

1 - METHOD BACKGROUND

NAME OR CODE	MHR - River Hydromorphological Monitoring
COUNTRY	Poland
KEY REFERENCE	Ilnicki et al. (2009)
WEBPAGE	
CATEGORY	The method aims to assess the overall hydromorphological quality of rivers. It has been developed in Poland based on experiences and assumptions of previously used Polish and international (e.g. RHS) methods

2 - METHOD CHARACTERISTICS

A - SOURCE OF INFORMATION / DATA COLLECTION	Maps/Remote sensing	Existing topographical (1:10000; 1:50000) and ortophoto maps; Google Map and other websites. Together with databases, they represent the main source for the assessment protocol	
	Field survey	Field survey must cover 10% of the investigated river, to verify the results of the desk studies protocol. Features that must be identified in the field are: cross section, reversion of the channel, river channel vegetation, structure of the riparian zone	
	Rapid field assessment	NOT APPLICABLE	
	Existing database	The method uses available data (hydrological and more generic data) from the databases of the Institute for Meteorology and Water Management and the river authorities	
B - SPATIAL SCALE	HIERARCHICAL SPATIAL SCALE	River catchment/Water body/ Reach/Cross Section	NOT APPLICABLE (all the main water body is assessed)
	LONGITUDINAL SPATIAL SCALE	Fixed length Scaled to channel width	NOT APPLICABLE NOT APPLICABLE
	LATERAL SPATIAL SCALE	Variable length Channel	All the river body is assessed (main watercourse, not tributaries) Assessed in detail
		Banks/Riparian zones Floodplain	Artificial features are mainly assessed Its features and attributes are mainly described
C - TEMPORAL SCALE	Physical and morphological assessment	Hydrological assessment	Only the present state is assessed and compared to a reference one; changes in hydrological regime compared to past mean annual flow are assessed Mean annual discharge, flood risk and drought risk: 1961-1980 and 1981-2000
	Characterization/classification	Assessment by index	Some attributes are descriptive (25%; e.g. river flow, valley characteristics, catchment size) and do not enter in the status assessment 4 main river elements described and/or assessed by 81 attributes, organised in 16 features: 1. hydrological regime (4 features), 2. river continuity (1 features), 3. river morphology (7 features) and 4. valley (4 features). Each of the 81 attributes is scored in a scale from 0 (bad state) to 5 (very good). Attribute scores are summed and compared (rated) to reference conditions to obtain the score for each river feature. Features scores are averaged to obtain the sub-index for each of the 4 elements. The quality index is calculated as the average of the score of 4 elements (not weighted)
D - TYPE OF METHOD	Deviation from reference	General assessment / Design framework	The method complies with WFD requirements and relates the settled status to reference status (natural) = anthropogenic unchanged watercourse NOT APPLICABLE
	Modelling status / Scenario	Final expert judgment	NOT APPLICABLE NOT APPLICABLE
	Links with other systems		NOT APPLICABLE
E - REFERENCE CONDITIONS			It identifies the existent state in Poland from the mid-twentieth century before the intensification of agriculture as a natural state (Ilnicki et al., 2010b). In the method, reference conditions are related to natural watercourses which have been classified on the basis of EQR in the upper interval of the very good status (Ilnicki et al., 2010b).
F - GENERAL INFORMATION	RIVER TYPOLOGY	TYPOLOGY LIMITATIONS	Similar to Germany: 26 river types, but not used in the assessment protocol No typology limitation, at least for Polish river types
	TYPE-SPECIFIC (Protocol / Assessment method)		Only type-specific limitations for quality classes (natural: 5 classes; HMWBs and AWBs: 4 classes); in principle the method applies to all river bodies, but a different (simplified) protocol has been proposed to assess artificial water bodies
	BASIS FOR STANDARDS / THRESHOLDS		Each of the 81 attributes is evaluated (or in some cases only described) in as scale from 0 (bad state) to 5 (very good), in relation to defined reference conditions; scores for each features (sum of scores of a group of attributes) are normalized to the maximum possible value (reference state) to obtain a point scale from 0 (bad) to 1 (reference); limit of the classes are differentiated for natural, heavily modified and artificial watercourses
	REACH SCALE SURVEY STRATEGY	TIMING AND FREQUENCY	NOT APPLICABLE NOT APPLICABLE
	DATA PRESENTATION (OUTPUT/LAYOUT)		4 quality sub-Indices (4 elements) and a final index (water body scale). Data collected have to be compiled in a special database and used to develop maps (five colour coded maps)
	METHOD SUPPORT / APPLICATION TOOLS		The basic document is a few page office protocols (the same for natural and HMWBs); a simplified protocol for AWBs
	SPATIAL COMPARISON		Comparison is possible given that the method does not relate to specific river types, but only amongst natural rivers or HBWBs or AWBs
	CONNECTION TO ECOLOGY		The method relates to data supplied by other ecological surveys (for river's ecological status). It also assesses the length of water body (%) with limited possibility of fish migration and river shading and the % of protected valley areas
	USERS		NOT AVAILABLE (apparently wide use)
	SCALE INFORMATION		Water body scale information is collected and assessed; larger scale information concerns catchment size and flow characteristics
NUMBER OF END PARAMETERS			4 main elements, described by 16 features, organised in 81 attributes. Main elements: hydrological regime (4 features), river continuity (3 features), river morphology (7 parameters) and valley characteristics (4 features)

3. RECORDED FEATURES

A - CATCHMENT / VALLEY	LARGE SCALE CHARACTERISTICS	Descriptive form: catchment size. evaluation/scoring form: flow disturbance (reservoirs, uptake, transfer, etc.)
	HYDROLOGICAL REGIME	Descriptive form: specific flow; degree of human pressure on stream gauge records; mean annual discharge; minimum flow. Evaluation/scoring form: changes in mean annual discharge, flood and drought risk changes
	VALLEY FORM / FEATURES	Minimum annual discharge, mean annual discharge, high annual discharge NOT APPLICABLE
B - CHANNEL	CHANNEL PATTERN / PLANFORM	Descriptive form: valley characteristics (cross-section) Evaluation/scoring form: sinuosity index; number of channels
	CHANNEL FORMS	Evaluation/scoring form: cross profile (Presence of natural channel forms)
	BED CONFIGURATION	Descriptive form: presence of waterfall. Evaluation/scoring form: variability of longitudinal slope
	CHANNEL DIMENSIONS	Descriptive form: channel width, average longitudinal slope
	FLOW-TYPE	NOT APPLICABLE
	PHYSICAL / HYDRAULIC VARIABLES	NOT APPLICABLE
	SUBSTRATE	Descriptive form: predominant sediment composition, group of abiotic types
C - RIVER BANKS/ RIPARIAN ZONE	IN-CHANNEL VEGETATION	Evaluation/scoring form: river channel vegetation (% cover)
	WOODY DEBRIS	Descriptive form: fallen trees. Evaluation/scoring form: presence of coarse wood debris
	ARTIFICIAL FEATURES AND STRUCTURES	Descriptive form: bridge with piles in the channel, waterway with sluice, damming structure. Evaluation/scoring form: revetment of the channel (reinforcing structures, movement of sediment), range of river regulation, water uptake, transfer and retention
	BANK PROFILE / SHAPE	Evaluation/scoring form: cross section (profile regularity, bank slope, slope)
	BANK MATERIAL	NOT APPLICABLE
D - FLOODPLAIN	RIPARIAN VEGETATION STRUCTURE	Evaluation/scoring form: structure of the riparian zone
	LONGITUDINAL CONTINUITY OF RIPARIAN VEGETATION	Evaluation/scoring form: riparian zone continuity
	RIPARIAN VEGETATION WIDTH	NOT APPLICABLE
	VEGETATION COMPOSITION, COVERAGE AND OTHER RIPARIAN VEGETATION CHARACTERISTICS	Evaluation/scoring form: presence of numerous exposed roots on the bank, shading
	ARTIFICIAL FEATURES AND STRUCTURES	Descriptive form: river embankments (%). Evaluation/scoring form: reinforcing structures
E - CHANNEL ADJUSTMENTS	LAND USE	Evaluation/scoring form: annual bank cutting and plant removal; % of areas not used for farming
	FLUVIAL FORMS	Evaluation/scoring form: % of periodically flooded areas
	INFO ON FLOODPLAIN FEATURES	NOT APPLICABLE
F - VERTICAL CONTINUITY	LAND USE	Descriptive form: Predominant land use; location of river, road and railway embankments. Evaluation/scoring form: % of natural, grassland, developed areas, etc.

4. RIVER PROCESSES

A - LONGITUDINAL CONTINUITY	Sediment and wood	It records the presence of damming structure; it assesses the in-channel sediment mobility (erosion, clogging, etc.). It assesses the length of water body (%) with limited possibility for fish migration
	Water flow	It records the presence of damming structure and assesses water uptake, transfer and retention, as well as changes in hydrological regime
B - LATERAL CONTINUITY	Lateral hydraulic continuity	It records the level of flood protection (embankments etc.) and assesses the % of periodically flooded areas, as well as changes in hydrological regime
	Sediment (and wood) lateral continuity	It assesses the width of the inter-embankment zone
C - BANK EROSION / STABILITY		It could be indirectly assessed from information on bank profile
E - CHANNEL ADJUSTMENTS	Planimetric (pattern & width)	NOT APPLICABLE
	Vertical	NOT APPLICABLE
F - VERTICAL CONTINUITY	Groundwater connection	Descriptive form: number of groundwater bodies. Evaluation/scoring form: % of ground runoff; status connection to groundwater

5. APPLICATION TO WFD

OFFICIAL METHOD (WFD implementation) / COMMONLY USED METHOD (not compulsory)	The method has been developed to specifically comply with the WFD requirements (and following directives) and it has been officially approved for the hydromorphological river assessment in Poland
APPLICATION TO ALL WATER BODIES	It applies to all water types and to natural and HMWBs; a simplified protocol exists for AWBs
USED IN THE CLASSIFICATION OF HIGH-STATUS / OTHER STATUS CLASSES	It is used to calculate both the ecological quality index (natural watercourses/water bodies) and the ecological potential (artificial/heavily modified watercourses/water bodies)
USED TO PREDICT RISK OF DETERIORATION	Potentially used (see information on changes in hydrological regime)
USED TO IDENTIFY IMPROVEMENT TARGETS	The calculation of EQR for all features allows for the identification of factors that prevent the attainment of a good ecological status and, therefore, requiring recovery measures
USED TO HELP IDENTIFY CAUSE OF ECOLOGICAL IMPACTS	It could be potentially used for this purpose given that the method relates to data supplied by other ecological surveys (for river's ecological status)
KEY STRENGTHS FOR RIVER MANAGEMENT	A simple method characterized by low cost and low labour intensity and which widely covers WFD requirements