# HMWB Workshop, 12-13 March 2009, Brussels
# Member State Questionnaire

## 1. Context

A workshop on Heavily Modified Water Bodies (HMWB) will be organised on 12-13 March 2009 in Brussels by Germany, UK and the European Commission in cooperation with the WFD CIS-ECOSTAT-group and the CIS-HYMO-activity.

The workshop aims to allow information exchange on the following topics:

- **Designation of HMWB**:
  Exchange of experiences on practical application of HMWB designation processes in Member States.
- **Establishing good ecological potential (GEP)**:
  Exchange information on the practical application of both methods for deriving GEP (HMWB Guidance No 4 approach based on biological quality elements and the "Prague" approach based on mitigation measures – *see Annex*) and collect examples of results.
  Compare results of methods and discuss, if they are comparable and what are reasons of differences.
- **Objective setting and measures**:
  Collect and discuss experiences of Member States on objective setting for HMWB (including related issues like application of exemptions) and exchange information about planned mitigation measures.

A discussion document will be prepared for the workshop. In order to collect background information for the workshop discussion document, Member States are kindly asked to fill in the present questionnaire on water uses and parameters included in HMWB designation, methods for classification of HMWB and ways of objective setting for HMWB in Member States.

Please fill in *one questionnaire per Member State* and return to **eleftheria.kampa@ecologic.eu** at the latest by **16 January 2009.** Please do not hesitate to answer, even if you can only provide information on national RBD level.

## 2. General information

**Q2.1:** Name of Member State.

Norway (non EU member, but obligated to implement WFD due to the EU-EFTA agreement).

**Q2.2**: Name and contact details of person to be contacted if any clarifications on the reply to this questionnaire are needed.

Anja Skiple Ibrekk, Norwegian Water Resources and Energy Directorate, asi@nve.no
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## 3. HMWB designation

***Note:*** *For each answer below* ***rounded figures*** *would be appropriate.*

**Q3.1: Please tell us about the proportion of each water category you have identified for designation as heavily modified by completing the two Tables below**

**Number of HMWB**

| River | | Lake | | Transitional water | | Coastal water | |
|---|---|---|---|---|---|---|---|
| Total number of water bodies (including non-HMWBs) | Number to be designated | Total number of water bodies (including non-HMWBs) | Number to be designated | Total number of water bodies (including non-HMWBs) | Number to be designated | Total number of water bodies (including non-HMWBs) | Number to be designated |
| 7869 | 1451 | 5521 | 878 | 0 | 0 | 1850 | 203 |

**Length and area of HMWB**

| River | | Lake | | Transitional water | | Coastal water | |
|---|---|---|---|---|---|---|---|
| Total length of water bodies (including non-HMWBs) (Km) | Length of to be designated (Km) | Total area of water bodies (including non-HMWBs) ($Km^2$) | Area to be designated ($Km^2$) | Total area of water bodies (including non-HMWBs) ($Km^2$) | Area to be designated ($Km^2$) | Total area of water bodies (including non-HMWBs) ($Km^2$) | Area to be designated ($Km^2$) |
| 465692 | 9765 | 13426 | 4505 | 0 | 0 | 89075 | 1847 |

**Q3.2: Please tell us about the water uses for which you have identified water bodies as heavily modified by completing the three Tables below**

***Note****. If a water body has been designated for more than one use, please count each use.*

| Water use [Art.4(3)(a)] | Number of water bodies |
|---|---|
| Wider environment [Art.4(3)(a)(i)] * | |
| Navigation, including port facilities, or recreation [Art.4(3)(a)(ii)] | 126 |
| - Navigation, including port facilities | |
| - Recreation | |
| Activities for the purposes of which water is stored [Art.4(3)(a)(iii)] | |
| - Storage for drinking water supply | 145 |
| - Storage for power generation | ca 700 |
| - Storage for irrigation | 0 |

| Water regulation, flood protection, land drainage [Art.4(3)(a)(iv)] | Total | Urban land | Agricultural land |
|---|---|---|---|
| | 1453 | | |
| - Water regulation | 1277 | | |
| - Flood protection | 176 | | |
| - Land drainage | | | |

*** Please specify your definition of "wider environment": …**

| **Description of each 'equally important sustainable human development activity' for which HMWB are to be designated** [Art.4(3)(a)(v)] | **Number of water bodies** |
|---|---|
| On-shore transportation | 117 |
| Urbanisation | 99 |
| Industry | 76 |
| Agriculture | 52 |
| Registration missing | 91 |

**Multiple water uses of HMWB**

| **Number of water bodies designated for one use** | **Number of water bodies designated for two uses** | **Number of water bodies designated for three or more uses** |
|---|---|---|
| 2306 | 96 | 41 |

**Q3.3: Please tell us about the criteria you used to decide if a water body was substantially changed in character for it to be considered for designation as heavily modified by completing the applicable Tables below**

| **Did you use impact-related criteria (e.g. length or area expected to be worse than good status or substantially changed in hydromorphology)? (yes/no)** | **Did you use pressure-related criteria (e.g. volume of water stored; height of dam)? (yes/no)** | **Did you use use-related criteria (e.g. number of people provided with drinking water; protection against particular flood return period; daily number of vessels)? (yes/no)** | **Did you use other types of criteria? (yes/no)** |
|---|---|---|---|
| Yes | Yes | No | No |

If you used **impact-related criteria**, please complete the following Table

| Water category | Description of impact-related criteria (e.g. length or area expected to be worse than good status) |
|---|---|
| River | - Major alteration of species and/or life stages composition and abundance of river benthos or fish populations.<br>- Introduction of migration barriers.<br>- If a river water body is normally covered with ice becomes free from ice cover and no longer has a temperature below +1$^{o}$C as a result of water intakes in deep reservoirs or other physical changes to the watercourse.<br>- Water bodies which normally contain wild salmon, but have a pH which has been reduced by more than 0.5 to a value below 5.5 as a result of the upstream import of water from outside the natural catchment.<br>- If rivers with salmon have had their turbidity changed from "clear" (turbidity < 1.5 FTU) to "turbid" (turbidity > 2.0 FTU) as a result of the upstream import of water outside the natural catchment. |
| Lake | - Removal of aquatic or riparian vegetation zones/types.<br>- Major alteration of flora and fauna in the shore line.<br>- Major alteration of species and/or life stages composition and abundance of benthos or fish populations.<br>- Lakes which can change from oligotrophic to eutrophic or vice versa due to a change in hydraulic load by a factor 5.0 or more, due to article transfers between catchments (primarily for lowland lakes).<br>- Increased turbidity in salmon rivers due to water transfer which result in mixing of turbid water into previously clear water (from < 0.5 FTU to > 2,0 FTU). |
| Transitional water | |
| Coastal water | - Major alteration of key species and/or life stages composition and abundance of benthos. |

If you used **pressure-related criteria**, please complete the following Table

| Pressure | Description of pressure-related criteria (e.g. volume of water stored; height of dam)? |
|---|---|
| Impoundment | |
| Other hydromorphological alterations | |
| - Rivers | - Rivers which are impounded to form a lake with a surface area greater than 0.5 km$^2$ or raise water level more than 5 m (or vice versa).Artificial alteration of water level more than 0.5 m in a wetland.<br>- Small rivers where an upstream dam removes all water for at least part of the year. This HMWB should be extended downstream until the catchment area for undistributed inflow has returned to at least 75 % of natural catchment |

| | |
|---|---|
| | area.<br><br>- For all rivers below a dam where a minimum environmental flow is required, but which is lower than the natural minimum flow without the dam, measured as the flow with 95 % percentile excedence ($Q_{95}$), the following two alternatives: When the minimum flow is below 20 % of $Q_{95}$, the water body is automatically a HMWB candidate. For values between 20 % and 100 % of $Q_{95}$, the designation should be based on expert judgement and data available.<br><br>- Flow discharges, which are regulated by more than 5 % per hour relative to maximum turbine flow.<br><br>- Rivers which no longer experience the natural average annual flood more than once every 20 years due to upstream storage.<br><br>- Artificially channelled rivers and rivers with sluices for boat traffic, which are affected from more than 1 km total length or where alterations affect more than 50 % of the total length of the water body (measured along both banks).<br><br>- Stream that is affected by urbanization in more than 50 % of its total catchment area, or more than 50 % of its channel length is affected by culverts, pipes, roughness alterations, man-made alterations in vegetation/substrate etc. |
| Lakes | - Lakes which have been raised more than 10 m above natural water level.<br><br>- Lakes with an active annual regulation zone of 3 m or more. |
| Transitional waters | - Not relevant in Norway |
| Coastal waters | - Harbour development and morphological changes in seabed to facilitate ship transport. The changes have to cover >50% of the coastline distance or >50% of the total area of the identified coastal water body.<br><br>- Extensive stone and earth waste deposits in narrow fjords substantially reducing the water depth and changing bottom substrate.<br><br>- Change in ocean current regime by narrowing entrances to fjords and coastal water bodies as a result of constructing road and rail embankments.<br><br>- Reclamation of river delta land by canalisation, dredging, landfill, anti-erosion measures etc., resulting in reclamation of >1/3 of the original estuary area at high tide.<br><br>- Substantially increased or reduced freshwater discharge to sheltered fjords by river regulation. |

| | |
|---|---|
| | Changes in yearly freshwater discharge by a factor of >2; changes in winter runoff by a factor of > 5 (either way); and changes in spring flood level by a factor of > 2 (either way).<br><br>- Pumping up nutrient-rich deep water (for industrial (aquaculture) purposes) in a sheltered coastal water body.<br><br>- Freshwater lake changed into a salt/brackish water body by canalisation or widening of the exit to the lake.<br><br>- Coastal water body changed into freshwater lake by blocking tidal water inflow. |

If you used **use-related criteria**, please complete the following Table

| **Water use** | **Description of use-related criteria (e.g. number of people provided with drinking water; protection against particular flood return period; daily number of vessels)** |
|---|---|
| Wider environment [Art.4(3)(a)(i)] | |
| Navigation, including port facilities, or recreation [Art.4(3)(a)(ii)] | |
| - Navigation, including port facilities | |
| - Recreation | |
| Activities for the purposes of which water is stored [Art.4(3)(a)(iii)] | |
| - Storage for drinking water supply | |
| - Storage for power generation | |
| - Storage for irrigation | |
| Water regulation, flood protection, land drainage [Art.4(3)(a)(iv)] | |
| - Water regulation | |
| - Flood protection | |
| - Land drainage | |
| Equally important sustainable human development activity' [Art.4(3)(a)(v) | |

If you used **other criteria**, please complete the following Table

| **Description of other criteria used to decide if water bodies are substantially changed in character to consider designation** |
|---|
| |

**Q3.4: Please tell us about the criteria you used to decide if implementing a measure (e.g. a restoration measure to achieve good status or a mitigation measure aimed at improving the ecological potential of a water body) would have a significant adverse effect on use by completing the two Tables below**

| **Have you developed specific criteria on significant adverse effects on use to help prepare the draft river basin management plans?** | |
|---|---|
| yes | No |
| | X<br>Assessment based on WB-specific conditions |

| **Have you identified pressure-specific criteria to help screen out measures which would have a significant adverse effect on use (e.g. reducing abstraction by > 50 %)? (yes/no)** | **Have you identified measure-specific criteria to help screen out measures which would have a significant adverse effect on use (e.g. dismantling major dams)? (yes/no)** | **Have you identified use-specific numeric criteria (e.g. % loss of energy generation) to help screen out measures which would have a significant adverse effect on use? (yes/no)** | **Have you identified other types of criteria to help decide what constitutes a significant adverse effect on use? (yes/no)** |
|---|---|---|---|
| No | Yes | No | Yes |

| **Water use** | **Examples of the principal criteria you used to decide if a measure or combination of measures would have a significant adverse effect on use** |
|---|---|
| Wider environment [Art.4(3)(a)(i)] | |
| Navigation, including port facilities, or recreation [Art.4(3)(a)(ii)] | |
| - Navigation, including port facilities | Possibility to maintain necessary port services. |
| - Recreation | |
| Activities for the purposes of which water is stored [Art.4(3)(a)(iii)] | |
| - Storage for drinking water supply | |
| - Storage for power generation | No significant reductions in power production due to restrictions on water storage/draw down at national level. |
| - Storage for irrigation | |
| Water regulation, flood protection, land drainage [Art.4(3)(a)(iv)] | |
| - Water regulation | No significant reductions in power production from increased minimum flow requirements at national level (used as a general criteria, no exact limits on production losses). |
| - Flood protection | Maintain necessary flood protection (considering effect of future climate change). |
| - Land drainage | |

| | |
|---|---|
| Equally important sustainable human development activity' [Art.4(3)(a)(v) | |

**Q3.5: Please tell us about the other environmental options you considered to decide if the benefits of the use could be provided by a significantly better environmental option [Art. 4(3)(b)] by completing the Table below**

| Water use | Other environmental options considered |
|---|---|
| Wider environment [Art.4(3)(a)(i)] | |
| Navigation, including port facilities, or recreation [Art.4(3)(a)(ii)] | |
| - Navigation, including port facilities | |
| - Recreation | |
| Activities for the purposes of which water is stored [Art.4(3)(a)(iii)] | |
| - Storage for drinking water supply | Use of groundwater wells |
| - Storage for power generation | |
| - Storage for irrigation | |
| Water regulation, flood protection, land drainage [Art.4(3)(a)(iv)] | |
| - Water regulation | National studies show that hydropower has the lowest cost per unit among renewable energy sources today (NVE 2007, Håndbok 1). A life-cycle analysis shows that hydropower has the lowest environmental costs as compared with energy production based on biomass, gasproduction and coal-fired power (NVE 2008, oppdragsrapport A). |
| - Flood protection | Restoration of original river bed |
| - Land drainage | |
| Equally important sustainable human development activity' [Art.4(3)(a)(v) | |

## 4. Establishing Good Ecological Potential (GEP)

**Q4.1: Please tell us about the method you used to classify the ecological potential of heavily modified water bodies by completing the applicable Tables below**

| Are you satisfied that your draft classification results reflect the effect of hydromorphological alterations on | Have you classified the effect of hydromorphological alterations on ecological potential using biological | Have you classified the effect of hydromorphological alterations on ecological potential by assessing whether all | Have you developed another method of classifying the effect of hydromorphological alterations on ecological potential? |
|---|---|---|---|

| ecological potential ? (yes/no) | assessment methods (according to CIS Guidance No. 4 – See Annex)? (yes/no) | practicable mitigation measures have been taken (according to the Prague approach - See Annex)? (yes/no) | (yes/no) |
|---|---|---|---|
| No | No | Yes | No |

| Have you adapted your existing biological assessment methods for application to heavily modified water bodies? |
|---|
| Yes – partly by using the biological criteria given in Q 3.3 for the designation process as part of the characterisation. |

| Have you developed specific biological assessment methods for classifying HMWBs? |
|---|
| HMWBs have not yet been classified in Norway (the environmental objectives will not derivate from a classification scheme, but based on a site-specific assessment). However, related to the development of hydromorphological elements in the classification system being developed in Norway, two fish related assessment methods are developed. These methods are still not tested completely. These are<br>1) fish population structure index, based on changes in species composition and abundance, and<br>2) fish biomass production calculation, based on present fish production vs the historical fish production in the water body. |

Please complete the Table below if you have classified the effect on ecological potential of hydromorphological alterations using **biological assessment methods** (according to CIS Guidance No. 4 – See Annex)

| Water category | Were you able to derive biological references for maximum ecological potential? (yes/no) | What biological quality element (or elements) have you used to make these assessments? |
|---|---|---|
| Rivers | No | Fish will most likely be applied (see above) |
| Lakes | No | Fish will most likely be applied (see above) |
| Transitional waters | Not relevant | Not relevant |
| Coastal waters | No | Not decided |

Please complete the Table below if you have classified the effect on ecological potential of hydromorphological alterations using the **mitigation measures approach** (according to the Prague approach - See Annex)

| Water use | Did you develop use-specific generic checklists of mitigation measures? (yes/no) | Did you identify water body-specific mitigation measures rather than generic checklists? (yes/no) | If applicable, did you modify the generic list to take account of the specific characteristics and use of each HMWB? (yes/no) | Did you involve the water users in applying the method? (yes/no) |
|---|---|---|---|---|
| Navigation, | | Yes | | |

| | | | | |
|---|---|---|---|---|
| including port facilities | | | | |
| Storage for drinking water supply | | | | |
| Storage for power generation | Yes | Yes | Yes | Yes |
| Storage for irrigation | | | | |
| Water regulation | Yes | Yes | Yes | Yes |
| Flood protection | | | | |
| Land drainage | | | | |
| Equally important sustainable human development activity' | | | | |

| **If you have developed generic checklists of measures, please describe these** |
|---|
| Please see the Norwegian generic checklist in "WFD and hydromorphological pressures. Technical Report. Good practice in managing the ecological impacts of hydropower schemes, flood protection works; and works designed to facilitate navigation under the Water Framework Directive". Annex IV, pp. 48-52. |
| **Please specify if you have a special methodology for the definition of Maximum Ecological Potential (MEP), which differs from your GEP methodology** |
| Norway has used the alternative method to define GEP in the first planning cycle i.e. GEP has not been derivative from MEP. GEP has been decided by assessing realistic measures at the water body level. The assessment of what is a realistic measure may vary over time due to political, administrative and technical circumstances. A draft definition of Maximum Ecological Potential (MEP) has been introduced to describe a long-term environmental ambition, where even measures not being realistic today can form the basis of MEP. |

For Member States that have used both approaches of GEP establishment (Guidance No. 4 approach & "Prague" approach):

**Q4.3:** How do the results of using the two approaches compare? Are the mitigation measures needed to achieve good ecological potential comparable? Are there any examples to combine both methods?

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|---|
| Both approaches were carried out 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. In addition, no conclusion for acceptable level of significant adverse effect on power production was taken. The report is available |

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| in Norwegian at www.vannportalen.no/hoved.aspx?m=31151&amid=1933749 |

## 5. Exemptions for HMWB

**Q5.1:** Do you intend to apply Art. 4(4) exemptions (time derogation) to HMWB?

| yes | No |
|---|---|
| In some cases time derogation will be applied (measures take long time to come into effect etc.). Focus will be on realistic GEP that may be adjusted every 6th year. | |

Do you intend to apply Art. 4(5) exemptions (less stringent objectives) to HMWB?

| yes | No |
|---|---|
| In some cases less stringent objectives will be applied (where costs outdo the benefits of measures etc.). Focus will be on realistic GEP that may be adjusted every 6th year. | |

How did you combine this with HMWB designation according to Art. 4 (3) and CIS guidance No 4?

| |
|---|
| The HMWB-designation is not yet completed in Norway. Draft method: If it is obvious that GES can not be reached in a WB, the WB will simply be designated as HMWB. If dubiously – the GES level will be compared with the GEP level. If GEP is at the same level or ecologically better than GES, then the WB will not be designated as HMWB (and the other way round). |

## 6. Suggestions for the workshop

**Q6.1:** Do you have any suggestions for the upcoming workshop on Heavily Modified Water Bodies (12-13 March 2009, Brussels)? E.g.

- Any questions proposed for discussion?
- Public participation ideas concerning HMWB?
- Any pilot projects, methods for presentations at the workshop?

| |
|---|
| A. Have any general minimum ecological requirement been established as for GEP in accordance with appendix V in WFD?<br>B. Have any general minimum ecological requirement been established for GEP when using the Praha approach?<br>C. Is there a need for defining a comparable set of considerations/criteria to restrict "significant adverse effect on the specific use" within Europe?<br>D. How are rivers affected by abstractions as by-passing or downstream regulations handled throughout Europe? As HMWB, exemptions or as natural rivers with GES?<br>E. GEP should be determined on a site specific level i.e. GEP varies from WB to WB. How can this be combined with a classification scheme for GEP?<br>F. Presentation of challenges and experience with designation of HMWB and GEP in Norwegian hydropower related water bodies. .<br>G. Presentation of a study where both approaches were applied the same water bodies. Case: Aura river basin, Norway. And a harbour related HMWB case study. |

**Annex: Additional background information on the establishment of Good Ecological Potential (GEP)**

- ✓ Good ecological potential is defined in the Annex V 1.2.5 to the Water Framework Directive as an ecological state in which "*there are slight changes in the values of the relevant biological quality elements as compared to the values found at maximum ecological potential"*.

- ✓ The values for the biological quality elements at MEP should 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"*. The definition recognises that the MEP biological values (a) depend on the MEP hydromorphological conditions and (b) may be different from those of the any natural surface water body type because no such natural type is completely comparable.

- ✓ The Directive defines the MEP hydromorphological conditions as those "*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 mitigation measures referred to in the definition of MEP hydromorphological conditions are limited to those that would not have a significant adverse effect on (a) the wider environment or (b) the use or uses that are dependent on the modified characteristics. The purpose of designation of a water body as a HMWB or AWB would be defeated if mitigation measures that would have such adverse effects were included.

- ✓ This also means that GEP cannot represent a state that could only be achieved using measures that would have a significant adverse effect on the wider environment or on the use or uses justifying designation in accordance with Article 4.3.

- ✓ GEP therefore 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.

- ✓ In contrast, the definition of good ecological status is independent of any consideration of impact of the measures that may be needed to achieve it. Costs of these measures are also not considered.

- ✓ The generic steps relevant to defining GEP and described in the CIS Guidance Document No.4 can be summarised as in Figure 1 below.

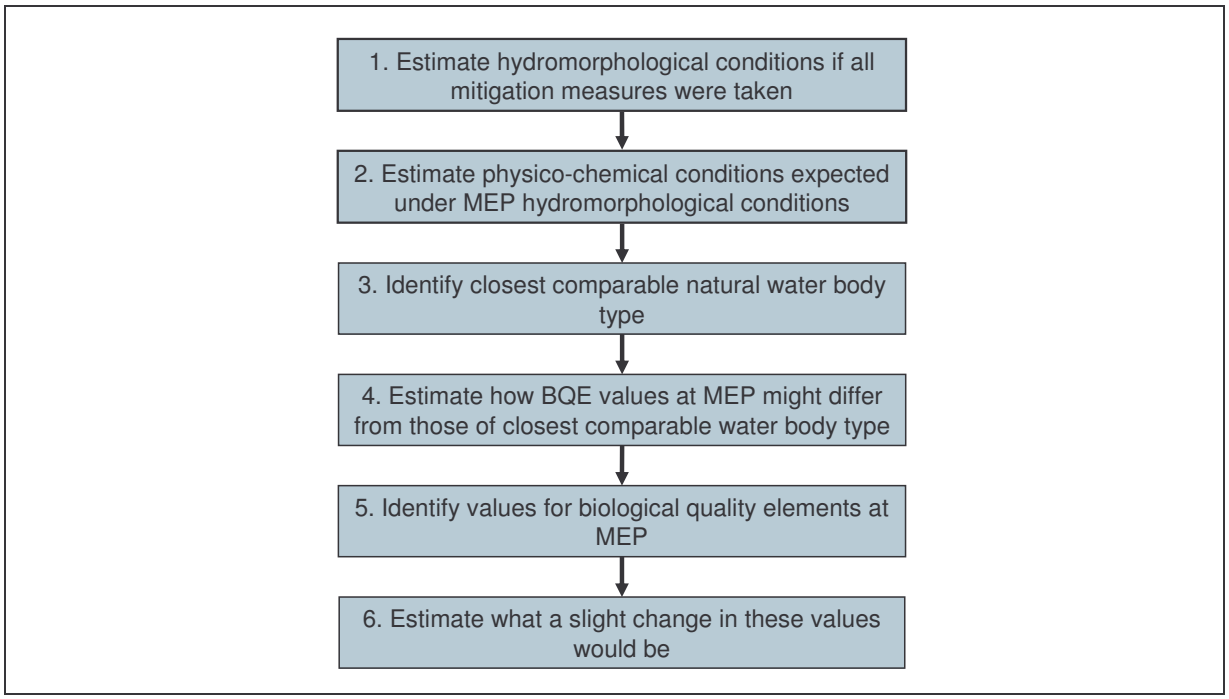


**Figure 1:** Steps in defining GEP as described in the CIS Guidance Document No. 4.

- ✓ Technically the approach is complicated and highly reliant on good predictive modelling or expert judgement. Any errors in the estimates made in each of the steps will tend to sum. This compounding of errors could result in a definition of GEP that cannot be achieved without significant adverse effects on a relevant water use or that fails to reflect the level of ambition intended by the Directive.

- ✓ The alternative method described below defines GEP relevant to those biological quality elements and physico-chemical quality elements that are so affected by the heavily modified characteristics that they cannot achieve their GES values without measures being taken that would have a significant adverse effect on the wider environment or on a use of the water body that is reliant on the modifications. For other quality elements, their values at GEP are expected to be the same as their GES values prior to the hydromorphological modifications.

- ✓ Figure 2 summarises the main steps involved in the alternative approach to defining GEP (left side of Figure) and compares this with the main steps in the approach set out in CIS Guidance Document No. 4 (right side of Figure).

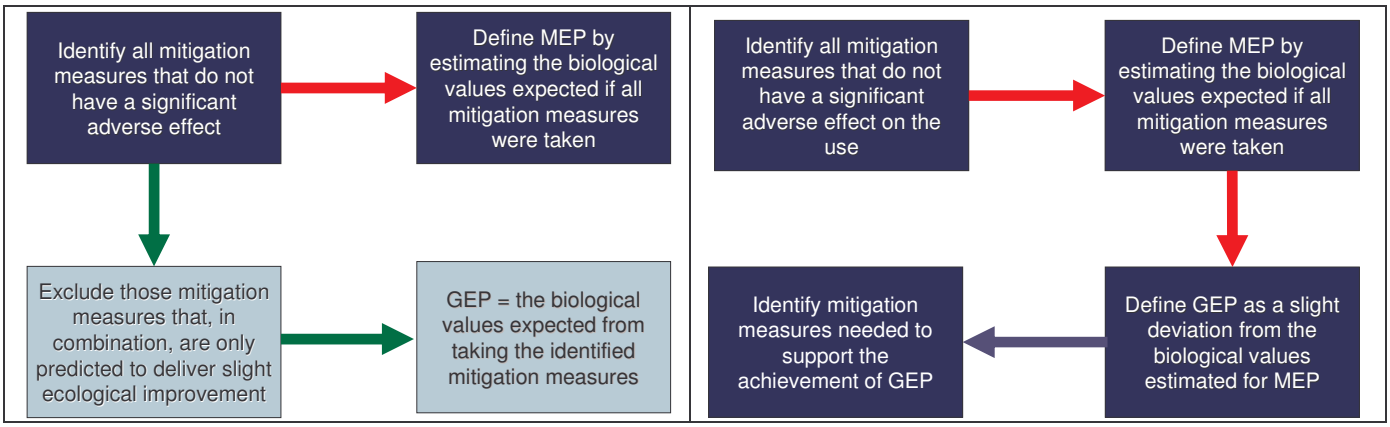


**Figure 2:** Steps involved in defining GEP using alternative approach (left side) compared to the relevant steps in the approach described in CIS Guidance Document No. 4 (right side); red arrows: steps following CIS method, green arrows: modifications of CIS method.

- ✓ Under both approaches the gap between MEP and GEP in ecological quality terms will be slight. Ecologically, GEP will represent the same level of ambition whichever of the two approaches is used.

- ✓ Nevertheless both approaches are still somewhat theoretical. Their advantages and disadvantages are yet to be demonstrated. Practical experience of defining GEP is currently very limited, the definition of GEP seems to be very complex. In the course of implementation, knowledge and understanding will increase enabling the further development and improvement of the approaches. Member States may also identify other alternative approaches.