



Household innovation & agency in mini grid energy access & use: A case study of households in Kenya

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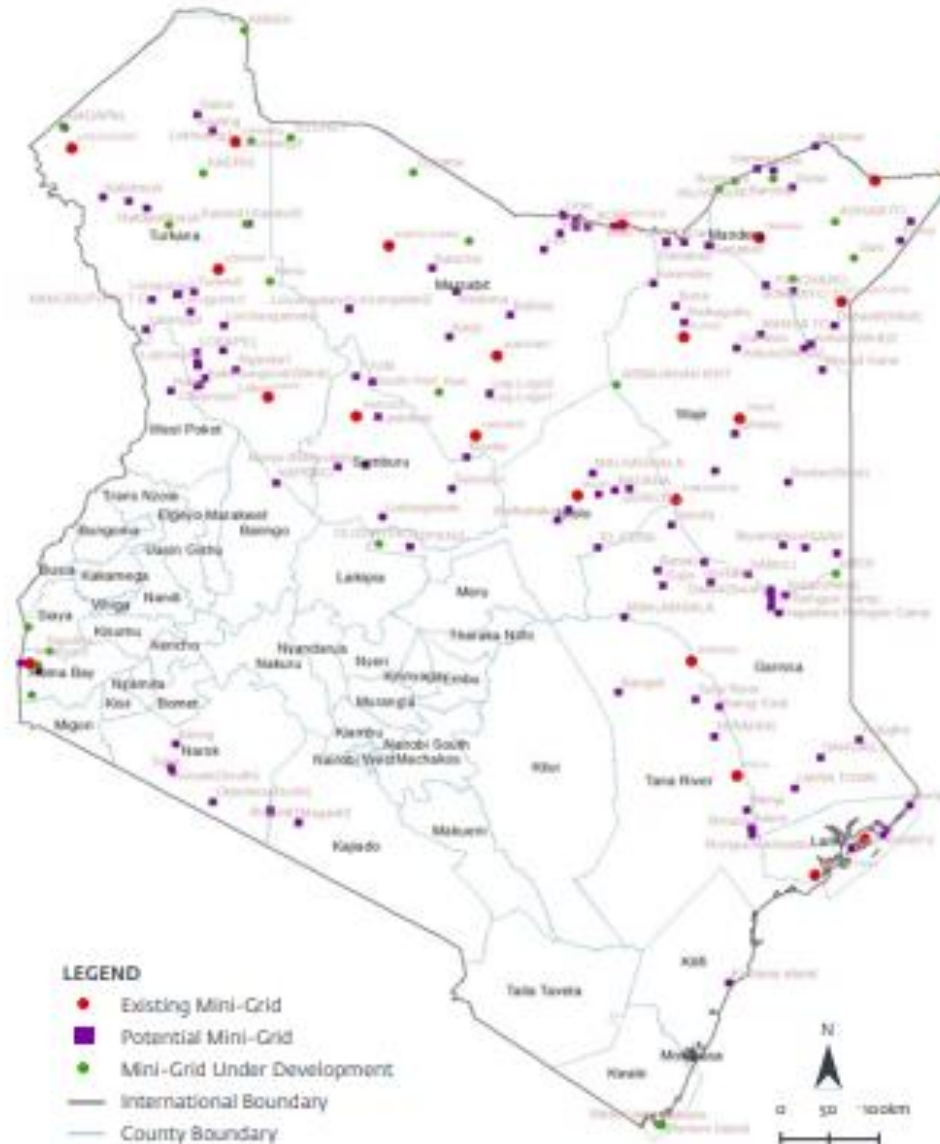
Outline

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Introduction

- Energy poverty challenge perpetuated by low electricity access is one which the Global South continues to contend with.
- This is due to:
 - Low-capacity demands
 - prohibitive costs associated with extending the grid
- Therefore, mini grids are thought as the next-best option to transition to low-carbon electrification (Zalengera et al., 2020).
- Development of mini grids presents an opportunity for private & government sector

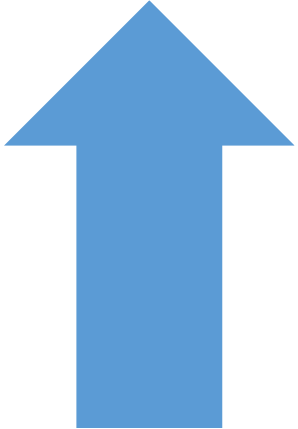
- In Kenya, strides have been made to improve electricity access; 75% access to electricity (both from grid and off-grids)



Introduction...cont..d


- A complex socio-technical innovation system around mini-grid development has emerged.
- The innovation system encompasses a network of actors from the private sector, development partner organizations, households, etc
- The heterogeneous nature of actors forming the network is mostly understood. The systems put in place by actors & characteristics of their operations that bolster or undermine their performance is understood (Jahangir et al., 2020; López-González et al., 2020; Nsengimana et al., 2020).
- However, households, who are the primary targets of mini grid projects, are largely considered a homogenous unit within the network, benefiting from the installed electricity generation projects

However, researchers hold divergent views on households



households as a homogenous unit (closed box)

(Moglia et al., 2011; Seebauer et al., 2019).



Households are dynamic and heterogeneous in nature (open box); (Bergman and Eyre, 2011; Lazowski et al., 2018; Strengers, 2011; Naus et al., 2014).

They interact with other units in a social system;

HH individuals differ in character, values, and beliefs and play distinct crucial roles in sustainability transitions

- Households play a significant role in determining the path taken by social innovations & use of resources (Raven et al, 2021)
- The decision made by households to participate or abstain from energy projects is important and is determined by various prevailing household dynamics
- These factors align with the agency exercised by households to determine the extent to which a household will participate in the transition.
- It is, therefore, crucial that the role of HH within this network is understood since it forms the basis upon which developers operate

Methodology

- Primary data collection;
 - Mini grids visited
 - 15 in Western, Central & Northern Kenya
 - Technology
 - Solar-11
 - Hydro-1
 - Hybrid -2
 - Status
 - Fully operational-11
 - Semi-operational-4
 - Decommissioned-1
 - Interviews (23) with:
 - Connected & unconnected HH
 - FGDs
 - Mini grid developers & their reps
 - Development partner
- Data analysis
 - Coding into Atlas to identify emerging themes.
 - Content & context analysis

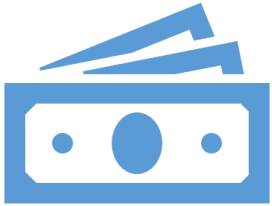
Household agency towards connection to the mini-grid

- HH agency activities before set-up leading to connection include:
 - Attending meetings chaired by mini-grid developers & other stakeholders,
 - Engaging in land lease agreements as determined by land tenure systems
 - Provision of labour during installation-paid or voluntary
 - Giving access to the developer to set up poles and ready boards
 - Payment of the installation fee
 - Agreeing to participate in the market surveys
 - Provide crucial information -willingness & ability to pay, energy needs, etc- which developers use for establishing mini-grids in the area.
- Some households conversely exercised agency by:
 - Not attending sensitisation meetings
 - Not connecting to the mini grid and choosing to retain their energy source

Household agency after connection to the mini-grid

- Agency after connection to mini-grids manifests in three ways;
 - Household engagement in activities that aid in coping with challenges they face after connection
 - Adoption to technology and
 - Modification of behaviour.

Coping with challenges after connection



Challenges faced after connection include:

- Technical and system failures
 - System failure prevents electricity auto-reconnection
- Mobile money service challenges
- Affordability of the electricity



HH exercise their agency and respond to the challenges by:

- Joining a constant learning curve and always learn how to overcome every energy related challenge and optimise how they use electricity
- Constantly being in touch with mini-grid operators for them to solve arising challenges
- Continuous discussions and engagement with mini-grid operators regarding:
 - Power outages, token depletion, delay in reconnection after payment, upgrade of the power tier.
- Continuously paying subscription their fees

Adoption to technology

- After installations, households have to pay for electricity, therefore:
 - Adoption of mobile money payment technology as the only mode of payment.
 - Learning how to; pay via Mpesa using their unique account numbers.
 - Learning how to correctly key in the unique number on the metre box after making payments.
 - The decision of choosing to pay for the electricity using the technology shows agency.
- Adoption of new appliances
 - Adaptation to & learning how to use electric appliances such as token metres, incubators and posho mills, electric pressure cookers

Behaviour modification

- Households modify their behaviour in relation to electricity use due to:
 - System failure
 - High costs of electricity
 - Outages
 - Rationing of electricity
- Forms of behaviour modification:
 - Energy stacking: electric cooking & charcoal, firewood, solar lamps
 - Regulation of the use of electric appliances e.g., iron boxes, EPCs
 - Opting not to use electric appliances e.g., EPCs, iron boxes

Household Innovation

- While adopting to the new technology, households have been innovative in the use of mini-grids
- Techno-economic innovation:
 - Making smaller payments Vs large payment. Smaller payments are perceived to last longer than larger ones.
 - Bypassing mobile money transaction charges by making payments of 100 Ksh instalments; transactions of KES 100 and below don't attract a transaction fee.
- Social innovation:
 - Leveraging on social networks that unconnected HH have with connected households to charge their electronic devices
- Economic innovation:
 - Venturing into unique businesses that didn't exist in the locality before e.g., cyber cafes, egg incubation, barbershops, posho mills.
- Mini grids developers have leveraged on household innovations to stimulate demand for electricity through productive use



Conclusion

- Households react differently to mini grids and electricity use and can therefore be considered as not homogeneous
- Whilst designing and distributing energy technologies, designers, and users (HH) are brought together through a myriad of activities and linkages forming a large actor network
- HH agency provides an avenue for the improvement of the engagement between the HH and mini grid developers thus contributing to the sustainability and continuity of mini grid projects
- Change in behaviour of household is important since behaviour change has the potential to generate innovations that can empower the community and lead to meaningful research and development in the mini grid sector.