

## **Hydromorphology and the EU Water Framework Directive**

According to the Water Framework Directive (WFD), each EU Member State is asked to develop its own methodology for the assessment of the hydromorphological status of rivers, to include with biological and chemical-physical characteristics in the estimate of the rivers Ecological Status. Hydromorphology is a relatively new discipline (it was introduced as part of the 2000/60 / EC Directive) by integrating river hydrology and geomorphology, studies the fluvial processes and forms, their interactions with anthropic pressures and the implications on ecological processes<sup>1</sup>.

All these methodologies are aimed at estimating the hydromorphological conditions, essential for river's restoration and/or river dynamics in order to mitigate risks. Over the years a wide variety of hydromorphological evaluation methods were developed, with considerable differences in terms of goal, space-time scale and approaches. We can list all existent methodologies in five distinct categories:

- Physical habitat assessment;
- Riparian habitat assessment;
- Morphological assessment;
- Hydrological regime alteration assessment;
- Longitudinal fish continuity assessment.

The main Italian methodology is the MQI Index (Morphological Quality Index); this index has been adopted in Italy through the Minister for the Environment n. 260/2010 decree, which establishes the methods for the classification of the biological, chemical and hydromorphological status of water bodies. This index, belonging to the category of the evaluation of morphological conditions, it the main Italian tool for the evaluation and monitoring of the morphological quality of watercourses, finalised at the implementation of the Water Framework Directive. Despite its great importance, the index does not seem to have found a wide application on the national territory.

An important bibliographic review of these methodologies was recently produced within the European FP-7 project REFORM - REstoring rivers FOR effective catchment Management<sup>2</sup>". Results of this review are present online at the following web address: <http://wiki.reformrivers.eu>.

The FP7 REFORM project has produced as a result of a four-year period research (Nov. 2011–Oct. 2015) a methodological framework to be used at the time of the second district planning cycle

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<sup>1</sup> [http://people.dicea.unifi.it/massimo.rinaldi/private/argomento4\\_ricerca\\_it.htm](http://people.dicea.unifi.it/massimo.rinaldi/private/argomento4_ricerca_it.htm)

<sup>2</sup> RINALDI M., BELLETTI B., COMITI F., MAO L., NARDI L., BUSSETTINI M., con il contributo di VEZZA P. (2016). Sistema di rilevamento e classificazione delle Unità Morfologiche dei corsi d'acqua (SUM). Versione aggiornata 2016. ISPRA, Manuali e linee guida, 132/2016. Roma, gennaio 2016: <http://www.isprambiente.gov.it/it/pubblicazioni/manuali-e-linee-guida>

(sensu Water Framework Directive 2000/60/CE), providing the tools for the integration of objectives of various European directives (Water Framework Directive, Flood Directive, Birds and Habitats Directives, Groundwater Directive, Renewable energies Directive) involving the management and protection of river systems. The project, coordinated by the Dutch agency Deltares, sees the involvement of 21 European universities or research institutes with the role of core partner and 4 European government agencies with the role of Applied Partners, including ISPRA, through the Department of Internal Water Protection and Marine, CEDEX, EA and DLG<sup>3</sup>.

The website developed as part of the projects REFORM and FORECASTER, is a knowledge and information system relating hydromorphology and ecology of European rivers, offering quick access to key information, with links to background information ranging from case-study experiences to scientific publications. Particularly interesting is the section in which the results of the revision are summarized in a simple table, including hydromorphological valuation methods most commonly used and/or formally approved for the WFD implementation in each EU country.

The 21 methods reported in the table and object of the revision, were chosen considering primarily methodologies available with information in English. For each methodology the table displays the application state and the principal bibliographical references. Furthermore additional information are provided, when available, regarding the hydromorphological assessment for countries that do not use a specific method, or for methods adopted for a particular objective related to hydromorphology, as for example, the criteria applied in Romania for the HMWB methodology. Further information about methodologies in the table can be consulted, through the links of the monographic cards, dedicated to the individual methodologies, where all the information, their characteristics and their methods of use are reported.

For more information on the subject it is possible to consult, on the same website, the introductory page of the hydromorphological assessment methods, which gives access through the appropriate links, at five pages dedicated to the different categories in which the methodologies were divided. In each single page, information is summarized in a table, containing pre and post WFD European methodologies and non-European methodologies, as for example the Australian methodologies (TRARC and SRS), USA methodologies (PFC, HIT, and RSAT), and South Africans methodologies (IHI, VEGRAI, and GI). For all methodologies the nationality and the main bibliographic references are reported.

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<sup>3</sup> <http://www.isprambiente.gov.it/it/progetti/acque-interne-e-marino-costiere-1/reform/reform-restoring-rivers-for-effective-catchment-management>