Project description:

Background

Rainwater is clean. However, rainwater that has been in contact with roads, buildings and other urban surfaces becomes polluted. The extent of this pollution depends on land-use factors and building characteristics. Recent investigations have clearly shown adverse eco-toxicological impacts in aquatic ecosystems receiving this water.

Urban run-off water does not usually kill fish directly - except in cases where illegally discharged toxic substances enter stormwater outflows. However, it contributes to an accumulation of pollutants in the food chain, which can have a terrible effect on biodiversity over time. Whilst effective technologies have been addressed to tackle pollutant loads from households and industries, urban run-off waters have largely not been addressed.

The treatment of rainwater run-off presents particular technical challenges. Firstly, rainwater comes in bursts and normal municipal waste water treatment plants cannot cope with occasional large volumes. Secondly, the pollutants in rainwater are mostly inorganic. Thirdly, many pollutants are dissolved in the water. Not only are these not removed by traditional technologies, but they are also the most mobile and most easily taken up by plants and animals.

Three Danish water companies and two Danish universities joined forces in this project to address the issue of advanced stormwater treatment.
Objectives

The TREASURE project aimed to develop and demonstrate cost-effective and efficient technologies for removing dissolved pollutants from stormwater run-off to reduce diffuse urban pollutant loads onto receiving waters.

The project hoped to test and demonstrate the robustness of treatment facilities based on a semi-natural lake extended with filtration, absorption, chemical and/or plant-uptake technologies. It planned to run pilot activities in wet detention pools in three different urban structures at Aarhus, Odense and Silkeborg. The technologies should be constructed as natural and recreational elements that contribute to an improved urban environment and be technically simple enough to be easily adopted in existing urban land-use structures.

The treatment measures were meant to particularly focus on phosphorous - a macro-nutrient largely responsible for eutrophication of lakes and inland coastal waters - and toxic substances, mainly heavy metals and organic micropollutants. It had the specific target of reducing the outflow of toxic substances originating and charged with stormwaters in urban areas, by 80-90%.

Results

The TREASURE project successfully demonstrated treatment methodologies for reducing the pollutant content of urban run-off water by up to 80-90%, depending on the concerned polluting substance.

The project constructed three detention ponds in the urban environments of Odense, Silkeborg, and Århus, in Denmark. These were designed not only to remove small particles and colloidal and soluble bound pollutants from the surface waters collected from the catchment area, but also to be attractive showpieces as part of the local urban landscape. The ponds were equipped for on-line monitoring of the treatment performance.

The most effective treatment process for reducing a broad range of dissolved and colloidal pollutants in the stormwater run-off was found to be the wet retention pond with a sand filter and fixed-media absorption filter. Plants contributed only marginally to the cleaning processes, but were important for ensuring integration of the facilities as recreational elements of the urban environment.

The fixed-media absorption technology proved very efficient at managing high loads of dissolved heavy metals, allowing very low outlet concentrations regardless of the initial level of pollution. For all measured pollutants, the outlet concentration was consistently below the relevant water quality criteria. Copper was reduced from an average of 310 μg/L down to 4 μg/L, corresponding to an overall removal rate of 99%. Phosphorous was reduced from 0.27 to 0.025 mg/L, corresponding to an overall removal rate of 91%.

Tests with iron enrichment of the bottom sediments and the dosing of aluminium to enhance coagulation/flocculation found that these did not result in a general decrease in pollutant concentrations, but did counteract growth of
algae in the pond, particularly the aluminium. This shows their effectiveness against phosphorous and consequent eutrophication of aquatic environments.

Although the initial set-up costs are high for these treatment plants, the results are excellent and the costs must be compared against the current lack of effective treatment for urban run-off water. Application is not restricted to any particular urban context and could also be expanded to purposes such as treating contaminated drinking water or phosphorous-polluted surface waters. The methodology could play an important role in implementing the EU Water Framework Directive.

Further information on the project can be found in the project's layman report and After-LIFE Communication Plan (see "Read more" section).

Environmental issues addressed:

Themes

Water - Water management and supply

Keywords

pollutant elimination, water treatment, urban area, rain water

Target EU Legislation

- Water

Natura 2000 sites

Not applicable

Beneficiaries:

Coordinator Silkeborg Kommune (Municipality of Silkeborg)
Type of organisation Local authority
Silkeborg Spildevand A/S is a local water management operator, which is also responsible for the regulatory and environmental aspects related to water management. It is fully owned by the local municipality of Silkeborg.

Municipality of Aarhus, Denmark Odense Vandselskab AS, Denmark Aalborg University, Denmark University of Aarhus, Denmark

Administrative data:

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Project location Fyns amt(Danmark) Århus amt(Danmark) Nordjyllands amd(Danmark)

Read more:

Project web site Project's website (DK)
Project web site Project's website (EN)
Publication: After-LIFE Communication Plan Title: After-LIFE Communication Plan (EN) Year: 2009 No of pages: 3
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