

Social acceptance of Decentralized Renewable Energies in East African rural communities: preliminary evidence from a multiple case study

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Abstract

Africa is facing a severe energy crisis, with over 660 million people lacking access to electricity. Renewable energy (RE), including the decentralized ones, offers a promising solution to achieve universal energy access and promote sustainable development. However, the success of this energy transition depends also on the social acceptance of RE projects by local communities. This research study focuses on analysing the social acceptance of geothermal off-grid power plants in four East African regions: Homa Bay County (Kenya), Era Boru (Ethiopia), Lac Abbè (Djibouti), and Bugarama Valley (Rwanda). The communities involved in this study exhibit diverse livelihood conditions and primary economic activities. The study employs a multiple case study approach, combining the Social Representation Theory with a qualitative analysis of data collected through focus group discussions and interviews with community members and key stakeholders. Preliminary findings show that communities display varying degrees of openness and participation towards the geothermal project, and concerns include potential changes in the use of existing geothermal resources and understanding of the new technology. Community ownership, benefit sharing, and understanding of the technology emerge as key factors for social acceptance. Repeated interaction with researchers and understanding of the communities' precarious living conditions appear to influence their level of acceptance towards RE. Encouragingly, knowledge sharing and peer-to-peer communication within similar communities seem to improve acceptance. This study contributes to a deeper understanding of Social Representation Theory and the dynamics influencing the social acceptance of RE projects in Africa, providing valuable insights for the design and implementation of future initiatives. Managerially, underestimating social acceptance and its cultural underpinnings, especially in culturally distinct regions, can be critical. Further managerial implications will arise from ongoing data analysis. Our analysis faced limitations. Inviting diverse participants to focus groups proved challenging due to cultural factors, like gender roles in some communities. Additionally, historical political dynamics may influence RE acceptance. Time constraints prevented revisiting all sites. We recommend future longitudinal studies on social acceptance and communication's impact on socio-cultural factors.

Key words: *energy access; social acceptance; decentralized renewable energy; social representation theory; Africa; rural communities.*

Framing of the research. *Africa is facing a serious energy supply crisis, leaving more than 660 million people without access (IEA, 2022b), just 570 million in Sub Saharan Africa (Liu, Y., & Bah, Z. (2021). The increasing energy demand in the region, fuelled by population growth forecasts, is a major obstacle to sustainable economic development (Adenle, 2020). Improving energy access in Sub-Saharan Africa has the potential to improve, among the others, healthcare, life expectancy, education, recreation, economic opportunities, and gender equality (Opuku et al., 2021; Musango et al., 2020). The lack of infrastructure and poverty are the main reasons for energy access issues in Africa (IEA, 2022c). Energy poverty remains a pressing challenge, also limiting clean cooking technologies (IEA, 2022). Moreover, energy poverty, in a vicious circle, resulting from poverty and perpetuating poverty, hinders development, and disproportionately impacts rural communities (UN, 2021). Fortunately, Africa boasts vast renewable energy-RE potential, offering a promising path towards a brighter future (Bugaje, 2006). Especially in rural areas of Sub-Saharan Africa, RE is considered as a channel to development and livelihood transformation (Liu & Bah, 2021). According to the IEA's NZE scenario, by 2030, more than half of the population will gain access to full electricity through decentralized solutions like mini-grid and stand-*

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alone systems, with 90% of them using renewable energy sources (IEA, 2022). Decentralized Renewable Energies-DREs present a compelling alternative to grid extension in SSA, simultaneously driving energy access and fostering socio-economic development (Mandelli et al., 2016), especially for rural areas and communities.

DREs, as other power plants, need stakeholder support for their implementation (Enserink et al, 2022). Indeed, stakeholders can influence a project by playing a supporting and/or hindering role. At the same time, stakeholders are influenced by the outcome of REs (Ruggiero et al., 2014). Among the different type of stakeholder support, DREs need acceptance; acceptance is a challenge developing countries too (Hosseini et al., 2018). When dealing with development of RE, social acceptance is insufficiently covered by issues of technology design (Dewin-Right et al., 2017). Social acceptance can be measured also ex-ante, with collecting stakeholders' perception and ensuring a match with expectations (Prosperi et al., 2019). Within social acceptance, the community acceptance dimension refers to the specific acceptance of siting decisions and RE projects by local stakeholders, particularly residents and local authorities (Wüstenhagen et al., 2007). Moreover, communities are central actors in current low-carbon energy transitions (Küpers & Batel, 2023). Low-carbon transition is even important in Sub-Saharan Africa, where rural communities suffering from lack of clean energy access can benefit in terms of social development (Casati et al., 2023). Social - and community - acceptance can bring success for developing community-based projects, particularly when implemented with a bottom-up approach (Velasco-Herrejon and Bauwens, 2020). Acceptance of RE can be favoured by community engagement (Jami and Walsh, 2017). Community engagement can help in developing trust and dialogue for the mutual benefit of all involved (Ryder et al. 2022). In Africa, lack of community engagement has been demonstrated as a possible barrier to the DRE project's durability (Akinyele et al., 2018), such as the practice of using only outsiders to plan and execute local community projects could be a recipe for the failure of the systems (Nuru et al., 2022). Community engagement and social acceptance can be favoured - and studied by scholars - through participatory processes, as previous research has successfully demonstrated (i.e.: Alvial-Palavicino et al., 2011; Dewin-Right et al., 2017; Geekiyanage et al., 2020; Jami and Walsh, 2017; Liu & Bah, 2021;).

Purpose of the paper. Theory-building research on the social-cultural dimension of acceptance of RE is in its infancy (Jami and Walsh, 2017). Research has shown that different theoretical approaches may only capture limited aspects of how society - and communities - perceives energy technologies (Batel, 2018). They may overlook the contributions of various stakeholders, their expectations and engagements, and the varying manifestations of technologies on different levels (Dewin-Right et al., 2017). Our analysis starts from the community acceptance dimension proposed in the framework by Wüstenhagen et al. (2007), theorizing a holistic approach to social acceptance. The paper by Wüstenhagen et al. (2007) is a ground-breaking in the field of research, not only establishing it as a distinct area of study, but also organizing previous research and outlined a direction for future research on the social acceptance of RE, urging a focus on the relationship between opposition to RE and various socio-political, market, and community factors, rather than relying solely on the NIMBY explanation (Batel, 2020). Moreover, Dewin-Right et al. (2017) call for understanding which socio-cultural aspects shape the public acceptance of RE. In addition, Batel (2020) wishes to further develop, at an empirical level, the research on dynamics of people's responses to RE at local level. Dewin-Right et al. (2017) suggest this must be done through examining the communication, both coming from third parties and among the members of the communities, within focus group discussions with members of communities engaging with or affected by RE. We have answered to these calls for research through the lens of the Social representation theory (Moscovici, 2001; Wagner, 2011). Social representations theory examines the evolution of social knowledge, focusing on the psychological and social processes that shape how individuals and communities interpret and adapt to new ideas or technologies like RE adoption. This theory suggests that understanding these changes occurs at both the individual and societal levels, with communication playing a key role in knowledge construction. Social representation theory helped us in analysing and understanding various socio-cultural aspects that can favour social acceptance, including resistances, ability to understand new technology, effects of local beliefs and behaviours (including religious and cultural one), etc. Power dynamics among actors also influence how information is shared and understood (Dewin-Right et al., 2017). Hence, we have also looked for differences in the ability to accept the technology depend on the nature of the stakeholders. Our Research Questions are: "How do socio-cultural aspects shape the community public acceptance of RE? How do local community dynamics affect people response?"

Methodology. Our research employs a multiple case study approach (Stake, 2013; Yin, 2015), with different sites for each case study. We took part of a participatory process for a feasibility study on the design of an off-grid geothermal plant, catering to both direct and indirect uses, across four geographically distinct regions in four different countries in East Africa. The regions/counties/districts involved were Homa Bay County in Kenya, Era Boru in Ethiopia's Afar Region, Lac Abbè in Djibouti, and Bugarama valley in Rwanda. These communities exhibit diverse livelihood conditions and primary economic activities. Homa Bay County in Kenya is community of both farmers and fishers, living in an old volcano site. Geothermal energy is present and is used mainly for religious and healing reasons, as well as recreational. The same similar conditions are present in the Bugarama site in Rwanda, with the difference that the communities live mainly from subsistence agriculture and the cultivation of rice and fruit trees. Era Boru and Lac Abbè are morphologically and geographically distinct, as well as culturally. The two sites are united by the presence of the same community, the Afar. The Afar are separated by the border between Ethiopia and Djibouti but share the same cultural customs. The Afar live mainly by pastoralism and are a semi-nomadic community. The sites of Era Boru and Lac Abbè are in the hottest places on Earth, and the population has developed ways of living that depend on the direct use of geothermal energy as a source of water. Each site presents differences inside. For instance, within Homa Hills, three locations directly participate in geothermal direct utilization, while two locations are neighbouring. While belonging to

the same linguistic and cultural groups (Luo people), the communities showcase distinct social characteristics. In Homa Hills, for instance, some communities are solely focused on agriculture, whereas others primarily engage in fishing on Lake Victoria.

Willing to study socio-cultural aspects that can favour social acceptance through the lens of Social Representation Theory, we adopted a qualitative grounded theory approach (Chun Tie et al., 2019). Data collection was done priorly with desk research aiming at understanding the communities' features. Then, we conducted at each site, and within various sub-locations, primary data collection.

Data collection methods included focus group discussions (FGDs) and semi-structured interviews with key stakeholders and community members with an interest in the project. These stakeholders encompassed citizens, public authorities, and representatives from non-governmental organizations (NGOs). Each FGD lasted approximately three hours, while interviews averaged one and a half hours. FGD participants were chosen through a random selection process within the community, ensuring representation of various social categories (e.g., occupation, gender, age, community role, religious leaders, etc.). During the FGDs, a research team of three to four individuals with diverse backgrounds (e.g., economist, anthropologist, sociologist, geologist) was present, accompanied by a simultaneous interpreter and translator. To facilitate comprehensive discussions and capture nuanced perspectives, participants were encouraged to express their opinions in their native language (DhoLuo in Kenya, Kinyarwanda in Rwanda, Afar in Ethiopia and Djibouti). We conducted seven FGDs in Kenya, two each in Rwanda, Ethiopia and Djibouti. Interviews span from a minimum of four to a maximum of fifteen for each site. Primary data collection was done between November 2022 and November 2023. Moreover, we visited one of the sites twice, a year later. This second stage enabled a deeper exploration of socio-cultural aspects and communication, both coming from third parties, considering the presence of external actors. All FGDs and interviews were audio-recorded and transcribed by a native mother tongue for each of the languages, resulting in a significant and paramount volume of transcribed data. Data analysis and coding were performed using a combination of manual techniques and dedicated software (i.e., NVivo) by a team of two researchers working collaboratively.

Results. *The analysis of the results is always ongoing, so only preliminary evidence will be presented below. The communities immediately appeared different both in their willingness to participate in the participatory process and in their acceptance of the geothermal plant. Although they were given many opportunities to design the system and be involved in the subsequent phases, some populations immediately showed a bit of reluctance towards the intervention. Others showed concerns regarding the possibility that this plant could change the use that was already being made of the geothermal resource. Some populations, however, have shown interest and openness to possible substantial changes in use, as long as benefits were achieved. Some other populations have demonstrated ability to understand new technology, others less so. In both categories, some were willing to participate in various ways. Surely, communities' members knowledge of RE is very different within the community, depending often on the role inside the community and on the background of individuals. For instance, sometimes, have a certain public role (i.e, public officials) can bring members to be more open-minded. This, at the same time, may be caused to the public role effect on expressing opinion in public.*

A theme that emerged is the possible ownership of the power plant by the community, as long as there is sharing of information first. Nevertheless, ownership is not to be understood in the strict sense. Finally, the site that was visited two times gave interesting results on the effects on community acceptance due to multiple interactions, which were also methodologically different from each other. Another research result, which seemed evident to us, depends on the starting condition of the populations. These populations often live in conditions of accentuated poverty. This can make them accept RE at any cost. Finally, we observed how during the discussions, the community knowledge of RE was influenced both from the intervention of third parties (i.e, experts) and from the discussion within the community, with social processes shaping how individuals and communities interpret and adapt to new ideas on geothermal energy. These results confirm what Social representation theory states, with changes in knowledge construction occurring with the key role of communication.

Research limitations. *Although the data collection was very comprehensive, our article is not without limitations. First of all, when we got into the cases, we realized that, although we had tried to invite more actors to participate in the FGDs, this did not happen, also for cultural reasons. For example, some communities, by religion, expect men to make decisions. So, even if women were present in the FGDs, they often did not speak up or seemed embarrassed to counter men's theories. Another limitation, however, depends on how the ethnic group has experienced some national political dynamics in recent decades. This could affect the willingness to accept the RE regardless of their goodness. Finally, it would have been interesting to return to all the sites twice, but this was made impossible due to time and resource constraints. We suggest further research on longitudinal study on social acceptance and the effect of communication on socio-cultural factors.*

Managerial implications. *The first managerial implication of this article is that the issue of social acceptance for DREs in Sub Saharan Africa should not be underestimated. Above all, the socio-cultural factors behind social acceptance must not be underestimated, especially in areas where the populations have very marked cultural characteristics. What seemed positive to us, however, is the impact of knowledge on social acceptance and of two-way communication made by peers, as when members of similar communities from the same nation were invited into the community. Other managerial implications will emerge as the data analysis continues.*

Originality of the paper. *To the best of our knowledge, the field of social acceptance of DREs in Sub Saharan Africa, looked through the lens of Social Representation theory, is quite new in the management literature. Moreover, RE are still underdeveloped in Africa and new projects could take inspiration from the methodology and managerial implications of our article.*

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