

Zero Emission Concept for Water and Wastewater Management, Project Rügen, Germany

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Keywords

blackwater, case study, decentralized treatment, demonstration project, greywater, reed bed, rural area, source separation, sustainable sanitation, vacuum toilet, water saving, zero emission

Abstract

A sustainable sanitation concept will be realized at a visitors centre in the national park JASMUND on the isle of Rügen, Germany. Main idea of the zero-emission concept is source separation of faeces. Blackwater will be collected by vacuum toilets and reused via biogas plant and agriculture. Greywater will be treated on-site by reed bed technology and recycled for toilet flushing and watering. Rainwater will be throttled on-site and infiltrate in a nearby forest. In comparison to conventional wastewater management (3km duct to public sewer or decentralized treatment of unseparated wastewater) cost reduction of 25 percent are estimated.

Introduction

The environmental foundation World Wide Found for Nature (WWF) Germany and the city of Sassnitz are realizing the reconstruction of a former military base into a visitors centre. The project is located in the smallest German national park Jasmund on the isle of Rügen in the very north-east of Germany. The visitors centre will consist of ecological exhibition and restaurant. Up to 1.000.000 persons per year and up to 4.000 persons per day are expected to visit the location close to the famous chalk-cliff (figure 1).

The planned shape of the building 120 m above sea level is shown in figure 2.

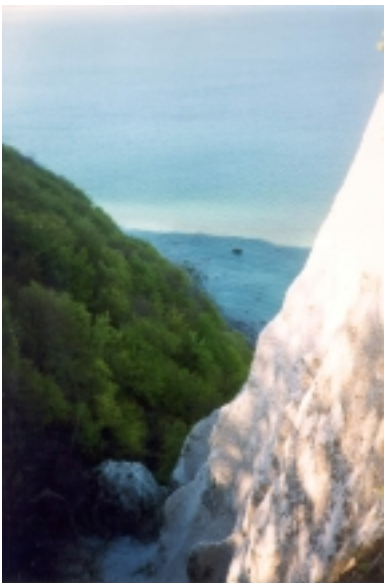


Figure 1: Crowd puller chalk-cliff



Figure 2: Visitors centre

Present situation

After feasibility studies in 1998 the centre is under construction at the moment and will open in 2004.

During former use of the area wastewater from public restrooms and restaurant was partly discharged to the Baltic sea after sedimentation and partly transported to municipal treatment plants by tanker. The public sewer is in a distance of 3 km.

Freshwater is taken from a nearby spring. Due to the little flow especially during summer months and for ecological reasons the water consumption has to be reduced to a minimum.

Zero emission concept

Water supply and wastewater management bases on the idea of source separation and recycling of substances and water. Another goal is to prevent any pollution in the surrounding ecosystems of the national park and the Baltic sea. Furthermore the change of water balance of the area has to be reduced to a minimum.

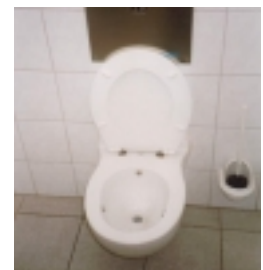
Main idea of the concept is the separate drainage and treatment of

- rainwater,
- greywater and
- blackwater.

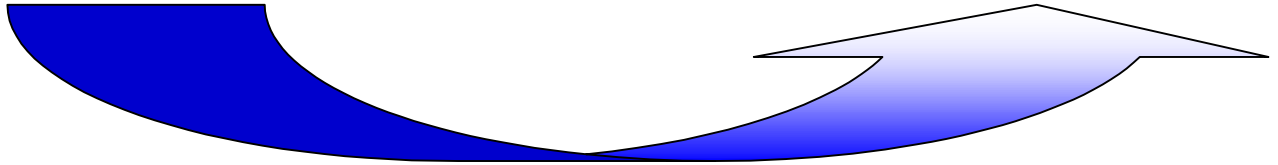
Rainwater will be collected in a pond on-site and throttled to the natural flow. It infiltrates in a nearby forest.



Greywater, mainly from washbasin, will be treated by reed bed technology on-site and recycled for toilet flushing and watering.



Blackwater will be collected by vacuum toilets and is stored on-site. Transportation takes place by tanker to a nearby existing biogas-plant. After fermentation the substrate will be used as fertilizer in agriculture.



Rainwater will be mainly drained in shallow trenches and collected on-site in a pond. To reduce erosion and to maintain the natural local water balance from this pond a throttled flow of rainwater will be discharged to infiltration in nearby forest.

Less polluted wastewater without faecal contamination (greywater) will be treated by a reed bed (vertical flow constructed wetland). The soil filter planted with reed was designed on the water and organic load on the basis of experiences gained with treatment of greywater in projects in Berlin and Hanover. The treated greywater is used for toilet-flushing and watering. Surplus water will be discharged together with the rainwater. High polluted wastewater (dishwater, etc.) and wastewater from vacuum-toilets and urinals (blackwater) will be stored on-site. Transportation takes place by tanker to a nearby existing biogas-plant. After fermentation the substrate will be used as fertilizer in agriculture.

Conclusions and Results

Based on a detailed analysis of the fluxes of water and nutrients, investment and running costs the effects of ecological sanitation compared to conventional solutions were quantified:

- Reduction of demand of drinking water of about 80 %:
 - 5 percent by water saving fittings (2.5 litre per min at washing basins)
 - 12 percent by dry urinals
 - 43 percent by vacuum-toilets
 - 21 percent by greywater-recycling
- No emissions to the Baltic sea and the surrounding ecosystem
- Recycling (agricultural use) of 750 kg nitrogen and 150 kg phosphorus each year
- Production of 1.900 m³ biogas each year
- Negligible change of local water balance
- 25 % reduction of costs (investment and running costs)

As shown in this example ecological sanitation is not only advantageous for environment but even cheaper than conventional (end-of-the-pipe) solutions.

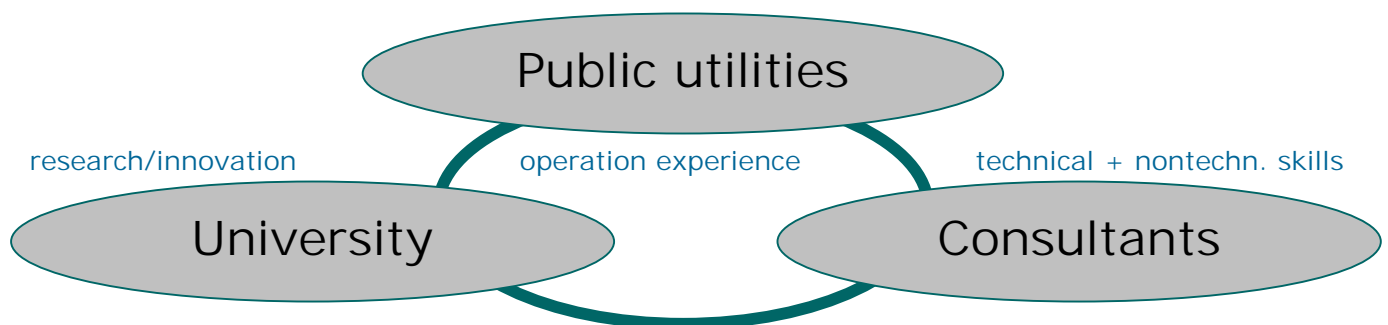
Other ongoing and future ecosan-projects of “aquaplaner”

Apart the zero-emission-concept Sassnitz the following ecosan-projects of the *aquaplaner* engineering office are in preparation. Depending on the local conditions different combinations of ecosan-techniques will be realized.

Ecological sanitation and water management for:

- Museum in Egypt (7.000 visitors daily)
- Housing estate in Darmstadt (400 inhab.)
- Housing estate in Hannover (750 inhab.)

Future projects will be offered in cooperation with the association „WATER HANOVER - Centre for sustainable water management”.



WATER HANOVER is a network of consultants (e.g. engineering offices), Public utilities of water supply and wastewater drainage and university.

The aim of WATER HANOVER is to offer independent integrated consulting services world wide. In comparison to conventional consulting offices social aspects, operation experience and education of local personal are included. By this holistic approach WATER HANOVER is the ideal partner for planning of sustainable projects.

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