



## RIVER BASIN MANAGEMENT SCENARIOS

A screening tool for effective evaluation of planning alternatives

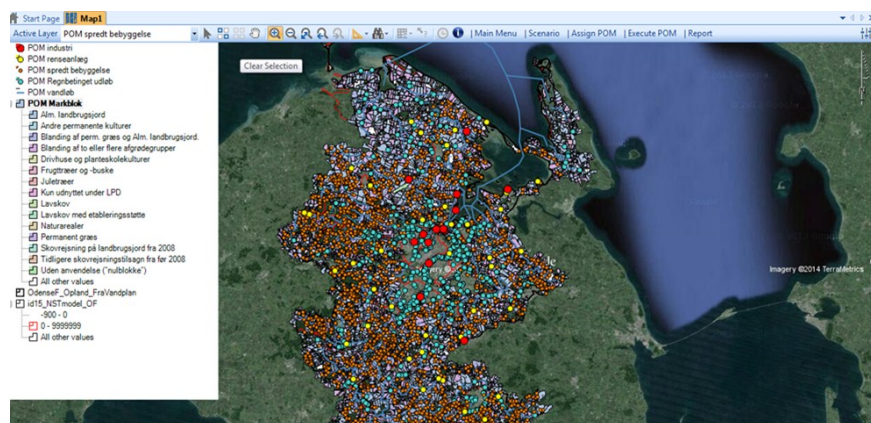
River basin management must address multiple objectives and use many different water management measures to ensure sustainable water resources development. Our map-based Programme of Measures (POM) tool helps you identify the most feasible and cost-effective management scenarios. It provides efficient screening of many options, estimates the cost-effectiveness of the different combinations, and includes tools that allow you to export to MIKE Powered by DHI models for more comprehensive process-based river basin modelling.

### SCENARIO SCREENING

Originally developed to address the requirement of the European Union Water Framework Directive (EU WFD), the POM tool can be applied to a range of water management issues including:

- water allocation
- water scarcity
- nutrient loading
- pollution
- greenhouse gas emissions

The POM tool calculates the effects of different measures through the river network and sub-basin structure of a basin.



POM tool user interface. © DHI

### CLIENT

- River basin organisations
- Local and national authorities
- Universities and research institutions

### CHALLENGE

- Need for efficient analytical tools capable of evaluating and screening many river basin management alternatives
- Need to build stakeholder consensus
- Need to rapidly narrow down the range of feasible solutions to be evaluated in detail

### SOLUTION

Our Programme of Measures (POM) tool implemented in MIKE Powered by DHI:

- offers a map-based specification of management measures with rapid evaluation of costs and impacts
- is easy to use for non-experts

### VALUE

- Screens for best performing water management scenarios
- Saves money by replacing expensive measures with cheaper alternatives
- Evaluates scenarios in terms of cost-effectiveness and ability to fulfil multiple management goals
- Enables transparent water planning by sharing information between authorities and stakeholders
- Enables scenario compliance to formulated goals including the estimated time horizon
- Improves the use of complex river basin models by efficiently identifying the best of feasible scenarios

By assigning site-specific measures from a pre-defined catalogue, the user can create a complete programme of geographically targeted measures that meet river basin management goals – for example, saving water or reducing nutrient loads.

Distributed losses or retention factors associated with both groundwater and surface water can also be included to help find the most effective geographic locations of the measures to be implemented.

### EU WFD PROGRAMME OF MEASURES

The POM tool was initially developed to address the requirement for 'good ecological status' in the EU WFD but it can be applied to a wide range of basin-scale water management issues. For the WFD, 'good ecological status' must be achieved for rivers, lakes and estuaries within each basin unit. Management objectives include reducing nitrogen and phosphorous loads from both diffuse sources as well as a range of point sources.

The cost-effectiveness of each measure varies significantly across the basin as a function of the chain of retention processes from source to receiving water body. Therefore, a large number of combinations of site-specific measures making up a POM scenario must be evaluated to achieve targeted and cost-effective solutions. By gradually adding measures and recalculating their impacts, a complete basin-wide scenario can be created and quickly modified.

### KEY OUTPUTS

The key outputs of our POM tool include:

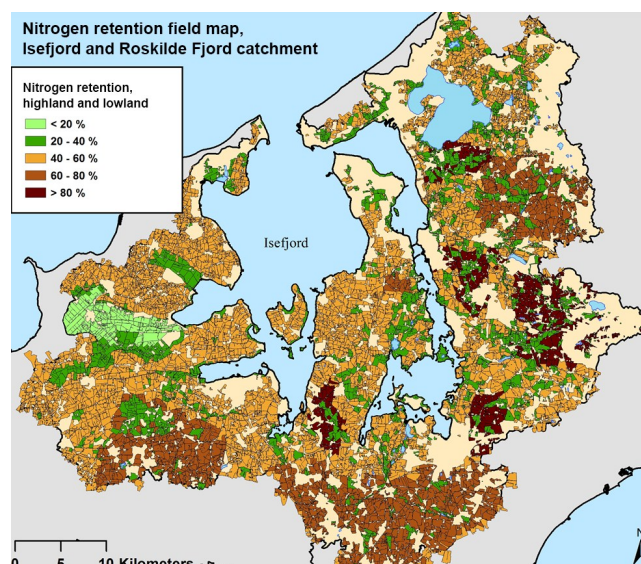
- evaluation of the scenario compliance with management targets
- estimation of total costs of each POM scenario
- ranking of individual measures by cost-effectiveness
- overview results as well as detailed local analyses
- complete mapping of measures applied by location, extent and time of implementation

Results from three Danish basins (Suså, Roskilde Fjord, and Odense Fjord), for example, show that considerable costs savings can be achieved while reducing nutrient load by adopting a differentiated strategy. For any given basin, this strategy locates different measures relative to nutrient retention in groundwater and surface water.

Since the cost-effectiveness varies significantly depending on the type of measure and the geographical location, the POM tool scenario analysis helps find the best overall locations and types of measures. Unnecessary costs from inefficient measures that would lead to economic losses to stakeholders, industries, and governments are avoided.

The POM tool is accessible via the Internet, supporting the involvement of multiple stakeholders and organisations in the planning and consensus building process.

Information about the underlying data, planned measures, costs and derived environmental benefits can be shared both between central authorities, local authorities and the public. The map interface enables users to inspect both the basin wide plan and the proposed local measures. The best suited programmes of measures can be carried through to preliminary river basin plans and stakeholder interaction, followed up by implementing these measures and monitoring their impacts.



Map of field scale nitrogen retention used in POM tool analysis of Roskilde Fjord, Denmark. © DHI

### EXPORT TO RIVER BASIN MANAGEMENT MODELS

The POM tool is a simple accounting-type tool for screening purposes. It can be supplemented by more detailed analyses using process-based numerical models. The best performing scenarios from the screening analysis can be exported to an existing river basin model. All point or diffuse nutrient load sources are transferred to input files for MIKE SHE or MIKE 11.

By using more advanced, dynamic and process-based basin water quality models, a more detailed and scientific assessment of effects can be provided. Since comprehensive river basin water quality models are often computationally demanding, this limits their use for evaluating a large number of alternative scenarios. Utilising this screening tool in combination with advanced models offers non-expert users easier access to scenario formulation and enables a more effective and transparent planning process.

### REFERENCE

Kaspersen, B.S. T.V. Jacobsen, M.B. Butts, H.G. Müller, E. Bøgh, T. Kjær (2013) Målrættede vandplaner - hvordan?, Vand & Jord [Targeted water plans - How?, Water & Soil] Nr. 4, December 2013, 136-141.

Contact: [info@dhigroup.com](mailto:info@dhigroup.com)

For more information, visit: [www.dhigroup.com](http://www.dhigroup.com)