

Use of the GREAT-ER model to estimate the mass flux of chemicals, carried into the Western Scheldt estuary from the Rupel basin

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GREAT-ER

Abstract

The poster illustrates the application of the GREAT-ER model to estimate the mass flux of chemicals carried from a river basin into an estuary. GREAT-ER (Geo-referenced Regional Exposure Assessment Tool for European Rivers) is a newly developed model (ECETOC, 1999) for management and risk assessment of chemicals in river basins (see www.great-er.org). Recently the Rupel basin has been made available for use within GREAT-ER. This now allows to make a reliable estimation of the contribution of pollutant point sources in the Rupel, to the pollutant load in the Western Scheldt Estuary.

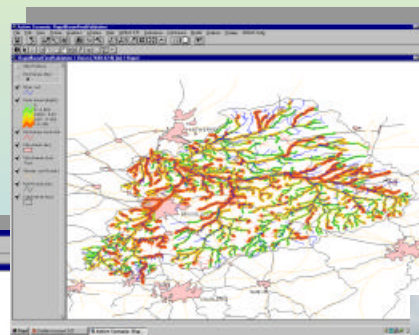
A calculation of the mass flux in the last stretch of the river network was made for five household chemicals or pharmaceuticals (i.e. LAS, boron, HHCb, aspirin and ethinyl oestradiol) as an example. The 'Watershed Attenuation Factor' (WAF) concept allows to calculate the fraction of the total load of these chemicals eliminated on their way to the estuary through the combined action of sewers, municipal waste water treatment infrastructure and/or biological self-purification of the rivers. The calculated WAFs range between 0% (boron) to 85% (LAS) for this test set of chemicals.

If the GREAT-ER Rupel basin could in the future be combined with the other sub-basins in the Scheldt watershed, it would open the perspective to make highly accurate estimations of the total estuary's pollutant input via its rivers.

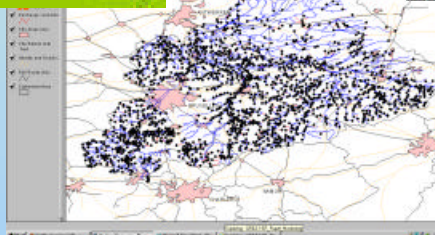
Concept: Emission, transport and removal of chemicals in the Rupel Basin modelled with GREAT-ER



Scheldt Estuary



Computer simulations of chemical water quality in the Rupel basin



Emission points in the Rupel Basin

Calculation of the mass flux and Watershed Attenuation Factor (WAF) for five household chemicals

The WAF is defined as the fraction of the total chemical emitted to a river basin which is eliminated on its way to the estuary, under steady state conditions. It is calculated from GREAT-ER output as follows : $WAF = (1 - (\text{chemical flux in most downstream stretch} / \text{total emission to the basin})) \times 100$. WAFs range between 0% and 100% elimination. The elimination can be due to various processes such as (bio)degradation, volatilization, sorption, settling, etc. taking place in the sewers, waster water treatment plants and in the river itself.

Chemical	Function	Emission (g/capita.year)	WAF (%)	Rupel flux (kg/year)
Boron	Detergents - bleaching agent	69.00	0	253174
LAS	Detergents - high volume surfactant	1100.00	85	598523
HHCb	Perfume ingredient	4.02	59	6046
Aspirin	Pharmaceutical	13.37	28	366
Ethinyl Oestradiol	Pharmaceutical	0.00015	25	0.41

For technical details about the GREAT-ER model or the presented results please contact the author.