

Development of a 'weight-of-evidence' model for assessing sediment quality and associated hazards

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Introduction: Quality assessments are crucial to all activities related to removal and management of sediments. Following a multidisciplinary, weight-of-evidence approach, a new model is presented here for comprehensive assessment of hazards associated to polluted sediments.

Methods: The considered lines of evidence (LOE) were sediment chemistry, assessment of bioavailability, sublethal effects on biomarkers, and ecotoxicological bioassays. Logical flow charts were developed within individual modules, with each summarizing the data into four specific synthetic indices, prior to overall hazard evaluation.

This model, previously applied in other field cases, was applied to 5 sediment samples from Venice lagoon.

Chemical data (trace metals, PAH, PCB and OCP), were processed using LOE 1.

Bioavailability and biomarkers were evaluated using European eels (*Anguilla anguilla*) and mussels (*Mytilus galloprovincialis*) as bioindicators, which were exposed under laboratory conditions to samples (LOEs 2-3).

To assess the effects of pollutants to different levels of trophic chain, the results of a bioassays battery composed by 8 different species, were considered (LOE 4).

Results obtained from the application of 4 LOEs were finally integrated by using a WOE approach which give an integrated index of Hazard.

The results obtained by use single LOEs and from the integrated approach (WOE) were compared with Protocol of Venice (8 april. 1993) sediments classification.

Results: The model elaborated the following results:
LOE 1: from chemical characterization of sediments, Hazard levels ranged from Moderate to Severe, depending on considered normative limits and samples characteristics.

LOE 2: Bioavailability of pollutants revealed a Moderate to Major Hazard depending on samples and tested species, resulting greater for eels (exposed to whole sediments) than mussels (exposed to elutriates).

LOE 3: Biomarkers were sensitive and able to discriminate different samples with levels of hazard from Moderate up to Severe.

LOE 4: The integration of results from the battery of bioassays indicated a generally lower level of hazard at organism level (Slight-Moderate), with a higher contribution given by of *Acartia tonsa*.

WOE integration: Based on the results of individual LOEs, the model summarized 3 different levels of hazards for considered sediments.

Discussion: Based on comparisons with expert judgment, the model presented efficiently discriminates between the various environmental conditions, both as individual modules and as an integrated final evaluation, thus appearing as a powerful tool to support more complex processes of environmental risk assessment.

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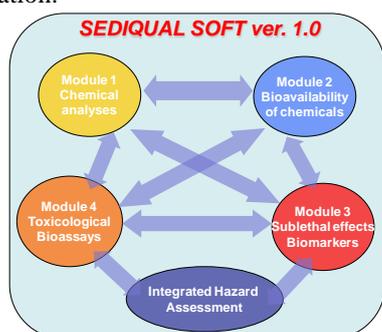


Fig. 1: SediqualSoft[®] functioning scheme.