Lighting and appliances for lives and livelihoods: a foundation for strategic energy efficiency policies in East and Southern Africa

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Abstract

Markets in East and Southern Africa are inundated with low-quality and inefficient on- and off-grid energy appliances. Furthermore, energy security is also an issue as most countries are faced with electricity generation deficits resulting in load shedding to match electricity supply and demand daily. Well-implemented energy efficiency measures are inexpensive ways to mitigate the deficit energy supply and improve energy security. The Sida-funded program on Energy Efficient Lighting and Appliances in East and Southern Africa (EELA), implemented by UNIDO and partner organisations in East and Southern Africa, addresses challenges through a local-driven, regional harmonized approach aiming to achieve a market transformation towards EELA. Besides promoting the uptake of high-quality and efficient lighting, air-conditioners and household appliances, the focus also lies on devices designed for income-generating activities to improve livelihoods in the communities in the East African Community (EAC) and Southern African Development Community (SADC) regions. Achieved project milestones include enhanced policy dialogue and messaging, enhanced market governance capacities, the adoption of harmonized Minimum Energy Performance Standards (MEPS) for lighting and cooling appliances with attendant energy efficiency (EE) labels, development of EE Tool-kits such as the regional compliance frameworks, energy efficiency public procurement guidelines, electronic waste management guidelines as well as strengthened regional reference laboratories for appliance testing and pilots for private sector EE market development.

Introduction

Achieving global net zero Greenhouse Gas (GHG) emissions by 2050, and thus staying on track to limit the increase of temperature to below 1.5 degrees above pre-industrial levels[1] requires increased investments in energy efficiency (EE). According to the projections, the focus on required investment priorities in emerging and developing economies will have to shift from renewable energy to EE. This will become a top precedence in the years 2030–2060 (International Energy Agency (IEA) 2023, p. 47, Fig. 1.18.).

The Sida-funded program 'Energy Efficient Lighting and Appliances' (EELA) in East and Southern Africa, implemented by the United Nations Industrial Development Organization (UNIDO) in collaboration with the East African Centre of Excellence for Renewable Energy and Efficiency (EACREEE) and the Southern African Development Community Centre for Renewable Energy and Energy Efficiency (SACREEE), is working towards achieving the objective of reducing GHG emissions while improving living standards. The decision to focus on lighting and appliances is rooted in an assessment of the market dynamics within the Sub-Saharan Africa (SSA) region. Recognizing the role of EE practices in sustainable development, the

1. Under the 2015 Paris Agreement, countries agreed to cut greenhouse gas emissions with a view to 'holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels'.

project addresses the need for improved policies which in turn can secure more sustainable energy production and consumption patterns in SSA where electricity demand is foreseen to increase by 75 % by 2030 according to the IEA African Energy outlook 2022. In the Sustainable Africa Scenario (SAS[2]) it is evident that lighting and appliances are significant contributors to energy consumption in the region. In the SAS, households account for over half of the rise, driven by increased ownership of appliances and other electrical equipment for those that already have access as well as new household connections. The rest is contributed by industry (IEA 2022, p. 87). The project aims to foster EE technologies and practices that align with regional demands and challenges and the establishment of financing mechanisms for EE throughout all sectors of society.

The following pages illustrate how EE products helped make EE policy targets in SSA concrete. The paper investigates the role of single product quality aspects and standardization at the regional market level to initiate EE action programs in Africa, assuming: 1) Products (Lighting and Appliances) constitute a substantial part of the current and future energy use. 2) Regional Economic Communities and standardization bodies are well-placed to accelerate the quality aspect and bring legislative momentum. 3) Product quality and its energy-saving aspects are relevant for the general public, public procurement as well as industry and the commercial sector and thus create an opportunity for a strong demand-driven approach and revelation for energy efficiency interventions. 4) Technical specifications and quality standards are tangible Key Performance Indicators (KPI) used by financial institutions for financing EE schemes, therefore Minimum Energy Performance Standards (MEPS) enhance bankability. 5) Pay-back times for EE products are shorter than for whole building or industry refurbishment and EE intervention schemes, suggesting that entrepreneurs are likely ready to test the concept of energy service companies (ESCOs) in different forms. 6) Development financing can be effectively targeted towards pilots in this realm and catalyze private capital investments.

The paper is organized to provide an initial overview of the study's rationale and approach, followed by an exploration of the Status and Trends for Energy Challenges and Empowering solutions in EAC and SADC. Subsequently, the EELA project will be outlined, alongside impactful interventions, culminating in the presentation of results and conclusions.

Rationale and approach

This paper is based on the EELA project in the East African Community (EAC) and the South African Development Community (SADC), which aims to catalyze a shift in the market towards energy-efficient lighting and appliances throughout the two regions. While EE equipment is a strategic foundation, the project recognizes its role in establishing a more comprehensive institutional infrastructure for energy efficiency programs. This approach aligns with local resources and competence, providing new actors an opportunity to enter the market and build institutional capacity. The EELA project accelerates the execution and delivery of EE services in the region to meet anticipated objectives and closely collaborates with complementary initiatives like the United for Efficiency (U4E) programs and those under the Climate Technology Centre and Network (CTCN). It also supports the development of the EAC Regional EE Policy which constitutes a comprehensive EE policy framework and aims to accelerate the EE actions of the region. The importance of the EELA project lies in preparing the grounds for the pan-regional institutional capacity and market development for keeping EE high on the agenda and attracting private capital for sustainable investments over the coming decades in SSA. The focus is on technical solutions, capacity building, technical assistance, financial support and awareness raising. The intervention integrates gender aspects recognizing how EE appliances not only contribute to economic and environmental sustainability but also foster social and gender equality.

To build trust among investors and players within the international lighting and appliances industry, it has been important to create a transparent and inclusive process. This has been a way of avoiding that a minor number of international firms can control the market, which can sometimes result in unfavourable pricing, moderate quality, and above-normal market returns. Therefore, the design of the process includes an open and inclusive outreach and communication plan, a structured stakeholder dialogue, a series of events at the early stage of product selection and specification, clear communication of milestones for the technical standardization process and a high integrity standardization process anchored in the local governance structures, consulting international best praxis from MEPS development and ensuring no undue influence from manufacturing industries.

The methods employed in this paper draw from the authors first-hand involvement in the project implementation over a period of five years, incorporating insights gained from market studies, progress reporting, as well as engagement in meetings and workshops.

Status and Trends for Energy Challenges and Empowering Solutions in EAC and SADC

Lighting comprises roughly 15 % of global power usage and 5 % of GHG emissions, with a significantly larger proportion in areas where electricity accessibility and consumption are limited (UNFCCC 2023). Especially the countries in Southern and East Africa have limited access to electricity with regional electrification rates of an average of 51 % to 53 %, respectively (Statista Research Department 2023). Since 1990 energy intensity in SSA has increased and is likely to experience a boom in energy demand as well as in energy intensity. Reasons behind this include the growth of population (IEA 2021, p. 97) and anticipated economic growth in GDP, which is foreseen to be more remarkable in SSA than the world average (International Energy Agency 2021, p. 96, F. 2.1.). Countries in these regions therefore need to be set for managing energy intensity to keep their energy systems development in line with the Paris Agreement.

EE measures offer a range of possibilities. An overview of the EE regulatory measures in place made by Rise indicates that regulatory measures for EE were hardly existent in SSA by 2010. South Africa started to impose regulations in 2012,

2. The Sustainable Africa Scenario (SAS) envisions the continent accomplishing all of its energy and climate-related objectives by 2030, meeting universal energy access targets and fulfilling its Nationally Determined Contributions (NDCs).

followed by Rwanda in 2014, then Ghana and Kenya. Only after 2020, the number of countries with at starting to adopt regulations on EE amounted to ten.[3] While most of these countries have launched some kind of MEPS and labelling schemes, almost none have established financing mechanisms for EE (Rise 2021).[4,5] Within the context of ever more interconnected regional energy markets, the advancement, acceptance, and alignment of standards, regulations, and policies hold significance. For instance, Zambia and Zimbabwe took steps in 2016 and 2017 by introducing regulations via a statutory instrument (SI) to prohibit incandescent bulbs in line with the directives set by the SADC Ministers of Energy to eliminate inefficient lighting by 2019. However, the efficacy of these measures depends on broader regional adherence. The porous national borders pose challenges as banned products can still enter markets as the East and Southern African region lacks a common policy framework where countries have harmonized standards for traded goods. The interventions have been ad hoc rather than systematic, characterized by actions like replacing inefficient household lighting primarily funded by national electricity utility budgets. This has resulted in consumers often resorting to purchasing inexpensive, inefficient light bulbs when replacements are required. Markets remain country-focused and small, with limited economies of scale to address affordability through standardized products, resulting in limited private sector involvement in EELA development.

A review of countries' National Designated Contributions (NDC) in 2021, including 193 reporting countries, concludes that 70 % of the world's countries referred to EE in buildings as a priority. This is the second most prevalent priority area after renewable energy generation (UNFCCC 2021, fig. 13). In 65 % of the world's countries, efficient lighting, appliances and equipment have been identified as a mitigation option with significant potential for reducing emissions, costing USD 20/t CO_2 eq or less (UNFCCC 2021, paragraph 189). Nearly every nation in SSA has incorporated EE objectives in their NDCs, with some outlining precise goals related to electrical devices such as lighting and appliances. However, only a small number of them explicitly reference MEPS and labelling schemes[6]. Many countries, including those in SSA, often lack specific actions and financial mechanisms in their NDCs to support the stated targets. The EELA project is supporting countries to appropriately reflect energy efficient appliance ambitions in the revised NDCs (the next one expected in 2025).

The strategic focus on lighting and equipment in SSA as first movers for establishing EE policy interventions, governance structures and bankable investments is based on insights into the African energy markets, the recent deregulations of the power sector, including for rural electrification and the large dependence on off-grid solutions, but also given experiences from Europe. Among the European directives and measures that seemed most suitable for the African market was the Eco-design directive, focusing on single electric equipment and setting standards and market regulations based on them, which has resulted in EE gains amounting to 10 % lower annual energy consumption by the projects in scope[7]. Europe's experience is that measures, such as industrial processes and whole building refurbishment are more complex and require more in-depth competence than single products and therefore have hinged on voluntary market initiatives as well, such as building labelling schemes that go beyond mere building regulations. Centred around this complexity and increased value of knowledge, there is an opportunity for a private sector engagement that can for example include ESCOs and risk-sharing agreements. The single-product approach enables competence building at many levels, including standardization bodies, market regulators, procurement officers and others to create momentum and illustrate the financial viability of opting for EE in a market where no such business models were in place. The single-product market does not have to be tied to utilities but is more connected to the common over-the-counter market and public procurement of equipment. Single-product markets may also involve local manufacturing of products, after-market sales and repair as well as end-of-life management and recycling. This way lighting and appliances were seen to be an effective eye-opener for creating basic regulations, financial incentives, local skills, and business models. While it is anticipated that local business models can eventually take on more complex EE measures.

In SSA, 38 % of final electricity consumption is industrial, 36 % is for household use and 18 % for public and commercial services. In the latter two categories, electricity uses are largely tied to buildings, installations such as Heating, Ventilation and Air Conditioning (HVAC) and equipment, appliances and lighting devices appliances. Commercial and public services account for 18 % of the total energy consumption (United Nations Department of Economic and Social Affairs 2023, p. 46–47). Over-the-counter sales are an important market segment for EE lighting and appliances in Africa[8], although a substantial market share can also be subject to public[9] procurement schemes depending on the type of appliance. Commercial services also

3. SA (2012); Rwanda (2014); Ghana (2015); Kenya (2016); Malawi and Chad (2019); Senegal, Cote d'Ivoire and Niger (2020); Zambia (2021).

4. Mandatory MEPS for lighting (8/10 countries) SA; Rwanda; Ghana; Kenya; Malawi; Chad; Senegal; Cote d'Ivoire; Niger; Zambia. RISE 2021: Mandatory MEPS for HVAC (7/10) SA; Rwanda; Ghana; Kenya; Malawi; Chad; Senegal; Cote d'Ivoire; Niger; Zambia.

5. Note: Data presented herein may be subject to potential outdatedness due to evolving conditions.

6. Angola stands out with a focus on EE lighting. Botswana has no targets. DRC alludes to developing an EE strategy. Kenya addresses EE in general terms. Lesotho's includes improving access to modern EE technologies, launching awareness campaigns, and setting a goal to phase out incandescent bulbs. Mozambique emphasizes increased access to efficient technologies and clean energy, targeting the replacement of incandescent bulbs and the installation of off-grid lighting. Namibia aims to introduce EEA. Rwanda targets efficient lighting in buildings, the dissemination of CFL and LED lamps, subsidies, and VAT exemptions. SA mentions EE broadly without details. Uganda focuses on promoting renewable energy sources and EE technologies, targeting the adoption of EE lighting technologies and the replacement of lighting fuels. Tanzania is referring to appropriate technologies. Zambia lacks specificity, mentioning renewable energy and EE as part of broader mitigation focus areas. Zimbabwe mentions EE, with an emphasis on the agricultural value chain and general measures for EE buildings, but lacks specific targets related to equipment, standards, or labelling (UNFCCC 2024).

7. European Commission: The current Ecodesign Directive 2009/125/EC has a long track record of delivering benefits to businesses, consumers and the environment. In 2021 alone, the impact of the current Ecodesign measures, covering 31 product groups, saved EUR 120 billion in energy expenditure for EU consumers and led to a 10 % lower annual energy consumption by the products in scope.

8. Estimated as the household share of final electricity use at least.

9. Estimated to be the lion part of commercial and public share of final electricity use.

have an important market share and may acquire equipment through so-called concept designs such that lighting and appliances are included in the architectural design and acquired in other markets outside SSA.

Enhancing Energy Efficiency in EAC and SADC as a driver to improve lives and livelihoods – The driver for the development of the EELA project

Many SADC and EAC countries lack policies and regulations to control the entry and sale of products in their markets. Consumers with limited access to electricity often buy low-quality, inefficient products at lower prices, which, despite initial cost savings, have high electricity consumption and a short lifespan. This results in higher life-cycle costs and environmental harm, leading to electronic waste and inefficient resource utilization. Therefore, products such as cooling, lighting and electric appliances or devices designed for income-generating activities play a significant role in reducing poverty by decreasing energy costs for households and companies. This is benefiting especially low-income households, women, and small businesses in rural areas. Especially women are disproportionately affected by inefficient appliances as they often shoulder the responsibilities of household chores and use productive use appliances for income generation. Furthermore, women are the primary drivers of entrepreneurship in rural SSA, providers of energy solutions and thus hold the potential for successful ventures in the evolving energy landscape (United Nations Development Programme 2012, p. 3–5).

MEPS act as effective measures to phase out outdated technology, fostering the production and distribution of more efficient products, and playing a pivotal role in increasing the pace of the transition to efficient and environmentally friendly appliances. This prevents markets from becoming receptacles for products that are rejected in other parts of the world. Regional implementation of MEPS is crucial, in overcoming trade barriers and reducing costs through harmonized policies and shared testing laboratories. The associated harmonized standards yield enduring benefits, promoting consumer savings on electricity bills, amplifying industrial productivity and competitiveness, limiting loads in distribution networks, and contributing to long-term reductions in air pollution and GHG emissions. Successful MEPS enforcement hinges on supportive policies that complement their acceptance, necessitating a comprehensive approach, especially in developing countries like Uganda, where existing voluntary MEPS for various products underscore the need for multi-faceted strategies.

The private sector and policy regulations are coming into focus to efficiently transform the EELA market. It can play a crucial role in accelerating the uptake of EE appliances, but investments are hampered by insufficient regulations, the absence of affordable financing instruments and the need for the adoption of appropriate business models. The private sector's viewpoint is best addressed through national interventions, while regional contributions offer benefits such as harmonized trade, coordinated policies, and public-private development partnerships. The adoption of voluntary requirements, especially for upcoming MEPS, can be a tool for transforming supply chains, emphasizing quality over price as a competitive advantage. The SSA market for lighting and appliances faces challenges, like the private retail and service sector in general, including weak legislation, porous borders sub-standard product imports, and limited resources. While the transition to LED-based products has started, poor regulation and a lack of consensus on EE quality standards result in a lack of trust among consumers and suppliers in new technologies. In addition, the business environment for EE Lighting companies requires attention to factors beyond MEPS introduction, considering distribution networks, importers' multiple roles, and reliance on overseas suppliers for technical expertise.

Numerous factors highlight the importance of a collaboration of several countries in Southern and Eastern Africa. First, collaborations between regions can eliminate trade barriers for EE products and unlock economies of scale. Furthermore, regional collaboration contributes to cost efficiency, making sustainable appliances economically viable and accessible to a wide range of people. This cost reduction not only enhances affordability and fosters the widespread adoption of EE, but consequently also amplifies energy savings and environmental benefits. A regional collaboration also leads to a common framework for monitoring, verification, and enforcement of EE standards. Additionally, it supports coordinated compliance planning and efficient use of resources when a regional market shares comparable products. Another critical point which shows the benefits of regional collaboration is that it has immense potential to avoid the duplication of compliance efforts. The importance of regional harmonization becomes pronounced as both the EAC and SADC move towards establishing a customs union through the Common Market for East and Southern Africa (COMESA). This initiative aims for the free movement of goods and services, necessitating consistent standards across all countries within the customs union. As lighting products and appliances are traded goods, and as regional energy markets become more integrated, countries in East and Southern Africa must adopt complementary standards, regulations, and policies such as MEPS. Legal frameworks, such as the EAC Standardization, Quality Assurance, and Metrology Testing Act, provide the basis for the development of regional standards, with ongoing discussions for harmonization across EAC, SADC, and COMESA. The harmonization of standards supports the effective enforcement of regional regulations, such as the SADC's initiative to phase out incandescent bulbs. Additionally, it creates substantial market volumes, potentially attracting investments in manufacturing and assembly, and fostering the development of regional markets.

The adoption of EE relies heavily on the synergies among supportive policies, standards, regulations, and financing mechanisms. A significant obstacle to embracing efficient lighting, particularly the more advanced light-emitting diodes (LEDs), is the associated higher costs when new technologies enter the market. For example, in 2008, LED light bulbs could cost in the order of USD 50 per piece (Gullberg, M. & Bakiri, O. 2015). However, over time, larger volumes as well as effective enabling policies can play a pivotal role in driving down these costs. As demonstrated by current trends, the price of LEDs has considerably decreased in recent years, approaching parity with compact fluorescent lamps (CFLs). Concerns arise in developing countries due to a lack of technical, administrative, scientific, and enforcement capacities to meet emerging standards. This challenge is evident in the failure of many SADC member states to implement directives for phasing out inefficient lighting. A

comprehensive approach, encompassing policy, standards, regulations, and financing mechanisms, supported by extensive capacity building and awareness-raising, is crucial.

EE Appliances – High Impact Opportunity for the Private Sector

The following paragraph explores diverse business opportunities in EE, presenting models that benefit both private and public sectors, fostering economic growth in the countries of the EAC and SADC regions.

EE services are revolutionizing the energy landscape through innovative business models and operational principles. At the forefront of this transformation are Energy-as-a-Service (EaaS) models, which aim to alleviate the key barrier hindering end-users from accessing energy-efficient appliances and technologies at the upfront investment cost. An essential entity in this field is the Energy Service Company (ESCO), which serves as a prime example of an energy service business model.

ESCOs play a multifaceted role, encompassing the development, design, construction, and financing of projects geared towards energy conservation, cost reduction, and decreased operations and maintenance expenses. Clients engaging with ESCOs benefit from a streamlined arrangement, where they pay a fee for energy services without the concern of technical solutions or upfront investment costs. ESCOs, equipped with expertise in selecting optimal solutions based on energy consumption and life cycle costs, then implement and finance EE projects. ESCOs provide performance guarantees for entire projects, assuming the bulk of technical, financial, construction, and performance risks associated with EE interventions. ESCOs further diversify their services through various business models, including Energy Performance Contracting (EPC), Cooling as a Service (CaaS) and Lighting as a Service (LaaS). This dynamic and comprehensive approach positions ESCOs as key drivers in the transition toward a more EE future, providing knowledge and often sharing part of the financial risks. EPC is a strategic initiative where an ESCO takes on the responsibility of providing diverse energy services, guaranteeing energy or cost savings, and facilitating financing. The compensation structure for ESCOs is contingent on achieving the promised energy or cost savings. EPC offers flexibility through various arrangements such as shared savings, guaranteed savings, or a 'chauffage' contract.[10] Cooling as a Service (CaaS) represents an approach where end customers pay the ESCO for the cooling service rather than invest in the cooling equipment. This is especially interesting in East and Southern African countries, where lack of access to cooling leads to economic and social losses in agriculture, food value chains, and health services.

In a CaaS setup, clients cover expenses for equipment, installation, maintenance, electricity, and profit margins through periodic payments. These payments, fixed according to the quantity of cooling service received, distinguish CaaS from the EPC model. CaaS offers flexibility through pay-per-service or district cooling approaches, optimizing cooling infrastructure utilization. LaaS involves an ESCO selling lighting to clients, often building users or public lighting for municipalities, rather than the physical infrastructure providing lighting. The ESCO guarantees uptime and light levels, often specified in contractual illumination levels in addition to taking care of recycling and other end-of-life issues. LaaS also addresses the risk of technology installed today being eclipsed by future lighting technology. The diverse models offer several advantages to potential clients and ESCOs like overcoming the substantial upfront costs associated with adopting EE appliances and technologies and transforming costs from capital expenses to operational expenses for clients, freeing up capital for other crucial investment priorities.

In the realm of leasing models, there are distinctions between capital/finance leases and operating leases. A capital lease, resembling a long-term loan, involves the transfer of asset ownership to the lessee, who records the asset and its associated liability on the balance sheet. On the contrary, an operating lease allows asset usage without conveying ownership rights, representing a form of off-balance-sheet financing, keeping the asset and its liabilities off the company's balance sheet. Leasing offers benefits like avoiding upfront costs, optimizing subsidies and tax deductions, accessing additional financing with operating leases, and mandating suppliers to provide services. It enables the distribution of technology beyond financial reach, yielding cost savings. It also provides an avenue to distribute innovative energy technology that may initially face customer scepticism due to being unknown and perceived as risky. For equipment suppliers, leasing becomes an additional revenue stream alongside outright selling.

Results of the EELA project

The EELA project has played a pivotal role in advancing sustainable energy practices, yielding significant outcomes across various domains. The project focused on establishing a regional coordination mechanism and platform for EE Lighting and Appliances. This initiative is strongly locally driven and aims at fostering collaboration, sharing best practices, raising awareness of new policies, and exploring the market potential for ESCOs. The regional bodies within the EAC and the SADC embrace the project with commitment as the initiative aligns with the goals of the region, recognizing the potential for positive impacts on EE, economic development, and environmental sustainability.

In terms of policy influence, the project shaped the regional policy and regulatory environment in SADC and EAC and corresponding compliance frameworks. This involved considerations for climate change and gender responsiveness. The EELA project has resulted in the formulation and execution of regionally agreed-upon MEPS to advance EE standards. As part of the project, the EAC has recently introduced two new lighting standards. The first one, EAS 1064-1:2022, focuses on the EE and performance of lamps, including general service and tubular

10. In a shared savings contract, the ESCO assumes both performance and credit risks, funding the energy efficiency project from its resources or through a third-party loan. Cost savings are divided between the ESCO and the client for a predetermined period based on an agreed-upon percentage. Under a guaranteed savings contract, the ESCO commits to a specific energy level without financing the project. If actual savings fall short of covering the initial investment, the ESCO covers the difference; exceeding savings leads to the client paying an agreed percentage to the ESCO. The chauffage contract involves the ESCO delivering agreed energy services, like cooling, heating, or lighting, at a cost lower than the current bill or providing superior service for the same cost. The ESCO's earnings increase as it efficiently provides these services.

Table 1. MEPS adoption supported by the EELA project.

Adoption of MEPS	EAC REGION	SADC REGION*
MEPS for **Lighting** (General lighting, service lighting, off-grid lighting)	Regionally adopted in 2022 **National Adoptions****: Kenya, Rwanda and Uganda	Regionally adopted in April 2021 **National Adoptions****: DRC, Eswatini, Mozambique, Namibia, South Africa
MEPS for **Cooling Appliances** (Household Refrigerators and Room air conditioners)	Regional adoption process in an advanced stage **National Adoptions****: Rwanda	Regionally adopted on 7 November 2023 **National Adoptions****: Botswana, Eswatini, Namibia, Seychelles, South Africa and Zimbabwe are being supported by U4E and GIZ to adopt Cooling MEPS by end 2024 Stakeholder consultations have already begun in Botswana and Namibia

* *Zambia has started the adoption process for both MEPS for lighting and Cooling appliances under the Zambia Energy Efficiency and Sustainable Transformation (ZEEST or ZE2ST) Programme funded by the EU.*

** *Status March 2024.*

lamps and the second one, EAS 1064-2:2022, covers the EE and performance requirements of luminaires, specifically addressing ambient luminaires and outdoor luminaires (Clasp 2020). In SADC working under the SADC Cooperation in Standardization (SADCSTAN) umbrella, the regionally harmonised MEPS for lighting was approved and adopted in 2021 and referenced SADC HT109:2021. Further MEPS for room air conditioners and household refrigerators have been harmonised and adopted regionally as SADC HT 110:2023 and SADC HT 111:2023 for air conditioners and refrigerators respectively. The cooling MEPS were supported by the EELA project in cooperation with U4E.

Beyond the regional level, noteworthy progress has been achieved with five SADC member states, including DRC, Eswatini, Mozambique, Namibia, and South Africa in adopting MEPS for lighting at the national level. Similarly, within the EAC, Uganda, Kenya, and Rwanda have embraced the Harmonized MEPS for lighting at the national level. Furthermore, Eswatini, Botswana, Namibia Seychelles, South Africa and Zimbabwe are envisaged to adopt MEPS for refrigerators and air conditioners at the national level by the end of 2024 with technical assistance from U4E. Complimentary programmes in the region are offering further support at country level such as the "Leapfrogging to EE Refrigerators and Distribution Transformers" under the CTCN which is supporting eight SADC countries to advance on MEPS and roadmaps for larger uptake including financing mechanism. EELA partners are closely coordinating with these initiatives.

This widespread acceptance of MEPS has played a crucial role in promoting EE lighting and appliances in the market, although the challenge of addressing higher up-front costs remains pertinent.

The EELA project also prioritized strengthening capacities within key institutions, testing centres, and stakeholder groups, investing in knowledge, skills, and infrastructure for the long-term viability of EE practices.

Appliance testing and monitoring capacity has been strengthened in the regions through the establishment of regional reference laboratories in Uganda and Mozambique and the procurement of portable lighting test equipment for all 21 SADC and EAC member states (MS). Capacity-building workshops, both virtual and physical have been held for laboratory technicians using the portable lighting test equipment. Currently, Lab technicians in MS are receiving technical assistance to test LED lamps on the market and establish baselines of existing EE lighting in the countries. Reports have been shared with Ministries of Energy in the respective country and the EELA Project.

Furthermore, the project demonstrates results in private sector development. Incentive mechanisms to encourage projects based on EE lighting and appliances in SADC and EAC were established through the launch of the EELA Technical Assistance and Co-financing Facility, motivating stakeholders to adopt sustainable energy practices, and creating a self-sustaining ecosystem for EE projects. Examples of effective pilot initiatives supported by the EELA project have emerged in Kenya, focusing on the agricultural sector; in Malawi, targeting households and agricultural enterprises; and in Rwanda, directed at commercial establishments providing public services such as health and education. The types of contracts entail Energy Service Performance Contracting including a shared savings agreement and Hire and Purchase agreements including arrangements based on payroll deductions. In total, these EELA pilots demonstrate annual energy savings amounting to 2,188 MWh, equivalent to 314 tonnes of CO_2 eq. reduced emission, per annum. This shows how development financing (ODA) can be catalytic and mobilize other capital (private or public) to achieve results. Business arrangements that can embrace ODA seed funding are important for reaching the most vulnerable groups and leaving no one behind.

The project further particularly enhanced awareness among market players and policymakers, disseminating information, educational initiatives, and targeted campaigns to create a comprehensive understanding of EE benefits.

In conclusion, the outcomes of the EELA project collectively reflect a comprehensive and integrated approach to advancing sustainable energy practices in the SADC and EAC regions. By addressing coordination, policy, capacity, awareness, and incentives, the project has made significant strides toward fostering a greener and more EE future in these vital regions.

Conclusions and recommendations

Africa's aspired economic growth and industrialization is expected to result in a significant increase in the demand for energy. In order to be able to meet this demand, a net zero motivated transformation of the economy with investments in energy infrastructure is required, with clean technologies at

the forefront, including high performing energy efficient appliances. The EELA project drew important lessons learned after five years of implementation highlighting that continuous collective efforts towards a market transformation promoting high performing energy efficient appliances for household and productive use is essential. The authors of this paper strongly suggest based on their experience that countries in SSA continue to develop and update specifications for MEPS and quality and propose to support further enhanced institutional capacities. In particular, the authors recommend supporting enhanced institutional capabilities to develop, manufacture, test and demonstrate the quality of electric lighting and appliances within SSA. It is critical to enhance local demand for EE appliances and products with the public sector in the forefront through powerful policy tools such as the integration of EE requirements in public procurement practices. Further efforts are required to strengthen the value chains for high performing EE appliances in Africa, identifying opportunities for enhanced local value addition though increased manufacturing or assembling. It is advised to retain an inclusive and transparent process that brings in particularly African youth and female entrepreneurs. MEPS can benefit the development of local markets, they create entry barriers for low quality and inefficient appliances into the market, serve as a catalyst for the growth and prosperity of local producers by encouraging innovation, improving competitiveness, and facilitating market access. Furthermore, the authors encourage countries in SSA to support a variety of private sector initiatives that can benefit from deploying and installing quality products and complement their deeper knowledge for more EE intervention and services-offering, including after-sales market and end-of-life management of products.

Moreover, the absence of private sector involvement is concerning, as their participation is vital for fostering adoption and enforcement. Energy Service business models supported under the EELA project have demonstrated the business case and the high potential in the region with important lessons learned. For the private sector to stronger embark on this business opportunity, appropriate financing mechanisms responding to the particular needs for EE projects need to be accessible. Close collaboration with financing institutions is critical to design these instruments and to facilitate risk evaluation of EE projects.

Lessons learned of the EELA project indicate the necessity to continue targeting industrialization and business opportunities, particularly in local manufacturing and specialized ESCOs. Experiences emphasize the importance of adaptive strategies to address evolving market dynamics and capitalize on emerging opportunities in the pursuit of sustainable energy practices.

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