



eSwatini

*Energy and the poor*  
Unpacking the investment  
case for clean energy

## The Making Access Possible Programme

Making Access Possible (MAP) is a multi-country initiative to support financial inclusion through a process of evidence-based country diagnostic and stakeholder dialogue, leading to the development

of national financial inclusion roadmaps that identify key drivers of financial inclusion and recommended action. Through its design, MAP seeks to strengthen and focus the domestic development

dialogue on financial inclusion. The global project seeks to engage with various other international platforms and entities impacting on financial inclusion, using the evidence gathered at the country level.

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The views expressed in this publication are those of the author(s) and do not necessarily represent those of the United Nations, including UNDP, or the UN Member States.

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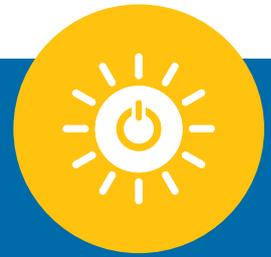
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## The cover symbol and artwork

Through the MAP programme, we hope to effect real change at country level and see the impact of financial inclusion on broader national growth and development. The cover graphic features the Leontopodium, the national flower of eSwatini. The flower symbolises growth and development while the circle represents inclusive growth. Each flower is an example of the successful growth in a unique environment.





# Working together to support implementation of Agenda 2030

*Countries are seeking new ways to address complex and interconnected challenges. Reaching the promise of the SDGs requires multisectoral approaches that brings together expertise from a range of perspectives. By harnessing our comparative advantage and working within the context of our respective mandates, we can collectively make significant progress towards achieving the vision of the Sustainable Development Goals (SDGs).*

This diagnostic on access to clean energy is a collaboration with the United Nations Development Programme (UNDP) and the United Nations Capital Development Fund (UNCDF) to jointly address UNDP's Signature Solution 5 that seeks to work with countries to close the energy access gap.

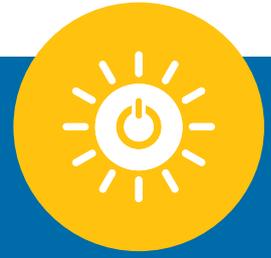
Signature Solution 5 focuses on increasing energy access, promoting renewable energy and enhancing energy efficiency in a manner that is inclusive and responsive to the needs of different sectors of the population, in line with the aspirations of Sustainable Development Goal 7.

This will support countries to transition to sustainable energy systems by working to de-risk the investment environment; attract and leverage private and public-sector resources. In contexts, where energy does not yet reach everybody, it will be necessary to focus on supporting innovative private and public solutions that increase energy access and delivery.

In contexts where energy is already available to most or all people, the focus will be on transitioning to renewable energy and energy efficiency measures and policies.



*UNCDF offers “last mile” finance models that unlock public and private resources, especially at the domestic level, to reduce poverty and support local economic development.*



## Partnering for a common Purpose

*By combining inspiration, ideas and resources with our partners, we become more than the sum of our parts.*

We are committed to empowering investors—public and private—with the clarity, insights and tools they need to optimize the positive impact of their investments, closing the gap between high-level principles and financial performance to make a positive contribution to society.

FinMark Trust is an independent non-profit trust whose purpose is ‘Making financial markets work for the poor, by promoting financial inclusion and regional financial integration’, by using both the creation and systematic analysis of financial services consumer data to provide in depth insights and following through with systematic financial sector inclusion implementation actions to overcome market level barriers hampering the effective provision of services, thus working to unlock real economic sector development through financial inclusion.

The UNDCF, together with MAP partner FinMark Trust, commissioned Nova Economics to undertake a market assessment of the energy needs, usage and market potential, focusing on the potential for cleaner off-grid energy solutions across five countries in the Southern African Development Community (SADC) region, namely Lesotho, eSwatini, Malawi, Mozambique and Madagascar. The objective of this study is to provide insight into the potential to develop the market for, and promote access to, cleaner off-grid energy solutions in the selected countries. This includes insight into the current programmes and initiatives in each market, to assess the current supply and demand for off-grid cleaner energy solutions and the scope for partnerships and innovative financing models to move forward the clean energy agenda under SDG 7 as it relates to financial inclusion and inclusive growth.

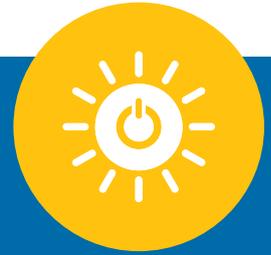
This report represents the country analysis and findings for eSwatini only. A separate report for each country is available, as well as a summary report drawing together the findings for all five countries.

### *Note on the use of household data*

Within this document (unless otherwise referenced), demographic, income and financial usage data is obtained from the 2018 FinScope Consumer Survey and the 2017 FinScope MSME survey undertaken in eSwatini. A summary report and presentation of FinScope is available as a separate deliverable, and the FinScope dataset is available for future research at <https://uncdfmapdata.org>.



*The transition to clean and affordable energy helps countries reduce the impacts of indoor and outdoor air pollution, particularly in rapidly developing urban areas.*



## Our technical response

The MAP target market segmentation model identified four crucial consumption needs that households are regularly fulfilling out of their income. Payments for energy and utility services are consistently highlighted as the single most crucial need. The methodology as applied here seeks to address the need for access to energy as it relates to current usage, affordability and access to infrastructure in order to identify and quantify the financing necessary to accelerate the transition to clean energy.

### *UNDP's work on Energy*

UNDP is the leading United Nations organization fighting to end the injustice of poverty, inequality, and climate change. Working with our broad network of experts and partners in 170 countries, we help nations build integrated, lasting solutions for people and planet.

UNDP's Energy team focuses on clean and affordable energy development; low-emission, climate-resilient urban and transport infrastructure; and access to new financing mechanisms. Learn more at [undp.org](http://undp.org) or follow at [@UNDP](https://twitter.com/UNDP)

### *UNCDF's work on Energy*

UNCDF's energy programme aims to improve access to clean energy finance for poor and low-income people. By partnering with energy and financial service providers and offering capital, data analytics, capacity building and policy advocacy services in the off-grid energy finance markets, UNCDF has scaled energy business models for cleaner, efficient and more effective sources of energy for poor people. As of 2019, UNCDF digital energy finance activities have enabled over 3 million people to benefit from clean energy solutions through micro and PayGo financing.

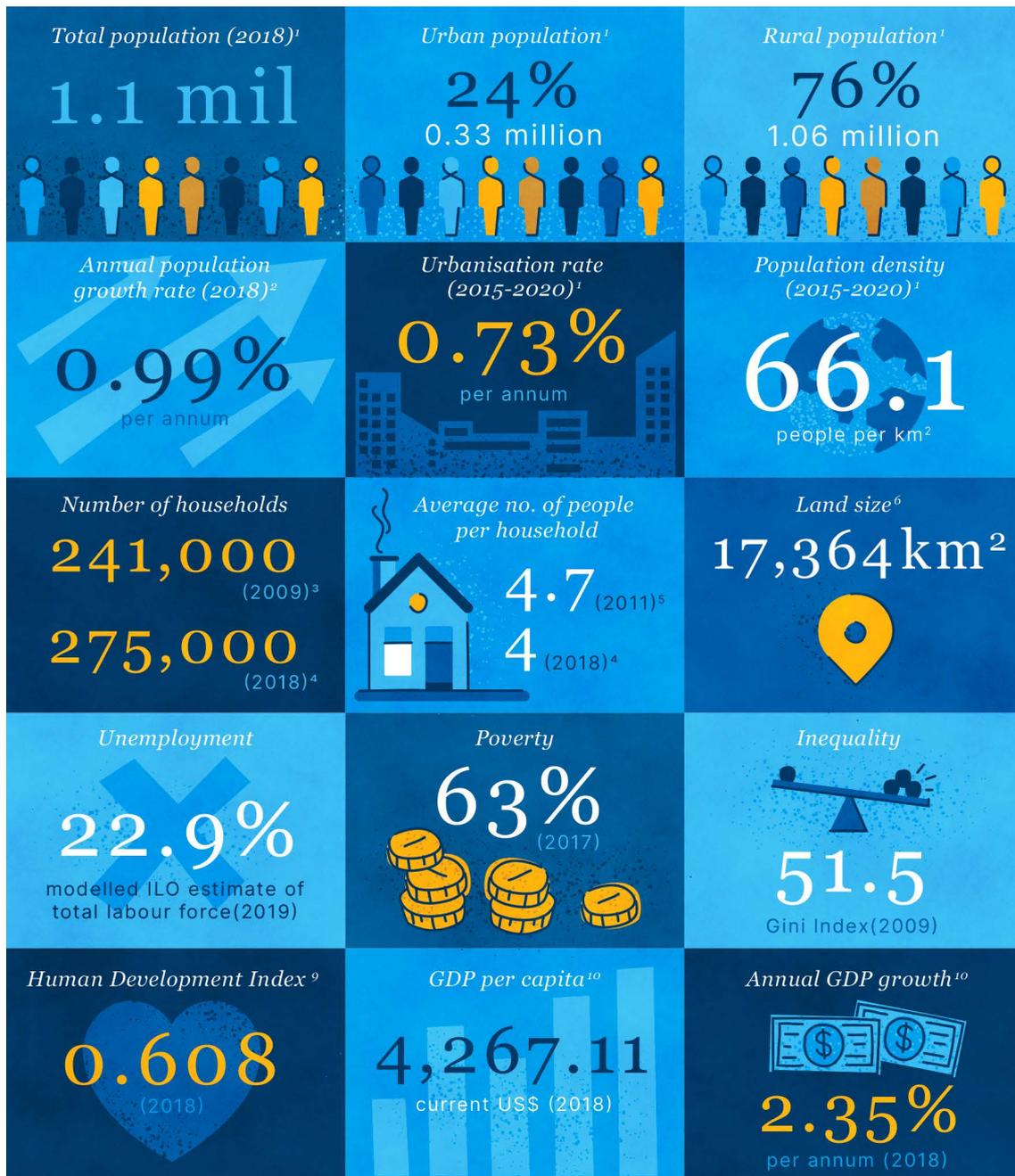


*The methodology as applied here seeks to address the need for access to energy as it relates to current usage, affordability and access to infrastructure in order to identify and quantify the financing necessary to accelerate the transition to clean energy.*

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# eSwatini at a glance

*eSwatini is a landlocked country situated between South Africa and Mozambique, covering only 17,364 km<sup>2</sup> giving it a population density of 66.1 people per km<sup>2</sup>.*



Sources: 1) Based on UN population estimates 2) UN World Urbanization Prospects: The 2018 Revision 3) Derived (population/average household size) 4) Estimated using total population 2018, and average household size of 4 (<https://www.prb.org/international/indicator/hh-size-av/map/>). 5) UN statistics database, household size and composition 6) CIA world factbook 7) Country census, demographic statistics database, 8) IMF, World Economic Outlook database 9) UN Statistics Division 10) IMF, World Economic Outlook database, 2018

The proportion of people living in urban areas has grown at an average annual rate of 0.7 percent and accounts for 24 percent of the total population (2018). eSwatini is classified as a lower-middle-income country with GDP per capita at USD 4,267 (2018), but inequality is high (Gini coefficient 51.5). During 2018, eSwatini's GDP grew by 2.35 percent with inflation at 2.8 percent. There is significant income and wealth disparity between urban and rural populations with roughly 63 percent of people living in poverty as nationally defined (FinScope 2019 finds that 41 percent of the population earns USD 1.9 per day or less).

The country ranks low on the UN Human Development Index (HDI), scoring only 0.608 (138 out of 189 countries). The HIV/AIDS prevalence rate in the 15 to 49 age group is 28 percent, the highest in the world. Youth populations (0-17 years of age) represent 43 percent of the total population. Unemployment is estimated at 23 percent with most employment opportunities in the service sector (63.3 percent), and industrial activities (24 percent). Agriculture accounts for only 12.7 percent of employment.

## Energy sector overview

eSwatini is heavily dependent on solid fuels (biomass sources such as wood, bagasse - a by-product of the sugar industry), coal and oil products. With no oil or natural gas reserves, the country imports oil and gas, as well as coal from South Africa. The population relies on multiple fuel sources to meet its domestic and productive energy needs. In rural areas, biomass is used for cooking and heating, and candles, paraffin and electricity for lighting. Approximately 90 percent of the total rural energy is provided by fuelwood. In urban areas, households rely less on biomass and more on electricity for lighting but are still reliant on biomass sources of energy for cooking and heating. Despite relatively good access to the electricity grid (estimated at 80 percent for 2020), there is still large-scale use of biomass energy, which reflects the level of poverty and affordability of other energy sources. This is both ineffective and damaging for the mitigation of climate change.

Electricity is transmitted and distributed by the state-owned and vertically integrated eSwatini Electricity Company (EEC). In 2018/2019, the EEC sold 1105.8 gigawatt hours (GWh) of electricity, and the system maximum demand was reported as 238 megawatts (MW). However, the EEC only has an installed generation capacity of approximately 70 MW. Domestic generation is therefore insufficient to meet national demand with a peak capacity shortfall of ~170 MW. This makes eSwatini a net importer of electricity which it obtains largely from Eskom in South Africa (and to some extent from the South African power pool on the day-ahead market). Domestic electricity consumption was estimated at 795 kilowatt-hour (kWh) per capita in 2019 (or 2.2 kWh per person per day).<sup>1</sup>



*Despite 80% access to the electricity grid (2020) there is still large-scale use of biomass energy, which reflects the level of poverty and affordability of other energy sources.*

<sup>1</sup> eSwatini Electricity Company. "Annual Reports,"

EEC generation peaked in 2011 when local generation contributed 29 percent to the national requirements, and it is currently contributing only 21 percent (2019). This contribution comes largely from hydropower generated by four plants ranging in capacity between 5 MW and 20 MW. However, these stations are not baseload power stations<sup>2</sup>. There is limited dam capacity, which is subject to variable and unreliable rainfall patterns. Consequently, these hydro stations are not run constantly but rather serve as peaking power. Furthermore, in drought years like 2016, the EEC has only been able to generate 10 percent of total electricity output.

As a result, in 2019, the majority of power used in the country (59 percent) was imported from Eskom, the state-owned utility in South Africa. The EEC also procured 20 percent of the country's needs from a few local independent power producers and the South African Power Pool. For instance, the sugar industry owns and operates significant co-generation facilities (with a capacity of 107 MW) that provide electricity to its factories and associated communities using bagasse. One company, Ubombo Sugar Limited, sells a portion of the electricity it generates to the EEC.

The Ministry of Natural Resources and Energy (MNRE) is responsible for policy and overall oversight of the electricity supply industry. In 2018, the MNRE promulgated the National Energy Policy 2018 (NEP). The policy sets out five objectives: (a) Ensuring access to modern energy services for all; (b) Enhancing employment creation; (c) Ensuring security of energy supply; (d) Stimulating economic growth and development; and (d) Ensuring environmental and health sustainability.<sup>3</sup>

## Rate of electrification, electrification plans and need for off-grid solutions.

Access to electricity has grown rapidly in the past decade. In 2007, only 40.9 percent of the population had access to electricity and by 2017 this had risen to 73.5 percent. Estimates show that this has risen to 80 percent by 2020. In 2013, eSwatini opted into the Sustainable Energy for All (SEforALL) programme, a global initiative of the United Nations to drive action towards Sustainable Development Goal (SDG) 7 on access to affordable, reliable, sustainable and modern energy for all<sup>4</sup>. eSwatini's SEforALL Rapid Assessment and Gap Analysis, together with an Action Plan for 2014 to 2030, were successfully implemented in 2014 with support from UNDP.

eSwatini's progress toward its stated goal of universal access has in large part been due to the Rural Electrification Program (REP) supported by both government and grants from cooperating partners including Taiwan, China and



*In 2007, only 40.9% of the population had access to electricity and by 2017 this had risen to 73.5%. Estimates show that this has risen to 80% by 2020.*

2 The baseload of a grid is the minimum level of demand on an electrical grid over a span of time. The baseload therefore is not adequate to meet demand during peak demand periods.

3 Kingdom of eSwatini, Ministry of Natural Resources and Energy, "ENERGY MASTERPLAN 2034."

4 Kingdom of eSwatini, Ministry of Natural Resources and Energy, "ENERGY MASTERPLAN 2034."

the EU (via a micro-project programme)<sup>5</sup>. The micro-projects programme is expected to reduce available funding. Given the current reliance on funding from the micro-projects programme to help expand electrification, reduced funding for this programme, which is now expected, will increase the funding gap for future electrification. This funding gap will partly be addressed through the Rural Access Fund established by the Government of the Kingdom of eSwatini (GoKE) which has been capitalised since April 2017 through a levy on electricity tariffs. A review of completed electrification projects in the fiscal year ending March 2019 shows that the EEC has continued to focus on the electrification of households in rural areas.<sup>6</sup>

In order to meet the targets set by SDG 7 and to estimate the likely future electricity access deficit in 2030, we extrapolated the current rate at which the government is electrifying households and the increasing need due to expected population growth (see Table 1).<sup>7</sup>

Our analysis has shown, that between 2012 and 2017, eSwatini connected an average of 41,000 people to the grid annually. If EEC is able to connect the same number of people annually, and that eSwatini’s total population increases from 1.1 million to 1.3 million by 2030,<sup>8</sup> 100 percent of the rural population and 97 percent of the urban population will have access to the grid by 2030.



*Our analysis has shown, that between 2012 and 2017, eSwatini connected an average of 41,000 people to the grid annually*

**Table 1: Nominal change in electrification (average annual)**

PERIOD	ESWATINI
<b>Urban</b>	
2007 – 2012	7 698
2012 – 2017	9 029
2017 – 2030*	9 029
<b>Rural</b>	
2007 – 2012	32 833
2012 – 2017	31 928
2017 – 2030*	32 833

\* Projected  
Source: Own analysis

eSwatini has set ambitious targets to increase electricity access for households from 80 percent currently (2020) to 85 percent in 2022 through the acceleration of the REP. The MNRE has cautioned however that with reduced donor support, electrification rates will slow and universal access to electricity may only be

5 “Network Reinforcement and Access Project (P166170),” updated March 07, 2019.  
6 Eswatini Electricity Company, “Eswatini Electricity Company Annual Report, 2018-2019.”  
7 See Appendix A for more detail on our electrification projections.  
8 Based on UN population estimates and projections

reached by 2034. In 2018, the MNRE promulgated the National Energy Policy 2018 (NEP) which sets out eleven broad policy objectives for the energy sector. Some of the most relevant objectives (concerning off-grid clean energy) are to:

- Ensure the efficient and cost-effective electricity supply integrating pricing for economic efficiency and financial sector viability.
- Support the development of renewable energy resources for a target of 50 percent of the electricity generation mix.
- To strive to provide all households with access to modern energy.

In 2018, MNRE in conjunction with UNDP produced a framework to achieve affordable clean energy for all known as the Partnership for Affordable Renewable Energy (PAREE). Under the framework, UNDP seeks to facilitate investment in renewable energy and build generation capacity through public-private partnerships. The framework aims to assist eSwatini in attracting investment into both on-grid and off-grid renewable development projects. It notes however that as access has risen, it is increasingly expensive to extend the electric grid to remote areas, given the high maintenance costs and low returns.

The MNRE also released a Kingdom of eSwatini Energy Masterplan 2034<sup>9</sup> which was developed with support from the International Renewable Energy Agency (IRENA). In the masterplan, the GoKE acknowledges that the target to achieve universal access is ambitious and will only be realised if there is increased investment and continued support from donors. The plan illustrates that most households in eSwatini live within one kilometre of the existing grid network, hence the historical focus on grid extension as the means of achieving universal access.

In terms of the need for off-grid solutions, the Energy Masterplan 2034 recognises that grid extension may not be the least cost solution for all remaining rural communities. According to the masterplan, it may be necessary to fund distributed (off-grid) systems in areas where grid extension is not expected in the foreseeable future due to high capital costs. This may include mini-grids and solar home systems (SHS).



*The target to achieve universal access is ambitious and will only be realised if there is increased investment and continued support from donors.*

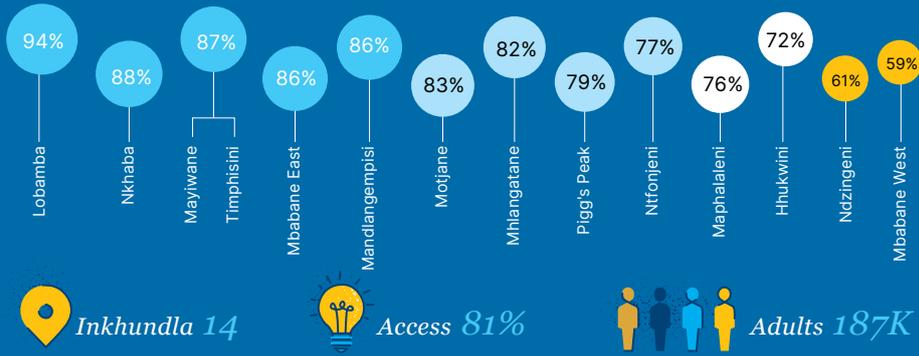
## A closer look at access to energy – consumer realities on the ground

High level national numbers tends to mask the realities within small communities and rural areas. Using FinScope, a closer analysis on the consumer realities on the ground was undertaken by looking at the underlying access to energy within the different regions.

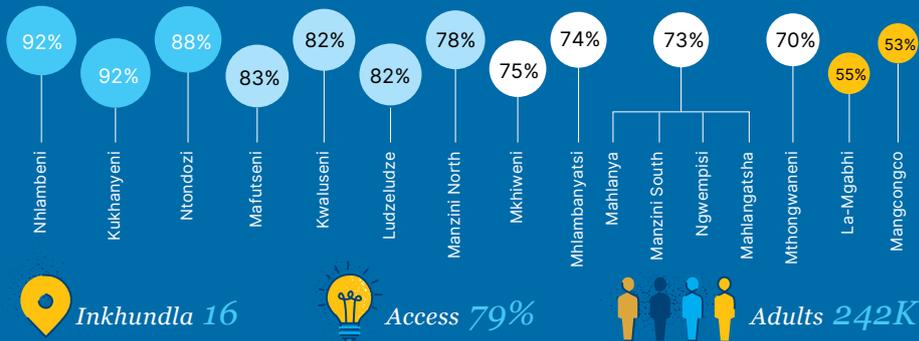
FinScope Eswatini (2018) finds that 76 percent of adults had access to electricity in 2018, which is in line with the increasing access trend projected by World Bank data. Access is the lowest in Shiselweni (66 percent) and highest in Hhohho (81 percent). Access in Manzini is 79 percent. Access at a sub district level (inkhundla) is contributing to regional differences. There are

9 Kingdom of eSwatini, Ministry of Natural Resources and Energy, "ENERGY MASTERPLAN 2034."

## Hhohho



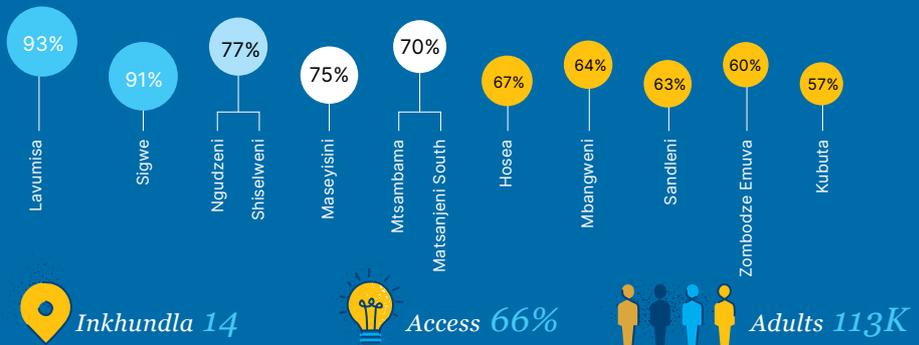
## Manzini



## Lubombo



## Shiselweni



● 86% access or more    ● 76% to 85% access    ● 70% to 75% access    ● less than 70% access

Figure 1: Access to electricity by sub division (Inkhundla)

Source: FinScope Eswatini 2018

12 inkhundla where access is less than 70 percent (out of a total of 55). Of these, 7 inkhundla are in Shiselweni, which is 50 percent of all subdivisions in Shiselweni. Furthermore, there are 14 inkhundla where access to electricity is 85 percent or higher. Of these, 6 are in Hhohho (43 percent), while only two are in Shiselweni. However, the three inkhundla with the lowest rates of access are not in Shiselweni, rather, these are in Manzini (2) and Lubombo.

Access to electricity also correlates with education. Only 65 percent of those with no education or only primary education has access, while 91 percent of those with a tertiary education has access to electricity from the grid. In addition, access correlates with income. Of those who earn E2,000 (USD 121) per month or less (76 percent of adults), only 73 percent have access, while for those earning more than E2,000 (24 percent of adults), 86 percent have access. Similarly, poverty has a big impact. Of those who have experienced one of three poverty related events<sup>10</sup> in the last year (43 percent of adults), only 66 percent had access to electricity, while 86 percent of those who have not experienced these events in the past year has access. Access is also low for people whose main income source is government grants (4 percent of adults of which 63 percent has electricity access), and farming/fishing (4 percent of adults of which 69 percent has electricity access). This is in contrast with formal employees which represent 19 percent of adults with 80 percent access to electricity.



*Access correlates with income. Of those who earn E2,000 per month or less (76 percent of adults), only 73 percent have access, while for those earning more than E2,000 (24 percent of adults), 86 percent have access.*

## Initiatives promoting off-grid cleaner energy uptake

While several development partners are active in the grid electrification space, there are few programmes and initiatives that focus on the uptake of off-grid solutions.

**Table 2:** Donor initiatives to promote off-grid renewable energy solutions in eSwatini

DONOR	FUNDING	DATES	TECHNOLOGY	OBJECTIVES
UNDP	Up to USD 7.7 million- in the project concept stage at present.	Up to 2024	RE systems such as mini-grids, microgrids, SHS, Pico PV and utility-scale renewable energy (on-grid)	Facilitate access to electricity from renewable sources to approximately 30 % of Swazi's with no access to electricity by the year 2024. Project in inception stage, at present, with project documentation being developed to pilot mini-grids.
World Bank	~USD 2 million of a broader USD 40 million project	Up to 2024	Off-grid and on-grid	This component will finance technical assistance to enhance electrification planning, implementation, monitoring, and verification capacity at the MNRE. It will also maximise financing for development by enabling greater private sector participation in renewable energy generation and off-grid electrification.

<sup>10</sup> Poverty related events include: skipping a meal, foregoing medical care/medicine when required, or unable to send children to school

The PAREE framework from MNRE and UNDP proposed a revision of the rural electrification plan to include off-grid pro-poor solutions such as mini-grids, microgrids and rooftop PV. The programme identified the need to:

- conduct feasibility studies to identify appropriate mini-grid pilot sites
- set up at least one demonstration site
- establish at least four mini-grids
- roll out 200 solar home systems.

Within the broader PAREE framework, UNDP is currently designing a Global Environment Facility (GEF) funded project to pilot the use of renewable energy mini-grids in isolated rural communities in eSwatini. The UNDP is also assisting eSwatini to access funding for off-grid solutions from the Global Environmental Facility Clean Rural Electrification for African Countries (GEF CREAC) programme.

The World Bank notes that it will aim to complement the activities of other partners in the sector and in particular the PAREE programme. The World Bank has also committed to support eSwatini with a USD 40 million loan for grid network reinforcement and electricity access from 2019 to 2024<sup>11</sup>. The project aims to support the country's goal of reaching universal access to electricity by 2022 via the REP. The project is expected to improve the reliability and quality of electricity supply in the Shiselweni area<sup>12</sup>, including the provision of access to an estimated 8,000 households (32,000 people) and a reduction in network losses.

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11 Kapika, Joseph Mwelwa. 2019. Environmental and Social Commitment Plan - Network Reinforcement and Access Project - P166170.

12 One of four regions in Eswatini.

# 3 / Access to electricity

## A framework for access to energy

Typical measures of energy access include the proportion of households that have access to electricity via the national grid. Simple measures like this, however, cannot provide an accurate view of the quality and quantity of energy provided. Our series of reports applies a more detailed framework for the evaluation of access to energy, based largely on the ESMAP/SEforALL multi-tier framework. For more detail on this approach and framework, please see the cross-country summary report.

Access to energy has been recognised as a key enabler of socio-economic development. Universal access to ‘modern energy’ by 2030 is one of the three key pillars of the SEforALL programme. SEforAll is an initiative co-chaired by the Secretary-General of the United Nations and the President of the World Bank. In 2015, the SEforALL Knowledge Hub, with the Energy Sector Management Assistance Program (ESMAP) of the World Bank released a report outlining a multi-tier framework for defining and measuring access to energy.<sup>13</sup> This multi-tier framework outlines the use of three main sources of energy by households:

- electricity
- solid fuels
- modern fuels

Solid and modern fuels are used primarily for cooking and heating. Solid fuels as defined in the multi-tier framework include biomass such as wood, charcoal and dung, as well as coal. Modern fuels include liquid petroleum gas (LPG), natural gas, kerosene (including paraffin), ethanol, and biofuels.<sup>14</sup>

The multi-tier approach aims to measure access to household electricity as a continuum of improvement (as opposed to a binary metric like access vs. no access). This is done by reflecting all attributes of electricity supply that affect the user’s experience while being technology and fuel neutral. Different energy services (such as lighting, television, air circulation, refrigeration, space heating, etc.) require different levels and quality of energy. The actual use of energy might be constrained by factors such as capacity, availability, affordability and convenience amongst others.



*Access to energy has been recognised as a key enabler of socio-economic development.*

*Universal access to ‘modern energy’ by 2030 is one of the three key pillars of the SEforALL programme.*

13 Mikul and Angelou, “Beyond Connections - Energy Access Redefined.” p.15

14 Mikul and Angelou, “Beyond Connections - Energy Access Redefined.”

In terms of the framework, households in Tier 0 are said to have no access to electricity while households in Tier 5 have full access to reliable, safe and good quality electricity. Access to all sources of energy can be measured using multi-tiered standards, including access to *cleaner off-grid electricity*. The relevant ESMAP/SEforALL multi-tier standards for household access to grid-supplied electricity are presented in Table 3.

**Table 3: Multi-tier energy framework to measure access to household electricity supply**

ATTRIBUTES	TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Power capacity ratings (daily Wh)		Min 12 Wh	Min 200 Wh	Min 1.0 kWh	Min 3.4 kWh	Min 8.2 kWh
Supported appliances		Task lighting and phone charging	General lighting, phone charging and television/fan (if needed)	Tier 2 and medium power appliances	Tier 3 and high-power appliances	Tier 4 and very high-power appliances
Typical supply technologies		Solar lantern	Small SHS, Rechargeable battery	Medium SHS, Fossil fuel-based generator, Mini-grid	Large SHS, Fossil fuel-based generator, Mini-grid, Central grid	Large fossil fuel-based generator, Central grid
Availability (Duration)		Min 4 hrs	Min 4 hrs	Min 8 hrs	Min 16 hrs	Min 23 hrs
Reliability					Max 14 disruptions per week	Max 3 disruptions per week of total duration <2 hrs
Quality					Voltage problems do not affect the use of desired appliances	
Affordability				Cost of a standard consumption package of 365 kWh/year <5 % of household income		

Source: ESMAP, SEforALL (2015) Energy Access Redefined

Off-grid technologies such as solar home systems can be used to provide electricity services from Tier 2 to Tier 4, while mini-grids are typically used to provide services from Tier 3 to Tier 4. Table 4 illustrates which energy services can be accessed by households at each tier and which of the services could also be met using either solid or modern fuels. While solid and modern fuels can often be used instead of electricity for cooking, heating and lighting, access to electricity is required for most other energy services.

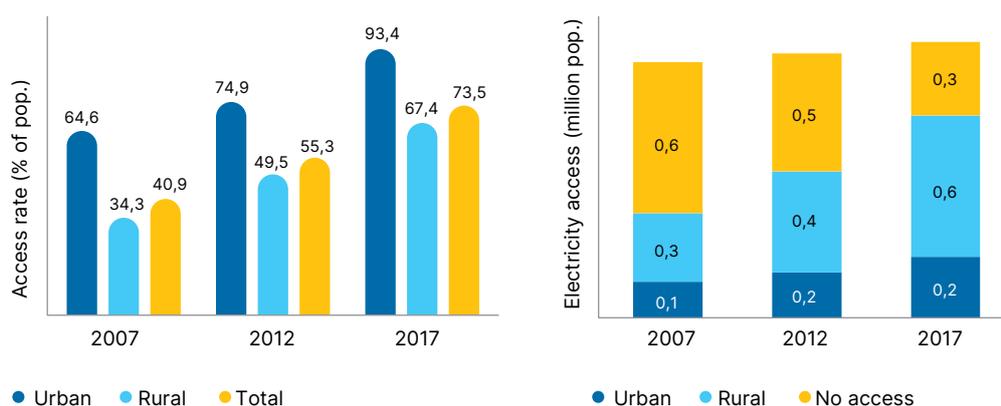
**Table 4:** Access to energy services by tier and source of energy

Energy services	ELECTRICITY						MODERN FUELS	SOLID FUELS
	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5		
1. Lighting		✓	✓	✓	✓	✓	✓	✓
2. Entertainment and communication		✓	✓	✓	✓	✓		
3. Space cooling and heating			✓	✓	✓	✓	✓	✓
4. Refrigeration				✓	✓	✓		
5. Mechanical loads				✓	✓	✓	✓	
6. Product heating					✓	✓	✓	✓
7. Cooking				✓	✓	✓	✓	✓

Source: Own analysis based on ESMAP SEforALL. 2015. Energy Access Redefined

## Access rate and deficit

eSwatini has a high electricity access rate by comparison to other countries in Sub-Saharan Africa. In 2017, 73.5 percent of the population had access to electricity (estimated at 80 percent in 2020) via the national grid. As mentioned, the access rate has almost doubled from 40.9 percent in 2007; the access deficit - the number of people without access to electricity - has also continued to fall. In 2017, 298,000 Swazis had no access to electricity, down from 627,000 in 2007 (Figure 1). However, access to grid-supplied electricity is significantly lower in rural eSwatini. In 2017, only 67.4 percent of the 265,000 Swazi's living in rural areas had access to grid-supplied electricity compared to an access rate of over 97 percent in urban areas. (Figure 2).



**Figure 2:** Access to grid-supplied electricity, eSwatini (2007, 2012, 2017)

Source: Own analysis based on data sourced from the World Bank development indicators database

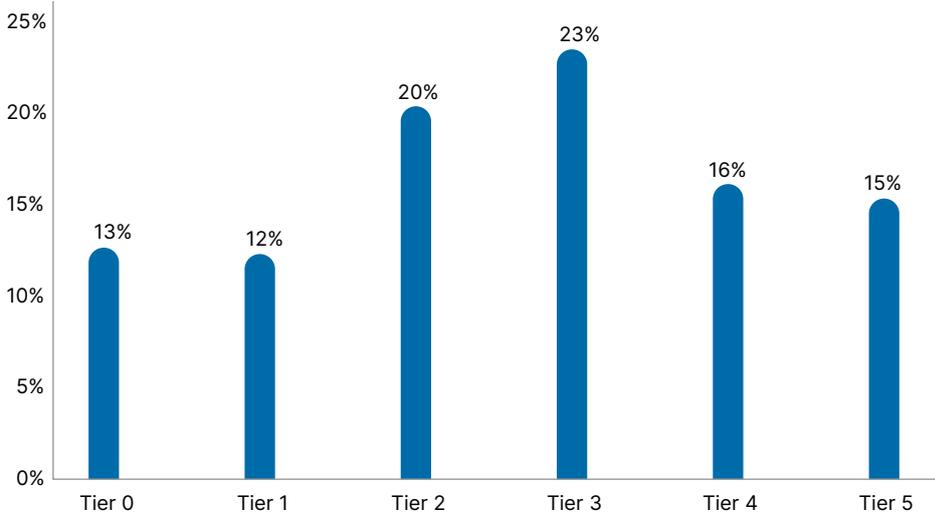
# Availability, reliability, and quality of grid-supplied electricity

eSwatini has a firm supply agreement in place with Eskom, the state-owned electricity utility in South Africa. Under the agreement, Eskom guarantees that it will maintain its power supply to eSwatini. Technically, if the South African grid is experiencing supply shortages, eSwatini may be required to implement load-shedding (i.e. a rolling blackout). However, Eskom has not limited supply to eSwatini even when load-shedding has been implemented for its South African consumers.

The EEC publishes a list of planned outages monthly. Planned outages occur infrequently and are mainly due to planned maintenance.<sup>15</sup> Based on the published data, we conclude that eSwatini’s grid-supplied electricity is of the highest tier (Tier 5). However, despite eSwatini as a country being on Tier 5, access is by no means uniform across the population. Using daily consumer expenditure on energy and water to calculate (max) kWh use per day, FinScope (2018) finds that only 15 percent of adults in eSwatini would fall into Tier 5 with 45 percent below Tier 3.



*eSwatini has grid-supplied electricity of the highest tier yet high levels of poverty as well as use of biomass energy highlight that energy usage and expenditure is intrinsically woven into both poverty and climate change.*



**Figure 3:** Proportion of population by energy use Tier, based on kWh consumption per day  
 Source: FinScope Eswatini 2018

15 eSwatini Electricity Company, “Planned Power Outage Notification- January 2020.”

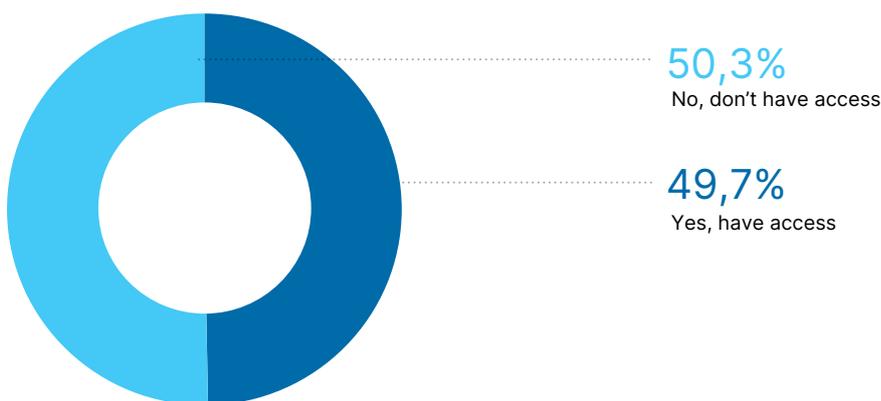
# 4

## Consumer profile of energy needs and usage

*Almost 80 percent of households use electric lighting. Despite ready access to electricity, traditional wood biomass remains a primary energy source for roughly 60 percent of households.*

In rural communities, most energy for cooking and heating comes from burning fuelwood. Unfortunately, improved or efficient cookstoves are only used by half the population (Figure 6). The source of traditional biomass (fuelwood) is the indigenous forest, where trees are harvested without following sustainable management practices, placing severe pressure on these forests. Wood from indigenous forests is also used for income generation, where rural people cut trees to sell to urban dwellers and meat roasting businesses.<sup>16</sup>

According to FinScope (2018), on an individual basis, energy usage for cooking and lighting is comparable to the household level data above. 26 percent of adults live in households where electricity is used for cooking, while 61 percent use solid fuel/biomass. For lighting, 76 percent use grid electricity, and only 2 percent use off-grid electricity. The differences for lighting is not significant between rural and urban areas – 75 percent use electricity in rural areas vs. 81 percent in urban areas.

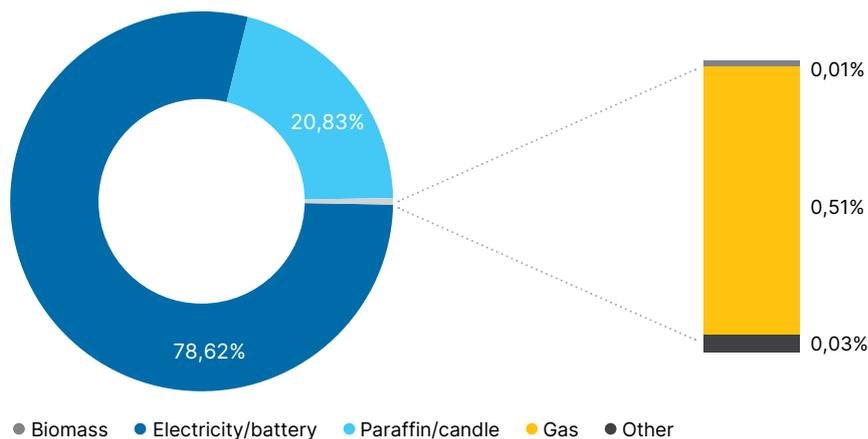


**Figure 4:** Access to clean fuels and technologies for cooking, (% of the population)

Source: Own analysis based on data World Bank, Sustainable Energy for All (SEforALL) database from the WHO Global Household Energy database (2014)

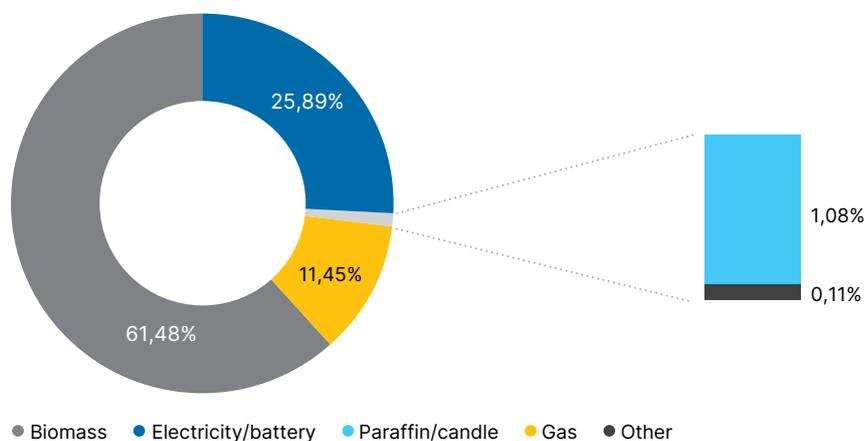
16 Renewable Energy Agency, International. "Swaziland Renewables Readiness Assessment."





**Figure 5: Access to clean fuels and technologies for lighting (% of households)**

Source: Own analysis based on data sourced from the FinScope survey (2018)



**Figure 6: Access to clean fuels and technologies for cooking, (% of households)**

Source: Own analysis based on data sourced from the FinScope survey (2018)

However, the difference for cooking is much more pronounced with 79 percent of adults in rural areas using solid fuel/biomass for cooking vs. only 19 percent in urban areas, where electricity (55 percent) and modern fuels (26 percent) are used much more.

People aged 55 or over are also more likely to use solid fuel/biomass for cooking (75 percent vs 59 percent for those that are younger). Similarly, 84 percent of people with primary or no education use solid fuel/biomass, compared to 51 percent of those with a secondary or tertiary education. Income and poverty also influence the likelihood to use solid fuel with 70 percent of those earning E2,000 or less vs. 34 percent for those earning more. Having experienced a poverty symptom<sup>17</sup> increases the chance of using solid fuel even more, at 82 percent.

17 The FinScope Consumer Survey tests three indicators that it defines as a 'poverty risk':

- Skipped a meal because of insufficient money to buy food.
- Gone without medical treatment or medicine.
- Unable to send children to school.



Those whose main income source is farming or fishing has the highest use of solid fuel for cooking (93 percent), followed by grant recipients (88 percent), informal employees (79 percent) and remittance dependents (65 percent).

This is in line with the Kingdom of eSwatini Energy Masterplan 2034<sup>18</sup>, where the GoKE found that the use of electricity for cooking increased from 0 percent to 20 percent between 1997 and 2013, but fuelwood remained the main energy resource for cooking and space heating, particularly in rural areas. A 2016 Wood Efficient Cookstoves survey conducted by the Renewable Energy Association of Swaziland, found that fuelwood is used inefficiently in rural areas. The extensive use of traditional biomass creates social and environmental costs as a result of the negative impacts on air quality and health, deforestation and the opportunity cost of time used for wood collection.

The Energy Masterplan 2034 notes that besides expanding access to electricity via the grid, the Government will also need to incentivise households to gradually replace the use of traditional biomass in cooking. This can be done through policy mechanisms such as a system of rebates on cleaner cookstoves, rolling out mini-grids in rural areas, cross-subsidisation pricing, licensing frameworks for new operators, and supporting greater adoption of on and off-grid electricity products. In line with SEforALL goals developed in 2016, the Government aims to decrease reliance on fuelwood by promoting electric stoves, LPG stoves and use of more efficient cookstoves.

Following a pilot project aimed at promoting the efficient use of fuelwood, the Government is planning to extend the use of improved wood-efficient cookstoves, which can reduce the pace of deforestation. However, the use of wood-efficient cookstoves remains suitable for non-electrified areas, and for those who cannot afford electricity or electrical appliances. The Government envisage that the use of fuelwood will decrease by 90 percent in the residential sector, while the use of LPG will increase almost three-fold by 2034.<sup>19</sup> By 2030 the portion of the population relying on fuelwood for cooking and heating is planned to fall to 20 percent. In a similar vein, the Government will promote the increased use of solar water heating in the residential sector where it is estimated that 82 percent of households still use wood, 9 percent electric geysers and 5 percent solar water heaters.

There is a limited case for purely market-led approaches to promote cleaner cooking initiatives because the majority of the Swazi population have access to electricity but continue to use fuelwood as it is free or a very inexpensive alternative to cooking with electricity.

Most adults in Eswatini report spending money on utilities (water and energy) on a monthly basis (87 percent), with an average of E262 per month. This equates to E176 million (USD 11.8 million) per month. Based on the financial needs and usage analysis, energy is high on the priorities of individuals and households. However, this usage is not uniform.

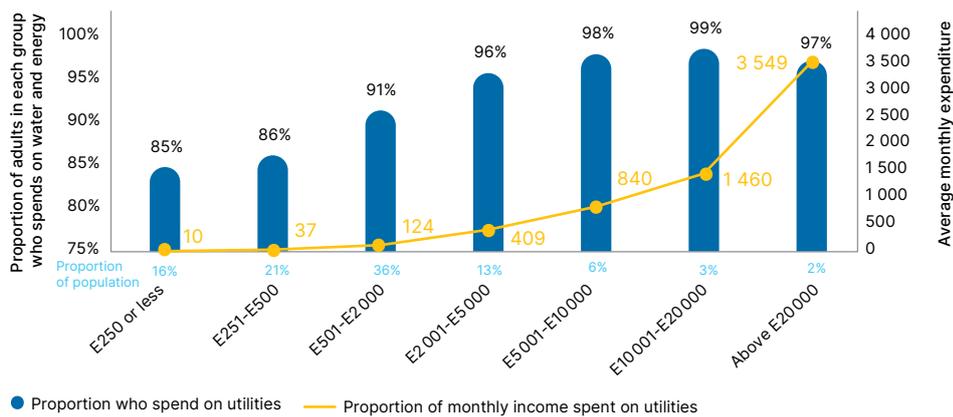


*Following a pilot project aimed at promoting the efficient use of fuelwood, the Government is planning to extend the use of improved wood-efficient cookstoves, which can reduce the pace of deforestation.*

18 Kingdom of eSwatini, Ministry of Natural Resources and Energy, "Energy Masterplan 2034."

19 Kingdom of eSwatini, Ministry of Natural Resources and Energy, "ENERGY MASTERPLAN 2034."



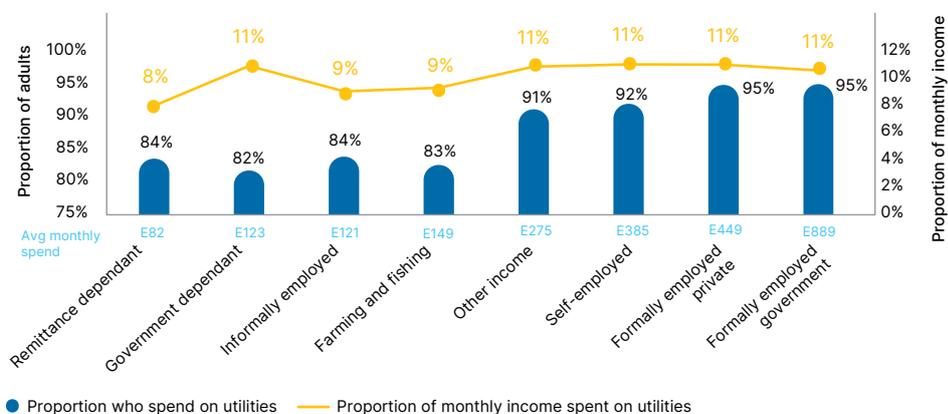


**Figure 7: Spending on utilities as proportion of monthly income vs portion of adults spending on utilities**

Source: FinScope Eswatini 2018

Fewer consumers who are poorer report spending money on utilities, and for those who do, the nominal amount spent is far less. For instance, 89 percent of adults report earning less than E5,000 per month. The adults in this group spend on average only E120 per month. On the other hand, only 11 percent of adults earn more than E5,000 per month, but this group spend on average E1,450 per month on utilities. That is 12 times as much as the lower 89 percent of earners (see Figure 7). This implies that poorer households are experiencing energy poverty (although less pronounced than in other SADC countries).

The same is true when segmenting based on income source. Figure 8 shows the proportion of adults that spend money on utilities, by main income source, the proportion of monthly income spent, and the average monthly amount spent. The income sources are ordered by average monthly income levels, so the poorest income sources are on the left. Those who receive less income, tend to also have fewer adults who spend money on utilities, while those who do spend money on utilities, spend a smaller proportion of their income on it. This likely has to do with affordability (see section 4.1), and the use of alternative energy sources, especially for cooking (as discussed), which is also driven by affordability of electricity.



**Figure 8: Spending on utilities by main income source**

Source: FinScope Eswatini 2018

## Affordability of grid-supplied electricity and cost-reflectivity of tariffs

In their latest application to the eSwatini Energy Regulatory Authority (ESERA), EEC applied for a 5.7 percent year over year (y/y) increase in 2020 and 2021 after a government freeze on tariffs in 2019.<sup>20</sup> For the analysis of the affordability of electricity in eSwatini, we used the official 2020 tariffs, as published by EEC. The current tariff (effective since 1 April 2018) for single-phase domestic electricity is SZL 1.75 (USD 0.10) per kWh while the lifeline supply (for access to at most 20 Amp capacity) is discounted to SZL 1.65 (USD 0.10) kWh (Table 5).

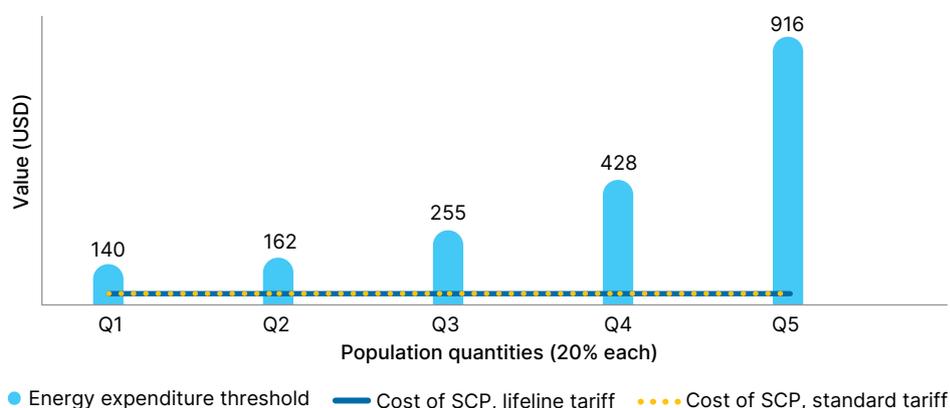
**Table 5: Cost of grid-supplied electricity, eSwatini (2020)**

	CURRENCY	COST PER KWH	COST OF SCP (365 KWH)
Lifeline tariff, prepaid	SZL	1.65	602.25
	USD	0.10	36.50
Residential tariff, prepaid	SZL	1.75	638.75
	USD	0.10	38.71

Source: Own analysis based on tariff data from <http://www.eec.co.sz/>

The ESMAP/SEforALL multi-tier framework measures the affordability of grid electricity by comparing the cost of a standard consumption package (SCP) of 365 kWh per year to a maximum energy expenditure threshold, set at 5 percent of total household expenditure. According to this metric, we find that all households in eSwatini can afford a standard consumption package priced at either the lifeline or the standard residential tariff (Figure 9).

However, FinScope (2018) provides data on the monthly income of adults in eSwatini, as well as expenditure on utilities, which include water, electricity, paraffin, gas and other fuel. The average spend on these utilities for all adults in Eswatini is E3,144, which is about 5 times the cost of the SCP for electricity.

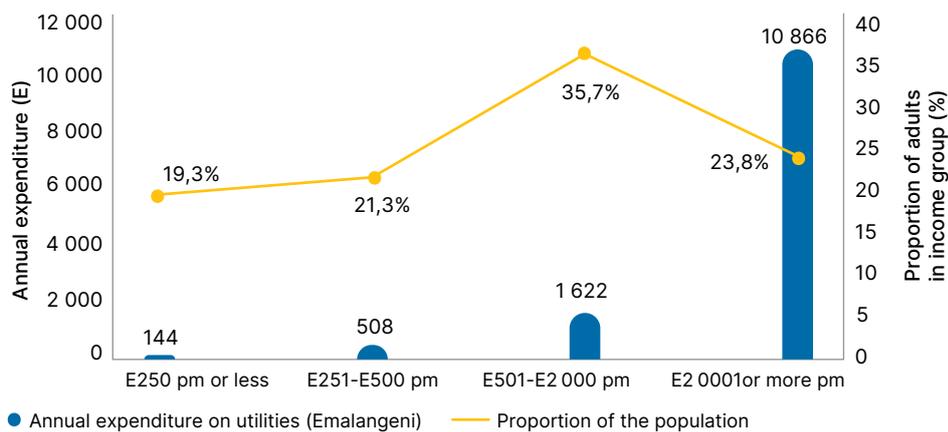


**Figure 9: Affordability of grid electricity (2020)**

Note: Cost of standard consumption package (SCP): Lifeline tariff = USD 36.50; Standard tariff = USD 38.71

Source: Own analysis

20 eSwatini Electricity Company, "TARIFF INCREASE PROPOSAL - Eswatini Electricity Company."



**Figure 10: Annual spending on utilities by income group**

Source: FinScope Eswatini 2018

However, on a more granular level, this data show that about 41 percent of adults spend less than the cost of the SCP of 365 kWh per year on utilities. Given that utilities include water as well as other energy sources, these adults spend far less on electricity than the SCP cost. More worryingly, almost 20 percent of the population spends significantly less – only E144 per year, compared to E602, the cost of the SCP at the lifeline tariff.

By looking at the exact expenditure of adults (the above takes the average by income group), 45 percent spend less than the cost of the lifeline SCP, with 35 percent of all adults spending only 50 percent of this or less. Even at the SCP, very little energy is available for normal use of appliances. To put this in perspective, Table 6 provides examples of the energy use for different energy use brackets. At the SCP, a household can use a 2000 Watt electric stove for only 30 mins a day. This does not leave any energy for lighting, heating/cooling, charging, a TV, listening to the radio or any other appliances. Even at two times the SCP, a household can use a 2000 Watt stove for only one hour a day, still only allowing them to cook one meal. At four times the SCP, a household can cook one meal a day, and have a very small fridge to allow food not to spoil. Therefore, only 27 percent of adults in eSwatini buys sufficient energy to operate a more diverse set of electrical applications.

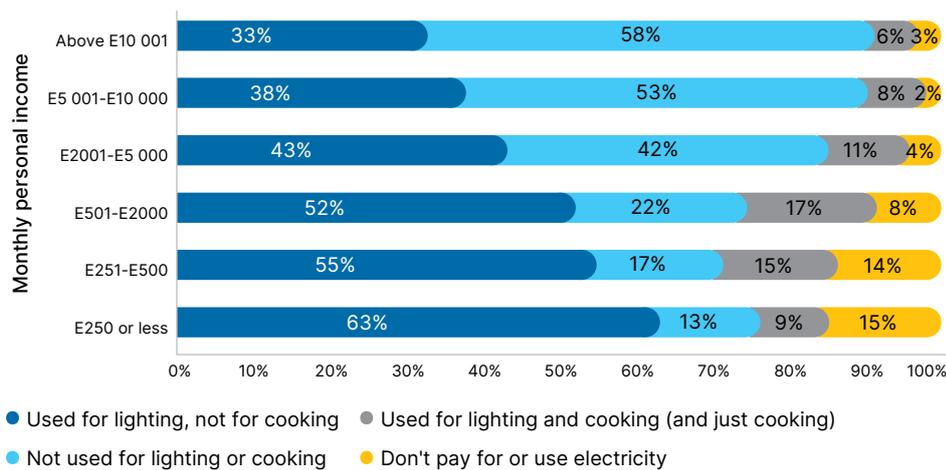


*Only 27 percent of adults in eSwatini buys sufficient energy to operate a more diverse set of electrical applications.*

**Table 6: Examples of energy use per energy use bracket**

ENERGY USE BRACKET	PROPORTION OF ADULTS	EXAMPLE ENERGY USE
Nothing	13%	NA
50% of SCP	22%	Using 2000 Watt cooking stove 15 mins each day
SCP	10%	Using 2000 Watt cooking stove 30 mins each day
2xSCP	14%	Using 2000 Watt cooking stove 1 hour each day
4xSCP	15%	Using 2000 Watt cooking stove 1 hour each day and having a 100 Watt mini fridge
More than 4 x SCP	27%	Above plus.

Source: FinScope Eswatini 2018



**Figure 11: Use of electricity for lighting, cooking and other purposes**

Source: FinScope Eswatini 2018

Given that people who purchase low levels of energy are unlikely to use this for only the functions described above, and instead using it for lighting, charging phones etc, it is not surprising that the use of electricity for cooking also correlates with income. The source of income will also influence this, given the correlation with income. Those whose main income source is farming/fishing, and those who receive government grants are the least likely to use grid electricity for cooking, at only 6 percent (Figure 11).

## Cost reflectivity of grid electricity

Electricity in eSwatini is not fully cost-reflective (revenue from the tariff does not cover the full costs of producing power plus a market-related return on capital invested). The World Bank (2016) estimated that the true cost of supplying power in eSwatini was USD 0.14 per kWh while the current household tariff is USD 0.10 per kWh.<sup>21</sup> This implies that the tariff would need to increase by 27 percent and/or measures to improve the efficiency of electricity production would have to be introduced if the tariff were to become fully cost-reflective. Given the already high rates of unaffordability, bringing rates closer to costs will further impact poor households. Thus, clean energy solutions also need to look at new business models, as well as cost effective energy efficient products, to address inclusive growth and alleviate poverty.

21 Trimble et al., "Financial Viability of Electricity Sectors in Sub-Saharan Africa-Quasi-Fiscal Deficits and Hidden Costs."

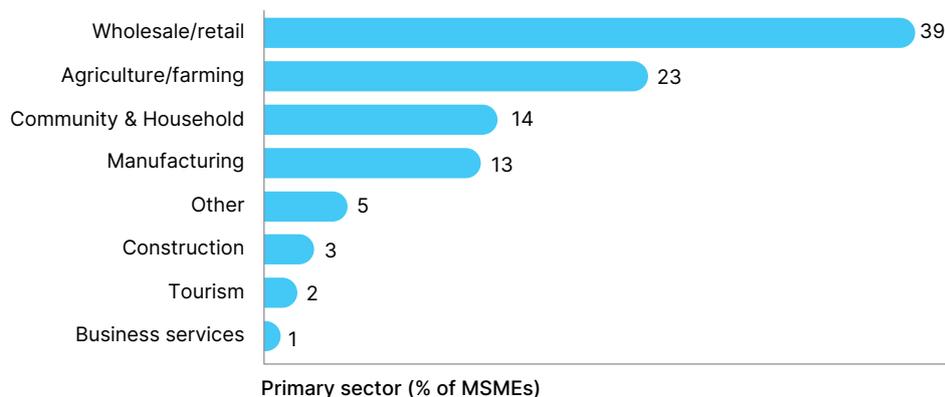
# 5

## Micro, Small and Medium sized enterprise (MSME) energy usage for productive use-cases

*Energy usage for household consumption is very different from energy use for businesses. Given that large numbers of the population run their own businesses, energy usage in the productive sense was examined, largely to determine the potential to drive further income generation through better access to energy.*

### Small business profile

There are 59,283 MSMEs in eSwatini (10 percent of the adult population own MSMEs). The sector employs ~93 000 individuals (16 percent of the total working-age population).<sup>22</sup> Business owners included in the FinScope survey consist of 75 percent independent entrepreneurs (not employing anyone), 18 percent micro-businesses, 7 percent small businesses and 1 percent medium businesses. The majority of MSMEs are in the retail (39 percent) or agricultural (23 percent) sectors (Figure 12).



**Figure 12: MSMEs by sector**

Source: Own analysis based on FinScope MSME survey for eSwatini, 2017

22 FinMark Trust, "FinScope MSME Survey eSwatini 2017."



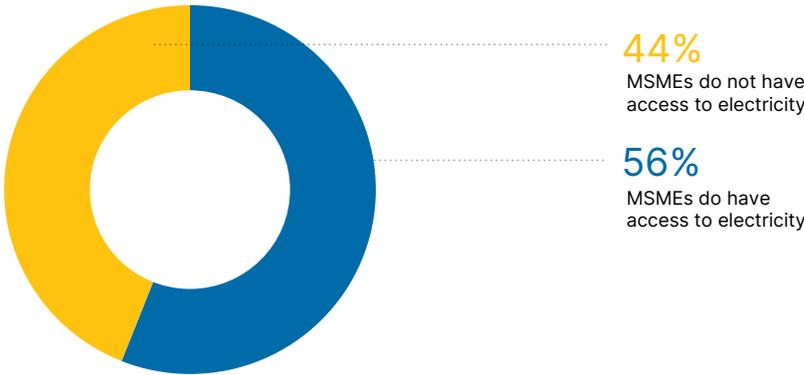
Most Swazi MSMEs (55 percent) operate from a residential premise, while only 21 percent operate from commercial premises, and the majority (74 percent) are in rural areas. However, almost half of MSMEs are in only one region (Manzini). Three-quarters of businesses are not licensed (informal) with most reporting that they are too small as the reason for not registering.<sup>23</sup> Owners of MSMEs are more likely to be older (only 27 percent are below the age of 35) and female (65 percent). Most MSME owners only have one business (87 percent), and their business is their only source of income (75 percent).



*Only 66 percent of MSMEs reported that electricity supply was “stable and predictable”.*

### MSME access to electricity

A relatively high proportion of Swazi MSMEs had access to electricity in 2017 (56 percent) when compared to MSMEs in other Sub-Saharan African countries (Figure 13). Nonetheless, access to electricity for businesses seem low compared to access to electricity for households in the same period (73.5 percent), and even compared to access for households in rural areas (67.4 percent), where 74.5 percent of MSMEs are based. Low access for businesses is therefore either driven by the nature of small business (largely informal, with many operating door-to-door or on the street, and therefore not needing electricity), or could be due to supply side factors.

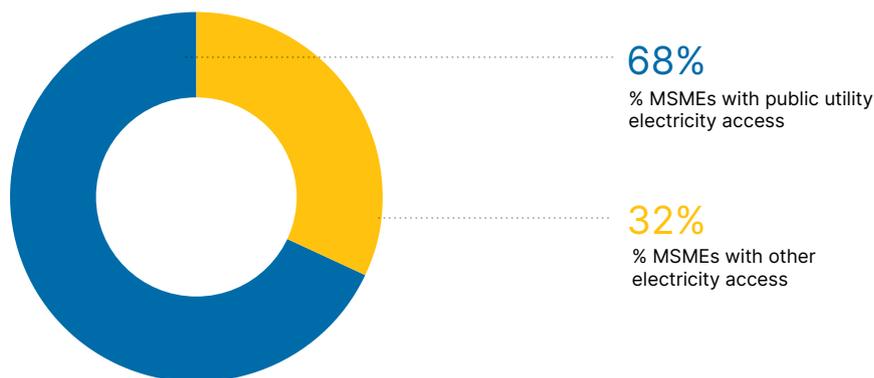


**Figure 13: MSME access rate**

Source: Own analysis based on FinScope MSME survey for eSwatini, 2017

The FinScope survey for eSwatini (in contrast to other country surveys) asked respondents specific questions about their electricity source and whether the supply was sufficient to meet their business needs. Most MSMEs obtain electricity from a public utility (Figure 14). The use of cleaner off-grid solutions is virtually non-existent. 95 per cent of MSMEs reported that electricity supply was sufficient to meet their business needs. However, only 74 percent reported that they had constant electricity access (all the time), while another 12 percent reported access for 15 to less than 24 hours a day. In addition, only 66 percent of MSMEs reported that electricity supply was “stable and predictable”.

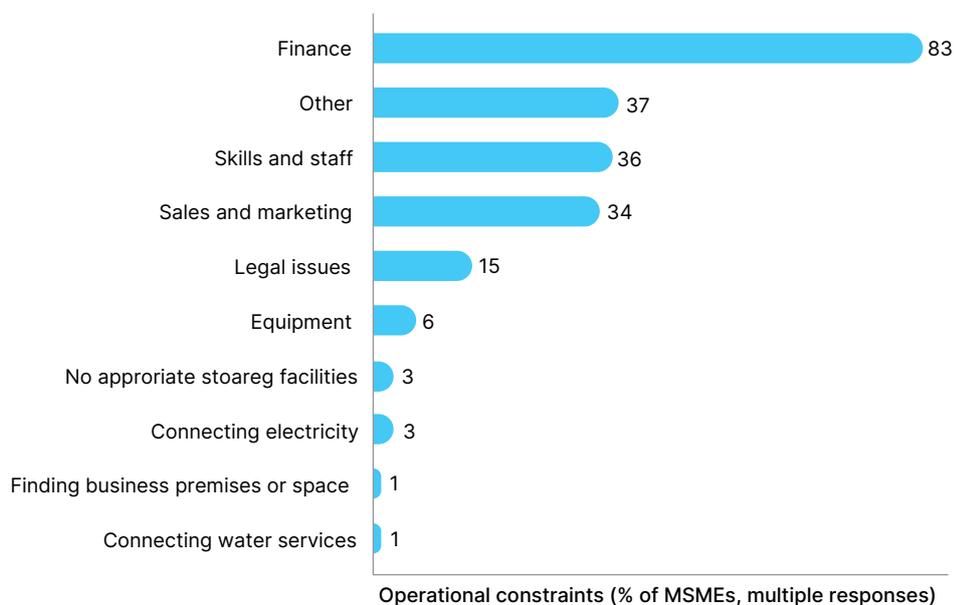
23 Finmark Trust, “FinScope MSME Survey eSwatini 2017.”



**Figure 14: Source of electricity for MSMEs with electricity access**

Source: Nova economics analysis based on FinScope MSME survey for eSwatini, 2017

Only 3 percent of MSMEs indicated that electricity was a barrier to operations (when multiple responses were available) (Figure 15). A far more pressing constraint to daily business operations is access to finance, which was identified by 83 percent of MSMEs as being a major operational constraint, and the single biggest constraint for 25 percent of respondents. Interestingly, 20 percent report space to operate as a constraint, which – if fulfilled, could arguably lead to greater demand for electricity for business purposes. According to FinScope respondents with a bank account, only 7.5% indicated that they have paid their utility bills (water or electricity) through a bank in the last month, despite 69 percent of MSMEs in eSwatini being banked and 76 percent being formally included.



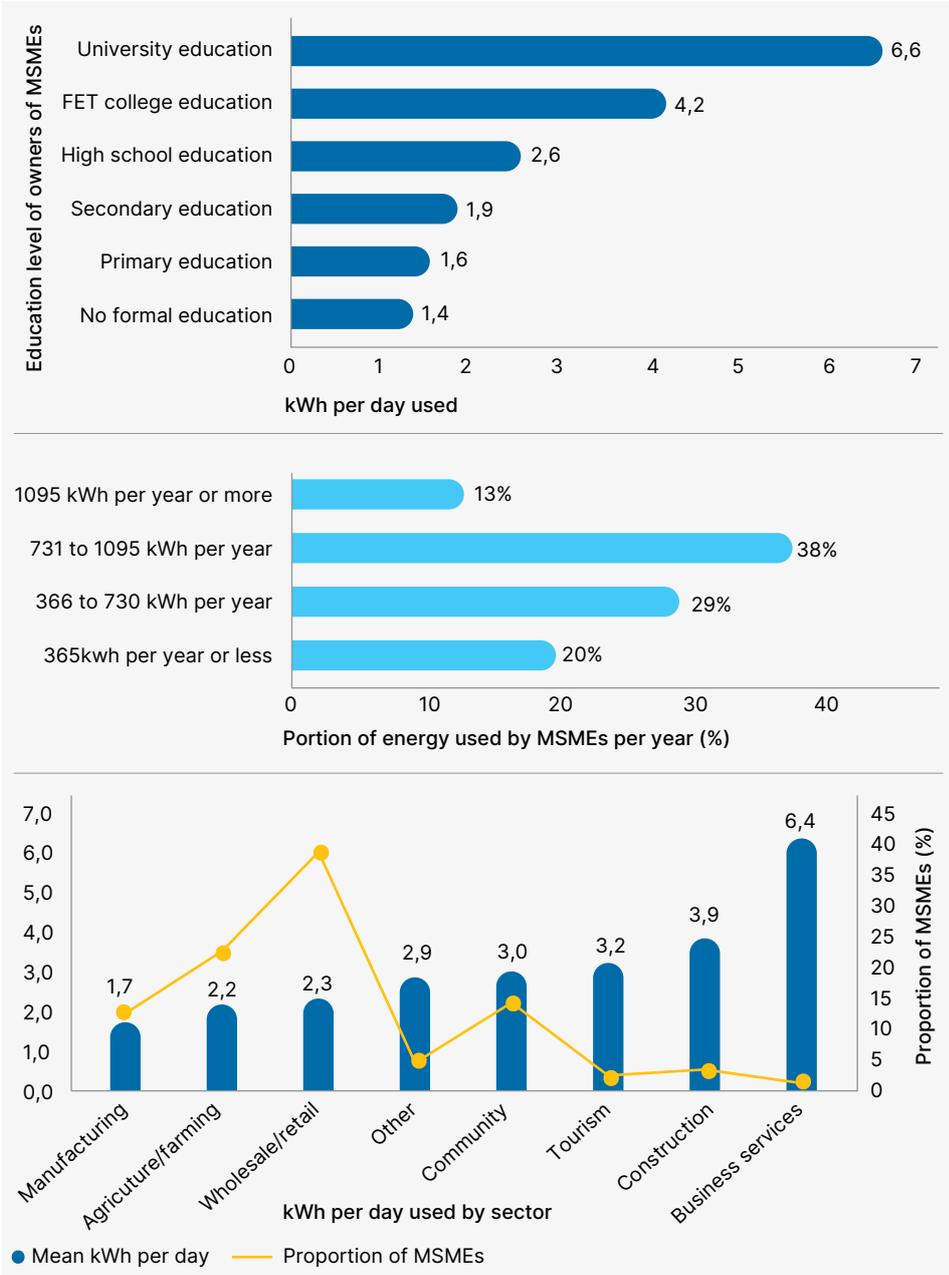
**Figure 15: Challenges faced by MSMEs**

Source: Nova Economics analysis based on FinScope MSME survey for eSwatini, 2017



# MSME household and business electricity use

Although data on actual electricity use and expenses on electricity is not available, FinScope MSME eSwatini (2017) contains some questions on household and business assets, which includes energy consuming items like TV, refrigerators, computers, printers, cash registers, air conditioners etc. Based on this disclosed ownership, known values of electricity consumption for these appliances, and estimated typical hours of use per appliance, an estimate of household and business energy consumption can be made. Although this does not include energy consumption for business machinery, it does yield useful insights on energy consumption and affordability across different segments of MSMEs. Household and business energy use is combined, as most businesses operate from home.



**Figure 16: electricity use (kWh) by MSMEs, by education, income source and per annum**  
 Source: Own analysis based on FinScope MSME survey for eSwatini, 2017

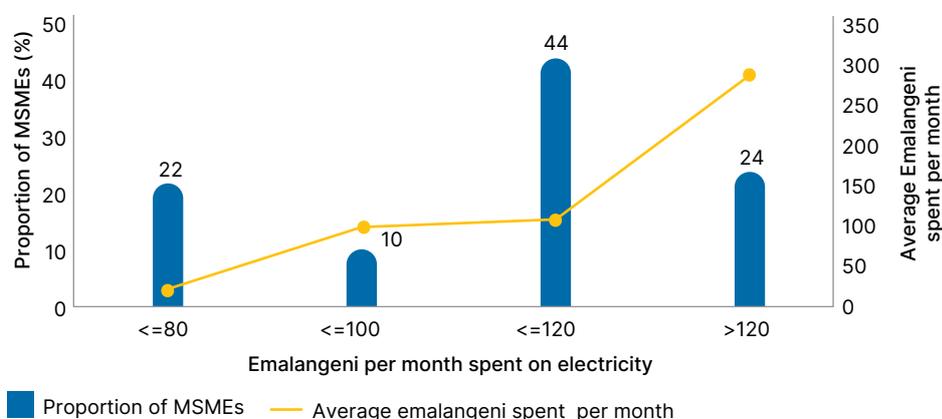
**Table 7: Estimated kWh use per day by MSME segments, split by rural/urban**

BUSINESS SIZE	ESTIMATED KWH PER DAY		
	URBAN	RURAL	TOTAL
Independent entrepreneur (0 employees)	2.5	1.8	2.0
Micro Business (1-3 employees)	5.7	2.7	3.4
Small Business (4 - 10 employees)	5.3	4.4	4.7
Medium Business (11 - 50 employees)	10.3	7.7	8.8
Average (all MSMEs)	3.3	2.2	2.5

Source: Own analysis based on FinScope MSME survey for eSwatini, 2017

Based on the estimated use, urban MSMEs consistently use more electricity than rural MSMEs, with use increasing with the size of business. The level of education of the business owner tends to correlate well with electricity use. By sector, business services use by far the most electricity, followed by the construction sector. Although none of the sectors on average use less than 1kWh per day (the standard consumption package of 365 kWh per year), 20 percent of individual MSMEs (across all sectors) uses less than this amount. At a sector level, rural independent entrepreneurs, as well as those with no formal education, and the manufacturing sector, use the closest to this amount, with 1.8, 1.4 and 1.7 kWh per day, respectively, on average. Of particular surprise is the latter (manufacturing sector), which typically should be the highest energy usage sector (per institution). Agriculture similarly could be a higher energy use sector, particularly if irrigation is utilised on a broad basis across the industry.

The 20 percent of MSMEs that use less than 365kWh per year have very distinct characteristics. They are mostly rural (84 percent), independent entrepreneurs (87 percent) who are less educated. Only 2 percent have a tertiary education, versus 50 percent for those who use the most electricity per year. They are more likely to be in manufacturing (the lowest energy intensive sector), and less likely to be in business services, construction or tourism (The three highest energy



**Figure 17: Proportion of MSMEs by expenditure on electricity**

Source: Own analysis based on FinScope MSME survey for eSwatini, 2017





# 6

## The investment case for cleaner off-grid solutions in eSwatini

*eSwatini has made significant progress in recent years in expanding grid access with ambitious targets to increase electricity access for households through the acceleration of the rural electrification programme (REP).<sup>1</sup>*

As a first step to address and achieve the objectives of the REP to increase access to households, we have attempted to size the market, based on two typical stand-alone solutions currently available in the market.

### *Option 1: Tier 1 SHS solution or ‘pico-solar’ solution*

Assumed costs USD 60 per annum, providing a low-end solution with a single light and charging solution. This is typically sold for cash but we have assumed it could be sold on an instalment basis over a maximum repayment period of 12 months.

### *Option 2: High-end Tier 1 SHS*

Package includes two to three lights, a mobile device charger, and possibly a low power appliance (e.g. radio) with an assumed purchase price of USD 150 per year over a 24- to a 30-month repayment period.

Given that these solutions cannot be used for cooking (which require a Tier 3 solution), the market for these two options is therefore limited to those households who currently don't have access to grid electricity, or about 77,000 households in 2017. However, due to its small population size, high electrification rates and reliable supply, the potential market for standalone or off-grid solutions that can provide basic lighting, phone charging and appliance services also include those who are currently unable to afford the standard package (365kwh per year), or who use biomass for cooking, despite access to electricity (45 percent and 36 percent respectively, or up to 275,000 households).

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<sup>1</sup> (United Nations Eswatini 2019)



**Table 8:** Typical standalone Tier 1 SHS solutions

SOLUTION	BENCHMARK PRICE (USD)	FUNCTIONALITY
Pico-solar (low-end)	60	Single light and mobile device charging 
Basic SHS (high-end)	150	Three lights, mobile device charging, low power appliance (e.g. radio) 

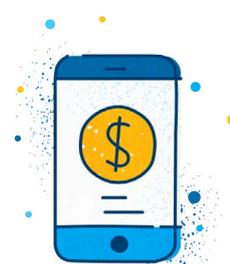
Source: Own analysis

To estimate the affordability of SHS solutions, it is necessary to calculate the monthly instalment, based on the repayment terms, as well as the affordability threshold of different segments. Assuming a favourable interest rate of 10 percent, the ‘pico-solar’ solution (USD 60) has a monthly instalment of E79, given a repayment period of 12 months. For the same interest rate, the high-end Tier 1 SHS solution (USD 150) would have a monthly instalment of E103 over 24 months, but this drops to E85 over 30 months. Given these assumptions and using FinScope (2018) data, we find that 46 percent, 56 percent and 49 percent of adults, respectively do not earn enough to afford this (where the instalment is 10 percent of monthly income or lower). It is therefore clear that lower cost solutions need to be found, or the financing models have to change drastically in order to make these products more accessible.

Lowering the cost to USD 40, a Tier 1 system, at 10 percent interest over 12 months, will have a monthly instalment of E52, and over 18 months, E36. However, even at this reduced cost, this exceeds the affordability threshold for 41 percent and 23 percent of adults respectively. Furthermore, the *willingness* to pay for electricity access in the form of Tier 1 to Tier 3 standalone or mini-grid solutions is likely to be lower than the *ability* to pay given that most households are geographically close to the grid, or already connected to the grid, and would prefer a reliable and more cost-effective Tier 4 or Tier 5 capacity connection to the grid than a lower capacity off-grid solution.

On the payments side, viable business models for pay-as-you-go (PayGo) solutions typically require a monthly payment of at least USD 5, which is not much more affordable than a USD 60 loan over 12 months (E75 versus E79). Even at USD 1 per month, 12 percent of adults in eSwatini would still not be able to afford it.

Given the dearth of microfinance providers, donor and government grant-funded microfinance institutions could perhaps play a larger part in the provision of credit to low income and unemployed individuals, with a focus on clean energy provision. The high mobile phone penetration rate suggests that PayGo models could be a feasible way to collect revenue efficiently from rural customers for either mini-grid or SHS energy services, if monthly payments can be kept affordable.



*The high mobile phone penetration rate suggest that PayGo models could be a feasible way to collect revenue efficiently from rural customers.*

While the market sizing addresses the rural electrification plan and universal access to energy goal, it does not address the broader needs around substituting cooking with biomass fuels, switching to cleaner off-grid energy solutions to reduce the climate impact and lowering the costs of solutions for both affordability and poverty alleviation. Given the high levels of unaffordability of electricity for poor households to meet their basic demands, further analysis of equipment costs, mini-grid solutions, energy pricing and affordability related to income is required. This will inform both the policy and regulatory options to incentivise clean energy usage as well as determine realistic national financing needs that can feed into a national plan and roadmap.

Given the few existing suppliers in the market and UNCDF's strong relationship with microfinance institutions, there is a strong compatibility to work with the existing model of market-led adoption of standalone Tier 1 to Tier 3 SHS. In other countries, we have seen more MFI loans for larger, productive use systems being more popular. Furthermore, there is an opportunity to extend off-grid solutions to households for lighting and use of appliances by providing certain isolated rural communities with access to electricity from hybrid mini-grids that can provide electricity services at the capacity and reliability that is comparable to the grid (Tier 4 or Tier 5), as a more cost-effective alternative to a grid connection.

Lastly, cost effective, more efficient wood stoves could also have an impact on the cooking, heating and water heating market. Consumer data shows that usage remains low for clean cooking solutions and electricity use for heavier appliances is unaffordable for most adults, with almost half of adults unable to afford the standard package of electricity. Further expansion of the electricity grid and infrastructure has to be balanced with improving the affordability and type of access to energy, through alternative financing models, clean energy and off grid solutions. This requires differentiated solutions from the private sector, reducing the burden on government for financing infrastructure, and sharpening the focus on pro-poor solutions, that also focuses on the financing solution. However, government can support this push through a focus on appropriate pricing models, quality control of equipment, consumer protection around equipment, and universal access policies around clean energy for the poor, combined with incentives to support provision.



*Further expansion of the electricity grid and infrastructure has to be balanced with improving the affordability and type of access to energy, through alternative financing models, clean energy and off grid solutions.*

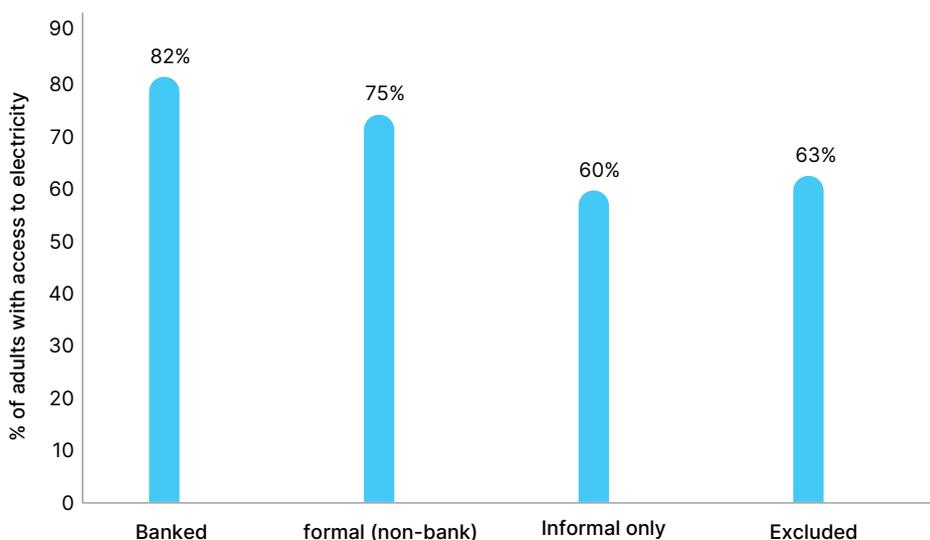
# 7

## Financial inclusion as an enabler

*Taking a financial inclusion lens to the usage of electricity, those who use only informal services (2 percent of adults) and the financially excluded (15 percent of adults) are also most likely to not have access to electricity.*

This again points to the fact that the poor and the vulnerable present significant risks to the climate change agenda through lack of choice of more climate friendly alternatives, as a result of having no money. Currently, those that use electricity are likely to use cash as a payment option. Payment solutions that lower the cost, particularly for the informal and excluded, will be significant to addressing their daily needs. The use of mobile payments can also make purchasing electricity more convenient.

For financing mechanisms to purchase larger items, banked and non-bank channels are the formal options for clean energy credit financing. The following sections unpack the financing options, particularly from a channel perspective, for the lower-end of the market.



**Figure 19: Financial inclusion and access to electricity**

Source: FinScope survey for eSwatini, 2018



In 2018, FinMark Trust's FinScope survey noted that only 50 percent of Swazis reported having a bank account in their name. Four commercial banks have operations in eSwatini. In addition to these banks, the Swaziland Building Society offers long-term mortgage loans. Commercial banks have historically had an operating model focused on traditional banking products without activity in microfinance but have recently started moving into the payroll lending market.

The microfinance sector in eSwatini remains in a prolonged state of early-stage development, due to several challenges and weaknesses in the sector. Microfinance portfolios, especially ones that contain loans to lower-income or unemployed people, is risky and unappealing to for-profit financial institutions in eSwatini. This means that provision of credit is primarily limited to salaried employees. The provision of credit to low-income people and non-salaried entrepreneurs is reliant on credit institutions funded by donors or government grants. Credit institutions in eSwatini comprise three main types: formal, donor or government-funded, and informal.

Other than commercial banks, several large institutions in eSwatini operate in the formal microfinance market. These institutions operate with a similar business model: they provide unsecured loans to formally employed government staff and the private sector. Funeral insurance and credit life insurance are also on offer. Debtors usually take out the loan for consumption purposes, to pay for food, housing, education and for emergency purposes, rather than using these loans for income-generating activities, such as purchasing assets for sale. Loan repayments are usually automatically deducted from an individual's salary.<sup>1</sup>

A recent addition to the formal microfinance market has been MTN, the sole mobile network operator. MTN has been offering a mobile money service since mid-2011 but recently launched a 30-day loan product through its pre-existing mobile money platform.<sup>2</sup> According to the FinMark Trust's country diagnostic report, eSwatini has an estimated mobile penetration of 86 percent of the population. Mobile network coverage was estimated at 90 percent of the country in 2014. Given a lack of competition, eSwatini has a very high average revenue per user measure compared to other countries in Africa. Mobile money payment channels are very popular. According to the Central Bank of eSwatini, 92 percent of adults had active mobile money accounts in the country.

Donor and government grant-funded microfinance institutions have also played a part in the provision of credit to low income and unemployed individuals. These institutions are usually set up for a specific target audience; IMBITA, for example, is a not-for-profit providing start-up entrepreneurial loans to unemployed, impoverished rural women. There are currently no donor-funded institutions mandated to promote clean energy solutions.

Informal credit is by far the most common form of credit used in the country. Methods of accessing credit include borrowing from family and friends, belonging

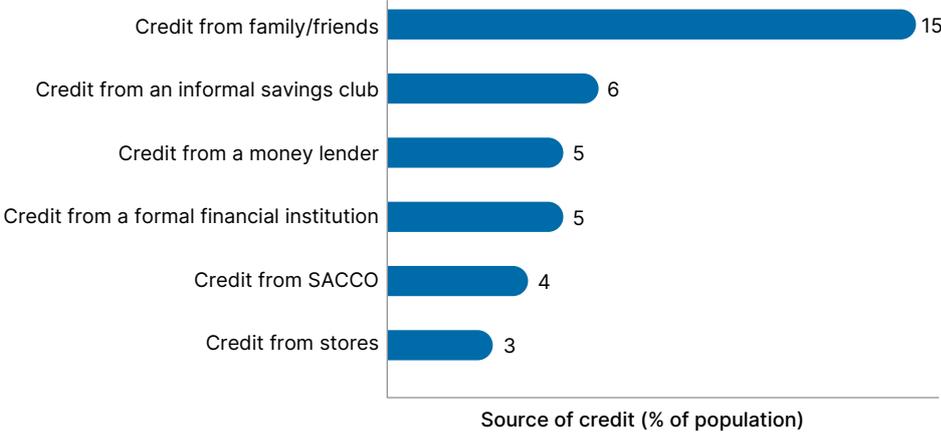


*The microfinance sector in eSwatini remains in a prolonged state of early-stage development, due to several challenges and weaknesses in the sector.*

1 Micro Finance Unit Swaziland, "State of MicroFinance Sector in Swaziland August 2016."

2 MTN, "MTN Momo."

to Savings Credit Corporative (SASCCOs) and stokvels, and short term (shorter than one month) loans from money lenders. Access to and usage of credit is low in eSwatini. Based on data from the 2018 FinScope survey, the primary source of credit is from friends and family. 5 percent of people had borrowed money from formal financial institutions, and only 3 percent of individuals had store credit (Figure 20).



**Figure 20:** Source of credit

Source: Own analysis based on FinScope survey for eSwatini, 2018





### *Small potential market and a limited number of local suppliers*

Given the size of the country, the potential market for off-grid solutions in eSwatini (the grid access deficit) is relatively small. 82 percent of the adult population translates to about 550,000 individuals, or between 140,000 and 275,000 households. While it would be difficult to achieve economies of scale for any specific clean energy product, it is an ideal market to test solutions especially in rural areas and at a community level to understand market uptake and switching from biomass to clean energy solutions. As the local energy service company “Watts Up” noted, no companies are operating in the pico-solar PV, solar home system or mini-grid space in the country. This is likely due to a potential market that is too small to achieve economies of scale in distribution, especially given the fast pace and scale of electrification. However, some donor partners operating in the country believe that off-grid solutions may be required, and could also be the least cost option, given that the remaining areas that are not electrified are also the hardest, and most costly to reach.



### *Little incentive to switch from biomass to more sustainable but costly sources of energy*

Biomass resources have come under intense pressure through the overreliance on fuelwood, combined with the clearing of land for agricultural production. Because the resource is essentially free, and the cost of electricity and electrical appliances are not, high demand aggravated by low-end use efficiency, has contributed to environmental degradation, rural poverty and rural energy shortage. However, because there is no direct cost to households for using fuelwood, there is little incentive to switch to more efficient cookstoves or more modern and environmentally sustainable sources of energy for cooking and water heating. Incentives for consumers to promote and improve the uptake of improved or cleaner cookstoves and solar water heaters to reduce deforestation and environmental degradation, through policy and regulatory mechanisms, would therefore have limited effect on its own. Without addressing the underlying affordability and poverty issues, it would be difficult to move people out of biomass. Even then, behavioural and cultural preferences for woodfuel may remain, as improved technologies often just don't create the same taste.



### *Financial inclusion as a lever to address real economy needs*

Poor people need energy but don't have the luxury of choice. eSwatini has high levels of financial inclusion, with FinScope data already highlighting high usage of energy through the payment of services. Using newer and cheaper digital payment options can lower the costs of payments



for energy. Providing more affordable credit or subsidised models for equipment purchase or lease, allows for better financing of clean energy products, with better financing options for consumers (See section 7).



*Guaranteeing quality of services and performance standards*

There are no standards to control the quality of imported equipment, installation, operation and maintenance of off-grid solutions. There are also no systems in place for the accreditation of installers. This could lead to poor quality imports and installations, which could have a shorter lifespan. Malfunctioning equipment, without proper maintenance support from suppliers, can also undermine trust in clean energy solutions, especially given the affordability issues (and comparatively high cost) of such solutions for the low end of the market.



*Small local market but potential to investigate regional equipment manufacturing*

There are strong regional dependencies on electricity provision already in the region with South Africa providing a large amount of the access to countries. Given the existing relationships, there is a potential to create regional relationships for clean energy solutions, including local manufacturing of equipment to bring down equipment costs, regional financing mechanisms, and leveraging the existing prevalence of banks operating across the region.

## Acronyms and abbreviations

EEC	eSwatini Electricity Company
ESERA	The eSwatini Energy Regulatory Authority
ESMAP	The world Bank Energy Sector Management Assistance Program
GEF	The UNDP Global Environment Facility
GEF CREAC	The UN Global Environmental Facility Clean Rural Electrification for African Countries programme
GoKE	The Government of the Kingdom of eSwatini
Gwh	Gigawatt hours
HDI	Human Development Index
IRENA	International Renewable Energy Agency
kWh	Kilowatt-hour
LDCs	Least Developed Countries
LPG	Liquid petroleum gas
MAP	The UNCDF Making Access Possible programme
MNRE	Ministry of Natural Resources and Energy
MSME	Micro, Small and Medium sized enterprise
MW	Megawatts
NCE	Nature, Climate and Environment
NEP	National Energy Policy 2018
PAREE	The Partnership for Affordable Renewable Energy in eSwatini
PayGo	Pay-as-you-go
REP	Rural Electrification Program
RETs	Renewable energy technologies
SADC	Southern African Development Community
SASCCOs	Savings Credit Corporative
SCP	Standard consumption package
SDGs	Sustainable Development Goals
SEforALL	The Sustainable Energy for All Programme
SHS	Solar home systems
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
Wh	Watt-hour

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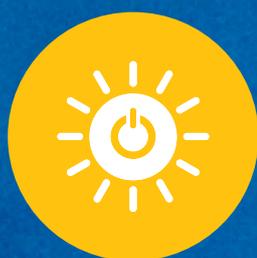
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## About the UNCDF

The UN Capital Development Fund makes public and private finance work for the poor in the world's 47 least developed countries (LDCs). UNCDF offers "last mile" finance models that unlock public and private resources, especially at the domestic level, to reduce poverty and support local economic development. UNCDF's financing models work through three channels: (1) inclusive digital economies, which connects individuals, households, and small businesses with financial eco-systems that catalyze participation in the local economy, and provide tools to climb out of poverty and manage financial lives; (2) local development finance, which capacitates localities through fiscal decentralization, innovative municipal finance, and structured project finance to drive local economic expansion and sustainable development; and (3) investment finance, which provides catalytic financial structuring, de-risking, and capital deployment to drive SDG impact and domestic resource mobilization.



# 7 Affordable and Clean Energy

