

Policy Briefing

Decentralised Access to Electricity Through Mini-Grids in Tanzania

Renewable, decentralised mini-grids are a promising technology for electrifying remote communities in sub-Saharan Africa. However, most mini-grids struggle not only to obtain a profit, but also to recover costs. This *Policy Briefing* describes the case of a private, for-profit mini-grid business model which also developed the productive commercial uses of electricity to achieve financial sustainability. The model failed due to high regulatory risks, initially high tariffs, and complex management of commercial activities. We argue that public-private partnerships and collaboration with local agrobusinesses could improve affordability, reduce risks, and ensure long-term sustainability.

Key messages

- Though mini-grids offer a promising way to electrify remote communities across the African continent, no business model has proved widely successful and scalable across sub-Saharan Africa.
- The Keymaker model (KMM), implemented in Tanzania by JUMEME, followed a privately owned, for-profit approach, involving developing commercial fish-processing activities alongside electricity generation.
- The KMM struggled to reach financial sustainability due to government-imposed tariff reductions, cash flow problems, and management deficits.
- Public-private partnerships, subsidies, and deep engagement with local businesses, political representatives, and the community can mitigate mini-grid risks.



Mini-grids are expected to be a key piece of the universal electrification puzzle: they could provide least-cost access to at least 30 per cent of the unelectrified population in Africa.

Mini-grids business models

Decentralised electrification is expected to play an important role in electrifying sub-Saharan Africa, where 51 per cent of the population remain without access. Mini-grids are a popular approach to reach remote populations in the sub-continent and have received increased attention from donors and the private sector. Most mini-grid developers are small companies or start-ups, but large international corporations have recently entered the market. The financing of mini-grid technologies relies mostly on public funds, such as grants or concessional loans from development finance institutions or donor agencies.

The term 'business model' has been used in the mini-grid literature to describe how mini-grids create and deliver value for investors and customers. Some elements to define a mini-grid business model include ownership and operation management approaches; revenue generation strategies; customer focus; and implementation strategies. Several combinations of these different elements have been tested. For example, private ownership and management directed to productive consumers, seeking to recover costs and obtain a profit, or public ownership and management, with a focus on residential customers and relying on subsidies for financial viability. Some evidence points to hybrid ownership, partially subsidised, focused on anchor customers, as the most promising.

However, to date, no mini-grid business model has proved broadly successful and scalable in sub-Saharan Africa. Balancing affordable service provision with financial sustainability remains a challenge. Success is highly context-specific, depending on distinct regulatory and socioeconomic variables.

Implementation of the Keymaker model in Tanzania

The Tanzanian mini-grid developer JUMEME was established in 2016 as a private joint venture, mainly financed through a European

Union grant. From the start of its activities, it sought a business model that would enable at the same time the financial sustainability of its mini-grids and affordability for final consumers. To achieve this, productive users – those using electricity to generate an income – were essential. However, the remote populations targeted by their mini-grids often lacked sufficient productive demand. Through a trial-and-error process, JUMEME developed an original approach, which they called the Keymaker model (KMM). Under the KMM, the mini-grid company develops productive activities relying on natural resources and supply chains already available in the community, in partnership with local workers and entrepreneurs. Accordingly, revenue not only accrues from the sale of electricity, but also from the sale of agricultural products such as fish or maize. The availability of reliable electricity and management competencies provided by the mini-grid developer also unlocks local opportunities so far underutilised in the community.

Researchers from IDS and the Tanzania Gender and Sustainable Energy Network (TANGSEN) worked together with JUMEME to implement and test the viability of the KMM in the Lake Victoria island of Maisome. In 2019, JUMEME built a 60kW mini-grid in the island, serving approximately 600 customers, most of them residential, but with 21 intensive productive users and around 50 commercial users. The mini-grids initially charged cost-recovery tariffs that could cover operational and replacement costs, the share of investment costs not covered by grants, and could also deliver a profit for private investors. These tariffs were significantly higher than those charged by the national utility Tanzania Electric Supply Company (TANESCO).

To expand and diversify revenue sources, JUMEME started two commercial activities in parallel to the mini-grid: the commercialisation of Tilapia (freshwater fish), enabled by the availability of deep freezers powered by the mini-grid, and aquaculture,

where fish grow in floating cages in the lake and electricity is used in water pumps, freezers, and milling machines for fish food pellets. JUMEME also planned to control the fish food supply value chain by partnering with a local entrepreneur who would process grain with mills and extruders to produce pellets to feed the fish. Alongside this, the research team supported some male and female entrepreneurs – such as millers, tailors, and fish traders – with electrical equipment and training to improve the productivity of their businesses or create new ones.

The Tanzanian government mandated a reduction of mini-grid electricity tariffs in 2020, to match those of TANESCO. As a result, JUMEME's revenues decreased by over 90 per cent and it became no longer financially sustainable to operate. Availability and reliability of electricity declined, and there was a halt to new connections. JUMEME had to limit electricity use for existing consumers to a maximum of 2KWh per consumer per week for residential and commercial users. The decline in the quality and availability of electricity raised discontent among Maisome's customers, even though affordability improved dramatically. Cash flow problems and management deficits also caused the KMM activities of fish trading and aquaculture to fail.

Appraisal of the KMM in Tanzania and lessons learned

An appropriate tariff design is at the heart of the commercial and financial viability of a mini-grid business model. JUMEME followed a private ownership model, which required a tariff that could recover most costs, except for a capital investment grant, and generate an attractive profit for investors. However, this tariff was considered unaffordable or unjust by many customers, who would compare it to the low national tariff applied by TANESCO for the same service. Although the mini-grid was clearly creating positive externalities for the community, a sense of grievance prevailed. When there is a gap between affordability and financial sustainability, guaranteed and

stable subsidies should be part of the revenue generation strategy.

The design of the KMM complemented electricity revenues with fishing and aquaculture revenues that also added a productive load to the mini-grid. However, this element of the business model did not take off due to the lack of working capital, skills, and motivation.

Even the best-designed business model is not immune to context-specific external and organisational risks. The most significant risks faced by the KMM in Maisome were regulatory. The sudden tariff reduction mandated by the government without previous consultation sparked a corporate management crisis. The resulting decline in quality of electricity supply also led to social discontent in the community, and the prospect of losing their jobs due to JUMEME's economic woes reduced staff motivation and increased cases of internal fraud.

It is hard to say if the KMM model would have been viable and scalable had the initial tariffs remained. But some lessons can be learned about the different mitigation strategies required for different risks. First, private mini-grids will be harder to implement and scale up in countries with heavily subsidised national tariffs, as these will be taken as a benchmark by customers. Stable and secure consumption subsidies should be considered as part of the revenue generation strategy in this context. Second, meaningful partnerships with local businesses, and continuous engagement with political representatives and the community are clear risk mitigation strategies. Finally, having a robust management system and keeping costs to the minimum while providing good quality of supply are also key to scalability.



A stable regulatory framework is the No.1 condition for success. (JUMEME senior management)

Policy recommendations

Drawing from the experience of the implementation of the KMM mini-grid business model in Maisome, we outline four key recommendations for mini-grid developers:

- **Set affordable tariffs for your customers.** Affordability of electricity is defined in three main ways, as: the ability to pay, the willingness to pay (WTP), and compared to other electricity supply alternatives, primarily the national grid. A preliminary survey to determine ability and willingness to pay can support tariff design, but developers should be wary of the dynamic character of WTP. When the service is not yet available, or at the start of operations, customers are typically willing to pay a high price for a high-quality electricity service they did not have before. But the WTP evolves downwards as they take the new energy services for granted and compare the price they pay to the grid tariff. To account for this, developers should plan for a downward review of tariffs to get closer to the grid after a few years in operation.

- **Stay close to the political pulse of the country.** Developers should undertake a political economy analysis to identify powerful actors and the interests they protect. There is a need to align with those actors supporting the universal and sustainable provision of high-quality electricity supply to rural areas and engage with policymakers at the local, regional, and national levels.
- **Partner with local companies** with a strong track record to gain greater understanding of the complexity of agro-processing activities and reduce the risk of commercial failure.
- **Ensure a stable source of consumption subsidies** if required to bridge the gap between financial sustainability and affordability. For a mini-grid to be financially sustainable, tariff revenues must at least cover all operational and replacement costs. If this is not the case, a secure source of subsidies, whether national or international, should complement the revenue generation strategy. ■

Institute of Development Studies, Library Road, Brighton, BN1 9RE, United Kingdom +44 (0)1273 606261 ids.ac.uk

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Further reading

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