

Assessment of minimum water level and flow in water bodies in Greece under the impact of climate change

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Abstract

Despite any delays on the implementation process of the European Union (EU) Water Framework Directive (WFD), the first River Basin Management Plans (RBMPs) for all of their respective Water Districts (WD) at EU scale have been completed. Following the six year planning cycle of action and review that has been set as the sequential time frame for the revised version of the management plans, the 2nd cycle RBMPs is now underway towards 2021. The latter, among other significant water related issues, is aiming at evaluating the programme of measures that has been proposed during the first phase of planning and thereafter updating the environmental indicators that are correlated with specific measures and foster the improvement of the water environment. In Greece, due to the fact that the minimum water level and flow in water bodies has not properly been defined by the national legislation, i.e. environmental flow is considered as a portion of the mean annual flow regardless other basins' characteristics such as topographic, water and land uses etc, the assessment of the lake's water level and river's flow is proposed in almost all accomplished RBMPs' programmes of measures.

Towards this direction, the goal of the present research is threefold: a) to quantify the environmental flows and water levels based on i) fish fauna and ii) macrophytes requirements on water, b) to assess the impacts of climate change to water resources and investigate potential fluctuations of basin's water regime and c) to propose specific measures for the maintenance of minimum water levels in lakes and environmental flows in rivers. A cascade of mathematical models related with lake's hydrodynamics and river's hydrology are coupled with climate change data derived by a Regional Climate Model in order to examine the water bodies' capabilities to preserve the good environmental status of these water bodies. For the assessment of water level, the case study area is a complex of lakes in the WD of Western Macedonia, Greece, while the environmental flow will be explored in the Greek part of a transboundary river basin in the WD of Thrace. The proposed methodology and the derived results is foreseen to contribute to the refinement of the relative legislation and moreover to be adopted in the updated RBMPs.

Keywords: minimum water level; environmental flow; climate change; water districts of Western Macedonia and Thrace