

MALAWI ENERGY LAND SCAPE AND RELATED ISSUES ON ENERGY ACCESS

CLEMENT KALONGA



OUTLINE

- ▶ **Energy Access Overview**
- ▶ **Energy Policy Framework in Malawi**
- ▶ **Micro Hydro assessment experiences**
- ▶ **Peco solar Market Assessment in Malawi**

Key Issues for Consideration

1. How to effectively enhance the conceptual understanding of Energy Access across stakeholders
2. How to diversify Energy delivery models and energy technology mix towards enabling increased access
3. With SDGs can Energy Access can be prioritised and mainstreamed by all actors (donors, govt, pvt sector and CSOs)
4. How to ensure systematic collection and accessibility of data for enabling investments in the energy sector in Malawi.
5. Viability of off grid and community based energy enterprises.

The Regional and national context

- Most countries in the region except ranked low in human development
- Correlation between GDP and lack of access to modern energy in Zimbabwe, Malawi, Zambia and Mozambique.
- Access to modern energy (rural) as measured by the electrification rate remains low Malawi (1%), Mozambique (7%), Zambia (13.8%) and Zimbabwe (19%).
- Combined population of the above 4 countries of 63 have an average rural electrification rate of less than 8%.



Energy Access

- Energy \neq Grid Extension
- Energy for household lighting over emphasized
- Energy for cooking ignored
- Energy for livelihood and earning a living - a far fetched dream

Electricity Access challenge in Malawi

- One power utility: Low generation capacity, frequent supply interruptions and blackouts.
- Over-dependence hydropower
- Environmental problems in river catchments a major concern
- 25% of urban households and about 1 % of rural households with electricity supply
- High connection costs and delays (ESCOM 1990/91 to 1995/96 from 14 days to almost over a year now)

National Power Utilities

- Autonomous parastatals on paper
- Critical decisions made by Govts i.e tariff setting, investments, borrowing etc.
- Electricity is being sold at about 30-40% below cost recovery
- Unable to recover costs, earn a profit, or meet fiscal obligations.

National Rural Electrification Programmes

- Policy based approach to enhancing Energy Access
- Often levy-based i.e. Electricity levy in Malawi
- Grid extension focused (MAREP, REA etc.)
- Focus on growth centres

Energy Investments for the Poor

- No clear offering for energy access to enterprises for business development by large finance institutions
- Community credit cooperatives exist provide microfinance for households appliances and cooking facilities.

CURRENT MALAWI ENERGY POLICY: GOALS

- ▶ To make the energy sector **sufficiently robust** and efficient to adequately support GOM's **socio-economic agenda of poverty reduction, sustainable economic development** and enhanced labour productivity
- ▶ To catalyse the establishment of a more liberalised, private sector driven energy supply industry in which pricing will reflect the competition and efficiency that will develop with the reform process
- ▶ To transform the country's energy economy from one that is overly dependent on biomass to one with high modern energy component in the energy mix

KEY ENERGY LEGAL INSTRUMENTS IN MALAWI

- ▶ Energy regulation act
- ▶ Electricity act
- ▶ Rural electrification act
- ▶ Downstream liquid fuels and gas supply act
- ▶ Renewable energy supply act
- ▶ Downstream coal supply act

Micro Hydro Assessments

Technical

▶ Net power, ***Power (kW) = $\rho g H Q e$***

Where:

- ▶ ρ = density of water (taken as 1000kgm⁻³)
- ▶ g = acceleration due to gravity taken as 9.81 m²/s,
- ▶ H = the total head (m)
- ▶ Q = the flowrate of the water (m³/s)
- ▶ e = overall efficiency of the system.

Hydro .Technical ...

▶ Total demand;

▶ ***Demand (kW) = $\sum_{a=1}^x W_a$***

Where:

- ▶ W_a = wattage of appliance number (1) summed up to the appliance number x.
- ▶ For the scheme to be technically viable the amount of power available from the water should be greater than or equal to the desired demand. This is an important step in deciding whether to proceed with the feasibility study or to bring it to closure.
- ▶ ***If Net Power (kW) \geq Demand (kW) then proceed with design of scheme***

Else

- ▶ ***If Net Power (kW) $<$ Demand (kW) then look at alternative options***

Other Key Hydro assessment considerations

- ▶ Location, Description and demographic information
- ▶ Social and Cultural Background of the Community
- ▶ Economic Activities in the Target Community
- ▶ Current Energy Demand and Consumption trends
- ▶ Alternative analysis
- ▶ Stakeholder plans

Operational micro Hydro systems

Scheme Name	Generating Capacity (kVA)
Bondo, Malawi	88
Nyafaru, Zimbabwe	20
Chipendeke, Zimbabwe	25
Dazi, Zimbabwe	20
Ndiriri, Mozambique	27
Nyamwanga, Zimbabwe	30
Nerufundo, Mozambique	24
Chitunga, Mozambique	33
Hlabiso, Zimbabwe	25

Pico/Micro – Hydro Systems in Manica Province of Mozambique

Site Name	Chimucono	Mussapa	Ndacada	Nguarai	Ganhira	Chinyambudzi	Nyamukwarara
GPS Location	S19 47.541	S19 35.331	S18 50.230	S18 50.214	S18 49.265	S19 01.814	S18 48.446
	E33 20 527	E32 55 217	E32 49.021	E32 50.046	E32 54.718	E32 54.926	E32 50.624
Flow Rate (m3/sec)	0.15	0.15	0.11	0.08	0.3	0.15	0.1
Head (m)	30	20	48	59	10	30	120
Recommended Type of Turbine	Cross Flow	Cross Flow	Cross Flow	Cross Flow	Cross Flow	Cross Flow	Pelton
Potential Capacity (kW)	28	20	32	30	20	30	75
Total Cost (US\$)	300,000	250,000	250,000	250,000	300,000	370,000	375,000
Cost Per kW (US\$/kW)	10,714	12,500	7,813	8,333	15,000	12,333	5,000
Potential Households & Bancas	400	200	200	75	100	100	500

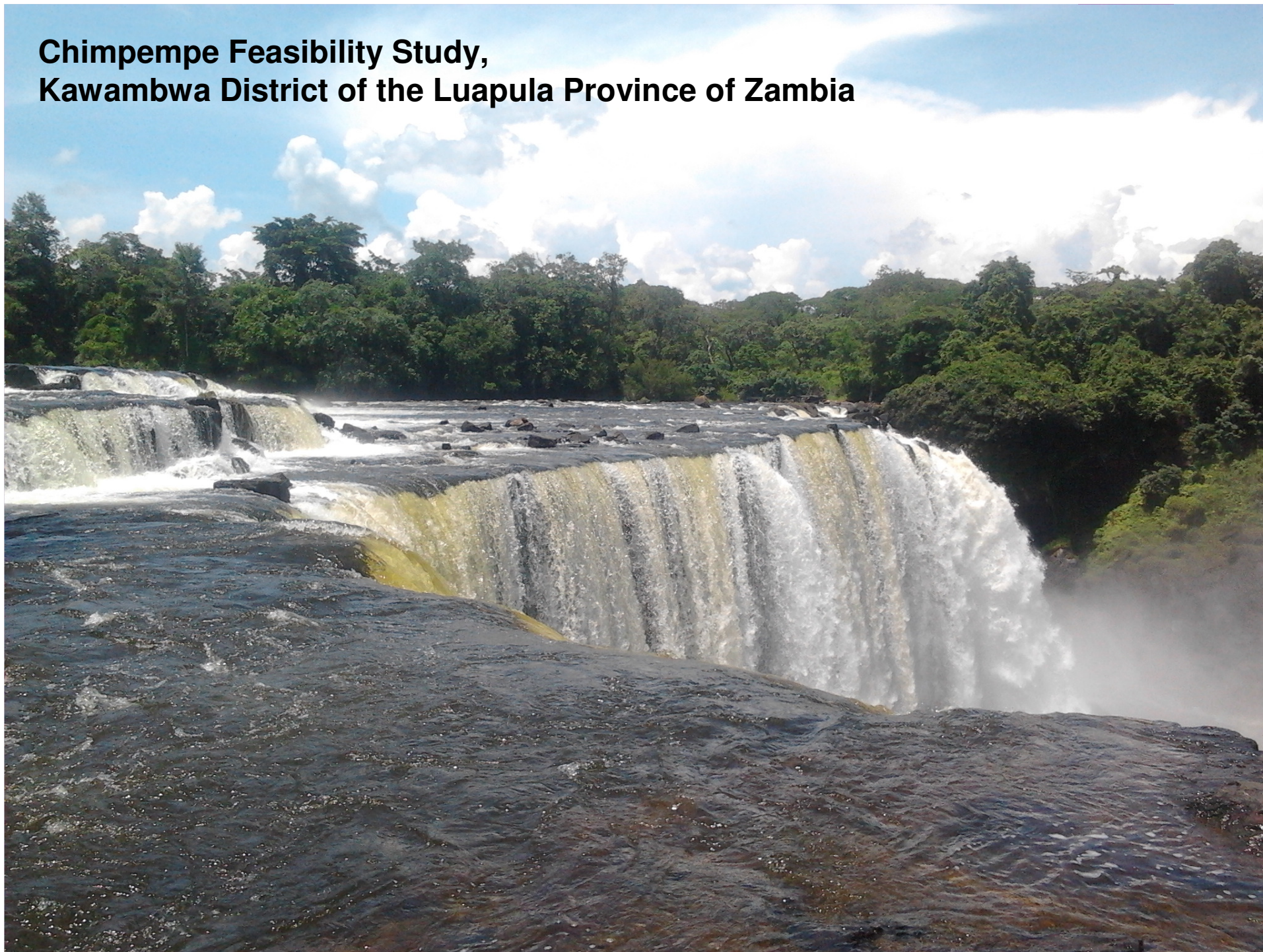
Feasibility study Key steps

- ▶ Desk study of key docs and policies related to energy sector
- ▶ GIS mapping showing land use, resource availability and potential
- ▶ Socio economic information through household surveys and consultations with local communities - energy needs, potential demand, ability and willingness to pay etc.
- ▶ Technical feasibility and field data collection – water flow, river data, topography, positioning of powerhouse and power lines etc.
- ▶ Design of the power system options – Technical (Civil, electromechanical equipment and electrical power lines
- ▶ Env and Social Impact Assessments
- ▶ Design of the power system: Financial appraisal of the options.
- ▶ Selection of the optimal system and recommendations

Bondo Community Hydro Scheme – Mulanje (Malawi)



**Chimpempe Feasibility Study,
Kawambwa District of the Luapula Province of Zambia**





DfID funded Business Innovation Facility

**Facilitating Systemic
Change in the Malawi Pico
Solar Products Market**



About BIF

- ▶ The DfID funded Business Innovation Facility phase 2 known as BIF2, aims to achieve poverty reduction by providing consultancy support to the private sector.
- ▶ BIF2 works with companies to grow inclusive business models and tackle constraints that affect the whole market.
- ▶ The programme operates for four to five years, initially in the selected markets of Pico Solar Products (PSP), Pigeon Peas (PP) and Rice in Malawi.
- ▶ The three markets were selected based upon their potential to grow, relevance to the poor, and where BIF2 could have the biggest impact.
- ▶ BIF2 supports through technical assistance to private sector by identifying the fundamental constraints to market development and proposes a series of interventions that will promote change to the market.

Pico Solar Products Market in Malawi

- ▶ PSPs: low-cost solar products that provide basic lighting, mobile phone charging and communication services.
- ▶ Selected by BIF2 because of the potential market (13.6 million people live off-grid in Malawi), and the affordability and accessibility for low-income households.
- ▶ The health, education and economic benefits to users are a primary objective of BIF2 engagement.
- ▶ Other available options – such as solar household systems (SHSs) and mini-grids – were also considered however the PSP market exhibited greater feasibility in terms of private sector activity and alignment with existing government / donor programmes.
- ▶ In the medium to long term SHSs for homes where there is no access to grid provision is a valid aspiration.
- ▶ Manufacturers and distributors cite the concept of the 'energy ladder', whereby in the long-term users progress from cheaper products to more expensive and highly functional products.
- ▶ However, until then, PSPs offer improved energy access for non-electrified households in the short to medium term.

The BIF2 focus

- ▶ Products that are potentially affordable to low income households, starting with the lowest price products with basic functionality (a single lamp and / or phone charging capability) currently selling at \$10 and up to approximately \$30.
- ▶ PSPs are the lowest priced solar goods on the market and there are now more than 30 companies providing quality-assured products to Africa.
- ▶ PSPs come in many forms, but each has three key components:
 - ▶ A small solar panel (<5Wp);
 - ▶ A rechargeable battery; and
 - ▶ An LED (light emitting diode) bulb

Market Structure and Performance

- ▶ Uses 'market systems' approach linked to Practical Action PMSD
- ▶ Identifies ways to change markets for the benefit of the poor.
- ▶ Implementing interventions to achieve market system change requires thorough analysis of the entire market.

(See slides on PMSD)

BIF2 Market Strategies and Interventions

- ▶ 1) Improved Marketing and Distribution Strategies
 - ▶ Addressing non-optimal marketing strategies, the lack of effective product promotion and limited supply chains.
 - ▶ BIF2 support will facilitate learning and analysis, and help provide focus to ensure investment in effective and profitable strategies.
 - ▶ It is expected that a small number of distribution channels and marketing strategies will prove to be superior, and that this innovation and discovery will offer learning for other players in the market.
 - ▶ Where necessary the improved strategies will promote new and expanded distribution and marketing partnerships.

BIF2 Market Strategies and Interventions...

▶ 2) Consumer Finance

- ▶ Addressing constraint related to consumers not being able to afford the purchase price of PSPs.
- ▶ This is despite poor consumers paying more for poor quality lighting (and phone charging) through small and regular payments according to household cash flows.
- ▶ Technology developments are expected to play a significant role in these models, with mobile money and pay-as-you-go at the forefront in reducing transaction costs and facilitating consumer credit.
- ▶ BIF2 is exploring support to one importer-retailer piloting a pay-as-you-go (PAYG) scheme, providing assistance to analyse and refine the business model.
- ▶ The intervention will support another importer-distributor seeking to establish a consumer finance offering in partnership with a number of MFIs

F2 Market Strategies and Interventions...

- ▶ 3) Market Intelligence and Influencing
 - ▶ The publication of a market trend report and the facilitation of a business forum / conference will be explored to promote business networking and encourage inward investment from different stakeholders.
 - ▶ Seeks to influence key supporting functions and rule makers to promote a sustainable commercial PSP industry, for example the establishment of an industry body and the implementation of a public awareness campaign.
 - ▶ BIF2 will play a supporting role unless circumstances change and there is reason to believe these partners are not able to deliver the outcomes required.



Thank you