



Access to Reliable and Affordable Electricity for all Kenyans – and How Gender Matters

Research Brief for Policy and Practice

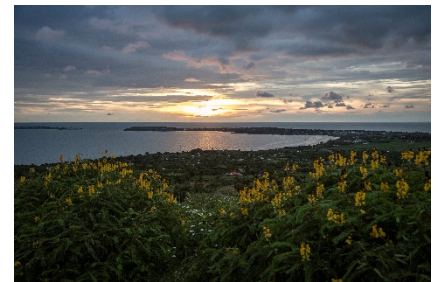
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Equitable access to reliable and affordable electricity for all is a high priority for Kenya and other countries in Sub-Saharan Africa. This policy brief gives insights into key factors that affect progress towards this goal and shows that attention to gender is fruitful.

This policy brief is likely to be relevant not only for Kenya but also for other countries in Sub-Saharan Africa. It is based upon research that was carried out in 2015-2018, in rural areas in Homa Bay County in Western Kenya and in Kitui County in Eastern Kenya.¹ The case study sites were selected because of the availability of several supply options; both from the main grid and a range of decentralized solutions. Our approach considered women's empowerment as a process towards gender equality, and therefore requiring analytic attention to both women and men; girls and boys.



Photos: Sven Torfinn/ENERGIA

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1 Introduction

The overall research objective was to account for the various factors that enhance and restrict women's opportunities and empowerment through electrification, both as users of the electricity services and as involved actors in the provision of electricity. Among these factors, the project looked specifically at:

- The choice and design of technological system, with a specific focus on comparing grid and decentralized solutions for electricity supply;
- The process of electrification and the management and operation of the systems;
- Socio-cultural factors (e.g., gender ideologies, roles and relations, household finances, poverty, etc.);
- Policy, regulations, financing schemes and the role of international actors

The project examined and compared these issues for various types of interventions in different local contexts in India, Nepal and Kenya.

This policy brief is based upon the findings from the Kenya component of the research, but where relevant it also draws upon the comparative situations in the different country contexts.

2 Research Findings

2.1 Access to Electricity: Poverty Remains a Key Constraint

In Homa Bay County 59% of households in the researched villages had *no electricity provision at all*, despite access to, or proximity to either (or both) on- or off-grid sources of electricity. Only 6% of households had grid access² and 35% had access through decentralized solutions such as solar home systems.

The results align with the finding that in many parts of rural Kenya where the grid has been extended the overall picture is that actual connection rates average at only 5% (Lee et al. 2016)³, despite significant public investments into rural grid extensions.⁴

There are multiple barriers to grid connections, ranging from physical (the distance between the household and the transformer) through to the resources, capabilities and priorities of the power utility. Our research strongly highlights that affordability is a major barrier to (i) connections to the grid and (ii) the on-going consumption of electricity.

Fluctuating low incomes as a result of growing seasons play a significant part in considering affordability. Our work in East Kitui found that low-income rural household spending patterns tend to prioritize other purposes for spending over energy for basic needs (electricity for lighting and phone charging, biomass for cooking). The picture is similar in the study sites in Homa Bay County. The impacts of climate change are also tangible, manifesting in less water availability, longer droughts, more frequent extreme weather events and, as a result, diminishing and less predictable household incomes.

Decentralized renewable power supply systems (such as pico solar lanterns; solar home systems; solar charging stations and minigrids) have become important alternatives to the main grid. Access rates to these solutions are higher than that of the main grid (35% of households have some sort of solar system). Innovations such as pay-as-you-go-solar have unlocked accessibility and affordability constraints for some of the off-grid market, but to many people (59% of households), any kind of electricity still remains out of reach. Our results highlight that despite significant gains in an area considered as one of Kenya's "solar hot spots" poverty remains a key constraint to electrification, despite the availability of new solutions.

² In areas where the grid was present.

³ K. Lee, E. Brewer, C. Christiano, F. Meyo, E. Miguel, M. Podolsky, J. Rosa, C. Wolfram, Electrification for 'Under grid' households in rural Kenya, *Dev. Eng.* 1 (2016) 26–35

⁴ The Kenyan national rural grid access rate was reported to be 16% in 2015-16 (International Energy Agency, *Tracking SDG 7: The Energy Progress Report* (2018, 140), but empirical studies suggest this is overestimated.

Whilst affordability affects all rural households and small businesses, gender differences also play an important role, because women earn less than men. In the case study area in Western Kenya, we found that women's income was only 38% of the men's. This difference is substantial in itself, but becomes starker when considering particularly vulnerable groups such as widows or single mothers. Our findings showed that the majority of women within these groupings had no access to electricity whatsoever,⁵ whether the main grid, or off-grid solar power (including the smallest 'pico solar' solutions), despite both of these options being present and in theory accessible to them.

For most of these women, who constitute a significant proportion of the poorest and most vulnerable households in Kenya, nightfall literally means complete darkness. They are being left behind by both public and private initiatives in rural electrification because they simply cannot access or afford either of them.

2.2 Grid Reliability and Off-Grid Quality Issues: Hidden "Levies" on Rural Kenya and, in Particular, the Poor

Kenya has made tremendous gains in its rural electrification and last mile grid connection programmes. However, at the very extremities of grid extended lines, we observed a lack of grid reliability that has an underlying vicious circle: people are too poor to connect and consume the electricity; too few users and limited consumption makes the lines unprofitable and challenging to maintain, which in turn feeds into an unreliable grid.

This vicious circle is exacerbated by problematic legacy issues of poor quality grid extensions in the past: sub-standard transformers and other installations contribute to unreliability, make lines even more expensive to maintain and further diminish the value of expensive public investments into infrastructure.

During our research in both Kitui and Homa Bay Counties, we heard many cases showing how the poor bear heavy costs to unreliable electricity supply, whether in public services or in their own private endeavours. These costs are implicit in the *alternatives* to supply that people have: either to simply continue as they have without electricity, or to procure expensive alternatives as back-up solutions. There are also additional costs to the frequent brownouts which can ruin appliances and equipment, with methods of recourse far harder to access than in urban areas. We came across schools that had to suspend after-hours tuition and boarding facilities for its crucial exam-going years when electricity became too unreliable and then disappeared altogether. All of the rural clinics we met with were unable to store vaccines or blood, and in several cases, despite the presence of the grid lines nearby, night-time emergencies and maternal deliveries were conducted by torchlight. A small carpentry shop spoke of how electricity brought productivity and efficiency to the business, but with increasing unreliability, costs have escalated: the shop has had to procure an expensive diesel generator and every time there is a power outage, a batch of work has to be discarded.

Off-grid solar solutions also suffer from unreliability issues mainly through the prevalence of poor quality solar products in remote rural areas. Far from the reaches of the Kenya Bureau of Standards or Lighting Africa quality programmes, these products often have poor lumen levels and short lifetimes. This negatively affects the poorest families the most, because whilst people may desire the convenience of solar electricity, they cannot afford the better quality solar products and make their purchasing choices accordingly.

In both on and off-grid situations, the potential for exploitation is high, especially at these extremities where a lack of clarity is prevalent, loopholes exist, and people are unaware of who they might contact to resolve these issues of unreliability and poor quality. We observed several instances during in which single mothers and widows had been sold barely functioning poor quality solar products. In other cases, it was unclear to people whom they should contact for a grid connection⁶ or reporting power cuts and there was a variance on what

⁵ In our sample of 200 households surveyed, 35% were households headed by single mothers and widows. 75% of these households did not have access to either grid electricity or off-grid solar power. In contrast, in households where men also resided, the proportion was a lower 40% without access to either grid or off-grid solar power.

⁶ With people confusing the roles of the Rural Electrification Authority and that of Kenya Power

people perceived they should pay for a connection. We heard about cases of extortion for connections: people charged much higher than the actual mandated last mile connection fees. It may not be the norm throughout the country, but at the margins of the grid, these practices that exploit vulnerabilities, including a simple lack of awareness and information, are present. Women are particularly prone.

All of these examples illustrate how both the *lack of electricity* and *unreliable electricity*, undermine the potential of policy interventions and infrastructural investments towards critical Government priorities in education, healthcare and economic development. This, of course, impacts both genders but in many of the very basic necessities, women and girls are hardest-hit: curtailed schooling; poor maternal and child health outcomes; high insecurity and high costs of rural production.

2.3 Electricity has not significantly reduced Women's Drudgery

Improved infrastructure is considered as one of the important means for ending discrimination against women (SDG 5). Numerous studies on rural electrification have documented positive effects of electrified public services on women's and girls' empowerment in terms of increased human resources as a result of better health outcomes and opportunities for learning. As noted above, these effects are hindered by unreliability and poor quality. Mobile phones have almost become universal in Kenya, widely used by both women and men.⁷ The mobile phone is a significant communication resource for people living in rural areas, which enhances their access to social networks and for mobile money services (transfers and banking), and which have been very important in extending the reach of financial inclusion. We observed that whilst all these positive effects were highly noticeable during our research, they are also constrained to differing extents by the unreliability and poor quality issues.

A striking finding from our research is that electricity has not brought significant improvements in peoples' access to water and in the way that they cook. Both of these tasks are traditionally seen as women's roles, with predominantly girls (but also some boys) facing the burden of water and firewood collection. Water collection remains the main type of drudgery for women in our study sites: we found that households spend up to two hours a day collecting water either from centralised water points (typically boreholes) or directly from open water sources such as shallow wells or Lake Victoria. In most cases, we found water supply was not targeted for electrification during the design stages of a rural electrification programme. When it was, the failure to improve services did not derive from limited capacity in the electrical systems, but from irregular and poor quality supply together with a lack of investment in water infrastructure.

Cooking is complex in the consideration of social norms and practices, affordability and the availability of alternatives to primary fuels currently in use. The use of firewood was the norm in the case study sites, only one household in our survey had (but hardly used) an electrical cooker. Under certain conditions, it is possible to transform the way people cook in order to release time spent on collecting firewood, but it does depend upon context and upon holistically designed Government programmes that include private sector stakeholders (e.g. for cooking appliances), relevant tariffs and subsidies and campaigns around behavioural change. We did not find evidence of this in Kenya, but our counterpart research in Nepal found the prevalence of electric rice cookers in areas where firewood for cooking used to prevail⁸.

In summary, our research shows that electricity has not significantly reduced women's drudgery or improved people's health, neither through improved access to and quality of water supply nor modified the traditional, time-consuming cooking practices. This constitutes a missed opportunity for women's empowerment because it negatively affects their time use, health and safety. Such services do not just depend on electricity but when supporting infrastructures are also in place, reliable electricity access can dramatically improve conditions. As such, the power of electricity to reduce drudgery is yet to be realised.

2.4 Electricity and the Opening up of New Opportunities

⁷ In the study area in Homa Bay, 91% of the households kept at least one phone (1.62 phones in average).

⁸ Matinga, M.N., Gill, B., & Winther, T. (2019). Rice Cookers, Social Media, and Unruly Women: Disentangling Electricity's Gendered Implications in Rural Nepal. *Frontiers in Energy Research*, 6(140)

Our research looked at factors such as house and land ownership through to electricity subscriptions and choices in what appliances are used, where they are used, by whom, and how. Ultimately, electricity's development objectives envision the expansion of electricity's uses from the current status quo of basic or convenience appliances (such as for lighting and phone charging) into applications for productive purposes. Once again, affordability, accessibility, and poverty impact upon peoples' ability to access and purchase such appliances; and the quality and reliability of supply impact upon how they are used.

The study finds that men's higher involvement in electricity in both the supply and customer side, social and cultural norms that guide men's long-term control of assets as well as men's higher level of income and status as family providers have a bearing on decision making on appliances used in the house and small businesses. They are part of a complex set of factors that hinder women in accumulating wealth and deciding upon and investing in appliances of their choice. So whilst both men and women are impacted (e.g. poverty constraints), women face the bigger hurdles.

Our findings further show that whilst, by and large, electricity has enabled longer working hours and to some extent more efficiency in some aspects of production, it has not fulfilled the ambitions of opening up new businesses and opportunities in rural areas as a result of investments into grid infrastructure. It is not sufficient just to provide the electricity infrastructure or access to small solar home systems, additional support mechanisms are necessary in order to unleash those additional potential opportunities.

2.5 Involving Women in the Supply of Electricity Challenges Gender Norms and Changes Practices for the Better

The electricity sector in Kenya is a male dominated realm. In Kenya Power for example, there are currently 3.9 times more men working than women, although in recent years there are good signs of progress towards a better gender balance among staff and in leadership positions, including at the board level of the company.

Gender equality is enshrined in the Constitution of Kenya, the supreme law directing 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 two-thirds of elective or appointive bodies may be comprised of members of the same gender.⁹ This has been a significant driver of change across all spheres nationally, including the energy sector.

According to scientific literature on gender, a diversity of life-work experience in organizations and companies improves their performance and capacity for making innovations. Improving the gender balance is therefore an opportunity to improve the way the sector works. Balancing the genders is also an issue of justice and equal rights to jobs, opportunities, and to knowledge and skills.

A challenge for obtaining real gender balance in the sector – whether in the public or the private sector – is the structural issue that the number of women who study engineering and other technical related subjects is still low and hence the talent pool from which to recruit women is limited. This follows on from a low number of girls who choose STEM subjects¹⁰ at high school and beyond and therefore have limited confidence to enter such roles, which in itself follows, in part from the high secondary school drop-out rates by girls, especially in rural areas.

Furthermore, positions involving installation, operation and maintenance of energy systems particularly in rural areas are often seen as risky and unsuitable for women. Kenya Power has had some interesting initiatives in this regard: creating recruitment and training opportunities specifically for women; providing good facilities (including separate washrooms for female and male staff), working conditions (e.g. flexibility on night shifts) and security for women in remote power stations, including the prevention of situations where a woman would be alone amongst male staff. During our household surveys, security in daily activities such as bathing or going to the market was an issue raised not just by women, but also by some courageous men and boys – and whilst

⁹ Winther, T., Ulsrud, K., & Saini, A. (2018). Solar powered electricity access: Implications for women's empowerment in rural Kenya. *Energy Research & Social Science*, 44, 61-74.

¹⁰ Science, technology, engineering, mathematics

most men may not feel confident to report their feelings of insecurity in field jobs (perhaps for fear of appearing “weak”), by making the workplace and field conditions safe for women, it also addresses security for men.

Part of our research also looked into the set-up and organization of two cases of community energy supply which were operated and managed by women. These were a solar energy centre operated and managed by women in Kitui and a community project in Homa Bay, in which women were responsible for installing and maintaining solar home systems in their villages.

In both these cases, our findings show that adopting a gender approach resulted in positively affecting men’s beliefs in what a woman can do and increased self-esteem for the women who become successfully involved in supply. As shown in previous studies¹¹ when women get involved in technical/managerial positions in the electricity projects or in the electricity supply system, they are more often likely to be listened to in their community. This may help overcome traditional social barriers and transform the view of women in the local community, especially when the process of including them in such initiatives is based on deep insights into local socio-cultural factors and includes measures to overcome their barriers.

There is an important caveat to this: failed attempts to include women in supply can have negative consequences in reinforcing the gender norms they seek to change. Initiatives in the past have failed because they were too weakly designed, implemented and followed up and did not have the long-term vision, patience and deep engagement required to make a lasting effect.

2.6 Access to Electricity for the Poorest

Our research found several solutions targeted at poorer people, offering the ability to rent or lease portable lanterns. One of these was the solar charging centre in Kitui, which provided lantern charging services in addition to other services such as printing and photocopying. The other was a CSR project being implemented by Kenya Power, in which solar lantern and mobile phone charging services are being offered by agents in selected pilot areas in 13 counties (~20,000 customers), with the lanterns available on a lease-to-own basis by the agents. With both of these low cost solutions, women have started to act more independently than for grid connections in two main ways. The first is in portability and flexibility of use: such lanterns are practical and easy to carry to the kitchen and other areas in the household, providing more scope for women to decide on where to use the light compared with solutions with fixed light points. The second is in the mode of supply: as observed in the study area in Kitui County, charging stations with the option to rent lanterns allows very poor householders to decide and plan when they can hire the lanterns (such as for children revision periods near exam time or during festivities) according to their seasonal income and household budgets. The payment patterns are also more flexible and similar to what they have previously used on kerosene and dry cell batteries.

The scalability and sustainability of such charging stations / rental facilities is under threat, despite them making basic electricity services accessible to the poorest people. They are entirely dependent upon an initial capital subsidy, and hence either Government or donor investment, in order to establish and there are far too few initiatives that are highly visible in the national discourse to influence both Government and donors. Once again we observe that the poorest and most vulnerable households in Kenya are being left behind by both public and private initiatives in rural electrification.

3 Recommendations for Policy and Practice

Many significant gains have been made in both rural electrification and gender policy in Kenya. It is not the purpose or intent of this policy brief to criticize, but to contribute to the discourses and processes in which political priorities and public and private investment adjustments need to be made in order to maximize potential for Kenya’s rural areas. In our view, there has been good progress, but the bar needs to be continually raised.

¹¹ Women’s empowerment and electricity access: How do grid and off-grid systems enhance or restrict gender equality? Research Report from RA1 under the ENERGIA Gender and Energy Research Programme.

We have compiled below a series of recommendations and suggestions for strengthening policy and practice based upon the comprehensive research conducted by the EFEWEE project in six case study areas in rural Nepal, Kenya and India.

3.1 Consult and consider measures to make electricity subscriptions gender inclusive

Addressing: energy ministries and regulators at the national levels and private/voluntary actors who plan and implement electricity systems (grid/off-grid)

Possible options:

3.1.1 Allow other individuals than house owners to obtain subscription (grid and off-grid)

- Problem: In many contexts, only the formally registered owner of a house can subscribe, and this person tends to be a man.
- Effect: women depend on husbands or other men for obtaining access to electricity. This hinders women's agency and access to electricity
- What can be done? Modify regulations for a subscription so that a person registered at a certain address (citizenship card/ID) can obtain a subscription
- What will be the result: Women living in houses they do not formally own, will get the possibility to access electricity and get access to using electricity's services.

3.1.2 Ensure that instalment guidelines for house wiring give priority to the kitchen area

- Problem: In Homa Bay, Kenya, 39% of the households with a subscription to electricity do not have electric lights in the kitchen. On an average, they keep 5 light points. In areas with systems offering portable systems in Kenya, women regularly use lanterns in the kitchen, indicating the need for light in kitchens.
- Effect: Every evening after darkness a female member of the household (female head, daughter, other women or a servant) cooks a meal. Performing this activity with only kerosene, the light of mobiles or the light from the fire is unhealthy, inconvenient and more time consuming than when cooking with electric light present.
- Promising models: In Chhattisgarh, India (where more people than in Kenya say that men decide on lights and appliances), the homes are 20 percentage points more likely than in Kenya to have lights in the kitchen, even when there is only one light point in the house. In Chhattisgarh (and Nepal), installers advice people to put up light in the kitchen, which has resulted in electrified kitchens.
- What can be done? Modify prescriptions/regulations in Kenya so that installers of electric equipment/light as default advice householders to put lights in the kitchen.
- What will be the result: Kenyan women will get an improved working environment and increased efficiency. Symbolic implication: It is possible that the electric light in the cooking place would contribute to increasing the value of women's work.

NB: As a result of our research, a brief about wiring up rural homes safely and in ways that support women's choices has been written and provided to the Rural Electrification Authority for their consideration in future last mile connection programmes.

3.1.3 Make electricity subscriptions affordable

- Problem: Homa Bay, Kenya: 74% of widows do not have access to either grid or off-grid electricity. For other types of households where also men reside, a lower share (ca 40 %) does not have access. The high connection/subscription fee to the grid and SHS makes electricity access out of reach to the widows due to a high level of poverty, partly resulting from HIV epidemic in the area. In comparison, the cost of grid connection is more than 3.7 times higher in Kenya than Nepal and 37 times higher than in India, where universal access to either grid or off-grid electricity is almost achieved in the study areas.

- Effect: The high cost of connection/subscription to grid/off-grid supply particularly hinders women's agency and their access to electricity and adhering services
- What can be done? Investigate what mix of solutions (grid/off-grid) would work under what conditions in rural Kenya and make electricity connections/subscriptions (grid and off-grid) affordable to all. Consider lowering connections fees for marginalised groups and further improvement of the social tariffs ('the lifeline tariff') (e.g. make it into a Free Basic Energy Tariff with free access up to 50 units/month).
- What will be the result: The poorest segment of the population would get access to electricity and to using electricity's services. This would enhance their convenience, reduce drudgery and time use (making mobile charging possible at home and eliminating need to buy kerosene), improve the indoor environment, which would ease their lives and enhance communication. This would also imply less social exclusion and dependency on others.

NB: A recent initiative has been implemented by the government of Kenya to remove standing charges (fixed monthly payments) for grid electricity, however it is too early to analyse the impact of this upon rural connection and consumption rates.

3.1.4 Improve women's access to adopting appliances and machines powered by electricity

- Problem: Across the three countries, most of the appliances observed in people's homes were either controlled and used jointly by household members or decided on/controlled/owned by a man. This results from women's income being ca 40% lower than men's and because men tend to own the house and are the electricity subscriber.
- Effect: Women have limited decision making power to obtain appliances and equipment that fulfil their needs, including time-saving appliances and machinery for productive activities (e.g. maize mills).
- What can be done? Adopt a systemic approach (e.g. appliance supply chains, financing, credit schemes) and work with local groups and communities to identify suited schemes (rental, instalments etc.) for making appliances and machines that women want available and affordable.
- What will be the result: Women would get a higher likelihood of adopting appliances that could help reduce the time spent on drudgery tasks and/or make productive activities become more convenient and effective.

3.2 Consult and consider measures to make electricity systems gender responsive

Addressing: energy ministries, regulators, rural electrification authorities, electricity suppliers and private/voluntary actors who plan, implement and operate electricity systems

Possible options:

3.2.1 Ensure a minimum degree of reliability

- Problem: The grid in many rural areas counties is highly unreliable.
- Effect: This negatively affects private households, forcing people who wish to have access to electricity to also keep solar systems, not only as a back-up but in effect as their main type of supply (Nepal, Bihar, Kenya). Unreliability also negatively affects businesses and the quality of public services (see also below).
- What can be done? In the process of creating access for all, governments need to invest sufficiently in ensuring at least a minimum degree of reliability by emphasizing maintenance, monitoring and sustainability of existing grid systems and networks (lines etc.) as well as off-grid systems of supply.
- What will be the result? People and institutions who have already paid a high cost for obtaining access would get the service they have paid for. It would make the share of the population with access appear real and not only intended/potential, which is in line with the Global Tracking Framework that accounts for reliability and affordability.

3.2.2 Provide enabling conditions for the involvement of women and men in supply to ensure gender equitable outcomes

- Problem: Conventional, gender-blind electricity interventions (whether grid or off grid), are male-biased in that mainly men are recruited and get paid jobs in the systems of supply on the local level. In centralized systems, some women are recruited for administrative jobs in central areas. In contrast, two cases of localized electricity systems (Kenya), both supported by external donors, represent best practice in that the adopted gender approach resulted in women becoming key players in the supply system. This had the additional effects that gender norms were modified and that customers were handled in a way that sustained their enduring access to services (e.g. in case of non-payment, the female staff suggested a schedule for repaying debts while maintaining access).
- Effect: The male-biased systems increase the gender income gap, serve to reinforce stereotyped gender roles, and lead to missed opportunities in terms of influencing gender norms that discriminate women.
- What can be done? Spot possibilities for 'double transformation' (electricity access and transformed gender relations) when setting up localised systems of electricity supply:
 - i. stating in the project strategy that women's inclusion in supply is a goal (33%, or 50% of staff, and, in a series of interventions, ensure an equal number of women and men leaders); that they should have equal pay as men; and that the degree to which these goals are realised will be monitored and reported
 - ii. working in collaboration with women's groups in the local community to find champions and leaders who can take part in the planning of the intervention and in the recruitment and training process (e.g. ensure that the training is substantial so as to reduce the need for technical pre-qualifications) and ensure that the project accommodates women staff's particular needs and creates conducive working conditions including in the field (e.g. kindergarten, separate toilets, work hours, buildings and infrastructure, security)
 - iii. include a budget that accommodates for women's inclusion
 - iv. expect resistance (silent or open) from men, and include men actively in the gender-sensitive planning to get them on board regarding the wider benefits of including women
- What will be the result: Women's inclusion in supply would:
 - i. empower the individual women involved who will get increased psychological power and economic autonomy and become role models for young girls
 - ii. contribute to changing stereotyped gender roles and expanding the expectations for what women can do
 - iii. enhance the local system's financial viability (based on two case studies and involved people's assessment)
 - iv. reduce the barriers to field work and operations for women technical staff
 - v. contribute to making poor segments maintain access to electricity (such groups are at times unable to pay the fees, for example, due to seasonal variation in income, and in the case of Ikisaya, customers highlighted the female staff's flexibility, politeness and willingness to negotiate ways to pay back in the near future.

3.3 Consider measures to strengthen public services

Addressing: energy-, health-, education and water ministries and planning agencies

Possible options:

3.3.1 Ensure that public services are provided with reliable electricity access and necessary equipment

- Problem: The study observed that water provision systems had rarely been targeted for electricity, and this negatively affects women in particular (time use). Clinics were often targeted and connected, but supply tended to be non-functional which implies that electricity could not be used and the quality of services remains poor. Because electricity in the study areas does not improve the quality of such services, the high amount of women's drudgery

work continues. There are also serious impacts on health (e.g. no capacity to store medicines needed quickly after a snake bite, lack of examination light when giving birth, poor quality of drinking water taken from lakes etc.). Another problem is the lack of equipment to facilitate the use of electricity (e.g. pumps, pipes, fridges, lamps). Schools more often have a subscription, but the reliability of electricity supply is relatively low, and equipment for labs, computers etc. are lacking. Boarding school facilities have a documented positive effect on girls' performance in particular, and such services depend on electricity for being able to operate. However, the situation with unreliable supply hinders the operation of boarding facilities. A milling facility (Nepalese site, owned by men) reduced women's drudgery but was only observed in one single site/village.

- Effects: Drudgery tasks remain, health problems remain, girls' education opportunities remain limited
- What can be done? Electricity, water and health sectors should work together (e.g. in inter-ministerial action groups addressing specific problems) to ensure that village infrastructure is improved in key public services that women in particular depend on. In particular, water supply should be targeted for electrification / included in electrification plans for an area. In health clinics and schools, the reliability of supply should be ensured and monitored (e.g. yearly, which tier), as should the provision of equipment/appliances that are needed to provide needed services (e.g. milling).
- What will be the result: Women's drudgery tasks would be reduced, allowing them to spend more of their time on productive activities (if other conditions are in place) and for leisure (having today a working day from 12-16 hours). Improved health and improved quality of education.