1 - METHOD BACKGROUND			
NAME OR CODE			**HEM - Hydromorphological monitoring**
COUNTRY			Czech Republic
KEY REFERENCE			Langhammer (2007)
WEBPAGE			http://www.ochranavod.cz/cz/voda
CATEGORY			The aim is to evaluate the hydromorphological characteristics of rivers in accordance to CEN standards
2 - METHOD CHARACTERISTICS			
A - SOURCE OF INFORMATION / DATA COLLECTION		Maps/Remote sensing	The method uses historical maps to compare the present state to the state before the industrial development
		Field survey	Field mapping (and scoring). Depending on indicator: direct measures (e.g. width), estimation of % (range, e.g. variability of the longitudinal profile), presence/absence
		Rapid field assessment	NOT APPLICABLE
		Existing database	Data from existing databases are used in the assessment (rating) protocol. Hydrological data series are used to assess hydrological changes
		Modelling	NOT APPLICABLE
B - SPATIAL SCALE	HIERACHICAL SPATIAL SCALE	River catchment/Water body/ Reach/Cross Section	The method assesses single features, then attributes a score to each river zone (main groups of parameters), and then assigns a final score to the reach. Several scores for several reaches can be used (averaged) to obtain a final value for the water body
	LONGITUDINAL SPATIAL SCALE	Fixed length	NOT APPLICABLE
		Scaled to channel width	10m width = 100m long; 30m width = 500m long; > 30m width = 1 km
		Variable length	The main criterion is to identify homogenous flow reaches and homogenous floodplain characters. If the reach is too long, the criterion "length vs. width" is applied
	LATERAL SPATIAL SCALE	Channel	Channel pattern and channel bed
		Banks/Riparian zones	Left and right banks assessed separately. Riparian area is assessed in a strip of 50m wide
		Floodplain	All the floodplain width is assessed
C - TEMPORAL SCALE		Physical and morphological assessment	It assess the present states, but makes comparison (and maps) to the state before the industrial age
		Hydrological assessment	Average daily and annual flow
D - TYPE OF METHOD		Characterization/classification	The method makes firstly a feature mapping (frequency or extent) and then it rates features
		Assessment by index	The rating system is based on the principle of individual scoring parameters, evaluated from the perspective of their impact on stream hydromorphological quality. Then it calculates the partial hymo quality score for each zone/main group of parameters (4 sub-indices); parameters are weighted to emphasize the influence of key indicators on hymo conditions; then it attributes a final index, the HMK (averaging 4 sub-index) to the reach. The hymo quality of a water body (HMKvu) corresponds to the average of hymo quality of its reaches, weighted by their length
		Deviation from reference	The method assesses the deviation from potential natural flow conditions
		General assessment / Design framework	NOT APPLICABLE
		Modelling status / Scenario	NOT APPLICABLE
		Final expert judgment	The scoring system (for each indicator) is defined by experts; weighting parameters for indicators assessment are settled by the authors
		Links with other systems	NOT APPLICABLE
E - REFERENCE CONDITIONS			The highest hydromorphological quality corresponds to a potential natural flow conditions with the highest variability. The reference condition state is defined as: 1) totally or near totally undisturbed conditions in terms of flow regime (quantity and dynamic) and connection to GW; 2) natural flow longitudinal continuity conditions (sediment, flow and organisms); 3) Riverbed/banks/riparian zones conditions and structures correspond totally or nearly totally to undisturbed conditions (hymo quality value close to 1 and not higher than 1.7)
F - GENERAL INFORMATION	RIVER TYPOLOGY		NOT AVAILABLE (Similar to Germany: 53 river types)
	TYPOLOGY LIMITATIONS		NOT AVAILABLE
	TYPE-SPECIFIC (Protocol / Assessment method)		NOT AVAILABLE
	BASIS FOR STANDARDS / THRESHOLDS		Indicators are scored on a 1-5 scale (1 the best, 5 the worst), in comparison to the potential natural flow conditions; values are based on expert judgment, field validation and comparison with analogous methodologies available. Values are weighted to emphasize the relative importance of indicators to determine hymo conditions; weighting values are settled by author. The score for water body is also weighted by the length of the included reaches. The final index allow to a 5 class classification of hymo quality state
	REACH SCALE SURVEY STRATEGY		All the selected reach is assessed including its floodplain (riparian zone within 50m from the channel)
	TIMING AND FREQUENCY		It is recommended to apply method in low flow period and every 6 years
	DATA PRESENTATION (OUTPUT/LAYOUT)		Maps showing the scoring values
	METHOD SUPPORT / APPLICATION TOOLS		HEM field mapping (monitoring) methodology (Langhammer, 2007) and HEM scoring system (Langhammer, 2008)
	SPATIAL COMPARISON		NOT AVAILABLE
	CONNECTION TO ECOLOGY		The method is used to support the assessment of ecological status (survey and monitoring) of rivers
	USERS		The method is used to support the assessment and monitoring of ecological status for the implementation of the WFD
	SCALE INFORMATION		Method collects/provides info only at the reach scale
	NUMBER OF END PARAMETERS		17 parameters organised into 4 main groups: channel pattern (5), channel bed (4), riparian and floodplain zones (4), hydrological regime (4)

3. RECORDED FEATURES			
A - CATCHMENT / VALLEY	LARGE SCALE CHARACTERISTICS		NOT APPLICABLE
	HYDROLOGICAL REGIME	Hydrological conditions	Hydrological conditions/characters (waterfall, cascade, tidal stream, pools, backwaters); influence on the hydrological regime (unchanged, periodic backwater, flow control, abstraction) and water flow conditions
		Metrics of hydrological regime	Flow variability/variation (average daily and annual flow, minimum 3 years period)
		Hydro-peaking	NOT APPLICABLE
	VALLEY FORM / FEATURES		NOT APPLICABLE
B - CHANNEL	CHANNEL PATTERN / PLANFORM		Channel pattern conditions (braided meandering, straight, etc.) at present and in the past, variability of channel width
	CHANNEL FORMS		Variability of depth in the cross section (high, medium, natural/related to channelization, low); channel bed structures (islands, not structures, etc.)
	BED CONFIGURATION		Variability in the longitudinal profile (% range, artificially increased/reduced); channel bed morphology (pools, rapids, etc.)
	CHANNEL DIMENSIONS		Channel width (max & min); variability of channel width; Variability of depth in the cross section
	FLOW-TYPE		NOT APPLICABLE
	PHYSICAL / HYDRAULIC VARIABLES		NOT APPLICABLE
	SUBSTRATE		Channel bed substrate (boulders --> clay, peat, artificial)
	IN-CHANNEL VEGETATION		NOT APPLICABLE
	WOODY DEBRIS		Dead wood in the channel (number, range)
	ARTIFICIAL FEATURES AND STRUCTURES		Channel bed conditions (reinforcement, culvert, artificial sediment input, no evidence of artificial impact, etc.); Longitudinal continuity conditions (dams, weirs, fish passages)
C - RIVER BANKS/ RIPARIAN ZONE	BANK PROFILE / SHAPE		Variability of depth in the cross section (high, medium, natural/related to channelization, low)
	BANK MATERIAL		NOT APPLICABLE
	RIPARIAN VEGETATION STRUCTURE		River bank vegetation structure (high herbs, shrubs, trees, no vegetation on banks)
	LONGITUDINAL CONTINUITY OF RIPARIAN VEGETATION		Intermittent vegetation belts
	RIPARIAN VEGETATION WIDTH		NOT APPLICABLE
	VEGETATION COMPOSITION, COVERAGE AND OTHER RIPARIAN VEGETATION CHARACT.		Natural forest, economic forest, galleries vegetation
	ARTIFICIAL FEATURES AND STRUCTURES		Bank conditions (gabions, blocks, reinforcement, any evidence of impact, etc.); Variability of depth in the cross section (high, medium, natural/due to channelization, low)
	LAND USE		Riparian zone land use (forest, meadow, pasture, Lakes, agricultural area, urban, industrial)
D - FLOODPLAIN	FLUVIAL FORMS		NOT APPLICABLE
	INFO ON FLOODPLAIN FEATURES		NOT APPLICABLE
	LAND USE		Floodplain land use (forest, meadow, pasture, Lakes, agricultural area, urban, industrial)
4. RIVER PROCESSES			
A - LONGITUDINAL CONTINUITY		Sediment and wood	Longitudinal continuity conditions (dams, weirs, fish passages)
		Water flow	Longitudinal continuity conditions (dams, weirs, fish passages)
B - LATERAL CONTINUITY		Lateral hydraulic continuity	Continuity with floodplain (number and/or % of buildings along the river, levees, embankments, longitudinal dykes)
		Sediment (and wood) lateral continuity	NOT APPLICABLE
C - BANK EROSION / STABILITY			NOT APPLICABLE
E - CHANNEL ADJUSTMENTS		Planimetric (pattern & width)	River planform modification (straightening, widening, historical conditions, etc.)
		Vertical	Variability in the longitudinal profile (% range, artificially increased/reduced)
F - VERTICAL CONTINUITY		Groundwater connection	Water abstraction is assessed. Groundwater connection is also taken into account in the definition of reference sites
5. APPLICATION TO WFD			
OFFICIAL METHOD (WFD implementation) / COMMONLY USED METHOD (not compulsory)			It was recommended as a standard method for hydromorphological surveying by the Ministry of Environment in the Czech Republic in 2008 (Matouskova et al., 2010), based on the EN 14614 standard
APPLICATION TO ALL WATER BODIES			The method seems to be applied to all water bodies at least in CR
USED IN THE CLASSIFICATION OF HIGH-STATUS / OTHER STATUS CLASSES			It is used in the classification of high/reference biological status in the absence of reference sites
USED TO PREDICT RISK OF DETERIORATION			Given that it is adopted used in the monitoring programs, it could be used to predict the risk of deterioration
USED TO IDENTIFY IMPROVEMENT TARGETS			It is used in monitoring programs
USED TO HELP IDENTIFY CAUSE OF ECOLOGICAL IMPACTS			The method has been developed to support hymo quality assessment for the classification of ecological status: it has been applied in priority at sites/water bodies where ecological data were available
KEY STRENGTHS FOR RIVER MANAGEMENT			It complies with WFD requirements; both mapping/inventory and assessment protocols/phases; it is based on expert knowledge (low subjectivity)