Opportunities for participatory data collection	No opportunities identified
Additional information	
References	European Parliament. (2000). *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*. http://data.europa.eu/eli/dir/2000/60/oj European Commission. (2012). *Report from the Commission to the European Parliament and the Council on the Implementation of the Water Framework Directive (2000/60/EC). River Basin Management Plans*.

4.56 Total number and species richness of aquatic macroinvertebrates

Project Name: UNaLab (Grant Agreement no. 730052) and PHUSICOS (Grant Agreement no. 776681)

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Total number and species richness of aquatic macroinvertebrates	**Water Management**
Description and justification	The Extended Biotic Index (EBI) is based on the analysis of macroinvertebrate communities that colonize river ecosystems. Aquatic macroinvertebrates are animals that do not have a backbone, can be observed without magnification and spend at least part of their life in water. Most macroinvertebrates spend part of all of their life attached to submerged rocks, logs and vegetation. They are good indicators of the health of aquatic ecosystems because: • Macroinvertebrates are affected by physical, chemical and biological conditions of the stream

	• Macroinvertebrates are relatively long-lived and cannot escape pollution, so can therefore reflect changes to stream conditions across space and time • Macroinvertebrates are ubiquitous in perennial aquatic systems • Macroinvertebrates are a critical part of the food web in streams • Macroinvertebrates have a range of different life history strategies (e.g., mode of respiration, feeding strategy, reproduction) that can be used to evaluate causes of aquatic ecosystem impairment • Macroinvertebrates can easily be sampled and identified in a cost-effective manner These communities live in the substrate and are composed of populations characterized by different levels of sensitivity to environmental modifications and with different ecological roles. Since macroinvertebrates have relatively long life cycles, the index provides integrated information over time on the effects caused by different causes of disruption (physical, chemical and biological). In monitoring the quality of running waters it must therefore be considered a complementary method to the chemical and physical control of water.
Definition	Total number and species richness of aquatic macroinvertebrates (unitless)
Strengths and weaknesses	+ Most commonly used element for biological classification of the European rivers + Yields an opportunity for community members to engage in environmental monitoring +/- Macroinvertebrate monitoring can not only provide information about how changes to the landscape or stream characteristics affect the health of the biological community - Low effectiveness in deep rivers, where the invertebrates may be difficult to sample. - May not yield accurate results
Measurement procedure and tool	It is recommended that an aquatic biologist assist in the design of a biosurvey programme and provide a locally-adapted macroinvertebrate identification key. Monitoring approaches typically involve the establishment of a transect-type study area or sampling ‘reach’ and macroinvertebrate sample collection along with habitat assessment. The relative intensity of the biosurvey and level of supervision by professional aquatic biologists depends upon the programme objective. It is generally

	recommended that macroinvertebrate sampling programmes start with the simplest, least resource-intensive approach and work towards increasing complexity depending on the available resources, expertise and volunteer interest. An example of a macroinvertebrate sampling programme is: • Establish sample location (sample station) • Estimate habitat proportions • Collect macroinvertebrate samples • Clean and preserve the sample • Habitat assessment and estimation of flow • Generate a site sketch The gathering of invertebrates typically occurs through a net with a handle and is performed by sampling at different points within the water course so that all the different habitats are examined; the collected sample is preserved by addition of formalin and analyzed in the laboratory using a stereomicroscope. Each collected specimen is identified at the systematic level (genus or family) requested by the method. The determination of the EBI value is based on a double entry table: the rows have as headings the different groups of macroinvertebrates listed in order of decreasing sensitivity to environmental changes; the columns have as headings the ranges of the total number of systematic units than can be found in the samples. The EBI score is obtained by crossing the line corresponding to the most sensible systematic group with the column of the number of systematic units found. The score corresponds to a water quality class and represents a synthetic valuation.
Scale of measurement	Plot to neighbourhood/district scale or river basin scale
Data source	
Required data	Sampling distances from the stream, types of habitats, relative proportion of each habitat, stream bed composition, stream flow.
Data input type	Qualitative and quantitative
Data collection frequency	Daily, weekly, monthly or annually
Level of expertise required	For sampling, low to moderate. For identification of samples, some degree of expertise is required.

Synergies with other indicators	Synergies with the indicator group *Water quality* indicators
Connection with SDGs	SDGs 6 Sustainable water management, 13 Climate action, and 14 Life below water
Opportunities for participatory data collection	Opportunities for community members to engage in the data collection with assistance
Additional information	
References	European Parliament, Council of the European Union. (2000). *EU Water Framework Directive: Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 Establishing a Framework for Community Action in the Field of Water Policy*. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02000L0060-20140101 http://www.isprambiente.gov.it/

4.57 Morphological Quality Index (MQI)

Project Name: NAIAD (Grant Agreement no. 730497)

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Morphological Quality Index (MQI)	**Water Management**
Description and justification	The Morphological Quality Index was developed to assess the hydromorphology quality of rivers as introduced in the EU Water Framework Directive (WFD). An extensive review of existing methods to assess the hydromorphology of rivers demonstrated that most methods insufficiently account for physical processes (Belletti et al. 2015). Based on a weighted aggregation of 28 subindicators, the MQI is aimed at an assessment, classification and monitoring of the current morphological state of rivers (Rinaldi et al. 2017). First developed in Italy (Rinaldi et al. 2013), the index was tested and expended on rivers of all Europe (Rinaldi et al. 2015b) during the REFORM EU Project (https://www.reformrivers.eu).
Definition	The MQI is computed by a weighted sum of alteration scores on sub-indicators. The list of sub-indicators is context specific (confined versus partially confined and unconfined reaches). The full mathematical equations are provided in Rinaldi et al. (2015a, p. 99-102). Forms are provided in the appendix of Rinaldi et al. (2015a) as well as in Microsoft Excel spreadsheets that performs the computation automatically