SOLTRAIN

SOUTHERN AFRICAN SOLAR THERMAL TRAINING AND DEMONSTRATION INITIATIVE

Lessons learned
Project Structure

**Contracting Authority:**
Austrian Development Agency (ADA)

**Austrian Development Cooperation**

**Co-financed by:**

[DFID Logo]

Uniting against Poverty
Project implementation:

Sustainable Energy Society of Southern Africa (SESSA)
P.O.Box 58 Hartbeespoort 0216
South Africa

Centre for Renewable and Sustainable Energy Studies (CRSES)
Stellenbosch University
South Africa

Renewable Energy & Energy Efficiency Institute (REEEI)
Polytechnic of Namibia, P. Bag 13388
Windhoek
Namibia

Eduardo Mondlane University (UEM)
Faculty of Engineering
Av. Mozambique, Km 1.5
Maputo
Mozambique

Domestic Solar Heating Pvt. Ltd, (DSH)
11 Kingsbridge Avenue, Northwood
Mt. Plesant, Harare
Zimbabwe

Bethel Business and Community Development Centre (BBCDC)
PO Box 53, Mt. Moorosi 750
The duration of the project was 36 months

May 2009 - April 2012
The overall goal of this southern African regional project is to contribute to the switch from a fossil fuel based energy supply to a sustainable energy supply system based on renewable energies.

This should be achieved by building up training capacities in the participating countries in the field of solar thermal technology and the improvement of the quality, performance and lifetime of solar thermal systems.

Furthermore it is the aim of the project to create new jobs at small and medium enterprises and to initiate and/or to strengthen political support mechanisms for solar thermal systems.
50 demonstration systems for social institutions (hospitals, orphanages, homes for elderly people, HIV/AIDS institutions etc.) will be installed in order to increase the hygienic standard of the social institutions and to reduce significantly the energy cost for water heating.

The project was carried out in Mozambique, Namibia, South Africa and Zimbabwe in cooperation with educational institutions as well as institutions and companies working in the field of renewable energies.
Target Groups

Training institutions like universities and other training centres

Small and medium enterprises

Social institutions

Policy and administration
SOLTRAIN I
Monitoring of 7 existing systems

Seven already existing systems were selected and equipped with monitoring devices. To have a good distribution of different system concepts and designs 4 South African systems, 2 Namibian systems and one Mozambican system were chosen for monitoring.

As foreseen all seven systems have been monitored for a period of 12 months.
Monitoring of 7 existing systems

System 1 at a commercial laundry, Cape Town

System 2 at a residential house, Stellenbosch

System 3 at the Lilium Student Residence, University of Pretoria

System 4 at ABI Miller, North Riding
Monitoring of 7 existing systems

System 5 at the Polytechnic student hostels, Windhoek, Namibia

System 6 Katutura State Hospital, Windhoek

System 7 at the Lousada Family Home in Maputo, Mozambique
Monitoring of 7 existing systems
Key figures of monitored systems

<table>
<thead>
<tr>
<th>System</th>
<th>System design</th>
<th>collector area [m²]</th>
<th>storage volume/m² collector area [liter]</th>
<th>average mass flow in collector circle [liter/hour system]</th>
<th>specific average mass flow in collector circle [liter/hour m²]</th>
<th>maximum mass flow in collector circle [liter/hour m²]</th>
<th>maximum specific mass flow in collector circle [liter/hour m²]</th>
<th>average temperature difference between solar flow and solar return flow [°K]</th>
<th>maximum temperature difference between solar flow and solar return flow [°K]</th>
<th>average daily hot water consumption [liter/day]</th>
<th>average daily hot water consumption/installed m² collector area [liter/m²·day]</th>
<th>yearly collector yield [kWh/a]</th>
<th>specific yearly collector yield [kWh/m²·a]</th>
</tr>
</thead>
<tbody>
<tr>
<td>System 1</td>
<td>indirect thermosyphon system</td>
<td>4</td>
<td>300</td>
<td>75</td>
<td>27</td>
<td>6.8</td>
<td>57</td>
<td>14.3</td>
<td>21.3</td>
<td>513</td>
<td>128</td>
<td>3.198</td>
<td>800</td>
</tr>
<tr>
<td>System 2</td>
<td>direct thermosyphon system</td>
<td>3</td>
<td>200</td>
<td>67</td>
<td>32</td>
<td>10.7</td>
<td>64</td>
<td>21.2</td>
<td>14.0</td>
<td>30.6</td>
<td>140</td>
<td>47</td>
<td>723</td>
</tr>
<tr>
<td>System 3</td>
<td>pumped system (energy meter is installed in secondary circle)</td>
<td>160</td>
<td>30,000</td>
<td>188</td>
<td>1,246</td>
<td>7.8</td>
<td>1,916</td>
<td>12.0</td>
<td>22.4</td>
<td>43.1</td>
<td>15.748</td>
<td>98</td>
<td>72.133</td>
</tr>
<tr>
<td>System 4</td>
<td>pumped system (energy meter is installed in secondary circle)</td>
<td>72</td>
<td>6,400</td>
<td>89</td>
<td>1,426</td>
<td>19.8</td>
<td>2,309</td>
<td>32.1</td>
<td>9.9</td>
<td>36.8</td>
<td>7.648</td>
<td>106</td>
<td>55.363</td>
</tr>
<tr>
<td>System 5</td>
<td>indirect thermosyphon system</td>
<td>4</td>
<td>300</td>
<td>75</td>
<td>31</td>
<td>7.9</td>
<td>59</td>
<td>14.8</td>
<td>16.3</td>
<td>40.5</td>
<td>523</td>
<td>131</td>
<td>3.050</td>
</tr>
<tr>
<td>System 6</td>
<td>pumped system (energy meter is installed in secondary circle)</td>
<td>99</td>
<td>8,000</td>
<td>81</td>
<td>695</td>
<td>7.0</td>
<td>1.125</td>
<td>11.4</td>
<td>18.2</td>
<td>34.8</td>
<td>6.191</td>
<td>63</td>
<td>29.868</td>
</tr>
<tr>
<td>System 7</td>
<td>direct thermosyphon system with evacuated tubes</td>
<td>8</td>
<td>400</td>
<td>50</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>2.901</td>
</tr>
</tbody>
</table>

* this values can't be monitored because of the special design of a direct thermosyphon system with evacuated tubes
48 Training Courses – 1317 Participants

Nine “train the trainer courses” for professionals were carried out in the partner countries. A total of 400 persons participated the nine courses.

30 dissemination courses with a total of 701 participants were organized by the project partners. 17 of these courses took place in South Africa, three in Windhoek (Namibia), three in Maputo (Mozambique) and 7 courses took place in Harare (Zimbabwe).

Nine workshops for political decision makers and administration with a total of 216 participants were carried out.
Training Courses
Test Facility at Stellenbosch University
Training Trailer for REEEI in Namibia
Installation of Demonstration Systems at Social Institutions

A total of 60 solar thermal systems with a total collector area of 668 m² were installed and handed over to the social institutions.
60 Demonstration Systems

Pumped system at Meerhof School, South Africa

Baphumelele Childrens Home, South Africa
60 Demonstration Systems

Kestell Orphanage, South Africa

Nuwerus Home for the aged – Worcester, South Africa
60 Demonstration Systems

Pumped system - home of retired sisters, Zimbabwe

Direct thermosyphon system at Makumbi visitation high school, Zimbabwe
60 Demonstration Systems

Anglican Medical Services, St Mary’s Health Centre, Namibia

Ndlavela Hospital, Maputo, Mozambique
Awareness Activities

Southern African Solar Thermal Training and Demonstration Initiative "SOLTRAIN"

Country Market Reports

AEE - Institute for Sustainable Technologies
Gleisdorf, February 2010

Welcome the sun into your home

Solar water heating

A SOLTRAIN project

www.aee-intec.at AEE - Institut für Nachhaltige Technologien
SOLTRAIN II - Duration

November 2012 - February 2016
SOLTRAIN II – Lessons learnt

Framework conditions are very different in each county
- Knowledge at institutions of higher education
- Knowledge of installers (basic to excellent)
- Political support (Namibia, South Africa versus Mozambique)
- Quality control (SABS in SA, none in other counties)
- Possibilities of local production
- Awareness of the population

SOLTRAIN II (diversification - but joint goals)
- Adjusted work program for each country
- SA: Advanced training on solar air conditioning and industrial applications
- NAM, ZIM and Mozambique: Combination of practical and theoretical training
- Different focus on demonstration systems
SOLTRAIN II includes four major activities

1. Focused awareness campaigns
2. Centres of Competence
3. Solar Thermal Technology Platforms
4. Solar thermal Demonstration Systems
1. Focused **awareness campaigns** on solar thermal systems to inform all relevant stakeholders and the interested population about the different applications of solar thermal energy and the related impact on security of energy supply, poverty, employment and on the environment.
Awareness Campaign - Trade Fairs

Up to now: Participation at 10 trade fairs
TV and radio and other PR
Work Package 2 - Awareness Campaign
Annual Market Survey - Solar Statistics
Annual Market Survey - Solar Statistics

Cumulated Installed Capacity
Glazed Water Collectors (FPC and ETC)

- South Africa
- Namibia
- Zimbabwe
- Mozambique

www.aee-intec.at  AEE - Institut für Nachhaltige Technologien
Annual Market Survey - Solar Statistics

Cumulated Installed Capacity per 1,000 inhabitants
Glazed Water Collectors (FPC and ETC)

- South Africa
- Namibia
- Zimbabwe
- Mozambique

www.aee-intec.at  AEE - Institut für Nachhaltige Technologien
The 2nd activity is to implement a sustainable institutional structure and focal points for solar thermal information, training, support for industry and policy as well as for applied research.

These Centres of Competence will be implemented in institutions of higher education in each country.

Centres of Competence

CRSES, UEM, REEEI and SESSA
In total: 13 “train the trainer courses” for professionals with a total of 624 participants were carried out in the partner countries. 41 dissemination courses with a total of 925 participants were organized by the project partners. Also 11 workshops for political decision makers and administration with a total of 292 participants were carried out.
Training systems at the educational institutions
Demonstration systems at the educational institutions
Training system at BBCDC in Lesotho
Centres of Competence (2)

The CoC’s in South Africa (CRSES) and Namibia (REEEI) are also going to carry out *workshops with banks/finance institutions* in order to find out the interest and possibilities to finance solar thermal systems (e.g. micro financing schemes and revolving funds).
The 3rd major activity is the establishment and implementation of “Solar Thermal Technology Platforms” (STTP) into all Centres of Competence in Namibia, Mozambique.

These platforms will be cross linked to a Southern African Solar Thermal Technology Platform in order to enhance the information exchange and the cooperation between the platforms.
The national STTP’s include all stakeholders (companies, higher education as well as administration and policy) who make a positive input in improving growth of solar thermal applications in all relevant sectors. The STTPs are going to prepare a national Solar Thermal Roadmap and implementation plan for each participating country and should act as the relevant entity for decision makers when it comes to support measures in terms of technical solutions, subsidy schemes or research and dissemination activities for solar thermal systems.
Assistance to local producers

Locally manufactured tanks and locally assembled collectors in Zimbabwe
Support to local companies

Zimbabwe
Demonstration systems

To show and demonstrate the different solar thermal applications “flag ship sites or districts” will be established after consultation with policy, local authorities or NGO’s.

The idea of “flag ship sites or districts” is to have several systems for different applications at different eligible institutions installed relatively close together (one village, town or small region).
Flag-ship Demonstration Districts

Work Package 5 – Demonstration Systems

Namaacha
80 km

Marracuene
40 km

Inhaca Island
50 km

Boane
40 km

Vocational School
15 km

Namibia
Demonstration systems

In order to apply the knowledge gained at the training courses solar demonstration systems

A total of 100 solar thermal systems were installed and handed over to social institutions and small enterprises
<table>
<thead>
<tr>
<th><strong>Beneficiary:</strong></th>
<th>Huis Horison, Employment Centre for Disabled</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Address:</strong></td>
<td>1 Patrys Street, Stellenbosch</td>
</tr>
<tr>
<td><strong>Installer:</strong></td>
<td>Natural Dynamics</td>
</tr>
<tr>
<td><strong>Solar Thermal System</strong></td>
<td>1 system</td>
</tr>
<tr>
<td></td>
<td>Installed Collector area: 18.4 m²</td>
</tr>
<tr>
<td></td>
<td>Hot water storage volume: 1,000 l</td>
</tr>
<tr>
<td></td>
<td>Application: Domestic hot water</td>
</tr>
<tr>
<td></td>
<td>System type: Pumped</td>
</tr>
<tr>
<td><strong>Date of installation:</strong></td>
<td>8-12 July 2013</td>
</tr>
<tr>
<td><strong>Date of commissioning:</strong></td>
<td>12 July 2013</td>
</tr>
<tr>
<td><strong>Date of quality check:</strong></td>
<td>2 August 2013</td>
</tr>
</tbody>
</table>

*financed by*

Austrian
Development Cooperation
Beneficiary: Welverdiend Retirement Village
Address: Corner of De Oewer & Stellenberg Rd
        Bellair, Cape Town
Installer: Deacons Solar

Solar Thermal System
1 system
Installed Collector area: 50 m²
Hot water storage volume: 3x2,000 l
Application: Domestic hot water
System type: Pumped

Date of installation: November 2013
Date of commissioning: 29 November 2013
Date of quality check: 22 November 2013

financed by
Austrian Development Cooperation
<table>
<thead>
<tr>
<th><strong>Beneficiary:</strong></th>
<th>Bergridge Park Retirement Village</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Address:</strong></td>
<td>c/o Edison Drive and Firgrove Way, Meadowridge Cape Town</td>
</tr>
<tr>
<td><strong>Installer:</strong></td>
<td>Solaheat – Div of Solaheat Services CC</td>
</tr>
<tr>
<td><strong>Solar Thermal System</strong></td>
<td>3 systems</td>
</tr>
<tr>
<td></td>
<td>Installed Collector area: 11.22 m²</td>
</tr>
<tr>
<td></td>
<td>Hot water storage volume: 900 l</td>
</tr>
<tr>
<td></td>
<td>Application: Domestic hot water</td>
</tr>
<tr>
<td></td>
<td>System type: Indirect thermosyphon system</td>
</tr>
</tbody>
</table>

Date of installation: 31 August 2013
Date of commissioning: 31 August 2013
Date of quality check: 16/10/2013
**Beneficiary:** Mzuri Sana Farm (Plant 2)

**Address:** Tarisa Road, Ruwa, Zimbabwe

**Installer:** Sunex Solar Systems/Moderate Air

**Solar Thermal System**
- 1 system
- Installed Collector area: 16 m²
- Hot water storage volume: 1,000 l
- Application: Staff showers on a chicken farm
- System type: Direct thermosyphon system

**Dates:**
- Date of installation: 13-17/01/14
- Date of commissioning: 27/01/14
- Date of quality check: 27/01/14

*financed by*

**Austrian Development Cooperation**
**Beneficiary:** Fambidzanai Permaculture Centre

**Address:** 4 Dovedale Road, Mount Hampden, Harare

**Installer:** SUNEX SOLAR SYSTEMS P/L

**Solar Thermal System**

- 1 system
- Installed collector area: 8 m²
- Hot water storage volume: 500 l
- Application: Shower block and kitchen
- System type: Direct thermosyphon system

**Date of installation:** 5/11/2013
**Date of commissioning:** 11/12/2013
**Date of quality check:** 11/12/2013

**Financed by:**
60 m² system
Flanking measures for a successful deployment

Coherent strategy to promote solar thermal

- Training
- R & D
- Ambitious targets
- Demonstration projects
- Awareness raising
- Financial incentives
- Regulations
Thank you for your attention