Water is Life – Omeya ogo omwenyo

CuveWaters mid-term report

CUVE waters
integrated water resources management

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The Cuvelai-Etosha Basin

Namibia is the driest country in southern Africa. Water is a scarce resource here. The effects of climate change, rapid population growth, and rural exodus pose additional challenges and threaten people's livelihood as well as the balance of the ecosystem. The Cuvelai-Etosha Basin in central-northern Namibia is particularly affected: Around 850,000 people – almost half the population – live here, in an area of 34,723 km^2.

The basin is part of the transboundary Cuvelai catchment shared by Angola and Namibia. The climate in the region is classified as semi-arid. In the basin, highly variable rainfall and contrasting extremes such as droughts and floods define the pattern of life, limiting people's food supply and income.

The two main sources of water for this region come from Angola: from the hydrologically important upper part of the Cuvelai-Basin, and from the Kunene River which feeds a long-distance canal and a pipeline system that provides drinking water. The water supply system – sometimes just consisting of an open canal – provides many of the communities with drinking water. But where this supply network ends, people are dependent on water from hand-dug wells. At lower layers, the groundwater is salty. This puts the population's health at considerable risk.

Additional problems arise from increasing urbanisation and a lack of sanitation facilities. Approximately 40 per cent of the Namibian population in urban areas have no access to improved sanitation facilities. In rural areas and informal settlements, however, the situation is far more dramatic: There is an acute need for action to improve the sanitary conditions. This was the starting point for the Namibian Sanitation Strategy in 2009: The Namibian government has clearly stated that the "benefits of the provision of sanitation are promoted as a public good and include health, environment, energy generation (biogas) and food production (water reuse)". This strategy has to be seen in the context of the rapid growth of towns and the effects of climate change. Therefore, the water supply and wastewater treatment systems of the future need to be able to adapt flexibly to urban development, with considerable impact on the quality and spatial distribution of demand. The urbanisation in northern Namibia is a model not only for the development in Sub-Saharan Africa but also for other arid urbanising regions around the world.

Access to clean water and to sanitation are crucial for social welfare, health, economic development, and the preservation of nature. The United Nations acknowledge the importance of these aspects within their Millennium Development Goals (MDGs). Integrated concepts and solutions are needed in order to achieve these goals, while taking socio-economic and cultural dimensions in particular into account. The CuveWaters project contributes to these goals in northern Namibia.

Oshanas are shallow rivers draining the area during the rainy season

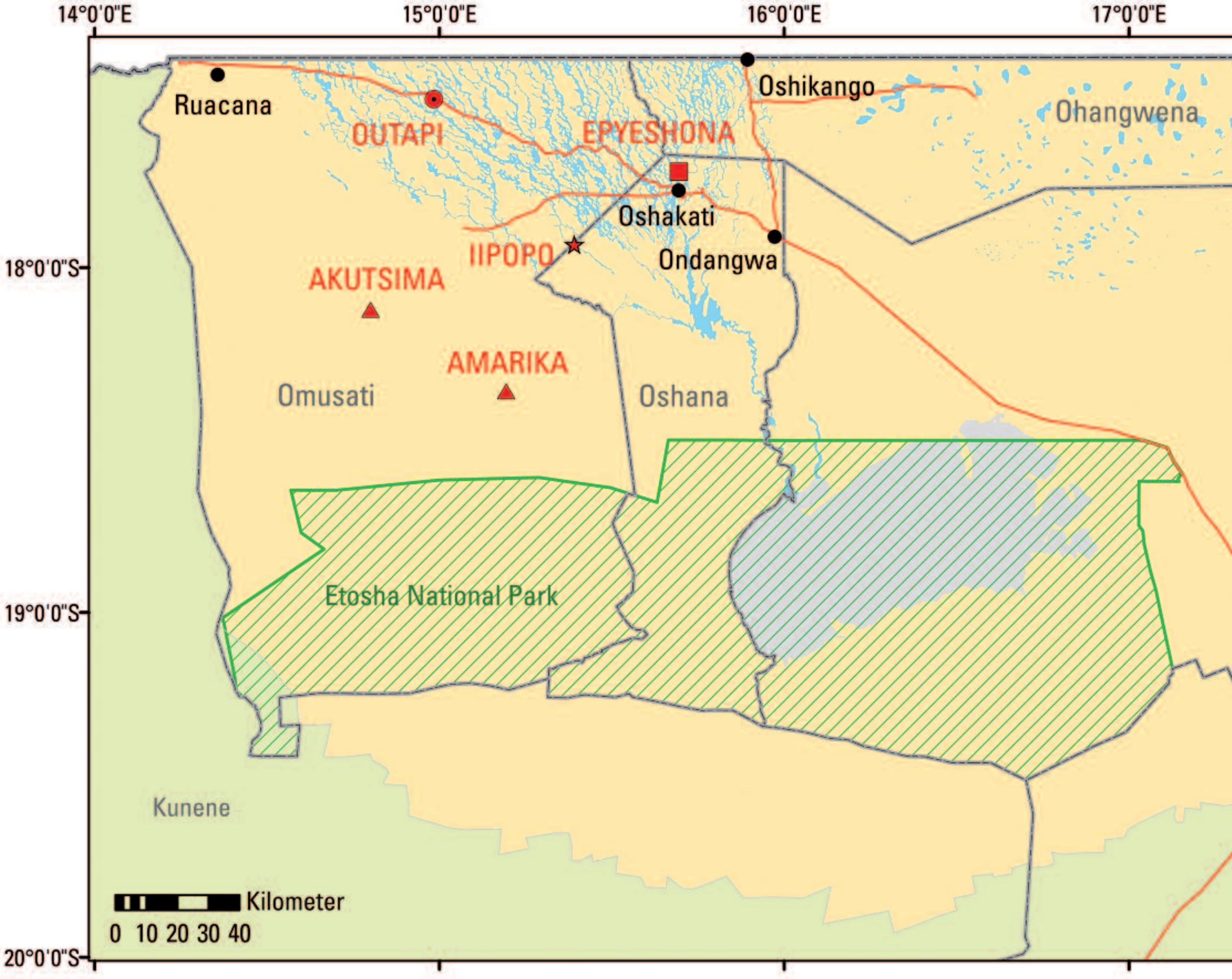
Typical traditional homestead in central-northern Namibia

WHAT ARE THE MILLENNIUM DEVELOPMENT GOALS?

The eight Millennium Development Goals (MDGs) translate the most pressing and vital development goals into tangible objectives, all by the target date of 2015. In 2000, the goals were officially established following the UN Millennium Summit. They form a blueprint agreed to by all the world's countries and their leading development institutions.

Progress of the target achievement is monitored and regularly reported. In Namibia, there have been good improvements in the field of water supply since independence in 1990. In 2008, 92 per cent of the population used an improved drinking water source (compared to 64 per cent in 1990). However, in the field of sanitation, particularly in rural areas, there is still a large backlog. In 2008, only 33 per cent of the population used improved sanitation facilities, which is only a slight increase compared to 25 per cent in 1990.

Source: United Nations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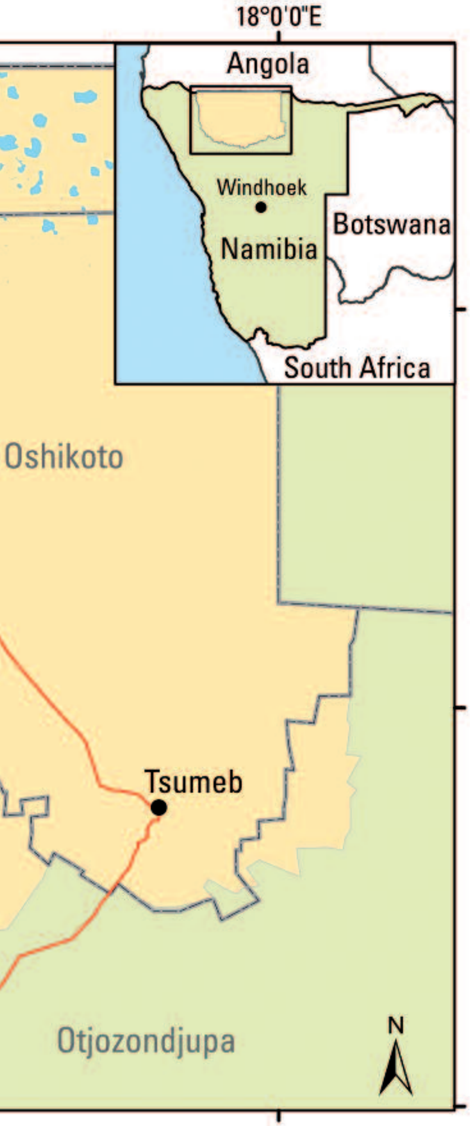


Study area and location of the pilot plants

- Rural: Rainwater harvesting
- Rural: Floodwater harvesting
- Rural: Groundwater desalination
- Urban: Sanitation & water reuse
- Cuvelai-Etosha Basin
- Surface water
- Border (national/regional)
- Town
- Main road
- National park
- Salt pan

Data sources:

Northern Namibia Environmental Project (NNEP)
Environmental Economics Programme (EEP)
Ministry of Environment and Tourism (MET)

Cartography & Layout:

ISOE (2013)

"For me the whole world can be at the same level if we facilitate it. That is the concept of cooperative partnership. I see this as a very good ladder we can climb. When development partnership takes place we go to the people on the ground. They are the ones who must tell us what they need, because they know."

Abraham Nehemia
Undersecretary in the Namibian Ministry of Agriculture, Water and Forestry (MAWF)

The CuveWaters Project

In the water sector, innovative and adapted solutions are needed, along with a new way of thinking about water. These measures must impact decisions and actions at every level. Since 2004, CuveWaters has been contributing to these ideas in central-northern Namibia. The international joint research project is led by the Institute for Social-Ecological Research (ISOE) in cooperation with the Technical University Darmstadt in Germany and the Namibian Ministry of Agriculture, Water and Forestry (MAWF) as well as the Desert Research Foundation of Namibia (DRFN). The project is being funded by the German Federal Ministry of Education and Research (BMBF).

The project develops and implements Integrated Water Resources Management (IWRM) in a form tailored to the Cuvelai-Etosha Basin. The central goal is to strengthen the potential of the region's resources by developing, adapting and implementing innovative technologies for water supply and sanitation as pilot plants. The implemented technologies comprise pilot plants for rain- and floodwater harvesting, groundwater desalination, as well as sanitation and water reuse. Depending on its quality, the water is used as drinking water or to irrigate vegetable gardens.

Technical project parts are framed by societal and scientific components. Thus, CuveWaters has been cooperating closely with the regional population and institutions from the very beginning. They played an active part in the planning and building of the plants. In addition, monitoring, capacity development, and knowledge management play key roles. This strengthens users' self-reliance and ownership, and ensures sustainable operation of the plants. Furthermore, IWRM is embedded in existing processes and adapted to the specific political, social and economic conditions.

WHAT IS INTEGRATED WATER RESOURCES MANAGEMENT (IWRM)?

"IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."

Integrated Water Resources Management is a cross-sectoral policy approach designed to replace the traditional, fragmented sectoral approach that has led to poor services and unsustainable resource use.

IWRM strategies are based on the four Dublin Principles presented at the World Summit in Rio de Janeiro in 1992:

1. Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
2. Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.
3. Women play a central part in the provision, management and safeguarding of water.
4. Water is a public good and has a social and economic value in all its competing uses.

Source: Global Water Partnership (GWP)

Benefits

The successfully implemented pilot plants collect rain- and floodwater, desalinate groundwater and clean wastewater so that it can be used again. First positive results of the integrated solutions are already evident:

Food security. Storage and reuse of water allows fields to be cultivated even during the dry season. Furthermore, nutrients of the treated wastewater are used as fertiliser. Now vegetables can be grown that usually don't thrive in the arid soil, such as spinach, tomatoes and melons. This enriches the diet of the villagers and also generates an income from market sales.

Drinking water. Desalination of groundwater provides access to safe drinking water in remote areas which are not connected to the pipeline system.

Health improvement. CuveWaters helps to improve health conditions by enriching the diet and by providing drinking water. In the basin, water sources (e. g. water holes) are often contaminated or strongly saline, which leads to diseases and child mortality.

Adaptation to climate change. The project introduces technologies to buffer rainfall variability and water shortage. This is an effective measure to sustainably adapt to climate change.

Namibia's Vision 2030 & Millennium Development Goals. CuveWaters supports Namibia's water demand management strategies. In addition, it is in line with the National Water Supply and Sanitation Strategy and the Namibian Water Act. In particular, it contributes to achieving Namibia's Vision 2030 and the Millennium Development Goals "Eradicate extreme poverty and hunger" (Goal 1), and "Ensure environmental sustainability" (Goal 7).

*Omeya ogo omwenyo**

* Water is life
A saying in Oshiwambo

"My name is Kristofina Lyaxulapo from Epyeshona. I am a secretary at the Desmond Tjinemba Tjikesho farm. It is organised by CuveWaters. I also have my own small garden. It started at the headman's house. Containers were set up there. What was it for? There it was, looking like a sports field. But it collects rainwater for the water tank. It was a big surprise. I went there one day when it was raining. Water was running into the water tank. That was really good. If you would ask me to build a tank, now I could do it."

Kristofina Lyaxulapo
Farmer and secretary at the Desmond Tjinemba Tjikesho Green Village, Epyeshona

Rainwater Harvesting

Rainwater harvesting is a technology that is very well known all over the world as a means of providing good quality water on a small scale, especially in developing countries. It helps to bridge water shortages during the dry season and buffers fluctuations in rainfall.

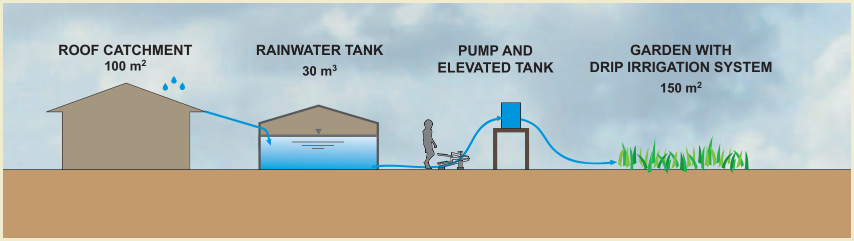
In CuveWaters, different options of rainwater harvesting have been piloted in the village of Epyeshona, near Oshakati, since 2010. Gardens with water-saving drip irrigation systems were established next to the tanks. During the short rainy season, rainwater is harvested on rooftops and concrete surfaces and stored in tanks made of different materials. The harvested water is of fairly good quality and is mainly intended for gardening purposes, but can also be used for washing, cooking or watering livestock. People cultivate tomatoes and other vegetables with the harvested water. Without supplemental irrigation, they can't grow in the arid environment. As part of capacity development, the project provided training and enabled local people from the village to build, operate and maintain the facilities. Furthermore, people have learned to cultivate and manage gardens, and make profits from the yield.

Construction of a plant:
The CuveWaters "blue team" installing gutters that deliver water from the roof to the tank

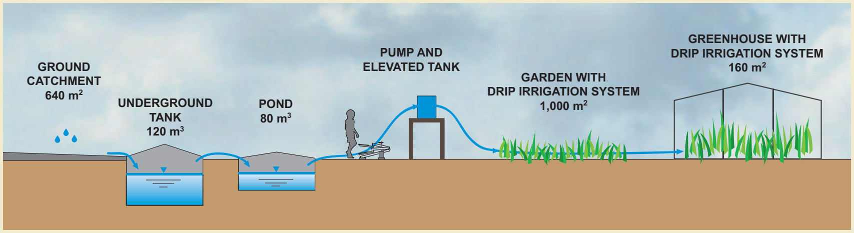
Use of harvested rainwater:
Emerita in her little greenhouse irrigating spinach

HOUSEHOLD AND COMMUNAL APPROACH

CuveWaters is testing two technical and organisational options for rainwater harvesting: the household and the communal approach.



In the household approach, water is harvested from the roof of three single households and stored in above-surface tanks made of different materials, namely ferrocement, bricks and polyethylene. All tanks in this category have a useable volume of 30 m^3.



The communal approach comprises five different households that work together. They named their facilities "Desmond Tjinemba Tjikesho Green Village"; it consists of an underground tank, a covered pond, a greenhouse and an open garden area. Advantages of greenhouses are the prevention of evaporation, temperature control and the protection of plants from wind and pests.

Achievements

- Good quality rainwater has been available during the dry season for gardening and cooking.
- Construction and operation of rainwater harvesting facilities in Namibia is possible.
- Cost-benefit and sustainability analyses showed that on the household level, ferrocement tanks, and on the communal level, greenhouses with ponds are the most appropriate options.
- Knowledge about construction, agriculture and irrigation have been further developed.
- Income generation by selling crops varied. The highest income was generated by a household: N$ 12,000 per year.
- Diet and health status of families have been improved.
- Jobs have been created as further plants have already been built in the region by people trained in the project.

Costs

Individual/household approach

- Total investment:
  from N$ 12,000 to 18,000*, additional costs for the garden: approx. N$ 2,700*
- Operation and maintenance:
  N$ 100 per year for the tank and N$ 300 per year for the drip irrigation system as well as other running costs (e. g. seeds and pesticides)

Communal approach

- Total investment:
  approx. N$ 115,000* for the tanks and the ground catchment, additional N$ 4,700* for the garden including greenhouse and drip irrigation system
- Operation and maintenance:
  about N$ 150 per year for the tank and N$ 380 per year for the garden

* Costs may vary depending on different materials and facilities.
N$ = Namibian Dollar (N$ 10 ≈ € 1)

"My name is Rauna Nakahambo. I live in Etope village. The water we use is rainwater and river water. Before, we did not know how to harvest water from Oshana. We used to let the water flow away along the Oshana. But now we have learned this good method to harvest water from the Oshana. We use a kind of bicycle and pump the water into the tanks. So we can use it during the dry season."

Rauna Nakahambo
Farmer and manager of the Green Village in Iipopo

Floodwater Harvesting

The central-northern region of Namibia is characterised by a system of oshanas, very shallow river streams that drain the region from north to south during the rainy season (October to March). The whole area is regularly affected by floods and droughts. Major challenges of using the oshana water are high evaporation rates and rapid quality degradation of the water due to uncontrolled use by humans and animals. The aim of floodwater harvesting is to solve these problems by storing the water in artificial, closed reservoirs made of different materials. Therefore, the oshana water is pumped into storage reservoirs with pedal pumps at the height of the rainy season, when the water quality is at its best.

In 2012, the pilot plant was established in Iipopo, a remote village in the Oshana region. Ten villagers use the stored water for small-scale gardening. For this reason, a greenhouse and an open garden area were constructed and equipped with water-saving drip irrigation systems. The outside garden area is used both for self-consumption as well as for market production of vegetables.

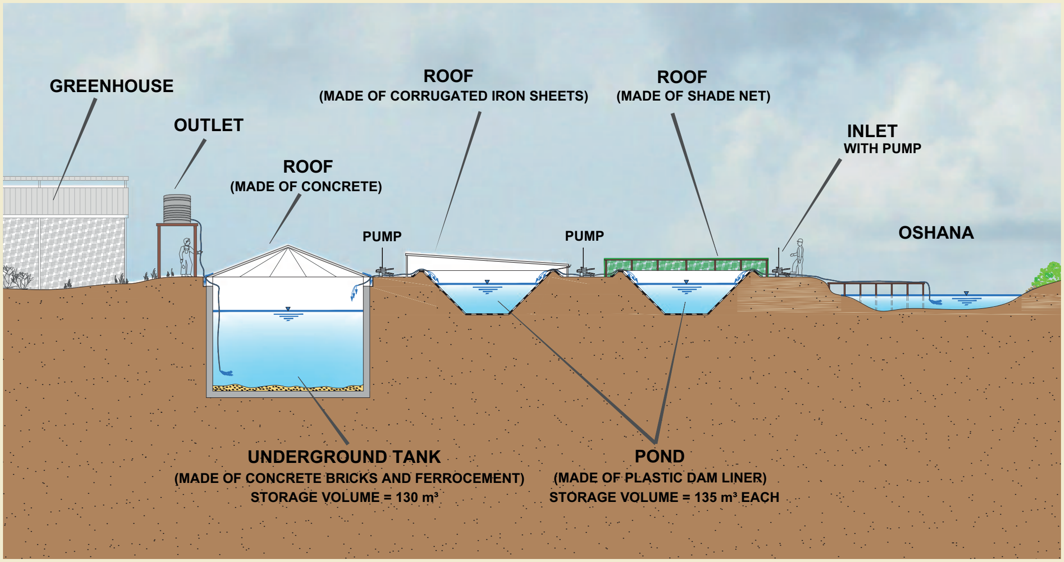
All farmers were trained in how to prepare the soil for the plants, how to plant the seeds, how to supply the plants with fertiliser and how to use the water properly, professionally and efficiently.

The Oshana in Iipopo during the flood of 2011, in the background the floodwater harvesting plant

Meme Taimi proudly shows the first carrot harvest from her individual garden site

STORAGE OF OSHANA-FLOODWATER

The pilot plant for the storage of oshana-floodwater is a combination of different storage options. It consists of an underground tank (volume 130 m³) and two ponds, one with a shade net roof and one covered by corrugated iron (volume 135 m³ each). The pilot plant has a total storage capacity of 400 m³. Since the water is intended to be used for irrigation purposes, the pilot plant is equipped with a greenhouse (176 m²) and a total open garden area of 1,200 m². Market-ready vegetables can be grown inside the greenhouse, since the plants are protected from direct sunlight, wind and pests. The whole compound is surrounded by 150 fruit trees to protect the area from wind and to harvest fruits.



Source: Christoph Treskatis

Achievements

- Good quality floodwater has been available. The lower water quality compared to rainwater harvesting doesn't seem to have a negative effect on the crops.
- Construction and operation of floodwater harvesting facilities in Namibia is possible.
- Availability of water during the dry season varied. In 2012, enough water was available, whereas in 2013, additional water had to be bought to protect the yield, caused by extremely low rainfall.
- Knowledge about agriculture and irrigation have been further developed.
- Income generation in the first season: N$ 4,700 by selling crops (greenhouse) plus on average an additional N$ 1,500 (individual plots outside). The total was N$ 19,700.
- Diet and health status of families have improved.
- 10 permanent jobs have been created.

Costs

Total investment costs: N$ 186,000. This includes

- N$ 47,000 for the outside garden, including drip irrigation (1,175 m^2)
- N$ 43,000 for the greenhouse, including drip irrigation (176 m^2)
- N$ 23,000 for the shade net covered pond, and another N$ 31,000 for the corrugated iron covered pond (135 m^3)
- N$ 42,000 for the underground tank (130 m^3)

Running costs are still to be determined by the ongoing monitoring process.

N$ = Namibian Dollar (N$ 10 ≈ € 1)

"My name is Moses Shatika and I am from Akutsima. Life before the plants was not good, because we used to drink unhealthy water. But now after the plant was built, life is good and it is quite healthy. At the beginning of the project I was called a caretaker.
After training in Windhoek I got a certificate. I'm responsible for the everyday operation. Now, I'm no longer a caretaker but rather a plant operator."

Moses Shatika
Operator of the desalination plants in Akutsima

Groundwater Desalination

Central-northern Namibia is characterised by a lack of perennial surface water bodies and by saline groundwater. A pipeline provides parts of the region with drinking water. But where this supply network ends, people depend on water from hand-dug wells. The wells become saltier due to evaporation and hydraulic connection to the saline groundwater during the dry period. In some places the salt content of the groundwater is three times higher than seawater. The contamination of the water in the hand-dug wells with algae, faeces and parasites can be tremendous. Drinking this water makes people sick, especially children.

To provide remote areas with clean and healthy drinking water, the project has installed four innovative desalination pilot plants in the two villages of Amarika and Akutsima (Omusati region). Supplying peripheral rural areas decentrally with water is a very challenging task. Thus, the research focusses on the adaptation and operation of high-tech plants in remote areas. People from the villages were trained to take care of the plants and are responsible for their protection.

In October 2010, the plants were officially inaugurated by the former Honorable Deputy Minister of MAWF, Petrus Iilonga.

Moses, operator of the plant in Akutsima, cleaning the solar panel

Child drinking desalinated water from the pilot plant

SMALL-SCALE SOLAR-DRIVEN GROUNDWATER DESALINATION

All four installed plants are powered by solar energy, since the region is most suitable for solar energy plants and the desalination process requires substantial amounts of power. All plants also operate free of chemicals, producing between 0.5 and 3.3 m³ of safe drinking water per day. The research is focussing on the operation of high-tech plants in remote areas.

In the village of Akutsima, two independent plants have been installed:

- an evaporation plant with plastic heat exchangers which produces about 1.4 m³ water per day (Terrawater)
- a multi-stage desalination plant with plastic-metal composite construction which produces about 0.5 m³ (Ingenieurbüro für Energie- und Umwelttechnik IBEU and Solar-Institute Jülich SIJ)

In the village of Amarika, two independent plants have been installed:

- a reverse osmosis plant with electrochemical pretreatment which produces about 3.3 m³ water per day (pro|aqua)
- a membrane distillation plant which produced about 0.8 m³ (Fraunhofer Institute for Solar Energy Systems ISE). Since this plant could not stand up to Namibian conditions, it was dismantled.

Achievements

- Enough water of high quality is available for all people in the two villages for drinking, cooking, washing, etc.
- Adaptation of 3 plants to Namibian conditions has been successful.
- Valuable experience with small-scale decentralised desalination plants has been gained.
- People have been trained to ensure plant operation and maintance.
- Health conditions have improved, e.g. fewer diarrhoea incidents and increased subjective well-being in general.
- Handover of the plants to the Namibian Ministry of Agriculture, Water and Forestry has begun.

Costs

Costs for desalination are highly dependent on site conditions, especially on the prevailing salt content and the preferred freshwater quality. The existing infrastructure (electricity, tarred roads, foundations, security, etc.) makes a remarkable difference in terms of investment costs and maintenance costs. The source of energy is also very important with regard to running costs (when conventional energy sources are used) or investment costs (when regenerative energy sources like solar power are used). Therefore, taking only the investment costs of the desalination plant into account, plants similar to these pilot plants can be provided for approx. N$ 48–120/m^3.

N$ = Namibian Dollar (N$ 10 ≈ € 1)

"The people themselves make sure that everything is working successfully. They are very hard working people, they are determined to accomplish their task and they have a policy of inclusiveness, that means that they have to make sure that other stakeholders are included, that other stakeholders are consulted, they also want to hear other views. After completion the project can be implemented elsewhere in Namibia or in other parts of the world. We wish the project can also be extended to another area within Outapi."

Oswin Namakalu († 25 July 2013)
Chief Executive Officer (CEO) of the Outapi Town Council

Sanitation and Water Reuse

Approximately 40 per cent of the urban population in Namibia does not have access to enhanced sanitation facilities. To improve this situation the Namibian National Sanitation Strategy proposes efficient technologies including flush toilets in combination with advanced sewage technologies, such as vacuum transport. CuveWaters takes these major recommendations into account, combining wastewater management with water reuse, fertiliser recovery, energy generation, and a community-based approach. Special attention is paid to altering hygiene behaviour to prevent waterborne diseases.

Outapi, a municipality with about 4,600 inhabitants, was chosen for implementing the sanitation and water reuse infrastructure. Approximately 1,500 inhabitants benefit. The concept includes among other things, small and communal washing houses as well as almost a dozen Community Health Clubs to improve household health and hygiene. They help to foster self-organisation and communication between the users themselves and with the municipality.

Cluster washing house in the Tobias Hainyeko settlement

Regular meeting of a Community Health Club

SANITATION FACILITIES, WASTEWATER TREATMENT AND AGRICULTURAL IRRIGATION

A waterborne vacuum sewer system with poor-flush toilets was chosen for sewage conveyance from the informal settlements to a wastewater treatment plant (schematic illustration see following pages). This 'closed system' helps to overcome the threat of seasonal floods in the area. After the wastewater has been transported from the sanitation facilities to a vacuum station, first it is pretreated and then further purified with rotating biological contactors. Organic compounds are oxidised and nutrients largely remain in the water for fertigation purposes. Finally, solids and pathogens are removed by a microsieve and UV radiation before the water is stored in a pond for reuse in irrigation. Rainwater is also collected in this pond to gain additional irrigation water. The biogas produced from the sludge and biomass of the agricultural irrigation site is used to generate electricity, and the processed sludge itself is utilised as fertiliser.

Main building of the wastewater treatment plant in Outapi

Farmers preparing the irrigation site. Main crops are maize, tomatoes and peppers

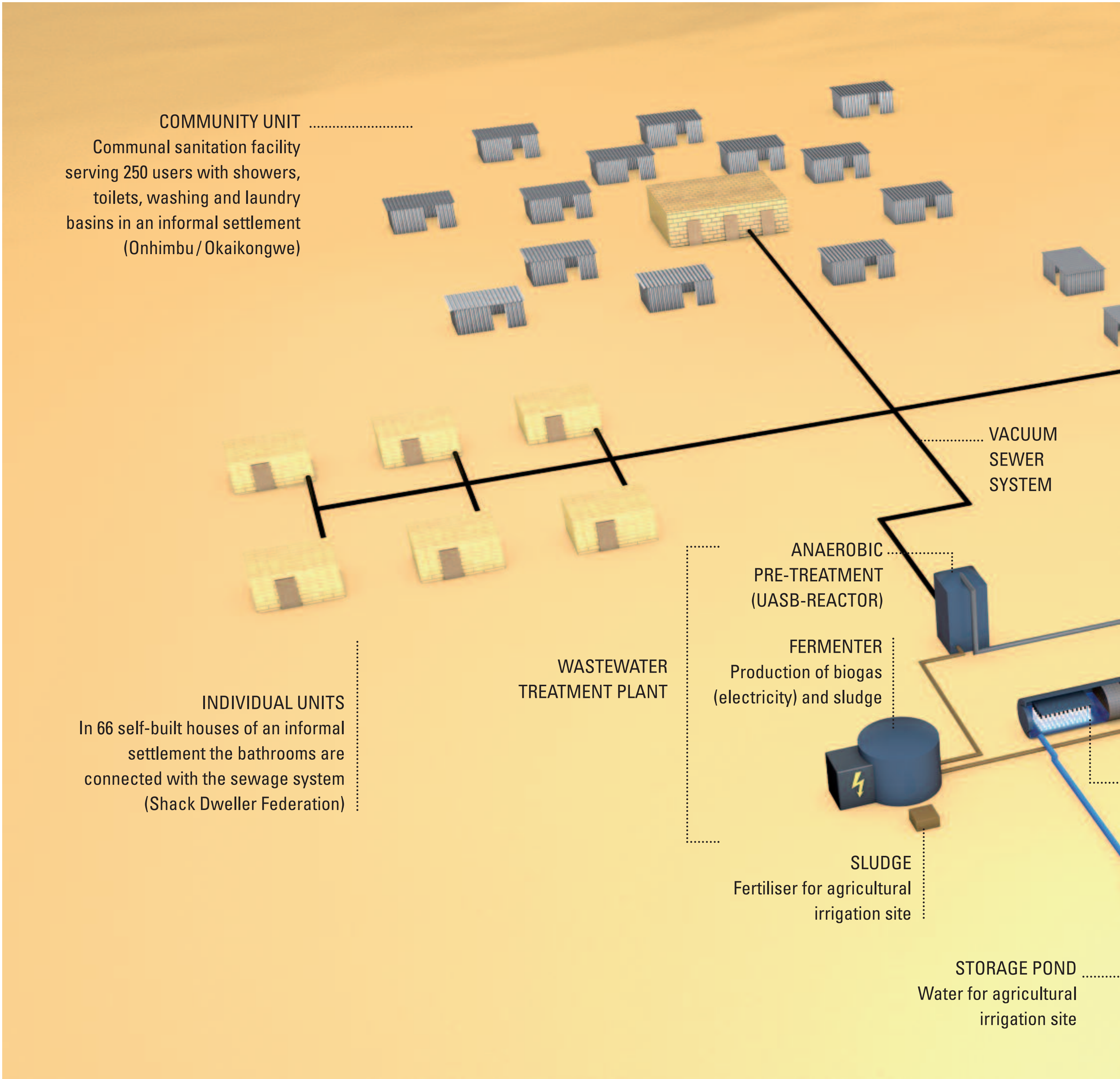
Achievements

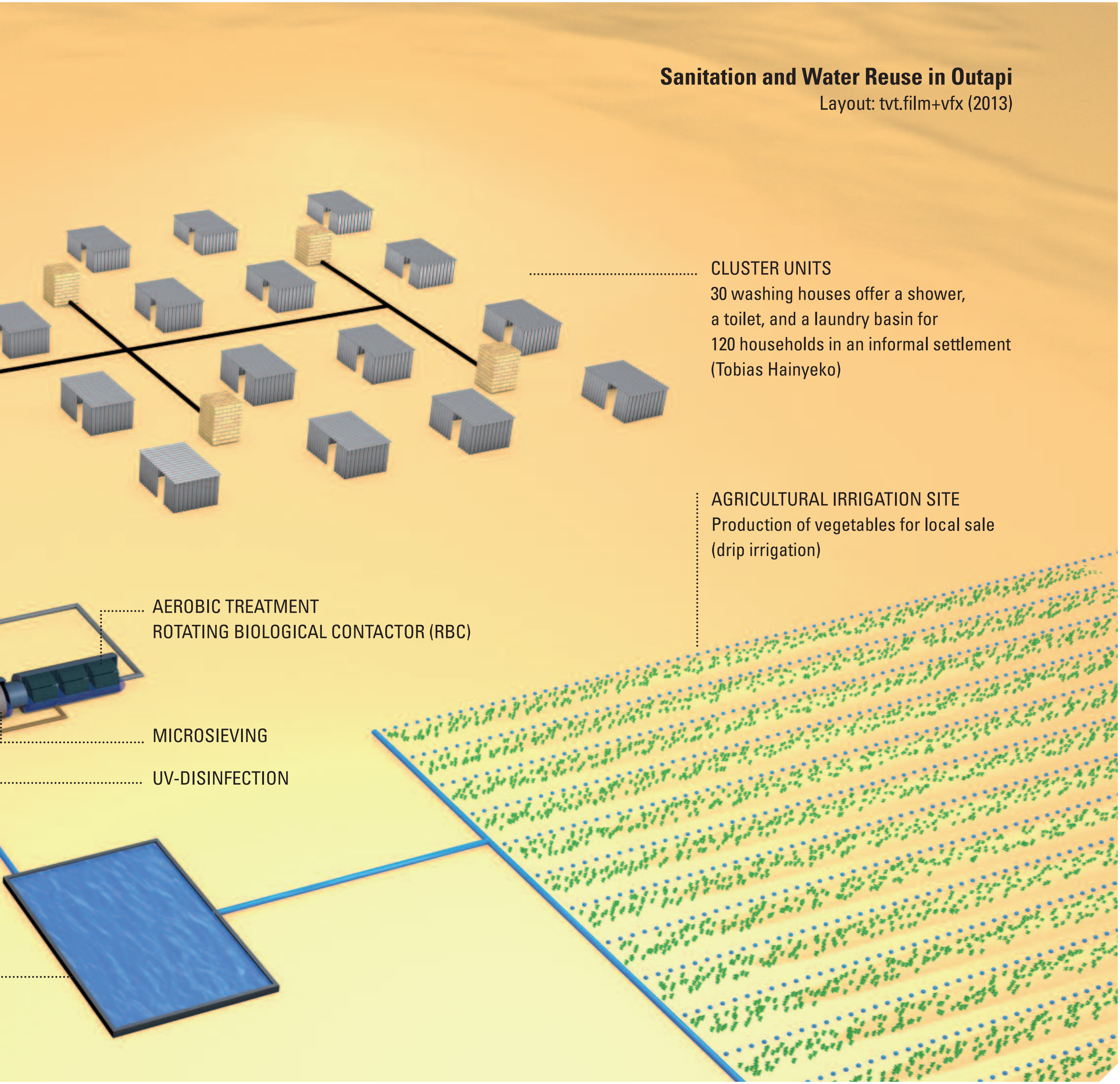
- Privacy and comfort: Private and communal sanitary facilities are available for around 1,500 inhabitants.
- Improved health and hygiene in families through the introduction of Community Health Clubs.
- Implementation of a tariff and billing system for the new sanitation system at Outapi Town Council.
- Knowledge about agriculture and irrigation techniques as well as wastewater treatment and vacuum sewer system has increased.
- 12 permanent jobs have been created: 5 farmers, 4 cleaning staff and 3 security guards at the washhouse.
- Producing and selling of vegetables for the local market.

Costs

- N$ 100,000 – 200,000 for construction of washhouses (cluster and community unit)
- N$ 800,000 – 900,000 for construction of vacuum sewers and pumps
- N$ 1,000,000 – 1,500,000 for construction of wastewater treatment plant
- water, electricity, spare parts, laboratory equipment is required for operating resources wastewater treatment plant and vacuum sewer system
- ca. 7 full-time personnel (technicians, skilled helpers, caretakers, security staff)
- N$ 1,200,000 – 1,400,000 for construction of an agricultural irrigation site (ca. 2 ha) including storage pond, drip irrigation and drainage system, greenhouses, fence

Since the project's implementation is still ongoing, numbers for costs are preliminary and only represent an estimation. Costs for other sites with no pilot character and a higher number of future users are expected to be much cheaper (with regard to per capita costs). Expenses may also vary depending on local conditions. Therefore, only ranges are given for construction costs. N$ = Namibian Dollar (N$ 10 ≈ € 1)


COMMUNITY UNIT
Communal sanitation facility serving 250 users with showers, toilets, washing and laundry basins in an informal settlement (Onhimbu / Okaikongwe)
VACUUM SEWER SYSTEM
ANAEROBIC PRE-TREATMENT (UASB-REACTOR)
FERMENTER
Production of biogas (electricity) and sludge
WASTEWATER TREATMENT PLANT
INDIVIDUAL UNITS
In 66 self-built houses of an informal settlement the bathrooms are connected with the sewage system (Shack Dweller Federation)
SLUDGE
Fertiliser for agricultural irrigation site
STORAGE POND
Water for agricultural irrigation site


Sanitation and Water Reuse in Outapi
Layout: tvt.film+vfx (2013)
CLUSTER UNITS
30 washing houses offer a shower, a toilet, and a laundry basin for 120 households in an informal settlement (Tobias Hainyeko)
AGRICULTURAL IRRIGATION SITE
Production of vegetables for local sale (drip irrigation)
AEROBIC TREATMENT
ROTATING BIOLOGICAL CONTACTOR (RBC)
MICROSIEVING
UV-DISINFECTION

Top: Participatory mapping during a stakeholder workshop
Right: Trainees from Epyeshona and experts building an underground tank for rainwater harvesting
Bottom: Farmers from Iipopo Green Village seeding plants

Top: People from Outapi washing their clothes at the communal sanitation facility
Top right: Technician of the Outapi Town Council at the wastewater treatment plant
Right: Children at the groundwater desalination plant
Bottom left: Farmer checking tomatoes in the greenhouse in Epyeshona
Bottom right: A unique view of the groundwater desalination plant

Scientific & Societal Approach

Technologically sophisticated concepts can easily clash with users' socio-cultural needs and everyday behaviour. Therefore, the project uses a transdisciplinary approach based on the integration of science, technology and society. This approach is reflected in the project's structure: the scientific components, concept development and empirical studies are closely interlocked with the integrative societal components. These processes constitute the basis for adapted problem-solving, since they promote the social embedding of technologies and the active involvement of institutional players and the local population. A new participatory method (demand-responsive approach) has thus been jointly developed with Namibian partners. It is applied in the project to develop and implement the new technologies based on informed choices.

INFOBOX

WHAT DOES TRANSDISCIPLINARY RESEARCH MEAN?

Transdisciplinary research means that social, engineering and natural sciences all contribute to the results. Furthermore, the practical experience and expertise of partners from society, politics and the economy are integrated from the very beginning. Due to this integration of knowledge, the connectivity of the research results to both science and society is guaranteed. Transdisciplinary research is necessary because the problems facing our world today (e. g. climate change) are becoming ever more complex. It generates new scientific knowledge and comes up with strategies for societal action with practical relevance.

"My name is Isaac Kariuki from Kenya. I had an opportunity to come and work in Namibia through CuveWaters. The purpose of my coming is to train the people here in clean water harvesting. The impression that I have is that the water is there, the land is there, the soil is there. What was lacking was information."

Isaac Kariuki
Rainwater harvesting consultant from Kenya

"In order to lead a project properly you have to speak to people. Whether they are old or young, you have to show them respect. You do not only demand respect, you show it yourself. You have to be friendly with everyone. Who will work with you if you are not willing to really cooperate?"

Emerita Iipinge
Acting village head of Epyeshona

Scientific and Societal Components

Participation ensures that various groups of players (such as users, practitioners, administration, political bodies) are included in the process at a local, regional and national level. Decisions on issues such as the selection of suitable sites, implementation or legal rights are made in cooperation with all the stakeholders.

Capacity development aims at improving and transferring knowledge at all levels. This comprises academic and non-academic training. The latter enables the local residents to autonomously maintain and operate the facilities beyond the project's duration.

Empirical studies generate valid and fundamental data on the project to evaluate and further adapt the technologies. A technical and socio-cultural monitoring programme is being developed with the communities at every project site. Furthermore, social-ecological impact assessment has been carried out to analyse the impacts on and potential risks of the technologies for hydrology, land use or health.

Knowledge management provides tools to support decision-making and planning processes. In addition to these tools, knowledge is disseminated through fact sheets, films, publications and conference participation.

Good governance & institutionalisation deals with the institutional consolidation of the IWRM process by supporting legal and institutional structures. Such analyses provide strong back-up for the incorporation of CuveWaters into current regional planning activities.

Village mapping with the community

Students at the vacational school

INTERACTIVE DIGITAL ATLAS OF THE CUVELAI-ETOSHA BASIN

The digital multimedia atlas integrates existing information about the Cuvelai-Etosha Basin and project results with the help of easy-to-understand maps, texts, photos and graphs. Basic analysis tools, overlay functionalities and cartographic multilayer display make it easier to grasp complex facts and processes. The ultimate goal is to allow everyone who is interested access to this wealth of information. The atlas is a joint project developed by Namibian and German partners and is available in a bilingual English-German version.

www.cuvewaters.net/knowledge-management.27.0.html

Outlook

The project has successfully developed a concept for sustainable water management that is adapted to regional conditions in northern Namibia. It improves the living conditions of the people and provides the means for climate change adaption. The pilot plants are being used for practical demonstration and to show that the initial solutions – being approached in an integrated technical, social and scientific way – are proving effective and generating substantial benefits. We have learned that, for long-term success, the active involvement of stakeholders, demand-orientation and knowledge transfer play a vital role.

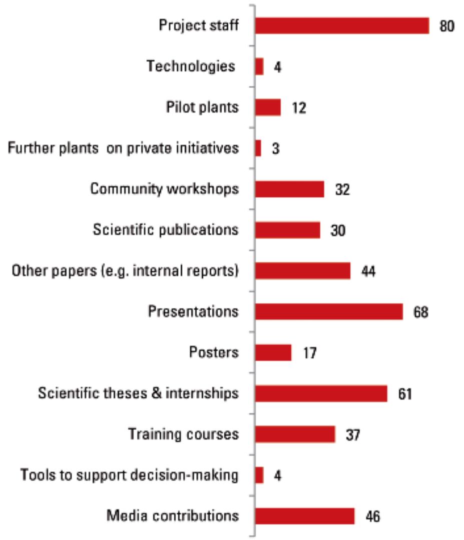
The central goal of CuveWaters, until the project ends in 2015, is the takeover of the plants by Namibian partners, as well as empowering these partners to operate the plants autonomously in the long term. The plants have thus been developing into a 'lighthouse project' that can serve as a beacon for others. This will also enable a further dissemination of the adapted solutions to other areas in Namibia and neighbouring countries facing similar challenges. This will open up new market opportunities for the technologies. Thus, embedded into the regional and national processes of integrated water resources management, the various benefits will spread and the living conditions of the population in the region will be improved.


Technician at the wastewater treatment plant


Child with spinach harvest

Highlights & Figures

- 2011: “IWRM Vacational School” in Namibia
- 2012: E-learning module on modeling and tools to support decision-making
- 2012: CuveWaters film Water*Changes* premiere
- 2012: CuveWaters nominated for the “Sustainable Developments” research award of the German Federal Ministry of Education and Research (BMBF)
- 2012/2013: Two additional Rainwater Harvesting facilities built by the Nambian Development Trust and Okashana Rural Development Centre



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