Sampling site selection Analytic Hierarchy Process Model towards the Ecological assessment of European Union streams

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Abstract

Ecological assessment is nowadays recognised as fundamental to sustainable management of the world's freshwater resources. In Europe, where the European Union Water Framework Directive (WFD) 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 *Official Journal L 327, 22/12/2000 P. 0001 - 0073*, requires that water resources be subject to ecological assessment, to provide a basis for the management and restoration of catchments.

The assessment of the ecological status of streams is the main idealistic approach of the WFD, whereas in practical terms the implementation of the WFD is turning into a scientific problem. Much work was developed into the elaboration of such a strategy, with solid scientific information and outstanding experts, however Europe changed, and the geographical coverage enlarged, creating new challenges into the application and uniformity of the WFD. Previous works financed by the European Union failed in changing the attitude and interpretation of the directive by each of the implementing institutions with exceptions made to the sampling methodology and data interpretation.

Despite most countries endeavours in delivering its main objectives of non-deterioration and the achievement of good status for all European Union waters, implementation problems arise in the most various forms. One of the main issues is sampling site selection where a set of legislative criteria imposes that sampling sites must respect several geographical and natural parameters.

This paper proposes the use o QGIS software to model a multi-criteria decision-making, the Analytic Hierarchy Process (AHP), which ranks the alternatives or selects the optimal alternatives on basis of the hierarchical structure, criteria and sub criteria. Multi-criteria decision-making analyses can help users understand the results of Geographic Information System based decision-making procedures, in this case, trade-offs among policy objectives and the use of results in a systematic and justifiable way to develop policy recommendations by ensuring a flexible environment for the analysis of various alternatives based on their criteria.

Results present the application of the AHP methodology using QGIS software for selecting the most appropriate set of sampling sites towards an appropriate implementation WFD. The model was tested for the Nabão River in Tomar-Portugal confirming the adequacy of the model's stretch selection facilitating the methodological applicability of the WFD. Furthermore, such model may be one of the routes towards methodological uniformization of sampling site selection for European Union streams Ecological Assessment.

Keywords: European Union Water Framework Directive, Nabão River, QGIS software