1 - METHOD BACKGROUND			
NAME OR CODE			**CARAVAGGIO - Core assessment of river habitat value and hydro-morphological conditions**
COUNTRY			Italy
KEY REFERENCE			Buffagni et al. (2005)
WEBPAGE			
CATEGORY			The method has been developed to adapt RHS to the Italian context and , more in general, to Mediterranean rivers. It focuses on the characterization and assessment of physical habitat and the overall hydromorphological state
2 - METHOD CHARACTERISTICS			
A - SOURCE OF INFORMATION / DATA COLLECTION		Maps/Remote sensing	The method collects some map-based general characteristics
		Field survey	Consistent with RHS. It collects some additional features specific of Mediterranean rivers
		Rapid field assessment	NOT APPLICABLE
		Existing database	Same as RHS
		Modelling	NOT APPLICABLE
B - SPATIAL SCALE	HIERACHICAL SPATIAL SCALE	River catchment/Water body/ Reach/Cross Section	Same as RHS
	LONGITUDINAL SPATIAL SCALE	Fixed length	Same as RHS
		Scaled to channel width	NOT APPLICABLE
		Variable length	NOT APPLICABLE
	LATERAL SPATIAL SCALE	Channel	Consistent with RHS. Natural and artificial channel characteristics (both for main and secondary channel) are recorded on a map for all the 500 m of reach length
		Banks/Riparian zones	Consistent with RHS. Banks are assessed separately from the channel
		Floodplain	Consistent with RHS
C - TEMPORAL SCALE		Physical and morphological assessment	Same as RHS
		Hydrological assessment	NOT APPLICABLE
D - TYPE OF METHOD		Characterization/classification	Consistent with RHS; it collects some additional river features compared to RHS (e.g. characterization of secondary channels, indication about secondary flow types and substrate)
		Assessment by index	4 descriptors: HQA (habitat quality assessment), HMS (Habitat Modification score), LUI (Land Use Index), LRD (Lentic-lotic River Descriptor). First 3 indices are used to calculate IQH (Habitat Quality Index): they are converted into EQR and averaged to obtain the final index
		Deviation from reference	The quality assessment is compared to reference site conditions
		General assessment / Design framework	NOT APPLICABLE
		Modelling status / Scenario	NOT APPLICABLE
		Final expert judgment	HMS and HQA are the same as RHS; other indices thresholds are defined by the expert judgment of the authors, on the basis of data collected on reference sites
		Links with other systems	The IQH is a multiple index (HQA + HMS + LUI)
E - REFERENCE CONDITIONS			It uses a theoretical definition of reference sites, identified as those in which the human impact is absent. The results of the CARAVAGGIO method can support/validate the definition of reference sites
F - GENERAL INFORMATION	RIVER TYPOLOGY		It uses a river typology combining system A and B of the WFD
	TYPOLOGY LIMITATIONS		It applies to Mediterranean rivers
	TYPE-SPECIFIC (Protocol / Assessment method)		NOT APPLICABLE
	BASIS FOR STANDARDS / THRESHOLDS		For HQA and HMS, same as RHS. For LUI: 5 score-classes following the land use (0=natural to 5=urban). For LRD: it gives positive scores to lotic characteristics and negative to lotic ones, at the same time considering natural characteristics (LRDn) and artificial modifications (LRDa); the sub-indices are summed to give the LRDtot
	REACH SCALE SURVEY STRATEGY		Same as RHS
	TIMING AND FREQUENCY		Same as RHS
	DATA PRESENTATION (OUTPUT/LAYOUT)		Several final indices; a database
	METHOD SUPPORT / APPLICATION TOOLS		A standard protocol to collect field data (4 pages), some explicative papers and a Software (Caravaggiosoft) for data collection and processing
	SPATIAL COMPARISON		Consistent with RHS
	CONNECTION TO ECOLOGY		Consistent with RHS. Additionally, the LRD has specifically been developed to help in the characterization of habitats for macroinvertebrates
	USERS		Same as RHS
	SCALE INFORMATION		Same as RHS
	NUMBER OF END PARAMETERS		92 parameters (+ sub-parameters, with some of them collected for different morphological units: i.e. for both banks, for main/secondary channel, for channel/banks/banktop), organised in 17 main sections

3. RECORDED FEATURES			
A - CATCHMENT / VALLEY	LARGE SCALE CHARACTERISTICS		Valley characteristics and general channel morphology
	HYDROLOGICAL REGIME	Hydrological conditions	Differently from RHS, it also considers the lentic-lotic character of rivers (being important in Mediterranean rivers); it comes from data collected at spot-checks (flow type, depth, substrate, organic matter and debris) and sweep-up (flow type and depositional features)
		Metrics of hydrological regime	NOT APPLICABLE
		Hydro-peaking	It assesses if the river is subject to hydropeaking
	VALLEY FORM / FEATURES		Consistent with RHS. Info could be obtained from existing maps
B - CHANNEL	CHANNEL PATTERN / PLANFORM		Channel morphology (e.g. sinuous, meandering, braided) and general conditions of the reach (naturally/artificially confined). Info could be obtained from existing maps
	CHANNEL FORMS		It records the presence and number of selected channel form features (transverse/alternate/concave bar, vegetated/unvegetated point/lateral bar, mature island, etc.). At the overall reach scale it also records some main bar forms (lobated)
	BED CONFIGURATION		It records the number of selected bed configuration features (riffle, pool, nickpoint, eroded alluvial deposits, etc.)
	CHANNEL DIMENSIONS		Either for main and secondary channel: position of wetted channel; wetted channel width; maximum depth; Total wetted and total channel width
	FLOW-TYPE		Consistent with RHS. Flow types recorded either for main and secondary channel; it also records the main and secondary flow types
	PHYSICAL / HYDRAULIC VARIABLES		NOT APPLICABLE
	SUBSTRATE		Coherent to RHS. Substrate type recorded both for main and secondary channel; it records both the main and secondary substrate type. It records, at the overall reach scale, the presence of fine sediments in pools and large sediments in riffle
	IN-CHANNEL VEGETATION		Consistent with RHS
	WOODY DEBRIS		Consistent with RHS
	ARTIFICIAL FEATURES AND STRUCTURES		Consistent with RHS but either for main and secondary channel. It records also the position of artificial features along the 500 m reach on a map
C - RIVER BANKS/ RIPARIAN ZONE	BANK PROFILE / SHAPE		Consistent with RHS. It also measures bank extent and bank slope
	BANK MATERIAL		Consistent with RHS
	RIPARIAN VEGETATION STRUCTURE		Consistent with RHS
	LONGITUDINAL CONTINUITY OF RIPARIAN VEGETATION		Consistent with RHS
	RIPARIAN VEGETATION WIDTH		It measures riparian vegetation width
	VEGETATION COMPOSITION, COVERAGE AND OTHER RIPARIAN VEGETATION CHARACTERISTICS		Consistent with RHS. It also records the riparian tree vegetation composition (presence/absence/extension) on bank and banktop and also channel (islands, bars), both for natural and exotic species
	ARTIFICIAL FEATURES AND STRUCTURES		Consistent with RHS
	LAND USE		Land use at 5m on banktop (spot-check) is used to calculate the LUI, together with the land use at 50m on banktop (sweep-up)
D - FLOODPLAIN	FLUVIAL FORMS		Coherent to RHS
	INFO ON FLOODPLAIN FEATURES		It records the presence of large boulder in the floodplain as well as glacial deposits (at the overall reach scale, as special features)
	LAND USE		Land use at 50 m on banktop (sweep-up) is used to calculate the LUI, together with the land use at 5 m on banktop (spot-check). At the overall reach scale it records also if agriculture field are tilled parallel or orthogonally to the river flow direction
4. RIVER PROCESSES			
A - LONGITUDINAL CONTINUITY		Sediment and wood	Consistent with RHS
		Water flow	Consistent with RHS. The presence of hydropeaking is also noted
B - LATERAL CONTINUITY		Lateral hydraulic continuity	Consistent with RHS
		Sediment (and wood) lateral continuity	Consistent with RHS
C - BANK EROSION / STABILITY			Consistent with RHS
E - CHANNEL ADJUSTMENTS		Planimetric (pattern & width)	NOT APPLICABLE
		Vertical	It records tracks of evident river incision
F - VERTICAL CONTINUITY		Groundwater connection	Consistent with
5. APPLICATION TO WFD			
OFFICIAL METHOD (WFD implementation) / COMMONLY USED METHOD (not compulsory)			It has been developed as compulsory method only for reference sites
APPLICATION TO ALL WATER BODIES			It applies to all river bodies at least in Italy and Mediterranean rivers
USED IN THE CLASSIFICATION OF HIGH-STATUS / OTHER STATUS CLASSES			It has been used to help in the definition of Italian reference sites. The IQH is used to define high ecological status (only 2 classes)
USED TO PREDICT RISK OF DETERIORATION			It can be potentially used to define the risk of deterioration of physical habitats
USED TO IDENTIFY IMPROVEMENT TARGETS			Consistent with RHS
USED TO HELP IDENTIFY CAUSE OF ECOLOGICAL IMPACTS			Consistent with RHS
KEY STRENGTHS FOR RIVER MANAGEMENT			It can be used characterize/inventory in detail physical habitats and to get an overall state of physical structure of rivers