

Modeling Study of the Marano and Grado Lagoon (Italy) to Support the Regional Water Protection Plan

Isabella Scroccaro^{1,2}, Giorgio Mattassi¹

¹ARPA FVG, Environmental Protection Agency of the Friuli Venezia Giulia Region, via Cairoli n. 14 - 33057 Palmanova (UD) Italy

²NSF Science and Technology Center for Coastal Margin Observation & Prediction, Institute of Environmental Health, Oregon Health & Science University, USA

The Water Framework Directive 2000/60/EC (WFD) contemplates the classification of water bodies and establishes that water bodies have to achieve a good quality 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. 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 and FM3 water bodies seem to be characterized by a high confinement since they are delimited by a bridge, called “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 “poor”. This means that the Regional Administration, involved in the setting up of the Water Protection Plan, according with the above mentioned decree and directive, has to propose a specific program of measures to improve the quality status of these water bodies.

In this context modeling may be used as a scientific and technical tool to support the evaluation of FM2 and FM3 water bodies and the effectiveness of specific measures for the achievement of the quality objectives. In this study the effectiveness of some proposed measures is investigated with the SHYFEM model, developed at ISMAR CNR in Venice. The proposals are:

Modifications of the bridge “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 in order 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, since these are preferential ways for the water to pass in and arrive to the areas in which the circulation has to be increased.

RMS Velocity and residence times have been chosen as representative hydrodynamic parameters. In summary, results show that any action suggested in this study would not bring significant changes in these hydrodynamic parameters. FM2 and FM3 water bodies seem to be insensitive to the physical changes simulated by different scenarios in order to improve circulation, imagining thereby to modify the water exchange and quality. Results may also suggest that FM2 and FM3 water bodies are not structurally able to achieve a "good ecological status", as currently expressed through the quality criterium “macrophytes”. This indicator, conventionally used for the assessment of the ecological status, seems not to represent the level of alteration of this ecosystem.