



Lesotho

*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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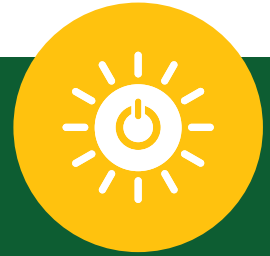
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## The cover symbol and artwork

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 an Aloe polyphylla, the national flower of Lesotho. 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.

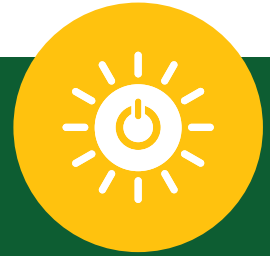
Signature Solution 5 focuses on increasing energy access, promoting renewable energy and enhancing energy efficiency in a manner that is inclusive and responsive to the needs of different sectors of the population, in line with the aspirations of Sustainable Development Goal 7.

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 Lesotho only. A separate report for each country is available, as well as a summary report drawing together the findings for all five countries.

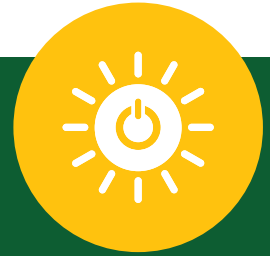
### *Note on the use of household data*

Within this document (unless otherwise referenced), demographic, income and financial usage data is obtained from the 2011 FinScope Consumer Survey undertaken in Lesotho, while MSME data is obtained from the 2016 MSME FinScope for Lesotho. 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](https://undp.org) or follow at @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 three million people to benefit from clean energy solutions through micro and PayGo financing.

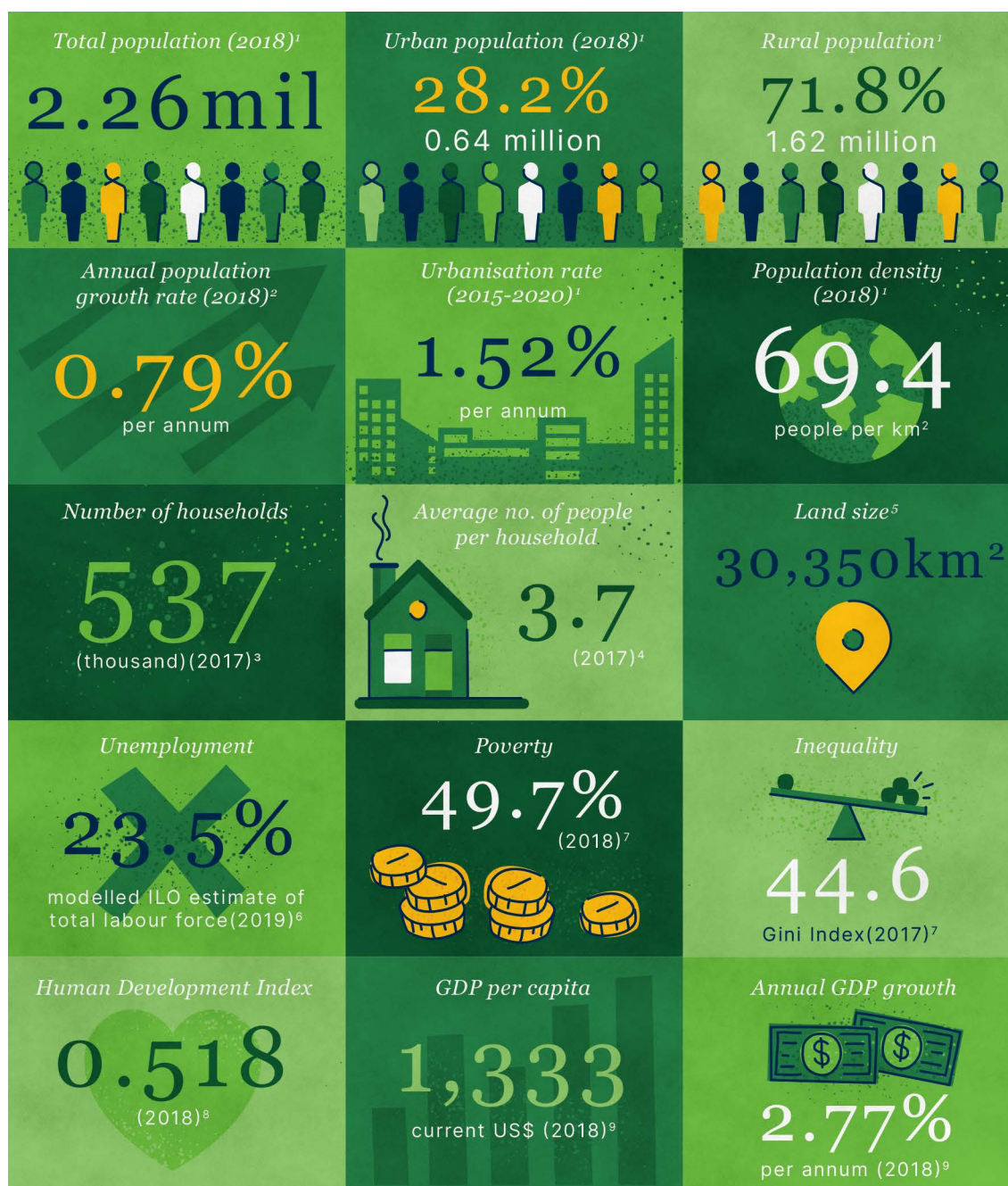


*The methodology as applied here seeks to address the need for access to energy as it relates to current usage, affordability and access to infrastructure in order to identify and quantify the financing necessary to accelerate the transition to clean energy.*

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# Lesotho at a glance

*The Kingdom of Lesotho is a small, mountainous country fully enclaved by South Africa. It has a population of 2.3 million people, with a relatively high population density, although the mountainous terrain makes large areas of the country difficult to reach.*



Sources: 1) UN population division, World Population Prospects 2019; 2) UN World Urbanisation Prospects: The 2018 Revision; 3) 2016 Lesotho population and housing census; 4) 2016 Lesotho population and housing census; 5) CIA world factbook; 6) Country census, demographic statistics database; 7) Lesotho, Bureau of Statistics uses a welfare indicator is measured against a pre-determined threshold (the poverty line) below which a household or individual is deemed poor. Lesotho uses a consumption-based welfare measure to measure poverty, referred to as the consumption aggregate. The cost-of-basic needs (CBN) method is used to determine poverty; 8) UN Statistics Division 9) IMF, World Economic Outlook database, 2018



Lesotho generated USD 2.64 billion gross domestic product (GDP) in 2017 (GDP per capita of USD 1,333). Tertiary services collectively account for 60% while the secondary sector accounts for 25%. Manufacturing is the single largest sub-sector, generating 16% of GDP, mainly from the production of textiles, clothing, and apparel. GDP growth of only 2.8% in 2018 reflects a contraction in the mining industry and reduced demand in the textile industry and delayed delivery of large construction projects.<sup>2</sup> Lesotho's relatively small formal economy does not offer enough job opportunities and the unemployment rate remains high (23.5%). The main areas of employment are industry (~42%), services (~29%), and agriculture (~29%).

*Electricity makes up only 4% of Lesotho's total final energy consumption. Lesotho is highly dependent on biomass such as wood, animal dung, coal imported from South Africa, and petroleum for energy.*

In 2006, the Government of Lesotho introduced the Lesotho Renewable Energy-Based Rural Electrification Project (LREBRE), supported by the UNDP.<sup>9</sup> The project, which ended in 2013, aimed to promote off-grid renewable energy access in three districts (Mokhotlong, Thaba Tseka, and Qacha's Nek). Faced with many challenges, the project was ultimately unsuccessful where only 1,537 of the 5,000 Tier 1 solar home systems (SHS) targeted were ultimately rolled out by 2012.<sup>10</sup>

10 UNDP. "Lesotho Renewable Energy-Based Rural Electrification Project (LREBRE) Draft Terminal Evaluation Report"



### Lessons learned from the LREBRE

The intention was for LREBRE to be commercially viable, with cash or credit-based market mechanisms. When this failed, the project was revised so that the systems were delivered by direct contracting of the private sector for supply, installation and a one-year maintenance period. Systems were sold to customers who paid an upfront deposit of LSL 50 (USD 3) and then purchased the system for LSL 2,000 (USD 121) either paid as a lump sum or in instalments over seven years. While customers paid LSL 2,000, actual costs of the installed system were LSL 12,570 (USD 762) each, of which the Government paid the balance of LSL 10,570 (USD 641) (84% of the cost), resulting in the programme being highly subsidised. Most consumers understood and appreciated the value of the SHS solution, but were reluctant to pay for the solutions. Cash sales in the three districts were minimal, and only 30% of individuals who elected to fund the system through a loan ultimately ended up repaying the loan.<sup>11 12</sup>

One of the failures of the LREBRE plan was as a result of a lack of maintenance, and replacement parts not being easily available in rural communities. Recognising the contribution these factors played in the failure of the previous plan, UNDP introduced a new energy project, under the Sustainable Energy for All (SEforALL) banner, partly funded by the European Union's European Development Fund.<sup>13</sup> This plan, which has concluded its inception phase at present, will establish energy centres in rural villages in Lesotho. These energy centres are meant to function as one-stop shops selling a variety of off-grid, cleaner energy solutions such as LED lights, SHS, and clean cookstoves as well as replacement parts for these solutions. Unfortunately, due to procurement of installers (who were primarily based in urban areas, and travelled to rural areas to facilitate the installation) and a high rate of equipment failure, a significant proportion of the originally installed systems were no longer operating by the time the project terminated. The termination report notes that the effectiveness and reliability of installed systems were highly dependent on the installer involved. One of the failures of the LREBRE plan was as a result of a lack of maintenance, and replacement parts not being easily available in rural communities.<sup>14</sup>

11 Mabohlokoa Tau, UNDP Programme Manager in Lesotho

12 UNDP. "Lesotho Renewable Energy-Based Rural Electrification Project (LREBRE) Draft Terminal Evaluation Report"

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14 UNDP. "Lesotho Renewable Energy-Based Rural Electrification Project (LREBRE) Draft Terminal Evaluation Report"

Mabohlokoa Tau, UNDP Programme Manager in Lesotho



In 2018, the Government of Lesotho published a revised electrification plan, named the Lesotho Electrification Master Plan (EMP). The primary aim of the plan is to improve electricity access in the country. The EMP found that grid extension would continue to play an important role in achieving the access target as it is the least-cost supply solution for roughly 64% of the total population, while off-grid solutions (primarily mini-grids) would be least-cost for 36% of Lesotho's population. A portion of the plan therefore focuses on grid extension, but there is also a large component which focuses on the establishment of mini-grids. Geographic zones in Lesotho have therefore been classified into three groups: (a) to be electrified through grid extension; (b) to be electrified through mini-grids; (c) to be electrified through SHS.

The EMP also includes an off-grid development plan focused primarily on rural electrification, particularly those areas of Lesotho that are not easily reached by the national power grid.<sup>15</sup> However, in terms of the annual electrification budget committed by the Government, 80% is allocated to grid electrification while the remaining 20% will be allocated to off-grid electrification. Based on this budget, the Government estimated in its Off-Grid Master Plan Report<sup>16</sup> that it would be able to connect about 10,600 households to off-grid energy solutions (mainly solar lanterns and small SHS solutions) and 300 households to mini-grids each year. With the LEC's current plans and budget for electrification, as outlined in the EMP, focused on prioritising least-cost grid connections in high-density urban communities, rural access is likely to remain a challenge. The Government of Lesotho has also decided to assess the effectiveness of the UNDP and SEforALL programme to promote uptake of off-grid technologies (see Section 2.6) before proceeding with further off-grid activities under the EMP programme.

Current private sector efforts to address rural off-grid electrification needs are small in scale and not effectively tailored to community needs. According to the World Bank, no major studies have been undertaken to map demand and willingness to pay in conjunction with off-grid energy services. In the case of solar mini-grids, there is a small pilot project being undertaken by One Power Africa which is testing not only the technology but also the business model for the long-term sustainability of the service.



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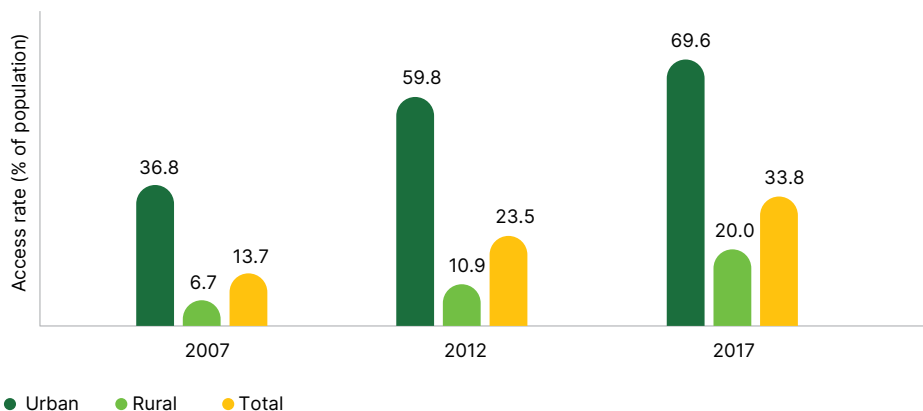
## Current electricity access rate and deficit

Lesotho has one of the lower electricity access rates in the Southern African region, especially when compared to its closest neighbours - South Africa and eSwatini. In 2017, only 34% of the population (655,000 people) had access to electricity via the national grid (Figure 1). As a result of an intensive electrification plan, the access rate has almost tripled over the ten years from 2007 to 2017, from 14% to 34% (Figure 1).

<sup>15</sup> World Bank. "Lesotho - Renewable Energy and Energy Access Project

<sup>16</sup> AETS Consortium, "Lesotho Electrification Master Plan,

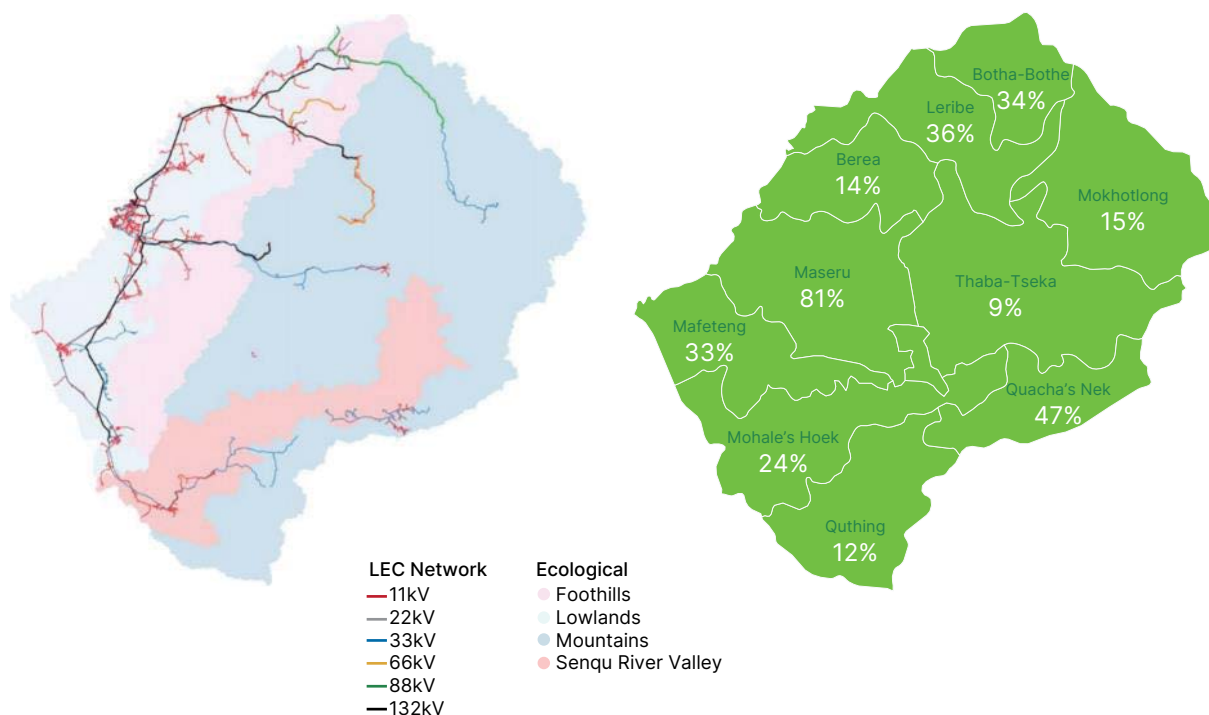




**Figure 1: Electricity access, Lesotho (2007, 2012, 2017)**

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

Access to grid-supplied electricity is much lower in rural areas of Lesotho – with a 20% access rate in rural areas as compared to 70% in urban areas. Since the LEC’s electrification plan prioritises least-cost connections in higher-density urban settlements, rural access is likely to remain low.<sup>17</sup> In 2017, only 20% of the 1.6 million Basotho living in rural areas had access to grid-supplied electricity. Grid extension to the Lesotho highlands is difficult because of the mountainous terrain of this area (mountainous region indicated in dark blue in (Figure 2).



**Figure 2: Existing Electricity Transmission Grid in Lesotho, and access rate by area**

Source: Lesotho Master Electrification Plan (2018).

17 Lesotho Electricity Company, “Annual Report 2016 - 2017 .Pdf.”

FinScope Lesotho (2011), which measures access only for adults, differ slightly from the above findings in terms of level of access. However, this is largely explained by the skew in age distribution in Lesotho, where a large portion of the population is below the age of 18 years (not captured in FinScope). The rate of access to electricity in FinScope (for 2011) is therefore higher at 27% of adults<sup>18</sup>, compared to the World Bank figure of 24% in 2012. Nevertheless, the rural and urban rates of access is fairly comparable, at 11% and 61%. Using this data, we are able to explore access to electricity through additional geographical and demographical lenses. For instance, using ecological zones, we can see that access to electricity is the highest in the Lowlands zone (light blue in Figure 2), at 41%, which is expected as this is where the majority of the countries' distribution infrastructure is located (and also the majority of its adults – 51%). The Foothills (pink) and Mountains (dark blue) zones have comparable access at 14% and 12%, while the Senqu River Valley (red) has by far the lowest access at 4%, although only 10% of adults reside here. However, these figures are bound to have increased, as indicated by the area figures provided in Figure 2 (right hand side).

As a result of the access rate in Lesotho improving between 2007 and 2017, the access deficit (the number of people without access to electricity) has also fallen substantially from 1.7 million in 2007 to 1.4 million in 2017 (Figure 3). This is partially due to a low rate of population growth in Lesotho, as countries like Mozambique have experienced a rise in the access deficit, despite similar increases in the rate of electrification.

**Figure 3: Electricity access, Lesotho (2007, 2012, 2017)**

18 Note that access to electricity is constructed from three variables: (1) using electricity for cooking, (2) ownership of a fridge, and (3) a television. For rural adults, combined ownership is required (to allow for adults who power televisions with batteries), while for urban adults, ownership of both was included.



In terms of the United Nations (UN) SDGs, the goal concerning energy access (SDG7) is to ensure that all people have access to affordable, reliable, sustainable and modern energy by 2030. To estimate the likely future electricity access deficit in 2030, we anticipate the electrification rate required for countries to meet SDG7. Assuming that governments will be able to continue with electrification at the same rate as what they historically achieved, we were able to forecast what the access deficit would be in 2030, taking into account population growth over the same period. We conducted our analysis on a rural and urban level and aggregated these figures to a national level. Based on population size and electricity access rates, we calculated the number of people with electricity access. This also gave us the nominal electricity access deficit. Using these figures, we calculate the nominal change in electricity access (Table 2). For our projection, we assume electricity access increase at the highest annual average achieved between either 2007 and 2012 or 2012 and 2017. This allows some leeway for the multitude of factors that could impact the pace of electrification. We forecast the number of people with access to electricity by applying the assumed annual average change to the existing electricity access base while accounting for population growth. We do not account for significant reductions in the number of people connected to the grid due to, for example, natural disasters. By subtracting the projected number of people with electricity access from the estimated 2030 population, we determine the projected nominal electricity access deficit.

Between 2007 and 2017, Lesotho connected nearly 420,000 additional people to the grid, more than doubling national electricity access (from 14% to 34%). Applying this same rate of growth, Lesotho will reach 57% electricity access by 2030, falling short of SDG7's target of universal access. This is based on the assumption that LEC continues to connect 41,000 people to the grid every year (annual average between 2007 and 2017) and that Lesotho's total population increases from roughly 2.2 million to 2.3 million by 2030.<sup>19</sup> We approximate electricity access in urban areas (accounting for 34% of the population) will reach 78% while rural access rate will increase to 47% by 2030.

**Table 2: Nominal change in electrification (average annual)**

PERIOD	LESOTHO
Urban	
2007 – 2012	21,636
2012 – 2017	12,926
2017 – 2030*	21,636
Rural	
2007 – 2012	21,026
2012 – 2017	28,349
2017 – 2030*	28,349

\* Projected

Source: Own analysis

<sup>19</sup> Based on UN population estimates and projections



*To estimate the likely future electricity access deficit in 2030, we anticipate the electrification rate required for countries to meet SDG7.*

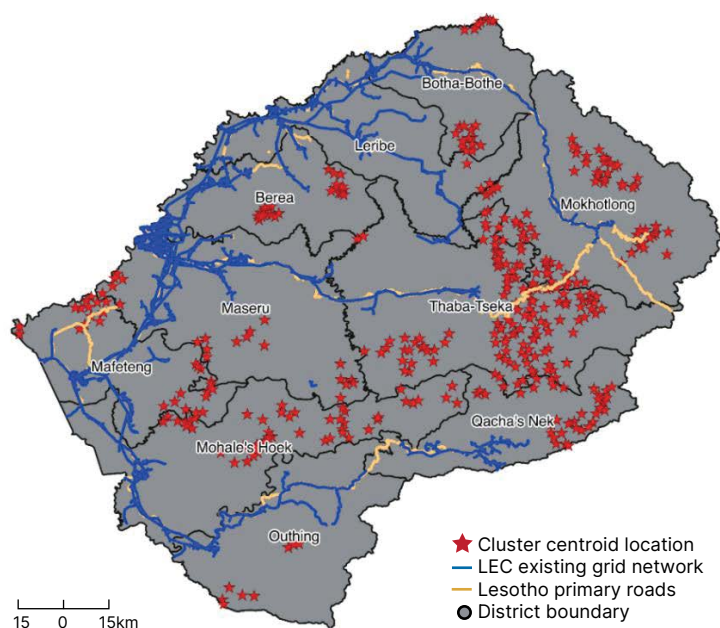
In this case, 1.3 million of 2.3 million Basotho will still live without access to the grid-supplied electricity by 2030. Just over half of these people (720,000) would be living in rural areas. To achieve universal access by 2030, the Government of Lesotho would have to accelerate the current electrification programme. Our analysis suggests that at least 91,000 rural people would have to be connected on average every year between 2017 and 2030 (3.2 times the current rate of 28,000 people) and an average of 35,000 urban people annually (roughly 1.6 times the current rate of 22,000 people).

A recent report by the World Bank considered several grid expansion scenarios for Lesotho. Given the largely mountainous terrain and low population density in remote villages, they noted that electrification using grid extension, while preferred, is likely not the least-cost option for many rural communities. The authors conclude that mini-grids offer a better solution for electrifying off-grid households, community facilities, and small businesses located more than 15km from existing grid infrastructure (Figure 4).<sup>20</sup>

The Government of Lesotho prepared an EMP that sets out the role of both grid and off-grid electrification in meeting national access targets.<sup>21</sup> The EMP, financed by LEC, found that grid extension would continue to play an important role in achieving the access target as the least-cost supply solution for roughly 64% of the total population. Off-grid solutions (primarily mini-grids), however, would be the least-cost route for the remaining 36%.



*Given the largely mountainous terrain and low population density in remote villages, they noted that electrification using grid extension, while preferred, is likely not the least-cost option for many rural communities.*



**Figure 4: Potential off-grid mini-grid sites, Lesotho**

Note: Clusters contain at least 100 households and are located 15km or further from existing grid infrastructure.

Source: World Bank. "International Development Association project appraisal document on from scaling-up renewable energy

<sup>20</sup> World Bank. "Network Reinforcement and Access Project (P166170) (2020).

<sup>21</sup> World Bank. "International Development Association project appraisal document on a proposed credit in the amount of SDR 29.2 million (USD 40.0 million equivalent) a proposed grant in the amount of USD 4.9 million from scaling-up renewable energy program."

## A closer look at access: consumer realities on the ground

Geographic location has an obvious impact on access, given the infrastructure requirements for distribution. However, there are other demographic indicators that provide useful insights into the drivers of access to electricity. For instance, access increases significantly over income, with the poorest (and also largest) groups, having the least access (between 12% and 18%), while those who earn more have higher access (between 37% and 66%). The former group, earning less than LSL 500 per month, comprises 61% of adults, while the latter (earning LSL 500 or more) are 39%.

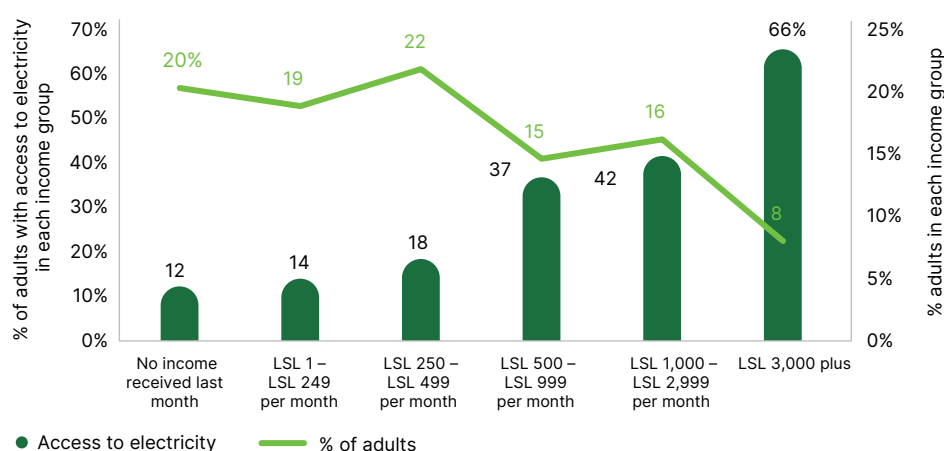
To a large extent, income correlates with access because income is influenced by geographic location, however, it does provide a useful breakdown within the same location as well. Income source is another useful indicator, as those with the same income source tend to have similar demographic characteristics (including income), and also tend to live in similar types of locations. Access to electricity by income group negatively correlates almost directly with the proportion of adults in each income group that are rural.

For instance, only 37% of the formally employed are rural, versus 82% of farmers. In other words, the income groups that are the most rural, have the lowest access rates to electricity, and vice versa. Income groups with the highest access to electricity in general also tend to have the highest income (the formally employed, and the self-employed), and those with the lowest access tend to have the lowest income (farmers and the informally employed).

Education is another demographic indicator (perhaps the best indicator) that correlates strongly with access to electricity. For instance, of those who have no education, or only have a primary education (in part or in full) only 18% have access to electricity. These two groups comprise 26% and 42% of adults respectively (a total of 68% of the population). Of those with a secondary education (in full or in part) 31% have access to electricity (another 18% of adults).



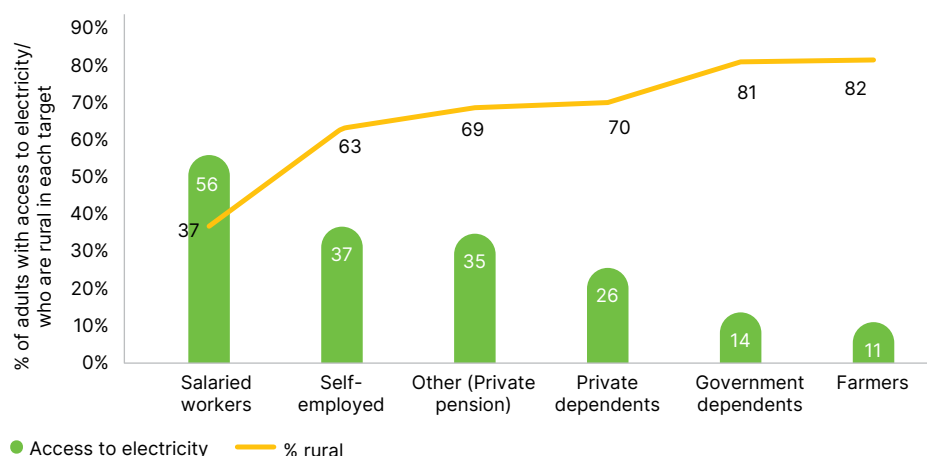
*37% of the formally employed are rural, versus 82% of farmers. In other words, the income groups that are the most rural, have the lowest access rates to electricity, and vice versa.*



**Figure 5: Access to electricity by income group**

Source: FinScope Lesotho 2011





**Figure 6: Access to electricity by target market (income source)**

Source: FinScope Lesotho 2011

Those with a high school education (in full or in part) have an access rate of 49% (another 10% of adults), while those that have an education in addition to high school (vocational training or tertiary) have the highest levels of access at 81%, but this is only 5% of the population. Interestingly, women also report a slightly higher access rate than men (28% versus 25%).

## Programmes and initiatives to promote the uptake of off-grid cleaner energy

Several development partners are active in the grid and off-grid electrification space in Lesotho. According to the World Bank,<sup>22</sup> the European Union (EU) is currently the biggest player in the energy sector and is supporting the institutional reform of the energy sector including a review of the energy policy and development of an Energy Act to overcome hurdles for private sector participation in the sector.

The EU's European Development Fund in collaboration with the UNDP is currently implementing a new energy project, under the broader SEforALL programme with support from the Global Environment Facility (GEF). The objective of this project is to unlock private investment in small-scale renewable energy projects in Lesotho through the provision of technical assistance and financial support via the Financial Support Scheme (FSS). The first call for proposal was in May 2019 with a total of 74 proposals received (34 for Renewal Energy Mini-Grids and 40 for Village Energy Centres). The FSS aims to support the establishment of ten renewable energy mini-grids<sup>23</sup> and ten energy centres. The establishment of energy centres will be funded via a credit line that will have a blend of debt and results-based grants. Fuels and energy solutions will be sold to local communities. Products sold in each centre will be manufactured and distributed by private companies (local and international), and while the solutions might be



*Those with a high school education have an access rate of 49%, while those that have an education in addition to high school have the highest levels of access at 81%, but this is only 5% of the population.*

<sup>22</sup> World Bank. "Lesotho Renewable Energy and Energy Access Project"

<sup>23</sup> FSS targets renewable energy mini-grids with at least 18 kW of PV.

partially subsidised, the programme is meant to be self-sustaining and market-led, with profits on sale being used to cover operating costs.

The project seeks to promote the adoption of rural electrification products by supporting local companies to set up private sector-led mini-grid sites and energy centres (to be stocked and funded by private players) to retail rural electrification technologies to rural communities and micro, small and medium sized enterprises (MSMEs). These partially subsidised energy centres are meant to function as one-stop shops selling a variety of off-grid, cleaner energy solutions and fuels such as liquefied petroleum gas (LPG), kerosene, LED lights, SHS, and efficient cookstoves as well as replacement parts for these. They are also intended to disseminate information about the benefits of cleaner energy, and provide technical support and replacement parts for solutions which have been sold.

Some clean energy companies exist, but they are mainly based in the urban lowlands. The expectation is that through support from the UNDP and SEforALL project, these companies will be incentivised to expand operations to rural centres in the mountainous highlands. Relevant private players expected to be impacted include One Power Africa (mini-grid implementation), SolarLights (Pico solar and SHS) and Africa Clean Energy (clean cookstove manufacturer). Through discussions with the UNDP in-country contact in Lesotho,<sup>24</sup> we understand that this project has concluded its planning phase, and rural energy centres are planned to be established in the next year. We also understand that funding from the European Development Fund is expected to conclude in 2021 and that this programme is currently looking for other funding to support the roll-out of these energy centres.

In addition to its collaboration with the EU, the UNDP is supporting the Government of Lesotho to develop a regulatory framework for mini-grids, which will solve legal and technical issues and will guide private developers on the setup and operation of mini-grids.

- i. The World Bank, through the Lesotho Renewable Energy and Energy Access Project,<sup>25</sup> is launching a programme to complement some of the existing initiatives. The programme consists of three components: a grid extension to peri-urban areas of Lesotho (International Development Association [IDA] USD 30 million equivalent) which will be implemented by the LEC.
- ii. Electrification by mini-grids (IDA USD 10 million equivalent) supporting the electrification of areas where mini-grids represents the least-cost option from a country perspective, as underpinned by the EMP and geospatial analysis. The focus will be on solar hybrid systems - solar generation with battery storage and diesel.
- iii. Technical Assistance and Implementation Support (Scaling up Renewable Energy Program (SREP) Grant USD 2.9 million equivalent)



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<sup>24</sup> Limomane Peshoane and Tau Mabohlokoa (UNDP), in conversation with the authors, 11 February 2020.

<sup>25</sup> World Bank. "Lesotho Renewable Energy and Energy Access Project "

Under component ii, the World Bank will fund the deployment of several mini-grids using private sector-led business models. It is expected the project will support the development of between 30 and 39 mini-grid sites based on solar hybrid (PV-diesel-battery) technologies and will connect 4,800 customers. Sites will be prioritised on the basis of geospatial analysis; the sites must be at least 15km from the grid and have a minimum of 100 potential customers. Hybrid solar PV-diesel-battery systems are estimated to cost in the ~USD 300,000 with much of the capital expenditure subsidised through a public-private partnership (PPP) arrangement where the private sector operator will be required to cover the full costs of operating the systems from consumers via tariff.

Refer to Table 3 for a summary of the programmes and initiatives running in Lesotho.

**Table 3: Donor initiatives to promote off-grid renewable energy solutions in Lesotho**

DONOR	FUNDING	DATES	TECHNOLOGY	OBJECTIVES
The European Union's European Development Fund with the UNDP	EUR 1.25 million	Up to 2021	Solar PV (Pico), SHS, off-grid power solutions for MSMEs	<p>The project's first aim is to establish sustainable social enterprises to distribute energy-efficient and renewable energy services and technologies to rural populations to meet their different needs. The project also aims to establish a sustainable distribution chain from the builder to the final beneficiary in Lesotho's rural areas.</p> <p>A secondary objective of the project is to develop the revenues of 40 independent distributors. A third goal is to sensitize 10,000 community members on the negative impact of the use of biomass fuels in their homes and to encourage the use of solar lamps.</p>
The World Bank's International Development Association (IDA) and Climate Investment Funds.	USD 52.9 million (USD 40 million from the IDA, USD 12.9 million from Climate Investment Funds)	2019 to 2021	Grid extension to peri-urban areas, and the establishment of mini-grids promotion.	<p>The project's overall objective is to scale up renewable energy-based off-grid electrification in rural and peri-urban areas of Lesotho.</p> <p>The programme consists of three components, 1) grid extension to peri-urban areas of Lesotho (IDA USD 30 million equivalent) which will be implemented by the LEC 2) Electrification by Mini-grids (IDA USD 10 million equivalent) supporting the electrification of areas where mini-grids represents the least-cost option from a country perspective, as underpinned by the EMP and geospatial analysis. The focus will be on solar hybrid systems - solar generation with battery storage and diesel 3) Technical Assistance and Implementation Support (SREP Grant USD 2.9 million equivalent)</p>

## 2 / 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 on the SADC countries, which this report is part of, applies a more detailed framework for the evaluation of access to energy, based largely on the ESMAP/SEforALL multi-tier framework.

Access to energy is an 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 UN and the President of the World Bank. The SEforALL multi-tier framework provides three main sources of energy used by households: 1) electricity, 2) solid fuels, and 3) 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 LPG, natural gas, kerosene (including paraffin), ethanol, and biofuels.<sup>26</sup>

The multi-tier approach measures access to household electricity as a continuum of improvement (as opposed to a binary metric like access vs. no access) 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. 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 4.



*Access to energy is an enabler of socio-economic development. Universal access to 'modern energy' by 2030 is one of the three key pillars of the SEforALL programme.*

26 Mikul and Angelou, "Beyond Connections - Energy Access Redefined."



**Table 4:** 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 watt-hour - 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 & 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 solar home systems, Rechargeable battery	Medium solar home systems, Fossil fuel-based generator, Mini-grid	Large solar home systems, 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 5 illustrates which energy services can be accessed by households at each tier and which of the services could 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.



*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 5: 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

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

LEC reported 415 local (rather than widespread or national) outages between April 2016 and March 2017. Of these, 355 were restored within four hours and the remaining 60 within 24 hours. None of the outages lasted longer than 24 hours. In terms of this ESMAP/SEforALL framework, grid-supplied electricity in Lesotho meets the requirements for the highest rating (Table 6).

**Table 6: Grid-supplied electricity rating, Lesotho**

		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
AVAILABILITY (DURATION)	HOURS PER DAY		Min 4 hrs	Min 4 hrs	Min 8 hrs	Min 16 hrs	Min 23 hrs
	HOURS PER EVENING		Min 1 hr	Min 2 hrs	Min 3 hrs	Min 4 hrs	Min 4 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	

Lesotho has secured a firm supply agreement from Eskom, the state-owned utility in South Africa. Under the agreement, Eskom guarantees that it will maintain the power supply to Lesotho. Technically, if the South African grid is experiencing supply shortages, Lesotho may be required to implement load-shedding. However, Lesotho has not been subjected to load-shedding in the recent past, despite supply shortages and consequent load-shedding in South Africa. LEC reports on the quality of electricity supply, stating that frequency deviations averaged less than 1%, well within the target band of 2% variance around 50 hertz (Hz).



# Consumer profile of energy needs and usage

For Lesotho, we do not have data on electricity usage and other energy sources for lighting purposes. However, in the other four SADC countries included in our study, the use of electricity for lighting purposes closely follows the overall level of access to electricity. In other words, most people who have access to electricity use that electricity for lighting purposes. This is because lighting is one of the lowest use cases for electricity, and people can usually afford the cost of electricity to power lights.

Nevertheless, because the rate of access to electricity is below 50% in most of these countries, the majority of adults still use alternative sources of energy for lighting purposes. These other sources are mostly paraffin, candles, lanterns, fire and solar panels. The latter is used by 6% in Madagascar and 10% in Mozambique for instance. Given the differences in access to grid electricity between urban and rural areas, there is obviously a similar difference in the use of electricity for lighting. Therefore, electricity is likely used for lighting purposes by around 70% of urban adults and around 20% of rural adults in Lesotho.

Correspondingly, fewer people in urban areas would use alternative sources for lighting. A much larger proportion of rural adults would be using alternative sources, and although the majority of these would use paraffin, candles or lanterns, a higher proportion would also use fire, solar panels, or simply not use any lighting source.

Lastly, data from other SADC countries also indicated that the use of kerosene lamps, candles, lanterns and other sources (including fire) decreases as income increases, while the use of grid electricity increases substantially as income increase. The proportion of adults that report not using any source also decrease as income increases. Similarly, for income source, farmers and those with no income source are the least likely to use grid electricity for lighting, while those who are formally employed (receive a salary or wage) have the highest usage.

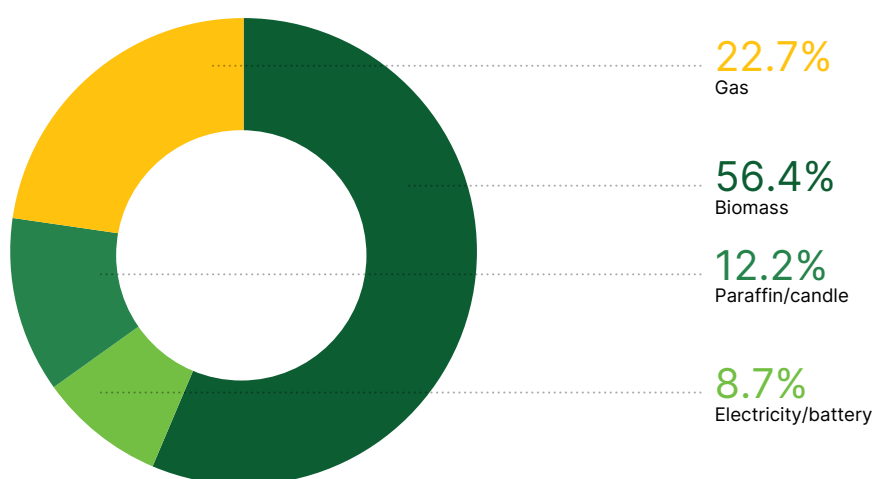


Electricity is likely used for lighting purposes by around 70% of urban adults and around 20% of rural adults in Lesotho.

Data on the use of different energy sources for cooking is available for Lesotho. Lesotho is heavily reliant on biomass and imported gas for cooking (Figure 7). Firewood is the predominant biomass fuel used for cooking in the country (55%), while animal dung are used by another 2%. Interestingly, in other SADC countries, charcoal is the main substitute for firewood, and is used more by people in urban areas, or people in higher income groups. In Lesotho, almost no one reported using charcoal to cook, and instead, gas seems to be the main substitute people switch to once they can afford it. Only 9% of adults reported using electricity for cooking, which is much lower than the rate of access to electricity, but it also quite typical, i.e. most people who have access to electricity, cannot afford the high electricity cost required to utilise an electric stove or cooking appliance. In terms of the World Health Organisation (WHO) definition, 36% of Basotho had access to clean fuels and technologies for cooking in 2016 (Figure 8). This is one of the highest rates observed in the five SADC countries, and is primarily due to the high rate of gas and paraffin usage for cooking.

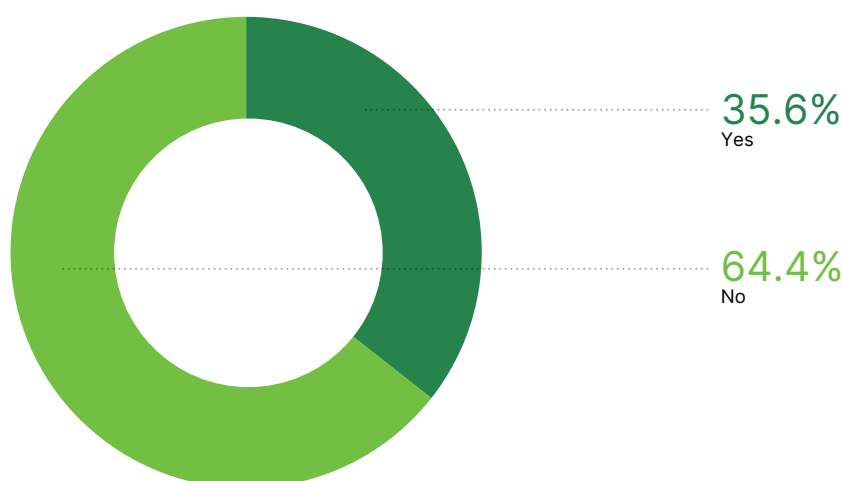


*In Lesotho, almost no one reported using charcoal to cook, and instead, gas seems to be the main substitute people switch to once they can afford it.*



**Figure 7: Fuels used for cooking, Lesotho (% of households)**

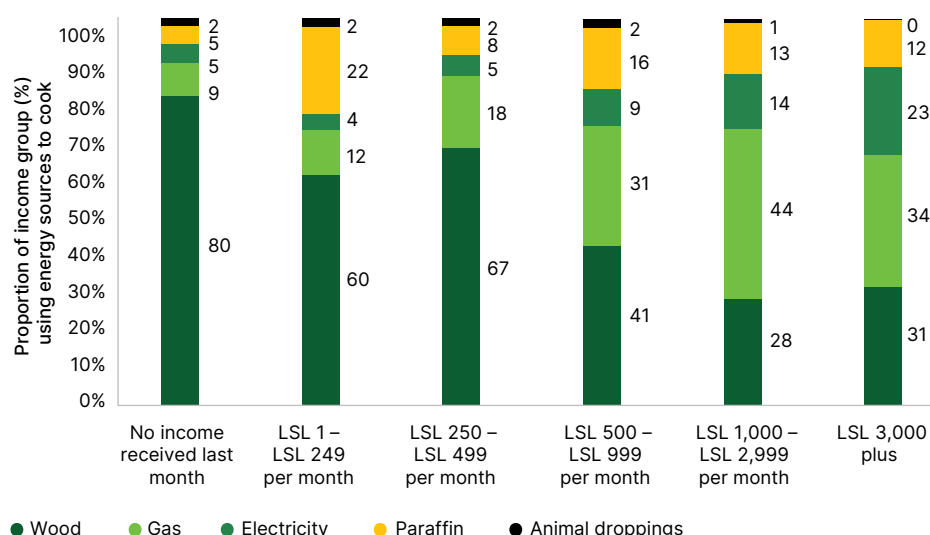
Source: Own analysis based on FinScope survey for Lesotho, 2011



**Figure 8: Access to clean cooking fuels and technologies, Lesotho (% of the population)**

Source: Own analysis based on data World Bank, SEforALL database from WHO Global Household Energy database





**Figure 9: Use of energy sources for cooking by income group**

Source: FinScope Lesotho 2011

Similar to lighting, there is also a difference in the energy sources used for cooking based on geographic location. Most rural households rely on traditional solid fuels – mainly wood (75%) for heating and cooking, compared to only 9% in urban areas (animal dung account for another 2% in rural areas, while almost no one uses it in urban areas). Another 21% of rural adults use gas (11%) or paraffin (10%), while only 2% of rural adults use electricity for cooking. Conversely, 50% of urban adults report using gas, followed by electricity (24%) and paraffin (17%). Lesotho's mountainous topography increases the cost and difficulty of extending the grid to remote locations. Off-grid solutions therefore provide an alternative source for the rural population to meet their energy needs.<sup>27</sup>

The use of firewood decreases over income, while the use of gas and grid electricity increases. However, even for the highest income groups, almost a third of adults still use firewood, and around a third to half still use gas. Farmers and government dependents report the highest use of wood to cook (71% and 68%), while salaried employees report the highest use of gas (44%) and electricity (21%) and the lowest use of wood (20%). Women are slightly more likely to use wood or gas to cook, while men are more likely to use paraffin. The use of wood to cook decreases dramatically as education increases (from 68% for those with no education to 3% for those with a tertiary education), while the use of electricity and gas increases (from 5% and 17% to 47% and 45%). The use of firewood increases over age, while the use of gas decreases.



*The use of firewood decreases over income, while the use of gas and grid electricity increases. However, even for the highest income groups, almost a third of adults still use firewood, and around a third to half still use gas.*

<sup>27</sup> Department of Energy- Government of Lesotho., "Investment Plan for Scaling-up Renewable Energy in the Kingdom of Lesotho."

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

### Cost and affordability of grid-supplied electricity

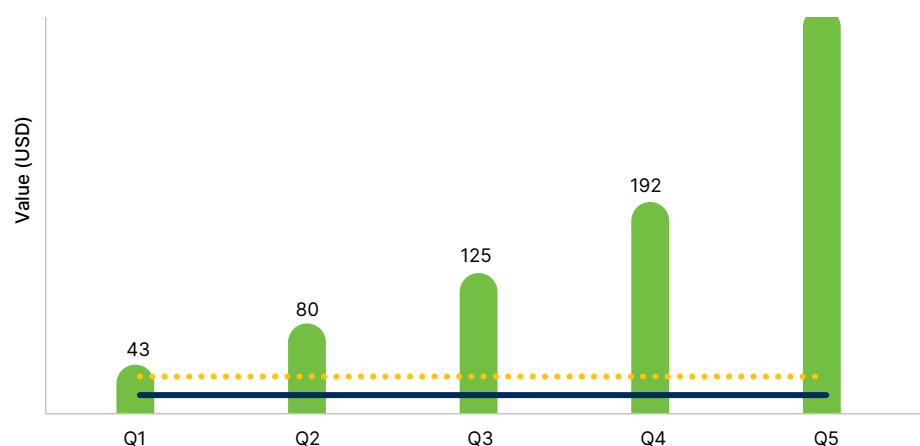
The LEC's latest published tariffs for single-phase domestic supply is LSL 1.48 per kWh (USD 0.09),<sup>28</sup> while the first 30 kWh per month per household is discounted to LSL 0.73 (USD 0.04).<sup>29</sup> The ESMAP/SEforALL multi-tier framework defines a standard consumption package (SCP) as 365 kWh a year, or one kWh per day. The SCP would therefore cost LSL 270 (~USD 16) based on the 'lifeline' or discounted household tariff applied to the first 360 kWh and the standard tariff applied to the remaining 5 kWh. Without this discount, the SCP would cost LSL 540 (~USD 33) using the standard residential tariff (Table 7).

**Table 7:** Cost of grid-supplied electricity, Lesotho (2020)

	CURRENCY	COST PER KWH	COST OF SCP (365 KWH)
Lifeline tariff, prepaid	LSL	0.73	270.2
	USD	0.04	16.38
Residential tariff, prepaid	LSL	1.48	539.54
	USD	0.09	32.70

Source: Own analysis based on tariff data from <https://www.lec.co.ls/publications>

The ESMAP/SEforALL multi-tier framework measures the affordability of grid electricity by comparing the cost of the SCP of 365 kWh per year to a maximum energy expenditure threshold, set at 5% of total household expenditure (Figure 10). According to this metric, we find that all households in Lesotho can afford a SCP priced at either the lifeline or standard residential tariff.



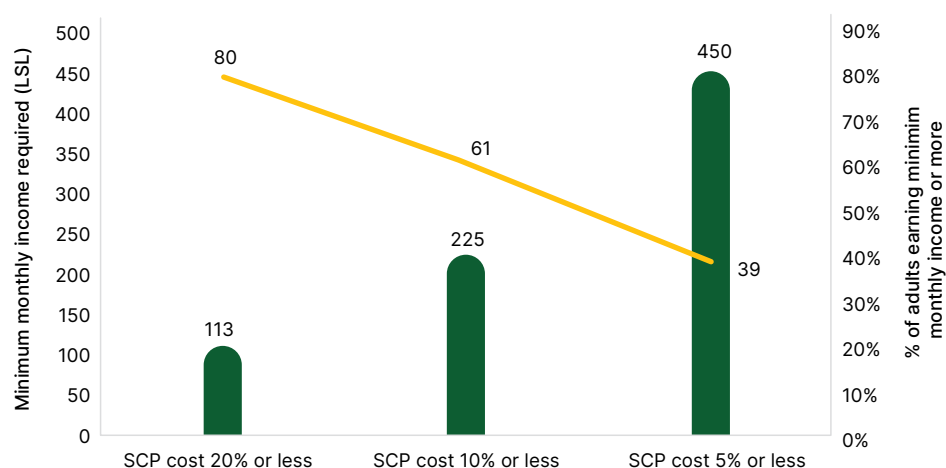
**Figure 10:** Affordability of grid electricity by income quintile, Lesotho (2020)

Note: Cost of SCP: Lifeline tariff = USD 36.50; Standard tariff = USD 38.71

Source: Own analysis.

<sup>28</sup> Translation at rate of LSL 14.25 to USD 1

<sup>29</sup> Lesotho Electricity Company, "Schedule of Tariffs and Charges by Lesotho Electricity Company October 2019."



**Figure 11: Minimum monthly income required to fall into different brackets of affordability of the SCP**

Source: FinScope Mozambique 2019

FinScope can assist to provide more insight into the affordability of electricity in relation to segments of the adult population (or segments of households), and their level of use of electricity. As the lifeline tariff applies to an allocation of usage comparable to the SCP (30 kWh per month versus 30.4 kWh), it provides a discount on essentially the entire SCP. Given the monthly cost of the SCP, at the lifeline tariff, we can calculate the minimum household/personal monthly income required to fall into specific brackets of affordability of the SCP. For instance, in order for the SCP to be 5% of your monthly income or less, you would need to earn LZL 450 (USD 27) per month or more (Figure 11). We can calculate from this data that only 39% of adults would be able to purchase the SCP at 5% of their monthly income or less. This therefore paints a very different picture than the estimates above. Furthermore, even if looking at affordability thresholds higher than 5%, for instance, 10% and 20%, we can still see that not everyone in Lesotho can afford to purchase electricity (between 61% and 80%).

However, household income is higher than personal income (but not available from the Lesotho FinScope), and a larger proportion of households would therefore be able to afford the SCP. We also know from other SADC countries that the majority of people with access to electricity use less than the SCP. In other words, their monthly cost would be less than the cost of the SCP, which makes expenditure on electricity more affordable. The ESMAP/SEforALL multi-tier framework prescribes minimum thresholds of electricity usage (in Wh) by tier (See Table 4, section 2). We can therefore estimate the minimum and maximum cost of electricity for each tier of electricity users, and similarly, calculate affordability by usage tier, both for the minimum and maximum usage amount, to estimate the proportion of adults likely able to afford electricity under each tier.

When doing so, we find that 10% of adults in Lesotho would be able to afford the minimum amount of usage prescribed under Tier 5, when looking at affordability rates of 5%, while an additional 20% of people (total of 30%) would be able to afford it when looking at an affordability threshold of 10% of monthly income. However, a very small proportion of people would be able to afford the maximum



*A maximum of 30% of Lesotho adults would be able to afford the minimum amount of usage prescribed under Tier 5, when looking at affordability rates of 10% of monthly income.*

Under the minimum usage prescribed by each Tier, we therefore calculate that 30% of electricity users are at Tier 5, while the remaining 70% are at Tier 4, and under the maximum prescribed usage by Tier, we estimate that 1% of electricity users are at Tier 5, 30% at Tier 4, and 69% at Tier 3. In this scenario, most users of electricity are therefore likely to use less electricity than prescribed by Tier 4 and 5, and would therefore fall in Tier 3.

*Affordability of electricity will therefore likely be the main barrier to electricity usage going forward, even if distribution to remote mountainous areas can be solved.*

When considering the business/investment case of producing electricity, one therefore needs to take into account the subsidy applied for the majority of households. However, this is a complicated consideration, as without the subsidy, almost no individual would be able to afford electricity, and the electricity system would work almost exclusively for business and industry.

27 Consumer profile of energy needs and usage

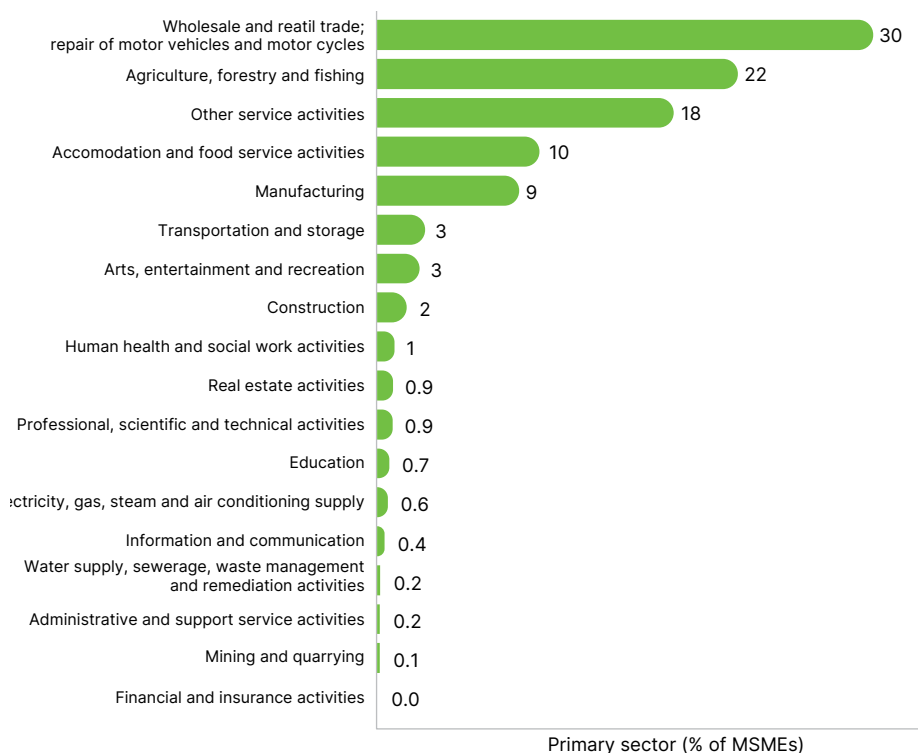


# 4 MSME energy use for productive purposes

## Small business profile

There are about 76,000 MSMEs in Lesotho, employing 118,000 people (including owners)<sup>31</sup>. The majority (70%) of MSME owners rely on their businesses as their sole source of income and 45% earn less than LSL 2,000 per month – equivalent to about USD 121.<sup>32</sup>

Most MSMEs in Lesotho are micro-enterprises (83%) and employ only the owner. The remaining 17% of MSME owners (~13,000) employ a total of 55,000 people, around 60% (32,368) of which are employed on a full-time basis.<sup>33</sup> In terms of operating location, 61% of small businesses operate from residential premises, with 18% operating from roads or the roadside pavement.



**Figure 12: MSMEs by sector, Lesotho (2016)**

Source: Own analysis based on FinScope MSME survey for Lesotho, 2016.

31 Own analysis based on FinScope survey (2016),

32 Finmark Trust, "FinScope MSME Survey Lesotho 2016."

33 Finmark Trust, "FinScope MSME Survey Lesotho 2016."

The MSME sector in Lesotho is characterised by retail and agricultural activity which, combined, comprise just over 50% of MSMEs (Figure 12). Around 30% of MSME work in the wholesale and retail sector involves selling goods or services in the same form (i.e. do not add value). For those in the agriculture sector (22%), a majority rear livestock (53%) with only 15% growing crops. Another 10% and 9% of MSME owners work in accommodation and food services (Figure 12). A further 28% are involved in providing services (both general and food and accommodation). A relatively small proportion (10%) reported that they were engaged in manufacturing.

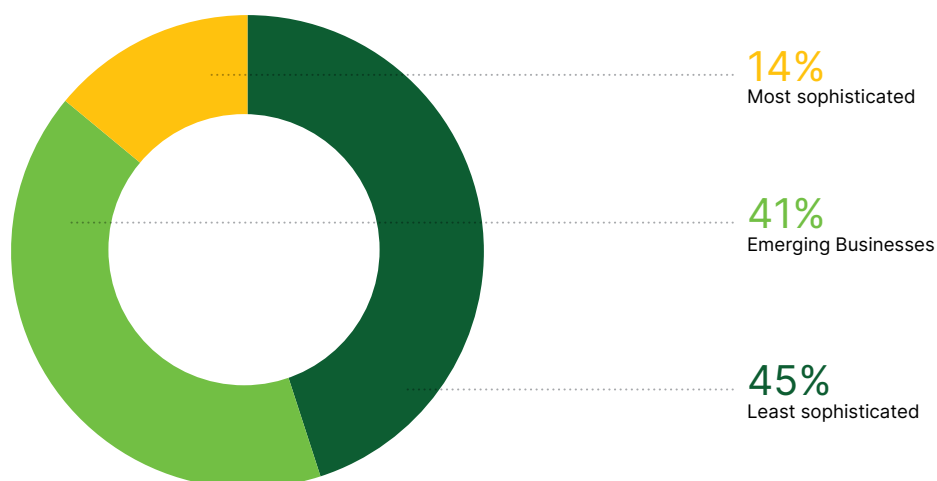
MSMEs in Lesotho are relatively well-established with the majority (64%) reporting that their business has been in operation for more than three years. In total, 18% of MSME owners reported that their businesses are registered. Of the registered MSMEs, 82% are owned by individuals (sole proprietors), 6% are companies, and 5% are in partnership. Despite being established, however, Lesotho's MSME sector is characterised by a lack of business sophistication as measured by FinScope's Business Sophistication Measure (BSM).

The BSM provides a spectrum of formality across eight categories, with one being least formal and eight being most formal, by combining eight variables recorded in the FinScope Small Business Survey. These are: business registration; compliance with taxes; ownership structure; customer base; business premises; access to facilities (water, electricity, sanitation); business equipment (fax, computer, cell phone); and some money management variables (record keeping, usage of financial services).<sup>34</sup>

In Lesotho, approximately 45% of businesses are classified as least sophisticated (an estimation of 35,000 businesses), followed by 31,000 (41%) emerging businesses. Only 11,000 (14%) businesses were found to have characteristics of a most sophisticated business (Figure 13).



*In Lesotho, approximately 45% of businesses are classified as least sophisticated, followed by 41% emerging businesses. Only 14% of businesses were found to have characteristics of a most sophisticated business*



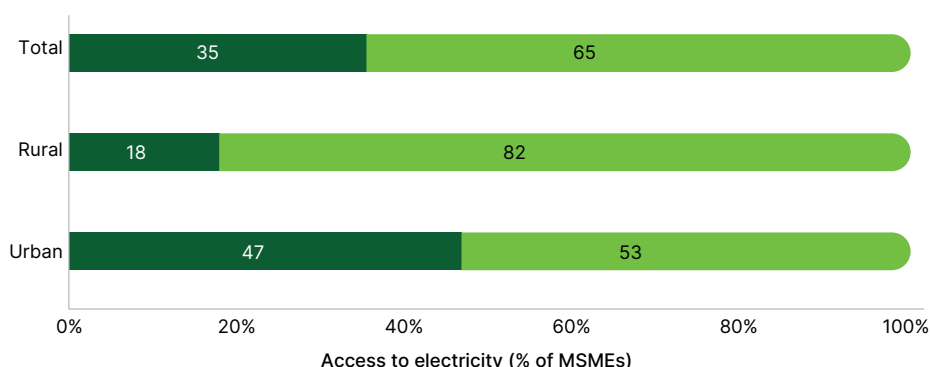
**Figure 13: MSME business sophistication, Lesotho (2016)**

Source: Own analysis based on FinScope MSME survey for Lesotho, 2016.

34 FinMark Trust, "FinScope MSME Survey Lesotho 2016."

## MSME access to electricity in Lesotho

The majority (~65%) of MSMEs interviewed by FinScope reported that they do not have access to electricity. The proportion of MSMEs without access to electricity in rural areas is even higher – more than 80% (Figure 14). Although these access figures are comparable to the overall population access figures for 2017 (see Section 2.3), the level of access of urban MSMEs are notably lower. It is therefore a potentially low hanging fruit to address.



**Figure 14: MSME access to electricity, urban versus rural divide, Lesotho (2016)**

Source: Own analysis based on FinScope MSME survey for Lesotho, 2016.

Even though most MSMEs lack access to electricity, only 9% of firms interviewed identify 'connecting to electricity' as the primary operational constraint facing their business (Figure 15), and only 3% of firms identify 'electricity' as the most significant barrier to growth (Figure 16).

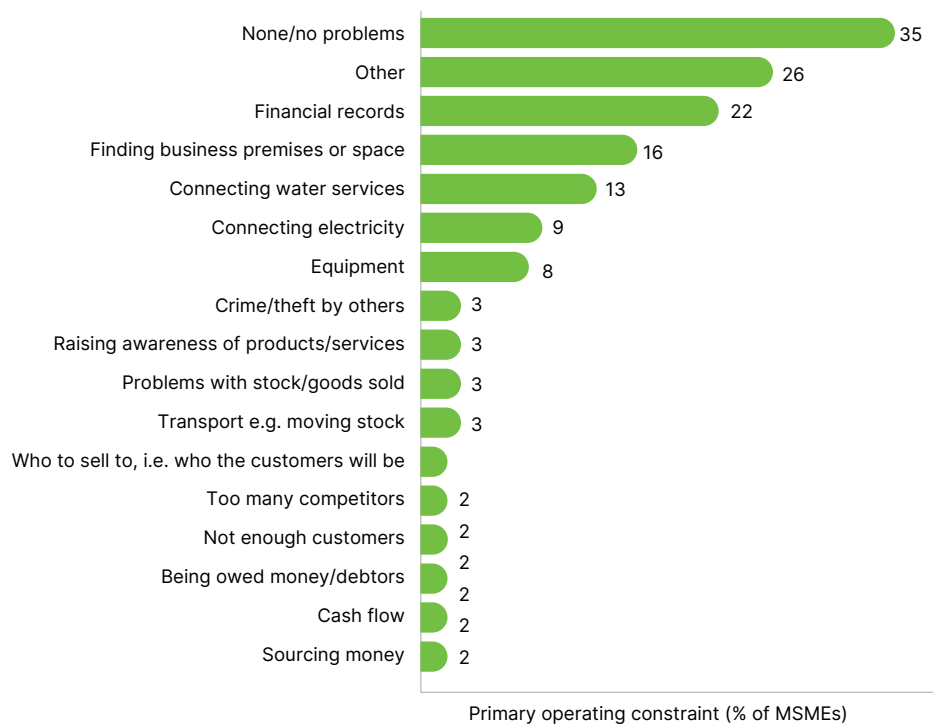
This suggests while the potential market for off-grid, cleaner energy solutions for productive uses is quite large given relatively low access, uptake or willingness to pay may be quite low because a lack of electricity is only one of many constraints that MSMEs in Lesotho face. The highest ranking barriers include a lack of financial records, finding business space or premises, and connecting water services. This may be explained by the lack of business sophistication that characterises most of Lesotho's MSMEs. It may also be explained in terms of the operating locations of Lesotho's MSMEs: with 18% of MSMEs operating from the street and/or pavement, access to electricity is unlikely to be a requirement for operating or growing the business.

Although access to finance is not noted as a major constraint, survey results indicate that 35% of business owners (28,000) are financially excluded, that is they do not use any financial products or services (neither formal nor informal) to manage their business finances and only 41% (31,000) of business owners are banked and 12% (9,000) have other formal non-bank products and services.<sup>35</sup> About 46% of business owners in urban areas are banked while 36% in rural areas are banked. Around 22% of rural business owners rely only on informal mechanisms to manage their business finances, as opposed to 18% of urban business owners.

35%

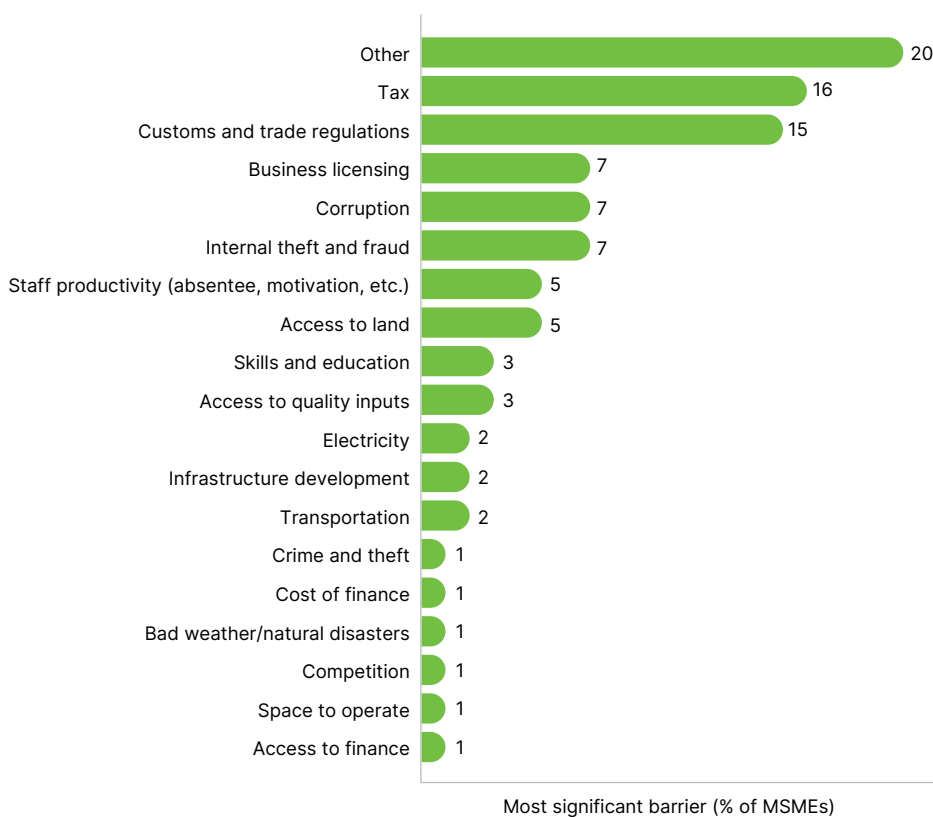
*Although access to finance is not noted as a major constraint in Lesotho, survey results indicate that 35% of business owners are financially excluded.*

<sup>35</sup> Finmark Trust, "FinScope MSME Survey Lesotho 2016."



**Figure 15: Primary operational constraints faced by MSMEs, Lesotho (2016)**

Source: Own analysis based on FinScope MSME survey for Lesotho, 2016.



**Figure 16: Most significant barrier to business growth, Lesotho (2016)**

Source: Own analysis based on FinScope MSME survey for Lesotho, 2016.



## Potential to deploy off-grid power solutions for productive applications

Although most MSMEs in Lesotho do not have access to electricity, this was not identified by businesses as the primary or most significant constraint to operating or growing a business (Figure 15 and Figure 16). This suggests that effort to support small business will have to be more holistic and should be geared to improving access to credit and financial services in addition to provide access to basic services such as water and clean energy. Given that 85% of MSMEs are micro-enterprises with no employees, it seems unlikely that Lesotho's MSMEs will be able to afford electric appliances.

Based on the lack of sophistication of MSMEs, and the fact that 18% of them operate on the street, the opportunity for large-scale deployment off-grid power solutions in Lesotho appears low. However, based on the profile of MSMEs in the country, there may be scope for a niche productive application. For example, 10% of MSMEs are involved in "accommodation and food service activities". For these MSMEs operating in rural areas, there is an opportunity for a positive externality to stem from the existing deployment of solar lanterns, solar kits, SHS, and mini-grids under the Government of Lesotho's EMP.

Also, 22% of MSMEs report that they operate in the agriculture sector, with 54% of these firms (53%) rearing livestock and 15% growing crops. There are generic productive applications that leverage off-grid solar energy in the agriculture space (Figure 17). A study of these applications by the World Bank suggests that water pumps are most ready to scale, cooling solutions are relatively expensive, and agro-processing units are still at the pilot stage.<sup>36</sup>

In addition, the report highlights that the market readiness of productive uses leveraging solar energy technology varies significantly depending on the use case and associated energy consumption and system requirements.<sup>37</sup> Understanding market readiness in Lesotho will require an analysis of the energy needs of farmers in this sector to design an appropriate product. These constraints aside, at a fundamental level, lack of access to finance is the barrier that will prevent many MSMEs from adopting cleaner technologies for productive use applications.



**Figure 17:** Potential uses of off-grid solar energy in agriculture (not-exhaustive)

Source: World Bank. 2019.

36 World Bank. "The Market Opportunity for Productive Use Leveraging Solar Energy (PULSE) in Sub-Saharan Africa" p. 13

37 World Bank. "The Market Opportunity for Productive Use Leveraging Solar Energy (PULSE) in Sub-Saharan Africa" p. 9

# 5

## Access to financial services

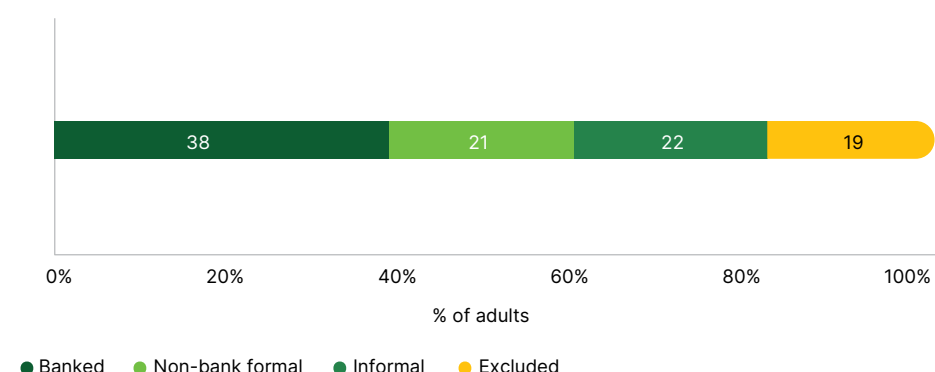
*In 2011, FinScope reported that 38% of the surveyed Basotho reported having a bank account. An additional 21% used non-bank formal financial services, but did not have a bank account, indicating total formal financial services usage by 59% of adults.*

Furthermore, 22% of adults used informal financial services, but no formal services, which means that 19% of adults used no financial services (either formal or informal). The overlap between bank, other formal and informal financial services (those who use more than one of these three types) is substantial though, as total non-bank formal usage was 46% and total informal usage 62%.

The banking sector in Lesotho is dominated by four banks, whose combined assets are equivalent to more than 40% of GDP. There is a relative lack of formal non-bank credit, savings or payments providers, with only eight microfinance institutions (MFI) in the country. Many informal and formal money lenders exist and serve a large proportion of the population, but there are no key players in this market. Given the remoteness of many rural communities in Lesotho, accessing formal financial services is both difficult and expensive, increasing the importance of informal providers to supply credit, a safe place to save and earn a return and to pool risk.

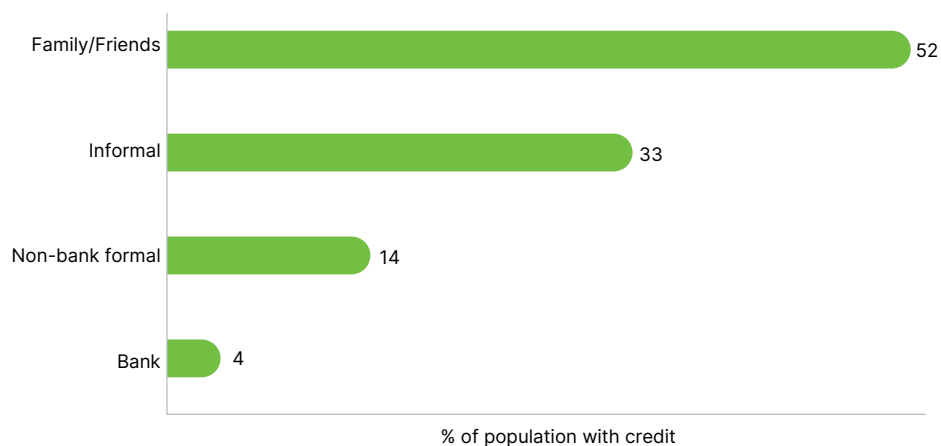


*Many informal and formal money lenders exist and serve a large proportion of the population, but there are no key players in this market.*



**Figure 18: Financial inclusion access strand (2011)**

Source: FinScope Lesotho 2011

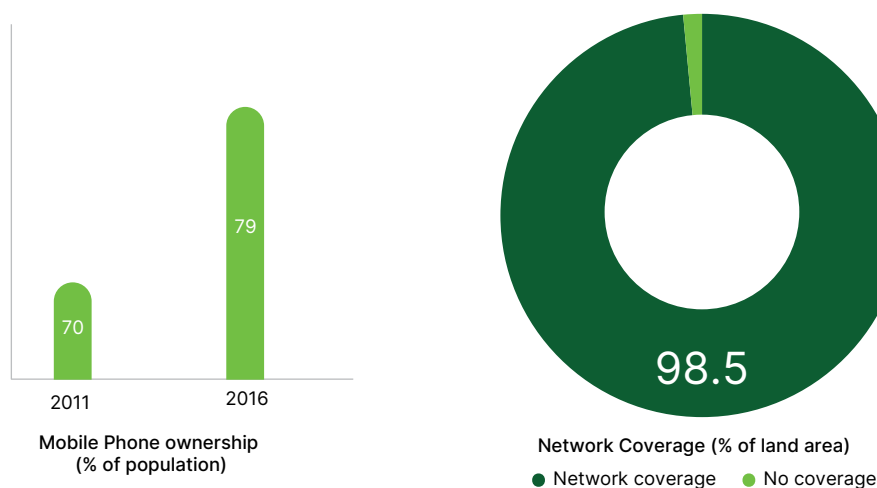


**Figure 19: Source of credit, Lesotho (2011)**

Source: FinScope survey for Lesotho, 2011

Very few Basotho have access to credit from formal providers. Just over half (52%) reported that they had a loan with family or friends and a third (33%) had borrowed from an informal savings club (Figure 19). In contrast, 14% reported that they had a loan with a formal, non-bank source, and a fraction (4%) had credit from a bank. The prime lending rate has dropped over the period 2008-2018 from 16.6% to 11.3%, making credit more attractive for the population, however, interest rates from non-bank formal providers, and especially informal lenders are reported to be much higher, with typical loan rates starting at 20% to 25%.

Lesotho has one credit reference bureaus (Compuscan Lesotho) which was established in 2014. According to the World Bank's development indicators, 15.9% of adults in the country were reported on by the credit bureau, with a focus on the formal bank and MFI creditors.



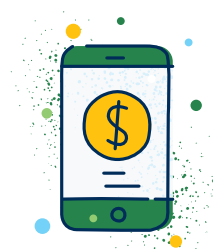
**Figure 20: Mobile phone access and network coverage, Lesotho**

Source: Own analysis based on data sourced from the from FinScope survey for Lesotho, 2011 and ITU's The State of ICT in Lesotho, 2017.

Mobile penetration increased by 9% between 2011 and 2016, with nearly 80% of respondents reporting they owned a cell phone (Figure 20). In 2019, Vodacom Lesotho, the largest mobile operator in terms of subscribers, reported 1.6 million active customers (approximately 80% of the population) with network coverage of 98.5% in the country. Mobile phone access has grown significantly and remains the easiest way to achieve financial inclusion for most of the rural population of Lesotho.

There are two mobile money services in Lesotho, Econet's Eco-cash, launched in 2012, and Vodacom Lesotho's M-Pesa service launched in 2013. By the end of December 2018, the Central Bank of Lesotho (CBL) reported that Eco-cash and M-Pesa had collectively registered a total of 1.3 million customers, representing ~56% of the population. The CBL notes that ~54% of the registered mobile money agents were in the capital Maseru, with 46% in other districts.

Lesotho's economy remains highly cash-based. However, in the two years after the introduction of mobile money solutions, nearly 450,000 Basotho had subscribed to one of the two services available. The quick adoption of mobile money solutions indicates a need for cheap, safe payment solutions with good distributional reach.




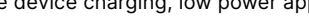
*Mobile penetration increased by 9% between 2011 and 2016, with nearly 80% of respondents reporting they owned a cell phone*





Total cost is USD 69, providing a low-end solution with a one light and charging solution. This is typically sold for cash but assumed it could be sold on an instalment basis over a maximum repayment period of 12 months.

Package includes three lights, a mobile device charger, and possibly a low power appliance (e.g. radio) with a purchase price of USD 150, repaid over a 24-month period.

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) 

91% of adults do not use electricity for cooking, and the market for improved efficiency, non-electrical or clean energy products for cooking would therefore also be substantial – depending on their cost and affordability in relation to current methods used for cooking (see the analysis in section 4). However, given that the above solutions cannot be used for cooking (which require at least a Tier 3 solution), the market for these two options is therefore limited to those households who currently do not have access to grid electricity or solar/generator power (used for lighting). This equates to about 830,000 adults (73% of adults) in 2011. However, despite this substantial market for clean energy products for lighting (and potentially cooking), affordability remains a major constraint to the market for SHS in Lesotho. There is however a clear incentive for households to purchase small SHS systems as they can replace candles and paraffin typically used for lighting and phone charging services which are estimated to cost about USD 6 per month in countries like Malawi, and up to USD 10 per month in countries like Mozambique.

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According to these assumptions and using FinScope 2011 income distributions for individuals and households, we calculate both the proportion and the number of adults that would be able to afford Option 1 and Option 2 at the three levels of affordability thresholds. The proportion of adults that can afford these products at the 5% affordability threshold is 13% (Option 1) and 10% (Option 2). At the 15% affordability threshold, the proportion is 30% for both options. At the 30% affordability threshold, 61% of adults can afford both options. For households, the proportions that can afford the products should be more, as household income exceeds personal income (although it is not available in Lesotho's FinScope).

*The World Bank recommends that larger more densely populated communities, which require electricity for productive uses and institutional facilities, should install solar-hybrid mini-grids.*

38 1PWRAfrica, in conversation with the authors, 11 February 2020.

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However, in the absence of grid connections, the CEO maintains that households are willing to purchase approximately 1 kWh per household per day.

# The market for off-grid cleaner energy solutions

*The off-grid market in Lesotho is still in its infancy. Uptake of off-grid solutions is hampered by a lack of funding and an immature regulatory and legal environment.*

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**Table 9:** Standalone SHS solutions available in project countries

STANDALONE SHS SOLUTIONS	TIER	ANNUAL COST (USD)	REPAYMENT PERIOD
Rechargeable Light <10-watt solution	0-1	6	Once off cash price
Sun king Solar Home System 60Z Three lights and phone charging. <10-watt solution	1	69	>6 months
One Power Africa Mini-grid Cost based on the standard package of 365 kWh per year. Up to 2 kW, grid parity solution- each kWh charged at up to USD 0.45	2-3	164	Pay per unit of electricity.

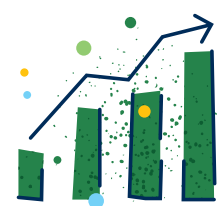
Some of the main barriers to the uptake off off-grid solutions in Lesotho include the remote nature of several rural communities, limited access to credit and financing alternatives to pay-as-you-go (PayGo), relatively low mobile money use, and the lack of a regulatory environment conducive to the development of mini-grids. However, the Government of Lesotho is supportive of off-grid electricity programmes, and the high penetration of mobile phones and availability of mobile money services offer opportunities. These are discussed in turn:



### *High-distribution and maintenance costs*

A key challenge for Lesotho is distributing and maintaining SHS solutions given the low-density and mountainous nature of the country with many relatively inaccessible villages. Representatives from the UNDP based in Lesotho noted that one of the key challenges of the 2006 LREBRE Project (discussed in Section 1)

was that the recipients of the solutions under this programme were located in rural areas. Typically, SHS was installed by installers who were urban-based. When these SHS failed, replacement parts and repairs were not easy.

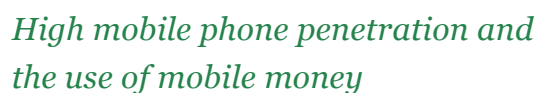


### *High interest rates and little access to formal credit, especially in rural areas*

One of the most important dimensions of the enabling environment for off-grid cleaner energy solutions is the extent to which people can access finance to purchase these products. Given relatively large upfront costs of the products relative to income in developing

countries, few consumers can buy the solutions on a cash-basis and therefore rely on access to credit from microfinance providers or instalment payment mechanisms such as PayGo. However, there are few MFI's who lend to poor, unemployed rural Basotho, and access to formal credit, and especially bank credit, which offer lower interest rates, is relatively low in Lesotho. Given the relatively low cost of the standalone solutions that are likely to be deployed in rural Lesotho (Tier 1 solutions up to USD 150 per year) and the fact that there are only eight MFI's operating in Lesotho, solutions financed by MFI's are unlikely to be viable.





Mobile phone access is high and has grown significantly and



The Government has identified the need to promote off-grid solutions, both in terms of smaller solutions (such as Tier 1 to Tier 3 SHS and lanterns) and mini-grids (Tier 3 to 5). Representatives of the UNDP<sup>41</sup> noted that the Government is interested in developing the off-grid space, but they are waiting on the successes of the

The overall regulatory framework for renewable energy-based rural electrification is not very strong in Lesotho. In the case of mini-grids, there are technical rural electricity service standards and cost-reflective tariffs are subject to review by the Lesotho Electricity and Water Authority (LEWA) and agreement by the community<sup>42</sup>. The

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## Acronyms and abbreviations

BSM	Business Sophistication Measure
CBL	Central Bank of Lesotho
CBN	Cost-of-basic needs
EDM	Electricidade de Moçambique
EMP	Lesotho Electrification Master Plan
ESMAP	The World Bank Energy Sector Management Assistance Program
EU	European Union
FSS	Financial Support Scheme
GDP	Gross Domestic Product
GEF	Global Environment Facility
HDI	Human Development Index
HZ	Hertz
IDA	International Development Association
IPP	Independent power project
KW	Kilowatt
kWh	Kilowatt-hour
LDCs	Least Developed Countries
LEC	Lesotho Electricity Company
LEWA	Lesotho Electricity and Water Authority
LHDA	Lesotho Highlands Development Authority
LHPP	Lesotho Highlands Power Project
LPG	Liquid petroleum gas
LREBRE	Lesotho Renewable Energy-Based Rural Electrification Project
LSL	Lesotho Loti/Maloti (national currency)
MAP	The UNCDF Making Access Possible programme
MFI	Microfinance institution
MSME	Micro, Small and Medium sized enterprise
MW	Megawatts
MWh	Megawatt hour
NREF	National Rural Electrification Fund
PayGo	Pay-as-you-go
PPP	Public-private partnership
PULSE	The Market Opportunity for Productive Use Leveraging Solar Energy
SADC	Southern African Development Community
SCP	Standard consumption package
SDGs	Sustainable Development Goals
SEforALL	The Sustainable Energy for All programme
SHS	Solar home systems
SREP	Scaling up Renewable Energy Program (World Bank)
UN	United Nations
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
Wh	Watt-hour
WHO	World Health Organisation

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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.





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Affordable and Clean Energy

