Factsheet on Sanitation and Water Re-use

CUVEwaters integrated water resources management

Background

The CuveWaters research project pursues the conceptual development and practical implementation of an integrated water resources management (IWRM) in the Cuvelai-Etosha-Basin in the North of Namibia. The central goal of the CuveWaters project is to strengthen the potential of the region's resources by combining new and adapted technologies in a multiresource mix for water supply and sanitation. In this context, water re-use can contribute to augment resource efficiency and mitigate pressure put on available water resources.

In Outapi, a municipality in the central north of Namibia, suitable technology options for wastewater treatment and re-use will be implemented and start operation in 2012.

Community workshop in Outapi

Sanitation Concept – Overview

Vacuum sewers are used to collect and transport the wastewater from the three settlements to a wastewater treatment plant with a combined anaerobic and aerobic treatment. The treated nutrient-rich wastewater will be used for an agriculture initiative. Energy efficiency is high due to the anaerobic pre-treatment of the raw wastewater and anaerobic digestion of the sewage sludge. Additionally, residues from the crops produced in the agricultural area will be co-digested with the sewage sludge to enhance biogas production, thus maximising wastewater use.

Special attention is paid to altering hygiene behaviour to prevent infections. Community Health Clubs have been established beginning 2012 to change norms and values with regard to health and hygiene behavior.

The sub-project "Sanitation and Water Re-Use" is being implemented together with the Outapi Town Council and Roediger Vacuum as the German industry partner. It is sponsored by the German Federal Ministry of Education and Research (BMBF).

Benefits

The proposed infrastructure provides fresh water, adequate sanitation and resources for agriculture while minimizing environmental impacts.

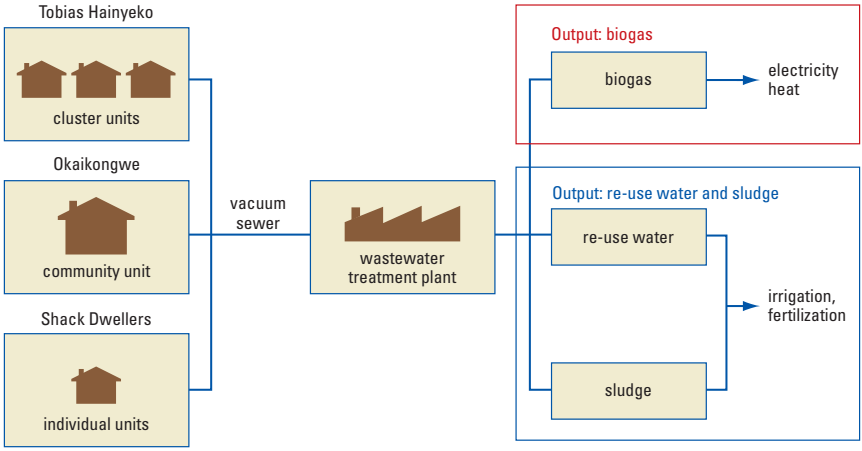
Cluster unit in Tobias Hainyeko

Construction of communal washing house

Technical Facts Pilot Plant

General Information		
Location	Outapi, Namibia Longitude: 14.988295 Latitude: -17.498132	90 km from Oshakati, 130 km from Ondangwa Airport
Start of operation	November 2012	
Number of future users	1500 persons	
Inhabitants Outapi	>5000	
Components of the sanitation concept	1. sanitation facilities 2. vacuum sewer system 3. wastewater treatment plant 4. agricultural irrigation site	
Sanitation Facilities		
Shack Dwellers	66 households are individually connected to the water supply and sewage system. The settlement consists of modular constructed brick houses that already are equipped with a bathroom.	
Tobias Hainyeko	30 small washing houses (so-called »cluster units«) with a shower, a toilet, a hand wash basin and a big sink will be shared by four to five families in Tobias Hainyeko. In this area most people live in zinc huts but there are also some brick houses being constructed.	
Onhimbu/Okaikongwe	A communal washing house for 250 users offers toilets, showers, hand wash basins and sinks for laundry and dish washing. Onhimbu is a rather old part of Outapi with a lively market. The zinc shacks in the new settlement of Okaikongwe were installed from 2010 onwards.	
Vacuum Sewer System		
Vacuum sewer system	Vacuum sewers connect the sanitation facilities to the wastewater teatment plant and transport the wastewater from the settlements to the plant. During the rainy season, waterborne diseases may occur in the Cuvelai-Etosha basin. To prevent a spread of pathogens contained in wastewater the implementation of a watertight vacuum sewer system is essential.	
Wastewater Treatment Plant		
Anaerobic pre-treatment (UASB-reactor)	Wastewater is first treated in an anaerobic UASB-reactor (in the absence of oxygen). UASB signifies »upflow anaerobic sludge blanked«.	
Aerobic treatment RBC	The wastewater is purified with a rotationg biological contactor (RBC). Microorganisms are attached to discs mounted on a rotating shaft. The rotation brings microorganisms in contact with wastewater and oxygen. Carbon compounds are oxidised, while the nutrients largely remain in the water.	
Microsieving	A 0.15 µm microsieve keeps solids and helminth eggs out of the effluent.	
UV-Disinfection	A mercury arc lamp emits UV-radiation. It penetrates the cell of microorganisms and destroys their ability to reproduce.	
Fermenter	Sludge from wastewater treatment and agricultural residues are digested anaerobically to produce biogas and stabilize the sludge. Biogas is used to produce electricity and heat for the wastewater treatment plant. Stabilized sludge is dried in the sun and can bu used as a fertilizer.	

Wastewater Treatment Plant		
Wastewater volume (expected)	90 m^3/day	
Expected loads and concentrations in raw wastewater	Chemical oxygen demand COD ~ 150 kg/d Biochemical oxygen demand BOD_5 ~ 75 kg/d Total solids TS ~ 90 kg/d Nitrogen N ~ 12 kg/d Phosphorus P ~ 2 kg/d	COD ~ 1600 mg/l BOD_5 ~ 800 mg/l TS ~ 1000 mg/l N ~ 130 mg/l P ~ 20 mg/l
Agricultural Irrigation Site		
Field size	1.5 ha	
Crops	Maize, tomatoes, peppers, pumpkins etc.	
Storage pond	Wastewater is generated everyday all year in more or less equal quantitites. Irrigation demand in agriculture is high during the dry season and low during the rainy season or harvest. Therefore, a pond with a capacity of 3000 m^3 is used for wastewater storage.	
Societal Scope		
Community Workshops	In several community workshops specific needs and opinions of the users were taken into consideration. The goal is to raise acceptance for the new infrastructure before it exists.	
Community Health Clubs	Community Health Clubs (CHC) were set up in Outapi in April 2012. In the clubs, people meet regularly to learn more about health and hygiene. Knowledge gained leads to improved hygiene and health behaviour and contributes to better living conditions. The CHC approach has already been successfully implemented in Rwanda, South Africa, Sierra Leone and Zimbabwe.	



Overview of the sanitation concept with water re-use in agriculture

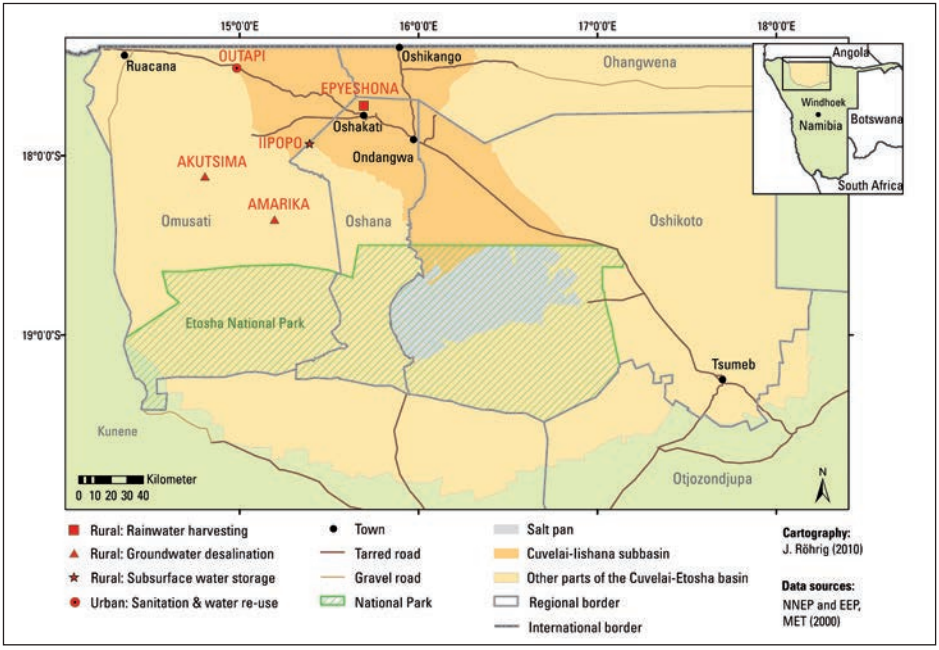
Cost Estimate

The pilot facilities in Outapi were designed for 1500 users. Since the project´s implementation is still ongoing, the numbers for costs are preliminary and only represent an estimate for the pilot project. Costs for other sites with no pilot character and a higher number of future users are expected to be much cheaper (regarding per capita costs). Expenses may also vary depending on local conditions, so only ranges are given for construction costs. Running costs are covered (partly or as a whole) by fees paid by the users and income from agricultural products.

Construction of washhouses (cluster units and community unit): 100,000–200,000 N$; construction of vacuum sewers and vacuum pumps: 800,000–900,000 N$; construction of wastewater treatment plant: 1,000,000–1,500,000 N$; pond and fencing irrigation site: 300,000–600,000 N$; Operating resources wastewater treatment plant and vacuum sewer system: water, electricity, spare parts, laboratory equipment as required; personnel (technicians, skilled workers, caretakers, security staff): about 7 persons full time.

Contact

Alexia Krug von Nidda
cuvewaters@isoe.de
Phone: +49 (0)69 707 6919-20
www.cuvewaters.net



Institute for Social-Ecological Research
IWAR TECHNISCHE UNIVERSITÄT DARMSTADT
BGR giz
SPONSORED BY THE
Federal Ministry of Education and Research
proaqua
Fraunhofer ISE
terra water
Solar-Institut Jülich
IBEU
ROEDIGER VACUUM
FONA Sustainable Water Management BMBF