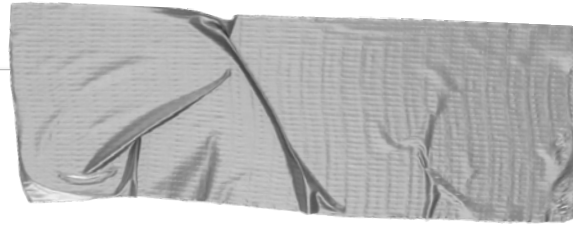


# CEANGAL Framework System Specifications, Architecture & Relevant Tools (Deliverable 2.2)

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Dr. Ehiازه Ehimen





# Introduction

- **Rural electrification and improving energy access using decentralised renewable energy systems (RES) is not a new concept, however there has been a high level of project failures and lack of sustained operation of such systems especially in low income communities (LIC).**
- **Following from evaluation of previous projects, research and survey findings, practical mechanisms to support sustained RES operation are needed.**

One of such mechanisms is the development and use of a

# practical **GUIDING FRAMEWORK**

supporting the intention of improving energy access in Sub-Saharan African (SSA) LIC through the effective selection, operation and sustainance of suitable RES.



# The CEANGAL Framework : Overview

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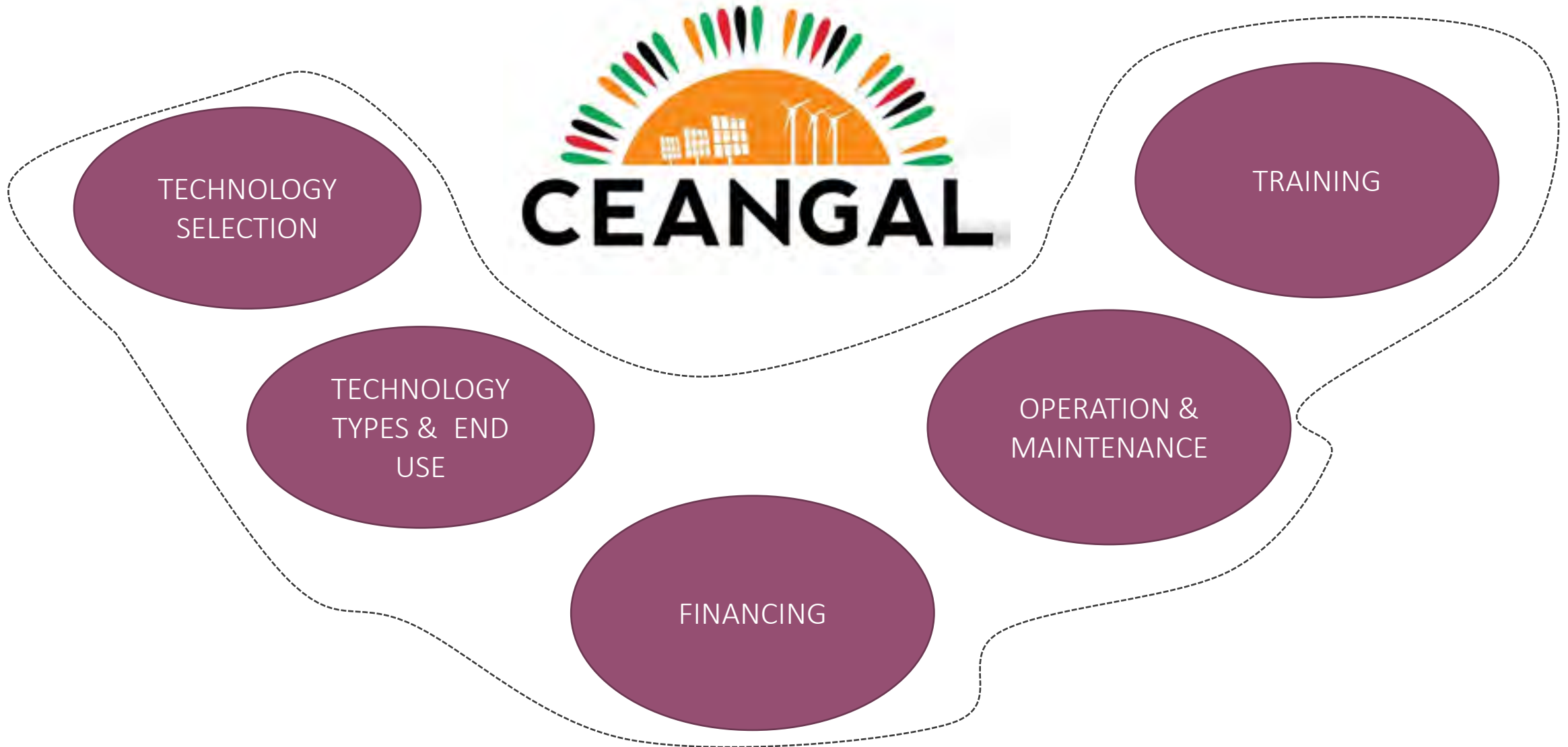
The CEANGAL Framework is one of the principal outputs of the Irish Research Council and Department of Foreign Affairs funded CEANGAL project.

It puts forward operational guidance and recommendations of the key considerations, actors and roles, as well as factors which should be covered to ensure the successful implementation of decentralised standalone or community RES projects.

The Framework which will be developed via knowledge exchange between the Irish (ATU Sligo) and Malawian (MUBAS) researchers, will establish the important sequential steps, processes and approaches relevant in the local operating environment for sustainable RES projects with emphasis on the SSA region.

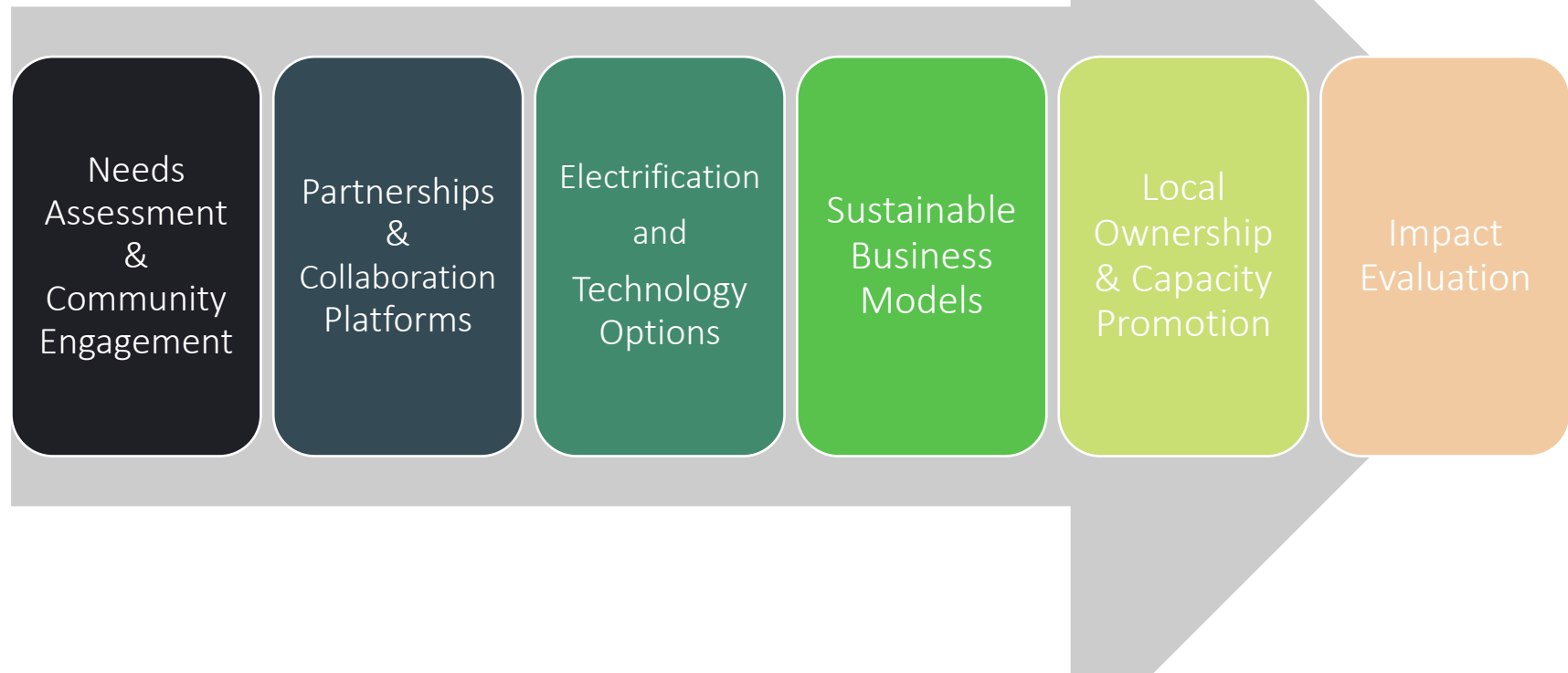
In addition to the generalised approach, specific regional schemes to create a more uptake favourable environment and afford an improved RES industry and use are also covered in the CEANGAL Framework.

Several models and frameworks focused on individual aspects of technology selection, use, finance and operation are currently available. The CEANGAL Framework however considers the entire RES life cycle including RES acquisition , use, operational sustainability and the development of local capacities and training.



# CEANGAL FRAMEWORK OVERALL ARCHITECTURE & STEPS

To effectively address the different considerations in the RES use and implementation life cycle the CEANGAL Framework was divided into the main SIX broad steps:





# 1. Needs Assessment & Community Engagement

This step covers the necessary aspects relating to effective community engagement, conducting a needs assessment to understand the specific needs and challenges of the target communities (i.e. availability of grid infrastructure, energy demand, and economic capacity) and ensuring adequate awareness on RES use.

## 2. Partnerships & Collaboration Platforms

To support the development of relevant multi-stakeholder partnership that includes government agencies, private sector actors, community-based organisations, and international development institutions to leverage resources, expertise, and networks to ensure sustainable structures to facilitate RES uptake.





### 3. Electrification and Technology Options

This crucial step advises on the selection and choice of suitable mix of electrification solutions that can meet different levels of demand and affordability.

This includes considerations of existing grid extension, use of mini-grids, and off-grid (standalone or community) RES solutions.



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## 4. Sustainable Business Models



This step ensures that the solutions and technology choices considered for use are sustainable, affordable, and accessible to low-income households. This will be achieved by taking into account the specific use scenarios and economic capacity of the intended users.

This step covers the proposition and design of tailored business models that will support the ability for them to acquire and own such systems, are commercially viable and potentially offer flexible operation and/or payment options, such as pay-as-you-go schemes suitable for low income communities.



## 5. Promote Local Ownership and Capacity

This step will be used to investigate mechanisms to afford the prioritisation of local ownership and capacity building. This will be supported by the Community Engagement step (Step 1) with community members and potential RES users engaged in the planning, design, and implementation of the solutions, and providing dedicated long-term training and support to local users, entrepreneurs and technicians.

## 6. Impact Evaluation

To monitor and evaluate the impact of the interventions, by collecting data on energy access, income, health, and education outcomes, and using this information to refine and scale up the interventions over time.





A close-up photograph of various tools and equipment. In the foreground, a hammer with a wooden handle and a metal head lies on a wooden surface. Next to it are a pair of worn, tan leather work gloves. Behind the gloves is a brown leather tool bag or pouch, which is open and contains several items: a yellow tape measure, a red-handled pencil, a green level, and a silver metal square. To the left, a portion of a circular saw with a red blade guard is visible. The background is a blurred workshop setting with a yellow object on the right.

# THE CEANGAL TOOLS

# CEANGAL TOOLS

## Introduction and Overview

The CEANGAL Framework will be further supported by specifically produced tools which will serve to meet a range of purposes for different intended users, this ranges from providing information on RES suitability to use scenario, to training manuals on different RES, easy to use energy demand calculators, RES selection for local considerations, and financial models to provide funding and ownership options.

Of

importance, is the drive to have a robust set of tools which is relevant for the intended local stakeholders, and in the face of new technologies and future innovation. The eventual suite of tools will house several component tools made available in a range of easily accessible formats and available in local languages (i.e. digital, paper based and audio-visual).

An overview of the tools which will be contained in the CEANGAL tools suite are presented in the following pages. It is the intention that the CEANGAL project will continuously expand the tools suite to include other deemed relevant tools as indicated by the end-users. The initial tools suite list is therefore only introductory and not supposed to be considered as exhaustive.

# CEANGAL INITIAL TOOLS LIST

*Renewable Energy Systems Selection tool:* This will be used as an initial assessment tool to identify most suitable RES for the targeted environment, and considering local resources and factors

*Greenhouse Gas Emissions Estimator:* This is to be used by relevant users, government or advocacy groups in the planning stages of RES selection. The tool provides estimates on the GHG equivalencies based on the proposed community or individual energy data, provision of electricity using conventional sources and from the RES operation

*Financial & Ownership Models:* An elaboration of several ownership and financing models is provided here to enlighten potential stakeholders on applicable routes employable to achieve RES acquisition and use.

*Financial Decision Support Tool:* This tool provides the economic rationale that will support the consideration of strategies or options facilitating the community RES acquisition and long-term operation);

*RES Training manuals:* The project will put forward several operational manuals to provide guidance on how to operate, maintain and sustainably manage individual standalone or community RE systems. The initial focus will be on the operation and maintenance of Solar PV, micro wind and pico hydro systems. The training manuals will be produced in a variety of formats suitable to the end users (paper and audio-visual).

*Relevant Funding Database:* This tool will provide up to date information on external funds that are available to be applied for to support the goals of RES projects and acquisitions. Such funding can be local, national or international. The database will be periodically be revised and updated listing of relevant funding schemes

## RES & ENERGY ACCESS ISSUES

- Does the community want this project?
- Are relevant community stakeholders engaged?
- Energy resources and needs assessment
- Sustainability considerations
- Who are the responsible parties? either on an individual or community level.
- Awareness
- Have all the relevant parties and stakeholders necessary for the successful project implementation been engaged?
- Government and regulatory requirements?
- External supporting structures (private and public) to ensure sustainability.

- Potential for grid extension
- Suitable technology use and sizing
- Safety, security and ease of use
- Standalone vs mini-grid
- Operation and sustainability analysis
- How will such systems be acquired, financed and sustained?

- How will the RES be operated and maintained?
- How is the long-term sustainability of the RES guaranteed?
- Post commissioning ownership & community assurance.
- Continuous training and capacity development
- What are the environmental, societal and economic impacts and benefits of the use of the selected RES and implementation mechanisms?

## CEANGAL FRAMEWORK STEP



### NEED ASSESSMENTS & COMMUNITY ENGAGEMENT



### PARTNERSHIPS & COLLABORATION PLATFORMS



### ELECTRIFICATION & TECHNOLOGY OPTIONS



### SUSTAINABLE BUSINESS MODELS



### LOCAL OWNERSHIP, OPERATION & CAPACITY PROMOTION



### IMPACT EVALUATION

## RELATED CEANGAL TOOLS & APPROACH

- CEANGAL Regional Expertise Hub
- Community Contact Centre
- Greenhouse gas (GHG) emissions estimator tool

- CEANGAL Regional Expertise Hub

- RES Selection tool
- Consultation on best RES system
- Services of Expertise Hub

- Database on funding mechanisms
- CEANGAL business models
- RES affordability calculator
- Expertise hub as intermediary between financial institutions, communities and technology providers

- F2F and Online courses
- Fostering local industry-systems manufacture, repairs and maintenance
- RES operation & maintenance tools
- Direct assistance from expertise hub

- Impact analysis
- Stakeholder feedback
- Development indicators



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