# Representation of GREAT-ER simulations in the WIS:

## Georeferenced modelling as complementary approach to environmental monitoring

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## Introduction

One of the objectives of the MEDUWA project is to protect our water resources and contribute to a better ecological and chemical status of our surface waters. Pursuing this objective would require to monitor the presence of substances that may have harmful effects on the environment. At the same time, continuous basin-wide monitoring (as it would be necessary) is practically impossible to implement. Models like GREAT-ER can help to fill existing knowledge gaps by complementing environmental monitoring with appropriate simulation results.

## Model description

The Georeferenced Regional Exposure Assessment Tool for European Rivers (GREAT-ER) constitutes a model tool for exposure and risk assessment of down-the drain chemicals such as pharmaceuticals in surface waters (Fig. 1). It delivers spatially resolved predicted environmental concentrations (PEC) in a whole catchment based on chemical and physical properties under the assumption of steady state [e.g. 1,2]. Estimated emissions from sewage treatment plants and hospitals are taken into account to simulate the status quo of contaminations in the catchment.

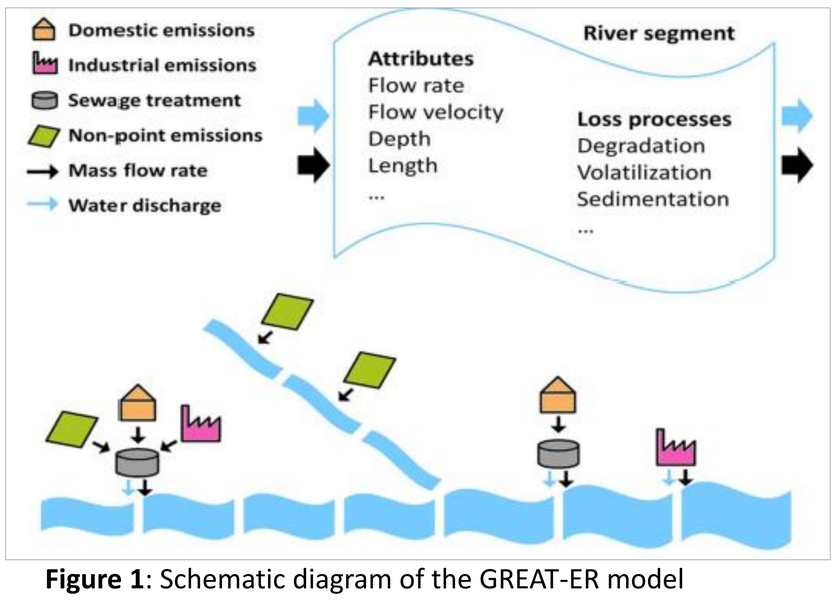


**Figure 1**: Schematic diagram of the GREAT-ER model

## Aim of the study

The objective of this study is to demonstrate how GREAT-ER simulations can contribute to the WIS by predicting pharmaceutical concentrations in surface water and for an a priori evaluation of the effects of MEDUWA innovations.

## Study area

The study area comprises the catchment of the Dutch-German cross-border river Vecht covering an area of around 6000 km². Discharge at the outlet is approximately 50 m³/s having received wastewater of 1.5 million inhabitants.

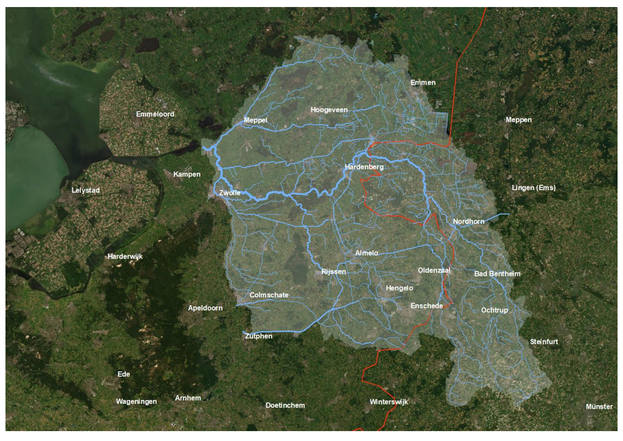


**Figure 2**: Location of the Catchment

## Presentation of results

Selected results can be made publically available on a Web GIS platform. The WIS (Watershed Information System) has been developed within the MEDUWA. Several interactive maps offer and interested users information about predicted concentrations of pharmaceuticals in the area. The information system combines, manages and properly visualizes data from several sources, which are collected by different partners including background information, monitoring data, risk assessment and solution approaches.

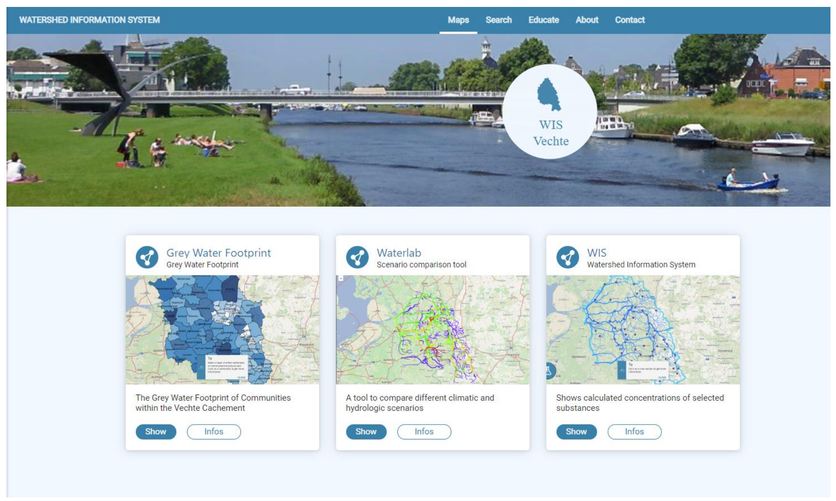


**Figure 3**: Presentation of MEDUWA results in the WIS

## Management scenarios

One of the key functionalities is the built-in scenario creator which allows for evaluating the effect of various reduction measures without cost-intensive on-site measurements. These include, for example, refitting of sewage treatment plants with tertiary/quaternary treatment or newly developed MEDUWA innovations. Simulation results can be directly compared with the status quo (simulations and monitoring data) for an a priori evaluation of the effectiveness of the measures.

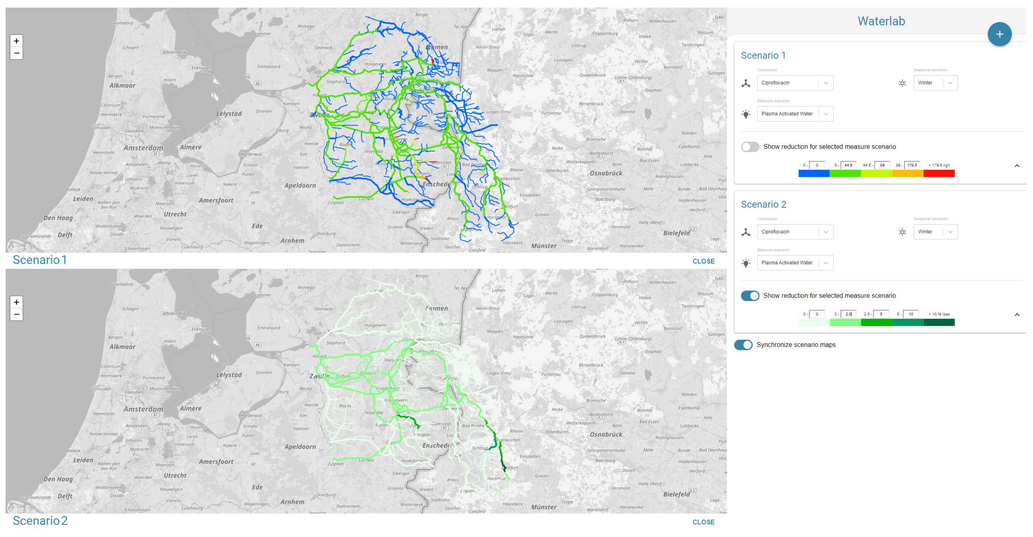


**Figure 4**: Comparison of scenarios in the WIS

Figure 4 shows, for example, how the implementation of plasma activated Water (PAW) at three selected hospitals would affect the entire catchment area for the antibiotic Ciprofloxacin. Especially in small tributaries with insufficient dilution ratio it is often enough to upgrade just a few facilities to reduce the concentration levels on a large scale.

## Conclusions

- Predicted PEC/EQS exceedances are in a range also measured by monitoring campaigns in Europe (3) and in the Meduwa project
- The model allows an a priori evaluation of reduction strategies
- The information system combines, manages and properly visualizes data from several sources and project partners, therefore the system effectively contributes to the field of science communication

## References

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