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Forecasting the Risks of Pollution from Ships along the Portuguese Coast

Rodrigo Fernandes (1), Ramiro Neves (1), Filipe Lourenço (2), and Frank Braunschweig (2)
(1) MARETEC - Instituto Superior Técnico, Lisbon, Portugal, (2) Action Modulers, Mafra, Portugal

Pollution risks in coastal and marine environments are in general based in a static approach, considering historical data, reference situations, and typical scenarios. This approach is quite important in a planning stage. However, an alternative approach can be studied, due to the latest implementation of several different real-time monitoring tools as well as faster performances in the generation of numerical forecasts for metocean properties and trajectories of pollutants spilt at sea or costal zones. These developments provide the possibility of developing an integrated support system for better decision-making in emergency or planning issues associated to pollution risks.
An innovative methodology to dynamically produce quantified risks in real-time, integrating best available information from numerical forecasts and the existing monitoring tools, has been developed and applied to the Portuguese Coast. The developed system provides coastal pollution risk levels associated to potential (or real) oil spill incidents from ship collision, grounding or foundering, taking into account regional statistic information on vessel accidents and coastal sensitivity indexes, real-time vessel information (positioning, cargo type, speed and vessel type) obtained from AIS, best-available metocean numerical forecasts (hydrodynamics, meteorology - including visibility, wave conditions) and simulated scenarios by the oil spill fate and behaviour component of MOHID Water Modelling System. Different spill fate and behaviour simulations are continuously generated and processed in background (assuming hypothetical spills from vessels), based on variable vessel information and metocean conditions. Results from these simulations are used in the quantification of consequences of potential spills. All historic information is continuously stored in a database (for risk analysis at a later stage).
This dynamic approach improves the accuracy in quantification of consequences to the shoreline, as well as the decision support model, allowing a more effective prioritization of individual ships and geographical areas.
This system was initially implemented in Portugal for oil spills. The implementation in other Atlantic Regions (starting in Galician Coast, Spain) is being executed in the scope of ARCOPOL+ project (2011-1/150), as well as other relevant updates. The system is being adapted to include risk modelling of chemical spills, as well as fire & explosion accidents and operational illegal discharges. Also the integration of EMSA's THETIS "ship risk profile" (according to Annex 7 from Paris Memorandum of Understanding) in the risk model is being tested.
Finally, a new component is being developed to compute the risk for specific time periods, taking advantage of the information previously stored in the database on the positioning of vessels and / or results of numerical models. This component provides the possibility of obtaining a support tool for detailed characterization of risk profiles in certain periods or a sensitivity analysis on different parameters.