BONUS CLEANWATER PROJECT
Summary report 1st April 2017 to 31st March 2018

1 Project outline of goals and results envisaged at the beginning of the project cycle

BONUS CLEANWATER focusses on the removal of micropollutants and microplastic from wastewater as means to decrease the loads of the Baltic Sea by eco technological approaches. Thus CLEANWATER focusses on identifying and discriminating sources (wastewater, stormwater and combined sewer overflow), optimize ozonation, biofilm technologies, membrane bioreactors, reverse and forward osmosis with biomimetic membranes, biofilters, cost and lifecycle assessments, and advanced sensing.

CLEANWATER integrates not only the removal but also the transformation of micropollutants and the formation of transformation products.

2 Work carried out in the project

Main sources for micropollutants and –plastics have been identified. For the assigned removal technologies, pilots have been designed and built.

For WP 2-5 the main work until now was designing, building and operationalising the pilot reactors (Figure 1). They have been started to be used to assess degradation and removal of the assigned technologies. First experiments have been performed as well as a few hundred samples have been analysed for a cocktail of 30 micropollutants. Several new transformation pathways have been identified. Others have been identified by means of a literature review and verified for the designed systems.

Figure 1 The biofilm reactors as they were delivered to BIOFOS (left); the reactors are filled with multilayers of porous material: gravel, filtralite, stonewool (right: view from top) (courtesy Nadia B Nord).

BONUS CLEANWATER has received funding from BONUS (Art 185), funded jointly by the EU and Innovation Fund Denmark, Sweden's Innovation Agency VINNOVA and the German Ministry for Education and Science (BMBF).
3 Main results achieved during the project

Sources: CLEANWATER has been focusing on integrating engineering experiences, pollutant loads and concentrations as well as physicochemical properties. Most inputs will be introduced via dry weather WWTP effluents. Only where there are sources discharging with the rainwater (e.g. biocides), stormwater will be the main source. Combined sewer overflow will only outpace dry weather wastewater effluents for compounds with very high removal in the WWTP.

Deliverables: Report on comparison of loads from WWTP effluent, combined sewer overflow, rain runoff water for the Baltic Sea has been submitted. The deliverable “Downloadable excel file: Comparison of loads from WWTP effluent, combined sewer overflow rain runoff water for the Baltic Sea” has been submitted.

Pilots: all pilots have been deployed either at Avedøre WWTP, Denmark, or at Landskrona WWTP, Sweden during the period and work has started on optimizing processes in those.

Results: Concerning the moving bed biofilm reactors and biofilters, it turned out that they are indeed able to remove i) compounds that are produced during ozonation and ii) persistent to ozonation (Figure 2).

Figure 2 Biological degradation of the ozonation products clindamycin-N-oxide and erythromycin N-oxide in contact with MBBR carriers (Taken from H. El-taliawy, M. Escola Casas, K. Bester: Removal of ozonation products of pharmaceuticals in laboratory Moving Bed Biofilm Reactors (MBBRs). J. Hazardous Materials 347 (2018) 288-298. (courtesy to the authors).

4 The continuity plan of the project

The project is following its initial plan. Within the runtime of the project:

- According to plan, the appointed technologies will be systematically optimised to achieve higher and more complete removal rates.
- According to plan, sensing and determination will be further expanded, enhanced and validated.
- Cost and life cycle assessments will be performed in the second half of the project as appointed.

Beyond the runtime of the project:
Future activities will be discussed and decided upon in the steering committee in the last year of the project. Bilateral agreements might be taken by single partners.