MALAWI

Energy Access By Institutions, Business Enterprises and Communities Report

2023 Malawi Multi-Tier Framework Survey

WORLD BANK GROUP MTF Multi-Tier FRAMEWORK ESMAP UNDP

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ACKNOWLEDGEMENTS

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ESMAP is a global knowledge and technical assistance program that supports low- and middle-income countries to increase their knowledge as well as their institutional capacity to achieve environmentally sustainable energy solutions for both poverty reduction and economic growth. ESMAP is funded by Australia, Austria, Denmark, the European Commission, Finland, France, Germany, Iceland, Italy, Japan, Lithuania, Luxembourg, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the Rockefeller Foundation, as well as the World Bank.

The MTF survey in Malawi was undertaken by the Ministry of Energy and implemented by the National Statistical Office (NSO). The survey was conducted with financial support from United Nations Development Program (UNDP) through the Access to Renewable Energy Project (ACRE) and the World Bank through Malawi Electricity Access Project (MEAP). The financial support provided by the UNDP and World Bank is greatly appreciated.

This Energy Access by Institutions, Business enterprises and Communities Report provides the status of access to electricity by these institutions in the country. It is a supplementary report to the Energy Access Diagnostic Report which provides the status of access to electricity and cooking solutions by households in the country. Both reports are products of the Malawi MTF survey which was conducted between 26th May and 25th July 2023. This initiative has relied on the critical support of multiple entities and individuals that the MTF survey team would like to acknowledge.

The main contributors to the realization of the Malawi MTF survey project from the Ministry of Energy are; Lucy Chimombo (Chief Energy Officer), Saidi Banda (Deputy Director for Off-Grid Electricity), Thokozani Malunga (Deputy Director for R & D), Austin Theu (Principal Energy Officer), Zhengjia Meng Team Leader for World Bank MEAP project, Michael Chipataule Gongwe (World Bank),Svitlana Orekhova (Wolrd Bank), Federico Nicolas Hinrichs (World Bank), Nicolina Erica Maria Lindblad (World Bank) and Emmanuel Mjimapemba (Project Manager -UNDP). The key officers who worked on the implementation of the survey from the National Statistical Office are Lizzie Chikoti (Commissioner of Statistics, retired), Shelton Kanyanda (Commissioner of Statistics), Hector Kankuwe (Deputy Director of Economic statistics), Bright Mvula (Chief Statistician), Samuel Chipokosa (Statistician). Other Key NSO officers who contributed to the survey implementation are; Imran Chiosa, Twika Mwalwanda, Philip Simkonda, Benson Chambo, Isaac Mwale, Steve Pakundikana, Moses Majiya and Rehema Msosa. From the World Bank MTF-ESMAP team, we acknowledge immeasurable contributions by Bryan Bonsuk Koo (Energy Specialist) and Hussain Samad (Energy Specialist). Most importantly, special thanks should go to the data collection team and respondents for making the survey a success.

This report was jointly prepared by the NSO team and a World Bank MTF-ESMAP team.

ABBREVIATIONS

ACRE	Access to Renewable Energy Project
EA	Enumeration Area
ESCOM	Electricity Supply Corporation of Malawi
ESMAP	Energy Sector Management Assistance Program
GOM	Government of Malawi
GTF	Global Tracking Framework
kW	Kilowatt
LDC	Least Developed Country
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
MEAP	Malawi Electricity Access Project
MIP-1	Malawi 2063 First 10-Year Implementation Plan
MWK	Malawi Kwacha
MTF	Multi-Tier Framework
NSO	National Statistical Office
PHC	Population and Housing Census
PPS	Probability Proportional to Size
PSUs	Primary Sampling Units
SE4All	Sustainable Energy for All
SHS	Solar Home System
SDGs	Sustainable Development Goals
SLS	Solar Lighting System
SRS	Simple Random Sampling
UN	United Nations
UNDP	United Nations Development Program

EXECUTIVE SUMMARY

Malawi is on a path to achieve universal access to electricity by 2030. Through the adoption of the Sustainable Energy for All (SE4All) by the United Nations (UN) and the National Energy Policy, 2018, the Government of Malawi (GOM) seeks to achieve 30% of energy access through on grid connections while 70% access will be met by off-grid solutions. Access to electricity that goes beyond household use and includes institutions such as health facilities, education facilities, enterprises and communities has potential to help achieve the GOM'S goal of universal access. Thus, the Access to Energy by Institutions Report provides information on the status of electricity access by institutions and can be used as a benchmark for monitoring progress. The Ministry of Energy through the National Statistical Office (NSO) conducted the Malawi MTF survey to establish a baseline for tracking progress towards the Sustainable Development Goal (SDG) #7.1 on access to affordable, reliable, and sustainable modern energy by 2030. The survey, which covered public institutions, business enterprises and communities in separate questionnaires, was conducted between 26th May and 25th July 2023 with financial support from the United Nations Development Program (UNDP) through the Access to Renewable Energy Project (ACRE) and the World Bank through Malawi Electricity Access Project (MEAP).

The key findings on access to electricity health facilities, education facilities, business enterprises and communities are outlined below:

Access to electricity by education facilities

- Overall, 46.2% of the interviewed Primary and Secondary schools have access to electricity: 35.3% through the national grid and 10.9% through off-grid solutions, mostly solar. Access to electricity is higher among secondary schools at 61.4% compared to primary schools at 10.3%.
- Access to electricity is higher among secondary schools at 61.4% compared to primary schools at 10.3%, mainly due to higher access to grid electricity among secondary schools (80.9%) than in primary schools at 27.4%.
- Only 14.6% of schools receive electricity at least 23 hours a day, 7 days a week.
- Services of 27.1% of the schools are limited by electricity supply available with a higher proportion among secondary schools at 35.3% compared to primary schools at 25.6%.
- Electricity bills are mostly paid by the schools themselves (72.1%) followed by community or village or municipality at 14.6%.
- Schools mostly own low load appliances: 67% of schools own LED bulbs, 39.7% own computers and 36.1% own printers.
- The most common issue that grid-connected schools are facing is the high cost of electricity (23%) followed by unpredictable interruptions (17.8%) and low or fluctuating voltage at 15%.
- Of the schools using off-grid solar solutions, the majority are using solar lighting systems (54.4%) while 34.8% are using solar home systems. Only 10.9% of the selected schools use solar lanterns. (Figure 18)
- Of the 9.9% of schools using off-grid solar solutions, 65.9% acquired the products for free while 24.4% purchased on their own and 9.8% were partially sponsored.

Access to electricity by health facilities

- Overall, 92.9% of the selected health facilities have access to electricity of which 71.9% are using grid-electricity while 21% are using off-grid solutions such as solar.
- Results by type of health facility show that all (100%) of the selected hospitals have access to electricity, followed by health centers at 91.7% and dispensaries at 88.9%.
- Daily availability of electricity supply is adequate for 25.7% of the facilities that have at least 22 hours of electricity daily.
- Only 8.4% of health facilities have reliable electricity as they experience less than 4 outages a week with a total duration of less than 2 hours.
- The quality of electricity is an issue among health facilities as 46.3% of the selected facilities using the national grid or mini grid reported incidents of low or fluctuating voltage.
- Electricity bills for grid-connected health facilities are mostly paid by government (66.5%) followed by payments by the facilities themselves at 30.5%.
- The majority of the health facilities with access to off-grid solar technology are using solar home systems (70.9%) while 34.6% are using solar lighting systems.
- Of the 20.7% of health facilities using off-grid solar solutions, 72.4% acquired the products for free while 19% purchased on their own and 8.6% were partially sponsored.
- The most common challenge experienced by the health facilities is limited capacity to power large appliances (22.8%) and low voltage (22.8%) followed by duration of supply (hours per day) at 17.5%.

Access to electricity by business enterprises

- Almost all of the interviewed enterprises (98.8%) have access to electricity: 97.5% through the national grid while 0.9% and 0.4% through off-grid solutions of solar technology and electric generators, respectively.
- Electric generators are the most common back-up source of electricity among enterprises (51.2%) followed by rechargeable batteries (8.8%) and solar energy (8.6%).
- Only 4% of enterprises have adequate supply of electricity for at least 23 hours every day.
- Nearly two-thirds (65.3%) of grid-connected enterprises experience between 4 and 14 unscheduled electricity outages a week.
- The quality of electricity is an issue for one third of the grid-connected enterprises (33.7%) that reported incidents of low or fluctuating voltage.
- Only 1.2% of the business enterprises reported incidents of injuries or death of individuals from using grid electricity service during 12 months preceding the survey.

Access to electricity by communities

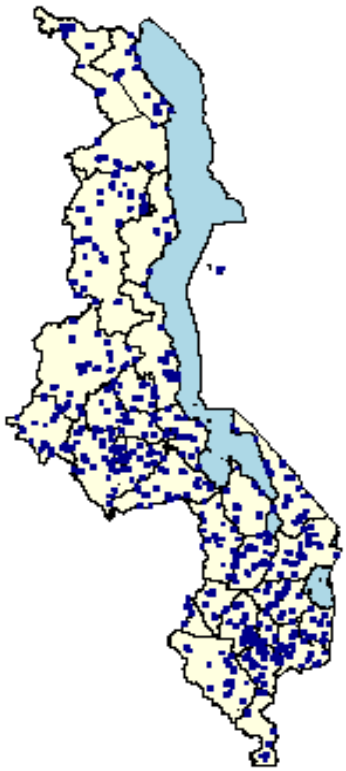
- Across the communities, 76.1% have access to electricity: 14.5% through the national grid and 61.6% through off-grid solutions, mostly solar.
- Most of the communities using off-grid solutions use solar lighting system (20%) followed by solar lanterns (15.2%), solar home systems (12%) and rechargeable batteries (8.6%).
- Although one-fifth of the communities (20.6%) did not report access to conventional electricity sources, they reported using dry cell batteries to power low load appliances such as torchlights and radios.
- Only 3.4% of the communities did not report using any of the electricity sources.

- Most of the communities (82.5%) reported that solar products are available or used in their communities. The solar products were mostly purchased from shops outside the community (53.9%) while 17.4% of the communities purchased from private companies.
- Use of biomass is very predominant across the communities; 91.1% of communities reported use of biomass as a source of fuel for lighting and cooking. Specifically, wood or twigs (47.8%) are the most common source of fuel followed by charcoal (31.7%) and crop residue or plant biomass (10.5%).
- Only 7.5% and 0.6% of communities reported use of electricity and Liquefied Petroleum Gas, respectively.
- Nearly two-thirds of the communities have programs that distribute improved cookstoves. The programs are mostly implemented by Non-Governmental Organizations (91.1%) and only 4.1% by government. The cookstoves are mostly for free (66%) while 35% are for sale.
- Awareness campaign programs on the health risks of cookstoves were reported in 38.8% of the communities. The programs were mainly by NGOs (73.2%) followed by government at 20.8%.
- The majority of communities (72.1%) have programs that campaign for awareness on deforestation due to firewood use. The programs are mostly implemented by NGOs (55.5%) followed by government at 38.8%.

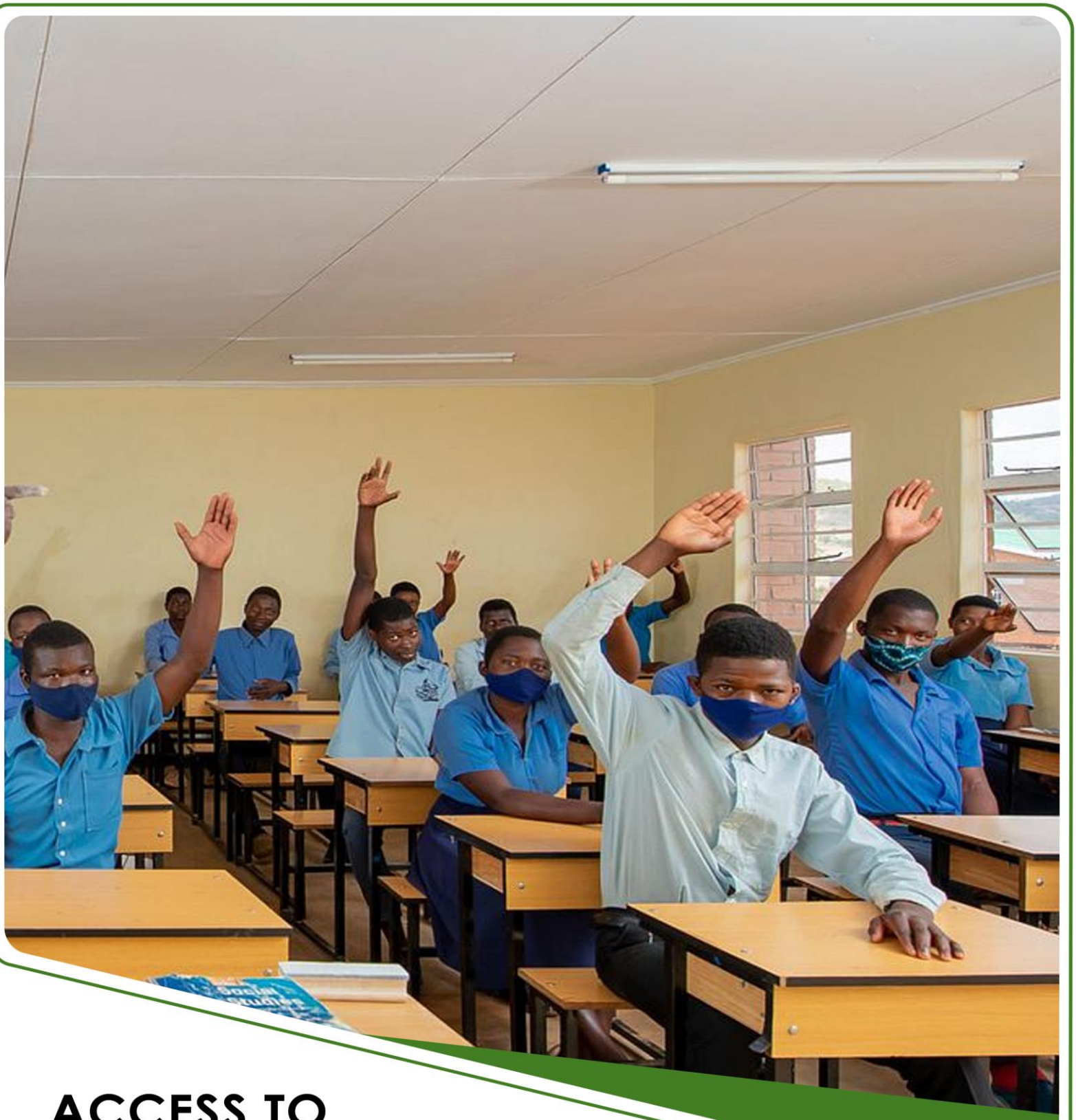
MTF SURVEY IN MALAWI

The MTF survey in Malawi, undertaken by the Ministry of Energy and implemented by National Statistical Office (NSO), was based on a nationally representative sample (including rural and urban areas) of 9,195 households and was carried out between 26th May and 25th July 2023. Geographically, the survey covered all 28 districts which were split between urban and rural, making a total of 32 districts or strata. Unlike the household survey, which was sampled based on probability proportional to size, the institutional survey was sampled on twofold: Firstly, the education facilities, health facilities and communities located or largely used by the residents of the selected Enumeration Areas were interviewed. These are the health facilities and education facilities mostly accessed by households in the selected EAs. Additionally, community interviews were held with participants drawn from the selected EAs or surrounding areas. Participants included key community personnel such as traditional leaders, members of community groups, clubs or associations, teachers, police officers, and political leaders. To select business enterprises, a second approach was used. Business enterprises were selected from the Statistical Business Register maintained by the NSO which contains details of all enterprises in the country. A more detailed description of the sampling procedure of enterprises is outlined in Annex 1.

Map 1: Location of sampled households of the Malawi MTF survey



Source: Malawi MTF institutional survey 2023.



ACCESS TO ELECTRICITY BY EDUCATION FACILITIES

ACCESS TO ELECTRICITY BY EDUCATION FACILITIES

This chapter presents findings on access to electricity by education facilities. The survey covered a total of 459 education facilities across the country. The education facilities selected were those that were accessed by households interviewed in the household component of the survey. The respondents included school administrators, head masters, and deputy headmasters.

Characteristics of the selected education facilities

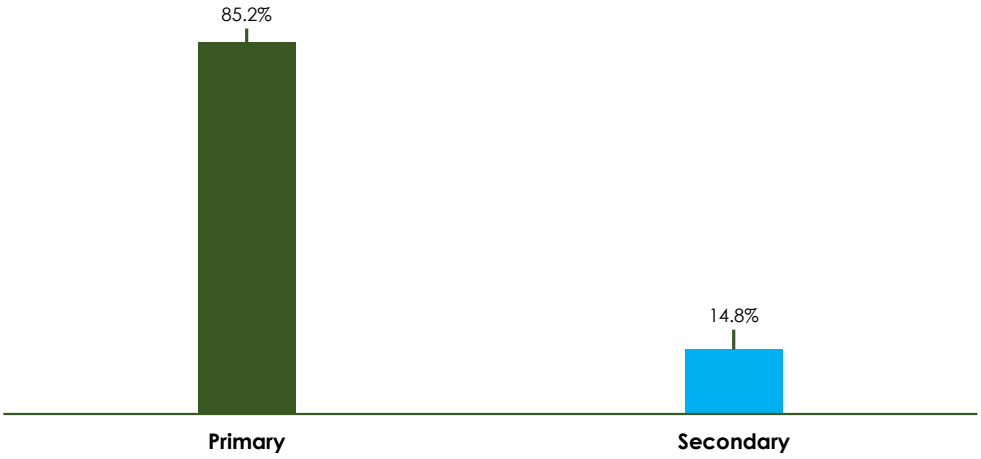
Table 1 shows the distribution of the education facilities by district and type of facility. The majority of facilities accessed by households in the selected EAs were primary schools at 85.2% while 14.8% were secondary schools (Figure 1).

Table 1. Number of education facilities by type and district

District	Type of education facility		
	Primary	Secondary	Total
Total	**391**	**68**	**459**
Chitipa	5	0	5
Karonga	12	4	16
Nkhata Bay	6	6	12
Rumphi	9	5	14
Mzimba	22	0	22
Likoma	6	3	9
Mzuzu City	11	7	18
Kasungu	16	4	20
Nkhotakota	8	2	10
Ntchisi	6	2	8
Dowa	20	0	20
Salima	14	1	15
Lilongwe	34	4	38
Mchinji	12	2	14
Dedza	19	0	19
Ntcheu	15	3	18
Lilongwe City	15	2	17
Mangochi	24	0	24
Machinga	18	3	21
Zomba	12	1	13
Chiradzulu	7	0	7
Blantyre	10	1	11
Mwanza	4	0	4
Thyolo	14	2	16
Mulanje	14	1	15
Phalombe	7	2	9
Chikwawa	18	2	20
Nsanje	2	0	2
Balaka	13	4	17
Neno	4	1	5
Zomba City	4	3	7
Blantyre City	10	3	13

Source: Malawi MTF institutional survey 2023.

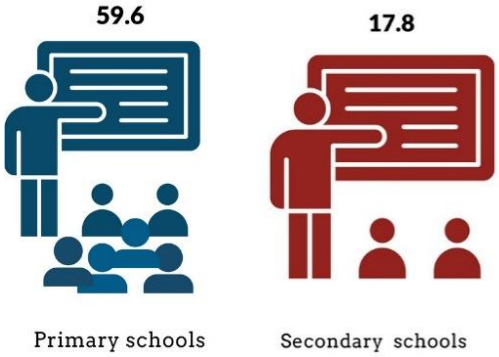
Figure 1: Share of education facilities by type at national level



Source: Malawi MTF institutional survey 2023.

The total population of students in the 391 primary schools was 469,767 while 28,607 students were in the 68 secondary schools. There is a higher pupil-teacher ratio of 59.6 in primary schools compared to 17.8 in secondary schools (Figure 2).

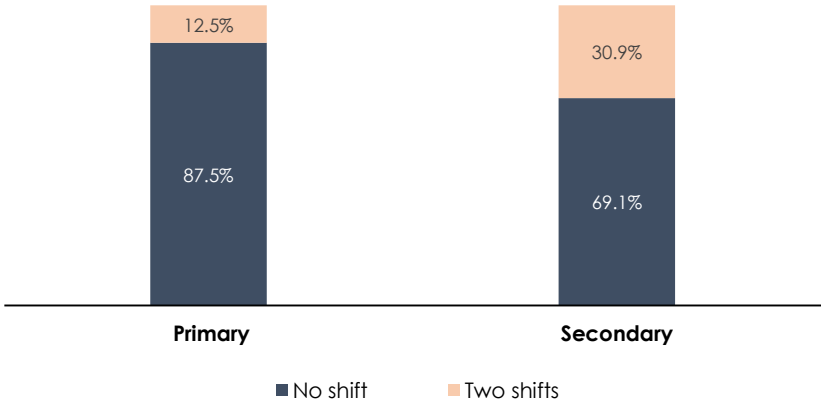
Figure 2: Pupil-teacher ratio in Primary and Secondary schools



Source: Malawi MTF institutional survey 2023.

Schools with high enrolment of students and limited facilities such as classrooms mostly deliver lessons in shifts. The first shift usually covers the morning hours while the second is in the afternoon. Use of shifts is more common in secondary schools at 30.9% compared to primary schools at 12.5% (Figure 3).

Figure 3: Use of shifts in Primary and Secondary schools

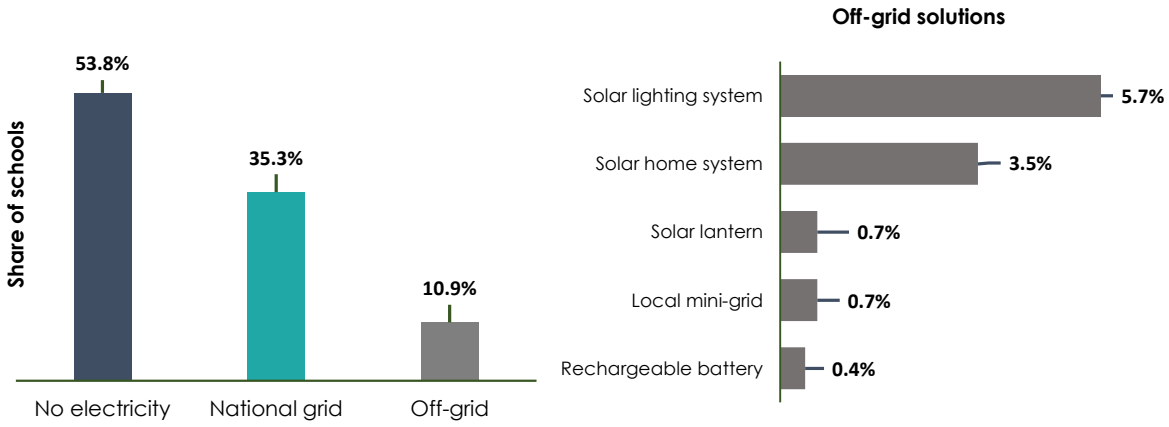


Source: Malawi MTF institutional survey 2023.

Electricity access by education facilities

Overall, 35.3% of the selected schools have access to grid electricity while 10.9% are using off-grid solutions such as solar. Solar lighting system (5.7%) and solar home system (3.5%) are the most common off-grid solutions used by schools (Figure 4).

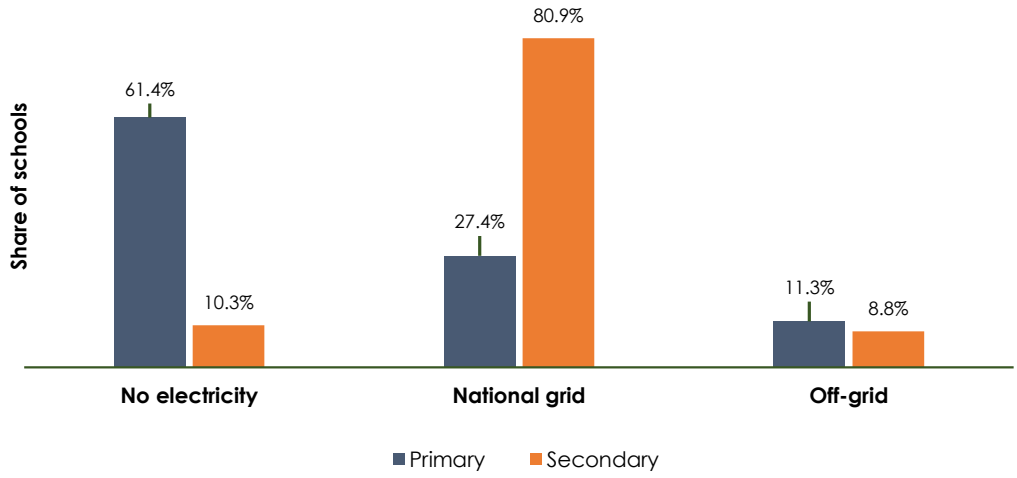
Figure 4: Share of Primary and Secondary schools with access to electricity by source



Source: Malawi MTF institutional survey 2023.

Access to electricity is higher among secondary schools at 61.4% compared to primary schools at 10.3%. This is mainly due to higher access to grid electricity among secondary schools (80.9%) than in primary schools at 27.4%. Minor differences exist in access to off-grid solutions between primary and secondary schools (Figure 5).

Figure 5: Share of Primary and Secondary schools with access to electricity by source and by type of school

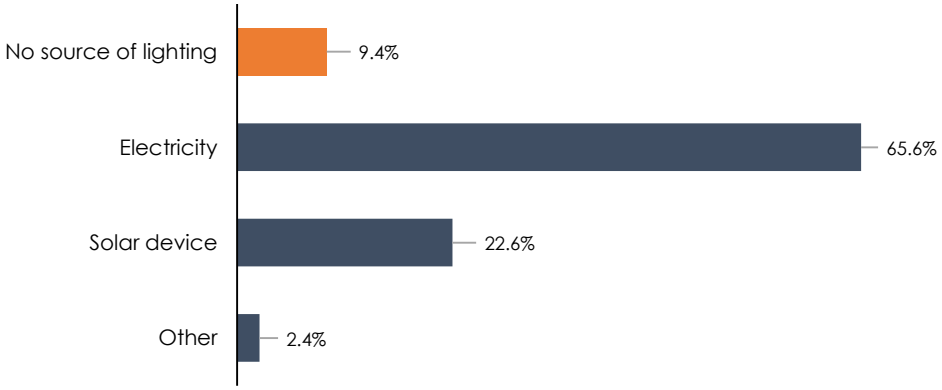


Source: Malawi MTF institutional survey 2023.

Main source of lighting

The main source of lighting among schools with access to electricity is grid electricity (65.6% of schools) followed by solar device at 22.6% (Figure 6).

Figure 6: Main source of lighting in Primary and Secondary schools



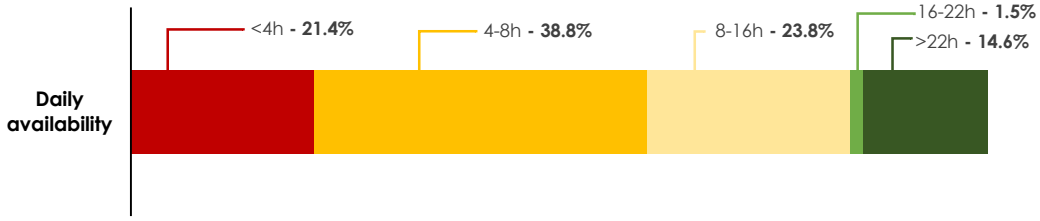
Source: Malawi MTF institutional survey 2023.

Daily availability

Daily availability relates to availability of electricity service during the day (24 hours). Only 14.6% of schools receive electricity at least 23 hours a day, 7 days a week. Most schools have at least 4

hours of electricity a day while 21.4% of the schools receive electricity less than 4 hours a day (Figure 7).

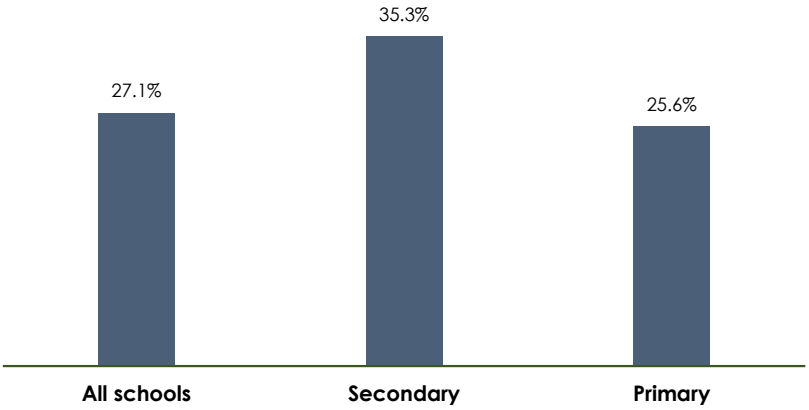
Figure 7: Share of Primary and Secondary schools with daily access to electricity



Source: Malawi MTF institutional survey 2023.

The survey further assessed whether the school working hours were limited by the electricity supply available. Across all schools, 27.1% are limited by electricity supply available with a higher proportion among secondary schools at 35.3% compared to primary schools at 25.6% (Figure 8).

Figure 8: Share of Primary and Secondary schools with working hours limited by electricity supply available

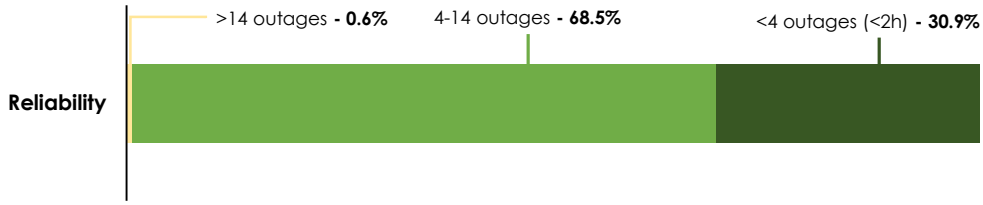


Source: Malawi MTF institutional survey 2023.

Reliability

The Reliability attribute relates to the frequency and duration of unscheduled outages experienced by grid-connected schools. Most grid-connected schools experience less than at least 4 electricity disruptions a week (and less than 2 hours). Nearly a third of the schools (30.9%) experience less than 4 unscheduled outages a week (Figure 9).

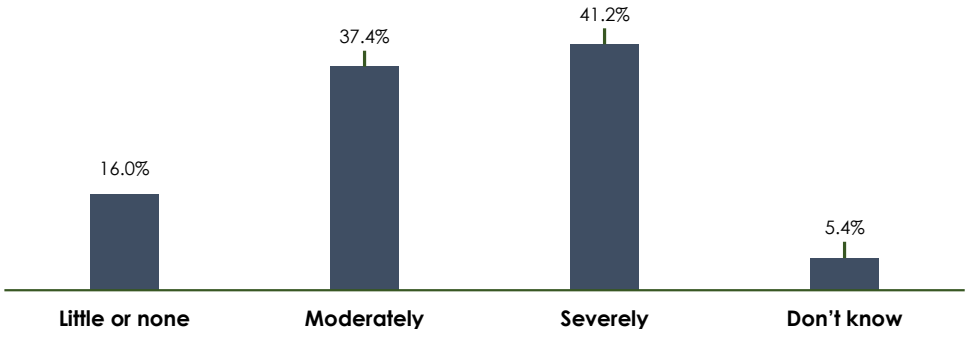
Figure 9: Share of Primary and Secondary schools with access to reliable electricity



Source: Malawi MTF institutional survey 2023.

The respondents were asked to provide their assessment of the impact of unscheduled outages on delivery of services. The majority of the respondents (41.2%) perceived the unscheduled outages as having severe impact on service delivery followed by those that thought the impact was moderate (37.4%). Only 16% of respondents perceived the outages as having little or no impact (Figure 10).

Figure 10: Impact of unscheduled outages on service delivery

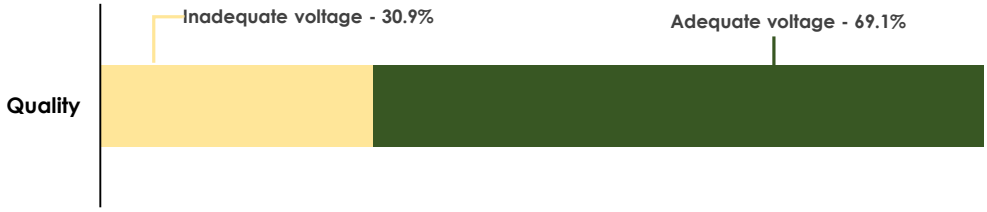


Source: Malawi MTF institutional survey 2023.

Quality

The quality of electricity is assessed using incidence of voltage issues such as low or fluctuating voltage experienced by schools on either the national grid or mini-grids. Low or fluctuating voltage affects the performance of electric appliances and may result in damage. Nearly a third of the grid-connected schools (30.9%) reported voltage issues (Figure 11).

Figure 11: Share of Primary and Secondary schools with access to quality electricity

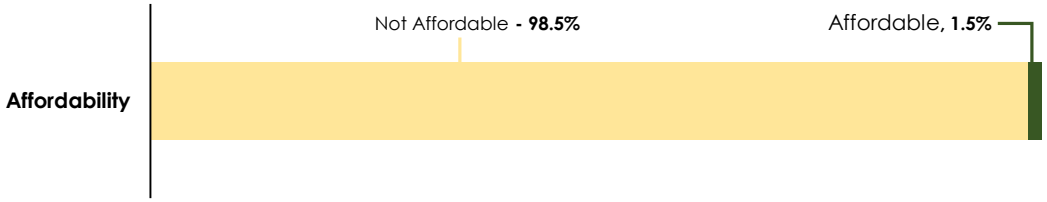


Source: Malawi MTF institutional survey 2023.

Affordability

The survey defined electricity as affordable if a school spends less than 5% of their total expenditure on electricity per year. Only 1.5% of schools have access to affordable electricity (Figure 12).

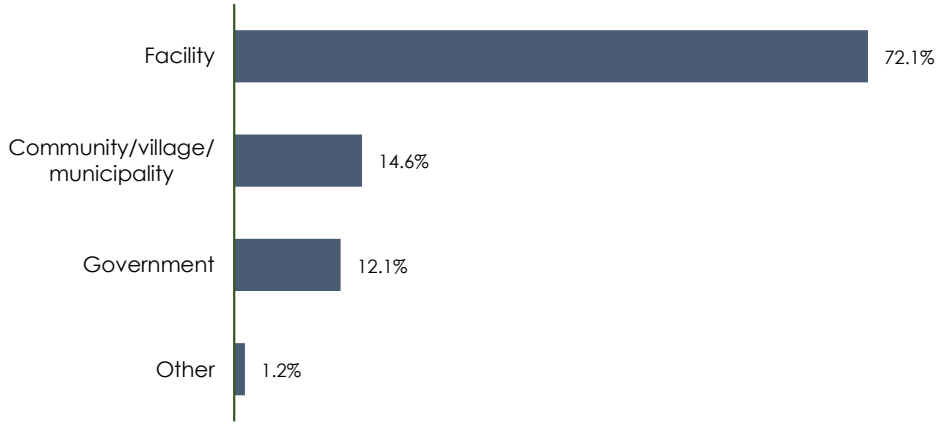
Figure 12 : Share of schools with access to affordable electricity



Source: Malawi MTF institutional survey 2023.

Among the schools with grid electricity, the electricity bills are mostly paid by the schools themselves (72.1%) followed by community or village or municipality at 14.6% (Figure 13).

Figure 13: Share of Primary and Secondary schools by institutions paying electricity bills



Source: Malawi MTF institutional survey 2023.

Health and safety

Health and Safety attribute captures the incidence of any injuries or death of individuals from using grid electricity service for 12 months preceding the survey. Thus, electricity access is considered safe when users have not suffered any accidents with their electricity supply that resulted in permanent injuries. Only 0.6% of grid-connected schools reported accidents causing permanent injury or death (Figure 14).

Figure 14: Share of Primary and Secondary schools by Health and Safety of electricity access

Source: Malawi MTF institutional survey 2023.

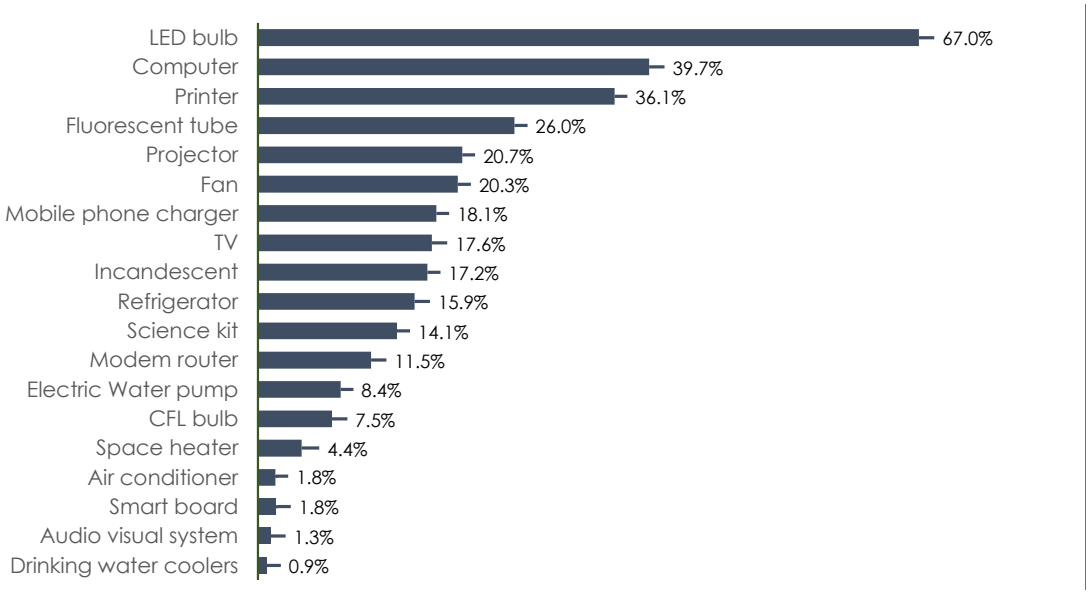
Formality

A grid connection is classified as formal if the schools' connection is provided and/or sanctioned by the authority. Informal connections are unlikely to be regulated and may pose a safety risk. Results show that no school reported an informal connection in the survey. The MTF survey uses indirect questions that respondents may be more willing to answer to collect information on Formality. For instance, respondents were asked what method their household uses to pay the electricity bill. Therefore, the actual percentage of schools with an informal connection may differ from the data reported here.

Ownership of appliances

Schools mostly own low load appliances: 67% of schools own LED bulbs, 39.7% own computers and 36.1% own printers. Fewer schools own medium load appliances such as flat screen TV (17.6%), refrigerator (15.9%). Very high load appliances such as space heaters and refrigerators are not very common in schools (Figure 15).

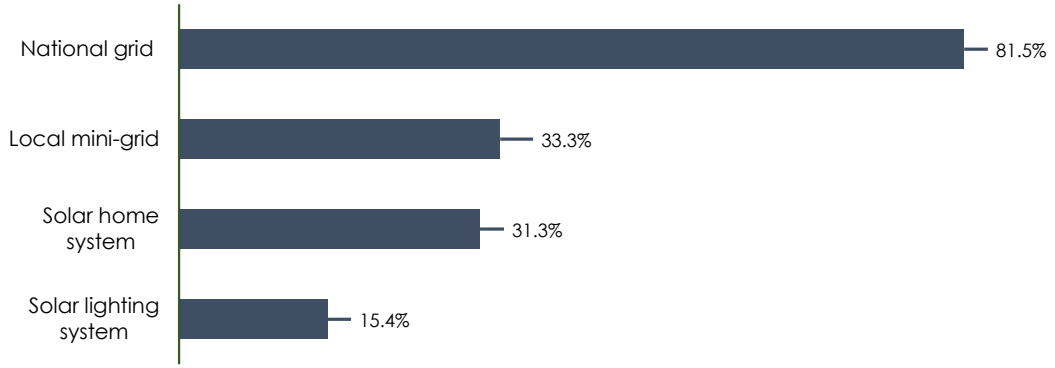
Figure 15: Share of Primary and Secondary schools by ownership of appliances



Source: Malawi MTF institutional survey 2023.

Schools were assessed on the capacity of their electricity based on whether the source can power all the needed appliances simultaneously. Most grid-connected schools (81.5%) reported that their electricity supply is adequate to power all the required appliances. Nearly one third of schools using local mini-grid (33.3%) or solar home system (31.3%) reported that their electricity capacity was sufficient compared to only 15.4% of those using solar lighting system (Figure 16).

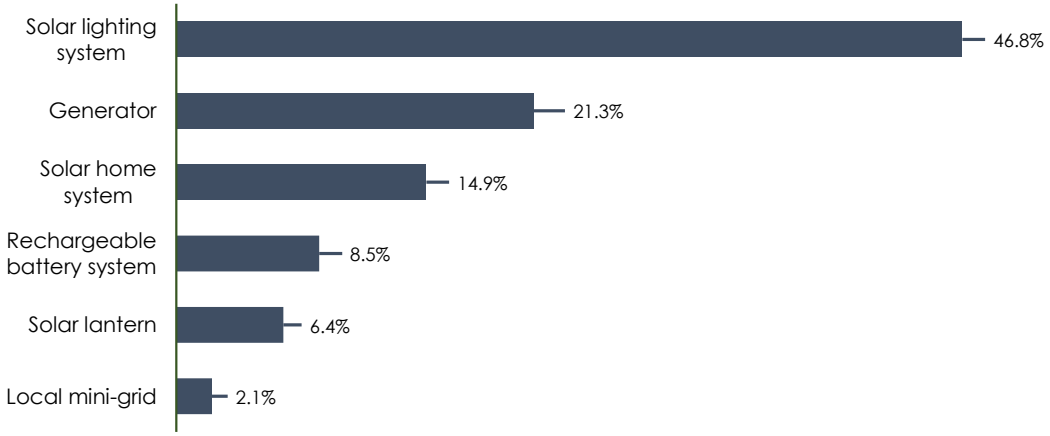
Figure 16 : Share of Primary and Secondary schools by Capacity of the primary source of electricity to run simultaneously all electrical appliances needed in the facility



Source: Malawi MTF institutional survey 2023.

About one-fifth of schools (22.2%) with access to grid electricity have a backup source of electricity. Most of these schools use solar lighting system (46.8%) as a backup source followed by generator (21.3%) and only 2.1% use a min-grid (Figure 17).

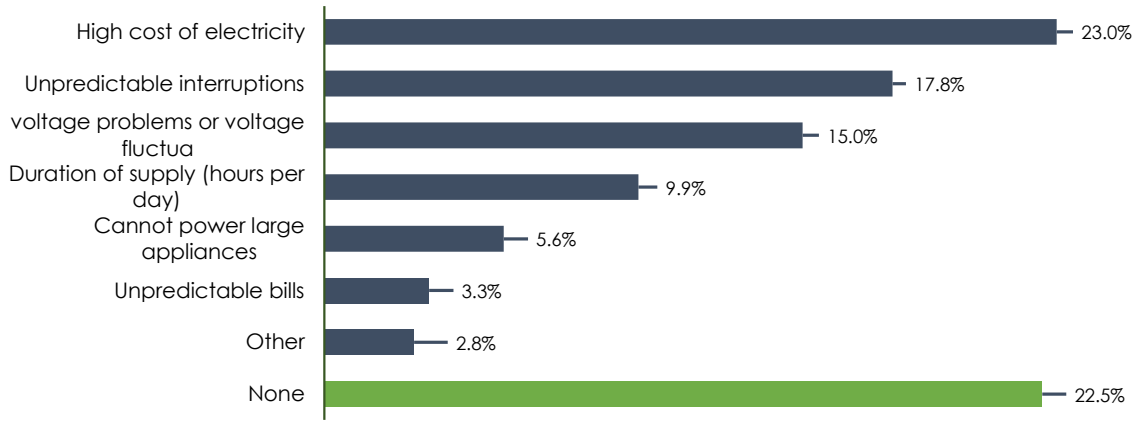
Figure 17 : Share of Primary and Secondary schools by backup source of electricity



Source: Malawi MTF institutional survey 2023.

The most common issue that grid-connected schools are facing is the high cost of electricity (23%) followed by unpredictable interruptions (17.8%) and low or fluctuating voltage at 15% (Figure 18).

Figure 18: Distribution of issues faced by grid-connected Primary and Secondary schools

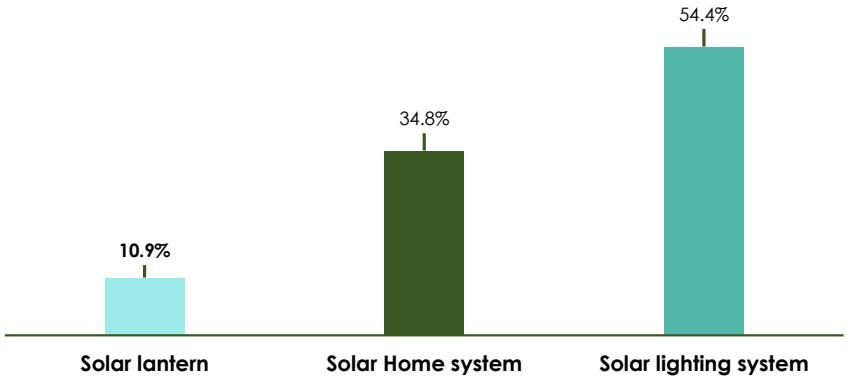


Source: Malawi MTF institutional survey 2023.

Off-grid solar access

Of the schools using off-grid solar solutions, the majority are using solar lighting systems (54.4%) while 34.8% are using solar home systems. Only 10.9% of the selected schools use solar lanterns. (Figure 19).

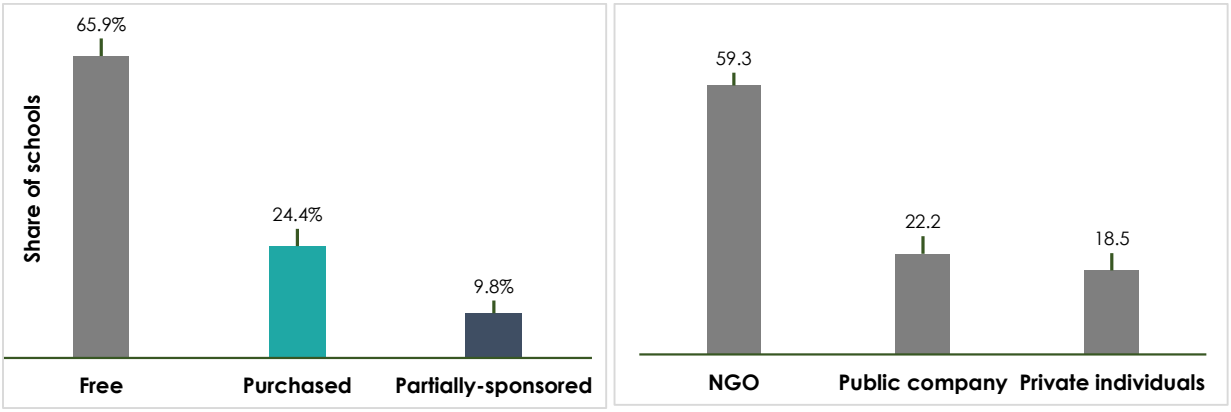
Figure 19: Proportion of Primary and Secondary schools with access to off-grid solar by technology



Source: Malawi MTF institutional survey 2023

Of the 9.9% of schools using off-grid solar solutions, 65.9% acquired the products for free while 24.4% purchased on their own and 9.8% were partially sponsored (Figure 20). Those schools that acquired off-grid solution for free mostly received from NGOs (59.3%) followed by public companies (22.2%) and private individuals (18.5%).

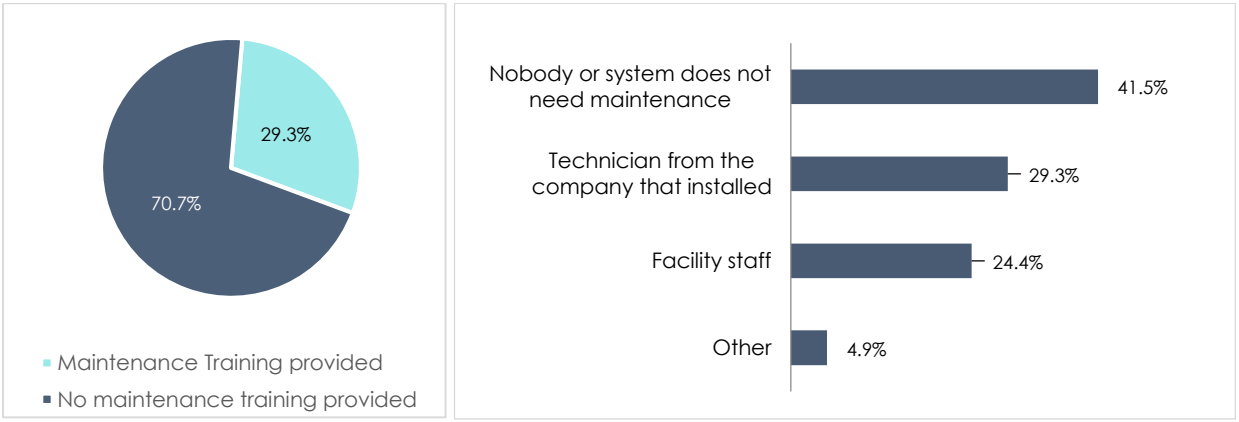
Figure 20: Share of Primary and Secondary schools with off-grid solar solutions by source



Source: Malawi MTF institutional survey 2023.

Only 29.3% of schools using solar technology received training on maintenance of the solar systems. Maintenance of the solar equipment is mostly conducted by the technician who installed the system (29.3% of the facilities) while 24.4% of facilities using solar technology are maintained by facility staff. Notably, the solar systems of 41.5% of the schools using off-grid solar solutions did not need maintenance (Figure 21).

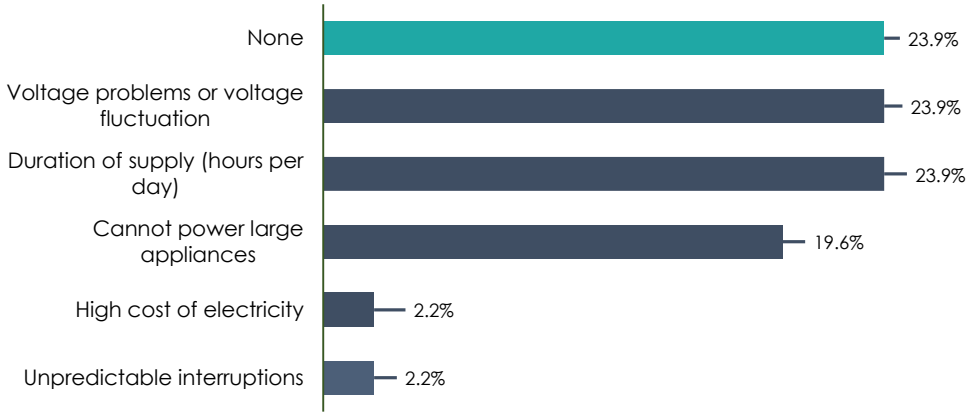
Figure 21: Share of education facilities with off-grid solar by training and provider of maintenance services



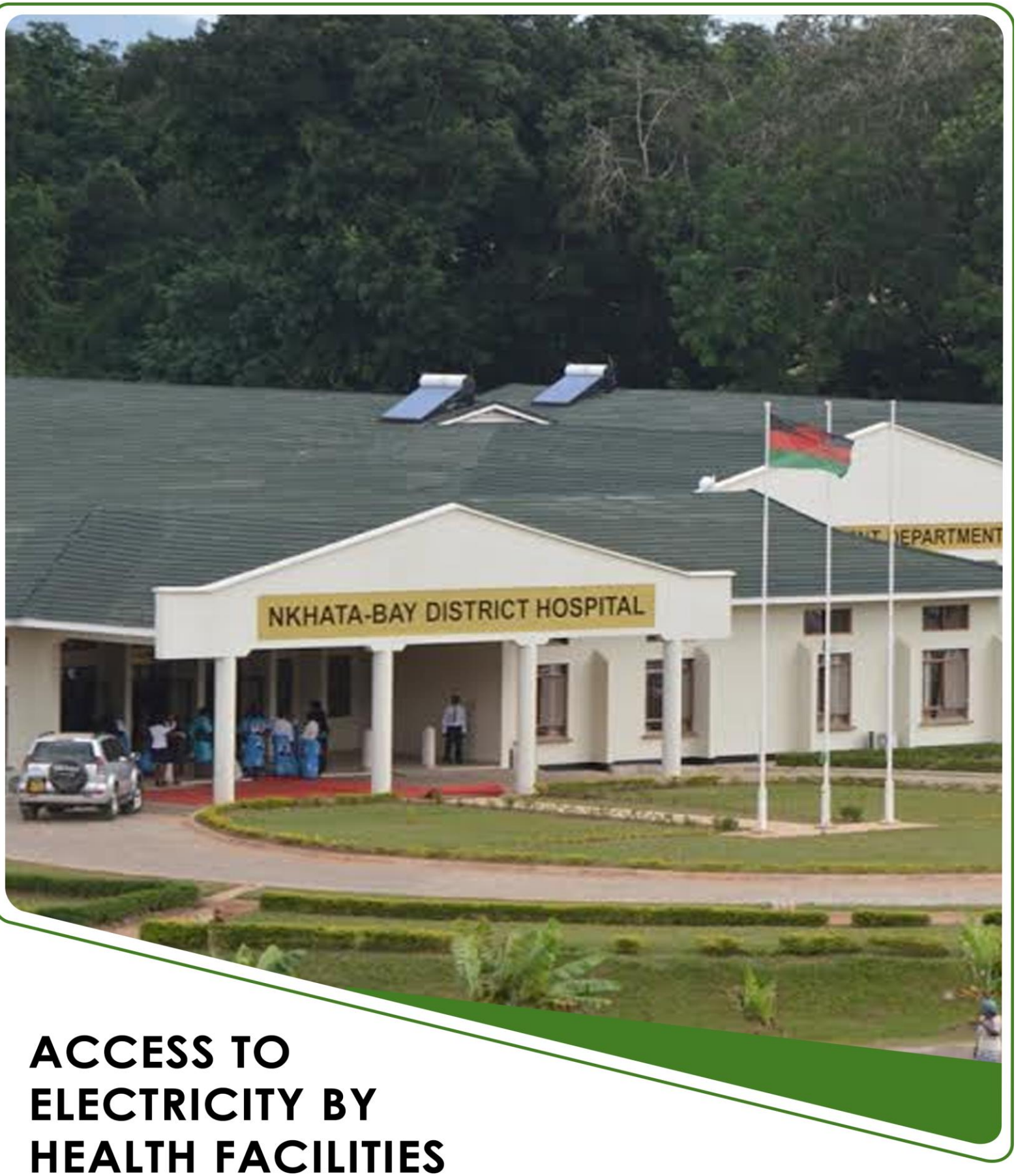
Source: Malawi MTF institutional survey 2023.

The most common challenges experienced by schools using solar technology are low or fluctuating voltage (23.9%), limited duration of supply per day (23.9%) and limited capacity to power large appliances (19.6%). One fifth of schools using solar powered electricity did not report any challenges with their solar technology (Figure 22).

Figure 22: Share of Primary and Secondary schools with off-grid solar by challenges faced



Source: Malawi MTF institutional survey 2023.



ACCESS TO ELECTRICITY BY HEALTH FACILITIES

ACCESS TO ELECTRICITY BY HEALTH FACILITIES

This chapter presents the Malawi MTF Survey findings on access to electricity by health facilities. The survey collected information on health facility details, access to electricity and challenges associated with the primary source of electricity.

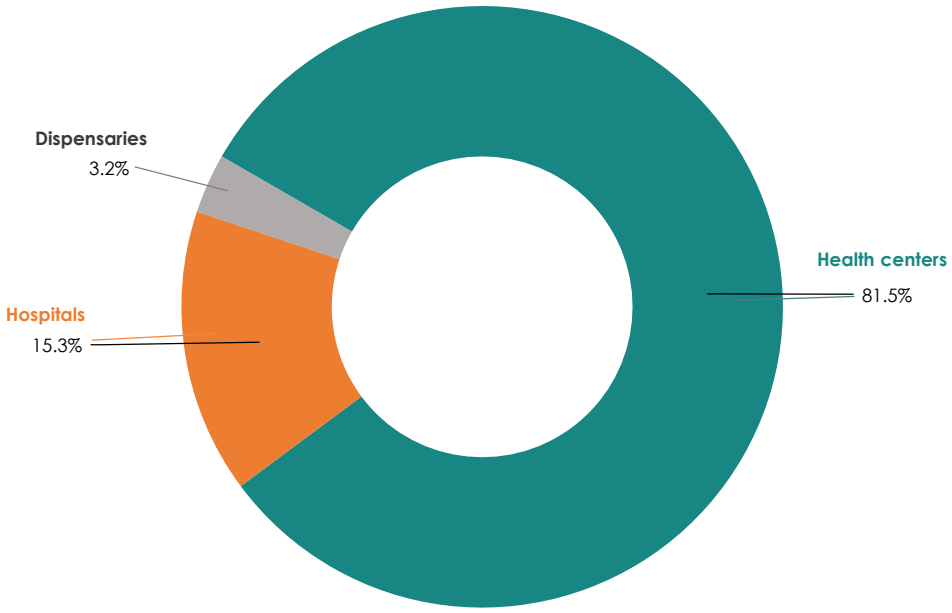
Characteristics of health facilities

This section highlights some of the characteristics of the health facilities covered by the survey. Specifically, the section looks at the distribution of selected health facilities, type, ownership, number of staff, and number of daily patient visits.

Distribution of health facilities

The survey covered a total of 281 health facilities across all the districts. The health facilities selected were those accessed by households that were interviewed in the selected Enumeration Areas. The respondents of the health facility interview included facility in charge, nurses, clinicians and medical assistants. The majority of facilities accessed by households in the selected EAs were health centers at 81.5% (Figure 23). Table 2 shows the distribution of the selected health facilities by district and type of facility.

Figure 23: Distribution of health facilities by type or level of facility



Source: Malawi MTF institutional survey 2023.

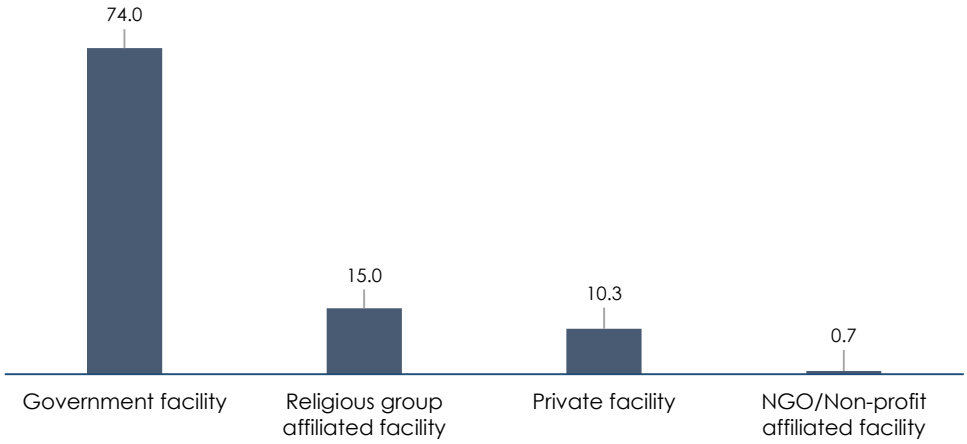
Table 2. Number of health facilities by district and type

District	Health Center	Hospital	Dispensary	Total
Total	**229**	**43**	**9**	**281**
Chitipa	2	0	0	2
Karonga	5	3	0	8
Nkhatabay	6	2	0	8
Rumphi	4	1	0	5
Mzimba	10	4	1	15
Likoma	2	1	0	3
Mzuzu City	5	1	0	6
Kasungu	12	2	0	14
Nkhotakota	6	1	0	7
Ntchisi	7	1	0	8
Dowa	6	2	0	8
Salima	11	1	0	12
Lilongwe Rural	21	3	0	24
Mchinji	7	2	0	9
Dedza	11	1	4	16
Ntcheu	11	1	2	14
Lilongwe City	5	1	0	6
Mangochi	16	4	1	21
Machinga	10	1	0	11
Zomba Rural	6	1	0	7
Chiradzulu	5	0	0	5
Blantyre Rural	2	0	1	3
Thyolo	11	0	0	11
Mulanje	8	1	0	9
Phalombe	5	2	0	7
Chikhwawa	13	3	0	16
Nsanje	0	1	0	1
Balaka	11	1	0	12
Neno	1	1	0	2
Zomba City	2	1	0	3
Blantyre City	8	0	0	8

Source: Malawi MTF institutional survey 2023.

Analysis by ownership of the facility indicates that the highest proportion of the selected health facilities are government owned at 74%, followed by facilities affiliated with religious institutions at 15%, and private owned facilities at 10.3%. Only 0.7 percent of the selected health facilities are owned by Non-Governmental Organizations (NGOs) (Figure 24).

Figure 24: Distribution of health facilities by affiliation (Ownership)



Source: Malawi MTF institutional survey 2023.

Government facilities receive the greatest number of patients daily followed by NGO and religious affiliated (Figure 25).

Figure 25: Average daily patient visits by facility affiliation

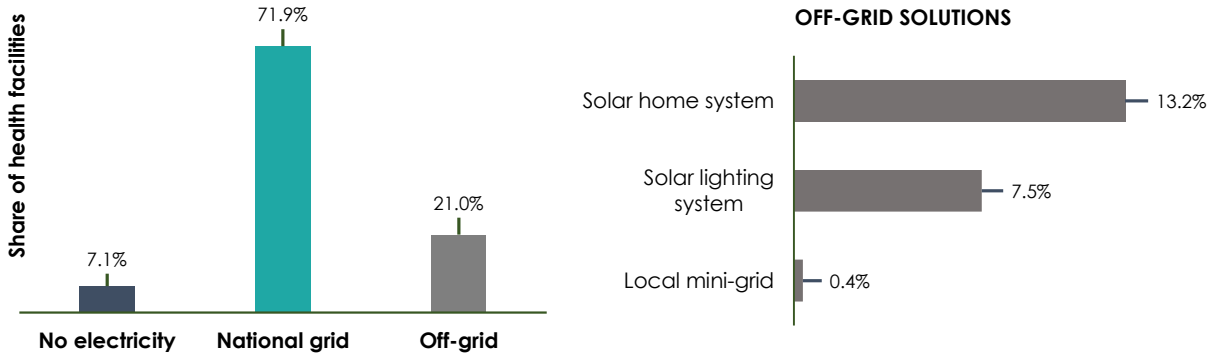
Source: Malawi MTF institutional survey 2023.

Electricity access

This section presents survey findings on access to electricity by health facilities. Specifically, the section provides information about the main source of electricity, availability, and challenges associated with accessing electricity.

Overall, 92.9% of the selected health facilities have access to electricity of which 71.9% are using grid-electricity while 21% are using off-grid solutions such as solar. Among the off-grid solutions being used by health facilities, solar home system (13.2%) and solar lighting system (7.5%) are the most common technologies (Figure 26).

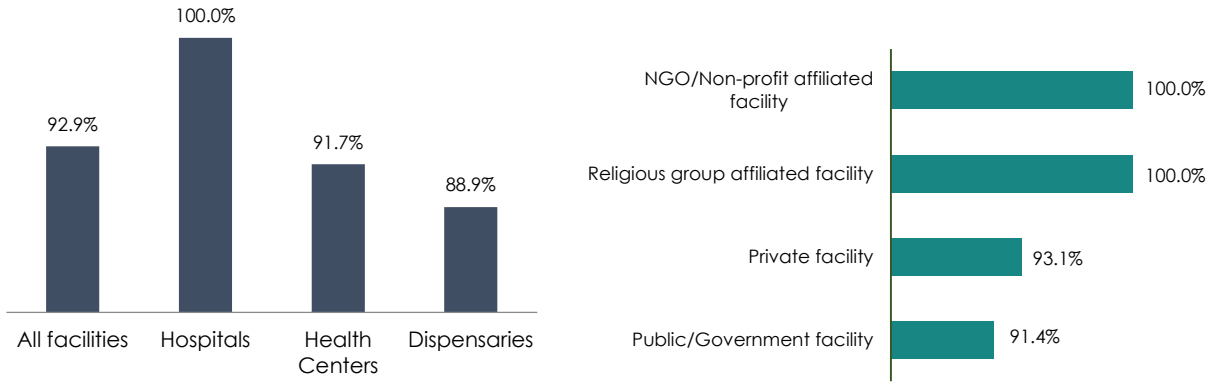
Figure 26: Proportion of health facilities with access to electricity



Source: Malawi MTF institutional survey 2023.

Differences exist in electricity access by type of facility. Results show that all the selected hospitals have access to electricity, followed by health centers at 91.7% and dispensaries at 88.9%. All religious and NGO affiliated facilities in the country have access to electricity, while 93.1 percent of private facilities and 91.4 percent of public or governmental facilities have access to electricity (Figure 27).

Figure 27: Proportion of health facilities with access to electricity by facility affiliation

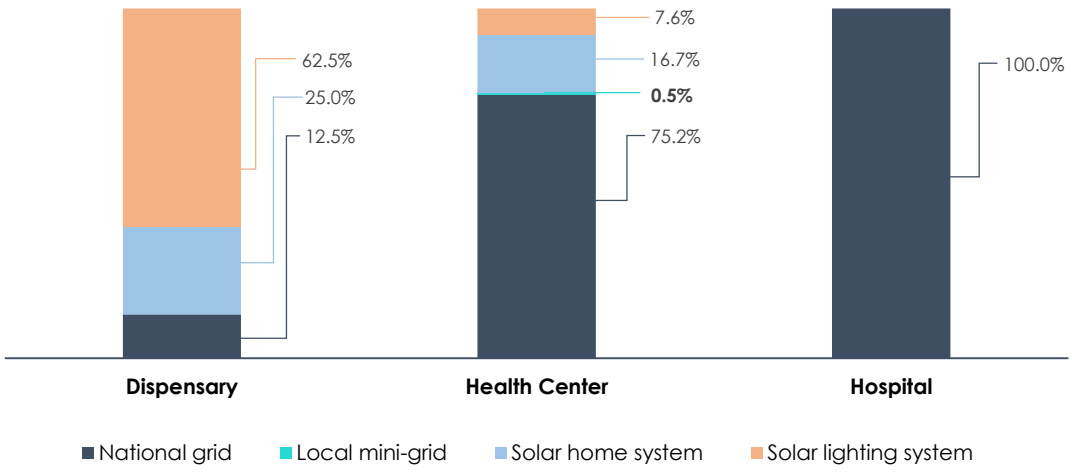


Source: Malawi MTF institutional survey 2023.

The national grid is the only primary source of electricity in the selected hospitals at 100%. Further, grid electricity is the primary source for 75.2% of health centers. Solar is the primary source of

electricity for dispensaries with 62.5% using solar lighting system and 25% using solar home system (Figure 28).

Figure 28: Proportion of health facilities with access to electricity by facility type

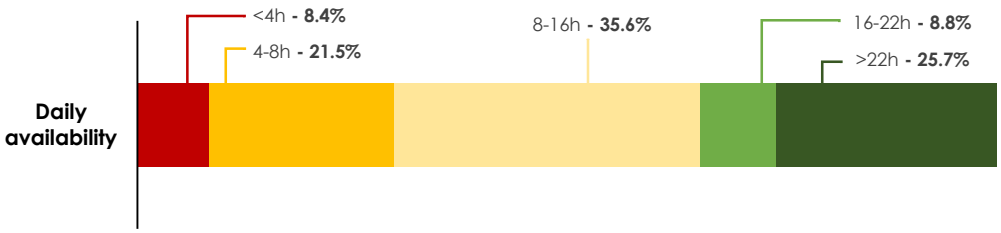


Source: Malawi MTF institutional survey 2023.

Daily availability

Daily availability of electricity supply is adequate for 25.7% of the facilities that have at least 22 hours of electricity daily. Nearly a third of the health facilities have electricity for at least 4 hours and 35.6% have between 8 hours and 16 hours of electricity supply daily (Figure 29).

Figure 29: Share of health facilities with daily access to electricity

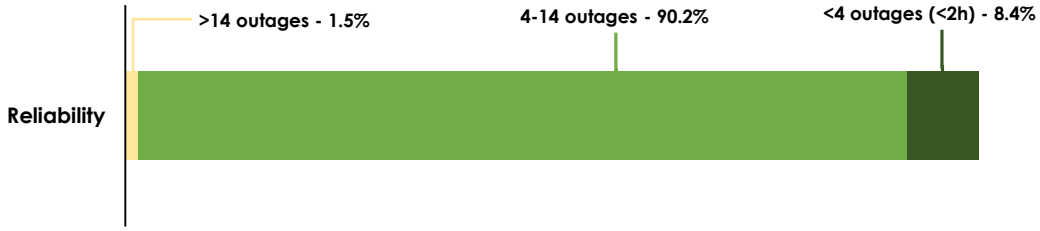


Source: Malawi MTF institutional survey 2023.

Reliability

Most grid-connected health facilities experience between 4 and 14 unscheduled electricity outages a week (and less than 2 hours). Only 8.4% of health facilities have reliable electricity as they experience less than 4 outages a week with a total duration of less than 2 hours (Figure 30).

Figure 30: Share of health facilities with reliable access to electricity

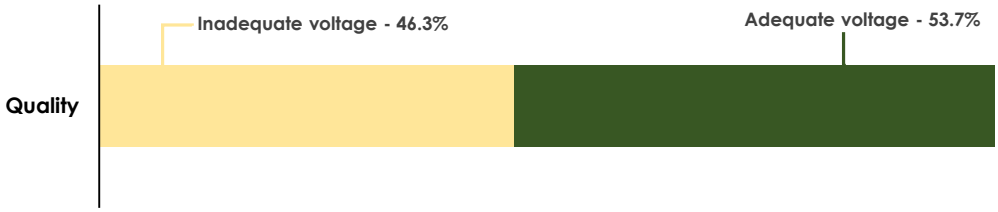


Source: Malawi MTF institutional survey 2023.

Quality

The quality of electricity is an issue among health facilities as 46.3% of the selected facilities using the national grid or mini grid reported incidents of low or fluctuating voltage. Thus, these health facilities may experience low performance of electric appliances and may result in damage. Conversely, about half of the grid-connected health facilities (53.7%) did not experience any voltage issues (Figure 31).

Figure 31: Share of health facilities by quality of electricity access

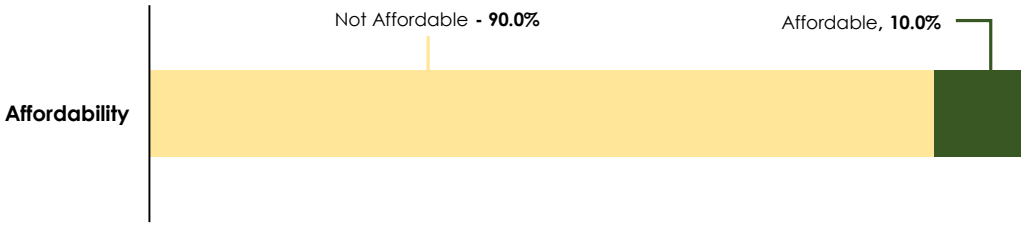


Source: Malawi MTF institutional survey 2023.

Affordability

Affordability of electricity is an issue among health facilities. Only 10% of the health facilities have access to affordable electricity as they spend less than 5% of their total expenditure per year (Figure 32).

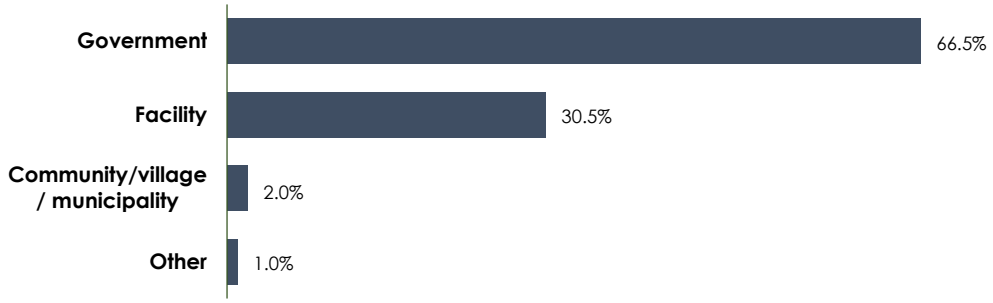
Figure 32: Share of health facilities with access to affordable electricity



Source: Malawi MTF institutional survey 2023.

Electricity bills for grid-connected health facilities are mostly paid using government funds through monthly Other Recurrent Transactions (66.5%) followed by payment by the facilities funds at 30.5% (Figure 33).

Figure 33: Share of health facilities paying electricity bills



Source: Malawi MTF institutional survey 2023.

Health and safety

There were no reported incidents of any injuries or death of individuals across health facilities from using grid electricity service during 12 months preceding the survey. Thus, electricity access in health facilities is considered safe.

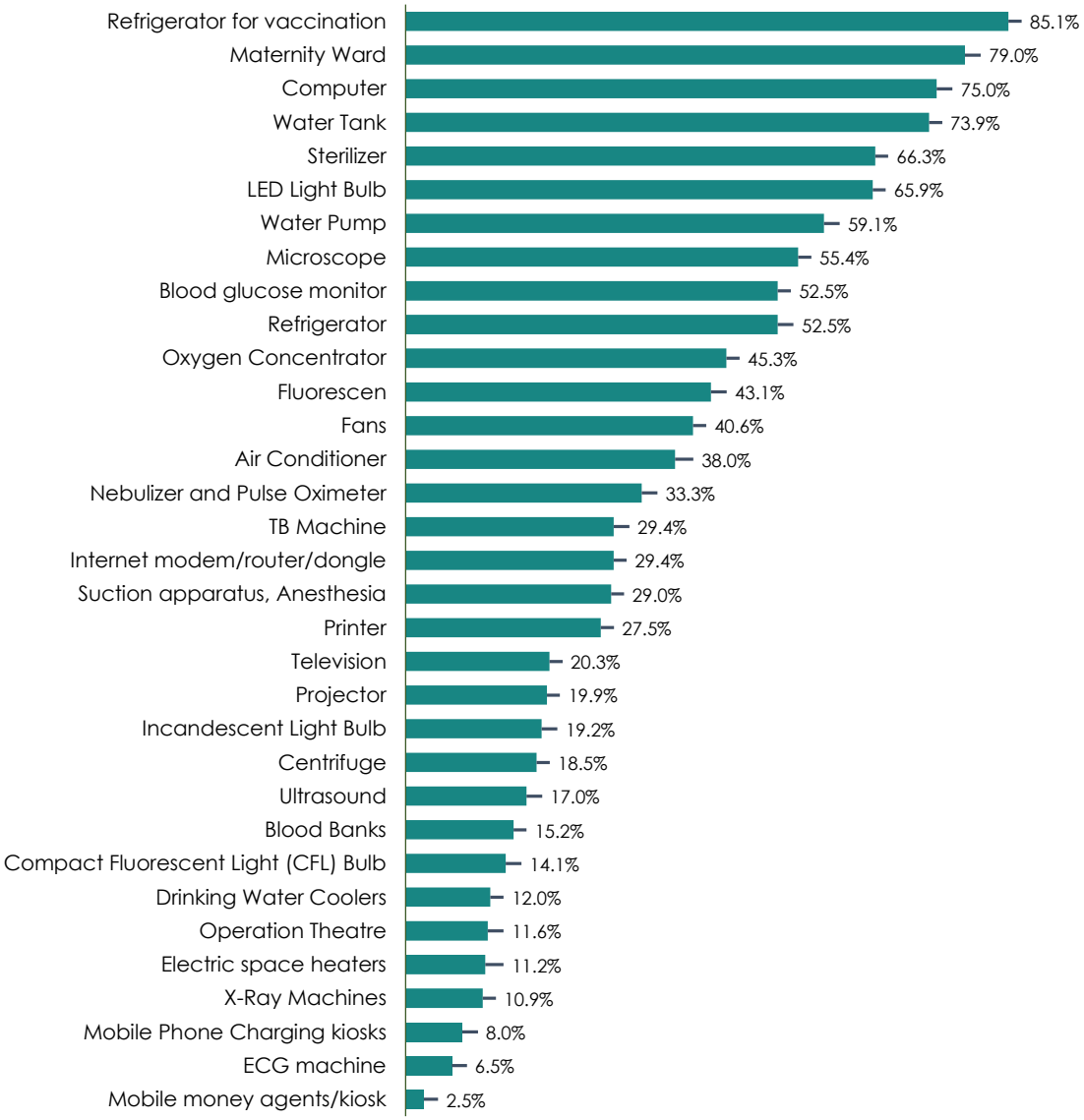
Formality

Results show that formality is universal among the selected health facilities as no health facility reported an informal connection in the survey. The MTF survey uses indirect questions that respondents may be more willing to answer to collect information on Formality. For instance, respondents were asked what method their household uses to pay the electricity bill. Therefore, the actual percentage of health facilities with an informal connection may differ from the data reported here.

Ownership of appliances

Health facilities have a mixture of low, medium, high and very high load appliances and facilities that require high-capacity electricity supply. The most common electric appliances and equipment in the health facilities include refrigerator for vaccination (85.1%), maternity ward (79%), computers (75%) and water tank (73.9%). The least owned appliances and facilities include mobile phone charging kiosks (8%), ECG machines (6.5%) and mobile money agents or kiosks at 2.5% (Figure 34).

Figure 34: Share of health facilities by ownership of appliances and facilities

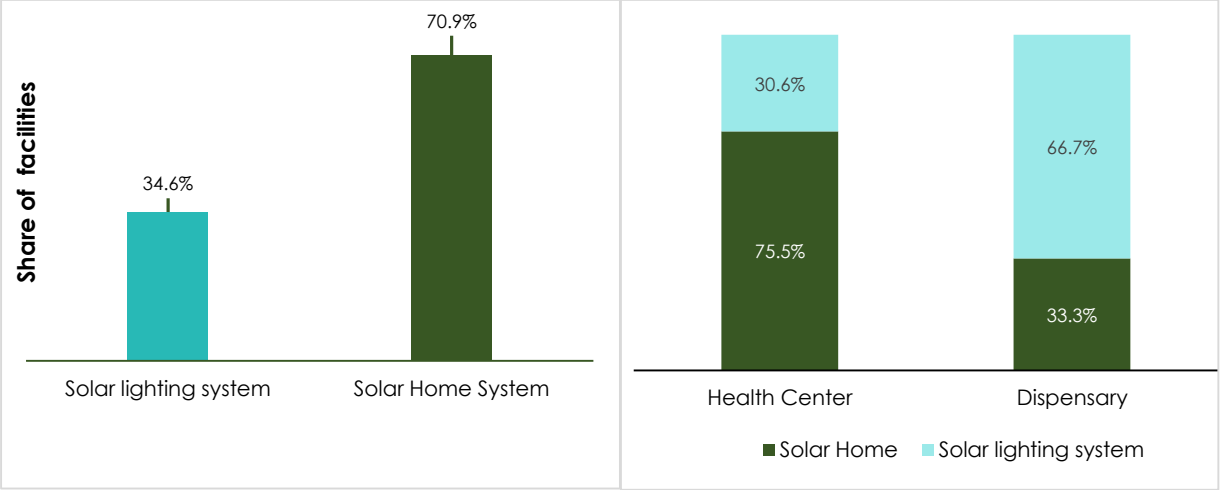


Source: Malawi MTF institutional survey 2023.

Solar devices

The majority of the health facilities with access to off-grid solar technology are using solar home systems (70.9%) while 34.6% are using solar lighting systems. Access to solar home systems is higher in health centers (75.5%) compared to dispensaries (33.3%). Conversely, dispensaries are using more solar lighting systems (66.7%) compared to health centers (30.6%). Notably, none of the selected hospitals reported using solar technology and none of the selected health facilities reported using solar lanterns (Figure 35).

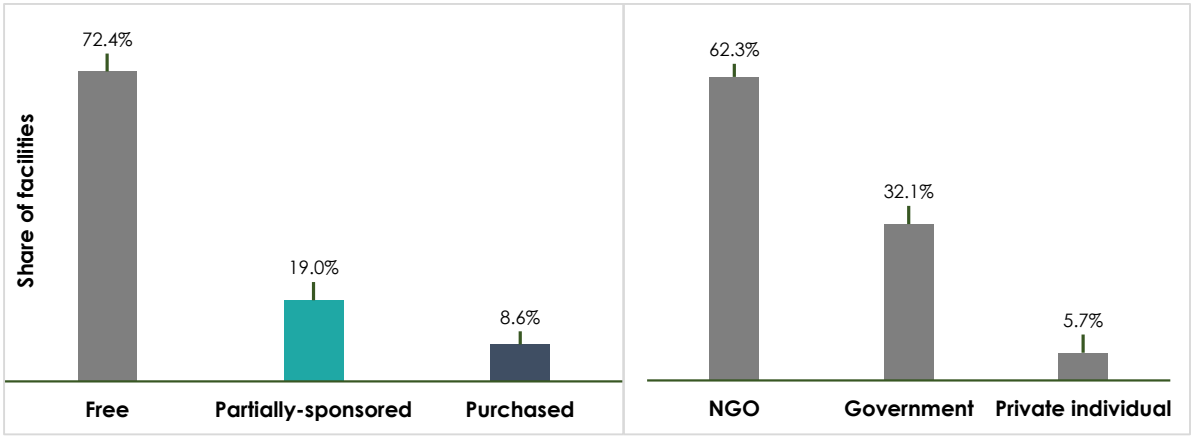
Figure 35: Proportion of health facilities with access to solar technology by type and level of facility



Source: Malawi MTF institutional survey 2023.

Of the 20.7% of health facilities using off-grid solar solutions, 72.4% acquired the products for free while 19% purchased on their own and 8.6% were partially sponsored (Figure 36). Those health facilities that acquired off-grid solar solutions for free mostly received from NGOs (62.3%) followed by government (32.1%) and private individuals (5.7%).

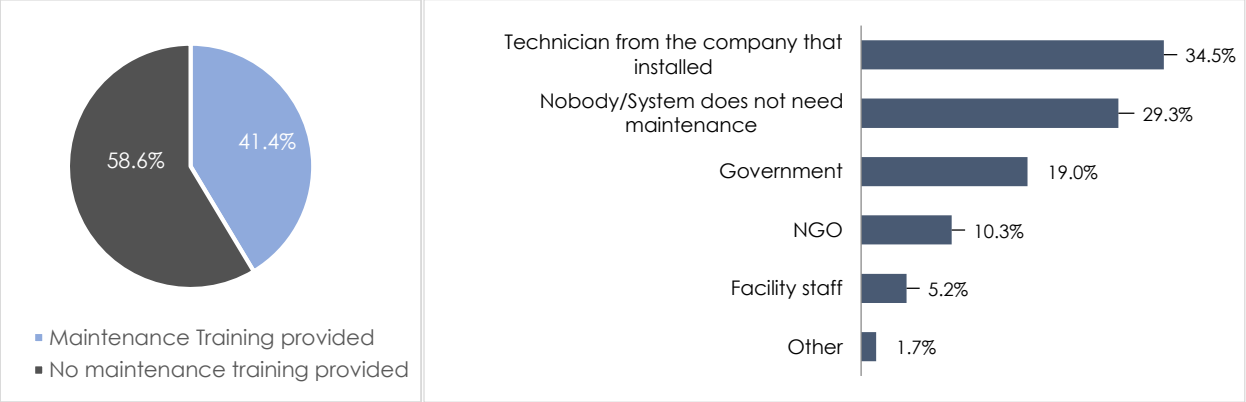
Figure 36: Share of health facilities with off-grid solar solutions by source



Source: Malawi MTF institutional survey 2023.

Only 41.4% of health facilities using solar technology received training on maintenance of the solar systems. Maintenance of the solar equipment is mostly conducted by the technician who installed the system (34.5% of the facilities) while 29.3% of the facilities using solar technology did not need maintenance (Figure 37).

Figure 37: Share of health facilities with off-grid solar by training and provider of maintenance services

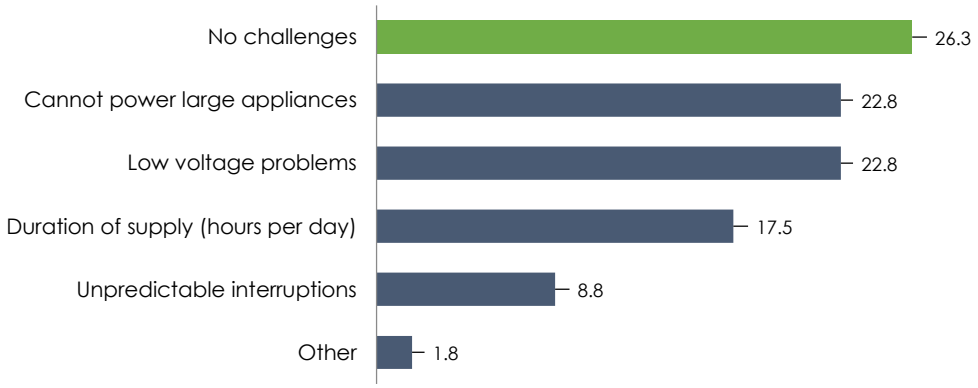


Source: Malawi MTF institutional survey 2023.

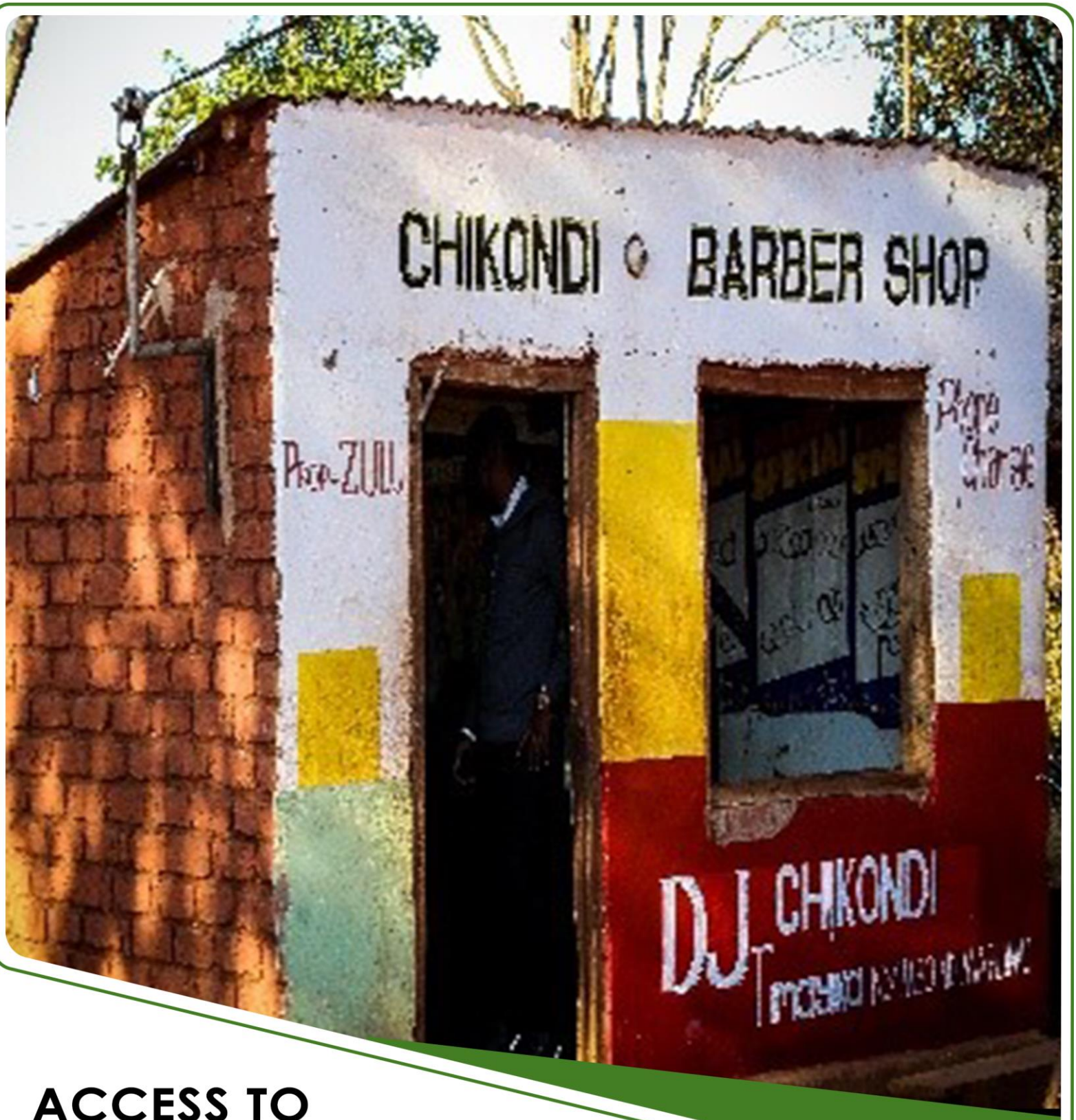
Challenges

The most common challenge experienced by the health facilities is limited capacity to power large appliances (22.8%) and low voltage (22.8%) followed by duration of supply (hours per day) at 17.5% percent (Figure 38).

Figure 38: Share of health facilities with off-grid solar by challenges faced



Source: Malawi MTF institutional survey 2023.



ACCESS TO ELECTRICITY BY BUSINESS ENTERPRISES

ACCESS TO ELECTRICITY BY BUSINESS ENTERPRISES

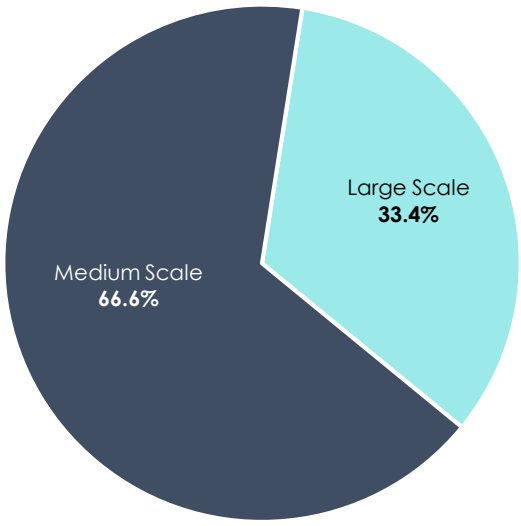
This chapter presents results on access to energy by business enterprises across Malawi. The Malawi MTF survey targeted a sample size of 1,080 businesses across all sectors. The sample was drawn from the 2016/17 Statistical Business Register (SBR) which is benchmarked through the Census of Economic Activities and is updated annually through Annual Economic Surveys (AES). As is the case with most business surveys, a total of 691 business enterprises were interviewed out of the 1,080 businesses that were sampled. Thus, the survey reached a response rate of 64%. This is mainly due to changes in business physical locations, absence of reliable contact information and closing of businesses. The survey concentrated on the medium and large-scale enterprises located in the cities of Mzuzu, Lilongwe, Blantyre and Zomba and selected urban centres across the districts.

Characteristics of interviewed enterprises

Size

Two thirds (66.6%) of the business enterprises interviewed are medium scale while 33.4% are large-scale (Figure 39). The description is based on annual turnover: enterprises with annual turnover of less than 50 million Malawi Kwacha are classified as small scale, those with more than 50 million Malawi Kwacha but less than 500 million Malawi Kwacha are classified as medium scale while enterprises with annual turnover of more than 500 million Malawi Kwacha are classified as large scale.

Figure 39: Share of enterprises by Size



Source: Malawi MTF institutional survey 2023.

Sector

The sectors of the enterprises were classified using the International Standard Industrial Classification of All Economic Activities, 4TH Revision (ISIC Rev 4), an international reference classification of productive activities. The highest proportion of the interviewed enterprises are in Wholesale and retail trade; repair of motor vehicles and motorcycles (46.6%) followed by manufacturing (11.7%) and construction (6.8%). Enterprises in the mining and quarrying have the lowest proportion of 0.6% (Table 3)

Table 3. Distribution of enterprises by ISIC

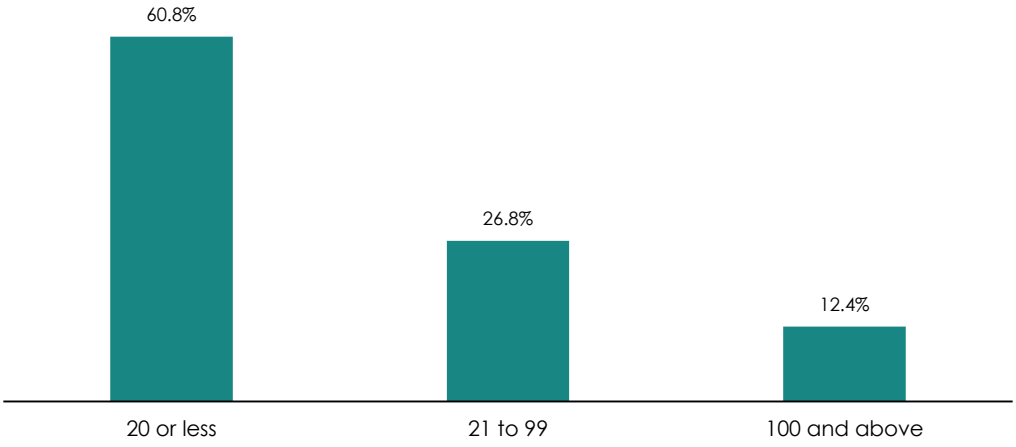
ISIC Section		Share
A	Agriculture, forestry and fishing	3.5%
B	Mining and quarrying	0.6%
C	Manufacturing	11.7%
D	Electricity, gas, steam and air conditioning supply	0.7%
F	Construction	6.8%
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	46.6%
H	Transportation and storage	4.8%
I	Accommodation and food service activities	3.9%
J	Information and communication	1.2%
K	Financial and insurance activities	2.2%
L	Real estate activities	1.5%
M	Professional, scientific and technical activities	3.3%
N	Administrative and support service activities	1.9%
O	Public administration and defence; compulsory social security	2.0%
P	Education	3.8%
Q	Human health and social work activities	4.1%
R	Arts, entertainment and recreation	0.9%
S	Other service activities	0.7%

Source: Malawi MTF institutional survey 2023.

Employment

The majority of the enterprises (60.8%) have 20 or less full-time workers while 26.8% of the enterprises have between 21 and 99 workers. Only 12.4% of the enterprises have 100 or more full-time workers (Figure 40).

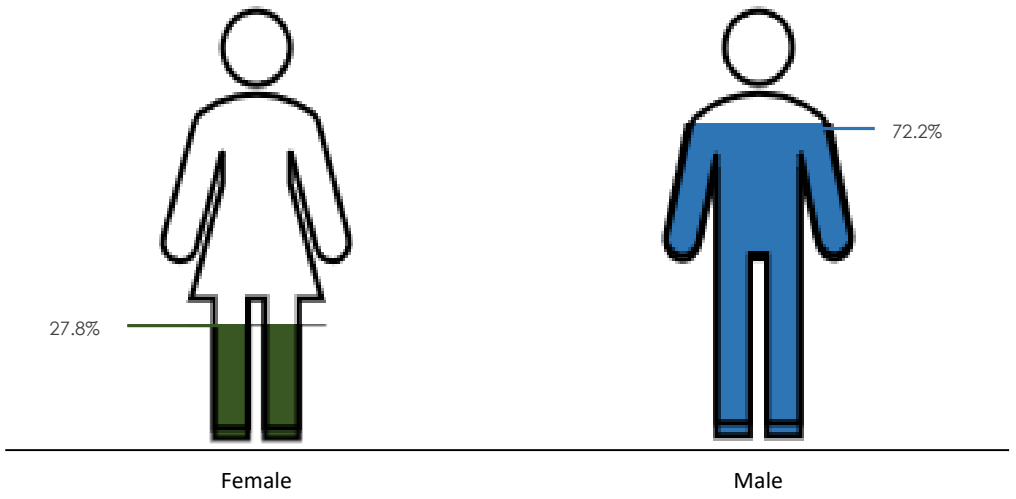
Figure 40: Distribution of enterprises by number of full-time workers



Source: Malawi MTF institutional survey 2023.

In terms of sex of full-time staff, 72.2% of the workers are male while 27.8% are female (Figure 41).

Figure 41: Distribution of enterprises by sex of full-time workers

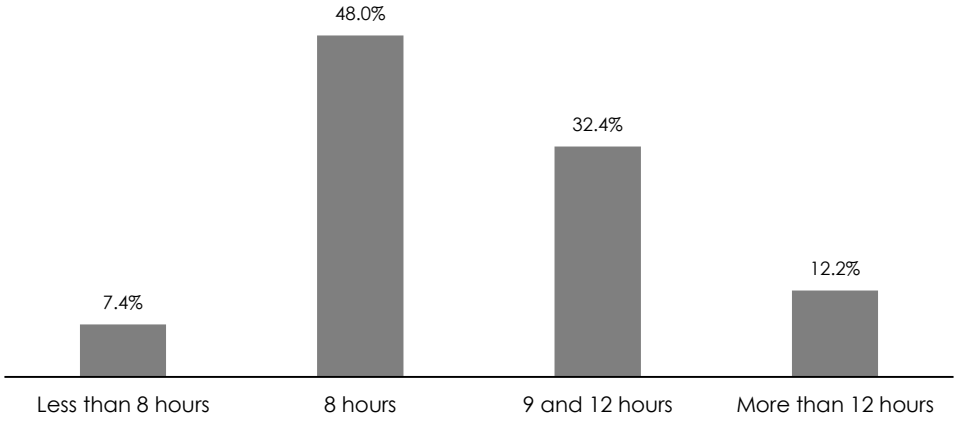


Source: Malawi MTF institutional survey 2023.

Operating hours per day

Most of the enterprises (48%) operate for 8 hours per day followed by those that operate between 9 and 12 hours per day (32.4%). Few enterprises (12.2%) operate for more than 12 hours per day and even less (7.4%) operate for less than 8 hours per day (Figure 42).

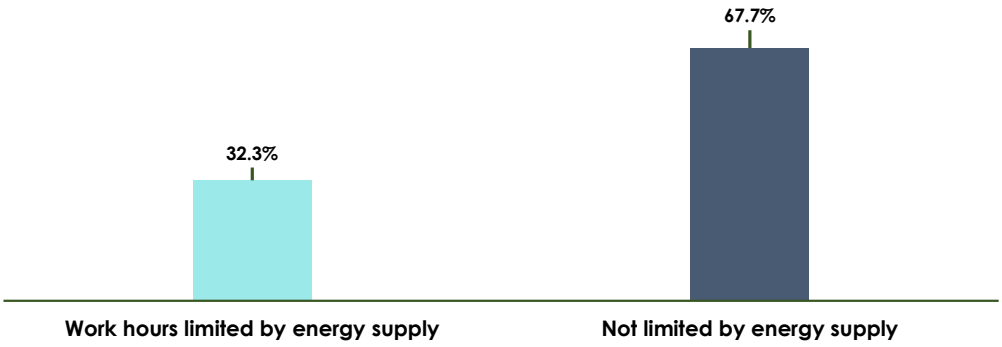
Figure 42: Distribution of enterprises by number of hours they operate per day



Source: Malawi MTF institutional survey 2023.

Nearly a third of the enterprises (32.3%) reported that their operation time is limited by energy supply. Conversely, the majority of the enterprises (67.7%) indicated that their working hours are not limited by energy supply (Figure 43).

Figure 43: Distribution of enterprises by impact of energy supply on working hours

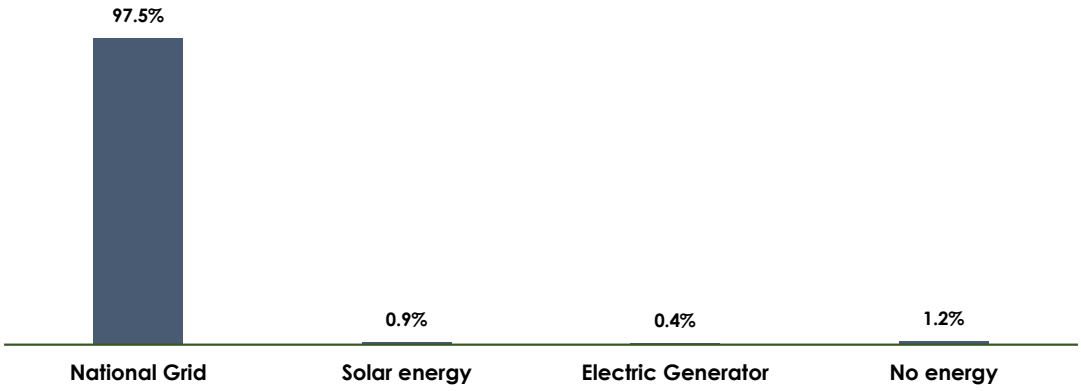


Source: Malawi MTF institutional survey 2023.

Access to electricity

Access to electricity is almost universal among the interviewed enterprises. Most of the enterprises (97.5%) have access to electricity through the national grid and 0.9% and 0.4% use off-grid solutions of solar technology and electric generators, respectively. Only 1.2% of the enterprises have no access to electricity (Figure 44).

Figure 44: Share of business enterprises with access to electricity by source



Source: Malawi MTF institutional survey 2023.

Electricity access by sector shows high access to electricity in most sectors except in Agriculture, Forestry and Fishing where 12.5% of the selected enterprises do not have access to electricity (Table 4).

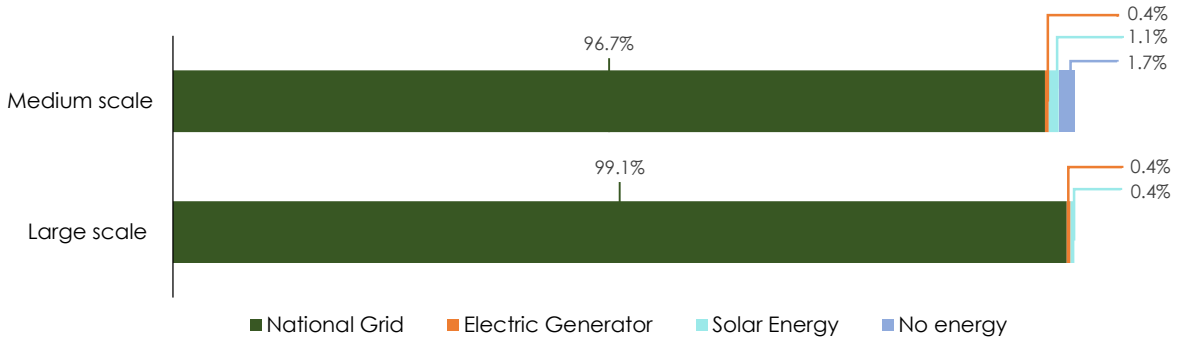
Table 4. Share of business enterprises with access to electricity by source and sector

ISIC Section		National Grid	Electric Generator	Solar Energy	No energy
	Total	**97.5%**	**0.9%**	**0.4%**	**1.2%**
A	Agriculture, forestry and fishing	83.3%	0.0%	4.2%	12.5%
B	Mining and quarrying	100.0%	0.0%	0.0%	0.0%
C	Manufacturing	100.0%	0.0%	0.0%	0.0%
D	Electricity, gas, steam and air conditioning supply	100.0%	0.0%	0.0%	0.0%
F	Construction	93.6%	0.0%	2.1%	4.3%
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	98.1%	0.0%	0.9%	0.9%
H	Transportation and storage	100.0%	0.0%	0.0%	0.0%
I	Accommodation and food service activities	100.0%	0.0%	0.0%	0.0%
J	Information and communication	100.0%	0.0%	0.0%	0.0%
K	Financial and insurance activities	100.0%	0.0%	0.0%	0.0%
L	Real estate activities	100.0%	0.0%	0.0%	0.0%
M	Professional, scientific and technical activities	95.7%	4.4%	0.0%	0.0%
N	Administrative and support service activities	100.0%	0.0%	0.0%	0.0%
O	Public administration and defence; compulsory social security	92.9%	0.0%	7.1%	0.0%
P	Education	92.3%	7.7%	0.0%	0.0%
Q	Human health and social work activities	100.0%	0.0%	0.0%	0.0%
R	Arts, entertainment and recreation	100.0%	0.0%	0.0%	0.0%
S	Other service activities	100.0%	0.0%	0.0%	0.0%

Source: Malawi MTF institutional survey 2023.

Similarly, there is high access to electricity in both large scale and medium scale enterprises. Almost all the large-scale enterprises (99.1%) have access to grid electricity compared to 96.7% among medium scale enterprises (Figure 45).

Figure 45: Share of business enterprises with access to electricity by source and size of enterprise

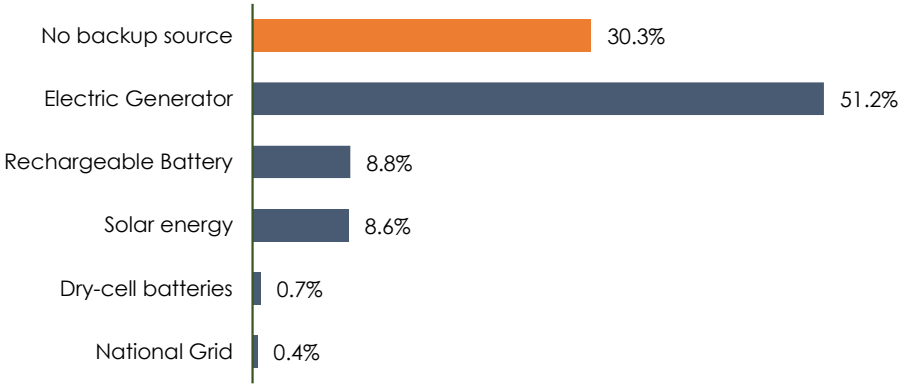


Source: Malawi MTF institutional survey 2023.

Back-up sources of electricity

Electric generators are the most common back-up source of electricity among enterprises (51.2%) followed by rechargeable batteries (8.8%) and solar energy (8.6%). Nearly a third of the enterprises (30.3%) have no backup sources of electricity (Figure 46).

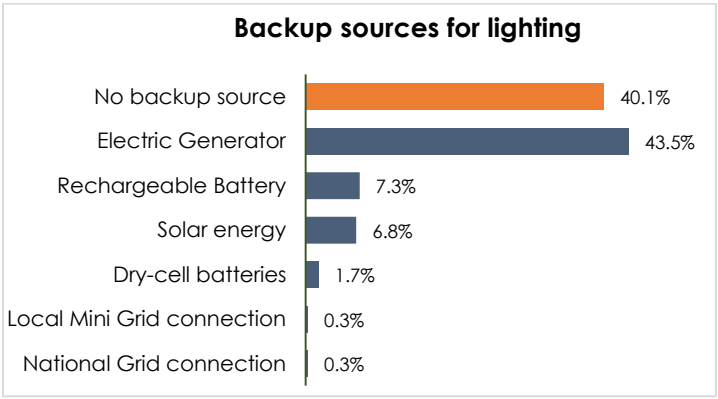
Figure 46: Share of business enterprises by back-up source of electricity

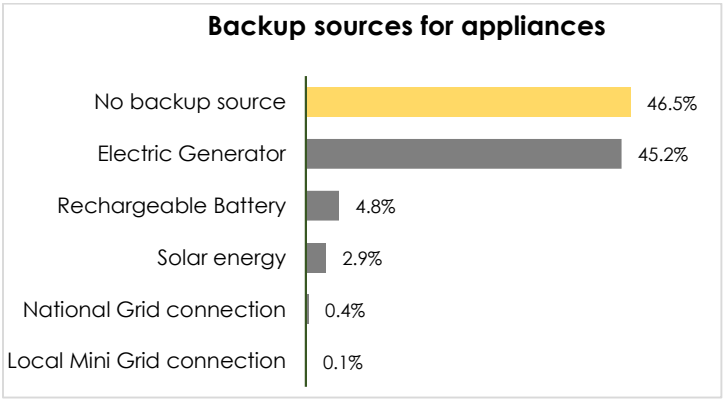


Source: Malawi MTF institutional survey 2023.

Further results on backup sources specifically for lighting and for appliances show that electric generators are still the leading backup source: 43.5% for lighting and 45.2% for appliances (Figure 47).

Figure 47: Share of business enterprises by back-up source of electricity for lighting and appliances



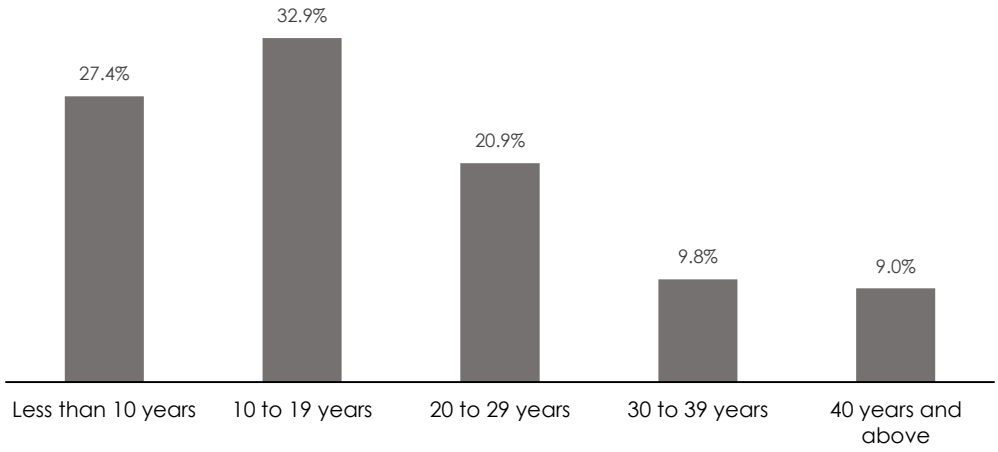


Source: Malawi MTF institutional survey 2023.

Duration of grid connection

Grid electricity connection among enterprises has increased in the recent years as 27.4% of the enterprises received their electricity connections less than 10 years preceding the survey while 32.9% received the connection between 10 and 19 years preceding the survey. Only 18.8% of the enterprises have had grid electricity for 30 years or more (Figure 48).

Figure 48: Share of business enterprises duration of grid-connection

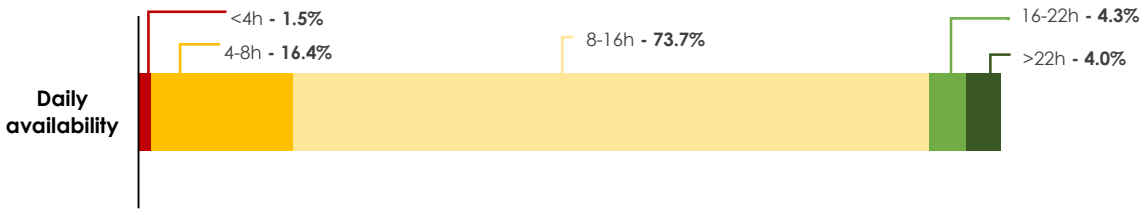


Source: Malawi MTF institutional survey 2023.

Daily availability

Only 4% of enterprises have adequate supply of electricity for at least 23 hours every day. The majority of enterprises have electricity supply for 8 to 16 hours per day while 16.4% have electricity supply for 4 to 8 hours a day (Figure 49).

Figure 49 : Share of business enterprises with daily access to electricity

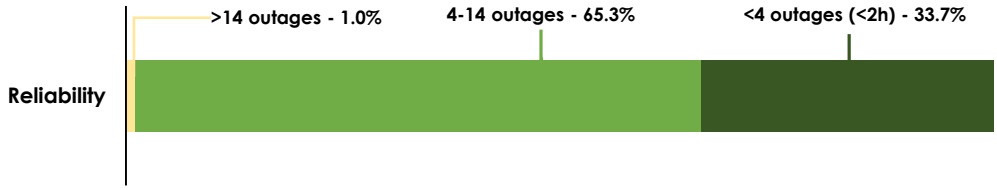


Source: Malawi MTF institutional survey 2023.

Reliability

Most grid-connected enterprises (65.3%) experience between 4 and 14 unscheduled electricity outages a week. Only a third of the enterprises (33.7%) have reliable electricity as they experience less than 4 outages a week with a total duration of less than 2 hours (Figure 50).

Figure 50: Share of business enterprises with access to reliable electricity

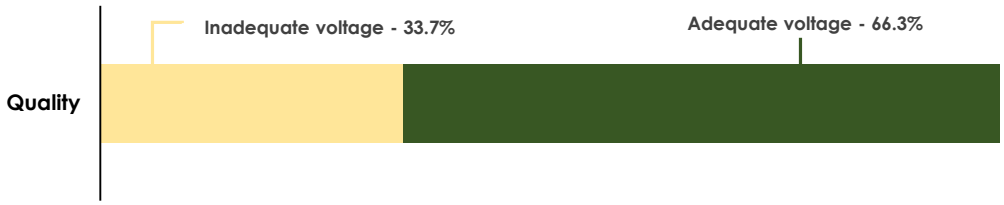


Source: Malawi MTF institutional survey 2023.

Quality

The quality of electricity is an issue for one third of the grid-connected enterprises (33.7%) that reported incidents of low or fluctuating voltage. Thus, these enterprises possibly experience low performance of electric appliances and may result in damage. Conversely, two-thirds (66.3%) of the grid-connected business enterprises did not report any voltage issues (Figure 51).

Figure 51: Share of business enterprises by quality of electricity access



Source: Malawi MTF institutional survey 2023.

Health and safety

Only 1.2% of the business enterprises reported incidents of injuries or death of individuals from using grid electricity service during 12 months preceding the survey (Figure 52). Thus, electricity access among business enterprises is considered safe.

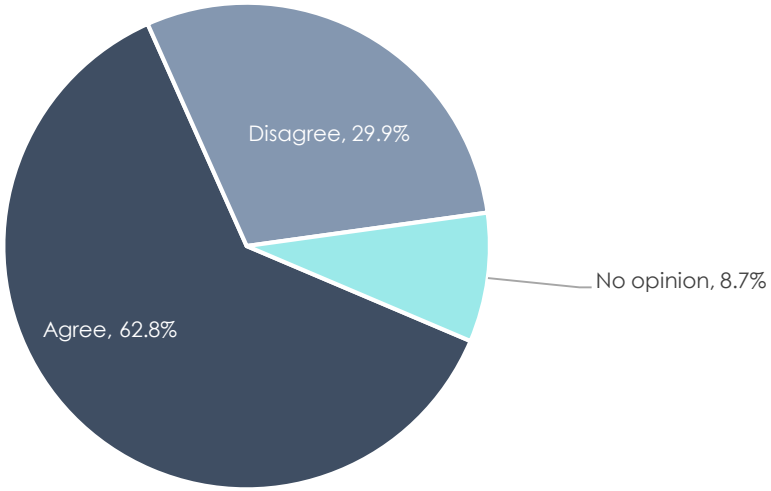
Figure 52: Share of business enterprises by safety of electricity access

Source: Malawi MTF institutional survey 2023.

Opinion on Access and use of Energy sources by Enterprises

The enterprises were asked to give their opinion about whether electricity is too expensive for their enterprises' needs. About 62% of enterprises agreed that electricity is too expensive, 29% disagreed while 9% percent had no opinion on the same (Figure 53).

Figure 53: Share of opinions on whether electricity is too expensive for enterprises' needs

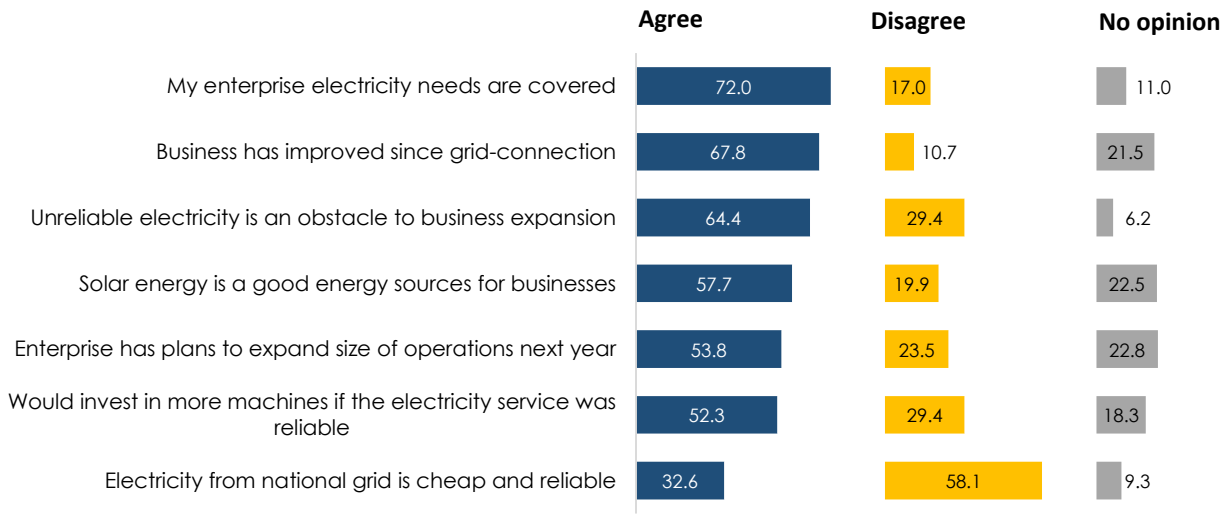


Source: Malawi MTF institutional survey 2023.

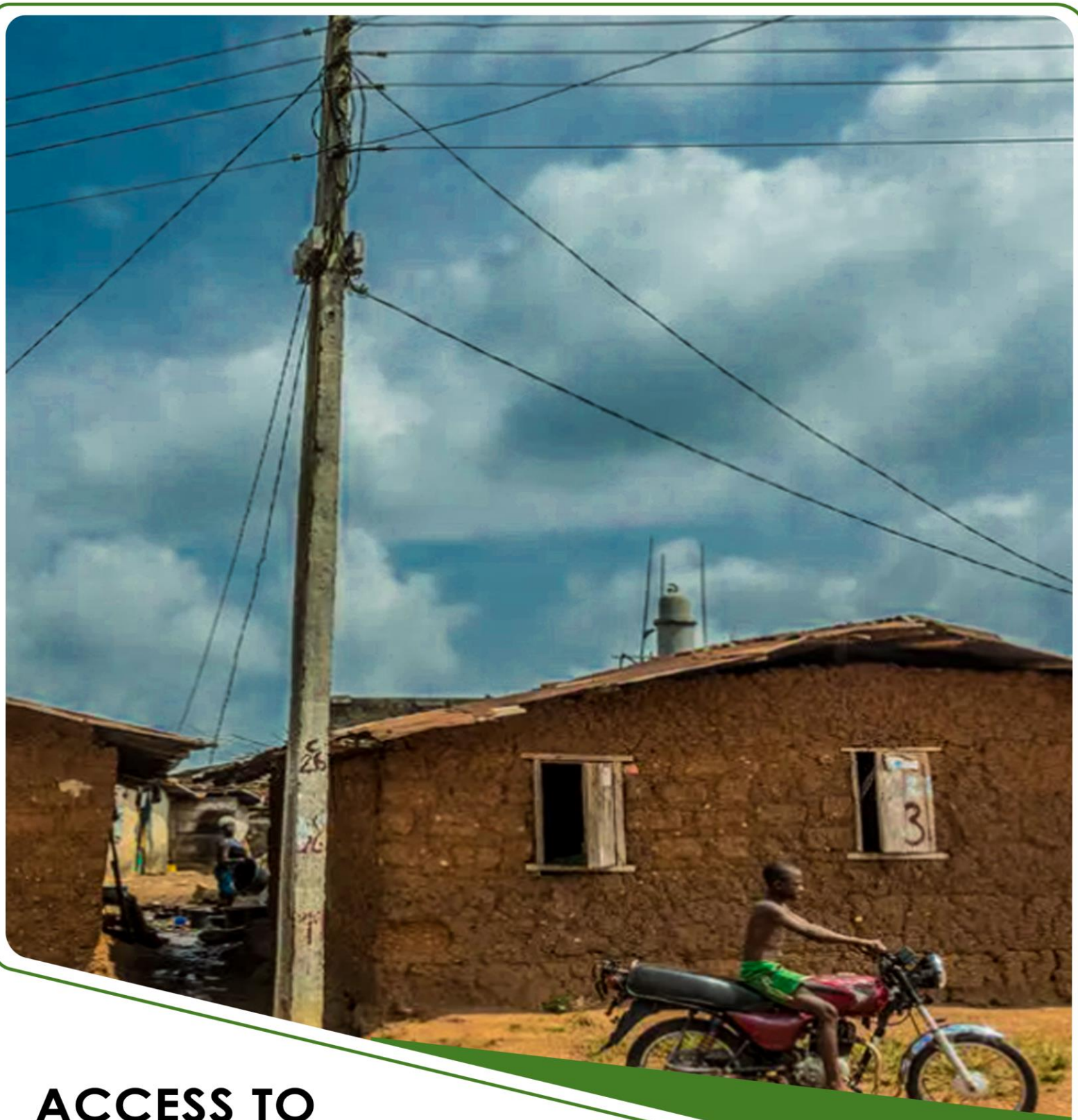
The majority of enterprises (72%) said that their electricity needs are covered, 17% disagreed while 11% have no opinion. About 68% of enterprises said that their businesses have improved since they got access to electricity while 21.5% had no opinion. About 52% of the enterprises agreed that they would invest in more machines if the electricity service were more reliable.

Over half of the enterprises (58.1%) disagreed that electricity from the national grid is cheap and reliable and 57.7% agreed that solar energy is a good energy source for a business (Figure 54).

Figure 54: Percentage Distribution Enterprises' Opinion on Access to Electricity



Source: Malawi MTF institutional survey 2023.



ACCESS TO ELECTRICITY BY COMMUNITIES

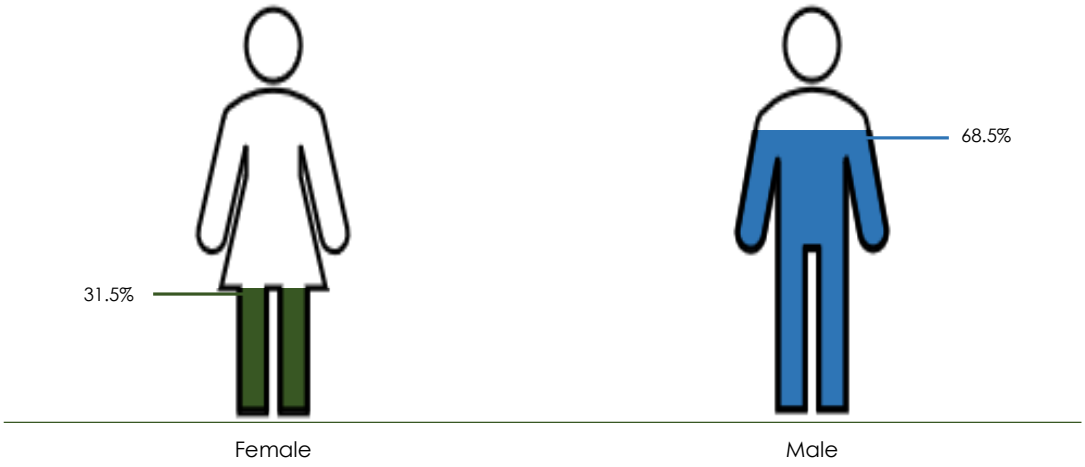
ACCESS TO ELECTRICITY BY COMMUNITIES

This chapter provides community level information on access to electricity. The survey collected data from 433 communities across the country. Each community interview involved 5 to 8 key community members from the EAs that were selected for the household survey or surrounding areas. Field team supervisors organized the interviews in close collaboration with traditional leaders of the areas. The participants of the community interviews targeted individuals with diverse roles in the communities to provide perspectives on access to electricity in their community. The interviews were conducted in the form of Focus Group Discussions (FGDs) that allowed the participants to discuss their responses to a structured questionnaire.

Characteristics of community interview participants

A total of 2,795 community members participated in the community interviews across the country. A bout a third of the participants (31.5%) were female while the rest (68.5%) were male (Figure 55).

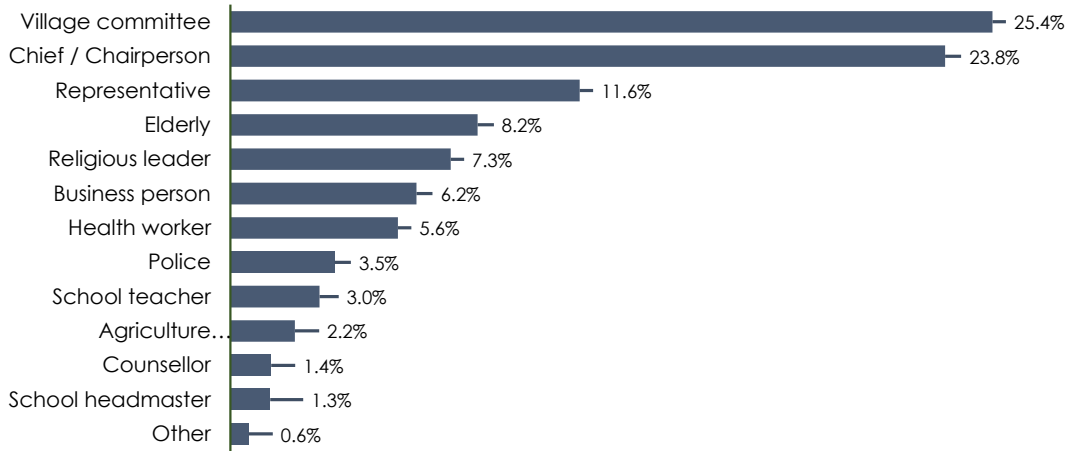
Figure 55: Share of community interview participants by sex



Source: Malawi MTF institutional survey 2023.

Most of the participants were members of village committees (25.4%) such as Village Development Committee, Village Civil Protection Committees, Community Policing Forum, School Committee and youth clubs. Other participants included chiefs or chairpersons of committees (23.8%), representatives of chiefs or chairpersons (11.6%) and the elderly at 8.2% (Figure 56).

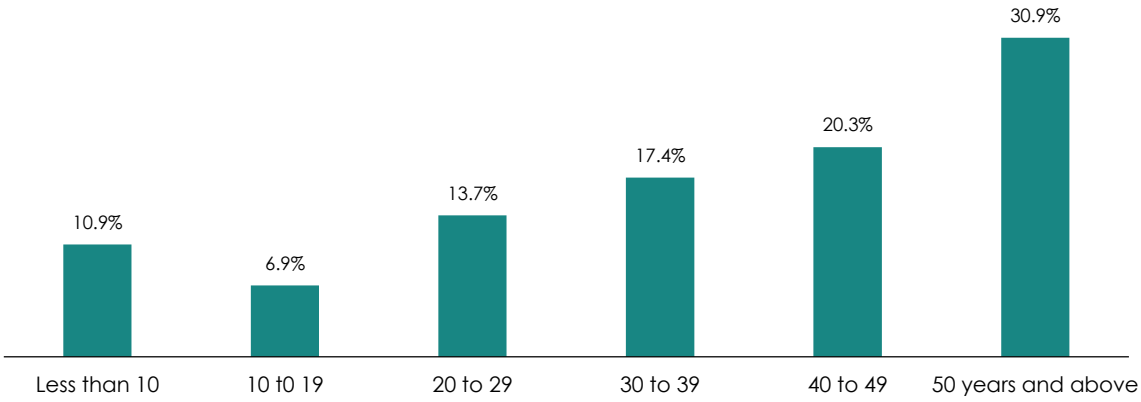
Figure 56: Share of community interview participants by position or role



Source: Malawi MTF institutional survey 2023.

The majority of participants had lived in the community for a long period of time by the time of the survey. Only 10.9% had lived in the community for less than 10 years while nearly a third of the participants had lived in their community for 50 years or more at the time of the interview (Figure 57)

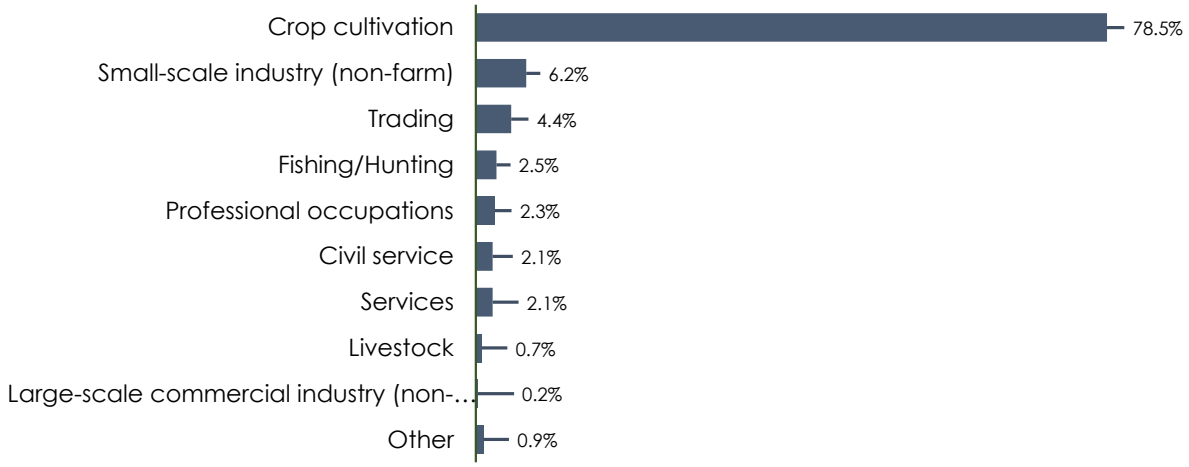
Figure 57 : Share of community interview participants by number of years lived in the community



Source: Malawi MTF institutional survey 2023.

The main source of income for most households in the selected community is crop cultivation at 78.5% followed by non-farm small-scaled industry at 6.2% (Figure 58).

Figure 58: Share of households' source of income

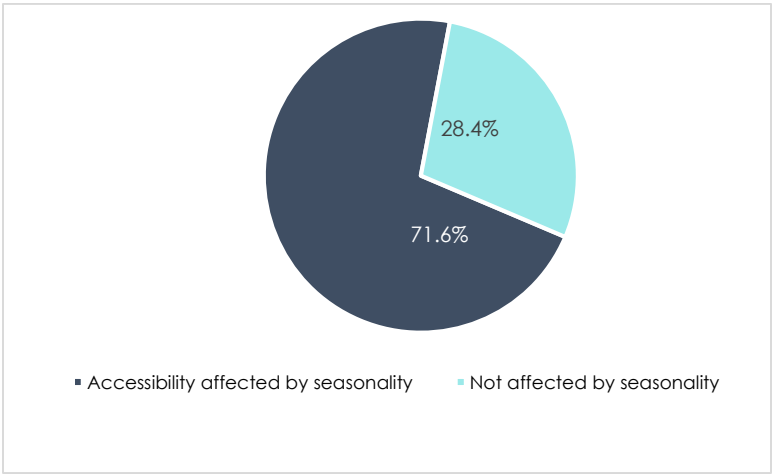


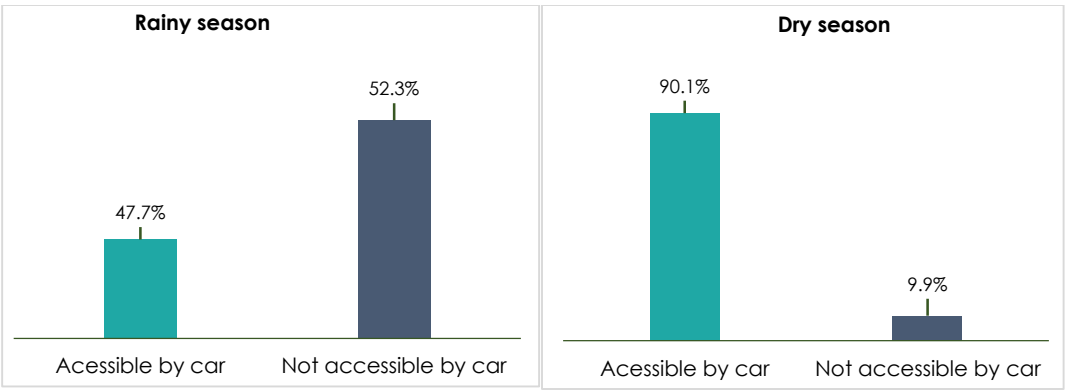
Source: Malawi MTF institutional survey 2023.

Accessibility of communities by road

Accessibility to the nearest town by road is a challenge to 71.6% of communities as the roads are only passable during specific seasons. About half (52.3%) of the communities are not accessible by motor vehicles during the rainy season. More communities (90.1%) are accessible by motor vehicles during the dry season (Figure 59).

Figure 59: Share of communities accessible by road by season





Source: Malawi MTF institutional survey 2023.

Mobile phone network availability

Most of the communities have working mobile phone networks. However, only 40.4% of the communities have network available in the entire community while 29.4% of the communities with working network have the network in most parts of the community (Figure 60).

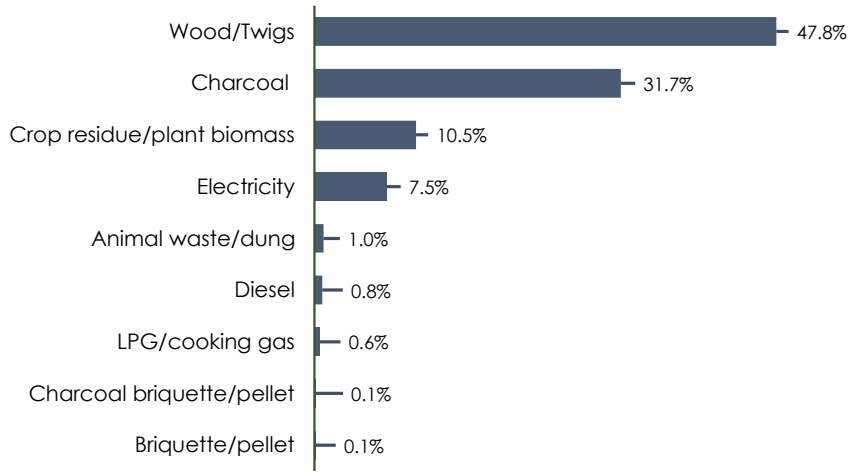
Figure 60: Share of communities with working mobile phone network

Source: Malawi MTF institutional survey 2023.

Fuel use

Use of biomass is very predominant across the communities; 91.1% of communities reported use of biomass as a source of fuel. Specifically, wood or twigs (47.8%) are the most common source of fuel followed by charcoal (31.7%) and crop residue or plant biomass (10.5%). Only 7.5% and 0.6% of communities reported use of electricity and Liquefied Petroleum Gas, respectively (Figure 61).

Figure 61: Share of communities by type of fuel used

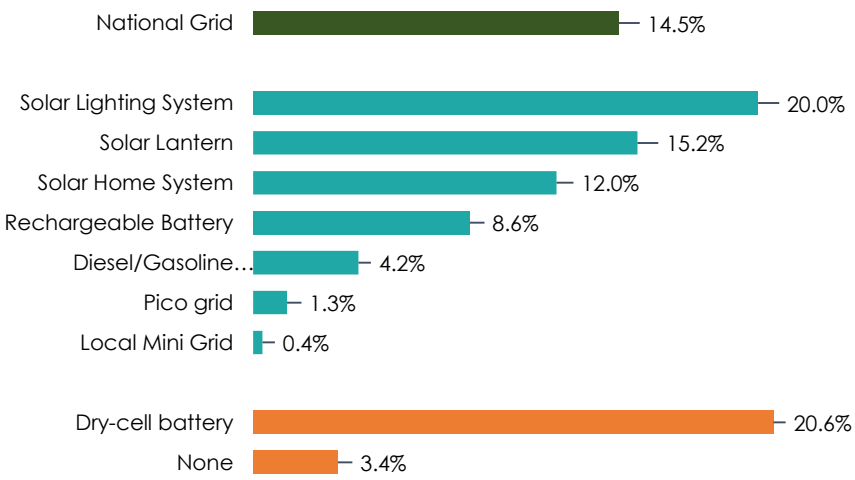


Source: Malawi MTF institutional survey 2023.

Access to electricity by communities

Across the communities, 14.5% have access to electricity through the national grid. Nearly two-thirds of the communities (61.6%) have access to electricity through off-grid solutions, mostly solar. Most of the communities using off-grid solutions use solar lighting systems (20%) followed by solar lanterns (15.2%), solar home systems (12%) and rechargeable batteries (8.6%). Although one-fifth of the communities (20.6%) did not have access to conventional electricity sources, they reported using dry cell batteries to power low load appliances such as torchlights and radios. Only 3.4% of the communities did not report using any of the electricity sources (Figure 62).

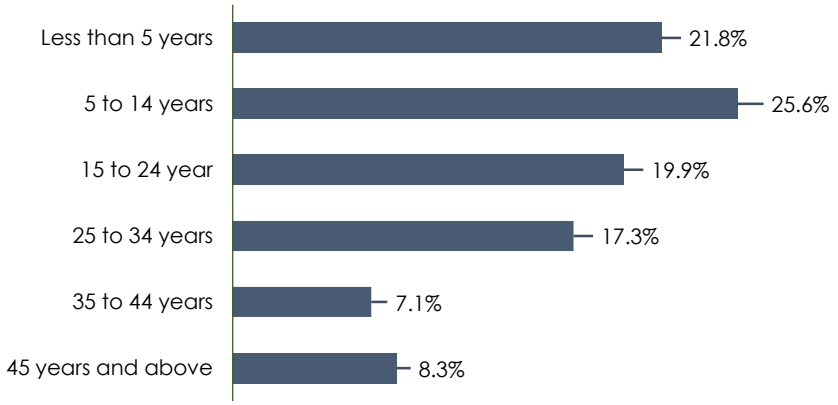
Figure 62: Share of communities by source of electricity



Source: Malawi MTF institutional survey 2023.

Grid electricity is a fairly new phenomenon across the communities as 47.4% of the communities received electricity within the last 14 years preceding the survey. About one third (32.7%) of the communities have had grid electricity for at least 25 years preceding the survey (Figure 63).

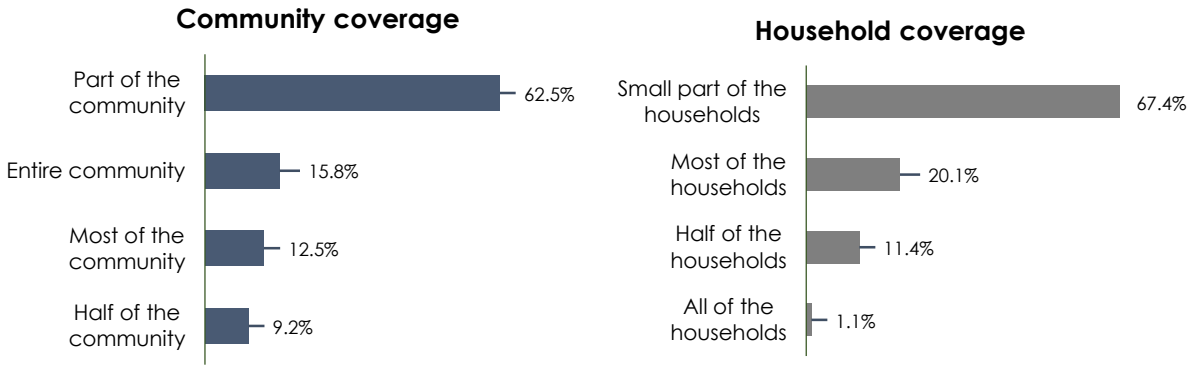
Figure 63: Share of grid-connected communities by duration of grid-electricity



Source: Malawi MTF institutional survey 2023.

Grid access is not universal within communities that have access to grid electricity. Only 15.8% of the communities reported universal access to grid electricity within their community while 12.5% reported that most of their community has access to grid electricity. Similarly, only 1.1% of the communities reported universal household connection with their community. The majority of communities (67.4%) said few households are connected to the grid in their community (Figure 64).

Figure 64: Share of grid–connected communities by coverage of grid-electricity within the community

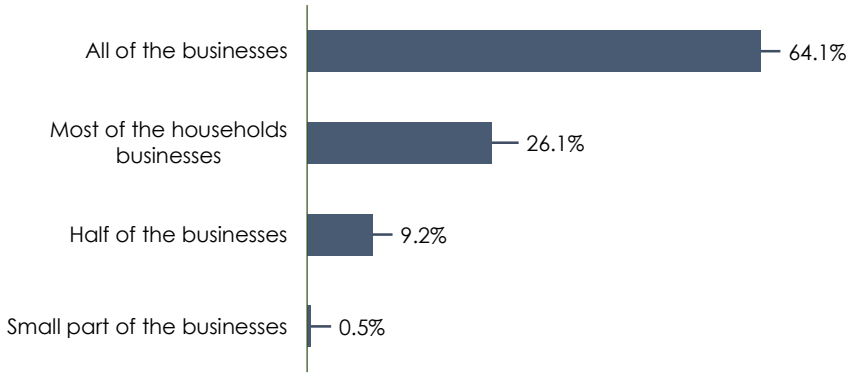


Source: Malawi MTF institutional survey 2023.

Grid access among enterprises within the grid-connected communities is more common compared to household connection. Nearly two-thirds of the communities (64.1%) reported the all the businesses in their community are connected to the national grid. Further, 26.1% of the

communities reported that most of the household businesses were connected to the grid (Figure 65).

Figure 65: Share of grid-connected communities by coverage of grid-electricity within the community

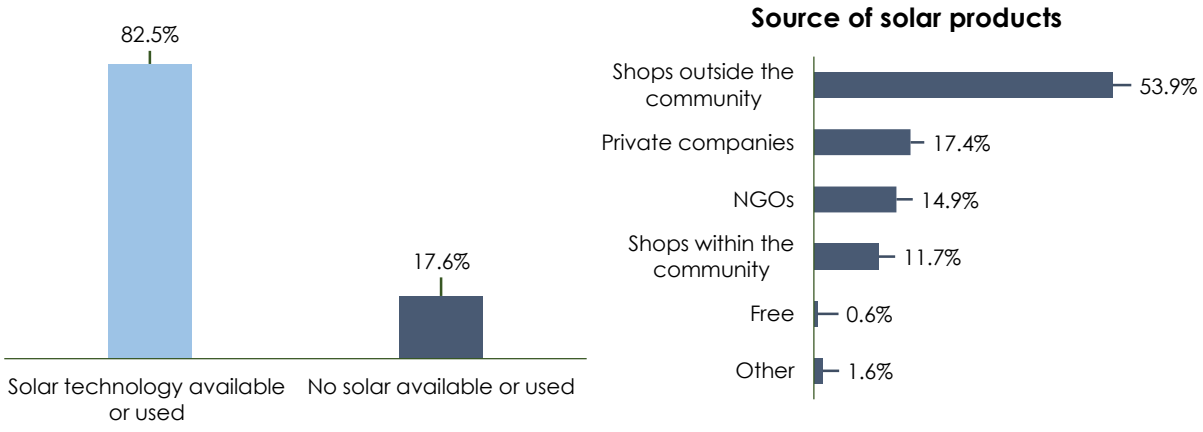


Source: Malawi MTF institutional survey 2023.

Solar

Solar technologies such as solar lighting system, solar home systems and solar lanterns are widely available at community level. Most of the communities (82.5%) reported that solar products are available or used in their community (Figure 66). The solar products were mostly purchased from shops outside the community (53.9%) while 17.4% of the communities purchased from private companies.

Figure 66: Share of communities by source of electricity



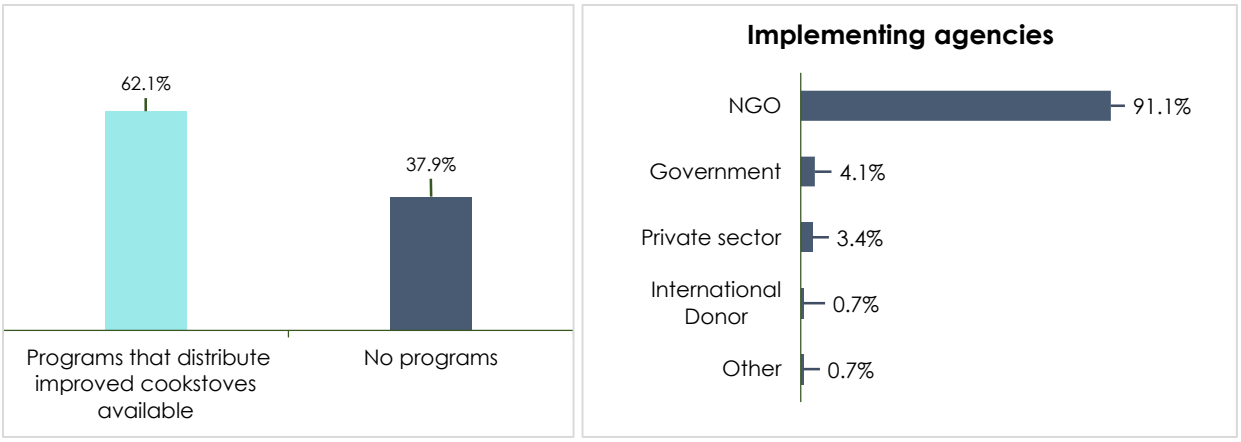
Source: Malawi MTF institutional survey 2023

Availability of community level programs

Nearly two-thirds of the communities have programs that distribute improved cookstoves. The programs are mostly implemented by Non-Governmental Organizations 91.1%. Only 4.1% are

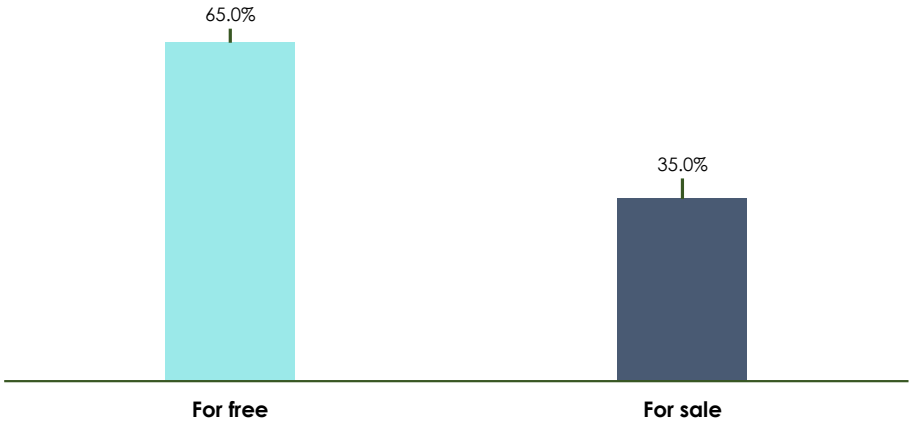
being implemented by the government (Figure 67). The cookstoves are mostly for free (65%) while 35% are for sale (Figure 68).

Figure 67 : Share of communities with programs that distribute improved cookstoves and their implementing agencies



Source: Malawi MTF institutional survey 2023.

Figure 68 : Share of communities with programs that distribute improved cookstoves for free

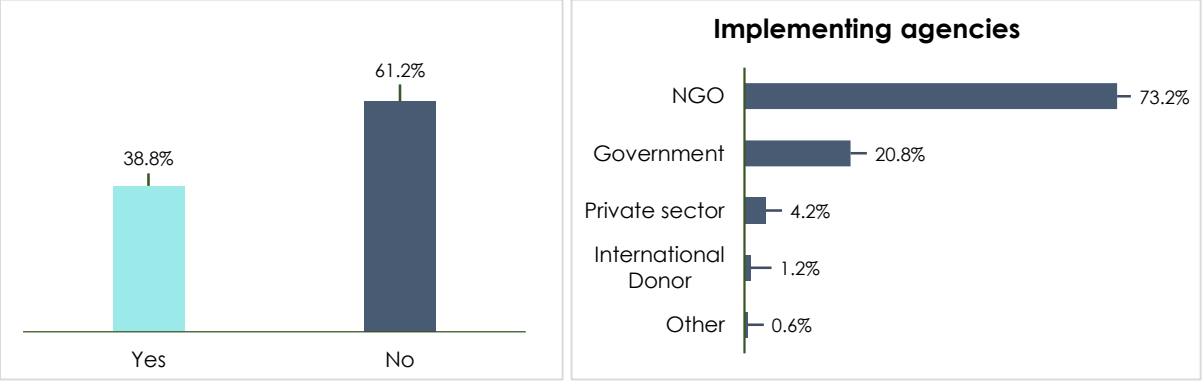


Source: Malawi MTF institutional survey 2023.

Awareness campaigns on the health risks of cookstoves

Awareness campaign programs on the health risks of cookstoves were reported in 38.8% of the communities. The programs were mainly implemented by NGOs (73.2%) followed by government at 20.8% (Figure 69).

Figure 69: Share of communities with awareness campaigns on the health risks of cookstoves and their implementing agencies

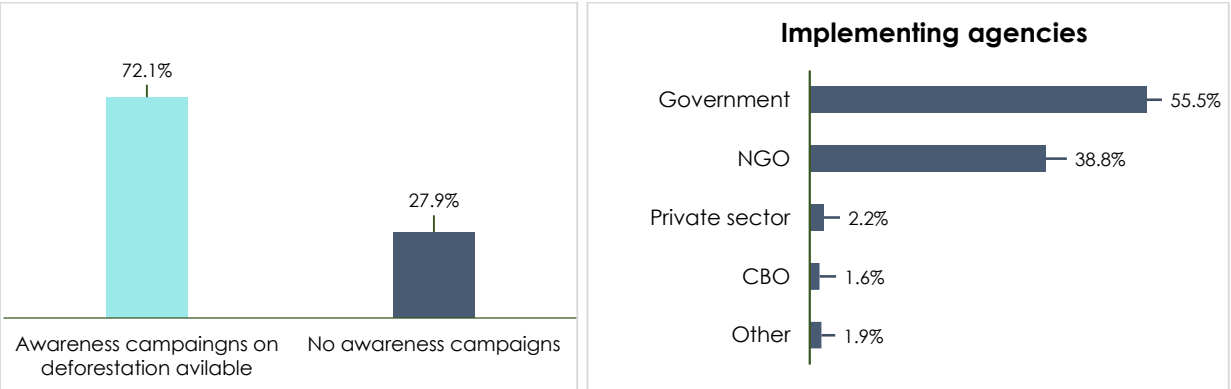


Source: Malawi MTF institutional survey 2023.

Awareness campaigns on deforestation due to firewood use

The majority of communities (72.1%) have programs that campaign for awareness on deforestation due to firewood use. The programs are mostly implemented by NGOs (55.5%) followed by government at 38.8% (Figure 70).

Figure 70: Share of communities with awareness campaigns on deforestation due to firewood use and their implementing agencies



Source: Malawi MTF institutional survey 2023.

ANNEX 1. SAMPLING PROCEDURE

Sampling of Business Enterprises

The Malawi National Statistical Office uses 2016/17 Statistical Business Register (SBR), benchmarked through the comprehensive Census of Economic Activities (CEA) which is updated yearly through Annual Economic Surveys (AES). Annual Economic Surveys collect data from the private sector and parastatals/government firms across the districts in Malawi. The Surveys use standardized survey instruments and a uniform sampling methodology to minimize measurement error and to generate data that are comparable across the Malawi's economy. The SBR provides a quality and exhaustive enterprise sampling frame.

The 2016/17 CEA and annual surveys assess the constraints to private sector growth, productivity, and job creation, build a panel of establishment-level data that will make it possible to track changes in the business environment over time.

This note provides information on the sampling methodology for MTF Enterprise Survey that was conducted in 2023 by Malawi National Statistical Office in collaboration with the Ministry of Energy. A complementary document, the Questionnaire Manual, provides a detailed explanation of the questions contained in the questionnaire and how the questionnaire was administered.

Sampling Methodology

The sampling methodology of the MTF Enterprise Survey generated a sample size appropriate to achieve the main objective which was to benchmark the access and use of energy collective for all businesses across all sectors and Malawi's districts.

To achieve this objective, the sampling methodology involved a large enough sample, assumed to be representative to the population of all enterprises (SBR) and the industrial/sectoral level, to conduct statistically robust analyses with 95% confidence intervals.

Stratification

The Universe of Inference of the Enterprise Surveys includes all the ISIC revision 4 sections: C, F, G, H, I. Additionally, the Universe of Inference includes all formal establishments. The formula below was used to have sample sizes of all strata, all enterprises' subgroups/sections ensuring representativeness at sector level.

$\boldsymbol{n_i} = \left(\frac{\mathbf{1}}{\boldsymbol{N_i}} + \frac{\boldsymbol{N_i - 1}}{\boldsymbol{N_i}} * \frac{\mathbf{1}}{\boldsymbol{P_i Q_i}} \left(\frac{\boldsymbol{k}}{\boldsymbol{z_{1-\alpha/2}}}\right)^{\mathbf{2}}\right)^{\mathbf{-1}}$, where N_i is the total number of enterprises for i^{th} sector, P_i probability for choosing an enterprise from for i^{th} sector, $Q_i = 1 - P_i$ and n_i is the sample size for i^{th} sector

The sample sizes obtained through the formula above were revised downwards to meet the anticipated challenges due to availability of resources.

Systematic Sampling

The probability sampling particularly systematic sampling was employed in which business units from the said enterprise sampling frame were selected according to a random starting point but with a fixed, periodic sampling interval. This interval was calculated by dividing the population size at sector level by the desired sample size. The exercise was being carried out in MS. Excel.

$\boldsymbol{k^{th}} = \frac{\boldsymbol{N_i}}{\boldsymbol{n_i}}$, where k is systematic sampling interval, N_i total number of enterprises for i^{th} sector and n_i is a desired sample size for i^{th} sector

Non-response

As it is the case with most surveys, the Enterprise Surveys may face some degree of non-response. Evidence shows that the degree of non-response varies by type of firms. Most of the approaches to correct for non-response rely on assumptions on how non-respondents relate to respondents. To avoid making any assumptions, the replacement approach to non-response is substitution by cell of stratification during the survey period; that is, establishments that refused/closed, the interviews were being substituted with establishments belonging to the same combination of sector. The expectation was that establishments in the same industry of the country face the same business environment and behave similarly. This approach also ensured that the original sample design was preserved.

The final representative sample size of 1,080 businesses was drawn, and the survey achieved a 64 percent response rate. The survey concentrated on the large and medium scale enterprises located in selected urban centres and cities of Mzuzu, Lilongwe, Blantyre and Zomba.