



Morphological Quality Index in Sicily: application to the San Bartolomeo basin (North-western Sicily)

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To estimate the ecological status of the Surface Water Bodies (SWB) the IDRAIM multiparametric approach has been applied in Sicily, which adopts the general communitarian framework established in the WFD (Water Framework Directive). IDRAIM (stream hydromorphological evaluation, analysis and monitoring system) is in general based on the expert-based assignment of each reach in which a SWB is split to one of the classes of a set of indicators, expressing the Geomorphological Functionality, Artificiality and Channel Changes status.

In this study, a focus is given to the sensitivity analysis of the Indices so to recognize the main causes of current and potentially future quality status.

The San Bartolomeo River Basin stretches in the northwestern part of Sicily, with an area of about 420 km². The geological framework is primarily given by the outcropping of Meso-Cenozoic carbonate successions, clay-marly sequences and clastic deposits. In the coastal areas, these geological successions are covered by Quaternary detrital-organogenic deposits. The climate regime of the basin can be classified as temperate-Mediterranean, characterized by a rainy period (October–April) and a dry period with minimal precipitation (June–August), during which the highest temperatures are also recorded.

Five Surface Water Bodies (SWBs) within the San Bartolomeo drainage network were selected for assessment using the IDRAIM methodology: the Sirignano, Freddo, Caldo, and Bartolomeo streams. The Morphological Quality Index (MQI) values for these five fluvial segments are as follows: 0.73 and 0.79 (good quality) for Sirignano and Freddo1, 0.69 (moderate quality) for Freddo2, and 0.77 (good quality) for both Caldo and Bartolomeo. The quality status of these streams is primarily influenced by the F1, F2, F11, F13, A1, A2, and A5 indicators.

To evaluate the potential effects of variations in the assignment classes of each indicator, the analysis of the reaches was divided into two groups based on their confinement type: the first group consists of confined reaches (a total of five), while the second group includes semi- and unconfined reaches (a total of thirty-three). By iteratively modifying the assignment class for each factor, new MQI values were obtained for each reach. A total of 192 modifications were applied to a set of 21 indicators (48 classes) for the confined reaches, and 2,343 modifications were applied to a set of 25 indicators (59 classes) for the semi- and unconfined reaches. The results showed effects on MQI values of individual reaches of up to 80% (42% on average) for two of the five confined reaches analysed and up to 70% (52% on average) for twelve of the thirty-three semi- and unconfined reaches analysed. The confined reaches shifted from an excellent to a good quality status, while the semi- and unconfined reaches transitioned from good to sufficient quality.

The sensitivity analysis is a mandatory procedure when adopting expert based multiparameter ranked approaches as it opens a view on the real reliability of the quality estimation. At the same time, it furnishes useful indications regarding the more sensitive reaches and more influential factor changes which is an important tool to support management decision.

KEYWORDS Morphological Quality Index, IDRAIM, sensitivity analysis, San Bartolomeo River, Sicily
