Hydromorphological assessment and monitoring methodologies in coastal and transitional waters

Summary of European country questionnaires
Table of contents

Acknowledgements ........................................................................................................... 4
Abstract .............................................................................................................................. 5
1. Introduction .................................................................................................................... 6
   1.1 Aim of the Report ....................................................................................................... 6
2. European country Questionnaire on Hydromorphological Assessment and Monitoring ............................................................................................................. 7
   2.1 Overview questionnaire ............................................................................................ 7
   2.2 Questionnaire on the method .................................................................................. 8
   2.3 Responding countries .............................................................................................. 11
3. Overview of the information on Hydromorphological classification, HMWB Designation and Ecological Potential classification ........................................................................... 13
   3.1 Hydromorphological classification .......................................................................... 13
   3.2 Designation of Heavily Modified Water Body ......................................................... 18
   3.3 Ecological potential classification .......................................................................... 24
4. Overview of methods in European countries .................................................................. 30
5. Use of methods for different purposes .......................................................................... 33
   5.1 Use for WFD or non WFD related assessments ....................................................... 33
   5.2 Use of methods in the WFD planning process ......................................................... 34
   5.3 Biogenic considerations .......................................................................................... 36
   5.4 Biological considerations (relationship between hydromorphological alterations and habitat quality required by biological quality elements) ........................................... 36
   5.5 Relevance of methods for specific pressures .......................................................... 36
6. Status of application method ........................................................................................ 37
   6.2 Scale of application .................................................................................................. 37
   6.3 Available supporting material ................................................................................ 38
7. General Characteristics of the method ......................................................................... 42
   7.1 Source of information/data collection ..................................................................... 42
   7.2 Scale of consideration ............................................................................................ 42
   7.3 Specific areas of consideration ................................................................................ 42
   7.4 Reference conditions .............................................................................................. 43
   7.5 Temporal dimension ............................................................................................... 47
   7.6 Severity of hydo pressures ...................................................................................... 47
8 Recording of hydromorphological features .................................................................. 48
   8.1 Recording of hydrological features .......................................................................... 48
   8.2 Recording of morphological features ....................................................................... 54
   8.3 Recording of Recorded artificial elements ............................................................. 56
9 Assessment output of methods ...................................................................................... 59
Conclusions ....................................................................................................................... 61
References .......................................................................................................................... 64
List of abbreviations and definitions ................................................................. 65
List of figures .................................................................................................................. 66
List of tables ................................................................................................................. 67
Annex I: List of national experts responding to the Questionnaire............. 68
Acknowledgements

This report is based on the answers provided by Members States to the European country Questionnaire on Hydromorphological Assessment and Monitoring in Coastal and transitional waters.

It has a similar structure to that used for inland waters and prepared by Massimo Rinaldi, Martina Bussetti and Eletheria Kampa; but in this case a joint questionnaire for transitional and coastal waters was designed by the ECOSTAT core group on TraC.

We wish to thank all national experts who completed European country Questionnaire on Hydromorphological Assessment and Monitoring. Their responses to the questionnaire served as the main source of information for this report.

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Abstract

This report summarizes the information reported on 18 methods for hydromorphological assessment in coastal and transitional waters from 14 European countries. It gives an overview of all methods, indicating which main components are covered by each method, describing their uses for different purposes, the extent to which they are applied, requirements for specific expertise and training as well as some indications on the resource intensity involved. It also summarizes the general characteristics of the methods with specific emphasis on the consideration of different scales and the approach followed with respect to reference conditions and typology.
1. Introduction

Within the European Water Framework Directive (WFD), hydromorphology is used as a quality component to elaborate the type-specific reference conditions of water bodies (Annex II, 1.3 WFD), define the quality targets for the ecological status assessment, pre-classify the different types of water bodies (natural, heavily modified or artificial) (Annex II, 1.1 WFD) and assess them in terms of current status achievement or failure, and risk (Annex II, 1.4 and 1.5 WFD).

The designation of surface water bodies as artificial or heavily modified is based on the changes to the hydromorphological characteristics that have significant adverse effects on the environment and on different forms of human use or activities (Article 4, 3; Annex II, 1.4 WFD).

The Directive requires Member States to determine that hydromorphological and physico-chemical conditions should be suitable for supporting biological assemblages.

Annex V WFD recommends using guidance standards available from the European Committee for Standardization (CEN) and the International Standards Organization (ISO).

EN 16503 (Water quality – Guidance standard on assessing the hydromorphological features of transitional and coastal waters) describes a protocol for field survey and feature recording, whereas EN 17123 (Water quality – Guidance on determining the degree of modification of the hydromorphological features of transitional and coastal waters) gives guidance on assessing the modification of TraC hydromorphological features. Although the procedure described in this standard enables the hydromorphological modification of TraC waters to be determined and described, it does not attempt either to describe methods for defining high status for hydromorphology under the WFD or to link broadscale hydromorphological classification to assessments of ecological status.

There is a need for hydromorphological assessment methods in coastal and transitional waters; to share the information on methodologies used by some Member States could be very helpful for those countries that still have not developed or applied an approach to assess the hydromorphological conditions.

1.1 Aim of the Report

This report provides information about the methodologies used in European countries for TraC hydromorphological assessment and monitoring. It has been developed as part of the work programme 2016-2018 of the CIS ATG on Hydromorphology (see Task 2.3 in the ToR of the ATG on Hydromorphology).

It is based on the answers received from the Member states to the questionnaire elaborated on the methodologies in use to assess the hydromorphological status of transitional and coastal waters and has the objective of providing an overview of these different approaches.

The questionnaire was elaborated by the ECOSTAT core group on TraC. It has a similar structure to that used for inland waters; but in this case a joint questionnaire for transitional and coastal waters was designed.

The general impression from the questionnaires is that a very broad range of approaches has been used for the status classification, HMWB designation and classification of the ecological potential, from expert guidance, to detailed structured methods and to uncertain methods. The results from the overviews are presented in this report.
2. European country Questionnaire on Hydromorphological Assessment and Monitoring

A questionnaire was circulated in July 2017 to national experts in countries implementing the WFD to gather information on hydromorphological assessment and monitoring methods. The information collection exercise focused on coastal and transitional waters.

The questionnaire consists of two parts: overview questions and the questionnaire on the method(s) in use.

2.1 Overview questionnaire

<table>
<thead>
<tr>
<th>ID</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Please provide a high level description of all of the tools/ methods used for hydromorphological classification</td>
</tr>
<tr>
<td>1.2</td>
<td>Were the same approaches applied everywhere? If not, explain extent of application and differences across regions</td>
</tr>
<tr>
<td>1.3</td>
<td>Number of Status Classification categories for a water body</td>
</tr>
<tr>
<td>1.4</td>
<td>Is the method explicitly broken down into the two directive element categories (Tidal Regime and Morphological conditions)</td>
</tr>
<tr>
<td>1.5</td>
<td>Is biological information used at any stage to assess if the biological quality elements are being supported? If so, how</td>
</tr>
<tr>
<td>1.6</td>
<td>Provide a general overview of the type of ongoing monitoring that takes place</td>
</tr>
</tbody>
</table>

2. HMWB Designation

<table>
<thead>
<tr>
<th>ID</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>High level description of all of the tools/ methods used for designation.</td>
</tr>
<tr>
<td>2.2</td>
<td>Were the approaches applied everywhere? If not, explain extent of application and differences across regions</td>
</tr>
<tr>
<td>2.3</td>
<td>Was the designation process binary only or was there a degree of modification score for a water body?</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2.4</td>
<td>Were cumulative impacts factored in</td>
</tr>
<tr>
<td>2.5</td>
<td>Provide a general overview of the type of ongoing monitoring that takes place</td>
</tr>
</tbody>
</table>

### 3. Ecological potential classification

<table>
<thead>
<tr>
<th>ID</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>High level description of all of the tools/ methods used for classification of ecological potential</td>
</tr>
<tr>
<td>3.2</td>
<td>Were the approaches applied everywhere? If not, explain extent of application and differences across regions</td>
</tr>
<tr>
<td>3.3</td>
<td>Was the &quot;mitigation measures approach&quot; (or &quot;Prague approach&quot;) used? - Reference. If so, can you refer and/or attached a method statement/guidance document?</td>
</tr>
<tr>
<td>3.4</td>
<td>Number of potential Classification categories for a water body</td>
</tr>
<tr>
<td>3.5</td>
<td>Were the same number of classification categories everywhere</td>
</tr>
<tr>
<td>3.6</td>
<td>Did the method consider biological information</td>
</tr>
<tr>
<td>3.7</td>
<td>Provide a general overview of the type of ongoing monitoring that takes place</td>
</tr>
</tbody>
</table>

### 2.2 Questionnaire on the method

#### 1. General Information

<table>
<thead>
<tr>
<th>ID</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Components covered by the method</td>
</tr>
<tr>
<td>1.2</td>
<td>Use of the method</td>
</tr>
<tr>
<td>1.3</td>
<td>Use of the method for the WFD planning process</td>
</tr>
<tr>
<td>ID</td>
<td>Question</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1.4</td>
<td>Use for other Directives (except WFD)</td>
</tr>
<tr>
<td>1.5</td>
<td>Biogenic Considerations: The method inherently considers biogenic reefs?</td>
</tr>
<tr>
<td>1.6</td>
<td>Biological considerations (relationship between hydromorphological alterations and habitat quality required by biological quality elements)</td>
</tr>
<tr>
<td>1.7</td>
<td>Status of method</td>
</tr>
<tr>
<td>1.8</td>
<td>Scale of application</td>
</tr>
<tr>
<td>1.9</td>
<td>Geographic extent of application</td>
</tr>
<tr>
<td>1.10</td>
<td>Relevance for specific pressures</td>
</tr>
<tr>
<td>1.11</td>
<td>Key reference</td>
</tr>
<tr>
<td>1.12</td>
<td>Available supporting material</td>
</tr>
</tbody>
</table>

### 2. General Characteristics of the method

<table>
<thead>
<tr>
<th>ID</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Source of information/data collection</td>
</tr>
<tr>
<td>2.2</td>
<td>Scale of consideration</td>
</tr>
<tr>
<td>2.3</td>
<td>Specific areas of consideration</td>
</tr>
<tr>
<td>2.4</td>
<td>Approach used by the method to define reference condition</td>
</tr>
<tr>
<td>2.5</td>
<td>Temporal dimension</td>
</tr>
<tr>
<td>2.6</td>
<td>Severity of hydromorphological pressures</td>
</tr>
</tbody>
</table>

### 3. Hydrological considerations

<table>
<thead>
<tr>
<th>ID</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Components of flow regime (only in the case of Transitional waters)</td>
</tr>
<tr>
<td>3.2</td>
<td>Characteristics of flow regime( only in the case of transitional waters)</td>
</tr>
<tr>
<td>3.3</td>
<td>Magnitude (e.g. average monthly flow)</td>
</tr>
<tr>
<td>3.4</td>
<td>Frequency (e.g. number of low pulses, high discharge)</td>
</tr>
<tr>
<td>3.5</td>
<td>Alterations to tidal states</td>
</tr>
</tbody>
</table>
3.6 Water balance
3.7 Wave exposure is feature recorded?
3.8 Currents (only in the case of coastal waters)
3.9 Pressures on hydrology considered for hydrological alteration assessment

### 4. Recorded Morphological Features

<table>
<thead>
<tr>
<th>ID</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Planform pattern (e.g. sinuous, meandering, etc.)</td>
</tr>
<tr>
<td>4.2</td>
<td>Longitudinal profile/gradient</td>
</tr>
<tr>
<td>4.3</td>
<td>Variability of cross-section by width/depth</td>
</tr>
<tr>
<td>4.4</td>
<td>Erosional/depositional features (mudflats, saltmarsh, bars, eroding banks)</td>
</tr>
<tr>
<td>4.5</td>
<td>Fluvial landforms in the floodplain</td>
</tr>
<tr>
<td>4.6</td>
<td>Bed substrate (substrate composition)</td>
</tr>
<tr>
<td>4.7</td>
<td>Macrophytes</td>
</tr>
<tr>
<td>4.8</td>
<td>Biogenic reefs</td>
</tr>
</tbody>
</table>

### 5. Recorded artificial elements

<table>
<thead>
<tr>
<th>ID</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>Flood protection, flood risk management</td>
</tr>
<tr>
<td>5.2</td>
<td>Coast protection, erosion control</td>
</tr>
<tr>
<td>5.3</td>
<td>Urban development</td>
</tr>
<tr>
<td>5.4</td>
<td>Land claim, reclamation, realignment</td>
</tr>
<tr>
<td>5.5</td>
<td>Barrier, barrage, impounding structure</td>
</tr>
<tr>
<td>5.6</td>
<td>Port and harbour infrastructure is the feature recorded</td>
</tr>
<tr>
<td>5.7</td>
<td>Navigation dredging</td>
</tr>
<tr>
<td>5.8</td>
<td>Dredged material disposal</td>
</tr>
<tr>
<td>5.9</td>
<td>Extraction (gravel, sand, shell, etc.)</td>
</tr>
<tr>
<td>5.10</td>
<td>Fishing (beam trawling, scallop dredging)</td>
</tr>
</tbody>
</table>
5.11 Aquaculture
5.12 Renewable energies (wind, wave, tidal, etc.)
5.13 Oil and gas infrastructure
5.14 Seabed infrastructure (pipelines, cables, etc.)
5.15 Shoreline infrastructure (outfalls, intakes, etc)
5.16 Infrastructure supporting recreational use
5.17 Military, defense infrastructure
5.18 Floating or tethered infrastructure
5.19 Wrecks and reefs
5.20 Other structures with impacts affecting the shoreline

6. Assessment Output

<table>
<thead>
<tr>
<th>ID</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>Type of output of the assessment</td>
</tr>
<tr>
<td>6.2</td>
<td>Type of scoring: qualitative evaluation (e.g. qualitative class)</td>
</tr>
<tr>
<td>6.3</td>
<td>Scoring information</td>
</tr>
<tr>
<td>6.4</td>
<td>Whole or partial water body considered?</td>
</tr>
<tr>
<td>6.5</td>
<td>Degree of confidence</td>
</tr>
</tbody>
</table>

7. Lesson learned

<table>
<thead>
<tr>
<th>ID</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Lessons learned from the application of this method in WFD implementation?</td>
</tr>
</tbody>
</table>

2.3 Responding countries

19 questionnaires from 14 Member States have been received. The questionnaires address 18 different assessment methods. The table below gives an overview of the number of questionnaires received per Member State.
Table 1 Number of questionnaire responses received by European countries

<table>
<thead>
<tr>
<th>Member state</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>1</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>1</td>
</tr>
<tr>
<td>Finland</td>
<td>1</td>
</tr>
<tr>
<td>France</td>
<td>1</td>
</tr>
<tr>
<td>Germany</td>
<td>2</td>
</tr>
<tr>
<td>Ireland</td>
<td>2</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1</td>
</tr>
<tr>
<td>Norway</td>
<td>1</td>
</tr>
<tr>
<td>Malta</td>
<td>1</td>
</tr>
<tr>
<td>Poland</td>
<td>1</td>
</tr>
<tr>
<td>Portugal</td>
<td>1</td>
</tr>
<tr>
<td>Romania</td>
<td>2</td>
</tr>
<tr>
<td>Spain</td>
<td>2</td>
</tr>
<tr>
<td>UK</td>
<td>2</td>
</tr>
</tbody>
</table>

Malta answered the overview questionnaire but not completed the hymo assessment method questionnaire. Bulgaria and Netherlands did not provide answers to the overview questionnaire.

Croatia and Cyprus advised that it was not possible to answer the questionnaire because, there is no specific method used at present (in the case of Cyprus), or it is still in development (in the case of Croatia).
3. Overview of the information on Hydromorphological classification, HMWB Designation and Ecological Potential classification

3.1 Hydromorphological classification

Classification methods differ both between Member States and within Member States. Classification methods may be restricted to either coastal or transitional water bodies. Some MS do not have a specific classification for hydromorphological quality elements.

Classification methods combine tools and indices with expert judgement. Where classification is applied, the number of classes ranges from binary classification to degradation levels. In many cases, some type of monitoring takes place (Table 2).
<table>
<thead>
<tr>
<th>Country</th>
<th>Water category</th>
<th>Classification methods</th>
<th>Classification categories</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>CWTW</td>
<td>Assessments in all countries examined the level of modification in order to classify status. Scotland has largely used the TraC MIMAS tool and expert judgement. England and Wales have used morphological Risk assessments, TraC MIMAS, statistical low flows and expert judgement. Northern Ireland have used TraC MIMAS and expert judgement.</td>
<td>5 (Scotland); 2 (England and Wales)</td>
<td>Focus in England and Wales is on saltmarsh extent mapping (every 6 years), seagrass extent (every 1-3 years) monitoring. Flood defence information is frequently updated everywhere. License areas are recorded comprehensively in Scotland to track the level of modification.</td>
</tr>
<tr>
<td>FR</td>
<td>CWTW</td>
<td>Method based on assessment of indicators describing the presence of human activities acting in the water body, in terms of area (or length) relatively to the WB area (or WB coastline length)</td>
<td>2 (Good, not Good)</td>
<td>The monitoring is not totally effective today. Its implementation will consist in monitoring the main human activities/pressures acting in the WB.</td>
</tr>
<tr>
<td>PT</td>
<td>CWTW</td>
<td>Expert judgment</td>
<td>2 (High, Good)</td>
<td>We intend to use the guidelines of HYMO to perform the following assessment in this scope</td>
</tr>
<tr>
<td>ES- Catalonía</td>
<td>TW (estuaries, coastal lagoons)</td>
<td>ECELS index</td>
<td>5</td>
<td>Coastal lagoons are sampled two years in a period of 6 years. At each sampling year, two samplings are made, one in the beginning of spring and the other at the beginning of summer. Chemical, physicochemical, biological (benthic fauna) and hydromorphological parameters (ECELS index) are measured in every sampling date at each station. In Catalonia, there are 26 transitional water bodies, which are monitored with 35 sampling stations.</td>
</tr>
<tr>
<td>Country</td>
<td>Water category</td>
<td>Classification methods</td>
<td>Classification categories</td>
<td>Monitoring</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>ES-Galicia</td>
<td>CWTW</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DE</td>
<td>CWTW</td>
<td>Combination of expert knowledge and the use of the HyMo Assessment Matrix</td>
<td>5</td>
<td>X</td>
</tr>
<tr>
<td>NL</td>
<td>CWTW</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>BG</td>
<td>CWTW</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>RO</td>
<td>CWTW</td>
<td>Method agreed at the level of the Commission for the Protection of the Black Sea</td>
<td>3 (High, Good, No good)</td>
<td>TW: Monitoring of geomorphological elements (area of emerged beach) and tidal regime - Operational monitoring Frequency 2 / year. (latest data 2016) Coastal waters Monitoring of Wave regime and water level. - Operational monitoring/Monitored twice a year. (Latest data 2016), and - Marine / coastal currents and return coastal currents -Operational monitoring/ Monitored twice a year. (latest dates 2016)</td>
</tr>
<tr>
<td>Country</td>
<td>Water category</td>
<td>Classification methods</td>
<td>Classification categories</td>
<td>Monitoring</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>------------------------</td>
<td>---------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>NO</td>
<td>CW</td>
<td>X</td>
<td></td>
<td>No specific monitoring on hydromorphology is going on</td>
</tr>
<tr>
<td>IE</td>
<td>CWTW</td>
<td>TRaC MIMAS tool</td>
<td>5</td>
<td>Developing tools that use existing monitoring programme - so specific monitoring for HYMO</td>
</tr>
<tr>
<td>DK</td>
<td>CW</td>
<td>HYMO parameters included in the national monitoring programme and in the modelling of coastal waters</td>
<td>-</td>
<td>Standardized monitoring including biological, physical-chemical and hydromorphological parameters.</td>
</tr>
<tr>
<td>FI</td>
<td>CW</td>
<td>Survey of 4 factors: 1. Share of constructed shoreline, 2. Area of modified seabed, 3. Area effected of bridges and embankments, 4. Natural connection between sea and bays</td>
<td>4</td>
<td>Permitted activities are stored in registers. Also environmental permitting includes proper monitoring of modifying activities</td>
</tr>
<tr>
<td>MT</td>
<td>CW</td>
<td>The characterization of coastal water bodies used the following criteria: exposure, depth, mixing, substratum, current and velocity</td>
<td>4</td>
<td>Currently a monitoring programme (through EMFF funds) has started and another project through the LIFE IP funds will start in the future. The EMFF monitoring program monitors biological quality elements, physico-chemical parameters as well as contaminants. The LIFE IP will be developing a hydrographic model for Malta’s marine waters and will be modelling simulations for Malta’s marine waters to quantify and investigate pressures in the marine environment.</td>
</tr>
<tr>
<td>PL</td>
<td>CWTW</td>
<td>The method is based on the inventory of various permanent and temporal pressures expressed</td>
<td>3</td>
<td>Yearly inventory of the pressures, crosssectional morphology measurements</td>
</tr>
<tr>
<td>Country</td>
<td>Water category</td>
<td>Classification methods</td>
<td>Classification categories</td>
<td>Monitoring</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>------------------------</td>
<td>--------------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in sq. kilometres or kilometres, and then the reference area or the length of the coastline is compared (divided by) with appropriate values of pressures, resulting with the percentage of decrease of so-called ecosystem resilience. It allows for classification of the water bodies. Water discharge is taken into account if necessary. Additionally, the results of crossectional measurement of the coast morphology carried out every 6 years will allow for assessment of the coast line changes</td>
<td></td>
<td>(every 6 years), and chemical status of the sediment.</td>
</tr>
</tbody>
</table>
3.2 Designation of Heavily Modified Water Body

In general, the designation of HMWB does include aspects of hydromorphology (although for specific types of water bodies different approaches are used). The criteria used to include hydromorphological elements and the process to do so differ. In most cases the designation results in a binary classification.
Table 3. Overview of the information on Hymo designation methods

<table>
<thead>
<tr>
<th>Country</th>
<th>Water category</th>
<th>Designation method</th>
<th>Designation categories</th>
<th>Cumulative impacts considered</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>CWTW</td>
<td>England &amp; Wales used a range of risk assessments, cumulative assessment along with expert judgement. Scotland used the TraC MIMAS tool as well as expert judgement. N. Ireland used expert judgement and TraC MIMAS</td>
<td>2</td>
<td>Yes</td>
<td>Ongoing license reviews in Scotland to determine if degree of modification warrants HMWB modification</td>
</tr>
<tr>
<td>FR</td>
<td>CWTW</td>
<td>The designation of HMWB is done following the Article 4.3 of the WFD</td>
<td>Modification degree</td>
<td></td>
<td>The designation process of HMWB is reviewed every 6 years to take into account changes in environmental, social and economic conditions, using available data.</td>
</tr>
<tr>
<td>PT</td>
<td>CWTW</td>
<td>Designation was performed through evaluation of degree of margin modification using digital geographic information</td>
<td>2</td>
<td></td>
<td>We intend to use the guidelines of HYMO to perform the following assessment in this scope</td>
</tr>
<tr>
<td>Country</td>
<td>Water category</td>
<td>Designation method</td>
<td>Designation categories</td>
<td>Cumulative impacts considered</td>
<td>Monitoring</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
<td>-----------------------------------------------------------------------------------</td>
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<td>-----------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ES- Catalonia</td>
<td>CWTW</td>
<td>Coastal lagoons: changes in typology due to human activity</td>
<td>2</td>
<td></td>
<td>Coastal lagoons: Explained before (table 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bays: based on hydrology changes</td>
<td></td>
<td></td>
<td>Several control stations were defined in transitional bays per biological, physicochemical or chemical elements, at every HMWB waterbody. The frequencies have been determined by each of the different quality elements: phytoplankton (at least 4 samples/year), marine phanerogams (1 sampling every 2 years), macroinvertebrates (1 sampling every 3 years), physicochemical (at least 4 samples/year) and chemical (12 samplings in 6 years) elements.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coastal waters: Modification of hydromorphological characteristics</td>
<td></td>
<td></td>
<td>Several control stations were defined in coastal waters per biological, physicochemical or chemical elements, at every HMWB waterbody. The frequencies have been determined by each of the different quality elements: phytoplankton (at least 4 samples/year),</td>
</tr>
<tr>
<td>Country</td>
<td>Water category</td>
<td>Designation method</td>
<td>Designation categories</td>
<td>Cumulative impacts considered</td>
<td>Monitoring</td>
</tr>
<tr>
<td>------------</td>
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<td>--------------------------------------------------------------</td>
<td>------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ES-Galicia</td>
<td>CWTW</td>
<td>Modification of hydromorphological characteristics</td>
<td></td>
<td>Yes</td>
<td>macroinvertebrates (1 sampling every 3 years), physicochemical (at least 4 samples/year) and chemical (12 samplings in 6 years) elements.</td>
</tr>
<tr>
<td>DE</td>
<td>CWTW</td>
<td>Expert knowledge</td>
<td>2</td>
<td>Yes</td>
<td>No separate monitoring for HMWB, included in general WFD monitoring programme for coastal waters</td>
</tr>
<tr>
<td>NL</td>
<td>CWTW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG</td>
<td>CWTW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RO</td>
<td>CWTW</td>
<td>National guide based on Guideline no. 4 of the Joint Implementation Strategy of the WFD - Identification and Designation of Heavily Modified and Artificial Water Bodies (CIS Guidance no.4).</td>
<td>Modification degree</td>
<td>Yes</td>
<td>Update / Review every six years in the frame of RBM development process.</td>
</tr>
<tr>
<td>Country</td>
<td>Water category</td>
<td>Designation method</td>
<td>Designation categories</td>
<td>Cumulative impacts considered</td>
<td>Monitoring</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>-------------------</td>
<td>------------------------</td>
<td>------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>NO</td>
<td>CW</td>
<td>size</td>
<td>Modification degree</td>
<td></td>
<td>no repetitive monitoring is going on, but investigative monitoring before new development</td>
</tr>
<tr>
<td>IE</td>
<td>CWTW</td>
<td>Risk assessment by expert knowledge</td>
<td></td>
<td></td>
<td>No separate monitoring for HMWB, included in general WFD programme</td>
</tr>
<tr>
<td>DK</td>
<td>CW</td>
<td>National guide based on Guideline no. 4 of the Joint Implementation Strategy of the WFD - Identification and Designation of Heavily Modified and Artificial Water Bodies (CIS Guidance no.4).</td>
<td>Yes</td>
<td>According to standards in the national monitoring programme (NOVANA).</td>
<td></td>
</tr>
<tr>
<td>FI</td>
<td>CW</td>
<td>Scoring approach</td>
<td>Modification degree</td>
<td>Yes</td>
<td>Permitted activities are stored in registers. Also environmental permitting includes proper monitoring of modifying activities. Monitoring is realised every sixth years.</td>
</tr>
<tr>
<td>MT</td>
<td>CW</td>
<td>Changes from their original, natural hydromorphological</td>
<td>Yes</td>
<td>Currently, a monitoring programme (through EMFF</td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Country</th>
<th>Water category</th>
<th>Designation method</th>
<th>Designation categories</th>
<th>Cumulative impacts considered</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL</td>
<td>CWTW</td>
<td>The method is similar to the hidromorphological status classification, with separate scale of classification</td>
<td>Modification degree</td>
<td>Yes</td>
<td>The same as for hidromorphological classification monitoring.</td>
</tr>
</tbody>
</table>

conditions and that such changes are extensive and therefore permanent and irreversible.

funds) has started and another project through the LIFE IP funds will start in the future. The EMFF monitoring programme monitors biological quality elements, physico-chemical parameters as well as contaminants. The LIFE IP will be developing a hydrographic model for Malta's marine waters and will also be modelling simulations for Malta's marine waters to quantify and investigate pressures in the marine environment.
3.3 Ecological potential classification

Ecological potential has not been determined in all Member States. The classification methods differ. Several respondents refer to the CIS Guidance documents and in some cases to the 'Prague method'. The number of classification schemes ranges from 3 to 5.

1 The response of Cristian Rusu [romania] gives a short description "PRAGUE method (alternative method) through which the good ecological potential is obtained by implementing mitigation measures (of the effects of hydromorphological pressures) that are technically feasible and not have significant negative impacts on uses and on the environment."
Table 4. Overview of the information on ecological potential classification

<table>
<thead>
<tr>
<th>Country</th>
<th>Water category</th>
<th>Method</th>
<th>Categories</th>
<th>Did the method consider biological information?</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>CWTW</td>
<td>Mitigation measures approach or &quot;Prague approach&quot;</td>
<td>3</td>
<td>No</td>
<td>Updated and reviewed for each RBMP</td>
</tr>
<tr>
<td>FR</td>
<td>CWTW</td>
<td>the same methodology as natural WB</td>
<td>5</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>PT</td>
<td>CWTW</td>
<td>Under development</td>
<td>4</td>
<td>Yes</td>
<td>Nevertheless, transitional and coastal waters must be monitored at least once (one year monitoring) every planning cycle to ensure classification for RBMP.</td>
</tr>
<tr>
<td>ES-Catalonia</td>
<td>CWTW</td>
<td>the same methodology as natural WB</td>
<td>5</td>
<td>Yes</td>
<td>Coastal lagoons: (see table 2) Coastal waters and estuaries: see table 3)</td>
</tr>
<tr>
<td>ES-Galicia</td>
<td>CWTW</td>
<td>the same methodology as natural WB</td>
<td>5</td>
<td>Yes</td>
<td>Surveillance monitoring</td>
</tr>
<tr>
<td>DE</td>
<td>CWTW</td>
<td>no ecological potential classification by now</td>
<td>5</td>
<td>Yes</td>
<td>Surveillance and operational monitoring</td>
</tr>
<tr>
<td>Country</td>
<td>Water category</td>
<td>Method</td>
<td>Categories</td>
<td>Did the method consider biological information?</td>
<td>Monitoring</td>
</tr>
<tr>
<td>---------</td>
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<td>-----------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the same methodology as natural WB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NL</td>
<td>CWTW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG</td>
<td>CWTW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RO</td>
<td>CWTW</td>
<td>A combined method, including the method based on the definition of relevant biological quality elements, has been used, based on the specifications of Guidance 4 - Identification and designation of heavily modified and artificial water bodies developed in the framework of the Common Strategy Implementation of the Framework Directive Water (Method A) presented in Annex 6.1 of the National Management Plan, as well as PRAGUE method (alternative method) through which the good ecological potential is obtained by implementing mitigation</td>
<td>3-5</td>
<td>Yes</td>
<td>Update / Review every six years in the frame of RBM development process.</td>
</tr>
</tbody>
</table>

26
<table>
<thead>
<tr>
<th>Country</th>
<th>Water category</th>
<th>Method</th>
<th>Categories</th>
<th>Did the method consider biological information?</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>CW</td>
<td>mitigation measures approach</td>
<td>5</td>
<td>No (biological information define status, but GEP is the sum of all current measures.)</td>
<td>No</td>
</tr>
<tr>
<td>IE</td>
<td>CWTW</td>
<td>the same methodology as natural WB</td>
<td>5</td>
<td>Yes</td>
<td>No separate monitoring for HMWB, included in general WFD programme</td>
</tr>
<tr>
<td>DK</td>
<td>CW</td>
<td>the same methodology as natural WB</td>
<td>5</td>
<td>Yes</td>
<td>Standardsized monitoring including biological, physical-chemical and hydromorphological parameters.</td>
</tr>
<tr>
<td>Country</td>
<td>Water category</td>
<td>Method</td>
<td>Categories</td>
<td>Did the method consider biological information?</td>
<td>Monitoring</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>--------</td>
<td>------------</td>
<td>-----------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>FI</td>
<td>CW</td>
<td>Prague approach. Instructions are available in <a href="http://www.ymparisto.fi/download/noname/%7B1ACDC072-1AAB-4BF3-A262-EDD117BBE3E3%7D/74886">http://www.ymparisto.fi/download/noname/%7B1ACDC072-1AAB-4BF3-A262-EDD117BBE3E3%7D/74886</a></td>
<td>4</td>
<td>No</td>
<td>Surveillance and operational monitoring exists</td>
</tr>
<tr>
<td>MT</td>
<td>CW</td>
<td>Prague approach</td>
<td>4</td>
<td>Yes</td>
<td>Currently a monitoring programme (through EMFF funds) has started and another project through the LIFE IP funds will start in the future. The EMFF monitoring programme monitors biological quality elements, physico-chemical parameters as well as contaminants. The LIFE IP will be developing a hydrographic model for Malta's marine waters and will also be modelling simulations for Malta's marine waters to quantify and investigate pressures in</td>
</tr>
<tr>
<td>Country</td>
<td>Water category</td>
<td>Method</td>
<td>Categories</td>
<td>Did the method consider biological information?</td>
<td>Monitoring</td>
</tr>
<tr>
<td>---------</td>
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<td>------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>the marine environment.</td>
</tr>
<tr>
<td>PL</td>
<td>CWTW</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
4. Overview of methods in European countries

18 different methods for hydromorphological assessment and monitoring have been reported.

Each method covers one or two components in terms of hydrology or morphology.

United Kingdom has presented a questionnaire/method for hydromorphological assessment and other for hydromorphological designation, but it is the same method.

Bulgaria has presented a questionnaire for coastal and other for transitional waters but it is the same method.

The majority of the methods cover both components.

Only two of the methods reported by Ireland (HQI) and Netherlands are still in development.
<table>
<thead>
<tr>
<th>Member state</th>
<th>Name of the method, or acronym/abbreviation</th>
<th>Water category</th>
<th>Hydrology</th>
<th>Morphology</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>Risk assessments, cumulative impact</td>
<td>CWTW</td>
<td>x</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Trac MIMAS</td>
<td>CWTW</td>
<td>x</td>
<td>X</td>
</tr>
<tr>
<td>Spain (Galicia)</td>
<td>No name</td>
<td>CWTW</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Spain (Catalunia)</td>
<td>ECELS</td>
<td>TW</td>
<td>x (indirectly)</td>
<td>X</td>
</tr>
<tr>
<td>France</td>
<td>No name</td>
<td>CWTW</td>
<td>x</td>
<td>x (indirectly)</td>
</tr>
<tr>
<td>Portugal</td>
<td>No name</td>
<td>CWTW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>România</td>
<td>Princeton Modell (POM)</td>
<td>CWTW</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Granulometric</td>
<td>CWTW</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>No name</td>
<td>CW</td>
<td>x</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>No name</td>
<td>TW</td>
<td>x (indirectly)</td>
<td>X</td>
</tr>
<tr>
<td>Norway</td>
<td>Size of pressures</td>
<td>CW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>Voimakkaasti muutettujen ja keinotekoisten pintavesien tunnistaminen ja tilan arviointi</td>
<td>CW</td>
<td>x</td>
<td>X</td>
</tr>
<tr>
<td>Germany</td>
<td>HyMo Assessment Matrix for Coastal and Transitional Waters of Germany</td>
<td>CWTW</td>
<td>x (indirectly)</td>
<td>X</td>
</tr>
<tr>
<td>Denmark</td>
<td>National RBMP and national monitoring programme</td>
<td>CW</td>
<td>x (indirectly)</td>
<td>x (indirectly)</td>
</tr>
<tr>
<td>Member state</td>
<td>Name of the method, or acronym/abbreviation</td>
<td>Water category</td>
<td>Hydrology</td>
<td>Morphology</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------</td>
<td>----------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>Ireland</td>
<td>HQI</td>
<td>CWTW</td>
<td>x</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>TRAC MIMAS</td>
<td>CWTW</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Handboek Hydromorfologie 2.0 (Oste et al. 2013)</td>
<td>CWTW</td>
<td>x</td>
<td>X</td>
</tr>
<tr>
<td>Poland</td>
<td>Monitoring hydromorfologiczny wód przejściowych i przybrzeżnych</td>
<td>CWTW</td>
<td>x</td>
<td>X</td>
</tr>
</tbody>
</table>
5. Use of methods for different purposes

5.1 Use for WFD or non WFD related assessments

The majority of the methods are used to classify hydromorphological status in the context of the WFD and most of them are also used to support ecological classification for the WFD; many methods are also used for designing measures and for environmental impact assessment.

Only 2 of the methods are used as a proxy of biological quality.

Figure 1 Use of the methods for WFD or non WFD related assessment

Most of the methods reported are used for hydromorphological assessment but are not only used for WFD. In fact, half of the methods are also used for the Marine Strategy Directive. Only 2 methods are used for the Habitats Directive.
5.2 Use of methods in the WFD planning process

Most of the methods are used to support at least two or more steps in the WFD planning process. Like in rivers, the use of reported methods in water body delineation is low, and the pressures and impact analyses is used by most of the methods, as well as the designation of HMWB and the design of program measures and risk analyses.

Figure 3. Use of the methods in the WFD planning process
## Table 6. Use of the methods in the WFD planning process

<table>
<thead>
<tr>
<th>Member state</th>
<th>Method</th>
<th>WB delineation</th>
<th>typology</th>
<th>Pressures &amp; impacts</th>
<th>EQS classification (for high status only)</th>
<th>EQS classification (for good status only)</th>
<th>Risk analyses</th>
<th>HMWB designation</th>
<th>Definiton of good ecological potential</th>
<th>Desig n of program of measures</th>
<th>exemptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK (Hymo assessment)</td>
<td>– Amix/ combination of risks assessment, cumulative impact, TracMIMAS</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK (Hymo designation)</td>
<td>A combination of risks assessment categories, cumulative impact, TracMIMAS</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain (Galicia)</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Spain (Catalunia)</td>
<td>ECELS</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>France</td>
<td>No name</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>No name</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
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<td></td>
<td>x</td>
</tr>
<tr>
<td>România</td>
<td>Princeton Modell (POM)</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Granulometric</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Bulgaria</td>
<td>No name</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>Size of pressures</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>Voimakkaasti muutettujen ja keinotekoisten pintavesien tunnistaminen ja tilan arviointi</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Germany</td>
<td>HyMo Assessment Matrix for Coastal and Transitional Waters of Germany</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Denmark</td>
<td>National RBMP and national monitoring programme</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
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<td></td>
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</tr>
<tr>
<td>Ireland</td>
<td>HQI</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Netherlands</td>
<td>Handboek Hydromorfologie 2.0 (Oste et al. 2013)</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>Monitoring hydromorfologiczny wód przejściowych i przybrzeżnych</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.3 Biogenic considerations

Only 5 hymo assessment methods include biogenic considerations; The revised TraC-MiMAs tool (UK, IE) includes a high-level assessment of the potential impacts of morphological alterations upon seven intertidal and subtidal habitats. The HQI method (IE), still in development, will use seagrass and saltmarsh data to assess biogenic features. The Dutch method inherently considers biogenic reefs and the Danish method also includes biogenic consideration (i.e. mussels community in sluise fjords characterised as HMWB). The German assessment method considers biological quality elements (QE 1.1, 1.2 and 1.3) as a sensitivity factor in the assessment algorithm (www.gewaesser-bewertung.de).

5.4 Biological considerations (relationship between hydromorphological alterations and habitat quality required by biological quality elements)

3 hymo assessment methods include biological considerations: The Danish and norwegian methods, and the HQI method (IE).

5.5 Relevance of methods for specific pressures

Most of the reported methods (10) are relevant for all types of hydromorphological pressures (i.e. they are generic), whereas 5 methods are relevant only for specific hydromorphological pressures.

Table 7. Relevance of methods for specific pressures

<table>
<thead>
<tr>
<th>Country</th>
<th>Method</th>
<th>Specific pressures, hydromorphological pressures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portugal</td>
<td>No name</td>
<td>Dredging, deposition of dredged materials, harbour and port infrastructures, land claim, coastal protection infrastructures, and coastal erosion</td>
</tr>
<tr>
<td>France</td>
<td>No name</td>
<td>Flood protection, coasta protection, coastal erosion, urban development, land claim, barrier, fishing, aquaculture, extraction, dredge material disposal, seabed infrastructure, shoreline infrastructure, wrecks and reefs</td>
</tr>
<tr>
<td>Poland</td>
<td>Monitoring hydromorfgicznь wód przejściowych i przybrzeżnych</td>
<td>marine infrastructure, navigation, coastal defence, tourism, beach nourishment</td>
</tr>
<tr>
<td>Romania (both methods)</td>
<td>Princeton Modell (POM)/Granulometric</td>
<td>Coast protection, urban development, barrier port and harbour infrastructure, renewables energy, infrastructure supporting recreational use, military- defense infrastructures</td>
</tr>
</tbody>
</table>
6. Application of methods

6.1 Status of application method

Most of the methods are the official methods. In the case of Spain, the methods reported by Galicia and Catalonia are official methods in these regions, so we can consider them as methods partially official in Spain.

The method HQI (IE) and the Dutch methods are still in development. Polish method will be used in 2019.

The number of methods applied has slightly increased from the 1\textsuperscript{st} to the 2\textsuperscript{nd} RBMP. French and Bulgarian methods have been used in the second RBMPs but were not used in the first cycle.

Figure 4. Relevance of methods for specific pressures

6.2 Scale of application

Most of the methods are applied at water body level and considered at that level. Only 3 methods (DE, ES-Catalonia, and NO) are applied in a part of the water body but results are nonetheless considered at a water body level.
6.3 Available supporting material

All of the methods are supported by a guidebook or method statement. This guide book can be a national guide or a process chart (as the case of UK and IE method), etc. Half of them are also supported by databases. Table 8 includes information more detailed on the type of the guide book.

Figure 5. scale of application

Figure 6. Supporting material
<table>
<thead>
<tr>
<th>Name of the method, or acronym/abbreviation</th>
<th>Guide book</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UK</strong></td>
<td>TraC MIMAS has a supporting document.</td>
</tr>
<tr>
<td>A combination of risks assessment categories, cumulative impact, TraC MIMAS</td>
<td>A process chart along with the methodologies for the risk assessments that were used in combination to derive the classification is available for England And Wales.</td>
</tr>
<tr>
<td><strong>UK</strong></td>
<td>A method statement for the designations is available for England and Wales.</td>
</tr>
<tr>
<td>A combination of risks assessment categories, cumulative impact, TraC MIMAS</td>
<td>Guidance available for TraC MIMAS</td>
</tr>
<tr>
<td><strong>Spain (Galicia)</strong></td>
<td>RBMP Galicia 2015-2021. Annex VI</td>
</tr>
<tr>
<td><strong>Spain (Catalonia)</strong></td>
<td><a href="http://aca-web.gencat.cat/aca/appmanager/aca/aca?_nfpb=true&amp;_pageLabel=P1206254461208200588613#fragment-3">http://aca-web.gencat.cat/aca/appmanager/aca/aca?_nfpb=true&amp;_pageLabel=P1206254461208200588613#fragment-3</a></td>
</tr>
<tr>
<td><strong>France</strong></td>
<td>Member state</td>
</tr>
<tr>
<td><strong>Portugal</strong></td>
<td>No name</td>
</tr>
<tr>
<td><strong>România</strong></td>
<td>Princeton Modell (POM)</td>
</tr>
<tr>
<td></td>
<td>The studies on the development systems for the global classification and assessment systems of surface water status (ie transitional waters and coastal waters) in accordance with the requirements of the Water Framework Directive 2000/60 / EC on the basis of biological, chemical granulometric</td>
</tr>
<tr>
<td>Country</td>
<td>Method Name/Description</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>WFD Guidance document № 4 &quot;Identification and Designation of Heavily Modified and Artificial Water Bodies&quot; and adopted national approach based on this Guidance.</td>
</tr>
<tr>
<td>Norway</td>
<td>Size of pressures</td>
</tr>
<tr>
<td>Finland</td>
<td>Voimakkaasti muutettujen ja keinotekoisten pintavesien tunnistaminen ja tilan arviointi</td>
</tr>
<tr>
<td>Germany</td>
<td>HyMo Assessment Matrix for Coastal and Transitional Waters of Germany</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>TraC MIMAS</td>
</tr>
<tr>
<td>Netherlandes</td>
<td>Handboek Hydromorfologie 2.0 (Oste et al. 2013)</td>
</tr>
<tr>
<td>Poland</td>
<td>Monitoring hydromorfologiczny</td>
</tr>
<tr>
<td>Name of the method, or acronym/abbreviation</td>
<td>Guide book</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>wód przejściowych i przybrzeżnych</td>
<td></td>
</tr>
</tbody>
</table>
7. General Characteristics of the method

7.1 Source of information/data collection

The most common sources to obtain the information for the methods reported are existing GIS data and databases, aerial photos and GIS derived parameters.

*Figure 7. Source of information*

<table>
<thead>
<tr>
<th>Source of information</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>existing GIS data</td>
<td>10</td>
</tr>
<tr>
<td>GIS derived parameters</td>
<td>8</td>
</tr>
<tr>
<td>existing databases</td>
<td>6</td>
</tr>
<tr>
<td>field survey</td>
<td>4</td>
</tr>
<tr>
<td>LiDAR data</td>
<td>4</td>
</tr>
<tr>
<td>drone/UAV images</td>
<td>2</td>
</tr>
<tr>
<td>satellite images</td>
<td>2</td>
</tr>
<tr>
<td>aerial photos</td>
<td>2</td>
</tr>
<tr>
<td>present topographical maps</td>
<td>2</td>
</tr>
<tr>
<td>historical maps</td>
<td>2</td>
</tr>
<tr>
<td>modelling derived parameters</td>
<td>2</td>
</tr>
<tr>
<td>modelling derived parameters</td>
<td>2</td>
</tr>
<tr>
<td>other</td>
<td>2</td>
</tr>
</tbody>
</table>

7.2 Scale of consideration

Excepting the Bulgarian method (in transitional waters), the rest of the methods consider the total waterbody assessed and the full coastline length.

7.3 Specific areas of consideration

The majority of the methods consider intertidal and subtidal area. Only the methods of UK, IE and Spain (Catalonia) consider saltmarshes. Only flood plain is considered by the methods developed by United Kingdom, Finland, Germany, Poland and Netherlands.
7.4 Reference conditions

The main approaches used by the reported method are empirical and theoretical. A theoretical approach indicates that the reference conditions have been based on some theoretical assumption or some expert judgment. Empirical means that a range of expected values has been defined based on the range of data measured or calculated for a sufficient number of reference sites of the same coastal or transitional water type. Historical assumes a condition in the past as the reference condition.
### Table 9. Approach to use reference conditions

<table>
<thead>
<tr>
<th>Member state</th>
<th>Methods</th>
<th>Empirical/statistical</th>
<th>Historical</th>
<th>Theoretical</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>A combination of risks assessment categories, cumulative impact, TraC MIMAS</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>Hymo designation method</td>
<td>x</td>
<td></td>
<td>Early OS maps used as indicators in England and Wales (~1890s)</td>
<td>x</td>
</tr>
<tr>
<td>Spain (Galicia)</td>
<td>No name</td>
<td>No answer</td>
<td>No answer</td>
<td>No answer</td>
<td>No answer</td>
</tr>
<tr>
<td>Spain (Catalonia)</td>
<td>ECELS</td>
<td>No reference condition</td>
<td>No reference condition</td>
<td>No reference condition</td>
<td>x</td>
</tr>
<tr>
<td>France</td>
<td>No name</td>
<td>No reference condition</td>
<td>No reference condition</td>
<td>No reference condition</td>
<td>No reference condition</td>
</tr>
<tr>
<td>Portugal</td>
<td>No name</td>
<td>No answer</td>
<td>No answer</td>
<td>X (expert judgement)</td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td>Princeton Model (POM)</td>
<td>The data were interpolated by the Objective Analysis method (bi-linear interpolation) on a calculation grid adapted to a 1/60 ° (approximately 2 km) horizontal resolution obtained from USNavy (dbdbd1 - the database for the whole Mediterranean Sea). The output / result data was represented by the Gradsc and Matlab (student version) programs. In the direction of initialization of the data available in the 1979-1993</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member state</td>
<td>Methods</td>
<td>Empirical/statistical</td>
<td>Historical</td>
<td>Theoretical</td>
<td>Other</td>
</tr>
<tr>
<td>--------------</td>
<td>---------</td>
<td>-----------------------</td>
<td>------------</td>
<td>-------------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PoM-based marine model, the calculation grid construction procedure was followed by defining the marine model geometry adapted to the model's bathymetry in the range 410 ° - 46.68 ° N and 27.5 ° - 34.0 ° E.</td>
<td>Granulometric data of collected sediment samples from depths of 1.0 m to 15.0 m from 1986, 1987, 1988, 1993, 1994 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td></td>
<td>No applicable</td>
<td>No applicable</td>
<td>No applicable</td>
<td>No applicable</td>
</tr>
<tr>
<td>Norway</td>
<td>Size of pressures</td>
<td>No applicable</td>
<td>No applicable</td>
<td>No applicable</td>
<td>No applicable</td>
</tr>
<tr>
<td>Finland</td>
<td>Voimakkaasti muutettujen ja keinotekoisten pintavesien tunnistaminen ja tilan arviointi</td>
<td>No applicable</td>
<td>No applicable</td>
<td>No applicable</td>
<td>No applicable</td>
</tr>
<tr>
<td>Germany</td>
<td>HyMo Assessment Matrix for Coastal and Transitional Waters of Germany</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>National RBMP and national monitoring programme</td>
<td>Modelling of a Danish fjord with an existing sluice (Hjarbæk Fjord) in a scenario with and without the sluice.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member state</td>
<td>Methods</td>
<td>Empirical/statistical</td>
<td>Historical</td>
<td>Theoretical</td>
<td>Other</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------------------</td>
<td>-----------------------</td>
<td>------------</td>
<td>-------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Ireland</td>
<td>HQI</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TRAC MIMAS</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>Handboek Hydromorfologie 2.0 (Oste et al. 2013)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>Monitoring hydromorfologiczny wód przejściowych i przybrzeżnych</td>
<td>Reference conditions have not been defined</td>
<td>Reference conditions have not been defined</td>
<td>Reference conditions have not been defined</td>
<td>Reference conditions have not been defined</td>
</tr>
</tbody>
</table>
7.5 Temporal dimension

The methods of France, Poland, UK, Romania, Bulgaria (transitional waters), Denmark (for a single fjord) and Germany (only in a small number of cases) give some consideration to past morphology or other conditions in the assessment.

7.6 Severity of hymo pressures

Most of the methods attempt to account for or evaluate the severity of hydromorphological pressures. In the case of France, it refers in terms of area or length, not in terms of physical intensity. In the case of Denmark, this refers to of sluice management (in the case of a single fjord).

Only Finland has answered that its method does not attempt to evaluate the severity of hydromorphological pressures.

Bulgaria is the one country that has answered that its method attempt to account for the ecological significance of hymo pressures.
8 Recording of hydromorphological features

8.1 Recording of hydrological features

Components of flow regime (only in the case of Transitional waters)

Statistical low flows are considered in England and Wales in all estuaries. In Romania, the assessment of the natural background values was made taking into account the minimum monthly average and the maximum monthly average of the cumulative monthly flows of the Danube.

In the case of the Irish method (HQI) long term annual averages are taken into account.

The Dutch and Polish methods consider average, low and high flows.

Characteristics of the flow regime (only in the case of Transitional waters)

Magnitude

The magnitude of the flow regime is a parameter considered by the methods of France, Poland, Romania, Germany, Bulgaria, Ireland (HQI method) and Netherlands.

In the case of Ireland, Germany and Netherlands the feature is used for the evaluation of the estuary and is recorded periodically.

For France the magnitude is recorded periodically (at least monthly, for majority of estuaries), and in the case of Romania is used for the evaluation of the estuary. The magnitude of flow of freshwater discharged by the Danube is a factor of the influence of transitional waters, as evidenced by the synoptic analyzes of the fresh water penetration at the mouth of the Danube made on satellite images (ASTER and LANDSAT), as well as the hydrographic records at the Sulina sea grave.

Frequency

The frequency is a parameter considered by the methods of France, Romania, Bulgaria, Poland, Ireland (HQI method) and Netherlands. In the case of Netherlands it is used for the evaluation of the estuary and it is done periodically.

In the case of Poland is not used for classification, but can be used as explaining factor.

Alterations to tidal states

This feature is considered by assessment methods of France (for some estuaries), Romania, Germany, Ireland (HQI), and Netherlands; Romania and Netherlands uses it for the evaluation of the estuary and is recorded periodically.
**Water balance**

*Wave exposure*

Changes in wave exposure can be induced by different types of artificial structures, Changes in wave exposure can also be induced by changes in bathymetry due to human activities such as extraction or disposal.

The wave exposure is a parameter considered by 7 methods (France, Romania, Bulgaria, Germany Ireland, Poland and Netherlands). In the case of Denmark, wave exposure is basic parameter for the description of the water body in the monitoring programme of benthic vegetation. Changes in wave exposure is not recorded. Thus no directly use in the description of hydromorphology.

In the case of methods of Poland, Romania, Ireland and Netherlands the wave exposure is used for the evaluation of the estuary and/or coastal conditions and it is done periodically. In the case of Germany, it is used for the evaluation of the conditions.

**Currents (only in the case of coastal waters)**

*Alteration to dominant currents*

Half of the methods have considered the alteration of the dominant currents

*Table 10. Overview of the information on the alteration to dominant currents*

<table>
<thead>
<tr>
<th>Country</th>
<th>Method</th>
<th>Alteration to dominant currents</th>
<th>Is the feature used to evaluate coastal waters condition?</th>
<th>Is recording and/or evaluation done periodically?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Romania</td>
<td>Princeton Modell (POM)</td>
<td>X</td>
<td>The proposed values for the &quot;High&quot; ecological status for marine / coastal currents range from 0 to 75 cm / s and even up to 150 cm / s during hail periods in areas near shore with obstacles / coastal or offshore constructions ; - The proposed &quot;Very Good&quot; ecological status for coastal coastal currents is between 0.9 and 1.1 m / s</td>
<td>Twice/year</td>
</tr>
<tr>
<td>Country</td>
<td>Method</td>
<td>Alteration to dominant currents</td>
<td>Is the feature used to evaluate coastal waters condition?</td>
<td>Is recording and/or evaluation done periodically?</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>----------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Granulometric</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>No name</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Germany</td>
<td>HyMo Assessment Matrix for Coastal and Transitional Waters of Germany</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>Voimakkaasti muutettujen ja keinotekoisten pintavesien tunnistaminen ja tilan arviointi</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>National RBMP and national monitoring programme</td>
<td>X</td>
<td>Based on marine hydrodynamic modelling</td>
<td>For each WFD planning period</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Handboek Hydromorfologie 2.0 (Oste et al. 2013)</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Poland</td>
<td>Monitoring hydromorphologiczny wód przejściowych i przybrzeżnych</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**Pressures on hydrology**

*Pressures considered for hydrological alteration assessment*

The majority of the assessment methods consider flood defence, flood mitigation and urbanisation as the pressures for hydrological alteration assessment.
Figure 10. Pressures considered for hydrological alteration

Pressures considered for hydrological alteration assessment

- other
- agriculture
- urbanization
- artificial waves from navigation
- flood mitigation
- land claim
- flood defence
- abstraction

Graph showing the pressures considered for hydrological alteration assessment.
Table 11. Pressures considered for hydrological alteration

<table>
<thead>
<tr>
<th>Country</th>
<th>Method</th>
<th>Abstraction</th>
<th>Flood defence</th>
<th>Land claim</th>
<th>Flood mitigation</th>
<th>Artificial waves from navigation</th>
<th>Urbanization</th>
<th>Agriculture</th>
<th>Hydro peaking</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>Classification methods use a combination of risks assessment categories, cumulative impact, TraC MIMAS</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>Hymo designation method</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ES-Galicia</td>
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<td></td>
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<tr>
<td>ES-Catalonia</td>
<td>ECELS</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
<td>x</td>
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<td>x</td>
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<td>BU(CW)</td>
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<tr>
<td>BU(TW)</td>
<td>No name</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FI</td>
<td>Voimakkaasti muutettujen ja keinotekoisten pintavesien tunnistaminen ja tilan arviointi</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Method</td>
<td>Abstraction</td>
<td>Flood defence</td>
<td>Land claim</td>
<td>Flood mitigation</td>
<td>Artificial waves from navigation</td>
<td>Urbanization</td>
<td>Agriculture</td>
<td>Hydro peaking</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------------------------------</td>
<td>-------------</td>
<td>---------------</td>
<td>------------</td>
<td>-----------------</td>
<td>----------------------------------</td>
<td>--------------</td>
<td>-------------</td>
<td>---------------</td>
</tr>
<tr>
<td>DE</td>
<td>HyMo Assessment Matrix for Coastal and Transitional Waters of Germany</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>X</td>
<td>x</td>
</tr>
<tr>
<td>DK</td>
<td>National RBMP and national monitoring programme</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>IE</td>
<td>TRaCMIMAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IE</td>
<td>HQI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NL</td>
<td>Handboek Hydromorfologie 2.0 (Oste et al. 2013)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL</td>
<td>Monitoring hydromorfologiczny wód przejściowych i przybrzeżnych</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.2 Recording of morphological features

**Planform pattern**
This feature is only considered by Bulgarian method (in transitional waters)

**Longitudinal profile/gradient**
The longitudinal profile gradient is considered by methods of four countries: ECEL method (Spain-Catalonia) for some estuaries, Bulgaria (in transitional waters), Germany and Netherlands. In the case of Spain, Denmark and Netherlands the feature is used for the evaluation of the water body condition and it is recorded periodically.

**Variability of cross-section by width/depth**
Only methods of France, (locally, estuary), Bulgaria (in estuaries), Germany and Netherlands have considered this feature. Dutch method is the one that consider this feature for the evaluation of the water body conditions as it is recorded periodically.

**Erosional/depositional features (mudflats, saltmarsh, bars, eroding banks)**
Only methods of France, (at very large scale), Bulgaria (in estuaries), Portugal, Ireland and Netherlands have considered this feature. The Dutch methods consider this feature for the evaluation of the water body conditions and is recorded periodically. The UK consider saltmarsh features in the assessment of ecological status.

**Fluvial landforms in the floodplain**
Only it is considered by Bulgaria (transitional waters)

**Bed substrate (substrate composition)**
8 methods consider bed substrate for the hydromorphological assessment.
Table 12. Overview of the information on bed substrate

<table>
<thead>
<tr>
<th>Country</th>
<th>Method</th>
<th>Bed substrate</th>
<th>is the feature used to evaluate coastal waters condition?</th>
<th>is recording and/or evaluation done periodically?</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>No name</td>
<td>X</td>
<td>Not directly</td>
<td>Locally</td>
</tr>
<tr>
<td>Romania</td>
<td>Granulometric</td>
<td>X</td>
<td>Sedimentary classes, silt sand and clay according to Wentworth classification</td>
<td>Monitoring by INCDM_GA.</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>No name</td>
<td>X (some places)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Germany</td>
<td>HyMo Assessment Matrix for Coastal and Transitional Waters of Germany</td>
<td>X</td>
<td>X</td>
<td>X (in parts of the water body)</td>
</tr>
<tr>
<td>Denmark</td>
<td>National RBMP and national monitoring programme</td>
<td>X</td>
<td>Important for the evaluation of data.</td>
<td>Parallel to the specific monitoring</td>
</tr>
<tr>
<td>Ireland</td>
<td>TRAC MIMAS</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>Handboek Hydromorfologie 2.0 (Oste et al. 2013)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Poland</td>
<td>Monitoring hydromorfologiczny wód przejściowych i przybrzeżnych</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Macrophytes**

8 countries (ES-Catalonia, FR, RO, DE, DK, IE, UK, PL and NL) have answered that this feature is considered, but most of them specify that it is taken into account for the ecological status assessment (BQE macroalgae and angiosperms), not for hymo assessment.

**Biogenic reefs**

Only Ireland considers biogenic reefs in assessment or designation. In the case of Denmark mussels are recorded as a part of the monitoring of vegetation (transects) and not as a hymo feature as such.
Biogenic reefs are required to be considered as important WFD features in industry guidance in the UK.

### 8.3 Recording of Recorded artificial elements

The structures recorded/considered by the majority of the methods (15) are coast protection, navigation dredging, and port and harbour infrastructures. Dredged material disposal, barriers, structures of flood protection, land claim and urban development are also considered by most of the methods (Figure 11 and table 13).

**Figure 11. number of methods considering artificial elements**

![Bar chart showing the number of methods considering artificial elements.](chart)

- Other structures with impacts affecting the shoreline
- Wrecks and reefs
- Floating or tethered infrastructure
- Military, defence infrastructure
- Infrastructure supporting recreational use
- Shoreline infrastructure (outfalls, intakes, etc)
- Seabed infrastructure (pipelines, cables, etc.)
- Oil and gas infrastructure
- Renewable energies (wind, wave, tidal, etc.)
- Aquaculture
- Fishing (beam trawling, scallop dredging)
- Extraction (gravel, sand, shell, etc.)
- Dredged material disposal
- Navigation dredging
- Port and harbour infrastructure
- Barrier, barrage, impounding structure
- Land claim, reclamation, realignment
- Urban development
- Coast protection, erosion control
- Flood protection, flood risk management

Number of methods
Table 13. Number of methods considering artificial elements, number of methods using pressure to evaluate water body conditions and if number of them that done this evaluation periodically

<table>
<thead>
<tr>
<th>Artificial elements</th>
<th>Is the feature recorded?</th>
<th>Is the feature used to evaluate coastal waters condition?</th>
<th>Is recording and/or evaluation done periodically?</th>
<th>Not considered</th>
<th>Not relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood protection</td>
<td>13</td>
<td>7</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Coast protection</td>
<td>15</td>
<td>9</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Urban development</td>
<td>11</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Land claim, reclamation</td>
<td>13</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Barrier, barriage</td>
<td>14</td>
<td>11</td>
<td>6</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Port and harbour infrastructure</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Navigation dredging</td>
<td>15</td>
<td>7</td>
<td>9</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Dredged material disposal</td>
<td>14</td>
<td>7</td>
<td>10</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Extraction</td>
<td>10</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Fishing</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Aquaculture</td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Renewable energies</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Oil and gas infrastructure</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Seabed infrastructure</td>
<td>9</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Artificial elements</td>
<td>Is the feature recorded?</td>
<td>Is the feature used to evaluate coastal waters condition?</td>
<td>Is recording and/or evaluation done periodically?</td>
<td>Not considered</td>
<td>Not relevant</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>--------------------------</td>
<td>-----------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Shoreline infrastructure</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Infrastructure supporting recreational use</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Military, defence infrastructure</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Floating infrastructure</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Wrecks and reefs</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Other structures affecting the shoreline</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
9 Assessment output of methods

Type of output
The application of the assessment methods can produce a series of outputs, such as scoring, report, maps, summary reports, etc.

The output of most of the methods is scoring, maps and reports. Other types of outputs are parameters in marine models (DK), or assessment of pressures (NO).

Figure 12. Type of output of the assessment

Type of scoring
The type of scoring, in most of the methods, depends of the indicators of the feature considered in the methods. The majority of the assessment methodologies result in qualitative and quantitative scoring (i.e France considers qualitative scoring for the indicators’ assessment, and quantitative scoring for water body status informed by expert judgement.)
**Scoring information**

In the majority of methods (11) the scoring and algorithms are transparent. In the case of Danish method (for HMWB designation), a decision diagram according to the WFD CIS guidance is used on a qualitative basis. In the case of Portugal, the scoring is based on expert judgment.

**Whole or partial water body considered?**

11 methods are applied to all reaches included in the water body, and only 2 (FI, NO) are applied to only one portion of the water body (i.e. one or more sites/reaches) and the score is then extended to it.

**Degree of confidence**

The majority of the countries (10) have answered that there are no information on the degree of confidence in relation to their methods.

Only three methods (Norwegian, Irish methods and Danish methods) include some indication about the degree of confidence (uncertainties). In the case of Danish method, this is in general for the marine modeling.
Conclusions

Information on 18 Trac hydromorphological assessment methods have provided by different Member States. The number of hydromorphological assessment methods applied for WFD purposes has increased significantly from the 1st to the 2nd RBMPs.

The table 13 summarizes the information provided by the Members States on the conclusion and lessons learned after the application of their methods for the WFD implementation. The answers provided give also an idea on the robustness and/or weakness of the methods, and the need for improvement of some of them.

Table 14. Overview of the information on the lesson learned by the Member States

<table>
<thead>
<tr>
<th>Member state</th>
<th>Name of the method, or acronym/abbreviation</th>
<th>Lessons learned</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>Classification methods - a combination of risks assessment categories, cumulative impact, TraC MIMAS</td>
<td>There are many ways to classify a water body for hydromorphology - we would be open to looking towards a common standard in the future to have a standard that has the same meaning everywhere. However, the method developed will need to be relatively simple and high level to accommodate the complex dynamics and variation of estuarine/coastal systems.</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Hymo designation method</td>
<td>HMWB designation is very subjective process, some very basic standards/rules of thumb however would be beneficial to standardise things across Europe.</td>
</tr>
<tr>
<td>Spain (Galicia)</td>
<td>No name</td>
<td></td>
</tr>
<tr>
<td>Spain (Catalonia)</td>
<td>ECEL</td>
<td>This method is not totally relevant for hymo status assessment as the hymo alterations induced by human activities are not known and assessed.</td>
</tr>
<tr>
<td>France</td>
<td>No name</td>
<td>Methodology provided a first approach on hydromorphology. Methodology using clear criteria and quantitative scoring needs to be developed. We intend to use the guidelines of HYMO to improve our methodology.</td>
</tr>
<tr>
<td>Portugal</td>
<td>No name</td>
<td>This method of assessing the hydrological conditions (- wave characteristics, freshwater flow, water level, marine / coastal currents and coastal currents) was developed in 2008 by INCDM Grigore Antipa and was used for the evaluation for the first RBMP (2009-</td>
</tr>
<tr>
<td>România</td>
<td>Princeton Modell (POM)</td>
<td></td>
</tr>
<tr>
<td>Member state</td>
<td>Name of the method, or acronym/abbreviation</td>
<td>Lessons learned</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>Granulometric</td>
<td>2015) and the revised BMP (2015-2021). This method has not been reviewed. In the assessment made for the Updated RBMP 2016-2021 data, were used the sea currents from the hydro-meteo stations: Sf. Gheorghe, Portița, Midia, Constanța Cazino, Constanța Meteo, Eforie Sud, Mangalia for 2013 and Gloria platform for 2012.</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>No name</td>
<td>This method of assessing the morphological conditions (granulometric characteristics of the substrate) was developed in 2008 by INCDM Grigore Antipa and was used in the assessment for the first RBMP (2009-2015). This method has not been reviewed and has not been used in the assessment for the updated RBMP 2016-2021.</td>
</tr>
<tr>
<td>Norway</td>
<td>Size of pressures</td>
<td>During the second WFD planning period, it is necessary to further develop the method following the Guidance document № 4 &quot;Identification and Designation of Heavily Modified and Artificial Water Bodies&quot; for its application to coastal waters as well. There is a need of field observations of all transitional water bodies to complete data and information gaps for correct application of the used national approach.</td>
</tr>
<tr>
<td>Finland</td>
<td>Voimakkaasti muutettujen ja keinotekoisten pintavesien tunnistaminen ja tilan arviointi</td>
<td>National method supports implementation of WFD.</td>
</tr>
<tr>
<td>Germany</td>
<td>HyMo Assessment Matrix for Coastal and Transitional Waters of Germany</td>
<td>It is the only hymo assessment tool we have for coastal waters by now. So far it could only be used for some quality elements; for depth variation, substrate and wave exposure it well applicable.</td>
</tr>
<tr>
<td>Denmark</td>
<td>National RBMP and national monitoring programme</td>
<td>In Denmark hydromorphological parameters are recorded as standard parameters in the national monitoring programme of coastal waters. The HYMO</td>
</tr>
<tr>
<td>Member state</td>
<td>Name of the method, or acronym/abbreviation</td>
<td>Lessons learned</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>parameters are included in the typologization and the evaluation of ecological status classification (BQE) of coastal waters and integrated in the national marine modelling set up which form the basis of the programme of measures in the RBMP. Hydromorphology is also included in an assessment of possible characterization as HMWB as a result of physical changes in the water body.</td>
</tr>
<tr>
<td>Ireland</td>
<td>TraC MIMAS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HQI</td>
<td>this tool is under development to assess Generic features and their associated metrics</td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>Monitoring hydromorfologiczny wód przejściowych i przybrzeżnych</td>
<td>The method is relatively easy to apply, however needs some update on the basis of pilot measurements and further studies in order to achieve high confidence and determination, and parametrization of the relationship between h-m conditions and biotic components of the ecosystem.</td>
</tr>
</tbody>
</table>
References


EN 16503. Water quality – Guidance standard on assessing the hydromorphological features of transitional and coastal waters.

EN 17123. Water quality-Guidance on determining the degree of modification of the hydromorphological features of transitional and coastal waters

List of abbreviations and definitions

ATG: Ad Hock Task Group
BG: Bulgaria
CEN: European Committee for Standardization
CIS: Common Implementation Strategy
CW: Coastal waters
DE: Germany
DK: Denmark
ECOSTAT: WFD CIS working group dedicated to the ecological status of surface water bodies
ES: Spain
HMWB: Heavily modified water bodies
Hymo: Hydromorphology
ISO: International Organization for Standardization
FI: Finland
IE: Ireland
MS: Member State
MT: Malta
NL: Netherlands
NO: Norway
PL: Poland
RBMP: River Basin Management Plan
RO: Romania
Trac: Transitional and Coastal waters
TW: Transitional waters
WFD: Water Framework Directive
List of figures

Figure 1 Use of the methods for WFD or non WFD related assessment .......... 33
Figure 2. Use of the methods for other Directives .................................. 34
Figure 3. Use of the methods in the WFD planning process ....................... 34
Figure 4. Relevance of methods for specific pressures ................................ 37
Figure 5. scale of application .................................................................. 38
Figure 6. Supporting material .................................................................. 38
Figure 7. Source of information ............................................................... 42
Figure 8. Areas of consideration ............................................................... 43
Figure 9. Approach used to define reference conditions .............................. 43
Figure 10. Pressures considered for hydrological alteration ....................... 51
Figure 11. number of methods considering artificial elements .................... 56
Figure 12. Type of output of the assessment ............................................. 59
Figure 13. Overview of the type scoring .................................................... 60
List of tables

Table 1 Number of questionnarie responses received by European countries.... 12
Table 2. Overview of the information on classification methods ...................... 14
Table 3. Overview of the information on Hymo designation methods............. 19
Table 4. Overview of the information on ecological potential classification ...... 25
Table 5. Overview of the methods and their components............................. 31
Table 6. Use of the methods in the WFD planning process ............................. 35
Table 7. Relevance of methods for specific pressures ................................. 36
Table 8. Supporting material/Guide book ................................................. 39
Table 9. Approach to use reference conditions .......................................... 44
Table 10. Overview of the information on the aleration to dominant currents ... 49
Table 11. Pressures considered for hydrological alteration ......................... 52
Table 12. Overview of the information on bed substrate............................. 55
Table 13. Number of methods considering artificial elements, number of methods using pressure to evaluate water body conditions and if number of them that done this evaluation periodically .......................... 57
Table 14. Overview of the information on the lesson learned by the Member States ........................................................................................................... 61
## Annex I: List of national experts responding to the Questionnaire

<table>
<thead>
<tr>
<th>Member state</th>
<th>Name of the method, or acronym/abbreviation</th>
<th>Contact person</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>Classification methods - a combination of risks assessment categories, cumulative impact, TraC MIMAS</td>
<td>Niall Phelan (<a href="mailto:niall.phelan@environment-agency.gov.uk">niall.phelan@environment-agency.gov.uk</a>)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Hymo designation method</td>
<td>Niall Phelan (<a href="mailto:niall.phelan@environment-agency.gov.uk">niall.phelan@environment-agency.gov.uk</a>)</td>
</tr>
<tr>
<td>Spain (Galicia)</td>
<td>No name</td>
<td></td>
</tr>
<tr>
<td>Spain (Catalonia)</td>
<td>ECEL</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>No name</td>
<td>Olivier Brivois (<a href="mailto:o.brivois@brgm.fr">o.brivois@brgm.fr</a>)</td>
</tr>
<tr>
<td>Portugal</td>
<td>No name</td>
<td>Susana Nunes (<a href="mailto:susana.nunes@apambiente.pt">susana.nunes@apambiente.pt</a>)</td>
</tr>
<tr>
<td>România</td>
<td>Princeton Modell (POM)</td>
<td>Granulometric</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>No name</td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>Size of pressures</td>
<td>Maria Pettersvik Arvnes (<a href="mailto:maria.pettersvik.arvnes@miljodir.no">maria.pettersvik.arvnes@miljodir.no</a>)</td>
</tr>
<tr>
<td>Finland</td>
<td>Voimakkaasti muutettujen ja keinotekoisten pintavesien tunnistaminen ja tilan arviointi</td>
<td>Pirkko Kauppila (<a href="mailto:Pirkko.Kauppila@ymparisto.fi">Pirkko.Kauppila@ymparisto.fi</a>)</td>
</tr>
<tr>
<td>Germany</td>
<td>HyMo Assessment Matrix for Coastal and Transitional Waters of Germany</td>
<td>Christian Reimers (<a href="mailto:Christian.Reimers@llur.landsh.de">Christian.Reimers@llur.landsh.de</a>)</td>
</tr>
<tr>
<td>Denmark</td>
<td>National RBMP and national monitoring programme</td>
<td>Morten Brozek (<a href="mailto:mobro@mst.dk">mobro@mst.dk</a>)</td>
</tr>
<tr>
<td>Ireland</td>
<td>TraC MIMAS</td>
<td>Robert Wilkes (<a href="mailto:r.wilkes@epa.ie">r.wilkes@epa.ie</a>)</td>
</tr>
<tr>
<td></td>
<td>HQI</td>
<td>Robert Wilkes (<a href="mailto:r.wilkes@epa.ie">r.wilkes@epa.ie</a>)</td>
</tr>
<tr>
<td>Member state</td>
<td>Name of the method, or acronym/abbreviation</td>
<td>Contact person</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
<td>Tom Buijse (<a href="mailto:tom.buijse@deltas.nl">tom.buijse@deltas.nl</a>)</td>
</tr>
<tr>
<td>Poland</td>
<td>Monitoring hydromorfologiczny wód przejściowych i przybrzeżnych</td>
<td>Magdalena Kaminska</td>
</tr>
</tbody>
</table>
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