Groundwater Protection as important Component of an IWRM- Experiences from central northern Namibia

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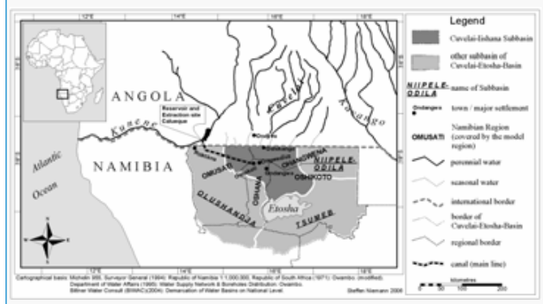
Introduction

Environmental change and population growth are putting increasing pressure on scarce water resources in central northern Namibia. Almost 50% of Namibia's population live in this region, which experiences a high dependency on transboundary water supplies from the Kunene River. In the framework of the Integrated Water Resources Management (IWRM) concept, the project 'CuveWaters' investigates demand-driven and adapted water supply and waste water treatment technologies. The overall goal of the project is to improve livelihoods by innovative and adapted technological solutions, but also by incorporating groundwater protection into the concept.



The Cuvelai-Etosha Basin in central-northern Namibia as part of the transboundary Cuvelai Basin

Cuca shop (top) and water Point (bottom) in rural areas

Materials and Methods

To achieve the overall goal, the CuveWaters project investigates the potential for introducing alternative water supply and sanitation technologies in urban and rural areas of the Cuvelai-Etosha Basin.

Background research into rainwater harvesting, desalination and groundwater recharge technologies in rural areas as well as decentralised urban infrastructure systems in urban areas was carried out.

In addition a socio-ecological survey was conducted, to assess people´s perceptions of water and sanitation use and management in an informal settlement in Oshakati town (Evululuko), in a rural village (Epyeshona) and in two small rural settlements (Amarika, Akutsima). In workshops held in those settlements adapted participatory rural appraisal methods were combined with qualitative social-empirical methods.

Workshop activities in Amarika

Rural Areas

Current Situation

- Sufficient water supply is one of the major challenges.
- Ephemeral Cuvelai streams (Oshanas) are traditionally a very important water source, despite their only seasonal availability.
- Groundwater is the second most important source of water supply:
  - Shallow groundwater is fed by rain and run-off; is traditionally accessed by hand dug wells.
  - Water quality varies from fresh to salty.
- Most of hand dug wells are not protected from livestock and are therefore very vulnerable to faecal pollution.
- Locations of latrines can also negatively influence the hand dug wells.

Hand dug well field near Uuvudhiya settlement

Hand dug well used for drinking water

Possible Solution

- Awareness campaigns and social marketing with a focus on water is part of CuveWaters. This aims at improving the water quality of available endogen resources.
- The introduction of alternative water supply technologies is accompanied by thorough investigations about potential negative impacts.
- One focus is solar thermal groundwater desalination in remote settlements with no existing or inadequate infrastructure for water supply and no electrical grid. The evolving brine can either be re-inifiltrated into the ground or deposited in evaporation ponds. Negative impacts on the environment, including aquifers, are avoided by thorough hydrogeological investigations beforehand.

Drilling rig

Model of solar thermal desalination plant

Urban Areas

Current Situation

- Sewer systems only exist for the formal areas.
- Wastewater is often collected in oxidation ponds – main part evaporates, another part probably infiltrates into the groundwater.
- In informal settlements a sanitation infrastructure is missing. In some places dry toilets have been installed but in many cases people use the bush as a toilet. This leads to hygienic problems and contamination of shallow groundwater, especially during the rainy season.

Dry toilets in informal area in Outapi

Oxidation Pond near Outapi

Possible Solution

- Within CuveWaters, a semi-decentralised urban infrastructure concept is investigated in an informal settlement.

Model of Community Unit

Gardening activities

- Community Unit: around 250 people can use a number of toilets, showers and other washing facilities (dish-washing and laundry).
- Cluster Unit: three to five households share sanitation facilities.
- Semi-central anaerobic wastewater treatment plant (for up to 5000 inhabitants), produces biogas (e.g. for cooking), and recycled water (nutrients stay in the effluent ➔ irrigation and fertilisation possible; micro-filtration for hygienisation).
- Use of rainwater: collected on roofs and stored underground – can be used to flush toilets, to wash cars and houses.
- Possibility of income generation through production of vegetables for the local market.

This concept reduces the exposure of groundwater resources to possible pollution through inadequate sanitation systems