

Network of
Energy Excellence
for Development

Promoting Renewable Energy Technologies in Southern Africa



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Background

The **ACP Science and Technology Programme** is an ACP-EU co-operation programme that started its operation in June 2008. Promoting intra-ACP co-operation, it contributes to building capacity through networks of institutions in the ACP region by funding partnership projects. It is implemented by the ACP Secretariat with funding from the European Union.

The overall objective of the ACP Science and Technology Programme is to support ACP countries in formulating and implementing science and technology (S&T) policies that can lead to sustainable development and to poverty reduction through economic growth and progressive integration in the world economy.

The purpose is to strengthen the internal S&T capacity of ACP countries to support research, development and innovation in the ACP region at three levels:

- Institutional, administrative and policy making;
- Academic research and technology;
- Business and civil society.

The Programme promotes **interdisciplinary approaches** to sustainable development along three main axes:

- Co-ordination and networking in applied research;
- Instruments for collaborative research;
- Management of research activities and reinforcement of research.

The **expected results** of the ACP Science and Technology Programme are:

- Networks established or consolidated at intra ACP-level with linkages to international networks;
- Increased capacity to assess research needs to facilitate the formulation and implementation of research policies;
- Increased capacity and incentives to research network partners to prepare and submit project proposals to funding, including for example the EC's 'Seventh Framework Programme for research and technology development' (FP7);
- Research results better capitalised and disseminated;
- Quality of research results improved.



Settlement outside Lusaka, Zambia
(April 2014)



Foreword

Dear reader,

Sustainable and secure energy supply as well as access to energy remains a challenge for many Southern African countries, especially in remote areas. General plans and policies have been developed highlighting renewable energy (RE) resources as priority. However, despite these ambitious action plans the environmental and economic potential of renewable energy technologies (RETs) in the region is not yet being exploited.

While mainly small-scale research projects have been implemented, a comprehensive and integrated approach for the use of RETs on a broad scale is not yet established. The NEED project partners consider the weak link between research and education institutions, the private sector and decision-making processes at government level a major obstacle in this context. This is where the NEED project has stepped in establishing an all-encompassing network to unite and boost local capacities and rolling-out specific fields of activity that have been out of scope in the past.

Over the past three years, five universities from Botswana, Germany, Namibia and Zambia have joined forces to create structures for the development of technical know how, to interlink relevant stakeholders, raise awareness and to foster political willingness to take sustainable action in the area of RE and energy efficiency (EE) in the target countries.

We are proud to close the NEED project with the launch of the long-term cooperation within the formally registered NEED entity, the **NEED Ltd**. The institutionalisation of the NEED consortium allows us to build on our work within the project period and strengthen our cooperation in the area of RETs in the region on a long-term. By formalising our cooperation we aim to ensure the sustainability of the network and stakeholders' long-term engagement.

Hoping that you will find this publication informative and inspiring I look forward to our potential future cooperation promoting the use of RETs in the Southern African region.

Signature of Prof. Wilfried Zörner.

Prof Wilfried Zörner, Project Leader



Topnaar settlement, Namibia
(March 2015)

Summary of the Action

Over the past 3.5 years, the NEED project has interlinked successful initiatives, research institutions, small- and medium-sized enterprises (SMEs) as well as national and local public decision-makers in the area of RETs to contribute to a wider acceptance and application of renewable energies within Southern African societies.

All project activities aimed at linking and boosting existing local capacities – of students, policy makers, SMEs and research institutions – in the implementation of RETs. By formulating research policies, developing industry standards and promoting higher education as well as vocational training for young people in the Southern African region, the NEED project has rolled out specific activities that were previously inaccessible.

Based on this experience, energy concepts and transition roadmaps for two model regions could be developed. As these model regions are representative of typical local environments (a small

village in the desert and an accumulation of lodges in a national park), the principles that have been developed for setting up an energy concept and its incorporation within local structures and policies serve as a template for the implementation of sustainable energy concepts in other rural areas.

By focussing project activities not only on national level but also on local structures and stakeholders that will profit from the integration of RET in local policies, it is especially the local private sector and societies that will benefit from the outcomes of the NEED project. For instance, well-educated young scientists will be available on the job market, while local communities will profit from a professional workforce in the field of RET and on the long term, from an increased supply of secure energy.

In addition, experiences from the model regions can subsequently be incorporated into the formulated (research) policies on a national scale.



Third NEED project meeting in Maun,
Botswana (September 2015)

Specific Objectives

- Inter-link policy makers, research institutes and stakeholders of the private sector to promote innovation in RET
- Promote consensus building in S&T research policy and RET planning
- Enhance academic combined with practical education in RET ('dual studies')
- Harmonise resp. develop industry standards to support the diffusion of RET
- Develop model regions ('best practice') to foster sustainable national energy and rural development
- Disseminate project results and promote a culture of science amongst policy decision-makers and the public



Excursion during the fifth NEED project meeting in Livingstone, Zambia (September 2016)

Project Partners



NAMIBIA UNIVERSITY OF SCIENCE AND TECHNOLOGY

Namibia University of Science and Technology
Windhoek

www.nust.na

Work Package Leader
Dr Samuel John
Namibia
Dual Studies
Renewable Mini-Grid Drylands



UNIVERSITY OF BOTSWANA

Okavango Research Institute
Maun

www.ori.ub.bw

Work Package Leader
Prof Joseph E. Mbaiwa
Botswana
Fossil-Free Wetlands



BIUST
BOTSWANA INTERNATIONAL UNIVERSITY OF SCIENCE & TECHNOLOGY

Botswana International University of Science and Technology
Palapye

www.biust.ac.bw

Work Package Leader
Prof Tunde Oladiran
Botswana
Industry Standards



UNIVERSITY OF ZAMBIA

University of Zambia
Luksaka

www.unza.zm

Work Package Leader
Prof Mundia Muya
Zambia
Research Strategies
Industry Standards




Technische Hochschule
Ingolstadt

Institute of
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Technische Hochschule Ingolstadt
Ingolstadt, Germany

www.thi.de

Project Leader
Prof Wilfried Zörner

Germany
Coordination & Networks
Results Dissemination

Germany – Coordination / Dissemination

Technische Hochschule Ingolstadt
Institute of new Energy Systems

Project Leader

Prof Wilfried Zörner
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Since its foundation in 1994, the Technische Hochschule Ingolstadt (THI) offers a wide range of programmes that prepare students to use scientific methods in their professional career. Excellent learning and working conditions for 126 professors, more than 330 employees and more than 5,500 students from around the globe create the necessary framework for a short period of study and a high level of success.

Dual Study – Market Leader in the German federal state of Bavaria: The dual study model offers the ideal combination of theory and practice. THI supports and develops its dual study programme in close cooperation with prestigious business partners. Currently, THI provides the largest number of dual students of all Bavarian universities of applied sciences.

The **international profile of THI** is best reflected in its mission and targets. THI strives to meet the highest standards in all areas of research, teaching and management, taking into account the increasing globalisation and the educational expectations of our students, business partners and society. One in three THI graduates spent at least one semester of study or internship abroad.

THI's **Institute for New Energy Systems (InES)** is involved in several national and international research networks such as the Solar Heating and Cooling Programme of the International Energy Agency. Students from all study courses of THI as well as national

and international partner universities are actively involved in the research projects in the institute's main thematic working areas: Industrial Energy Systems, Energy Systems Technology, Domestic Energy Systems and Geo-Energy.

InES is the project coordinator and leader of Work Packages (WP) 1 and 7. It takes care of the overall management of the project and monitors regular knowledge transfer within NEED. Besides, all dissemination activities are managed by THI.



Botswana – Industry Standards

Botswana International University of Science and Technology
College of Engineering & Technology

Work Package Leader

Prof Tunde Oladiran
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The Botswana International University of Science & Technology (BIUST) was established by the government of Botswana to spearhead the drive to transform Botswana's resource-based economy into a knowledge-based economy through training, research and innovation in the fields of science, engineering, and technology.

Located 275 km North-East of the capital, Gaborone, BIUST is developing infrastructure on a 2,500-hectares piece of land in Palapye, a village which is gradually growing into a university town.

BIUST admitted the first cohort of students in August 2012 and now has approximately 1,800 undergraduate and postgraduate students in its two faculties: the Faculty of Engineering & Technology and the Faculty of Sciences.

The university is building a wide network of collaborations and partnerships locally and internationally in order to achieve its mission within the shortest possible time. One such partnership is embodied in the NEED project.

BIUST is coordinating Work Package 4, studying and assessing existing national and regional RET standards with a view to develop a standardisation framework for RETs in the region in relation to international standards.



Namibia – Dual Studies/Renewable Mini-Grid Drylands

Namibia University of Science and Technology
Faculty of Engineering

Work Package Leader

Dr Samuel John
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www.nust.na

The Namibia University of Science and Technology (NUST) is a dynamic and fast growing institution with a strong focus on science, engineering, technology and mathematics. It emphasises innovation and strives to improve the living conditions of people through the pursuit of applied and problem-solving research. NUST was established in 1996 as Polytechnic of Namibia by an act of the Namibian Parliament to offer career-oriented programmes to meet the scarce skills challenging the country. In December 2012, the Cabinet of the Republic of Namibia approved the long-standing request for a name change to Namibia University of Science and Technology.

NUST currently has about 13,000 students enrolled in six schools (faculties): Computing & Informatics; Engineering; Health & Applied Sciences; Human Sciences; Management Sciences; Natural Resources & Spatial Sciences.

The NEED project is managed by the Faculty of Engineering. The faculty's strategic focus areas are: excellence in teaching and learning, student centeredness and building strong national and international collaborations. The faculty plays a critical role as the key driver of innovation, especially within the context of the imminent name change. NUST has a double role in the NEED project: It is responsible for the activities of Work Packages 3 and 6.

The Namibia Energy Institute was established in 2006 through a cooperation agreement between the Ministry of Mines and Energy (MME) and NUST with a mandate to:

- facilitate and conduct research into RE and EE;
- develop materials and standards, reports and disseminate information and materials on RE and EE;
- facilitate cooperation between MME and NUST as a public institution, primarily responsible for RE and EE



Zambia – Research Strategies/Industry Standards

University of Zambia
School of Engineering

Work Package Leader

Prof Mundia Muya
mmuya@unza.zm
www.unza.zm

The University of Zambia (UNZA) was founded in 1966 with only 312 students in three schools. It now has nine schools, five directorates, dealing with over 16,000 students who are served by about 600 academic members of staff both at undergraduate and postgraduate levels: Humanities & social sciences, Education, Natural sciences, Medicine, Engineering, Mines, Agricultural sciences, Veterinary medicine and Law.

The NEED project is managed in the School of Engineering (SoE), which is one of the old schools of UNZA established in 1969 with five departments. Over the years, the SoE has graduated over 4,000 undergraduate students. It has 17 Masters degree level programmes, in addition to PhD programmes in each department.

The SoE has specific undergraduate courses which relate directly to renewable energy engineering, particularly in Agricultural, Electrical and Electronics and Mechanical Engineering. The SoE also boasts a Master of Engineering programme in Renewable Energy Engineering at graduate level.

At UNZA, the NEED project is led by Prof Mundia Muya, who is the Dean of SoE. UNZA's role in the NEED project is to lead the development of 'Research Strategies' (WP2).





Botswana – Fossil-Free Wetlands

Okavango Research Institute
University of Botswana

Work Package Leader

Prof Joseph E. Mbaiwa
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www.ori.ub.bw

The Okavango Research Institute (ORI) was established in 1985 as an institute for the study and conservation of one of the world's largest and most intact inland wetland ecosystems – the Okavango Delta – as well as other Southern African wetlands, river basins, watersheds and surrounding dry lands. Academic programmes offered at ORI include the following:

- MPhil/PhD Programme in Natural Resource Management
- A6 credit undergraduate course on research methods otherwise known as winter course: Introduction to wetland research
- Regional master degree programme in integrated water resource management

Key facts

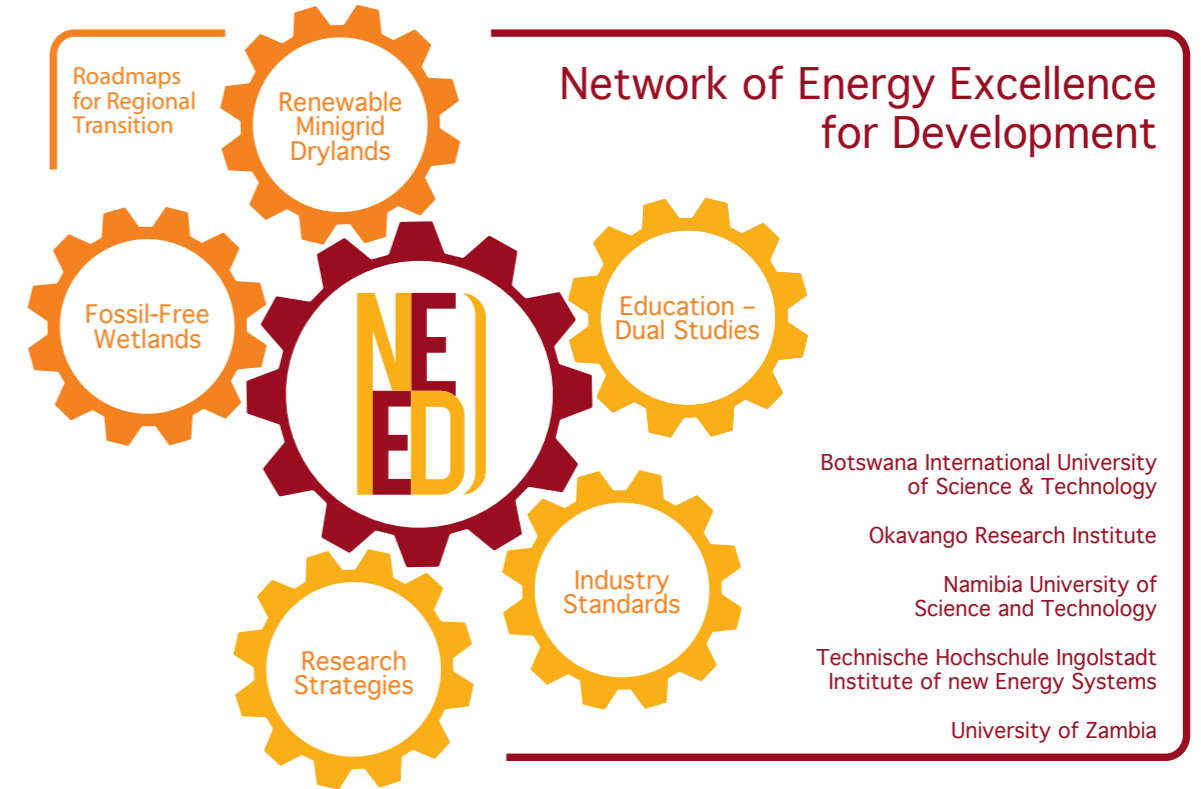
- 33 academic staff from a range of disciplines
- About 50 support staff
- Field base – camps in Delta (Moremi) and Panhandle
- Environmental laboratories
- Tented camp to accommodate visitors
- GIS-data base laboratory

ORI's thematic research areas are the following: Water Resources Management; Sustainable Tourism; Climate Change; Ecosystem Services as well as Ecosystem Dynamics.

Within the NEED project, ORI leads WP5, 'Fossil-Free Wetlands'.



Project Overview



Each of the five partner institutions is responsible for at least one work package of the NEED project.

A work package is headed by the local institution in a given country and then the corresponding activities are transferred to the whole target area.

1. Analysis of topical area **for own country**
2. Development of a project plan for implementing the related follow-up tasks
3. Presentation of results and related project plan to core team
4. Team discussion of the presented project plan and collective decision on how to roll out the plan **for the whole target region**
5. Transition of the collectively decided project plan for the respective country by each project partner



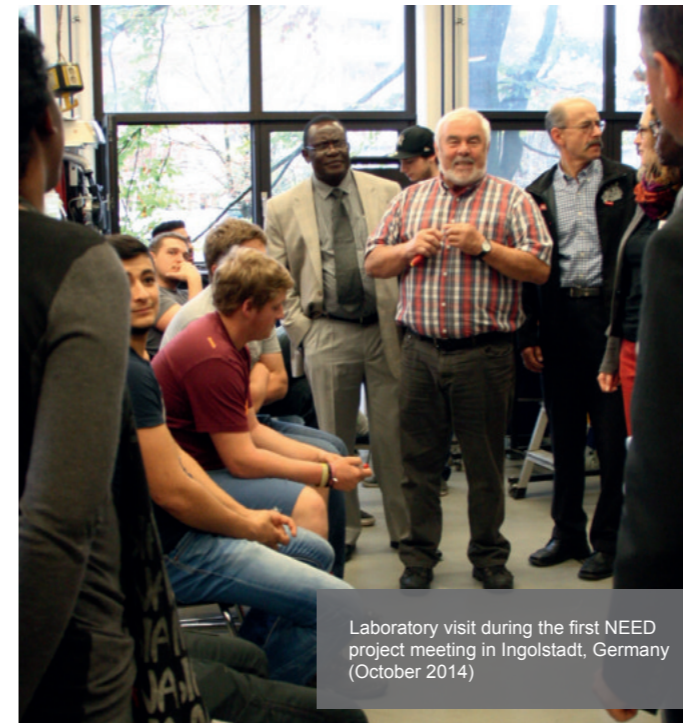
Group work at the third NEED project meeting in Maun, Botswana (September 2015)

Work Package 1 – Coordination & Networks



**Project Leader
& Work Package Leader**

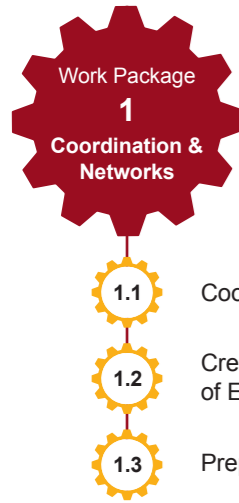
Prof Wilfried Zörner
Technische Hochschule Ingolstadt
Institute of new Energy Systems



Laboratory visit during the first NEED project meeting in Ingolstadt, Germany (October 2014)

- ✓ 6 Project meetings held & Final conference
- ✓ Monthly virtual meetings conducted throughout

- July 2017 **7** **NEED Final conference**
Windhoek, Namibia
- August 2016 **6** Livingstone, Zambia
- March 2016 **5** Windhoek, Namibia
- September 2015 **4** Maun, Botswana
- March 2015 **3** Gobabeb, Namibia
- October 2014 **2** Ingolstadt, Germany
- April 2014 **1** **Kick-off meeting**
Lusaka, Zambia



- 1.1 Coordinate Overall Project
- 1.2 Create Institutional Framework for Network of Excellence
- 1.3 Prepare Joint Research Projects

- Monitoring of project progress
- Financial management
- External representation of the NEED project
- Ensure preparation and delivery of all project meetings
- Coordination of the kick-off meeting
- Exploration of modes of institutionalising the network
- Analysis of national and international private and public funding schemes
- Extension of NEED network (to other countries)



Work Package 1 – Main Achievements

1 Coordinate Overall Project

- ✓ Formalisation of the partnership: consortium agreement developed
- ✓ Definition of milestones and logframe indicators
- ✓ Biannual interim financial and narrative report compiled
- ✓ Monitoring of project progress
- ✓ Development of annual project progress report
- ✓ Project controlling and financial management
- ✓ Project audit conducted
- ✓ Point of contact for general public
- ✓ Regular updates provided to NEED Steering Board and the Contracting Authority
- ✓ Communication with the funding institution
- ✓ Regular networking meetings, public stakeholder events and excursions to RET facilities organised
- ✓ Bi-directional knowledge transfer fostered
- ✓ External representation of NEED ensured

2 Create Institutional Framework for Network of Excellence

- ✓ Institutional structure for the network created
- ✓ Continuous interaction and consultation with RET stakeholders and target groups in the Southern African region ensured, jointly with local partners
- ✓ Analysis of existing networks, platforms and initiatives in Europa and Southern Africa conducted

3 Prepare Joint Research Projects

- ✓ Preparation of joint research projects initiated
- ✓ Additional project launched, together with BIUST and UNZA: Academic Initiative for Renewables (AIR project)

Work Package 2 – Formulate Research Policies



Work Package Leader

Prof Mundia Muya
University of Zambia
School of Engineering



TARGET Acceleration of research in RET appropriate to endogenous energy resources
TASKS Preparation of research strategies in cooperation with relevant stakeholders and anchoring of the research strategies in national research policies



- 2.1 Analysis of Status Quo & RET Research Needs
 - Collection of information on the current status of RET research strategies and research funding
- 2.2 Develop RE Research Roadmap
 - Consultation of stakeholder and target groups and conduct of focus group interviews and workshops
- 2.3 Develop & Institutionalise Public Decision-Making Process
 - Development of national research roadmap
 - Exploration of modes of institutionalising the research framework
- 2.4 Mainstream Research Roadmap into National & Regional Policies
 - Identification of processes of influencing RET research strategies/roadmaps in national development plans



The aim of this task was to accelerate research in RET which is appropriate to endogenous energy resources. Research strategies were prepared in cooperation with relevant stakeholders and shall be anchored in national research policies, so that in future newer and innovative projects on RET will be rolled out. The status and the needs of the RET research in Southern Africa have been well understood.

Dr Ackim Zulu, Coordinator WP2

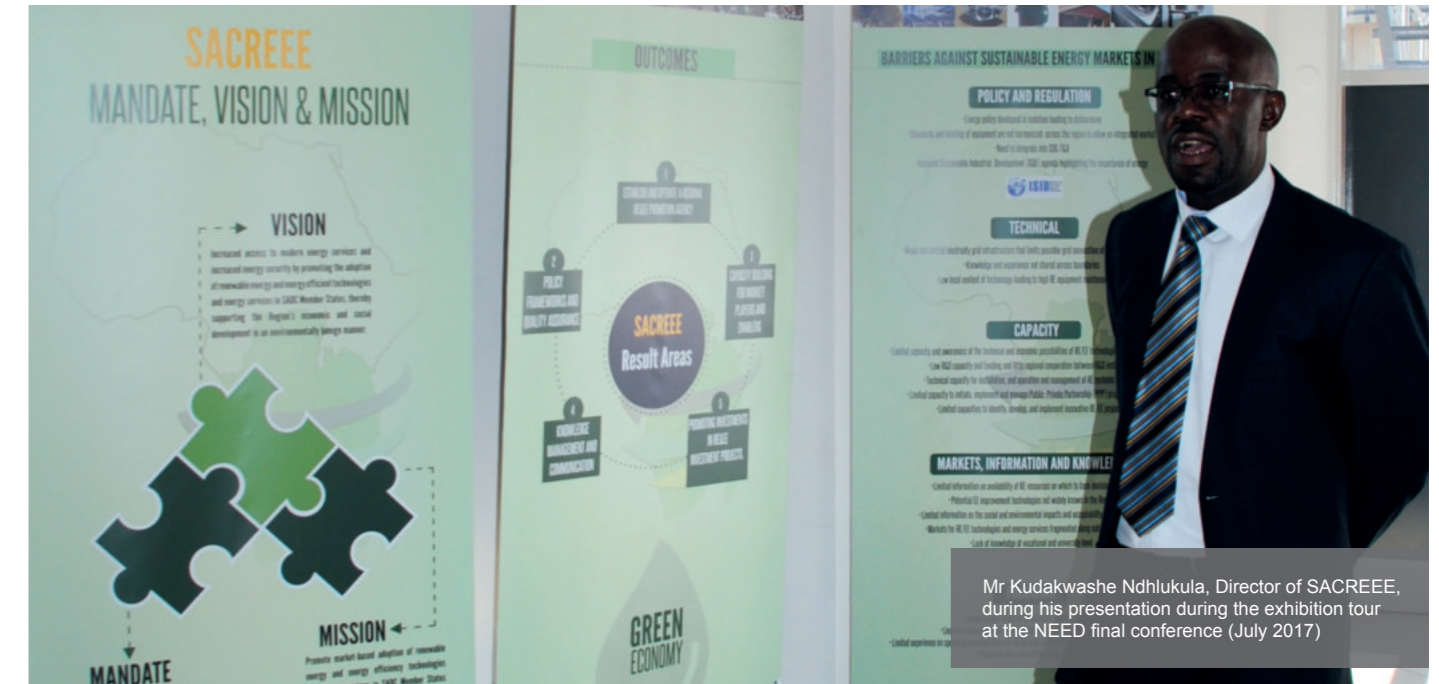
Work Package 2 – Main Achievements

Formulate Research Policies

- ✓ Network of stakeholders and associates created
- ✓ Participated in Zambia International Energy Conference in November 2014 in Lusaka
- ✓ RET research strategy gives guidance for national requirements
- ✓ Generated government's interest in the RET sector
- ✓ Generated local industry's interest to work with higher education and research institutions
- ✓ Developed ranking of RETs in Southern Africa
- ✓ Created a methodology for the development of a RET research roadmap



- ✓ Stakeholder mapping conducted
- ✓ Strategic objectives for RET research roadmap developed:
 - Increase human resource capacity for administration of RET research
 - Develop mechanism for sharing of high-capital infrastructure and equipment by RET researchers in the Southern African region
 - Establish specialised RET research units
 - Promote activities in the four RET research needs identified for Southern Africa
- ✓ Status of RET and research needs in Southern Africa analysed
- ✓ Roadmap for RET research developed



Lessons Learnt

- ✓ Stakeholders (government, industry, research institutions, public) can work together to promote RET in the Southern African region
- ✓ Identifying RET needs jointly with all stakeholder creates ownership for subsequent strategies
- ✓ Formation of SACREEE is timely for promotion of RET in the Southern African region
- ✓ Incredible opportunities for promotion of RET up to national level

Outlook

- ✓ Full buy-in for RET research roadmap by stakeholder to be vigorously pursued
- ✓ Completion of data in satellite sites of Botswana and Namibia needed
- ✓ Generalisation of results for the whole Southern African region or Africa – is this possible?

Work Package 3 – Education – Dual Studies



Work Package Leader

Dr Samuel John

Namibia University of Science and Technology
Faculty of Engineering



Education –
Dual Studies

TARGET Enhancement of practical education for RET as part of the academic formation

TASKS Development of a training concept not only taking into account theoretical knowledge transfer, but also hands-on education



Work Package
3
Education –
Dual Studies

3.1

Analysis of Existing Vocational Training & Training Needs

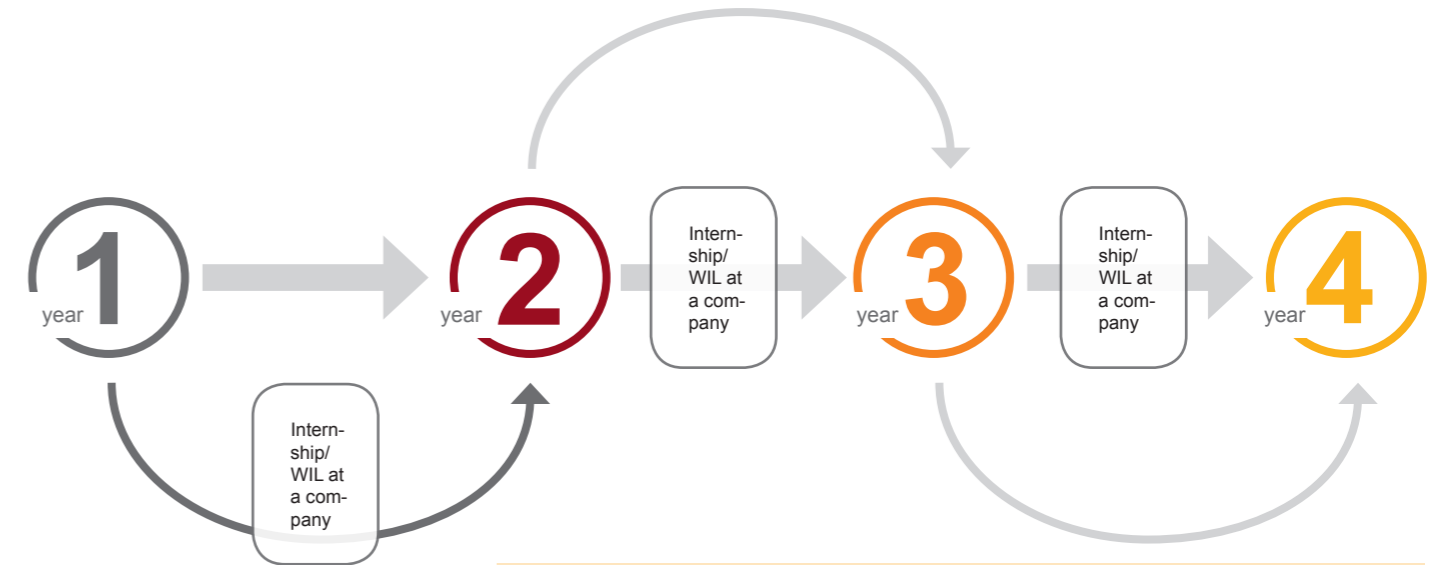
3.2

Develop Framework & Structure of Dual Study Programmes

3.3

Institutionalise Culture of Science to promote RET amongst Young People

- Analysis of training policies, content and teaching methods
- Conduction of focus group discussions and web-based surveys
- Identification of best case study scenarios
- Development of concept for 'train the trainers' on sustainable RET and practices
- Design of tailored practical short courses
- Conduction of best paper awards and organisation of 2 RET summer camps



► Proposed professional curriculum for Energy study programmes, including Work integrated Learning (WIL)



The NUST Project team:
Dr Paul Chisale
(Coordinator WP6)
Dr Samuel John
(WP Leader)
Andrew Zulu
(Coordinator WP3)

Work Package 3 – Main Achievements

Education – Dual Studies

- ✓ Two workshops on capacity needs in Namibia organised in 2014
- ✓ Existing dual study programmes in partner countries analysed
- ✓ Survey conducted on RET training needs (online questionnaire) & results presented at 1st International Renewable Energy Symposium (IRES) in Windhoek in October 2015
- ✓ Developed vocational curriculum framework for solar and wind sector
- ✓ Train-the-trainer concept developed
- ✓ Tailored practical short courses designed (photovoltaics, solar thermal, wind)
- ✓ Participated in science fair project exhibitions
 - NamPower/NCRST National Science Fair in September 2016 in Windhoek
 - NCRST National Science Festival in September 2016 in Ongwediva
 - Science quiz competitions in Mathematics, Physics, Chemistry and Biology in September 2016 in Windhoek
- ✓ Addressed lacking RET research policy and standards
- ✓ RET curricula developed for governing bodies
- ✓ Identified potential to lower unemployment rate through dual study system
- ✓ Revealed interest in dual study system through questionnaire
- ✓ Initiated partnerships with private sector actors for cooperation in dual study programmes
- ✓ Popularised the culture of science and RETs:
 - NCRST STI in Ongwediva in September 2016, Topnaar community, Namib desert in November 2016, NUST science fair in March 2017



Clean Energy Trainer
(Solar and Wind)



Solar-Wind Hybrid
(Trainer)



Ecoboxx
(Solar)

► RET kits: Popularisation of the culture of science and RETs



NEED connects academia with industry partners: Mr Richard Schultz, Head of the Namibian company Terrasol, explains interested students his installation at the exhibition during the NEED final conference in Windhoek, Namibia (July 2017)

Work Package 4 – Develop Industry Standards



Work Package Leader

Prof Tunde Oladiran

Botswana International University of Science and Technology
Department of Mechanical and Energy Engineering

Industry Standards

TARGET Disappearance of the obstacle of missing / inconsistent industry standards in RET in the target countries

TASKS Development resp. harmonisation of necessary RET standards in cooperation with local stakeholders

Work Package
4
Develop Industry Standards

4.1

Analyse Requirements for RET Industry Standards

- Analysis and prioritisation of appropriate technology sectors
- Analysis of the state-of-the-art for related technology sectors
- Investigation of currently applied standardisation processes
- Development of measures for harmonising existing industry standards
- Identification of the key players in the development of RET engineering standards
- Conduction of multi-stakeholder workshops

4.2

Develop Relevant Standards for Defined Set of RET

4.3

Institutionalise Standardisation Processes on Public Level



The work package 'Industry Standards' was jointly coordinated by the Botswana International University of Science & Technology and the University of Zambia. The objective of this WP was to assess existing national and regional RET standards with a view to developing a RET standardisation framework.

Former BIUST Work Package Leader Prof James Katende with WP4 Coordinator Dr Leungo Kelebobile at the fifth NEED project meeting in Livingstone, Zambia (August 2016)

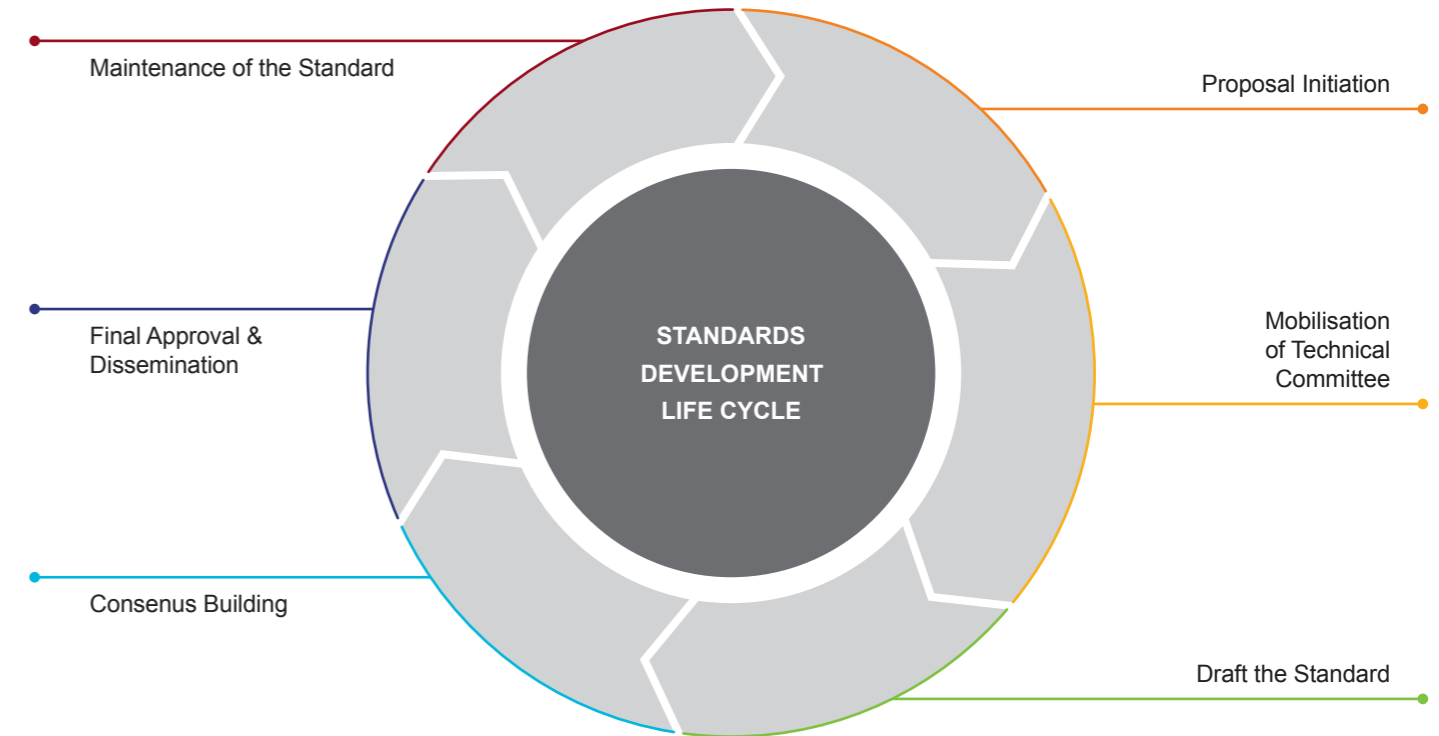


UNZA Coordinator for WP4, Donat Ngendo, during his presentation at the NEED final conference in Windhoek, Namibia (July 2017)

Work Package 4 – Main Achievements

Develop Industry Standards

- ✓ Stakeholder meeting organised in February 2015 bringing together relevant actors engaged in the RET sector in Botswana
- ✓ Establishment of the 'Renewable Energy Association of Botswana' (REAB)
- ✓ Assessment and prioritisation of RET sectors conducted
- ✓ Mapping of stakeholders and existing standards in target countries
- ✓ Report on applicable RET industry standards developed
- ✓ REAB and RET stakeholders meeting organised
- ✓ Identification of potential key role players in the development of RET engineering standards on national, regional and international level
- ✓ RET stakeholders meeting organised
- ✓ Workshop on 'Solar Photovoltaic & Solar Thermal Standards' organised at the Botswana Bureau of Standards (BOBS)



Work Package 5 – Fossil-Free Wetlands



Work Package Leader

Prof Joseph Mbaiwa
Okavango Research Institute
University of Botswana

Fossil-Free
Wetlands

TARGET Development of an energy concept taking into account the specific conditions
Incorporation of the energy concept in local politics and societal structures and sensitizing of relevant stakeholders and governmental institutions
Creation of a model for the implementation of sustainable energy concepts in other typical rural areas

Roadmaps for Regional Transition

Work Package
5
Fossil-Free
Wetlands

5.1

Collect & Evaluate Energy Production & Consumption Data

- Establishment of methodologies for collecting and evaluating energy production and consumption data for the Okavango Delta

5.2

Develop Regional Energy Concept incl. Fields of Action

- Analysis of measures and activities rolled-out in the past
- Definition, evaluation and prioritisation of specific potentials and fields of action

5.3

Develop Roadmap for Regional Transition incl. Socio-Cultural Aspects

- Highlight the advantages of using RET in the Okavango Delta

5.4

Initiate & Institutionalise Transition Process within Ministries

- Development of capacity building measures and conduction of workshops



Okavango Delta, Botswana
(September 2015)



Project Leader Prof Wilfried Zörner and WP Leader Prof Joseph Mbaiwa at the fifth NEED project meeting in Livingstone, Zambia (August 2016)

Work Package 5 – Main Achievements

Fossil-Free Wetlands

- ✓ Analysis of energy sources currently used in the Okavango Delta
- ✓ Analysis of perceptions towards the use of RETs
- ✓ Case study conducted: Chobe Game Lodge, Okavango Wilderness Safaris and Mombo Camp

- ✓ Case study conducted: Guma Lagoon Lodge
 - Analysis of available natural resources
 - Assessment of the Energy Demand (electricity and hot water)
 - Simulation of a combination of PV and solar-thermal systems

- ✓ Energy production and consumption data collected and evaluated (Okavango Delta Management Plan, stakeholder questionnaires)
- ✓ Task report produced: “Comprehensive Report on Energy Production and Consumption of Tourist Services in the Okavango Delta, Botswana”
- ✓ Four journal articles produced
- ✓ Roadmap for regional transition in sustainable energy production and consumption envisioning ‘Fossil-Free Wetlands’ in the Okavango Delta developed
- ✓ Workshop on the roadmap organised

Work Package 6 – Renewable Minigrid Drylands



Coordinator WP6

Dr Paul Chisale

Namibia University of Science and Technology
Faculty of Engineering

Renewable
Minigrid
Drylands

TARGET Development of an energy concept taking into account the specific conditions
Incorporation of the energy concept in local politics and societal structures and sensitizing of relevant stakeholders and governmental institutions
Creation of a model for the implementation of sustainable energy concepts in other typical rural areas

Roadmaps for Regional Transition

Work Package
6
Renewable
Minigrid
Drylands

6.1

Collect & Evaluate Energy Production & Consumption Data

6.2

Develop Community-Based Energy Concept incl. Fields of Action

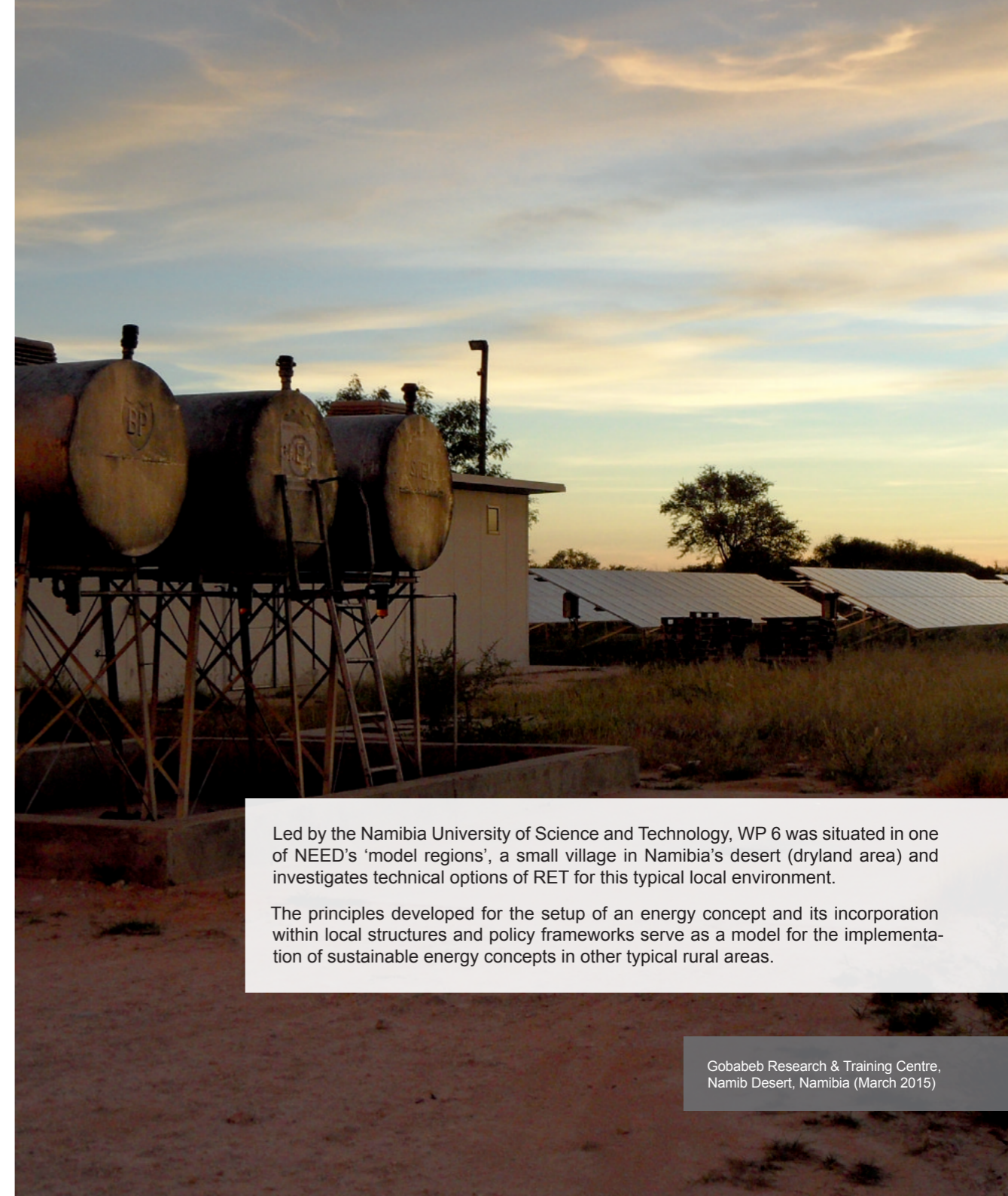
6.3

Develop Roadmap for Community-Based Transition incl. Socio-Cultural Aspects

6.4

Initiate & Institutionalise Process within Ministries

- Establishment of methodologies for collecting and evaluating energy production and consumption data for Gobabeb (GBB)
- Establishment of system management and cost recovery mechanisms for mini-grid systems
- Definition, evaluation and prioritisation of specific potentials and fields of action
- Development of a concept for training modules for secondary school environment

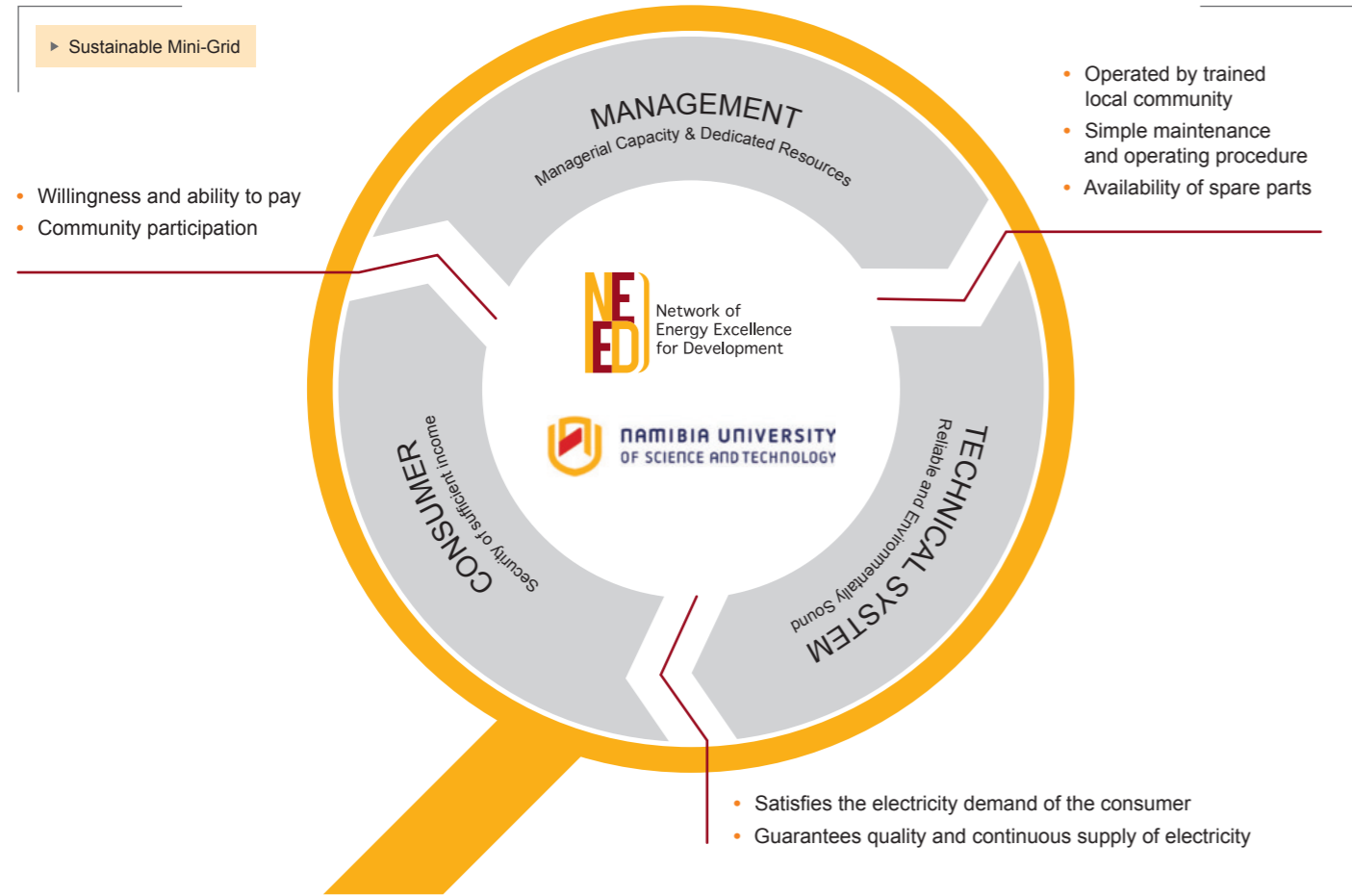


Led by the Namibia University of Science and Technology, WP 6 was situated in one of NEED's 'model regions', a small village in Namibia's desert (dryland area) and investigates technical options of RET for this typical local environment.

The principles developed for the setup of an energy concept and its incorporation within local structures and policy frameworks serve as a model for the implementation of sustainable energy concepts in other typical rural areas.

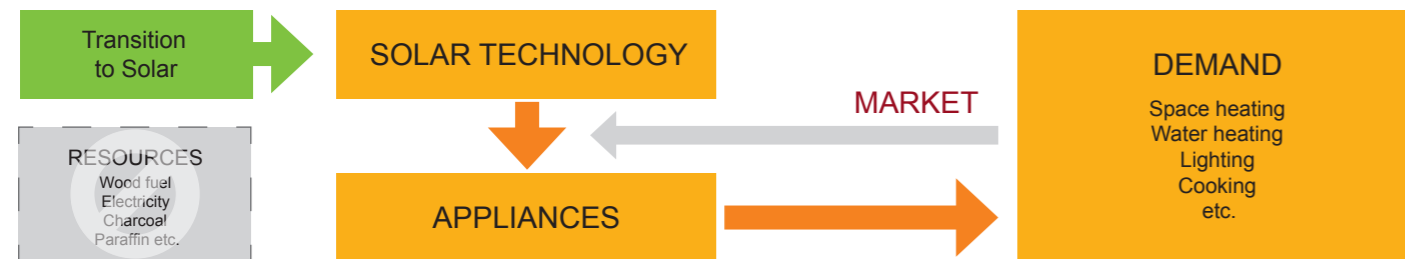
Gobabeb Research & Training Centre,
Namib Desert, Namibia (March 2015)

Work Package 6 – Community-Based Energy Concept



WP6 Activities

- ✓ Analysis of access to electricity in the region
- ✓ Analysis of rural electrification in Namibia
- ✓ Development of a simulation model of settlements – Methodology:
 - Analysis of model villages setup, based on different economic stages
 - Creation of daily electricity profiles
 - Development of annual electricity load profiles
- ✓ Case study conducted: Topnaar community
 - Simulation applied for two model villages
- ✓ With the reference model, the knowledge gap regarding missing electricity load profiles is bridged. It allows...
 - to optimize the dimensioning
 - to make precise statements about the electrical needs of rural settlements





Gobabeb Research & Training Centre, Namib Desert, Namibia (March 2015)

Work Package 6 – Main Achievements

1

Collect and evaluate energy productions and consumption data

- ✓ Methodologies for collecting and evaluating energy production and consumption data established
- ✓ Adequate database developed (number of users, energy consumption throughout the year, outlook for related development in the future)
- ✓ Contributed to development of training modules for secondary environment clubs
- ✓ Management system and cost recovery mechanisms for mini-grid systems with focus on technology affordability and energy demand management established
- ✓ Electricity meters, timer modules, consumption and production loggers installed and used for collection of data and training

2

Develop regional energy concept incl. fields of action

- ✓ Measures and activities rolled-out in the past analysed, to contribute to a more sustainable energy production and consumption situation of GBB, including Topnaar community
- ✓ Specific potentials and fields of action for sustainable energy production and consumption defined, evaluated and prioritised
- ✓ Local community energy concept developed, based on the analysis and data gathered from mini-grid operation including selected fields of action and timeline

3

Develop roadmaps for community-based transition incl. socio-cultural aspects

- ✓ Draft energy concept circulated and community workshop organised
- ✓ Renewable energy training model for demonstration and training of secondary school science clubs developed
- ✓ Do-it-yourself suitable maintenance strategies for GBB mini-grid systems evaluated and revised
- ✓ Science club leadership summit for secondary schools in the community organised
- ✓ Local community workshop on all aspects on mini-grid organised, including costing, maintenance, management and operation
- ✓ Modules for university and polytechnic 6-month internship experiences at GBB developed
- ✓ One intern per year assigned to work on management of energy production and consumption

4

Initiate and institutionalise process with ministries

- ✓ Draft of energy concept circulated
- ✓ Two workshops held with ministries
- ✓ Two presentations prepared and given to Ministry of Mines and Power
- ✓ Materials outlining economic and social benefits on mini-grid systems developed

Work Package 7 – Results Dissemination



Work Package Leader
Prof Wilfried Zörner
 Technische Hochschule Ingolstadt
 Institute of new Energy Systems



Work Package
7
 Results
 Dissemination

- 7.1 Develop Project Website
- 7.2 Plan Expert Conference
- 7.3 Produce Dissemination Materials



- Development of project website
- Provision of a forum for communication with interested page visitors
- Collection of topics for a scientific conference / expert session
- Development and implementation of project corporate identity
- Preparation of press releases, poster, presentations, leaflets and brochures etc.
- Production of promotional items
- Implementation of a newsletter

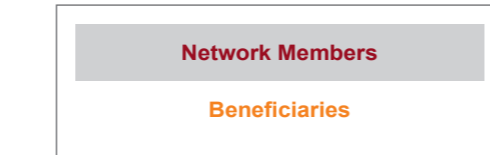
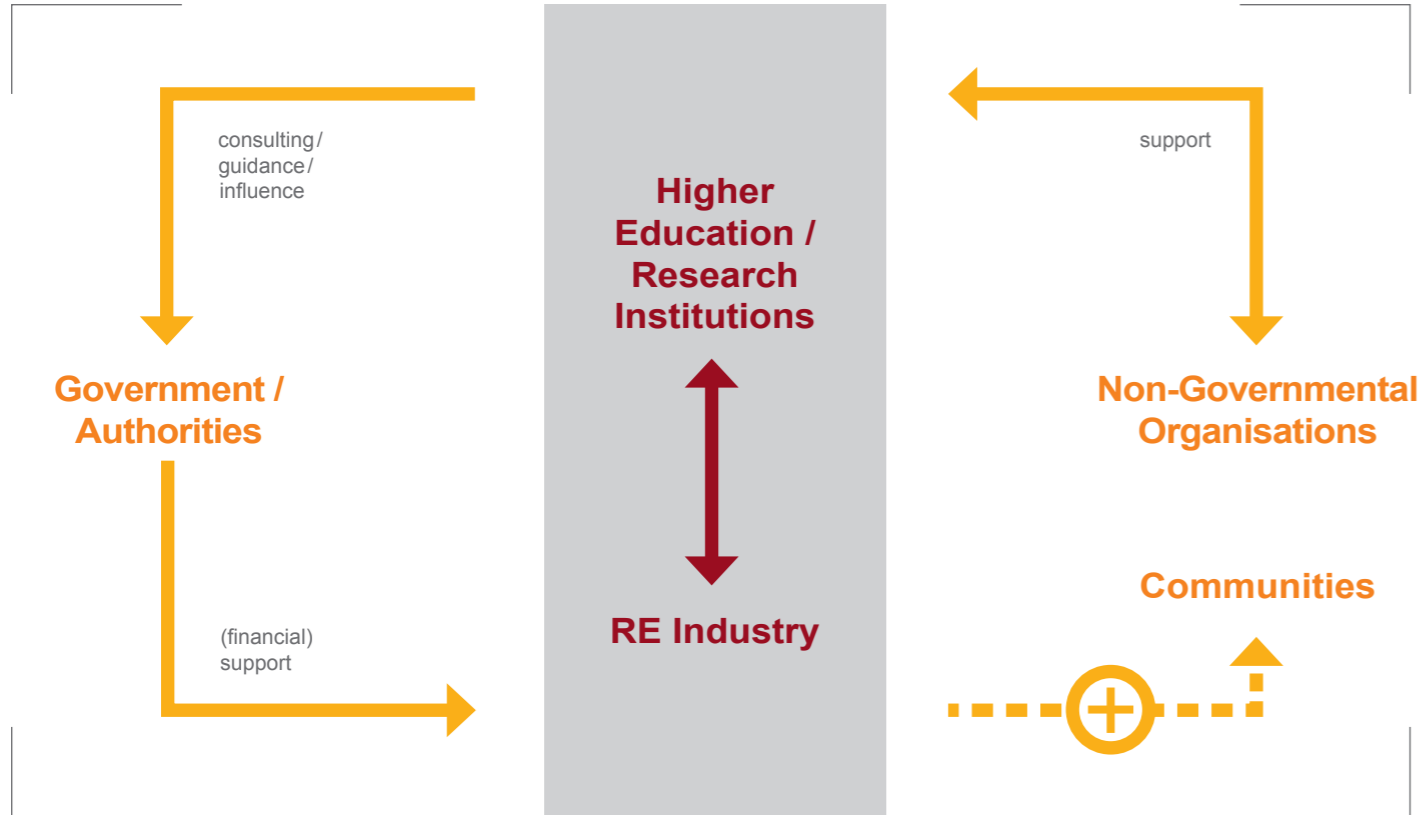
- ✓ 5 NEED Newsletters
- ✓ Article in the Etango Magazine “NEED Project tackles Renewable Energy obstacles“ (April 2016)
- ✓ Article published in Poly News (April 2015)
- ✓ Newspaper articles
- ✓ Maintenance of the NEED Website
- ✓ NEED Final Report

- March 2017 International Conference ‘Fostering Cooperation in Energy Efficiency and Accessibility in East Africa’ in Zanzibar, Tanzania
- February 2017 ‘EU-Africa workshop on Climate Change and Renewable Energy’ in Brussels, Belgium
- September 2016 ‘Summit on Renewables’ organised as part of the ‘International Conference on Infrastructure Development and Investment Strategies for Africa’ (DII2016) in Livingstone, Zambia & International Conference ‘Solar Technologies & Hybrid Mini Grids to improve energy access’ in Bad Hersfeld, Germany
- July 2016 ‘EU-ACP Edulink/S&T Stakeholder Conference’ in Brussels, Belgium
- June 2016 ‘Botswana Business Breakfast’ in Munich, Germany & ‘Knowledge Exchange Forum’ in Windhoek, Namibia
- April 2016 ‘Zambia International Energy Conference’ in Lusaka, Zambia
- March 2016 ‘Domestic Use of Energy International Conference’ in Cape Town, South Africa
- October 2015 ‘International Conference on Clean Energy for Sustainable Growth in Developing Countries’ in Gaborone, Botswana
- October 2015 ‘International Renewable Energy Symposium’ (IRES) in Windhoek, Namibia
- July 2015 ‘EU-ACP Edulink/S&T Stakeholder Conference’ in Brussels, Belgium
- November 2014 ‘International Conference on Solar Energy Technology in Development Cooperation’ in Frankfurt, Germany
- April 2014 ‘EU-ACP Edulink/S&T Stakeholder Conference’ in Brussels, Belgium

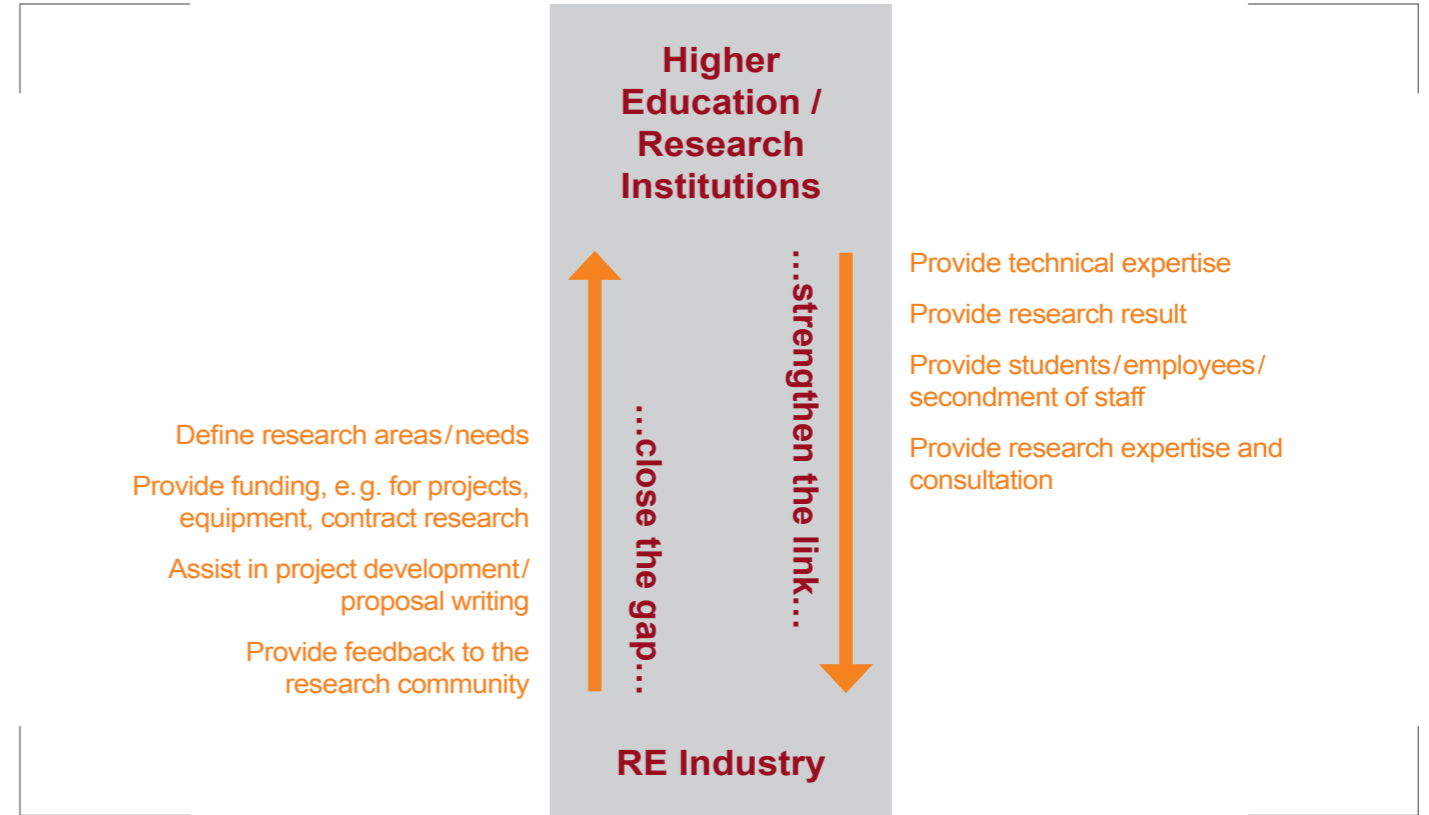
Institutionalisation of the Network

In July 2017, the registration of the Network of Energy Excellence for Development (NEED Ltd.) as a non-profit organisation in Zambia was completed with all five NEED project partners participating as founding member institutions.

NEED Ltd. aims at further strengthening the cooperation between relevant institutions in the area of RETs in the region, building on the work done within the NEED project period. The network shall provide governments and other relevant authorities in the energy sector in participating countries with guidance and consultation on the implementation of RETs.



► Possible Members and Beneficiaries of the NEED Ltd.



► Objectives of the long-term Network

Impressions: NEED Final Conference

End of July 2017, the final conference of the NEED project took place at the Namibia University of Science and Technology in Windhoek, Namibia. With this closing event, the NEED team once again brought together key players of the renewable energy sector in Namibia and other member countries of the Southern African Development Community (SADC). With more than 60 participants, the conference was considered a great success.

The meeting started off with a high-level reception and dinner at the NUST Hotel School on Monday, 24 July. As host of the conference, NUST Vice Chancellor Prof Tjama Tjivikua welcomed 20 invited guests, including diplomats and representatives from the local renewable energy sector. H. E. Hon Obeth Kandjoze, Minister of Energy and Mines, provided the keynote speech.

On 25 and 26 July 2017, the final conference was held at the NUST Auditorium and jointly opened by H.E. Jana Hybaskova, EU Ambassador and Head of Delegation, and Prof Tjama Tjivikua, NUST Vice Chancellor. In addition to the presentations of the NEED project's activities and main achievements by all project partners, the programme included inter alia an exhibition by industry partners engaged in the area of renewable energy in Southern Africa.



NUST Vice Chancellor Prof Tjama Tjivikua during his keynote address at the high-level dinner and reception



Dr Samuel John (NUST) and Prof Wilfried Zörner (THI) announced the NEED final conference live on TV: 'Good Morning Namibia', Monday, 24 July 2017



H.E. Jana Hybaskova, EU Ambassador and Head of Delegation giving the keynote speech at the opening of the NEED final conference



H.E. Hon Obeth Kandjoze, Minister of Energy and Mines, delivering the keynote speech at the high-level dinner and reception

Impressions: NEED Final Conference

In a panel discussion with NEED stakeholders such as the directors of the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE), TESLA Energy Solutions and Alensy Holdings Pty Ltd., past and potential future cooperation with the NEED network was discussed.

To widen the audience's perspective on activities being conducted by other actors in the sector, Dr Yaone Rapitsenyane from the University of Botswana presented the background and outcomes of the EU-funded "LeNSes" project, which ended in early 2017.



The panellists, from left to right:
Mr. Kudakwashe Ndhulukula (SACREEE),
Dr Anna Matros Goreses (NUST),
Dr Samuel John (NUST – Moderator),
Mr. Norbert Dörgeloh (Alensy Holdings Pty Ltd),
Mr. Barend de Waal (TESLA Energy Solutions)

“Capacity is still a big issue in Africa’s renewable energy sector, we need to build this capacity at both individual and institutional level.”

Mr. Kudakwashe Ndhulukula, SACREEE

“Namibia can become 100% renewable. To achieve this, we need to set a target at national level such as reaching 80% renewable energy supply in 10 years from now. In my opinion, we need to start with general awareness raising and focus on a specific target.”

Mr. Norbert Dörgeloh, Alensy Holdings Pty Ltd

Exhibition: Industry Partners & Other Stakeholders



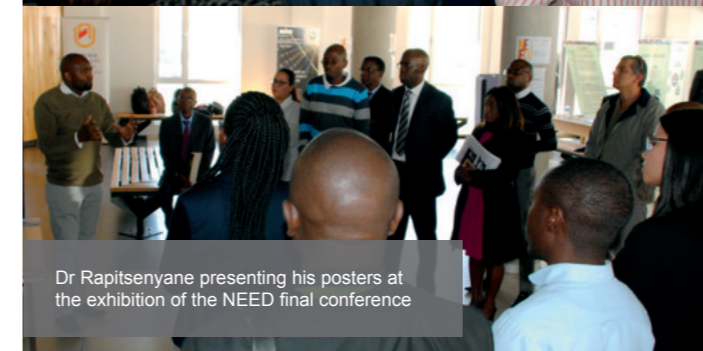
Mr. Harald Schütt, Renewable Energy Industry Association of Namibia (REIAoN)



Mr. Barend de Waal, TESLA Energy Solutions



Dr Clemens von Doderer & team, Hanns-Seidel-Foundation Namibia



Dr Rapitsenyane presenting his posters at the exhibition of the NEED final conference



Ms. Helvi Ileka, Namibia Energy Institute

Impressions: NEED Final Conference

The NEED final conference served as perfect opportunity to officially announce and celebrate the formal registration and institutionalisation of the non-profit network NEED Ltd.

“It is a great pleasure for us to launch our long-term network, the NEED Ltd., today with so many of our key stakeholders from 3 ½ years of the NEED project present. Despite the nostalgic feeling when closing the project period, we very much look forward to continuing our work in the RET sector in the region, not only as project team, but especially together with our long-standing and potential new partners.” Prof Wilfried Zörner, Project Leader

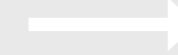


Prof Wilfried Zörner at the NEED final conference in Windhoek, Namibia (July 2017)

Lessons Learnt & Recommendations

Requirements for Future Activities

Need for further interdisciplinary research and exchange between all stakeholders

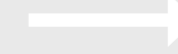


The long-term network NEED Ltd. aims at strengthening the linkages between relevant RET stakeholders in the SADC region

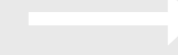
Moving on, the technological focus should be put on...



energy systems rather than single technologies



a holistic view on applications (household-level, public buildings, districts, industry, commerce)



all forms of energy demand (electricity, hot water, heat, cooling/ air-conditioning)



applications targeted for the specific local context

Installation, maintenance and monitoring in operation was identified as major issue



Need to invest in capacity building to train local workforce



More emphasis should be put on practice-oriented research and implementation rather than solely theoretical studies

Analysis of local technology requirements and solutions



Important to improve system concepts, design and engineering



Applied and interdisciplinary research approach considered useful

Need to influence policy making process and support suitable legislation in the area of RET

Next step:

Development of suitable follow-up initiatives and acquisition of joint applied research projects

NEED Team

NEED Steering Board Members

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Botswana Institute for Technology Research and Innovation

Mr. Cheddi Kiravu

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Member of the Board of Trustees of the
European Environment Foundation

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Mr. Nekwaya Leonard Nghiishililwa

THI

Ms. Anna Storr

Mr. David Missbach

Ms. Stephanie Topp

Mr. Martin Zierer

List of Abbreviations

ACP	African, Caribbean and Pacific
AIR	Academic Initiative for Renewables
BIUST	Botswana International University of Science and Technology
BOBS	Botswana Bureau of Standards
EE	Energy Efficiency
EU	European Union
GBB	Gobabeb Research & Training Centre
InES	Institute of new Energy Systems
IRES	International Renewable Energy Symposium
MME	Ministry of Mines and Energy
NUST	Namibia University of Science and Technology
ORI	Okavango Research Institute
RE	Renewable Energy
REAB	Renewable Energy Association of Botswana
REIAoN	Renewable Energy Industry Association of Namibia
RET	Renewable Energy Technology
S&T	Science & Technology
SACREEE	SADC Centre for Renewable Energy & Energy Efficiency
SADC	Southern African Development Community
SMEs	Small- and medium-sized enterprises
SoE	School of Engineering
THI	Technische Hochschule Ingolstadt
UNZA	University of Zambia
WIL	Work Integrated Learning
WP	Work Package

List of Publications

NEED scientific publications include, but are not limited to:

- A. Zulu, P. Chisale, S. John, S. Kapfhamer, M. Hüneke, W. Zörner, S. Mpanga, M. Muya, A. Zulu, J. Katende, "Capacity Building in Renewable Energy Technologies in Namibia, Zambia and Botswana" Journal of Renewable Energy and Energy Efficiency of Southern Africa (JREESA), Vol. 1, No. 1, October 2016, pp. 25-29
- A. Zulu, M. Kaoma, M. Muya, S. Mpanga, D. Ngendo, "Research Requirements in Renewable Energy Technologies for Southern Africa" (2016) Third International Conference on Infrastructure Development and Investment Strategies in Africa, Livingstone/Zambia, 31.08-02.09.2016 (ISBN 978-0-620-70336-9)
- F. Junker, S. Kapfhamer, S. Schneider, W. Zörner, D. Kgathi, J.E. Mbaiwa, M.R. Motsholapheko, J. Katende, L. Kelebopile, T. Oladiran, T. Onyango, P. Chisale, S. John, A. Zulu, M. Kaoma, S. Mpanga, M. Muya, M. Mwanza, D. Ngendo, A. Zulu, "The NEED Project: Strengthen the Implementation of Renewable Energy Resources in the Southern African Region", International Conference on Solar Technologies Hybrid Mini Grids to improve energy access, Bad Hersfeld/Germany, 21. – 23.09.2016
- J. Katende, M.T. Oladiran, L. Kelebopile, T. Onyango, M. Hüneke, S. Kapfhamer, W. Zörner, D. Kgathi, J.E. Mbaiwa, M.R. Motsholapheko, P. Chisale, S. John, A. Zulu, S. Mpanga, M. Muya, M. Kaoma, D. Ngendo, A. Zulu, "The NEED Project: Enhancing the Widespread Use of Renewable Energy Resources in Southern African Region" (2016) International Conference on Domestic Use of Energy (DUE), Cape Town/South Africa, 30. – 31.03.2016 (ISBN 978-0-9946759-0-3)
- L. Kelebopile, J. Katende, M.T. Oladiran, T. Onyango, W. Zörner, S. Kapfhamer, S. John, P. Chisale, A. Zulu, M. Muya, A. Zulu, D. Ngendo, J.E. Mbaiwa, M.R. Motsholapheko, "Development and Harmonization of Renewable Energy Technology (RET) Standards in the SADC Sub-Region" (2016) Third International Conference on Infrastructure Development and Investment Strategies in Africa, Livingstone/Zambia, 31.08. – 02.09.2016 (ISBN 978-0-620-70336-9)
- Mbaiwa, J.E., Motsholapheko, R.M., Kgathi, D.L. & Monnamorwa, S. (2017). Tourism and Energy Use in Lodges and Camps in the Okavango Delta, Botswana. International Journal of Tourism Policy
- Mbaiwa, J.E., "Waste Disposal, Water Resources and the Tourism Industry in the Okavango Delta, Botswana." (2016) The 17th WaterNet/WARFSA/GWP-SA Symposium, 26 – 28th October 2015 theme "Integrated Water Resources Management: Water Security, Sustainability and Development in Eastern and Southern Africa", GICC, Gaborone, Botswana.
- Mbaiwa, J.E., Moseki R. Motsholapheko, Donald L. Kgathi, "Perceptions of Tourism Operators towards Renewable Energy Use in Accommodation Facilities in the Okavango Delta" (2016) Third International Conference on Infrastructure Development and Investment Strategies in Africa, Livingstone/Zambia, 31.08. – 02.09.2016 (ISBN 978-0-620-70336-9)
- Motsholapheko, M.R., Kgathi, D.L., & Mbaiwa, J.E., (2017). Access to grid electricity in Botswana: Implications for energy transition in the Okavango Delta.
- P. Chisale, S. John, A. Zulu, "Sustainable Renewable Energy Mini-grids for Energy Access: Economic and Social Benefits of Mini-grid Systems" (2016) Third International Conference on Infrastructure Development and Investment Strategies in Africa, Livingstone/Zambia, 31.08. – 02.09.2016 (ISBN 978-0-620-70336-9)
- P. Chisale, S. John, A. Zulu, "Dual Studies – An Alternative Pedagogy for Renewable Energy Training in Southern Africa" (2016) Third International Conference on Infrastructure Development and Investment Strategies in Africa, Livingstone/Zambia, 31.08. – 02.09.2016 (ISBN 978-0-620-70336-9)
- T. Oladiran, "Inching towards RET Industry Standards for Promotion of Renewable Energy in Botswana" International Renewable Energy Conference (IREC), Gaborone/Botswana, 26. – 28.10.2016.

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2017