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Low Emissions Development Program

ANNUAL REPORT

SOUTH AFRICA LOW EMISSIONS DEVELOPMENT PROGRAM (SA-LED)

1 OCTOBER 2018 – 30 SEPTEMBER 2019

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Cover Photo: A mechanic entering one of George's buses, part of George's Integrated Public Transport (ITP) Network on which SA-LED facilitated an exchange to learn from ITP. Photo credit: George Integrated Public Transport Network.

CONTENTS

ACRONYMS

AD	Anaerobic Digestion
CD	Capacity Development
CHDM	Chris Hani District Municipality
CoCT	City of Cape Town
CoP	Chief of Party
CoT	City of Tshwane
CSAP	Camdeboo Satellite Aquaculture Project
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DEDEAT	Department of Economic Development, Environmental Affairs & Tourism
DM	District Municipality
DoE	Department of Energy
DST	Department of Science and Technology
EEDSM	Energy Efficiency Demand Side Management
EEPBI	Energy Efficiency in Public Building Infrastructure Program
EWS	eThekwini Water and Sanitation Unit
EE	Energy Efficiency
GGES	Green Goal Energy Strategy
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoSA	Government of South Africa
GTAC	Government Technical Assistance Centre
HVAC	Heating, ventilation and air conditioning
ICAT	International Climate Action Transparency
ICLEI	Local Governments for Sustainability (International Council for Local Environmental Initiatives)
IDP	Integrated Development Plan
ITP	Integrated Transport Plan

kV	Kilo-Voltage
LED	Low Emissions Development
LEDS	Low Emission Development Strategies
LOP	Life of Program
LPG	Liquid Petroleum Gas
LM	Local Municipality
M&E	Monitoring and Evaluation
MOU	Memorandum of Understanding
MRV	Measuring, Reporting, and Verification
NGO	Non-Governmental Organization
PMC	Project Management Committee
PPP	Public Private Partnership
PSC	Project Steering Committee
PV	Photovoltaic
RFP	Request for Proposal
SACN	South African Cities Network
SA-LED	South Africa Low Emissions Development Program
SALGA	South African Local Government Association
SANEDI	South African National Energy Development Institute
SARChi	South African Research Chair
SoW	Scope of Work
SSEG	Small-Scale Embedded Generation
TA	Technical Assistance
ToC	Theory of Change
TOR	Terms of Reference
UKZN	University of KwaZulu Natal
UoSA	Use of Systems Agreement
WESSA	Wildlife and Environment Society of South Africa
WWTP	Wastewater Treatment Plant
WWTW	Water Treatment Works

EXECUTIVE SUMMARY

In fiscal year (FY) 2019, the USAID South Africa Low Emissions Development (SA-LED) Program focused on consolidating activities, capturing knowledge from four years of implementation, and toward the end of the year began the process of scaling down technical assistance to its low emissions development (LED) projects and planning for the handover of projects to partners and municipalities. Applying experience and lessons learned from Years 1, 2, and 3, SA-LED focused on mainstreaming LED into the municipal planning and budgeting processes to ensure sustained political and administrative support for Program-supported initiatives. SA-LED also sought to increase public awareness of the various socio-economic benefits associated with LED projects.

Building on the results of the first four years of the Program, SA-LED continued to achieve outstanding results in FY19, meeting and exceeding the majority of the Program's targets for the year and for life of program (LOP). SA-LED applied its project selection criteria to identified projects and supported eight new LED initiatives eligible for technical assistance. To support new and ongoing projects, the Program deployed technical assistance in engineering consulting services, financial and legal advisory services, economic modeling, revenue and utility impact analysis, LED multiple benefits analyses, and GHG emissions analysis, among other forms.

As a result of SA-LED technical assistance across a variety of initiatives in FY19 alone, a projected 312,902 tons of CO2 equivalent emissions will be mitigated, about 30 times more than the annual target of 10,000. Moreover, the Program was able to leverage a further $2.23 million to support LED initiatives across the various provinces and municipalities that SA-LED serves. This year, SA-LED trained 243 individuals against the annual target of 20 across four projects in greenhouse gas (GHG) monitoring and reporting and other LED initiatives including trainings on Small-Scale Embedded Generation (SSEG) to enhance the knowledge and skills of municipal officials in operationalizing various aspects of SSEG systems assessment, metering and billing, illegal systems, and related aspects. 152 trainees applied the skills they acquired. For example, those individuals trained on biogas in schools when on to set up food gardens based on information they acquired in the training.

SA-LED further supported an enabling environment for LED through supporting the Polokwane Municipality in developing the municipality's "Green Goal Energy Strategy" which aims to address the key challenges of energy security, economic competitiveness, climate change, and poverty. The Program also provided technical assistance to the development of Mpumalanga Province's climate change mitigation strategy that represents the Province's first mitigation strategy that identifies climate actions that can be implemented by the Provincial Government and represents one of the only strategies of its kind in South Africa having been adapted to international standards.

As SA-LED approaches its final year of implementation, the Program will ensure an effective handover of LED projects and activities to its partners. SA-LED will also focus on capturing and sharing knowledge and lessons learned from its various projects to then house select LED tools and promotional material in a resource library to ensure the sustainability of the Program's initiatives after its close in May 2020.

HIGHLIGHTS FOR THE YEAR

FUNDS MOBILIZED OR LEVERAGED TO SUPPORT LED PROJECTS

$2,234,032

GHG EMISSIONS REDUCED

312,902 TONS OF CO2E

CLEAN ENERGY GENERATION CAPACITY

9 MEGAWATTS (MW)

INDIVIDUALS TRAINED: 243

- **Biogas training for two schools in the Eastern Cape: Nyanga and Arthur Mfebe Senior Secondary Schools**
- **Sustainable transport peer learning exchange for Mpumalanga Provincial and Gert Sibande officials**
- **OR Tambo CLEER tool training**
- **CapeNature LED training**

1. INTRODUCTION

GOAL

The South Africa Low Emissions Development (SA-LED) Program is a $14.9 million, five-year USAID-funded initiative aimed at supporting the Government of South Africa to achieve its green growth objectives.

OBJECTIVES

SA-LED is working to strengthen the capacity of the public sector to plan, finance, implement, and report on low emissions development projects and to accelerate the adoption of low emissions technologies in both the public and private sectors. A particular focus is to increase the flow of investments into LED projects and to increase the size and quality of the LED project pipeline.

SECTORS

To support the implementation of South Africa's Climate Change Response Policy, SA-LED focuses on near-term priority flagship sectors: Renewable Energy, Energy Efficiency and Energy Demand Management, Waste Management, and Transport.

PARTNERS

The USAID SA-LED Program was co-created in conjunction with the South African Department of Environmental Affairs (DEA) and the Department of Science and Technology (DST).

South Africa's transition to a low-carbon economy illustrates the typical dichotomy facing developing economies: joining the global fight against climate change, while advancing economic growth and social development.

In recognition of its status as one of the world's largest emitters of GHG emissions, South Africa has embarked on an ambitious effort to use low emissions development (LED) to reduce its GHG emissions in a more sustainable, equitable, and just manner. To do so has required change at multiple levels and sectors, including mitigating key capacity bottlenecks and coordinating with a diverse set of actors who contribute to LED project development.

South Africa's Climate Change Bill (2018) acknowledges the important role of sub-national government at the provincial and local levels in achieving the country's national climate change response. While the Climate Change Bill, in its current form, recognizes the role of municipalities in climate change mitigation, it does not explicitly establish sectoral emissions targets for municipalities, although municipalities will be subject to carbon taxation under the carbon taxation contemplated by this Bill. However, the Bill does require mayors of municipalities to undertake climate change needs and response assessments within a year of the promulgation of the Climate Change Bill. This will be followed up by the development of municipal climate change response implementation plans, which are expected to include measures or programs (LED projects) relating to both adaptation and mitigation.

Significant obstacles remain in translating this vision into actual LED projects. Many South African municipalities not only lack the capacity to move projects through the pipeline, but a clear structure for coordination between the sub-national government spheres and the national government climate change mitigation mandate has yet to be articulated. These institutions are working to understand the operational and planning implications of the Climate Change Bill and have experienced challenges in translating national Department of Environmental Affairs (DEA) recommendations into actionable projects. South African investors also have a limited understanding of LED technology or the legal and regulatory framework surrounding green investment and therefore perceive such investments as risky. Addressing these challenges requires translating LED concepts into replicable projects, proving their success, and aiming to scale.

THE SA-LED APPROACH

The overall approach of SA-LED focuses on helping South African municipalities move LED projects through the project development life cycle, operating as the vehicle to deliver technical assistance and capacity building. Under this approach, SA-LED identified municipal projects that were stuck in the project pipeline and provided the training and support needed to move these projects towards implementation. This approach provides opportunities for practical learning, using real project blockages as the training materials to build the capacity of municipalities. Since its inception, SA-LED has employed a comprehensive suite of training resources that will remain in the public domain long after the

Program ends. These activities bring lasting benefits to the country by building the capacity of those who are working within the sector, provinces, and municipalities. The Program has brought lasting benefits to a diverse set of LED actors within South Africa that will enable the country to sustain the envisioned flow of LED projects.

SA-LED's approach in Year 4 focused on building on the successes and milestones of the first three years of the Program. The focus of the Program for Year 3 was on project development and capacity enhancement. While SA-LED's original objectives remain, two key and interrelated approaches have guided all activities and technical assistance during the final phase of implementation. The two approaches are that of "*supporting municipalities to prepare for and implement climate change response implementation plans*" and "*ensuring sustainability of technical assistance*." These approaches were supplemented with knowledge sharing activities and LED tool development and dissemination.

Although significant progress has been made and many targets have been met since the introduction of SA-LED in 2015, one of the most important considerations for Year 4 of project implementation was to consolidate, improve upon, and ensure the sustainability of the Program's technical assistance and associated impacts. Communications and outreach also continued to serve as a crosscutting function to support the distribution of lessons learned, the development of training manuals, and knowledge management across each of the Program's five intervention areas.

RESEARCH AND ANALYSIS

While research and analysis, including conducting market research and identifying project blockages and best practices, played a vital role in the early years of the Program, these activities were emphasized less in Year 4. During FY19, SA-LED continued its working relationship with key consortium partners within the LED sector, namely DNA Economics, The Green House, Linkd Environmental Services, and ICF International. In view of sustaining this legacy work, research, and analysis was focused on addressing specific blockages related to ramping-up technical assistance. Where SA-LED has gained traction in sectors, analysis became the key tool develop audience-specific business case studies, decision-support tools, and training materials.

LED PROJECT DEVELOPMENT

SA-LED continued supporting LED initiatives across each of the four flagship sectors in unblocking and progressing projects that face challenges and in providing technical assistance that will help bring projects to financial close or RFP award. This technical assistance support included conducting feasibility assessments; mobilizing finance; evaluating LED technology options; and providing legal, financial, and engineering technical assistance to LED projects.

CAPACITY DEVELOPMENT

SA-LED continued to engage experts and conduct formal training with municipal partners. For example, the Program collaborated with key stakeholders to train 243 individuals this year, including 36 municipal electricity supply department officials from 17 municipalities on small-scale embedded generation (SSEG) installations and 27 municipal officials from the City of Tshwane and City of Johannesburg on the new South African National Standards (SANS) 10400-XA municipal level green building guidelines.

ENABLING ENVIRONMENT

SA-LED works to create an enabling environment that institutionally supports LED efforts across local, provincial, and national government. Based on the results of the research and analysis focus of the Program in FY16, activities in this area increased in FY17 to enhance existing municipal networks, trainings and government initiatives, and industry association efforts. In FY18, these efforts were implemented into actionable projects, operating at the municipal level, and in FY19 these interventions translated to support with climate change mitigation implementation plans, such as the Mpumalanga Climate Change Mitigation Strategy (MCCMS) and Polokwane's Green Goal Strategy. In the Program's final year, a large part of creating an enabling environment and raising awareness of LED will be finalizing SA-LED's technical products and showcasing them through communications products to be stored in a resource library for use after the Program's close.

MEASURING, REPORTING, AND VERIFICATION OF GHG EMISSIONS

SA-LED continued supporting municipalities to (i) perform project-level GHG emissions analysis using USAID's Clean Energy Emission Reduction (CLEER) Tool[1], where applicable, and (ii) articulate the multiple-benefits of LED projects. In FY19, the Program continued with work on finalizing the GHG mitigation sections of the DEA's Monitoring and Evaluation Sectoral Guidelines for the combined Energy and Transportation and Industrial Processes and Product Use sectors, and supported select municipalities to apply the CLEER Tool training in Eastern Cape.

KEY ASSUMPTIONS

Assumptions explain the underlying logic behind SA-LED's expectations of the connections between different components of the pathway-of-change. The underlying assumptions of the Program are as follows:

1) Implementation of LED initiatives will ultimately contribute towards reducing relative levels of GHG emissions.

2) Provision of capacity building and technical assistance to targeted municipalities will result in increased investment in LED initiatives.

3) Assistance to mainstreaming LED initiatives into municipal planning, programming and budgeting processes will result in increased uptake of

[1] https://www.cleertool.org/support

LED projects at the municipal level, such as generation of renewable energy, improved waste management, and efficient public transport systems.

4) Municipalities are key actors in developing and implementing climate change mitigation policies and programs as they are located at the interface of local action, through their service delivery mandates, and national commitments.

5) Implementation of LED initiatives has the potential to support economic development and job creation for women and youth.

SA-LED's Progress for FY19 is detailed in the following sections. The report provides information on progress on projects that will lead to a reduction in GHG emissions, capacity building with respect to LED, and activities to promote an enabling environment for the uptake of LED projects. Given the present position of the LOP, the report will also focus on projects that are scaling down at present.

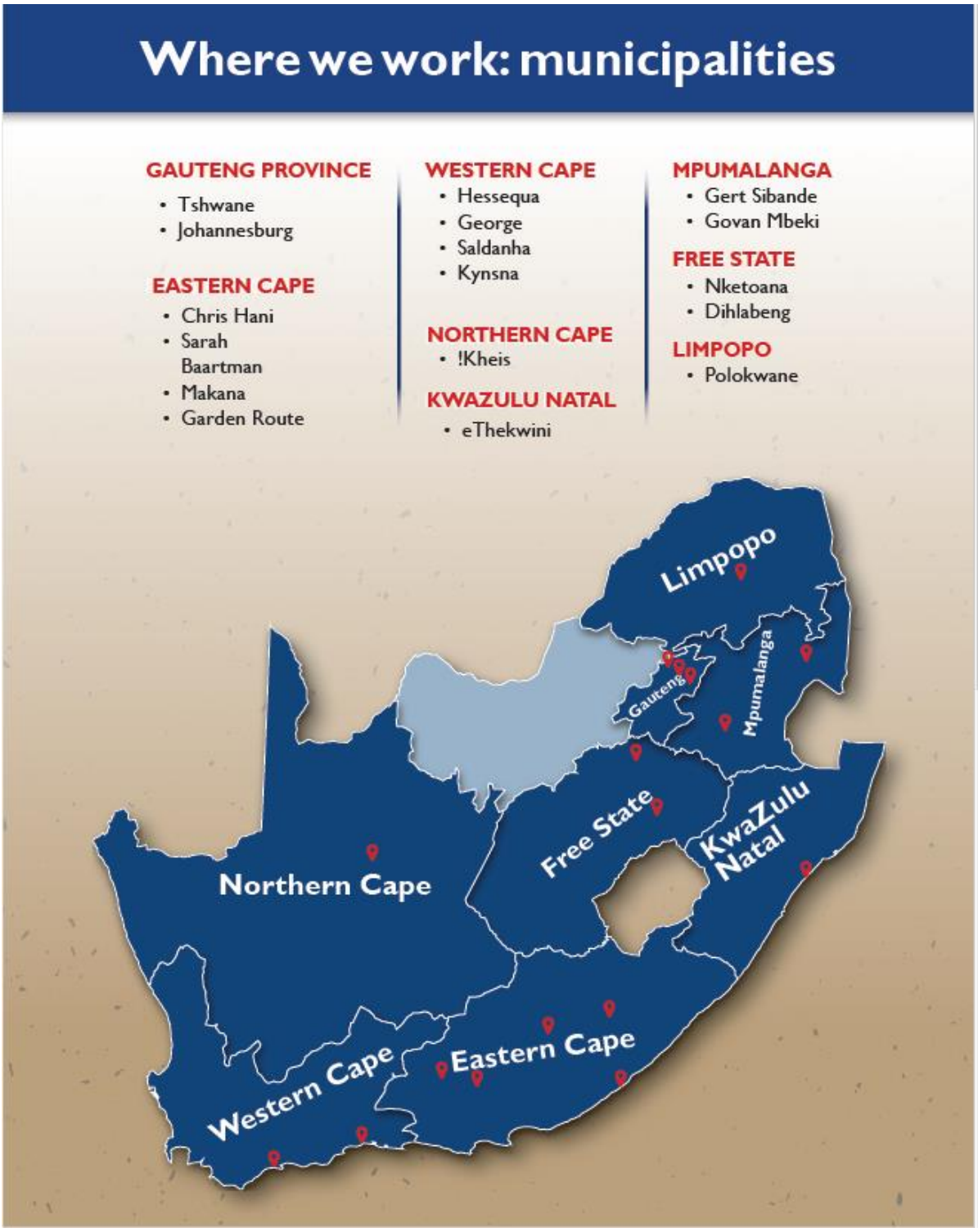


Figure 1: Map of current projects located throughout the country.

2. LED PROJECT DEVELOPMENT

In FY19, SA-LED continued to provide technical assistance to a variety of LED projects, including eight new projects. The Program provided support to different types of municipalities (e.g., metro, district, and local) and across the GoSA's climate change flagship sectors of waste management, transport, energy efficiency and energy demand management, renewable energy, and water conservation and demand management. Figure 1 above provides a geographical representation of where technical assistance is provided. The projects outlined below include institutional capacity building initiatives and initiatives that promote an enabling environment to increase uptake of LED projects, including financial advisory support and LED planning.

ANNUAL HIGHLIGHTS

eTHEKWINI METROPOLITAN MUNICIPALITY: KWA ZULU NATAL PROVINCE

In FY19, SA-LED continued its extensive work with the team at the eThekwini Water and Sanitation (EWS) unit on various projects. Below are the highlights of the work that was completed with EWS throughout the year. Some of SA-LED's work with EWS will be concluded in FY20.

eTHEKWINI SOLAR PHOTOVOLTAIC PANELS ON RESERVOIRS

Photo 1: Site visit to EWS

In its effort to contribute to the city's climate change mitigation objectives, EWS has been working to install solar photovoltaic (PV) panels on the available space above its water reservoirs. Successful solar installations need to demonstrate both technical and financial feasibility in order to gain adequate support both within the municipality and the investment community. EWS therefore requested that SA-LED provide technical and financial advisory assistance on the potential installation of solar PV panels on select reservoirs, as EWS intends to procure the solar PV through a municipal Public Private Partnership (PPP) arrangement. In Year 3, SA-LED assessed 39 sites for potential solar PV development, which could result in a total installed capacity of 9.8 MW. This year, EWS shortlisted nine sites for further assessment. They include: Woodlands, Montille, Dunkeld, Northdene, Umlazi 2, Chatsworth 4, Phoenix 2, Phoenix 4, and Lamont.

After the technical and financial assessment of all reservoirs identified by the EWS, eight sites were deemed to be financially viable to a private party under a PPP arrangement. The

preferred sites were: Woodlands 3 and 4, Montille 1 and 2, Dunkeld, Umlazi 2, Phoenix 4, and Lamont. It is important to note that the financial viability of these sites is affected by losses that could have come from shading and exclusion zones. SA-LED then updated the financial model with grid infrastructure upgrade cost estimates from the eThekwini Electricity Department and additional data and financial parameters as requested by National Treasury's PPP unit and EWS. The total installed capacity for these sites would be 5MW at a capital cost of approximately R70 million or approximately $4.6 million. The Municipality's decision on which sites to develop will be informed by its strategic objectives, carbon footprint reduction, environmental responsibility, development of townships, and overall reduced reliance on Eskom supplied electricity.

SA-LED presented the final draft of the financial model to the municipality in September 2019. The project proved to be financially beneficial to the Municipality given it yields a positive net present value (NPV) and has a reasonable payback period of 15 years. Before finalization of the feasibility study and proceeding with the procurement process, SA-LED recommended that EWS consider instead conducting a two-step procurement process: (1) undertake a market sounding exercise to gauge the general market for municipal Power Purchase Agreements (PPAs); and (2) issue an RFP based on responses from the solar industry market obtained from the market sounding exercise.

SA-LED's appointed PPP legal advisors then conducted a legal review of the feasibility study to ensure it meets requirements of the PPP regulatory processes, ensuring that it will be approved by the National Treasury's PPP Unit. In Q1 of FY20, the financial model will be presented to the National Treasury PPP Unit to ensure the model meets the requirements of feasibility necessary for the Municipality to proceed with project development and procurement next steps. The financial model will then be formally handed-over to EWS so they can proceed with the intended procurement, and SA-LED will develop a financial model guidance tool that can be used by other municipalities. As a final step, SA-LED will hand over the work on the proposed market sounding exercise to other stakeholders including Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the South African Local Government Association (SALGA), Sustainable Energy Africa (SEA), the South African Cities Network (SACN), and the Association for Municipal Electricity Utilities. SA-LED is capturing the information from this process, and the results of the market sounding exercise and the subsequent PPA agreements are meant to form a blueprint for South African municipalities wishing to enter into renewable energy PPAs.

eTHEKWINI NORTHERN AND WESTERN AQUEDUCT CONDUIT HYDROPOWER

SA-LED is the transaction advisor to EWS on inline conduit mini-hydropower projects for both the Northern Aqueduct and the Western Aqueduct in eThekwini. These projects will be procured under the National Treasury's prescribed PPP processes. The Northern Aqueduct is expected to host eight mini-hydro sites of less than 1MW each and the Western Aqueduct has the potential for small-scale hydropower generation - less than 10MW for each site - at the break pressure tanks located at the reservoirs at Ashley Drive and Wyebank.

Early in Year 4, SA-LED focused on gathering data on projected water demands, water flows, and pressures on the Western and Northern Aqueduct. The technical analysis helped confirm the water demand, flows and projections which have an impact on power generation possible at each potential hydropower site, particularly in the Western Aqueduct. Further data collection and analysis is needed to determine the power generation potential of the Northern Aqueduct. From the technical options analysis conducted by SA-LED on the hydropower potential at the two Western Aqueduct sites (Ashley Drive and Wyebank Road), the potential hydropower generation is estimated at 4MW, and the projected quantity of CO2e reduced or avoided by 2030 is 226,402.27 metric tons. It has been agreed that the Northern Aqueduct sites will be included as a part of the whole hydropower procurement process as additional sites will be developed.

Photo 2: The inside of the plant at Ashleigh Drive

SA-LED developed and presented to EWS a high-level financial analysis model to complete the feasibility study of the ongoing PPP efforts as a follow up to the technical analysis on the hydropower potential completed for the Western Aqueduct. The financial model built on the revenue model previously developed as part of the technical options analysis. The model analyses power generation tariffs at peak, off-peak, and standard megalux rates, and was created according to national Renewable Energy Independent Power Producer Procurement Programme regulations determined by state utility provider Eskom. The model demonstrates that the hydropower projects are financially viable and that the incurred debt could be paid out over a seven-year period. If there is a default of payment of the project, a Green Fund Facility has been built into the model to cover any penalties incurred.

EWS and the Government Technical Assistance Centre (GTAC) will be reviewing the financial model further to ensure that it complements the intended feasibility study. In the meantime, EWS indicated they are negotiating a 4% interest reduction from the National Treasury for the project and decided that while the two sites will be included together in the procurement process, the Northern Aqueduct financial model will be developed separately from the Western Aqueduct models so that the Northern aqueduct is an option for further investigation. It is expected that the reparation of the of bid documents including the draft of the PPP agreement will be finalized in Q2 of FY20.

eTHEKWINI ENERGY AUDITING OF THE PHOENIX AND OTTAWA ROAD DEPOT

SA-LED further supported EWS by conducting energy audits on its Phoenix wastewater treatment plant and a solar rooftop yield assessment on the Ottawa Road Depot located next to the treatment plant. The municipality intends to implement an energy efficiency retrofit program at the wastewater treatment plant. It will also generate power from solar PV panels that will be installed on the roofs of selected municipal office buildings within these facilities -

on both the Phoenix and Ottawa Road Depot sites. This intervention aims to reduce power consumption at the wastewater treatment plant and 'green' the plant by running it on renewable power generated by the solar PV plants.

SA-LED conducted a structural roof assessment on the existing Ottawa Road Depot and Phoenix wastewater treatment plants' roof structures. The structural integrity assessment concluded that the roofs at both locations can withstand the additional loads from installed solar PV panels.

SA-LED also analyzed data collected from energy loggers at both locations and the audits indicated that both the Ottawa and Phoenix plants have energy efficient installations. The energy audit report confirmed the efficiencies and will provide suitable recommendations to ensure continued efficiency. SA-LED plans to submit the audit report in FY20, as well as submit the completed application for the Energy Efficiency and Demand-Side Management (EEDSM) fund to the eThekwini Energy Office. This will allow them to submit their application for grant funding to the Department of Mineral Resources and Energy (DMRE). In Q1 of FY20, EWS will explore the possibility of expanding the use of the USAID/SA-LED sponsored Power Monitoring System (PME) to integrate other wastewater treatment plants (WWTPs) to enable real-time monitoring of plant equipment.

While SA-LED indicated that the Program would not be able to provide additional trainings to wastewater treatment plant technicians in this round of audits, this gap was filled by the Program's long-standing partners; GIZ, WISA, and SALGA. Collectively they provided training for municipal wastewater treatment officials in August 2019.

CITY OF TSHWANE COMBINED HEAT AND POWER SYSTEM DESIGN: GAUTENG PROVINCE

The DRME requested SA-LED to provide technical assistance to the City of Tshwane on the technical design of a combined heat and power plant (CHP) at the municipality's Zeekoegat wastewater treatment plant. This support is a follow-up to technical feasibility studies completed by GIZ in January 2018. The DRME is providing financial support towards the development of this CHP plant through the department's EEDSM fund. SA-LED's technical assistance will include the detailed design of the CHP plant for Zeekoegat, considering the specific equipment required for the plant.

In Q4 of FY19, SA-LED conducted an infrastructure and operational audit of the Zeekoegat wastewater treatment plant. The audit included:

- Determining the functionality and serviceability of the current infrastructure.
- The inlet works, such as the functionality of the inlet strainers, de-gritters and primary settling tanks (PSTs); the capability to de-sludge the PSTs on a regular basis; the serviceability of the dissolved air flotation process; and the delivery of the primary sludge and the waste activated sludge to the anaerobic process. All these activities were carried out within the older portion of the plant.
- Evaluation of the new anaerobic infrastructure that has been operational since 2016 but is not functional.
- The competencies available to operate the existing infrastructure.

- Determining the amount of feedstock available at the plant. This included testing at the City of Tshwane's laboratory as well as at an external laboratory, depending on the requirements.

SA-LED then advised the City of Tshwane on the regulatory and statutory requirements, including environmental screening management and the need for surveys, analyses, test and site or other investigations as well as approvals needed for the CHP procurement. The estimated cost of the development of the CHP plant and required infrastructure upgrades is expected to cost between R 14 and 21 million (or between approximately $930,000 and $1.4 million). The DMRE is providing financial support towards the development of this CHP plant through the department's EEDSM fund. Moving forward, SA-LED will finalize the technical tender specification, assist the City of Tshwane in compiling bid documentation and tender specifications according to the municipality's guidelines and requirements, and will develop a resources material fact sheet on taking CHP WWTW biogas projects from pre-feasibility to feasibility.

WASTE CHARACTERIZATION STUDIES IN SALDANHA MUNICIPALITY: WESTERN CAPE PROVINCE

Saldanha Bay Municipality is located on the West Coast of South Africa, approximately 140 kilometres north of Cape Town. Saldanha has the largest natural port in Africa and the area is earmarked as a regional motor for the development of the Western Cape Province.

SA-LED received a request for support from the Saldanha Municipality to conduct a waste characterization study for their construction and demolition waste stream. This study added a new dimension to the previously completed waste characterization work in the Garden Route District Municipality and offered an opportunity to mitigate emissions by reusing construction waste and generating multiple-benefits impact, particularly job creation through recycling and separation on-site, among others. The work in Saldanha was formally the first project with which SA-LED and the International Council for Local Environmental Initiatives (ICLEI) actively collaborated on through co-signing a letter of agreement with the municipality. This approach is meant to ensure the sustainability of work after SA-LED closes, as ICLEI's funding will remain in the market to continue the work and support to the municipality.

The Program conducted a study to define specific construction and demolition waste sources by type and volume in the seven towns in the Saldanha Municipal Area. SA-LED identified existing stakeholders and initiatives and conducted an analysis of potential solutions and opportunities to utilize the highly reusable and recyclable materials. The Program then provided waste/dump site specific test results and gravel grading outcomes that contributed to identifying overall metrics of the construction and demolition flows in the Municipality.

SA-LED's 'Cradle to Cradle Construction and Demolition Waste Stream' (C&D) analysis ultimately supported Saldanha to include a C&D waste stream as a potential revenue stream in their planning and waste management processes. SA-LED met with the municipality and conducted site visits to assess the baseline of the project. The work with the municipality was scaled up in Q3, where the Program initiated the data collection phase of the study and conducted site visits throughout the municipality. Potential solutions for crushing the

construction and demolition waste into a useable product and marketing of C&D waste were considered and further site meetings were held with potential off-takers and partners for the waste in Cape Town. In Q4, SA-LED collated data from the C&D waste source surveys and assisted with the consideration of options for municipal management of C&D waste. Moving forward, the municipality will use the waste characterization data provided by SA-LED to make informed decisions about how to use their waste. Cape Town has a robust circular economy for the reuse of C&D waste and provides significant opportunities for local economic development and beneficiation by diverting valuable waste from the landfill. As an example, the SA-LED waste characterization study resulted in a "Reclaimed Products Business Model Canvas" decision-support graphic that outlines recommendations for the key value proposition of reusing and valuing C&D waste instead of dumping it in a landfill.

MAKANA
MUNICIPALITY | EASTERN CAPE
...a great place to be

CACADU DEVELOPMENT AGENCY: FINANCIAL ENERGY ADVISORY IN MAKANA: EASTERN CAPE PROVINCE

SA-LED's financial advisory support to Makana in Year 4 focused on coordinating the energy trading relationship between the municipality, Cacadu Development Agency (CDA), and PowerX. The National Energy Regulator of South Africa (NERSA) permits municipalities to generate up to 1MW of power, and should a municipality want to generate more than 1MW (or trade the power on the Eskom grid), it is required to sign a Use of Systems Agreement with a licensed energy trader. Most municipalities do not possess the technical capacity to engage in these processes. SA-LED therefore coordinated with Makana, CDA and PowerX to facilitate the signature of the Use of Systems Agreement between Makana Municipality and PowerX, South Africa's only licensed entity that can buy and sell green energy on the Eskom grid.

The aim of this project is to wheel renewable, solar, biomass and waste, and potentially hydro- and wind-based electricity from generators connected to the local municipal network to other areas on the grid. Makana municipality is financially constrained with much work required on basic service delivery activities, including electricity, water and waste. It is anticipated that the mutually beneficial agreement that SA-LED helped broker between the local municipality, private power producers, green energy customers, and power trader(s) will assist in improving the level of electrical services in the town and surrounding district. Procurement of electricity by local municipalities at a significantly increased scale is critical to the sustainability of the South Africa energy sector.

SA-LED developed a recommendations report that outlines the basic processes, implications, and specific focus areas of power trading and how it may impact the municipality. To compile the draft recommendations report, SA-LED reviewed several documents to identify any outstanding issues and map the way forward to finalize and integrate the project in the Municipality. The documents included:

- Work plan to integrate the project into the Municipality
- Business case
- Cost benefit analysis and model
- Distributed generation analysis

These documents have been submitted and will contribute to the development of CDA's request for proposals for power producers in the market to supply generation capacity on

the Makana Municipality's distribution system in the near term when market conditions are favorable for energy trading. The final report with recommendations on how to handle the transactional, contracting and financial intricacies of power trading was completed in Year 4 and will be shared with the municipalities in FY20.

CACADU DEVELOPMENT AGENCY: GREENING THE MOHAIR VALUE CHAIN: EASTERN CAPE PROVINCE

The greening of the Mohair value chain is one of SA-LED's most innovative projects. Based in the Eastern Cape Province, the project relies on partners such as the Eastern Cape Veterinary Services, Eastern Cape Rural Development Agency, and BKB Limited - a key stakeholder in the South African agricultural sector with a focus on wool and mohair brokerage services. In FY19, SA-LED completed the draft Mohair Sustainability Standard and Animal Welfare Protocol that it began working on in November 2017. The standard and protocol helps to ensure that mohair production is environmentally sustainable and socially responsible and that animals are treated humanely in order to align with international regulations for the production of mohair.

South Africa is one of the largest mohair exporters in the world and international exporters place a high value on green and responsibly sourced fiber mohair. With the global emergence of interest in a green economy, it is essential that producers adhere to sustainability standards and animal welfare protocols domestically, to not lose out on economic opportunities.

In Q1 of FY19, SA-LED collected feedback on the draft Standard and Animal Welfare Protocol from a wide range of relevant parties, including government and academic stakeholders, veterinary scientists, and local farming cooperatives. Throughout Year 4, the Program compiled guidance documents to assist emerging mohair farmers in complying with the Standard and Animal Welfare Protocol. The guidance included documents on rangeland, energy, animal conservation, waste, and water management. International buyers are currently interested in sustainable mohair and with a national standard and protocol, may pay a premium for 'green' mohair. These frameworks will support emerging farmers in complying with certified processes that will enable them to understand the value of 'green' mohair and will allow them to benefit from a highly lucrative industry.

Throughout the year, SA-LED worked to tie all the "greening the mohair value chain" components into a strategic macro-economic perspective and model of how "green" mohair will affect demand and supply in South Africa. This work is considered crucial by industry experts in shifting mohair farming and production from business-as-usual to a green value chain that will have up and down stream low emissions and economic development benefits. The macroeconomic study will be completed in FY20 and SA-LED is also developing a multiple benefits case study to showcase the impact of greening mohair.

GEORGE LOCAL MUNICIPALITY WATER/WASTEWATER TREATMENT WORKS ENERGY EFFICIENCY AUDIT: WESTERN CAPE PROVINCE

SA-LED has been providing the George Local Municipality with technical assistance since March 2018. George Municipality requested SA-LED's assistance with upgrading their wastewater treatment works, as well as with conducting energy audits. In order to meet its financial obligations to work towards the

project, the municipality has received funding from Dutch Engineering Consulting Firm Royal Haskoning DHV. This funding was dedicated to upgrade water and wastewater treatment works for energy efficiency. In this vein, SA-LED conducted energy audits at the municipality in an effort to identify opportunities for energy-saving and a reduction in the operational costs of managing the wastewater treatment works. SA-LED had two main recommendations for the municipality: (1) to install a timer on the light switches was imperative to their cost savings; and (2) to change the Kilo-Voltage (kV) on the pumps at the site because running mechanical equipment at its right voltage reduces energy consumption. These recommendations were to ensure energy savings by making the mechanical processes more efficient overall.

In addition, the overall functioning of the pumps was considered, and recommendations were made to increase efficiency through installing variable speed drives. SA-LED's technical assistance aimed to lower the energy use required to effectively operate and maintain the wastewater treatment works. From this perspective, SA-LED further recommended options to use sludge for energy, as well as rooftop solar PV panels to be installed on top of the wastewater treatment plant to increase the renewable energy component of the electricity use.

SA-LED further assisted the municipality with their application to the Department of Mineral Resources and Energy (DMRE) to access funds for Energy Efficiency Demand Side Management (EEDSM) based on the findings of the energy efficiency audit report on the wastewater treatment works. The results from the energy audits heightened their chances of procuring funds, as the findings fed into the application, rendering it eligible for consideration. Accessing these funds from the DMRE will fund the municipality to embark on other LED projects, such as installing solar PV on municipal buildings, new wastewater treatment plants, and freshwater treatment plants that the EEDSM could fund.

As part of implementing its EEDSM work plan, George municipality organized a "World of Tomorrow Festival 2019" to raise public awareness of the importance of energy efficiency. The initiative took the message to the homes of George residents through an Industrial Theatre Competition among nine schools and explored the topic, 'How to mitigate climate change with energy efficiency'. The dramas highlighted the changes individual residences and schools could make, to become more energy efficient, which in most cases, will assist with curbing the effect of Climate Change:

https://youtu.be/9k3V3mKnpUE

The EEDSM application was approved in Q2, with an amount of R 16 million granted from 2019 until 2022, from which the municipality leveraged $357,142 for FY19. The application for EEDSM included various recommendations for energy efficiency initiatives such as the optimization of bioreactors, including aeration and associated pumps. The money procured from the EEDSM funding will be used to fund the Outeniqua and Gwaing wastewater treatment plants within George. As part of receiving EEDSM funding, the municipality was required to provide an awareness component to the project (see box above).

GARDEN ROUTE DISTRICT MUNICIPALITY, WESTERN CAPE: WASTE MANAGEMENT STUDY AND WASTE CHARACTERIZATION

The waste characterization study completed in December 2018 defined the Garden Route District Municipality's (GRDM's) specific organic waste sources and identified the volumes and sources of six organic waste streams. This study enabled a multiple-benefits analysis to be completed in Q1 of FY19. The completed multiple benefit analysis revealed that if approximately 6,000 tons of green garden waste per month was

diverted to the composting facility, the lifespan of the Municipality's new landfill could be doubled. This diversion of green waste to the composting facility could also reduce GHG emissions by 5.7 million per year, and potentially save the Municipality up to R 25 million or approximately $1.7 million per year. The Program has equipped the GRDM with sufficient baseline data against which they can assess private sector proposals that aim to use their organic waste streams.

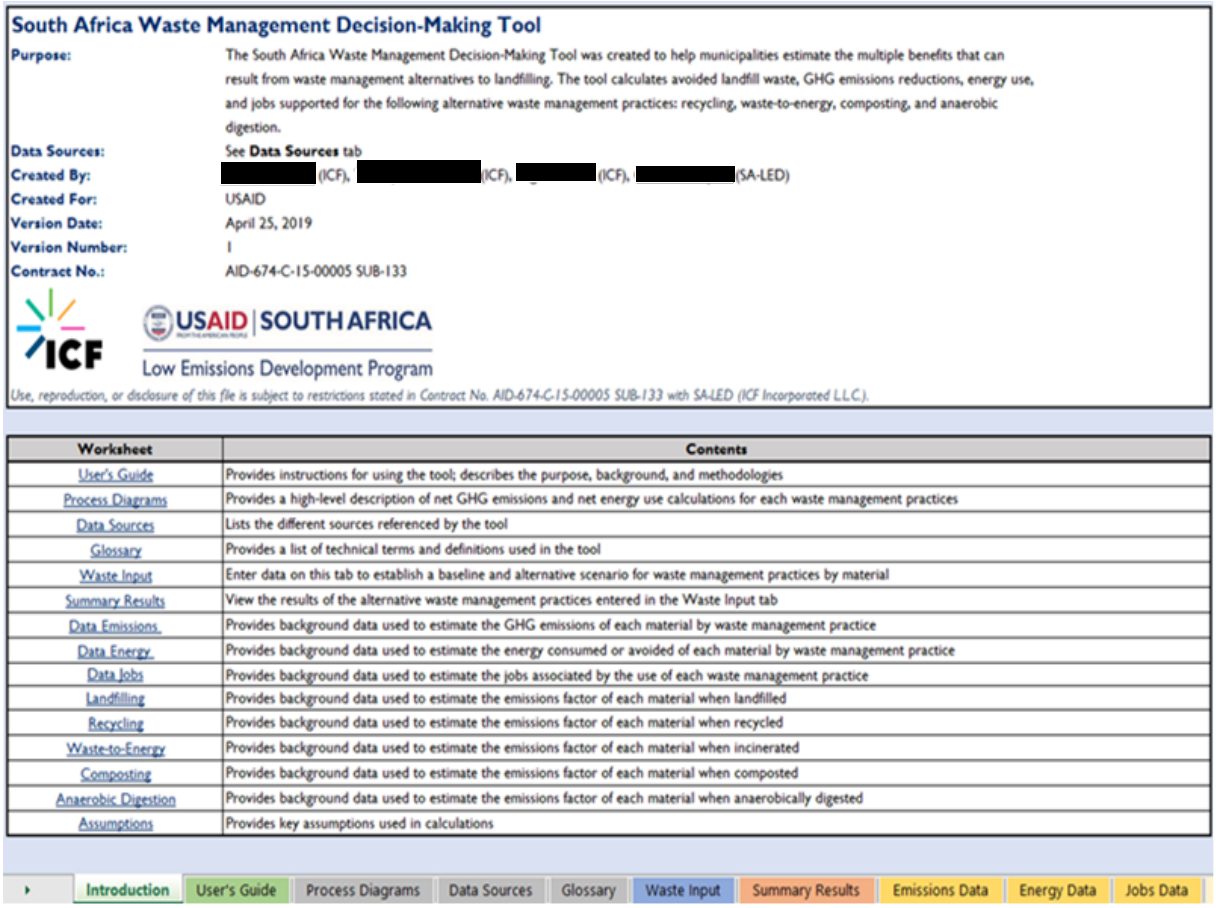
With the baseline data collected, SA-LED used proposals presented to GRDM as inputs to develop a decision support tool. The municipality regularly receives proposals requesting to make use of the GRDM's waste streams and, without a decision matrix, it is difficult to decide upon which proposal to approve. By using these proposals as inputs in the design of the tool, SA-LED assisted the GRDM to decide which proposals to accept to utilize organic waste streams for alternative energy generation. SA-LED finalized a draft online Waste Management Decision-Making Tool for the GRDM, which integrates waste stream information with alternative technology solutions that can utilize the waste to provide low emissions development outcomes, rather than sending it to a landfill.

Alternative waste management practices include:

- Recycling
- Waste-to-energy
- Composting
- Anaerobic digestion

For each alternative practice, the tool calculates:

- Avoided landfill waste
- GHG emissions reductions
- Energy use
- Jobs supported



South Africa Waste Management Decision-Making Tool

Purpose:	The South Africa Waste Management Decision-Making Tool was created to help municipalities estimate the multiple benefits that can result from waste management alternatives to landfilling. The tool calculates avoided landfill waste, GHG emissions reductions, energy use, and jobs supported for the following alternative waste management practices: recycling, waste-to-energy, composting, and anaerobic digestion.
Data Sources:	See **Data Sources** tab
Created By:	[redacted] (ICF), [redacted] (ICF), [redacted] (ICF), [redacted] (SA-LED)
Created For:	USAID
Version Date:	April 25, 2019
Version Number:	1
Contract No.:	AID-674-C-15-00005 SUB-133

ICF

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Low Emissions Development Program

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Worksheet	Contents
User's Guide	Provides instructions for using the tool; describes the purpose, background, and methodologies
Process Diagrams	Provides a high-level description of net GHG emissions and net energy use calculations for each waste management practices
Data Sources	Lists the different sources referenced by the tool
Glossary	Provides a list of technical terms and definitions used in the tool
Waste Input	Enter data on this tab to establish a baseline and alternative scenario for waste management practices by material
Summary Results	View the results of the alternative waste management practices entered in the Waste Input tab
Data Emissions	Provides background data used to estimate the GHG emissions of each material by waste management practice
Data Energy	Provides background data used to estimate the energy consumed or avoided of each material by waste management practice
Data Jobs	Provides background data used to estimate the jobs associated by the use of each waste management practice
Landfilling	Provides background data used to estimate the emissions factor of each material when landfilled
Recycling	Provides background data used to estimate the emissions factor of each material when recycled
Waste-to-Energy	Provides background data used to estimate the emissions factor of each material when incinerated
Composting	Provides background data used to estimate the emissions factor of each material when composted
Anaerobic Digestion	Provides background data used to estimate the emissions factor of each material when anaerobically digested
Assumptions	Provides key assumptions used in calculations

Introduction | User's Guide | Process Diagrams | Data Sources | Glossary | Waste Input | Summary Results | Emissions Data | Energy Data | Jobs Data

Figure 2: The Waste Management Decision-Making Tool

The decision-making tool will help the GRDM make informed decisions on how to use its organic waste for low emissions and local economic development benefits and represents the final output of SA-LED's phased technical assistance to the municipality over the last year. The tool also has value for broader audiences and SA-LED is working to include additional waste conversion factors to make the tool applicable to other municipalities in South Africa.

KNYSNA
Municipality Munisipaliteit uMasipala

KNYSNA WASTE COST OF SERVICES STUDY: WESTERN CAPE PROVINCE

Municipalities find it challenging and unaffordable to operate in a legally compliant manner at local landfill site because the sites are often mismanaged and are faced with illegal dumping practices. The Western Cape Provincial Department of Environmental Affairs and Development Planning has therefore indicated that only regional landfill sites will be approved in the future, to ensure environmental management compliance. Understanding the cost of managing waste and potential reduction options are thus crucial for these municipalities. Transport reduction, sustainable disposal of waste, at-source waste reduction and closer–to–source waste reduction, separation processes, efficient human resource application, and public-private cooperation in waste reduction and sustainable disposal play major roles in mitigating GHG emissions.

To support the Knysna Municipality in their waste optimization plans, SA-LED had to first understand the actual cost of their current waste management system. In Year 4, SA-LED

assisted the municipality in developing a cost of waste management services study where the Program collaborated with municipal officials and the Knysna Waste Department to analyze municipal waste data collection to help inform the study. SA-LED supported the municipality to: (1) analyze potential solutions and related to the cost challenges and opportunities; and (2) identify LED solutions to be included in their Integrated Waste Management Plan.

The study was drafted and provided to the municipality in Q2 of FY19 and included recommendations of various waste management options and detailed findings from the completed feasibility studies. A key component of the work was to identify various technologies and market trends that municipalities can employ to manage their respective waste streams. This analysis drew from case studies, research, and market trends by looking specifically at the types of waste management options employed by other municipalities to divert solid waste from landfills to into the local economy in ways that mitigate climate change.

Other factors that potentially affect the cost of waste management at the municipality include:

- The impact of the municipality's contribution to the establishment of this facility (R 10 million or $665,000) as well as the cost involved in transporting the waste.
- The management of all the waste facilities.
- The management of staff and clarification on job descriptions in addition to filling of all posts in the waste department.
- The more waste is conveyed on the road, the more expenses the municipality would have to incur to compensate for this transportation service, which is normally outsourced.
- As Knysna Municipality is seeking to embark upon a strategy to minimize the waste that ends up on the landfill sites, by recovering the usable material from the waste stream, there is an opportunity to improve livelihoods from their waste streams, which will have a positive impact on the cost of waste management.

These recommendations were shared with the municipality, and SA-LED will follow-up with an updated executive summary that will be shared with the municipality in FY20.

HESSEQUA LOCAL MUNICIPALITY: ENERGY AUDITS AND WASTEWATER TREATMENT WORKS: WESTERN CAPE PROVINCE

Photo 3: The Hessequa Power Station

In FY18, Hessequa Local Municipality requested assistance from SA-LED in developing their energy efficiency strategy as well as optimizing their existing PV plant and conducting a solar yield analysis, energy efficiency audits of municipal buildings, and energy efficiency audits of wastewater treatment works in Riversdale, Southern Cape. In FY19, SA-LED assisted the municipality with conducting the energy audits. SA-LED's visits to the two wastewater treatment works revealed broken aerators that were not operating at full capacity, which resulted in compromised water quality. SA-LED requested for Hessequa Local Municipality to collect data from the wastewater treatment works for three months, which the Program then analyzed and developed a report with findings and recommendations on various solutions to alleviate the problems set off by the broken aerators.

In Q3, SA-LED conducted energy audits on two municipal buildings that the Hessequa Municipality had identified for the installation of solar PV. The results from the energy audits indicated that both buildings were found to be strong enough to mount solar PV on top of them. The municipality agreed to install the solar PVs after having seen the forecasted savings. The municipality intends to leverage R 1.5 million ($100,000) over the next three years, saving 47MW of power and saving R 400,000 ($27,000) per year. In FY20, SA-LED will support the project with a financial feasibility study that will complement the technical forecast and findings to hand the project over to the municipality.

!KHEIS MUNICIPALITY MICRO-HYDRO AND PROJECT MANAGEMENT SUPPORT: NORTHERN CAPE PROVINCE

SA-LED has been providing micro-hydro and water services technical assistance to the !Kheis Municipality in the Northern Cape since late 2017. The Northern Cape is South Africa's driest province and suffers from perennial droughts. As a result, it has been targeted by donors in the past, such as the EU Climate Energy and Water Initiative in partnership with GoSA departments. SA-LED, along with the Department of Water and Sanitation (DWS), the Water Research Commission (WRC), and the Department of Science and Technology (DST), to build on previous work done with other donors, has been working with the municipality on micro-hydro installations at the Groblershoop water treatment works site. These hydro installations improve energy and resource efficiency in municipal water treatment works.

In FY19, the SA-LED worked with the water services manager to document the existing municipal water service plan and provide inputs on the engineering and project management services and processes for the municipality. The first phase of the !Kheis micro-hydro installation at Groblershoop water treatment works was commissioned and handed over from the DWS. During this process, SA-LED assisted !Kheis to implement small-scale hydro installations within public water infrastructure. This work represents a precedent for small-scale hydro installation within public water infrastructure. It has the potential to drive improved energy and resource efficiencies in municipal – as well as other public – water treatment works and of increasing the share of renewable energy contribution to service delivery.

The Municipality is faced with a lack of technical resources, aging infrastructure and a low revenue collection base. Though the Program could not assist with all of these challenges, SA-LED's technical interventions resulted in four micro-hydro installations amounting to an average capacity output of 12kW. These have assisted the Municipality to deploy micro-hydro systems to help sustain the municipality's scarce water supplies. SA-LED has helped the municipality scale-up its in-house capacity with its municipal workers, in efforts to bolster municipal service delivery. In Q3 and Q4, the Program recorded the lessons learned from this project and incorporated these lessons learned into a case study that will be provided to the Municipality in FY20.

BLUE KAROO TRUST FISH FARM: AQUACULTURE PROJECT: EASTERN CAPE PROVINCE

Fisheries have historically offered South Africa a high source of protein and constitute a large part of the population's diet. The country used to be a large supplier of pilchards, however there has been an approximate 80% decline in sardine stocks off the east coast of South Africa in the last decade, due to the effects of climate change as well as over-fishing. Blue Karoo fish farm Camdeboo Satellite Aquaculture Project (CSAP) has demonstrated a high level of innovation that has been employed to establish and operate the fish farm. The aim is for the success of this particular fish farm to be utilized to replicate and install other fish farms across the country. Since the inception of the project, SA-LED has assisted the aqua project to design, install, and monitor the fish farm's integrated wastewater repair and anaerobic digester pilot system, which are all integral components of ensuring that the farm's aquaculture ecosystem operates optimally.

In FY19, the program continued to provide technical assistance through monitoring and evaluation (M&E) support to Blue Karoo. SA-LED monitored and collected data to inform the design of a repair system for the algal raceways to assist them to operate more efficiently. Fully functional algal raceways help inform the design of a repair system for a full-scale commercial fish farm. The anaerobic digester that forms part of the pilot wastewater repair system at Blue Karoo fish farm has been fitted with a monitoring and thermal conversion system that has been tracked and logged.

Furthermore, SA-LED assessed the socio-development impacts of the farm to the local municipality, as it has had multiple-benefits impacts for the municipality, included in the table below. Finally, the fish processing facility was opened by the local Mayor in Q3, and delegates from the IDC, the Department of Forestry and Fisheries and Environmental Affairs, the Department Agriculture, Rural Development and Land Reform, the Department of Trade and Industry and Economic Development attended. This processing facility will increase the volume of fish processed on the farm and will continue to employ people from the local community. SA-LED then created a video on the fish farm and its operations, showcasing the benefits to the community in terms of increased food and employment opportunities, particularly for women.

Indicator	Change
Total annual GHG emissions	-8,600 tons CO2e/year
Number of employees under 35 years	89 youth employees
Number of women employees	76 women employees
Total number of employees	105 jobs
Number of Karoo Catch employees trained and Level 1 qualified at NQF	11 trained and Level 1 NQF-qualified employees
Quantity of water discharged while cleaning the filters	4,500m^3/month
Total renewable solar electricity generated	72,359 kWh/year
Number of people fed by Karoo Catch production	65,000 people/year
Amount of reused solid waste	30 tons/month
Amount of locally produced nutritious fish protein	720 tons/year

CAPE NATURE LED IN PROTECTED CONSERVATION AREAS: WESTERN CAPE PROVINCE

In FY19, SA-LED also applied its technical assistance to nature reserves within the Western Cape Provincial Environmental Conservation Unit, CapeNature. CapeNature is a public institution mandated to promote and ensure the conservation of biodiversity in the Western Cape Province. The relationship with CapeNature represents the first time that SA-LED has provided technical support to a conservation organization with a number of nature reserves, as opposed to smaller scale livestock farms or municipalities.

Beginning in Q2, SA-LED worked with CapeNature to develop environmentally sustainable design with an emphasis on their waste and water facilities, storm water system, retrofitting of existing buildings, advising on green development for new building facilities, and mainstreaming LED into the education department's strategies and operations. A technical review of the site revealed significant above and below ground infrastructure for potential LED interventions. For example, using the gravity flow of the site for conduit mini hydro, capturing runoff water for use in the wastewater treatment works, and the development of a retention pond on site.

In Q4, SA-LED presented these recommendations and presented findings of above and below ground technical research report to CapeNature's senior management. One of the findings suggested that the LED technical interventions seem feasible, particularly with regards to wastewater treatment works and water capture as well as the inline reticulation hydro. These will, however, require further data analysis to implement. This will be done by CapeNature as and when their budgets allow.

Finally, SA-LED visited the Wolwekloof Reserve to assess the progress in refurbishing the reserve prior to its intended re-opening in the beginning of 2020. There was concern around the water from the perennial stream being lost into the stormwater system. SA-LED recommended that CapeNature: (1) create a retention pond to capture the runoff water; (2) retain the water to feed the water treatment works; and (3) retain, prepare, and filter the water for use as potable water.

All information and recommendations have been shared with CapeNature to include actionable next steps for the organization to complete within their own budget. SA-LED has then provided capacity building to CapeNature, as described in the next section of this report.

3. CAPACITY DEVELOPMENT

Enhancing capacity development continued to be a central component of SA-LED's work. In FY19, the Program trained 243 individuals across four projects.

BIOGAS IN SCHOOLS, EASTERN CAPE

Since 2016, SA-LED has supported the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) with a Biogas in Schools Project that the Eastern Cape Provincial Government, through DEDEAT, is currently implementing. This project covers thirty schools and is run by the Eastern Cape Development Corporation (ECDC). SA-LED assisted DEDEAT in unlocking European Union funding from the National Treasury Generic Budget Support Programme for implementing biogas systems in schools through the Environmental Resource Management Support (ERMS) Programme. SA-LED is also supporting three schools from the Wildlife and Environment Society of South Africa (WESSA) in the biogas project, bringing the total number of schools supported to 33. The Biogas in School project is a highly innovative and important initiative, as it promotes LED through engaging the community in the biogas process and food gardens.

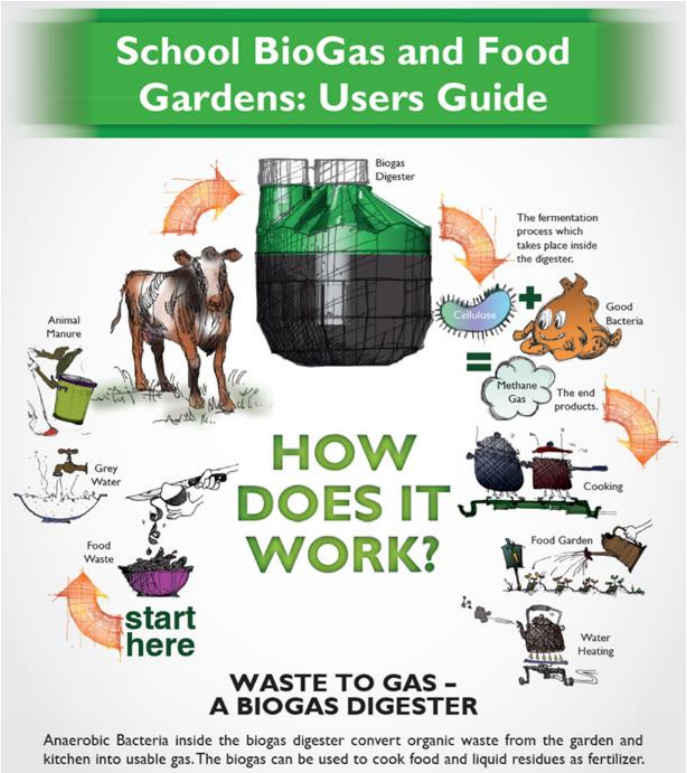

Figure 3: School poster that SA-LED developed this year to demonstrate the biogas digester process

The Biogas in Schools project intended to use the installation of 33 integrated schools' biogas systems, complete with food gardens and rainwater harvesting systems, to build the capacity of the technical skills needed in the Eastern Cape Province to ensure the future success of similar projects. By integrating the biogas systems with the gardens and rainwater harvesting systems, this would increase the chances of long-term sustainability of the biogas technology. In FY19, the program completed the following:

- Pre-selection and approval of all 33 schools for the project.
- Identification and training of seven youth as Small-Micro Medium Enterprises (SMMEs) in the implementation and management of micro-digesters and the broader biogas field. They have also been upskilled as trainers of trainers that will be able to continue training new schools.

- Trained a total of 32 staff from three schools' namely, Mount Arthur Girls High, Arthur Mfebe High School and Nyanga High School (garden staff, kitchen feeding scheme staff and teachers). The participants were trained on how to operate the micro-digester as well as how to ensure maintenance of the technology. The kitchen staff received specific training in how to use the biogas from the micro-digester for the gas stoves in the kitchens.
- Permaculture gardens were developed at three of the above-mentioned schools and are currently producing vegetable for the school feeding schemes.

While the first phase of the project was completed, SA-LED was unable to implement the second phase due to delays in the release of European Union funds from the National Treasury Generic Budget Support Programme to the Eastern Cape Provincial Government for the procurement of biogas micro-digesters. SA-LED will ensure a comprehensive handover of the project's management and implementation approach documentation to the provincial office thus ensuring a continuation for future implementation. To this end, the Program will develop short tutorials videos to capture the different aspects of the operationalization and use of micro-digester, and content to support various user groups. SA-LED plans to complete the videos in FY20.

MICRO DIGESTER WORKING GROUP SMALL SCALE BIOGAS IMPLEMENTATION GUIDELINES: GAUTENG AND KWAZULU NATAL PROVINCE

Working in parallel to the work that SA-LED undertook in rolling out of biogas in schools in Mpumalanga and the Eastern Cape, the Program collaborated with the South African National Energy Development Institute (SANEDI), GIZ, and the DRME to develop the national guidelines for implementing micro-digester biogas projects. SA-LED partnered with the National Biogas Platform, a multi-stakeholder forum on biogas, convened by the DRME and the Southern African Biogas Industry Association (SABIA) and hosted by GIZ GmbH to promote the development of the biogas industry in South Africa. As more citizens, organizations, and schools migrate towards implementing micro-digester biogas projects, there is a need to have streamlined guidelines on behalf of the industry to inform those interested in installing and running micro-digesters.

The National Biogas Micro Digester Guidelines serve to inform users about the critical aspects of the implementation of a micro-digester project. It constitutes an essential source of information for entities involved in the planning, procurement, financing, design, construction, operation, maintenance, and monitoring of micro-digester systems. It is envisaged that these guidelines will have long-term socio-economic impacts and benefit to the various stakeholders in South Africa and as such, is intended to assist entities (i.e. any municipality, school, farmer, etc.) with the implementation process and the drafting of Terms of Reference (TOR) or Request for Proposal (RFP) when considering a micro-scale biogas project based on anaerobic digestion. The guidelines are currently awaiting SANEDI's final approval which is expected in FY20.

SMALL-SCALE EMBEDDED GENERATION (SSEG) MUNICIPAL TRAINING

SA-LED continued its collaboration with GIZ and completed a series of trainings on the Small-Scale Embedded Generation (SSEG) Municipal Support Programme for municipalities. SSEG installations have the potential to unlock grid capacity in areas or municipalities with constrained grid capacities as demonstrated by various shopping mall developments that have made it possible for residential developments to access power. In FY19, 36 municipal electricity supply department officials from 17 municipalities were trained and informed on SSEG installations. The objective of the trainings was to enhance the knowledge and skills of municipal officials in operationalizing various aspects of SSEG systems assessment, metering and billing, illegal systems, and related aspects. The training covered topics including elements of municipal SSEG process, various solar PV systems, by-law and policy for SSEG guidelines, SSEG policy, and metering for SSEG guidelines.

Figure 4: Elements of a functioning municipal SSEG process.

During the training sessions, officials indicated that they required guidance on evaluating and approving applications for renewable energy interconnection with the municipal grid networks within their areas of operational control. This is due to the fact that there is increased recognition by municipal electrical departments that the renewable energy industry (led by solar PV) is advancing rapidly. This rapid energy transition requires municipalities to adjust their business models and also ensure their grid networks can cope with the integration of renewable energy systems. Municipal fiscal framework is overly dependent on revenues from electricity sales, therefore an increased adoption of renewable energy systems (mainly SSEG) poses a threat to the municipal revenues hence the need to adjust their business models. To protect municipal revenues, it is usually recommended that municipalities develop SSEG tariffs that are cost reflective. However, the unavailability of approved SSEG tariffs shouldn't mean that the municipality cannot allow SSEG installations. Rather, SSEG tariffs should be designed to protect both municipal and consumer business cases.

Following the training, a total of 15 municipalities established clearly defined approaches to the integration of these technologies. Furthermore, each municipality now has a SSEG policy and municipal customized forms and documentation of the elements of functioning a municipal SSEG process. In FY20 Q1, SA-LED will continue to provide remote technical assistance by responding to municipal questions on the existing WhatsApp Group, " SSEG Municipal Support Group", and also responding via emails. The entire SSEG program will continue to receive support from the SSEG Working Group consisting of the DMRE, GIZ-SAGEN, SALGA, and SEA once SA-LED closes in May 2020. GIZ-SAGEN 3 has committed resources to provide ongoing support to municipalities and the DMRE until 2021. The proposed GIZ-SAGEN 4 programme that will commence in late 2021 will deepen support in this space going forward.

SANS 10400 XA: ENERGY EFFICIENCY IN NEW BUILDINGS: GAUTENG PROVINCE

SA-LED, in partnership with the South African Local Government Association (SALGA) and City of Johannesburg, implemented a follow-up two-day training workshop on the revised South African National Standards (SANS) 10400-XA in April 2019. SANS 10400-XA speaks to the application of the National Building Regulations on energy efficiency legislation for new buildings. The main objective of the standards is intended to be a starting point for implementing environmental sustainability in new buildings. The follow-up workshop was held at the City of Johannesburg's Metro Centre in Johannesburg with a total of 27 municipal officials attending the training.

The SANS 10400–XA regulations serve as guidelines for municipal officials, building control officers and professionals in the building development industry in the methodology of National Building Regulation XA and SANS 10400-XA compliance. The SANS 10400-XA workshop was designed to provide a practical methodology for the staff within the building control offices and municipalities in understanding, adopting and complying with the performance requirements of SANS 10400-XA regulations. A secondary goal was to provide insight on the upcoming changes in the SANS 10400-XA (version 2) that will be published by the South African Bureau of Standards (SABS). Knowledge of these developments are critical since it will strengthen South Africa's goal of ultimately achieving a zero-carbon building standard by 2030.

One of the key outcomes of the first workshop was that participants indicated that some of the procedures and forms in the SANS 10400-A were not suitable for the requirements of NBR-XA (SANS 10400-XA). Based on participant recommendations, the forms were updated to be more user friendly, to include sustainability requirements (for NBR-XA and future requirements, and to outline procedures more logically. The updated procedural documentation as an output of this project responded to a critical gap in the building regulation space and will assist building control officers in enforcing compliance.

Key deliverables and recommendations from the follow-up two-day training workshop included:

- The revised SANS 10400-XA training materials were tested, revised and are ready for use nationally.
- Training resources should be made available in e-book format.

- Technical products such as the pocket insulation guide and the pocket SANS 10400-XA summary guide are easy-to-use tools that will assist building inspectors in their day to day operations.
- A frequently asked questions guide to SANS 10400-XA should be developed as part of the toolbox of resources for national training.
- Future training must include capital costs linked to the implementation of SANS 10400-XA.
- The pre-and post-assessments conducted before and after the workshop indicated a significant improvement in participants' understanding of the SANS 10400-XA regulations. These results support the notion for continued capacity building of building control officers on the SANS 10400-XA regulations.
- SALGA and the Regulator should provide mentorship and support for building control officers and building departments.

With the training materials developed and available for use in the building regulations space, SA-LED initiated conversations with organizations such as SALGA and SEA to adopt and make use of these resources in their continued training initiatives with municipalities. The collaboration with the relevant organisations will ensure sustainability of the work to which SA-LED has contributed.

CAPE NATURE CAPACITY DEVELOPMENT: WESTERN CAPE PROVINCE

SA-LED's collaboration with CapeNature has two main objectives: (1) to provide technical support to advance the implementation of environmentally sustainable green designs at CapeNature's reserves (discussed in Section 2 above); and (2) to ensure the integration of LED into the organization's Education Unit's strategy and operational plans through capacity building support.

On the second objective, SA-LED developed and conducted two one-day training workshops with the CapeNature's education unit staff and senior operational managers and one half-day engagement session with the executive management team. The training sessions, conducted at the Vrolikheid Nature Reserve in MacGregor and Wolwekloof in Ceres, introduced education unit staff and operational managers to the concepts including climate change mitigation and adaptation, the role of protected areas in LED, green building design and eco-districts, energy efficiency, and energy audits. The engagement session with the executive managers focused on presenting the findings from the Wolwekloof LED technical research report as well as sharing information about eco-districts, green building design and the links to the SANS 10400 XA regulations. A total of 31 CapeNature staff members participated in this capacity building intervention in September 2019.

The expected outputs from the capacity building and training intervention is that CapeNature will ensure mainstreaming of LED and green development design into their strategic and operational plans at the executive management level, that infrastructural design and development at the reserve levels will integrate LED approaches and methodologies, and that the education unit will mainstream LED and green development into their education awareness raising and training strategies, projects, and learning materials.

SA-LED plans to support CapeNature in FY20 by responding to specific requests that emerged out of the training sessions. Planned technical assistance includes:

- Conduct a CLEER tool training workshop for operational managers from the different reserves in order to assist CapeNature with the collection of carbon emissions data and monitoring climate change patterns across all reserves.
- Present a comprehensive energy efficiency audit workshop for operational staff responsible for managing the energy use sources/systems facilities at the reserves.
- Provide technical training to operational managers on how to conduct an integrated wastewater treatment assessment of their facilities.
- Provide additional training to education unit staff on the topic of green building design and its potential application CapeNature facilities.

Through providing the above capacity building support, CapeNature will be able to expand the learnings to all its reserves, thus ensuring a continued sustainable process of LED integration.

CLEER TOOL TRAINING, EASTERN CAPE

During FY19, SA-LED provided a hands-on training to 11 energy management officials on the Clean Energy Reduction (CLEER) tool, in Mthatha, Eastern Cape. The purpose of the training was to train the municipal officials and DEDEAT on how to calculate projected savings when implementing energy efficiency projects. The 11 trainees included a mixture of interns and environmental officers from the King Sabata Dalindyebo (KSD) Local Municipality, OR Tambo District Municipality, Port St Johns Local Municipality, and DEDEAT. The training included interactive sessions where municipalities were able to calculate real time savings on their energy efficiency initiatives. One of the municipalities provided their data to demonstrate how much GHG is emitted from their buildings and how much their electricity bill costs. These results were then generated into reports that municipalities can use as proof of their energy savings and emissions reductions and support the EEDSM application process. In FY20, SA-LED will assess how many municipalities eventually applied for the EEDSM funding as an indicator of success for this initiative.

4. ENABLING ENVIRONMENT

SA-LED recognizes that in order to play a meaningful role in scaling the uptake of LED projects in South Africa, considerable work must be conducted across legal, financial, policy, and regulatory boundaries. Numerous government departments, existing networks, donor agencies, development finance institutions, and private industry have done excellent work for many years to attain the same goals. SA-LED works to leverage these existing efforts as frequently as possible. During FY19, several meetings and collaborative efforts were undertaken to continue enhancing the SA-LED's working relationships and supporting the Program's key stakeholders. Highlights are as follows.

MPUMALANGA CLIMATE CHANGE MITIGATION STRATEGY PRESENTATION TO PROVINCIAL OFFICIALS: MPUMALANGA PROVINCE

Mpumalanga Province is the highest emitter of GHGs in South Africa. Thus, there is a large need for the Province to have a comprehensive strategy to mitigate the emissions and reduce the causes of climate change. SA-LED has been overseeing the development of the Mpumalanga Climate Change Mitigation Strategy (MCCMS). The strategy is one of the most rigorous provincial climate change strategies in South Africa. Embedded within the MCCMS are sectoral GHG emission outlooks as well as mitigation strategies.

The MCCMS represents the Province's first mitigation strategy that identifies climate actions that can be implemented by the Provincial Government and represents one of the only strategies of its kind in South Africa having been adapted to international standards. In Q3, SA-LED presented the final strategy to the Mpumalanga Provincial Government Director General, who assured that the strategy would be adopted by all of the Province's sector departments.

SA-LED submitted and presented the final strategy to the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) in September 2019. The Provincial Government has targeted plans for the next five years to address climate change mitigation priorities. DARDLEA presented a proposed budget of R 50 million ($3.3 million) to support the establishment of a stand-alone Climate Change Directorate aligned to the MCCMS' proposed institutional arrangement. The MCCMS completes the Province's climate change response plan, which speaks to support a transition to a low carbon, resilient Province. While the plan is being refined and a series of strategies adopted, provincial political and administrative executives are working to secure full political buy-in in Q1 of FY20 and have the strategy published by March 2020.

POLOKWANE MUNICIPALITY GREEN GOAL STRATEGY: LIMPOPO PROVINCE

Since 2017, SA-LED has provided capacity building assistance to Polokwane Local Municipality. In FY19, SA-LED continued to support an embedded EEDSM coordinator to lead the implementation of streetlight retrofits within Polokwane. The coordinator developed energy efficiency messages for an awareness campaign

focusing on demonstrating to the public how they can save energy. These messages were then developed into posters (see Figure 9). SA-LED also developed a case study on the energy audits that were conducted in FY18 where students from the local technical university, Capricorn Technical Vocational Education and Training, were trained on how to conduct energy audits on municipal buildings. The case study highlights the successful engagement of the students to conduct the audits. based on the students' experience and demonstrating the benefits of engaging students in such work. Also in FY19, SA-LED assisted Polokwane Local Municipality to receive an R 8 million ($533,000) grant from the DoE's EEDSM program for the 2018/2019 financial year and the coordinator further supported the Municipality to prepare and submit their EEDSM request for proposals for 2019/20 to the DMRE for retrofitting additional streetlights. The Municipality is preparing to transition the EEDSM coordinator position into a full-time position within the Municipality–a new organogram proposing two EEDSM positions, including the coordinator, has been approved by the Municipality and is awaiting budget approval.

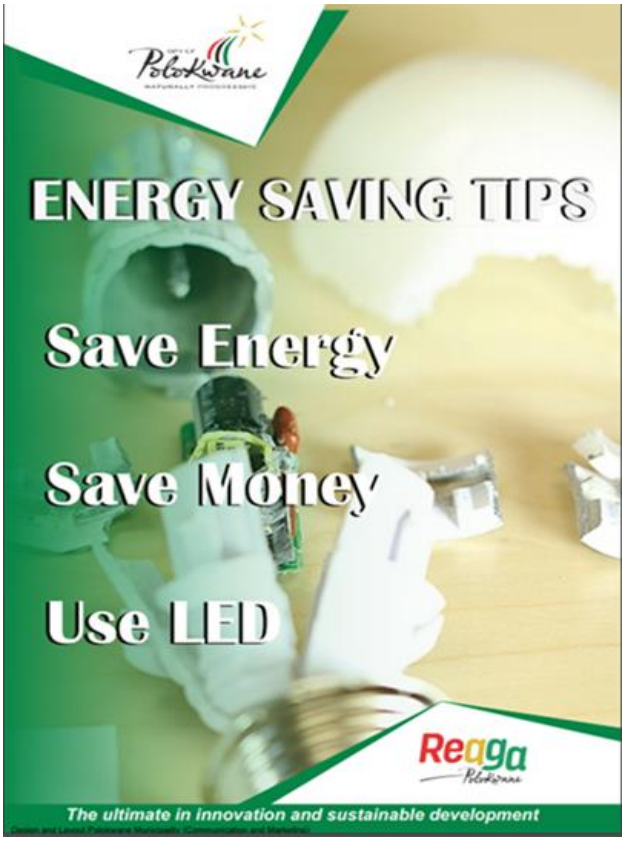

Figure 5: A poster that SA-LED helped to create for Polokwane Municipality

SA-LED also supported the finalization of the Municipality's Green Goal Strategy, which is currently in the approval process. The Green Goal Energy Strategy provides an action agenda for sustainable energy development. The strategy aims to provide a shared vision for Polokwane's role in sustainable energy development as well as a holistic action plan. The strategy provides a framework through which partners across the Municipality can work together to achieve the vision for sustainable, safe, and affordable energy for all.

SUSTAINABLE TRANSPORT PEER TO PEER LEARNING EXCHANGE GEORGE MUNICIPALITY, WESTERN CAPE

In Year 4, SA-LED provided support to Gert Sibande District Municipality in Mpumalanga Province to develop a strategic roadmap for their Integrated Transportation Plan (ITP). This support was in line with SA-LED's support to municipalities interested in developing public transport initiatives that were environmentally friendly and financially feasible to both the public and municipalities. For example, transport has been a core component to the MCCMS. SA-LED also worked on sustainable transport with Govan Mbeki Municipality, assisting them to also develop a strategic roadmap for their own ITP. Combining this support and in Q2, SA-LED facilitated a peer to peer learning exchange among five municipal officials working in the respective provincial transport departments in the two municipalities. The exchange took place in George at the GoGeorge! Offices.

The George Integrated Public Transport Network (GIPTN) aims to launch a new and improved public transport system for the city of George and surrounding areas. The exchange provided Gert Sibande and Govan Mbeki Municipal officials the opportunity to learn how ITP systems compare to standalone projects and review modes with low carbon intensity that can be used in areas requiring transport for large volumes of people. Officials from GoGeorge! were able to share their experience with their municipal counterparts on how to run an effective ITP, considering their ITP had been running for five years. The municipal officials learned how to coordinate among provincial, municipal and private stakeholders to collectively maintain the ITP. Furthermore, participants learned how to employ low carbon intensive methods while concurrently running an effective public transport network. The work between the two municipalities was an excellent way in which SA-LED was able to bring beneficiaries together to collectively learn to attain a common LED goal.

COMMUNICATIONS ACTIVITIES

SA-LED's overall communications goal is to promote public and private sector LED technical capacity. During Year 4, the Program's communications objectives aimed to:

1) Improve LED awareness
2) Demonstrate how to apply tools and technical products developed through SA-LED's expertise
3) Showcase SA-LED's success stories

In FY19, SA-LED worked to create 10 communications products that describe the quality of technical expertise provided by the Program. Specifically, SA-LED short videos, case studies, and posters including but not limited to the following:

1) *Polokwane Energy Audit Video:* showcases engaging college students in conducting energy audits for the municipality.
2) *Blue Karoo Fish Farm Video*: highlights the methodology of support to the aquaculture farm as well as the multiple benefits involved, including employing members of the community with a particular focus on women.
3) *Biogas Systems for Schools Poster:* describes the entire value chain of having had a biogas digester in schools and is pictured in Section 3 of this report.
4) *Blogs:* two blogs focused on projects where our technical knowledge had been dispensed, these were namely for EcoDistricts and on lessons on Public Private Partnership transactions at eThekwini Municipality.[2]
5) *Polokwane Case Study:* describes the Polokwane Municipality's engagement with students in energy audits, showing the cost and educational benefits of the engagement.
6) *Polokwane Energy Saving Posters:* four different posters promoting awareness of energy saving actions.

In addition, SA-LED developed two technical products/tools in FY19:

1) *SANS 10400-XA Inspection Tool:* to be used by municipal site building inspectors to ensure that the buildings they erect are compliant with SANS 10400-XA national regulations.

[2] https://www.chemonics.com/blog/laying-a-blueprint-for-municipal-public-private-energy-partnerships/

2) *Greening Mohair Standard:* helps ensure that mohair production is environmentally sustainable and socially responsible and that animals are treated humanely, treating them in a dignified fashion, to align with international regulations for the production of mohair.

The focus of the Program's communications activities in FY20 will be on finalizing and disseminating additional technical products and tools. The main focus includes launching SA-LED's page on Climatelinks, which will house SA-LED's technical tools and communications products. SA-LED also plans to hand over the communications and technical products to SALGA and SEA and upload the materials to DEA's online portal to serve as a reference library. SA-LED anticipates the Climatelinks site to be launched in FY20 Quarter 1. Finally, as technical activities wind down, SA-LED is finalizing case studies showcasing the multiple benefits, impacts, and results of key projects and LED interventions with the aim of demonstrating the potential for replicability and scaling up.

SA-LED also presented experiences and lessons learned from Program implementation in the following forums during FY19:

1. Shared SA-LED's experience on innovative financing of a municipal energy project through a PPP arrangement at the 11th Annual Energy Africa Conference in Denver, Colorado inDecember 2018.
2. Presented on the multiple benefits assessment framework to the World Resources Institute in Washington, DC in February 2019.
3. Facilitated a breakout session on energy efficiency at the Urban Energy Network, organized by Sustainable Energy Africa, SALGA, and the South African Cities Network (SACN) in Cape Town in June 2019.
4. Served on a panel convened by The United Nations Industrial Development Organization (UNIDO) on sustainability and digitalization in energy management during the 9th Annual Sustainability Africa Week held by Council for Scientific and Industrial Research (CSIR) in the City of Tshwane in June 2019.
5. Presented institutional LED planning in municipalities through application of the SA-LED-developed OCAT tool during the Free State Provincial IDP Capacity building Session in September 2019.

5. MULTIPLE BENEFITS

In FY19, SA-LED continued support to LED projects to further analyze "multiple benefits" associated with the Program's technical assistance and more importantly, demonstrate the potential of LED projects to municipalities. Building upon the United Nations International Climate Action Transparency (UN-ICAT) framework, global sustainable development goals, as well as EPA indicators for assessing multiple benefits, SA-LED finalized its multiple benefits framework contextualized to the South African context. The Program then applied the methodology to seven of SA-LED's LED projects. The primary components of the multiple benefits assessments include:

1) **Social Impacts**
   - Employment for women and youth
   - Training and empowerment of staff
   - Livelihood enhancement
   - Associated businesses and jobs
2) **Environmental Aspects**
   - Water use
   - GHG and other emissions
   - Waste management
   - Land use change
3) **Social Redress and Community Resilience**
   - Redressing past social and economic injustices
   - Fit within the local municipal development plan

From these assessments and in line with SA-LED's communications strategy, SA-LED drafted eight multiple benefits case studies that will be finalized in FY20 and uploaded into SA-LED's resource library on Climatelinks and DEA's online portal and shared with partners such as SALGA and SEA. In FY19, SA-LED applied the methodology to the Garden Route District Municipality Abattoir and the Mpumalanga Province Biogas in Schools project and the. Details on each analysis is as follows:

GARDEN ROUTE DISTRICT MUNICIPALITY: ABATTOIR WASTE

At Garden Route Municipality, abattoir waste was identified through multiple waste characterization analyses as the most problematic food waste type to manage due to its hazardous nature. A solution to manage the potential negative impacts is anaerobic digestion, which generates biogas that can be used to produce heat and/or electricity, as well as a by-product that can be used as fertilizer. Abattoir waste was diverted away from landfills into anaerobic digestors, thus reducing GHG emissions through methane capture and renewable biogas energy generation. While the construction and maintenance of the anaerobic digester facility creates local jobs.

The multiple benefits analysis confirmed a variety of social and environmental benefits of installing anaerobic digesters at the abattoir namely:

- *Emissions reduction: GHG* emissions could be reduced by 5,700 tons of CO2e per year.

- *Employment creation:* management of the anaerobic digester has the potential to create an estimated 53 jobs.
- *Budget savings:* Anaerobic digestion when calculated over 10 years, saves R32 per ton of waste resulting in an annual savings of over R 313,000 or approximately $21,000.

MPUMALANGA PROVINCE BIOGAS IN SCHOOLS

SA-LED completed a multiple benefits analysis of installed biogas digester systems at Lamlile Primary School, Mkhulu Combined School, and Takheleni Primary School in Mpumalanga Province. The biogas digesters are fed with organic waste from the school feeding schemes and vegetable gardens located on school premises and utilize water from rainwater harvesting systems. The multiple benefits analysis confirmed a variety of social and environmental benefits of installing biogas digester. Benefits include:

Photo 4: Students at Lamkhalani School in Mpumalanga attend to their vegetable garden. The vegetables are used as part of the biogas in schools program.

- *Improved nutrition for students.* Food grown and harvested from school vegetable garden contribute to school feeding schemes.
- *Budget savings.* Biogas systems have saved the three schools approximately R60,000 or approximately $4,000 that would have otherwise been spent on electricity or LPG costs.
- *Emissions reduction.* Gas produced from the biogas system is from organic waste and not reliant on electricity and thus, it reduces the carbon emissions that would normally come from these energy sources.

6. CHALLENGES, CONSTRAINTS, AND LESSONS LEARNED

Throughout FY19, valuable lessons learned and challenges became more defined as SA-LED continued providing technical assistance to provincial and municipal partners. The overarching lesson learned was that in planning technical assistance to LED projects, more upfront consideration must be given to unforeseen circumstances such as municipalities' responsiveness to requests, political changes and labor strikes; the availability and quality of data; and municipal or provincial government funding allocation delays.

A persistent barrier that SA-LED has been required to overcome is the responsiveness of municipalities to inquiries that impact the Program's ability to move technical assistance forward. As 2019 was a general election year in South Africa, there were numerous political

changes at the national, provincial, and municipal levels. Moreover, even if SA-LED's municipal counterparts did not change, they were frequently engaged in campaigning for their political parties. These factors affected the responsiveness of Program counterparts and at times, slowed decision making processes required to move LED projects forward. Engaging multiple officials could help address barriers of responsiveness and availability.

Labor strikes within municipalities also featured dominantly within the municipalities the SA-LED supports. Strikes are a common occurrence in South Africa, frequently due to disagreements over wages and working conditions. Municipal workers enjoy protection from strong and organized unions, and issues between workers and municipal management are frequently resolved through the unions. When strikes occurred in FY19 (such as in eThekwini), SA-LED's ability to provide technical assistance, collect data, and/or interface with municipal managers was limited and in turn, LED project implementation cycles was disrupted. Thus, programs providing support to municipalities should account for delays by establishing longer and flexible project timelines.

Another key lesson learned SA-LED faced across multiple projects in FY19 was gathering or obtaining data from municipalities that was essential for the Program's technical assistance. SA-LED learned that the collection and retention of data is not seen as a priority by many and is therefore not being completed and delivered. For example, in eThekwini, the Program found there was no metering data collected by the Municipality, which made it difficult to obtain data necessary for project activities. Additionally, the lack of data retention across municipalities presented another challenge. Since SA-LED relies heavily on data to structure technical assistance, provide sound advice, and advocate for benefits related to renewable energy, the absence of accurate data at times brought LED projects to a halt. Thus, understanding what data is available from the beginning is essential prior to committing to specific technical assistance and implementation timelines. To mitigate risks associated with the availability and/or quality of data, programs similar to SA-LED should include expectations around data requirements within the initial MOU and/or wait on signing the MOU until there is an agreed-upon understanding of what data exists or does not exist. Moreover, programs should integrate data collection or verification into the project timeline and if required, allocate budget from the onset of technical assistance.

Finally, on LED projects where municipal or provincial partners are financial contributors, SA-LED learned that an in-depth understanding of funding allocation or procurement processes of respective institutions is required to develop realistic implementation timelines. For example, SA-LED was unable to implement the second phase of the biogas in schools project (which commenced in February 2019) due to delays in the release of European Union funds from the National Treasury Generic Budget Support Programme to the Eastern Cape Provincial Government for the procurement of biogas micro-digesters. While the second phase of SA-LED's technical assistance had to be canceled, the Program plans to compile a comprehensive training plan (and associated materials, including instructional training videos) in FY20 to enable the Province to continue with project as initially envisioned with their own resources.

ANNEX A. DEFINITIONS

DISTRICT MUNICIPALITY: There are 47 Category C or District Municipalities which are made up of several local municipalities that fall under one district (between three to six local municipalities form a district council). The District Municipality coordinates development and service delivery in the entire district.

LOCAL MUNICIPALITY: There are 231 Category B or Local Municipalities which share responsibility for service delivery with District Municipalities.

METROPOLITAN MUNICIPALITY: There are 8 Category A or Metropolitan Municipalities representing the largest cities. These municipalities have a population of 500,000 and above.

MRV: The implementation of climate change mitigation actions in a "measurable, reportable and verifiable" manner.

SALGA: South African Local Government Association is an autonomous association of 278 municipalities with its mandate derived from the Constitution of the Republic of South Africa. This mandate defines SALGA as the voice and sole representative of local government. SALGA interfaces with parliament, the National Council of Provinces, cabinet, as well as provincial legislatures.

ANNEX B. INDICATORS AND MILESTONES

The table below provides a summary of progress towards the achievement of SA-LED's targets for FY 2019 and over the life of the Program. Progress on activities as laid out in the SA-LED's FY 2019 work plan is also described in the table. The table is structured to illustrate how work plan activities contribute towards the achievement of the SA-LED's indicators.

Level of Results	Result Statements	Indicators	LOP Targets	FY16 Results	FY17 Results	FY18 Results	FY19 Targets	FY19 Progress Q4	Annual Performance Achieved to Date (in %)	Comments
Ultimate Outcome	**Reduced greenhouse gas emissions through implementation of SA-LED initiatives**									
Intermediate Outcome 1: Increased investment in LED										
KRA: Innovative LED projects identified, supported, and facilitated		Number of LED projects provided with technical assistance	20	6	5	11	**4**	2	200% (8 projects)	SA-LED surpassed its Life of Program (LOP) target by completing 30 total projects. In Q4, SA-LED provided technical assistance to **four** projects: two **new projects –** i) Hessequa Solar Wastewater Treatment Works (WWTW); ii) Zeekoegat Wastewater Treatment Plant (WWTP) - Combined Heat and Power Designs **two existing projects** –(i) eThekwini Hydro; ii) CapeNature: LED in Protected Areas
KRA: Reduced emissions potential in strategic sectors demonstrated		Projected quantity of GHG emissions in metric tons of CO2e, reduced or avoided by 2030	100,000 tons	0	70,942 tons	438,243 tons	**10,000 tons**	226,402	3129% (312,902 tons)	SA-LED surpassed its LOP target by achieving 822,087 tons. Reported emissions come from eThekwini hydro. Zeekoegat WWTP project will be reported in FY20 Q1.
		MW of clean energy generation capacity	10MW	0	2.96 MW	0.59MW	**6MW**	4MW	150% (9MW)	SA-LED exceeded its LOP target and annual target due to strategically identifying projects with high MW impact, achieving a total of 12.55 MW.

Level of Results	Result Statements	Indicators	LOP Targets	FY16 Results	FY17 Results	FY18 Results	FY19 Targets	FY19 Progress Q4	Annual Performance Achieved to Date (in %)	Comments
Ultimate Outcome	**Reduced greenhouse gas emissions through implementation of SA-LED initiatives**									
		supported by SA-LED assistance[3]								MW reported are generated by eThekwini hydro. Zeekoegat WWTP project will be reported in FY20 Q1.
Immediate Outcome 1.1: Improved project preparation										
Activity		Comments of Progress								
Activity 1.1.1	Provide technical assistance to projects to strengthen LED development	In Q4, SA-LED provided technical assistance to 4 projects: i) Hessequa WWTW; ii) Zeekoegat WWTP projects, iii) eThekwini hydro and iv) CapeNature: LED in Protected Areas.								
Activity 1.1.2	Evaluate existing projects according to finance and multiple benefits criteria	A multiple benefit comparative analysis of projects supported has been conducted, and a draft report that shows the trends, similarities and contradictions per SA-LED sector per multiple-benefits indicator (youth, gender, environmental impact, job creation and redress) is currently being finalized.								
Activity 1.1.3	Maintain a robust pipeline of LED projects	SA-LED provided technical assistance to 28 projects. In Q4, SA-LED started sharing completed projects with key stakeholders and other Development Finance Institutions to ensure continuity of an entire project and/or specific aspects of the SA-LED project pipeline. As such SA-LED, shared projects with the IFC, GIZ and CapeNature for continuation. In addition, SA-LED will conduct financial feasibility studies of at least two projects in the FY20 Q1.								
KRA: Resources from Development Finance Institutions (DFIs), Public Sector Finance funds (such as the SA Green Fund), and Private Sector Finance mobilized or Leveraged		Value of funds in USD mobilized or leveraged to support LED projects	US$206 M	US$200M	US$ 1,356,145	US$ 3,286,435	**US$1.5M**	US$ 1,620,450	148% ($2,234,032)	Funds reported in Q4 are leveraged from the EcoDistricts work SA-LED supported City of Johannesburg's municipality with. i) Global Environment Facility ($1,120 450) and ii) City of Johannesburg ($500,000). LOP, SA-LED has achieved $206,876,612.
Immediate Outcome 1.2: Increased financial support to LED projects										

[3] This is a LED project, with energy being one of the aspects in which we work. As such, SA-LED will contribute to Power Africa goals and share monitoring and reporting data from our energy projects with Power Africa. The annual targets for this indicator are not true "targets" we hope to meet necessarily but this is rather a "monitoring indicator" to make sure we can report on any clean energy generation projects SA-LED ends up supporting.

Level of Results	Result Statements	Indicators	LOP Targets	FY16 Results	FY17 Results	FY18 Results	FY19 Targets	FY19 Progress Q4	Annual Performance Achieved to Date (in %)	Comments
Ultimate Outcome	**Reduced greenhouse gas emissions through implementation of SA-LED initiatives**									
Activity		Comments of Progress								
Activity 1.2.1	Implement SA-LED finance approach	Because of changes in the ability of the Drakenstein Municipality to respond to SA-LED's technical assistance (changes in the roles of key champions), SA-LED had to cancel the Drakenstein EcoDistricts/Finance project. In lieu of this work, SA-LED completed the groundwork to roll out final aspects of the Program's finance approach, i.e. (i) providing technical assistance for the uptake of the IDC Guarantee; and (ii) conducting targeted financial feasibility studies of two SA-LED projects. As part of this work, SA-LED met with the IDC to explore the possibility and details around reactivating the partial risk guarantee. SA-LED will proceed with this work in the FY20 Q1. Furthermore, SA-LED established a solid working relationship with the IFC's Cities Platform team to jointly seek out financially feasible projects from SA-LED's pipeline of projects.								
Activity 1.2.2	Collaborate with DFIs, grant agencies, and government finance streams and other relevant finance stakeholders to provide a financial offering	In line with the Program's revised FY19-20 Work Plan, SA-LED is no longer pursuing the development of another standalone finance product or mechanism due to time and resource constraints. SA-LED continues to work on two project finance modelling examples at municipal level; the eThekwini solar and hydro and the PowerX trading mechanism that will both be packaged into "how to" guides for municipalities. In addition, SA-LED will develop a fact sheet for municipalities on how to access the existing IDC partial risk guarantee, and seek to prepare financial feasibility studies of two additional SA-LED project in the coming quarter.								
Intermediate Outcome 2: Accelerated rate of implementation of LED initiatives										
KRA: Capacities of the Public and Private Sectors to Identify, Develop, and Fund LED Projects in Strategic Sectors Strengthened		Number of institutions with improved capacity to address LED issues	20	0	2	2	**11**	15	209% (23 institutions)	SA-LED has surpassed its LOP target, achieving a total of 27 institutions. Institutions with improved capacity in this quarter are those supported through the SSEG training. Municipalities have started establishing SSEG application and approval processes.
KRA: Public planning for LED improved		Number of laws, policies, regulations, or standards addressing LED	10	0	1	5	**4**	0	100% (4 public planning documents)	SA-LED has reached its LOP target and is awaiting the approval of two additional strategies: Polokwane Green Goal Energy Strategy and Govan Mbeki

Level of Results	Result Statements	Indicators	LOP Targets	FY16 Results	FY17 Results	FY18 Results	FY19 Targets	FY19 Progress Q4	Annual Performance Achieved to Date (in %)	Comments
Ultimate Outcome	**Reduced greenhouse gas emissions through implementation of SA-LED initiatives**									
		formally proposed, adopted or implemented as supported by SA-LED assistance								Climate Change Response Implementation Plan. SA-LED has LOP achieved 10 laws/policies/regulations/standards.
Immediate Outcome 2.1: Mainstream LED into programming, planning and budgeting of municipal services										
Activity		Comments of Progress								
Activity 2.1.1	Provide technical assistance to municipalities to mainstream LED into programming, planning and budgeting	SA-LED provided technical assistance to three municipalities: i) Hessequa Local Municipality on energy efficiency audits on their wastewater treatment works; ii) eThekwini Metropolitan Municipality on legal due diligence on the feasibility of the hydropower project; iii) City of Tshwane on the infrastructure and operational audit of the Zeekoegat wastewater treatment plant; including iv) CapeNature on pre-feasibility study on the identified below ground infrastructure opportunities.								
Activity 2.1.2	Implement SA-LED overarching capacity building plan	Following the SSEG training provided to Southern and Northern municipalities in March and April, SA-LED in collaboration with GIZ/South African Local Government/Council for Scientific and Industrial Research/Department of Energy (SALGA/CSIR/DoE) continued to provide technical assistance to these municipalities to continue to develop their SSEG systems. As a result, 15 municipalities are in the process of establishing SSEG application and approval processes and systems. In addition, SA-LED trained CapeNature staff on low emissions project development and furthermore supported the peer to peer integrated transport plan learning exchange between Gert Sibande District Municipality and George Municipality.								
Activity 2.1.3	Conduct institutional capacity building assessments of institutions working with SA-LED and develop institutional strengthening plans	SA-LED is no longer conducting capacity assessments but is instead measuring progress made by institutions that were assessed in 2017 as part of collecting baseline information. Reviews for Govan Mbeki and Chris Hani District Municipality are now planned for FY20 Q1.								
Activity 2.1.4	Implement institutional strengthening plans	SA-LED conducted progress review for Polokwane Municipality to assess the extent to which they implemented the capacity building plan. Both Polokwane Green Goal Energy and Govan Mbeki Climate Change Strategies are not yet approved. Polokwane's strategy was submitted to the Municipal Manager and the finance service business unit was requested to develop a five-year municipal budget to support the projects identified in the strategy. SA-LED continued supporting								

Level of Results	Result Statements	Indicators	LOP Targets	FY16 Results	FY17 Results	FY18 Results	FY19 Targets	FY19 Progress Q4	Annual Performance Achieved to Date (in %)	Comments
Ultimate Outcome	**Reduced greenhouse gas emissions through implementation of SA-LED initiatives**									
	for above mentioned assessed institutions	Gert Sibande District Municipality through peer to peer learning exchange as part of developing the Sustainable Transport Roadmap which will also benefit Govan Mbeki Local Municipality.								
KRA: Technical skills and strategic knowledge within relevant national, provincial or municipal government entities developed		Number of people trained in LED	130	33	117	400	**20**	88 *(45 Male, 43 Female)*	1215% (243 Annual number people)	SA-LED surpassed its LOP and annual target due to the collaboration with GIZ on SSEG training as well as responding to ongoing requests from municipalities. In Q4, the Program supported three more trainings: i) Biogas training for two schools in the Eastern Cape: Nyanga and Arthur Mfebe Senior Secondary Schools; ii) Sustainable Transport Peer Learning Exchange for Mpumalanga Provincial and Gert Sibande officials; and iii) CapeNature LED Training. LOP, SA-LED has achieved 793 people trained.
		Number of individuals receiving USAID SA-LED training who apply the new knowledge and skills	92	0	3	66	**49**	82	310% (152 Annual number people)	Reported individuals applied knowledge and skills acquired from the SSEG training. SA-LED's collaboration with GIZ on SSEG training helped the Program to surpass its annual target. LOP, SA-LED has achieved 221 people applying new skills.
Immediate Outcome 2.2: Increased municipal capacity for project assessment, design and development										
Activity		Comments of Progress								

Level of Results	Result Statements	Indicators	LOP Targets	FY16 Results	FY17 Results	FY18 Results	FY19 Targets	FY19 Progress Q4	Annual Performance Achieved to Date (in %)	Comments
Ultimate Outcome	**Reduced greenhouse gas emissions through implementation of SA-LED initiatives**									
Activity 2.2.1	Provide capacity building support to individuals to strengthen LED capacity	SA-LED continued the collaboration with GIZ/SALGA/CSIR/DoE to provide technical assistance to the Southern and Northern municipalities trained in March and April 2019 to develop their SSEG systems. SA-LED conducted two more trainings during Q4: (i) LED training for CapeNature staff; and (ii) biogas training for two schools in the Eastern Cape – Arthur Mfebe and Nyanga senior secondary schools.								
Activity 2.2.2	Conduct study tours	SA-LED conducted a peer to peer learning exchange between Gert Sibande District Municipality and Mpumalanga Provincial Government officials and George Local Municipality. The exchange aimed at exposing the officials to the processes that George municipality followed to develop and implement their Go-George Bus Rapid Transport system.								
KRA: Key stakeholder knowledge and awareness of LED technologies and implementation strategies improved		Number of communication products produced by SA-LED	50	1	10	7	**20**	1	50% (10 communication products)	SA-LED documented energy audits support provided to Polokwane into a case study: Polokwane Energy Audits Case Study. While the Program did not meet its annual target, eight products are drafted and will be submitted to USAID in FY20 Q1: i) Climatelinks Blog; ii) 6 multiple benefits case studies; and iii) Multiple benefits Methodology Poster. LOP, SA-LED has developed 28 communications products.
KRA: Technical products to facilitate GoSA development and management of LED developed		Number of technical products developed to facilitate GoSA development and management of LED	8	1	3	1	**3**	0	67% (2 technical products)	While the Program did not meet its annual target, the Organizational Capacity Assessment Tool is on track to be finalized and reported in FY20 Q1.
Immediate Outcome 2.3: Strengthened municipal LED knowledge base										
Activity		Comments of Progress								

Level of Results	Result Statements	Indicators	LOP Targets	FY16 Results	FY17 Results	FY18 Results	FY19 Targets	FY19 Progress Q4	Annual Performance Achieved to Date (in %)	Comments
Ultimate Outcome	**Reduced greenhouse gas emissions through implementation of SA-LED initiatives**									
Activity 2.3.1	Develop and disseminate information on LED technologies and implementation strategies	Three multiple-benefits case studies: (i) Ekurhuleni Solar PV; (ii) Greening the Mohair Value Chain and (iii) Garden Route Abattoir waste - are drafted and will be shared with USAID in FY20 Q1. SA-LED also drafted three additional multiple-benefits case studies that will be reviewed in FY20 Q1: (i) Garden Route Household Composting; (ii) biogas in schools and (iii) Karoo Catch. These case studies are going through a comments process and will be finalized in FY20 Q1.								
Activity 2.3.2	Document best practices on different LED implementation approaches	SA-LED supported Polokwane Municipality with energy audits for its buildings with the assistance of Capricorn Technical Vocational Education and Training College students in 2018. This approach has been documented into a case study to be shared as best practice.								
KRA: Knowledge and awareness of the relationship between economic, gender, and youth implications of low emissions development increased		Number of projects supported by SA-LED that have co-benefits	10	0	1	3	**4**	0	50% (2 projects)	SA-LED started analyzing multiple benefits for Chris Hani District Municipality and will be finalized in FY20 Q1.
Immediate Outcome 2.4: Increased LED credibility as a pathway to local economic development, including gender and youth										
Activity		Comments of Progress								
Activity 2.4.1	Integrate youth and women into SA-LED projects and activities	SA-LED provided training for CapeNature staff in LED project development. The training included two youth who are completing g internships with CapeNature's Youth in Environmental Services Program. In addition, as part of implementing its EEDSM work plan EEDSM, George Municipality organized "World of Tomorrow Festival 2019" to raise public awareness of the importance of energy efficiency. The initiative took the message through children - to the homes of George residents - by means of an Industrial Theatre Competition (between nine schools), which introduced and explored the topic on 'How to mitigate climate change with energy efficiency'. The dramas highlighted the changes individual residences and schools could make, to become more energy efficient, which in most cases will assist in mitigating effects of Climate Change.								
Activity 2.4.2	Capture learnings on multiple benefits from projects supported	In Q4, SA-LED conducted a multiple-benefits assessment of the Chris Hani District Municipality Long-term Capacity Facilitation process. The outcomes were captured in a draft report and will be finalized in FY20 Q1. The Program also completed technical assistance on the CapeNature project during the quarter and will thus be able to conduct a multiple-benefits assessment for the CapeNature project in FY20 Q1.								
Activity 2.4.3	Roll out further multiple-benefits	SA-LED identified three projects to be analyzed for multiple benefits in FY20 Q1: (i) CapeNature, ii) eThekwini Hydro; and (iii) Zeekoegat CHP.								

Level of Results	Result Statements	Indicators	LOP Targets	FY16 Results	FY17 Results	FY18 Results	FY19 Targets	FY19 Progress Q4	Annual Performance Achieved to Date (in %)	Comments
Ultimate Outcome	**Reduced greenhouse gas emissions through implementation of SA-LED initiatives**									
	analyses for other SA-LED initiatives									
Intermediate Outcome 3: Improved quality of monitoring and reporting of GHG emissions at sub-national and project level										
KRA: GoSA skills to monitor, report, and communicate on GHG emissions improved		Number of people capacitated in GHG MRV	130[4]	0	38	53	**29**	0	37% (11 People)	No GHG related training was conducted in this quarter. LOP progress is 102 people.
Immediate Outcome 3.1: Improved skills to monitor, report and communicate GHG emissions at sub national and project level										
Activity		Comments of Progress								
Activity 3.1.1	Support municipalities with project level GHG MRV	No municipality requested GHG MRV support in this quarter.								
Activity 3.1.2	Support municipal level GHG inventorying	No municipality requested assistance in GHG inventorying.								

[4] This is a general training target to which training in GHG MRV contributes.

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