

Practical Criteria for Numerical Modeling of Water Quality in Coastal Zones

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ABSTRACT

Water quality in coastal zones of urban settlements is usually impacted by domestic discharges. In order to mitigate or remediate this impact, an extended enough sewage system must be implemented, including water treatment plants. In many cases, the discharges from the plants cannot be localized at the coast itself if water quality needs to be preserved throughout the coastline; hence, subaquatic outfalls must be built.

In order to establish limited water use zones in the coastal area, and/or define the values of the design parameters of the disposal system (outfalls extension, level of treatment for the water treatment plants), numerical modeling must be used. This includes a hydrodynamic model, to simulate the circulation in the coastal zone, and a pollutant transport model, to determine the spatial and temporal concentration distributions.

The numerical aspects of both types of models are already well established. But selection of the appropriate ones for the particular problem, and proper implementation and validation of the selected models require some expertise. In the present paper, based on a combination of conceptual principles and experience, a series of practical criteria are stated in order to choose, implement and validate those models. They include items such as extension of domain, dimensionality of the models, spatial grid, time steps, numerical approach (eulerian or lagrangian), meaning of validation, strategies for calibration.

They are illustrated through their application for two case studies of particular relevance in Argentina: water quality in the coastal zone of the city of Buenos Aires, on the Plata River, including the project of a new set of two outfalls [1], and the design of an outfall for the city of Ushuaia on the Beagle Channel, in Patagonia.

REFERENCES

- [1] Menéndez, A.N., Badano, N.D., Lopolito, M.F., Re, M., *Water Quality Assessment for a Coastal Zone through Numerical Modeling*, Journal of Applied Water Engineering and Research, 1:1, August 2013, 8-16, DOI: 10.1080/23249676.2013.827892