SUMMARY REPORT OF THE SIGMA TANZANIA DISSEMINATION EVENT ORGANISED BY TATEDO-SESO AT WHITE SANDS HOTEL, DAR ES SALAAM, TANZANIA 23RD FEBRUARY 2024

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DISCLAIMER

The views expressed in this report are those of the authors and do not necessarily represent the views of the institutions they are affiliated to or those of the funding agencies.

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FEEDBACK

If you have any comments, suggestions, or feedback, please send them to the SIGMA project lead by email: s.c.bhattacharyya@surrey.ac.uk

Background

The one-day dissemination event was organised by TaTEDO-SESO of Dar es Salaam Tanzania, a collaborating organisation in the **Sustainability, Inclusiveness and Governance of Mini-Grids in Africa (SIGMA) Project,** funded by **UK Research and Innovation** and **Global Challenges Research Fund**, coordinated and team lead by Professor Subhes Battacharyya from University of Surrey United Kingdom**.**

Participants

A total of 30 physical and 5 virtual participants attended drawn from academia in UK, Nigeria and Tanzania, Tanzania Ministry of Energy, Tanzania Electric Supply Company (TANESCO), Rural Energy Agency (REA), Energy and Water Utilities Regulatory Authority (EWURA), Tanzania Bureau of Standards (TBS), Tanzania Renewable Energy Association (TAREA), Civil Society Organisations (CBOs), Tanzania Microfinance Institutions (TAMFI), Mini-Grid developers, equipment suppliers, operators and the host TaTEDO -SESO.

Project Dissemination

Eng. Sawe's, the SIGMA Team leader for Tanzania welcomed and thanked all the participants to the event for the honour and finding time to participate in the event. He also expressed his appreciation to the sponsors of the event the Government of UK through UK Research Innovation and Global Challenge Research Fund (GCRF) for making the study and the event not only possible but also has immensely contributed to the support for renewable energy electrification of Tanzania and Sub-Saharan Africa via off grid mini-grids. Furthermore, he thanked Professor Subhes Battacharyya and his backstopping team for the leadership and guidance in steering the project to achieve intended milestones. Not least, he thanked all the mini-grid stakeholders interviewed and visited for their useful information conveyed that has helped the project's team understand the issues under investigation of sustainability, inclusiveness, and governance of mini-grids in Tanzania.

Prof. Subhes Bhattacharyya Introduced and provided main insights of the research project undertaken in the four countries of Tanzania, Kenya, Nigeria, and Senegal which started from March 2020 to end on 1st March 2024. He mentioned that the main research focus was to develop- an evidence base of mini-grid performance; to analyse political economy of energy access and a sustainability framework of mini-grids; country case studies focussing on sustainability, inclusiveness, and governance in four countries; and collaborate, build capacity, and disseminate the insights from the project. He pointed those activities undertaken included extensive literature review, developed a mini-grid data base, framework for mini-

Prof. Subhes attending the dissemination event virtually.

grid performance and sustainability analysis, stakeholder interviews and mini-grid field visits, analysis of country cases, collaboration, networking and capacity building and dissemination.

Insights from the project findings indicated limited technical sustainability with short term focus whereas long term perspective is missing, business viability hardly demonstrated, inclusiveness not well observed, wider socioeconomic benefits have not reached all equally, and user satisfaction remains questionable. On reflections on the future, he pointed that sustainable mini grids are hard to find, conversation on the tension between state vs market solutions need to continue, and value chain integration, expansion to MW scale capacities, centralised procurement, and implementation plan. In his concluding remarks, the research outputs to consist of conference papers, journal articles, working papers, webinars and collaborations and will be public.

A participant wanted a clarification on user satisfaction and how a developer can reduce investment costs. The response given was that due to high tariffs, low affordability and poor power supply, many customers are not satisfied with the services. Intervention requires improvement in power quality of supply and efficient services. On the latter question for developers with many mini grid sites can undertake a negotiated bulk procurement and implementation plan to reduce investment costs.

Next **Eng. Sawe** presented Tanzania's project overview starting with observed country's 100% electrification access target by 2030 and indicated the population in 2023 was 61.5 million with 35% being urban and 65% rural, electricity connectivity access was 39.9% in 2020 of which rural access was 24.5% with 30.4% being solar based solutions and urban access was 73.2%.

Eng. Sawe presenting during the dissemination event.

He informed that in 2022 there were 176 mini-grids and embedded systems in 21 regions with total installed capacity of 160.7 MW connecting 279,723 customers. He indicated current challenges to mini -grid development in Tanzania include limited data availability, lengthy and cumbersome planning and licensing processes, low level of coordination among the stakeholders, inadequate local capacity to develop mini grids and low affordability.

On his conclusions, he indicated that women and children benefit most from access to mini grid electricity services, key mini-grid drivers include right technologies, appropriate policies, regulations, financing, and effective business models; hinders of mini grid are political interventions, high tariffs, limited knowledge, and access to financing. His recommendations were: Build knowledge about mini

grid experiences on what works and not, simplify the mini grid planning process and improve coordination, build local capacity, and for social equity reasons, VSPPs be directly subsidised.

The next presenter **Mr. Shukuru Meena** provided insights from Tanzania's study. Stakeholders interviewed included experts from ministry of energy, the regulator, power utility, rural energy agency, mini grid developers and operators, households, institutions, SMEs, equipment and technology suppliers, NGOs, CBOs, development partners and financiers. Total of 18 mini grids were visited in 9 regions, 13 of which were operating and 5 were non-operating, 6 were grid connected and 12 were decentralised, 4 coexisted with the national grid, 14 were private, 2 public, 1 PPP and 1 FBO owned.

Research findings on technical sustainability: limited data for design leading to oversizing/undersizing MGs, lack of expertise to design and install MGs, lack of expertise to undertake major maintenance, spare parts availability and affordability, difficulties to obtain operational data, and low MGs capacity utilisation. On environmental sustainability, water basin authorities and developers do educate villagers on soil erosion and siltation effects, sewage disposal systems availed in bagasse-based MGs, cloudy and drought weather affect solar MGs performance, end of life disposal of MG components is a challenge. Financial sustainability: MG financing is by equity, grants, loans, and subsidies; credit facility and risk guarantee not readily available, securing financing for local developers is difficult, local MG developers lack capacity to prepare bankable documentation, MG financial sustainability guaranteed by selling electricity to anchor customers.

Inclusiveness: Due to limited capacity, local communities are side-lined, local communities are rarely involved in tariff setting process, gender inclusion in management and operation of MGs observed, MG developers support social services as part of corporate social responsibility.

On governance, the LGA at district levels is key to supporting land and water right permit processing and there is no decentralization on energy sector to the local level, political directives have influenced the mini-grids development process which is a concern to minigrid developer; no example of any developer being compensated to date, lack of coordination between agencies for licenses, permits to establish mini-grids.

The last presenter was **Eng. Katyega** who introduced Tanzania's small power projects (SPP) regulatory framework. Policies and legal instruments guiding the framework include Electricity Act of 2008, SPP Guidelines and Rules of 2008, Act establishing the Energy and Water Utilities Regulatory Authority (EWURA) of 2001, Rural Energy Fund and Rural Energy Agency Act of 2005, The national energy policy of 2015, Public and Private Partnership Act of 2010, Environmental Policy of 2004 update of 2015.

Eng. Katyega presenting during dissemination event.

He pointed out that 0.1 MW to 10 MW SPPs are regulated that involves pricing, setting standards and quality of services and entry and exit conditions for providing energy services. In turn what is not regulated is MGs of <15 kW, they are not licensed and set their own tariffs depending on business model employed. SPPs can enter into standardised power purchase agreement (SPPA) with the distribution network operator and sell via standardised power projects tariff (SPPT) or feed-in tariff (FiT). The SPP framework has migrated from 2008 - 2015 1st generation SPP framework FiT was technology neutral, 2015-2017 2nd generation framework FiT was technology and size specific, for solar and wind FiT were site specific and US dollar pegged, 2017 3rd generation SPP framework whereby multiple plants of > 1 MW can obtain a single license, also allow MGs to operate on islanded mode when the national grid is out, provides conditions when the grid extends to MG network.

In the case of tariffs, they are computed to recover capital costs, operating costs, maintenance costs, depreciation, and a margin for profit. National grid and decentralised grids operated by the national utility and SPPs selling power to TANESCO their tariffs are computed by the regulator. Very Small Power Producers (VSPPs) set their own tariffs depending on the business model employed. Economies of scale have generation cost that is low in the national grid, is higher for SPPs and highest for VSPPs. Similar findings are portrayed for customer retail tariffs. Energy pre-payment metering appears easier to comprehend by consumers compared to load limiters, also allow efficient energy consumption by end users. Web based pay-as-you-go payment system by cash or token whereby connection and disconnection is based on the web platform appears convenient for MG developers.

Notwithstanding of the above, some of the observed regulatory challenges can be addressed by potential interventions. Provision of policy guidelines that ensure equity considerations are adhered to is a challenge to the government which can be addressed by improved revision of the existing policy. Monitoring quality of supply of multitude VSPPs is a challenge to the regulator that can be addressed by empowering the regulator to undertake such monitoring and evaluation. The tariff for the national

utility appears not cost reflective and SPPs face difficulties to enter SPPA with the utility due to FiT appear higher than average selling price, both challenges can be addressed by the regulator undertaking a cost of study so as to address them. Not a single VSPP has been compensated following grid encroachment can be addressed by developers abiding to SPP rules of 2020. VSPPs do not have customer care service charters with their customers that can be addressed by the regulator preparing a standardised charter for the VSPPs. High VSPP tariffs are controversial which can be addressed by VSPPs operators if they could be subsidised for social equity reasons.

In conclusion, mini grid selling electricity to anchor customers tends to be financially sustainable whereas VSPP models appear not sustainable. Based on the above it was recommended for the regulator to undertake M&E of VSPPs quality of supply and tariffs issues; and the metering system should be convenient to both suppliers and customers.

Question and Answers Session

Workshop participants reflected on the presentations by commenting and asking questions for clarification. One participant commented that a master's degree course on renewable energy can be used to learn more on mini grids. She advised for the community to be involved from the begging of the project when the investors leave, the community can continue with operations.

Another participant commented on potential for mini grid carbon financing and the developers must work closely with Vice Presidents Office responsible for environment for further guidance.

Another participant commented by narrating how Tanzania is rich with renewable resources and asked whether Geothermal MG can be developed. He mentioned on the prices for solar and wind are falling hence an interesting opportunity for minigrid, disposal of solar panels and batteries being a challenge and there is no clear disposal strategy in the country.

Another participant commented on why minigrids are not compensated when the national Grid encroaches their network, the reason being that they are not constructed to standards or did not follow the required procedures. He said the micro grid are supported and encouraged because they provide frequency and voltage regulation for areas supplied with long medium voltage lines. He pointed that awareness among the consumers on potential and ability of solar is low, some don't trust solar energy capability. He advised that minigrid operators society be established for a common voice to the public. He also pointed that sustainability of the minigrid is guided by financing models.

Another participant questioned on the sustainability of the minigrid as the investment costs of VSPPs are very higher and returns are low of which most of the poor in the villages cannot connect. She wanted to know whether the developers consider what they are generating compared to what will be consumed basing on the purchasing power of the end users.

Participant commenting and giving views on presentations.

Another participant suggested that rural investors need to educate their customers on how they can use loaned productive equipment.

One of developers among those participated said that they offer loan for productive equipment to their customers to increase anchor customers. He also pointed that when designing minigrids they forecast the annual load increment at 2%.

The developer also pointed that six out of their 10 sites in Kigoma region have been encroached by the grid and no compensation paid. He urged on the ongoing electrification program by REA to consider and ensure safety during construction and operation of the networks.

Another participant emphasized the importance of minigrid to be used productively as way of empowering customers to be able to pay their bills. He also reiterated importance of gender mainstreaming in mini grid projects.

A representative from Ministry of Energy indicated that there are many minigrids being encroached and there is a need of a study. He gave example of MGs in Njombe regions and how they have instructed the Rural Energy Agency to undertake study. He also pointed that the politicians look for funds from REA to extend grid to the rural areas to replace minigrids just for the political mileage. He also narrated that the environmental impacts for some minigrid is huge with example of sites in Njombe regions which have been affected. The solar intermittence is a challenge and declared that compensation to the mini grid developers is a challenge. On Government's contribution on minigrids development, he pointed on the establishment of Renewable energy investment facility (REIF), prepared a rural energy master plan among others.

The other participant indicated that the Ministry of Energy is considering reviewing the National Energy Policy of 2015. He also pointed that the regulator is currently regulating VSPPs but cannot monitor all as it is very expensive. Lack of customer charters by VSPPs was another area he narrated whereby no minigrid developer has submitted to the regulator to date. He urged other relevant authorities who regulate the environment issues to come up with strategies to deal with disposal of equipment after their end of life. The standard wiring is important for the safety of users and commended end users to use contractor licensed at EWURA. The six-month time notification by REA to minigrid developers on grid encroachment was insisted as a way for developers to prepare.

One participant wanted to know existence of community owned minigrids in Tanzania. He was given example of the community owned minigrid of Lumama Hydro of 300kW. This minigrid have their own strategies to increase their anchor customers by loaning the productive use equipment and support

other income generating activities i.e. agro processing and tree planting. He also wondered if there is any electrification strategy by REA in supporting minigrid and grid extension at the same time at a single site. The response was that the Rural Energy Agency deals with both electrification types.

Wrap up.

During wrap up, the moderator informed the participants that all their contributions will be documented. The power points presentations will be shared for their references.

Closing

During closing, Eng. Katyega started by thanking the participants by finding time to attend and for their active participation. He also emphasized the importance of networking among participants as a way of accessing and knowing more on what is going on in minigrid sector which is still the potential area to work on.