USAID | SOUTH AFRICA
Low Emissions Development Program

FINAL REPORT

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CONTENTS

ACRONYMS

CDA	Cacadu Development Agency
CHDM	Chris Hani District Municipality
CHP	Combined Heat and Power
CLEER	Clean Energy Emission Reduction
CO_2e	Carbon dioxide equivalent
DCA	Development Credit Authority
DEA	Department of Environmental Affairs
DEDEAT	Department of Economic Development, Environmental Affairs, and Tourism
DMRE	Department of Mineral Resources and Energy
EEDSM	Energy Efficiency and Demand Side Management
EU	European Union
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoSA	Government of South Africa
ICAT	Initiative for Climate Action Transparency
IDC	Industrial Development Corporation
IDP	Integrated Development Plan
IFC	International Finance Corporation
I-JEDI	International Jobs and Economic Development Impacts
ITP	Integrated Transport Plan
LED	Low Emissions Development
LCOE	Levelized cost of electricity
MCCMS	Mpumalanga Climate Change Mitigation Strategy
MW	Megawatts
MRV	Measurement, reporting, and verification
OCA	Organizational Capacity Assessment
PPP	Public-private partnerships
PV	Photovoltaic
RFP	Request for proposal

SA-LED	South Africa Low Emissions Development
SALGA	South Africa Local Governance Association
SANS	South African National Standards
SEA	Sustainable Energy Africa
SSEG	Small-scale embedded generation
TVET	Technical Vocational Education and Training

EXECUTIVE SUMMARY

As with many developing nations, South Africa is particularly vulnerable to climate change. If left unaddressed, climate change effects will significantly hurt the economy and society, affecting water resources and food production, and increasing the vulnerabilities of impoverished communities. With an economy heavily dependent on fossil fuels, South Africa's challenge is to mitigate climate change effects while maintaining long-term sustainable economic development. The country has set ambitious greenhouse gas (GHG) emissions reduction targets within its National Climate Change Response White paper (2011), as well as in the Nationally Determined Contributions to the Paris Climate Agreement (2015/16). Through the USAID-funded South Africa Low Emissions Development (SA-LED) program, USAID partnered with the South African government to support its green growth agenda and expand low emissions development (LED) to meet these reduction targets.

APPROACH

SA-LED focused on helping South African municipalities move LED projects through the project development life cycle, serving as a vehicle to deliver technical assistance, capacity building, financial advisory services, and to support in sourcing external finance. SA-LED identified municipal projects stuck in the project pipeline, and provided training and support to move them toward implementation. This approach provided opportunities for practical learning, using real project challenges as training material to build municipal capacity. To help implement South Africa's Climate Change Response Policy, SA-LED supported the South African government's near-term priority flagship initiatives in renewable energy, sustainable agriculture, energy efficiency and demand management, transport, and waste management. The SA-LED program was co-created with the South African Department of Environment, Forestry, and Fisheries,[1] and the Department of Science and Innovation.[2]

KEY RESULTS

SA-LED worked with municipalities to provide targeted technical assistance to develop LED projects, building capacity and creating an enabling environment for LED at the sub-national level to produce sustainable results.

TECHNICAL ASSISTANCE TO LED PROJECT DEVELOPMENT

By assisting municipalities to move LED projects from planning to implementation, SA-LED achieved the following results:

- Provided technical assistance to 31 LED projects
- Mobilized or leveraged more than $200 million to support LED initiatives

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[1] Formerly the Department of Environmental Affairs (DEA)
[2] Formerly the Department of Science and Technology

- Reduced 858,000 metric tons of carbon dioxide equivalent (CO_2e) by 2030 through program interventions (eight times the target of 100,000 metric tons)
- Developed 12.95 megawatts (MW) of clean energy generation capacity
- Developed 12 technical products or tools to facilitate LED projects by various actors

CAPACITY DEVELOPMENT TO IMPLEMENT LED

SA-LED worked to equip municipal officials with the knowledge, skills, and tools required to implement South Africa's national climate change response policy, bring LED projects to technical and financial feasibility, and implement LED projects effectively. In this regard, the program achieved notable results:

- Provided 28 institutions with improved capacity to address LED issues
- Trained 793 individuals in LED (six times the target of 130 individuals)
- 232 individuals that were trained in LED later applied the new knowledge and skills gained through the trainings
- Trained 102 individuals in GHG monitoring, reporting, and verification specifically

CREATING AN ENABLING ENVIRONMENT FOR LED

SA-LED worked to foster an enabling environment by turning climate change mitigation policy into action and by standardizing approaches to project design and implementation. SA-LED achieved the following:

- Assisted in proposing, adopting, or implementing 12 laws, policies, regulations, or standards to address LED
- Produced 53 communications products raising awareness of LED and capturing lessons learned and best practices

This report explores and expands on these results, detailing how SA-LED achieved them and consolidated, recorded, and communicated lessons to further benefit those working in LED throughout South Africa.

SUSTAINABILITY

SA-LED provided technical assistance and support with a view towards sustainability, ensuring municipal buy-in from the onset. Municipal uptake of LED initiatives and the use of SA-LED resources, tools, and best practices show the sustainability of SA-LED interventions. Where SA-LED addressed project barriers, municipalities have taken projects forward, replicated them, and scaled them. For capacity building efforts, SA-LED worked closely with other donors and stakeholders in the LED space to avoid duplication and ensure that efforts continued after SA-LED intervention. Finally, SA-LED capitalized on its repository of tools, methodologies, best practices, and lessons learned by developing a resource library for municipalities or other groups interested in pursuing

LED or green growth. All resources have been uploaded to the program's page on USAID's Climatelinks site.[3]

LESSONS LEARNED

SA-LED identified key lessons through facing and responding to challenges and developed recommendations for designing and implementing future municipal-focused LED/green growth, governance, and/or institutional development technical assistance programs. These lessons are:

Adaptive management. SA-LED's adaptive management approach and flexibility allowed for the program to re-orient activities at various points. The key is to maintain the ability to change course and adapt, while ensuring planning upfront.

Iterative learning. Iterative learning increases impact. SA-LED found success when integrating support packages to municipalities to include both capacity building and project development support to build on and complement each other.

Targeted communications from program managers. Focused, high-level communications from SA-LED staff enabled beneficiaries to maintain momentum during unexpected challenges and respond to changes in municipal leadership.

Champions in the political economy. Identifying and supporting champions in municipalities was critical to 1) align and secure resources at various levels of government and 2) engender ongoing leadership at lower levels of government.

Political momentum. When faced with political momentum challenges, such as delays caused by elections or changes in political leadership, SA-LED found, in addition to identifying and supporting champions and providing consistent, targeted communications, it is also important to establish longer and more flexible timelines.

Financial sustainability. LED requires sustained funding or financing to continue beyond the programmatic period of support. LED programming going forward should look beyond indicators of "leveraging" and more explicitly orient activities around securing sustained funding or financing as an objective.

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[3] https://www.climatelinks.org/project/south-africa-low-emissions-development-program

INTRODUCTION AND OVERVIEW

BACKGROUND AND CONTEXT

South Africa's transition to a low-carbon economy illustrates the typical dichotomy facing developing economies: how to join the global fight against climate change while advancing economic growth and social development. South Africa's GHG emissions represent 1.1 percent of global emissions, yet the country's share of global GDP is only 0.6 percent. In the latest National GHG Inventory (2015), the energy sector accounted for 79 percent of emissions. This includes transportation, and industrial processing (8 percent), agriculture (9 percent), and waste (4 percent).[4]

To achieve meaningful reductions in GHG emissions, the South African government has implemented a comprehensive set of strategies, policies, and plans within key contributing sectors of the economy. Born out of the South Africa's 2011 National Climate Change Response White Paper that outlined cross-sectoral mitigation goals for South Africa,[5] the Climate Change Bill (2018)[6] acknowledges the important role of sub-national government at the provincial and local levels in achieving the country's national climate change response.

DEFINING THE PROBLEM

Significant obstacles remain in translating a vision of a low-carbon economy into actual LED projects and green economy development. Sub-national LED projects frequently fail to reach the implementation stage due to limited capacity and funding as well as a lack of technical expertise. An unsupportive enabling environment further results in lost opportunities to accelerate action for green growth that meets national low-carbon growth goals and municipal climate change imperatives captured in the Climate Change Bill. South African investors also often have a limited understanding of LED technology or the legal and regulatory framework surrounding green investment and therefore perceive such investments as risky. Municipalities struggle to understand their role in the national low-carbon transition or how to respond to the call for reduced GHG emissions and increase development impact. Addressing these challenges requires translating LED concepts into replicable projects, proving their success, and aiming to scale up.

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[4]https://www.environment.gov.za/sites/default/files/reports/GHG-National-Inventory-Report-SouthAfrica-2000-2015.pdf
[5]https://www.environment.gov.za/sites/default/files/legislations/national_climatechange_response_whitepaper.pdf
[6] https://www.environment.gov.za/sites/default/files/legislations/climatechangebill2018_gn41689.pdf

PROGRAM OBJECTIVE AND APPROACH

SA-LED was awarded on May 18, 2015 to Chemonics International and its consortium partners, DNA Economics, ICF, Agama Biogas, Linkd Environmental Services, and The Green House.

SA-LED's objective was to support the South African government in its efforts to expand LED to stimulate "green growth" through improving the capacity of South African LED actors at the sub-national level to select, plan, implement, and expand LED projects in support of national goals and to foster an enabling environment where the public and private sectors work collaboratively to continually mobilize future LED at scale. These goals are articulated in the program's two integrated strategic objectives:

> *Objective 1: Strengthen public sector-related development planning and project development capacity for low emissions projects, including the mobilization of development finance and private sector participation.*
>
> *Objective 2: Increase public sector core competencies through technical assistance and learning activities in support of the South African government's Green Growth initiatives.*

The South African government co-created the program's terms of reference, assisted in the procurement process, and participated in the program's Strategic Advisory Committee, comprised of senior officials of key national government departments. SA-LED therefore enjoyed strong local ownership and strategic support by its partners at the national level; the Department of Environment, Forestry, and Fisheries; and the Department of Science and Innovation. The program was designed to support the U.S. government's Development Cooperation Strategy in South Africa, specifically Intermediate Result 2.4 – *Transition to a low-emissions economy promoted.*

KEY ASSUMPTIONS AND THEORY OF CHANGE
Five key assumptions, below, guided SA-LED and provide context for the underlying logic behind SA-LED's theory of change.

- LED initiatives will contribute towards reducing relative levels of GHG emissions.
- Capacity building and technical assistance to targeted municipalities will result in increased investment in LED initiatives.
- Assistance to mainstreaming LED initiatives into municipal planning, programming, and budgeting processes will result in the increased uptake of LED projects at the municipal level.
- Municipalities serve as key actors in developing and implementing climate change mitigation policies and programs as they can stimulate local action through their service delivery mandates and national commitments.
- Implementation of LED initiatives has the potential to support economic development and job creation for women and youth.

Given these assumptions, SA-LED's theory of change articulates the ultimate outcome "Reduced greenhouse gas emissions through implementation of SA-LED initiatives" as

well as three intermediate outcomes: 1) increased investment in LED, 2) accelerated rate of implementation of LED initiatives, and 3) improved quality of monitoring and reporting of GHG emissions at the sub-national and project level. SA-LED's approach was grounded in these five assumptions and desired outcomes.

SA-LED'S APPROACH TO TECHNICAL ASSISTANCE

SA-LED's approach to meet its objectives focused on supporting an enabling environment for LED at the sub-national level and helping South African municipalities move LED projects through the project development lifecycle. It operated as the vehicle to deliver associated technical assistance, capacity building, financial advisory services, and support in sourcing external finance. SA-LED identified municipal LED projects that were stuck in the project development pipeline and provided the training, support, and technical expertise needed to advance these projects to implementation. This approach provided opportunities for practical learning, using real project barriers to provide training material to build the capacity of municipalities that would then support the uptake of LED. To support the implementation of South Africa's climate change response policy, SA-LED focused on interventions within the South African government's near-term priority flagship sectors: renewable energy, sustainable agriculture, energy efficiency and demand management, transport, and waste management. SA-LED's approach is summarized in Figure 1.

FIGURE 1. SA-LED'S APPROACH TO TECHNICAL ASSISTANCE

Research and Analysis	Monitoring, Reporting, and Verification	LED Project Development	Capacity Development	Enabling Environment
· Identify best practice · Develop case studies · Conduct market research · Identify project blockages	· Conduct LED project-level GHG accounting training · Inventory GHG on a community scale · Conduct lifecycle assessments · Develop GHG quantification technical products · Develop communications products	· Continue with existing projects · Focus on project preparation · Determine financial feasibility · Consolidate technical processes, methodologies, and best practices · Enhance programmatic work · Implement technology per sector programmatically	· Strengthen GoSA capacity · Strengthen LED project development capacity · Support LED planning · Conduct LED training	· Implement SA-LED finance strategy · Consolidate regulatory support · Ensure sustainable capacity and technical legacy for SA-LED · Integrate into products for market

Communications and Outreach

Bridging the gap between national policy and sub-national implementation meant that SA-LED had to work strategically to seek out pivotal opportunities for LED intervention in a donor-saturated sector. This approach required careful coordination with key stakeholders, the government, municipalities, and other LED actors to avoid duplicating efforts while building on best practices in the market. While the program provided targeted support to LED project development and capacity enhancement in its first three years, the program's final two years capitalized on these efforts by consolidating tools and methodologies to develop lessons learned to ensure the sustainability. In this vein, SA-LED focused on supporting municipalities to prepare for and implement climate change response implementation plans. It developed a comprehensive suite of tools and learning materials to remain in the public domain long after the program ends. By program end, SA-LED had integrated its work across interventions, including finance, capacity building, and technical expertise, to offer integrated solutions to municipalities.

FIGURE 2. WHERE SA-LED WORKED
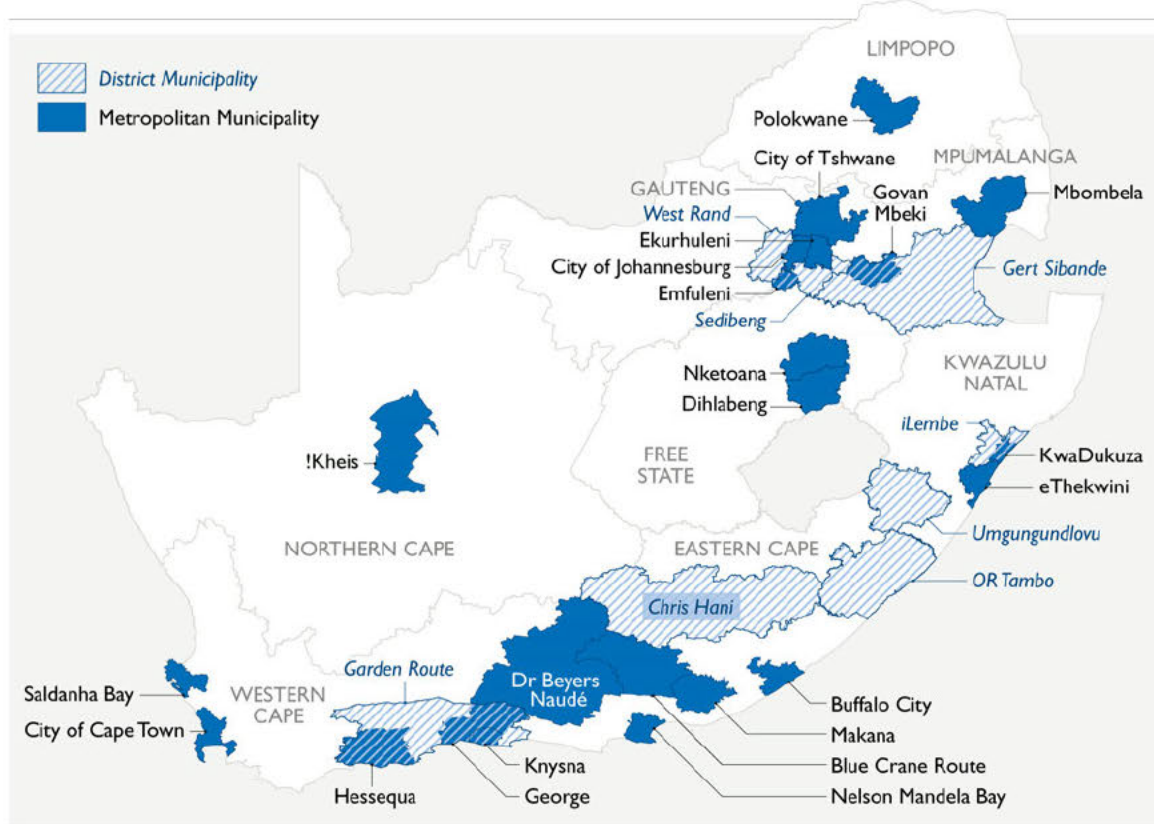
WHERE SA-LED WORKED

Over the course of five years, SA-LED worked with metropolitan and district municipalities across eight provinces (see Figure 2, above). SA-LED selected municipalities based on its ability to absorb SA-LED technical assistance, the level of support within the municipality, the municipality's ability to finance the project (or the likelihood of securing financing), environmental or socio-economic side benefits to assistance, and possibility for innovation, among other factors.

SUPPORT TO LED PROJECT DEVELOPMENT

SA-LED supported 31 municipal-led LED initiatives across each of the five flagship sectors and beyond at various points in the project development lifecycle. Technical assistance took the form of conducting project feasibility assessments; mobilizing finance; evaluating and proposing LED technology options; and providing legal, financial, and engineering assistance to LED projects.

SA-LED'S LED PROJECT TECHNICAL SUPPORT METHODOLOGY

To ensure rigor in selecting municipalities and LED projects, SA-LED developed a unique methodology to identify, select, and provide technical support to LED projects. The methodology ensured the program could strategically respond to municipal challenges with context-specific LED solutions and allowed the program to support municipalities at the right time and with the right interventions. Critically, to encourage municipal ownership of the interventions, we ensured our support was consultative and participatory. This paved the way for an uptake in LED projects following SA-LED's intervention and ensured long-term sustainability.

> **LED PROJECT DEVELOPMENT RESULTS**
>
> - 31 LED projects supported
> - $207 million mobilized to finance LED projects
> - Over 858,000 tons of CO_2e reduced by 2030
> - 13 MW of clean energy capacity developed
> - Assessed the multiple benefits of 10 LED initiatives
> - 12 technical products or tools developed to facilitate development and management of LED

Engage the municipality. SA-LED would first meet with officials relevant to a service delivery area and secure buy-in for LED intervention. This way, we identified champions who would then support SA-LED in driving technical assistance in the municipality.

Discuss LED in the municipal context. To fully understand the municipality's specific situation, service delivery scope, development challenges, and barriers in LED project development, SA-LED worked with municipal staff to understand the context and how LED solutions could be applied to the benefit of the municipality. This conversation extended to the district, and in some cases, the provincial level to ensure coordination.

Understand the LED development context and processes. Many challenges municipalities face in implementing their climate change mitigation agendas are similar to those faced by other municipalities. It was important, however, to identify each municipality's baseline capacity for LED to tailor technical support that would be relevant and effective. This included looking at a given municipality's internal makeup, development and service delivery challenges, and the status of their integrated development plans (IDPs) and climate change mitigation and implementation plans.

Identify specific LED projects for technical assistance. Once familiarized with the context and municipality-specific challenges, SA-LED would target and prioritize a problem that would lift a barrier to the municipality achieving its LED and development mandates or resolve an immediate need for expertise. SA-LED therefore developed selection criteria to ensure a fair selection of municipalities and LED initiatives to support. SA-LED first prioritized GHG reduction as part of the criteria, then prioritized the other social, economic, and environmental benefits that would arrive from support to a given project. Next, SA-LED would co-create the solution to a given issue to ensure ownership and buy-in by the municipality so that the work would carry on following SA-LED's targeted technical assistance.

Confirm support for technical assistance. Once SA-LED identified a technical intervention, it would confirm its planned support and the municipality's buy-in through a memorandum of understanding or letter of engagement.

Select and phase specific project to support. SA-LED would work directly with officials to advance technical assistance and plan the intervention.

Engage the market. SA-LED brought expertise and best practices to the municipality through engaging experts in the international and South African market to apply LED solutions.

Procure expertise. SA-LED procured and deployed technical assistance, serving as the liaison between technical expertise and the municipality.

Monitoring and evaluation. SA-LED monitored progress of technical assistance against program indicators and worked with municipalities to gather data and monitor their progress.

Communications. As a final step, SA-LED packaged and consolidated best practices, lessons learned, and successes on the tools and methodologies applied through its technical support to municipalities to market LED impact and learnings.

Using this methodology, SA-LED then consolidated SA-LED technical assistance to standardize tools, methodologies, and mainstream market interventions to apply to other municipalities, assess the financial feasibility of projects, and assess the multiple socio-economic and environmental benefits that result from LED projects.

ASSESSING THE MULTIPLE BENEFITS OF IMPLEMENTING LED PROJECTS

One of the challenges that policymakers face in promoting LED projects is effectively articulating and quantifying the positive socio-economic benefits that LED projects produce. To understand and quantify the benefits to the local community and environment arriving from LED, SA-LED developed a multiple benefits assessment methodology designed to measure benefits that came as a result of LED interventions under SA-LED support.

SA-LED's "multiple benefits assessment" framework is based on the Initiative for Climate Action Transparency (ICAT) tool,[7] global sustainable development goals, and U.S. Environmental Protection Agency indicators for assessing multiple benefits. The ICAT provides policymakers globally with tools and support to measure and assess the impacts of their climate actions. It aims to help governments build capacity to measure the effects of their policies and report progress publicly to foster greater

MORE ON MEASURING THE MULTIPLE BENEFITS OF LED

Click on the links below for more information on SA-LED's multiple benefits assessment for LED:

- Multiple Benefits Assessment Framework (brochure)
- Multiple Benefits Assessment Framework (poster)
- Multiple Benefits Assessment Guide (step by step guide)

transparency, effectiveness, trust, and ambition in climate policies.[8] Drawing from international best practices and contextualized to South Africa, SA-LED focused on the areas presented in Figure 3, below, as indicators of multiple benefits of LED.

FIGURE 3. MULTIPLE BENEFITS

Social Impacts
· Employment for women and youth
· Training and empowerment of staff
· Livelihood enhancement
· Associated businesses and jobs

Environmental Aspects
· Water use
· Greenhouse gas and other emissions
· Waste management
· Land use change

Social Redress and Community Resilience
· Redressing past social and economic injustices
· Fit within the local municipal development plan

The program analyzed the multiple benefits of 10 LED interventions in various sectors. This analysis later guided SA-LED in municipality selection and helping municipalities understand the potential range of benefits from implementing LED interventions.

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[7] https://climateactiontransparency.org/
[8] http://www.climateactiontransparency.org/about/

HIGHLIGHTS OF SA-LED'S SUPPORT TO LED PROJECT DEVELOPMENT

While SA-LED supported 31 LED initiatives across each of the flagship sectors and beyond, this section highlights LED projects that achieved noteworthy results where municipalities successfully implemented SA-LED-developed tools, methodologies, and resources, spurred continued LED work. Please see Annex B for a full list of SA-LED-supported LED initiatives.

PROCURING SOLAR PHOTOVOLTAIC (PV) ENERGY IN EKURHULENI AND ETHEKWINI

As numerous municipalities across South Africa strive to reduce GHG emissions and provide reliable energy, many have been looking to invest in renewable energy. One such municipality, Ekurhuleni Metropolitan Municipality, has set an ambitious renewable energy goal, pledging to derive 10 percent of its energy from renewable sources by 2020. To do so, the municipality planned to procure more than 600 MW of renewable energy capacity from a range of

Municipal officials participate in a walking tour of solar PV installations at CSIR in the City of Tshwane. (Credit: SA-LED)

technologies by entering into power purchase agreements with independent power producers.

The municipality had set aside funding to implement renewable energy projects to provide clean energy to its own operations. In 2016, municipal officials engaged SA-LED to provide technical assistance in procuring solar PV panels to install on the roofs of select municipal buildings. Large municipal buildings, like civic centers, use significant amounts of electricity, but also offer large rooftop surfaces for solar PV panel installation. SA-LED worked with the municipality and local experts to conduct a feasibility study and develop a municipal tender for a rooftop PV installation on six municipal buildings. Once implemented, the project will generate two MW of clean energy and reduce 1,800 metric tons of GHG emissions by 2030, resulting in an average cost savings of R 725,000 (USD $50,000)[9] in annual energy expenses.

SA-LED assisted the municipality to determine the energy potential of the planned PV through a solar energy yield assessment. It also assisted the municipality to adopt and use a levelized cost of electricity (LCOE) model developed by the Council for Scientific and Industrial Research to ensure a cost-efficient procurement of solar PV assets. The LCOE model allows the municipality to adopt different criteria for evaluating bids received in response to a request for proposals (RFP). The LCOE model made it possible to screen proposals, evaluate, and determine the price ranking of each offer by assessing different

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[9] Exchange rate of 14.50:1 used (average across the life of the program)

factors, such as projected installation size, energy performance certificate price, operation and maintenance fees, and guaranteed performance ratio for the first three years of performance. As opposed to traditional procurement methods, which include criteria on quality but are ultimately decided based on total energy performance certificate price leading contractors to offer only the minimum required installed capacity at the minimum required quality, the LCOE model offers a more comprehensive analysis. More specifically, the model emphasizes quality and system performance by including the factors listed above, incentivizing contractors to optimize design towards the LCOE, and ensuring that solar PV assets are offered at the best value (high quality and lowest possible lifetime cost).

Using the LCOE model, Ekurhuleni was able to obtain a competitive LCOE and install a high-quality solar PV system. Given its success, the municipality plans to continue to use the tool in the second phase of its procurement and in future projects. SA-LED similarly supported the City of Cape Town in the use of the LCOE model for a solar PV procurement and Mbombela, Hessequa, George, and Nelson Mandela Bay municipalities with solar energy yield assessments.

The program further worked with the CSIR and the National Renewable Energy Lab to localize the [International Jobs and Economic Development Impacts (I-JEDI)](link)[10] model to analyze the economic impacts of renewable energy development using the potential gross economic impacts of wind, solar, biomass, and geothermal energy projects for a specific country. SA-LED supported eThekwini's Water and Sanitation unit to conduct a feasibility study for the installation of solar PV panels on the available space on its water reservoirs through a municipal public-private partnership (PPP), which included job quantification using the I-JEDI tool. Like any successful infrastructure project, solar PV installations need to demonstrate both technical and financial feasibility for them to gain support within the municipality and investment community. SA-LED therefore assisted in providing a high-level technical and financial

> **MORE ON FINANCING FOR SOLAR PV**
>
> Click on the links below for more information on financing solar PV:
>
> - Simplified Financial Model to Assist Municipalities in the Procurement of Solar PV Projects (fact sheet)
> - Simplified Financial Model for the Procurement of Solar PV Projects (tool)

feasibility assessment of ground mounted solar PV installations on the reservoir sites. The total installed capacity for the sites would be five MW and would result in a positive return on investment. Through this exercise, SA-LED developed a solar PV calculator (see box, right) to assist the municipality in determining financial feasibility.

With this technical assistance, SA-LED was able to provide the municipalities with the tools and know-how to move the procurement process forward and to conduct similar procurements in the future. SA-LED further supported eThekwini in tapping into another source of renewable energy—hydropower—by serving as the transaction advisor for the

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[10] https://www.i-jedi.org/south_africa.html

procurement of small-scale hydropower infrastructure in an aqueduct through a PPP. See box, right, for more information on this process.

BIOGAS IN SCHOOLS: ENGAGING YOUTH AND COMMUNITIES IN LED

Over nine million learners rely on meals provided through the school. To help contribute to these meals while capitalizing on LED technology, SA-LED leveraged R 500,000 (USD $34,615)[11] in funding from the Mpumalanga provincial Department for Economic

Development and Tourism to install micro-biogas digesters in three schools in the province: Lamlile Primary School, Mkhulu Combined School, and Takheleni Primary School. Biogas digesters are tanks that decompose or breakdown organic matter through anerobic digestion. The digesters in these schools convert food and yard waste from the schools into methane biogas and liquid fertilizer through this process. The biogas can then be used at the school for fuel for cooking, replacing fossil-derived liquid petroleum gas or firewood. The fertilizer is used for the school's garden, which contributes to the food

School staff and community members attend a training on how to install and use biogas digesters in schools in Mpumalanga. (Credit: SA-LED)

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[11] Exchange rate of 14.50:1 used (average across the life of the program)

supply of the school and community. SA-LED then provided training and training materials to the schools on the operation and maintenance of the systems.

Following the success of the three pilot schools, SA-LED engaged the Eastern Cape Department of Economic Development, Environmental Affairs, and Tourism (DEDEAT) to support the roll out of biogas digesters in schools across the Eastern Cape Province, specifically with the aim to assist them with system maintenance post-installation. SA-LED assisted DEDEAT in identifying and selecting 33 schools to receive biogas systems with food gardens and rainwater

harvesting systems. To finance this initiative, SA-LED assisted DEDEAT in leveraging R 40 million (USD $2.76 million) [12] in European Union (EU) funding from the National Treasury Generic Budget Support Programme for implementing biogas systems in schools through the Environmental Resource Management Support Programme. SA-LED created training materials and trained seven youth in implementing and managing micro-digesters and the broader biogas field who will be able to support maintenance requests at schools in the future. SA-LED also trained 32 staff from three schools, including garden staff, kitchen feeding scheme staff, and teachers on how to operate and maintain the micro-digester.

The Multiple Benefits of Biogas in Schools
The pilot projects revealed a variety of interconnected, multiple benefits associated with installing and using biogas digester systems. First, the systems provide a renewable energy source produced on school grounds using organic waste from school gardens and the school's feeding scheme, saving the schools money on energy costs, such as for electricity or the purchase of liquid petroleum gas. Second, biogas offers the schools a low-carbon method of cooking food and contributes to reducing emissions by diverting organic waste from landfills. About 600 kilograms of food waste per month (or six metric tons annually) that would normally end up in municipal landfills or illegal dumping grounds releasing methane gas, a potent GHG, can go into the digester. The biogas slurry, or liquid by-product of the biogas, can be used to fertilize school vegetable gardens, saving the school money in purchasing food. The systems, inclusive of the vegetable garden, rainwater harvesting system, and the micro-biogas digester itself, offer students and teachers knowledge and skills on nutrition and operating LED technology, complementing their learnings in the classroom. Finally, the installation and construction of the digesters as well as their maintenance creates employment opportunities.

USING TOOLS TO MANAGE WASTE: GARDEN ROUTE WASTE CHARACTERIZATION
The Garden Route District Municipality in the Western Cape comprises seven local municipalities that faced challenges with waste management, largely due to the district

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[12] Exchange rate of 14.50:1 used (average across the life of the program)

landfill exceeding capacity and waste continuing to be dumped illegally. The municipality also had large amounts of organic waste that could potentially be used for green economy-related projects but did not know the exact organic waste streams, their volumes or flows, or what to do with each stream.

Plastic bottles have been separated at Sedibeng District Municipality's landfill for recycling. SA-LED helped the municipality analyze waste management approaches. (Credit: SA-LED)

Beginning in 2017, SA-LED worked with the municipality to assist with its waste management, first through a waste characterization study that identified six organic waste streams and their respective volumes and sources so that the municipality could make informed decisions on alternative waste management interventions. SA-LED similarly supported Saldanha Bay Municipality and Witzenberg Local Municipality with characterizing their waste.

The Garden Route District Municipality regularly receives proposals from the private sector requesting use of its waste streams but lacked a decision matrix to assess proposals and select projects. Using the results of the waste characterization study, SA-LED developed a waste management decision-making tool that determines which waste management technologies and processes could be applied to manage the waste streams in an environmentally sustainable way while at the same time diverting waste away from landfill. With the tool, the municipality now has the ability to make informed decisions on how to assess proposals and determine best technology to apply to each waste stream,

including: hydrocarbon recycling, wet organic waste recycling, waste-to-energy, composting, and anaerobic digestion. For each alternative practice, the tool also calculates avoided landfill waste, GHG emissions reductions, energy use, and jobs supported. The tool can be adopted by any municipality in South Africa to support waste management decisions. See box, right, for links to the tool, as well as a factsheet on the tool and poster related to the waste characterization process that the municipality undertook.

The Multiple Benefits of Applying LED Technologies to Waste Management

There are various multiple benefits—social, environmental, and economic—that result from diverting organic waste from landfills using LED technologies. Using the multiple benefits assessment tool, SA-LED assessed the benefits of applying LED technologies to two of the six waste streams—garden waste and abattoir waste.

The municipality is planning to construct a composting facility inland that includes a materials recovery facility, a composting area, and an area for processing construction and demolition waste. Using the multiple benefits assessment, SA-LED determined that if approximately 32,000 metric tons of green garden waste per month were to be diverted to the composting facility, the lifespan of the municipality's landfill could be extended by 10 years. This diversion of green waste to the composting facility could also reduce GHG emissions by an estimated 11,500 metric tons of CO_2e per year, and potentially save the municipality up to R 37 per ton of waste or about R 25 million ($1.7 million)[13] per year.

Through the waste characterization analysis, SA-LED identified abattoir waste 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 or electricity, as well as a by-product that can be used as fertilizer. If abattoir waste is diverted from landfills into anaerobic digestors, GHG emissions would be reduced through methane capture and renewable biogas energy generation, resulting in an estimated reduction in GHG emissions of 5,700 metric tons of CO_2e per year. The construction and maintenance of the anaerobic digester facility would also create 53 new local jobs. When calculated over 10 years, this results in a cost savings of R 32 per ton of waste, or an annual savings of over R 313,000 (USD $21,586).[14] Diverting this waste would also extend the landfill's lifespan by three years with 9,700 metric tons of abattoir waste diverted annually. Finally, 290 metric tons of fertilizer, a byproduct of anaerobic digestion would be created, replacing the harmful use of chemical fertilizers.

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[13] Exchange rate of 14.50:1 used (average across the life of the program)
[14] Exchange rate of 14.50:1 used (average across the life of the program)

THE CASE FOR COMBINED HEAT AND POWER (CHP): ENERGY GENERATION FROM BIOGAS IN THE CITY OF TSHWANE

Wastewater treatment plants (WWTP) require electricity to operate equipment used in water recovery. Most of South Africa's electricity—as supplied by the national utility Eskom—comes from coal, which contributes climate change-causing GHGs. WWTPs also account for 20 percent or more of municipal electricity consumption and are among the top consumers of energy in municipal operations.[15] WWTPs also generate methane from anaerobic digestion, which itself is a GHG but can be recovered and used to meet all or some of the plant's electricity needs. Specifically, in a CHP process, methane can be combusted to generate electricity in a turbine. Residual heat can be recovered for use at the plant, such as heating the digesters that breakdown waste.

The city of Tshwane in Gauteng engaged SA-LED to support the development of CHP at its Zeekoegat WWTP based on GIZ-conducted feasibility studies. SA-LED conducted an infrastructure and operational audit of the plant, assisting with the detailed design of the CHP system for Zeekoegat. SA-LED also assisted with developing the tender specifications for the procurement of the CHP plan and related infrastructure services. Through this technical assistance, SA-LED leveraged R 11 million (USD $758,620)[16] from the Department of Mineral Resources and Energy (DMRE)[17] for the development of this CHP plant through the department's Energy Efficiency and Demand Side Management (EEDSM) fund.

The Multiple Benefits of CHP

Once operational, the CHP plant will have the capacity to generate 0.4 MW of clean, renewable energy and will offset electricity that would otherwise be generated from coal-fired power stations, resulting in a potential emissions reduction of 3,279 metric tons of CO_2e per year. CHP therefore provides an efficient and renewable way to recover the maximum energy value from the methane produced at the plants, which would otherwise be vented or flared. CHP can also offer cost savings from decreased electricity costs and improve the reliability of the plants through minimizing the impacts of power outages on plant operation, which is particularly prevalent in the South African context. See box,

MORE ON ENERGY GENERATION FROM CHP

Click on the links below for more information on generating energy from CHP at WWTPs:

- Moving Towards Carbon Neutral Wastewater Treatment Plants: the Case for Combined Heat and Power (case study)
- CHP: An Overview for Project Development in WWTPs (fact sheet)
- CHP: Project Development Process (fact sheet)
- CHP: Ideal Design and Structure of WWTPs (fact sheet)
- CHP: Project Procurement (fact sheet)
- GHG Emissions Reduction Calculator for CHP (tool)

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[15] https://www.sustainable.org.za/userfiles/wastewater%20biogas(1).pdf
[16] Exchange rate of 14.50:1 used (average across the life of the program)
[17] Formerly the Department of Energy

right, for lessons from this process captured through a case study on the Zeekoegat plant as well as resources and tools to develop CHP at WWTPs. Further, SA-LED developed a calculator based on the existing Clean Energy Emission Reduction (CLEER) Tool[18] where municipalities can measure the GHG emissions that are reduced through the use of CHP.

OTHER SA-LED SUPPORTED INTERVENTIONS

While SA-LED's mandate centered on supporting local government to respond to the national climate change response policy, the program also expanded its reach to non-governmental organizations. For example, SA-LED assisted the Karoo Catch fish farm with piloting a wastewater repair and anaerobic digester system to capture energy from the farm's organic waste and provided the CapeNature nature reserve with recommendations on how to mainstream LED in its facilities. See box, right, and Annex B for more information on these interventions.

> **MORE ON KAROO CATCH AND CAPENATURE**
>
> Click on the links below for more information on SA-LED's work with Karoo Catch and CapeNature reserve:
>
> - Sustainable Aquaculture at Blue Karoo Fish Farm (video)
> - A Self-Sustaining Fish Farm to Benefit the Economy and Environment (case study)
> - Low Emissions Development in a Conservation Area: CapeNature (poster)
> - Mainstreaming Low Emissions Development in a Conservation Organization (blog post)

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[18] https://www.cleertool.org/

CAPACITY DEVELOPMENT TO IMPLEMENT LED

SA-LED worked to ensure that municipal officials were equipped with the knowledge, skills, and tools necessary to implement the Climate Change Bill, bring LED projects to technical and financial feasibility, and implement them effectively. SA-LED engaged experts to train municipal staff and organizations to measure GHG emissions using the CLEER tool, use LED technologies, implement energy efficiency

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CAPACITY DEVELOPMENT RESULTS

- 28 institutions with improved capacity to address LED issues
- 793 individuals trained in LED, of which 232 applied the new knowledge and skills
- 102 individuals trained in GHG monitoring, reporting, and verification

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technologies, conduct energy audits to apply for DMRE EEDSM funding, and design green urban infrastructure. SA-LED also facilitated long-term capacity within municipalities by embedding LED experts within municipalities, assessing municipal capacity for climate action, and using that information to tailor and create climate action plans.

ASSESSING AND ADDRESSING ORGANIZATIONAL CAPACITY FOR CLIMATE ACTION

Through its initial capacity building support to municipalities, SA-LED assessed the organizational capacity of municipalities to identify and target specific capacity gaps to implement climate action. SA-LED adapted USAID's Organizational Capacity Assessment (OCA) tool to measure municipal capacity to implement climate action and LED projects. The tool focuses on six areas within a given municipality: governance and leadership, policies

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MORE ON ASSESSING CAPACITY FOR LED

For more information on the adapted OCA tool to assess capacity for and mainstream LED in a municipality, click on the link below:

- Organizational Capacity Assessment Tool for Climate Action (case study)
- Organizational Capacity Assessment: CHDM (newsletter)

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and service delivery, strategy and resources, program development, financial management, and internal functions.

In 2017, SA-LED conducted OCA workshops for three municipalities: Govan Mbeki Municipality in Mpumalanga, Chris Hani District Municipality (CHDM) in the Eastern Cape, and Polokwane Municipality in Limpopo. During these OCA workshops, officials from different municipal departments identified climate change capacity building gaps and needs. This information formed the baseline against which SA-LED provided technical and advisory services and capacity building support to the three municipalities.

LONG-TERM CAPACITY FACILITATION TO EMBED LED IN A MUNICIPALITY

To address capacity gaps discovered through the OCA process, SA-LED embedded technical advisors in CHDM and in Polokwane. In CHDM, the embedded technical expert

worked within the municipality, providing transaction advice for project development and LED capacity building. The expert worked to address capacity gaps identified through the OCA. This included updating the district municipality's climate change mitigation strategy and using it as a capacity building and integrating tool to work across the different municipal departments to institutionalize and mainstream climate change.

As a result of assistance from the embedded advisor, the OCA post-implementation review highlighted notable achievements. CHDM is also the only municipality out of those supported that subsequently took its climate change strategy through all stages: proposal, executive approval, and implementation. The municipality now has in place a climate change mitigation strategy, an environmental management plan, an air quality management plan, and funding for the Rural Sustainability Villages project.

In Polokwane, SA-LED embedded an EEDSM coordinator within the municipality's Energy and Electricity Department to the coordinate and promote EEDSM projects for the municipality, including identifying, recommending, and promoting energy efficiency and sustainability initiatives and practices throughout the municipality and involving appropriate staff, departments, and agencies in key strategies and goals. The coordinator supported the municipality to manage a grant from the DMRE to retrofit nearly 1,000 streetlights with LED fixtures and worked on the application for the next DMRE grant RFP for the 2018/19 financial year. The coordinator also supported the municipality to finalize its Green Goal Energy Strategy. SA-LED's support enabled the municipal technical department to highlight the importance of this work and the municipality has subsequently absorbed the position on a full-time basis.

In Govan Mbeki Municipality, the OCA process led municipal staff to draft and finalize a climate change mitigation strategy and action plan in 2018. In addition, SA-LED assisted in developing and presenting a GHG inventory to the municipality. Both documents have been included in the municipal 2019/20 Integrated Development Plan, which was approved by the city council and is available on the municipality's website.[19]

Ultimately, through applying the adapted OCA with various municipalities, SA-LED found that using tools and standardized methodologies to gather or assess information can be highly useful if applied correctly, but it is also necessary to recognize the strengths and constraints of tools and methodologies and be flexible enough to adapt. The use of the OCA tool brought together officials from different departments to jointly focus on the municipality's climate change agenda, thus significantly increasing the likelihood of successful project implementation. The information gathered during the OCA engagements further assisted municipalities in operationalizing their respective climate actions, by nudging them in the right direction, leading them to develop and finalize climate change mitigation strategies and securing EEDSM program funding to increase the energy efficiency of their building facilities.

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[19] http://www.govanmbeki.gov.za/wp-content/strategic_documents/draft_idp_2020.pdf

CAPACITY BUILDING TO ACCESS EEDSM PROGRAM FUNDING

Students at a local TVET college in Polokwane conduct an energy audit of a municipal building. (Credit: SA-LED)

The DMRE manages the EEDSM program, which aims to support municipalities with implementing energy efficiency interventions within their facilities through grant funds. The EEDSM program provides for conditional grants that originate from the national fiscus and are disbursed by the National Treasury through the Division of Revenue Act.

Upon successful application, selected municipalities receive grants for planning and implementing energy efficient technologies ranging from public lighting—traffic, high mast, and street lighting—to energy efficiency measures in public buildings and water service infrastructure. As significant consumers of electricity, municipal buildings and facilities provide the greatest opportunity to reduce municipal electricity consumption. Water supply and wastewater treatment facilities have the highest electricity efficiency savings potential among the electricity consuming sectors.

Municipalities, however, often lack the capacity or funding required to collect energy consumption baseline information on municipal buildings and facilities, which is necessary to apply for EEDSM grant funding. SA-LED intervened in this regard and supported multiple municipalities—Polokwane, Govan Mbeki, George, Hessequa, Dihlabeng, and Nketoana—in conducting energy audits to gather this information.

The Polokwane Local Municipality in Limpopo Province was interested in exploring energy efficiency projects but lacked the funding and capacity to conduct energy audits for their municipal buildings to collect baseline energy consumption data. Seeking a cost-effective way to conduct the audits while building local capacity, SA-LED engaged 20 students and 10 faculty at Capricorn Technical Vocational Education and Training (TVET) College in Polokwane to conduct energy audits for 25 municipal buildings by first training them on the process and then facilitating the audits. From this initiative, Polokwane was able to successfully complete the DRME EEDSM application using the data collected by the students, which allowed the municipality to replace more than 134 400-watt high pressure sodium (HPS) floodlights at two sports complexes with 120-watt LED floodlights in 2018/19. This will result in an energy savings of 28,728 kWh/a, or 45 percent, translating to a financial savings of approximately R 25,500 (USD $1,758)[20] per year.

Ten of the students engaged later went on to conduct electricity meter audits for 6,000 houses in Thaba Chweu Local Municipality in Mpumalanga. Therefore, through the energy audits, Polokwane was able to tap into local resources by engaging students and the local TVET and identify key potential areas for energy efficiencies and translate these efficiencies into cost savings. Engaging students in the audit proved be a cost-effective way to obtain the required energy consumption data while at the same time providing practical, hands-on instruction to the students. Municipalities facing similar capacity and resource restrictions need look no further than their nearest vocational college.

PROMOTING ENERGY EFFICIENCY THROUGH ADHERING TO NATIONAL BUILDING REGULATIONS

The South African government has introduced energy efficiency and energy consumption standards in the country's National Building Regulations and Buildings Standards Act to decrease the energy consumption and associated GHG emissions of new commercial and

SPOTLIGHT ON EEDSM IN GEORGE

As part of implementing its EEDSM work plan, George organized a "World of Tomorrow Festival 2019" to raise awareness of the importance of energy efficiency. The festival sponsored a theatre competition among nine schools exploring how to mitigate climate change with energy efficiency. The dramas highlighted the changes residential homes and schools could make to become more energy efficient and curb the effect of climate change. https://youtu.be/9k3V3mKnpUE

MORE ON EEDSM

Click on the links below to read more on the EEDSM process and SA-LED's support to Polokwane:

- Auditing for Energy Efficiency: Students Conduct Energy Audits in Polokwane (case study)
- Lessons from Supporting Municipalities in Accessing Grant Funding from the DMRE's EEDSM Program (case study)

MORE ON SANS 10400-XA

Click on the links below to read more on SANS 10400-XA and its applications:

- SANS 10400-XA (fact sheet)
- Increasing Energy Efficiency through Green Building Design and South Africa's National Building Regulations (success story)

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[20] Exchange rate of 14.50:1 used (average across the life of the program)

residential buildings. Adopted in 2011 and instituted by the South African Bureau of Standards (SABS), these standards include the [South African National Standards (SANS) 10400-XA,](#)[21] which prescribe energy efficiency requirements of new buildings and define the maximum energy demand and maximum annual energy consumption for various kinds of buildings in South African climate zones across the country.

Key to ensuring compliance with SANS 10400-XA in municipalities is providing municipal building control officers with the right tools and resources to enforce the regulation. Recognizing this need, SA-LED, in partnership with City of Tshwane, City of Johannesburg, and the Green Building Design Group, trained municipal building control office staff on how to enforce compliance within their respective municipalities. SA-LED trained 51 building control officials from five municipalities—

> The **SANS 10400-XA** compliance workshop is the most practical training that I have ever attended of the **SANS 10400** series.
>
> **— NICK VAN ZYL, BUILDING DEVELOPMENT, EKURHULENI**

Ekurhuleni, City of Johannesburg, City of Tshwane, and Mogale city—as well as five industry observers. In addition, the program trained 27 officials during a follow-on workshop. With municipal building control office staff able to translate the regulations into practical application, municipalities are now one step closer to reducing energy inefficiencies in new buildings. Correctly designing a building envelope, combined with energy saving techniques can reduce energy losses and energy consumption by 78 percent and present significant costs savings due to reduced energy consumption and utility costs.

Expanding on its work with SA-LED, the Green Building Design Group has been working with the International Finance Corporation (IFC)'s Excellence in Design for Greater Efficiencies program and Sustainable Energy Africa (SEA)'s C40 South Africa Buildings Programme to expand SANS 10400-XA training to municipal building control officials outside of Gauteng and across the country, including in eThekwini, Cape Town, Nelson Mandela Bay, Ekurhuleni, and Johannesburg. The group plans to train 550 building control officers in the next year. Further, the South African Local Governance Association (SALGA) is planning to provide SANS 10400-XA training based on SA-LED's training, materials, and experiences.

CREATING RESILIENT AND SUSTAINABLE MUNICIPALITIES THROUGH GREEN PRECINCT DESIGN AND PLANNING

Integrating sustainable, green design in infrastructure planning helps communities to prosper while at the same time considering environmental sustainability. SA-LED supported the development of green communities through green precinct design in South Africa by collaborating with the Green Building Council of South Africa and EcoDistricts in the United States. SA-LED first worked with the Green Building Council to identify 14 municipal-led pilot "green community" projects in South Africa developed to encourage

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[21] https://store.sabs.co.za/pdfpreview.php?hash=269e61a2c3c68e9cb5f54affd2917dafaecd0768&preview=yes

resource efficiency in water use reduction, energy, and GHG emissions at the neighborhood, or community, level.

Capitalizing on international experiences in sustainable urban design, SA-LED collaborated with EcoDistricts, a U.S.-based non-governmental organization that promotes a collaborative, ecological urban design for neighborhoods, precincts, and districts through sustainable, climate-conscious city planning. In 2017, SA-LED sent representatives from three of the 14 green community pilot projects from the City of Johannesburg and the City of Cape Town to Portland, Oregon, to attend EcoDistrict's annual three-day intensive incubator.[22] The purpose of the incubator is to empower urban development project teams to achieve EcoDistrict's global performance standard, the EcoDistricts Protocol[23]—a comprehensive project management framework that guides equitable and sustainable urban and community development projects.

Following the incubator, in 2018 and 2019, SA-LED ran two successful follow-up training sessions in Johannesburg and Cape Town with EcoDistricts experts to train multidisciplinary teams of municipal officials engaged in urban planning and policy development. More than 100 municipal officials and related agency specialists on green precinct design in South Africa participated. Participants learned how to establish strategies to meet the EcoDistricts imperatives for equity resilience and climate protection; establish project governance structures and collaborative decision-making to support long-term project implementation and operations; and identify key project performance metrics and strategies to support the development of an EcoDistricts roadmap with a focus on green infrastructure.

As a result of the training, numerous municipal officials and other professionals learned how to implement the EcoDistricts Protocol. The Green Building Council was able to bring local expertise to help contextualize global best practices to South African cities. Ultimately, green precinct design promotes LED by mitigating GHG emissions, and green infrastructure promotes green service delivery.

> **MORE ON ECODISTRICTS IN SOUTH AFRICA**
>
> Click on the links below for more information on SA-LED's work with EcoDistricts on sustainable precincts:
>
> - Addressing Climate Change through Sustainable Integrated Urban Planning (success story)
> - EcoDistricts: Catalyzing change in South Africa's cities "from the neighborhood up" (blog post)

Members of the City of Johannesburg's City Transformation and Spatial Planning Department have applied these learnings and mainstreamed green precinct design. For example, the city was able to mobilize funding from the Global Environment Facility (GEF) and other internal municipal budgets totaling R 23.5 million (USD $1.6 million)[24] to fund green urban development initiatives using an adapted EcoDistricts Protocol for the City of

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[22] https://ecodistricts.org/2017/07/11/oregon-south-africa-incubator-2017/
[23] https://ecodistricts.org/protocol/
[24] Exchange rate of 14.50:1 used (average across the life of the program)

Johannesburg. The city is also working on a Green Building Policy—the city's first—which will incorporate concepts and guidelines from the EcoDistricts Protocol.

BUILDING CAPACITY TO MEASURE GHG EMISSIONS REDUCTIONS USING THE CLEER TOOL

USAID's CLEER Tool[25] is a free, user-friendly online calculator that can be used to calculate GHG emissions reduction from existing or planned clean energy projects. Municipalities can use data generated by the tool to report on progress in implementing mitigation actions and planning for future mitigation as part of their climate change response policies. To improve municipalities' skills to monitor, report, and communicate on GHG emissions for this reason,

SA-LED organized a series of training workshops for municipal officials on the use of the CLEER tool. Once trained on the tool, officials had a better idea of what they can do to lower GHG emissions within their departments. Municipalities can use results from the tool to generate reports that verify their energy savings and emissions reductions and support the EEDSM application process.

Over the course of the program, 102 individuals participated in training on how to monitor, report, and verify GHG. While SA-LED sought to train an increased number, competing priorities within municipalities limited the number ultimately trained.

SMALL-SCALE EMBEDDED GENERATION

To move away from centralized power generation and distribution, governments have been leaning towards more localized power generation. A component of this is small-scale embedded generation (SSEG)—power generation under one MW that is located on residential, commercial, industrial, or municipal sites where electricity is also consumed. In South Africa, 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.

SA-LED collaborated with the SSEG Working Group, comprised of GIZ, DMRE, SALGA, the

> I have been able to use the [CLEER] tool to determine our carbon saving on our high mast light conversion to LEDs...We will surely continue using the tool as and when we get data from our colleagues in the Energy Department. If data was not the problem, we would be able to report a total carbon saving for all projects implemented in a financial year.
>
> — KHETHIWE MALAZA, MBOMBELA LOCAL MUNICIPALITY

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[25] https://www.cleertool.org/

Council for Scientific and Industrial Research, and SEA, on a series of training sessions for the SSEG Development Support Programme, which serves 40 municipalities. The SSEG working group aims to assist the municipalities apply for SSEG, or to improve their current SSEG processes. With this goal in mind, SA-LED worked with GIZ to train 36 municipal electricity supply department officials from 17 municipalities on the municipal SSEG process, including on solar PV systems, SSEG regulations, SSEG policy, and metering under the SSEG guidelines. Following the training, 15 municipalities established clearly defined approaches to the integration of these technologies and an SSEG policy and process specific to the municipality. The next steps in this process are for the municipalities to process their SSEG applications and to keep a record of installed systems for sharing with the DMRE for national energy planning purposes. The SSEG website[26] offers an array of resources to assist municipalities on SSEG.

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[26] https://www.sseg.org.za/

FROM POLICY TO ACTION: CREATING AN ENABLING ENVIRONMENT FOR GREEN GROWTH

SA-LED worked to create an enabling environment that institutionally supports LED efforts across local, provincial, and national government. To increase the number and scale of LED projects in South Africa, considerable work was needed across the legal, financial, policy, and regulatory spheres. SA-LED provided municipalities with regulatory technical assistance, using research and analysis to inform project design and implementation. It also

CREATING AN ENABLING ENVIRONMENT FOR LED RESULTS

- 12 laws, policies, regulations, or standards addressing LED proposed, adopted, or implemented
- 53 communications products produced raising awareness of LED and capturing lessons learned and best practices

provided support in mobilizing finance to achieve market integration of LED projects. Moreover, the Climate Change Bill provides for the "coordinated and integrated response to climate change and its impacts by all spheres of government," and mandates that municipalities complete climate change needs and response assessments and develop and implement climate change response implementation plans. SA-LED therefore played a major role in ensuring supported municipalities had the tools and capacity to prepare and implement these climate change response implementation plans.

Over the course of the program, SA-LED supported 12 laws, strategies, policies, regulations, guidelines, or standards addressing LED, detailed in the Table 1.

TABLE 1. LAWS, STRATEGIES, POLICIES, AND STANDARDS SUPPORTED

LAW, STRATEGY, POLICY, OR STANDARD	DESCRIPTION
Department of Environmental Affairs (DEA) Monitoring and Evaluation Sector Guidelines: Energy, Transport, Industrial Processes and Product Use, and Waste sector guidelines	The guidelines contain climate change-related policies, strategies, and laws that enable effective tracking, monitoring, and mitigation of effects of these policies, strategies, and laws considering the South African national context and circumstances.
Mpumalanga Climate Change Mitigation Strategy	The strategy provides a climate action plan for LED initiatives in the province and its municipalities. SA-LED supported strategy development, linking it to the existing provincial adaptation strategy. More on this strategy below.
Polokwane's Green Goal Energy and Climate Mitigation Strategy	The strategy provides an action agenda for the municipality for sustainable energy development. SA-LED assisted the municipality in

LAW, STRATEGY, POLICY, OR STANDARD	DESCRIPTION
	refining the strategy using newly available data and synthesized it with new municipal plans and developments.
Govan Mbeki Local Municipality Climate Change Strategy and Action Plan	Informed by a GHG inventory, the strategy provides the municipality with an action plan to reduce its GHG footprint.
Chris Hani District Municipality Climate Change Strategy	The strategy represents a LED roadmap so that the municipality can mainstream LED into its IDP planning processes and is based on an analysis of GHG emissions in the municipality.
Buffalo City Metropolitan Municipality LED Roadmap	The roadmap is a template for planning for the adoption of LED initiatives and for integrating LED into industrial development and municipal planning processes.
Guideline to Plan and Implement Anaerobic Micro-Digester Projects in South Africa	The guideline details all aspects to consider throughout the lifecycle to a biogas micro-digester program to assist with the design, planning, procurement, implementation, and monitoring of a biogas micro-digester rollout. SA-LED worked with the Micro-Digester Working Group to develop the guideline.
SANS 10400-XA Regulations	SANS 10400-XA provides for the application of Regulation XA of the National Building Regulations, or the minimum requirements for energy efficiency and environmental sustainability in building design in South Africa. SA-LED facilitated soliciting feedback on the regulation from municipal building control officials to update the protocols to be more user-friendly.
Greening the Mohair Industry: Strategy and Action Plan for Greening and Growing South Africa Mohair Production	The macroeconomic study provides for a strategy and action plan for greening the mohair value chain in South Africa and details the macroeconomic benefits and impacts of doing so. It serves as a coordinating strategy to undertake a greening of the industry.

DEVELOPING A PROVINCIAL CLIMATE CHANGE MITIGATION STRATEGY

One example of a climate change response implementation plan that SA-LED supported is the development of the Mpumalanga Climate Change Mitigation Strategy and Implementation Plan (MCCMS) through assistance to Mpumalanga Province's Department of Agriculture, Rural Development, Land, and Environmental Affairs. As the host of the country's coal power stations and therefore the highest emitter of GHGs among South Africa's nine provinces, a comprehensive strategy to mitigate emissions in Mpumalanga was imperative. To ensure appropriate climate action planning regionally, SA-LED helped develop a provincial-wide GHG inventory to inform the evidence base of GHG emissions in the province and on which to base scenarios to show how GHGs emissions might evolve. The GHG inventory and scenarios informed the MCCMS implementation and planning. See box, right, for more information on developing a sub-national GHG inventory and scenario modeling.

MORE ON CREATING A PROVINCIAL GHG INVENTORY

For more information and lessons learned on creating a sub-national GHG inventory and scenario modeling, click on the link below:

- Climate Action Planning: Developing a Provincial Greenhouse Gas Inventory and Emissions Scenarios Modeling (case study)

The resulting MCCMS was adapted to international standards and is one of the most rigorous provincial climate changes strategies in South Africa and includes sectoral GHG emission scenarios and mitigation strategies. As part of the strategy, the provincial

government has targeted plans for the next five years to address climate change mitigation priorities. Moreover, the MCCMS completes the province's climate change response plan, which speaks to support a transition to a low-carbon, resilient province.

MPUMALANGA INTEGRATED TRANSPORT

SA-LED further supported the Mpumalanga Provincial Government in crafting its sustainable transport roadmap for its Integrated Transport Plan (ITP), a key component of the MCCMS. SA-LED also worked with Gert Sibande District Municipality and Govan Mbeki Municipality in Mpumalanga Province with strategic roadmaps for their respective ITPs and facilitated a peer-to-peer learning exchange with the two municipalities in

A mechanic with the City of George's GO GEORGE public bus system provides maintenance to a GO GEORGE bus. (Credit: City of George)

George at the GO GEORGE 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 low-carbon intensity methods that can be used in areas requiring transport for large volumes of people. Officials from GO GEORGE were able to share

their experience with their municipal counterparts on how to run an effective ITP, which they have been running for five years. Furthermore, participants learned how to employ low-carbon intensive methods while running an effective public transport network.

MOBILIZING FINANCE FOR LED MARKET INTEGRATION

As part of creating an enabling environment for LED at the sub-national level, SA-LED assisted in

> **MORE ON TRANSPORT PLANNING**
>
> Click on the links below for more information on SA-LED's work on transport planning:
>
> - Municipal Fleet Costs and Environmental Impacts Calculator (tool)
> - Municipal Fleet Costs and Environmental Impacts Calculator (user guide)

mobilizing green finance. SA-LED leveraged or mobilized $207 million to finance LED initiatives that would often be complemented by SA-LED technical assistance and capacity building support. This included finances leveraged from national and local government departments as well as donors. For example, as part of its support to municipalities in building their capacity to apply for DMRE funding, the program was able to successfully mobilize EEDSM funding for LED initiatives such as DMRE EEDSM funding, DEDEAT funding for energy efficiency in Polokwane, Nketoana, Dihlabeng; municipal buildings; and

George's WWTP. SA-LED also leveraged funding from Mpumalanga's Department for Economic Development and Tourism and EU funding for the National Treasury Generic Budget Support Programme for the installation of biogas digesters in schools in Mpumalanga and the Eastern Cape, respectively.

SA-LED looked to further leverage finance from development finance institutions (DFIs). Since energy access is one of the most crippling issues facing South Africa, local economic development and foreign direct investments cannot occur in an environment of constrained, expensive, or uncertain energy supply. The opportunity for DFIs is ripe because banks, at this point time, are reluctant to fund small-scale renewable energy projects which are seen as a significant way forward in ensuring energy access in South Africa.

SA-LED worked with the Industrial Development Corporation (IDC) and USAID's Development Credit Authority (DCA) to facilitate the DCA signing a partial-risk guarantee with the IDC in September 2016. This provided the IDC with the market confidence to open a LED debt facility to jumpstart small-scale renewable energy in South Africa in general and to specifically provide project finance to rooftop PV developers wheeling green energy, for example. Commercial banks in South Africa at this time will only provide debt to projects that sign power purchase agreements with Eskom backed by an explicit South African National Treasury guarantee. In short, the IDC facility creates an opportunity to scale small-scale renewable energy generation in the municipal space without negatively impacting municipal revenues from electricity sales.

SUSTAINABILITY

LED PROJECT TECHNICAL ASSISTANCE

SA-LED provided technical assistance to municipalities with a focus on sustainability. The program ensured municipal buy-in from the onset and placed an emphasis on choosing sustainable, replicable, and scalable projects to highlight and use as storytelling vehicles to showcase the multiple benefits of implementing LED projects. This approach was at the core of SA-LED's LED project technical support process, which ensured buy-in by the municipality in identifying and identifying areas for LED intervention and co-creating LED solutions.

SA-LED saw this uptake of municipal-led LED initiatives in many of the municipalities it supported. In Ekurhuleni, the municipality was able to carry out the procurement of solar PV panels for its municipal buildings and has committed to use the LCOE tool in future solar PV panel procurements. In the Eastern Cape, DEDEAT has been able to secure EU funding and is planning for the rollout of biogas digesters in schools. In eThekwini, the municipality is continuing with the PPP process to procure small-scale hydropower.

SA-LED's methodologies and tools that successfully facilitated technical support were also replicated in other municipalities and standardized for use by any municipality. These methodologies, tools, and best practices included the methodology to engage and support municipalities in LED and the multiple benefits assessment methodology, which contributed to the knowledge base for implementing LED initiatives at the sub-national level in South Africa.

CAPACITY DEVELOPMENT FOR LED

In most cases, SA-LED handed over capacity building activities to other partners or donors. For example, the Green Building Design Group has been engaged by the IFC and SEA to continue providing workshops on SANS 10400-XA and has been able to expand its program to train municipal officials across South Africa, including in eThekwini, Cape Town, Nelson Mandela Bay, Ekurhuleni, and Johannesburg. Further, SALGA is planning to roll out SANS 10400-XA training based on SA-LED's training, material, and experiences. Following SA-LED's collaboration with GIZ and the SSEG Working Group on the implementation of SSEG training to municipal officials, GIZ continued to train municipal officials as part of its country assistance program.

City of Johannesburg officials have continued to integrate the EcoDistricts Protocol in urban development. Members of the City of Johannesburg's City Transformation and Spatial Planning Department have mainstreamed green precinct design and the city is working on a Green Building Policy—the city's first—which will incorporate concepts and guidelines from the EcoDistricts Protocol.

SA-LED also worked to ensure the long-term value from the embedded technical advisors within the municipalities. While SA-LED's advisors embedded within CHDM and Polokwane added significant value to their respective municipalities, SA-LED handed over tools and resources to the municipalities once their contracts ended. For example, the advisors supported the municipalities to prepare climate change response implementation plans in response to the Climate Change Bill and work to integrate GHG measurement, reporting, and verification and climate change responsibilities into municipal official job descriptions, key performance areas, and IDPs. In this way, SA-LED helped to mainstream LED into municipal programming, planning, and budgeting. Further, Polokwane has absorbed the EEDSM coordinator position and technical advisor.

CREATING AN ENABLING ENVIRONMENT FOR LED

In the program's final years, SA-LED focused on supporting municipalities to prepare for and implement climate change response and implementation plans to turn policy into action. SA-LED supported developing these plans for municipalities Goven Mbeki, Polokwane, and CHDM in addition to a provincial plan for Mpumalanga. With these plans, these municipalities have effectively translated policy into action, using GHG inventories and scenario modeling to create action and implementation plans to mitigate GHG emissions across municipal departments.

SA-LED'S RESOURCE LIBRARY

SA-LED has compiled a comprehensive portfolio of resources, building off of the technical assistance provided, tools and methodologies developed, and lessons learned with the aim to improve LED awareness, demonstrate how to apply tools and methodologies, and showcase LED successes. SA-LED developed 53 communications products with this content and purpose in mind, which have been linked and referenced throughout this
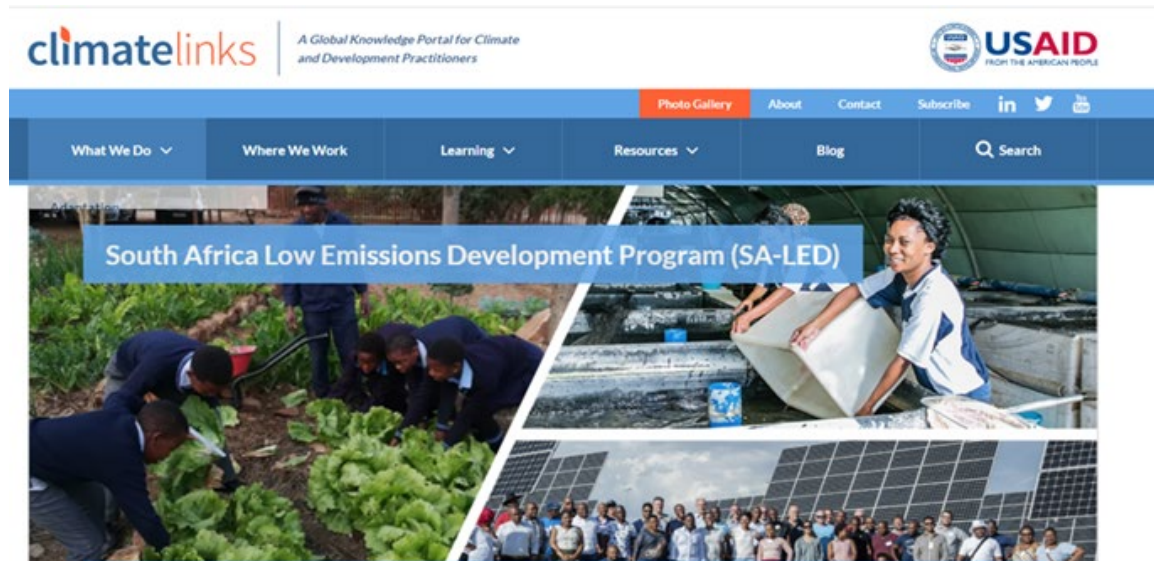
SA-LED's landing page on USAID's Climatelinks website.

report. All resources have been uploaded to the program's page on [Climatelinks,](https://www.climatelinks.org/project/south-africa-low-emissions-development-program)[27] to serve as a resource library for those interested in pursuing LED initiatives and green growth.

STAKEHOLDER ENGAGEMENT FOR SUSTAINABILITY

Stakeholder engagement and coordination was a key tenant of SA-LED's approach to avoid duplication and ensure sustainability. SA-LED coordinated with donors such as GIZ to take up technical assistance activities following SA-LED's end, which was made easier by SA-LED's coordination and collaboration with donors throughout the program's lifespan. SA-LED's engagement with stakeholders allowed for LED initiatives, such as the municipal SSEG training, to continue.

SA-LED also actively participated in national and international platforms to contribute to knowledge sharing and capturing best practices. One example is SA-LED's involvement with the National Biogas Platform, including the South African National Energy Development Institute, GIZ, and the DMRE on biogas trends in South Africa. Small-scale biogas projects—micro-digesters—hold a tremendous potential given their compact nature, especially in residential homes or schools. SA-LED worked with these partners to develop national guidelines for implementing micro-digester biogas projects to benefit the increasing number of organizations adopting micro-digesters and the need to streamlined guidelines on behalf of the industry to inform those interested in installing and running micro-digesters.

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[27] https://www.climatelinks.org/project/south-africa-low-emissions-development-program

LESSONS LEARNED

SA-LED proactively took the time to pause and reflect throughout the program to identify key lessons and adapt implementation accordingly. As the program came to a close, SA-LED conducted a lessons learned exercise covering a cross-section of SA-LED's beneficiaries to explore challenges and recommendations for designing and implementing future municipal-focused LED/green growth, governance, or institutional development technical assistance programs. See below for summaries on key takeaways from SA-LED's implementation. Annex C contains the SA-LED full lessons learned report.

ADAPTIVE MANAGEMENT

SA-LED demonstrated flexibility by adapting activities at various points throughout the program, leveraging existing and new resources that would not have otherwise been possible. However, in some cases, projects would have benefited from additional planning from the onset. It's important to balance the need to create a streamlined application process (while allowing the flexibility to change course) with having the benefit of planning upfront.

ITERATIVE LEARNING

While this kind of adaptive management created efficiencies in some instances; in others, iterative learning after some activities started would have increased impact. In one example, by bringing some of the trained personnel back to the second set of training sessions to integrate what they had learned from using their new skills, the training sessions would have improved for the second set of trainees. Additionally, SA-LED found success when integrating support packages to municipalities to include both capacity building and project development support to build on and complement each other.

TARGETED COMMUNICATIONS FROM PROGRAM MANAGERS

Focused, high-level communications by SA-LED staff enabled beneficiaries to maintain momentum during unexpected challenges and respond to changes in municipal leadership. The communications emphasized SA-LED's intervention at a global level and the value it brings to the local context including socio-economic benefits. In one case, program senior management returned to a project during implementation and presented the project to new stakeholders. The action refreshed understanding among new municipal leadership and other stakeholders of the value and purpose of the program. The additional communications helped sustain political support and break logjams in agency approval processes.

CHAMPIONS IN THE POLITICAL ECONOMY

Program staff often found it difficult to maintain support from local political leaders, agency and department leaders, and across siloed units within agencies for interventions of longer duration, such as embedded personnel. When political leadership changed, activities

would lose momentum and new political or bureaucratic obstacles arose. Leadership, through program "champions," was critical to aligning and securing resources at various levels of government, and engendering ongoing leadership at lower levels of government. Champions in this context appear to be either visionary, providing legitimacy to the activities through their own charisma, or technocratically adept at navigating established processes and power relations to achieve measurable results. An ability to get LED programming into IIDPs, for example, was attributed more than once to program activity champions. Other champions succeeded by mentoring successors to their positions, as well as lower-level staff, to continue advocating for LED at different levels of government. Identifying and supporting champions within municipalities was key to ensuring continued political momentum for LED. For example, the leadership of a director in DEDEAT over several years in coordinating LED programming at the provincial level contributed significantly to the success of sub-activities at the district and municipal levels.

POLITICAL MOMENTUM

At times, it was challenging to keep the political momentum required to implement LED initiatives, as SA-LED competed with other political demands. For example, local government elections led to delays in engaging with government, executing memorandums of understanding, or conducting training with government staff. When faced with delays due to elections or municipal strikes, SA-LED found success in working with the municipality to establish longer and more flexible timelines, or pivoting to other technical assistance or capacity building that could take place in lieu of delayed activities. On LED projects where municipal or provincial partners contributed financially, 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, due to delays in the release of EU funds from the National Treasury Generic Budget Support Program to the Eastern Cape provincial government for the procurement of biogas micro-digesters.

FINANCIAL SUSTAINABILITY

LED requires sustained funding or financing to continue beyond the programmatic period. The lessons learned exercise included a review of some interventions that were oriented towards securing funding or financing. Some beneficiaries noted they had hoped for clearer paths to funding or financing for specific installations or projects, despite or regardless of other types of progress (e.g. assessing climate impacts as part of planning process). Alternatively, they consistently considered those interventions successful that resulted in national grant funding, municipal budget support, or third-party financing. In this light, LED programming going forward should look beyond indicators of "leveraging" and more explicitly orient activities around securing sustained funding or financing.

Not all program activities need sustained funding or financing as a primary objective because they focus on awareness building or intangible outcomes. Therefore, new programming that builds in sustainable funding or financing should be on a case-by-case basis for specific interventions. Before programs begin or as part of initial work planning,

LED could categorize certain interventions according to their ability to identify specific sources of funding or financing. For example, national grants for energy efficiency installations served as an orientation point for the program's embedded Polokwane Municipality staff member and the sub-activities of that individual were further oriented around the steps necessary to secure those grants. In another case, technical assistance in the form of a feasibility analysis and management consulting were provided to secure a private financing transaction. Moving forward, interventions and related programming can more closely follow these models to enhance their success as measured by sustained funding or financing. Categorizing interventions by funding or financing goals requires an initial assessment that determines what is more appropriate for the circumstance. Funding and financing are very different and require, respectively, distinct types of capacity.

ANNEX A. PERFORMANCE RESULTS

PROGRESS AGAINST TARGETS

The table below provides a summary of progress towards the achievement of SA-LED's targets over the life of the program. The table is structured to illustrate how work plan activities contribute toward achieving SA-LED's indicators.

Level of Results	Result Statements	Indicators	LOP Targets	FY16 Results	FY17 Results	FY18 Results	FY19 Results	FY20 Results	Life of Program Results
Ultimate Outcome: Reduced greenhouse gas emissions through implementation of SA-LED initiatives									
Intermediate Outcome 1: Increased investment in LED									
Immediate Outcome 1.1: Improved project preparation									
KRA: Innovative LED projects identified, supported, and facilitated	Number of LED projects provided with technical assistance	20	6	5	11	8	1	31 (155%)	
KRA: Reduced emissions potential in strategic sectors demonstrated	Projected quantity of GHG emissions in metric tons of CO_2e, reduced or avoided by 2030	100,000 tons	0 tons	70,942 tons	438,243 tons	312,902 tons	36,080 tons	858,167 tons (858%)	
	MW of clean energy generation capacity supported by SA-LED assistance[28]	10MW	0	2.96 MW	0.59MW	9 MW	0.4 MW	12.95 MW (130%)	
Immediate Outcome 1.2: Increased financial support to LED projects									
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 million	US $200 million	US $ 1,356,145	US $ 3,286,435	US $2,234,032	US $785,714	US $ 207,662,326 (101%)	

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[28] 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 were not true "targets" we hoped to meet but rather a "monitoring indicator" to ensure we could report on any clean energy generation projects that SA-LED supported.

Intermediate Outcome 2: Accelerated rate of implementation of LED initiatives								
Immediate Outcome 2.1: Mainstream LED into programming, planning and budgeting of municipal services								
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	23	1	28 (140%)
KRA: Public planning for LED improved	Number of laws, policies, regulations, or standards addressing LED formally proposed, adopted, or implemented as supported by SA-LED assistance	10	0	1	5	4	2	12 (120%)
Immediate Outcome 2.2: Increased municipal capacity for project assessment, design and development								
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	243	0	793 (610%)
	Number of individuals receiving USAID SA-LED training who apply the new knowledge and skills	92	0	3	66	152	11	232 (252%)
Immediate Outcome 2.3: Strengthened municipal LED knowledge base								
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	10	25	53 (106%)
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	2	5	12 (150%)
Immediate Outcome 2.4: Increased LED credibility as a pathway to local economic development, including gender and youth								
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	2	4	10 (100%)

Intermediate Outcome 3: Improved quality of monitoring and reporting of GHG emissions at sub-national and project level								
Immediate Outcome 3.1: Improved skills to monitor, report, and communicate 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[29]	0	38	53	11	0	102

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[29] This is a general training target to which training in GHG measurement, reporting, and verification (MRV) contributes.

ANNEX B. SUMMARY OF SA-LED INTERVENTIONS

PROJECT NAME	PROJECT PARTNER(S)	TECHNICAL ASSISTANCE PROVIDED
PROJECTS SUPPORTED		
Ekurhuleni Rooftop Solar PV	Ekurhuleni Metropolitan Municipality, Gauteng	SA-LED provided technical assistance to develop an RFP for rooftop solar PV and evaluate the offers using the LCOE model. SA-LED also conducted a solar yield assessment and structural integrity assessment to ensure the municipal buildings could hold the solar PV installations that would develop 2 MW of energy potential.
Nelson Mandela Bay Rooftop Solar PV	Nelson Mandela Bay Metropolitan Municipality, Eastern Cape	SA-LED provided financial support to the developers working with the municipality to sign use of facility and use of services agreements and conducted a solar energy yield analysis of 30 municipal buildings to determine energy production potential.
Green Community Tool	Green Building Council of South Africa	SA-LED worked with the Green Building Council of South Africa to identify 13 green community pilot projects to inform a green star program for communities.
Blue Karoo Trust Wastewater Repair System Design	Eastern Cape Department of Economic Development, DEDEAT, Eastern Cape	The program supported the installation of a pilot wastewater repair system and anaerobic digester system that would then inform the design of a repair system for a full-scale commercial fish farm. SA-LED also created a marketing video to showcase the success of Blue Karoo fish farm business model, which other companies around the country could replicate. The video promotes SA-LED's goals in job creation and incorporation of women and youth into business models by promoting the farm's successful model.
CHDM WWTP Energy Audits	CHDM, Eastern Cape	The WWTPs in CHDM were not functioning efficiently, so SA-LED supported the municipality to identify operational challenges and solutions as part of an energy audit of the WWTPs.
Zeekoegat WWTP CHP	City of Tshwane, Gauteng	SA-LED reviewed feasibility studies for the use of biogas at Zeekoegat WWTP to inform the development of an RFP for the CHP biogas system installation.
East London Industrial Zone Low Emissions Park Roadmap	East London Industrial Zone, Buffalo City Metropolitan Municipality, DEDEAT, Eastern Cape	SA-LED supported the municipality and its partner region, the East London Industrial Development Zone, in developing a GHG inventory and creating a LED roadmap. The roadmap is a template for planning for the adoption of LED initiatives and for integrating LED into industrial development and municipal planning processes.
Sedibeng Waste Treatment	Sedibeng District Municipality, Gauteng	Provided a technical review of a feasibility study for a proposed waste-to-energy incineration plant and proposed alternative waste treatment approaches.
iLembe WWTP Energy Audit	iLembe District Municipality, KwaZulu-Natal	SA-LED conducted an energy audit of the municipality's WWTPs, where it was determined that cost savings could be secured from tariff adjustments and increasing the plants' notified maximum demand.
City of Cape Town WWTP Energy Audit	City of Cape Town, Western Cape	Conducted an energy, process, and resource efficiency audit for the city's WWTP to identify energy conservation, energy efficiency, and resource efficiency interventions.

PROJECT NAME	PROJECT PARTNER(S)	TECHNICAL ASSISTANCE PROVIDED
Greening the Mohair Value Chain	Cacadu Development Agency (CDA), Blue Crane Route and Makana Metropolitan Municipalities, Eastern Cape	SA-LED conducted research on the green mohair value chain as a comparison to other standards in South Africa (wool and cotton) and developed a green mohair standard. SA-LED further contributed to developing an online information platform to help the farmers with essential farming information and further support farmers to adopt the green standard. Finally, SA-LED developed a macroeconomic study on a national green mohair standard.
Municipal Facilities EEDSM Audits	Dihlabeng and Nketoana Local Municipalities, Free State and Polokwane Metropolitan Municipalities, Limpopo	SA-LED supported energy audits for municipalities to enable them to submit applications for funding under the DMRE's EEDSM Program EEDSM for the 2018/19 financial year. The energy audits identified the following energy efficiency opportunities: - Annual projected energy savings: 250,822 Kilowatt hours resulting in ZAR 313,308 - Projected GHG reductions: 3,963tCO2e (2019 – 2030)
Biogas to Renewable Natural Gas	eThekwini Metropolitan Municipality, KwaZulu-Natal	SA-LED provided technical assistance to Durban Solid Waste to ensure successful implementation of a bio-CNG for vehicular use at the Buffelsdraai landfill. SA-LED commissioned a study on lifecycle assessment and lifecycle costing of renewable natural gas to vehicular use to help the municipality in deciding to invest on the project.
Mbombela Rooftop Solar PV	Mbombela Metropolitan Municipality, Mpumalanga	SA-LED conducted a solar yield analysis and roof structure assessment for two of the municipality's facilities for the installation of rooftop solar PV.
City of Cape Town SSEG	City of Cape Town, Western Cape	Developed tender specifications for the procurement of a 960kW solar PV installation for the city. SA-LED worked with the city to use the template used for the Ekurhuleni solar PV tender and to apply the LCOE model.
eThekwini Conduit Hydropower Project	eThekwini Metropolitan Municipality, KwaZulu-Natal	SA-LED served as the transaction advisor to eThekwini Water and Sanitation's proposed PPP hydropower projects on the yet-to-be commissioned Western Aqueduct (small-scale <10MW) and the Northern Aqueduct (mini-hydro <1MW).
eThekwini Solar PV on Reservoirs	eThekwini Metropolitan Municipality, KwaZulu-Natal	SA-LED conducted solar yield assessments on 440 sites identified by eThekwini Water and Sanitation Department for solar photovoltaic (PV) installations. Applying a minimum potential installation limit of 100kWp DC power brought the number of feasible sites to 52. eThekwini selected eight preferred sites for further assessment.
Govan Mbeki Municipality High Mast Lighting EEDSM Energy Audits	Govan Mbeki Metropolitan Municipality, Mpumalanga	SA-LED conducted energy audits on high mast lighting to enable the municipality to complete the Department of Energy application templates with the following results: - Annual projected energy savings – 1,273,704 kWh - Greenhouse gas emissions reductions – 16,050tCO2e (2019 – 2030)
Mpumalanga Biogas in Schools	Mpumalanga Province	SA-LED leveraged funding from Mpumalanga Province to install biogas digesters at three schools in Mpumalanga Province: Lamlile Primary School, Takheleni Primary School and Mkhulu Combined School. SA-LED then provided capacity building and training support on operating and maintaining the biogas digesters. The three schools are generating gas, growing vegetables, and managing their waste.
Garden Route Waste Mapping	Garden Route District Municipality, Western Cape	SA-LED conducted a waste characterization study for six organic waste streams in the Garden Route District Municipality. This work was done in response to a request from the municipality that

PROJECT NAME	PROJECT PARTNER(S)	TECHNICAL ASSISTANCE PROVIDED
		they need assistance understanding their waste flows to make informed decisions. The municipality (with rich organic waste streams) is inundated with proposals to help them manage their waste, but they did not have up-to-date information to direct their responses to the offers. This work culminated in the development of a waste management decision-making tool to analyze and compare waste management technologies.
Saldanha Waste Characterization	Saldanha Bay Metropolitan Municipality, Western Cape	SA-LED supported the municipality with a "Cradle to Cradle Construction and Demolition Waste Stream" waste characterization study for its construction and demolition waste stream, which offered an opportunity to mitigate emissions by reusing construction waste and generating job creation through recycling and separation on-site while at the same time creating a revenue stream through the reused waste.
CDA Financial Advisory in Makana	Makana Metropolitan Municipality, Eastern Cape	SA-LED coordinated an energy trading relationship between the municipality, the CDA, and PowerX through the signing of a use of systems agreement.
George WWTP Energy Audit	George Metropolitan Municipality, Western Cape	SA-LED conducted energy audits for the municipality's WWTPs to ensure energy savings by making mechanical processes more efficient.
Hessequa LED Support	Hessequa Metropolitan Municipality, Western Cape	SA-LED supported the optimization of the municipality's existing solar PV plan through a solar yield analysis, energy audits of the WWTP, and energy audits of municipal buildings.
Umgungundlovu Chicken Manure Management	Umgungundlovu District Municipality, KwaZulu-Natal	SA-LED used a chicken farm as a test case for sustainable agricultural waste management. The program calculated GHG emissions associated with the production of organic fertilizer and the related benefits as opposed to applying conventional fertilizers.
CapeNature	CapeNature, Western Cape	SA-LED worked with CapeNature to recommend ways it can mainstream LED at its waste and water facilities, storm water system, and buildings, including retrofitting buildings and installing conduit hydropower.
!Kheis Micro Hydro	!Kheis Metropolitan Municipality, Northern Cape	SA-LED proved the municipality with engineering and project management support for micro-hydropower installations. Four micro-hydropower installations with the capacity of 12kW were installed and have also helped the municipality with its scarce water supply.
Knysna Waste Cost of Services	Knysna Metropolitan Municipality, Western Cape	SA-LED supported a business process efficiency analysis to support planned revenue and tariff assessments. The municipality was interested in identifying efficiencies in its waste management system and its tariff structure to improve business processes and to integrate LED solutions in its integrated waste management plan.
CAPACITY BUILDING INITIATIVES		
GHG CLEER Tool Training	West Rand District Municipality, Gauteng; OR Tambo District Municipality, Eastern Cape; Mpumalanga Province	SA-LED provided GHG accounting training using the CLEER tool to various municipalities, training a total of 102 individuals.

PROJECT NAME	PROJECT PARTNER(S)	TECHNICAL ASSISTANCE PROVIDED
Embedded Technical Support to CHDM	CHDM, DEDEAT, Eastern Cape	SA-LED embedded a technical expert in CHDM to support and develop LED initiatives and update the municipality's climate change mitigation strategy. The municipality now has in place a climate change mitigation strategy, an environmental management plan, an air quality management plan, and funding for the Rural Sustainability Villages project.
OCAs	CHDM, Eastern Cape; Govan Mbeki District Municipality, Mpumalanga; Polokwane Metropolitan Municipality, Limpopo	SA-LED successfully conducted OCA workshops with three municipalities. All three municipalities have subsequently developed Climate Change Strategies or Action Plans aligned to their IDPs.
Polokwane Embedded Support	Polokwane Metropolitan Municipality, Limpopo	SA-LED provided embedded technical support to Polokwane through an embedded EEDSM coordinator to assist with the municipality's Green Goal Strategy and EEDSM grant funding initiatives.
EcoDistricts Protocol Trainings	City of Cape Town, Western Cape and City of Johannesburg, Gauteng	SA-LED provided training to planning officials from the City of Cape Town and the City of Johannesburg on green precinct design and the EcoDistricts Protocol.
SANS 10400-XA – Energy Efficiency in New Buildings Trainings	Ekurhuleni, City of Johannesburg, City of Tshwane, Mogale City, Gauteng	SA-LED conducted multiple training sessions for municipal building control officers on complying with South Africa's SANS 10400-XA regulations for energy efficiency in buildings.
Cambridge University Prince of Wale's Business and Sustainability Executive and Practitioner Course	!Kheis, KwaDukuza, and Makana metropolitan municipalities	SA-LED funded the participation of five senior officials from three municipalities in the executive program. In addition to the municipal executives attending the CSIL course, five of the middle management officials from the mentioned municipalities also completed the practitioner course. Exposing both senior and middle management officials strengthens the ability of the municipality to respond to their climate change objectives.
SSEG Training	Various municipalities	SA-LED worked with the SSEG Working Group to provide training to 36 municipal electricity supply department officials from 17 municipalities on the municipal SSEG process.

ANNEX C. LESSONS LEARNED REPORT

LESSONS LEARNED REPORT

SOUTH AFRICA LOW EMISSIONS DEVELOPMENT PROGRAM (SA-LED)

Contract No. AID-674-C-15-00005

Cover photo: Municipal officials participating in walking tour at the Council for Scientific and Industrial Research, City of Tshwane (Photo Credit: SA-LED)

EXECUTIVE SUMMARY

The South Africa Low Emissions Development (SA-LED) Program is a ▮▮▮▮▮▮▮ five-year USAID-funded initiative aimed at supporting the Government of South Africa (GoSA) to achieve its green growth objectives. The Program aims to strengthen public sector-related development planning and project development capacity for low emissions (LED) projects and increase public sector core competencies through technical assistance and learning activities in high priority sectors. GoSA priority sectors include waste management, transport, energy efficiency and energy demand management, renewable energy, and water conservation and demand management. Direct beneficiaries include municipal government authorities, local communities, local private sector service and equipment providers, and civic organizations.

In October and November 2019, SA-LED conducted a lesson learned exercise covering a cross-section of the Program's beneficiaries for the purpose of providing recommendations for the design and implementation of future municipal-focused LED/green growth, governance, and/or institutional development technical assistance programs. The following summarize the five primary lessons gathered from the exercise:

ADAPTIVE MANAGEMENT

Beneficiaries spoke appreciatively of the Program's "flexibility" and cited instances in which it improved outcomes. As a form of adaptive management, SA-LED's flexibility was demonstrated in an ability to re-orient activities at various points in the Program. In more than one example, this enabled leveraging of existing or new resources that would not have otherwise been possible. In one case, the primary beneficiary counterpart first identified by the Program was unable to take advantage of the offered activities and the beneficiaries said they were able to reprogram the activity easily and with proactive support from the Program.

ITERATIVE LEARNING

While this kind of adaptive management created efficiencies in some instances, in others more iterative learning after some activities started would have increased impact. In one example, by bringing some of the trained personnel back to the second set of trainings to integrate what they had learned from using their new skills, the trainings would have improved for the second set of trainees. Because of the additional resources required for iterative learning of this kind, the cost of programming increases with the number of discrete activities to which it applies.

TARGETED COMMUNICATIONS FROM PROGRAM MANAGERS

Focused communications with SA-LED staff enabled beneficiaries to maintain momentum during unexpected challenges and to respond to changes in municipal leadership. In one case, Program senior management returned to a project during implementation and presented the project to new stakeholders. The action refreshed understanding among new municipal leadership and other stakeholders of the value of the purpose and value of the Program. The additional communications helped sustain

political support and break logjams in agency approval processes. In other instances, beneficiaries stated that a lack of more regular communications with the Program may have contributed to missed opportunities to improve the type or how technical assistance was delivered. In one instance, early or more frequent communication – a kind of "pause and reflect" exercise – could have helped avoid breakdowns during comparable leadership changes. Together the examples constitute evidence that targeted communications did, and in future programming can, improve outcomes.

CHAMPIONS IN THE POLITICAL ECONOMY

Leadership through so-called "champions" of the Program was critical to both (1) aligning and securing resources at various levels of government or (2) engendering ongoing leadership at lower levels of government. Champions in this context appear to be either visionary, providing legitimacy to the activities through their own charisma, or technocratically adept at navigating established processes and power relations to achieve measurable results. An ability to get LED programming into Integrated Development Plans (IDP), for example, was cited more than once as the success of champions around program activities. Other champions succeeded by mentoring successors to their positions, as well as lower level staff, to continue advocating for LED at different levels of government.

I. INTRODUCTION

South Africa is faced with the challenge of maintaining long-term sustainable economic development under the threat of climate change with an economy heavily dependent on fossil fuels. South Africa has set ambitious Greenhouse Gas (GHG) emissions reduction targets within its National Climate Change Response White paper (2011), and the Nationally Determined Contributions to the Paris Climate Agreement (2015/16). USAID partnered with the GoSA to provide support to its green growth agenda and expand LED in order to meet these reduction targets.

To remedy these challenges, the overall approach of SA-LED focused on helping South African municipalities move LED projects through the project development life cycle, operating as the vehicle to deliver technical assistance, capacity building, financial advisory services, and support in sourcing external finance. 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 provided opportunities for practical learning, using real project blockages as the training materials to build the capacity of municipalities. To support the implementation of South Africa's Climate Change Response Policy, SA-LED focused on the GoSA's near-term priority flagship programs of waste management, transport, energy efficiency and energy demand management, renewable energy, and water conservation and demand management. The Program was co-created with the South African Department of Environmental Affairs and the Department of Science and Technology.

In October and November 2019, SA-LED conducted a lesson learned exercise covering a cross-section of SA-LED's beneficiaries for the purpose of providing recommendations for the design and implementation of future municipal-focused LED/green growth, governance, and/or institutional development technical assistance programs. The following report lays out the method used for completing the exercise, the interview questions, and organizes the findings, as well identifies ideas for future programing in sustainable urban development. The report will also be annexed to SA-LED's final report.

II. METHODOLOGY AND LIMITATIONS

METHODOLOGY

According to recognized best practices of knowledge management, lessons learned exercises gather information from an existing body of work to inform design of future programs, as well as to improve the way development professionals deliver specific types of support in current and future work (see Annex C for more information "lessons learned" exercises in the field of knowledge management). A lessons learned exercise is highly qualitative and experiential, with minimal reliance on quantitative analysis. In contrast, evaluations or assessments are typically considered a balance of qualitative and quantitative analysis in reference to pre-determined indicators of successful impact. Rather than attempting to determine whether a program has objectively succeeded or failed, the main objective of a lessons learned exercise is open-ended and integrative, identifying ways to improve delivery of support in relation to the tools used in the project. In the case of SA-LED, these tools include, among others, embedded personnel, third party training programs, or project feasibility studies. Through direct interaction with a cross-section of SA-LED's beneficiaries and stakeholders, we captured experiential learning in select activities and interventions, and identified strengths and weaknesses of *how* support was delivered.

The learning team was led by Michael Ashford, Director of Chemonics' Water, Energy & Sustainable Cities Practice. He was supported by SA-LED Chief of Party Maria Olanda Bata and M&E Specialist Rosalia Mofolo. The exercise began with a literature review of SA-LED reports and general information on learning agendas and lessons learned exercises under the larger heading of knowledge management in international development. The first interview was held on October 8, 2019 and they continued until early November 2019. The interview portion comprised 18 total interviews, 16 of which were conducted in person in South Africa from October 14-25, 2019. Because the interviews often included more than one representative of a given municipality, department, or province, and because those individuals were in some cases the counterparty for more than one activity under SA-LED, the exercise was able to touch upon 41 total activities, representing 49% of the total 83 engagements under the Program.

Interviewees included national, provincial, district, and municipal level representatives of climate change mitigation policy making and program implementation. Of the 18 persons interviewed, two represented national level policy making, four provincial level, and nine municipal level. In addition, the interviewees included collaborating partners. The exercise covered the three types of support and six of the eight provinces where SA-LED activities were implemented. Annex A includes a table listing the interviewee, date and location of each interview and whether it was completed in person or over the phone.

The interviews were based on a set of questions pre-agreed with USAID (see Annex B). Each interviewee was given the opportunity to respond to each question or some form thereof. The questioning also allowed for discussion and expansion on specific topics which are detailed in the section "General Lessons Learned" below. Each interview explored the critical question: *Knowing what you know now, and looking back at what has happened, is there anything you would do differently (with "benefit of hindsight")?*

LIMITATIONS

Interview-based surveys of this kind are vulnerable to positively biased responses because beneficiaries have incentives to seek further support from USAID and other donors. Beneficiaries do not want to appear ungrateful for the support which might endanger future access to funding faced with their own limited resources. The exercise attempted to mitigate this bias by prefacing each interview with explanations that constructively critical feedback would not have consequences beyond informing USAID and SA-LED program staff of what worked and did not work and to improve performance going forward. In most cases, interviewees did offer some constructive criticism in the form of suggestions for improving specifics of the Program, which are summarized in more detail below. Only one interviewee was predominantly negative in his responses, but even this interviewee made great efforts to discuss this in person and explain the circumstances and conditions for his disappointment.[30] In summary, the overall response to the list of questions, as well as the tenor of the discussions of strengths and weaknesses of the support delivered, was very positive. Time constraints were another limitation to the exercise as structured, combined with the challenges of travel and scheduling among many disparate locations in South Africa.

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[29] The only interview consistently, and constructively, critical about how SA-LED support was delivered appears to have lacked the kind of communication reflecting best practices of project management.

III. LESSONS LEARNED

This section is organized by general lessons learned across all forms of SA-LED's technical assistance, followed by five key lessons learned.

GENERAL LESSONS LEARNED

For all but one of the 18 interviewees, SA-LED was considered positive and effective. Respondents were particularly appreciative of the Program's flexibility and ability to offer a "menu" of types of support services. Similarly, in many instances SA-LED was lauded for being adaptive to changes in circumstances or considering and responding to new information during implementation. Flexibility in the Program, according to respondents, enabled the beneficiaries to align SA-LED's support with existing LED-related workstreams, for example, and scale or replicate successful initiatives. In another example, the Program was able to quickly change the primary beneficiary and scope of work after initial contact was established with a department less able to respond. Another common positive observation was that the application process was straight forward and efficient, that once an intervention was identified, it was easy to formally apply and start work. Interviewees cited the ease of working with SA-LED in comparison with other donor programs which required more resources in preparation and offered less flexibility in implementation to meet program requirements.

Of the 18 interviews conducted regarding support delivery, 12 observed that the type of support provided would have benefitted from additional time and resources in program preparation before providing specific support. Successful delivery of any outside support must strike a balance between preparation and execution; over-preparation can make perfect the enemy of the good if it causes delays and planning fatigue. Planning and preparation also means different things for different types of support, so *additional* preparation and planning that is recommended in hindsight should be geared to the specific type of assistance provided. Nevertheless, the observation is generalizable in relation to the value of "pausing and reflecting" during the early stages of program implementation.

In this light, the output of a standard needs assessment – such as the Organizational Capacity Assessment – benefits from a secondary stage of preparation after the primary gap has been identified. For example, in cases where a lack of capacity for prioritizing actions was identified, the USAID's Clean Energy Emission Reduction (CLEER) tool appeared fit for purpose. However, after those gaps were identified and the CLEER tool chosen as a method to address the gaps, a second stage of vetting of – and getting commitments from – individual participants in the training could have improved outcomes in two ways. First, more time spent identifying specific participants and the capacity of those individuals to benefit from the CLEER training would have in some instances increased attendance and penetrated deeper into the municipality. Second, in at least one instance, further vetting and preparation would have likely revealed the value of a more basic informational exercise than that of the CLEER tool, one that focuses on what climate change is and why it is important. Similarly, additional preparation through discussion with the targeted participants could have shown that a shorter, higher level informational session for senior public or elected officials, together with the intensive CLEER tool training for staff under their purview, would

have built awareness among senior positions of the value in newly trained staff and helped their support.

Approximately ten interviewees observed that more, and more frequent, communication from SA-LED to the beneficiary and other stakeholders – about why and what type of support is being provided – would facilitate greater uptake and impact. They stated this was important *during* the period in which support was provided. After project initiation within organizations with complex political and economic environments, for example, brief check-in meetings with key stakeholders were identified as ways to bring newly elected leaders or senior staff up to speed during project implementation. Similarly, follow-up communications would have enhanced the targeted beneficiary to overcome organizational rigidities and "not invented here" reactions to the Program's support. This reflects the general observation that municipal departments can be "siloed" and have difficulty seeing the systems-level costs of climate change and the related opportunities from collaboration across departments.

In the case of embedded personnel in Polokwane, for example, the beneficiary cited a follow-on visit from USAID and SA-LED staff as particularly beneficial in getting buy-in from shifting political leadership in the municipality. They said more frequent, shorter visits from SA-LED or USAID could have, similarly, helped overcome resistance to LED project activities in other departments still in the critical path to implementation (e.g. procurement officers). Additional communication from USAID or SA-LED, some interviewees said, would also help the disparate stakeholders reaffirm their alignment with the overall program goals.

LESSON 1: FLEXIBILITY CREATED EFFICIENCIES

In approximately ten instances, interviewees stated that flexibility was a positive characteristic of SA-LED, both in terms of the variety of support offered as well as the ability to change and adapt during implementation. In comparison, in approximately 16 instances the interviewees observed that their activities would have benefited from additional planning and preparation. SA-LED's flexibility was often observed positively in comparison to the rigidity of other donor programs[31] working in similar technical areas (e.g. energy and climate change mitigation). Also, in comparison with other donor programs, SA-LED's application and approval processes were praised for being easy and simple. The tension lies in the ease of the application process and later ability to change course and adapt, on the one hand, and on the other hand, the benefit of time and effort in planning upfront along with ongoing efforts to assess and adapt during implementation.

LESSON 2: CAPACITY WAS LOWER THAN ANTICIPATED

Several interviewees cited the need for awareness building and training in project management skills that is more basic than the kind provided by the Program. They described the need for more fundamental interventions in the face of intractably low

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[31] Notably, representatives of other donor programs observed that the SA-LED programming could benefit from more extensive pre-assessment and planning, as well as unified structure during implementation.

levels of capacity among municipal employees. Not surprisingly, this was most prevalent in small, inland jurisdictions. One interviewee spoke of the awareness training as easy to obtain and generally valuable because it was delivered as a package of support for related projects. Yet because it was to some extent standardized and delivered quickly, it was mismatched with the attendees' level of decision making and, in some cases, their basic capacity to understand the relevance to their work. The interviewee suggested that after agreeing on a climate change awareness activity, but before delivery, more time should be spent on identifying a specific set of attendees, assessing their needs and roles in policy making or implementation, and customizing the awareness training accordingly.

Every municipal level participant in the lessons learned exercise either directly or indirectly expressed the desire for more support in building basic management skills and core competencies among municipal staff in association with support for LED projects. When expressed indirectly, this was evident in the appreciation for long-term capacity building and training through embedded personnel or, negatively, through frustration over inability to follow through on project recommendations from technical assistance. When expressed directly, interviewees often stated that their work would have benefitted from non-technical training in management and administration related to their day-to-day work within the municipality.

Reviewing instances in which interviewees observed a need for more training in core competencies helps inform how that may take shape in future programming. The City of George, for example, expressed preference that any future support for capacity building come in the form of embedded personnel or other programs that reflect the success of their own internship programs which includes building skills in department administration and management, as well as how to work collaboratively across departments to successfully complete distinct projects. Similarly, representatives of cities of Tshwane and Johannesburg discussed the desire to retain and then expand management skills and know-how that was associated with SA-LED trainings to more successfully deliver results in the technical area addressed (e.g. energy efficiency in buildings). The clearest expression of the value of additional project management and administrative skills training came from Polokwane Municipality. In this case, the embedded personnel stated that basic skills training in administrative management and budgeting would have enabled her to more effectively organize the Energy Efficiency Demand Side Management (EEDSM) application process.

LESSON 3: HIGH-LEVEL COMMUNICATION FROM SENIOR PROGRAM MANAGERS IS IMPORTANT

When interviewees were asked to describe the ways in which support was delivered in a particularly effective way, they often referred to the frequency of communication from SA-LED's senior managers and USAID, beyond the communications from Program technical leads. Arguably, interviewees were describing a way in which SA-LED's activities achieved and maintained a level of importance through personal, high-level communications that overcame, or, in cases they were not used, were expected to overcome, bureaucratic inertia, changes in leadership, potential meddling or obstruction, and other challenges of activities that were otherwise disadvantaged in competing with the existing political and economic system. Interviewees referred to

direct communications from SA-LED and USAID staff to stakeholders affected by, or critical to, the success of the Program.

The value of these types of communication from senior managers was also clear from the number of times in which interviewees noted the need for more or improved high-level communications. Counting both the instances when it was described as impactful or lacking, the value of high-level communications was raised approximately ten times during the lessons learned exercise.

LESSON 4: MORE DIRECT FUNDING OR FINANCING WAS EXPECTED

In three instances, interviewees said they did not know until sometime after activities began that SA-LED's support did not offer specific opportunities for grant funds or third-party financing. In the case of some projects, as well, such as the support to the City of Tshwane for landfill gas capture and use and biogas to power generation at the city's waste water treatment plant, the interviewees said they were surprised to learn there was no grant funding or access to financing accompanying the project specific support. Representatives of the City of Tshwane and others noted that if they had understood this earlier in the program engagement, they might have been able to coordinate better with the municipal budgeting process to identify other funding sources.

> "We thought we would get to financing faster; we have a lot of other donors, so we know what we are doing."
> - *Municipal department director overseeing external relations and program resources*

Regardless of whether that assumption was right or wrong, the fact that it existed and created expectations indicates the potential gap in understanding the role of capacity building support as well as, potentially, an opportunity to review the kinds of capacity building provided. Such a gap in understanding also reveals an opportunity to reconsider how and what type of capacity building delivered is aimed specifically at increasing access to financing and funding. This is explored further in the recommendations section below.

Interviewees in more senior positions of municipal government, as well as all interviewees working at the provincial and national level or in partner organizations, expressed frustration over not being able to secure financing or funding for continued project development. Among the 18 interviews conducted, the lack of a clear path to securing funding or financing was raised in some form approximately 30 times. One interviewee emphasized that successful adoption of LED planning should not be measured in terms of financial or economic metrics, at least not solely; large scale adoption also requires complex shifts in social value systems, for example. Overall thought, interviewees were largely unanimous in the observation that the inability to access funding or financing – the lack of tools such as basic information, knowledge and other business operation skills – was a major impediment to a given LED project's success.

Conversely, project activities or technical assistance that did result in securing funding of some kind were considered a success. An example for the latter is securing EEDSM funds for municipal street lighting or energy efficiency in buildings in Polokwane and George. The

> "The technical training on biogas digester programming was spot on."
> - *Provincial Economist*

absence of funding or third-party financing was not always attributed to gaps in SA-LED support. In one example, the Program's support for biogas digester operations in George was lauded for being comprehensive and inclusive, both technically and in relation to stakeholder relations. Yet the project did not move forward because the National Treasury was unable to provide expected grant funds for purchase of a biogas digester, something outside of SA-LED's control. Similarly, in two interviews, resistance by ESKOM to the regulatory reforms or formal approvals for operating embedded generation was cited as an obstacle to advancing otherwise "bankable" small-scale installations. The program partner Sustainable Energy Africa also pointed out the larger challenge of financing local projects when individual and government agency customers are not contributing (i.e. this could be in the form of insufficient local revenue from fees or taxes or from customer service payments).

LESSON 5: CHAMPIONS ARE CRITICAL

Six interviewees discussed the value of having or finding "champions" that embodied the political will to make changes required for mainstreaming LED programming. This was usually expressed in terms of senior leadership within the beneficiaries' organizational structure. The way these champions contributed to a given activity's success varied. In some cases, they were described as visionaries, in others as effective managers of political systems; they either enabled others to organize around their leadership or inspired others to take leadership at other levels or agencies of government. In all cases, the importance of continuity of leadership was demonstrated by challenges arising from interruptions as newly elected officials – who are unaware or uncommitted to the Program – displaced established leaders.[32] Conversely, the leadership of a Director in Eastern Cape's Department of Economic Development, Environmental Affairs & Tourism over several years – successfully coordinating LED programming at the provincial level – contributed significantly to the success of sub-activities at the district and municipal level.

In the Chris Hani District, for example, the mayor was referred to as an inspiring, visionary leader on climate change policy, whose influence remains in the leadership of his chancellors who are coming up behind him in political rank. Notwithstanding the anecdotal nature of this reference, the interviewee was emphatic that the "championing" roles of the mayor, herself and others were essential for long-term success. As evidence, she pointed out the creation and funding of an Environmental Management Unit with four staff to implement policies and projects.

Long-term leadership in Mpumalanga has similarly been critical to securing funding from national level for projects in the provincial and municipal level. A deputy director championing climate change programming has been active in the arena for over 10

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[32] As noted in earlier, targeted communications from senior managers in SA-LED and USAID overcame the loss of "champions" resulting from an election.

years and was able to describe the growing awareness and commitment among political leaders and staff in the province. When asked if funding or financing was the primary indicator of success, she responded that larger social and political awareness of the problems was more important. She noted that her ability to persuade the Director General of the economic (e.g. employment) opportunities that accompany LED programming, for example, in supporting a new solar market as coal plants in the province shut down, enabled the Program to move forward. In another case, a municipal deputy director explained differently how his role in championing LED programs was successful. He persisted, despite several setbacks, in finding ways to work through the rules, processes and power dynamics of getting his agenda, climate change programing, into the municipality's IDP. He cited the Cambridge awareness training as a turning point for his engagement, motivating him to explain and persuade throughout the municipality the need and value of mainstreaming low emissions planning more broadly.

Finally, in Johannesburg and Tshwane, senior leadership's commitment to the Program's activities – in the offices of city planning and mayor, respectively – has led to greater coordination among city agencies and with other donors.

IV. RECOMMENDATIONS FOR FUTURE, SIMILAR PROGRAMMING

Should USAID consider future, similar programming or if opportunities present themselves from other donors, the lessons learned exercise uncovered opportunities and challenges to LED programming that are useful in several ways. By methodically discussing specific interventions in a setting that is not conditioned with normative rules, the interviewees were able to prioritize independently "what works and doesn't work" for them as actors. At the same time, by structuring interviews with a standard set of questions, the exercise revealed common observations that are translatable to recommendations for future programming in municipal development. Finally, while the lessons learned exercise focused on ways in which support was delivered for municipal development, the larger objective was to lower GHG emissions measured in relation to what would occur in the absence of the interventions. As a result, the exercise reveals recommendations for both improving the ability to deliver support services to municipal development *and* how to support LED in the future.

RECOMMENDATION 1: ADOPT FLEXIBILITY IN PROGRAM OPTIONS AND DURING IMPLEMENTATION

LED is a multi-faceted process, captured by a combination of market forces and positive and negative incentives posited by public authorities (i.e. regulations). Recognizing this, SA-LED offered different options to municipal actors in selecting different types of support for their work in light of their own objectives and limits, for example, transaction support as well as long-term capacity building. SA-LED in some cases also shifted resources after implementation to meet unforeseen challenges as articulated by the beneficiaries. This flexibility was cited almost unanimously as a positive characteristic of the Program.

In the future, LED programming should therefore intentionally identify specific ways in which flexibility and adaptivity is built into programing as a distinguishing characteristic from other capacity building programs focused on urban sustainability. This was recognized as an advantage of the Program not only in its ability to shift activities in relation to new or changing opportunities, but also in the simplicity of applying and administering the Program. One clear example is the choice between technical assistance that is transaction focused versus capacity building devoted to institutional sustainability. These are not mutually exclusive in relation to achieving the desired outcomes, so allowing beneficiaries more options in subscribing and shifting during implementation can accelerate progress.

RECOMMENDATION 2: PRIORITIZE ITERATIVE LEARNING AT THE SUB-ACTIVITY LEVEL

Future programming should build in more iterative learning at the sub-activity level. Specifically, in the case of SA-LED, using more intentional "pause and reflect" assessments between standardized trainings, for example, would likely lead to a

greater impact of those tools, in terms of depth of knowledge transferred and efficacy in application.[33]

RECOMMENDATION 3: DEDICATE PERIODIC HIGH-LEVEL COMMUNICATIONS ON PROGRAM VALUE AND RELEVANCE

The lessons learned exercise revealed challenges with maintaining support from local political leaders, agency and department leaders, and across siloed units within agencies for interventions of longer duration, such as embedded personnel. Political leadership changed, in some cases, or applications for LED project funding reached the desks of department offices long after the activity began. As a result, activities could lose momentum, in some cases, and new political or bureaucratic obstacles arose. Beneficiaries stated that targeted communications from senior management of SA-LED and USAID helped overcome these challenges during implementation. The communications comprised a high-level iteration of the importance of the SA-LED intervention at a global level and the value it brings to the local context (e.g. economic growth; project installations; job creation, etc.).

Future LED programming should find a way to identify and elevate challenges that arise during implementation that can be addressed by targeted communications from senior Program managers. The senior program managers or USAID representatives should continuously re-emphasize the value and importance of the interventions and reiterate the need to maintain support and organizational structure to keep them moving forward. This could be in the form of scheduled "check-ins" for senior management and, as merited, focused communications by the Chief of Party and/or USAID Contract Officer Representative/Senior Technical Advisor. The value is in either correcting lingering misunderstandings from the program launch or, more importantly, addressing unexpected challenges among the stakeholders in the critical path to implementation.

RECOMMENDATION 4: IDENTIFY AND SUPPORT PROGRAM CHAMPIONS

The lessons learned exercise revealed the value of champions who provided leadership, enthusiasm, and influence to the benefit of LED initiatives. These were individuals at different levels of regional and local government who learned the value of LED programming early on and maintained their support over the project period. Future LED programming should employ methods, such as small-scale political economic analyses, to identify champions early in program design and launch. In some cases, champions rose organically from the awareness campaigns in the Program's initial stages. This could be an opportunity to more intentionally use awareness campaigns to recruit champions associated with program activities.

To effectively introduce tools and methods specific to identifying and fostering champions associated with program interventions and/or activities merits additional investigation. As mentioned above, it could be integral to program activities around assessments and awareness or stakeholder campaigns. Recent efforts to demystify

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[33] As noted elsewhere, it was only after trainees put their new knowledge to use did they realize how their training could be slightly changed to benefit future trainees, but there was no process to capture those insights. Having some trainees take the course again with a group of new attendees could be a vector for that in the future.

"political will" include consideration of political economic analysis that identifies and supports champions in this way. Further investigation could generate more prescriptive tools to identify and sustain champions such as publicizing detailed description of their roles, ways to stay in contact and support them during program implementation, and general guidelines oriented to program objectives that staff can refer to on an ongoing basis.

RECOMMENDATION 5: ESTABLISH FINANCIAL SUSTAINABILITY TARGETS FOR SELECTED INTERVENTIONS

LED requires sustained funding or financing to continue beyond the programmatic period of support. The lessons learned exercise included review of some interventions that were oriented towards securing funding or financing. Additionally, some interviewees said they had hoped for clearer paths to funding or financing for specific installations or projects, despite or regardless of other types of progress (e.g. assessing climate impacts as part of planning process). Alternatively, interviewees consistently considered those interventions successful which resulted in national grant funding, municipal budget support, or third-party financing. In this light, LED programming going forward should look beyond indicators of "leveraging" and more explicitly orient activities around securing sustained funding or financing as an objective.

Not all program activities need sustained funding or financing as a primary objective because they focus on awareness building or intangible outcomes. Therefore, new programming that builds in sustainable funding or financing should be on a case-by-case basis for specific interventions. Before programs begin or as part of initial work planning, LED could categorize certain interventions according to their ability to identify specific sources of funding or financing. For example, national grants for energy efficiency installations were an orientation point for the Program's embedded Polokwane Municipality staff member and the sub-activities of that individual were further oriented around the steps necessary to secure those grants. In another case, technical assistance in the form of a feasibility analysis and management consulting were provided to secure a private financing transaction. Moving forward, interventions and related programming can more closely follow these models to enhance their success as measured by sustained funding or financing. Categorizing interventions by funding or financing goals requires initial assessment that determines what is more appropriate for the circumstance. Funding and financing are very different and require, respectively, distinct types of capacity.

Since this is a recommendation in relation to some reported confusion or disappointment around access to funding or financing, but connected to broader discussions of private sector engagement and the Journey to Self-Reliance, further details are included below in Annex D.

RECOMMENDATION 6: IDENTIFY A LIMITED NUMBER OF SPECIFIC SECTORS AND APPLY SA-LED TYPE TOOLS

SA-LED was successful as a demonstration of how flexible use of a menu of support can accelerate LED at the municipal level. A future program could take best practices and lessons learned of *how* capacity development and technical assistance was delivered under SA-LED and dedicate the same set – improved and adapted – to two

or three sectors with the greatest likelihood of scaling. These could include, for example, continuation and expansion of SA-LED work on distributed solar PV systems within municipal utility models, "wheeling" dedicated clean power generation in peer-to-peer contracts, continued support for biogas production at waste water treatment facilities, or energy efficiency investments in energy intensive sectors that result in lower operating costs.
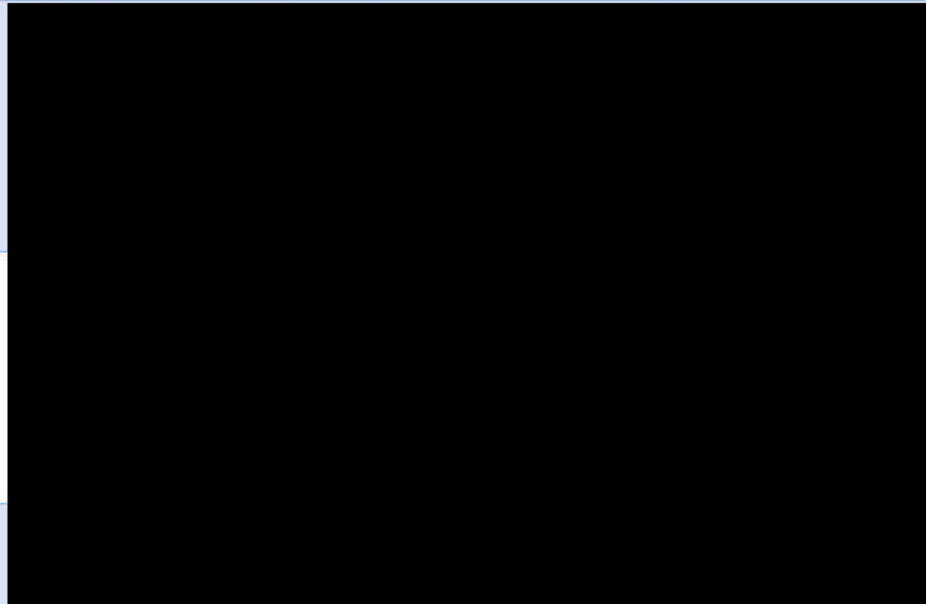
An important component of dedicating the support to a few, select sectors is intensive assessment and coordination in the pre-funding phase to avoid duplication with other national or donor-directed programs, on the one hand, and on the other, ensuring alignment through jurisdictions (local, provincial, national) with already identified strategic, national objectives. SA-LED did this successfully with support for municipal programs that accessed national EEDSM funds. A future program along these lines could align support for local capacity and project development with the strategic objectives of South Africa's new carbon tax.

In a similar way, a future program could select a limited number of projects – as opposed to sectors – which have received initial support from SA-LED to comprise a project pipeline served further with the flexibility and adaptiveness of SA-LED's existing tools. This pipeline could be augmented with appropriately aligned projects among other donor and national programs. In this way, transaction support and capacity building, for example, applied in the complementary and flexible fashion of the current SA-LED program could lead to further LED project completion at the municipal level.

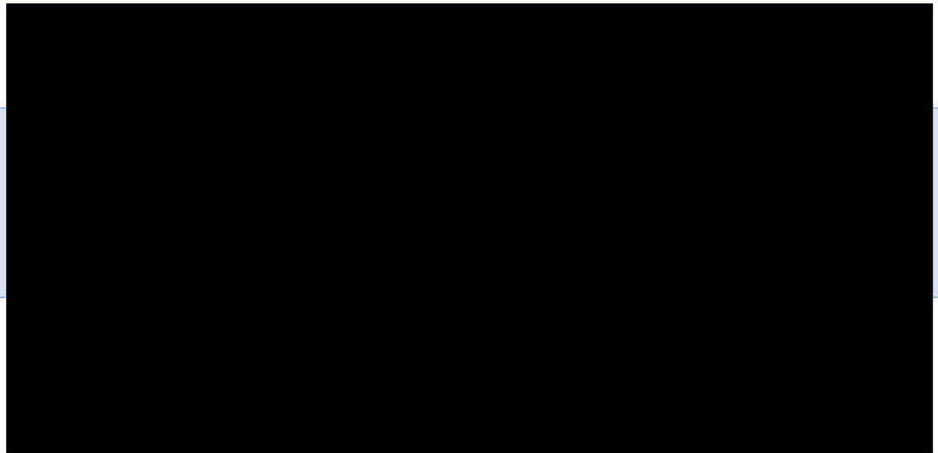# LESSONS LEARNED REPORT ANNEX A. TABLE OF INTERVIEWS CONDUCTED

DATE	ACTIVITY	PARTNER	GEOGRAPHICAL	CONTACT INFORMATION
10/8/19	*Skype call*	Sustainable Energy Africa (SEA)	Collaboration Partner	
10/14/19	*In person meeting*	Department of Science and Technology (DST)	National	
10/14/19	*In person meeting*	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)	Collaboration Partner	

DATE	ACTIVITY	PARTNER	GEOGRAPHICAL	CONTACT INFORMATION
10/15/19	*Teleconference call (from SA-LED office)*	Garden Route District Municipality	Western Cape	
10/15/19	*Skype call/phone*	Cacadu Development Agency (CDA)	Eastern Cape	
10/16/19	*In person meeting*	Eastern Cape Provincial Government: Department of Economic Development, Environmental Affairs and Tourism (DEDEAT)	Eastern Cape	
10/17/19	*In person meeting (in East London – DEDEAT's office)*	Chris Hani District Municipality (CHDM)	Eastern Cape	
10/17/19	*In person meeting*	The Green House (TGH)	Consortium Partner	

DATE	ACTIVITY	PARTNER	GEOGRAPHICAL	CONTACT INFORMATION
10/18/19	*In person meeting with both municipalities combined*	1. George Local Municipality 2. Hessequa Local Municipality	Western Cape	███████████████████
10/21/19	*In person meeting*	Polokwane Local Municipality	Limpopo	
10/22/19	*In person meeting* *(at Govan Mbeki municipality)*	Mpumalanga Provincial Department of Economic Development and Tourism	Mpumalanga	

DATE	ACTIVITY	PARTNER	GEOGRAPHICAL	CONTACT INFORMATION
10/22/19	*In person meeting*	Govan Mbeki Local Municipality	Mpumalanga	
10/23/19	*In person meeting*	eThekwini Metropolitan Municipality	Kwazulu-Natal	

DATE	ACTIVITY	PARTNER	GEOGRAPHICAL	CONTACT INFORMATION
10/24/19	*In person meeting*	City of Tshwane Metropolitan Municipality	Gauteng	
10/24/19	*In person meeting*	City of Johannesburg Metropolitan Municipality	Gauteng	
10/24/19	*In person*	Mpumalanga Province - Department of Agriculture, Rural Development, Land	Mpumalanga	

DATE	ACTIVITY	PARTNER	GEOGRAPHICAL	CONTACT INFORMATION
		and Environmental Affairs (DARDLEA)		
10/25/19	*In person meeting*	Department of Mineral Resources and Energy (DMRE - DoE)	Gauteng	
11/4/19	*Email exchange*	Aquaculture Innovations	Partner	

LESSONS LEARNED REPORT ANNEX B. LESSONS LEARNED EXERCISE INTERVIEW QUESTIONS

1. Can you please describe to me what your understanding of the SA-LED Program is/has been trying to achieve?

2. Can you please describe to me your understanding of what your role in the project is/was?

3. What is/was, in your view, the SA-LED team expecting you to do in relation to the project?

4. What were/are the things you expect(ed) to happen from your/our contribution to the project?

5. On the other side of that same coin, what do/did you expect the project to be able to do/have done with your participation in the project?

6. How did you do your work with SA LED, for example, what were the processes and formats? In other words, what happened and how did it happen?

7. If you had all the time and money you wanted to do this [and everything else you wanted to do professionally = no limits on resources], would you WANT to do it? And, if so, how would you do it differently?

8. What value did SA-LED add to your immediate work, stakeholders and industry?

9. Keeping South Africa's "green carbon" in mind, how did SA-LED's technical assistance help you to promote low emissions development in your organization/country outside of the immediate project?

10. Knowing what you know now, and looking back at what has happened, is there anything you would do differently (with "benefit of hindsight")?

LESSONS LEARNED REPORT ANNEX C. ADDITIONAL RESOURCES ON WHAT IS A LESSON LEARNED AND OTHER KNOWLEDGE MANAGEMENT TOOLS

1. USAID (2019, March) [So you want to propose a learning agenda question?](#)
2. USAID (2018, August) [Tips for Creating a Learning Agenda](#)
3. USAID (2018, October) [Straight off the Shelf: Unpacking your Utilization-Focused Learning Agenda](#)
4. Smith Nightingale, D., Fudge, K. and Schupmann, W. (2018, March). [Evidence Toolkit: Learning Agendas](#)
5. USAID (TOPS Program) (2018, November) [Learning Agenda Workbook for Food Security and Nutrition Programming](#)
6. USAID Learning Lab (2017). [Establishing a Learning Agenda](#)
7. USAID Learning Lab (2017). [Implementing a Learning Agenda Approach](#)
8. USAID learning Lab (2014). [USAID's Leveraging Economic Opportunities Project Takes Stock of its Learning Agenda](#)
9. Griswold, S. (2017, 3 September). [Creating Learning Agendas that will be Used](#)
10. Baker, M. (2017, 26 April). [Learning Agendas: The Five Most Important Things You Need to Know](#)
11. DFID talks about [Learning Journeys](#)

LESSONS LEARNED REPORT ANNEX D. REFRAMING HOW TO PROVIDE CAPACITY BUILDING FOR FINANCIAL SUSTAINABILITY

The statement "lack of financing" has become part of the litany of challenges to sustainable development writ large. Numerous donor and bilateral donor programs focus on improving public financial management to increase general revenue to ultimately, in turn, provide sustained public funding for development, whether urban or rural, local, national or transboundary. Other program activities are dedicated to small enterprise development coupled with micro-financing, or technical assistance facilities coupled with concessional debt financing, in ways that develop a project through early stages to a readiness to service concessional debt or manage budgets. The SA-LED Program also anticipates some conversion of program activities into successful private financings, for example, as in support for eThekwini's public private partnerships in small-scale hydro power and small-scale solar generation.

The problem, however, is not addressed by identifying the lack of financing or funding, but by working differently or better in building beneficiaries' capacity to get funding or financing. The EEDSM program, for example, was praised by one beneficiary (i.e. municipal department) for its rigorous accounting requirements enforced by periodic audits. But the national level manager of the same program, sitting in the Department of Mineral Resources and Energy (DMRE), emphasized that municipalities were unable to submit enough quality applications and/or demonstrate enough ability to manage grant funds to take up the available national-level funds; only 40-50% of the program funds to the DMRE due to lack of local capacity to find and manage projects.

This raises the question of how municipal development programs such as SA-LED may be designed and implemented in the future to more effectively secure increased and/or sustained funding or financing. Part of the solution may lie in reframing the problem. Instead of by securing funding or financing, success is measured by the beneficiaries' ability to identify and create an asset that can return value from further investment. The further investment may be public or private, something which needs to be identified *before* project or program implementation, but both funding (which is budget oriented) and financing (which is revenue oriented) require the same alignment around an asset that generates value. By orienting around this goal, the capacity gaps are defined more directly in relation to what was often expressed by interviewees at the national level and more senior level of municipal administration as lacking at the local level: business administration and operation skills, human resource management skills, value for money procurement rules, and transparent, accountable processes and procedures for cost accounting in budget management and reporting.

At the municipal level, then, reorienting around asset creation and management could create more defined – or what economists call "real" – demand for increased public funding, as well as provide incentives to find those resources through typical public

methods (e.g. federal transfers, local fees and taxes, etc.). In the case of financing, which is largely the same for public and private sources except for the terms and tenor, the orientation would be explicitly around an ability to identify and manage an asset that generates positive cash flows for a return on investment. In either case, this approach identifies which activities are funded for their public benefits and which activities are funded or financed for their ability to generate revenue. The program support would then be provided according to those desired outcomes.

In this light, future programming that aims for secure, sustained funding or financing as an objective could include targeted grants and technical assistance in the form of a "technical assistance facility" that in turn creates real demand for a dedicated source of investment funds, public or private. Technical assistance facilities of this kind are already operating successfully with the goal of decarbonizing energy systems and building climate resilient infrastructure under the aegis of other donors and development finance institutions. For example, this type of sustainable financing for development is also envisioned for the recently created US International Development Finance Corporation (IFDC).