Project no. 4CE439P3

URBAN_WFTP

Introduction of Water Footprint (WFTP) Approach in Urban Area to Monitor, Evaluate and Improve the Water Use

WP 5.2.3 Water use and management practices evaluation

Wroclaw Urban Water Footprint Lab

Start date of project: 1 November 2012 **Duration: 25 months**

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1 Introduction

In output WP 5.2.2. the Wroclaw Urban Water Footprint Lab declared that its water footprint improvement objective is enhanced removal of Nitrogen from sewage through investments and process changes. In this document an estimate for the footprint impact is provided.

Without intervention and based on the legal effluent discharge limit values, the designed capacity of the wastewater treatment plant, and the natural Nitrogen concentration in the receiving water body assumed as 0 mg/l, the $WFTP_{Grey}$ is calculated to be 51 135 000 m^3/year.

Regarding the Sustainable Drainage System solutions their impact is impossible to predict for now.

2 Predicted change of the water footprint

As already detailed in the output WP 5.2.2., four solutions for reduced water footprint are considered. The first one is based on the change of the operational scheme at the biological treatment stage, i.e. transformation of the anaerobic reactors into denitrification reactors in order to increase the denitrification volume. This should improve Nitrogen removal efficiency by ca 0.5 mg/l according to the simulation studies, when implemented on a full scale.

The next solution is improvement of internal recirculation capacity by nearly 50%. This will increase the amount of nitrates recirculated from nitrification to denitrification reactor and further improve the efficiency of Nitrogen removal by enabling full utilization of increased denitrification volume.

With higher internal recirculation flow more oxygen will be transported to the denitrification reactor. This may decrease Nitrogen removal efficiency so the third step is optimization of the aeration conditions in the aerobic reactor.

The last project is implementation of anammox or nitrification/denitrification process of sludge dewatering liquor on a pilot scale. This is an ongoing research project, which is currently in the construction stage, and ends in 2016. If the project is successful, the chosen method will be possibly implemented on a full scale.

After implementing all solutions on a full scale the real Nitrogen loading should be reduced from 10 to 8 mg/l, for the designed effluent flow and assumed Nitrogen concentration in the receiving water body of 0 mg/l, reducing the $WFTP_{Grey}$ to 40 908 000 m^3/year. This is a 20% reduction in relation to the current estimated $WFTP_{Grey}$.

The Sustainable Drainage System solutions increasing the rainwater retention contribute to a reduction in $WFTP_{Blue}$ and $WFTP_{Grey}$, and an increase in $WFTP_{Green}$. However, the assessment of their effectiveness is difficult as it depends on the system chosen, and varies widely. It can be only assumed that in the case of harvesting rainwater from 10% of the Wroclaw roof area and using it to water green area, $WFTP_{Green}$ will increase from 34 278 000 to 35 059 000 m³/year (by 2.3%), while $WFTP_{Blue}$ will decline from 16 690 000 to 16 502 000 m³/year (by 1.1%). $WFTP_{Grey}$ reduction is small and difficult to estimate, as the pollution loading in the rainwater is small and difficult to evaluate. The Municipal Water and Sewage Company does not have a legal possibility to impose the implementation of these solutions. Possibly, after presenting them to the stakeholders, the relevant regulations will be created, which will result in their implementation, and thus progressing reduction of $WFTP_{Blue}$ and $WFTP_{Grey}$, and an increase in $WFTP_{Green}$.