; green arrows: "Prague" modifications of CIS method.

5.2 GEP definition in the Member States

Regarding general progress in the field of GEP definition, only in 38% of questionnaire replies, MS report being satisfied that their draft classification reflects the effect of hydromorphological alterations on ecological potential.

In terms of the methods and approaches used, the assessment of the MS questionnaire replies indicates that:

- In 28% of MS replies, HMWB have been classified using *biological assessment methods*.

  MS using this approach include BE, ES, LT, SK and FI.

- In 28% of MS replies, HMWB have been classified by assessing whether all practical mitigation measures have been taken (*Prague approach*).

  MS using this approach include IE, UK, NO, EE and BG.

- In 39% of MS replies, HMWB have been classified using *both approaches* (biological assessment approach and Prague approach).

  MS which reported the use of both approaches include FR, the NL, CZ, PT, RO, DE and AT. In some cases, the use of both approaches means that they have been used in a combined way, while in others, there is simply regionally differentiated use of methods within one country, e.g. some German states used the Prague approach and others worked with biological assessment methods.

In 6 countries (LU, SI, CY, HU, SE and PL), no information relevant to GEP establishment was included in the questionnaire. Also in the case of RO, the method for establishing GEP is currently under development.

5.2.1 Approaches based on biological assessment methods

In the majority of countries working with biological assessment methods for GEP establishment, existing methods have been adapted for application to heavily modified water bodies (BE, DE, LT, NL, SK, FI). In few cases, it is reported that specific methods have been or are being developed to support HMWB classification.

The following summarises key elements of the approaches used in countries applying or currently developing biological assessments to classify HWMB:

- **BE**: Existing methods have been adapted for specific types of HMWB such as large rivers, reservoirs and channels for several biological indicators. For rivers and lakes, the classification method has been adapted, either by reducing the class boundaries or by modifying the metric calculation method (BQE-dependant). These adaptations are water body-specific. In the case of transitional waters, all water bodies were heavily modified (or artificial), therefore, no assessment method for natural transitional water bodies was initially developed. For those water bodies, a water body-specific assessment scheme has been developed.
- **LT**: The assessment of ecological status of HMWB is based on a system developed for the most resembling natural water body type.

  Water reservoirs with area >50ha and their communities of aquatic organisms are considered to be comparable to those of natural lakes. The criteria for quality elements at MEP are the same as for natural lakes. Quality elements at GEP should meet the same (good status) criteria established for natural lakes of correspondent depth.

  In river HMWB, good status of biological quality elements is however hardly achievable due to significant reduction of flow and/or morphological modifications of the river bed. Therefore, the moderate status criteria of biological elements for natural river types resembling the modified river are applied to describe biological quality elements at GEP. MEP corresponds to good status criteria for natural rivers.
- **ES**: A system of reference conditions and limit values has been established for different types of HMWB within each category, defining applicable parameters and limit values for GEP.

- **DE** (one state; method comparable to LT): For each HMWB, the German Fauna Index of macrozoobenthos is used to determine the type. A comparison is then made with the GES of this type. For the quality element of fish, the potential reference community is determined by using a certain fish-based running water assessment method (FIBS) and the current population is compared to that reference. This approach is especially useful to assess several, mainly small water types. The approach does not cover some other types, especially of larger rivers. In these cases, GEP is considered equivalent to moderate status.
- **NO**: HMWB have not been classified yet in Norway; instead the derivation of the environmental objectives is based on a site-specific assessment (based on the Prague approach). Nevertheless, it should be mentioned that a classification system is being developed and regarding hydromorphological elements two fish-related assessment methods are developed: a fish population structure index (based on changes in species composition and abundance) and a fish biomass production calculation (based on present fish production versus the historical fish production in the water body).
- **FI**: A data and assessment method developed in earlier water-level regulation development projects has been used in lakes (Regcel-method).[5] The method used has been tested in a pilot study.

Six countries (BE, some federal states of DE, ES, LT, FI and SK) have been able to derive biological references for MEP using different biological quality elements in the assessments within different water categories. In NO, the methods are still under development.

The most frequently used biological quality elements for the different water categories are:

- **Rivers** – mainly macroinvertebrates and fish but in some cases also macrophytes, phytobenthos and phytoplankton.
- **Lakes** – mainly phytoplankton and in few cases also macrophytes, phytobenthos, macroinvertebrates and fish.
- **Transitional waters** – only two countries discuss biological references for MEP in this category (ES has partially derived biological references using phytoplankton and macroinvertebrates and BE uses its specifically developed method for transitional HMWB using all quality elements).
- **Coastal waters** - only ES has partially derived biological references using phytoplankton and macroinvertebrates.

Even in countries following the Prague approach for GEP establishment, it is possible that results from biological assessment methods are considered when determining if water bodies should be reported as heavily modified and artificial. This is the case for instance in the UK, where it is nevertheless noted that the development of further tools would be required to rely solely on biological results.

[5] Keto, A., Tarvainen, A., Hellsten, S. & M. Marttunen (2008). Use of the water level fluctuation analysis tool (Regcel) in hydrological status assessment of Finnish lakes. Hydrobiology,613,133–142.

5.2.2 Approaches based on mitigation measures (Prague approach)

Countries which apply the Prague approach to establish GEP have worked with both generic checklists of mitigation measures and water body-specific mitigation measures. Table 5 shows that generic checklists and water body-specific mitigation measures have been developed for all uses of HMWB designation (to a different extent in different countries). Table 5 also includes information from countries that have used the Prague approach in a combined way with elements of the biological assessment method (e.g. AT) as well as from countries that applied the biological assessment method but also provided information on their mitigation measures (e.g. ES, FI).[6]

Several countries have involved water users in applying the Prague method for the establishment of GEP. For example, in the Netherlands, the process started with generic lists, which have been applied by regional authorities to water body-specific lists of measures. In this process, stakeholders were involved and added valuable suggestions to the generic lists. In one federal state of DE, round tables and bilateral talks were held in very extensive form (more than 300 discussions).

Table 5 MS use of checklists of mitigation measures

Water uses	**Use-specific generic checklists of mitigation measures**	**Water body-specific mitigation measures rather than generic checklists**	**Modification of the generic list to take account of the specific characteristics and use of each HMWB**	**Involvement of the water users in applying the method**
Navigation, including port facilities	AT, DE*, IE, NL, UK	DE*, ES, IE, NL, FI	DE*, IE, NL, FI	DE*, ES, NL, UK, FI
Storage for drinking water supply	AT, DE*, IE, , NL, UK	BG, DE*, EE, ES, IE, NL, FI	DE*, IE, NL, FI	DE*, ES, NL, UK, FI
Storage for power generation	AT, DE*, IE, , NL, NO, UK, (FI)	BG, DE*, EE, ES, IE, NL, NO, FI	DE*, IE, NL, NO, FI	DE*, EE, ES, NL, NO, UK, FI
Storage for irrigation	AT, DE*, NL	BG, DE*, ES, NL, FI	DE*, NL, FI	DE*, ES, NL, FI
Water regulation	AT, DE*, NL, NO, UK, (FI)	BG, DE*, EE, ES, NL, NO, SE, FI	DE*, NL, NO, FI	DE*, ES, NL, NO, FI

[6] In fact, FI also developed a slightly modified version of the Prague method. The method aims first to identify whether GEP has already been achieved by doing a semiquantitative assessment of how much all practicable mitigation measures improve the current situation. Depending on the improvement potential, the water body is at GEP, not at GEP or an uncertain case. The FI questionnaire concludes that the Prague method can in some cases lead to the conclusion that more mitigation measures are needed compared to the biological assessment method.

Water uses	Use-specific generic checklists of mitigation measures	Water body-specific mitigation measures rather than generic checklists	Modification of the generic list to take account of the specific characteristics and use of each HMWB	Involvement of the water users in applying the method
Flood protection	AT, DE*, IE, NL, UK, (FI)	BG DE*, ES, IE, NL, FI	DE*, IE, NL, FI	DE*, ES, NL, UK, FI
Land drainage	AT, DE*, NL, UK	DE*, EE, ES, NL, FI	DE*, NL, FI	DE*, EE, ES, NL, UK, FI
Equally important sustainable human development activities	DE*, IE, NL, UK	DE*, ES, IE, NL, FI	DE*, IE, NL, FI	DE*, ES, NL, UK, FI

* *Some federal states of DE.*

In AT and DE, the generic checklists of measures are structured along the lines of specific hydromorphological pressures instead of uses and have the form of databases or catalogues of hydromorphological measures.

In Austria, a database of measures is available for each hydromorphological pressure (e.g. interruption of continuity, hydropeaking, impoundment, residual flow etc). For each pressure, a generic list of restoration/mitigation measures was developed including information on issues such as effects on the biological quality elements, effects on uses, cost and reaction time of effects.

In German states, catalogues of groups of hydromorphological measures have been developed targeting specific pressures (e.g. impoundments, structure and quality of banks, continuity, structure of substrate). These catalogues of restoration/mitigation measures usually give an indication of the effectiveness of each measure on the biological quality elements.

In the UK and NO, generic checklists target specific uses. For example, in NO, a generic list of groups of mitigating measures for HMWB was developed for the use of hydropower.[7] The approach of the UK to generic checklists is illustrated in the following box.

Box 1 UK approach to generic checklists on mitigation measures for GEP definition

The process of classifying ecological potential is based on an assessment of whether measures included in the checklists have been taken to mitigate the modified or artificial hydromorphological characteristics of the water body.

The hydromorphological characteristics of a water body will support the achievement of GEP or

[7] See CIS 2006: Good Practice paper on managing the ecological impacts of hydropower, flood protection and navigation, p.45-49.

better where all mitigation measures on the relevant checklists relevant to the identified impacts have been taken excepting those which: (i) are not practicable given the characteristics of the water body; (ii) have a significant adverse impact upon the use; or (iii) have a significant adverse impact upon the wider environment.

Where all measures are in place, the water body will be defined as achieving GEP or better, and where measures are not in place then the water body will be defined as Moderate Ecological Potential or worse.

The checklist approach is tailored to the water use or uses for which the water body has been designated.

The method used to classify water bodies and the checklists themselves (if the Alternative Approach continues to be used) will be reviewed and updated for each river basin planning cycle as methods and understanding improve. The reviews will take account of experience of applying the guidance, information from environmental monitoring programmes, and research projects on the impacts resulting from physical modifications, and information on the effectiveness and practicability of different mitigation measures.

To support the decision-making process, forms have been devised to allow GEP or better to be identified. The forms will require completion for each water body which has been designated as a HMWB or AWB. The forms facilitate identification of:

• the pressures and impacts present at a given site;

• the mitigation measures already in place at a site and whether they adequately mitigate the identified impacts;

• mitigation measures which, if implemented, would have a significant adverse effect on the water use (for example navigation or flood risk management), or the wider environment;

• mitigation measures which would only deliver a slight ecological benefit; and

• mitigation measures which could be put in place taking into account all of the above.

Where there are multiple uses affecting a water body, then the full range of potential measures for each sector should be assessed.

The decision making process on whether potential measures have already been taken is based on a step-wise process which is contained in a single form.

Each water use sector identifies the:

• Hydromorphological modifications or artificial characteristics (pressures) associated with the water use or uses concerned, and

• The adverse ecological effects (impacts) which are or may be associated with the modification or artificial characteristic occurring in the water body in question.

Mitigation measures are associated to the impacts in the checklists and are assessed against the questions in the next step.

A series of checkboxes are set out to test whether each mitigation measure for the identified impact(s) is in place and, where it is not in place, test the applicability of each listed measure.

Where all applicable mitigation measures on the checklist have already been taken or screened out,

the water body is classified as GEP or better. Where one or more applicable mitigation measure(s) remain to be taken, the water body is classified as Moderate Ecological Potential or worse. This will then be combined with the outcomes from other assessments to give an overall classification.

5.2.3 Use of both approaches for GEP establishment

Some MS (FR, NL, CZ, PT RO, AT and DE) have classified HMWB using *both approaches* for GEP establishment, i.e. the biological assessment approach and the Prague approach based on all practicable mitigation measures.

NL applied both the method from the CIS guidance and the alternative approach to different types of water (heavily modified and artificial) to compare the results of the two approaches:

- Method from the CIS guidance 4: For artificial ditches and canals, there were sufficient data for water bodies with a good status and no corrections had to be made for modified hydromorphological conditions. Therefore, a MEP could be derived from measurements. The GEP is slightly less than the MEP.
- Alternative method: For most of the heavily modified water bodies and some artificial water bodies, GEP was calculated based on the mitigation measures. Starting with the present EQR value (Ecological Quality Ratio), the effects of all possible (mitigation) measures were estimated and added to the present EQR to obtain GEP.

In federal Germany, several states have used only the Prague approach while others have based GEP establishment only on biological assessment methods. Some additional approaches have been developed which are considered a combination of both methods. Key steps of these "combined" approaches are summarised in the box below.

Box 2 DE combined approaches for GEP establishment

Method A	Method B
1) Choice of mitigation measures according to Prague methodology (GEP = all ecological effective measures) 2) List and abundance of habitats, which would be created when 1) would be fulfilled 3) Definition of the list of species and their abundance according to habitats under 2) (as "reference" for GEP) 4) Biological assessment	1) Identification of measures without use conflicts 2) Modelling hydromorphology after implementation of the measures 3) Calculation of class limits for ecological potential 4) Transfer of these class limits (hydromorphology) to the class limits of biological quality elements (use of correlation between hydromorphological and biological classes) 5) Comparison of the biological current potential with the determined values for GEP

AT uses a combined approach for defining GEP, applying the Prague approach but also specifying the biological goal at the beginning of the process (as verbal description and not in a specific index value).

In NO, the Prague approach has been used to define GEP in the first planning cycle. However, during a testing phase, Norway applied both approaches in hydropower-affected water bodies. The mitigation measures needed were comparable (in most WBs similar). The resulting GEPs from both approaches were quite similar, for some WBs they were identical. The reason for this was that the most important potential measure was environmental flow with adverse effect on use (power production), independent of approach. The size of environmental flow will be a dominant parameter for the resulting ecological quality, which therefore will be quite similar for both approaches. For FR, CZ and PT and, no further details on their use of both GEP definition approaches were given in the questionnaires. The RO method is currently under development.

6 Measures & objectives setting

The Article 4 of the WFD sets out the “environmental objectives” of the Directive. For heavily modified and artificial water bodies, Article 4(1) sets out “specific objectives” which include the achievement of good ecological potential and good surface water chemical status by 2015.

Also a number of “exemptions” from the Article 4(1) objectives are introduced, including the extension of deadlines (Article 4(4)), less stringent objectives (Article 4(5)), temporary deteriorations (Article 4(6)) and new modifications (Article 4(7)). The exemptions are an integral part of the environmental objectives set out in Article 4 and the planning process.

Artificial and heavily modified water bodies do not constitute a conventional objective or exemption themselves. They are a specific water body category – with its own classification scheme and objectives.

6.1 Measures

In implementing the WFD, the establishment of GEP is followed by the planning of measures to achieve the environmental objective for HMWB. It should be noted that the selection of mitigation measures for defining GEP and MEP is not identical with the planning of measures for achieving GEP.

In the process of planning measures to achieve GEP (as part of the programme of measures of the river basin management plan), the proportionality of costs, financing and the effectiveness of measures as well as the application of exemptions to the HMWB objectives are also considered.

In practice, several Member States refer to the same databases or catalogues of hydromorphological measures (mentioned in section 5.2.2 for defining GEP) in order to select measures which will be checked for their cost-effectiveness in the measures planning step.

6.2 Use of exemptions for HMWB

In setting the objectives for HMWB in the draft river basin management plans, Member States have made use of exemptions:

- MS replies to the HMWB questionnaire show that the **exemption most frequently used for HMWB is the extension of deadlines** (Article 4(4)). 78% of the MS replies were positive to the use of this extension.
- MS intend to apply also the Article 4(5) exemption, i.e. **less stringent objectives,** to HMWB but **to a smaller extent**. In specific, 39% of MS replies were positive and 83% were negative to the use of this exemption.[8] In some cases (LT, parts of PL), the use of less stringent objectives for HMWB is probable but this is not clear yet.
- All countries which reported the use of less stringent objectives (Art. 4(5)) reported also the use of extension of deadlines (Art. 4(4)).
- Three MS (CZ, IE and LV) reported that they do not intend to use any of the two exemptions for HMWB.

According to several MS replies, the process of HMWB designation and of MEP/GEP establishment is considered in principle as a process separate from the definition and application of exemptions. After the designation of HMWB, the status of the ecological potential is classified and in case the potential is less than good, the same procedure as for natural water bodies which fail to achieve "good status" is used to decide on the possible application of exemptions.

Justifications for HMWB exemptions

The use of the exemption of deadline extension (Article 4(4)) for HMWB is usually justified by the fact that measures take a long time to come into effect and it will not be feasible for all HMWB to attain good ecological potential by 2015. Technical feasibility is also related to deadline extensions, e.g. in cases where it is only possible to implement measures in steps, thus requiring more time for objectives achievement.

Other justifications mentioned by MS for the use of exemptions for HMWB include disproportionate costs but also natural conditions.

7 Questions to the workshop

The following are key questions proposed for discussion at the HMWB workshop:

HMWB designation

- How has the extent of HMWB changed from the provisional <u>identification</u> step to the <u>designation</u> step? How are changes explained? To what extent have the two steps been differentiated and treated separately?

[8] The sum of replies is not equal to 100% because in some MS, e.g. BE, DE and BG, different replies were given for different parts of the country.

- Which water uses are mainly considered for HMWB designation? What is included in "other equally important sustainable human development activities"?
- Which criteria and thresholds are used to assess the "scale of modification"? What are the main hydromorphological conditions identified for the ecological continuum (e.g. conditions for fish migration upstream and downstream of dams and reservoirs)?
- How are "significant adverse effects on use or the wider environment" defined in practice (criteria and thresholds)? What is the view of stakeholders on the definitions of "significant adverse effects" used by the MS? Could harmonized/comparable European criteria be developed for certain uses?
- What are the main "significantly better environmental options" considered (criteria and thresholds)?

Definition of Good Ecological Potential (GEP)

- What kind of practical approaches have been used to define reference conditions for HMWB (MEP) and set class boundaries for biological quality elements when using the method for classifying ecological potential laid down in CIS guidance No 4?
- Have special biological assessment methods been developed and used for classifying ecological potential? Has it been possible in practice to derive biological reference values and class boundaries from the closest comparable types?
- What kind of practical approaches have been used to define checklists of mitigation measures for GEP and then apply them according to the Prague method to classify ecological potential? How have water bodies been checked to determine if the mitigation measures used to define GEP are in place? Has it been possible to translate the expected biological effects of the mitigation measures into ecological reference values?
- How do the results of using the two approaches for GEP definition compare? Are the mitigation measures needed to achieve GEP comparable? Are there any examples to combine both methods?
- How many classes for HMWB are used by the MS? Is it possible to intercalibrate similar HMWB between countries? How does the European intercalibration exercise for reservoirs correlate with GEP definition via the Prague approach?
- How is information from stakeholders incorporated (or can be incorporated) into the process of classification of ecological potential?

Objectives & measures

- Which ways of setting objectives did Member States use for HMWB? Would exemptions under Art. 4 (5) (less stringent objectives) be consistent with HMWB designation according to Art. 4 (3) and CIS guidance No 4?
- Is it possible to define a list of ecologically efficient measures for all HMWB uses mentioned in Art. 4 (3) WFD?

- What criteria of ecological functionality are used for measures (e.g. in order to ensure continuity with fish ladders)?

8 Acknowledgements

We would like to thank all Member State experts who completed the EU questionnaire on HMWB and thus made a very valuable contribution to the preparations of this workshop.

9 Sources

Member State Questionnaires

Completed questionnaires of AT, BE, BG, CY, CZ, DE, EE, ES, FI, FR, HU, IE, LT, LU, LV, NL, NO, PL, PT, RO, SE, SI, SK and UK. Available online at: http://www.ecologic-events.de/hmwb/background.htm.

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10 Annex I: Water uses of HMWB in surveyed MS

Water uses for which WBs are identified as HMWB	AT	BE	BG	CY	CZ	DE	EE	ES	FI	FR	HU	IE	LT	LU	LV	NL	NO	PL	PT	RO	SE[9]	SI	SK	UK	Total
Wider environment	1	2	19			58		11		2	91	1		8		20		85	6	47				332	683
Navigation, including port facilities, or recreation		8	5	4		328		35		60					8	46	126			12			19	259	910
Navigation & ports	9	33	5	4	10	90		89	3	46		22	1	1	8	40		39	19	5	2	1	3	153	583
Recreation	1	1			51	208	10	9		7			49			11		134	24	7	1		16	113	642
Activities for the purposes of which water is stored		0	213	76		436		54		216	51					6				70			40	969	2131
Storage for drinking water		8	16	15	34	47	2	144	4	69	2	10		1	1	4	145	46	48	21			7	250	874
Storage for power generation	299	10	94	0	71	358	1	140	14	119	5	12	42	1	2	2	700	198	46	43	369	11	20	236	2793
Storage for irrigation		0	197	61		30	1	151		28	44						0	315	50	12			13	39	941
Water storage (non-specified)		0																						516	516
Water regulation, flood protection, land drainage		0				3204		157		62	101					272[10]	1453			69			40		5358
Water regulation		19	138		40	936	17	39	14	112	101				17	3	1277	767	99	23	134		5	43	3784
Flood protection	346	137	63		205	570		52	2	131		9			13	98	176	530	29	55		10	35	1137	3598
Land drainage		30	2			1661	120	22					152		19			10	17	7				448	2488
Mining subsidence						36																			36

9 Data based on two RBDs: Bothnian Sea RBD and Skagerrak and Kattegat RBD.

10 The Netherlands used water supply/water regulation, water management, agriculture and urban land as 4 separate criteria. The data under “flood protection” correspond to the criterion water management.

11 Annex II: UK-EW pressure-related criteria for substantial changes in character

Rivers and lakes:

The extent of modification within a water body was assessed in semi-quantitative manner as present, extensive, absent or unknown. For linear features such as embankments and reinforcement to banks the extent was measured as a percent of the water body length. If the feature was approximately ≤33% of the total water body length/area then it is recorded as present, if the feature is approximately ≥33% of the total water body length/area then it was recorded as extensive. In order to designate a pA /HMWB following pragmatic rule has been developed which if met allowed the water body to be designated. If a combination of any four or more of the modifications below were recorded as extensive in the provisional heavily modified water body then the water body was designated.

• Culverts

• Weirs

• Dams and Impoundments

• Channel Realignment

• Bed resectioned /deepened

• Bed material removal

• Bank reinforcement

• Embankments

• Flood defence structures

• Buildings/Bridges/ Roads/Railways

• Land Drainage

Transitional & coastal waters:

The pressure related criteria for Transitional and Coastal waters (TraC) was based on the extent of hydromorphological modifications associated with a specified uses/pressures. The uses and associated hydromorphogical modification considered in TraC waters A/HMWB designation were

a) Flood Protection Use:

The assessment was based on three separate elements relating to:

• The extent of reclaimed land protected by shoreline flood protection assets;

• Barrages and barriers across the width of the main water body or forming a boundary with another water body which provide flood protection benefits; and

• Sluices across the width of the main water body or forming a boundary with another water body which provide flood protection benefits.

b) Navigation, Ports, Harbour Use:

The key criteria that were used for the assessment are:

• The extent of navigation dredging in the water body – maintenance of navigable depth in previously deepened areas is critical to maintenance of the navigation use;

• The extent and intensity of dredge material disposal in the water body – disposal of dredge material is critical to the maintenance of the navigation use; and

• The extent of reclaimed areas behind quay lines – loss of quay line will directly affect specified use (unless there is significant long-term spare capacity).

c) Coastal Protection Use:

The key criteria that have been used for the assessment are:

• The extent of influence of manipulators of sediment transport on inshore waters within the water body; and

• The extent of infrastructure development afforded protection by coast protection structures.

d) Marine Aggregate extraction use:

The key criteria that have been used for the assessment are:

• The extent of water body area licensed for marine aggregate extraction; and

• The extent of water body area subject to active extraction or sediment disturbance in the past decade.

e) Fin/Shellfisheries

The criteria that have been used for the assessment are:

• The extent of shellfishing beds within designated shellfish waters within the water body.

• The extent of fin fishing activities including Otter and Beam trawling known to cause significant seabed disturbance

12 Annex III: Workshop Programme

	12 March 2009	
09:30	**Registration**	
	Session I: **HMWB designation, GEP, objective setting & measures**	**Chair**: Anton Steiner, DE
10:00	Welcome by Host Representation of the Free State of Bavaria to the EU	Director Heidrun Piwernetz
10:10	Welcome and aims of workshop: EC view on state of play of HMWB	Jorge Rodriguez Romero (EC, DG Environment)
10:20	Summary of MS questionnaires on HMWB	Eleftheria Kampa (Ecologic Institute)
10:50	UK: Designation & classification	David Corbelli (Environment Agency of England & Wales) Peter Pollard (Scottish Environment Protection Agency)
11:10	Germany: Designation & GEP	Ulrike Hursie (Ministry of Agriculture and Environment Saxony-Anhalt)
11:30	The Netherlands: GEP, objectives & measures	Diederik van der Molen (Ministry of Transport, Public Works and Water Management)
11:50	Q&A - Discussion	
12:20	Aims and design of working groups	Volker Mohaupt (German Federal Environment Agency)
12:30	**Lunch**	
	Session II: **Parallel Working Groups**	
13:30	**WG I:** **Hydropower** HMWB designation, GEP establishment, objectives & measures	**Chair**: Rory Wallace, UK **Rapporteurs**: Tor Simon Pedersen, NO; Ales Bizjak, SI **Support**: Eleftheria Kampa, Ecologic Institute
	Presentations / statements:	
	HMWB designation	
10´	Austria: Statement on designation	Veronika Koller-Kreimel, Gisela Ofenböck (Ministry for Agriculture, Forestry, Environment and Water Management)
	GEP establishment	

15´	Norway: Aura river basin - Application of both GEP approaches on the same water bodies - Experience and remaining challenges in Norway	Jo Halvard Halleraker (Directorate for Nature Management & Water Resources and Energy Directorate)
10´	Finland: GEP or not GEP? – A Finnish approach for assessing the status of HMWB *(hydropower focus)*	Mika Marttunen (Finnish Environment Institute)
	Objective setting & measures	
10´	UK: Statement on objective setting & measures	Peter Pollard (Scottish Environment Protection Agency)
	Stakeholders	
10´	Hydropower sector	Otto Pirker (EURELECTRIC)
10´	Small hydropower sector	Luigi Papetti (European Small Hydropower Association)
10´	Hydropower: The environmental NGO perspective	Gerhard Nagl (European Environmental Bureau)
13:30	**WG II:** **Navigation & ports** HMWB designation, GEP establishment, objectives & measures	**Chair**: Volker Mohaupt, DE **Rapporteurs**: David Corbelli, UK; Chris Vivian, CEFAS/CEDA **Support:** Cornelius Laaser, Ecologic Institute
	Presentations / statements:	
	HMWB designation	
10´	Belgium: Statement on designation	Wim Gabriels, (Flemish Environment Agency)
10´	Experiences in HMWB designation from ports and navigable water bodies	Jan Brooke (WFD Navigation Task Group)
	GEP establishment	
10´	UK: Experiences in HMWB GEP setting and measures from ports and navigable water bodies in the UK	Jan Brooke (WFD Navigation Task Group)
10´	The Netherlands: Navigation & ports in the GEP process	Paul Latour (Center for Water Management)
	Objective setting & measures	
10´	Belgium: Statement on objectives	Wim Gabriels (Flemish Environment Agency)
	Stakeholders	
10´	Navigation: The environmental NGO perspective	Sergey Moroz (WWF European Policy Office)
13:30	**WG III:** **Agriculture & flood defense** HMWB designation, GEP establishment, objectives & measures	**Chair**: Ursula Schmedtje, EC **Rapporteurs**: Rene Reisner, EE; Rebecca Fitton, UK **Support**: Thomas Dworak, Ecologic Institute
	Presentations / statements:	
	HMWB designation	
10´	Germany: Statement on designation	Thomas Menzel (Ministry for Environment of North Rhine-

		Westphalia)
	GEP establishment	
15´	The Netherlands: The road and hurdles towards GEP in the large rivers in the Netherlands	Fred Wagemaker (Center for Water Management)
10´	France: The French approach on GEP establishment - A typology of HMWB	Johann Moy (Ministry of Environment)
	Objective setting & measures	
15´	UK: Alternative approach to GEP, objectives setting & measures for flood risk and land drainage activities	Kevin Hall (Environment Agency of England & Wales)
	Stakeholders	
10´	Designation and the "changing" of designation of HMWB 2003-2007: Case study from Lower Saxony, DE	Moritz Busse (BUND, Wassernetz Lower Saxony/Bremen)
10´	Agriculture sector	Tania Runge (COPA-COGECA)
15:30	**Coffee Break**	
16:00	**Working Groups I-II-III *(continued)***	
18:00	**Closing of Day 1 –** **Reception in the Bavarian Representation**	

13 March 2009

	Session III: **Working Group Reports**	**Co-Chairs:** Jorge Rodriguez Romero, EC Bernd Mehlhorn, DE
09:00	**HMWB Designation**	
	WG I Rapporteur – Hydropower	
	WG II Rapporteur – Navigation & ports	
	WG III Rapporteur – Agriculture & flood defense	
	Plenary Discussion	
10:00	**GEP Establishment**	
	WG I Rapporteur – Hydropower	
	WG II Rapporteur – Navigation & ports	
	WG III Rapporteur – Agriculture & flood defense	
	Plenary Discussion	
11:00	**Objectives & Measures**	
	WG I Rapporteur – Hydropower	
	WG II Rapporteur – Navigation & ports	
	WG III Rapporteur – Agriculture & flood defense	

	Plenary Discussion	
11:30	**Coffee Break**	
12:00	**Session IV** **Conclusion & Outlook**	**Co-Chairs:** Peter Pollard, UK Volker Mohaupt, DE
	Conclusion & Outlook	
13:00	**Closing of Workshop**	