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N-SINK – reduction of waste water nitrogen load

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Protection of the Baltic Sea from eutrophication is one of the key topics in the European Union environmental policy. One of the main anthropogenic sources of nitrogen (N) loading into Baltic Sea are waste water treatment plants, which are currently capable in removing only 40-70% of N. European commission has obliged Finland and other Baltic states to reduce nitrate load, which would require high monetary investments on nitrate removal processes in treatment plants. In addition, forced denitrification in treatment plants would increase emissions of strong greenhouse gas N2O.
In this project (LIFE12 FI/ENV/597 N-SINK) we will develop and demonstrate a novel economically feasible method for nitrogen removal using applied ecosystem services. As sediment is known to have enormous capacity to reduce nitrate to nitrogen gas through denitrification, we predict that spatial optimization of the waste water discharge would be an efficient way to reduce nitrate-based load in aquatic systems. A new sediment filtration approach, which will increase both the area and time that nitrified waste water will be in contact with the reducing microbes of the sediment, is tested. Compared to the currently implemented practice, where purified waste water is discharged though one-point outlet system, we expect that sediment filtration system will result in more efficient denitrification and decreased N load to aquatic system. We will conduct three full-scale demonstrations in the receiving water bodies of waste water treatment plants in Southern and Central Finland. The ecosystem effects of sediment filtration system will be monitored. Using the most advanced stable isotope techniques will allow us accurately measure denitrification and unfavoured DNRA (reduction of nitrite to ammonium) activity.