Geo-referenced Regional Exposure Assessment Tool for European Rivers (GREAT-ER) : a case study for the Rupel basin (B)

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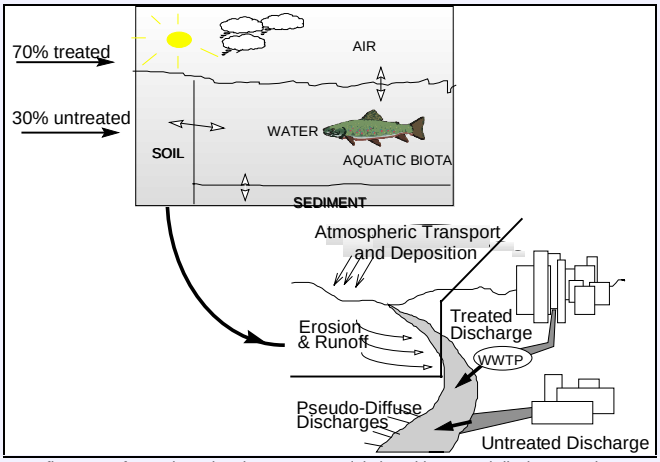
What's GREAT-ER?

The objectives of the **GREAT-ER** project were:

- to develop and validate an accurate **aquatic chemical exposure prediction tool** for use within the EU environmental risk assessment schemes.
- to develop a new database, model and software system
  - to calculate the **distribution of predicted environmental concentrations (PEC)** (both in space and time) of 'down-the-drain' chemicals in European surface waters on a river and catchment area level
  - using a **Geographical Information System (GIS)** for data storage and visualisation, combined with simple mathematical models for prediction of chemical fate.



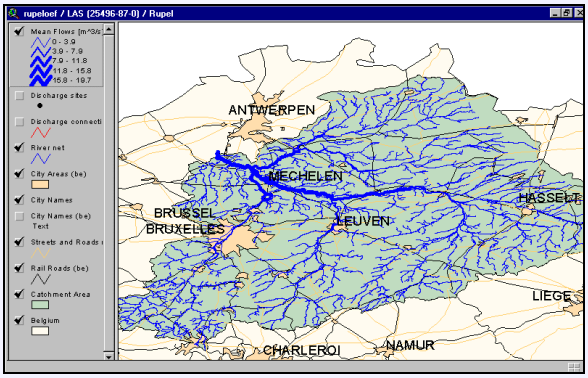
Refinement of generic regional exposure models by taking actual discharge pathway, treatment and river flow data into account

What's new: Belgian pilot study

A case study has been worked out for the **Rupel basin** in Belgium:

Goals:
- **Feasibility study** to apply GREAT-ER on a large (coarse) scale
- **Hydrological model**: which to use considering limited data ?
- **Optimal geographical scale**: is it necessary to include very small rivers?
- **Exposure assessment** of LAS (Linear Alkylbenzene Sulphonate, a surfactant used in household detergents) for the Rupel basin

The main rivers are Rupel, Grote & Kleine Nete, Dijle, Demer, Zenne,… The catchment has a **variety of landuse**: industrial, urban and agricultural zones.



- catchment area = **7,000 km²**
- **3,500,000 people** living in the area (including the capital city Brussels (1,000,000 I.E.)
- **30 - 40 % of the wastewater is treated** in more than **80 WWTP's.**
- Some rivers have **tidal** influences.
- **55 gauging stations** are located in the area

Approach

➢ Data collection

The appropriate authorities and companies were contacted for co-operation. No 'new' data were measured or generated otherwise. For the implementation of GREAT-ER only already existing data were used.

A **hydrological model**:was developed:
estimate flow using relationship between the flow Q (m³/s) and the sum of the lengths L of all upstream rivers (m)
→ $Q = a L^b$ with a and b regression coefficients.

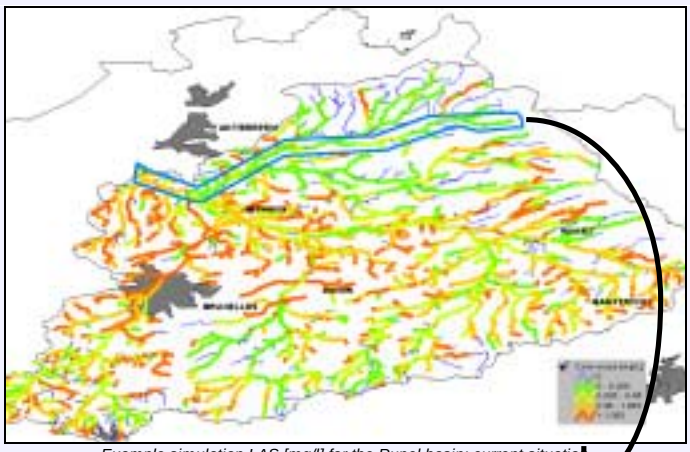
➢ GREAT-ER Output

1. a colour-coded GIS-map
2. a profile of a chemical's concentration versus the river distance of a river branch
3. aggregated PEC`s to integrate the results for an entire catchment

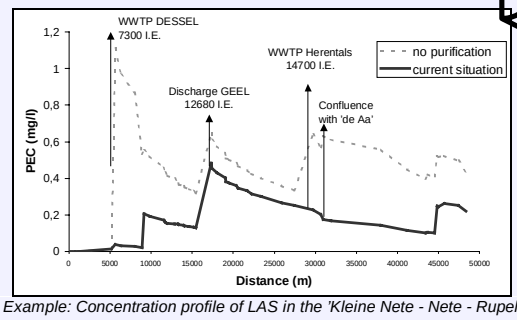
Results: simulation of LAS

Different `what-if`-scenarios were simulated:
- What if all discharges are treated and what if none are?
- What if a trickling filter is replaced by an activated sludge system?
- How does building a new WWTP at a specific location affect PEC in the rivers?
- How do in-stream-removal and in-sewer-removal affect the PEC in the rivers?

Results show that **WWTP's have a significant, though local, improvement** on LAS-concentrations in the rivers.



Example simulation LAS [mg/l] for the Rupel basin: current situation



Example: Concentration profile of LAS in the 'Kleine Nete - Nete - Rupel'

Take-home message

- **GREAT-ER: new chemical exposure assessment tool**
- **Preliminary simulations of LAS in the Rupel basin**
- **Planning of a monitoring campaign for validation**

GREAT-ER

Geography-referenced Regional Exposure Assessment Tool for European Rivers

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