MORPHEUS
Model Areas for Removal of Pharmaceutical Substances in the South Baltic

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

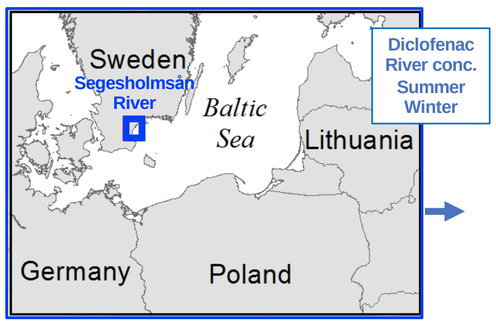
Interreg South Baltic

EUROPEAN UNION
European Regional Development Fund

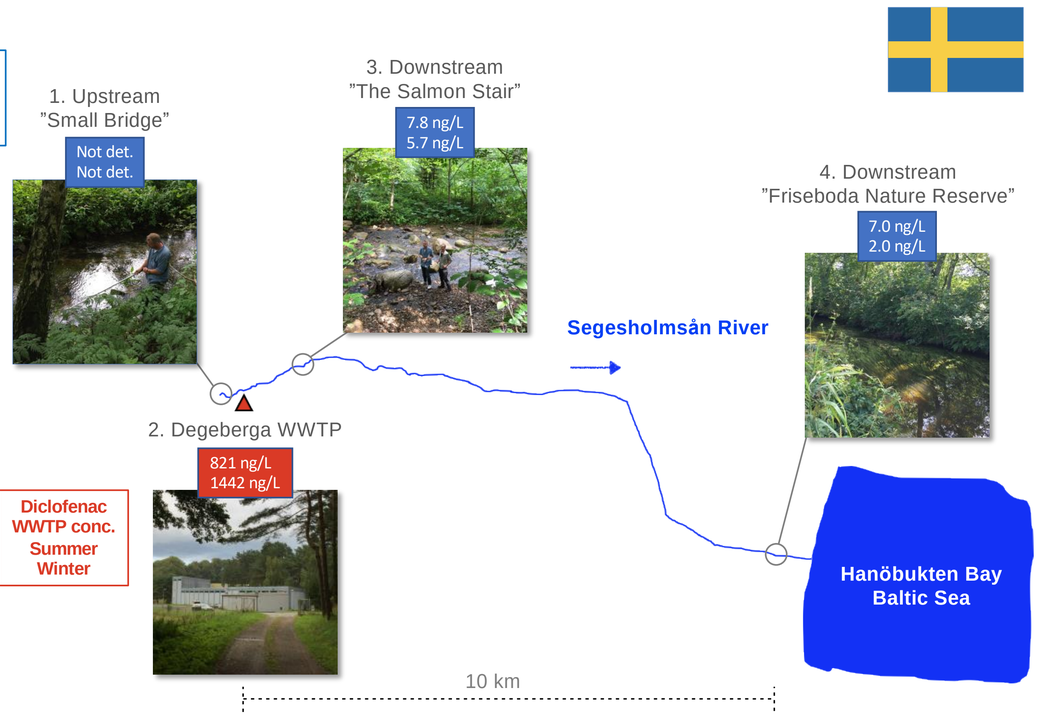
Roadmap for implementing advanced wastewater treatment at Degeberga WWTP, which discharges its water in Segesholmsån river, Region Skåne, Sweden

SEGESHOLMSÅN RIVER

Segesholmsån is one of the best-preserved rivers in Region Skåne. It has a relatively undisturbed stream with clean, cold and oxygen-rich water, which contains many sensitive species. The river houses several fish species such as Trout, Common minnow, Eel, European bullhead and rare species of Caddisflies. Segesholmsån ends in a nature preservation area at the Baltic Sea called Friseboda. Both Segesholmsån river and Friseboda are part of a unique wetland called “Vattenriket”, which was given the status of a UNESCO Biosphere Reserve in 2005, and holds many red listed species.



Diclofenac River conc. Summer Winter



Pharmaceutical	WWTP Outlet Average Conc. Summer + Winter	Outlet Load/ Year
Diclofenac (examplified)	(821+1442) / 2 = 1132 ng/L	89 g
Carbamazepine	4362 ng/L	345 g
Erythromycin	30 ng/L	2.4 g
Metoprolol	216 ng/L	17 g
Oxazepam	846 ng/L	67 g

Diclofenac WWTP conc. Summer Winter

DEGEBERGA WWTP

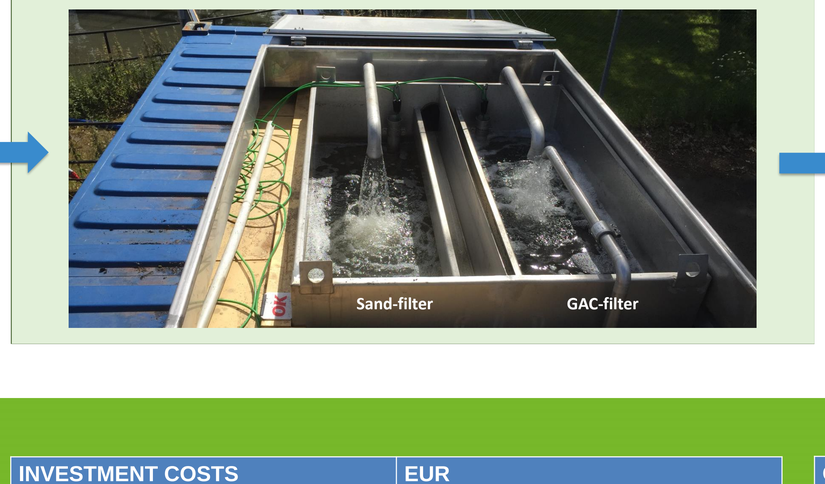
Degeberga WWTP is a small WWTP on the east side of Region Skåne releasing its wastewater into the small Segesholmsån river which ends in the Hanöbukten Bay of the Baltic Sea. It serves a population of 1,350 inhabitants and is the only WWTP releasing wastewater to the river, and is therefore the major source of pharmaceuticals. Existing treatment technology consists of mechanical, biological and chemical treatment. The requirements for treatment of water is an average yearly value of 10 mg/L BOD_7 and 0.3mg/L P_{tot}. Measured outlet concentrations were < 3mg/L BOD_7 and 0.05 mg/L P_{tot} with treatment efficiencies of 99.5% and 99.3%, respectively. Upstream Degeberga WWTP no pharmaceuticals could be detected, while several were identified downstream the WWTP as exemplified by the painkiller Diclofenac (see Figure). Downstream concentrations ranged between 2.0-7.8 ng/L. Based on the wastewater outlet concentrations and the total annual volume of treated wastewater the chemical load could be estimated. For example Carbamazepine which is used for treating schizophrenia and alcohol withdrawal syndrome and is known to be persistent in the environment, was released in high concentrations (4362 ng/L) corresponding to a load of 345 g/year.

ADVANCED TREATMENT USING SAND-GAC-FILTER

Personnel at Kristianstad municipality is running Degeberga WWTP and they have previous experience of a large-scale filter combining sand and granulated activated carbon (GAC), see below. Results from this study showed that e.g. diclofenac could be removed by more than 90 % over a time span of 1 year. The maintenance of the GAC filter was very low (1h/week).

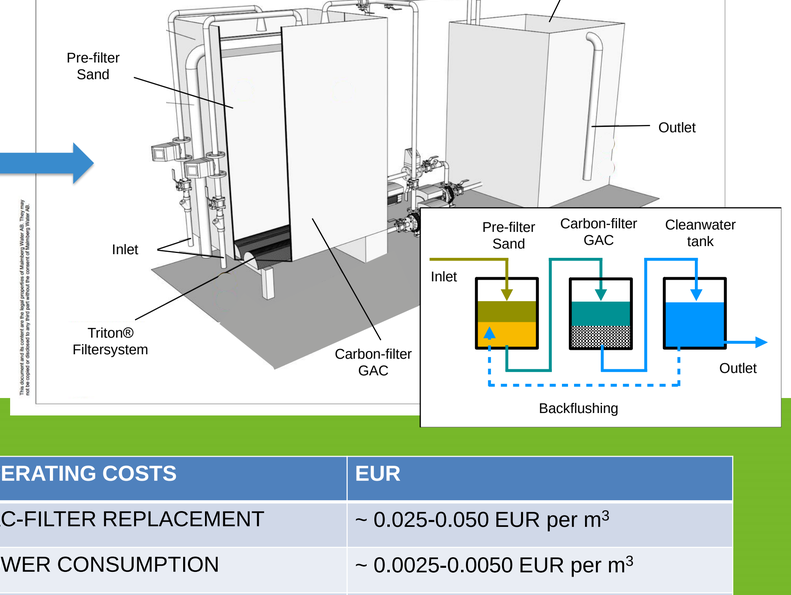
The size of the pilot-scale filter was 1m^3 of sand followed by 1m^3 of GAC.

The flow of wastewater was 2m^3/h.



TECHNICAL DESCRIPTION

In Degeberga the size of the GAC-filter will be eleven times larger. Degeberga is dimensioned for 22 m^3/h but is today running 9 m^3/h on average. Yet, the filter will be designed to take the full capacity of, Degeberga WWTP, which means going from 2 m^3/h to ca. 22 m^3/h.



The same type of filter as the one described to the left will be connect to the WWTP effluent. The GAC-filter will be placed right after the already existing sand filter at Degeberga WWTP. The estimated costs are shown below.

ESTIMATED COSTS ADVANCED TREATMENT

INVESTMENT COSTS	EUR
CONSTRUCTION GAC-FILTER	925 000
SAND-FILTERS FOR PRE-TREATMENT	ALREADY EXISTING
CIVIL WORK	160 000
TOTAL	1 085 000

OPERATING COSTS	EUR
GAC-FILTER REPLACEMENT	~ 0.025-0.050 EUR per m^3
POWER CONSUMPTION	~ 0.0025-0.0050 EUR per m^3
CIVIL WORK	~ 0.010 EUR per m^3
TOTAL	~ 0.0375-0.0650 EUR per m^3

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