

Exploring Factors that Enhance and restrict Women's Empowerment through Electrification (EFEWEE)

Scoping study report

University of Oslo, Centre for Development and the Environment (SUM), Norway
The Energy and Resources Institute (TERI), India
Seacrest Consulting, Kenya
Dunamai Energy, Malawi

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Summary

The overall objective of this independent research project is to examine how policy and practice may enhance women's empowerment through electrification in rural areas in the South. We consider women's empowerment as a process towards gender equality, hence a concept that requires analytic attention to women, men, girls and boys. We divide the work into four sub-tasks which focus on i) the impact of electricity access on women and girls, ii) the impact of women's involvement in supply, iii) the relationship between women's empowerment and different types of access (grid vs decentralised systems) and iv) how empowerment in the realm of electrification may be conceptualised and measured. The results gained from each of these sub-tasks will be used to provide policy recommendations. Empirical material will be collected in rural Kenya, India and Nepal where a large share of the population lacks access to electricity.

The scoping study comprises a desk study of policies and the general literature on gender and electricity, and outlines the methodology to be used in the subsequent empirical research. The desk study is divided into two parts; the first consists of a policy review of how gender elements are integrated into electricity policies and practices, focussing primarily on the selected countries for empirical research, Kenya, India and Nepal, and also on the role of international actors and discourses. The second part reviews the general literature on the impact of electrification on women's empowerment and develops a framework for measuring empowerment in this realm. We also account for electricity's effect on girls and boys in terms of study time and school enrolment.

The overall results show that electricity policies rarely address gender issues explicitly. National policies in the three countries are mainly attuned towards providing electricity access, making services affordable to the poor and enhancing the availability and reliability of electricity supply. Their approaches to electricity in policy, planning and programmes are often gender blind. International initiatives such as the Sustainable Development Goals (SDG) and Sustainable Energy for All (SE4All) highlight universal access as the primary goal, though their strategies and targets sometimes mention gender explicitly in terms of different needs of women and men as end-users of electricity. At the same time, overall goals for gender mainstreaming have been developed both by international actors (e.g. World Bank) and nationally, in which governments have committed themselves to promoting gender equality and other social goals, but these efforts have had a limited bearing on the development of the electricity sector. By and large, electricity policies and programmes which form the basis for the expansion of both centralised and off-grid systems have assumed that investments in electrification will trickle down and benefit women and men equally; thus they are gender blind. Furthermore, only in very few cases have women been involved in the formulation of electricity policy and execution of programmes and projects. Electricity policies pay limited or no attention to the different needs of women and men as end-users or the potential merit of engaging both genders in supply. Some efforts have been made to promote gender analysis and mainstreaming in the electricity sector (e.g. Kenya and India), driven by international actors and/or national governments themselves. However, with the exception of a few gender sensitive interventions in rural electrification such as in Botswana (Practical Action 2011), Lao PDR (World Bank 2012), and an element of the Zanzibar rural electrification programme (Winther 2008) of which only the latter was assessed by an independent source, most rural electrification projects (grid) continue to be implemented without articulated concern for gender issues. As to off-grid systems initiated by NGO's, several have adopted a gender sensitive approach during the implementation.

However, most of the international support provided to decentralised systems has been channelled through commercial actors (IEG 2008), and little is known about their strategies and gendered impacts. By and large, policy and practice presume that women will automatically benefit as end-users in the realm of the household, with little or no emphasis on subsidy schemes and loan arrangements to reduce barriers to women's access to electricity, expand women's productive uses of electricity, achieve gender balanced recruitment and staffing in the sector or promote women's involvement in the supply of electricity.

The literature review shows that most empirical studies have examined electricity's impact on women's welfare and found a positive effect. The reduced drudgery is striking and in one sense appears as the source for other effects, but women's wish to pursue specific activities such as earning income and watching television appears to motivate them to reduce drudgery when getting access to electric light and appliances at home. Changes in time use partly occur through uptake of electrical appliances that substitute former technologies (e.g. grainers, blenders and in a few cases, electric stoves). But studies also show that electrified homes, even when they do not have electric stoves, are more likely to use alternative fuels (e.g. LPG) and modern biomass stoves for cooking and less likely to rely on the open hearth, which reduces their time spent collecting fuelwood. Education is another central realm in which the evidence agrees: Household electrification enhances children's access to education in general and girls' education in particular. Even among poor households that can afford to get access, girls obtain more study time and higher school enrolment. This contradicts the general thesis that wealthier groups tend to benefit most from access to electricity. There are also clear signs that television watching reduces high fertility rates, and in some cases watching television has led to less acceptance of discrimination against women.

The review revealed that most studies on electricity's welfare impacts do not refer to women's empowerment at all, and when the notion is mentioned it is treated in a fragmented way. Similarly, electrification goals tend to either be expressed as increased welfare or as economic/political empowerment, where the latter is often considered as irrelevant in the electricity sector. Because electricity access often affects everyday life in fundamental ways, the present work argues for a framework for analysing empowerment which bridges improvements in welfare and economic and political empowerment. On the one hand, the resulting analysis shows that increased welfare such as access to electric light and reduced drudgery induce an increasing range of choices which in many cases imply increases in women's empowerment. This indicates a need to re-examine the perception that the (single) path to gender equality is through women's economic empowerment. On the other hand, what is taken to be an indication of economic empowerment is often unsatisfactorily substantiated. Many studies find that women use electricity for income generating purposes, and a few quantitative studies (Nicaragua, South Africa, but not India) observe increases in women's employment rate due to household electrification. However, the link between income generation and economic empowerment (i.e. increased economic autonomy) often remains under-researched due to a lack of attention to decision-making processes and the gendered control over material resources.

Among studies that have looked at the effects of including women in the electricity supply chain, positive changes in gender norms and steps towards women's political empowerment have been observed in cases where women came in control of the technology rather than merely being consulted. More broadly, the review shows that the design of the technical system, the organisation of supply and the process of electrification may influence the gendered impact of electrification in crucial ways. These socio-technical aspects remain highly under-researched, particularly for grid systems.

A striking finding from the review is that econometric and qualitative-oriented studies focus on distinct issues when examining the gendered impact of electrification. Econometric work tends to study singular welfare indicators such as women's employment, time use and fertility rates measured across large samples without being able to account for factors other than electrification that explain the observed effects. Qualitative studies tend to focus on how and why electricity produces a set of impacts, sometimes including a focus on the socio-technical design and gender relations, but they are based on case studies and smaller samples, which poses questions regarding representativity. The review argues that this distribution of work hinders the accumulation of knowledge on how and why electricity affects women's empowerment – and thereby what policies and measures it would take to enhance gender equality through electrification. The finding that international electrification goals and corresponding policies in Kenya, India and Nepal largely remain gender blind is likely to reflect this lack of knowledge of the dynamics that produce a given set of effects.

The report spells out the detailed findings from the two desk reviews, identifies knowledge gaps and provides some policy recommendations based on the policy and literature review. It also outlines the methodology to be used during phase 2. The empirical work will include qualitative case studies in Kenya, India and Nepal covering areas with grid and decentralised systems of supply in each country to enhance comparison between different types of systems including women's potential inclusion in the supply chain. Based on these findings and the contextual knowledge deriving from the case studies, a cross-country household survey will be conducted in one of the selected case study sites in each country to enhance an analysis of the relative significance of national policies, the system of supply and socio-cultural aspects for women's empowerment from having access to electricity. The survey will follow a purposive random sampling strategy based on social mapping and construction of three to four different strata in advance of the survey. This will enable us to focus on the causal explanations for electricity's effects and ensure strong validity and transferability of results to other contexts. To ensure that enough information derives from the most important group of respondents, we will have an overrepresentation of women (of various ages), but we will not exclude men. We will also include households (women and men) without access to electricity.

Colophon

Scoping Study Report < Research Area 1, Exploring Factors that Enhance and restrict Women's Empowerment through Electrification (EFEWEE), ENERGIA GENDER AND ENERGY RESEARCH PROGRAMME; Building the evidence base for improving energy interventions' effectiveness by taking a gender approach>

Full list of authors: Tanja Winther, Debajit Palit, Mini Govindan, Magi Matinga, Karina Standal, Kirsten Ulsrud, Anjali Saini, Henry Gichungi

Date: March 30th, 2016

The preparation of this publication was supported by the ENERGIA Gender and Energy Research Programme, funded by the UK Department for International Development (DFID), but the views and opinions expressed are the responsibility of the authors and should not be attributed to ENERGIA or DFID.

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Abbreviations

AEPC	Alternative Energy Promotion Centre
BPC	Botswana Power Corporation
CREP	Community Rural Electrification Programme
DFID	UK Department for International Development
DDUGJY	Deendayal Upadhyay Gram Jyoti Yojana
ERC	Energy Regulatory Commission
GENBO	Gender and Energy Network of Botswana
GTF	Global Tracking Framework (SE4ALL)
HIO	High Impact Opportunities
IAEG-SDGs	Inter-agency and Expert Group on Sustainable Development Goal Indicators
IEG	Independent Evaluation Group (The World Bank)
IEP	Integrated Energy Policy
KPLC	Kenya Power and Lighting Company Limited
KenGen	Kenya Electricity Generating Company
MDGs	Millennium Development Goals
NEA	Nepal Electricity Authority
NEP	National Energy Policy
NPR	Nepalese Rupee
P2P	Power to the Poor
RGGVY	Rajiv Gandhi Grameen Viduyutikarn Yojana
REA	Rural Electrification Authority
REDP	Rural Energy Development Programme
SE4ALL	Sustainable Energy for All
SDGs	Sustainable Development Goals
TERI	The Energy and Resources Institute
UiO	University of Oslo

Glossary of Key Concepts

Access to electricity: Pertains to usability including affordability of supply, rather than actual use of electricity (cf. SE4All, GTF).

Empowerment: The process in which individuals, groups or societies move from being marginalised, through poverty, ethnicity, gender or other discriminating relations and markers, to a state of equality. This draws on Friedman (1992). See also *Women's empowerment*.

Gender: Refers to a system of socially defined roles, privileges, attributes, and relationships between women and men, which are learned and not biologically determined.

Gender analysis: Gender analysis is the examination of differences in the roles, activities, positions, experiences, needs, opportunities, and endowments of women and men in order to identify gender issues which need to be taken into account and addressed for any given initiative.

Gender equality: Women and men's equal rights, access to, and control over resources and power to influence matters that concern or affect them. This draws on Kabeer (1999 and 2001).

Gender mainstreaming: The systematic integration of the different needs, interests, and experiences of women and men in all policies and activities of an institution at all levels: Policy development, research, advocacy/dialogue, legislation, resource allocation and planning, implementation, and monitoring and evaluation of programmes and projects. It is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic, and societal spheres, so as to enhance gender equality.

Gender relations: The socially constructed form of relations between women and men in a given socio-cultural context. Gender relations often involve a hierarchical power relation in which women are considered as subordinate to men, though this can vary according to age, caste, and other social indicators.

Gender roles: Gender roles refer to women's and men's different, ascribed roles in a given socio-cultural context. They are informed by norms and ideologies about what women and men are and how they should behave. Gender roles are learned from childhood but are also dynamic, and they are variable within and across societies. The gendered division of work is the delegation of different tasks between men and women.

Gender blind: The failure in policies and interventions to recognise that women's and men's positions and needs are often different.

Gender-neutral: Assumption that [energy] policies and projects benefit women and men equally.

Gender aware/responsive: Policies and projects which recognise that women's and men's needs are different, that they have different capacities to engage in and respond to interventions, and that they are likely to experience and be impacted by interventions in distinct ways.

Gender sensitivity: Gender sensitivity is to approach a given problem or perform a given task in a way that acknowledges women and men may have different positions, experiences, and needs. It is the opposite of gender neutrality.

Human resources: Access to information, education, knowledge, training, degree of drudgery (time use), comfort and convenience, health, safety, psychological, and negotiating power.

Material opportunities: Short-term access to food, income, and using assets.

Material endowments: Long-term access to and control over investments, savings, long-term financial security, ownership and accumulation of assets (includes economic empowerment).

Social resources: Access to communication and socialising, social and business related networks, degree of social inclusion.

Women's economic empowerment: Women's increased ability to participate in, contribute to, and benefit from the economy on equal terms with men. Involves an increase in women's long-term material endowments.

Women's empowerment: The process towards gender equality in terms of women and men's equal rights, access to, and control over resources and power to influence matters that concern or affect them.

Women's political empowerment: Women's increased decision-making power and their ability to participate in and influence political processes at all levels.

Women's social empowerment: Women's increased ability to act to enhance their social relations, including their engagement in institutional interactions necessary for their well-being, productivity and decision-making power.

1. Introduction

The provision of electricity and modern energy services is crucial for human well-being and is considered essential for overall economic development. Electricity provision is also increasingly regarded as a means of improving gender equality in developing contexts where women in particular often experience harsh living conditions, including discriminating norms. Currently, 18 per cent of the global population or 1.2 billion people lack access to electricity, of which more than 95 per cent reside in Sub-Saharan Africa and developing parts of Asia (WEO 2015). International initiatives aim to provide access to all by 2030 (Sustainable Energy for All, UN's Sustainable Development Goals), and these efforts provide a window of opportunity for women's empowerment, which we employ in a strong and relational sense as a process towards gender equality. Yet, it remains unclear how the provision of electricity could serve this particular purpose.

Given the signs of increased international attention to gender in electrification, a pertinent question is how this discourse becomes manifest in national policies and development practice. More fundamentally, how does the provision of electricity affect gender equality through the distribution of benefits for women, men, girls, and boys—and what role do policies and other conditional factors play in this picture?

Responding to these questions concerning how electrification may empower women and girls, this report presents the results of a desk study¹ in which we review the empirical literature on women's empowerment from electrification and international initiatives and national electricity policies in Kenya, India, and Nepal, three countries in different geographical areas where a large share of the rural population currently lacks access to electricity. In the subsequent phase of the research, we will conduct empirical work in the same countries.

The desk study is divided into two parts. The first comprises a policy review in which we examine the extent to which gender issues and women's empowerment are integrated into the electricity policies in Kenya, India, and Nepal. We also discuss the role of international actors and their goals for electrification. The review examines the extent to which the policies offer scope to enhance women's access to electricity; address women and girls' needs as end-users; ensure women's involvement in supply; and the extent to which women take part in policy formulation and in the execution of electricity programmes for centralised and decentralised electricity supply. We have also provided some practical experiences from 'the field' which will serve to illustrate whether international discourses and national policies on gender and electricity have been translated into practise in electricity interventions.

The second part reviews the general literature on the empirical evidence of the impact of electrification on women's empowerment and the effects on girls and boys. In addition, we look at

¹ The desk study was conducted from March 2015 to January 2016 and constitutes the first phase of the research project 'Exploring factors that enhance and restrict women's empowerment through electrification' (EFEWEE), led by the University of Oslo, Centre for Development and the Environment (SUM), Norway. Partner organisations include The Energy and Resources Institute (TERI), India; Seacrest Consulting, Kenya; and Dunamai Energy, Malawi. The research is financed by DFID, UK, and managed by ENERGIA, the Netherlands, under the Energy Research Programme (2015–18). EFEWEE constitutes the Programme's Research Area 1, titled: 'Electrification through grid and decentralised systems'. We thank ENERGIA IS, the Technical Advisory Board, DFID and fellow researchers in the programme for their valuable input on earlier drafts of this report.

the methodologies employed in key studies and how they account for the observed outcomes and develop and employ a framework for assessing women's empowerment through electrification.

We proceed by presenting the results from the policy review in Section 2, while Section 3 presents the results from the literature review. Section 4 provides a summary of identified knowledge gaps and policy recommendations based on the two sub-studies. In Section 5 we account for input collected through stakeholder engagements, and in Section 6 we share our reflections on the progress and the results obtained in the Scoping Phase. Section 7 outlines our plans for the second phase of the project, including the methodology that will be used.

2. Policy review: Gender issues in international discourses and national electricity policies in Kenya, India, and Nepal

2.1 Aim and methodology

The policy review aims to provide a comprehensive overview of the way gender issues are included in international discourses and national electricity policies and programmes, especially in the study countries of Kenya, India, and Nepal. The research was conducted from June to December 2015 through a desk review of electricity policies, literature, and programme documents. The following criteria were used to select the documents for review:

- *Geographical scope:* The literature review was primarily done with respect to the study countries, i.e. Kenya, India, and Nepal. However, the review also included some international experiences to distil lessons from countries in both the North and the South.
- *Type of literature reviewed:* Both peer-reviewed as well as grey literature (such as conference papers, presentations, project reports, etc.) were included.
- *Type of documents reviewed:* Both electricity policies and programme documents, as well as earlier review work of policies and programmes, were included.
- *Time horizon:* Though no restriction was set on the time of the interventions or the year of publication, the focus was primarily on the literature published within the last decade. By doing so, the search process and review aimed to ensure that all up-to-date studies and evidence were included in this review.

The databases queried in the search for relevant studies include, among others, Google Scholar, Elsevier Science Direct, ResearchGate, The World Bank, UNDP, etc. Each of these databases was questioned for a string of search terms, such as gender and electricity policies, gender audit of electricity policies, gender and electricity, gender in electricity programmes and projects, gender empowerment and electricity, gender and electricity in India, Kenya, and Nepal, etc. The literature review also builds on the work of previous related reviews on the topic, each of them dealing with particular aspects of the electrification-gender linkage. Due to time and accessibility constraints, books were not included in the review (except a few which were available from the authors).

In addition to the desk review, a limited number of consultations (both in-person and electronically) with experts comprising policymakers, practitioners, as well as experts from academia and private sector, were held to ensure we did not overlook any key research and grey literature. The consultations were conducted in the period July–December 2015 by project team members in India and Kenya. The policy review is prepared by the project team members from TERI in collaboration with the other members of the research project consortium.

The current study builds on the earlier gender audit of energy policies and programmes by ENERGIA. ENERGIA assisted seven country level gender audits, which included India and Kenya, with identifying and analysing the factors that hinder efforts to mainstream gender in energy policy (ENERGIA 2011). However, these studies looked at the energy sector as a whole and did not exclusively focus on electricity programmes and policies. For instance, in India the gender audit focussed solely on the Integrated Energy Policy of 2008 and projects/programmes of the Ministry of New and Renewable Energy (MNRE) and not on the Electricity Act of 2003 and the policies formulated based on the 2003 Act. In Kenya the gender audit was carried out in 2007 and involved a detailed content analysis of Sessional Paper No. 4 of 2004 on Energy and part of the agriculture policy (ENERGIA 2007). ENERGIA has later carried out a gender review of the energy sector policies, programmes and organisations in Nepal in 2013, which was supported by the Asian Development Bank (ETC/ENERGIA 2015).

The present study aims to cover all the relevant and recent electricity policies in the three focus countries, and it specifically examines the extent to which they include gender issues. We also analyse the degree of gender inclusiveness in delivery models for centralised and decentralised electrification, distil best practices, and examine how and to what extent policies and programmes contribute to enhancing women empowerment through electrification. The study specifically addresses the following questions:

1. To what extent do gender elements form part of electricity policies?
2. To what extent and how are these policies implemented in practice?
3. To what extent and how do the countries' electricity policies offer scope for gender considerations in programmes/projects?

2.2 Findings from the policy review

2.2.1 International discourses on electricity and gender considerations

There is a widespread recognition internationally that access to electricity is a fundamental prerequisite for poverty reduction and sustainable human development. The policy provisions addressing energy and particularly electricity services have been formulated at international levels through discussions and negotiations in various forms. At the United Nations Fourth World Conference on Women in Beijing in 1995, Objective G of the Platform for Action called for gender mainstreaming in all policies and programmes (ECOSOC 1995). Likewise, the ninth session of the UN Commission on Sustainable Development (CSD-9) in 2001 specifically recommended that governments "support equal access for women to sustainable and affordable energy technologies through needs assessments, energy planning and policy formulation at the local and national level". It further recognises that the role of women needs to be strengthened through participatory decision-making (ECOSOC 2001).

Trajectory of gender in electricity and how it has been studied

Historically, most of the initiatives in the energy sector have focussed on electricity supply rather than household fuels or energy services. Electricity was viewed as an important state-led development factor and was seen as a vehicle for economic advancement. Only in the 1970s were the gender issues realised, and the focus shifted to household energy and the use of biomass for cooking. But the emphasis on gender was not the only reason for this shift. Firstly, the shift towards the prudent use of biomass energy occurred due to the perceived environmental crisis, and hence, advancement was made towards improving the sector (Rai 2009). Secondly, as the problem of deforestation was increasingly observed in many countries, international development agencies (and Northern researchers) perceived households' use of wood fuel to be the major cause of the problem (Crewe 1997). This resulted in the emergence of many programmes for developing

improved cookstoves to serve the dual purpose of conserving forests and improving the lives of women, many of which were not successful because the interventions did not match the concerns of the cooks (women) themselves (ibid) or simply underestimated the capacity and flexibility of programmes on the ground (Barnes *et al.* 1993, Gifford 2010). This led to a temporary decline in stove programmes, until the issue reappeared on the agenda in the 1990s, when the growing concern for climate change became a new rationale for investing in stoves.

By the mid-1990s, the concept of gender and energy had also broadened from cookstoves, time saving, woodlots and biomass fuels, and appropriate technology to one that encompassed a wider range of issues including pricing, transport, and modern energy forms, such as electricity (Cecelski 1995). The impact of modern energy access on gender, such as availability of electricity for household chores, reduced drudgery, increase in leisure time, etc., began to receive due recognition, and linkages were also drawn between electricity access and women's incomes and standard of living. This was also a period when the energy sector was undergoing reforms in many countries, the private sector was increasingly recognised as the development partner, and governments started to play a stronger role as regulators rather than only being providers.

A large part of the gender discourses in energy policy and energy access studies, especially in the global South, have, and continue to be, focussed primarily on cooking energy, which is exemplified by numerous studies undertaken on gender and energy (Cecelski 1992, Skutsch 1995, Dutta 2003, IRADE 2009, Miller and Mobarak 2013, Practical Action 2014). Not many policy studies have been conducted to evaluate electricity and the challenges encountered by women in terms of access, participation in decision-making, policy reforms, etc. The literature shows that gender disparities are rarely addressed as an integral part of the national energy policy and programme design (Panjwani 2005, Cecelski 2005, Kohlin *et al.* 2011, Oparaocha and Dutta 2011).

This is also a clear North-South distinction on the subject of gender and energy. Early work by Khamati-Njenga and Clancy (2003) have clearly indicated that in the Northern² context energy is assumed to be 'gender neutral', and the analysis of gender and energy is primarily focussed on the South. The emphasis on gender and energy in the South probably derives from the prevalence of poverty and a heavy dependence on biomass for cooking as well as the burden of fuel collection on women. However, there is now a growing body of literature on energy poverty issues even in the countries of the North (Brunner *et al.* 2012). For instance, Clancy and Roehr (2003) have contested the gender neutrality of energy in the North, and indicated that there is a distinct gender dimension in the way women and men live in the North which is affected by energy use and which also has important implications for gender relations. Women in the North are also a minority in engineering and technology-related fields, which also means that they are a minority in the electricity sector. Only in the recent past have there been initiatives to recruit more women to the electricity industry.

Gender and electricity in the current international discourse

Universal energy access by 2030 is a key priority on the global development agenda. To realise this priority, the SE4ALL initiative was launched in 2011 with a focus on energy access, energy efficiency, and promotion of renewable energy sources. While high impact opportunities (HIO) have been formed under SE4All on Energy and Women's Health with the goal to increase access to, and the effective and sustained use of, energy-dependent health services, with a particular emphasis on women in low- and middle-income countries, Oparaocha (2013) opines that the missing perspective seems to be the energy-women's economic empowerment nexus. She suggests launching an HIO on energy-women's economic empowerment nexus, scale-up proven business models on energy access that support female entrepreneurship and develop gender action plans and assessments under the SE4All initiative. Even though SE4All has not yet derived a tool within the developed multi-tier global

²The term 'North' is not used in a geographical manner, but refers to the industrialised countries belonging to the Organisation for Economic Cooperation and Development (OECD) and includes countries in Eastern Europe, Australia, and New Zealand. The remaining parts of the world are termed the 'South'.

tracking framework for measuring 'access' in a gender sensitive way, there is an implicit message in SE4All regarding the electricity needs of women for productive, educational, and communicative services in various forms. Certain studies have called for more support through SE4All for 'bottom up solutions' such as off-grid, small scale, decentralised, and community-based sustainable energy options to serve the needs of hard to reach areas. However, the World Survey on the Role of Women in Development opines that the higher costs notwithstanding, electrical systems with a higher capacity than Pico will be needed to actively promote electricity services for gender equality (UN 2014).

Another significant international initiative focussing on development issues is the Sustainable Development Goals (SDGs), which were officially launched in September 2015 as a successor to the Millennium Development Goals (MDGs) for post-2015 scenario. In the SDGs, consisting of 17 goals and 169 targets, goal number 7 speaks about ensuring 'access to affordable, reliable, sustainable, and modern energy for all'. While the expert group formed by the UN is due to draw up a final set of indicators for goal 7 by March 2016, the indicators that have been proposed by different agencies and are being discussed by the Inter-agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDGs), formed by the United Nations Statistical Commission, do not seem to adequately capture the gender dimension of electricity access³. Although, like the goal on energy, there are separate goals on health, education, and employment, goal 5 which speaks of achieving gender equality touches upon all these aspects except for energy. Nonetheless, UN Women has welcomed the way gender equality has been treated in the SDGs and has mentioned that the agenda offers a real opportunity to drive lasting change for women's rights and equality, and to bring transformative change in women's and men's lives.⁴

Earlier in the 1990s the Beijing Declaration and Platform for Action of 1995 identified the need for inclusion of women's priorities in public investment programmes for economic infrastructure, such as electrification, energy conservation, water, and sanitation (UN Women 2014). So in a way, the gender-electrification nexus was recognised as far back as 1995, although the countries put little emphasis on this aspect in terms of implementation (UN Women 2014). The reason for not recognising or explicitly incorporating gender aspects in the electricity sector policies may be due to the fact that during the mid-1990s, the energy sector was undergoing reforms and more emphasis was placed on larger issues, such as the role of the private sector, public-private partnership, and subsidies.

2.2.2 Review of electricity policies and projects: India, Nepal, and Kenya

A major energy challenge facing India, Kenya, and Nepal is how to provide electricity to all households, businesses, and public institutions, particularly in the rural areas. While 97 per cent of the villages in India have reportedly become electrified, the share of households with access to electricity is much smaller, at around 67 per cent. Even though 55 million people gained access to electricity during 2010–2012 as part of a national rural electrification programme, there are questions about the quality of the power supply, the sustainability of the infrastructure and whether the revenues generated from the connected rural households are adequate (Palit *et al.* 2014). Grid connection has been the most favoured approach to rural electrification for the majority of rural households in India; however, renewable energy-based off-grid technologies have also been disseminated in areas which are either inaccessible for grid connectivity or because the hamlets are not recognised as villages as per national census records.

Nepal, despite having a vast hydropower potential, exhibits both general shortages of electricity as well as access deficit. Currently, around 72 per cent of the rural households in the country have access to electricity (WEO 2014). Further, grid electricity is only available during 60 per cent of the day on average (GoN 2013). The energy access challenges get further exacerbated by geographical

³<http://www.scidev.net/global/mdgs/news/un-sdg-mdg-indicators-consultation.html>

⁴<http://www.unwomen.org/en/what-we-do/post-2015/un-women-position>.

variations, poor transportability, fragmented settlements, illusive energy development strategies, and lack of adequate capital (Parajuli *et al.* 2011). Providing grid electricity to all areas in Nepal may be a Herculean task in this country as the marginal cost of grid expansion is very high due to physical isolation, lower electricity loads, and scattered low-income consumers (Mainali and Silveira 2011). These conditions have been recognised, and in Nepal today about 12 per cent of the total population have access to electricity through renewable off-grid energy systems (Sarangi *et al.* 2014). Decentralised electricity service delivery in the form of micro hydro and solar PV is thus widely used for rural electrification, but continues to play a minor role compared to grid solutions.

Like most other countries in Sub-Saharan Africa, Kenya is also facing a huge electricity access deficit. Here, only 20 per cent of the population has access to electricity, with almost 35 million people living without electricity. In rural areas, the situation is dismal with just 7 per cent of the population having access to electricity (WEO 2014). Rural Kenyan households reportedly spend around 26 per cent of their income on lighting (Solar Aid 2014). One reason for this low level of electrification in rural areas could be the lack of available finance mechanisms to handle capital and operating costs. The Rural Electrification Authority (REA) is the nodal agency for rural electrification in the country. The aim of the government is to reach a penetration rate of at least 70 per cent by 2016 and 100 per cent access by 2020, which translates into one million new connections every year for the next six years.⁵ Further, as part of a new constitutional arrangement, the Kenyan government has devolved the responsibility to provide clean and modern energy services countrywide to its 47 counties, making them important players in the development process.

The challenges of providing electricity in these three countries have been addressed by their respective authorities who play a central role in energy governance through public policy, key legislation, state-owned enterprises, programmes and projects, market regulation, and networks. The governments have also undertaken various policy reforms over the years to meet the challenges of the rapidly increasing energy demand of existing users on the one hand and a growing concern to connect the people who are not connected to the grid on the other. In this picture it is highly unclear if and how gender considerations are incorporated into policy and programmes.

Governance and overall electricity policies and programmes in India, Nepal, and Kenya

Based on the Indian government's regulations and policies, the evolution of the country's power industry can be divided into two phases: pre-reform (up to 1991) and post-reform. Up to 1991, the power sector was tightly regulated and dominated by vertically-integrated state utilities until economic reforms were implemented. Prior to the reforms, the provision of electricity was viewed from a welfare perspective, and the emphasis was to provide energy access to the entire population. In the 1990s, a series of power sector reforms made the sector more open and competitive through deregulation and encouragement of private investment (IEA 2002). Thereafter, in the 2000s the Electricity Act 2003 was passed, followed by the National Electricity Policy of 2005, the Rural Electrification Policy of 2006, and the Integrated Energy Policy of 2008.

In Nepal, the Ministry of Energy is the key energy ministry charged with grid electricity policy development and regulation. The Ministry of Energy also governs the Nepal Electricity Authority (NEA), a national public utility which is responsible for generation, transmission, and distribution of electricity as well as related engineering services. The NEA has two mechanisms for managing the distribution of electricity; one concerns grid electricity and is directly managed by the NEA. The other is set up as a cooperative model in which the government provides 80 per cent of the distribution cost and the remainder is covered through electricity users. Thus this governance regime is mainly centralised but also has an important decentralised element. For the purpose of renewable energy development, a separate agency has been established: Alternative Energy Promotion Centre (AEP) under the Ministry of Science, Technology and Environment (MoSTE), which is the focal agency for coordinating all renewable energy-related activities in Nepal as well as major off-grid electrification

⁵<https://www.esmap.org/node/55495>

programmes in general. The Nepal Electricity Act is the major policy governing the electricity sector.

In addition, the two key policies which steer the rural electrification in the country include the Rural Energy Policy (REP) of 2006 and the Subsidy Policy for Renewable (Rural) Energy of 2013 (This policy is revised on a periodic basis.) While the National Rural and Renewable Energy Programme (NREP) focusses on building policy elements to address rural energy needs including creation of rural energy subsidy per household and credit systems, the Subsidy Policy aims to make existing subsidies equitable and effective (GSEP 2013).

In Kenya, the Energy Act 2006 facilitated the establishment of the Energy Regulatory Commission (ERC). As a result, the Electricity Regulatory Board (ERB), previously established in 1998 by the Electric Power Act (EPA), Number 11 of 1997, was transformed into the Energy Regulatory Commission in 2007. The functions of the ERC include the regulation of petroleum and related products, electrical energy and renewable energy. The Government of Kenya launched a rural electrification programme in 1973, under the management of the Kenya Power and Lighting Company (KPLC). The scheme was restructured by the Electric Power Act (EPA), Number 11 of 1997 into the Rural Electrification Programme Levy Fund (REPLF), which became operational in 1998. The Energy Act 2006 facilitated the establishment of the Rural Electrification Programme Fund (REPF) and the Rural Electrification Authority (REA), which became operational in 2007. REA is responsible for expanding electricity access in Kenya to rural areas and other areas where electrification by licenced entities would not be economically viable. The Energy Act of 2006 is the key legislation for amending and consolidating any law relating to energy. It is a regulatory framework for both renewable and non-renewable energy sectors, energy efficiency, and conservation. More recent policies (including the draft National Energy and Petroleum Policy 2015) have increasingly focussed on improving electricity access for all communities specifically through integration of renewable energy and incorporating gender mainstreaming in electrification.

Table 1: Key electricity authorities, policies, acts, and programmes in India, Nepal, and Kenya

Categories	India	Nepal	Kenya
Key energy ministries	<ul style="list-style-type: none"> ▪ Ministry of Power ▪ Ministry of New and Renewable Energy 	<ul style="list-style-type: none"> ▪ Ministry of Energy ▪ Ministry of Science, Technology and Environment 	<ul style="list-style-type: none"> ▪ Ministry of Energy and Petroleum
Other regulatory bodies	<ul style="list-style-type: none"> ▪ Central Electricity Authority ▪ Central Electricity Regulatory Commission ▪ State Electricity Regulatory Commissions 	<ul style="list-style-type: none"> ▪ Alternative Energy Promotion Centre ▪ Nepal Electricity Authority 	<ul style="list-style-type: none"> ▪ Energy Regulatory Commission
Rural electrification	<ul style="list-style-type: none"> ▪ Rural Electrification Corporation 	<ul style="list-style-type: none"> ▪ Community Rural Electrification Department of NEA for grid systems ▪ Alternative Energy Promotion Centre for Off-grid 	<ul style="list-style-type: none"> ▪ Rural Electrification Authority
Main Acts*	<ul style="list-style-type: none"> ▪ The Electricity Act, 2003 (0; 0) 	<ul style="list-style-type: none"> ▪ Nepal electricity Authority Act 1984 (0; 0) ▪ Electricity Act 1992 (0; 0) ▪ 	<ul style="list-style-type: none"> ▪ The Energy Act, 2006 (0; 0)
Policies*	<ul style="list-style-type: none"> ▪ Integrated Energy Policy, 	<ul style="list-style-type: none"> ▪ Rural Energy Policy, 	<ul style="list-style-type: none"> ▪ The Energy Act,

	<p>2006 (8;34)</p> <ul style="list-style-type: none"> ▪ National Electricity Policy 2005 (0; 0) ▪ Rural Electrification Policy 2006 (0;3) ▪ National Tariff Policy 2006 (0; 0) 	<p>2006 (0;6)</p> <ul style="list-style-type: none"> ▪ Subsidy Policy for Renewable (Rural) Energy, 2013 (0;10) 	<p>Number 12, 2006 (0; 0)</p> <ul style="list-style-type: none"> ▪ Draft National Energy and Petroleum Policy 2015 (9;1) ▪ Kenya Vision 2030 (10;7)
Programmes/ Projects	<ul style="list-style-type: none"> ▪ Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY)/Deendayal Upadhyay Gram Jyoti Yojana (DDUGJY) ▪ Rural electrification programmes at state level 	<ul style="list-style-type: none"> ▪ Community Rural Electrification Programme (CREP) ▪ National Rural and Renewable Energy Programme (NRREP) ▪ Renewable Energy for Rural Livelihood (RERL) ▪ SASEC Power Expansion Project 	<ul style="list-style-type: none"> ▪ Rural Electrification Programme (REP)

Source: author's compilation, 2015

*The figures in parentheses indicate the number of times 'gender' and 'women', respectively, are mentioned in the acts and policies. The terms 'men' and 'man' were also searched but are not mentioned.

Gender perspectives in the electricity policies in India, Nepal and Kenya

The major foci of the policies and programmes in all the study countries are to expand and provide electricity to the populations that lack electricity access, to make the services affordable, and to enhance the availability and reliability of the energy services. The policies do not tend to focus explicitly on the respective needs of women and men, and traditionally the approaches in electricity development policy, planning, and programmes have often been gender blind. Previous studies undertaken or assisted by ENERGIA in the three project countries reflect similar findings. For example, a study by IRADE (2009) in India observed that women did not benefit from grid electricity on equal terms as men because women did not read and their work pressure was too high to allow them to enjoy entertainment. In the case of Nepal, a gender review indicated that although there have been attempts to include gender aspects in policies and organisations, the effects on gender equality and social inclusion have not been substantial (ETC/ENERGIA 2015). Similarly, a gender audit of energy policies and programmes in Kenya undertaken in 2007 concluded that energy planning in the country had not taken gender issues into consideration and that the energy sector policy at the time (i.e. Sessional paper 4) ignored gender issues such as ensuring gender balanced participation in interventions for energy production and use (ENERGIA 2007). By and large, the central electricity policies and programmes appear to have assumed that the benefits would trickle down and benefit both men and women equally. However, to say that gender issues have not received any visibility at the national level would also be incorrect, as there have been some initiatives and studies that have tried to capture the gender dimensions of electricity policies which are further discussed below.

In India, the Integrated Energy Policy (IEP) acknowledges and includes a gender approach. It promotes the wider purpose of ensuring women's access to and control over energy assets and resources. However, within the energy sector more emphasis has been placed on ensuring access to cleaner and affordable cooking energy. There have also been instances where policies have been a

vehicle for and provided opportunities to incorporate gender measures. For instance, the RGGVY has offered scope for women to take franchisee through women's Self-Help Groups (SHGs) for metering, billing, connection practices, and running local networks. Thus, the provincial governments in Maharashtra, Odisha, West Bengal, and Uttarakhand involved women in the electricity distribution at the local level. Uttarakhand and Maharashtra State have implemented a policy that reserves 30 per cent of the jobs for women by appointing women as line staff. The involvement of women was made possible through the IEP and Electricity Act, which permitted SHGs to also become franchisees. As most SHGs in India are run by women members, it became an option for women to become grassroots franchisees in the rural electricity sector.

The Rural Electricity Policy of 2006 specifically calls for involving women in the District Electricity Committee by recognising that the burden of the absence of supply of commercial energy, including electrical energy to households', mostly falls on women (REP India 2006). To obtain effective, efficient, and sustainable implementation of rural electrification programmes, it was considered important that women participate in providing solutions that meet rural energy needs. The District Committees were expected to coordinate and review the extension of electrification in the districts, review the quality of power supply and consumer satisfaction, and promote energy efficiency and conservation. However, lately the structure of the District Electricity Committee was altered with the launch of the new electrification programme, and the new notification dated April 1, 2015, does not explicitly mention involving women in the committees.⁶ The committees now typically comprise ex-officio positions, such as members of parliament from the particular district, district collectors, members of state legislatures from the districts, electricity distribution company officials, etc.

The Twelfth Five-Year Plan for 2012–2017 (Planning Commission 2013) in India also recognises women as the primary stakeholders in energy and natural resources management, especially for domestic use. The Twelfth Plan therefore suggests creating a portfolio of energy options and encourages initiatives that invite women's groups to undertake small power production units and energy-based enterprises. It also mentions the need to provide women with capacity building and seed-capital assistance to increase their participation in the management of energy programmes. The plan places emphasis on providing special training in the renewable energy sector (including the repair of solar lanterns, improved cookstoves, pumpsets, and so on) for women to develop their expertise in this sector. The Twelfth Plan also added two strategies to promote gender sensitive energy development, which are: (i) customising technology to reflect the views and experiences of women and (ii) creating a large pool of trained female energy technicians/entrepreneurs. Finally, the Twelfth Plan suggests providing electricity to all government schools and facilities for large scale computer-aided learning to benefit children.

In the case of Nepal, gender-specific considerations were reflected in the Rural Energy Policy of 2006. The policy recognises that the use of traditional energy resources has adversely affected the health of women and children. It therefore sees the need to develop clean energy resources by promoting financially affordable energy models to improve the living standards of the rural population. The policy notes that the implementation of special programmes which increase access to modern energy in rural areas can lead to positive impacts on women and children. Further, user and community organisations are required to allow for the representation of women as well as marginalised, low caste and socially and economically disadvantaged groups (GoN 2006). The policy further states that programmes aimed at women's development will be implemented as a part of the rural energy development programme. Women will also be regarded as an integral part of the rural

⁶DO letter dated April 1, 2015 from Joint Secretary (Rural Electrification), Govt. of India to Addl. Chief Secretaries(Energy)/Principal Secretary (Energy)/Secretaries (Energy) of all States/Union Territories; Available at: <<http://www.rggvy.gov.in/rggvy/rggvportal/index.html>>; last accessed on October 16, 2015.

energy technology programmes. However, the policy does not mention modern energy or women's participation in the management and supply of electricity.

The Subsidy Policy for Renewable Energy of 2013 in Nepal also covered gender issues in its goal and objectives. It states that in order to benefit men and women from more equitable economic growth, renewable energy service delivery should be accelerated. One of the objectives of the policy is that energy use for productive purposes should be enhanced so as to create rural employment, particularly for women. In addition, the policy has added a subsidy benefit of an additional NPR 2,500-4,000 (USD 23.63 – 37.81)⁷ per household if owners/beneficiaries of renewable energy technologies are single women, victims of any disaster or conflict or members of ethnic or socially or economically disadvantaged groups and NPR 10,000 (USD 94.53) per entrepreneur for establishing/upgrading RE-based enterprise for these group (GoN 2013). However, the policy has come under some criticism for not adequately recognising that there may be differences and disparities between various social groups based on gender, caste, and ethnic realities (SNV 2012).

In Kenya's National Energy and Petroleum Policy (Draft National Energy and Petroleum Policy 2015)⁸, gender mainstreaming in energy planning and development has been recognised as one of the key challenges. To address this gap, the policy states that no more than two-thirds of the members of representative bodies in each county government should be of the same gender. The policy has laid out the framework stating the time period in which the objective for each policy/strategy related to gender and youth and persons with special needs should be met. Specifically, two policies/strategies have been included in the KNEP draft, for fulfilment in the short-term implementation plan of 2015–2018. The government shall “comply with Article 27(8) of the Constitution” which requires equality and freedom from discrimination, and promotion of the one-third minimum gender principle in the membership of all elective or appointive bodies and “mainstream gender, youth, and persons with special needs, issues in energy and petroleum policy formulation, planning, production, distribution, and use”.

The Kenyan President also recently launched the Last Mile Connectivity Project⁹ to increase electricity access across the country. In this project, the President announced that the rates for installation cost of electricity will be reduced in order to achieve the vision of having 70 per cent of Kenya electrified by 2017. However, this project does not mention anything about gender or women's needs and focusses primarily on electricity supply.

Table 2: Gender inclusion in the electricity sector law/policy in India, Kenya, and Nepal

Policy	Gender aspects of the law/policy
Integrated Energy Policy, 2008, India	<ul style="list-style-type: none"> • Recognises that women and girls bear most of the burden of drudgery due to indoor air pollution, lack of access to modern energy services, and fuelwood collection. • Calls for publication of annual reports highlighting the details of women's participation and empowerment. • Acknowledges female Self-Help Groups (SHG) as one of the measures to take franchisee to run the local electricity network to make the government business model sustainable. • Talks about providing financing through SHG to transform the

⁷One USD = 105.78 NPR (As on 30th August 2015)

⁸<http://www.energy.go.ke/downloads/The%20National%20Energy%20and%20Petroleum%20Policy,%202015.pdf>

⁹http://www.kplc.co.ke/img/full/2nPESH9Dge4K_Launch%20of%20the%20Last%20mile%20connectivity%20Project.pdf

	lives of women.
Rural Electrification Policy 2006, India	<ul style="list-style-type: none"> • Recognises women's burden in case of absence of supply of commercial energy, including electrical energy to households. • Recognises the importance of women's participation in meeting rural energy needs, especially electricity for effective, efficient, and sustainable implementation of rural electrification programmes and therefore suggests women are represented on the district committee.
Rural Energy Policy (REP), 2006, Nepal	<ul style="list-style-type: none"> • Talks about implementing special programmes leading to positive impacts on women and children. • Representation of women to be taken into account in user and community organisations. • Places emphasis on implementing programmes aimed at women's development.
Subsidy Policy for Renewable (Rural) Energy ¹⁰ , 2013, Nepal	<ul style="list-style-type: none"> • Talks about enhancing energy use for productive purposes so as to create rural employment, particularly for women. • Policy adds a subsidy benefit of an additional 10 per cent but not exceeding INR 10,000 (USD 94.53) to 'single woman' developers/entrepreneurs.
Draft National Energy Policy ¹¹ , 2014, Kenya Draft Energy and Petroleum Policy ¹² , 2015, Kenya	<ul style="list-style-type: none"> • Talks about need to enhance gender considerations in energy policy formulation, planning, production, distribution, and use. • No more than two-thirds of the members of representative bodies in each county government shall be of the same gender. • Mentions challenges, such as gender imbalance in energy and petroleum institutions, inadequate implementation of gender inclusive/mainstreamed policy and inadequate public awareness regarding adverse impacts of fuelwood and kerosene on women and children's health, and women's inability to access and afford modern and clean energy. • Gender inclusiveness must be incorporated into all government appointments, including government institutions (Draft Energy and Petroleum Policy, 2015).

While the key electricity acts seem to be gender blind without the mention of men and women, almost all the policies do specifically mention gender or women in the document.

Selected field experiences at the international level and study countries

This section attempts to document some selected experiences from the field to reflect upon the translation of policies into practice. These experiences are described and discussed to illustrate how both centralised and decentralised energy supplies have focussed on building programmes/business models that include a gender dimension.

¹⁰<http://www.aepc.gov.np/old/images/pdf/RE%20Subsidy%20Policy%202013%20-%20English.pdf>

¹¹<http://www.energy.go.ke/downloads/National%20Energy%20Policy%20-%20Final%20Draft.pdf>

¹²<http://www.energy.go.ke/downloads/The%20National%20Energy%20and%20Petroleum%20Policy,%202015.pdf>

In several developing countries a large number of economically marginal households, especially female headed households, are unable to obtain grid connectivity due to the high connection costs associated with it. In order to tackle the gender discrepancies associated with obtaining grid connectivity, countries such as Botswana and Lao PDR took measures to make their rural electrification programme more inclusive. For example, the Botswana Power Corporation, with support from ENERGIA, undertook gender sensitive projects that included men and women in the planning and implementation stages of the rural electrification programme for both on-grid and off-grid operations. As a result, the most marginalised members of the society, most of whom were women, received the benefits of electricity access. According to the utility, gender sensitivity was also institutionalised within the organisation (Botswana Power Corporation 2011). Similarly, in Laos PDR the rural electrification programme was facing differences in its electricity connections in terms of the urban-rural divide and gender disparities. By introducing The World Bank-supported Power to the Poor (P2P) scheme, an interest-free loan programme was established and households were supported with 80 per cent of the connection cost, so that their financial balance was not upset (The World Bank 2012). The households used the money that they previously spent on kerosene and paraffin for lighting to repay the loan (Practical Action 2011). The scheme also took specific measures to help women gain access to electricity. These measures included gender-sensitive eligibility criteria: among non-electrified households, all female-headed and single parent households would automatically be eligible for support, as long as the house was safe to electrify. Following the programme, the electricity access rate in the provinces where the programme was implemented increased from 80.91 per cent to 97.38 per cent. Among the female-headed households, the connection rate increased from 63 per cent to 90 per cent (The World Bank 2012).

At the decentralised level in the global South, the Multifunctional Platform (MFP), initially set up in Mali and replicated in a number of countries, is another example of how energy supply can succeed in significantly reducing the time burdens of women and allowing them to earn higher incomes (UNIDO and UN Women 2013). Sovacool *et al.* (2013) observes that the MFP in Mali has empowered women by lightening their workload, improving the efficiency of water collection, and enabling their participation in the local economy. For instance, with access to an MFP, women can save nearly two hours every day. Further, up to 60 per cent of the members of project structures were women, who gained skills to manage and operate private electrification entities. Women participated in installation and management of the multifunctional platforms as well as public lighting. Before the project, such responsibilities had been considered a male domain, so the project initiated a change in gender roles and potentially also social norms and gender ideologies.

An analysis of the case studies from both the centralised and decentralised electricity sectors illustrate that when given an entrepreneurial opportunity in the energy sector, women are empowered to take monetary decisions and become self-sufficient. Furthermore, when organised as collectives, women also address issues related to their welfare. For instance, in the state of Odisha and Maharashtra, the government electricity distribution company has actively involved women in electricity service delivery from the main grid. In Odisha, the women SHGs have been involved as franchisees in energy distribution, while the Maharashtra State Electricity Distribution Company Ltd. (Mahavitaran)¹³ appointed women line staff known as Mahila Vidyut Sahayak (Women Electricity Support Staff) under a policy that reserves 30 per cent of the electricity line staff jobs for women as a part of the Mahavitaran agenda for women empowerment. The inclusion of women SHGs in the former experience resulted in significant improvements in terms of reduced distribution loss, reduced AT&C loss, increased billing percentage, and increased consumer coverage as well as increased total annual collection (Government of Odisha 2012). In the latter experience, it is the first time in India when a government entity has appointed women to work with electricity poles, live

¹³ http://www.mahadiscom.in/aboutus/company_profile.shtm

cables, transformers, and other pieces of field equipment that function as part of a power supply network. Apart from this initiative, Mahavitaran has also implemented all women squad formation popularly known as Damini Pathak (Readers of Light). This squad checks meter tampering and takes into account the consumer complaints regarding photo meter-reading. All these initiatives are part of the Mahavitaran agenda for women empowerment.

Similarly, in the off-grid sector, there are instances in which the institutional set-up in the form of SHGs has helped women to come forward and be a part of rural energy intervention. For instance, in order to promote rural electrification efforts through renewable energy, a programme was implemented in the Purnia district of Bihar by the Bihar Rural Livelihood Promotional Society (BRLPS) in collaboration with the Lighting a Billion Lives programme to promote Solar Home System (SHS) to facilitate clean household energy access to women-led SHGs under the JEEViKA project.¹⁴ As part of this collaboration since 2013, 15,000 SHSs have been installed in rural households in the Purnia district, Bihar. Under this project, only SHG members are entitled to take up energy loans, herein referred to as 'energy security credit' (Palit *et al.* 2015). This credit helps them with financing the SHS. Initially the seed money was provided by the government run JEEViKA programme to the women-led Cluster Level Federation (CLF) for onward lending to their female SHG members based on the demand. Since most of the households in the Purnia district are un-electrified, the women decided to use the credit to purchase an SHS and repay the loan in instalments to the CLF. Another classic example of empowering women to power off-grid communities is echoed in the initiatives undertaken by 'Empower Generation'¹⁵, and 'Ikisaya Energy Centre', Kenya. Empower Generation, a Nepal-based organisation, works to provide clean energy solutions, including solar lighting, in energy deprived communities in Nepal.

The organisation creates markets for clean energy products by providing low interest loans to women entrepreneurs so they can purchase and repair these products. The women not only write business plans but also select clean energy products which they deem fit for the needs of their market. They are further empowered to develop their brand and scale up their businesses. Ikisaya Energy Centre in Kenya, on the other hand, offers electricity services through the rental of recharged solar lanterns that provide light for a few hours every evening/night (Muchunku *et al.* 2014). The centre is operated by a staff team, with a local woman as the manager of the centre. The manager remarked that it has become normal in Ikisaya and neighbouring villages to see young women being trained and employed in the provision of electricity services, doing administrative and technical tasks.

Overall, the experiences reflect that both on-grid and off-grid programmes offer opportunities for gender inclusion. However off-grid programmes, which in a way also derive from gender blind policies, seem to offer better anecdotal evidence in terms of engendering management and organisation of supply. This may be due to the fact that off-grid programmes are usually designed through 'bottom-up' approaches, enabling participation of women and marginalised groups. Grid extensions have also included women in the systems of supply (e.g. Botswana), and subsidy schemes have had a positive impact on women's degree of access (e.g. Lao PDR), though this kind of initiative has received little scholarly attention. The barriers for employing gender-sensitive approaches in grid electrification may be linked to their top-down approach with limited prioritisation of gender issues by the management unless specifically initiated by external partners. The impression from the desk study, and which was reiterated in stakeholder consultations, is that there is a lack of documentation of the merit of including gender elements in electrification programmes in general and in grid programmes in particular.

¹⁴JEEViKA is a project for social and economic empowerment of rural women in Bihar, implemented by BRLPS and the World Bank.

¹⁵<http://www.empowergeneration.org/>

2.2.3 Key issues and gaps

Gender issues have a key role to play in electricity policies primarily because gender differences have a bearing on people's requirements, priorities, and opportunities. There has been some effort to include gender components in the planning phase of formulating the national electricity policies in all the study countries. However, the primary emphasis of electricity policies has been rooted in the ideology of national welfare, which is linked to the underdeveloped characteristics of the study countries. Women's needs for electricity and related services and their potential involvement in supply seems to have been left out of energy planning in many cases because these concerns do not always fit into the traditional energy paradigm.

Some of the main issues and knowledge gaps identified by this policy research are summarised below, while policy recommendations follow in Section 4.

- Although the second part of this scoping report will show that there is a substantial body of evidence on the gendered impact of access to electricity, there is a dearth of literature that looks at the current stance of gender in electrification policies and how the gender elements in the policies have been translated into practice through electrification programmes and projects, and what the outcomes of such initiatives are. Most of the available knowledge on the policy-electricity-gender nexus derives from singular case studies of off-grid supply, whereas grid systems have received even less attention.
- There is also a lack of systematic collection of gender-disaggregated statistics by energy ministries, as observed in the three study countries, and one rarely finds evaluations of centralised and decentralised electricity projects that use gender analysis or articulate the benefits of any policies and schemes pertaining to women.
- In most countries there appears to be a lack of inter-ministerial coordination, which is required for addressing gender and energy issues in effective ways. The implementation of energy projects in isolation, without integrating them into other sectors such as forestry, agriculture, and rural development, poses a risk of overlooking important aspects of gender and poverty.
- In all three study countries there are gender disparities between women and men when it comes to governance and accessibility to energy resources. As we discuss in the literature review, women's lack of ownership rights over productive resources and educational and institutional barriers are generally likely to exclude them from the decision-making arena in the electricity sector.

2.2.4 Summary and final reflections of the policy review

It is clear from the review of the national electricity policies of the selected countries that the main emphasis in the policies and programmes have been: (i) to expand and provide electricity to the population that lacks electricity access, both through on-grid or off-grid interventions, (ii) to make the services affordable to the poorest segment of the population, and (iii) to enhance the availability and reliability of the energy services. There has also been emphasis on ensuring that there is a link and promotion of gender analysis and mainstreaming in the energy sector in order to address the commitments made by governments on promoting gender equality, development and peace. However, such efforts mostly address women's needs in the realm of cooking and household lighting, and women are seen more from a consumer perspective, with little or no emphasis on expanding women's productive uses of electricity, achieving gender balanced recruitment and staffing in the sector and considering gender from a 'prosumer' perspective.

The international discourses, especially exclusive initiatives targeting energy access such as SE4ALL and other development initiatives such as SDGs, largely focus on ensuring universal access to affordable, reliable, and modern energy services, improvement in energy efficiency and promotion of renewable energy. While the term universal access also covers women, the discourses only sometimes focus explicitly on the differentiated needs of women and men. In contrast, in the

national energy acts and policies, approaches to electricity in development policy, planning, and programmes are often gender blind. By and large, the electricity policies and programmes which form the basis for the expansion of centralised systems have assumed that the benefits will trickle down and be of equal use to women and men. Very few policies and practices have been observed in which women have been involved in the decision-making process, policy formulation or execution of the programme or project. Furthermore, the overall focus continues to be on increasing the efficiency of electricity supply, privatisation of the sector, and reducing subsidies on fossil fuels.

It is also observed that the decentralised systems/programmes in the study countries varied in 'pace' and 'depth' in terms of including gender perspectives, but certain efforts were made towards gender inclusion. This is in spite of the fact that there are no specific policies related to gender aspects in decentralised energy. Gender aspects, if any, considered in the general electricity sector policies also yield relevance for decentralised electricity sector projects. Some of the underlying principles that seem to have been adopted for gender inclusion in the decentralised systems, though not mentioned explicitly, were identified as human welfare, equality/equity, empowerment, entrepreneurial opportunities and poverty alleviation. At the same time, several of the initiatives display missed opportunities to deliver the desired benefits to men and women.

Given the overall observed limitation of gender focus in the electricity sector policies, a crucial question for research and policy is to what extent the experiences with gender sensitive approaches found in the management and operation of decentralised electricity systems can be transferred to and benefit policies that govern the expansion and operation of centralised systems. Likewise, further research should also be done on how the lessons learned from enhancing women's access to electricity through subsidy schemes, as pioneered in a couple of grid cases, or other good practises of planning, implementation and monitoring may be used to inform effective measures for women's access to decentralised systems. The policy review also indicates that the current discourses in their present shape and form at the national level tend to recognise women's need for domestic energy and do not adequately incorporate women's other energy needs such as affordable access to electricity's productive services, educational or communication services, reproductive work, nor do they mention the aim to enhance women's participation in the management and supply of electricity.

The study further raises some pertinent questions for gender inclusion in the electricity policies:

- What should be the components of a gender-responsive policy framework for rural electrification (centralised and decentralised)?
- What lessons learned from gender sensitive approaches adopted in programmes for decentralised systems could be adopted and benefit grid extension programmes, and vice versa?
- How could the managerial, technical, and institutional design of electricity systems offer scope for gender inclusion?
- How do policies ensure that women's interests (not only voices) are represented in decision-making processes at all levels during electricity interventions and operations?
- What sort of 'sister policies' are required, and how can policies governing other sectors help to develop synergy for gender inclusion in the electricity sector?

An expanded version of this section will be published elsewhere (Palit *et al.* in progress).

3. Review of the evidence on women's empowerment through electrification

3.1 Aim and methodology

The literature review has a dual aim. Firstly, it seeks to systematise and document existing evidence on women's and girls' empowerment through electrification in the rural South. The second aim concerns methodology and the question of what counts as evidence when women's empowerment from electrification is assessed. Correspondingly, the second aim is to develop a suitable analytical framework for analysing women's empowerment in the realm of electricity.

The review was carried out from April 2015 to January 2016. The scope of analysis includes the macro, meso and micro levels, and we cover, but also go beyond, the 'chain' from electricity supply to the impact on end-users (e.g. empowerment) proposed by development actors, such as ENERGIA. The reviewed literature includes published and peer-reviewed empirical studies on the impact of electricity on women, conducted across the globe but mostly in developing countries. We also include peer-reviewed articles treating the concept of empowerment. Sources from the grey literature have also been consulted.

To identify relevant work, the review team drew on the members' existing knowledge of the literature in addition to searching scientific databases (Google Scholar, Elsevier Science Direct, ResearchGate, etc.). We started by listing relevant studies according to five initially identified factors that we considered as important to the outcome of electrification (see below). Then we identified the various methodologies applied in the literature, if and how empowerment had been defined, and the indicators that had been used for measuring empowerment.

The literature review report has been prepared by project team members from the University of Oslo and Dunamai Energy in collaboration with the other members of the research project consortium. Based on the literature review, two journal papers will be published elsewhere (Matinga *et al.* in progress and Winther *et al.* in progress). In this scoping report we summarise the findings. Identified knowledge gaps and policy recommendations are provided in Section 4.

3.2 Searching for explanations for electricity's impact

When revising the empirical evidence on electricity's gendered impact, we were not only interested in the specific outcomes that had been observed, but also in understanding the mechanism through which electricity produces a given set of impacts and the factors that condition them. To facilitate a systematic treatment of how conditional factors have been treated in the literature, we developed a hypothesis which presumed that six factors would be relevant.¹⁶ Inspired by a branch of socio-technical system theory that addresses the way the particular shape of a technology limits what people can do with it (cf. 'scripts', Akrich 1994), we first presumed that the design of the system of supply (various types of off-grid and grid-based systems) would be one such conditional factor. We consider the price of electricity and tariff regulations as part of the system's socio-technical designs. People's electricity use is determined by whether they have access to three hours of light and television in the evening or an 'unlimited', reliable supply 24 hours per day. Moreover, the details of centralised and various types of off-grid systems provide different opportunities and challenges for people, both for getting access to the electricity services provided and for the suitability of the services to people's needs in various socio-cultural contexts and for different social groups, including genders. Many people experience highly unreliable supply, which affects what they

¹⁶ We initially identified five factors, but the work with the policy review (Palit *et al.*, in progress) revealed that international actors sometimes play an important role, so we decided to include this as a sixth factor.

can do with electricity (cf. the 'multi-tier' framework developed by the Sustainable Energy for All initiative).

Secondly, again following socio-technical system theory, we expected that the ownership, management and daily operations would affect the socio-technical design of the system and thereby the type of access provided. For instance, the private sector is supported by international agencies to provide off-grid electricity services, in which "social concerns have to be weighed against financial viability" (IEG 2008). For conventional rural electrification, however, support to governments and promotion of a pro-poor agenda has been more common. Interestingly, the reviewed studies have mostly focussed on interventions organised by the public sector, NGOs or community-based organisations. We found only one study on the gendered organisation and impact of an intervention run on commercial principles. This case study from Sri Lanka compared two types of bio-energy plants for electricity and revealed that in the commercial grid women were excluded from control, whereas in the community plant women were active in community organising (discussed in CRGGE 2006:56). Given the many commercial electricity initiatives and growing public-private partnerships in development cooperation that are taking place at present, their social impact deserves more attention.

A third identified factor is the process of electrification. During the planning and implementation process, the major decisions on the socio-technical design are being made, as well as large investments in equipment. Important learning processes and acquisition of skills also take place. Therefore, in many ways this process has an impact on who is able to use, change, and benefit from the system in the long run. Electricity infrastructures are physically heavy, costly, and enduring, and the decisions taken when they are being shaped have long-term consequences. The importance of the process of electrification had been noted in the literature (e.g. Clancy *et al.* 2007), and it had also become clear through our own research that if women are excluded from the electrification process, their interests (e.g. productive activities) may be disregarded (Winther 2008).

Fourthly, the existing socio-cultural and material aspects of local communities and everyday practices shape the way technologies are negotiated and introduced, and are also affected by the technology (Wilhite 2008, Winther 2008, Ulsrud 2015). This factor is crucial for understanding how any development intervention affects gender relations and women's empowerment (e.g. Elson 1995). Finally, inspired by political economy, we wished to understand how the field of electrification is governed and how this potentially influences the gendered impact of electrification. Correspondingly, we included national policies and the role of international actors as our fifth and sixth conditional factors for women's empowerment through electrification. There are also other aspects that may come into play, but we decided to limit the analysis to focussing relatively closely on the interventions on the one hand, and the potential changes in the lives of women on the other. Nonetheless, in the analysis, we also discuss other contingencies for empowerment through electrification which have been noted in the literature.

The review process revealed to us that econometric studies tend not to focus on any of these factors apart from, in some cases, the political framework and the cost of electricity to the consumer. Rather, they seek to document the impact of having access to electricity on a limited set of indicators by comparing households with and without access to the grid, while controlling for factors that may

disturb a statistically valid result. The data are based on censuses containing large samples and the analysis is carried out in the aftermath of electrification. When accounting for the outcomes in terms of electricity's effect on school enrolment, fertility or employment, they provide suggestions for the underlying mechanisms. In contrast, qualitative studies have tended to focus on the process of electrification and several of the identified, assumed conditions for electricity's impact. The six factors, and the ways in which they have been treated in the body of reviewed qualitative literature, will serve as our guide when we embark on the empirical part of our research. We will also convey the significance of some of them in the discussion below.

3.3 Defining empowerment

The notion of empowerment needs clarification for the purpose of this review. Many studies on the impact of electricity on women do not refer to the concept of empowerment, but rather refer to the changes brought about by electricity as 'welfare benefits' such as improved education and health. Some studies use the strange notion of 'gender empowerment' as if the goal is to empower both men and women, which the term 'empowerment' alone would cover, while others take empowerment to mean 'economic empowerment', for which more women entering the labour force (employment) is used as an indicator. Political empowerment is rarely treated in studies of electrification. To clarify what we mean by the concept and allow for a structured analysis of the evidence, we use the following definitions (partly drawing on Friedman 1992) which consider the notion of empowerment in relational terms (i.e. women's situation compared to men's): Women's empowerment is a process towards gender equality which implies women's and men's equal rights, access to and control over resources and power to influence matters that concern or affect them. This conceptualisation is also largely influenced by Kabeer (1999, 2001) and her framework for measuring empowerment. However, Kabeer holds that people's empowerment is ultimately qualified by an increase in their ability to make strategic life choices ('first order choices') such as deciding whom to marry. For the realm of energy and electricity, which are implicated in everyday life in fundamental ways, we argue that changes in decision-making power over issues of less importance when considered in isolation ('second order choices'), such as deciding on when to start cooking an evening meal or whether to buy a mobile phone, should also be taken into account when assessing empowerment. As changes become aggregated across practices and over time, and affect large groups of women, we hold that these kinds of changes in a group's ability to make choices may be significant. Correspondingly, and relying heavily on Kabeer and the definition of gender equality, we arrive at a set of categories for measuring the situation before and after electrification (i.e. degree of empowerment) which includes access to and control over resource (material, social, and human) and agency in the two senses mentioned above. Because norms strongly affect what people can do, signs of changing gender norms and attitudes that reflect reduced acceptance for women's discrimination also imply increased agency. In addition, we focus on women's decision-making power in matters related to electricity, which may both constitute a condition for electricity's impact and result from the way electricity is organised, adopted and taken in use. In the analysis, the advantage of using this framework was not only that it facilitated the structuring of findings in the literature but that it also served to accommodate a joint treatment of three rather fragmented discourses on gender goals for—and impact of—electrification: welfare, economic empowerment and political empowerment (Skutsch 2005:40). In Section 7.3 we present the developed framework for analysing women's empowerment in the realm of electricity.

3.4 Evidence on electricity's impact on women's empowerment

Significant reductions in drudgery

The arrival of electric light affects people's time use in profound ways and leads them to reschedule and reorganise everyday routines. Because women in the rural South tend to spend more time working at home than men and often, but not always, have the main responsibility for collecting firewood, electricity significantly affects the way women perform these practices associated with the household. Because the literature has given limited attention to electricity's effect on women's time used to fetch water, we do not focus on this, though electrified water services may certainly reduce this type of drudgery.

The magnitude of time saved on drudgery due to household electrification in rural areas has been documented in several econometric studies which account for causality. In the Philippines (ESMAP 2002) total drudgery (firewood included) was reduced by one hour per day. In selected states in India, where women without electricity spent about 12 hours per month collecting fuel which was twice as much time as men spent on this activity, both genders reduced their time used by 3.3 hours per month (Khandker *et al.* 2014). In another study from India which did not account for statistical causality, women generally spent about 40 minutes daily collecting fuel or 20 hours per month. Women in households with electricity spent 20 minutes less than those without, and this tendency (access implied less time used to collect firewood) was observed for various income groups (UNDP/ESMAP 2004). In Nicaragua, where men spent twice as much time collecting fuel than women before electrification, electricity caused a daily reduction in this activity of about one hour (women: 45 minutes, men 65 minutes) (Grogan and Sadanand 2013). In South Africa, electrification reduced the use of firewood as the main fuel for cooking by 3.9 per cent, while the use of electricity for cooking increased by 5.6 per cent (Dinkelman 2011). In this last case, the shift in cooking technology was a documented explanation for the reduction in drudgery, whereas in the Nicaraguan case the authors suggest that the reduced time used to collect fuel might be linked to a growing uptake of gas stoves (Grogan and Sadanand 2013). Another study from India which did examine the link between non-electric but so-called modern stoves found that electricity increased the likelihood of owning a kerosene stove by 13 per cent and that such items were kept by 56 per cent of those with electricity access (van de Walle *et al.* 2015).

These studies document that electricity significantly reduces women's (and some men's) physical burden and time spent fulfilling basic needs for their families. Fuel collection may have detrimental effects on people's health, which means that they come to possess increased human resources. They also obtain more choice as to what to do with their time, thus reducing time poverty and increasing agency in everyday life. Notably, these findings also indicate that one of the mechanisms through which the reduced time spent collecting fuel occurs is an increased uptake of modern stoves (see below). Qualitative studies further help explain the mechanisms through which electricity contributes to reducing drudgery and producing other effects. First of all, electric light affects the *manner* in which household practices are performed, sometimes making them more efficient compared to when a kerosene lamp is used. For example, women in the Sundarbans described how the electric light helped them 'see better' and become more efficient, for example by watching a boiling stew at a distance as they were cutting onions and being able to use both hands at the same time (Winther 2014). It was also noted that electric light made it possible for several people to use

the same light at the same time. Thus, in the case of scarce resources, families did not have to choose who amongst their children would use the light because they could use the illuminated space jointly, thus enhancing equal study facilities for girls and boys (ibid.:54). This illustrates how the materiality of electric light, through its capacity to enlighten large spaces, often fixed on a surface, may influence people's time use. The particular quality and brightness of electric light is also a key in cost-benefit models for estimating the welfare impact of electrification which involves comparison of the technical quality of electric light (lumen) with that of kerosene light (ESMAP 2002, IEG 2008).

Secondly, the introduction of electric light may induce a *rescheduling* of tasks. A case study in India observed that women with access to electricity started cooking the evening meal half an hour earlier than before (Millinger *et al.* 2012), and such reallocation of time was also suggested as an explanation for reduced drudgery in one of the econometric studies (UNDP/ESMAP 2004). Access to electric light also affects children's allocation of time for studying and other activities, which are linked to those of their parents. From the material two contrasting patterns appear. In Afghanistan women said that after the arrival of the electric light, their daughters would help them in the evening (carpet weaving and other chores) and go to school during daytime (Standal 2010). Similarly, an econometric study from India suggested that girls' increased enrolment in school could be linked to a reallocation of their home duties from daytime to the evenings, thereby reducing parents' opportunity cost of sending their daughters to school (van de Walle *et al.* 2015). In contrast, girls in Madagascar continued to help their mothers to the same extent after electrification, but reallocated their study time from daytime to the evenings, when they would get help from their parents (Daka and Ballet 2011). They found that girls living in households with only a female head of household benefitted in particular from electrification in terms of increased study time because the mothers would now be able to help them in the evenings. In sum, because electric light extends the time available for doing various activities, one may expect reallocations of time to take place, but contextual factors (and negotiations within the households) will affect how time is managed.

Thirdly, the '*gender*' of established practices may change as new technologies become available and in turn spur more uptake of time-saving technologies. Two studies from South Africa (Annecke 2005, Matinga 2010) observe that the introduction of electric appliances resulted in some men engaging in cooking and ironing. The new technology extended the range of tasks that men could and were willing to do in their particular social context, thus modifying the conventions and norms governing specific social practices. For Nicaragua, there were some (statistically insignificant) changes in the time spent cooking: women with access to electricity reduced their time cooking by 35 minutes daily, whereas men's time increased from 5 to 7 minutes (Grogan and Sadanand 2013). Men entering the realm of cooking indicates that gender norms are being challenged, and because this releases women's time spent on unpaid and often devaluated tasks, it can be considered as a step toward women's increased agency and empowerment. Because this change was only observed in one single country and only performed by 'some men', it is hardly evidence of a major shift, but the observations in South Africa do demonstrate the close association often found between the hearth and women, and it signals the transformative potential embedded in new technologies. Evidence from South Africa notably suggests that electricity facilitates shifts in gender roles and responsibilities when they are backed by institutional support for gender equality. This is because electrification

makes it easier for men to take on domestic responsibilities, but legal backing is necessary for asserting women's rights (Annecke 2005, also discussed in CRGGE 2006:70).

Fourthly, *people pursue particular interests, identities, and purposes* when they reorganise former practices (such reorganisations are also negotiated, as we turn to below). A woman's motivation for reallocating her time and even start using a cookstove may derive from a range of sources beyond a wish to obtain more convenience, comfort, and flexibility and reduce drudgery and costs. For example, access to electricity increases the length of time women read (UNDP/ESMAP 2004), if not necessarily their likelihood for reading (IEG 2008). Based on the reviewed material, the wish to earn an income and watch television seems to be particularly important for many women. Whereas quantitative studies reveal the magnitude of electricity's degree of impact on specific variables (e.g. women's employment, see below), qualitative approaches have been used to account for how and why such shifts occur. For example, television watching was common in Zanzibar, and women pursued income-producing activities as well. Both these concerns came into play as women, due to electricity, reduced the number of meals they cooked per day from three to two.¹⁷ During daytime they were able to do engage in income-generating activities (not related to electricity), and in the evenings they could watch television. Hence, due to electricity access, they reduced drudgery, enhanced income generation, and got the opportunity to watch television. Such multiple purposes spurred by the new range of choices of what to do when also brought about a faster pace of life in the village where people felt more hurried than before (Winther 2008).

Positive impact on girls' and boys' schooling

Girls gain particularly from electrification in terms of school enrolment and duration of study hours at home. This is probably closely related to the reallocation of time spent on the various tasks noted above, through which girls benefit the most because they tend to do more households chores than their brothers. It is also a possibility that the amount of time girls spend on household chores sometimes actually decreases (this was the case in Zanzibar due to electrified water pumps). Women's reduced drudgery strengthens such an interpretation because girls' work is often denoted as 'helping mothers', and with more time available mothers might not need to ask their daughters for help as often. Three of the reviewed studies quantified the impact on education by specifying the impact on girls and boys. In Bangladesh, children without electricity only completed four years of schooling at the time the data was collected, and the authors note that the children from land-rich families benefitted the most, where electricity access caused an increase in the years in school by 20 per cent for girls and 16 per cent for boys (The World Bank 2009). The authors do not highlight the gender difference, but this becomes even more striking when looking at children from poor families. Here, the increase in enrolment as a result of electricity was 19 per cent for girls and 13 per cent for boys. Thus, poor girls nearly gained as much as rich girls, while the result for boys was less for both economic groups. In India, where girls still lag behind boys in receiving education, girls' enrolment increased by 14 per cent when the household got access to electricity, while the effect on boy's enrolment was insignificant. Because girls in rural India do not generally have the same opportunities for education as boys, electricity in this case contributed to closing the gender gap. In the longer perspective, women's human resources will be more on par with those of men. Finally, another study of the influence of cable television on changing attitudes towards gender discriminating norms found

¹⁷ In neighbouring villages without electricity but with the same kind of opportunities for income generation, women continued to cook three meals per day.

that girls aged 6 to 12 years increased their school enrolment by 12 per cent. A similar result was not found for other groups of girls or boys (Jensen and Oster 2009).

Varying impact on income production: economic empowerment?

Many studies found evidence for electricity's positive effect on women's access to short-term material opportunities, while fewer studies have observed women's long-term access to and control over resources (including economic empowerment), which we refer to as material endowments. Two econometric studies from South Africa (Dinkelman 2011) and Nicaragua (Grogan and Sadanand 2013) document that electricity caused significant increases in women's rate of employment, by 9 per cent and 23 per cent, respectively. Changes in men's rate of employment in the two contexts were insignificant. In contrast, a third study on employment from India (van de Walle *et al.* 2015) shows the opposite gendered impact of electrification. Here, only men benefitted through increased formal employment, whereas women in this sample increased the time spent on casual work by four days per year, while men's days on casual work were reduced by eight days. The opportunities to earn an income obviously vary between contexts, and the particularities of the labour markets and access to other infrastructures evidently influenced electricity's effect on employment in each place. However, there appears to be a general and close relationship between electricity access, uptake of modern stoves and access to income opportunities. This confirms previous observations. A report on the potential shift to modern stoves in China and other parts of rural Asia pointed to women's lack of employment and income as a reason for the low uptake (Kelkar and Nathan 2005). Here, public subsidies and information campaigns promoting stoves were not enough to cause a shift as long as women's labour was viewed as less valuable, which gave the households fewer incentives to change their cooking technology (*ibid.*).

When women enter the labour market it is likely to lead to economic empowerment in the long term. This is because labour participation increases women's likelihood of controlling resources over time (though there may be barriers, see below). Employment is also relatively enduring, likely to increase one's skills, and can be considered as an investment in future positions. Because casual work tends to be physically demanding and repetitive, we refer to increases in this activity as short-term opportunities because such work generates income but not long-term endowment.

An econometric study on the uptake of appliances in the US from 1930–1960 provides an interesting comparison to the presented material from the South. The study by Joshua Lewis (2015) analysed the effect of household electrification on female employment. The study found no evidence that the uptake of modern technologies led to increases in the employment rate at the time when they were introduced. However, when comparing women born in 1920 and 1950, he found that differences in *childhood* access to modern home technologies could account for almost 25 per cent of the rise in women's employment in the period (*ibid.*:542). The author suggests that this observed postponed effect of having access to modern appliances partly explains the paradox of the 'household revolution' in which time-saving appliances were taken in use without having immediate effects on time use patterns (cf. Cowan 1983): "It took several decades for the full impact of these new technologies to be felt." (Lewis 2015:542). Although there are important contextual differences involved, Lewis argues that this finding may imply that the benefit of electrification projects in the South may be underestimated.

Qualitative work has examined the extent to which employed women controlled the expenditures of their (new) incomes due to electrification. In Afghanistan women were recruited as engineers in the solar energy project, but had limited decision-making power regarding how the income should be spent (Standal 2010). In this case where women gained permanent positions but observably did not control their income, we do not consider the change to be long-term material endowments, but rather an increase in women's material opportunities and human resources. Some of the qualitative studies have also found a positive effect of electricity on women's income. These studies have tended to focus on women's income generation activities at home. Women in Mali who were using a 'multipurpose platform', which allowed for the use of electrified tools for activities such as rice hulling and shea nut grinding, increased their income by 47 USD per year (Sovacool *et al.* 2013). Also in South Africa, Afghanistan and Zanzibar women engaged in various income generating activities, but either these were small in volume to make a radical difference to women's finances (South Africa and Zanzibar) or women had limited power to decide how the income should be spent (Afghanistan). This exemplifies an important point not captured in the data presented in econometric analyses in that increased economic opportunities do not necessarily lead to increased control of the resources, thus economic empowerment. Agency is the crucial element for assessing empowerment, as we elaborate below.

Studies that have looked at the gendered ownership of appliances (Sundarbans, Uttar Pradesh, and Zanzibar) all found that men were the owners of the appliances including mobile phones (Winther 2014, Standal and Winther 2016, Winther 2008, see also Tenhunen 2008 on men's ownership of mobile phones). This implies that the women in these places had limited decision-making power over what appliances to purchase and where to put up the lights compared to men. They also did not accumulate assets in the long term, which follows the established gender division of wealth. In contrast, most women in South Africa had control over and long-term ownership of material resources including appliances, aided in part by the fact that many of these headed their own households (Matinga 2010).

Empowerment through television and mobile phones, including reduced fertility

People tend to reduce the amount of time they sleep after electrification, while the time they spend watching television may exceed the increased hours being awake, as was found for both the Philippines and Lao PDR (IEG 2008). Telling of the widespread attraction to television, IEG's mapping of a dozen countries showed that light and television constituted 80 per cent of households' electricity consumption (*ibid.*) In one of the Indian samples 40 per cent of households with access to electricity had a television set, and the authors noted the high frequency of television sets in light of the limited investments made in time-saving appliances that could have reduced women's daily burden (UNDP/ESMAP 2004). In Zanzibar, the priority of television over stoves was linked to the pattern of male ownership of appliances, and this pattern has been observed in other contexts, as seen. Such patterns indicate that men have stronger negotiating power in deciding on which appliances to obtain (Winther 2012). However, women also want to watch television and find time to relax as a result of electrification, and people without a television set at home often watch in other people's homes, modifying patterns of socialising (Winther 2008, Matinga 2010, Standal and Winther 2016). To people who live with time poverty and spend a large share of their time on physically heavy drudgery, increased time for relaxing is a sign of their improved human resources.

Most of the empirical data that informed the reviewed econometric studies were collected before the mobile phone became common, but there are some qualitative studies in areas where women's general mobility is restricted by cultural conventions (Uttar Pradesh, Sundarbans). Through the use of mobile phones the women strengthened their social networks through communication with people outside their locality. Tenhunen's ethnographic material from West Bengal has elaborated on the positive implications of women's new access to mobile phones (2014), where the phones provided women with support from their natal families in difficult times.

There is strong evidence that the content of television programmes may reduce the fertility rate. Based on a large sample from nine countries, IEG (2008:44) found that access to television reduced fertility on average by 0.6 children per woman. Two other econometric studies also found that the fertility rate declined with the arrival of television (La Ferrara *et al.* 2012) or particular channels conveyed through cable TV (Jensen and Oster 2009). To account for this effect, both studies (and IEG) assert that through television, women gained knowledge about family planning and alternative gender narratives, which reduced their likelihood of having many children, thus reducing health risk. Jensen and Oster (2009) also measured women's attitudes towards gender discriminating norms and observed that women with cable television were less likely to agree that it is acceptable for a husband to beat his wife, and they were less inclined to prefer having sons rather than daughters (which was a common attitude in these areas). The authors attribute these changes in attitudes, which reflect a higher status for women, to watching cable television. Thus, in contrast to the noted range of welfare benefits and occasional economic opportunities provided by electrification, the influence of television came through a direct impact on attitudes and women's social position, which is linked to agency on a structural level. Among qualitative studies, Afghan women received information about women's rights through Iranian TV and radio, and expressed that this had opened a space for them to demand being part of family decision-making (Standal 2010). Women in rural South Africa also acquired new knowledge through television about women's entitlements with respect to the government. Moreover, they learned about voting processes and how to interact with the government and other welfare institutions (Matinga 2010).

The nexus between health and electricity is important, and electrification contributes to improved health in several ways. The positive health effect of reducing the physical hardship of collecting firewood has been treated in depth by Matinga (2010). Another general impact derives from the substitution of kerosene for electric light, which brings a beneficial effect on health through reduced indoor pollution (reduced respiratory and eye infections). In monetary terms, IEG (2008) estimated the health benefit of substituting electric lighting for kerosene lamps to \$2.50 per year per household (*ibid.*:43). Moreover, Standal (2010) found that electricity reduced the likeliness that women would be beaten by their husbands. With the possibility to quickly turn on the lights at night, some women reported that this allowed them to comfort their crying children at night before their husbands became annoyed and beat them. Women's opportunities to do domestic chores after sunset, making sure everything was done 'on time', was also cited as a reason for a decrease in 'men's anger' (*ibid.*).

Impact on agency and decision-making: little is known

We argue that women's decision-making power in everyday life (cf. Kabeer's "second order choices") reflects steps towards empowerment if the scope and type of changes in decision-making power is significant in the women's lives. From the above discussion it is clear that access to light and reduced

drudgery immediately provide women with more choices about how they use their time, and this alone could be considered as confirmation that women have become empowered in an absolute sense. However, we use the concept of empowerment in a relational way; thus women's situation and decision-making power must be compared to those of men, who we saw above may also experience reductions in drudgery and corresponding increases in agency in daily life. We need more information to qualify this question.

Several studies treat agency. In the cases from South Africa (Anneck 2005, Matinga 2010) and Zanzibar (Winther 2008), the material shows that women's agency in daily matters did increase as compared to men. In the South African case (Matinga 2010) women also experienced increased agency in the strong sense, including strengthened political power and changing gender norms. Except for this study, the research that documents increases in the strongest type of agency studied cases in which women became involved in the supply of electricity (Matly 2005, Sovacool *et al.* 2013, Standal 2010). We comment on these cases in terms of what they found regarding decision-making in the realm of electricity and then proceed to discuss how such power relates to changing norms.

Matly (2005) shows that women in the US often persuade their husbands to obtain electricity connections, and they also play a central role when deciding which appliances to buy. Anneck (2005) similarly reports that women in Khayelitsha provided the cash and made decisions about many purchases of appliances. In this case there was often a difference in the kind of appliances women and men would purchase, with men focussing on televisions and large appliances such as refrigerators while women bought hot plates, stoves, and small electrical appliances. Correspondingly, Matinga (2010) found that women in rural South Africa decided on what appliances to purchase and use, and they also often monitored and decided on electricity's uses within the household. This control was normally concentrated in the hands of older women, including mothers-in-law and grandmothers, but sometimes, if they had contributed to purchasing electricity or had good knowledge of modern appliances, young women would also have a say about electricity use in the household.

In contrast, Zanzibari women continued to have limited influence over electricity. Due to men's ownership of houses and other socio-cultural traits, men became in charge of electricity at home, which left women with limited decision-making power over what appliances to purchase (*ibid.*:160). Moreover, during the electrification of Uroa village, Zanzibar, the effect of women's exclusion from the process was that their productive interests were not adequately addressed. Only men were involved in decisions regarding what village facilities could be electrified. As a result, spaces predominantly used by men such as the mosques and fish market were electrified, while those used by women such as the grain mill and kindergarten were not (Winther 2008). A similar lack of women's influence over the process was observed in the Sundarbans (Winther 2014).

In Nepal, women were included in the decision-making processes during electrification (Upadhyay 2009). However, as a result of embedded gender norms, the women's participation was either blocked or made ineffective. This suggests that simply inviting women to become engaged in electrification processes far from guarantees their actual involvement and potential empowerment.

In contrast, in studies that have focussed on gender sensitive electricity initiatives and women's involvement in supply, including the planning and implementation process, the evidence is positive. Women in the US who were invited to attend electricity cooperative meetings in the 1930s obtained increased decision-making power in the communities in general; thus they also increased their political power (Matly 2005). In Afghanistan women were trained and put in control of solar home systems in remote villages. Through this experience and the solar engineers' increasing recognition from women and men in the community, they also started to influence other types of decision-making processes in their communities (Standal 2010). Women held a central position in the supply of a highly desired electricity service, and the results indicate that gender norms were being challenged as a result of the way in which electricity was implemented. This occurred through expansion in the type of roles considered possible and appropriate for women; thus women moved from being associated solely with the domestic domain to also becoming regarded as economically and technically competent and capable of taking on tasks 'for the country' (Standal 2010).

Many positive changes have also been observed in Bangladesh and Bhutan in gender norms due to women's participation in electrification (ADB 2015). In Mali the signs of women's economic empowerment did not lead the authors to conclude that gender norms were also changing (Sovacool *et al.* 2013), but the signs of some men's resistance towards women's success and in some cases, new control of land, could indicate that these women were in fact challenging the gendered hierarchy. The studies on the impact of television can also be said to document changing gender norms in terms of people's attitudes towards reproductive decisions (Hoque 1988, La Ferrara *et al.* 2012), including the increased rejection of violence against women, changing aspirations for daughters' education, and changes in people's preference to have sons rather than daughters (Jensen and Oster 2009).

The potential for increased general agency increases along with greater opportunities and long-term material resources. However, these dynamics are rarely examined. The South African case provides an interesting contrast to the studies that observed empowerment through participation. Here, a conventional, gender neutral approach to grid electrification was followed; however, women exercised agency through participation in protests against electricity (Annecke 2005) and policymaking (Annecke 2003), indicating some level of empowered engagement with the electrification institutions (Matinga 2010). Matinga and Annegarn (2013) provide an account of how women in South Africa gained political power through their new knowledge about rights and how to assert them.

Electricity's negative effects

In Uttar Pradesh, the arrival of electricity and appliances can be considered to have reinforced patriarchal structures (Standal and Winther 2016). This is so because the modest improvements in daily life experienced by women end-users are more than counterbalanced when electricity only provides women opportunities to perform their duties within the confines of their reproductive role. This strengthens the patriarchal system that hinders gender equality in the first place and increases the channelling of resources through the dowry system. The availability of appliances is a driving force for the increase in dowry, as Wilhite (2008) found among the middle class in Kerala.

The burden of dowry negatively influences the rate of sex-selection abortions (abortion of females) and produces skewed sex ratios, which further reinforce gender inequality (Standal and Winther 2016, drawing on John 2011). In Zanzibar, women's long-term financial security appeared to be reduced as a result of electricity's arrival because men would increasingly bind up their resources in electricity, the house and appliances, whereas women increasingly supported everyday subsistence through the income they made on seaweed production. Also, when energy substitutes men's labour, this can give men the opportunity to migrate to urban areas. Women are left behind to take over their husband's tasks. These women-headed households lack labour and other resources. It cannot be assumed that remittances will flow to households with absent husbands (Clancy *et al.* 2011, referring to IDS 2003).

In South Africa, Matinga (2010) observed a negative effect of watching television. Some soaps displayed characters who had multiple partners without contracting HIV/AIDS, and this appeared to validate unfounded local beliefs which were contrary to the science in this field. In both South Africa (Matinga 2010) and Zanzibar (Winther 2008), electrification led to increased social stratification, and the poorest women (and men) experienced a heightened sense of exclusion because they could not afford desired appliances that others in their communities could afford. Also, parents in South Africa expressed their worries about young women and men who were said to be at risk due to sleep deprivation from television watching and mobile phone use which could potentially have a negative impact on classroom performance. Parents also said they experienced a heightened sense of distance from their children, as the children had become more aware of their 'rights' and adopted foreign practices. There was considerable anxiety about the behaviours children might adopt by watching television.

3.5 Summary and reflections

Almost all the reviewed studies have examined electricity's impact on women's welfare and human resources, and they found a positive effect. The reduced drudgery is striking, and in one sense appears as the source for other effects. We noted, though, that women's wish to pursue specific activities (e.g. education and watching television) may also motivate them to reduce drudgery. Changes in time use partly occur through uptake of electrical appliances that substitute former technologies (as in South Africa). But studies also show that electrified homes, even when they do not have electric stoves, are more likely to use alternative fuels (LPG/butane/propane/kerosene), and modern biomass stoves and less likely to only rely on the open hearth (ESMAP 2002, Heltberg 2004, van de Walle *et al.* 2015). Education is another central realm in which the evidence agrees: Access to electricity enhances children's education in general and girls' education in particular. Also among poor households that can afford to get access, girls benefit considerably through higher school enrolment, which somewhat contradicts the general thesis that wealthier groups tend to benefit the most from having access to electricity. There are also clear signs that television watching reduces high fertility rates.

Among the reviewed econometric studies on employment, two out of three found a significant positive effect of electrification, and many case studies show that women make use of electricity for productive purposes at home. The most uncertain yet central question, for which the studies do not

provide a clear answer, is whether women gained more decision-making power in relation to men. Electric light and reduced drudgery induce an increasing range of choices which in many cases imply increases in women's empowerment, but whether this implies increased agency and transformation in gender relations needs qualification in terms of how it affects women's control over resources and decision-making power vis-à-vis men. In addition, the inclusion of women in supply has only rarely been studied, but among cases that have looked at this aspect, changes in gender norms were observed. Finally, as the authors of one study suggest (Jensen and Oster 2009), television programmes may be an underestimated tool for transforming gender norms and discriminating practices.

Previous reviews on gender and energy in development have called for a qualitatively different method of practice, moving away from gender blind approaches towards addressing women and their interests in policy and practice (e.g. Kelkar and Nathan 2005, CRGGE 2006, Clancy *et al.* 2011). We follow these overall recommendations, but wish to point to how the problem and its solutions have been framed. The wording tends to be aligned with an economic language of making women's labour more productive and enabling them to increase their income. They also promote strategies that ensure women's access, capacity building, and a supportive institutional and policy environment. These recommendations are commendable and important as partial steps towards women's empowerment. However, the focus put on quantitative evidence and checklists directed towards increased productivity and labour could risk conflating gender-sensitivity and 'women's issues' and increase women's work burden further. This is especially true if recommendations on 'complementary inputs' (CRGGE 2006) remain vague and under-prioritised. Embedded in this dominating rhetoric is the perception that the single path to gender equality is through women's economic empowerment.

This review has shown that the pathways to women's empowerment through electrification are multifaceted, and we call for an agenda-setting approach anchored in knowledge about the structures that reproduce gender inequality. We have highlighted the need to take into account men's position as well in order to understand electricity's gendered effects, and we observed that in some of the cases where gender relations have been studied (Uttar Pradesh, Nepal, Zanzibar) men's privileged position was maintained or possibly became stronger after electrification. Electricity cannot be expected to combat gender inequality alone, but there is a danger that interventions serve to strengthen discriminating structures. Given the significant investments that are likely to go into electrification programmes in the rural South in the coming decades, there is currently a window of opportunity to balance rather than reproduce structures of inequality. In Section 4 we identify further knowledge gaps and provide some recommendations for policy.



Photo: Staff at the Zanzibar Electricity Company (ZECO) who were recruited through the rural electrification programme in 1991. From left: Ms. Mwanaidi Silima Jaffar and Ms. Wanja Khamis Hemed, Uzi Village, Zanzibar, July 2005. Photo by Tanja Winther.

4. Identification of knowledge gaps and recommendations for policy

4.1 Knowledge gaps

1. Based on the review of electricity policies in Kenya, India and Nepal, it is clear that policies are mainly gender blind, although it has been observed that some electricity policies formulated in the recent past contain a few gender elements. Global initiatives for promoting universal access only sometimes address gender issues, and when they do they focus on women and men's different needs as beneficiaries. Generally, electricity policies do not address the problem of gender inequality. More knowledge is needed on how gender is treated in existing policies and the kinds of policy measures that could have an effect.
2. Electricity policy and wider legislation and policies, such as land rights and regulations regarding divorce and inheritance, affect women's degree of empowerment through electrification (Winther 2008, Danielsen 2012). More attention is needed on how various policies jointly hinder—and could produce—empowerment for women through electricity and other measures.
3. There is a lack of studies that critically examine how various types of electricity interventions affect women's empowerment. There are some signs that women's participation in the process of electrification and their inclusion in supply empower them as a group. This effect has occurred in contexts where electricity (off-grid) was introduced for the first time and women became directly involved in providing electricity's services (Afghanistan, Mali). Initiatives for including women in the process and supply have also taken place during grid expansions (Botswana), but the effects have not yet received scholarly attention. Conversely, consulting women in the process and including them in political bodies and village committees have not always resulted in similar effects (India, Nepal). Reported numbers of female and poor customers in the aftermath of women-targeted subsidy schemes have also been noted (South Africa, Lao PDR). However, there is a dire need to systematically examine the impact of various types of processes, systems and regulations on women's empowerment. Is it also important to compare to what extent and how women and men, respectively, obtain and benefit from various types of access in order to understand what measures it would take for women to benefit in particular to balance women's widespread disadvantages. Also given the many commercial initiatives taking place at present and their complete lack of attention in the

- literature from a gender perspective, their strategies, practices and social impacts deserve attention.
4. There is a striking lack of studies that focus on gender relations and electrification, which would imply a focus on both women and men and their respective degree of decision-making power and control over resources. This issue is crucial for assessing women's empowerment in the way we have used the notion.
 5. Econometric studies have tended to either focus on time use (gender specific) or fuel use and uptake of modern stoves, and we see a potential for adjustment in design of future studies. If studies on cooking technology and fuel included questions about who in a family is the owner of various appliances and by whom they are used (normally missing), the picture would have been more complete for understanding the gendered drivers for and implications of fuel shifts. Moreover, in the reviewed studies there is a division in focus which reduces the explanatory power of each of the two main types of studies. The studies that document changes in material aspects (cooking technology, fuel) tend to rely on speculations in terms of the effects on time use, whereas time-use studies sometimes lack even basic information about the types of energy sources people use for which purposes. More integrated, gender sensitive documentation of technologies, fuel and time use would provide important insight into the channels through which electricity impacts people's everyday lives.
 6. One of the reviewed econometric studies found that different econometric models employed on the same dataset resulted in opposing/discordant results (Salehi-Isfahani and Taghvatalab 2014, see also Bensch *et al.* 2011). This illustrates that there is always a certain degree of uncertainty associated with results deriving from studies based on large samples. This may derive from the modelling process and/or the selection of indicators for measuring a given variable (e.g. 'health knowledge'), which implies that there is always a degree of interpretation involved and thus a need for insight in the given context. Anthropology and ethnography are equipped to provide knowledge that allows for contextualised interpretation of results. This is needed to account for causality, thus the mechanisms through which electricity has effects. While policymakers have access to statistical data (though not always gender disaggregated), the issue of causality and the significance of context appear to be poorly understood. Qualitative and mixed methods have the merit of producing results which allow policymakers to take decisions with a more in-depth understanding.

4.2 Recommendations

1. There is a need to focus on how electricity policies and interventions could be shaped to mitigate the *causes* of women's subordination more effectively and thereby create opportunities for women's and girls' empowerment. Though women-targeted measures are needed — such as ensuring women's access to and control of electricity, their inclusion in supply and complementary inputs to support women's economic opportunities as well as their access to facilities for education, health, water, and sanitation — we suggest that a stronger alignment between overall policies for gender equality and electricity could help mitigate the causes for gender inequality and also help to identify how electrification could play a more effective role to combat such injustice. Similarly, there is a need to look at how electricity policies can be better harmonised with sister policies (other sectors) and the general legislation to promote gender equality. Based on such harmonisation, electricity policy should become more willing to test our measures that could enhance gender equality through electrification.

2. Gender sensitive approaches to electrification are often initiated by international development actors and NGOs involved in concrete programmes and projects. National electricity policies in the three countries studies, as well as global initiatives to promote universal access, tend to be gender blind. Some gender elements are mentioned in recent policy documents, but gender is not given a similar significance strategically as the overall (and gender blind) goals of providing universal access and improving provision of supply. Moreover, based on the limited documentation available, there are few signs that the mentioning of gender in some policies has translated into practise. More effort is thus needed to facilitate the inclusion and realisation of gender issues in policy, planning, and practice. To increase the likelihood that governments comply with their general commitments to promote gender equality, more effort is required to monitor the extent to which investments in the electricity sector accommodate women's interests.
7. During consultation meetings, stakeholders in the electricity sector expressed sympathy with the general importance of addressing gender in electricity, but referred to a lack of continuous pressure from the grass-root level for realising gender goals. To motivate policymakers to take action, this indicates there is potential benefit in raising awareness at the local level (e.g. sharing examples of 'best practice' as well as the potential risk of unequal distribution of electricity's impact, for example through radio, television and social media).
8. In the three countries selected for the policy review, there appears to be a lack of inter-ministerial coordination. Such coordination is required for addressing gender and energy issues in effective ways. The implementation of energy projects in isolation, without integrating them with other sectors such as forestry, agriculture and rural development, poses a risk of overlooking important aspects of gender and poverty.
9. The importance of producing gender disaggregated data to inform policymaking has been argued for a long time, but national statistics continue to use the household as the unit of analysis, which camouflages the different effects of electricity access on women and men. During the policy review from Kenya, India and Nepal we rarely found evaluations of centralised and decentralised electricity projects that used gender analysis or articulated the benefits of any policies and schemes pertaining to women. The kind of gender data registered is also significant. Internationally, there is a need to monitor the gendered access to and impact of electrification. However, because a large number of questions is needed to map various types of access and there is a limit on how many questions can be included in a survey, gender issues risk being marginalised in forthcoming monitoring procedures. To obtain knowledge on the impact of electricity on gender equality it could be possible, if funders were willing to support it, to develop an index for measuring women's empowerment in energy similar to The Women's Empowerment in Agriculture Index (WEAI), which also examines decision-making power and women's empowerment in relation to men within their households (IFPRI 2012).
10. Commercial electrification initiatives funded through international development bodies that have gender equality as a cross-cutting development goal should account for the way they integrate gender issues into their activities.
11. To balance the trend that men rather than women are recruited for technical and managerial positions in electricity policy and supply, and to ensure equal rights for women and men in line with the governments' general commitments, gender balanced recruitment principles should be implemented. The more training included during the recruitment process, the more pre-qualification requirements can be reduced (Winther 2008, Ulsrud *et al.* 2015). This is likely to strengthen women's entering the labour force of the electricity sector. A similar effort should

- be made to ensure women's representation in the field of policy, science, and the power industry to obtain a more inclusive recruitment in the electricity sector.
12. In some contexts women-targeted subsidy schemes have significantly increased women's access to electricity. Greater consideration should be given to incorporating this mechanism into a country's electricity regulations.
 13. For households with male and female heads, the possibility and effects of requesting that new customers are registered in the name of the woman could be looked into.
 14. Even when other factors are controlled for, electrified households have a higher likelihood of using alternative fuels for cooking (LPG/butane/propane/kerosene) than non-electrified households. Uptake of modern stoves is thus positively correlated to and caused by electrification. To encourage a shift from solid biofuels (e.g. firewood and dung) and the open hearth to modern stoves, coordinated initiatives to promote electricity access and stoves are likely to be effective.
 15. Television programmes may be an underestimated tool for transforming gender norms and discriminating practices.

5. Other evidence and developments: Consultation meetings with stakeholders

In line with the project's ambition to engage in dialogue with stakeholders at an early stage, the project team conducted interviews with key stakeholders (6 in India, 2 in Kenya, and 3 in Nepal) comprising researchers, policymakers, and practitioners. In early June 2015, two team members met with Dr. Mumbi Machera at Nairobi University and received a comprehensive description of events and processes that had influenced the work on energy and gender in Kenya together with perspectives from the 2007 gender audit of energy policy and programmes in Kenya. Only two stakeholder interviews were carried out in Kenya because of a delay in obtaining a research permit. One of these was with Mr. Henry Gichungi, a team member in this project, who has a deep and rich experience from the time when he worked with Kenya Power. His perspectives are enlightening at this stage of the project because they confirm that both the Government of Kenya and Kenya Power have followed gender blind approaches to electrification. The other stakeholder interview was with an Interested and Affected Party (IAP) to an Environmental and Social Impact Assessment (ESIA) and Strategic Environmental Assessment (SEA) carried out on a geothermal power generation project. This interview illustrated that while there are mechanisms under Kenyan regulations for public participation in ESIA and SEA processes, and these ostensibly include gender considerations, they do not necessarily result in empowerment of women (or men). In the case of the geothermal project, both women and men were negatively impacted, but in different ways. The interview also highlighted areas where such processes during the planning stage of large power infrastructure processes could be strengthened from a gender perspective.

Interviews with stakeholders comprising experts from policy making, research institutions and the private sector in India¹⁸ and Nepal¹⁹ confirmed that women are largely excluded from the electricity sector and that electricity policies primarily focus on access, reliability and affordability. Stakeholders mentioned that the policies are gender blind because the electricity sector considers households as a

¹⁸Stakeholder consultations were held with Dr Govind Kelkar (Senior Advisor at Landesa India, Rural Development Institute), Dr Dev Nathan (Professor, Institute for human development), Dr Jyoti Parikh (Executive Director, IRADE), Dr Veena Joshi (Formerly with Swiss Agency for Development and Corporation), Dr Leena Srivastava (Vice Chancellor at TERI University), Dr Akanksha Chaurey (CEO, IT Power) and Ms Ann Josey (Research Associate, Prayas Energy Group).

¹⁹Interview with Dr Govind Pokharel (Professor at Institute of Engineering, Tribhuvan University, former deputy chairperson planning commission, former executive director at AEPC), Dr Nigma Tamrakar (Gender Budgeting Expert at UN Women).

unit and overlooks the individuals and their choices within the households and the power relations among them. The role of the policies literally stops at the doorsteps of the households, and by and large they do not take into account the individual needs of household members or the acquisition of appliances and uses of electricity. Gender elements and other social goals are not considered as priority for the private sector either, because they have no incentives to cater to the special needs of women or the poor. However, they indicated that during implementation of decentralised systems the organisation of production, supply and consumption of electricity offer more scope for women's involvement, not just as beneficiaries but also as producers, either as individuals or Self-Help Groups (SHGs).

Stakeholders also highlighted the importance of having gender balanced representation (including marginalised groups) and participation in various committees, commissions, and boards for ensuring better gender sensitive approaches. Moreover, some of the stakeholders (senior experts) said that to stimulate women's productive uses of electricity, complementary/supplementary policies should be in place to enhance women's uptake of loans/credit, access to technology and information, etc. They further reiterated that as long as electricity policies are supply driven, they will continue to be gender blind, but the moment the policies are designed on the basis of demand (bottom-up), the differentiated needs of men and women would naturally be taken into account.

Coordination within the Gender and Energy Research Programme: A meeting with the different Indian teams, representing Research Areas 1, 3 and 4, was conducted on 8 June 2015. The meeting was attended by 9 members (incl. ENERGIA's focal point in India), wherein all the three research teams made a brief project presentation and shared their project's objectives, research questions, approaches and methodologies, selection of study areas, expected outcomes, and plans for dissemination of research results. This enhanced the team's mutual understanding of each other's work at an early stage which, going ahead, is expected to assist in developing synergies and cross-learning between the teams. We have also been in dialogue with RA5 to exchange ideas regarding the planned survey, and we shared some of our own experiences with qualitative work. We are also in dialogue with RA 3 and RA 4 regarding a possible study on the political economy component of the research.

6. Reflection and lessons learned from the scoping phase and process

The project achieved its goals for the scoping phase, and the process led us to refine and sharpen the project's overall objective and research questions as well as the research design and plans for the empirical work to be conducted in Phase 2. We also met some challenges which are mentioned below.

The positive factors that influenced the achievement of the goals for the scoping phase include:

- *Established research consortium partnership:* Several members of the team have focussed specifically on the gender-electricity nexus in their previous work, and all members have a genuine interest in energy and gender issues. The team is gender balanced as well as trans-disciplinary in that it includes both researchers (anthropology, human geography, political science, development studies, energy) and practitioners, which is an advantage in applied research. Further, the team members are experienced in working in projects that combine research and practise, which gives the team both academic depth and practical experience from the field. Several members have considerable experience in formulating and promoting research results so that they become relevant and accessible to policymakers. Most of our consortium

members have previously worked together in energy research projects, and this familiarity with each other facilitates effective communication and collaboration.

- *Support from the ENERGIA secretariat:* While the reporting requirements in the programme are rather rigid, the support from ENERGIA staff through formal and informal meetings on a regular basis has positively influenced our progress.
- *Collaboration with sister projects, TAG members and ENERGIA:* We have drawn on the network established in the Energy Research programme at large, which has helped produce synergies in the case of India (with RA 3 and RA4 & Energia India focal point) and enhanced our understanding of policies and activities in Kenya (contact with TAG member). The Inception Meeting in February 2015 and the Scoping Workshop in November 2015 were inspiring and welcomed opportunities to discuss the project with the ENERGIA staff, TAG members and representatives from DIFD, ESMAP, and other organisations. We also highly appreciated the opportunity to spend time together as a team face-to-face in November (three members), which enhanced our internal collaboration. ENERGIA has also conveyed contacts between us and projects outside the programme doing similar research, including staff within the Global Tracking Framework. Participation during ENERGIA's webinars on central issues (concepts and indicators) helped us to think about our project and research methodology from a developer/applied perspective. However, although such events are not very time consuming in themselves, we have found that such engagement 'steals' our attention and disturbs the progress with our own project. One reason for this might be that the expectations to our contributions are not always clear.

The challenges faced during the year:

The team is geographically spread, have other obligations that also require travel, and one member had a health problem for some time that prevented her from working as expected, which means that it has often been challenging to meet the deadlines we have set within the team. This points to the importance of planning ahead, following up by sending out reminders and keeping the spirit of a unified team despite long geographical distances. The collaboration would benefit from a face-to-face team meeting as a kick-off for Phase 2, but budget constraints do not allow for this, unfortunately.

- *Delay in getting research permit, Kenya:* We are still waiting for a response to our application for a research permit in Kenya, and as a result, we have not been able to conduct stakeholder consultations with policymakers as intended for the scoping phase. Similar delays in obtaining research permits are not expected in India and Nepal based on our prior experience in these countries.
- *Requests for compensation, Kenya:* Some stakeholders have asked for monetary compensation for their time when participating in stakeholder interviews, and similar requests (based on our previous experience) are expected from communities in Nepal. The research team's view on this is to respect that interviews do take up stakeholders' time, but that it should be time that is voluntarily given so that there is no bias in replying. It is anticipated that this issue may arise from time to time during the project—whether when arranging for stakeholder consultations or focus group discussions. The team's policy in this regard is that we do not pay or provide sitting allowances, we openly share our purposes and clarify expectations, and we ensure informed consent of the interviewee concerned and full anonymity for interviewee, if desired.

7. Proposal for Phase 2

7.1 Problem statement and research questions

The results from the scoping phase revealed that there is a significant body of evidence on electricity's positive impact on women's welfare. There are also clear signs that women may gain economic opportunities through electrification and—in some contexts where other conditions are also favourable—more employment from electrification, which implies economic empowerment. However, the literature review also observed that little attention has been paid to how women's control over finances and assets in the long term and decision-making power relative to men affect household negotiations regarding decisions on access to electricity's services (i.e. selection of appliances and location of lights). Agency and control over resources are also the constitutional elements of the concept of empowerment; thus studies are needed that measure these aspects in depth and the extent to which electricity affects them. Moreover, although there is evidence that electrification enhances children's enrolment in school, less is known about how and why this occurs and how it is related to the time use of mothers. In general, the review showed that studies that used econometric tools on singular effects of electrification (e.g. fertility rates, employment, shifts in time use) provide limited explanations for how and why the changes occur (or why results from various contexts differ), which restricts the learning outcome for policy in terms of what measures could have triggered or increased positive outcomes and mitigated potential negative effects. Possibly linked to the lack of insight in the channels through which electricity may produce given effects, including the contextual factors that come into play, electricity policies tend to neglect gender issues. The policy review we conducted, focussing on Kenya, India and Nepal, showed that the national electricity policies in these countries are often gender blind. These governments' general commitment to promoting gender equality only rarely translates into electrification measures that could enhance women's position, and when they do (India, Nepal) it is by including women in local bodies of authority, which does not always seem to increase women influence over decision-making.

Qualitative studies have offered more nuanced descriptions for and explanations of electricity's impact in single case studies, but because they rarely provide comparative data, the learning outcome is often limited. Moreover, no previous studies have employed the elaborated framework for measuring empowerment in the realm of electricity which was developed in the scoping phase of this study. In Phase 2 of this research we will employ this framework when conducting empirical research in Kenya, India and Nepal where we will compare the impact of centralised and decentralised systems of electricity supply on women's empowerment. The particular system of supply heavily determines what kind of 'access' end-users get, thus their realistic possibility to use electricity of a given technical quality of supply which is also affordable to them (SE4ALL, GTF). Other conditions also influence women's and men's access to electricity and the gendered impact of this. To structure the analysis of conditional factors that may affect women's empowerment through electrification, we maintain our six-factor hypothesis and will examine the selected interventions in the three countries with respect to:

- a. The socio-technical design of technological system (e.g. grid and decentralised and its particular configuration such as duration and type of supply, price of electricity)
- b. Ownership and management of the systems (commercial, public, or community based organisations)
- c. The process of electrification (e.g. gender sensitive, participatory, top-down)
- d. The socio-cultural and material context (preconditions)

- e. Policy, regulations and financing schemes
- f. The role of international actors

Overall research questions and sub-questions for Phase 2

The overall research question for the study is: *What policies and practices enhance women's empowerment through electrification?*

This question was developed during the scoping phase together with the following sub-questions:

- RQ1 With respect to electricity access and use, what factors affect women's and girls' empowerment?
- RQ2 To what extent and how does women's involvement in electricity supply empower women as individuals and what is the impact of women's inclusion in supply on the empowerment of women and girls in the wider community?
- RQ3 What are the potentials and limitations of centralised and decentralised systems in terms of enhancing women's empowerment?
- RQ4 How empowerment in the realm of electrification may be conceptualised and measured?

7.2 Research plan

The empirical research will be conducted in India, Nepal, and Kenya. It includes qualitative case studies and a cross-country survey and focus on both centralised and decentralised electricity systems. The overall research is divided into six Work Packages, of which WP B has been completed during Year 1 and WP F has been initiated through interviews and dialogue with selected stakeholders and through formulation of policy recommendations in this scoping report:

- WP A Project Management
- WP B Literature Review/Research Design (scoping phase)
- WP C Empirical Case Studies
- WP D Survey
- WP E Synthesis
- WP F Dissemination, Stakeholder Engagement and Recommendations

The case studies

We will conduct in-depth case studies in the three countries, which will provide context-sensitive results with a high degree of validity. By focussing on a set of factors and how they influence the effects of electricity in each case, our ambition is to test the relevance of these factors and, based on the analysis, provide policy recommendations. The open approach also allows for disclosure of relevant factors other than the ones initially identified. Data from the case studies will be used to respond to the overall research question and all the sub-questions.

Both centralised and decentralised systems have been selected in each country because this factor is the overall topic of our research area and uniquely looked into by us. We have selected at least one area in each country where we know that the two main types of supply exist in parallel, which will

allow us to compare systems within the same socio-cultural context and study the systems' gendered accessibility and effects. We consider the source of local production (solar or hydro) and type of distribution (mini-grid vs. solar home or energy centre model for supply, etc.) to be less important when selecting the cases; thus this aspect will vary from one country case to another. In the analysis, however, all the systems of supply will be accounted for in detail, e.g. the quality and forms of supply (e.g. numbers of hours with supply, limitations on end-use, tariff system), because this will have a crucial effect on the types of access to use that are offered. It will also be an advantage to include various ownership/management structures, e.g. private sector, government, non-governmental organisations, community-based organisations, to enhance an analysis of this aspect, but all these kinds of initiatives are not available in all the areas.

Members of our team have been involved in designing and/or establishing two of the selected decentralised systems (Ikisaya, Kenya, and Rajanga, India), and one member was previously employed by Kenya Power, one of the providers of grid supply. The strength of these former associations is that the team members know the cases thoroughly, and in Ikisaya we also have access to gender sensitive data that have not previously been analysed or published, which implies value added and efficiency of work. The intervention in Ikisaya also followed a gender-sensitive approach during planning and implementation. Issues considered less important in the selection process are the exact coverage rates in the areas, but generally, a large part of the rural population in the selected areas lack access to electricity. When conducting the cross-country survey at a later stage, the same locations will be selected, which means that the work with the survey will benefit from the contextual analysis from the case studies.

Responsibilities

Winther has overall responsibility for research design. Members of each country team will ensure planning, data collection and analysis of their respective cases.

The country studies will be led by a senior researcher who will take part in the empirical data collection: Winther will have the overall responsibility for the case studies and take part in data collection in Kenya together with Ulsrud (country responsible) and Saini and Gichungi. Palit will be in charge of data collection in India (with Ulsrud) and will be responsible for the data collection in Nepal in cooperation with AEPC, while Matinga will contribute to data collection. In Nepal, Raju Laudari (AEPC) is designated as the focal person. We will also recruit and train research assistants and master's level students to assist with data collection.

Overview of selected cases

A. Kenya:

- Kitui district; Ikisaya Solar Energy Centre, solar PV introduced in 2012, a national grid was constructed in the area in 2014-2015 and has provided power since December 2015. The location is about five hours from Nairobi. A preliminary visit was made to Ikisaya in June 2015 in order to collect data on the financial and technical performance of the solar power supply, the roles of men and women on the staff board, and the views of these people on different aspects of the operation and use of the electricity services.
- Homa Bay County, Western Kenya. The area is interesting because there are a number of different power supply systems available: mini and micro-grids on the Lake Victoria islands, grid electricity on the mainland close to the islands, and on some of the islands, and the presence of a number of private sector companies selling solar home systems, in particular on a pay-as-you-go basis—an innovative business model that is showing great promise in

Kenya. Hence, there are a number of different power supply systems at play both in terms of ownership and operation, and in terms of the type of power supply system. It makes for a fascinating contrast to the Ikisaya cluster. Within Homa Bay County, the project proposes Mfangano Island (520kW decentralised diesel-solar hybrid mini-grid operated by Kenya Power) as the primary case study site together with the surrounding islands of Rusinga (grid electricity), Kiwa and Takawiri (several privately operated solar AC micro-grids, with a range of capacities up to 3kW installed capacity).

B. Nepal:

- Syanjya district; Putpute micro hydro power project, (phase 1 - 44kW and phase 2 - 90kW); managed by Putpute Management Committee formed by the users. There is also national grid connection in neighbouring VDCs called Vegdanda in the same district. The location is around 240km west from Kathmandu and around 40 km south west from Pokhara.
- Gulmi district; Daram Khola 1st (70kW) and 2nd (around 100kW) in, managed by Cooperative formed by the users. There is national grid connection in same as well as neighbouring VDCs. This location is around 340km west from Kathmandu and around 140 km west from Pokhara.

C. India:

- Raipur and/or Korba districts of Chhattisgarh state; solar PV mini-grids established and managed by Chhattisgarh Renewable Energy Development Agency (CREDA); largest number of mini-grids in India have been implemented in this state, all through 100 per cent government support. The districts tentatively identified for the case study are in the central and northern region of Chhattisgarh. There are also national grid connections in the same administrative block, which will be covered for the survey. In relation to a co-joining study (Solar XChange), team members conducted fieldwork in these two districts in April 2015, and some preliminary data have been collected to understand the functioning of the mini-grids and involvement of women in the management and end-use of electricity.
- Hindol block, Dhenkanal district; Rajanga village cluster, Odisha, solar PV mini-grid, established by TERI under OASYS South Asia project (A DFID supported project) in 2014; TERI has some baseline information which will be useful to compare with the impact. There are also grid connected villages in the same geography which will be studied.

Overview of methods for data collection and sampling, case studies

We will conduct a gender sensitive examination of both the electricity systems (including electricity entrepreneurs) and the situation of end-users such as their access to deciding on and using electricity for various purposes and the adhering benefits and challenges. In the initial phase we will seek to obtain an overview of the populations in question, such as their types of livelihood, women and men's engagement in productive work and domestic chores, employment opportunities, the provision of water, health, and education services, typical daily routines within the households for all household members, type of fuel and technology used by various members for lighting, cooking, grinding, etc. We will then seek to identify various groups within the populations (e.g. households led by women and/or men, with and without electricity, income groups, geographic location, whether people took part in the process of electrification or not) and seek to obtain a spread in the types of groups when selecting individuals for interviews. Due to our previous work, we already have some initial insight into contextual factors in Ikisaya (Kenya) and Rajanga (India).

We will start by conducting interviews with key stakeholders (electricity system) and people who are central in village life. Then we will conduct in-depth, semi-structured household interviews with a number of people (ca 15-20) in each of the six localities place (tentative figure).

The methods will include:

- **In-depth interviews with management and staff** (male and female) involved in the electricity supply/project. Obtain technical and financial documentation of system performance (incl. load shedding and power cuts), gender disaggregated information on training, staffing and salaries and electricity customers (geographic location, gender of customers, amount of consumption, paying compliance).
- **In-depth interviews with local administrative and political leaders**, staff at the health centres and schools, women's groups, other local corporations and businesses, elders groups, decision makers, etc.
- **In-depth household interviews with women and men** among groups who have electricity at home/shops/small businesses and those who do not. General themes for interviews include the gendered organisation of tasks and responsibilities, finances/ownership to assets, who services the electricity bill, who decided where to put up lights and what appliances to obtain, the gendered uses of electricity (including productive activities and men's potential involvement in domestic chores) and the social effects of electricity use including electricity's impact on girls and boys. We will also examine how respondents relate to the materiality and organisation of the system of supply (technology, prices, and staff), the process of electrification and gender ideologies.
- **Observations:** We will observe where and how electricity is being used by whom within households and in public. We will also attempt to observe how people use electricity (and traditional fuels), e.g. when cooking, while inviting dialogue on various issues (e.g. time use, convenience, taste, safety, gender roles).
- **Focus group discussions:** Based on findings from the interviews, we will conduct focus group discussions with single-sex groups and raise a limited number of suitable issues for discussion on electricity, gender, and poverty. The purpose is to map central discourses and women's and men's (potentially) different perspectives on the selected issues. The group discussions also provide an opportunity to discuss preliminary results and obtain input on the study, thus enhancing dialogue with local stakeholders.
- **Collection of life stories:** We will collect life stories from individual women and men who have access to electricity at home. Such stories are expected to provide a deeper understanding of people's living conditions and gender practices, and how such aspects may have changed over the years.
- **Registering of selected households' total production:** Income and food, exchange and consumption incl. volume and costs during a given period (make form, include location of markets and costs of getting there, gift exchanges specifying who is receiver/sender of gift, gender sensitive: specifying individual household members)

Collection of data, quantitative research: Survey

As the final step of the empirical research we will develop a joint survey design and conduct interviews in three of the case areas (one in each country). The purpose is first of all to produce evidence on the impact of electricity access on women's empowerment and how decisions regarding

electricity are made within households. Secondly, and facilitated by the proceeding qualitative work in the same areas, the survey is intended to enhance the overall analysis of the causal explanations for electricity's impacts. The results will serve a cross-country comparison of policies, their effects the ground, practices, socio-cultural factors and the resulting impacts on women's empowerment. This will ultimately be used for providing recommendations for policy and practice on the mechanisms that produce (and hinder) empowerment for women through electrification, which is the project's overall objective.

We will follow a purposive stratified random sampling strategy (Teddlie and Yu 2007). This strategy is suited for producing transferability²⁰ (i.e. results can be transferred to other contexts) when the characteristics of the population are relatively well known in advance. In our case, this will be obtained during the preceding qualitative research. The strategy is less resource demanding than random sampling (where general ability is always problematic due to contextual variation²¹) in that it requires smaller samples for documenting causality while ensuring robustness and transferability of results to other contexts. The results from the survey will constitute an important part of the study's overall evidence on how and why electricity may empower women, which will be used to provide policy recommendations.

The total sample size will be 300-500 households across the three selected sites, and the final sample size will be determined when we have acquired contextual information about the populations in the areas (see below) where three main types of households will be compared: those with access to the grid, those with access to off-grid services, and those without electricity access. Among those with access we will examine the type of access and the reliability of supply (cf. multi-tier framework).

We will purposively choose study sites that have well-known characteristics (e.g. presence and types of electricity access, demographic factors including household compositions, type of livelihoods, enrolment in school, and access to water, health services, and other infrastructures). Then we do a careful stratification by dividing the population into groups. We ensure a spread in households with the three types of access (grid, off-grid, and no access) which is our dependent variable, and to handle variation in other factors we construct strata based on selected criteria (e.g. household composition, primary livelihood, income and educational background). From each of these strata, the final sample will be selected randomly by following well-defined procedures such as drawing randomly (lottery) from a list of households that belong to a given strata. This will ensure unbiased sampling within each strata. The stratification procedure is a central step in producing reliable results (and will be documented accordingly), and together with the random sampling from each strata, the data will provide evidence suited to providing policy recommendations. Both women and men will be interviewed, although the proportion of women will be higher because they are the central group under study. The interview teams will consist of both women and men, and we consider it particularly important to have women interviewing women respondents in their homes to ensure more open discussion.

Registration and coding/systematisation of data

In addition to taking field notes from interviews, observations and informal talks, we will record focus group discussions if participants agree. Some of the interviews will also be recorded if the situation is

²⁰Referring to Lincoln and Guba 1985 and Tashakkori and Teddlie 1998, Teddlie and Yu (2007:91) define transferability as the generalisability of results from one specific sending context in a qualitative study to another specific receiving context .

²¹ For example, see White 2013 for a treatment of the problem of attribution also in 'randomised control trials' (RCTs) (White 2013).

suitable. The audio files will be transcribed by assistants. In most places we will be using translators during interviews, and we will take care to use female assistants when interviewing women. The material from the case studies will be coded in NVivo, and the material from the survey will be systematised and coded in SPSS. The categories for coding will partly be predefined following the structure of the interview guide, but the final variables/categories (and their values) will be created after having the dataset available. NVivo will be used for coding quotes according to themes which are likely to occur during the qualitative analysis. To make this process dynamic and ensure that the material at large receives a harmonised treatment, the senior researchers will exchange ideas about new themes as they appear in the process of analysis.

7.3 Analytical framework

We have developed an overall framework of analysis anchored in social science which informs this research. The framework draws on socio-technical systems theory (Bijker and Law 1994, Rohracher 2006), co-evolution of choice (Shove 2003), social practice theory (Bourdieu 1977, Sewell 1992, Ortner 2006), and Kabeer's (1999, 2001) notion and measurement of empowerment. This framework takes a broad approach and focuses on how 'preconditions' or existing structures— e.g. material structures such as economy, policy and the organisation of material objects in everyday life, and immaterial structures (i.e. cultural schemas, norms, frameworks of meaning)—affect and are affected by a given intervention (e.g. electrification). For understanding electricity's effect on women's empowerment, we thereby put emphasis on mapping the preconditions (contextual factors) in addition to the set-up and process of electrification, which together with the actors involved (men and women) and their agency, co-produce the social impact.

Defining and analysing empowerment in the realm of electricity

We conceive of gender equality as women and men's equal rights, access to and control over resources and power to influence matters that concern or affect them, and empowerment as a process towards this goal. In an associated publication (Winther *et al.* in progress) we account for how we arrive at a set of multi-dimensional categories for analysing women's empowerment through electrification, shown in Table 3.

Table 3 Categories for analysing women's empowerment through electrification

Category	Sub-categories/dimensions	Specification/examples (measurable indicators to be developed in Phase 2)
Overarching issues	Gender ideologies and norms	• How women and men are expected to be and behave, their roles and responsibilities.
	Social positions	• How women and men of various ages and classes are valued.
Resources	Material opportunities (short term)	• Access to and control over assets in the short term such as food, income, using light and appliances.
	Material endowments (long-term)	• Access to and control over investments, savings, long-term financial security, ownership and accumulation of assets. Includes economic empowerment.
	Social resources	• Access to communication and social networks, social inclusion.
	Human resources	• Access to information, education, knowledge, degree of drudgery (time use), comfort and convenience, health, safety. Includes psychological power.
Agency	Influence over life decisions	• A person or group's ability to influence decisions which

(general)	Influence over everyday decisions	they conceive as significant in their lives. Includes political power. <ul style="list-style-type: none"> • Ability to influence decision making in everyday life which in sum affects a person's or group's autonomy and power to influence matters that affect or concern them.
Agency in electricity	Influence over decisions regarding household electricity	<ul style="list-style-type: none"> • Ability to influence decisions regarding the household's subscription, installation, use and payment of electricity and acquisition and use of appliances.
	Influence over system of supply	<ul style="list-style-type: none"> • Involvement in and ability to influence electricity supply (governing, planning, socio-technical design, implementation, management and operation).
	Impact of women's potential involvement in supply	<ul style="list-style-type: none"> • The impact of women's involvement in supply on the empowerment of women in the wider community
Negative effects	Negative impacts of electrification	<ul style="list-style-type: none"> • Signs of deterioration in any of the above dimensions
Household practices²²	For each practice, focus on socio-material aspects: <ol style="list-style-type: none"> 1. Did the use of electricity induce a new or modify an existing practice? 2. What other material objects (than electricity) are required for performing the practice? 3. Who decided to make use of electricity (and required appliances) to perform the practice? 4. Who paid for and/or owns the items required to perform the practice? 5. Who normally performs the practice and what is the daily routine? 6. Who controls and who benefits from the practice? 	If modified practice, effects on <ul style="list-style-type: none"> • Time use and drudgery • Convenience, cleanliness and comfort²³ For new and modified practices, effects on <ul style="list-style-type: none"> • Overarching issues • Agency • Parallel practices

We also relate to the 'Theory of Change' adopted by ENERGIA and the overall programme which focuses on the process of change surrounding specific energy interventions—on macro, meso and micro levels, respectively—including the interventions' short-term, intermediate and long-term outcomes, the conditions for these outcomes and how the outcomes are causally linked. Our empirical research will mainly focus on concrete electrification projects and the outcomes of these, thus primarily concern the meso (e.g. energy company/supplier) level and micro level (end-users). However, we will also examine how the selected interventions have been influenced by policies, and this analysis will be enhanced by the results from our policy review. See Appendix 2 for more details on how we relate to the 'Theory of Change'.

With respect to the 'Causal chain between energy supply and impact' our research covers (but is not limited to) the five identified steps in the development literature: (i) The organisation of energy supply (institutional organisation, design, technology), (ii) Supply of energy forms (availability, costs,

²²Practices include providing fuel and water, cooking, cleaning and attending to children's and other family members' needs (care taking) and also obtaining education, communicating, socialising, relaxing, commuting, performing productive activities and performing the role of electricity customer.

²³Increases in comfort, cleanliness and convenience are likely to positively affect social resources and human resources.

reliability, quality), (iii) Access to energy services (energy and appliances), (iv) Use of energy services (productive and other purposes) and (v) Impacts of energy services on livelihoods and quality of life.

7.4 Plan for dissemination and involvement of stakeholders

The project aims to keep close contact with stakeholders at various levels throughout the process. Capacity building is also a goal within this project. The project has identified six groups that will be targeted with products suitable for them, and we include ongoing dialogue as well as provision of results and products. We put emphasis on engaging in dialogue with key stakeholders, especially policymakers, to include their needs and opinions in the research and facilitate uptake of findings.

We will publish articles in open access journals and will pay, if required, for open access (e.g. *Energy Policy*, *Gender and Development*, *Development Effectiveness*). We will attempt to sponsor a special issue of a journal that is freely and widely available to both researchers and practitioners (e.g. , *Boiling Point*) and publish a series of articles, possibly including co-authoring with other researchers under this call, to cross-feed knowledge. We are also considering publishing a book. In addition, we have established a blog and have started to write entries to share the results and invite dialogue. A project website has been established where we will post discussion papers and results for uploading (www.efewee.org). This was launched during the first quarter of Year 1. All other research products from this project will also be shared through the project website and academia.edu platforms.

Table 4 Plan for dissemination

Target group	Dissemination products and mode
Project beneficiaries <ul style="list-style-type: none"> • Villagers/village cooperatives/Self-Help Groups • Village electrification communities • Community-based organisations 	<ul style="list-style-type: none"> • Briefings during and after research including during focus group discussions • Findings to be provided in brief translated by team members in local languages into project brochures
National policymakers <ul style="list-style-type: none"> • Ministry of Energy/Power/Science and Technology • Ministry of Rural Development • Gender Ministries • Public agencies and directorates 	<ul style="list-style-type: none"> • Workshops • Policy briefs • Copies of published materials • Provide a tool for undertaking system-wide gender-sensitive evaluations and suggest how ToRs for impact evaluations may be formulated to account for the gender dimension
Project implementers <ul style="list-style-type: none"> • Those involved in the cases and in other electrification projects • Implementers of other relevant sectors, e.g. social entrepreneurs, etc. 	<ul style="list-style-type: none"> • Published project reports • Invitation to participate and share their own work in workshops • Share published material
Other research consortia funded within this DFID/ENERGIA call	<ul style="list-style-type: none"> • Project reports • Invitation to participate and share their own work in workshops • Share published material • Co-publishing findings
International colleagues DFID, ENERGIA, TERI, NORAD, SUM, UNDP Country	<ul style="list-style-type: none"> • Project reports • Invitation to participate and share their own work

and Regional Offices in West Africa, East and Southern Africa, and the Asia Pacific Regional Centre, The World Bank, African Development Bank, UNESCAP, Asia Development Bank, Alliance for Rural Electrification, United Nations Foundation Energy and Women's Health initiative, the GACC, UN Energy Access Practitioners Network	in workshops <ul style="list-style-type: none"> • Share published material • Participation in international workshops • Possible participation at the Commission on the Status of Women (CSW) and Commission on Sustainable Development (CSD) • Link in to upcoming events and processes
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7.5 Revisions of timeline, work plan, budget, project team and any other key revisions

7.5.1 Background to proposed timeline for Phase 2

The timelines for the key activities and milestones to be completed during Phase 2 are as follows:

- | | |
|---|---------------------------------|
| • Programme meeting in India | Submission date: November 2016 |
| • Empirical case studies in three countries | |
| ○ Country report India | Submission date: September 2017 |
| ○ Country report Kenya | Submission date: March 2018 |
| ○ Country report Nepal | Submission date: December 2017 |
| • Survey, analysis and report | Submission date: September 2018 |
| • Comparative analysis and synthesis report | Submission date: September 2018 |
| • Project completion report | Submission date: December 2018 |

Detailed timelines are provided in Appendix 3 (Timeline) and Appendix 4 (Annual Work Plan 2016).

7.5.2 Background to Annual Work Plan 2016

During 2016, we will focus on three major aspects. First, we will finalise the two journal papers based on the scoping phase work and submit to peer-reviewed journals. Newsletters and policy briefs on the same issues will also be produced and shared with stakeholders, researchers and the general public. We have submitted a paper abstract to the Anthropology Association in the UK, which will summon in July in Durham. Second we will develop a preliminary survey questionnaire and test this in India and Kenya. Third, we will conduct the qualitative case studies in India and Kenya and analyse the findings on India. We start similar data collection in Nepal and also here test out the preliminary survey questionnaire.

In addition to the above, one online workshop and one stakeholder workshop for policymakers will be organised to disseminate the knowledge developed under the project and share the findings. The project will also host a programme meeting in the second half of 2016 in India, which may be organised in connection with the stakeholder meetings (we will discuss this with the secretariat at ENERGIA). The ongoing activity of blog entries and policy papers will also be undertaken.

The Annual Work Plan 2016 is detailed in Appendix 4.

7.5.3 Background to the budget for Phase 2

The budget is developed as per the guidelines provided by ENERGIA during the proposal submission stage. There is no proposed revision suggested at this stage of the project. However, going ahead, there may be some changes in the budget depending on expenses incurred under each head, and we will provide such changes during submission of the semi-annual report in March 2016. The head-wise distribution of budget and percentage distribution of budget for the four years is provided below:

Direct Costs	Total sanctioned (£)	Percentage (%)
1. Personnel	2,23,928	55
2. Professional Services	18,800	5
3. Travel & Subsistence	41,867	10
4. Dissemination	63,762	16
5. Programme Meeting	10,680	3
6. Other Costs	5,358	1
7. Programme Cooperation	40,488	10
Total Direct Costs	404,883	90
Total Indirect Costs (10%)	44,987	10
Total budget	449,870	100

The percentage distribution of budget for the four years project is as follows:

	Year 1	Year 2	Year 3	Year 4
Originally sanctioned (%)	16	31	35	17

7.5.4 Project team for Phase 2

The members of this consortium have been carefully selected to provide grounded research on the electricity-gender nexus. A short overview of the project team is provided below, and the detailed CVs are provided in Appendix 3:

Dr. Tanja Winther is the project leader and provides the scientific and administrative leadership (WPA). Winther is also responsible for WP C (Case studies) and WPE (Synthesis) and will contribute with data collection in Kenya (part of WP C). Winther is a social anthropologist (PhD) and power engineer (Master's) at the Centre for Development and the Environment, University of Oslo. Winther has extensive experience in conducting research on the social impact of electrification and gender issues in particular and is familiar with the technical aspects of electricity systems. She has published widely based on the Zanzibar ethnography collected for her PhD on rural electrification (grid), which has received interest from policymakers and stakeholders involved in electrification. She is also involved in research on electricity use and the role of prosumers in Norway and the UK. Her recent research has focussed on electricity's social aspects in Ikisaya, Kenya, and the Sundarbans, India (research project 'Solar Transitions'), and she is also involved in a Senegalese project on decentralised electricity systems. Winther is a lecturer for two courses on energy and gender in SUM's Master's programme, and since May 2015 she has taught a graduate course on Gender and Development at the University of Malawi where results from this research will be conveyed.

Mr. Debajit Palit is Senior Fellow and Associate Director at TERI, India, and is responsible for the Lighting a Billion Lives Programme and energy access related activities. He co-leads the project with the responsibility for project management (reporting including finances), and leads WP D (Survey) and WP F (Dissemination). Palit will also coordinate the data collection in India and Nepal (with the Alternate Energy Promotion Centre) and is responsible for the workshops in the two countries. Palit has written widely on energy access and rural electrification issues, particularly related to South Asia, authored books on mini-grids and rural electricity distribution franchisees, and is currently pursuing a PhD on rural electrification policy.

Dr. Margaret Matinga leads the WP B (literature review) and will contribute to data collection in Nepal. Matinga is an Energy Anthropologist (PhD) at Dunamai Energy in Malawi and wrote an ethnographic PhD thesis at Twente University on women, electricity and health in South Africa, focussing on how women's experiences affect their perceptions of danger and uses of electricity. Matinga works as a consultant on gender and energy in biomass, electrification, policy, LPG and gender mainstreaming and also regularly publishes scientific papers. She has also conducted fieldwork in many other countries including Kenya, Myanmar, and Nepal.

Dr. Mini Govindan of TERI is a PhD in Development Studies and has about 15 years of experience working in various projects on gender, energy and sustainable development. She is involved in grassroots institutions development, a gender inclusive development approach in energy projects and capacity building. In the EFEWEE project, Mini has worked with Palit in the gender and energy policy review work and is responsible for the design and implementation of the survey and qualitative study for the India case study.

Dr. Kirsten Ulsrud is a Human Geographer from the University of Oslo and is responsible for the Kenyan case study and workshop, and will participate in the Indian case study work. Apart from the EFEWEE project, Ulsrud is leading her second research project on how decentralised electricity systems can be implemented in socially sustainable ways: 'SolarXchange' (Ikisaya, Kenya and Thies, Senegal), which builds on the previous project 'Solar Transitions' (the Sunderbans, India and Ikisaya, Kenya). Ulsrud has recently completed her PhD thesis on decentralised electricity systems and South-South transfer of knowledge.

Ms. Karina Standal is a Human Geographer at the Centre for Development and the Environment, University of Oslo. She is currently finalising her PhD on the effects of decentralised solar electricity systems on women in two Indian states. In the EFEWEE project, Standal has contributed in the scoping phase by sharing her experiences in the field of electricity and women's empowerment.

Ms. Anjali Saini (MSc) of Seacrest Consulting will take part in the Kenyan case studies and the organisation of the workshop in Kenya. Saini currently manages the REACT (renewable energy and adaptation to climate technologies) funding window for the Africa Enterprise Challenge Fund. REACT currently has investments in over 25 innovative renewable energy private sector companies delivering decentralised energy to off-grid rural households in East Africa and Mozambique. Saini also forms part of the research project 'Solar xChange' at the University of Oslo.

Mr. Eng. Henry Gichungi is an Associate Expert at Seacrest Consulting. He has wide experience working in the power sector, specialising in mini-grids, renewable energy, and grid connection studies. For many years, he worked at a senior level in Kenya Power, Kenya's power distribution utility, and has been instrumental in introducing, pilot testing, and rolling out solar (photovoltaic) PV-diesel hybrid solutions by Kenya Power and in scaling up the concept of remote charging stations for off-grid customers in hard-to-reach areas. In this project he provides support to Saini and will help to facilitate the research in Kenya.

In addition to the above, Alternate Energy Promotion Centre, Nepal, is a collaborating partner in the project and will facilitate the case study work in Nepal. Mr. Raju Laudari, Assistant Director, who has long experience in planning, monitoring, evaluation and research in renewable energy including gender issues will contribute to the case studies and the workshop in Nepal. Laudari is currently conducting PhD research on Energy Economics.

7.5.5 Other proposed revisions

None

7.5.6 Risks and mitigation strategy

At the proposal development stage, we identified several risks involved in this relatively complex, comparative research. The risks include financial risks, risks in terms of management and coordination, methodological and ethical risks, communication and dissemination risks, force majeure risks and risks in terms of having access to human resources. Table 5 shows how we seek to mitigate these risks.

Table 5 Risks and mitigation strategies

Risk Factors	Mitigation
Project budget overspend	<ul style="list-style-type: none"> • Finance rules for all budget managers for all partner organisations • Clear procedures and rules for spending and approvals • Expenditure monitoring through quarterly finance reports • Budget contingencies • Sanctions for overspends
Partner organisation(s) bankruptcy	<ul style="list-style-type: none"> • All partners involved are in good financial positions with long-term plans
Poor communication between research collaborators and/or partner organisations	<ul style="list-style-type: none"> • Phase 2 kick-off meeting • Clear project meeting minutes – circulated reviewed • Monthly Skype meetings to update on progress • Six-monthly project reviews and reports; Review of each phase/work packages before proceeding to the next phase • Mid and end-term reviews of the project including management and coordination
Poor uptake of project outputs or deliverables	<ul style="list-style-type: none"> • Inclusion of stakeholder needs in research objectives • Ongoing stakeholder dialogue • Reviews and adjustments after each phase
Changes in key project staff / members pulling out	<ul style="list-style-type: none"> • Ongoing capacity building with team to support successions • Develop succession plan
The project delivery is delayed	<ul style="list-style-type: none"> • Create and monitor realistic work plan • Regular team updates and progress reviews • Ensure good project management • Proactively address delays as soon as they are suspected or identified; In worst-case scenario • Request time adjustment based on justification
Failure to comply with ethical practices e.g. loss of anonymity	<ul style="list-style-type: none"> • Training of survey team including data enumerators before fieldwork
Poor understanding of research methodology and approach by some members of the research team	<ul style="list-style-type: none"> • Ongoing dialogue among team members • Training before fieldwork
	<ul style="list-style-type: none"> • All materials backed up on separate database

Loss of essential information due to IT failure	<ul style="list-style-type: none"> • A Google drive has been created to save all material
Poorly presented project objectives and goals lead to resistance /inaccurate project information provided, altering expectations	<ul style="list-style-type: none"> • Clearly agreed upon guidelines and objectives of publicity materials
Corruption and fraud risks	<ul style="list-style-type: none"> • Consortium is experienced in working with DFID and other research councils (such as the Research Council of Norway) on contracts similar in scope to this. • Tracks all project expenditure so that they are fully accountable and auditable. • Maintain robust procedures to ensure financial and commercial probity at all times. • Put in place strong financial management and monitoring systems and practices, tailored for use within the project. If required and there is a felt need, offer orientation and capacity building measures for research partners in respect of the DFID implementation and accounting guidelines.

Our current assessment of the overall risk related to achieving the intended objectives and output of the project is low. While mitigation strategies have already been identified for the anticipated risks, the research partner consortium has the ability to address any future risks that may be faced in the future.

7.6 Ethical considerations

The following ethical considerations will be made while conducting the research:

- 1) Entry through village leadership while conducting the field survey
- 2) Solicit informed consent at the village meetings, then at each interview
- 3) Maintain code of conduct in the field
- 4) Approach respondents in a sensitive way so as to avoid strengthening their sense of poverty/exclusion
- 5) Report and address any observed threats through dialogue
- 6) Maintain high quality work through robust methodology
- 7) Systematic research trail and record keeping
- 8) Confidentiality through pseudonyms unless subjects request otherwise. For policymakers, reference to titles rather than names
- 9) No human subjects in the sense of biological samples or interference
- 10) Publish in open access journals
- 11) Local language briefs of key findings to local communities
- 12) Take guidance from TAG, wherever required
- 13) Members of the research team were involved in establishing two of the Kenyan cases, and we will treat this association transparently and reflexively

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Appendix 2: Theory of Change

For better visibility, Appendix 2 is also attached as a separate excel file

Theory of Change, RA 1, EFEWEE						
LEVEL	PROCESS	OUTPUT	OUTCOME LEVEL 1	OUTCOME LEVEL 2	IMPACTS	TARGET GROUP
MACRO	Review literature on gender and energy, feminist theories, sociology, anthropology	Scoping report , academic publication shared with research community, policy makers and general public	Improved understanding of the concept of women's empowerment through electrificaiton enhancing further research	Evidence of factors that support women's empowerment in electricity access programmes and projects Gender sensitive energy access policies developed by research consumers (international policy makers and project implementers)		Researchers and international policy makers and funders
	Review international electricity policy	Scoping report, academic publ, policy brief, shared with policy makers and other stakeholders	International development actors formulate policy and implement interventions which are evidence based			
ASSUMPTIONS	Stakeholders will cooperate adequately and provided required data and information					
MESO	Review national policy and programme/project documents					
	Engagement meetings with policy makers, project implementers and gender experts to inform and refine research questions and methods	Share researh results with policy makers, project implementers, gender experts and other stakeholders. Obtain empirical data.	National and independent development actors formulate policy and implement interventions which are evidence based	Gender sensitive energy access policies developed by research consumers (national policy makers and project implementers)	Gender equality and women's empowerment	National and local policymakers, project developers, project funders
	Interviews and dialogue with community members and leaders in case study areas	Share results through face to face meetings and brochures. Obtain empirical data.	Community perspectives on energy and gender included in research methods, questions and findings	Increased awareness and interest in including women in local politics and development bodies		
	Data collection and dialogue with companies involved in electricity supply in case study areas	Share results and obtain data.	Electricity suppliers' perspectives and knowledge of their interaction with customers	Increased awareness and interest in including women in electricity supply	A higher share of women empowered by being involved in electricity supply	Local leaders and women's groups, electricity suppliers
	Collect customer data	Database	Input to research			
ASSUMPTIONS	Stakeholders are available and have the capacity, willingness and interest to contribute without requiring compensation Customer data is available in an accessible form and is consistent and useful for analysis					
MICRO	Qualitative and quantitative data collection among households (women and men)		Identification of socio-cultural, political, material and economic factors affecting women's empowerment Understanding of women's own perceptions of empowerment	Gender sensitive electricity access programme design and evaluation		Households (women and men)

Appendix 3: Timelines, Milestones and Outputs

RA1 EFEWEE Phase 2 Timeline (milestones marked in purple)

EFEWEE	2016				2017				2018			
	1	2	3	4	1	2	3	4	1	2	3	4
WP A: Project management (TW)	[Green bar across all quarters]											
Project report (DP)	[Orange bar across all quarters]											
Project meetings- Skype/in person (TW) (one every Qtr)	[Orange bar across all quarters]											
Annual Work plan (TW/DP)	[Orange bar across all quarters]											
Evaluation (Steering committee) before submission of annual reports in September	[Orange bar in Q4 2017]											
WP B: Literature review, research design (TW)	[Green bar in Q1 2016]											
Revise literature review (TW/MM)	[Orange bar in Q1 2016]											
Revise policy review. (DP)	[Green bar in Q1 2016]											
Research design (TW)	[Green bar in Q1 2016]											
Submission of final scoping report (TW/DP)	[Purple bar in Q1 2016]											
WP C: Empirical case studies (TW)	[Green bar across all quarters]											
Qualitative data collection and analysis India (DP)	[Orange bar in Q2 2016]											
Qualitative data collection and analysis Nepal (DP)	[Orange bar in Q3 2016]											
Qualitative data collection and analysis Kenya (KU/TW)	[Orange bar in Q4 2016]											
Country reports (DP/TW)	[Purple bar in Q4 2016]											
WP D: Survey (DP)	[Green bar across all quarters]											
Design draft survey guide & testing of the guide (DP/TW)	[Orange bar in Q1 2016]											
Design of final survey guide	[Purple bar in Q2 2016]											
Conduct survey, analysis and report (DP/TW)	[Orange bar in Q3 2016]											
Submission of report (DP)	[Purple bar in Q4 2016]											
WP E: Synthesis (TW)	[Orange bar in Q3 2016]											
Comparative analysis & synthesis report (TW)	[Yellow bar in Q4 2016]											
WP F: Dissemination, stakeholder engagement & recommendations (DP)	[Green bar across all quarters]											
JP1: 'Women's empowerment through electricity: What is (the) evidence?'	[Purple bar in Q1 2016]											
JP 2: 'A gender review of electricity policies: Perspectives from Kenya, Nepal and India'	[Purple bar in Q1 2016]											
Stakeholder Workshops (incl. with policymakers)	[Purple bar in Q2 2016]											
Research workshops (webinars)	[Purple bar in Q3 2016]											
Project webpage (maintenance and updating)	[Purple bar in Q4 2016]											
Blog entries including video snapshots (MM)	[Orange bar in Q1 2016]											
5 research summaries (incl policy recommendations) & policy briefs	[Orange bar in Q2 2016]											
Local language project brochures	[Orange bar in Q3 2016]											
Tool for gender-sensitive impact evaluations	[Orange bar in Q4 2016]											
JP,3,4 on 5 country studies	[Purple bar in Q1 2016]											
3 SE4ALL meetings attendance (dates open, usually in May)	[Orange bar in Q2 2016]											
Final (project close) report	[Purple bar in Q4 2016]											
JP6: Factors that enhance and restrict women's empowerment	[Purple bar in Q4 2016]											

Expected outputs

- 5 peer-reviewed journal papers
- 3 SE4ALL international conference attendances
- 3 Policy-focussed physical workshops
- 2 Research-focussed online workshops
- Project reports
- Policy briefs
- Tool (survey guide) for gender sensitive electricity impact evaluations
- Local language findings brochures
- Website and blog

Appendix 4: Annual Work Plan 2016

Project Details

Lead Organisation	University of Oslo, Norway
Research Area	Research Area 1. Electrification through grid and decentralised systems
Reporting period	1 January 2016 – 31 December 2016
Report compiled by	Dr Tanja Winther
Date submitted	01 February 2016

Overview

This project examines the gendered effects of emerging electricity systems in Kenya, India and Nepal. The overall objective of this research project is to examine how policy and practice may enhance women's and girls' empowerment through electrification in rural areas. The research is anchored in anthropology but also employs an interdisciplinary and mixed methods approach.

In 2016, i.e. the first year of phase 2, we will focus on three major aspects. First, we will finalise the two draft papers based on the scoping phase work and submit to peer reviewed journals. Newsletters and policy briefs on the same issues will also be produced and shared with stakeholders, researchers and the general public. Secondly, we will develop a preliminary survey questionnaire and test this in India and Kenya. Thirdly, we will conduct the qualitative case study in India and Kenya, and analyse and report the findings on India. We start similar data collection in Nepal.

In addition to the above, one online workshop and one stakeholder workshop for policy makers will also be organised to disseminate the knowledge developed under the project and share the findings. The project will also host a programme meeting in the second half of 2016 in India, which may be organised in connection with the stakeholder meetings (we will discuss this with the secretariat at ENERGIA). The ongoing activity of blog entries and policy papers will also be undertaken. We have submitted a paper abstract to the Anthropology Association in the UK, which will summon in July 2016 in Durham. The work with reviewing project documents (cases) was commenced in 2015 and will proceed in 2016 together with the collection of qualitative data and electricity customer data.

There is no major deviation from the original plan of the proposal submission stage. Initially, we planned to organise a workshop in India in November 2015, but this was deferred, as we felt that without having finalised the scoping report, the workshop would not add substantial value. Further, the budget allocated for the workshop may have to be spent on the field survey, as we now propose to cover more respondents in the survey (as agreed during the scoping phase meeting in Cape Town).

A problem we might face in 2016 regards the harsh natural conditions in Nepal which may pose a challenge regarding completion of the field work (we already decided to change the proposed sites for survey in Nepal as the one originally proposed have been badly affected by the earthquake in 2015). We will consult ENERGIA in case we need to change the plans.

Activities RA1, 2016

		Year: [01 Jan to 31 Dec 2016]											
		Months											
Activities		1	2	3	4	5	6	7	8	9	10	11	12
Project Activities													
Output 1: [Survey]]	Design and test survey guide		X	X	X	X				X	X		
	Finalisation of survey guide											X	X
Output 2: [Qualitative case studies]	Conduct qualitative case studies in India				X	X	X	X					
	Conduct qualitative case studies Kenya									X	X		
	Initiate qualitative case studies Nepal												X
	Report on India and preparation of India research paper												X
Output 3: [Peer reviewed journal papers ²⁴ based on policy & literature survey]	JP1 Women's empowerment through electrification: What is (the) evidence?	X	X	X									
	JP2 A gender review of electricity policies: Perspectives from Kenya, Nepal and India'	X	X	X									
Output 4: [Dissemination & Outreach]	Blog entries/discussion papers		X	X			X			X			
	ENERGIA Newsletter			X									
	Participation in SE4All Conference					X							
	Organise one research focus online workshop				X								
Output 5: [Stakeholder Workshop] [Programme Meeting]	Development of policy briefs (1-2 pages) based on results from review, preliminary results from Indian case studies share plans forward									X	X		
	Organisation of workshop and programme meeting in India & dissemination of results										X	X	

²⁴ The papers will be submitted by the first quarter; the acceptance and publication will depend on Journal's own policy

Measurable Key Milestones/deliverables per Quarter

Key milestones/deliverables can be qualitative or quantitative and used to track the performance of the project. Focus primarily on the main outputs/processes of the project. Use the table below to show the targets by quarter:

Key Milestones/ deliverables	Targets Quarter 1	Targets Quarter 2	Targets Quarter 3	Targets Quarter 4	Overall (for the year)
Project Meetings among all team members	1	1	1	1	4
Steering committee Meetings	1	1	1	1	4
Survey guide	1			1	1
India country report				1	1
Publication of peer reviewed papers			2		2
Participation in SE4All conference		1		1	1
Blog entries/discussion papers	1		1		2
Policy Briefs			1		1
Online workshop for researchers		1			1
Stakeholder workshop in India				1	1

Appendix 5: Curriculum vitae of team members

CURRICULUM VITAE OF TANJA WINTHER

Date of Birth : April 10, 1966

Nationality: Norwegian

Telephone : +4790573558

Email: tanja.winther@sum.uio.no

Qualifications: PhD Social Anthropology (2005), MSc Power Engineering (1991), Business Administration (1995)

Countries of experience: Zanzibar, Tanzania (15 months of fieldwork incl. survey and mixed methods); Kenya (incl. two field visits); West Bengal, India (three weeks' fieldwork and survey); Norway (employed in energy sector, research using qualitative/quantitative methods).

Relevant experience

Period:	Position/ Project or Employer
2015 – present	Associate Professor, Centre for Development and the Environment (SUM), University of Oslo Project Leader, Exploring Factors that Enhance and restricts Women's Empowerment through Electrification (EFEWEE); Client: Energia/ETC; 2015-2018
2009 - 2015	Researcher, Centre for Development and the Environment (SUM), University of Oslo Academic leader for Ph.D. course on 'Women, Energy and Health: Questioning Current Paradigms for Development and Social Change''(January 2014)
2006 – 2008	Lecturer, Centre for Development and the Environment (SUM), University of Oslo Consultant for Norad: Social impact evaluation, Information Project, both in Zanzibar Member of expert group engaged in Scanteam's impact evaluation of Norwegian Power-related assistance (2007)
2000 – 2005	Research Fellow, Centre for Development and the Environment (SUM), University of Oslo
1993 – 1998	Engineer/advisor and R&D coordinator Norwegian Electricity Federation (EnFO, today named Energy Norway)
1992 – 1993	Product development engineer, Noral A/S (producer of outdoor lighting)

Selected publications (peer-reviewed)

- Winther, T. and H. Wilhite (2015). Tentacles of modernity: why electricity needs anthropology, *Cultural Anthropology*, 30(3).
- Standal, K. and T. Winther (2016). Empowerment through energy? Impact of electricity on care work practices and gender relations. *Forum for Development Studies*, Published online 20 January 2016. <http://dx.doi.org/10.1080/08039410.2015.1134642>
- Winther, Tanja (2015). On the good life and rising electricity consumption in rural Zanzibar, In Karen V. L. Syse and Martin Lee Mueller (eds), *Sustainable Consumption and the Good Life*. Routledge. Chapter 9, pp. 146–164.
- Winther, T. (2015). Impact evaluation of rural electrification programs: What parts of the story may be missed? *Journal of Development Effectiveness*; 7(2): 160-174
- Ulsrud, K., Winther, T., Palit, D. and Rohrer, H. (2015). How can village- scale solar power supply be socially organised, sustained, expanded and scaled up? Results of an action research project in Kenya. Submitted on invitation to *Energy Research & Social Science* 5: 34–44
- Winther, T. (2014) The introduction of electricity in the Sunderban Islands: Conserving or transforming gender relations? in K.B. Nielsen and A.K. Waldorp (eds) *Women, Gender and Everyday Social Transformation in India*. Anthem Press.
- Westskog, H. and Winther, T. (2014) Electricity consumption: should there be a limit? Implications of people's attitudes for the forming of sustainable energy policies. *Consilience - The Journal of Sustainable Development*. ISSN 1948-3074. 11(1), s 97- 114.
- Winther, T. (2013) Space, time and socio-material relationships: Moral aspects of the arrival of electricity in rural Zanzibar, in S. Strauss, S. Rupp and T. Love (eds), *Cultures of energy. Power, practices, technologies*. California: Left Coast Press.

- Winther, T. and S. Bouly de Lesdain (2013) Electricity, uncertainty and the good life. A comparison of French and Norwegian household responses to policy appeals for sustainable energy. *Energy and Environment Research* 3 (1), 71–84.
- Winther, T. (2012) Negotiating energy and gender: Ethnographic illustrations from Zanzibar and Sweden, in K. Bjørkdahl and K. B. Nielsen (eds) *Development and Environment. Practices, theories, policies*. Oslo: Akademika Publishing.
- Winther, T. (2012) Electricity theft as a relational issue: A comparative look at Zanzibar, Tanzania, and the Sunderban Islands, India. *Energy for Sustainable Development* 16(1), pp. 111-119.
- Ulsrud, K. T. Winther, D. Palit, H. Roracher and J. Sandgren (2011) The Solar Transitions research on solar mini-grids in India: Learning from local cases of innovative socio-technical systems. *Energy for Sustainable Development* 15, pp.293–303.
- Winther, T. (2008) *The Impact of Electricity. Development, Desires and Dilemmas*. Oxford: Berghahn Books. Published as paperback in 2010.

Books

1. Winther, T. (2008) *The Impact of Electricity. Development, Desires and Dilemmas*. Oxford: Berghahn Books. Published as paperback in 2010.
2. Winther, T. (2008) *Umeme: Faidanaadharizake. Uzoefukutokakijiji cha Uroa*. Oslo: Centre for Development and the Environment, University of Oslo.

Reports, evaluations, theses

1. J. Clancy, T. Winther, M. Matinga and S. Oparaocha (2011) "Gender equity in access to and benefits from modern energy and improved energy technologies". Background Paper for the World Development Report 2012, the World Bank Group. ETC/ENERGIA-University of Twente-Nord/Sør-konsulentene Consortium.
<http://www.norad.no/en/thematic-areas/energy/gender-in-energy/attachment/385686?ts=13356322c17>
2. Winther, T. (2011) "Electricity's effect on gender equality in rural Zanzibar, Tanzania". Background Paper for the World Development Report 2012, World Bank Group.
<http://www.norad.no/en/thematic-areas/energy/gender-in-energy/attachment/390272?ts=1367c9e6fda>
3. Winther, T. (2006) "Evaluation of the social impact of rural electrification in Zanzibar, Phase IV", SUM, University of Oslo.
https://www.sum.uio.no/english/people/aca/tanjaw/evaluation_report_winther_final.pdf
4. Winther, T. (2005) "Information project, Zanzibar Rural Electrification Project, Phase IV: Project report". SUM, University of Oslo.
https://www.sum.uio.no/english/people/aca/tanjaw/information_report_winther_300905.pdf
5. Winther, T. (2005) "Current styles: Introducing electricity in a Zanzibari village". Thesis submitted to the partial fulfilment of degree Dr.Polit, University of Oslo.

CURRICULUM VITAE OF DEBAJIT PALIT

Qualification : PhD in Rural Electrification (On-going); Post Graduate Diploma in Non- Conventional Energy Technology (1996); Master of Physical Science (1995)

Date of Birth : September 6, 1970 Nationality: Indian

Telephone : 91-11-24682144 Email: debajitp@teri.res.in

Countries of Work Experience: India, Bangladesh, Bhutan, Cambodia, Myanmar, Nepal, Philippines in Asia; Ethiopia, Ghana, Kenya, Liberia, Sierra Leone and Uganda in Africa;

Relevant experience

Period: From - to	Position/ Project or Employer
2012 – present	Associate Director/Senior Fellow, TERI
2006 – 2012	Associate Fellow/Fellow, TERI
1998 - 2012	Research Associate, TERI
1997 – 1998	Service Engineer, Cannon Devices Private Ltd

Relevant Research projects

1. Co-lead, Exploring Factors that Enhance and restricts Women's Empowerment through Electrification (EFEWEE); Client: Energia/ETC; 2015-2018
2. Principal Investigator, Dissemination of appropriate technologies and delivery models to scale up use of clean lighting solutions & cookstoves for poor households in Africa; Client: DFID India; 2009-15.
3. Team leader, Analysis of the electrification programme in India using the 'energy plus' framework and the key lessons; Client: Global Network on Energy for Sustainable Development (GNESD); 2013-15
4. Co-Investigator, Utilizing Electricity Access for Poverty Escape; Client: DFID UK, 2014
5. Principal Investigator, Delivering energy access through clean energy in Myanmar - A technical assessment for off-grid energy supply; Client: Institute for Global Environmental Strategies, Japan; 2013-14
6. Team leader (South Asia component), Decentralised off-grid electricity generation in developing countries: Business models for off-grid electricity supply; Client: EPSRC/DFID UK; 2009-15.
7. Key team member, Solar Transitions - Transfer of social and technological innovations between India & Kenya; Client: Norwegian Research Council; 2009-14

Selected Publications (peer reviewed)

- Palit D, Bandyopadhyay KR (2015). Regulating Off-grid Electricity Delivery: Exploring the Grey Areas. Economic and Political Weekly; L(10):46-52
- Ulsrud, K., Winther, T., Palit, D. and Rohrer, H. (2015). How can village- scale solar power supply be socially organised, sustained, expanded and scaled up? Results of an action research project in Kenya. Submitted on invitation to Energy Research & Social Science 5: 34–44
- Palit D and Bhattacharyya S C. 2014. Adoption of cleaner cookstoves: Barriers and way forward; Boiling Point Issue 64; 6-9.
- Palit, D., Bhattacharyya, S. C., & Chaurey, A. (2014). Indian Approaches to Energy Access. In A.H, B.S. & J.R. (Eds.), Energy Poverty: Global Challenges and Local Solutions . Oxford University Press, UK, 237-256.
- Palit D, 2013. Solar energy programs for rural electrification: Experiences and lessons from South Asia, Energy Sustain Dev 17(3), 270-279
- Chaurey A, Krithika PR, Palit D, Rakesh S, Sovacool BK, 2012, New partnerships and business models for facilitating energy access, Energy Policy 47, 48-55.
- Palit D and Chaurey, A. 2011. Off-grid rural electrification experiences from South Asia: Status and best practices; Energy for Sustainable Development 15; 266–276.
- Palit D, Malhotra R and Kumar A. 2011. Sustainable model for financial viability of decentralized biomass gasifier based power projects; Energy Policy 39; 4893–4901
- Ulsrud K, Winther T, Palit D, Rohrer H and Sandgren J. 2011; The solar transitions research on solar mini-grids in India: Learning from local cases of innovative socio-technical systems; Energy Sustain Dev 15; 293–303

- Imai K and Palit D. 2013. Impacts of Electrification with Renewable Energies on Local Economies: The Case of India's Rural Areas; The International Journal of Environmental Sustainability; Volume 9, Issue 2, pp.1-18.
- Palit, D., Sovacool, B. K., Cooper, C., Zoppo, D., Eidsness, J., Crafton, M., Johnson, K., and Clarke, S. 2013. The trials and tribulations of the Village Energy Security Programme (VESP) in India. Energy Policy 57, 407-413.
- Kumar A, Mohanty P, Palit D and Chaurey A, 2009. Approach for standardization of off-grid electrification projects; Renewable and Sustainable Energy Reviews; 13 (8), 1946-1956.

Books

1. Bhattacharyya, S C, Palit D, Sarangi G K. 2015. Towards scaling up of electricity access: Summary and policy recommendations from OASYS South Asia Project; The Energy and Resources Institute, New Delhi
2. Bhattacharyya, S C and Palit D. 2014. "Mini-grids for rural electrification of developing countries: Analysis and case studies from South Asia"; Springer, London; (ISBN: 978-3-319-04815-4) <http://www.springer.com/energy/systems,+storage+and+harvesting/book/978-3-319-04815-4>
3. Palit D and Sarangi G K. 2014. Renewable energy-based rural electrification: The mini-grid experience from India; Global Network on Energy for Sustainable Development; <http://www.gnesd.org/PUBLICATIONS/Other-GNESD-Publications>

CURRICULUM VITAE OF MINI GOVINDAN

Name of Institution: The Energy and Resources Institute
Qualification: PhD in Development studies
Date of Birth: September 6, 1973 **Nationality:** Indian
Telephone: 91-11-24682144 **Email:** gmini@teri.res.in
Countries of work experience: India, Ethiopia and UAE

Relevant experience

Period: From – To	Position/ Project or Employer
2011 – present	Fellow, TERI
2009 – 2011	Associate Fellow, TERI
2006 - 2009	Research Associate, TERI
2005 - 2006	Consultant DANIDA
1998 – 2002	Ford Foundation Doctoral Research Fellow, Institute of Social & Economic Change, Bangalore

Relevant Research Projects

1. Principal Investigator - Gender, Renewable Energy and Climate Change. Client: UN Women. 2010 to 2011
2. Gender coordinator - Accelerated Usage of Biomass-based Clean Energy Solutions – Addressing Gender in energy value chain. Client: Swiss Agency for Development and Co-operation (SDC). 2011 – On going
3. Gender coordinator - Inclusive Development - Gender Mainstreaming. Client: Norwegian Framework Agreement 2011 – On going
 4. Gender coordinator - Ecosystems for life: Bangladesh and India initiative – Consultancy for situational analysis on energy security. Client: International Union for Conservation of Nature (IUCN). 2012 to 2012
 5. Team member of the gender component - Designing Sustainable Goals. Client: DFID. 2012 to 2014
 6. Team member of the 'Gender and Social' component - Support for developing a roadmap for promoting solar water pumps for irrigation in West Bengal. Client: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). 2014 – Ongoing

7. Team member - Blended Learning Programme on 'Policies and Practices for Natural Resource Management'. Client: World Bank. 2013-ongoing
8. Action Research to Promote Village Energy Security through MGNREGA. Client: Ministry of Rural Development and UNDP. 2009 to 2010.

Selected Publications

- Baruah B, Govindan M. 2015. Engaging with gender and other social inequalities in renewable energy projects; Sustainable access to energy in the global South: Essential technologies and implementation approaches (Eds: Hostettler, S, Gadgil A and Hazboun E); Springer.
- "Sustainable Growth and the Role of Green Economy Concepts in India" in "Green Economy Turning Over a New Leaf towards Sustainable Development? June 2012 (ed) Friedrich Ebert Stiftung Publication (<http://library.fes.de/pdf-files/iez/global/09196.pdf>). (peer reviewed)
- "Green Jobs in India: Potentials and perspectives" in "Economy of Tomorrow". December 2012, Friedrich Ebert Stiftung. (http://www.fes-asia.org/media/publication/2012_GreenJobsInIndia_FES-EoT_Study_Govindan_Bhanot.pdf). (peer reviewed)
- "Gender equality and climate change: Exploring threats and opportunities" in "Tackling Climate Change and Energy Poverty: Row to 2015". May 2012 (ed) TERI Publication (peer reviewed)
- "The Green Ecosystem". Survey of the Environment. Business India. June 10, 2012.
- "Green from the Grassroots: Improving quality of life through clean Cookstoves". Green Growth and Development Quarterly, Volume 1, October 2012, TERI Publication.

CURRICULUM VITAE OF MARGARET N. MATINGA

Education: BSc Mech Eng (2001), University of Malawi; MSc Eng Energy Studies (2004), University of Cape Town, South Africa; PhD Energy and Anthropology (2010), University of Twente, The Netherlands

Date of Birth: September 11, 1977

Nationality: Malawian

Telephone: +265-994817178, 882461634

Email: mmat_001@yahoo.com

Countries of experience: Myanmar, Thailand, Cambodia, Nepal, Kenya, Malawi, the Netherlands, South Africa, Tanzania, Uganda, Zambia, Mozambique

Relevant experience

Period: From – To	Name of assignment/ Project or Client
January 2015 to December 2018	Exploring Factors that Enhance and restrict Women's Empowerment through Electrification (EFEWEE) Client: Energia/ETC
April to June 2015	Developing a Global Environmental Facility (GEF) Project Information Form (PIF) for developing the rural renewable energy sector in Myanmar Client: UNDP Myanmar
January 2015 to December 2015	Supporting research project on Gender and the productive use of energy in the informal food sector in Senegal, Rwanda and South Africa. Client: University of Twente
November 2014 to December 2018	Exploring factors that Enhance and restricts Women's Empowerment through Electrification (EFEWEE) in India, Nepal and Kenya. Client: EFEWEE Project Consortium (TERI, India, University of Oslo, Norway, Dunami Energy, Malawi, Seacreaster, Kenya)
November 2014 to February 2015	Providing technical assistance to the Government of Tanzania in the development of the Tanzania SE4ALL action agenda and investment prospectus. Client: UNDP
September to December 2014	Gender mainstreaming the Africa Bioenergy Policy Framework and Guidelines. Client: United Nations Economic Commission for Africa (UNECA)
July to August 2014	Benefits of Converting to LPG for Women in the Developing World Client: World LPG Association
February to July 2014	Monitoring and Evaluation (M&E) Framework Support for the GACC Client: UN Foundation's the Global Alliance for Clean Cookstoves (GACC)
November 2013 to Present	Feasibility assessment of renewable energy for households in rural Myanmar. Client: UNDP Myanmar
December 2013	Guidelines on Incubating Energy Plus projects in communities in Asia Pacific

	Client: UNDP Asia Pacific Regional Centre
December 2012 to April 2013	UN SE4ALL Gap Analysis and Readiness Plan for Cambodia. Client: UNDP Cambodia
May 2012 to October, 2012	UN Sustainable Energy for All gap analyses for South Africa and Tanzania Client: UNDP Regional Service Centre – Southern and Eastern Africa
May 2012 to August, 2012	Designing the World Bank's African Clean Cooking Energy Solutions (ACCES) initiative components on quality and standards, consumer engagement, and policy and regulation. Client: The World Bank
February to May, 2012	Socio-cultural acceptability of improved cook stoves. Client: Concern Universal
January to December 2011	Post-Doc Researcher. University of Johannesburg
March 2012	Gender Equity in Access to and Benefits from Electrification in South Africa Client: ENERGIA and Nord/Sør- Konsulentene on behalf of NORAD's energy department

Relevant publications

1. Matinga M.N., 2015 LPG and livelihoods: Women in food processing in Accra. ENERGIA Newsletter 16(1) September 2015
2. Matinga M.N., Clancy J.S., Doyle V.J., and Annegarn H.J., 2015 Behavioral Challenges and the Adoption of Appropriate Sustainable Energy Technologies in International Energy and Poverty: Emerging Contours. eISBN 9781315762203. Routledge. Edited by Guruswany L and Neville E. University of Colorado. Publicly available from August 2015
3. Cecelski E and Matinga, M.N., 2014 Cooking with Gas: Why women in developing countries want LPG and how they can get it. Report developed for the World LP Gas Association by ENERGIA International Network on Gender and Sustainable Energy September 2014 Not peer reviewed
4. Matinga M.N, Pinedo-Pascua I, Vervaeke J, Montoforti-Ferrario F, & Szabo, S. 2014 Do African and European energy stakeholders agree on key energy drivers in Africa? Using Q methodology to understand perceptions on energy access debates. Peer reviewed
5. Matinga M.N, Clancy, J.S. & Annegarn, H. 2013 Explaining the non-implementation of health-improving policies related to solid fuels use in South Africa. Peer reviewed
6. Matinga M.N, Annegarn, H & Clancy, J.S. 2013 Healthcare provider views on the health effects of biomass fuel collection and use in rural Eastern Cape, South Africa: An ethnographic study. Peer reviewed
7. Matinga M.N & Annegarn, H. 2013 Paradoxical impacts of electricity on life in a rural South African village. Energy Policy 58 (2013) 295–302 Peer reviewed
8. Clancy, J., Winther, T., Matinga, M & Oparaocha, S. 2012 Gender Equity in Access to and Benefits from Modern Energy and Improved Energy Technologies. Gender Equality and Development, WDR 2012. Not peer reviewed
9. Matinga, M.N. 2011 A socio-cultural perspective on transformation of gender roles and relations, and non-change in energy-health perceptions following electrification in rural South Africa. Case study for Gender and Energy World Development Report Background Paper for ETC/ENERGIA and Nord/Sør-Konsulentene. Not peer reviewed
10. Matinga, M.N. 2010 We grow up with it: An ethnographic study of the experiences perceptions and responses to the health impacts of energy acquisition and use in rural South Africa University of Twente. Unpublished PhD thesis
11. Matinga M.N 2008 The making of hardiness in women's experience of health impacts of wood collection and use in Cuntwini, rural South Africa in Medische Anthropologie 20 (2) Peer reviewed
12. Matinga, M.N. 2005 Energy as a Key Variable in Reducing Child Mortality: A Gender and Energy Perspective on Empirical Evidence on MDG Not peer reviewed

CURRICULUM VITAE OF KIRSTEN ULSRUD

Qualifications: PhD Human Geography

Countries of experience: India (field work and survey in West Bengal, interviews with policy makers and experts on renewable energy in New Delhi), Kenya (repeated field visits over four years, cooperation with policy makers and renewable energy experts, coordination of solar power projects in villages).

Relevant experience

Period: From – To	Position/ Project or Employer
2015- present	Post-doc, Department of Sociology and Human Geography, University of Oslo
2012 - present	Project Leader, Solar xChange Project, Department of Sociology and Human Geography, University of Oslo
2010 – 2015	PhD fellow, Department of Sociology and Human Geography, University of Oslo
2009 - 2014	Project Leader, the Solar Transitions project, Department of Sociology and Human Geography, University of Oslo
2007 - 2010	Researcher, the COMPETE project – Competence platform for sustainable bioenergy in Africa, Department of Sociology and Human Geography, University of Oslo
2005 - 2010	Project Officer, Global Environmental Change and Human Security (GECHS), Department of Sociology and Human Geography, University of Oslo

Publications, peer reviewed

- Ulsrud, K. (2015) 'Village-level solar power in practice: Transfer of socio-technical innovations between India and Kenya.' Dissertation submitted for the PhD degree at the Department of Sociology and Human Geography, University of Oslo. <http://urn.nb.no/URN:NBN:no-52241>
- Ulsrud, K., Winther, T., Palit, D. and Rohrer, H. (2015). How can village- scale solar power supply be socially organised, sustained, expanded and scaled up? Results of an action research project in Kenya. Submitted on invitation to *Energy Research & Social Science* 5: 34–44
- Ulsrud, K. 2012. Bioenergy and sustainable adaptation in Africa. In: Janssen, Rainer and Rutz, Dominik (eds): *Bioenergy for sustainable development in Africa*. Springer, Dordrecht, Heidelberg, London, New York, p. 299-308
- Ulsrud, K.; Winther, T.; Palit, D.; Rohrer, H. & Sandgren, J. (2011). The Solar Transitions research on solar mini-grids in India: Learning from local cases of innovative socio-technical systems. *Energy for Sustainable Development*. 15(3), p 293- 303. doi: 10.1016/j.esd.2011.06.004. ISSN 0973-0826.
- Eriksen, Siri E H; Aldunce, Paulina; Bahinipati, Chandra; Martins, Rafael; Molefe, John; Nhemachena, Charles; O'Brien, Karen; Olorunfemi, Felix; Park, Jacob; Sygna, Linda; Ulsrud, Kirsten. When not every response to climate change is a good one: Identifying principles for sustainable adaptation. *Climate and Development* 2011; Volume 3.(1) p. 7-20.

Other publications

1. Muchunku, C., Ulsrud, K., Winther, T., Palit, D., Kirubi, G., Saini, A., Mauta, W. and Rohrer, H. 2014. The Solar Energy Centre – An Approach to Village Scale Power Supply. Report on the Solar Transitions pilot project in Kenya.
2. Ulsrud, K., Sygna, L. and O'Brien, K. 2008. More than rain: Identifying sustainable pathways for climate adaptation and poverty reduction. Report prepared for the Development Fund, Norway. Production manager: Gitte Motzfeldt.
3. Ulsrud, K. and Motzfeldt G. 2009. More than rain: Seminar and report launch in Oslo. *Climate and Development* 1, pp. 101-102.
4. Eriksen, S., Klein, R. J. T., Ulsrud, K., Næss, L. O. and O'Brien, K. 2007. Climate change adaptation and poverty reduction: Key interactions and critical measures. Paper prepared for the Norwegian Agency for Development Cooperation (NORAD). GECHS report no. 1. Global Environmental

Change and Human Security Project (GECHS), Institutt for sosiologi og samfunnsgeografi, Universitetet i Oslo.

5. Ulsrud, Kirsten & Eriksen, Siri E H (2007). Vulnerability and adaptation to climate change: New challenges for poverty eradication, In Norwegian Church Aid (ed.), *Understanding the Issue 1/2007. Climate Change Threatens the Fight against Poverty*. Norwegian Church Aid, 5, p. 23 - 51

CURRICULUM VITAE OF KARINA STANDAL

Date of Birth: January 26, 1977 **Nationality:** Norwegian
Telephone: +47-95170417 **Email:** karina.standal@sum.uio.no

08.2010 -Ph.D student, Institute for Sociology and Human Geography, University of Oslo

08.2005 -06.2008 Master of Social Science – University of Oslo

Master program in Human Geography with specialisation in political geography. Title of Master thesis: Giving Light and Hope in Rural Afghanistan – The Impact of the Norwegian Church Aid's Barefoot Approach on the Women Beneficiaries. The master thesis was awarded the grade A.

Teaching Activities (lecturer)

SUM 4019 Consumption, Sustainability and Social Change
SUM3000/4000 Development and environment: From theory to practice
SUM1000 Miljø og Utvikling (Norwegian)
UTV1000 Innføringsemne i utviklingsstudier (Norwegian)

Publications

- Standal, Karina & Tanja Winther (2016). Empowerment through Energy? Impact of Electricity on Care Work Practices and Gender Relations. Forum for Development Studies.
- Standal, Karina (2014). Between the Body and the Field: Reflections on Doing Fieldwork in Rural India as a Pregnant Researcher. Paper presented at the NFU conference, Tromsø, Norway, October 1–2.
- Standal, Karina (2010). 'Lighting the Path Towards Gender Equality: Training Women as Solar Engineers in Afghanistan', in E-net- Energy network.
- Standal, Karina. (2010). Giving Light and Hope in Rural Afghanistan: Enlightening Women's Lives with Solar Energy. Lampert Academic Publishing
- Standal, Karina (2008). Giving Light and Hope in Rural Afghanistan: The Impact of Norwegian Church Aid's Barefoot Approach on Women Beneficiaries. Master diss. University of Oslo

CURRICULUM VITAE OF ANJALI SAINI

Qualifications: Msc Environmental Technology (1992), B.Eng Mechanical Engineering (1991), MBA (on-going)

Countries of experience: Kenya, Tanzania, Uganda, Burundi, Rwanda, Mozambique, United Kingdom

Relevant experience

Period: From – To	Position/ Project or Employer
2010 – present	Position: Manager and technical adviser, Renewable Energy and Adaptation to Climate Technologies Funding Window, Africa Enterprise Challenge Fund (AECF) Clients/Projects: KPMG International Development Advisory Services (provides Fund Management services for the entire AECF)
2000 – present	Position: Independent Environmental and Energy Consultant, including as Director of Integrated Energy Solutions (established an energy service company offering energy efficiency and renewable energy services to Kenyan industry) and as Seacrest Consulting Clients/Projects (highlights): KPMG IDAS/AECF for window management of REACT (see above); Solar Transitions project, team member; IFC assessment of market potential, barriers to energy efficiency and potential pipeline projects in the tourism sector; Norken (I) Ltd lead environmental specialist on a number of infrastructure related environmental and social impact assessments; Tanzania Private Sector Foundation, lead consultant on SME market access programme for Tanzanian tourism SMEs; ILRI/BECA Team Lead, Environmental Impact Assessment and Strategic Environmental Assessment for Biosciences eastern and central Africa; UNIDO-GEF, environmental management systems specialist for COAST project; Conservation Development Centre, Senior Associate Consultant and Project Co-ordinator, Serengeti Trust Fund Establishment Project; ECM Centre/Pembina Institute, CDM technical specialist
Oct 1998 – Dec 1999	Position: Product Manager Employer: Somak Holidays, London
Jan 1997 – Sep 1998	Position: Independent Environmental Consultant Clients/Projects: environmental impact assessment; project development in the following sectors: infrastructure; tourism; waste management; urban development
Jan 1994 – Dec 1996	Position: Environmental Consultant Client: Sarova Hotels Kenya Ltd

Publications

1. Muchunku, C. Ulsrud, K. Winther, T. Palit, D. Kirubi, G. Saini, A. Mauta, W. Rohrer, H. (2013) The Solar Energy Centre: An Approach to Village Scale Power Supply. Oslo, Department of Sociology and Human Geography, University of Oslo.
2. Ulsrud, K., T. Winther and A. Saini. 2010. "Taking advantage of relevant experiences. Learning from solar power supply in the Sunderban Islands." India: The Solar Quarterly, July 2010.

CURRICULUM VITAE OF HENRY GICHUNGI

Name: Eng. Henry Gichungi

Qualifications B.Sc. Engineering (Mechanical) (1986)

Countries of experience: Kenya (employed in energy sector)

Relevant experience

Period: From – To	Position/ Project or Employer
2006 – Present	Deputy Manager, Off-grid Power Stations, Kenya Power. Operation and maintenance of off-grid power stations including developing new ones and retro-fitting of diesel stations with renewable energy. I am also involved in provision of basic energy services of lighting and mobile phone charging to remote villages that are far from the electricity grid using solar energy. Together with University of Oslo, I have initiated a project of providing such services through agents in the villages and the number of beneficiaries is growing steadily currently standing at approximately 400. These agents submit the revenue from these services via mobile money transfer and retain 30% as commission. I also work as a consultant to advice on mini grids and renewable energy including grid connection studies.
2004 – 2006	Chief Engineer, Managing Director's Office, Kenya Power. Worked as a Chief Engineer in the Managing Director's Office and the work involved assisting the Managing Director (MD) in general administration of the company.
1997 – 2004	Senior Energy Purchase Engineer, Kenya Power. Energy purchase functions at National Control Centre. This involves, checking and confirming Capacity and Energy declaration by power producers for purposes of invoicing, confirming adherence to the various power and capacity purchase agreements, preparing a report at the end of every month, of total energy purchased and costs for fuel cost adjustment, checking of energy and capacity invoices of the power producers and recommending for payment.
1996 – 1997	Team Leader, Implementation, Institutional Strengthening Project, Kenya Power. Worked as a team leader in implementation of Maintenance Management Subsystem of Institutional Strengthening Project. This involved supervision, training and giving support in the implementation of this computer based maintenance in all the power stations in the interconnected system in Kenya.
1989 – 1996	Station Engineer, Hydro Power Station. General administration of the power station. This included management of human and other resources in the power station, budgeting and procurement of spare parts and other materials, maintenance of electrical power generating equipment and their auxiliaries.