

**1 - METHOD BACKGROUND**

NAME OR CODE	<b>DHQI - Danish Habitat Quality Index</b>
COUNTRY	Denmark
KEY REFERENCE	Pedersen & Baatrup-Pedersen (2003); Pedersen et al. (2006)
WEBPAGE	<a href="http://www.dmu.dk/nyheder/artikel/forslag_til_fysisk_indeks_for_vandloeb/">http://www.dmu.dk/nyheder/artikel/forslag_til_fysisk_indeks_for_vandloeb/</a>
CATEGORY	The method has been formerly developed to add components of physical habitat to environmental impact/state assessment and setting target in catchment plans

**2 - METHOD CHARACTERISTICS**

A - SOURCE OF INFORMATION / DATA COLLECTION	Maps/Remote sensing	Remote sensing information (e.g. land cover, geology etc.) is collected, in the former version, during the first part of the method protocol ("Site protocol") which aims to characterize the survey site. However they don't enter in the assessment index
	Field survey	The "assessment protocol" consists in classifying features based on their presence or frequency. Features are assessed using 3 classes of frequency; parameters are the same in the former and recent versions (in the former version, some features of the "site protocol" were recorded during the field survey and entered in the index calculation). Field parameters are separated into 3 categories: reach, in-stream and substrate parameters
	Rapid field assessment Existing database Modelling	The method makes use of a rapid field assessment protocol NOT APPLICABLE NOT APPLICABLE
B - SPATIAL SCALE	HIERACHICAL SPATIAL SCALE	River catchment/Water body/ Reach/Cross Section
	LONGITUDINAL SPATIAL SCALE	Fixed length Scaled to channel width Variable length
	LATERAL SPATIAL SCALE	Channel Banks/Riparian zones Floodplain
		The index assesses the physical habitat quality at the reach scale
C - TEMPORAL SCALE	Physical and morphological assessment Hydrological assessment	The length to be assessed is 100 meter for small rivers, and 200 m for large rivers NOT APPLICABLE NOT APPLICABLE Channel features are recorded for the most part during the field "assessment protocol" Bank and riparian zone features are recorded for the most part during the filed "assessment protocol" Floodplain features (i.e. land use) are only recorded (but not assessed) up to 50 m of the riparian zone
	Characterization/classification	The method assesses the present state of a river reach NOT APPLICABLE
D - TYPE OF METHOD	Assessment by index	The method characterizes the surveyed site through the "Site protocol" (at least in the former version) The "assessment protocol" aims to obtain a final assessment index: 3 scores/intensity classes are possible for each parameters (4 in the former version). The score/intensity class is then weighted to the relative importance of the parameters. The final index is the sum of single sub-scores (given by the product between intensity and weight). The final index generates 5 habitat quality classes NOT AVAILABLE
	Deviation from reference General assessment / Design framework	NOT APPLICABLE
	Modelling status / Scenario Final expert judgment	NOT APPLICABLE NOT APPLICABLE
	Links with other systems	The method is used in the National Monitoring Programme
E - REFERENCE CONDITIONS		The method refers to known reference sites but it is unclear how the reference conditions for the physical environment have been established. Data on reference sites have been used to set-up limits between quality classes
F - GENERAL INFORMATION	RIVER TYPOLOGY	The method relates to a river typology in according to the implementation of the Water Framework Directive (System A)
	TYPOLOGY LIMITATIONS	The method is applicable to lowland river types (small and large rivers). The first version of the method was limited only to small lowland rivers. Probably it cannot be applied to large rivers where high flow depth prevents the assessment of bed conditions
	TYPE-SPECIFIC (Protocol / Assessment method)	The method applies the same protocol to small and large rivers; the only difference is the length of the assessed reach (100/200 m)
	BASIS FOR STANDARDS / THRESHOLDS	Data on reference and disturbed sites have been collected to set-up quality classes. The final score ranges from -12 to 63: -12÷0 bad; 0÷13 poor; 14÷25 fair; 26÷38 good; >38 high
	REACH SCALE SURVEY STRATEGY	A representative site is selected and assessed along all the defined length (100 or 200 m)
	TIMING AND FREQUENCY	The method has been developed to limit the time spent in the field to a maximum of one hour
	DATA PRESENTATION (OUTPUT/LAYOUT)	Main characteristics and the evaluation results are inserted into a GIS database; photos are also compiled for each surveyed reach
	METHOD SUPPORT / APPLICATION TOOLS	The survey data and the evaluation results are documented in standardised forms and field maps. The site protocol is accompanied by a protocol with description of parameters (by graphs, pictures and drawings)
	SPATIAL COMPARISON	Parameters in the habitat index are assessable in most wadable streams, therefore the evaluation of the physical habitat quality can be carried out for different types of lowland streams
	CONNECTION TO ECOLOGY	The connection to ecology is not direct but the method is used in National Monitoring Programme for rivers and stream. The method could potentially evaluate habitat changes (info on substrates, flow velocity, riffle-pool, etc.)
USERS	Field training is required but no accreditation procedures have been implemented	
SCALE INFORMATION	Information is collected at both large and local spatial scales, but only reach-scale features/information are used to calculate the assessment index	
NUMBER OF END PARAMETERS	Formerly: 20 parameters collected through the "site protocol" (map/remote sensing and field); 17 parameters collected into the field during the "assessment protocol"; 25 parameters entered formerly in the assessment index. The recent development of Pedersen et al. (2006) indicates 17 parameters into the final index	

### 3. RECORDED FEATURES

A - CATCHMENT / VALLEY	LARGE SCALE CHARACTERISTICS		In the "site protocol": stream order, geology, catchment area, distance to source, soil type, altitude, highest/lowest catchment points, catchment organic pollution, weed cutting – at present, etc.
	HYDROLOGICAL REGIME	Hydrological conditions	NOT APPLICABLE
		Metrics of hydrological regime	NOT APPLICABLE
		Hydro-peaking	NOT APPLICABLE
	VALLEY FORM / FEATURES		River valley form ("site protocol")
B - CHANNEL	CHANNEL PATTERN / PLANFORM		General "channel plan form" was recorded only in the "site protocol" in the former version (classes) but in the recent version it is assessed in the reach section; meandering is recorded in both versions
	CHANNEL FORMS		NOT APPLICABLE
	BED CONFIGURATION		Riffles and pools are assessed
	CHANNEL DIMENSIONS		Stream width (during the "site protocol"); Variation in depth (only in the former version); Variation in width
	FLOW-TYPE		High energy flow velocity
	PHYSICAL / HYDRAULIC VARIABLES		NOT APPLICABLE
	SUBSTRATE		Coverage of stones/gravel/sand/mud on stream bed
	IN-CHANNEL VEGETATION		Both emergent and submerged vegetation are recorded
C - RIVER BANKS/ RIPARIAN ZONE	WOODY DEBRIS		Presence of LWD and large stones (only in the former version); Roots in the stream
	ARTIFICIAL FEATURES AND STRUCTURES		In the recent version physical variations are recorded in the in-stream section
	BANK PROFILE / SHAPE		Cross section is assessed
	BANK MATERIAL		NOT APPLICABLE
	RIPARIAN VEGETATION STRUCTURE		NOT APPLICABLE
	LONGITUDINAL CONTINUITY OF RIPARIAN VEGETATION		NOT APPLICABLE
	RIPARIAN VEGETATION WIDTH		Width of natural vegetation in the riparian areas
	VEGETATION COMPOSITION, COVERAGE AND OTHER RIPARIAN VEGETATION CHARACTERISTICS		NOT APPLICABLE
	ARTIFICIAL FEATURES AND STRUCTURES		Indirectly assessed through the evaluation of the cross section
	LAND USE		NOT APPLICABLE
D - FLOODPLAIN	FLUVIAL FORMS		NOT APPLICABLE
	INFO ON FLOODPLAIN FEATURES		NOT APPLICABLE
	LAND USE		Land use in the river valley up to 50 m of distance from the stream (% of 12 classes, through the "site protocol" in the former version)

### 4. RIVER PROCESSES

A - LONGITUDINAL CONTINUITY	Sediment and wood	NOT APPLICABLE	
	Water flow	NOT APPLICABLE	
B - LATERAL CONTINUITY	Lateral hydraulic continuity	NOT APPLICABLE	
	Sediment (and wood) lateral continuity	This information could be in part obtained through knowledge of weed management (weed cutting – at present; changes in weed cutting procedure during past 5 years)	
C - BANK EROSION / STABILITY			Bank erosion is assessed in the "site protocol" in the former version and in the reach section of the field protocol in the recent version
E - CHANNEL ADJUSTMENTS	Planimetric (pattern & width)	NOT APPLICABLE	
	Vertical	NOT APPLICABLE	
F - VERTICAL CONTINUITY	Groundwater connection	NOT APPLICABLE	

### 5. APPLICATION TO WFD

OFFICIAL METHOD (WFD implementation) / COMMONLY USED METHOD (not compulsory)	The method is the evolution of the Aarhus method (Kaarup, 1999). The method is officially used in the National Monitoring programme for rivers and streams. In the recent version of Pedersen et al. (2006), the author suggests that the new index should be included as a quality element in the implementation of WFD
APPLICATION TO ALL WATER BODIES	The method applies only to lowland streams and rivers given that it has been developed for Danish water bodies; it does apply neither to HMWBs nor to AWBs
USED IN THE CLASSIFICATION OF HIGH-STATUS / OTHER STATUS CLASSES	NOT AVAILABLE
USED TO PREDICT RISK OF DETERIORATION	NOT APPLICABLE
USED TO IDENTIFY IMPROVEMENT TARGETS	Indirectly, given that the method is used in the national monitoring programme
USED TO HELP IDENTIFY CAUSE OF ECOLOGICAL IMPACTS	NOT APPLICABLE (given that pressures are not deeply assessed)
KEY STRENGTHS FOR RIVER MANAGEMENT	Easy and rapid to apply