



2nd Progress Report

SOLTRAIN – Phase IV

Southern African Solar Thermal Training
and Demonstration Initiative

Project: OEZA-Vertrag 2608-00/2019

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2nd Progress Report

SOLTRAIN – Phase IV

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Implemented by:



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1 Summary

1.1 Aims and goals of the project

The SADC region faces a huge power deficit due to low investment in the power sector. This is illustrated by the long-standing power supply crisis in southern Africa. In South Africa widespread rolling blackouts began in 2007 and continues to this day as supply falls behind demand. South Africa experienced its worst energy crisis, when Load Shedding Stage 6 activated for the first time ever in December 2019¹. Eskom stated that of its total nominal capacity of around 44,000 MW, it was unable to provide around 13,000 MW of total capacity, resulting in the nationwide blackouts².

In addition, in South Africa for example, 80% of the electricity is generated from coal³. In all countries that are part of the Southern African Power Pool (SAPP), the share of thermal coal-fired power plants is 61%⁴.

The recurring interruptions in the power supply throughout the SADC region are a major threat to the economic growth. Since a considerable share (40-50%) of the electricity generated, is converted into heat in the industrial, commercial and residential sectors, the use of solar water heaters could be a major contributor to the reduction of electricity use, with resulting environmental benefits such as reduced CO₂ emissions. SADC member states have excellent solar irradiation with more than 2,000 kWh/m² annual radiation and estimates from the International Energy Agency (IEA) suggest that solar thermal systems could meet about 70 – 80% of the regions low-temperature heating and cooling demand.

For these reasons, SOLTRAIN is designed to support and contribute towards the implementation of energy policies of the target countries that enhance the use of solar thermal systems. Energy poverty negatively affects the circumstances of large numbers of people, generally, and particularly in the SADC Member States. There are close links between energy supply and practically all aspects of sustainable development, such as access to water, agricultural and industrial productivity, health care, education, job creation, environmental pollution and climate change.

The focus of SOLTRAIN is to contribute towards reducing energy poverty by improving access to sustainable energy technologies, specifically solar thermal solutions, and thus directly contributing to the realisation of SDG 7 and indirectly to SDG 1, SDG12 and SDG 13⁵.

¹ Nkanjeni, Unathi (10 December 2019). "Stages 6 to 8 load-shedding: What it means and how it affects you". Times Live. Retrieved 2020-04-05.

² Moneyweb. 2019-12-09. Retrieved 2019-12-17.

³ <https://www.usaid.gov/powerafrica/south-africa>

⁴ SAPP Annual Report, 2019

⁵ <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

started in 2009 and is currently in its fourth phase of cooperation with partner institutions in Botswana, Lesotho, Mozambique, Namibia, South Africa, Zimbabwe and SADC Centre for SOLTRAIN Renewable Energy and Energy Efficiency (SACREEE).

In the first three phases, approximately 3,000 people were trained in 110 training courses and 326 solar thermal systems ranging from 2 to 600 m² collector area, per system, have been installed.

In order to support broad rollout programmes of solar thermal systems in all six participating countries, Solar Thermal Roadmaps and Implementation Plans were developed during SOLTRAIN Phase III in broad stakeholder processes in close cooperation with policy-makers (ministries and governmental bodies).

The logical step in Phase IV, is to support the countries in the implementation of these Solar Thermal Roadmaps and Implementation Plans. This is being done in a medium-term process, in close coordination with the renewable- and solar energy policy-makers of the partner countries.

SOLTRAIN – Phase IV focusses on five major areas:

Support political stakeholders with the implementation of the Solar Thermal Roadmaps and Implementation Plans that were published after a broad stakeholder process in all partner countries.

Increase technical skills by carrying out a number of training courses targeted at different levels and stakeholder groups in the value chain of solar thermal technology.

Raise awareness of the potential of solar thermal technologies by using targeted campaigns. In this way the relevant stakeholders and the public are made aware of the wide range of application areas for solar thermal systems. Awareness rising also includes showing the benefits of solar thermal systems with respect to energy supply, poverty alleviation, job creation and the protection of the natural environment.

Strengthen institutional structures that can offer expert advice, training and technical support to the local industry and politicians.

Support the solar thermal technology platforms that were established in the previous phases: Similar to the European technology platforms, these platforms include all key stakeholders and sectors that influence the general conditions of how to accelerate the dissemination and use of solar thermal systems. These platforms act as an interface between the local companies and the relevant

governmental institutions in order to speed up the broad implementation of solar thermal technologies.

Demonstrate that solar thermal technology works: SOLTRAIN will set up solar thermal demonstration plants in order to apply the knowledge taught in the training programs to installers, students and politicians. Both smaller and larger plants will be set up at social institutions and at small and medium enterprises, where they will contribute to water heating, cooling and the generation of process heat.

Target groups:

The target groups (or direct beneficiaries) consist of about **1,200 participants at different training courses.**

The beneficiaries are staff members, occupants, and patients of social institutions, students, guests of tourism facilities like lodges and hotels, as well as small and medium enterprises. At these institutions about 100 demonstration systems of different sizes and for different applications are planned to be installed. It is estimated that **about 7,000 persons** will directly benefit from these demonstration systems by reducing their energy bills and by improving the standard of hygiene.

The local partners in the six SADC member states are:

- the Clean Energy Research Centre at the University in Botswana
- the Solar Industries Association of Botswana (SIAB)
- the Bethel Business and Community Development Centre in Lesotho
- the Namibian Energy Institute at the Namibian University of Science and Technology in Namibia
- the National Company for Science and Technology Parks in Mozambique
- the National University of Science and Technology in Zimbabwe and
- the Centre for Renewable and Sustainable Energy Studies (CRSES) at Stellenbosch University and the South African National Energy Development Institute (SANEDI) in South Africa.
- SADC Centre for Renewable Energy and Energy Efficiency (SACREEE).

The installers of solar thermal systems (small and medium enterprises) will be supported by the optimisation and improvement of solar thermal systems. Furthermore, the major training activities are targeted to this group in order to build or to improve their skills in the design, installation, commissioning and maintenance of solar thermal systems. As for the companies who already participated in previous phases of SOLTRAIN, the cooperation will be intensified, as it can be built on already acquired skills. Based on the experience of the previous phases of SOLTRAIN, about 15 – 20 small and medium enterprises are expected to be active in the installation of the demonstration systems.

Results and expected outputs of Phase IV

- 1,200 persons will be trained in 90 training courses in the design, installation, maintenance and quality assurance of solar thermal systems
- 24 site visits with 250 participants will be carried out to show the potential and results of the operation of solar thermal systems
- 6 national Solar Thermal Roadmaps (one per country) are under implementation
- 6 annual solar thermal statistical data reports (one per country) are available
- 100 solar thermal demonstration systems for various applications installed, in operation and quality checked and
- at least 2,500 MWh of electricity saved and 430 tons of CO₂ emissions avoided annually.

1.2 Interim results and highlights of 2020

This chapter provides the highlights of the year 2020 and a brief summary of the work carried out since the commencement of the project in July 2019. A detailed description of all activities is given in chapter 3.

In general, it can be reported that the project is well on track and the schedule was largely met despite the Corona-related restrictions in 2020.

The following table shows the goals achieved by December 2020. In the right column, all those goals that are fully on schedule are shown in **GREEN**. The **ORANGE** marked targets are those where the schedule could not be fully met, but the delay is not critical. The percentage indicates the share of the respective targets that have been achieved by the end of 2020.

Table 1: Results achieved by December 2020, based on the indicators defined in the project document

Indicators of expected outputs <u>by the end</u> of the project	Achieved by Dec. 2020	
Work Package 1 - Solar Thermal Roadmap Implementation		
24 Policy Workshops carried out	12	50%
Participation at 24 trade fairs (4 by each partner)	5	20%
42 information workshops for private and public sector (6 by each partner)	11	26%
Work Package 2 - Training		
13 Train the Trainer courses carried out	13	100%
15 persons trained in the dual training program	3	20%
10 training courses for VTCs organized	1	10%
7 training courses for artisans from the private and public sector organized	2	29%
Three specialized courses for professionals carried out	1	33%
38 dissemination courses carried out	7	18%
Set of 4 short training videos on solar thermal	2	50%
6 advanced courses for quality inspectors carried out	0	0%
Solar Trailer for the National University of Lesotho	delivered in Feb. 2021	
Work Package 3 - Demonstration Projects		
100 Solar thermal demonstration systems approved	38	38%

100 Solar thermal systems installed, in operation and quality checked	6	6%
32 technical tours carried out	2	6%
Installed demonstration systems documented on the SOLTRAIN Web-site	6	6%
Work Package 4 - Quality Control, Maintenance, and Monitoring		
Quality checks carried out for all installed systems	6	6%
Monitoring reports for all monitored systems	0	0%
Work Package 5 - Awareness Raising and Dissemination of Results		
14 SOLTRAIN Newsletters published	5	36%
Redesign of the SOLTRAIN website	done	100%
10 articles in newspapers and journals	17	170%
3 SOLTRAIN conference organized	0	0%
20 student projects funded	8	40%
20 papers or posters for national and international conferences	2 due to Covid-19	10%
Work Package 6 - Management		
Kick-off meeting organized and carried out	done	100%
3 Annual progress and financial reports	2	66%
6 Steering committee meetings	10 ⁶	166%
Mid-term review	11/2021	
Final project evaluation	11/2022	
Final project completion and financial report	03/2023	

1.2.1 Highlights 2020

A total of **959 people took part in the 46 trainings and workshops** carried out until the end of 2020.

By end of December 2020, applications for a total of 47 **solar thermal demonstration systems** were submitted. 39 of these systems were approved for funding by the steering committee by end of December 2020.

31 or 79% of the approved solar demonstration systems will be used in institutions that **support women and marginalized groups**. Applications range from dormitories for female students to a training centre for the San community in Namibia and a maternity clinic in Zimbabwe. Another four systems will be installed at hospitals.

Six of the solar thermal demonstration systems approved by the end of 2020 have been constructed and are in operation.

The largest project that SOLTRAIN supported with the installation of solar systems is the Melville Place Residential Development, which is being built for low-income families in Cape Town. There, 18 solar systems with a total collector area of 343 m² have been installed by December 2020. Five more systems will follow in 2021.

⁶ Since physical meetings of all project partners were not possible due to the corona pandemic in 2020, it was decided to hold monthly steering committee meetings to maintain momentum in the project. This means that the frequency of Steering Committee meetings has been significantly increased compared to planning.



Figure 1: Solar water heating systems at the Melville Place Residential Development

Another highlight was the cooperation with the Osona Village project in Namibia. There, 10,000 homes will be equipped with solar thermal systems in the coming years. SOLTRAIN supports the OSONA Village project with training of installers, monitoring and quality control.

Electricity (Solar Water Heating) Regulation in Zimbabwe

An initial outgrowth of the Solar Thermal Roadmap and Implementation Plan was the Electricity (Solar Water Heating) Regulation, which took effect in Zimbabwe in November 2019. This regulation was developed with the significant participation of the SOLTRAIN partners from Zimbabwe and is mainly based on the recommendations of the Solar Thermal Roadmap and the Implementation Plan.

Gleisdorf, Gaborone, Harare, Johannesburg, Stellenbosch, Maputo, Windhoek,
Mt. Moorosi

February 2021

2 Background and Project Structure

The United Nations estimates that more than 1.3 billion people worldwide live without access to electricity. On the African continent alone, 500 million people live without electricity. Because of this, stoves are fuelled with waste wood and dung to cook meals, most often without a chimney or adequate smoke vent. This has serious adverse health effects. Three billion people worldwide don't have access to clean, healthy cooking facilities. In the world's poorest countries, 90% of household energy is obtained from wood, coal, livestock dung and agricultural residues.

The SADC region has high levels of poverty, marginalization, and inequality. An estimated 70% of the population in the region lives below the international poverty line of US\$ 2 per day, while 40% of the region's population, or 76 million people, live below the international poverty line of US\$ 1 per day (SADC 2010).

The Human Poverty Index (HPI), which measures the level of people's access to public and private resources such as health care, safe water, and food to enable a long and healthy life, is quite low in the SADC region. There are no SADC countries in the very high human development category. Seven of the 16 SADC countries are considered to be the most unequal societies in the world with high Gini-Coefficients.

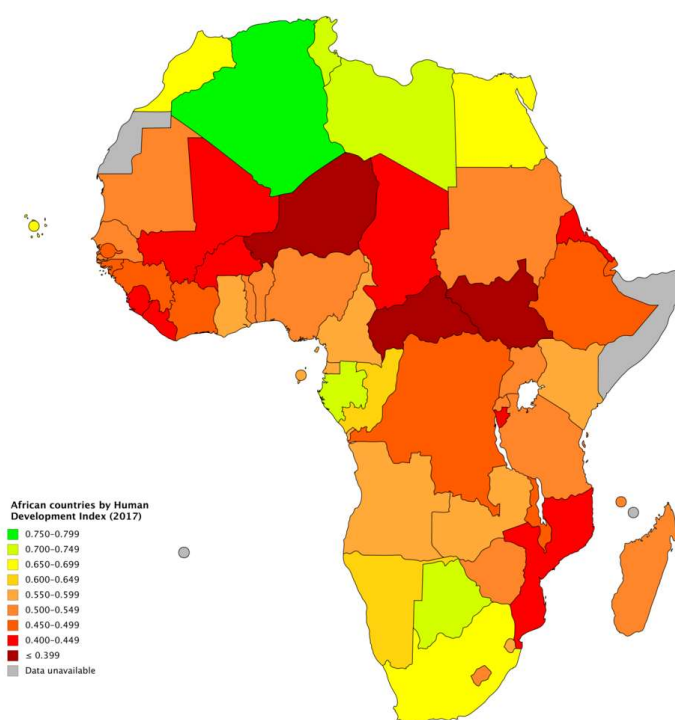


Figure 2: Human Development Index for African countries⁷

⁷ UNDP (2018), Human Development Report

The gross domestic product (GDP) per capita of the SADC region stood at US\$ 1,834 in 2016 representing a significant nominal decrease of 7.2% compared to US\$ 1,976 in 2015. When looking at individual countries, however, the difference is huge. Seychelles has the highest GDP per capita (US\$ 15,144) estimate, whilst Malawi has the lowest at US\$ 317 in 2016. The SADC Region registered an annual inflation rate of 10.0% in December 2017 compared with December 2016 as measured by the SADC Harmonised Consumer Price Indices (HCPI).

There is also insufficient and uneven access to electricity in the SADC region, with an average access of 42% overall and only 10% in rural areas. This is an ongoing energy deficit on the one hand and there is a pressing need to mitigate climate change on the other hand. This dilemma can only be overcome through the increased use of renewable energies. Therefore, there is a need of an increased awareness of the huge potential for renewable energy and energy efficiency development.

The SADC region is blessed with abundant renewable energy resources (hydropower, solar, wind, bioenergy...) as well as with opportunities for energy efficiency. Renewable energy already accounts for 30% of power generation⁸ in the member countries of the Southern African Power Pool and this figure could rise to 60% under favourable policy scenarios.

SADC's renewable energy market potential is promising for accelerating economic growth, poverty alleviation and regional integration, which are the pillars of the SADC's Revised Regional Indicative Strategic Development Plan (RISDP 2015-2020). The SADC Renewable Energy and Energy Efficiency Strategy and Action Plan (REEESAP) is an important and regional coherent commitment towards developing renewable energy and energy efficient technologies and services aligned with the UN Sustainable Energy for All Initiative (SE4All) and the SDGs, particularly SDG 7.

Even more challenging, is the implementation of the agreement on global warming reached at the UN climate change conference in Paris, in December 2015. According to the COP21 agreement, an almost complete phasing out of fossil energy supply is required by 2050. This presents enormous challenges for society, but also offers enormous opportunities to make a global contribution to this change.

In order to achieve the goals stated in the REEESAP and in the COP21 agreement, it is essential to use all available renewable energy sources and technologies also beyond the electricity sector, like the heating and cooling sector.

Heating and cooling include a wide range of end-use applications and technologies. In buildings, it includes cooking, water heating, space heating, ambient cooling, and refrigeration. In industry, besides space heating and cooling, it also includes process heating — from low-temperature applications (e.g. in the food industry) to high-temperature applications (e.g. in the cement, iron and steel industries).

⁸ SAPP Annual Report, 2019, page 26 (21% hydro, 4% solar PV, 3.9% wind, 1% CSP, 0,1% biomass)

Heating and cooling for residential, commercial and industrial purposes account for about 50% of the worldwide overall final energy demand.

Since a considerable share of electricity in the SOLTRAIN Partner countries is used for converting electricity into low-temperature heat like domestic hot water or low-temperature heat in the food and beverage industry, solar water heaters would be a major significant contributor to the reduction of electricity demand as well as the reduction of running costs for households, social institutions, small tourism facilities, SME's and others.

African countries have excellent annual solar irradiation, which is between 1,800 kWh and 2,400 kWh per year and estimates from the International Energy Agency (IEA) suggest that solar thermal systems could meet about 70 – 80% of the region's low-temperature heating and cooling demand.

2.1 Strategic Approach and Methodology

Phase IV of the SOLTRAIN project is based on the national and regional governmental targets as well as on the results and lessons learned in the previous phases of SOLTRAIN.

One focus of SOLTRAIN is to contribute to the reduction of energy poverty by improving access to solar water heating systems and, where required, also to space heating and thus reducing the expense for fuels. Due to training, support of local production, assembly and maintenance, jobs and income can be also be created as an indirect output of SOLTRAIN.

In comparison to electrical water heating systems or firewood, there are no running costs or labour needed over the lifetime of a solar thermal system. The household expenses or labour saved for preparing hot water can be used for education or other important things to improve daily life.

By creating income in different sectors (training, manufacture, assembly, installation, maintenance...) and reducing the running cost, poverty, in general, can be reduced.

As improving access to modern energy is only one factor in efforts to reduce energy poverty, another aspect of SOLTRAIN is to increase the affordability of solar thermal systems. Therefore, workshops are carried out to assess the possibility of financing of solar thermal systems by banks, for instance with gender-responsive micro-financing schemes.

The overall approach, and the elements of the project, are illustrated in the figure below. This figure illustrates the elements needed for a broad, successful and

sustainable implementation of solar thermal systems. Ambitious targets have been set in well-defined solar thermal roadmaps. Based on these targets, a comprehensive training program on all educational levels was defined. The trained persons have to apply their knowledge first with demonstration systems, to prove that they understood the content of the training.

In order to be successful in broad implementation, financial incentives are necessary for most countries. This has to be provided by banks or by the state. Regulations are essential when it comes to quality control and warranties. Last but not least, awareness campaigns are necessary in order to inform the public about the benefits of the technology and national research and development capacities (R&D) have to be built up if support of local production is to be established. At these awareness campaigns, a special focus is on a gender sensitive approach e.g. avoiding gender stereotypes.

The elements reflected in the work program of phase IV are shown in the following figure.

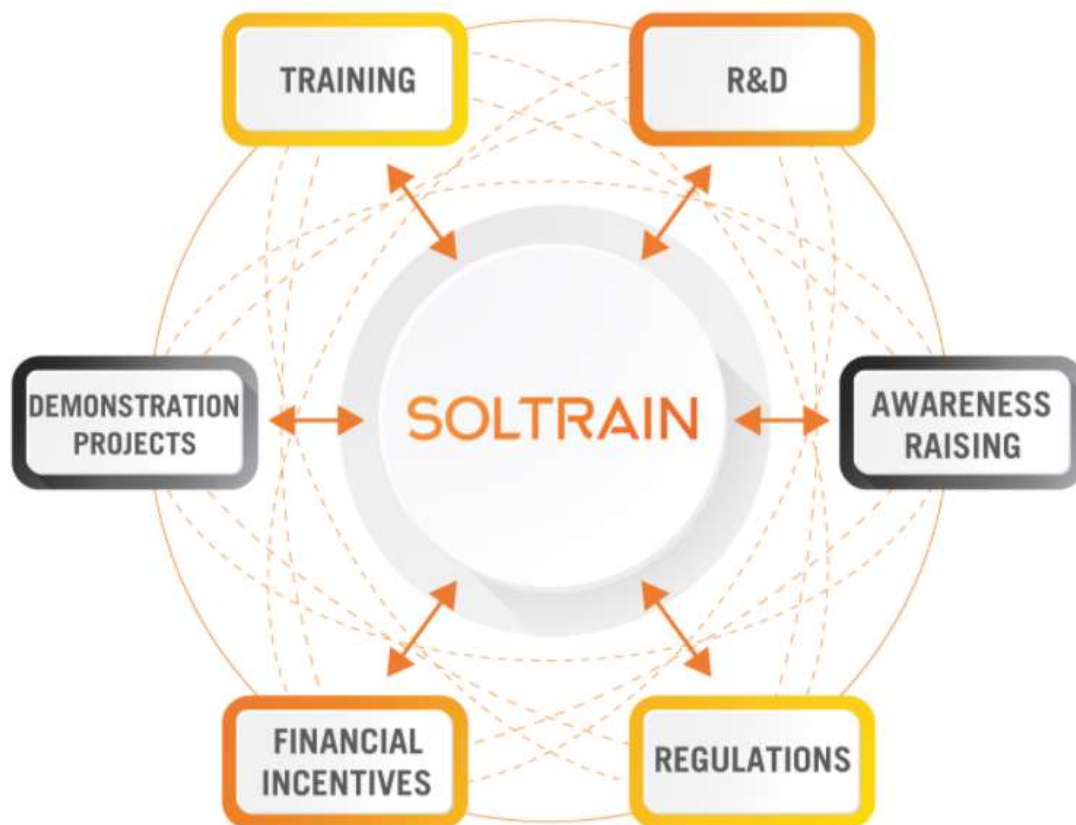


Figure 3: Elements of the project

The planned impact of SOLTRAIN – Phase IV is a contribution to improved energy access and security, in particular, solar thermal, while mitigating global climate change and poverty reduction.

The focus of the training on medium-scale solar thermal applications will significantly broaden the application area from small-scale solar water heating systems in the residential sector to medium-scale systems for hotels, student hotels, hospitals, and other social institutions, including large-scale systems for the commercial and industrial sectors.

This will be done on the basis of the Solar Thermal Roadmaps, which were developed in stakeholder processes in phase III. Therefore, phase IV is a logical next step concerning the implementation of the roadmaps and to support roll-out programs based on training and quality measures provided in SOLTRAIN so far.

The planned demonstration systems will prove the performance of solar thermal systems and the related energy and CO₂ savings in new applications, and also in small-scale applications for social housing programs of the countries.

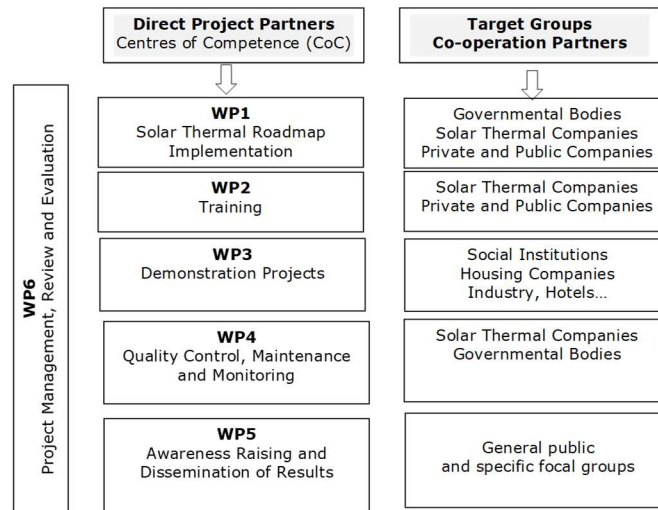
To strengthen the ownership and responsibility for solar thermal demonstration projects, it is foreseen that the beneficiaries will be required to contribute to the system cost with at least 50%. With this measure, it is intended to increase the probability that the solar thermal systems (including running costs) are maintained after the end of the project.

In order to support gender mainstreaming, a special sensitivity is on the invitation of female participants to attend training courses and participate in student projects. In addition, in calls for applications for solar thermal demonstration systems, a special focus is on institutions which support women and marginalised groups.

2.2 Activities and Methodology of Implementation

The activities of the project are split into 6 work packages. In general, all work packages are targeted on all project partners and all related partner countries. Due to the different states of the solar thermal market penetration as well as the very different political awareness and support in each partner country, the concrete work to be carried out in the partner countries is adjusted to the needs of the countries and is thus be quite different.

Figure 2 shown below gives an overview of the work package structure



Direct project partners (also called “Centres of Competence” in the previous phase of SOLTRAIN) are those who have a contractual relationship with the project. These partners are listed under “regional project partners” on page 1 and 2 of this project document.

Figure 4: Overview of the Work Packages Structure

2.3 Structure of the overall project

The structure of the internal organisation is shown in the following figure:

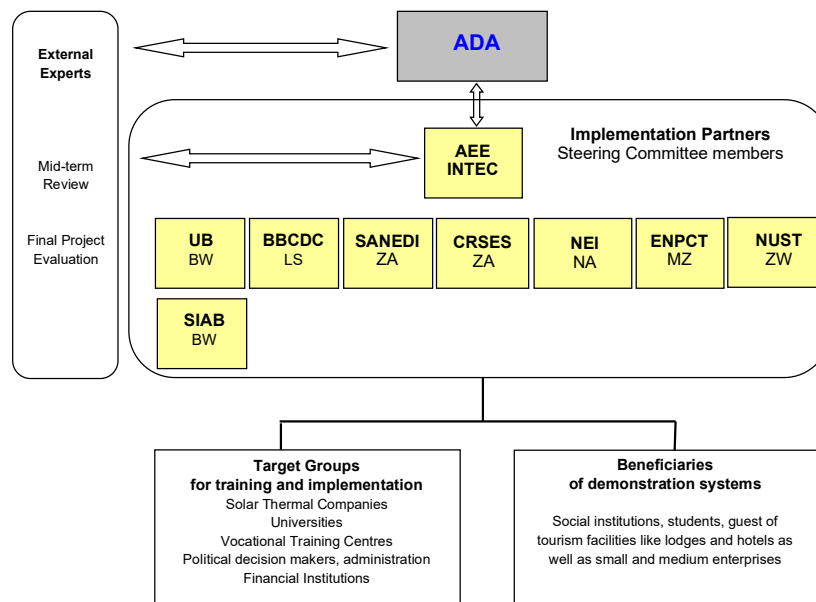


Figure 5: Structure of the internal project organization

2.4 Duration of the project

1 July 2019 – 31 December 2022

3 Work carried out

Work that was carried since the start of the project, is described in the following chapters. The reporting structure follows the structure of the work packages (WPs) as described in the project document.

3.1 Work Package 1 - Solar Thermal Roadmap Implementation

The goal of this work package is to support governments, solar thermal companies and other relevant stakeholders in the partner countries to realise the goals of the Solar Thermal Roadmaps, which were developed in Phase III of the project. The specific goal is to support the accelerated installation of solar thermal systems in all countries.

3.1.1 Support for the implementation of the solar thermal roadmaps

One focus in this work package up to now was the preparation and implementation of policy workshops with the aim to support responsible ministries with the development of concrete political measures for the Roadmap implementation.

As most of the project partners have a technical background, it was decided to team up with the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE), whose mandate is to facilitate market-based adoption of renewable energy and energy efficiency technologies and services in the SADC region.

The preparation and implementation of the first two series of policy workshops was therefore carried out in close co-operation between SACREEE, AEE INTEC and the respective project partners in each country.

The first series of policy workshops, held in January and February 2020, took place physically. At these workshops, representatives of AEE INTEC (Werner Weiss) and SACREEE (Kudakwashe Ndhlukula) were present in addition to the national participants.

Due to the Corona virus (COVID-19) travel and meeting restrictions, the Policy Workshops were held as hybrid workshops starting in June 2020. That is, participants from the respective partner countries met physically in a conference room in compliance with COVID-19 regulations. The representatives of SACREEE and AEE INTEC were present via a live internet link.

Despite this hybrid setting, good discussions were possible with all participants.

The following 12 policy workshops were held until the end of December 2020.

Table 2: Policy workshops that have been held so far

Workshop	Date	Venue	No. of Participants		
			male	female	total
1 st Workshop – Namibia	23 January 2020	Windhoek, Namibia Hotel School	20	8	28
1 st Workshop – Lesotho	28 January 2020	Maseru, Lesotho Avani Lesotho Hotel	17	14	31
1 st Workshop – South Africa - Gauteng	30 January 2020	Pretoria, South Africa Tsogo Sun Hotel Arcadia	8	6	14
1 st Workshop – South Africa – Western Cape	3 February 2020	Cape Town, South Africa Workshop17 Watershed, 17 Dock Road, V&A Waterfront	12	2	14
1 st Workshop – Zimbabwe	6 February 2020	Harare, Zimbabwe Holiday Inn Hotel	13	7	20
1 st Workshop – Botswana	9 Sept. 2020	Gaborone, Botswana University of Botswana	26	3	29 (18/11) ⁹
1 st Workshop – Mozambique	10 Sept. 2020	Maputo, Mozambique Complexo Kaya-Kwanga	13	5	18 (16/2)
2 nd Workshop – South Africa – Western Cape	17 Nov. 2020	Cape Town, South Africa Workshop17 Watershed, 17 Dock Road, V&A Waterfront	5	5	10 (8/2)
2 nd Workshop – Namibia	23 Nov 2020	Hotel School Windhoek, Namibia	15	13	28 (20/8)
3 rd Workshop – Zimbabwe	24 Nov. 2020	Harare, Zimbabwe Holiday Inn Hotel	8	4	12 (8/4)
2 nd Workshop – Lesotho	25 Nov. 2020	Maseru, Lesotho Avani Lesotho Hotel	10	7	17 (15/2)
Total			147	74	221

The percentage of female participants was 33%.

⁹ (Physical participants / Online participants)

Results of the policy workshops so far

The following summary of the results of the Policy Workshops was prepared by Kudakwashe Ndhluukula (SACREEE).

The 2nd round of workshops for policy makers in the partner countries were held between 17 - 25 November 2020 in South Africa (Western Cape), Namibia, Zimbabwe and Lesotho. The aim of the 2nd policy workshop series was to explore and concretise ways to mobilize funding for the execution of the Solar Thermal Roadmaps and Implementation Plans developed by partner countries. The workshops were held hybrid - both face-to-face and online.

The primary objectives of the 2nd policy workshops were to:

1. Present and discuss progress in the financing and execution of the Solar Thermal Roadmap and Implementation Plans.
2. Present and discuss other important support measures and concrete examples of the implementation of the roadmaps.
3. Discuss other support measures for governmental bodies concerning solar thermal policies for different application groups.

In the next paragraphs, the proceedings and outcomes of the workshops are presented.

South Africa (Western Cape) – 17 November 2020

The Workshop was held on 17 November 2020 with the face-to-face venue being Workshop 17 in the V&A Waterfront, Cape Town. The workshop was attended by representatives from Western Cape Government's (WCG) Departments of Human Settlements and Health as well as representatives from the City of Cape Town Metropolitan Municipality (CCT) and the South African Renewable Energy Business Incubator (SAREBI) and Solarex SA which presented the company's profile and project experiences of solar thermal installations for the local housing sector.

Below are some of the points proposed for next steps until the next policy workshop.

- 1) Need to engage the various units within the City of Cape Town (CCT) municipality to collaborate and ensure harmonized implementation (SOLTRAIN team to engage with CCT)
- 2) Engage with developers and role players in the different market segments, e.g. apartments, complexes, military veterans, commercial and industrial
- 3) Explore various funding avenues both internally and externally
- 4) Organize a meeting/workshop with CCT and various stakeholders and the agenda should include an item on "creating an enabling environment including building regulations for solar thermal". Workshop is planned for February 2021
- 5) Develop a communication strategy for solar thermal (CCT with technical support from SOLTRAIN Team)



Figure 6: Participants of the hybrid policy workshop that took place in Cape Town

Namibia – 23 November 2020

The Workshop was held on 23 November 2020 with the face-to-face venue being at the National University of Science and Technology (NUST) in Windhoek. In attendance included the following organisations; NUST, Ministry of Mines and Energy, Ministry of Finance, Development Bank of Namibia, Electricity Control Board, NamPower, private sector players and many others.

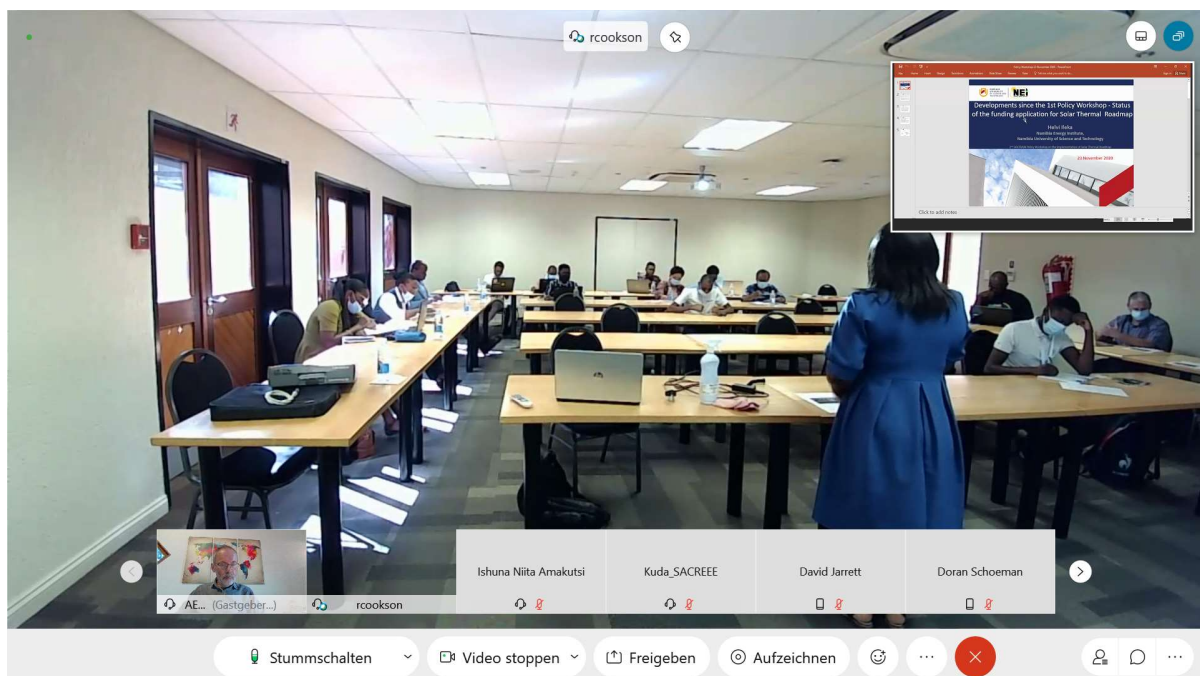


Figure 7: Participants of the hybrid policy workshop that took place in Windhoek, Namibia

Key issues to note from the workshop include:

- Progress on securing funding
- Noted that demand for solar watering from the Government's Solar Revolving Fund (SRF) is very low – highlighting low awareness of solar thermal
- The Government has submitted a proposal to Green Climate Fund (GCF) through the Development Bank of Southern Africa to get concessionary funding to scale up the SRF. In this proposal SRF has proposed to fund 2000 SWH over a 5-year period

Way forward:

- It was proposed to implement the Roadmap in phases. The bankable proposal to be developed should cover a period of 3-5 years of implementation
- It was agreed to involve the Ministry of Finance as well as the National Planning Commission in the development of the Business Plan
- Namibia Energy Institute (NEI) will lead the development of the Business Plan with the support of the Ministry of Mines and Energy (MME). NEI will seek support from other relevant stakeholders
- The Terms of Reference for the Business should be ready by mid-January 2020

Zimbabwe – 24 November 2020

Electricity (Solar Water Heating) Regulation – A first success

An initial outgrowth of the Solar Thermal Roadmap and Implementation Plan was the Electricity (Solar Water Heating) Regulation, which took effect in Zimbabwe in November 2019. This regulation was developed with the significant participation of the SOLTRAIN partners from Zimbabwe and is mainly based on the recommendations of the Solar Thermal Roadmap and the Implementation Plan.

The Statutory Instrument 235 issued on the 8th of November 2019 addresses all property developers, architects, engineers and future users of hot water. The new regulation combines the ban of electric water heaters with a recommendation for solar energy as in this phrase: "No owner of the premises after the effective day of these regulations shall connect electric geysers, but may, at his or her own expense, install and use solar water heating systems".

This was a crucial first step in implementing the Solar Thermal Roadmap. In 2020, the focus was on supporting the government in implementing this regulation. To this end, a total of two policy workshops were held in 2020 with the strong involvement of the Ministry of Energy and Power Development, the Ministry of Environment, Climate Change, Tourism and Hospitality Industry and the Zimbabwe Energy Regulatory Authority (ZERA).

The second policy workshop of the year 2020 was held on 24 November 2020 with the face-to-face venue being at the Holiday Inn hotel in Harare. The meeting was attended by various stakeholders including; Ministry of Energy and Power Development, Zimbabwe Energy Regulatory Authority (ZERA), Renewable Energy Industry Association of Zimbabwe (REIAZ), Department of Climate Change, Ministry of Public Works and Local Government, University of Zimbabwe, National University of Science and Technology (NUST) and others.

The meeting heard that:

- a national sub-committee was established in February 2020 to help establish the implementation modalities of the Solar Thermal Roadmap.
- The sub-committee developed the Terms of Reference (ToRs) to engage a consultant to help develop a bankable document
- The ToRs were developed with the guidance of the Zimbabwe Energy Regulatory Authority (ZERA)
- UNDP Zimbabwe offered to help engage a consultant
- The bankable document should explore and provide options to financing the Solar Thermal Roadmap including through on-bill financing, dedicated credit lines to financial institutions, pension funds, etc
- Other issues to be strengthened before and during the implementation of the Solar Thermal Roadmap include, training, awareness raising, quality standards and quality assurance



Figure 8: Participants of the hybrid policy workshop that took place in Harare, Zimbabwe

Lesotho – 25 November 2020

The Workshop was held on 25 November 2020 with the face-to-face venue at the Avani Lesotho Hotel in Maseru. In attendance were stakeholders from the Department of Energy, National University of Lesotho, the European Union Delegation in Lesotho, Bethel Business and Community Development Centre (BBCDC) and other private sector players.

The meeting heard of the challenges faced by the Lesotho renewable energy sector include the 11% import tax, and prioritisation of water provision ahead of any other service.

The DoE submitted a request to the EU delegation for support in developing a bankable proposal for the implementation of the Solar Thermal Roadmap. The EU delegation then submitted the request to GET-Invest, who have since come back with questions. The DoE has indicated that it is working on providing feedback to GET-Invest questions.

The DoE has finalised the Energy Bill which is before parliament. The Bill will address a number of challenges of the energy sector that have been highlighted, including funding. Additionally, the EU will be exploring the deployment of de-risking tools to the financial institutions targeting the energy sector.

The key takeaways from the workshop include the following:

- (1) The DoE to urgently submit responses to the issues raised by the GET-Invest regarding the bankable proposal
- (2) The SOLTRAIN team to continue exploring and engaging with other local funding possibilities including the power utility (Lesotho Electricity Company), banks, etc
- (3) Continue with awareness raising and training
- (4) Engage with the Department of Trade on the development of quality standards for the solar thermal industry
- (5) Work with the EU on the de-risking instrument to be deployed
- (6) Work with the DoE on the development of the National Energy Efficiency Policy
- (7) The DoE to convene a meeting with the stakeholders at the earliest possible time on the development of a bankable proposal.



Figure 9: Participants of the hybrid policy workshop that took place in Maseru, Lesotho

Direct Impact of the Policy Workshops in Lesotho

A call for tenders for a training program in the field of renewable energies was published in July 2020.

The Government of the Kingdom of Lesotho with the support of the African Development Bank is implementing the Promoting Enterprise Development (PED) Programme to support the promotion of MSME sector growth and development in Lesotho. A key component of the programme is to build the capacity of professional business development service (BDS) providers that will be able to provide their services to the Basotho Enterprise Development Corporation (BEDCO)'s MSME client base.

It has been identified that BDSPs require sector specific training to better serve their MSME clients, especially across the following sectors: Manufacturing, Agribusiness, **Renewable Energy** and Tourism.

The SOLTRAIN partner BBCDC was requested by the Department of Energy to propose a work program for the Renewable Energy sector and submit a bid. These were submitted by the BBCDC to the Ministry of Development Training in December 2020.

Botswana and Mozambique

On the 9th and 10th of September 2020, online the 1st workshop for Policy Makers on Solar Heat were held in Botswana and Mozambique, respectively. The workshops were organised with the partners, Clean Energy Research Centre at the University Botswana and Solar Industry Association of Botswana in Botswana, and Empresa Nacional de Parques de Ciência e Tecnologia E.P. (ENPCT, E.P.) of Mozambique. The workshops were organised with technical assistance from SACREEE and AEE INTEC.

In attendance at the respective workshops were senior officials in the Ministries responsible for Energy, industry associations, development finance institutions and other banks, utilities and other key industry players.

Outcome of the Workshops

In both countries national task forces were set up to develop frameworks for the implementation of the solar thermal roadmaps. The work of the national task forces would be coordinated by the partners, Clean Energy Research Centre at the University Botswana and Solar Industry Association of Botswana in Botswana, and Empresa Nacional de Parques de Ciência e Tecnologia E.P. (ENPCT, E.P.) of Mozambique, the respective countries.

For both countries, the Governments are seeking ways to address the challenges associated with high upfront costs of solar thermal systems as well as those of technical nature like quality installations. The financial institutions are keen to support the roll out of the solar thermal roadmaps but require clear structures that will support their implementation sustainably. The national task forces will prepare and recommend these structures meant to support the implementation of the Solar Thermal Roadmaps.

South Africa (Gauteng)

The 2nd policy workshop for the Gauteng region was postponed to early 2021 due to the COVID-19 situation in the country that affected largely public institutions like SANEDI being dissuaded to convene any public meetings.

3.1.2 Solar thermal campaigns

In order to inform potential customers of solar thermal systems, it is intended to address the different groups. This is done in close co-operation with the direct project partners and the solar thermal companies by:

- Development of target group specific information material.
- Joint participation at trade fairs - joint stands of SOLTRAIN partners (CoC) and solar thermal companies.
- Display of the solar trailer at general public awareness events targeting at different potential user groups.

Information brochures

During the reporting period, information brochures were completed for the following target groups.

- Policy
- Accommodation
- Tourism
- Health care sector
- Industry

The target groups were defined during the Steering Committee meeting on December 3, 2019.

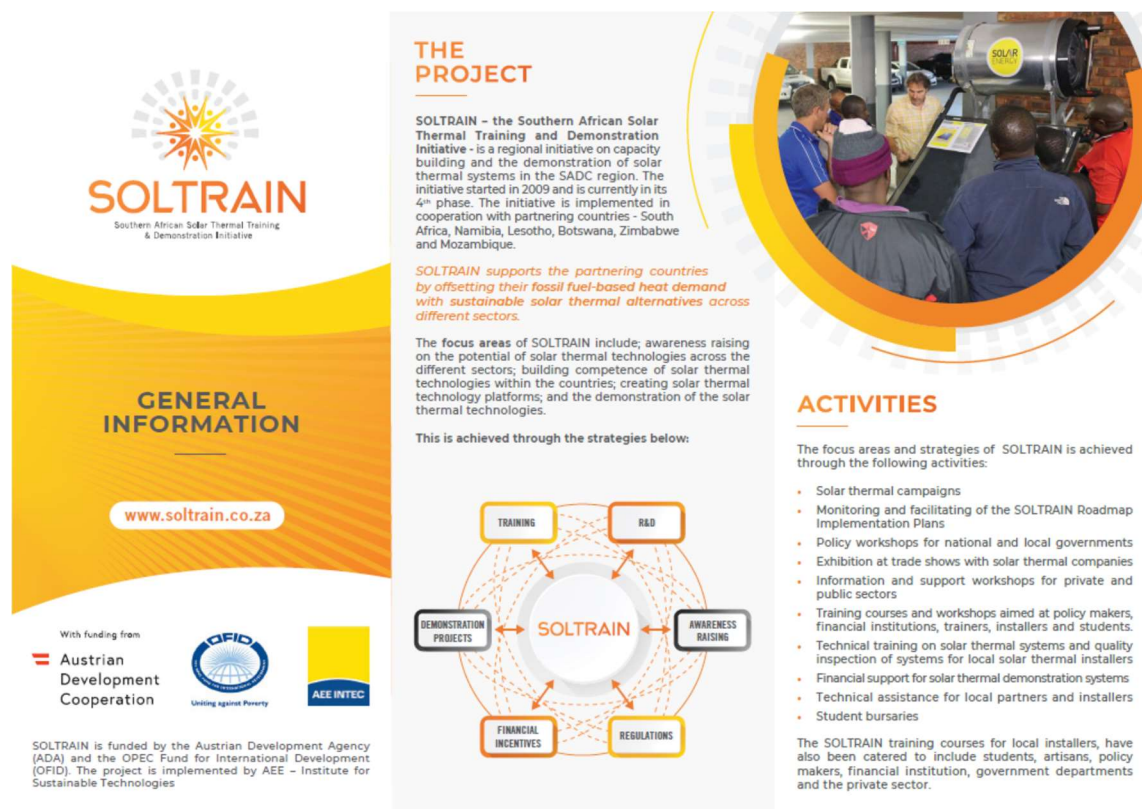


Figure 10: Brochure with general information about SOLTRAIN

In addition, a brochure with general information about SOLTRAIN and a brochure with general dimensioning guidelines were prepared.

The preparation, printing, and distribution of the information material to all partner organizations was the responsibility of CRSES. The information brochures were distributed during the Private and public-sector information workshops (see chapter 3.1.3). Digital copies of the brochures are available for download from the SOLTRAIN website: <https://soltrain.org/assets/brochures>

The following number of brochures was sent to the partners (including SACREEE):

- General Information brochure: 1,000 copies per partner
- Accommodation and Healthcare: 500 copies per partner
- Dimensioning: 200 copies per partner
- Industrial Applications: 200 copies per partner
- Policy: 200 copies per partner

In addition, AEE INTEC received 100 copies of each brochure.

Information activities and participation in trade fairs

Botswana Tourism Road Show

The SOLTRAIN partners, the Clean Energy Research Centre (CERC) from University of Botswana and Solar Industry Association of Botswana (SIAB) participated at the Botswana Tourism Bonanza Show on 29th and 30th November 2019 at Grand Palm Hotel in Gaborone. This was done jointly with Department of Energy (DoE) from the Ministry of Mineral Resources, Green Technology and Energy Security - MMGE. This event was published also in the social media like the Facebook page of the ministry.

At this tourism show the visitors were informed about thermal solar systems; also the Solar Trailer was presented and found very great interest.

The most impactful outcome of this show is that the SOLTRAIN project partners managed to interact with representatives from various industry sectors such as hotels and hospitals. They showed great interest on what SOLTRAIN can offer.



Figure 11: SOLTRAIN informed at the Botswana Tourism Road Show. Karen Giffard and a colleague from the project partner SIAB (left) Solar Trailer (right)

STEM Show 2020

SOLTRAIN participated at the BOTSWANA'S VIRTUAL STEM FESTIVAL AND THE NATIONAL SCIENCE WEEK from 5 – 9 October 2020

The Clean Energy Research Centre (CERC) contributed at the Botswana's virtual STEM festival and the National Science week from 5-9th October 2020 at a link, www.biust.ac.bw by showcasing at the virtual exhibition, the SOLTRAIN trailer whose main purpose was to raise awareness on SOLTRAIN and the potentials in solar thermal technology. This included, presenting the benefits of SOLTRAIN and solar thermal systems on energy supply, poverty alleviation, job creation and CO₂ emission reduction. This is line with the Botswana Government's national targets of increasing the share of renewable energy sources in the energy mix in 2030 in order to reduce dependency on the grid power and meet the increasing demand. The Government has committed to achieve an overall emissions reduction of 15% by 2030, which SOLTRAIN project can immensely contribute to. This event was broadcasted nationwide on national television.

The objectives of the two events were to allow public institutions and industry to showcase their STEM niches on which their businesses leverage as they contribute to the national socioeconomic betterment. The five-day event was honored by the BIUST Chancellor and former President H.E. Dr Festus G. Mogae, Minister of Tertiary Education, Research, Science & Technology Hon. Dr Douglas Letsholathebe and many other distinguished guests. More than 5000 stakeholders among them pupils, students, academia, businesses, community, captains of industry, local authorities, media and the public converged online to celebrate these two events.

Mozambique Trade Fair

A Mozambique Trade Fair (FACIM) was held in the period August 26th - September 1st, 2019. ENPCT participated with the demonstration of the solar trailer as shown in Figure 12.



Dr Geraldo Nhumaio briefing about the purposes of the solar trailer

Ana Cumbe speaking about the role of SOLTRAIN for ENPCT

Figure 12: Solar Trailer demonstration at the Mozambique Trade Fair (FACIM) held August 26 - September 01 2019

SOLTRAIN was broadcast via Mozambique National TV (TVM) for a week in the 1st fortnight of October 2019. Dr Gabriel Auziane was called to speak about the project, covering the following issues: (i) the goals of the project, (ii) involved partners, (iii) activities in past phases and the aims of the present one, (iv) beneficiaries and (v) constraints and financial challenges.

ASEZ Knowledge Sharing Session - South Africa

SOLTRAIN was represented at the Atlantis Special Economic Zone (ASEZ) Knowledge Sharing Session hosted by the official tourism, trade and investment promotion agency for Cape Town and the Western Cape, WESGRO, on 20 February 2020 in Atlantis, Cape Town.

The event was aimed at sharing business opportunities in the renewable energy sector with new and aspiring business owners in the region and surrounding communities. Mr. Angelo Buckley from Stellenbosch University Centre for Renewable and Sustainable Energy Studies presented the SOLTRAIN project at the event, showcasing its objectives and successes over the years. The event also allowed the opportunity for exhibiting the SOLTRAIN project and sharing material and further information with attendees. Attendees showed a large interest in learning about the project, its potential benefits for ASEZ and communities in Atlantis as well as the solar thermal training courses offered.



Figure 13: Angelo Buckley from Stellenbosch University Centre for Renewable and Sustainable Energy Studies presented the SOLTRAIN project at the ASEZ Knowledge Sharing Session in Cape Town.

Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL) Climate Science Exhibition – Namibia

SOLTRAIN was represented at the SASSCAL Climate Science Exhibition hosted by SASSCAL with the theme titled, "From Knowledge to Action: advancing Sustainable Climate Change Technologies for Adaptation", on 3 December 2020 in Windhoek. The exhibition was held online via ZOOM.

The objective of the exhibition was to showcase innovative and practical climate change adaptation technologies contributing to societal adaptation measures. Furthermore, the exhibition aims to provide a platform to connect exhibitors from different spheres of life, to increase the understanding on climate change adaptation and mitigation technologies, while inspiring advocacy for climate change solutions regionally and globally. Ms. Fenni Shidhika from the Namibia University of Science and Technology - Namibia Energy Institute presented the SOLTRAIN project at the exhibition. She presented the background and objectives of SOLTRAIN, share information on the co-financing of the solar thermal demonstration systems and successes of the SOLTRAIN project since 2009. The attendees were interested in the demonstration systems and on the SOLTRAIN data collected at various demonstration systems in Namibia. The Namibia Energy Institute received a certificate of participation at the exhibition.

3.1.3 Private and public-sector information and support

Private and public companies, like electricity companies, social housing companies and also the health and defence sector have either a huge heating or cooling demand in the buildings they are responsible for or might have interest in solar thermal systems from the demand side management point of view (electricity companies). It is, therefore, the aim of this activity to inform these institutions about the possibilities to use solar energy for heating and cooling.

Therefore, a series of information workshops for different sectors were carried out in order to the installation of demonstration systems (see work package 3).

It is the aim to carry out at least 6 information workshops by each project partner in co-operation with solar thermal companies.

The sector information workshops from the beginning of the project in July 2019 until February 2020 took place as physical events. All other events in 2020, like the policy workshops, were held in dual format. This means that the participants in the partner countries met physically in one event room. AEE INTEC (Werner Weiss) was connected online via WebEx.

To date, 11 sector-specific information workshops have been conducted with 195 participants. 28% of the participants were women.

The percentage of women who participated in the workshops varied significantly by country and sector. The highest percentage of women, at 75% and 30%, was in the sector workshops in Lesotho and Namibia.

On average, the percentage of female participants was 28%.

The following sectors were addressed in these workshops:

- Social Homes
- Health Sector
- Housing Sector
- Finance Sector
- Defence Forces
- Private Sector (general)
- Public Sector (general)

Table 3: Sector-specific information workshops held until December 2020

Country	Sector	Date and place	No. of participants		
			male	female	total
Botswana	Social Homes	15 December 2020 University of Botswana, Gaborone	9	4	13
Lesotho	Public and Private Sector	24 August 2019 Mohale's Hoek	2	6	8

Lesotho	Public Sector	20 March 2020 Mohale's Hoek	4	3	7
Lesotho	Private Sector	29 May 2020 Mountain View Hotel	4	2	6
Lesotho	Housing Sector	25 November 2020 Avani Lesotho, Maseru	7	3	10
Mozambique	Housing Sector	23 November 2020 Complexo Kaya- Kwanga Maputo	14	5	19
Namibia	Public and private Sector	24 January 2020 Namibia University of Science and Technology, Hotel School, Windhoek	21	9	30
South Africa, SANEDI	Defence Forces	12 November 2019 Hoedspruit	20	8	28
South Africa, CRSES	Public Sector - Western Cape Government Green Economy Reference Group	5 March 2020 Cape Town Lodge	45	13	58
South Africa, CRSES	Health Sector	13 March 2020	9	0	9
Zimbabwe	Finance Sector	17 March 2020	6	1	7
Total			141	54	195

3.1.4 Monitoring of the implementation

In all six Solar Thermal Roadmaps and Implementation Plans, annual goals concerning the installation of solar thermal systems are indicated. The focus of this activity is to monitor the progress of the implementation of the Solar Thermal Roadmaps.

This was done by collecting data and by providing an annual statistic on the installed solar thermal systems for each country. Besides the installed annual solar thermal capacity, the CO₂ reduction of the installed systems, as well as the electricity savings for the year 2019 also are presented below. With this, the contribution to the COP21 agreement and SDG7 are documented.

In addition to the statistical data above it, also information on the distribution of the installed solar thermal systems within the different social groups is provided below.

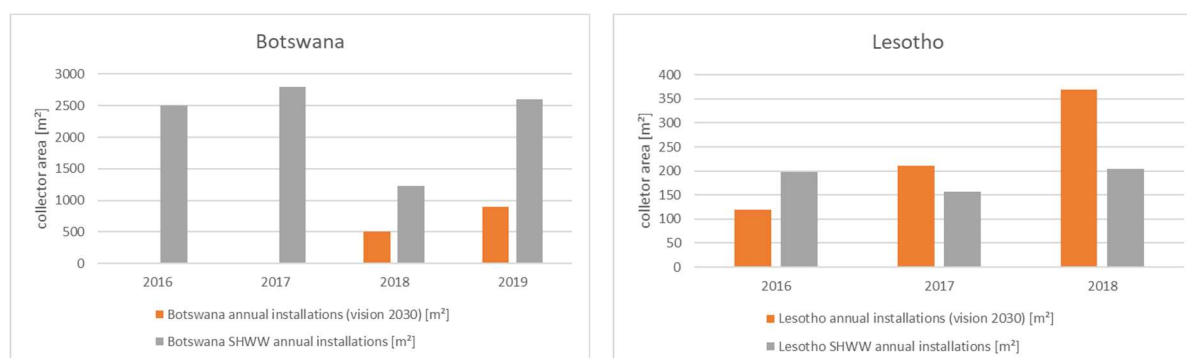
Table 4: 2030 targets for solar thermal collector area in the six SOLTRAIN countries, as stated in their solar thermal roadmaps

Country	Target collector area per inhabitant in 2030 [m ² /Inhabitant]	Target collector area in 2030 [m ²]	Installed collector area at the end of 2018 [m ²]
Namibia	0.5	1.5 million	46,393
South Africa	0.5	30 million	2,173,059
Lesotho	0.3	1.1 million	2,252
Botswana	0.3	910,000	13,529
Mozambique	0.1	3.4 million	3,136
Zimbabwe	0.1	2 million	59,639

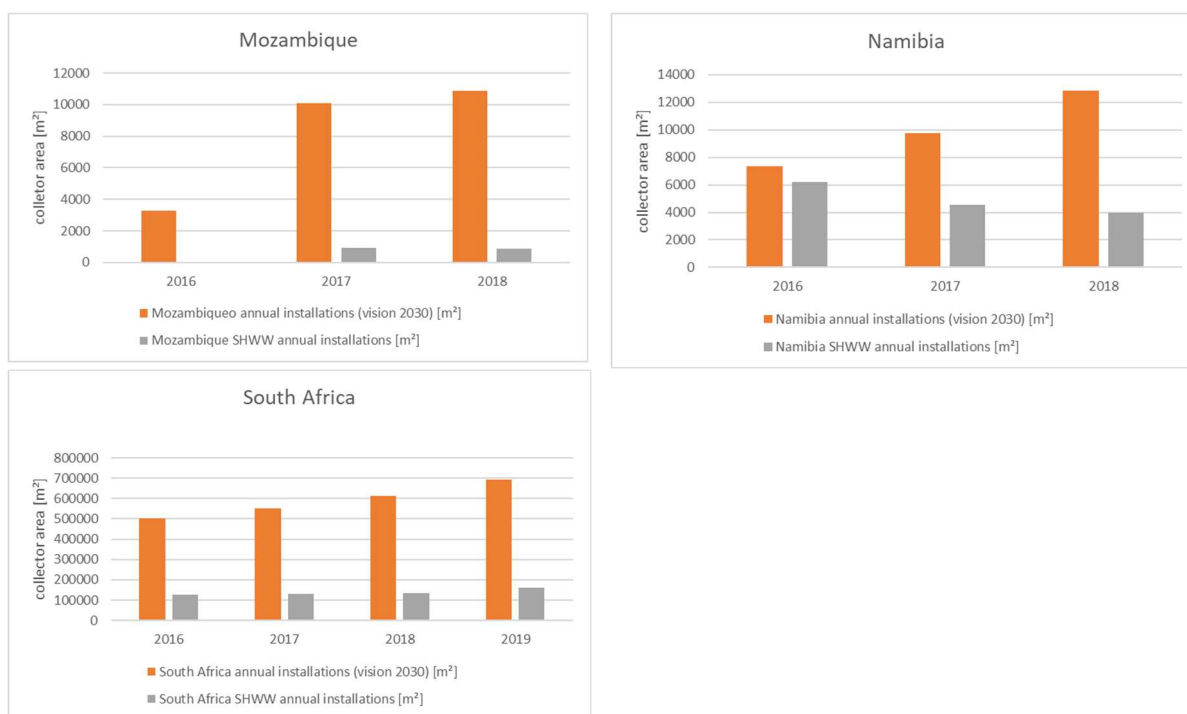
The following tables show the planned annual installations according to the developed Country Roadmap vision 2030 to reach the beforementioned aim of 0.1 to 0.5 m² collector area per inhabitant by 2030 as well as the actually installed collector areas according to the data received from the IEA SHC Solar Heat Worldwide report ed. 2020¹⁰.

Looking at Botswana the actually installed collector area is higher than the planned area indicated in the Roadmap. In Lesotho it was higher at the beginning (2016) and now lags behind the planned installations. All other countries did not reach their aims. This is mainly due to the fact that there are hardly any government programs for the market introduction of solar thermal systems so far. However, these are a basic prerequisite for achieving the roadmap targets.

Table 5: Comparison of annual collector installations of SOLTRAIN countries, according to the developed solar thermal visions 2030 (left) and the actually installed collector area (right; Source: IEA SHC Solar Heat Worldwide ed. 2020)



¹⁰ Solar Heat Worldwide, IEA SHC 2020 , <https://www.iea-shc.org/solar-heat-worldwide>



In 2019, the total collector area, the capacity, the solar yield as well as the electricity savings and the CO₂ reduction are given in the table below for all SOLTRAIN countries. The figures were taken from the IEA SHC Solar Heat Worldwide Report Ed. 2020. For calculating the electricity savings an electrical efficiency of 90% was assumed.

Table 6: Collector area, capacity, calculated number of systems, solar yield and CO₂ reduction as reported in the IEA SHC Solar Heat Worldwide Report, edition 2020. For calculating the electricity savings an efficiency of the electrical heating element of 90% has been assumed.

Country	Total collector area [m²]	Total capacity [MW _{th}]	Calculated number of systems	Solar yield [GWh/a]	Electricity savings [GWh/a]	CO ₂ reduction [tCO ₂ /a]
Botswana	13,529	9	2,210	13	14	4,314
Lesotho	2,252	2	643	2	2	675
Mozambique	3,136	2	478	3	3	883
Namibia	46,393	32	5,730	42	46,2	14,396
South Africa	2.173,059	1,521	5.09,474	1,567	1,723	5.33,174
Zimbabwe	59,639	42	2,7024	51	56	17,306

The table below shows the total collector area, total capacity, solar yield, electricity savings as well as avoided electricity cost and CO₂ reduction for all systems installed so far in the frame of SOLTRAIN phases I to IV (status end of December 2020). For calculating the avoided electricity cost Cape Town 2019 electricity tariffs have been used (222,39 c/kWh plus VAT = 255,75 c/kWh)

Table 7: Installed SOLTRAIN Systems (Phases I to IV)

Country	Nb. of systems	Total collector area [m ²]	Total capacity [kW _{th}]	Solar yield [MWh/a]	Electricity savings [MWh/a]	Avoided Electricity Cost [ZAR]	CO ₂ reduction [tCO ₂ /a]
Mozambique	6	57.4	40	50.2	55.2	141,278	17
Namibia	123	502	352	456.4	502.1	1,284,026	156
South Africa	121	3,286	2,300	2,346.3	2,580.9	6,600,766	814
Zimbabwe	53	484	339	409.3	450.3	1,151,672	140
Lesotho	26	186	130	168.9	185.9	475,413	59
Botswana	3	122	85	115.6	127.1	325,152	40
TOTAL	332	4,637	3,246	3,546.9	3,901.6	9,978,308	1,226

The systems that have been approved so far in Phase IV of the SOLTRAIN project are shown in the following table. The systems have been selected on the one hand to support social institutions, hospitals and schools and therefore also to especially support women and marginalized groups, on the other hand housing initiatives and lodges were chosen to promote the possibilities of solar thermal water heating in different sectors to support bigger rollout of the technology in the countries. However, 31 out of 39 approved systems support women and marginalized groups.

Table 8: Approved solar thermal demonstration systems in Phase IV by December 2020

Country	Beneficiary	Institution	Collector area [m ²]	Nb. of systems [-]	Support of women, marginalized groups?
Zimbabwe	CPS Sisters youth hostel	Social Institution	15,86	4	Y
Namibia	Ludwig Ntinda Primary School	Social Institution	46,2	13	Y
Namibia	Mother Win Orphanage	Social Institution	8,4	2	Y
Lesotho	Holy Trinity High School	Educational Institution	10	2	Y
Namibia	Katutura Hospital	Hospital	120	1	Y
Zimbabwe	Maiden Drive Lodge	Accommodation	26,46	6	N
South Africa	e-Junction	Mass housing project	249	1	N
Lesotho	Paray Hospital Kitchen System	Hospital	5,58	1	Y
Lesotho	Paray Hospital Male and Female Ward System	Hospital	14,4	1	Y

Lesotho	Refiloe Setona	Housing project	10	1	N
Zimbabwe	Maternity Centre Marondera	Hospital	15,86	6	Y
South Africa	Interchange Foundation_Pilote House	Single family home for old age people	2	1	Y
Total			453,3	39	

3.2 Work Package 2 - Training

In order to achieve the goals, set out in the Solar Thermal Roadmaps, it is essential to have enough skilled people to be able to design, install and to maintain these solar thermal systems. Also, a deeper understanding of the future role and possibilities of solar thermal systems in sustainable energy supply is needed. To achieve this, various training measures are carried out as part of this work package.

The training courses carried out to date in phase IV are presented in the following.

3.2.1 Train the Trainer courses

The Train the Trainer courses in Phase IV are focused on the group of solar thermal companies as well as staff of direct project partners, who previously attended several of the SOLTRAIN courses. The content of these courses is adapted to the different needs and available skills in the partner countries.

The participants of these courses shall be able to disseminate the gained knowledge in trainings for artisans from the private and public sector and dissemination courses.

These advanced courses are specifically oriented to medium- and large-scale pumped solar thermal systems. A special focus was placed on the dimensioning and design of these solar thermal systems.

In the second series of these Train the Trainer courses, the focus of the training was on simulation programs like T-Sol or Polysun as well as on energy audits in companies. Another focus was be on measures for standardisation, quality assurance, and maintenance aspects.

To date, all 13 Train the Trainer courses, that were planned, have been held, with a total of 319 participants. The share of female participants was 18%. Of the 319 participants, 261 (82%) took the exam of who 69% passed. A certificate was issued to all participants who passed the exam.

At the training course in Windhoek on 11 July 2019 the Deputy Minister of the Ministry of Mines and Energy, Honourable Kornelia Shilunga delivered the keynote address speech and welcomed all the participants at the training. This shows the commitment and recognition of the project by the Ministry responsible of Energy in Namibia.

Table 9: Completed Train the Trainer Courses

Train the Trainer course	Date and place	No. of participants			Exam	
		male	female	total	attended	passed
Zimbabwe – TtT 1	10 – 12 July 2019 NUST, Bulawayo Zimbabwe	17	4	21	21	18
Namibia – TtT 1	11 – 13 July 2019 NUST Hotel School Windhoek, Namibia	36	17	53	28	26
Lesotho – TtT 1	15 – 17 July 2019 BBCDC Mt. Morosi, Lesotho	7	2	9	9	6
South Africa Gauteng – TtT 1A	16 – 18 September 2019 SANEDI Pretoria, South Africa	16	5	21	21	16
South Africa Stellenbosch – TtT 1	23 – 25 September 2019 CRSES Stellenbosch, South Africa	20	2	22	20	17
Namibia Solar Thermo Syphon Systems TtT	30 September – 2 October 2019 Windhoek Namibia	48	4	52	40	28
Mozambique TtT 1 solar thermal pumped systems	27– 29 January 2020 Maluana Mozambique	30	1	31	30	10
Lesotho TtT 2 solar thermal pumped systems	30 – 31 January 2020 Windhoek Namibia	12	5	17	15	11
Zimbabwe TtT 2 solar thermal pumped and thermo syphon systems	3 – 5 February 2020 HIT Harare Zimbabwe	15	3	18	18	12
Namibia TtT 2 solar thermal pumped systems	6 – 7 February 2020 Windhoek Namibia	24	6	31	21	10
Botswana TtT 1	9 – 11 Sept. 2020 Gaborone, Botswana	19	3	22	20	15
South Africa Stellenbosch – TtT 2	17 - 18 Sept. 2020 Stellenbosch South Africa	7	1	8	5	5
South Africa Gauteng – TtT 2	3 and 4 November 2020 SANEDI Pretoria/Online South Africa	10	4	14	13	7
Total		261	57	319	261	181

The lecturers of these courses were experts from AEE INTEC as well as experts from the project partners who were trained in the previous phases of the project.



Figure 14: Participants of the 2nd Train the Trainer Course in Lesotho, 30 and 31 January, 2020



Figure 15: Participants of the 2nd Train the Trainer Course in Namibia, 6 and 7 February, 2020



Figure 16: Participants 2nd Train the Trainer Course in Zimbabwe, 3 – 5 February 2020



Figure 17: Participants 2nd Train the Trainer Course in Pretoria, South Africa, 3 and 4 November 2020. This course was organized as hybrid event due to the Corona restrictions. The trainers from AEE INTEC (Monika Spörk-Dür and Rudi Moschik) you can see on the screen behind the participants.

3.2.2 Dual training program for artisans

A strong demand for “hands-on training” was articulated by almost all project partners who were involved in SOLTRAIN Phase III. There is also a demand for skilled solar thermal installers within the solar thermal companies. In order to combine these demands, a “dual training program for artisans”, consisting of two theoretical and hands-on courses, in combination with an internship at a solar thermal company, is offered in Phase IV.

The theoretical and hands-on courses are carried out under the leadership of AEE INTEC in co-operation with Vocational Training Centres. The practical training is carried out by the solar thermal companies who provide the internship. Only solar thermal companies who attended training courses in previous phases of SOLTRAIN and who also already successfully installed demonstration systems, qualify for this activity.

The internship at a company was originally planned for 3 to 4 months. However, after discussions at the kick-off meeting, it was decided to offer the internship for a maximum of 6 months if the host company agrees to co-finance for this period. The cost for the internship is shared between SOLTRAIN and the solar thermal companies who apply for this dual training program.

In order to have a clearly structured process for the application, AEE INTEC created an application form and sent it to the project partners.

Since the beginning of Phase IV, six applications were submitted by four companies from Botswana, Lesotho, Namibia, South Africa and Zimbabwe. Three of the applications submitted were approved. Unfortunately, the other three applications had to be rejected because the proposed trainees did not meet the requirements or were already employed by the company when the application was submitted.

Table 10: Applications for the dual training program

Applicant Country	Apprentice	Gender	Duration of training		Salary (monthly) [€]	SOLTRAIN Contribution %	Status
			Start	End			
TBS Namibia	Rudolph Majiedt	M	Feb. 2020	Apr. 2020	344	50%	rejected
BlackDot South Africa	Richard Ndhlovu	M	Dec. 2019	Nov. 2020	430	40%	rejected
BlackDot South Africa	Letty Mnisi	F	Dec. 2019	Nov. 2020	490	15%	rejected
Solar Soft Lesotho	Sehlabo Khotsofalang	M	Jan 2020	June 2020	187	50%	approved

Artemis Engineering Botswana	Moagisi Modiagane	M	Feb. 2020	July 2020	460	50%	Approved
Sunex Solar Systems Pvt Ltd Zimbabwe	David Anesu Rupiya	M	March 2020	August 2020	490	50%	Approved

Contracts for the internship were concluded with the companies Solar Soft from Lesotho, Artemis Engineering from Botswana and Sunex Solar Systems Pvt Ltd Zimbabwe.

All three dual trainings were carried out in accordance with the contract and completed on time.

A questionnaire was sent by AEE INTEC at the end of the training period to all three companies that took on the apprentices. All three stated that they were very satisfied with the training format and the apprentices. Furthermore, all three companies employed the apprentices permanently after the training period.

The intention is to issue another call for this dual training program in early 2021.

3.2.3 Training in co-operation with Vocational Training Centers

In this work package SOLTRAIN offers training modules for the staff of Vocational Training Centres. Centralized or distributed training courses are offered for a restricted number of participants per country.

The main focus is on practical training, installation and quality control (manufacturing, quality of imported products, installation, and maintenance) These courses focus on simple systems (low and high-pressure thermosyphon systems), that could support the solar thermal mass roll out programs.

It is the goal to carry out a total of 10 training courses¹¹ for VTCs in order to provide targeted and intensive training for the teachers of VTCs.

These courses are carried out jointly by AEE INTEC experts and by experts from the partner organizations, who attended the Train the Trainer courses.

These courses are completed with an exam. The participants receive certificates.

Since the beginning of Phase IV, one training course in co-operation with VTC's has been conducted in Namibia.

Due to Corona travel restrictions, this training also took place in a hybrid format. The course participants in Windhoek met physically and the trainers were connected via WebEx.

¹¹ Two courses in each country, one in Mozambique.

Table 11: Training courses in co-operation with VTC's

VTC course	Date and place	No. of participants			Exam	
		male	female	total	attended	passed
Namibia	15 -16 and 22 October 2020 Windhoek, Namibia	9	6	15	11	9

The percentage of female participants in this course was 40%.

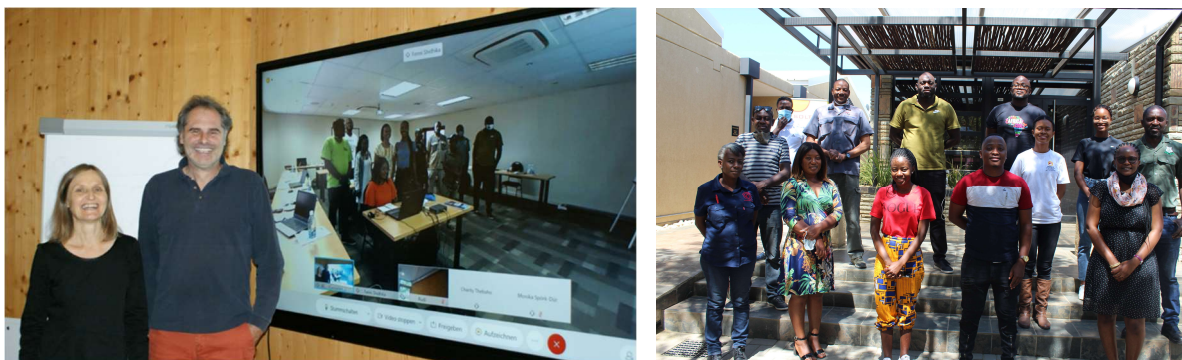


Figure 18: The trainers Rudi Moschik and Monika Spörk Dür from AEE INTEC (left) and the participants (right).

Curriculum for Solar Water Heater

In Namibia the curriculum for Solar Water Heater was approved under SOLTRAIN – Phase III. Three Vocational Training Centres started with the implementation of this Curriculum namely: Windhoek Vocational Training Centre, Eenhana Vocational Training Centre and Okakarara Vocational Training. Both are in the process of completing level 1.

In the discussion with NTA (Namibia Training Authority), there are also a number of plumbers who completed up to level 3 but have not done Solar Water Heating and are now registered in the data base of Ministry of Labour and who have not found employment yet. This is a national list and Currently a number of them are trained on Entrepreneur courses and are involved in private plumbing repairs. The idea is also to tap from this list to train some under SOLTRAIN to prepare them for the dual internship.

NTA also promised to share the curriculum being implemented by the three Vocational Training Centre in order to see how SOLTRAIN can support these Vocational trainees to benefit from the dual training

3.2.4 Training for artisans from the private and public sector

There is a growing interest in solar thermal technologies from private and public companies like electricity companies, social housing companies and also from the health and defence sectors. Phase IV of the SOLTRAIN project offers training for staff of these institutions.

After these courses, the artisans of the organisations should be able to carry out audits, design solar thermal systems, and prepare calls for tenders. After the installation of solar thermal systems by qualified solar thermal companies, these trained staff members should also be able to maintain these systems.

These courses are carried out jointly by AEE INTEC experts and by experts from the partner organisations who attended the Train the Trainer courses in previous phases of the project.

So far, two of these courses have been held in South Africa and Namibia.

Table 12: Training carried out for artisans from the private and public sector

Training course	Date and place	No. of participants			Exam	
		male	female	total	attended	passed
South Africa Gauteng – T f Artisans 1 South African National Defence Force	18 – 20 September 2019 SANEDI Pretoria, South Africa	20	2	22	22	10
Namibia Solar Thermosyphon Systems – Osona housing developers	30 September – 2 October 2019 Windhoek Namibia	48	4	52	40	28
Total		68	6	74	62	38

The percentage of female participants in these courses was 8%.

Training course for the South African National Defence Force

A training course was carried out by SANEDI, in cooperation with an expert from CRSES (Stellenbosch University) and an expert from AEE INTEC from 18 – 20 September 2019 for the South African National Defence Force (SANDF) (and 7 civilians).

This training was requested as a result, and in support, of the installation of two solar thermal systems at the South African Air Force's Hoedspruit Base.

At the function celebrating the commissioning of the solar water heating systems Dr. Karen Surridge from SANEDI emphasised the role that SOLTRAIN plays in skills and capacity development in the solar thermal sector, highlighting that SOLTRAIN

offers training in both the public and private sectors. She also thanked SOLTRAIN for the pilot project and training support received to date by the SANDF.

The responsible persons, which have decision making ability, at the SANDF indicated support, gratitude and extreme future interest in any course to develop the solar thermal skills of their artisans. Therefore, a three-day training course was carried out by SANEDI that involved 15 artisans who had successfully completed the SOLTRAIN thermosiphon course (Delivered January 2019 at the air force base by SANEDI and CRSES).

Through such training initiatives, facilities like the air force base will now have in-house skills to maintain and monitor their systems, measure the benefits and, by so doing, to grow their institutional capacity to make smarter, greener choices when it comes to energy, waste and water services.

Since the installation of the 2 pilot systems at Air Force Base Hoedspruit, the SANDF has pledged future support to next solar thermal developments and plans are now underway for much larger systems to support other military bases and the largest military hospital in South Africa. This investment is expected to be realised during Phase IV of SOLTRAIN, with technical and training support through the collaboration.



Figure 19: Participants and trainers of the training carried out for the South African National Defence Force

The course in Namibia, which was held from 30 September – 2 October 2019 was carried out in close coordination with the Osona Village Management.

Following on the success of a SOLTRAIN initiative in 2016 in which solar thermal systems were installed on 62 houses in Windhoek, a solar urban development concept is being implemented in Osona in Okahandja, about 60 km north of Windhoek. In the first phase, a new settlement with around 10,000 apartments, a vocational training campus and a commercial area is to be built on an area of 1,100 ha.

In addition, in order to keep OSONA Village's electrical connection power as low as possible, all residential buildings are to be equipped with Solar Water Heaters. As up to 10,000 apartments are to be built in the final stage, it is very important that the installed Solar Water Heaters comply with the highest possible quality standards. This is the only way to guarantee a long service life time of the systems and high solar yields as well as the desired savings of electricity.

It was agreed with the Osona Village Management to support this project with technical expertise such as review of the specifications for the Solar Water Heaters (SWH), so that high quality standards of the Solar Water Heaters at reasonable cost can be achieved, training of installers and quality control by AEE INTEC in collaboration with the Namibia Energy Institute.

Since no performance and load tests of the systems is in place, at three houses equipped with "low cost" SWH systems, monitoring devices were installed in September 2019. These systems will be monitored for comparison with high quality Solar Water Heaters that are Solar Keymark certified as per the SOLTRAIN requirement.

The first solar water heaters systems were installed already between 2017 and 2019. The systems were observed to be of poor quality and installed by installers with lack of knowledge. Some were not functioning. Therefore, it was urgently necessary to conduct this course for the installers who install solar thermal systems in Osona.

As mentioned above the course has been held in Namibia from 30 September – 2 October 2019. A total of 52 persons attended the course.



Figure 20: Solar Water heating Systems at the Osona Village project in Namibia

3.2.5 Design workshops and support for industry

In this work package special design workshops for medium-scale demonstration systems are carried out for solar thermal companies and the direct project partners who have special design questions for demonstration systems.

These workshops are arranged for small groups only in order to offer the opportunity to go into more detail.

These design workshops are carried out on demand once the direct project partners in co-operation with the solar industry have identified a potential customer for medium-scale systems.

So far, the companies Solsquare from Namibia and E3 Energy from South Africa have been supported.

Design support for the Lady Pohamba Hospital in Windhoek

The company Solsquare from Namibia was intensively supported in the period from January to December 2020 in the design and dimensioning of the plant for the Lady Pohamba hospital in Windhoek.

In order to provide a good basis for the decision of the hospital management to invest in this large-scale system, detailed feasibility studies and economic calculations were carried out.

E3 Energy - Monitoring support for a washing container

At the request of the company E3 Energy from South Africa, a monitoring concept for a "wash container" was developed in July 2020 and the necessary measurement technology was made available.

E3 Energy wants to test the performance of SUNPAD solar systems, which were mounted on a Container. The hot water generated by these systems shall be used to wash hands in townships and thus contribute to combating the corona pandemic.

Once the measurements are completed, E3 Energy will provide a report on the results and how to proceed.

3.2.6 Specialized courses for professionals

In order to design and install advanced high quality solar thermal systems for apartment buildings, hotels, hospitals, industrial applications etc., specialized courses for a restricted number of experts are going to be organized. A precondition to attend these courses is the participation in previous SOLTRAIN courses and the installation of demonstration systems.

As in the previous phases, it was planned to hold these courses once a year in Stellenbosch, South Africa for the participants from all project countries.

Due to the corona pandemic, the first course planned for November 2020 has been postponed to early 2021. This will now take place on January 19 and 21, 2021 in

the form of webinars. The focus of the webinar on January 19 will be on pumped medium-scale solar systems for apartment buildings, hospitals and hotels. On January 21, the focus will be on PVT systems. Photovoltaic-Thermal (PVT) collectors combine the production of both types of solar energy – solar heat and solar electricity – simultaneously in one collector.

The preparations for this first Specialized Course of Phase IV were carried out in cooperation between CRSES, Stellenbosch University and AEE INTEC.

3.2.7 Dissemination courses

In order to support the dissemination of the skills, each direct project partner (except ENPCT) is obliged to organize at least 6 dissemination courses. These dissemination courses are carried out by experts who were trained by AEE INTEC experts in the train the trainer courses.

Training material is provided by AEE INTEC.

Two types of courses are conducted:

- technical dissemination courses
- non-technical courses in order to convince stakeholders from social housing companies, lodges, other multipliers, financial institutions as well as from companies dealing with industrial process heat.

It is also the aim to support the project partners to develop a long-term business model for the dissemination of their knowledge gained during SOLTRAIN Phase IV. This would ensure that these training courses can be offered also after the end of the project.

By the end of December 2020, seven dissemination courses have been conducted in Botswana, Lesotho and Zimbabwe with a total of 123 participants.

Table 13: Dissemination courses that have been conducted so far.

Training course	Date and place	No. of participants		
		male	female	total
1 st Dissemination Course Lesotho	24 August 2019 BBCDC Mohaes Hoek, Lesotho	4	4	8
2 nd Dissemination Course Lesotho	5 and 6 December 2019 BBCDC BBCDC Campus, Mount Morosi, Lesotho	11	1	12
1 st Dissemination Course - Botswana	2 – 4 March 2020 CREC, Botswana University Gaborone, Botswana	25	8	33

2 nd Dissemination Course- Botswana	16 and 17 Dec. 2020 CREC, Botswana University Gaborone, Botswana	25	9	34
1 st Dissemination Course - Zimbabwe	16 – 18 December 2020 NUST, Bulawayo, Zimbabwe	8	0	8
1 st Dissemination Course – South Africa	1 and 2 December 2020 SANEDI and CRSES Limpopo, South Africa	26	2	28
Total		99	24	123

The percentage of female participants in these courses was 19.5%.



Figure 21: Dr Mmule Magama from CAD, UB receiving her certificate on 4 March 2020. Dr Magama is a nurse with no prior technical/engineering background but an enthusiastic lover of solar technology.



Figure 22: Participant of the 3rd Dissemination course in Botswana with her certificate



Figure 23: The Solar Trailer was also used in the 3rd dissemination course in Botswana.



Figure 24: A section of jubilant participants of the 1st dissemination course held in Botswana showing their certificates.



Figure 25: Participants of the dissemination course held in Limpopo Province, South Africa on 1 and 2 December 2020

3.2.8 Training videos

As stated in the project document, animated short videos will be produced to support the dissemination courses and for better visualization.

The tender process was carried out in the first half of 2020. Four companies submitted a bid. The best and most cost-effective offer came from the Graz-based company Polyzwei. This was commissioned with the production of four films at the beginning of July 2020.

Two of the videos on Thermosiphon systems and on pumped systems are completed and were already used in the dissemination courses in December 2020.

The completion of the other two videos is expected in February 2021.

It is planned that the videos will only be used by the project partners for educational purposes. Later, however, they will be made available to the general public via the SOLTRAIN YouTube channel.

3.2.9 Solar Trailer for NUL in Lesotho

In order to support the training capacities at the National University for Science and Technology in Maseru, Lesotho one pumped and one thermosyphon demonstration system will be provided by SOLTRAIN for training purposes. These systems are going to be installed on a trailer and will be equipped with basic monitoring devices so that students are able to carry out measurements.

These systems will also be used for diploma works or master theses.

After clarification of the award procedure with ADA, the South African company Sonnenkraft was awarded the contract to manufacture the solar trailer on August 10, 2020.

At the end of December, the Solar Trailer was close to completion and customs clearance for export to Lesotho was prepared.

It is intended to transfer the Solar Trailer to Lesotho in February 2021.

Contact person and responsible person for the solar trailer at the national University of Lesotho is Dr. Moeketsi Mpholo. He is the administrator of the Energy Research Centre.

After delivery of the solar trailer, a comprehensive training provided by AEE INTEC is going to take place for the University staff.



Figure 26: The solar trailer shortly before completion in December 2020

3.3 Work Package 3 - Demonstration Projects

The demonstration systems installed in the previous phases of SOLTRAIN not only made it possible for the companies who attended the training courses to apply what they have learned, but also contributed to awareness and to a good reputation of solar thermal systems. Like in several cases in Lesotho (Company Solar Soft), Namibia (Company TBS) and Zimbabwe (Company SuneX), the funded demonstration systems in phase III of SOLTRAIN also encourage multiplication of these systems without funding and thus stimulated the solar thermal market. Furthermore, the monitoring data served as proof of the performance of solar thermal plants.

Due to these reasons, the support of the installation of demonstration systems in so called "Flag-ship districts" is continuing in Phase IV, with the goal to co-fund the installation of another 100 demonstration systems. These "Flagship Districts" were established in all six partner countries in the previous phases of the project after consultation with policy, local authorities, training and research institutions, industry and NGOs. The aim of "Flagship Districts" is to have several systems for different applications at different eligible institutions installed relatively close together (small region). This also helps to increase the visibility and impact of the SOLTRAIN demonstration systems.

Selection of institutions for the installation of solar thermal systems

As in the previous phases, it is intended to motivate all institutions, direct project partners as well as local authorities, the solar thermal companies that were trained, to propose institutions for the installation of solar thermal systems. In the call for applications for demonstration systems, a special focus is on institutions that support women (e.g. girl's schools, maternity clinics, shelters for battered women) and marginalised groups (e.g. children and youth, in vulnerable situations, persons with disabilities, internally displaced persons, refugees and migrants). Social institutions, hospitals, clinics, communities as well as small enterprises that are located within the "flag ship district" are also able to directly apply for co-funded demonstration systems. The subsidy from SOLTRAIN is limited to a maximum of 50% of the overall system price for the beneficiary. In addition, monitoring equipment will be provided for a limited number of systems. The monitoring devices will be fully funded by SOLTRAIN.

The national partners assist institutions with their applications for proposed demonstration systems and also assist with finding appropriate solar thermal companies to do the installations.

If an insufficient number of applications from the defined "flagship districts" is received, other applications might also be considered for funding.

Application procedure

An application form was provided to the project partners by AEE INTEC and the solar thermal companies who attended train the trainer courses.

The completed application forms have to be sent to AEE INTEC. After a first technical and financial assessment by AEE INTEC, the applications are sent to the project Steering Committee members for their decisions. Once the funding decision has been made by the project steering committee, AEE INTEC is responsible for contracting with the applicants and for the transfer of the funds. Furthermore, the overall technical and financial documentation of the installed demonstration systems is also the obligation of AEE INTEC.

The cost of the installation of the demonstration systems will be shared by project funds and a contribution of the beneficiaries or other donors. On average, the contribution of project funds will be in the range of 50 % of the overall system cost, including installation.

By end of December 2020, 11 applications have been received. These were from Zimbabwe, Namibia, Lesotho, South Africa representing 47 demonstration systems. 38 of these systems were approved for funding by the steering committee by end of December 2020.

31 of the approved demonstration systems will be used in institutions that support women and marginalized groups. Another four systems will be installed at hospitals.

Six of the solar thermal demonstration systems approved by the end of 2020 have been constructed and are in operation (see Annex 1). Especially due to the restrictions caused by the corona pandemic, but also due to delivery delays, the installation of numerous plants has been delayed.

Table 14: Applications for demonstration systems

Applications	Nb. of systems	Approved systems	Installed and in operation
11	47	38	6

In addition to the above demonstration plants, 23¹² plants were erected on apartment buildings in Melville Place, Cape Town in Phase IV. These are systems that had already been approved in Phase III, but could not be installed in Phase III due to the delayed construction of the buildings (see also Phase III final report).

¹² 18 of the systems have been commissioned as of December 2020. 5 systems not yet commissioned due to buildings not having tenants.



Figure 27: Some of the 23 solar arrays installed at Melville Place in Cape Town.

New approach in Mozambique

In Mozambique, a new approach is being taken with regard to the construction of demonstration plants. At the suggestion of Birgit Weyss from ADA, contact was made with the Young Africa initiative. This organization, with the support of Horizon 3000, runs a training center for installers in Baira.

As a result of several web meetings, it was agreed to set up demonstration systems at the training centre of Young Africa. Co-financing has been secured and applications for support for the plants are expected in early 2021.

3.3.1 Technical tours for decision makers

The new approach for technical tours, as presented in the project document, could not be implemented so far due to the Covid-19 conditions.

Nevertheless, two technical tours have been conducted until December 2020 for decision makers in Lesotho and Botswana.

Lesotho

The technical tour in Lesotho took place on November 23, 2019. A total of 60 people took part.

This was a group of St Augustine's Seminarians from Roma. Their main interest was on Solar Water Heaters as they wish to have one big demonstration system installed for their institution.

Botswana

A technical tour was also carried out in Botswana on 27th November 2020 with the directors of the three disability centres from Mochudi Village: Mochudi Resource Centre, Pudulogong Rehabilitation & Motswedi Rehabilitation Centre. This technical tour followed a SOLTRAIN presentation that was delivered to them on 29th October 2020. These directors have expressed a keen interest to install SOLTRAIN demonstration systems at their centres.

3.4 Work Package 4 - Quality Control, Maintenance, and Monitoring

No work has yet been carried out on this work package, since the demonstration systems must first be built.

3.5 Work Package 5 - Awareness Raising and Dissemination of Results

To inform the relevant stakeholders and the interested parties about the different applications of solar thermal energy and the related impact on the security of energy supply, poverty, employment and on the environment awareness-raising activities are carried out.

This is also important to further improve the visibility of SOLTRAIN and to strengthen the regional co-operation and information exchange between the partners.

As planned in the project document, the project partner CRSES from Stellenbosch University developed a new communication strategy (for details please see 1st progress report). This contained a redesign of the newsletter and the website as well as a new logo.

The concept for the new strategy was sent to all project partners by CRSES in early September 2019. This concept was discussed and approved in a web conference on September 17, 2019 by the "Editorial Team". The editorial team includes one person from each project partner.

Editorial Team:

Karin Kritzinger, CRSES, South Africa
Karen Surridge, SANEDI, South Africa
Helvi Ileka, NEI, Namibia
Samson Mhlanga, NUST, Zimbabwe
Karen Giffard, SIAB, Botswana
Daniel Baloi, ENTCP, Mozambique
Puleng Mosothoane, BBCDC, Lesotho
Kudakwashe Ndhelukula, SACREEE
Werner Weiss, AEE INTEC

3.5.1 SOLTRAIN – Logo redesign

As already described in detail in the first progress report, a new project logo was developed.



Figure 28: The new SOLTRAIN project logo

3.5.2 SOLTRAIN e-mail Newsletter

A quarterly SOLTRAIN Newsletter is prepared and sent out via e-mail to all relevant stakeholders. The e-mail addresses of the stakeholders from each country were provided to CRSES by all the national implementation partners. Updates are provided to CRSES on a regular basis.

In general, the Newsletter informs on the project and its progress, achievements and highlights in each country. Based on requests of CRSES (co-ordinator of this activity), all other implementing partners have to report on a quarterly basis to CRSES on all SOLTRAIN activities and events.

For SOLTRAIN IV, the newsletter is in web format rather than print PDF format. This makes it easier to access and share, and takes less effort to produce, which in turn accords it more flexibility and allows greater focus on content rather than production. This is in line with SOLTRAIN's more agile and smarter communications strategy for this phase, in which the newsletter forms one side of the mutually reinforcing sides of the communications triangle – website / social media / newsletter.

Since the commencement of the project, five SOLTRAIN IV Newsletters have been prepared and distributed to a subscriber list which currently stands at 1,380 national, regional and international stakeholders.

All newsletters can be viewed here: <https://soltrain.org/assets/newsletters>

All the published newsletters from SOLTRAIN IV, with the relevant contributors, can be seen in Table 10.

Table 15: SOLTRAIN Newsletters published

Newsletter Edition	Contributions from:
Newsletter #1: October 2019	SACREEE, Namibia NEI, Namibia SANEDI, South Africa AEE INTEC, Austria
Newsletter #2: June 2020	CRSES, South Africa AEE INTEC, Austria SANEDI, South Africa NEI, Namibia NUST, Zimbabwe
Newsletter #3: August 2020	AEE INTEC, Austria University of Botswana CRSES, South Africa NUST, Zimbabwe BBCDC, Lesotho SACREEE, Namibia
Newsletter #4: November 2020	AEE INTEC, Austria SACREEE, Namibia BBCDC, Lesotho
Newsletter #5: December 2020	AEE INTEC, Austria CRSES, South Africa NUST, Zimbabwe NEI, Namibia University of Botswana BBCDC, Lesotho

SOLTRAIN newsletter performance

Since SOLTRAIN III, the SOLTRAIN newsletter subscriber list has increased in number by 29%.

Due to the fact that all news content is in the web version of the email, as opposed to in a PDF download as in SOLTRAIN III, requiring an additional step to click and download the newsletter, click rates for SOLTRAIN IV are unsurprisingly lower.

The detail of newsletter subscriber numbers, clicks and openings can be found in Table 11 below.

Table 11: SOLTRAIN Newsletters performance

	Subject	Total Recipients	Successful Deliveries	Unique Opens	Open Rate	Unique Clicks	Click Rate
SOLTRAIN III							
1	SOLTRAIN Newsletter, August 2016	773	685	189	27.59%	71	10.36%
2	SOLTRAIN Newsletter #2, October 2016	749	712	215	30.20%	59	8.29%
3	SOLTRAIN Newsletter #3, December 2016	740	697	171	24.53%	39	5.60%
4	SOLTRAIN Newsletter #4, April 2017	733	675	201	29.78%	50	7.41%
5	SOLTRAIN Newsletter #5, June 2017	716	665	177	26.62%	43	6.47%
6	SOLTRAIN Newsletter #6, October 2017	756	695	184	26.47%	64	9.21%
7	SOLTRAIN Newsletter #7, December 2017	747	665	142	21.35%	44	6.62%
8	SOLTRAIN Newsletter #8, April 2018	792	709	193	27.22%	66	9.31%
9	SOLTRAIN Newsletter #9, August 2018	829	738	173	23.44%	59	7.99%
10	SOLTRAIN Newsletter #10, November 2018	849	788	205	26.02%	74	9.39%
11	SOLTRAIN Newsletter #11, December 2018	851	809	172	21.26%	47	5.81%
12	SOLTRAIN Newsletter #12, June 2019	967	913	201	22.02%	73	8.00%
13	SOLTRAIN Newsletter #13, June 2019	942	905	186	20.55%	59	6.52%
SOLTRAIN IV							
1	SOLTRAIN - Newsletter #1 - 2019	983	950	239	25.16%	6	0.63%
2	SOLTRAIN - Newsletter #2 - 2020	1132	1062	266	25.05%	75	7.06%
3	SOLTRAIN - Newsletter #3 - 2020	1103	1042	135	12.96%	8	0.77%
4	SOLTRAIN - Newsletter #4 - 2020	1141	1077	211	19.59%	21	1.95%
5	SOLTRAIN - Newsletter #5 - 2020	1326	1219	319	26.17%	14	1.15%

3.5.3 SOLTRAIN Website

As the SOLTRAIN project website used until Phase III no longer met the requirements of a modern website, a completely new website was created for Phase IV under the leadership of CRSES, Stellenbosch University. Details were already presented in the first progress report.

The new website has been online since the beginning of 2020: <https://soltrain.org/>



Figure 29: Screen-shot of the new SOLTRAIN Homepage

Visitor numbers and page views have increased significantly. Using the month of November as a benchmark month for the last three years, the following is apparent:

	SOLTRAIN 3 Website	SOLTRAIN 3 Website	New SOLTRAIN 4 Website
	November 2018	November 2019	November 2020
Unique visitors	224	200	1,783
Sessions	933	644	8,121

This represents a roughly 80% increase in website activity compared to SOLTRAIN III, and can possibly be attributed to the following factors:

1. An improved website-structure
 2. Better use of the online medium (for example, a web-based newsletter)
 3. Increased email list numbers
 4. Increased social media activity
 5. A more professional ID by way of the SOLTRAIN rebrand
 6. Better knowledge in the market of the SOLTRAIN programme
- Increased interest in climate change and renewable energy

Web Content

The top 30 pages ranked by number of visitors for the period 15 August 2020 to 15 January 2021:

Rank	Hits	% of total	Page
1	9373	7.88%	/ (home)
2	1138	0.96%	/news/
3	966	0.81%	/about/background/
4	924	0.78%	/organisations/contacts
5	874	0.73%	/botswana/
6	808	0.68%	/systems/
7	805	0.68%	/assets/roadmaps
8	801	0.67%	/namibia/
9	735	0.62%	/about/focus/
10	713	0.60%	/south-africa/
11	643	0.54%	/mozambique/
12	634	0.53%	/assets/brochures
13	623	0.52%	/lesotho/
14	621	0.52%	/systems/installation-overview
15	621	0.52%	/systems/map
16	599	0.50%	/zimbabwe/
17	580	0.49%	/organisations/ecosystem
18	555	0.47%	/assets/newsletters
19	511	0.43%	/systems/cape-brewing-company/detail
20	476	0.40%	/systems/hotel-pension-at-the-waves/detail
21	468	0.39%	/systems/energy-&-co2
22	461	0.39%	/organisations/contacts
23	453	0.38%	/systems/laundry-africa/detail
24	430	0.36%	/news/soltrain-4-bursaries-awarded
25	428	0.36%	/systems/leisanyane-farm/detail
26	420	0.35%	/news/solar-water-heating-dissemination-workshop-in-botswana
27	413	0.35%	/news/solar-electric-vs-solar-thermal-water-heating-a-comparison
28	413	0.35%	/systems/melomed-private-hospital/detail
29	412	0.35%	/news/soltrain-supports-the-installation-of-another-100-solar-thermal-demonstration-systems
30	410	0.34%	/news/impact-of-the-covid-19-pandemic-on-soltrain

Referring sites

The following sites sent traffic to the new SOLTRAIN website between 15 August 2019 and 15 January 2021.

Referrals	Website
233	t.co (Twitter)
10	www.sacreee.org
7	www.crses.sun.ac.za
6	sessa.org.za
6	www.aler-renovaveis.org
5	www.solarthermalworld.org
4	energypedia.info
2	www.corporaid.at
2	www.diarioeconomico.co.mz
2	www.entwicklung.at
1	www.solarwaerme.at
1	www.beinewsecurities.com
1	www.iea-shc.org
1	www.solar-payback.com

Visitor Geo-location

North America	57.46%
United States	56.22%
Europe	29.57%
Asia	7.45%
Africa	4.46%
South America	0.13%
Oceania	0.06%

In addition to the public-facing parts of the website, good progress was made on the knowledge and data management aspects of SOLTRAIN's online activities as well as the login only section for SOLTRAIN online community members.

The website backend is underpinned by an enterprise-grade Postgresql database with all relevant backup and security protocols in place. The front end of the website runs on the Python-based Django web framework. Good progress has also

been made towards the management of SOLTRAIN's digital assets (e.g. images, PDF publications etc) and this will be built upon in the next reporting period.


The screenshot shows the pgAdmin 4 interface. The SQL editor contains the query: `SELECT * FROM public.systems_system ORDER BY id ASC`. The 'Data Output' tab displays the following table:

id	title	added_by_id	energy_service	backup	circulation	collector_area	collector_power	collector_tilt	collector_type	heat_ex
5	168 Polytechnic Hotel School	[null]	HOT_WATER	NONE	PUMPED	8.00	5.60	35	FLAT_PLATE	INDIF
6	169 National Youth Service Trai...	[null]	HOT_WATER	NONE	THERMOSYPHON	4.00	2.80	30	FLAT_PLATE	INDIF
7	170 BBCDC Training System 1	[null]	HOT_WATER	ELECTRICAL	PUMPED	7.05	4.90	35	FLAT_PLATE	INDIF
8	171 BBCDC Training System 2	[null]	HOT_WATER	NONE	THERMOSYPHON	3.70	2.50	35	EVACUATED_TUBE	INDIF
9	172 National Housing Enterprise	1	HOT_WATER	ELECTRICAL	THERMOSYPHON	130.20	91.14	30	FLAT_PLATE	INDIF
10	173 Joe's Beerhouse Kitchen	1	HOT_WATER	ELECTRICAL	PUMPED	60.00	42.00	35	FLAT_PLATE	INDIF
11	174 Okakarara Vocational Train...	1	HOT_WATER	ELECTRICAL	PUMPED	6.69	4.60	16	FLAT_PLATE	INDIF
12	175 Valombola Vocational Trai...	1	HOT_WATER	NONE	PUMPED	6.69	4.60	35	FLAT_PLATE	INDIF
13	176 Rundu Vocational Training ...	1	HOT_WATER	NONE	PUMPED	6.69	4.60	15	FLAT_PLATE	INDIF
14	177 Eenhana Vocational Traini...	1	HOT_WATER	ELECTRICAL	PUMPED	6.69	4.60	15	FLAT_PLATE	INDIF
15	178 Zambesi Vocational Trainin...	1	HOT_WATER	ELECTRICAL	PUMPED	6.69	4.60	15	FLAT_PLATE	INDIF
16	179 Bergridge Park	[null]	HOT_WATER	ELECTRICAL	THERMOSYPHON	33.66	23.67	30	FLAT_PLATE	INDIF
17	180 Midrand Graduate Institute	1	HOT_WATER	HEAT_PUMP	PUMPED	250.00	175.00	35/40	FLAT_PLATE	INDIF
18	181 Foghound Interactive Coffe...	1	HOT_WATER	ELECTRICAL	PUMPED	4.34	3.04	26	EVACUATED_TUBE	INDIF
19	182 Rosedon House	[null]	HOT_WATER	ELECTRICAL	THERMOSYPHON	38.52	27.00	30	FLAT_PLATE	INDIF
20	183 Welverdiend Retirement Vi...	1	HOT_WATER	HEAT_PUMP	PUMPED	50.00	36.00	18	FLAT_PLATE	INDIF
21	184 Huis Horison	1	HOT_WATER	HEAT_PUMP	PUMPED	18.40	12.88	30	FLAT_PLATE	INDIF
22	185 Zuid Afrikaans Hospital	1	HOT_WATER	HEAT_PUMP	PUMPED	46.00	32.20	30	FLAT_PLATE	INDIF
23	186 Grün: Bed & Breakfast, Trai...	1	HOT_WATER	HEAT_PUMP	PUMPED	41.00	28.76	75	EVACUATED_TUBE	INDIF
24	187 Monte Vista Housing Units	1	HOT_WATER	ELECTRICAL	PUMPED	24.00	16.80	12	FLAT_PLATE	INDIF
25	188 Louis Jackman Guesthouse	1	HOT_WATER	HEAT_PUMP	PUMPED	20.00	14.00	35	FLAT_PLATE	INDIF
26	189 Cape Brewing Company	1	PROCESS_HEAT	PARAFFIN	PUMPED	120.00	84.00	15	FLAT_PLATE	INDIF
27	190 Chalmers Beef	1	HOT_WATER	ELECTRICAL	DRAIN_BACK	111.60	78.00	22	FLAT_PLATE	INDIF

Figure 30: The Postgresql database backend underpinning the SOLTRAIN website

The new website also signals the beginning of using the web to streamline workflow processes and country-partner and other stakeholder interactions, particularly around the gathering and publishing of news and other content by way of custom-built tools for adding and updating content.

This places the SOLTRAIN project in a good position should it extend into subsequent phases and will accommodate role changes well.



[Home](#)
[About](#)
[Countries](#)
[News](#)
[Installations](#)
[Publications](#)
[Contacts](#)
[User Menu](#)

Welcome, Stephen

Last login: Jan. 18, 2021, 4:22 p.m.

Email: stephen@soltrain.org

Phone: +27836030559

[Update profile](#)

[Change password](#)

Shortcuts

[Add new article](#)

SOLTRAIN Steering Committee Updates

Steering committee notices will appear here. There are none currently.

My Article Submissions

[Solar water heating dissemination workshop in Botswana](#)
Published: 4 months, 2 weeks ago | [view](#) | [edit](#)

[Solar electric vs solar thermal water heating: A comparison](#)
Published: 5 months, 1 week ago | [view](#) | [edit](#)

[SOLTRAIN study visit to the Cape Brewing Company](#)
Published: 4 years, 1 month ago | [view](#) | [edit](#)

[More than 300 solar thermal systems as part of training & R&D co-operation](#)
Published: 5 months, 1 week ago | [view](#) | [edit](#)


[SOLTRAIN fulfils its training mandate with the Namibia Energy Institute and Osona Village Housing Developers](#)
Published: 7 months ago | [view](#) | [edit](#)

[Decision making in solar thermal investment for government partners](#)
Published: 2 years, 1 month ago | [view](#) | [edit](#)

[Austrian Development Agency \(ADA\) Managing Director, Dr Martin Ledolter, visits Namibia and South Africa](#)
Published: 1 year, 11 months ago | [view](#) | [edit](#)

[Monitoring of domestic solar water heating systems in Namibia](#)
Published: 2 years, 2 months ago | [view](#) | [edit](#)

SOLTRAIN Banner Downloads



SOLTRAIN Banner - Stellenbosch University branded version

This is the Stellenbosch University-branded version. Each country partner will have their own version using the generic version as the template to which additional country partner logo/s are added.

[Download](#) | [edit](#)

Figure 31: The user dashboard upon login

Title	Slug (determines page url)

Technical description

The screenshot shows the top of a Microsoft Word window with the 'Source' tab selected on the ribbon. The ribbon contains various icons for text formatting, including font face, font size, bold, italic, underline, strikethrough, subscript, and superscript. The 'Format' tab is visible on the right side of the ribbon. The main content area is empty, and the status bar at the bottom indicates 'Paragraphs: 0, Words: 0'.

Collector type -----	Collector power -----	Collector area -----	Collector tilt -----
Heat exchange -----	Backup -----	Circulation -----	Storage capacity -----
Country -----	District region province -----	Nearest settlement -----	
Collector supplier -----	Storage supplier -----	Installer -----	
Energy service -----	Solar yield -----	Carbon reduction -----	
Phase -----	Main image -----		

System count

© 2004 Blackwell Publishing Ltd

Location

Figure 32: The interface for adding or updating a demonstration system online

3.5.4 General awareness activities

Articles in newspapers and journals

So far 17 articles about SOLTRAIN have been published in newspapers and journals.

Table 16: Articles about SOLTRAIN published in newspapers or journals

Project partner / Country	Newspaper/ Journal	Issue
NEI	ETANGO	July/August 2019
NEI	ETANGO	September / October 2019
SANEDI / CRSES	Engineering News	Volume 39 no 37 September 27–October 3, 2019
SANEDI	Daily Dispatch https://www.pressreader.com/south-africa/daily-dispatch/20191119/281921659881256	November 2019
SANEDI / CRSES	Solar Update Solar Heating and Cooling Programme of the IEA (International Energy Agency)	12/2019
SANEDI	Engineering News	22 November 2019
SANEDI	Infrastructure news	22 November 2019
SANEDI	Lethaba Herald	29 November 2019
AEE INTEC	Weltnachrichten Report on SOLTRAIN in general	04/2019
AEE INTEC	INTABA Report on SOLTRAIN in general	04/2019
AEE INTEC	Der Standard Report on SOLTRAIN activities in Namibia	10/2020
ENPCT	Newspaper – O Pais Report on 1 st policy Workshop	09/2020
ENPCT	Jornal Notícias Report on SOLTRAIN demonstration systems	10/2020
NEI	ETANGO Article on the SOLTRAIN course carried out for VTC's	Oct/Nov. 2020
NEI	The Tech Newsletter for the Namibia University of Science and Technology- Article on the SOLTRAIN course for the VTC's instructors	11/2020
SACREEE	Solar Update Solar Heating and Cooling Programme of the IEA (International Energy Agency)	07/2020
CRSES	Isolabantu SOLTRAIN statement	03/2020



Figure 33: Newspaper article in OPaís above and in the Jornal Notícias (below) on the 1st Policy Workshop held in Mozambique.
10 September 2020

À LUZ DO PROJECTO SOLTRAIN

Maputo terá mais centrais térmico-solares

A instalação, no próximo ano, de três sistemas térmico-solares no Hospital Central de Maputo (HCM) e num centro educacional em Namacunde é a aposta do projecto Soltrain, com foco na massificação do uso de energias renováveis no país e na região.

O "Soltrain", avalia Gabriel Nuziane, coordenador da Soltrain na Empresa Nacional de Parques de Ciência e Tecnologia de Matola, hospedeira do projecto, que faz de negociações numa fase avançada numa aesse proposta.

"Após estudos, praticamente no fim do ano e acredito que nos estudos das primeiras opções, um conjunto de instalações solares", disse.

Sobre os ganhos decorrentes da instalação dos referidos sistemas, a fonte disse serem enormes, sendo em curta rão só a redução do consumo de energia eléctrica da rede nacional, como discussões do consumo.

"Há vantagens nisso tudo, porque é uma energia que será



Padre Humberto defende que o país deve investir na formação de técnicos

a curto prazo, depois de liquidado o valor da instalação, com uma manutenção barata e não se paga nada pela utilização dos sistemas", salienta.

Para o sistema básico a instalar numa família, por exemplo, e custo é de 120 euros, o equivalente a cerca de 30 mil meticais, com a vantagem de ter a metade cobrada pelas financiadoras.

Numa conferência realizada em Maputo, explicou o investigador, foram considerados potenciais intervenções no projecto, a exemplo de entidades como a empresa Electricidade de Moçambique (EDM) e municípios. O encontro visava a partilha de informação sobre a iniciativa e formação de grupos de trabalho numa 2ª implementação. A fonte fala de um projecto promissor, mas com grandes desafios financeiros.

"Precisamos de ter recursos financeiros. O projecto suporia 50 por cento dos custos de instalação mas quem vai admitir tem que ter a outra metade e isso é que agota o grande constrangimento", refere.

Sustentabilidade do sistema de painéis



Apesar de energias renováveis poder reduzir gastos com a compra de electricidade

O CENTRO de Saúde de Nhamitanga, no município de Matola, e beneficiário do projecto há dez anos, tendo sido monta-

dos quatro painéis com termo acumulador de mil litros de água para a maternidade.

Segundo Niza da Silva,

responsável pela maternidade desta unidade sanitária, o sistema é eficiente e garante a disponibilidade de água

quente para as parturientes e o pessoal médico, beneficiando cerca de 200 pessoas mensalmente. Refereu que

antes da instalação do sistema de painéis as parturientes lavavam banho com água fria.

O lar de São Pedro João, que acolhe os seminaristas católicos, na cidade de Maputo, também, abraça o projecto, há dois anos. Ao todo foram montados quatro painéis, com capacidade para aquecimento de 1200 litros de água quente e 100 litros, a um agregado de 20 pessoas. A instalação do sistema custou cerca de 900 mil meticais.

Segundo o padre Humberto Kati Pires, responsável do lar, a sustentabilidade do sistema de painéis só pode ser avaliada em função do tempo que durar.

Adicionalmente a durabilidade do equipamento e que vai definir se o custo de instalação compensa ou não, salientando que apesar de se notar a redução do uso da energia eléctrica da rede nacional é prioritário avaliar o projecto.

Asssegura que o sistema é mesmo dispendioso, visto que actualmente aquela lar possui em todas as casas de banho interiores e exteriores água quente, durante 24 horas.

País tem que investir na formação

O PADRE Humberto considera que com o avanço das tecnologias a pressão que investe na formação de técnicos nacionais para detetar, importar equipamento e pessoal de assistência.

Refereu ter sido uma fase não satisfatória segundo a instalação dos painéis naquele lar, pelo facto de todo o material ter vindo de fora do país e a montagem ter sido executada por uma empresa estrangeira, incluindo também técnicos, que foram sub-óptimos e ineficazes.

Para o padre, seria uma oportunidade de emprego e orgulho dos jovens moçambicanos por fazer um trabalho viável e de maior valor. "Mas, infelizmente, notou-se o desleixo do país, com tanta gente descomprometida. Não adianta termos muitas empresas cujos trabalhos são executados por estrangeiros, porque isso não beneficia em nada o país", disse.



Centro de Saúde de Nhamitanga é um dos beneficiários do Projecto Soltrain

Figure 34: Newspaper article in Noticias on the SOLTRAIN demonstration systems in Mozambique. 21 October 2020



Some of the Vocational Education Trainers who attended the training course on Thermosyphon Solar Water Heaters for small-scale residential systems in Namibia, with the two facilitators from NEI

VTC instructors introduced to simulation software for designing, optimisation and dimensioning of solar thermal systems

The Ministry of Mines and Energy, through the Namibia Energy Institute (NEI), recently held a training course for Vocational Education Trainers on Thermosyphon Solar Water Heaters for small-scale residential systems in Namibia.

The training was held on October 15, 16 & 22, under the framework of the Southern African Solar Thermal Training and Demonstration Initiative (SOLTRAIN) Project Phase 4. It was conducted by Rudolf Moschik and Monika Spörk Dör,

two solar thermal experts from AEE-Institute for Sustainable Technologies (AEE – INTEC), together with Helvi Iлека and Fenni Shidhika from the NEI at the Namibia University of Science and Technology (NUST), the local implementers of SOLTRAIN.

Due to the Covid-19 pandemic which limits large gatherings, the training was also held via virtual platforms to allow more VTC trainers to participate remotely.

The aim of the course was to increase the knowledge of Vocational Education Trainers on small-scale solar water heating

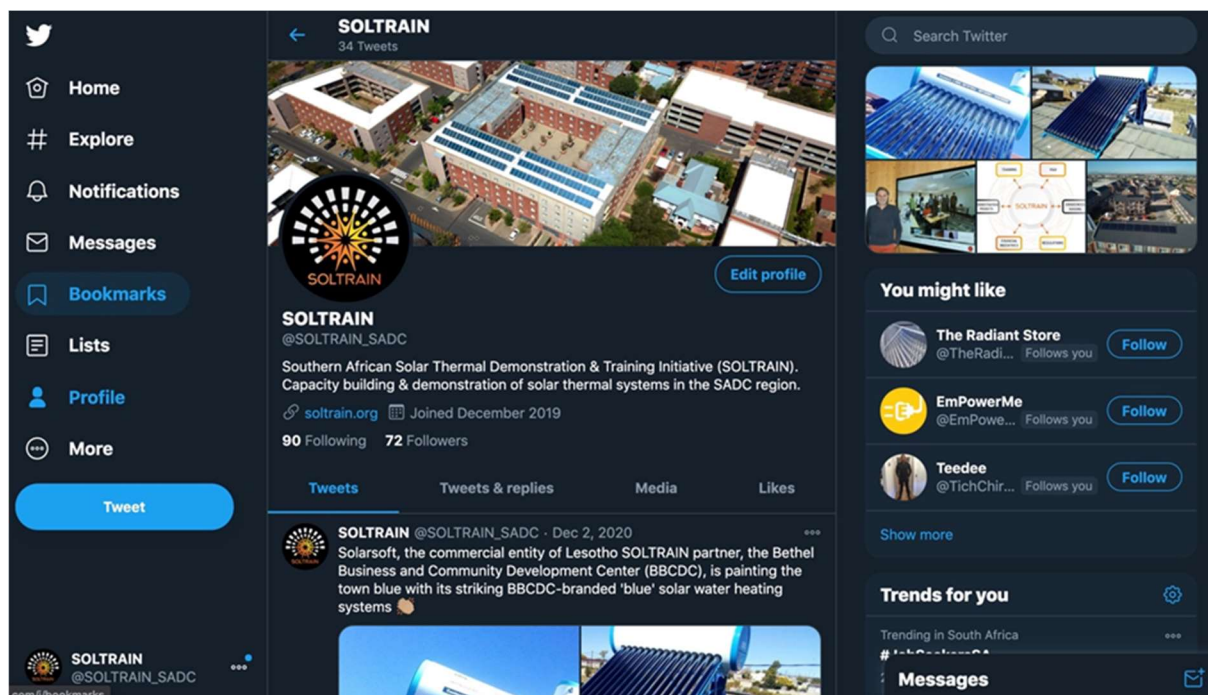
systems for the residential sector in Namibia. The trainers were introduced to different types of thermosyphon solar water heaters with a focus on both theory and practice. Participants learned about designing, installation, quality controls, quality of imported products, commissioning, quality checks, maintenance, monitoring of thermosyphon systems. They had an opportunity to design systems using the learned knowledge and were provided access to T*SOL simulation software.

T*SOL is a dynamic simulation

Figure 35: Article in the Namibian magazine ETANGO on the SOLTRAIN course carried out for VTC's

3.5.5 Social media activities

In keeping with SOLTRAIN's strategy to employ better use of social media, a Twitter account has been set up and has attracted a following of 72 users so far. Twitter activity has driven an average of 46 users per month to the SOLTRAIN website and, as the focus shifts from the initial bedding down of the web platform, social media efforts will be intensified in the next reporting period.



Social media activities on Twitter and Facebook were also carried out by CERC, Botswana and AEE INTEC, Austria.

The Facebook pages of both Botswana Government as well as University of Botswana at: <https://www.facebook.com/BotswanaGovernment/posts/twenty-six-graduate-from-soltrain-iv-training-for-experts-and-professionalstwent/2816151265134180/>

3.5.6 Dissemination of SOLTRAIN activities via the websites of the project partners

Extensive information about SOLTRAIN project activities was also disseminated through the project partners' websites.

Botswana: University of Botswana newsletter, Website and twitter pages as well as Botswana Government facebook page have broadcasted to the public, SOLTRAIN Policy workshop that was conducted on 09 September 2020 as well as the Dissemination workshops. As a result of this the Clean Energy Research Centre has been having an oversubscribed SOLTRAIN dissemination workshops and a lot of public enquiry and reactions on SOLTRAIN.

University of Botswana website news:

<https://www.ub.bw/news/twenty-six-graduate-soltrain-iv-training-experts-and-professionals>

AEE INTEC Website:

<https://www.aee-intec.at/soltrain-phase-iv-southern-african-solar-thermal-training-and-demonstration-initiative-n-phase-iv-p272>

<https://www.aee-intec.at/soltrain-phase-iii-solarthermische-trainings-und-demonstrationsinitiative-im-suedlichen-afrika-n-phase-iii-p271>

https://www.aee-intec.at/suchergebnis-17?suchennach=Soltrain&suche_submit=Suchen&suche_in_publicationen=on

TV and Radio contributions

On November 23, 2019, the Austrian television (ORF1) broadcast a 20-minute report on SOLTRAIN in the science magazine "Newton". The main content of this broadcast was the launch of the large solar plants at WITS Junction (Johannesburg) and at the tannery in Klein Karoo (both in South Africa) as well as on the social housing program in Namibia.

Some screen shots of the broadcast were shown in the first progress report.

Lesotho: 30 minute documentary video

The National University of Lesotho produced a 30-minute video about the solar installations at the campus of the project partner BBCDC in August 2020. The video ran on LTV a number of times and is trending on social media.

3.5.7 Annual SOLTRAIN conference

A SOLTRAIN conference will be organized annually to present the results of the project. All direct partners, but especially all stakeholders from policy, NGOs, development agencies and companies from the participating countries will be invited to these conferences.

The first SOLTRAIN Phase IV conference was scheduled to take place in Harare, Zimbabwe on June 9, 2020. However, due to Covid travel- and meeting restrictions, the Annual Conference had to be postponed to 2021. It is currently planned that the conference will take place in Harare on November 17 and 18, 2021.

The focus of the 2021 SOLTRAIN conference will be on the financing of the Solar Thermal Roadmap Implementation. For this, several financing institutions will be invited.

3.5.8 Support of student projects

Within Phase IV of SOLTRAIN it is planned to support twenty solar thermal student projects (master and post graduate students). Karin Kritzinger from CRSES and her team installed an online application form on the SOLTRAIN website. Mid of May 2020 the first call for bursaries was sent out to all partners and people from the SOLTRAIN network by Karin Kritzinger in order to inform interested students about the possible support for their theses. Topics of solar thermal energy were eligible for funding, but submissions with regard to the topics listed below was given priority.

1. Potential analysis for solar thermal systems in the health sector
2. Analysis of measurement data from selected systems from the SOLTRAIN project
3. Any topics related to the use of solar thermal technologies for heating/drying/cooling in industrial applications.
4. Documentation and analysis of mass housing programmes with mandatory installation of solar water heaters (only Namibia and South Africa)

The closing date of the first round of bursaries was June 19th, 2020. Up to that time twelve applications were received whereof one application dealing with the topic of rural electrification was eliminated because of not meeting the criteria. The steering committee evaluated the bursary applications according to a scoring scheme and eight students, two female and six male students from five countries, have been awarded the bursary. Mid July 2020 the students were contracted. Due to the Covid pandemic the students faced some difficulties in doing their planned work, but despite of this, four students could finalize their studies by end of December 2020.

In the table below an overview about the awarded studies is given.

Table 17: Student projects supported by SOLTRAIN IV (first bursary call 2020)

No.	Country	Name	Topic	Institution	Gender
1	Botswana	Kago Rabasoma	Numerical and Experimental Investigation of the Thermal Performance of a Solar Absorber and Nocturnal Radiator (SAANR) Hybrid Panel for Climatic Conditions of Gaborone, Botswana.	University of Botswana	male
2	Botswana	Orapeleng Modie	Potential analysis for solar thermal systems in the health sector	Botswana International University of Science and Technology	male
3	Lesotho	Malillane Lillane	Solar Thermal Energy for Breweries	National University of Lesotho	female

4	Lesotho	Oliver Nyamukondiwa	Potential Analysis for Solar Thermal Systems in the Health Sector	National University of Lesotho	male
5	Mozambique	Célia Artur	Domestic hot water technology transition to solar thermal systems: Barriers and opportunities in Maputo City, Mozambique	Eduardo Mondlane University	female
6	Namibia	Collin Hangula	Potential analysis for solar thermal systems in the Namibian health sector	University of Namibia	male
7	South Africa	Matthew Keyser	Techno-economic Assessment of a Solar Thermal Industrial-Scale System Using Compound Parabolic Collectors	Stellenbosch University	male
8	South Africa	Pareshin Naidoo	Development of a pilot-scale solar thermal dryer for the treatment of faecal sludge from on-site sanitation facilities	University of KwaZulu-Natal	male

3.5.9 Support – Participation at national and international conferences

This activity focusses on the dissemination of the results of SOLTRAIN core work as well as on dissemination of results of student projects at national and international conferences. A precondition for the activation of funding is the submission of a solar thermal related paper to the conference organisers and the presentation of the paper either orally or on a poster. Invited keynote lectures are also eligible for funding. Passive participation (without presenting SOLTRAIN results) will not be funded. With this support for active participation at national and international conferences, it is expected that the SOLTRAIN network will be extended and new possibilities for projects might be found.

The following procedure is applied:

- Staff members of the partner institutions submit SOLTRAIN related abstracts to the organisers of national or international conferences for review. In order to support gender mainstreaming, a special sensitivity has to be on the participation of female project partners.
- After acceptance of the abstract as oral presentation or poster, an application for funding of the participation can be made. An application form was provided by AEE INTEC. The application forms have to be sent to AEE INTEC and the project steering committee members.
- The project steering committee decides with a 2/3 majority on the funding application.

- AEE INTEC is responsible for contracting the applicants and for the transfer of the funds once the funding decision was made by the steering committee.
- The participation at the conference has to be documented by a short report, a photo and by submitting the conference program that proves the participation.

In total at least 20 papers or posters shall be presented at national and international conferences.

During the year 2019, 10 papers on SOLTRAIN activities were sent by the project partners to the Scientific Committee of the ISES Solar World Congress and to the Conference Committee of the 3rd International Conference on Solar Technologies & Hybrid Mini Grids to improve energy access. All 10 papers were accepted; 7 papers as oral presentations, and 3 as posters.

ISES Solar World Congress

The ISES Solar World Congress and the 13th International Symposium on Renewable Energy Education took place from November 4-7, 2019 in Santiago de Chile. Angelo Ian Buckley (CRSES) and Werner Weiss (AEE INTEC) both presented on SOLTRAIN results at these conferences. Angelo Ian Buckley's participation was funded through SOLTRAIN funds.

Table 18: Lectures and posters presented on SOLTRAIN results at national and international conferences.

Conference	City	Lecturer	Date	Title of the paper
ISES Solar World Congress 2019	Santiago, Chile	Angelo Ian Buckley	05-11_2019	Comparison of Photovoltaic and Solar Thermal Hot Water Systems in South African Context
ISREE – 13 th International Symposium on Renewable Energy Education Santiago de Chile	Santiago, Chile	Werner Weiss	05-11_2019	More than 300 Solar Thermal Systems as a Result of a Training and R&D Co-operation

The 3rd International Conference on Solar Technologies & Hybrid Mini Grids was initially scheduled from April 1st to 3rd, 2020 in Palma de Mallorca, Spain. Six of the accepted lectures and posters would have been financed from SOLTRAIN funds. The other two participations (staff members of AEE INTEC) would have been financed from other funds.

Table 19: Accepted lectures at 3rd International Conference on Solar Technologies & Hybrid Mini Grids.

Name	Institution	Title of the presentation	Type of lecture
Angelo Buckley	CRSES, Stellenbosch University, South Africa	The Potential of Solar Thermal Technologies for Large Tanneries within the SADC Region	oral presentation
Helvi Ileka	NEI, Namibia University of Science and Technology	Experiences with the Solar Water Heater (SWH) Systems at the National Housing Enterprise (NHE) Houses in Namibia and its Impact on the National Housing Program	oral presentation
Khothatso Mphegeke	SANEDI, South Africa	Solar Thermal Training and Awareness for South African Government Institutes	oral presentation
Monika Spörk-Dür	AEE INTEC, Austria	PV Systems or Solar Thermal Water Heaters for Hot Water Preparation in SADC Countries - Pros and Cons considering Measurements from SOLTRAIN Demonstration Systems	oral presentation
Werner Weiss	AEE INTEC, Austria	Solar Thermal Systems as Solution to the Power Crisis in southern Africa	oral presentation
Samson Mhlanga	National University of Science and Technology, Zimbabwe	Solar Thermal Roadmap and Implementation Plan for Zimbabwe and Realized Demonstration Systems	poster
Rudolf Moschik	AEE INTEC, Austria	Monitoring Results of Solar Thermal Systems in the South African Region	poster
Fenni Shidhika	NEI, Namibia University of Science and Technology	Creation of an Energy Efficiency Fund for the Implementation of the Solar Thermal Roadmap for Namibia	poster

However, this conference also had to be postponed to 2021 due to the corona pandemic. An exact date has not yet been published. The further procedure regarding participation will be decided in a Steering Committee Meeting as soon as the date for the conference is fixed.

3.6 Work package 6 - Project Management, Review, and Evaluation

Upon receipt of the signed contracts from ADA, AEE INTEC prepared and submitted subcontracts for all project partners in June 2019.

3.6.1 Project Coordination

The overall project coordination is carried out by AEE INTEC. It also acts as interface between the other project partners and ADA.

AEE INTEC also takes care of internal project monitoring and control. If necessary, AEE INTEC takes additional measures to achieve the set goals.

The day to day communication and information of the partners is done by regular e-mail correspondence or with web-based meetings.

3.6.2 Kick-Off Meeting and launching of the project

A kick-off meeting for SOLTRAIN Phase IV was held on 9 July 2019 in Johannesburg (South Africa) in order to structure the work programme in detail and to inform all national implementation partners as well as selected stakeholders from the partner countries about the content of Phase VI of the project.

A total of 17 persons from all six countries involved in Phase IV attended the kick-off meeting.

3.6.3 Steering Committee Meetings

The basis of the management process is carried out through regular steering committee meetings with the project partners. These meetings take place twice a year in coordination with other activities of the project or via web conferences.

The steering committee consists of one person per implementation partner organisation.

The project implementation partners are responsible for all the co-ordination and contacts to the respective national institutions, administration, the local companies and other stakeholders to be involved in the project. The coordination is organised by the steering committee members.

Since the commencement of the project, 10 steering committee meetings were held. The meetings and the participants are documented in Table 18 below.

As in the previous phases, it was planned to have one Steering Committee meeting at least every six months to plan the further steps for the implementation of the project. Due to the fact that AEE INTEC staff was regularly present in the partner countries, this was quite adequate. Due to the travel restrictions in the corona

pandemic as of March 2020, this was no longer the case. For this reason, it was decided to hold monthly web-based Steering Committee meetings to maintain the momentum of the project.

This approach proved to be very good, as it allowed the project schedule to be almost met with the necessary adjustments. The delays that have occurred so far are within a range that, from the current point of view, do not necessitate an extension of the project. However, this will only be possible if travel and thus physical meetings are possible again in the second half of 2021.

Table 20: Steering Committee Meeting conducted during the project

	Dr Karen Surridge SANEDI ZA	Karin Kritzinger CRSES, ZA	Daniel Baloi ENTCP MOZ	Helvi Ileka NEI, NAM	Samson Mhlana NUST, ZIM	Dr. Ditiro Setlhaolo CERC, UB, Botswana	Ivan Yaholnitsky BBCDC, Lesotho	Kuda Ndhulukula SACREEE	Werner Weiss AEE INTEC AT
03/12/20	X	X	X	X	X	X	X	-	X
25/03/20	X	X	X	X	X	X	X	X	X
21/04/20	X	X	X	X	X	X	X	X	X
19/05/20	X	X	X	X	X	X	X	X	X
16/06/20	X	X	X	X	X	X	X	X	X
28/07/20	X ¹³	X	X	X	X	X	X	X	X
01/09/20	X	X	X	X	X	X	X	X	X
28/09/20	X	X	X	X	X	X	X	X	X
16/11/20	X	X	X	X	X	X	X	X	X
07/12/20	X	X	X	-	X	-	X	-	

3.6.4 Annual progress and financial reports

Annual progress reports and financial reports (per end of December) must be submitted to ADA within two months following the date. After implementation of the project, a final comprehensive progress / completion report will be prepared within three months following the date.

AEE INTEC prepared templates for the preparation of the 1st and the 2nd progress report and the 1st and 2nd financial report for all project partners. The project partners prepared their reports based on the templates provided.

Based on the documents prepared by all project partners and the work carried out during the project, AEE INTEC prepared and submitted the two progress reports.

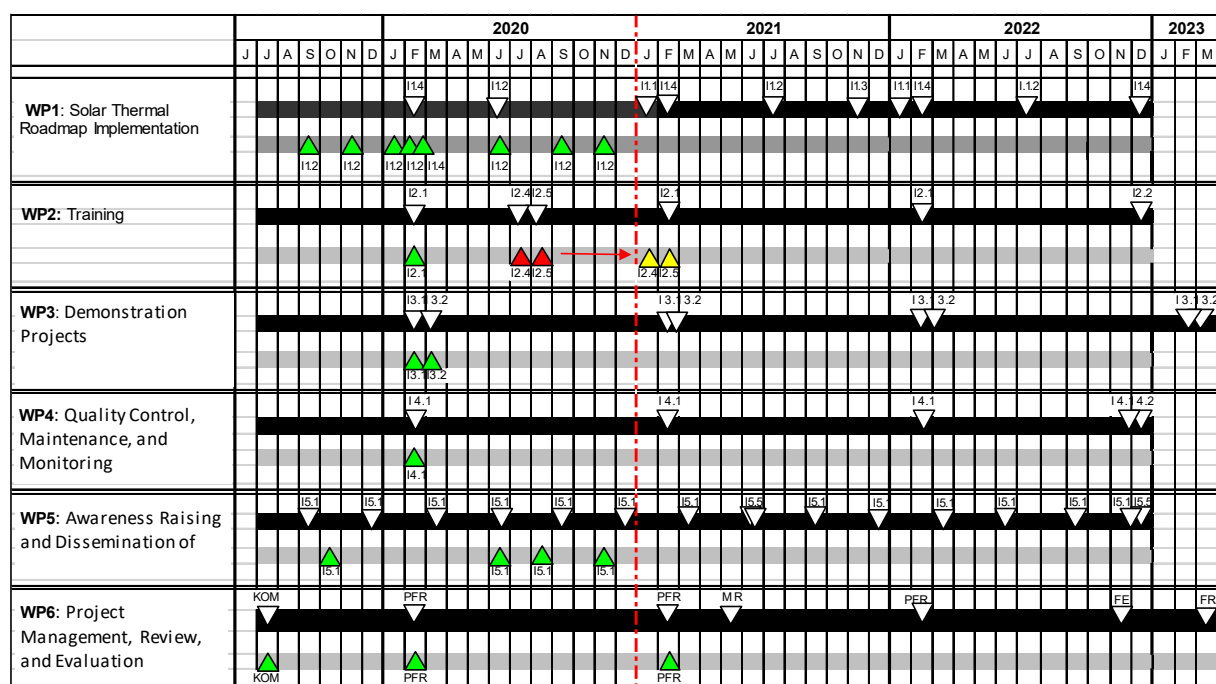
Table 21: Submitted reports

Report	Date
1 st progress report	28 February 2020
2 nd progress report	28 February 2021

¹³ Represented by Khothatso Mphegeke

Financial reports

A common financial reporting structure was drafted in Excel and sent to all project partners by AEE INTEC together with the minutes of the kick-off meeting. Based on these templates, the first and second financial report were prepared by all project partners. AEE INTEC compiled the cost statements and prepared the overall financial reports, which was sent to ADA on 28 February 2020 and in March 2021.



▽ Milestones scheduled	■ schedule according to the original planning (based on the contract)
▼ Milestones postponed	■ real progress according to the progress report
▲ Milestones achieved	
▲ Milestones not achieved	

Abbreviation	
KOM	Kick-off Meeting
PFR	Progress Report and Financial Report
FR	Final Report and Final Financial report
I 1.1.	Policy workshops
I 1.2	Participation at trade fairs documented
I 1.3	Demonstration systems for private and public sector initiated and contracts signed
I 1.4	Annual statistics on the installed solar thermal systems for each country available
I 2.1	Agendas of all training courses and the lists of participants are available
I 2.2	15 persons trained in the dual training program and exam passed
I 2.4	A set of short training videos produced and handed over to project partners for training purposes
I 2.5	Solar trailer manufactured and delivered to the NUST in Lesotho
I 3.1	Solar thermal systems documented in a booklet or a Web based format
I 3.2	Agendas and list of participants for all technical tours are available and documented in the progress reports
I 4.1	Signed quality check forms are available for demonstration systems
I 4.2	Monitoring reports for all monitored systems available in a printed version
I 5.1	SOLTRAIN Newsletters sent out
I 5.3	At least 10 articles in newspapers and journals published and documented in the progress reports
I 5.5	Reports on student projects available
MR	Mid-term review
FE	Final Evaluation

4 Gender aspects

The SOLTRAIN partners fully comply with the ADA minimum standard in sex-disaggregated data collection. For this reason, in Phase IV, the participant lists are kept in such a way that the participation of women can be well documented. The proportion of women is recorded and documented for each training and workshop (see all chapters above).

Elimination of barriers: The partner puts a specific focus on women's enhanced participation in training and project work.

The core team of the SOLTRAIN project has succeeded in achieving a very balanced ratio between women and men. 55% of the project team are women (see table below).

Table 22: Proportion of women and men in the SOLTRAIN project team

SOLTRAIN partner	Country	Female	Male	Total
AEE INTEC	Austria	2	2	4
BBCDC	Lesotho	1	1	2
CERC	Botswana	1	1	2
CRSES	South Africa	1	1	2
ENPCT	Mozambique	0	2	2
NEI	Namibia	2	0	2
NUST	Zimbabwe	0	1	1
SANEDI	South Africa	2	0	2
SIAB	Botswana	1	0	1
Total		10	8	18

The project team has made special reference to a balanced gender ratio in all invitations to workshops and trainings and tries to live up to this. This could not be achieved to the extent that would have been desirable. The proportion of women among the participants varied significantly depending on the target group and the topic.

The percentage of women who participated in the workshops varied significantly by country and sector. The percentage of female participants was highest in the trainings carried out in co-operation with vocational training centres (40%) and in Policy Workshops (33%) and lowest in the Train the Trainer courses (18%) and the trainings for artisans from the private and public sector (8%).

It should be mentioned that for the latter two, technical training as an installer is a prerequisite for acceptance. In the training of the artisans from the public sector, a course conducted for the South African National Defence Force played a special role. For systemic reasons, the proportion of women in this sector is very low.

Logframe Indicator: The SOLTRAIN Partner organizations put emphasize that institutions and organizations that are vital for women and women's empowerment are being in particular served by solar thermal systems to increase their energy sufficiency.

This is shown in the fact that 31 out of a total of 38 solar thermal demonstrations systems, which were approved for funding so far will be used in institutions that support women and marginalized groups.



5 Social Standards

In accordance with the recommendation made by ADA at the beginning of the project, it can be stated at this point that 31 or 79% of the approved solar demonstration systems will be used in institutions that support women and marginalized groups. Approved systems range from dormitories for female students to a training centre for the San community in Namibia and a maternity clinic in Zimbabwe.

As far as the access of marginalized and vulnerable people to the training is concerned, it must be explained here that this is possible in principle, but in reality it is very difficult to realize, because the training offered in SOLTRAIN is a special technical training, for which a completed secondary education and technical training (e.g. as installer) is a prerequisite to participate. This is something that these groups often do not have. However, this deficit cannot be compensated by the SOLTRAIN project and would go beyond the scope of the project.

6 Annexes

6.1 Annex 1 – Installed Solar Thermal Demonstration Systems

	
Beneficiary:	Holy Trinity High School
Address:	Quthing, Lesotho
Installer:	Solarsoft
Solar Thermal System	2 systems Installed collector area: 10 m ² Hot water storage tank: 1000 litres Application: Sanitary hot water System type: Direct thermosyphon system
 Austrian Development Agency	



Beneficiary:

CPS Sisters Youth Hostel

Address:

Harare, Zimbabwe

Installer:

Sunex Solar Systems P/L

Solar Thermal System

4 systems

Installed collector area: 15.86 m²

Hot water storage tank: 1150 litres

Application: Sanitary hot water

System type: Direct thermosyphon system

 Austrian
Development
Agency

