LUT University

SETaDiSMA – SUSTAINABLE ENERGY TRANSITION AND DIGITALIZATION OF SMART MINI-GRIDS FOR AFRICA

Evaluation Framework Development for Mini-Grid Business Ecosystem in Developing Countries

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Rationale

- Still today, 770 million people do not have access to electricity, of which majority is located in Africa and Asia *(IEA, 2022)*
- Approximately 77% of the global population living off-the-grid or without electricity is in sub-Saharan Africa, mainly in rural areas
- Renewables-based de-centralized and distributed energy resource (DER) technology enablers such as microgrids and mini-grids can play significant role in improving the energy infrastructure, and thus energy access rate in developing countries
- Currently, around 47 million people are connected to 19 000 mini grids, of which majority is hydro and diesel-powered, and
- 7500 mini-grids planned, majority solar-hybrid-based and in Africa, will connect more than 27 million people (*World Bank, 2019*)

Research project

- SETaDiSMA is one of the eight research projects under the LEAP-RE - Long-Term Joint European Union - African Union Research and Innovation Partnership on Renewable Energy program www.leap-re.eu
- LEAP-RE is a program funded by EU Horizon 2020 Research and Innovation Program, and involves 83 research partners from 33 countries
- The objective of the SETaDiSMA research project is to address the current challenges facing the mini-grid sector in relation to generation technology, energy planning, digitalization, and capacity building programs
- Through data collection, the project aims to study brown and green-field mini-grid projects in Algeria, Kenya, and Rwanda

Research scope in the project

- System designing and planning of mini-grids based on the socio-economic needs
- Estimation of energy demand and renewable energy generation potential
- Assessment of digital technologies for mini-grids and open innovation ideation for business cases
- Designing evaluation framework for business models in mini-grid development that considers technological, economical, social, and organizational dimensions

Evaluation framework design for mini-grid business models

- Development and design of evaluation framework for business and delivery models for mini-grids
  - *The evaluation indicators are adopted from models widely used as business and social evaluation tools in both the academia and industry*
- Apply the proposed evaluation framework to each case study, and propose and select best practices
  - *By analyzing data from case studies, we propose best practices in relation to the 4 dimensions (technological, economic, social and organizational)*
- Support productive use and local businesses though energy access and digital connectivity
  - *By evaluating the data from the selected mini-grids, we create a plan to upgrade to RE-based smart grid systems and study the impacts in energy utilization and local business activities*
- System design and planning of mini-grids
  - *We provide tools for dimensioning and optimizing energy systems collaboratively with other partners*

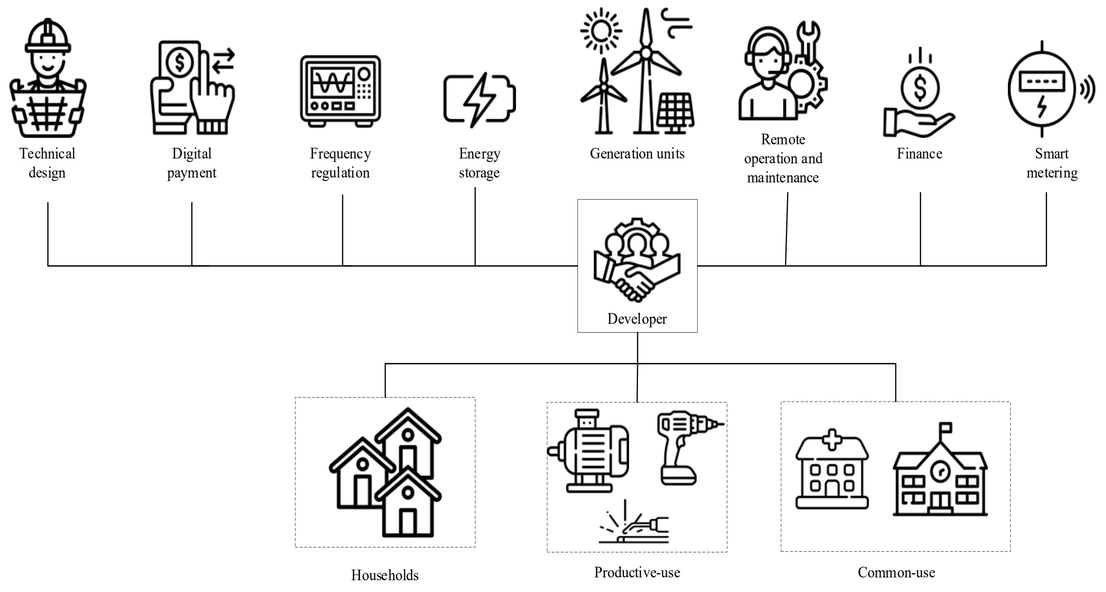

Figure 1. Micro/mini-grid value network.

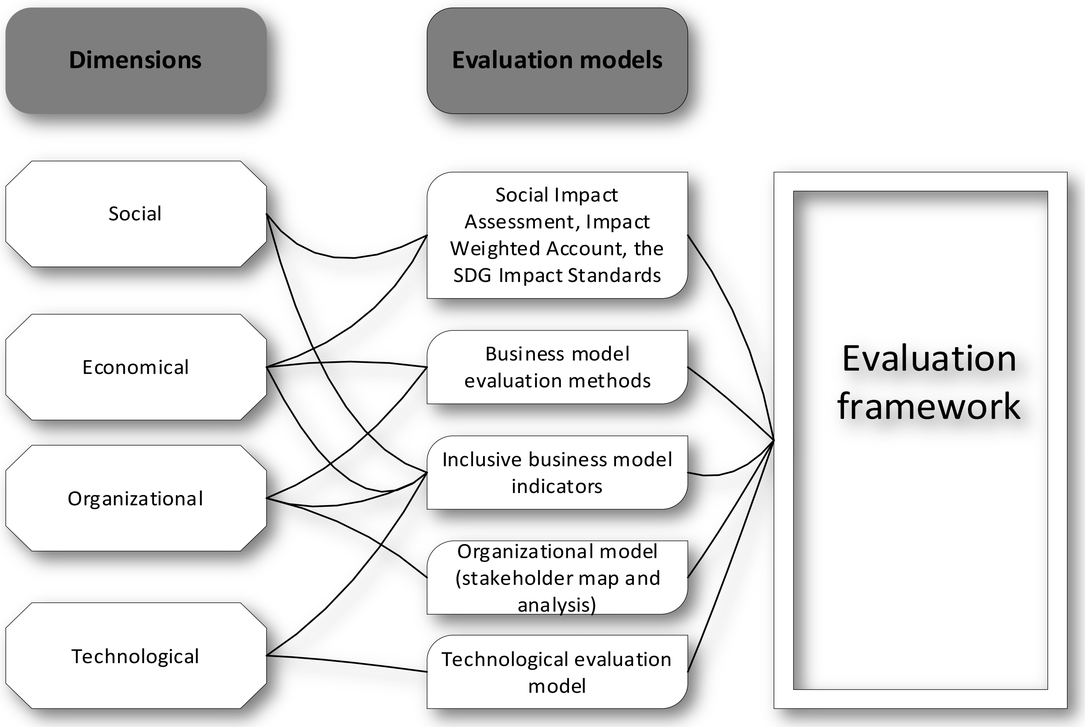

Figure 2. Evaluation framework design process.

SETaDiSMA project partners

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LEAP-RE
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