



# **SMART VILLAGES**

New thinking for off-grid communities worldwide

**Project Summary Booklet**

**June 2021**

# SMART VILLAGES

New thinking for off-grid communities worldwide



## The Rural Development Global Challenge



**770 MILLION**  
People lack  
access to  
electricity



**663 MILLION**  
People lack  
access to safe  
water



**3 BILLION**  
People lack safe,  
'clean' cooking  
facilities without  
polluting fuels

Smart cities are on everyone's lips, but this sole focus on cities is also worrying.

**Half the world's population do not live in cities**, and that includes **more than 70% of the world's poor**.

**We believe people in remote villages in the developing world  
deserve the same opportunities as everyone else.**

## Our **Innovative** Approach

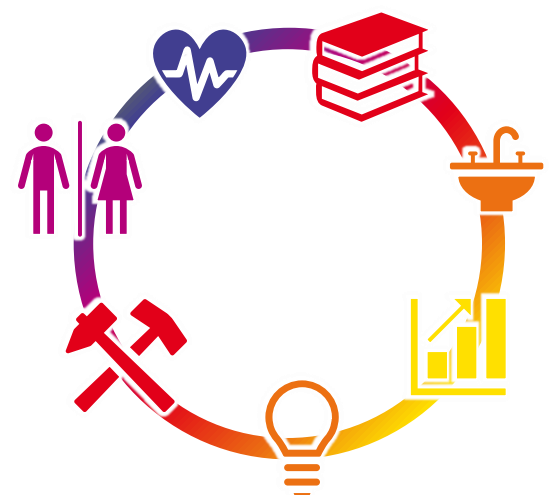
Developed from a 7-year long grassroots research program, to understand why development projects fail

1. Working Across the Sustainable Development Goals

2. Focusing on Community Needs and Priorities

3. Using Energy as a Catalyst

4. For Sustainable, Lasting Impact



Whilst the traditional approach focuses on a single technology or development goal, our **holistic model** maximises impact at little extra cost, developing systems for, and with, target communities, for lasting benefit. Through energy access and a carefully selected suite of complementary technologies, our 'Smart Villages' enable provision of good **education** and **healthcare**, access to **clean water**, **sanitation** and **nutrition**, the growth of productive **enterprises** to boost incomes, and enhanced **security**, **gender equality** and **democratic engagement**.

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**10 Projects**

**5 Countries**

**12 International Partners**

**1 Vision**

Innovate Access to Healthcare in Remote Communities

Developing Low Cost, Locally Appropriate Cold Storage Solutions for Rural Uganda

Innovating Farmers' Enterprise Centres for Wealth Generation and Energy Access in Rural Communities

Second-life battery solar system for rural schools in East Africa

Smart Sustainable PV Minigrids as an Alternative to Grid Extension in Lesotho

Sustainable Offgrid Education Technology in Rural Schools

Developing Interactive Community Energy Modelling Toolkits in Somaliland

Innovative Community Energy Monitoring, Control and Reporting Technology

Foster Community Environmental Stewardship by Removal and Recycling Plastic Waste from Rivers in Kenya

Smart Integrated Energy in Northern Community Tanzania

Our current projects, coupled with **rigorous monitoring** and **evaluation**, aim to **validate the Smart Villages Approach** to universal energy access and rural development, whilst **developing** and **testing innovative technologies** to deliver these integrated development objectives.

## Help us make a **lasting impact**

As an R&D and innovation-led, impact-oriented SME, we rely on external funding to make our projects possible, though often this funding does not cover 100% of costs for us and our partners. Recent cuts to the UK Overseas Development Aid budget have also severely impacted several of our projects.

Without additional funding we will be **unable to achieve all our initial project objectives**, and in turn, inevitably **disappoint the communities** with whom we have been working over the past year.

**We need your help to fill this funding gap.**



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## Innovative Access To Healthcare In Remote Communities

In Proud Partnership with

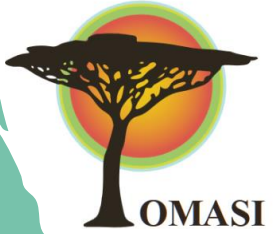




# SMART VILLAGES

Innovative Access to  
Healthcare in Remote Communities

In Partnership with



## The Rural Healthcare Challenge





Patients often resort to traditional medicines and **wait** until their health has severely deteriorated before journeying to their nearest health centre.

By this time it can be **too late**.

## Our Solution

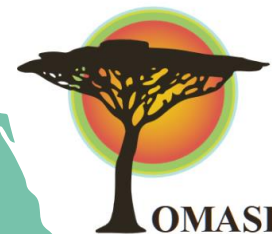
How we're **revolutionising** rural healthcare

-  Patient visits local telehealth centre with basic equipment, and has vitals taken
-  Consultation with doctor in main village is done remotely via video conference
-  Doctor advises patient and sends medication as required
-  Medicine is delivered from main village in batches, reducing transport costs
-  Long journey to doctor only required in emergencies and for specialized tests

## The Benefits

-  **Reduced patient cost, time and effort** to access to doctor, leading to **improved uptake**
-  **Fraction of cost to health authorities** when compared with building a new local clinic
-  **Improved health** in remote communities, reducing burden on existing hospitals and cost to healthcare system
-  **Increased time efficiency** of doctors consulting virtually
-  **Improved awareness** of health in remote communities for health authorities
-  **Improved ability** to contact patients in remote communities for doctors





## Innovative Access to Healthcare in Remote Communities



### Achievements

- + Extensive **Community Engagement** to verify **Healthcare Needs and Priorities****
  - 11 research activity types in 4 rural communities with 200+ participants
  - Support from rural and city Tanzanian public doctors, International Health NGO CACHA, and Tanzanian district health officials
- + Preliminary **Remote Consultations**:**
  - Validated feasibility of treating patients over video conference by local doctor in 2 rural dispensaries
  - Positive feedback from trial patients and local doctor
- + **Four Remote Health Clinics** in two off-grid villages:**
  - >50 patients, aged 1 to 78, treated via videoconference to nearest health centre
  - Patient vitals taken by trained operators prior to consultation
  - 65% of patients received medication, delivered in batches via motorbike, reducing costs
  - 23% of patients required a follow-up in-person appointment, knowing the journey was necessary
  - 100% of patients saved time and money on transport, and said they would be happy to pay for a remote consultation service in future.

**Patient and doctor feedback was overwhelmingly positive.  
All requested the service be made more widely available and permanent.**







# SMART VILLAGES

Innovative Access to  
Healthcare in Remote Communities

In Partnership with



## Where next?

On the path to **large scale adoption**

There is an urgent need for a remote healthcare system with widespread adoption.

To build a strong evidence base supporting our approach, we are planning long-term trials in multiple off-grid communities:

- Understand effect on demand for existing healthcare system
- Validate improved health quality in target communities
- Develop qualification for remote clinic operators and train local operators
- Develop financial model to present to health authorities for large-scale roll-out
- Refine software used, for video conferencing, patient data transfer, and medicine supply tracking
- Trial alternate technologies for 'offline' communities without internet or signal
- Partner with additional private/public local doctors/nurses, health NGOs, and health authorities

We are working with local partners OMASI in Northern Tanzania, to validate this approach through longer term trials, and to develop a business model to make large scale adoption more sustainable in remote communities across Sub-Saharan Africa.







# SMART VILLAGES

Innovative Access to  
Healthcare in Remote Communities

In Partnership with



## Introducing Kiruru Village

**Population:** 1000-1500 (240 households)

**Distance to nearest health facility:**

15 km, 1.5 hours via motorbike

**Communal facilities:** Church, Shop,  
Central 'meeting tree', Pre-primary school

**Challenges:** No phone signal,  
No primary or secondary school,  
Almost inaccessible by road in rainy season



## A village in need of remote healthcare

Kiruru is a small, marginalised community made up of multiple Maasai bomas spread over 15 square kilometres. In May 2021, Smart Villages installed a solar array in the village centre, **providing electricity** to the church, pre-primary school and encouraging the growth of central businesses. Despite this development, the **nearest health facility is still over an hour away**.

In June 2021, working with local NGO OMASI, Smart Villages installed an internet connection and ran two telehealth trials in Kiruru village. Patient turnout was overwhelming, showing the high demand for the service and several had to be turned away due to time-constraints. Through long-term telehealth trials, we hope to make access to healthcare more permanent.







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## Developing Low Cost Locally Appropriate Cold Storage Solutions for Rural Uganda

In Proud Partnership with



**ecolife**  
FOODS



# SMART VILLAGES

Developing Low Cost Locally Appropriate  
Cold Storage Solutions For Rural Uganda

In Partnership with  
 **ecolife**  
FOODS



## The Challenge

Post harvest losses for rural farmers are huge – up to 50%. Without adequate storage, farmers unsold produce is left to rot, or sold off at unfair low prices.

Existing cold-store solutions are expensive to buy and run, and generally need to be imported.

## Our Goal

A **low cost** solution to **reduce post-harvest losses** for off-grid farmers and in turn:

- Make them more resilient to climate change and poor harvests
- Increase their bargaining power over intermediaries to obtain fair prices for produce



## Presenting...



**Solar powered** chillers,  
not reliant on grid power



Providing a **cold storage facility** for farmers, keeping their crops fresh for longer post-harvest



Built using innovative **interlocking stabilised soil blocks** – cheaper, stronger and more eco-friendly than traditional bricks which require large quantities of wood/charcoal (to fire them) and cement (to build with them)



**Rice husk cavity wall insulation**, re-using locally available waste material that would otherwise be burnt

## ...the Off-Grid Cold Store

**Low Cost**  
**Eco-Friendly**  
**Local Materials & Equipment**  
**Simple Technology & Techniques**



**Waste heat** from chillers productively used to **dry crops**, adding value





## Development Progress

- 1** Methodical testing of **thermal properties** of potential cavity wall insulation materials



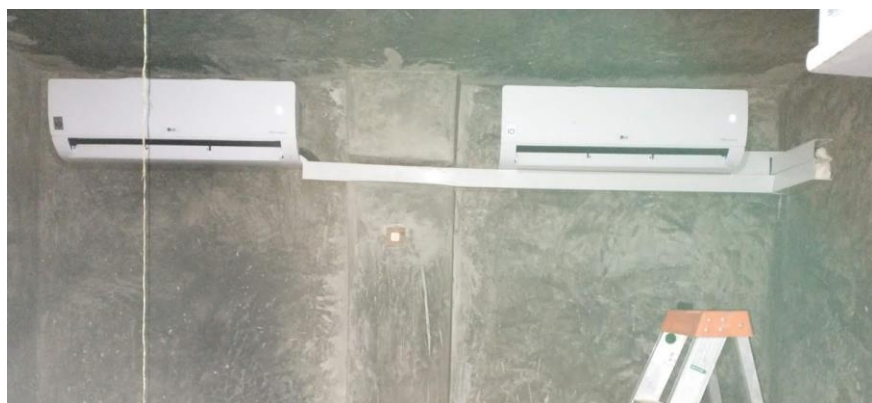
- 2** Perfecting **manufacture** of interlocking stabilised soil blocks and **training** community



- 3** **Construction** of pilot cold store with rice husk cavity wall insulation.



- 4** **Installation** of appropriately sized solar power and **chillers**



## Where we are now

- Conducting **performance evaluation**, with use-case analysis from farmer engagement.
- Researching suitable simple and low-cost ways of further improving the thermal performance (e.g. to keep the room at temperature overnight)
- Finding the **optimal sizing** of the solar power system.
- Developing **business model** for rollout in rural, off-grid villages





# SMART VILLAGES

New thinking for off-grid communities worldwide

## **Innovating Farmers' Enterprise Centres for Wealth Generation and Energy Access in Rural Communities**

In Proud Partnership with



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and







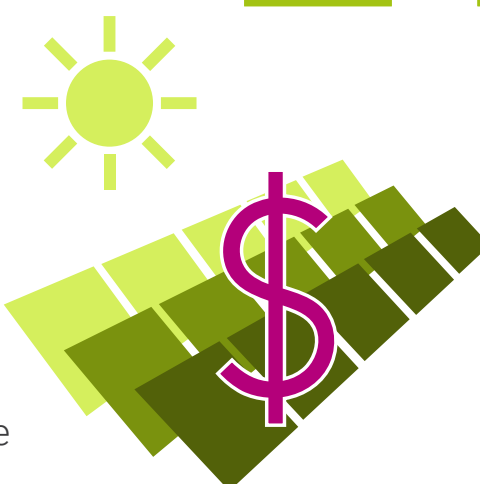
# SMART VILLAGES

Innovating Farmers' Enterprise Centres  
for Wealth Generation and Energy Access  
in Rural Communities

In Partnership with



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FOODS



## The Challenge

**Minigrids** are vital in providing power for businesses in off-grid communities, and yet **few are commercially sustainable**.

Communities are unable to pay the high repayment costs, and there is a lack of investment from donors & governments, leading to equipment falling into disrepair.

## The Opportunity

An **anchor load** (a significant industrial use) makes minigrid operations more financially and technically viable, whilst reducing the unit cost of electricity. If an anchor load can also bring money into the community, this increases people's ability to pay for electricity.

We propose designing and installing a **cold store** and **farmer's enterprise centre (FEC)** as an anchor load, to improve farmers' incomes and minigrid performance long-term.

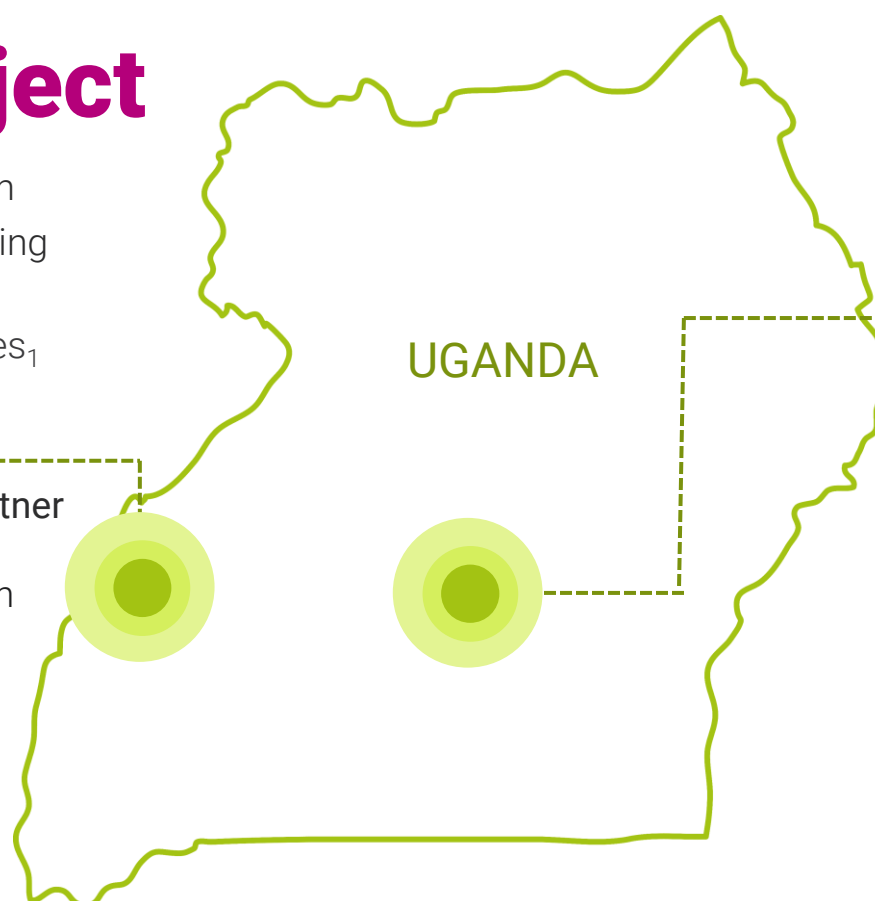
## The Project

Validating our model in  
**4** Rural Off-Grid Farming  
Communities, and  
**3** Control Communities<sup>1</sup>

### Western Uganda

Working with local partner  
Kiima Foods

- **2** communities with minigrid and FEC anchor load
- **1** community with minigrid only



### Central Uganda

Working with local  
partner Ecolife Foods

- **2** communities with minigrid and FEC anchor load
- **1** community with minigrid only
- **1** control community with no power

We work closely with each community to tailor the design of any installed minigrid and FEC to their needs, encouraging the growth of new businesses and increasing commercial sustainability.

Our detailed monitoring and evaluation strategy will provide clear evidence to evaluate the benefits of our anchor load model, upon project completion

<sup>1</sup>: Once the impact of each approach has been validated, a FEC will be installed in each control community, so all communities may benefit equally





# SMART VILLAGES

Innovating Farmers' Enterprise Centres  
for Wealth Generation and Energy Access  
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## Project Progress

- ✓ Careful selection of farming communities for minigrid success
- ✓ Extensive community engagement to identify needs and priorities for appropriate system design
- ✓ Baseline survey conducted in all villages for monitoring and evaluation purposes
- ✓ Partnerships formed with village leaders and repayment models agreed
- ✓ FEC designs completed, and preliminary business models defined for real-life validation



## Where Next?

- Installation and commissioning of FECs, with farming technologies tailored to each community
- Distribution of solar power from FECs to surrounding households, schools, churches and businesses (minigrid installation)
- Community training in best-practices for use of newly installed technology
- Continuous monitoring and performance evaluation as communities adapt to new systems and electricity provision
- Second impact survey to measure effects of system implementation
- Report on learnings from project, enabling large-scale roll-out across rural farming communities







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## Introducing...



High Street with shops

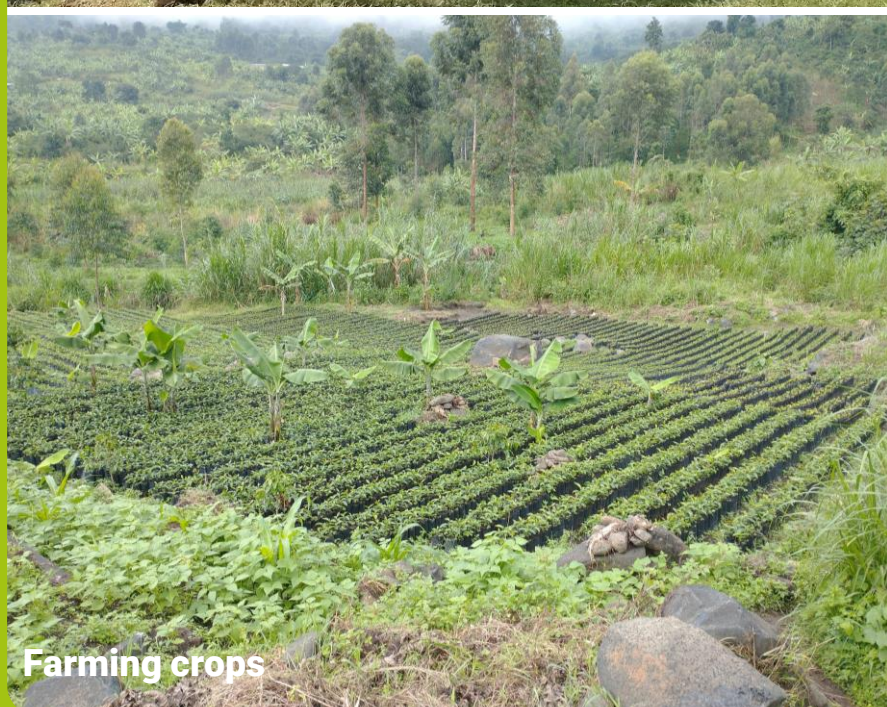
## Mbata Village Trading Centre



Grain store



Women's focus group



Farming crops



Men at work





# SMART VILLAGES

Innovating Farmers' Enterprise Centres  
for Wealth Generation and Energy Access  
in Rural Communities

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## Introducing...

### Location:

- The mountains of Western Uganda
- 50km from Kasese



### Population:

- 1000 inhabitants
- 250 households
- Average age 24

## Mbata Village Trading Centre

### Livelihoods *(Many people have multiple livelihoods):*

- 61% Farmer
- 34% Student
- 21% livestock husbandry
- 11% Casual manual labour
- 13% Unemployed
- 6% Small business owner

### Challenges:



**Access** - Situated in the mountains, the road is long and treacherous becoming impassable during the rainy season



**Electricity** - Mbata has no grid electricity, nor is it likely to be connected in the next 30 years due to its challenging location



**Phone Signal** - The community is cut off from any phone network, making communication with the outside world impossible

### Village Strengths

- Excellent fertile farmland
- Highly entrepreneurial youth
- Great community spirit







# SMART VILLAGES

New thinking for off-grid communities worldwide

## Smart Sustainable PV Minigrids as an Alternative to Grid Extension in Lesotho

In Proud Partnership with





# SMART VILLAGES

In Partnership with



## Smart Sustainable PV Minigrids as an Alternative to Grid Extension in Lesotho

### The Challenge

Electrification rates in Lesotho are extremely low:

**41%** Country-wide and **<10%** In rural areas

30% of the rural population is deemed to be living in **extreme poverty**. Modern energy services could accelerate development and create business. Yet grid extension is especially challenging due to:



Difficult mountainous terrain



Sparse population



### Our Goal

Demonstrate that the Smart Villages Model of minigrids, combined with a suite of productivity enhancing technologies and services, is a commercially sustainable and high impact solution for rural electrification.

### Project Impact

In **2 remote rural villages**, each with a 37kW solar-PV minigrid and complementary technologies:



Provide >3000 individuals with access to clean, affordable power



Create at least 10 new direct jobs in running the minigrid



Improve agricultural productivity and ability to market produce



Improve security through street lighting



Improve access to water through pumping...

...and more!

### Project Outcomes

- ✓ A rigorous assessment of needs and priorities from minigrid technology
- ✓ A set of business and technology models adapted to Lesotho
- ✓ Validation of our approach, enabling it to be used as a template for further rural electrification by the Government of Lesotho

### Our Team

- **Gram Oorja** bring a wealth of experience from rural minigrid design and delivery in India.
- **MOSCET** is a leading provider of renewable energy products in Lesotho.
- **NUL** provides local University students and staff experienced in research and analysis.





# SMART VILLAGES

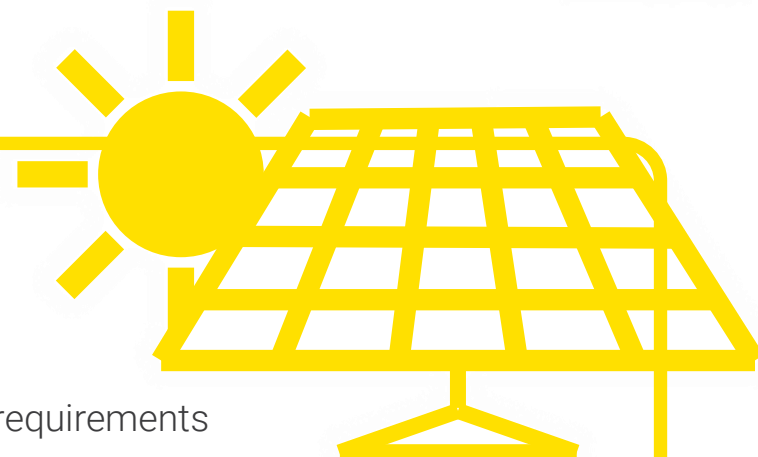
Smart Sustainable PV Minigrids as an Alternative to Grid Extension in Lesotho

In Partnership with



## Project Progress

- ✓ Careful selection of 2 communities for minigrid success
- ✓ Extensive community engagement to identify system design requirements
- ✓ Physical surveys conducted for minigrid system design
- ✓ Baseline survey conducted in all villages for monitoring and evaluation purposes
- ✓ Partnerships formed with village leaders for land/site and governance discussions
- ✓ Preliminary business models defined for real-life validation



Motete Village



Linakeng Village

## What Next?

- Installation and commissioning of 2 solar minigrids and suite of complementary technologies, tailored to each community
- Continuous monitoring and performance evaluation as communities adapt to new systems and electricity provision
- Second impact survey to measure effects of system implementation
- Report on learnings from project, enabling large-scale roll-out of model to other rural, mountainous Lesotho communities, in partnership with Lesotho government





# **SMART VILLAGES**

New thinking for off-grid communities worldwide

## **Sustainable Offgrid Education Technology in Rural Schools**





# SMART VILLAGES

Sustainable Offgrid Education Technology  
in Rural Secondary Schools



## The Challenge

There is a huge difference in the quality of education in rural schools in Tanzania compared to urban schools.



### Language Barrier

Rural students are less likely to speak English, the language of instruction.



### Large Classes

Rural schools often have very large classes, so no one-to-one teaching



### Technology

Many rural students have little IT experience.

## The Opportunity

To fix this disparity, we needed a teaching method which is understandable, suitable for use in school and at home, and trains students with technology.

### Language Options

The solution had to be in English and Swahili, so students can understand.



### Easy to Use

The solution had to be simple to use without a teacher's help.



### Simple Tech

The solution had to train students in using simple technology



We have created an initial version of an app which can be used to teach mathematics to students who do not speak English, are on track to fail their maths GCSEs, and have never held a smartphone before.



### Not just another app

There are no free, Swahili maths learning apps which are available to rural Tanzanian secondary schools

### Peer to peer

Poor or expensive network is not a problem, as this app can be shared between devices directly.

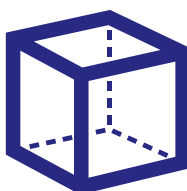


### Trialled in Tanzania

This solution has already undergone three iterations of testing in rural Tanzanian secondary schools.



## Our Solution



### Simplifying maths

Maths is perceived as one of the hardest subjects. By simplifying and making it fun instead of learning by rote, students will enjoy learning and want to continue.



### Bilingual

All content is available in Swahili and English, so students will no longer be held back by language barriers.

### Quality content

We want to develop content to cover the entire Tanzanian secondary school maths curriculum through a variety of learning methods for all types of learner.



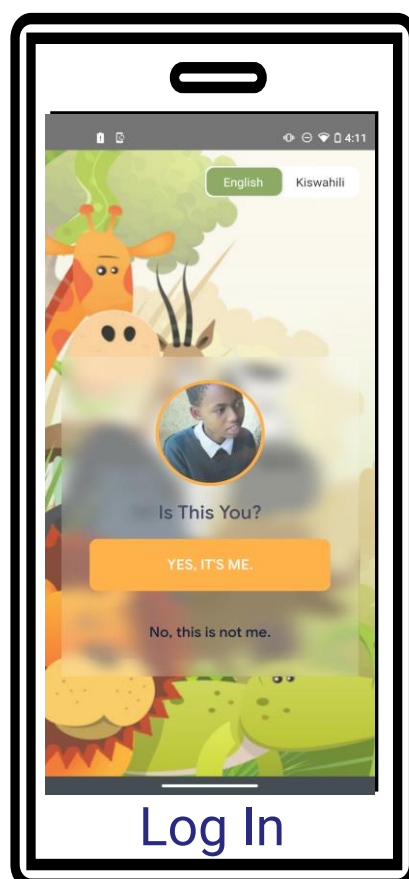


# SMART VILLAGES

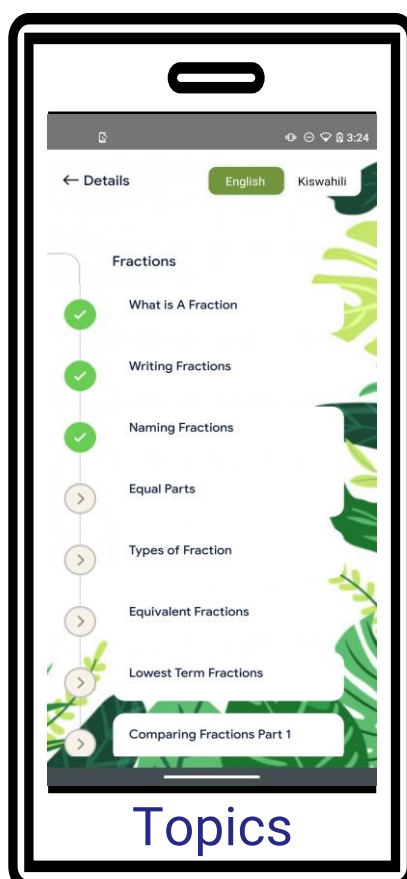
Sustainable Offgrid Education Technology  
in Rural Secondary Schools



## Our Solution

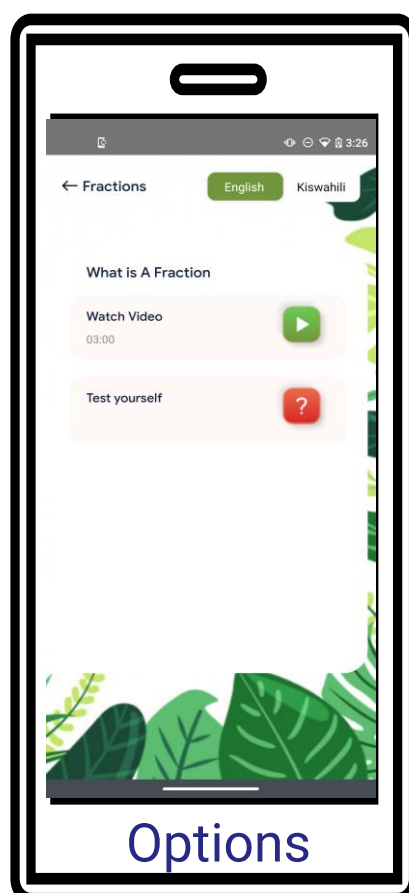
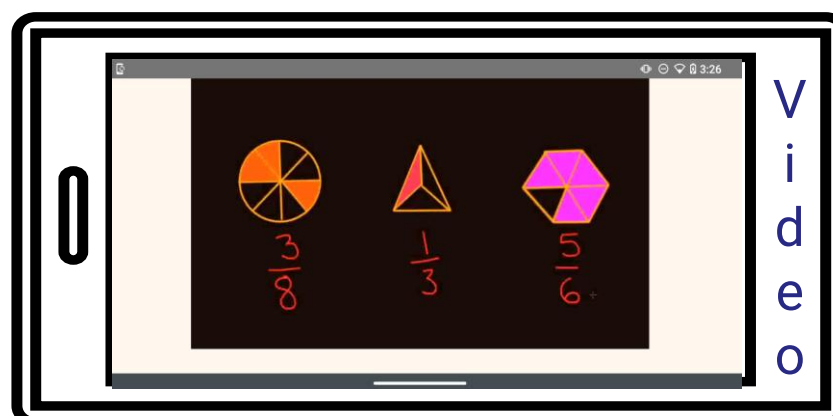


Log In



Topics

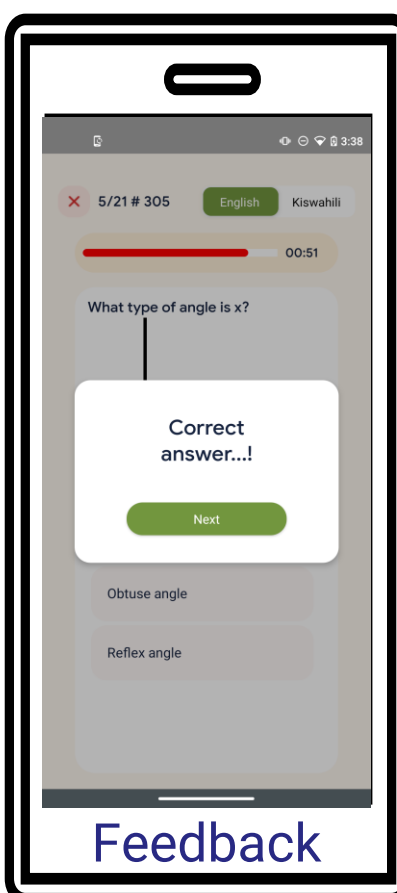
Screenshots of the initial version of the app which Smart Villages has developed and tested in secondary schools in rural Tanzania.



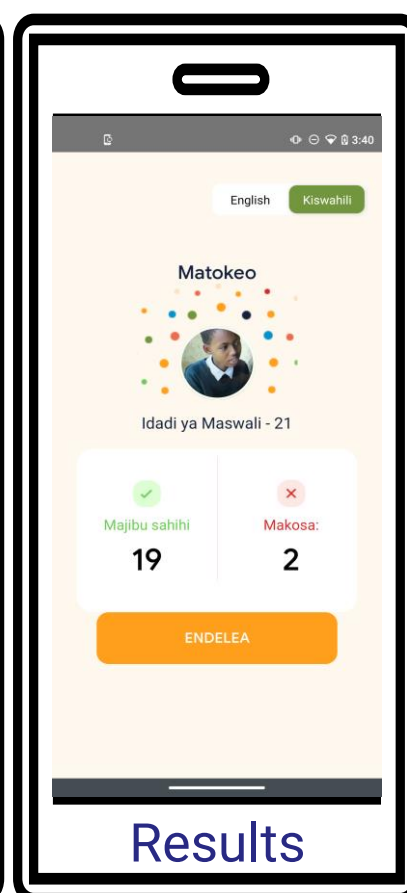
Options



Questions



Feedback



Results





# SMART VILLAGES

Sustainable Offgrid Education Technology  
in Rural Secondary Schools



## Testing



### 16 students

We tested the app with 16 students at Terrat Secondary School, Tanzania.



### 4 weeks

They used the app for 4 weeks, for a total of 8 sessions.



### 2 topics

The app covered the entirety of fractions and geometry in their curriculum



This group of students tested the app alongside normal lessons, and gave us the following feedback.



“

“The program made it easy for a student to learn even at home during holidays, so it is easier to understand faster”  
- Ashiraf, 14

”

“

I found the program great!”  
- Donath, 14

”

“

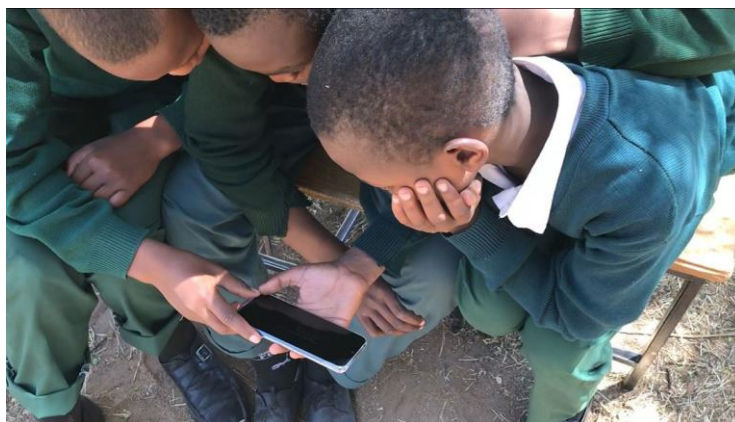
“The program can be improved by adding more topics and practice questions”  
- Caren, 14

”

“

“I have learned that Mathematics is a good subject.”  
- Lazaro, 16

”



“

“I liked to watch videos in English and Swahili, so as to understand in both languages”  
- Eliya, 16

”

“

“I have learned to calculate questions quickly and to use my time well inside the exam room.”  
- Neema, 13

”

“

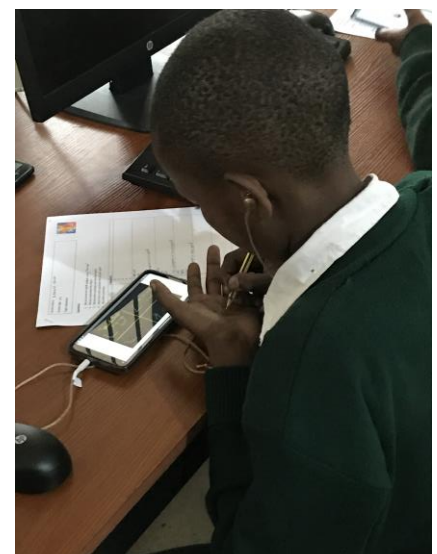
“You can improve the program through increasing the supply of mobile phones so that more students can benefit”  
- Zakayo, 16

”

“

“I like the program because now I understand practically unlike in the classroom where a teacher is teaching theoretically”  
- Donath, 14

”





# **SMART VILLAGES**

New thinking for off-grid communities worldwide

## **Developing Interactive Community Energy Modelling Toolkits in Somaliland**

In Proud Partnership with



**ClearSky**  
POWER

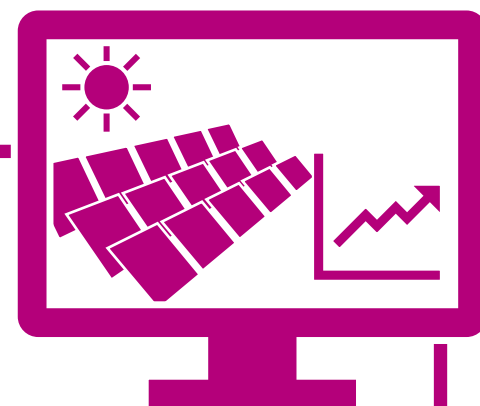


**Energy  
Action  
Partners**





## Developing Interactive Community Energy Modelling Toolkits in Somaliland



### The Challenge

Solar energy with energy storage systems are now capable of providing high quality and reliable power 24 hours per day. Yet the high cost of equipment presents a critical barrier to minigrid uptake.

Effective demand side management (DSM) modelling allows system design to be more accurately tailored to local demand, lowering system costs. But transfer to a rural setting is challenging. Communities need to understand how to share power usage and follow a set of governance rules to balance power consumption.

### The Innovation

The Community Energy Toolkit (COMET) enables minigrid project developers and community members to co-design a village energy system.

The tool is based around a networked, computer based simulation of a minigrid which supports community learning and consensus-building around issues such as system size, tariffs, productive use, and coordination of loads.

A prototype has been implemented in six communities in SouthEast Asia with positive results.

### Our Aims

- Explore and demonstrate how the Community Energy Toolkit (COMET) can facilitate DSM and optimize energy storage, to lower the up-front costs of solar minigrids
- Enhance COMET software with an explicit focus on DSM and battery storage
- Pilot the new version in minigrid planning workshops in 3 rural communities in Somaliland



### Our Team

- **Energy Action Partners** is a non-profit organisation from Malaysia, that have developed the Community Energy Toolkit (COMET)
- **Clear Sky Power** is an innovative private sector minigrid developer in Somaliland.



# **SMART VILLAGES**

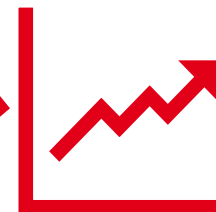
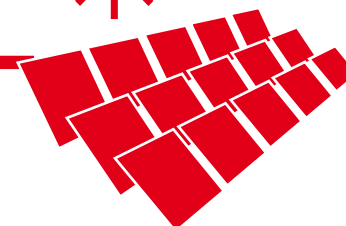
New thinking for off-grid communities worldwide

## **Innovative Community Energy Monitoring, Control and Reporting Technology**





Innovative Community Energy  
Monitoring, Control and Reporting Technology



## The Opportunity

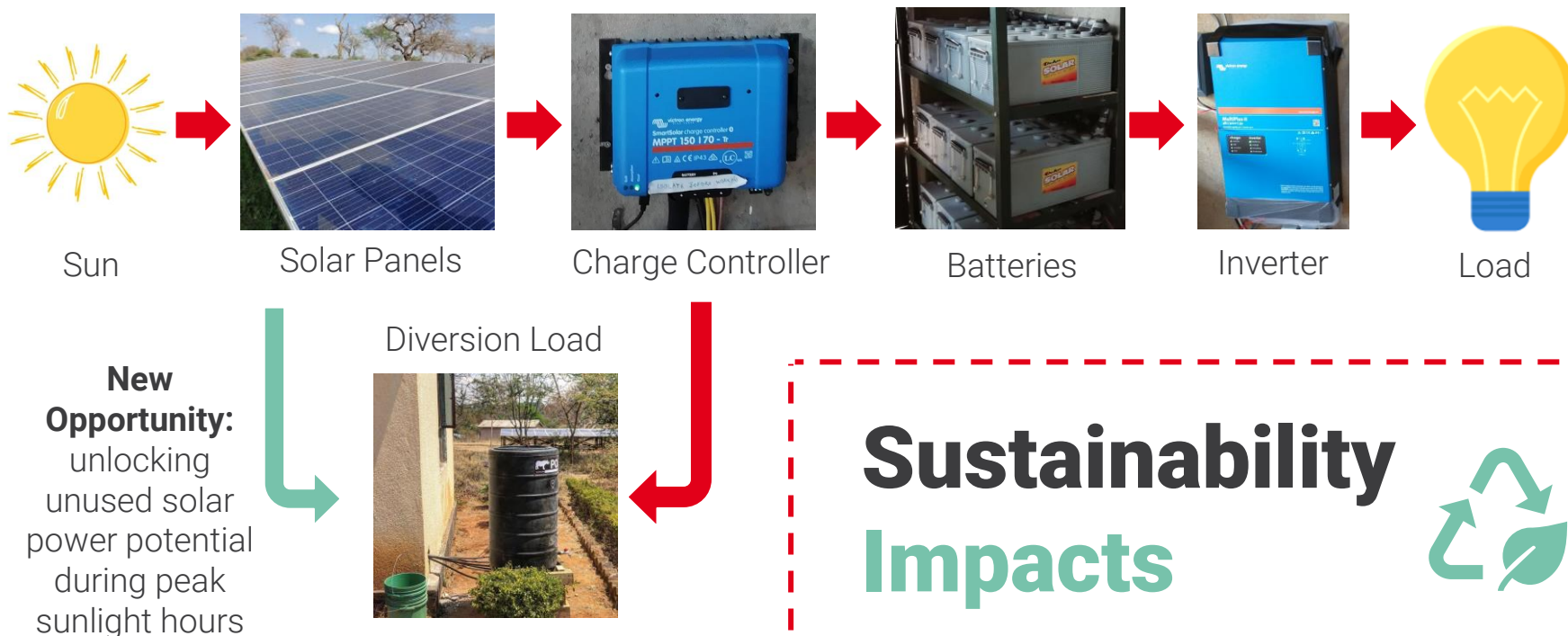
### 1. Data collection for solar system monitoring is complex, costly and sometimes impossible:

Tailored solar systems for a community often integrate equipment from multiple manufacturers. Each manufacturer has its own bespoke monitoring and data collection system, some requiring online accounts or even charging for access to data.. Collating data to fully understand the workings within and between solar installations is therefore **costly and extremely difficult**.

### 2. Unused power from solar panels is going to waste:

Solar arrays are oversized for their respective charge controllers for cost/output efficiency. This means during maximum daylight hours, significant solar power potential goes **unused**.

## Solar System Power Flow



## Our Product

1. An affordable, universal device, capable of monitoring and collecting data about a solar system, **compatible with any manufacturer's equipment**
2. Able to **divert excess solar power** directly from panels, before the charge controller

## Sustainability Impacts



Using predicted market of 1000 units of our solar system monitoring device and load controller in use in Africa within 5 years:

- **\$40,000 annual productivity gain** within African communities from reduced need for firewood gathering
- **7000 tonnes of CO2 emissions saved** annually
- > 50,000 trees saved annually
- **\$700,000 savings in capital costs** of community energy systems
- **\$500,000 annual savings** in community energy costs



# SMART VILLAGES



ClearSky  
POWER



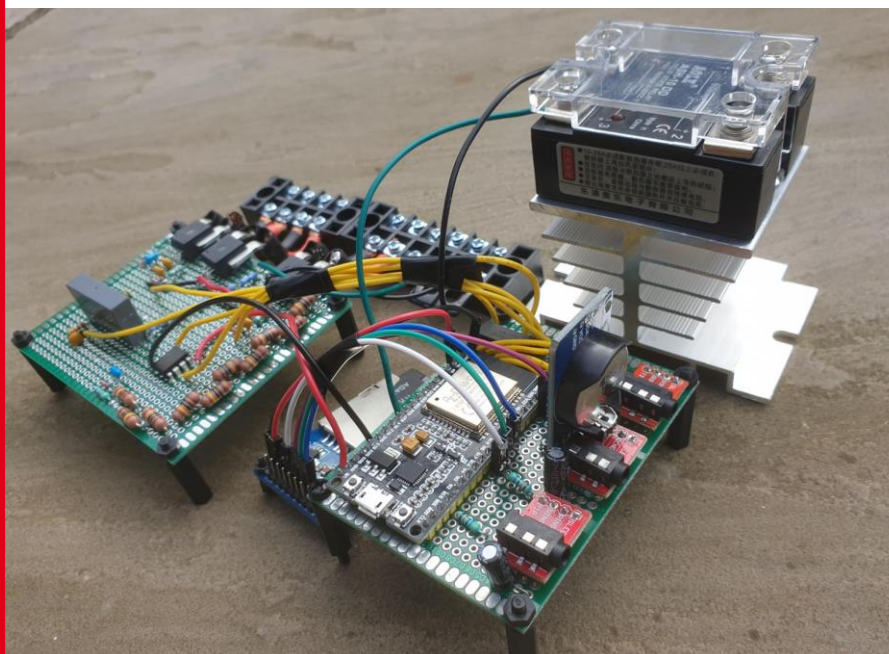
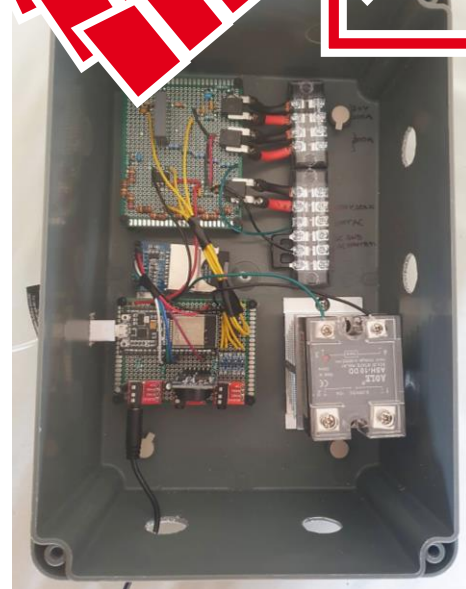
Energy  
Action  
Partners

Innovative Community Energy  
Monitoring, Control and Reporting Technology



## Progress to date

- ✓ **Technical specification** defined to maximise minigrid applications:
  - ✓ Voltage measurement up to 1000V DC and 500V AC
  - ✓ Current measurement up to 300A DC and 100A AC
  - ✓ Data logging to SD card and wirelessly to cloud
  - ✓ AI load controller for diverting excess power
  - ✓ Installation method independent of solar equipment manufacturer
  - ✓ Component cost under £100
- ✓ **Design, test and build of Mk1 prototype**, meeting all specifications.



## Route to Commercialisation

### Technology Development:

- Make device more robust
- Case studies & long-term use-testing with live data
- Enhanced safety features

### Relationship & awareness building with key stakeholders

- Mini-grid companies
- Rural Electrification Authorities
- Energy Access NGOs.

## Mk2 Development

This product offers **unique functionalities** unavailable elsewhere, and there is a significant market demand for it.

Our next step is the development of a Mk2 prototype, for long-term, use-testing in our off-grid solar arrays, enabling data collection for improved AI load controller performance, and validating its commercial, money-saving benefits.





# SMART VILLAGES

New thinking for off-grid communities worldwide

## **Foster Community Environmental Stewardship by Removal and Recycling Plastic Waste from Rivers in Kenya**

In Proud Partnership with







# SMART VILLAGES

Foster Community Environmental Stewardship  
by Removal and Recycling Plastic Waste  
from Rivers in Kenya

In Partnership with



## The Challenge

Rivers around the world funnel plastic waste into the ocean at an alarming rate causing harmful effects on ocean animals, coastal economies and human health.

There is an urgent need to combat this flow of plastic waste.

## The Project

Working with CHEMOLEX Ltd, a Kenyan energy and environmental technology start-up, we are developing technologies to collect plastic waste from river systems in and around Nairobi, and recycle/repurpose these into innovative products.

To target the source of the waste problem, CHEMOLEX are also training local communities and youth groups on recycling and waste management.



## Project Progress

- ✓ First 6 sites around Nairobi identified and surveyed for River Plastic Capture Systems
- ✓ Several passive plastic trapping technology systems and an electrically powered mechanical extraction system designed and tested for both small and medium-sized river environments
- ✓ Iterative design improvements to plastic waste collection systems through use-testing, making systems more resilient to flooding and adverse weather conditions
- ✓ Permanent installation of plastic capture systems in 5 river locations in Nairobi, both active and passive.





# **SMART VILLAGES**

New thinking for off-grid communities worldwide

## **Smart Integrated Energy in Northern Community Tanzania**

In Proud Partnership with





# SMART VILLAGES

Smart Integrated Energy in  
Northern Community Tanzania

In Partnership with



## Project Objective

Demonstrate use of the **Smart Villages model** to::

- 1) Increase demand for electricity
- 2) Enhance ability to pay
- 3) Generate more sustainable long-term implementation and impact

## Our Unique Approach

The Smart Villages approach differs over the traditional approach in 3 ways:

- 1) **Community engagement** and customisation,
- 2) **Co-deployment** of broad range of technologies and applications, for cost-effective integrated functionality
- 3) Rigorous **baselining** and **impact analysis** to build a body of evidence for future development agency and project planning use, and for funding and de-risking

## Project Impact

Through the use of 10kW+ **clean solar minigrids** and a suite of **productive use technologies**:

Improved agricultural  
productivity & value  
addition



Better  
healthcare  
facilities



Access to clean,  
affordable water



Improving the livelihoods of:

- 4 Marginalised off-grid Maasai communities
- 10,000 Village residents



Provision of light  
and improved  
security



Improved  
education  
facilities



Long-term, sustainable  
community  
development



We are working closely with local Tanzanian NGO, OMASI to implement this project in Northern Tanzanian Maasai communities.





# SMART VILLAGES

Smart Integrated Energy in  
Northern Community Tanzania

In Partnership with



## Project Progress

- ✓ Careful selection of communities for minigrid success
- ✓ Extensive community engagement to identify needs and priorities for appropriate system design
- ✓ Baseline survey conducted in all villages for monitoring and evaluation purposes
- ✓ Partnerships formed with village leaders and repayment models agreed
- ✓ Preliminary business models defined for real-life validation
- ✓ First 50kW solar installation constructed at Ormoti business site, enabling the development of a local business hub, beginning with powering a borehole water pump, milling machine, fridge, shop lighting, and security lighting.
- ✓ 10kW solar installation constructed in Kiruru, powering church, school and provision for 4 local shops







# SMART VILLAGES

Smart Integrated Energy in  
Northern Community Tanzania

In Partnership with



## Introducing...



### Clean Solar Power:

160 x 325W panels, installed by Smart Villages,  
and powering the entire site.



### Local Shop with Fridge and Lighting

Stocking the only cold  
drinks for miles, and  
providing phone charging  
services.



### 7kW Water Pump and VFD

Supplying water for  
sanitation and livestock to  
surrounding communities.

## Ormoti Business Hub



### Electric 2.2kW Milling Machine

Enabling local community  
members to process grain in more  
convenient, smaller quantities.  
Connected via VFD, to work in  
parallel with water pump.

### Still to come:

- A veterinary shop supplying cattle  
medicines
- A cooled dairy collection point,  
where Maasai women can sell  
cattle milk for profit







# SMART VILLAGES

Smart Integrated Energy in  
Northern Community Tanzania

In Partnership with



## The Demand:

Solar arrays built with metal frames can be expensive and time-consuming to assemble.

For locations which may be connected to the grid in the next few years, a more temporary, cheaper approach is required.

## Our Solution:



## A Bucket-Mounted Solar System

- ✓ Less than half the cost of a metal mounted installation
- ✓ Using locally available materials
- ✓ Quick to assemble (<2 days)
- ✓ No high power, specialist tools required

## The Installation:

- 32x335W solar panels
- 14x20 litre buckets
- 13 x 40 litre buckets
- 12 x 5m planks of wood
- Sand, dug from the river nearby
- Many, many cable ties!

The installation powers a 5kW water pump, supplying clean, affordable water, to the surrounding community.







# SMART VILLAGES

Smart Integrated Energy in  
Northern Community Tanzania

In Partnership with



## Reliable Energy for Orkonerei Radio Service

Orkonerei Radio Service (ORS FM) is the first Maasai pastoralists' radio and was established to better communicate with the Maasai in Terat, Simanjiro district.

For many Maasai who don't understand Swahili or English, it's their only source of information and important for education on health and agriculture. At their peak, ORS FM had more than 2 million daily listeners in Manyara, Arusha, Kilimanjaro, and Tanga.

The radio station gets its money from advertising and donation, but covering the cost of generator fuel can be challenging, and generator breakdowns force the station off-air.

We decided to help support the radio station by installing a temporary solar system.



## A Wood-Mounted Solar System

### The Installation:

Low cost, quick and easy to assemble, a wood mounted system was perfect as a temporary solution, providing power until ORS FM was connected to the grid (anticipated in 1-2 years time).<sup>1</sup>

The finished structure holds 90x335W solar panels, split over 3 arrays, each with 2 rows of panels.



<sup>1</sup>: As of Jan 2021, ORS FM became connected to the grid, but due to its unreliability, our solar is still used. Find out more at [www.e4sv.org](http://www.e4sv.org)





# SMART VILLAGES

Smart Integrated Energy in  
Northern Community Tanzania

In Partnership with



## Introducing Kiruru Village

- **Population:** 1000-1500 (240 households)
- **Distance to nearest health facility:** 15 km, 1.5 hours via motorbike
- **Communal facilities:** Church, Shop, Central 'meeting tree', Pre-primary school
- **Challenges:** No phone signal, No primary or secondary school, Almost inaccessible by road in rainy season

### Our Work:

- ✓ Extensive community engagement to determine solar system and technology needs.
- ✓ Installation of 10kW solar array, powering local school, church and with provision for 4 new businesses.
- ✓ Creation of village energy committee
- ✓ Agreement on repayment model to cover costs of installation.

