

# ENERGY VILLAGE CONCEPT APPLICATION IN AFRICA

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**LEAP-RE STAKEHOLDER FORUM**  
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## LEAP-RE

Long-Term Joint EU-AU Research  
and Innovation Partnership on Renewable Energy



The LEAP-RE project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 963530.

# INTRODUCTION: Energy Village Concept



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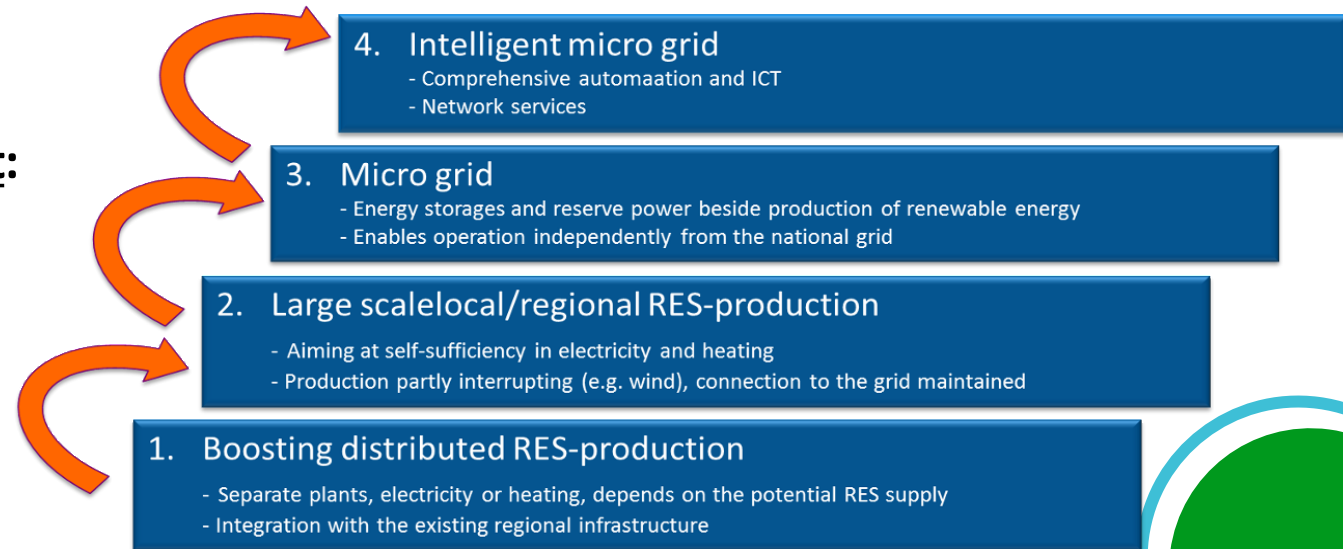
## IDEA:

To create energy **self-sufficient villages**: generation of own energy from the local renewable energy sources + for sale

- Existing RES: solar, wind-, water-, bio-energy, waste, geothermal...
- Consumption in the village: All energy vectors: traffic fuels, electricity & heat/cooling
- Vision and strategy with the villagers on how to achieve energy self-sufficiency with the RES potential
  - To take the **community** into the development process in the beginning and work together with them to ensure a smooth process in the village

## Previous Projects and Funders so far on EV concept:

- Energyby project
- Energy Village, in Finland – EU and ELY-keskus
- ASPIRE project
- EnergyVillage500, in the EU – Horizon EU



# Application: WP 14



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**Duration:** June 2021 – May 2025, 48 months

**Budget:** 504 000 €

## Partners involved:

- University of Vaasa (UVA), **Finland** (WP Leader)
- Addis Ababa Science and Technology University (AASTU), **Ethiopia**
- Botswana International University of Science and Technology (BIUST), **Botswana**
- Makerere University (MAK), **Uganda**
- Moi University (MU), **Kenya**

**Main WP objective:** The goal of the project is to develop and promote sustainable energy use in the villages.

- *To create energy-self-sufficient villages.*
- *To further develop the Energy Village concept together with our project partners.*
- *To create an African-wide network of Energy village experts who can utilize the method in their countries.*

## Multi-annual roadmaps:

- **Mapping joint research and innovation actions for next-step development of RES-specific challenges**
- **Smart stand-alone systems.**



- Identifying and selecting energy demo villages.
- Contacting locals and workshops in chosen Energy Villages.
- Data collection.
- Consumption and renewable energy potential estimations.
  - Formulas collection and applications on calculations.
  - Developing the ASPIRE model for the African context.
  - Using ASPIRE Model renewable energy online calculator website <https://calculator.aspiremodel.fi>
- Doing the energy assessment.
- Choose which renewable energy resources can replace the current fossil fuel consumption in the Energy Villages at least partly.

## 14.2. Demo villages - selection process – background information gathering – minimum 4 villages per country...

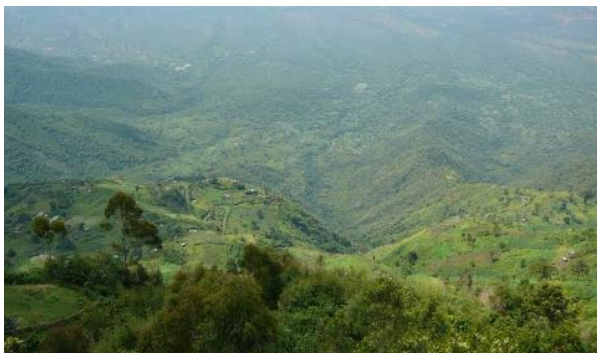
### KENYA

1. Moi University, Chebaiwo in Uasin Gishu
2. Langas, Eldoret in Uasin Gishu
3. Lelan in Elgeyo Marakwet County
4. Nandi Hills in Nandi
5. Kerio Valley in Kerio



### UGANDA

1. Bidibidi Refuge settlement
2. Kayanzi
3. Wanale
4. Maziba Murole
5. Nakasengere



### BOTSWANA

1. School -Regent Hill International School in Gaborone
2. Jamataka
3. Majwanaadipitse
4. Matsaudi Learning Centre



### ETHIOPIA

1. AASTU University Campus, Addis Ababa
2. Wonji Sugar Factory Village, Wonji
3. Langano, Ziway
4. Tulefa village in Debre-birhan





# Inspiring Energy Village cases – Ethiopia



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- **AASTU (Addis Ababa Science and Technology University) campus, Ethiopia**
  - Why this Energy Village is an inspiring case?
    - AASTU is an inspiring case because of its renewable resources on the one hand or within the camps areas.
    - The renewable energy potential that AASTU has, more than its demands.
- The AASTU energy village concept draws the attention of experts and top management of the university.
- The team proposed a solar-biomass hybrid system solution:
  - Consists of photovoltaic panels and collectors to provide hot water utilities.
  - Biodigester to produce biogas as an alternative for firewood consumption.
  - Thermal energy storage is proposed in addition to batteries.
- More universities in Ethiopia are interested in the Energy Village Concept.

# Inspiring Energy Village cases – Ethiopia



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✓ The potential renewable energy resources are:

✓ **Biomass**

- ✓ Food waste 500 tons/year; human waste about 300 tons/year

✓ **Solar**

- ✓ 7-12 hrs/day solar energy; about 5.76 KWh/m<sup>2</sup>/day solar intensity generates about 800 W/m<sup>2</sup>

✓ **Wind**

- ✓ Wind energy 24/7; 7.2 m/sec at 50 m height; wind power density can reach up to 300 W/m<sup>2</sup>

✓ The main consumption energy are:

✓ **Firewood and charcoal for the two cafes**

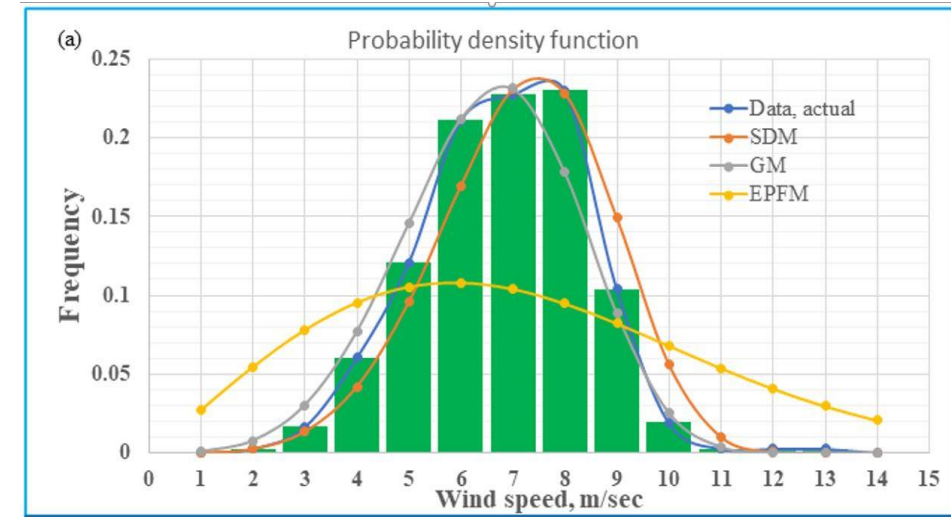
- ✓ 500 m<sup>3</sup> firewood

✓ **Electricity from the national grid**

- ✓ 1.5 Gwh/year

✓ **Oil fuels for vehicles and diesel oil generators**

- ✓ 200,000 liters of fuel/year



# Inspiring Energy Village cases – Ethiopia



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S/N	R(ES)	Potential, kWh/day	Consumption, kWh/day	
1	Biomass	Food waste	421.993	
		Peel waste	26.884	
		Human waste	20.80	
		Firewood		2000
		Charcoal		108.13
2	Solar	12,849.753		
3	Wind	712.8		
4	Others	Electricity	4,175.115	
5		Fuel (oil)	6,288.785	
Total		<b>14,032.23</b>	<b>12,572.03</b>	





- **Bidi-bidi, Refugees settlement in Uganda**
  - Why this Energy Village is an inspiring case?
    - The renewable energy potential, when harnessed to some extent, has a possibility of meeting about (40 – 50%) of the settlement's energy demand.
    - It has a huge potential to improve the living conditions of over 100,000 refugees and asylum seekers
- Biogas can meet some of the energy needs in the settlement.
  - 7.3119 TWh/yr from the biogas plant, which can meet about 37-38 % of the energy demand for the zone.
- Additional needs can be met by Solar and Wind renewable energy resources.
- Model development acted as a guide in the energy supply strategy and policy formulations for the rural setting.
- From the optimized model, it is feasible to use biogas to meet some of these energy needs in the settlement.

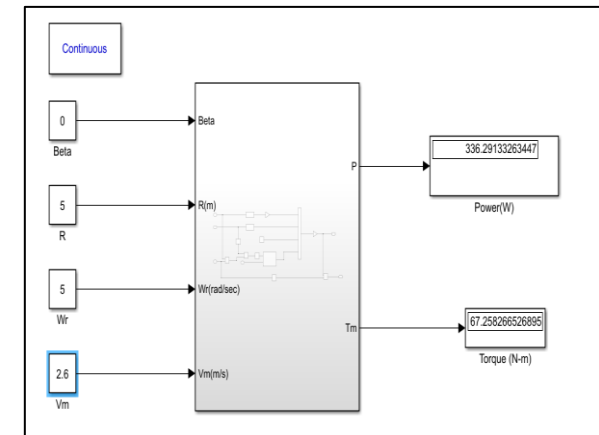
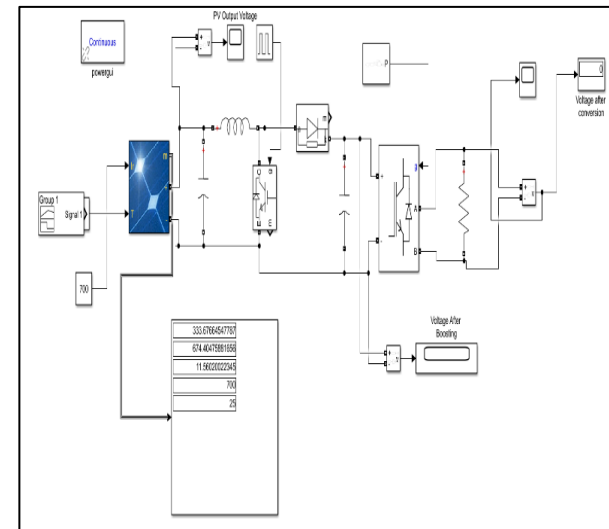
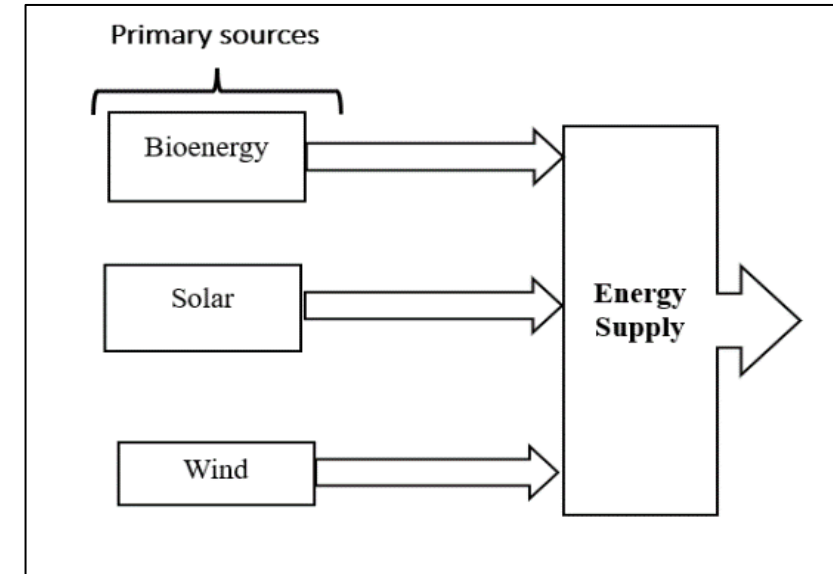


# Inspiring Energy Village cases – Uganda



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S/N	R(ES)	Potential, kWh/day	Consumption, kWh/day
1.	Different cooking sources		≈ 45,753.43
2.	Water pumping		≈ 608.83
3.	Electricity		≈ 1,600.56
4.	Solar (No. 212 pieces)	340	
5.	Wind (No. 20 turbines)	7.2	
6.	Biogas	20,032.602	
<b>Total</b>		<b>≈20,379.8</b>	<b>≈ 47,961.38</b>



# CONCLUSIONS



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- ❖ All in all, these two inspiring cases represent how different situations can be in villages and not all of them can act as the same Energy Village.
- ❖ The project has helped us to learn much about how to apply and what to expect while implementing the Energy Village Concept in Africa.
- ❖ There is a promising lead that the energy villages can be self-energy-sufficient and a replica for others.
- ❖ The inspiring case energy villages are ready for full implementation and there is a conducive environment for investment.
- ❖ The cases introduced in this study are a very unique, and different from each other.
  - ❖ What they do have in common is that they have untapped renewable energy potential for themselves and nearby residents and consumers.
- ❖ They also have features that make us believe there are thousands of similar cases across Africa that could and should be taken along into the energy transition and raising the quality of life for the residents.
- ❖ The energy village concept and the proposed solution can be customized to fit the energy demand of a given village.



- Invitation to join our Energy Village African Wide Network (EVAN)

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