Policy Brief: What are the Barriers to Off-Grid Energy Development by Private Sector in East Africa?

August 2022

Key messages and recommendations

- There are common challenges in the development of the off-grid energy sector in east Africa but also considerable variation within and across countries.
- Lack of market information and technical capacity, insufficiently comprehensive regulation are common problems that impede development of the off-grid sector.
- Informal sector competition (Tanzania), cost of doing business (Ethiopia), poor tariff policy (Tanzania), and lack of funding (Uganda) further impede development.
- Policy support such as subsidies, facilitated financing from donors or international investors, access to foreign exchange, technical assistance for regulatory matters, and capacity building are necessary to support further development.

Introduction

The falling costs of solar panels and progress with development of new and more cost-effective battery technologies have made off-grid solutions the preferred least cost technology for electrification in many rural settings across Africa. However, several barriers impede the development of off-grid energy sources. The literature on these barriers to off-grid energy development is growing but evidence on the perspective of mostly private off-grid energy firms remains limited, and there is little systematic evidence collected from large or representative samples of such organizations.

We studied barriers and opportunities for off-grid sector development in four countries in East Africa: Ethiopia, Kenya, Tanzania and Uganda.

Table 1 presents basic country demographic, economic, and energy access statistics. The overall level of electricity access in Ethiopia is 48% (as of 2020), which is less than in Kenya but higher than Uganda and Tanzania. Ethiopia and Uganda have the highest renewable shares, nearly all from hydropower (98% and 90%, respectively).

Table 1. Summary of the energy access situation in the four study countries

Variable	Ethiopia	Kenya	Tanzania	Uganda
Population in 2020 (million)[1] Urban share in 2020 (%)	115.0 22	53.7 28	59.7 35	45.7 25
Poverty headcount at 2011 USD $1.9/day (%), and year[1]	30.8 (2015)	37.1 (2015)	47.9 (2017)	41.3 (2016)
GDP per capita (2020 USD, PPP-adjusted)[1]	2421.9	4576.2	2780.1	2293.5
% of population with electricity in 2020[1] Urban Rural	48 93 36	70 91 62	38 73 19	41 71 32
Renewable energy in 2020 (% of total final energy consumption)[2]	98	74	39	90
Energy intensity in 2018 (MJ per 2017 USD, PPP-adjusted)[3]	7.9	5.4	6.2	10.1
International financial flows for energy investment in 2018 (2018 USD million, PPP-adjusted)[4]	34.7	257.6	13.2	236.3

[1]From World Bank: data.worldbank.org
[2]IRENA, 2021.
[3]IEA et al.(2021)
[4]ESMAP, 2021

Data and Methodology

In our study, we first conducted a listing of private sector enterprises involved in delivering energy generation or other energy sector technologies covering firms headquartered in each of the four national capital cities: Addis Ababa (Ethiopia), Kampala (Uganda), Nairobi (Kenya), and Dar es Salaam (Tanzania). From this list, in order to have sufficiently large samples in each country to analyze country-specific patterns, a sample size of fifty firms with off-grid energy activities or interests was targeted for participation. In Ethiopia, where the sector is nascent, the final number of participating firms was 41, while in Kenya, Tanzania, and Uganda, final sample sizes were 50, 50, and 49, respectively.

We used both descriptive analysis and a discrete choice experiment to obtain a more quantitative understanding of relative perceptions of institutional supports and regulatory frameworks for the off-grid energy sector.

As shown in Figure 1 below, about 55% of the sampled organizations identified off-grid energy as one of their main sectors of activity; this share was lowest in Ethiopia (41%), where the sector is new, and firms tended to be involved in more general energy activities, and highest in Kenya (98%), where the sector is most mature. Other large business activities were in energy efficiency (54% of firms overall), energy for public services (23%), other specific energy uses, e.g., water pumping (29%), and non-energy activities (37%). Thirty-five percent of firms are part of an off-grid energy association.

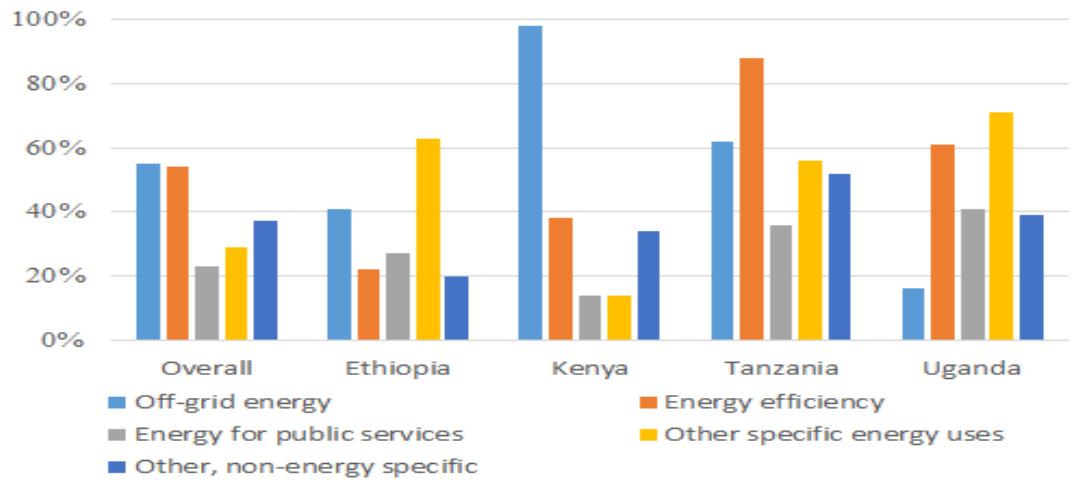

Figure 1. Main business activities, overall and by country

We next consider firms' perceptions of the regulations of off-grid energy in each country (Table 2).

Table 2. Firms' perceptions of the regulations of off-grid energy in each country

Variable	Overall	Ethiopia	Kenya	Tanzania	Uganda
Perceptions of regulations					
Familiarity with national off-grid regulations[1]	2.8 (1.3)	3.3 (1.5)	2.4 (0.88)	3.0 (1.5)	2.8 (1.0)
Perception of clarity of off-grid regulatory framework[2]	2.8 (1.1)	2.7 (0.89)	3.2 (0.92)	2.3 (1.4)	2.8 (0.88)
Perception of capacity of government to implement existing off-grid regulations[3]	2.6 (0.8)	2.3 (0.74)	2.6 (0.69)	2.7 (1.0)	2.5 (0.62)
N	190	41	50	50	49

Notes: Standard deviations reported in parentheses, for non-binary variables.
[1]Measured on a scale of 1 to 5: Extremely familiar (1); very familiar; moderately familiar; slightly familiar; not familiar at all (5).

[2] Measured on a scale of 1 to 5: Extremely clear (1); mostly clear; somewhat clear; mostly unclear; not clear at all (5). The mean reported here excludes 37 respondents that responded they "don't know"
[3] Measured on a scale of 1 to 4: Very strong capacity (1); moderate capacity; weak capacity; very weak capacity (4). The mean reported here excludes 28 respondents that responded they "don't know".

On average, respondents said they are just better than moderately familiar (on a Likert scale ranging from extremely familiar to not familiar at all) with their national regulations, with familiarity closest to very familiar in Kenya, and less than moderately familiar in Ethiopia. On average, firms reported that regulations are somewhat clear with the off-grid regulatory framework, with clarity ranked highest in Tanzania and lowest in Kenya. Governments are judged to have capacity to implement regulations at a level about midway between moderate and weak capacity, with weakest capacity in Tanzania. Thus, clarity in regulations does not necessarily indicate ability to implement them. That is, the government's capacity to implement existing off-grid regulations needs to be strengthened further.

Figure 2 shows that the most commonly identified barriers to greater off-grid investment are: lack of information needed to assess the market (30% of respondents), lack of comprehensive policy (25%), lack of technical capacity (22%), import restrictions or duties that raise costs (20%), and lack of financing or informal sector (and lower quality products) competition (18%). There is, however, significant country variation. In Ethiopia, the highest shares identified lack of information needed to assess the market (37% of respondents) and high cost of doing business (29%) as major barriers. In Kenya, the top two barriers were lack of information needed to assess the market (46% of respondents) and lack of comprehensive regulations (42%). In Tanzania, the most severe barrier by far was informal sector competition (60%), followed by poor tariff policy (34%). Finally, in Uganda, the top three issues were limited funding (46%), and lack of technical capacity and economic uncertainty (38% each).

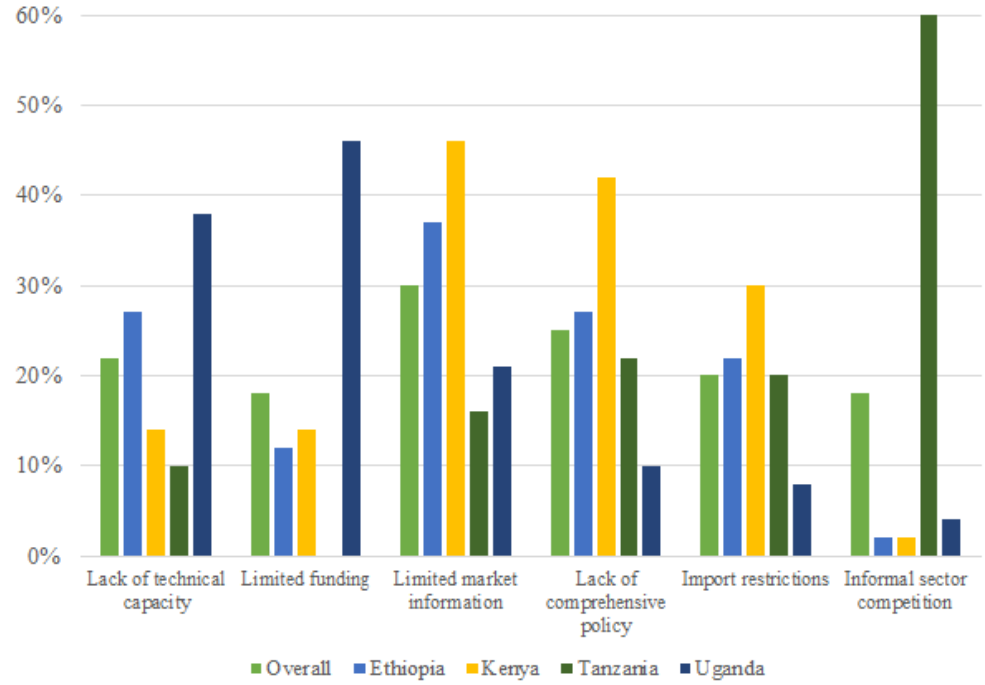

Figure 2. Main impediments to off-grid business identified in the survey, overall and by country

Nonetheless, the firms remain somewhat optimistic about opportunities in the sector, with 51% saying that opportunities have recently increased, despite COVID-related obstacles. Perceived opportunities are different across sample countries in that they are also increasing in Uganda and Kenya but declining in Ethiopia and Tanzania. The decline in these two countries may reflect the political instability in Ethiopia at the time of the survey, and the recent centralization of the energy sector in Tanzania. Respondents also suggest that the most important

support they would like to receive is finance followed by subsidy. This is the same for Kenya and Uganda. But in Ethiopia, foreign currency followed by finance, and in Tanzania subsidy followed by foreign currency are the most important supports firms would like to get.

In addition to the above analysis, we undertook quantitative estimates of the relative perceptions of different institutional supports for the off-grid energy sector. The purpose of the quantitative application was to provide deeper insight on off-grid firms' attitudes regarding solutions and regulatory structures for the sector. Accordingly, attributes considered were: a) capital subsidies (from donors or government); b) tariff regulation; c) licensing regulation; d) easing of constraints on foreign currency availability; and e) grid encroachment[1] policies. Consistent with our qualitative interviews, we found that off-grid firms tend to prefer higher grant subsidy support (relative to lower subsidy support). We also found preference for a tariff policy that imposes the grid rate (relative to a cost recovery or no tariff policy), a decentralized or less demanding centralized licensing regulation regime (that only requires centralized licensing for large projects), more foreign currency availability, and a buyout grid encroachment policy, where developers would be compensated for their investment costs should the grid arrive and displace their project (relative to no encroachment policy). In Ethiopia, on average, a relatively higher emphasis is placed on subsidy support (and less so, in Uganda) than in the other countries. Tariff regulation at the grid rate is most favorably viewed in Ethiopia**.** Firms in Ethiopia and Uganda expressed the greatest need for additional foreign exchange. Tariff regulation at a cost recovery level – where private firms' tariffs have historically been less constrained – is negatively viewed in Tanzania. Despite these general patterns, there was considerable heterogeneity in preferences across firms, with some, e.g., minigrid developers, preferring cost recovery tariffs relative to grid rates.

Conclusion and policy implications

This study considered barriers and opportunities for off-grid sector development in four countries in Eastern Africa: Ethiopia, Kenya, Tanzania and Uganda. There are a set of common challenges but also considerable variation within and across countries. The most common barriers that impede development of the sector are lack of market information and technical capacity as well as insufficiently comprehensive regulation. In specific countries, informal sector competition and poor tariff policy (Tanzania), cost of doing business (Ethiopia), lack of information needed to assess the market and lack of comprehensive regulations (Kenya) and lack of funding and lack of technical capacity and economic uncertainty (Uganda) impede sector development. In Ethiopia, the sector remains primitive and political uncertainty has engendered greater pessimism than in other countries. Similarly, organizations in Tanzania feel that opportunities are declining due to the recent centralization of the energy sector. Unlike Ethiopia and Tanzania, perceived opportunities are increasing in Uganda and Kenya.

Country-specific solutions to these differing barriers are essential. In particular, in Ethiopia, there is a need for integrated and holistic policy that tackles licensing inefficiencies, relieves the scarcity of foreign exchange, provides subsidy support, and stabilizes tariffs. In Kenya, tariff stability, a fully decentralized licensing regime, and reduced regulatory uncertainty especially around licensing and grid encroachment should be pursued. In Uganda, decentralized licensing, increased access to foreign exchange, and net metering and buyout policy implementation, are most critical. Finally, in Tanzania, measures are needed to reduce risks related to permitting timelines, tariff setting, regulatory uncertainty, and uncertainty over grid encroachment policy.

Despite important contextual nuances, responses to the survey emphasize the need for much greater policy support on all levels: subsidy, access to finance, access to foreign exchange, technical assistance for regulatory matters, and capacity building. Off-grid

[1] This refers to the physical and technical interconnection and absorption of the off-grid system by the main grid system (EEA, 2020).

firms generally prefer higher grant subsidy support, a tariff policy that imposes the grid rate, a decentralized or threshold-based centralized licensing regulation regime, more foreign currency availability, and a buyout grid encroachment policy. These preferences vary across countries. Thus, regulators seeking to leverage the potential of the private sector need to carefully consider trade-offs, e.g., between allowing higher tariffs that foster mini-grid development versus lower rates and subsidization to support companies' business models.

In conclusion, our analysis suggests that policy and the regulatory climate, and the implementation of those aspects, make a big difference to firms' perceptions of opportunities and constraints in the sector. Though the off-grid sector appears to be growing in these countries, in large part due to falling costs and policy momentum, many obstacles remain. In the absence of targeted policy support as highlighted above, these obstacles will continue to challenge achievement of the United Nations Sustainable Development Goal 7: sustainable, modern energy for all.

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The views expressed in this Policy Brief do not necessarily reflect the UK government's official policies.