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# Solar powered electricity access: Implications for women's empowerment in rural Kenya

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ABSTRACT

This paper examines the gendered implications of various types of electricity access in rural Kenya spanning from the central grid to solar-based systems such as community projects, village scale supply and private solar home systems (SHS).

Drawing on material collected in Homa Bay and Kitui counties in 2016, the paper examines the gendered set-up, organisation and effects of solarpowered electricity access as compared with the central grid. The paper employs a framework for analysing women's empowerment through electrification, which draws on Kabeer, Friedman as well as anthropology, socio-technical system theory and practice theory.

The results show that people tend to cherish solar-based solutions whereas the grid is perceived to be costly, unreliable and unavailable. As to the gendered organisation of supply, men dominate within the grid, mini-grids and private suppliers, leaving an important potential for women's empowerment untapped. Two community projects included women's 'hands-on' participation and spurred local discourses about women's capabilities.

Access is also gendered on the user side. Because men tend to own the houses, have a higher income and a moral right to make major decisions, fixed connections and high subscription fees provide women with less agency than what is the case in decentralised systems of supply.

> "Electricity [from the grid] is unreliable even when there is sunshine."
>
> Woman with a connection to the national grid as well as a solar home system.
>
> God-Bura village, Homa Bay, Kenya, October 2016

## 1. Introduction

Promoted by the private sector in particular, solar powered electricity services are rapidly growing in rural Kenya. At the same time, driven by the Kenya Vision 2030 and two key political projects (see below), the government is expanding the national grid, and has recently started to look into providing off-grid solutions. Internationally, the emphasis on universal access to electricity has never been more pronounced, as reflected in the Sustainable Development Goals (SDG). One of the targets for Goal 7 on energy[1] is the "proportion of population with access to electricity" [1, p. 23]. Following the "Global Tracking Framework" (GTF) as identified by the Sustainable Energy for All initiative (SEforAll), electricity access is not a binary entity. Rather, a multi-tier framework is used, acknowledging various levels of access, spanning from tier 0 (no access) to tier 1 (provision of some light for some hours)[2] up to tier 5 which implies continuous supply and the use of power-demanding appliances and machines. The framework also aims to take affordability and reliability into account; hence, it is not evident that grid connections provide a level of access corresponding to tier 5. However, we diverge from the GTF in that we consider electricity access to be people's *actual* subscription to and use of electricity's services rather than their (hypothetical) possibility to do so.[3]

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[1] SDG Seven: "Ensure access to affordable, reliable, sustainable and modern energy for all." [1].

[2] More specifically, tier 1 includes supply/capacity of 3 W, 20 Wh or 1000 lm h per day. Also, duration of supply should be minimum 4 h during daytime and minimum 1 h in the evening [37, p. 175].

[3] In the GTF, access to energy is defined not as actual subscriptions but as the "ability of an end-user to utilise an energy supply that can be used for desired energy services" when issues such as affordability and geographical location are accounted for [38, p. vii]. Because "ability" to utilise electricity is difficult to establish in practice, this definition remains theoretical and is therefore not purposeful in the present work.

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The aim of this paper is to examine the gendered set-up, organisation and effects of solar-powered electricity access as compared with the grid. We are particularly concerned with understanding how various types of access may contribute to women's empowerment (see below). In a context such as rural Kenya where various solutions are being promoted, it is important to examine the gendered aspects of various types of electricity access and how and to what extent electricity reaches and benefits various groups. We draw on qualitative material collected in rural areas in Homa Bay and Kitui counties in 2016. The systems of provision span from the national grid to solar-based decentralised systems (community projects/village scale supply) to private solar home systems (SHS) and solar lanterns offered in the market.

We assume that two types of "forces" contribute to shaping social practices and thereby people's actual access to electricity. First, there are systems of provision that are developed and promoted, making electricity available. Second, there are various types of end-users, situated in a particular socio-cultural context, who may or may not desire to obtain access for a range of reasons. Both end-users and systems of provision are socially constituted [2–4]. A large part of the literature on gender and electrification centres on end-use in terms of electricity's impact on women, men and children's welfare (for a review, see [5]). However, as pointed out [6,7,5], relatively few studies have looked at the gendered organisation and set-up of supply and the implications thereof. Among the exceptions, Ahlborg [8] conceptualises (power) relations of class and gender suffusing small-scale electricity systems. Standal et al. [9] address the gender dimensions in energy politics and Jenkins et al. [10], addressing energy transitions more broadly, call for a need to focus on energy justice so as to avoid entrenching gender bias and other forms of inequality. There are empirical examples showing that women's involvement in supply has had wider, positive impacts on gender norms in local communities [11], [12]. In comparison, gender-neutral processes have resulted in men rather than women becoming involved in systems of provision [13,14]. In the present discussion, we scrutinise how various types of electricity access are being constructed and gendered, and the implications of this for women's empowerment.

We regard women's empowerment as the process towards gender equality. Elsewhere [5] we developed a framework for analysing women's empowerment in the realm of electricity, in which we build on Naila Kabeer's work on empowerment (1999, 2001) and more general social theory.[4] In this paper, we draw on this framework (Table 1), which identifies three generic empowerment dimensions: *i) rights, norms and social position, ii) access to resources and iii) influence over decisions (agency)*. In the rural Kenyan contexts in question, women and men tend to have unequal access to such privileges, and we seek to understand whether electricity access in any way influenced the situation by providing empowerment for women. The framework also invites attention to negative events as a result of the intervention, conditional factors and women and men's degree of involvement and agency in the realm of the intervention, both on the supply side and in their role as subscribers and end-users. Of note in the present discussion is that women's inclusion in supply is regarded both as a possible conditional factor for women's general empowerment (measured through the three generic dimensions) and as a separate criterion for measuring empowerment through an intervention. The latter follows from the presumption that women, too, have a right to participate.

As indicated in Table 1 (highlighted fields), the present discussion primarily focuses on agency in terms of decision-making processes surrounding access and subscriptions; the purposefulness, affordability and challenges associated with various types of access; and signs of changes in gender norms and women's general agency and social position as a result of various types of electricity interventions. Potential long-term impacts on women's empowerment from using electricity's services, e.g. through improved public services or exposure to alternative gender discourses through television, are not treated in the present discussion. Rather, we specifically explore the relationship between gender and electricity access including decision-making regarding electricity's uses. In the following, Section 2 presents the position of solar power in Kenya and the policy and regulatory framework. In Section 3 we account for the methods used and provide an overview of the systems of provision available in the two study areas. Section 4 provides a contextual description of the two selected case study areas, Homa Bay and Kitui counties. In Section 5 we present findings on the gendered set-up of supply including the supplier-customer relationship and the gendered processes of implementation. In Section 6 we focus on decision-making and access to electricity in people's homes. In Section 7 we discuss the results, and Section 8 provides some concluding remarks and recommendations.

## 2. The position of solar power in Kenya

Kenya has a current population estimated at 46 million people, of which approximately 70% are rural [15]. Power generation is dominated (87%) by hydro and geothermal power [16]. Utility scale solar power generation plays only a niche role, although there are several pipeline projects under development [17]. Household connection rates average 32% across the country, but only 5% of rural households are connected to the grid.[5] This varies in different counties, with less than 3.3% household access in Tana River County in Kenya's Eastern Province [18], a county adjacent to Kitui County, included in the present study. Research carried out by in Western Kenya found that even in "seemingly ideal" conditions for rural electrification, that is, where there is high rural population density *with* grid coverage, electrification rates still remained dismally low, averaging 5% for rural households and 22% for rural businesses [19]. In addition, recent media reports have claimed that connection numbers are inflated because a large number of the meters (counted as connections) are non-vending.[6]

Kenya has long been known for its private sector-driven off-grid solar PV market [20] which has developed with the support of donors [21]. In recent years, diffusion of solar home systems (SHS) in rural areas has escalated dramatically primarily due to the ability of innovative companies to offer them on an incremental finance basis, with daily payments to match a typical rural household's expenditures on kerosene and phone charging. These companies have packaged together global technology innovations (LED lighting and Li-ion battery technology) and cost reductions in global solar PV prices; together with remote, automatised control systems and mobile money platforms such as M-PESA to develop plug-and-play systems ranging from 5 W to > 100 W, available off-the-shelf on credit from a nearby retail outlet. Recently (2017), Kenya Power, with financial assistance from the Nordic Development Fund, has installed 300–400 small PV charging systems in villages (distributed in eight different counties), including approximately 12.000 solar lanterns (expecting to reach 24.000 as the project evolves).[7] There has also been technological, economic and organisational innovation[8] in solar mini- and micro-grids; however, both the number of such supply systems and the uptake of connections remains limited. This is partly linked to regulatory barriers that hinder private sector investment (see below).

**Policy and regulatory context**

Gender equality is enshrined within the Constitution of Kenya. This supreme law directs the state to take measures that include legislation, affirmative action programmes and policies, representation in Parliament, and implementation of the principle that not more than

[4] Socio-technical system theory and social practice theory.

[5] HH electricity access at 32% across the country; with 51% urban and 5% of rural households connected to the grid [39]

[6] See for example Wafula [40], Okoth [41], Omondi [42].

[7] Communicated by Mr. Henry Gichungi, an engineer participating in the programme.

[8] Metering; remote control systems; mobile money payments.