University of Venda

UPDATES OF PRESENT BIOGAS PROJECT AT THE UNIVERSITY OF VENDA

By

David Tinarwo,

National Research Foundation

University of Venda
Creating Future Leaders

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UNIDO

sanedi
South African National Energy Development Institute

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Presentation outline

- INTRODUCTION
  - Typical challenges in rural communities
- Brief summary and update of the projects:
- UNIDO FUNDED PROJECT
- SANEDI SUPPORTED
- NRF SUPPORTED
- STUDENTS RESEARCH TOPICS
- Conclusions

Introductory background

- Governments alone cannot guarantee sustainable present and future; collaboration with the private sector, civil society, universities and educational institutions is key.
- Universities can support the implementation of every SDG, through:
  - learning and teaching, research, organizational governance, culture and operations and external leadership.
  - designing SDG-based education policies; encouraging SDG-oriented research and development; incubating new sustainable development businesses, such as hosting startup high-tech companies located near university research programmes; SDG-based training of future sustainable development leaders through cross-disciplinary and experiential learning; and fostering multi-stakeholder engagement.

Introductory background (cont…)

- UNIVEN works closely with government departments in the implementation of SDG-related programmes,
  - **UNIDO funded:** *Capacity Building for Domestic Biogas Digesters from the main project "Promoting organic waste-to-energy and other low-carbon technologies in small and medium and micro-scale enterprises (SMMEs): Accelerating biogas market development (36 Months duration)*
  - **SANEDI funded:** *Clean Renewable Energy Mix and Energy Efficiency projects,*
  - **NRF funded:** *Biogas Research Laboratory for South Africa (BIRLSA): South Africa/Austria Joint Scientific and Technological Cooperation Call for Applications for 2017-2018 Joint Projects (24 months duration)*
- **LEDET supported:** *Establishing Green Economy Centre of Excellence on campus (Limpopo Provincial Green Economy Plan since 2014)*

Typical challenges in rural communities

Shortage of clean, affordable, and sustainable energy to many,

Deep rooted poverty that needs total eradication

Prone to climate change effects that need mitigation

Solution

Collaborative action from researchers, stakeholders and governments to mitigate and combat emissions from any source using environmentally sustainable energy sources.

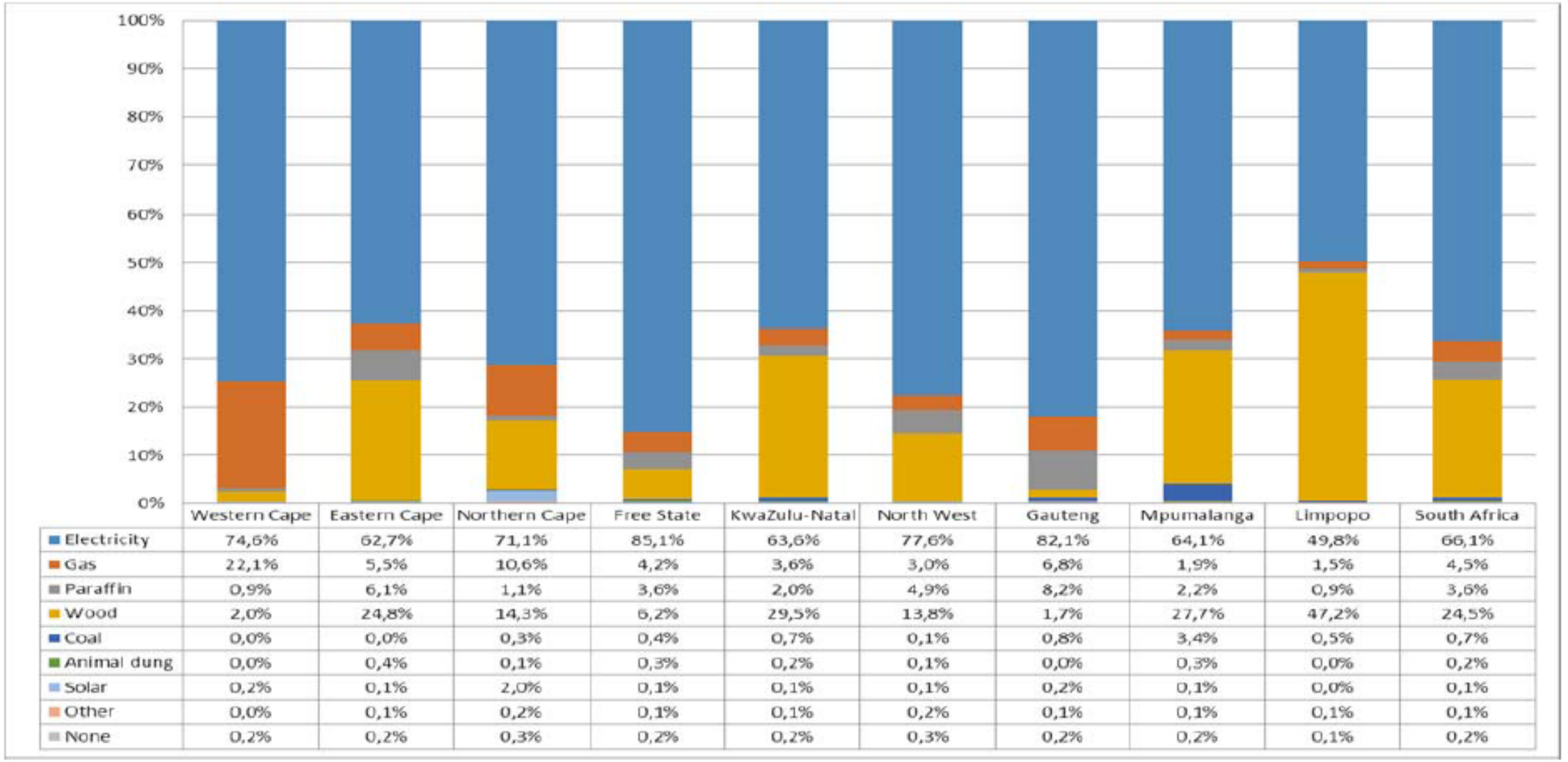
Typical rural cooking and heating energy

Women the most burdened

Piles and piles of wood in homes

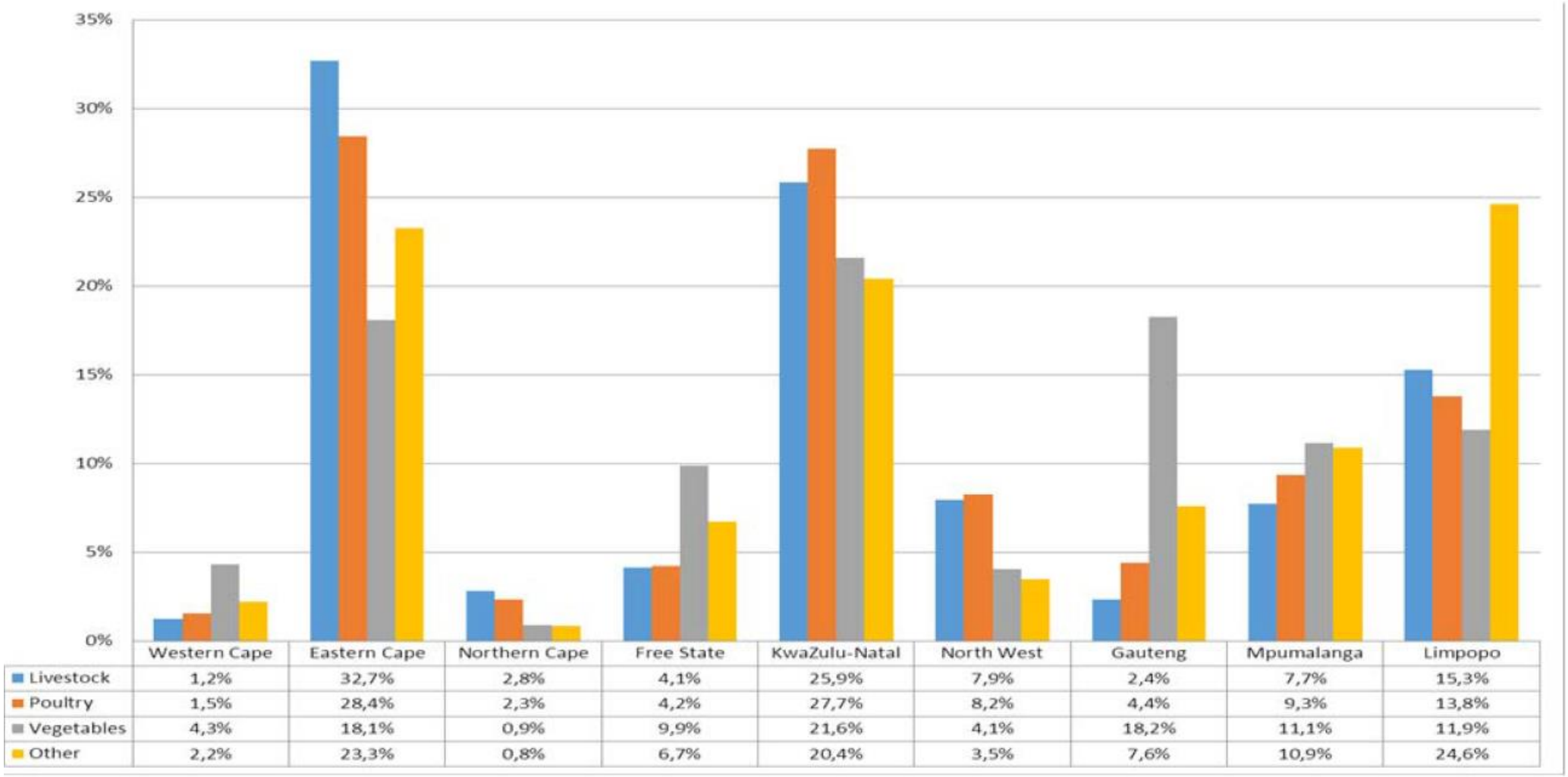
Forests depletion

Smoky cooking place



	Western Cape	Eastern Cape	Northern Cape	Free State	KwaZulu-Natal	North West	Gauteng	Mpumalanga	Limpopo	South Africa
Electricity	74,6%	62,7%	71,1%	85,1%	63,6%	77,6%	82,1%	64,1%	49,8%	66,1%
Gas	22,1%	5,5%	10,6%	4,2%	3,6%	3,0%	6,8%	1,9%	1,5%	4,5%
Paraffin	0,9%	6,1%	1,1%	3,6%	2,0%	4,9%	8,2%	2,2%	0,9%	3,6%
Wood	2,0%	24,8%	14,3%	6,2%	29,5%	13,8%	1,7%	27,7%	47,2%	24,5%
Coal	0,0%	0,0%	0,3%	0,4%	0,7%	0,1%	0,8%	3,4%	0,5%	0,7%
Animal dung	0,0%	0,4%	0,1%	0,3%	0,2%	0,1%	0,0%	0,3%	0,0%	0,2%
Solar	0,2%	0,1%	2,0%	0,1%	0,1%	0,1%	0,2%	0,1%	0,0%	0,1%
Other	0,0%	0,1%	0,2%	0,1%	0,1%	0,2%	0,1%	0,1%	0,1%	0,1%
None	0,2%	0,2%	0,3%	0,2%	0,2%	0,3%	0,2%	0,2%	0,1%	0,2%

Distribution of agricultural households by type of energy mainly used for cooking within each province (percentage) [STATSA, 2016]



	Western Cape	Eastern Cape	Northern Cape	Free State	KwaZulu-Natal	North West	Gauteng	Mpumalanga	Limpopo
Livestock	1,2%	32,7%	2,8%	4,1%	25,9%	7,9%	2,4%	7,7%	15,3%
Poultry	1,5%	28,4%	2,3%	4,2%	27,7%	8,2%	4,4%	9,3%	13,8%
Vegetables	4,3%	18,1%	0,9%	9,9%	21,6%	4,1%	18,2%	11,1%	11,9%
Other	2,2%	23,3%	0,8%	6,7%	20,4%	3,5%	7,6%	10,9%	24,6%

Provincial distribution of agricultural households involved in specific activities (percentage), [STATSA, 2016]

Available opportunities and problems

Conversion of waste to energy is an exceptionally potential multi-solver to the mentioned challenges, but on the ground the situation is different.

Adoption rate and utilization is unpleasantly low.

Household biogas technology is not presently at the expected levels of adoption and utilization.

So what could be the reasons for this?

Possible reasons for the slow uptake of the technology

Possible reasons:

- Low level of awareness on the part of communities and policy makers in relative departments
- Lack of technical capacity in communities
- Still exorbitant prices charged for the systems
- Stigma surrounding the technology
- Poor performance of installed units
- Lack of support systems (like research laboratories to develop the necessary local database for better system performance predictions

So the presently running projects aim to fill up this gap

Project aim and importance

UNIDO funded: *Capacity Building for Domestic Biogas Digesters from the main project*
The main aim of the project is:

The acceleration of the adoption and utilization of biogas generated from domestic, animal and plant waste as a clean and sustainable household energy source throughout the province and country at large, replacing fuels that are currently used for domestic energy needs such as fire wood or kerosene.

In this way:

The project supports the desperately needed localization of the Sustainable Development Goals (SDGs), leading to the Saemaul Undong aspired "New Rural Development Paradigm and the Inclusive and Sustainable New Communities Model" which is seen as a key dimension and a strategic approach in achieving all the sustainable development goals.

The overall training programme will be conducted in three different phases:

Phase 1:

Awareness workshops:

Target Group 1. Leadership
Government officials (provincial to local municipal ward councillor), traditional leaders, NGOs (open)

Target Group 2. Preselected communities (open)

Capacity Building for Domestic Biogas Digesters

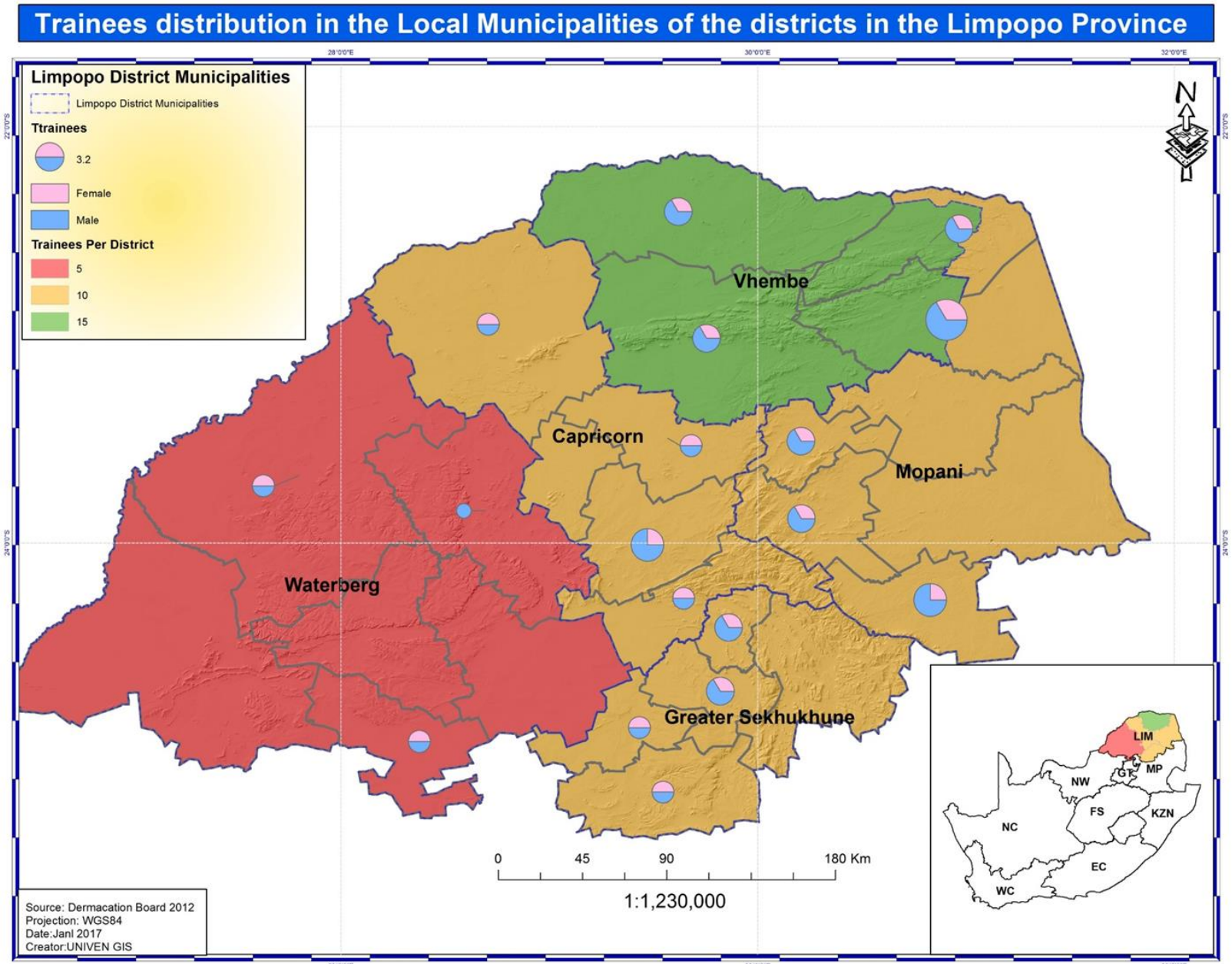
Phase 2:

Two-day biogas technology Training Seminar :
Target Group: Technicians from waste management sections from municipalities, NGOs and Government departments (30)

Phase 3:

On-the-job Masony training:
Target group: Matric & TVET graduates with some brick laying background (50)

PROJECT PROGRESS & STATUS



FORESEEN IMPACTS AND BENEFITS:

- Clean rural households energy and better indoor air quality.
- More disposable time for productive or recreational activities due to reduced time in collecting firewood.
- New jobs will be created (masons, supervisors, quality controllers, project managers)
- Income from sell of compost
- Improved food security

- 80 people will be trained

- 30 biodigesters will be installed under the training and a massive roll out is foreseen with the expected full supportive intervention of all relevant government departments.

- Each biodigester avoids about 9 t CO2 and 5,5 t of wood per year.

NRF funded: *Biogas Research Laboratory for South Africa (BIRLSA):*
LEDET supported:, *Establishing Green Economy Centre of Excellence on campus (Limpopo Provincial Green Economysince 2014)*

1. Scientific background
   - Information about bioenergy systems
   - Evaluation of sustainability

2. Establish biogas laboratory
   - Analysis of the biomass
   - Basis for technical design and proof of concepts
   - Establishment of standards

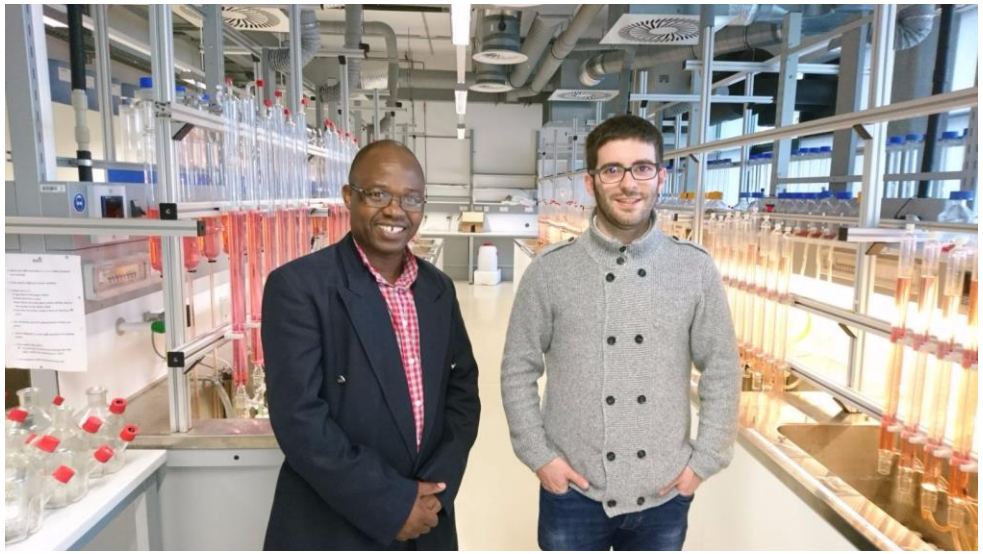
The BIRLSA project aims to:

- Develop and improve supporting facilities for proper development of the biogas technology in Limpopo
- Build the necessary human capacity for efficient biogas technology adoption in South Africa
- Enhance North-South cooperation through the collaboration of the two universities (UNIVEN and BOKU)

Research Plan

WP1: Practical training program and development of a biogas laboratory

- Train staff members from the University of Venda in BOKU laboratory on optimum utilisation of biogas laboratory equipment
- Develop state-of-the-art biogas laboratory plan for implementation at the University of Venda



Research Plan (cont...)

WP2: Development of an educational program in biogas

- The course aims increasing the knowledge on State-of-the-art, which will help students reach the basic tools and knowledge necessary for:
  - Analysing alternative uses of biomass and identify potential uses of biomass for a sustainable conversion into biogas.
  - Appling appropriate available technologies.
  - Technical and economic feasibility studies that are carried out prior to construction of an anaerobic digestion plant, energy income and size of fermenters and other equipment.

Research Plan (cont...)

WP3: Development of efficient utilization strategies of available organic residues based on scientific research

- To map the potential of biogas in South Africa through development of biomass database for the country.
- Transfer knowledge in the utilisation of agro-industrial and municipal wastes for biogas production through theoretical lectures at the University of Venda
- Jointly develop a holistic utilization strategy of agro-industrial and municipal waste according to the South African conditions

Expectations from the bilateral cooperation

1. Strategies for an innovative concepts for operational waste management and resource conservation

2. Scientific articles on the achievements of the project

3. Synergies to help overcome the current challenges of sustainable anaerobic digestion in both countries

4. Collaborative research projects for further cooperation between the South Africa and Austria

Involvement of young scientists

- Development of an educational program in biogas: target groups mainly students and young scientists.

- Both institutes are composed of young teams, where the master and PhD students carry out the major laboratory tasks and a big load of the scientific activities.

- Participation of young researchers in the proposed project to train them with latest tools and techniques in the areas of biogas technology.

Postgraduate student research topics

1. Development and Validation of a Heat Transfer Model to Predict the Prevailing Operating Temperature for Underground Biogas Digester System (PhD)
2. Development of Adoption and Utilization Model of Biogas as an Alternative Source of Energy and Emissions Reduction in Rural Villages of Limpopo Province (PhD)
3. Design and Develop a Cheap and Robust Wireless Multiple-Sensor Device for Monitoring Anaerobic Digestion Process Parameters (Masters)
4. An optimized design of a solar heated biogas digester system suitable for rural household. (Masters)
5. Study of the potential of using Anaerobic digestion in the removal of contaminants in dairy effluent. A case of Limpopo dairy farm, South Africa (Masters)
6. Isollation of methanogenic bacteria and evaluation of the phycochemical properties of cow dung slurry from operational digesters (Honors).

Recommendations

- The sustainable future we are looking for is invested in our young generations
- At any slightest opportunity for a project in sustainable development STUDENTS involvement is crucial
- Encourage stronger collaboration between academic institution and industry
- Industry to invest in the future labour force

Gemeinsam machen wir es möglich

Thank you

University of Venda
School of Mathematical and Natural Sciences
Department of Physics
Dr. David Tinarwo (UniVen)
david.tinarwo@univen.ac.za