

Research themes for Students and Post graduate students

Communal Water House (CWH)

Background

The German Federal Ministry for Education and Research and South African National Research Foundation are funding a scientific water management project, which deals with a technological unit called Communal Water House. Aim is to improve the water situation especially in rural communities. Five German and several R.S.A. companies are involved. Kouga Local Municipality is the benefiting Municipality for the R.S.A. national demonstration project. Project site is in Rooidrai in Hankey region. Project period is from November 2007 until June, 2009

Short description of the CWH system

Communal Water House is a facility, which aims to provide water of definite quality and temperature for household use, shower and laundry purposes, in rural settlements. It consists of two or more separate rooms inside the building for laundry and shower activities, and tap water outlets outside of the building. Water sources are e.g. tap water, rainwater, or well water. The water for laundry and shower purposes is recycled inside the building and treated by a service water treatment station. This treatment station consists of three technological units which work in a controlled manner: (1) a biological treatment unit, (2) an ultraviolet light disinfection unit as well as (3) membrane filtration modules. The quality of the treated water is in accordance with the European Union bathing water regulation. The water is heated by a solar heating system. Water pumping is by solar pumps.

CWH improves the water use efficiency. 2 to 3 times more people can be served by the same amount of water at the same level of services, highest sanitary standards, and reduced costs.

CWH is therefore very well suited for rural communities, which lack in water supply and energy, to improve the living conditions of people. It can be used as a full sustainable water management solution, or as an intermediate solution. Moreover it can be used in tourist facilities, such as camping grounds, sport grounds, and other camps. Sanitation for CWH users is by urine diversion toilet systems.

For more information and illustrations - see www.wasserhaus-suedafrika.de

Participation offer for students and post graduate researchers

The project team offers the participation in the project realisation by research activities in the establishment, operation, optimisation, and maintenance of the CWH in several engineering, hygienic, and social respects, especially in

- Water quality research
- Layout, operation and maintenance of grey water treatment units,
- Solar energy application (photo-voltaic, warm water collectors, solar pumping)
- Hygienic and sanitary research into water and residues quality
- Urine separation toilet design, construction, maintenance and control
- Modelling, control, and optimisation of the technological system
- Social aspects of CWH implementation in rural systems
- Financing and costs research
- Ecologic and climate related balancing of the complete system.

Special themes pl. see appendix. The activities are on-site, in Kouga Municipality, as well as laboratory work and computer aided activities.

Other participation proposals are welcome. Conditions of participation will be defined depending on the special task.

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Detailed description of projects

Project title	Balancing of water amounts and energy fluxes in the CWH under practical conditions – <i>...Alles fließt- fließt alles?</i>
Detailed description	In the CWH system, water is used for laundry and showering processes. Another part of water is taken away from the CWH for household uses. The water is from a borehole. It is collected in containers, from which it passes into a circuit system. After its use in laundry and as shower, it is collected and treated in the treatment station. After the treatment, it is used for laundry and shower again. A part of the water is mixed with fresh water. A part is heated up by solar heaters. In each process step, there are water losses, e.g. in showering through evaporation, and wet towels, or in the grey water treatment station as residues. The water amounts of the whole cycle are to be defined by measurements. Energy input by solar energy and output in different water streams are to be measured. Both are to be balanced to define systems efficiency.
Specifications	Water amount and temperature measurements on defined points
Company involved	Pontos Aquacycle, Potsdam University
Duration of the project	March, 2008 ... June, 2009
No. of students	3
Special conditions	Best suited for students from Kouga region, knowledge of Xhosa language

Project title	Measurement, Monitoring und Optimisation of a photo-voltaic module in the Communal Water House (CWH) <i>...Sonne Sonne scheine (schn)heller</i>
Detailed description	CWH is supplied by solar energy to an extent of about 90% of the total energy need. After construction of the CWH building and the installation of the technical equipment, energy is to be balanced and monitored by a technical system to establish the base for process optimisation.
Specifications	Date interpretation, comparison of experimental results with simulations, proposals for optimising energy fluxes in the CWH
Company involved	German Society for solar energy application (DGS), Berlin
Duration of the project	Ca. March, 2008 - August, 2008
No. of students	1
Special conditions	

Project title	Development of an education concept for Water House <i>...Alles reine Ausbildung</i>
Detailed description	For the rational use of the CWH, deeper knowledge into energy needs and measures to reduce it are necessary. It is assumed, that the knowledge base is relatively low, and that the use of solar energy for electricity as well as for air and water heating is not well known, and sometimes not accepted as a

	high tech version. Therefore a training concept must be developed with respect to the knowledge base of the people, including a concept to train trainers. DGS developed a solar energy teaching schedule which was applied in several countries, such as Germany, Taiwan and Afghanistan. The experiences from these applications must be transformed to the situation in EC, adopted to the needs of the people as well as the needs of the CWH project realisation. Intensive co-operation with CWH users and other people involved are necessary.
Specifications	Participation in the adaptation of the teaching module, optimisation of the teaching schedule, participation in seminars and classes
Company involved	German Society for solar energy application (DGS), Berlin; Potsdam University
Duration of the project	01/2008 until 06/2009
No. of students	3
Special conditions	Students from Kouga region

Project title	Architecture of CWH building <i>...WasserBauHaus-Architektur</i>
Detailed description	The building for the CWHs has several different targets: On the technological level it has to provide suitable room for the technical equipment as well as for the functions such as laundry and showering. In this respect, as a speciality it is to be considered, that the technical equipment will partly be provided in a container, which is about 12 m long. On the other hand, the CWH must fit into the needs and the cultural background of the people on site in the beneficiary community. Without their acceptance, a CWH cannot be successful. Therefore, a specific construction is necessary. It also has to keep in mind, that communal kitchens and other communal buildings are well known in the South African society, e.g. in the National parks.
Specifications	Preparation of a survey of typical South African communal buildings, such as communal kitchens, camping site buildings, etc. Preparation of a survey of traditional buildings and their typical shapes, which can be used for the CWH building, in dependence of specific regions and cultures Proposals for modern CWH buildings with high functionality Proposal for colours of CWH walls, and/or paintings on the CWH walls
Company involved	Potsdam University, Pontos
Duration of the project	Starting in 2008, 18 months
No. of students	2 or more
Special conditions	Kouga people or other people from typical cultural backgrounds

Project title	Assessment of the local population's needs and expectations concerning the Communal Waterhouse – a stakeholder analysis <i>...Don't stake too much, mein Holder</i>
Detailed description	The CWH is built in the community of Rooidrai. It is meant to improve the quality of life of the inhabitants. However, to fulfill this purpose, it is necessary that the CWH meets their needs and expectations. Otherwise, dissatisfaction and lack of acceptance will be the consequences. A survey shall be conducted amongst future users of the CWH, assessing their interests, needs, and propositions related to the CWH. This survey will be part of a stakeholder analysis which goes along with the implementation of the CWH.

	The project implies, depending on the qualifications of the applicant, constructing interview guidelines, interviewing the future CWH users, and analyzing the data. There will be a close collaboration with Humboldt University Berlin, Germany, during all stages of the project.
Specifications	Assessing the CWH users' needs, expectations and propositions concerning the CWH
Company involved	Humboldt University Berlin, Germany Prof. Dr. Harald A. Mieg, Dipl. Psych. Friederike Arnold friederike.arnold@geo.hu-berlin.de
Duration of the project	March, 2008 - August, 2008
No. of students	2-3
Special conditions	Best suited for students of social sciences from Kouga region; necessary: knowledge of the local languages

Project title	Financing concept of CWH operation <i>...Herr Ober Zahlen</i>
Detailed description	The Communal Water House intends to improve the living situation especially of rural people. It has to consider the governmental regulations of water supply, such as free public services. Nevertheless, the CWH operation and maintenance are not free of charge. A part of the financing will really come from the Municipality, but also the CWH users must contribute to the financing of the services, since they benefit from water supply, and energy supply, which is no longer a cost factor in the household. A suitable financing model is to be developed, after which a sustainable operation over a long periods is guaranteed. Moreover, regulations and control mechanisms are to be implemented
Specifications	Specification of the CWH building, operation, and maintenance costs. Preparation of a survey of cost participation models in rural communities in South Africa and elsewhere Development of a model for the cost sharing between municipalities and CWH users. Definition of control mechanisms for a regular water and energy use in CWH. Definition of financing limits for people for low income groups.
Company involved	Potsdam University
Duration of the project	01.01.2008-30.6.2009
No. of students	2
Special conditions	Students of economy

Project title	Implementation of CWH into GDM (Green development mechanism) activities for climate control <i>...CO2-Tonnen-Ideologie</i>
Detailed description	CWH deals with water related activities such as laundry and sanitation via use of solar or renewable energy, instead of fossil fuels for room and water heating, reduced energy needs for pumping and storage, etc. Therefore, it improves the net CO2-balance and is beneficiary for climate. In such cases, international regulations for climate control can be applied. For the CWH application, the so called green development Mechanism (CDM) is applicable, by which reduced CO2 emissions can be marketed on international level. For a CWH for about 200 people, a net reduction of CO2 emissions (calculated in CO2 equivalents) is estimated to about 30 ton per year, which at actual prices is ZAR 8000, annually. This may support the efforts of South African government to improve the CO2 balance and reduce CO2 emissions after Kyoto protocol obligations.
Specifications	Concrete definition of the CO2 reduction potential of CWH for different

	applications. Clarification of the application of CDM in the case of the CWH application Development of a strategy for marketing CWH related CO2 benefits in international markets.
Company involved	Potsdam University
Duration of the project	01.01.2008 to 30.6.2009
No. of students	2
Special conditions	Students of economy, MBA