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Modeling Study of the Marano and Grado Lagoon (Italy) to Support the Regional Water Protection Plan) TO SUPPORT THE REGIONAL WATER PROTECTION PLAN

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The Water Framework Directive 2000/60/EC (WFD) contemplates the classification of water bodies and establishes the quality objectives of water bodies to achieve a good status within 2015. Further, the Italian law which takes in the WFD with Decree n. 152/2006, allows to identify some water bodies as heavily modified (HMWB). The Regional Administration, involved in the setting up of the Water Protection Plan, according with the above mentioned decree and directive, has to establish specific programs to maintain or conform water quality to the requested quality objectives, also for heavily modified water bodies that have to reach the ecological potential.
In the north-eastern part of Italy, in the Friuli Venezia Giulia Region, the Marano and Grado Lagoon is the most complex transitional ecosystem in which four water bodies have been temporarily classified as heavily modified. They are identified as FM1, FM2, FM3 and FM4. In particular, FM2 – “Paludo della Carogna” and FM3 - “Barbana” water bodies seem to be characterized by some confinement since they are delimited by a bridge, called “Ponte Belvedere”. The preliminary evaluation of the quality status of FM2 and FM3 water bodies is conditioned by the value of one of the quality criteria: the macrophytes. In fact, macrophytes are represented by very few species in these two water bodies. In a preliminary way the overall judgement of FM2 and FM3 water bodies has been indicated by the experts as scarse. This means that a specific programme of measures has to be proposed to improve the quality status of these water bodies in order to reach the ecological potential.
In this context modeling may be used as a scientific and technical tool to support the evaluation on FM2 and FM3 water bodies and the effectiveness of specific measures for the achievement of the quality objectives. Numerical simulations of the Marano and Grado lagoon were performed for hydrodynamic circulation, temperature and salinity behavior with the SHYFEM model, a shallow water finite element model developed at ISMAR-CNR in Venice (Ferrarin et al., 2010) and experimental data were used to calibrate the numerical model. In this study the effectiveness of some proposed measures is investigated with the SHYFEM model, trying to solve the problem of the scarse quality evaluation of FM2 and FM3 in the eastern part of the Marano and Grado lagoon. The proposals are:
Modification of the bridge “Ponte Belvedere”: the bridge, which divides FM2 and FM3 from the western part of the lagoon, has some openings which are not very large. The proposal is to enlarge these openings on the dam to assess if this action might improve the circulation and consequently the water quality.
Excavation of a new channel on the bottom of the lagoon: besides the openings on the dam, it is also possible to hypothetically excavate one or more channels; these are preferential ways for the water to pass in and arrive to the areas in which the circulation has to be increased. This proposal seems to be efficient, with good effects on the inner circulation of the eastern lagoon.