O11, O12 – Pilot – A decentral wastewater installation that recovers water/energy from wastewater in Rotterdam and Den Hoorn (Delft)

The objective of the research is to recover decentralized fresh water from wastewater in order to reuse it as irrigation water in Rotterdam. At the location in Den Hoorn (Delft) PP8 is looking for local reuse of the water. Research has been done the past years with mainly physical and chemical processes, the results show that water can be recovered but the energy consumption and chemical use of the installations is rather high. The objective of Output 11 is to develop a more energy and chemical efficient (sustainable) method to produce fresh water from sewage. Output 12 objective is to concentrate the wastewater in order to get the chemical oxygen demand (COD) concentrations high to make energy recovery as efficient as possible.

A video about this pilot is available **here**.

❖ All aspects of resource recovery in a single pilot

Evides Industriewater built a pilot where all aspects of resource recovery were integrated: water reuse, nutrient recovery and energy recovery. The pilot was originally located at a Rotterdam city farm (Uit Je Eigen Stad), but due to its closure later moved to the Delft Blue Innovations site in the Harnaschpolder near Delft. There, reclaimed water from a wastewater plant is used for valuable applications. For instance, energy is extracted from sludge from the electrocoagulation process and useful fertilizers like phosphorus and nitrate as well as other valuable raw materials including cellulose are recovered.

The pilot centres around 4 key steps:

Wastewater is stored in a buffer tank, where sedimentation of coarse parts (including moist toilet paper) is accomplished. Experiments are being carried out into the enzymatic conversion of fine sieve screenings to carbon source, which can be used by the denitrifying bacteria in the wastewater treatment plant.

The wastewater then goes to an electrocoagulation system in which iron or aluminum is brought into solution and will coagulate with the particles, the COD and the phosphate in the wastewater. For the processing of the electrocoagulation sludge, we want to investigate various routes, namely fermentation and pyrolysis.

The wastewater treated by electrocoagulation then goes through a pre-filter for protection and then to the nanofiltration pilot system, which consists of two stages (first stage 2 membrane modules, second stage 1 membrane module). New phosphate recovery techniques will be tested on the nanofiltration concentrate, initially on a laboratory scale. The permeate of the nanofiltration pilot system passes through a softener, where calcium

and magnesium are removed, prior to the reverse osmosis (RO) membrane. This membrane makes a very clean water product, the RO permeate, that will be delivered to several local initiatives.

The concentrate of the reverse osmosis is used for an algae culture. Specifically, the demo focuses on a type of algae that produces a valuable blue pigment.