Gender in the transition to sustainable energy for all: From evidence to inclusive policies

ENERGIA
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Disclaimer

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Synthesis report of the evidence generated by the ENERGIA Gender and Energy Research Programme

ENERGIA International Network on Gender and Sustainable Energy

Elavarasan Devarajan/ENERGIA

Foreword

This five-year research project (2014-2019) was implemented by ENERGIA, the International Network on Gender and Sustainable Energy, as part of its contribution to the Sustainable Development Goals (SDGs). It was funded by the UK government's Department for International Development, under its Sustainable Energy, Access and Gender programme. The purpose of the research was to provide robust evidence and analysis of the interactions between energy, access and gender. In all, nine teams carried out research in 12 countries, with 29 partners, 21 of which were from the Global South. This report is a synthesis of the results.

The research programme focused on five thematic areas, selected through a literature review of current research and needs:

- electrification
- productive uses of energy
- energy sector reform
- the role of the private sector in scaling up energy access
- energy and related sector policy dynamics

We hope that this synthesis will assist decision-makers in the public, private, and voluntary sectors to combat the widespread inequities that exist in the use of modern energy services by men and women.

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Acronyms

ADB - Asian Development Bank

AEPC - Alternative Energy Promotion Centre

BIDs - Bangladesh Institute of Development Studies

BPL - Below poverty line (eg BPL households)

CREDA - Chhattisgarh State Renewable Energy Development Agency

CRT - Centre for Rural Technology

CSO - Civil Society Organisation

DFID - Department for International Development

ECOWAS - The Economic Community of West African States

ECREEE - ECOWAS Centre for Renewable Energy and Energy Efficiency

EPRU - Environmental Policy Research Unit

ESMAP - Energy Sector Management Assistance Program

FGD - Focus group discussion

GAP - Gender Action Plan

GESI - Gender Equality and Social Inclusion

GIZ - Deutsche Gesellschaft für Internationale Zusammenarbeit

GSI - Global Subsidies Initiative

Hivos - Humanist Organisation for Social Change

IAP - Indoor air pollution

ICS - Improved cook stove

IFC - International Finance Corporation

IISD - International Institute for Sustainable Development

IRADe - Integrated Research and Action for Development

IRENA - International Renewable Energy Agency

IS - International Secretariat

KII - Key informant interview

LED - Light-emitting diode

LPG - Liquefied Petroleum Gas

M&E - Monitoring and evaluation

MSE - Micro and Small-Size Enterprises

MSSRF - M. S. Swaminathan Research Foundation

NGO - Non-Governmental Organisation

OECD - Organisation for Economic Co-operation and Development

PI - Principal Investigator

PMUY - Pradhan Mantri Ujjwala Yojana

PUE - Productive uses of energy

RA - Research Area

RCT - Randomised Controlled Trial

REA - Rural Energy Agency

SDG - Sustainable Development Goal

SEAG - Sustainable Energy, Access and Gender

SEforAll - Sustainable Energy for All

SEWA - Self-Employed Women's Association

SFS - Street food sector

SHG - Self-Help Group

SHS - Solar Home System

SSI - Semi-structured interview

TAG - Technical Advisory Group

TERI - The Energy and Resources Institute

TZS - Tanzanian Shilling

UCT - University of Cape Town

UN - United Nations

UNDESA - United Nations Department of Economic and Social Affairs

UT - University of Twente

VLE - Village Level Enterprise

VSLA - Village Savings-and-Loan Association

WDR - World Development Report

Executive Summary

Since 2015, Sustainable Development Goal 7 has provided an ambitious mandate: to ensure access to modern energy for all, to double the share of renewable energy in the global energy mix, and to double the global rate of improvement in energy efficiency. While Sustainable Development Goal 5 separately recognises the importance of gender equality, in reality energy access and gender equality are inextricably linked, and addressing them together can offer multiple development gains. The overwhelming reality is that it will not be possible to meet targets for affordable, reliable, sustainable, and modern energy access for all by 2030 unless the energy needs of women are met.

This five-year research programme on gender and energy (2014-2019), coordinated by ENERGIA, was supported by the UK's Department for International Development (DFID) as part of its Sustainable Energy, Access and Gender (SEAG) programme. The objective of the programme was to generate and analyse empirical evidence of the links between gender, energy and poverty, and to translate this evidence into recommendations for energy policy and practice. In the context of energy access, the research sought to test the hypotheses that a gender-aware approach will:

- lead to greater equity between women and men in the impacts of modern energy services, and

- transform traditional gender roles and relations by empowering women through improved access to, or participation in the delivery of, modern energy services.

The research explored gender, energy and poverty linkages in six thematic areas identified through a review of current literature: (a) electrification, (b) productive uses of energy, (c) energy sector reform, (d) the role of the private sector in scaling up energy access, (e) the political economy of energy sector policies, and (f) women's energy entrepreneurship. Although cooking energy was originally excluded as a theme due to overlap with other DFID-supported research, many findings relevant to cooking energy emerged in the research and are included in this report. Each of the themes was narrowed to more specific research topics; for example, the wider theme of energy sector reform was narrowed down to focus on fossil fuel subsidies. This report presents a prioritised selection of key messages and associated policy implications. Recommendations for policy development and future research are included.

In all, 9 research teams from 29 universities and research institutions, 21 of which were from the Global South, conducted research in 12 countries (see Acknowledgements for a full list). All teams used a mixed-methods approach, combining quantitative and qualitative approaches to ensure rigour. Quantitative data was drawn from surveys, and qualitative data from semi-structured interviews (SSIs), key informant interviews (KIIs), and participatory focus group discussions (FGDs).

Key Messages from the research

Universal energy access targets are unlikely to be met unless energy policies are aligned to women's as well as men's energy needs, their assets, skills, limitations and capabilities, and existing gender norms

This research has found that energy policies that do not explicitly target women often result in inequitable access to energy services between men and women. The reasons for this are related to differences between men and women in their energy needs, which are a function of societal norms and resulting differences in responsibilities, as well as differences in men's and women's capacities to access energy services. These differences are frequently institutionalised, resulting in differential access to energy, to appliances, and to the potential benefits of energy services. Paying attention to these differences can help achieve more gender-equitable outcomes. Finally, local policies and regulations, as well as awareness of social norms, are crucial to ensure access to energy services for both men and women. The research team also found that even in cases where a gender-aware policy is in place, the implementation may lag behind, mainly because of the approaches adopted and the processes within the organisations implementing the policy. Achieving gender equality outcomes therefore requires not only a transformation in energy policy, but also a change in processes, and changes within the organisations that drive these processes.

Involvement of women in energy-system supply chains is good for women and their families, and it is good for business

The involvement of women in energy-system supply chains as entrepreneurs and employees – particularly in non-traditional roles – is a win-win situation. The energy supply chain offers women an opportunity to earn an income which can enhance their own welfare, as well as the welfare of their families. It can also build their self-confidence and agency, challenging gender norms in their households and communities. When women have discretion over their earnings, they tend to spend on education, healthcare and their children's welfare. For energy businesses, women can bring a unique value proposition as entrepreneurs. When given the right opportunities, they are eager to learn new skills, can deliver energy services to their communities with a high level of trust, and perform as well as men, even without any additional support. In particular, they are able to leverage existing social networks and form trusting relationships with potential customers – especially other women. However in order to realise this potential, women need to be supported through a comprehensive package of support, including capacity building in technology, business skills and leadership; marketing, promotion and distribution; access to finance; and one-to-one mentoring. At the same time, they have to be supported to overcome prevalent social and cultural barriers (e.g. lower literacy; lower access to finance, education, land, and mobility; burden of care work, etc.). Under-investment in overcoming these barriers is likely to perpetuate poverty and gender inequality.

Modern energy services for women's productive uses contribute to women's empowerment

Women and men typically engage in different types of productive activities, at different locations, and they have different access to enablers such as assets, finance, markets, infrastructure and skills. For this reason, the benefits each derives from using modern energy in their productive activities differ. Since men are typically involved in larger enterprises that use more electricity than enterprises run by women, their enterprises are more attractive to private sector suppliers. Women, on the other hand, are more reliant on fuels such as firewood, charcoal and LPG for running their businesses. In informal/street food production, sectors in which women predominate, process heat and mechanical power are also significant. The research showed that there is a positive relationship between the use of modern energy and the economic performance of a business. In the case of women's businesses, this was also seen to contribute to their economic empowerment. At the same time, however, the availability of modern energy is not always a sufficient input, and a number of complementary factors need to be in place in order to maximise the empowerment impacts. Many opportunities exist to support women's productive use of energy, especially in the informal business and agriculture sectors. However, an incomplete understanding of the nature of women's businesses means that opportunities are being missed to advance progress toward the SDGs through support for such energy use.

End-use appliances that deliver modern energy services to reduce drudgery and save time can transform gender roles and relations

End-use appliances are essential for the provision of modern energy services, as they convert modern energy supplies into the services people demand – fans for space cooling, phone charging for communication, sewing machines or hair clippers for trades, mechanised water pumps for irrigation, mills for processing grain, LED lights for illumination after dark, and televisions for information and entertainment. The research showed that besides the appliances used by all household members, such as televisions and fans, women prioritise appliances that help them perform their daily chores better, such as electric kettles (Kenya) and rice cookers (Nepal). Men, on the other hand, tend to prioritise television sets, radios, refrigerators and sound systems. The choice of appliances, how available and affordable they are, and how reliable the energy supply is, determines the impact of increased energy access. Some appliances meet women's practical needs and reduce drudgery in their current roles – both in unpaid care work and in their income-earning activities. These appliances also contribute to building women's human and social capital, by replacing the need for their manual labour. In some instances, appliances can go beyond meeting these needs and promote gender equality, by enabling women to undertake jobs traditionally barred from them. Appliances can also transform gender relations – when drudgery is reduced, men are more willing to share household responsibilities and to take on some household tasks such as cooking (though washing clothes and dishes remain women's domain).

Improving the affordability, reliability, capacity and convenience of modern energy services can help achieve gender-equitable outcomes, and will be critical for universal energy access

Affordability is an important determinant of how poor people – especially women – are able to access and benefit from modern energy sources, at the household level and in their income-generating activities. Among the various characteristics of energy supply, affordability of modern energy is well-recognised as a significant barrier for low-income households and the enterprises they run. Subsidies have been the policy instrument most commonly used to help low-income households gain access to modern energy sources, primarily for cooking and lighting, with more limited attention paid to appliances. At the same time, however, the problems of subsidies are well known, including poor targeting, elite capture, and diversion along the supply chain, which has increased pressure to stop their use. In recent years there have been examples of subsidised energy programmes targeting low-income households; however offering other options to enhance payment flexibility (e.g. recharges on credit, advanced payment, micropayment, fee-for-service, pay-as-you-go, etc.) could be another way of making energy services more affordable, even for the poorest.

Other important characteristics that determine energy choices include the reliability, capacity and convenience of energy services. Reliability of supply can affect women's use of time-saving appliances (e.g. LPG stoves), which in turn has implications for their workload, health, convenience, and comfort. In enterprises and businesses, these choices have implications for income and profitability, as they influence energy costs and quality of production, as well as sales, customer service, and hours of operation. Poor reliability of supply also leads people to turn to other, inferior (yet more reliable) energy options, which may limit their opportunities, aspirations and well-being. Inconvenience in accessing energy or recharge facilities also affects the use of energy services, with particular impacts on women. Quality of service has also been seen to directly affect the performance of community services such as health clinics and schools, which can be forced to divert operating funds from medicines and teachers' pay to cover the unexpected cost of backup diesel supply during times of shortages.

Engaging with political processes can help women access modern energy services and change gender norms

Gender norms govern what it means to be a woman and what it means to be a man; they govern the roles allocated to, and the obligations placed on, each gender, as well as the rights that can be claimed. The research shows that the ways in which these norms influence access and control over energy services differ between communities – 'context matters'. A significant contribution of this research has been to combine gender analysis with analysis of political and economic processes to understand the strategic energy needs of rural women (and men) who have experienced discrimination, marginalisation and exclusion in the development of energy infrastructure. The research looked at how access to and use of modern energy services and appliances, in the household and in micro and small-scale enterprises, can change the roles allocated to each gender and the power relations between them. The research showed how these norms can change over time, what causes them to change, and also how they vary between different contexts.

Use of modern energy services can contribute to changing gender norms and increased gender equality. Organisations delivering energy services can be more effective if they are gender aware. At the same time, women can gain better access to energy services and transform gender norms when they are able to harness political processes. This research demonstrated the different drivers that influence decision-making and power relations between women and men at three levels: the micro level of households; the meso level of local government agencies and women's organisations; and the macro level of national policy-making. Still, women's voices in the household, in local communities and in the policy space need further explicit support and encouragement if needs for modern energy services are to be met more effectively and Sustainable Development Goal 5 (SDG 5 for gender equality) is to be achieved.

Policy implications and recommendations

A number of policy implications and recommendations follow from this narrative. Some of these are specifically addressed to the energy sector, but others extend beyond energy to other sectors, such as agriculture, employment and health. In particular, the evidence suggests there is a need to:

Engage both women and men in the design, implementation, and monitoring and evaluation (M&E) of energy policies and programmes to enable gender-equitable outcomes

- To overcome gender norms and barriers that differ in different contexts and that are also rapidly changing, a gender assessment, targeted interventions, and gender-responsive monitoring and evaluation (M&E) are essential requirements for any energy intervention, whether through policy, programmes or projects.

- High-level gender policies and mandates that target women as well as men need to be more effectively translated into practical strategies, gender action plans, and operational actions on the ground.

- At the same time, organisations need to change their ways of operating to ensure that women are able to participate beyond administration. In order to facilitate this change, guidance needs to be developed, adapted, and provided for specific energy subsectors and national situations, based on good practices and lessons from past experiences.

- In order to overcome gendered social norms, gender-responsive innovations at the micro level are key to the successful implementation of policies. Gender mainstreaming processes imply benefits for both women and men, and both need to be involved in these processes.

Support women's involvement in energy-system value chains and employment, both by overcoming gender barriers and through equal opportunity strategies.

- Both public and private suppliers can benefit from pursuing proven strategies to promote women's entrepreneurship in the energy sector, including business education and skills development, training on personal agency and initiative, access to finance and capital, and access to coaches, mentors, and networks.

- In designing women's energy entrepreneurship models, consider that women's attitudes to risk differ from those of men. Women can be supported to join groups and associations to target customers together, access supplies at a lower cost, or increase their bargaining power with authorities. The importance of engaging men to support these new roles for women is also emphasised.

- Different forms of simple low-cost quotas should be tested in energy sector entrepreneurship and employment - as a low-cost strategy in both the public and private sectors - to improve benefits both for women and for business performance.

- Encourage the recruitment of women in non-traditional employment with appropriate appliances/equipment and support.

- Women should be assured of – and organise themselves to demand – full participation, as stakeholders and in employment, in the planning, management, and operation of energy supply in the energy sector.

Multiply social and economic impacts of energy access by targeting women's productive use.

- Specific efforts to target women as well as men should be included in productive use components of electricity programmes. Different strategies are required for men and women to meet their particular energy needs.

- Improve modern energy access for businesses and sectors where women predominate. In particular, women's energy-intensive food preparation businesses need modern energy and can be supported within cooking energy programmes or through women's entrepreneurship programmes. Specific actions to promote the use of modern energy in women's businesses include provision of information, financing mechanisms, investment in energy infrastructure, and targeted subsidies.

- Support groups that offer women the option of renting (instead of purchasing) energy appliances that can assist them in enhancing their incomes and productivity – which may lead to the transformation of gender roles and norms.

Increase poor women's ability to afford energy services through innovative financial mechanisms and by improving the enabling environment for women.

- Promote measures to make upfront costs of connections, electricity subscriptions, and energy-using equipment and appliances affordable, especially for women who may have limited decision-making power in this realm.

- Specifically target cost-reducing strategies (including subsidies and loans) to women's circumstances, while making the availability of such subsidies more widely known.

- Address energy service affordability by enabling payment flexibility and reducing payment size, through mechanisms such as pay-as-you-go schemes appropriate to poor women's needs and circumstances.

- Address the enabling environment needed to increase women's ability to afford energy connections: financial inclusion through access to banking and credit, equal legal rights to land and property, greater mobile phone connectivity, and better education and awareness around energy choices.

Improve reliability, convenience, and quality of energy supply to increase both women's and men's access to and use of energy services.

- Rapid adoption of electrical appliances will require attention to the reliability and quality of electricity supply, not merely the quantity of supply and access to it. This is important for both enterprises and households.

- Ensure the provision of reliable electricity to public infrastructure and services such as schools, health clinics, and water supply, to increase the benefits of using these services.

- If rural, poor, and remote areas are to benefit from modern energy services, the distribution of electricity and fuels – whether centralised or decentralised – will have to be improved and strengthened.

Support women's role in energy decision-making at household, organisational, and policy levels.

- Policy makers and development partners should adopt a twin-track approach of supporting women's organisations and networks known for more transformative agenda-setting, while also helping women to exert greater influence in mainstream (i.e. dominated by men) energy organisations and energy-policy forums where key decisions are made.

- Given the importance of context and the complexity of the policy space, political mobilisation will need to take place at the national level.

- Women's voices in the household, local communities, and the policy space related to energy need explicit support and encouragement from the energy sector, as well as from the gender sector.

This research programme generated a wealth of empirical evidence and data that can inform gender, energy, and poverty policies and programmes. Policy makers and practitioners need this evidence in order to more effectively implement programmes to enable equitable energy access for both women and men. One of the research programme's major findings was that 'context matters'. Context can make definitive answers naive or irrelevant, and this means that local and national research must play a key role in designing local interventions. For this reason, gender assessments, including consultations with stakeholders, are recommended as a first step in designing energy policies and programmes.

Many questions, both empirical and policy-oriented, remain for further exploration. The scope of the research themes did not cover all areas of interest, and research on cooking energy issues – a central energy need for women – was limited. Within the broader research areas, the scope was necessarily limited geographically or by subsector, and not all critical questions could be addressed. Some indicative examples of empirical questions that require further exploration, as identified by the researchers and ENERGIA as being particularly relevant in the context of advancing SDGs, include:

- How can women use the existing political and policy space to demand the modern energy services they require?
- How does energy access affect gender relations over time?
- How can the process heat and mechanical power needs of women and men be better met?
- Which types of women's energy entrepreneurship are most effective at expanding energy access?
- How can energy-sector reform better meet the needs of both women and men?

The overall message of this research is that many insights into more effectively linking gender and energy are simply not being translated into action on the ground. For this reason, in addition to the empirical research already mentioned, 'dissemination-influence-change' programmes, coupled with capacity development of target stakeholders/influencers, are required to facilitate the uptake and utilisation of research recommendations. As the 2030 deadline for the SDG Agenda looms, there is a need to do better. Research generated through this programme can catalyse action to move further, faster.

Sven Torfinn/ENERGIA

1. Building evidence on gender and energy

Building evidence on gender and energy

Introduction

The Gender and Energy Research Programme (2014 – 2019) was led by ENERGIA, the International Network on Gender and Sustainable Energy. The five-year research programme was supported by the UK's Department for International Development (DFID) as part of its Sustainable Energy, Access and Gender (SEAG) programme, which aims to deliver evidence that will shape the global effort to provide universal access to sustainable modern energy services by 2030. The SEAG programme has the broad objective to improve the integration of gender and equitable renewable energy access frameworks, processes, and mechanisms, and to incentivise investment in and development of renewable energy initiatives at the national level. This report presents a synthesis of the evidence generated by the research programme.

Background of the research: the challenge

Since 2015, Sustainable Development Goal 7 has provided an ambitious mandate: to ensure access to modern energy for all. While Sustainable Development Goal 5 separately seeks to achieve gender equality, in reality energy access and gender equality are inextricably linked, and can mutually reinforce each other. Addressing them together can therefore offer multiple development gains. The overwhelming reality is that it will not be possible to meet targets for affordable, reliable, sustainable, and modern energy access for all by 2030 unless the energy needs of women are met.

This challenge is being addressed by many key actors in the energy sector, ranging from governments, multilateral organisations and donors, to utilities, private companies, and civil society organisations, at both international and national levels. Policies and programmes are seeking to more effectively integrate gender equality as a key element. Gender action plans are being developed. These measures aim to ensure that women as well as men gain access to modern energy services and benefit from them. They also include the promotion of energy services that contribute to increasing income, women's empowerment, and the transformation of gender relations. However, these efforts are hampered by obstacles arising from the lack of understanding of gender dynamics in the energy sector, limited evidence on linkages between energy interventions and gender-equitable outcomes, and the absence of sex-disaggregated data.

ENERGIA, the International Network on Gender and Sustainable Energy, has been working on these issues through its research and through its programmes on gender mainstreaming, women's economic empowerment, and advocacy, since 1996. ENERGIA is an international network of like-minded organisations, currently working with 36 partners in 18 countries in Africa and Asia. Between 2003 and 2006, it carried out a DFID-supported research programme titled 'Gender as a key variable in energy interventions: Are we asking the right questions?' This programme contributed to a new analytical framework on gender, energy, and poverty, and built capacity in gender and energy research. Since 2015, ENERGIA has been providing technical advice to the UN Secretary-General's Advisory Board to Sustainable Energy for All, to ensure that gender equality is a central part of SDG 7. More recently, ENERGIA co-facilitated the Multi-Stakeholder Technical Advisory Group on SDG 7, convened by the UN Department of Economic and Social Affairs (UNDESA).

The current research programme was developed to respond to the need for deeper understanding and evidence on gender-energy linkages related to SDG 7 on energy and SDG 5 on gender equality, needed both for ENERGIA's own programmes, and for the effectiveness of the wider energy community in meeting these goals.

Objective, scope and approach of the research programme

Objective and scope

The objective of ENERGIA's Gender and Energy Research Programme was to generate and analyse empirical evidence of the benefits of taking a gender approach in energy access interventions, and to translate this evidence into recommendations for energy policy and practice. By doing so, it sought to build the evidence base for improving energy investment effectiveness by understanding and better-addressing women's specific needs for modern energy services.

In the context of energy access, the research sought to test the hypotheses that a more gender-aware approach will:

- lead to greater equity between women and men in the impacts of modern energy services, and
- transform traditional gender roles and relations by empowering women through improved access to, or participation in the delivery of, modern energy services.

Box 1: ENERGIA's definition of a gender approach

ENERGIA defines a gender approach as one that not only analyses the differential impacts of proposed energy interventions on women and men, but also recognises women's and men's different needs for energy, based on consultations that consciously seek advice from both women and men; the potential of women and men to participate in energy supply; and the need to tackle institutional barriers that limit women's participation in energy planning and production, and that limit their access to energy for a variety of end uses (Clancy et al., 2016).

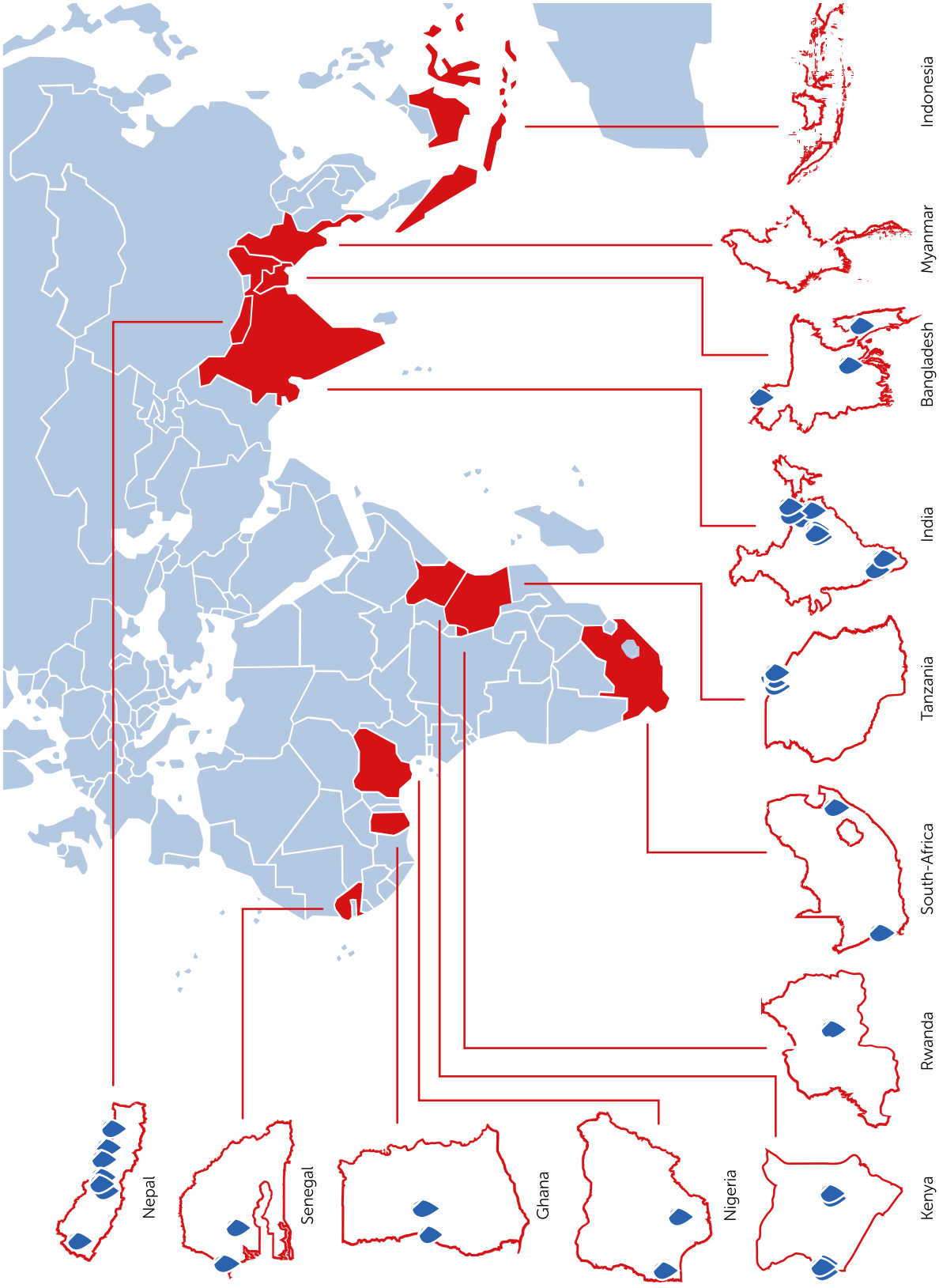
These issues were explored through six thematic areas where a need to generate new knowledge and close gaps had been identified through a literature review of current research: (a) electrification, (b) productive uses of energy, (c) energy sector reform, (d) the role of the private sector in scaling up energy access, (e) the political economy of energy sector policies, and (f) women's energy entrepreneurship. Cooking energy was originally excluded as a theme due to overlap with other planned DFID-supported research, but many findings relevant to cooking energy nonetheless emerged and are presented here. Through in-depth research, each of the six themes was narrowed down to more specific research topics; for example, the wider theme of energy sector reform was narrowed down to focus on fossil fuel subsidies.

Programme approach

The research programme was led by ENERGIA. The ENERGIA International Secretariat (IS) and a Principal Investigator (PI) managed the programme, coordinated research meetings, and took the lead in disseminating research findings at key SDG 7 policy forums. A Technical Advisory Group (TAG) of seven senior energy and gender experts was engaged to inform the research agenda, provide high-level technical guidance to the research teams, and peer review the research outputs. A call for proposals was issued as a competitive tender, initially for five research themes; proposals were reviewed and ranked by the TAG, and a selection was made based on the quality of the proposals, the academic qualifications of the team, the participation of partners from the South, and experience with policy engagement. The researchers, IS, PI and TAG formed a collaborative research platform which met annually to share and compare findings and discuss policy-influencing strategies.

In the first phase, from 2014 to early 2016, research priorities and research proposals were developed and selected based on agreed selection criteria, and scoping research was carried out for the first year of the programme. The scoping research reviewed the existing evidence through literature review, policy review, stakeholder consultation and pilot field research; it laid out the gaps, detailed the scope, methodology and concepts, and refined the research proposals. This provided the basis for empirical data collection and analysis in phase 2, which took place between 2016 and 2019. Since some of the selected research proposals were narrower than expected, gaps were identified and four more studies were commissioned as the project evolved. In all, 9 research teams (see Box 2) participated, in 29 universities and research institutions, 21 of which were from the Global South. The research programme and the members of the collaborative research platform engaged with policy makers and other stakeholders at global, regional, national and local levels, and influenced the initiatives of a number of key stakeholders working to deliver on SDG 7, such as the multi-stakeholder Technical Advisory Group on SDG 7 that supports the UN's review process of SDG 7.

Figure 1: The Gender and Energy Research Programme: countries and field study areas



Box 2: ENERGIA/DFID Gender and Energy Research Programme: Nine research areas (RAs)

1. **RA1: Exploring factors that enhance and restrict women's empowerment through electrification**
   Lead partner: University of Oslo (UiO), Norway
   With: The Energy & Resources Institute (TERI), India; Seacrester Consulting, Kenya; Dunamai Energy, Malawi
   Focus countries: Kenya, India, and Nepal
2. **RA2: Productive uses of energy in informal food preparation and processing sectors**
   Lead partner: University of Twente, The Netherlands
   With: University of Cape Town, South Africa; MARGE, Rwanda; and ENDA, Senegal
   Focus countries: Rwanda, Senegal, and South Africa
3. **RA3: The political economy of energy sector dynamics**
   Lead partner: M.S. Swaminathan Research Foundation, India
   With: Center for Rural Technology (CRT), Nepal
   Focus countries: India, Nepal, and South Africa
4. **RA4: Gender and energy sector reform**
   Lead partner: Global Subsidies Initiative of IISD
   With: Integrated Research and Action for Development (IRADe), India; Bangladesh Institute of Development Studies (BIDs), Bangladesh; Spaces for Change, Nigeria; SMERU Research Institute and UGM-Universitas Gadjah Mada, Indonesia
   Focus countries: Bangladesh, India, Nigeria, and Indonesia
5. **RA5: The role of the private sector in scaling up energy access**
   Lead partner: EPRU, University of Cape Town, South Africa
   With: IPA, Rwanda; NURU East Africa Ltd., Rwanda
   Focus country: Rwanda
6. **RA6: Unlocking the benefits of productive uses of energy for women in Ghana, Tanzania and Myanmar**
   Lead partner: Institute of Development Studies, UK
   With: Gesellschaft für Internationale Zusammenarbeit (GIZ); Institute of Statistical, Social and Economic Research (ISSER), Ghana; Tanzania Gender and Sustainable Energy Network (TANGSEN), Tanzania; Economic and Social Research Foundation (ESRF), Tanzania
   Focus countries: Ghana, Tanzania, and Myanmar
7. **RA7:Building the evidence base for women's empowerment and entrepreneurship to improve energy interventions' effectiveness – literature study**
   Lead partner: Johns Hopkins University, Bloomberg School of Public Health, USA
   With: Babson College, International Centre for Research on Women (ICRW)
   Focus countries: global literature review

8. **RA8: Commissioned research on lessons learned on gender approaches**
   Lead partner: University of Twente
   With: Practical Action East Africa, Kenya; CRT Nepal; Enda Tiers Monde, and Senegal
9. **RA9: Levers of change: how global trends impact gender equality and social inclusion in access to sustainable energy**
   Lead partner: SEforAll, United Nations Foundation

Methods and limitations

All the research teams used a mixed-methods approach, combining qualitative and quantitative methods. The research programme considers quantitative and qualitative research approaches to be complementary and, when used in combination, to be powerful tools which can provide the necessary rigour for the development of research findings in the complex gender and energy arena. The quantitative research in this study shows the 'what' and 'how much', and is used to provide indications of causality through analysis of correlations. One of the teams (RA5) used randomised control trials (RCTs) that allowed for a deeper level of quantitative analysis. Quantitative data was drawn from surveys (covering over 11,000 persons and including a longitudinal survey), as well as from a systematic literature study and experiments. The qualitative research was used to look into questions of 'why' and 'how', and was particularly effective in identifying intangible factors, such as social norms, gender roles, ethnicity and religion, that influence the choices men and women make regarding energy services. Qualitative data was gathered through semi-structured interviews (SSIs), key informant interviews (KIIs), participatory focus group discussions (FGDs), and literature studies. The research emphasised the collection of quantitative data, since this was generally lacking in the literature related to gender and energy research – the limited evidence available was typically in the form of qualitative case studies.

It is important to note that the studies were developed to answer specific research questions, and therefore sampling was developed across contrasting field areas to capture learning from the empirical work. The samples were not developed to be representative of the state or the country in which they were carried out (although for ease of reference this report sometimes refers to the field studies by country name).

The reader should keep in mind what is perhaps the one generalisation from this research: context matters. The research study areas differed in socio-economic-cultural contexts as well as in their enabling policy frameworks. Women's existing social and economic positions and their personal assets (such as education level) influence the benefits (such as contributions to their personal empowerment) that the use of modern energy services can bring. Women are not a homogeneous group, and power relations also exist between women. Energy policies as well as the causes of poverty for women and men are contextual at local, national, regional and international levels, while the social and economic data available for different countries was variable in its quality, coverage and consistency.

Structure of the research report

This report presents a synthesis of the evidence generated by the five-year research programme. It is not an abstract, and does not attempt to summarise all the research conducted as part of the programme. It draws from the empirical research conducted by the teams as well as the literature review undertaken. Starting by laying out the context of the research (chapter 1), the report sets out the overall purpose, approach and methodology of the research. This is followed by a discussion of the key findings, structured around six overarching findings (chapter 2). The report ends with the policy implications of these findings and a final conclusion that suggests a way forward, including identification of future research needs (chapter 3).

Sven Torfinn/ENERGIA

Bunu Dhungana/ENERGY

2. Research Findings

2.1 Universal energy access targets are unlikely to be met unless energy policies are aligned to women's as well as men's energy needs, their assets, skills, limitations and capabilities, and existing gender norms

Men and women have different energy needs, and different levels of access to and control over energy sources and technologies. Energy policies that aim to deliver equitable benefits to men and women should be cognisant of this differentiation. In reality, however, energy policies are mostly gender neutral – in other words, based on a presumption that they benefit women and men equally. At the same time, energy sector organisations take a gender-neutral approach in designing, implementing and monitoring their interventions. This section describes the origins and consequences of gender-neutral energy policies, provides a general definition of a gender-aware energy policy, and examines recent trends in countries that have developed and adopted gender-aware policies. Going further, the section presents an overview of how and to what extent these policies have been implemented on the ground.

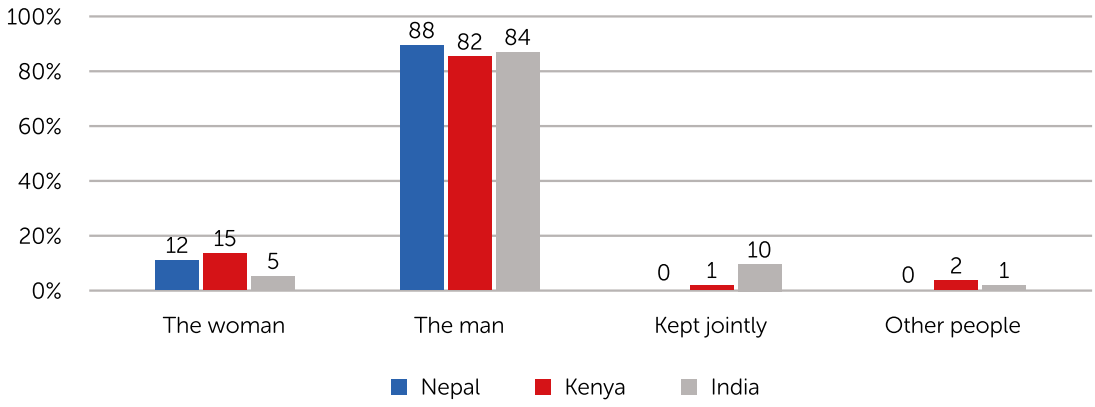
Gender-neutral energy policies

Energy policies, programmes, and projects that do not explicitly target women result in inequitable access to energy services between men and women (Clancy and Feenstra, 2006; Clancy et al., 2016). A review of national energy policies in the study countries showed that in most countries, the foci of energy policies include expanding energy services to the populations that lack it; making energy services affordable; and enhancing their availability and reliability. The policies do not focus explicitly on the specific needs of women and men, or reflect their different capacities to access energy services. In reality, however, the energy needs of women, both in terms of their household responsibilities and their productive activities, differ from those of men due to differences in the types of work they do, the enterprises they run, and the appliances they have access to. A function of societal norms, these differences are frequently institutionalised. When energy policies are gender neutral, they assume that benefits will automatically trickle down and benefit both men and women equally. In practice, such programmes and projects, together with local norms and practices, hinder women's empowerment in that the provision of access is tacitly designed to become a realm

largely dominated and controlled by men. They are also likely to reinforce a particular set of ideas about end users: men doing productive work and women occupying households (RA1).

Our research covering Nepal, Kenya and India showed that in all three countries, the percentage of electricity connections registered by men far outnumbers those registered by women. Even though at the policy level the electrification policies do not differentiate between men and women, in reality the number of women able to register for electricity is far lower than the number of men. This is because the utility generally requires the name on the connection to be the name of the owner of the household, and in most developing countries more men own houses than women. Women in rural areas rarely own the houses they live in, and are therefore unable to be 'subscribers' to electricity. Primary data collected in Kenya showed that widows and women divorcees who own their house are much more likely than other groups to not have access to electricity (74%). A likely reason is that many of them are poorer than married couples or single men (according to the research data, women in the Kenyan sample earned on average only 40% of the income earned by men) (RA1).

Figure 2: In whose name is the electricity supply connection? (Source: RA1)



The emergence of gender-aware energy policies

While there is no universally agreed vision of what a gender-aware energy policy should contain, ENERGIA proposes that 'a gender-aware policy is one that takes into account the social relationships of women and men as well as the differences in their needs, as opposed to a policy that is gender-neutral and implicitly assumes that women and men have the same needs' (Clancy and Machera, 2018).

A gender-aware policy is developed through gender-inclusive formulation processes in which women and men have equal opportunities to participate. It recognises that women and men have different energy dynamics (roles in the household, decision-making areas, energy needs, responses to crises and coping mechanisms). Accordingly, a gender-aware energy policy would make available energy technologies and services that match those dynamics (Clancy and Feenstra, 2006; Dutta, 2003), as well as employ appropriate policy instruments (such as taxation) to achieve those policy aims. Such an approach sees women as more than just passive recipients of modern energy; rather, it sees them as active participants along the supply chain and active users of energy services for

productive uses. Finally, a gender-aware energy policy also recognises existing social and cultural norms that influence access to energy connections, access to appliances, and use of services. It is crucial to ensure access to energy services for both men and women.

The research found signs that energy policies are beginning to be more gender-aware. In part, these developments can be attributed to the activities of multilateral agencies such as the World Bank's AFREA programme and the Asian Development Bank, bilaterals such as GIZ, regional government networks such as ECREEE in West Africa, and civil society organisations such as ENERGIA (Clancy et al., 2016). At the same time, national-level commitments made to gender-equality goals, as well as broader national-level efforts at gender mainstreaming, have also been critical (RA1). The Tanzanian National Energy Policy 2015, for example, promotes balanced participation of men and women in the energy sector (RA6). In Nepal, there has been an evolution from identifying women as passive beneficiaries (2006 Rural Energy Policy), to identifying specific goals of time and drudgery (2013 National Energy Strategy), to promoting the use of renewable energy by women for productive purposes (Renewable Energy Subsidy Policy, 2016) (RA1). Nigeria's 2013 National Energy Policy includes as one of its primary objectives: '[to] promote gender sensitivity and draw special attention to rural needs', though women's needs are defined as primarily related to their care economy tasks in the household (Energy Commission of Nigeria, 2013) (RA4).

In India, the draft 2017 National Energy Policy recognises how access to cooking energy has an impact on the health and workloads of women and children. Policy objectives, however, do not specifically support women to access and benefit from modern and productive forms of energy (RA1). In 2016, the government launched the Pradhan Mantri Ujjwala Yojana (PMUY) – a national cooking energy programme which aimed to provide 50 million LPG connections to poor households by 2019. The policy explicitly targeted 'the health of women and children', and built gender considerations into its design: 'Ensuring women's empowerment, especially in rural India, the connections will be issued in the name of the women of the households' (RA4). The PMUY programme provided one-time assistance to households in acquiring an LPG connection, targeted at women from poor households, on the condition that they opened bank accounts, showed proof of identity, and were listed in a poverty database.

At the same time, there are examples of gender-neutral energy policies benefiting women. The Free Basic Electricity Policy of the South African Government – although originally intended for household use – has been used by women and men to set up businesses. As part of this, a targeted subsidy to low-income households has enabled people to access an energy carrier that they would not previously have been able to afford. The data collected in the research shows that 50 out of 136 respondents (74% women, 26% men) receiving the free electricity subsidy were actually encouraged to start their SFS business because of the subsidy (RA2 51). Nevertheless, it can be questioned as to whether this is the most efficient way to provide start-up support to enterprises, and why women are not able to access loans for business development.

Gender-aware approaches in energy organisations

Achieving gender equality in policy outcomes requires not only a transformation in energy policies, but also a transformation of implementation processes in the

organisations responsible for those processes – organisations that in the energy sector tend to be dominated by men, particularly in decision-making and technical functions.

Transformation can be achieved in a number of ways – by increasing the numbers of women working in these organisations, for example, and by changing ways of working to be more gender-aware and gender-sensitive. For organisations, taking a gender approach in ensuring energy access can be instrumental in determining gender-equitable outcomes from modern energy services.

Ministries and energy agencies in many countries are now taking steps to become more gender-aware in their organisations. For example, in Tanzania the Ministry of Energy and Minerals has a gender desk and gender focal point, and is working to link this better with the renewable energy and energy efficiency sections of the Ministry coordinating the SEforAll initiative (RA6). The Ministry has prepared a Sustainable Energy for All – Gender Action Plan, which gives gender issues a central role in implementation. Also in Tanzania, encouraged initially by donors, the Rural Energy Agency (REA) established a Gender Desk in 2012 and went through a gender audit at the institutional level, which led to the preparation of the REA Gender Strategy and Action Plan. As a result, their Monitoring and Evaluation framework was reviewed to include gender indicators and REA staff received training on gender issues. The REA has targeted women's needs by, for example, giving priority to wells, schools, and dispensaries in electrification projects (RA6).

At the same time, there are employment policies that encourage women to join the energy sector. In Kenya, the utility Kenya Power, which is often cited as an example of good practice for gender mainstreaming in the energy sector and for engaging women in non-traditional roles, has shown signs of implementing a gender-sensitive approach when it comes to its employees. Recruitment policy is cognisant of women's family responsibilities; for example, a willingness to agree to overnight field stays is not specified as a condition of employment. The organisation is demand-responsive and willing to understand and address staff concerns. For example, they installed separate women's and men's toilets when requested by a female member of staff (RA1). In India, gender quotas are used at the state level, reserving 30% of jobs, at all levels, for women. However, women are mainly found in administrative jobs and men in technical ones. Women with technical skills tend to opt for working in urban/peri-urban areas, because in these areas the work is closer to home and requires less travel. This makes it easier for women to combine work with family-care responsibilities. The reality is that women subscribe to gender norms of what is acceptable behaviour for women (e.g. not climbing poles, which may be necessary in an electric utility job, or not travelling far from home) (RA1).

Besides government agencies, the research teams found a number of NGOs involved in decentralised renewable energy systems, some of which have strong social goals, target women as end-users of energy, and help overcome the barriers of access to energy services. For example, the JEEViKA –TERI ('Lighting a Billion Lives' project) in Bihar provided women with access to loan financing ('Energy Security Credit') (RA1). However, it should not be taken as a given that NGOs automatically take a gender approach. In four NGOs working with off-grid systems, the research team found the 'traditional' job distribution: men in technical posts and, if involved at all, women in administration (even when they had an engineering qualification) (RA1).

The gap between policy and practice

The research showed that in spite of the emergence of gender-aware policies at national level, implementation often lags behind. The research in India, Kenya and Nepal showed that in the cases of both grid extensions and mini-grid initiatives (off-grid), efforts to include gender in energy at the macro/national level were not very effectively transmitted to the meso/supplier and micro/village levels. In most of the study sites, particularly in India and Kenya, conventional grid electrification programmes were implemented through a top-down process with little participation of users or communities, whether women or men. A study of 14 systems of supply, ranging from grids to various types of off-grid systems, including mini-grids, showed that little attention was paid to gender issues in implementation. As a result it was mostly men, and not women, who become involved in supply at the local level (RA1). Private actors did not address the situations of the poorest, those living at a distance from central places, or the need to provide electricity access to enhance the quality of public and communal services.

In India, the PMUY, or Ujjwala scheme, has provided over 35 million new connections across the country as of April 2018 (PPAC, 2018) and it has been instrumental to a significant increase in LPG usage since 2014. Nonetheless, implementation issues continue, and there may be both negative and positive impacts for women in low-income households. The PMUY requires that a female household member sign for the connection, thus challenging the norm that signatories should be household heads – usually men. On the one hand, as noted in an analysis of the subsidy programme in 2014 (RA4), women may be less likely to possess the documentation required for registration. Thus a clean cooking programme designed in this way might cut off certain households who would otherwise register through a male household member; and a lack of access to clean cooking has health and time implications for women. On the other hand, this requirement may help drive women's access to financial services and mobile phones, creating important spillover benefits. Gender inequality linked to financial inclusion has also narrowed dramatically since 2014 as part of larger drives to promote financial inclusion nationally (Ministry of Finance, 2018).

Further, in many rural areas LPG is not delivered to the house and has to be collected from the LPG supplier. Households with a single LPG cylinder connection have to place an order for LPG, and in many villages, in the absence of doorstep delivery, women have to wait for a man, who may have to forego a day's wages, to go to the LPG distributor to pick up the cylinder (RA4). This creates a delay of a few days during which time the women manage by using biomass for cooking. A survey by RA3 of Ujjwala scheme LPG recipients in Odisha found that the beneficiaries ordered an average of just 3.7 cylinders per year for an average family of 4.5 persons. Newspapers have also reported that there is a low rate of refill orders from Ujjwala beneficiaries in some states, for example Jharkhand, Chhattisgarh and Odisha, where LPG cylinder refill orders average just two cylinders a year in some areas (RA3). An investigation by the environmental magazine Down to Earth in August 2017 quotes an LPG distributor in Shravasti district of Uttar Pradesh who says that barely half of the Ujjwala beneficiaries have come back for refills, and then just once or twice. Another LPG distributor in the Dindori district of Madhya Pradesh says, 'The refilling rate is quite low. It is not more than 7% in the district' (Pandey, et al., 2017). This should be viewed in the context that a family of four needs 8 to 9 cylinders per year where LPG is the primary cooking fuel (RA3). A low refill rate

means that women are possibly continuing to use biomass fuels, and hence continuing to endure indoor air pollution, as well as the drudgery of collecting fuelwood.

The implementation gaps in energy access can largely be ascribed to the differences in gender approaches being used by implementing organisations. In Chhattisgarh state in India, the Chhattisgarh State Renewable Energy Development Agency (CREDA) is responsible for off-grid electrification. During community mobilisation in villages where mini-grids were to be installed, only officers from CREDA were involved, and they interacted only with men in the villages (RA1). The installation work was solely carried out by CREDA, without the involvement of men (or women) from the villages. The operator of the system and the technicians and helpers employed by CREDA were also men, as were the technical staff in the (central) CREDA office, where women were only involved in administrative jobs.

In Nepal, on the other hand, the research showed a different implementation approach being adopted for off-grid electrification by the Alternative Energy Promotion Centre (AEPC), the nodal agency charged with promoting renewable energy technologies. AEPC has a Gender Equality and Social Inclusion (GESI) policy, which sets out guidelines to ensure the inclusion of women, as well as poor and marginalised groups, in renewable energy promotion. With four mini-grids in the research areas in Nepal, AEPC ensured that women were trained in the technical aspects of micro-hydro power. Taking a gender-sensitive approach in line with cultural norms, women were trained separately and in mixed groups. In spite of this, however, none of the women took up the opportunities offered by the training – gender norms about appropriate work for women were still strong. In addition, women's participation in the management committee of the decentralised systems did not materialise. It is also notable that when AEPC delegated some of the rural electrification work to the private sector, the gender approach evaporated and only men were involved (RA1).

Conclusion

The research found that energy policies that do not explicitly target women often result in inequitable access to energy services between men and women. The reasons for this are related to differences between men and women in their energy needs – which are a function of societal norms and the differences in responsibilities that result from these norms – as well as differences between men and women in their capacity to access energy services. This also relates to the political economy, in which women have little political influence (further explored by RA3 and discussed here in section 2.6). These differences are frequently institutionalised, resulting in differential access to energy, to appliances, and to the potential benefits of energy services. Paying attention to these differences can help achieve more equitable outcomes. Finally, awareness of social and cultural norms, and local policies and regulations that influence access to energy connections, access to appliances, and use of services, are crucial to ensure access to energy services for both men and women. It was also found that even in cases where a gender-aware policy is in place, the implementation may lag behind, mainly because of the approaches adopted and the processes within implementing organisations. Hence achieving gender-equality outcomes requires not only a transformation in energy policy, but also changes in processes and changes within the organisations that drive these processes.

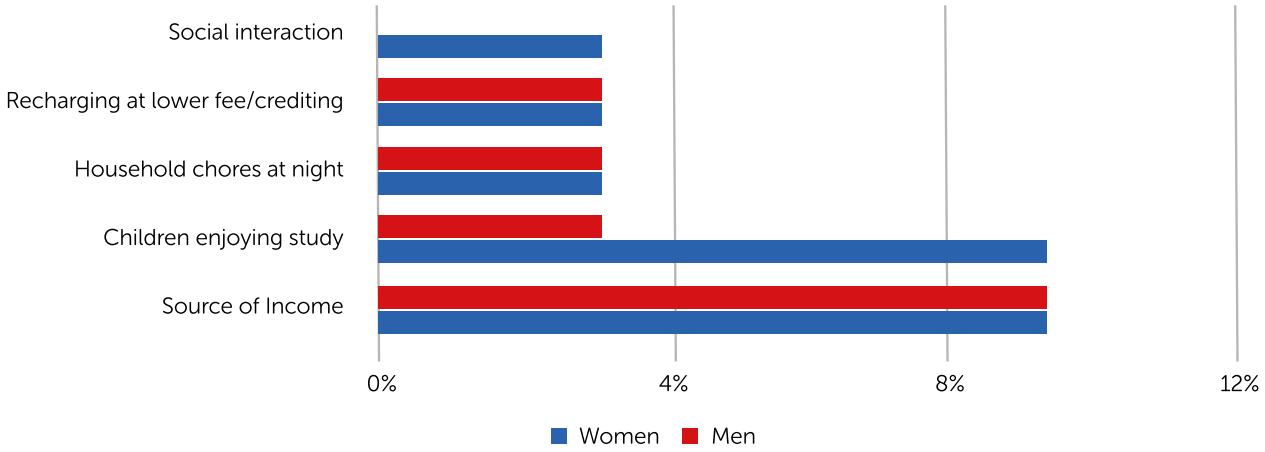
2.2 Involvement of women in energy-system supply chains is good for women and their families, and it is good for business

With the growing recognition of the role of local businesses in accelerating energy access, the contribution of women entrepreneurs and women's businesses to the sector has great significance for policy makers (ENERGIA, ESMAP and UN Women, 2018; Pearl-Martinez, R., 2018; OECD, 2010, Habtezion, 2016). This section starts by looking at what motivates women to take up energy entrepreneurship, and examines the validity of some commonly held assumptions about women's aspirations and their abilities as entrepreneurs. Next, it looks at the impacts of involving women in energy-system supply chains, starting with how involving women in energy businesses influences business outcomes. It also presents research findings on how involving women as energy entrepreneurs can build their self-confidence and agency, and contribute to their economic and social empowerment. Finally, it discusses the barriers women face when they are engaged in energy-system supply chains, and shares insights into possible mechanisms and types of support that can help women overcome these barriers.

Women's entrepreneurial aspirations

Do women's aspirations and motivations for becoming energy sector entrepreneurs differ from those of men? The research showed that for both men and women, the main motivation to engage in an energy business was to earn an income (See Figure 3). In Rwanda, the research looked at the entrepreneurial behaviour of women and men operating village level enterprises (VLEs) supplying rechargeable solar LED lights and providing recharging services as part of a solar energy programme implemented by Nuru Energy, an international social enterprise. The VLEs consisted of small groups of only women, only men, or men and women together. A sample survey of 15 VLEs and 15 key informants, including users and non-users of Nuru lights, showed that for both women and men, the primary motivation to become entrepreneurs was to earn an income, as well as to get access to the solar lights they were selling (RA5). The VLE operators generally aspired to buy houses and cattle, which in rural Rwanda are associated with wealth and status. However, while more men aspired to become homeowners, more women aspired to engage in business activities, join cooperative associations, own some livestock, become a teacher, or become rich.

Figure 3: Benefits of becoming an entrepreneur, by gender (Rwanda) (Source: RA5)



Competitiveness and risk-taking ability are identified in the literature as important elements that contribute to successful businesses. It is assumed that women are less competitive and more risk-averse than men, and hence women's businesses are less profitable than men's (Buvinic and Furst-Nichols, 2014). However, the research in rural Rwanda found that women operating VLEs did not shy away from competition. In fact, the experiments conducted found little difference between women and men in terms of competitiveness, and women in competitive situations were found to perform as well as men. At the same time, however, the research showed that women were less willing to take risks in their businesses than men (RA5).

The findings from the research also challenge a common assumption in the business literature that women's businesses tend to be small and survivalist, with little intention to grow (RA6, RA7). A key finding from the research in the street food sector (SFS) in South Africa, Rwanda and Senegal is that women's businesses were not survivalist, but had an aspiration to grow – an aspiration in which modern energy could play a role. This growth aspiration was found to be the same for both women and men in the SFS (RA2) (see Table 1). There was a similar finding for enterprises in Ghana and in Tanzania (RA6).

Table 1: Statement on wish to develop into a formal business (Source: RA2)

I would like my enterprise ultimately to develop into a formal business, like a real restaurant or food product factory (percentage of respondents reporting)							
		Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Total
Gender of the owner	Women	53%	36.6%	4.9%	4.2%	1.3%	100%
	Men	63.5%	29.4%	3.2%	3.5%	0.4%	100%
Total		57.3%	33.9%	4.0%	3.9%	0.9%	100%

The impacts of women's involvement in energy-system supply chains

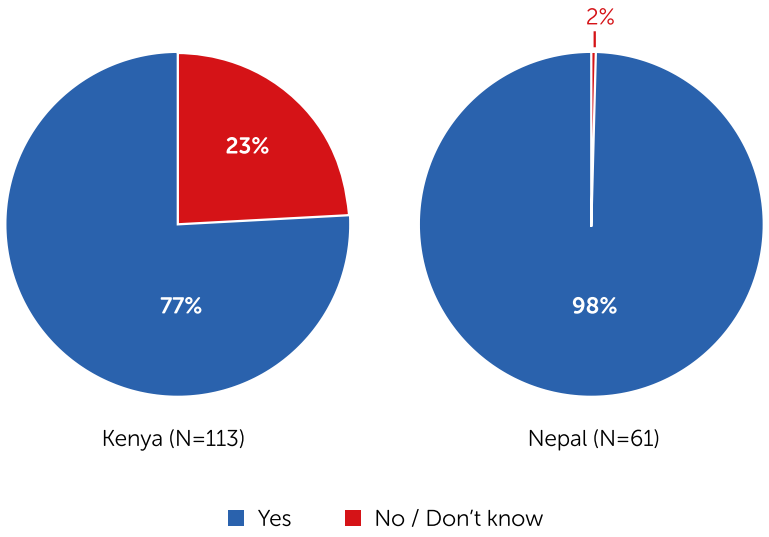
There is growing evidence that when compared to similar male business owners, women business owners tend to perform as well or better than their male counterparts (Du Reitz & Henrekson, 2000; Zolin et al., 2013; Robb and Watson, 2011; Shankar et al, 2015). This was corroborated by the research in Rwanda and Kenya, which showed that in off-grid solar, women were found to be as good sales agents as men (RA1, RA5). In some circumstances, women were seen to outperform men, since they were trusted more than men to provide quality service (RA1). This trust in their service increased sales, with a positive impact on revenue and the organisation's viability (RA1). Results from a randomly-assigned women's quota system in Rwanda showed that women-owned VLEs performed as well as VLEs owned by men. This was confirmed by self-reported microenterprise income figures obtained through end-line surveys of VLEs. Moreover, collective agency-based business models that supported women participating in groups with other entrepreneurs had higher average sales per VLE compared with teams led by men. This data suggests that when operating in groups, women tend to outperform men even more than when operating alone.

Data from a programme implemented by CARE in several countries in East Africa showed that women members of village savings-and-loan associations (VSLAs) were effective in selling clean-energy cooking and lighting products, mostly selling door-to-door, taking up stalls in local markets, or adding energy products to their existing small shops (Wright, 2013).

When women engage in energy businesses, multiple impacts are seen. First, they become more confident and self-reliant; gaining technical skills gives women self-confidence and builds their psychological empowerment ('I have managed to fix a fridge that uses solar in my house') (RA1). Once women start earning an income, their perception of what they can do is changed (Figure 4). Women members of self-help groups (SHGs) involved in off-grid electrification were found to have gained confidence to go out on their own, call meetings, sign documents, and negotiate with officials. In Rwanda, women entrepreneurs in VLEs were recognised as leaders in their villages and were asked to mediate conflicts between other villagers – which can be seen as an aspect of social empowerment (RA5). Women engaged as energy entrepreneurs often gained access to social networks, either directly through the enterprise structure, or through forming their own groups to share knowledge and best practices (RA7).

In Rwanda, one VLE owner explained, '...because I am a VLE, I get to now meet a lot of people, and others come for advice from me. I am trusted, and I think I can now contest for the position of a village leader.' (RA5)

Figure 4: Answers to the survey question (Nepal and Kenya): 'Has observing women in supply changed the way you think about women and what women can do?' (Source: RA1)



Women working in the SFS (where high numbers of women enterprise owners were found) reported that running their own business increased self-esteem, self-confidence, and feelings of worth. This was not necessarily a consequence of using a particular form of energy, and had more to do with their being engaged in a business (RA2) – however, entrepreneurs receiving electricity subsidies mentioned that the subsidies encouraged them to start their SFS enterprises.

Engaging women in supply can change gender-stereotyping attitudes; in particular, it can change men's beliefs in what women can do, and so challenge existing norms. A new role for women in the workplace can also reduce the pressures that men feel due to cultural norms that prescribe them as 'breadwinners' (RA6). Solar Mamas, an NGO working in Kenya, recruited only middle-aged or older women to become solar engineers. These women were trained for six months at the Barefoot College in India. The initial reaction was mixed, with some men complaining about only women being recruited. Those who provided support did so because it met their own goals: community leaders saw the project as a means of electricity access, and the husbands of the women involved were positive because of the new income opportunities it presented for their families. But once the women had returned from the training, there was a significant change in others' attitudes. When asked, 11 of 13 villagers interviewed responded that they had come to think about women in a different way (RA1). A literature review conducted as part of RA7 describes how lower-caste Gujar women in India experienced increased visibility, and increased recognition of their socio-economic and political empowerment, through their role as solar entrepreneurs (Baruah, 2017). In an earlier example, women who participated in the design, production, distribution, and installation of stoves in the Upesi Project in Kenya were able to leverage their increased confidence and status to serve on community development committees (Njenga 2001).

Another important outcome of women engaging in energy businesses is the investment they make in the well-being of their families (RA5, RA6, RA7). Working as

an entrepreneur appears to influence women's attitudes to children's education, particularly when it comes to their aspirations for their daughters.

In Kenya, 85% (96) of the 113 women entrepreneurs responding reported a positive change in their aspirations for their daughters, while in Nepal the corresponding number was 64% (39 of the 61 responding). Men and women reported similar aspirations (RA1).

In rural Rwanda, the research study of VLEs found noticeable educational effects among school-age children, in the form of increased time spent reading or studying at home, in households of all-female VLEs (RA5). However, no conclusions can be drawn about what the increased studying time means in terms of education outcomes such as improvements in school performance or attendance.

Overcoming barriers to women's involvement in energy supply chains

There are multiple pathways through which women can be engaged in energy businesses: through self-help groups, cooperatives, as micro-entrepreneurs, as MSE owners, or as leaders of high-potential firms (RA7). In spite of this, the research found that because of the additional constraints that women face in running energy businesses, the potential of women's engagement in these businesses is far from being realised.

When involving rural people in new enterprises, both women and men need support. In many cases and especially in contexts where gender norms have led to differences in access to education and training, women need extra support. With respect to business support, access to capital is one of the biggest barriers faced by women entrepreneurs, and one of the reasons for this is that most women lack the assets required by banks as collateral (IFC, 2011, Bardasi 2011). At the same time, women are less likely to be part of professional networks and associations. In Ghana, men's businesses were found more likely to be members of trade associations than women's businesses. These associations offered training courses and apprenticeships that built entrepreneurial skills (RA6). A further cause for concern is that despite the involvement of social enterprises in energy supply, and despite their efforts to include women in the workforce, women can still be paid less than men for similar work (RA5, RA6).

There have been attempts to enable women to overcome these barriers. In some cases, SHGs have stepped in to provide bundled services, including machines and training in how to use equipment, and formed groups to sell the services the machines can provide. SHGs have also facilitated loans that do not require land ownership as collateral, as conventional sources of finance – such as banks – usually do (RA3, RA7).

The research showed that context is an important factor when integrating women into the energy-system supply chain in non-traditional roles. The Africa Biogas Partnership Programme (ABPP), which aimed to help women take up non-traditional roles such as masons in five African countries, found that some communities responded faster than others. In 2012, the percentage of masons who

were women was 12% in Kenya, 6% in Uganda, 5% in Tanzania, 1% in Burkina Faso, and less than 1% in Ethiopia. By 2015, the percentage in Kenya had increased to 24% and in Tanzania to 12%; but in Uganda it had halved, and in Burkina Faso and Ethiopia it had disappeared (RA8).

The literature identifies four types of support that significantly enhance the performance and sustainability of women's energy businesses. These include, at the individual level, (a) business education and skills development and (b) training to foster personal agency and initiative; and at the business level, (c) access to finance and capital and (d) access to coaches, mentors and networks (RA7, Dutta, 2018). There is evidence that it is important to bundle services, including business, technology and leadership training. In addition, training programmes that adjust for household obligations, reduce travel costs and provide accommodation for childcare are more likely to be successful. In addition to training, creating ongoing touch points for mentoring and networking can help women entrepreneurs feel that they have a support network, to help them address business challenges as they arise, to learn good practices from other entrepreneurs, and to expand their networks and reach. Business networks, especially for women, are an important source of new information, and a means of obtaining social support from other entrepreneurs. Through improved social networks, women feel a greater solidarity with peers, appear to demonstrate greater financial independence, and can gain greater respect in their communities.

If women are to aspire to better paid, higher-skilled jobs in the energy chain, and if they are to seize entrepreneurial opportunities, they will require training and apprenticeship – but these come with costs that in effect act as a barrier. Role models and supportive parents who allow women exposure to professions traditionally dominated by men are considered important in enabling women to enter lucrative employment and in challenge existing norms – allowing them, for example, to take on roles which might previously have been considered 'not appropriate' for women, such as becoming solar technicians (RA1, RA6). However, advancing women's position in the workforce takes time. Only longitudinal studies over longer time spans may in fact be able to capture the dynamics of these changing roles.

Conclusion

The involvement of women in energy-system supply chains as entrepreneurs and employees – particularly in non-traditional roles – is a win-win situation. The energy supply chain offers women the opportunity to earn an income, which can enhance their own welfare as well as their family's welfare. Further, it can build their self-confidence and agency, challenging gender norms in households and communities. When women have discretion over their earnings, they tend to prioritise spending on their families, putting their earnings toward education, healthcare and their children's welfare. For energy businesses, women can bring a unique value proposition as entrepreneurs. When given the right opportunities, they are eager to learn new skills, can deliver energy services to their communities with a high level of trust, and perform as well as men, even without any additional support. In particular, they are able to leverage existing social networks and form trusting relationships with potential customers – especially other women. However, in order to realise this potential, women need to be supported through a comprehensive package of support, including capacity building in technology, business skills and leadership; support in marketing, promotion and distribution; access to finance, and one-on-one mentoring. At the same time, they have to be supported to overcome

prevalent social and cultural barriers (e.g. lower literacy, lower access to finance, education, land, and mobility; greater burden of care work, etc.). Under-investment in overcoming these barriers is likely to perpetuate poverty and gender inequality.

Elavarasan Devarajan/ENERGIA

2.3 Modern energy services for women's productive uses contribute to women's empowerment

Modern energy services for women's productive uses contribute to women's economic empowerment by enhancing income and profits in the production of goods or crops or services, and by diversifying the realm of activities women engage in. Despite their low financial returns, women's enterprises provide important sources of household income, even in households headed by men. However, there is little empirical data, particularly from a gender perspective, to show the impacts of energy costs on enterprises and how this influences enterprise profits. Because men and women use energy differently and face different challenges at work, productive uses of energy are likely to deliver differential benefits to women and men. This section presents evidence from the research on the role of energy services in expanding women's productive possibilities, and their contribution to women's economic empowerment. It maps the kinds of productive activities and sectors that women are predominantly engaged in and the energy services they use, examines the income generation potential of productive use of energy (PUE), and looks at how this can empower women.

Women's engagement in productive activities

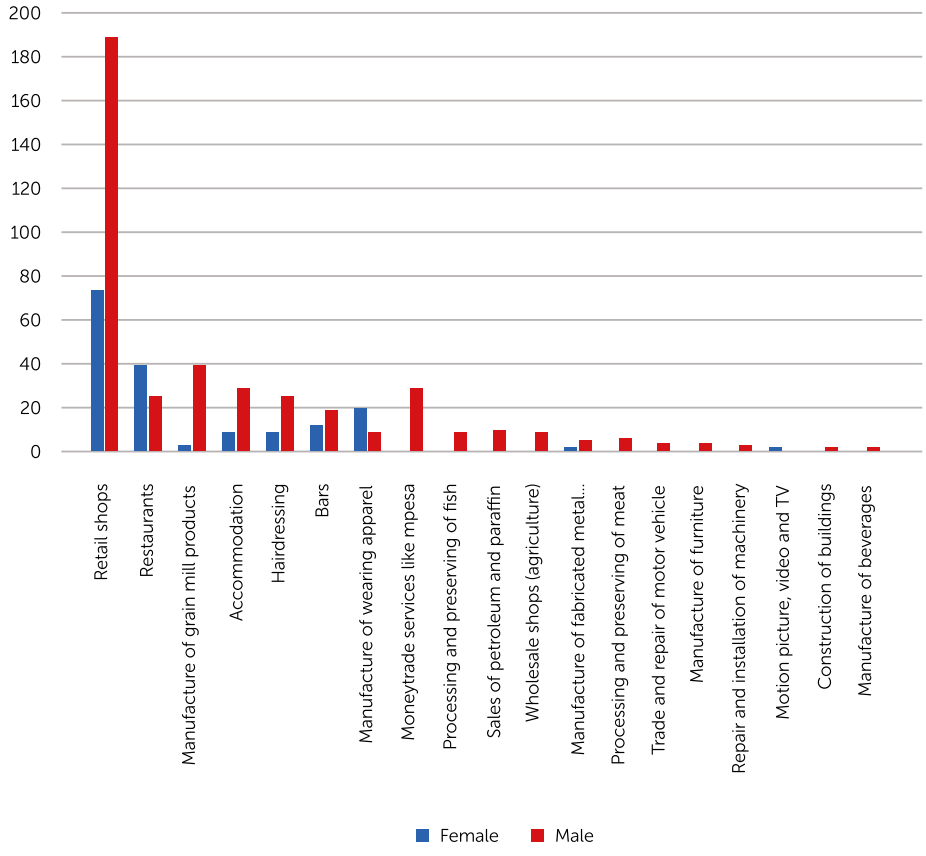
Men and women differ in the kind of income generation activities they engage in, and mostly these differences are embedded in social norms. Figure 5 illustrates how the representation of men and women in this research differed for different types of enterprises in rural Tanzania – a list that can be considered typical for many villages and small towns throughout the developing world. In rural contexts, men tend to dominate the key sources of agricultural income, such as fishing and cultivating cash crops, while women are mostly involved in subsistence agriculture. In non-agricultural production, women are found mainly in the service sectors: in small retail, tailoring, hairdressing, food preparation, phone charging, and running hotels/restaurants (RA1). In their work, women face a number of challenges: they are limited in their choice of markets and jobs, have limited access to capital, and are twice as likely as men to work in the informal sector. Women's limited access to capital and other resources also makes them more likely to specialise in lower-paid sectors. At the same time, they also face constraints to growing their business to a sufficient scale. Even when involved in the same type of activity, women tend to receive less income than men.

Another feature of women's productive activities is that they tend to work in sectors that are closely linked to the types of tasks allocated to women in the household, such as selling food (RA2) and tailoring. Men, on the other hand, undertake a wider

range of activities in manufacturing and services, often involving physical energy, which could be replaced by electricity or diesel engines. These men-dominated, energy-intensive activities include milling, carpentry, metal works and vehicle repair and maintenance. In rural settings, however, it was observed that many non-physical activities, such as money transfer services, or video halls or guest houses, were also run mainly by men (RA6).

There are multiple reasons for the narrow range of activities women are typically engaged in. For example, in Nepal, women identified the social constraints on their mobility as a primary reason for their restricted choices of sectors to work in (RA1). At the same time, there are some areas in which both women and men work, such as running shops and street food vending; however, within these, women and men were often found to have different roles and responsibilities (RA6). A cause for concern is that when involved in the same type of activity, women tend to receive less income compared to men. For example, in the study in Tanzania, men were involved in cultivating and selling cash crops, whereas women grew subsistence crops primarily for their family's consumption, with only small quantities (if anything at all) left over for sale (RA6).

Figure 5: Enterprise census per owner's gender and type of activity for five villages in Tanzania (number of businesses) (Source: RA6).



The research shows that in many cases, gender norms prevail even when women are running their own businesses. In Nepal, women were managing poultry businesses; however, men still made the decisions about buying and selling the chickens. Women accepted this situation since they subscribed to the social norm that held that men are better placed to manage a business because they have more

exposure, understand how things work, and are better acquainted with most people in the village.

In general, women's enterprises produce less income and lower profits, thereby limiting their ability to close gender gaps in monetary assets and relative financial security. Nonetheless, it cannot be automatically assumed that when it comes to assets, women are always in a worse position than men. The research in Ghana showed women doing as well as men. In terms of having a bank account, women fared better than men; although men did have better starting capital (see Table 2). In Kenya, the mobile phone has enabled access to banking services, with similar levels of usage among women and men (81%) (RA1).

Table 2: Access to capital and financial services by gender (Source: RA6)

	Ghana			Tanzania		
	All	Men	Women	All	Men	Women
Starting capital (USD)	669	739	550	**709**	**947**	**312**
Own bank account	**76%**	**73%**	**82%**	**34.7%**	**43%**	**22%**
Loan requested	38%	36%	43%	19%	17%	22%
Loan granted	93%	94%	92%	84%	90%	76%

Energy use patterns in women's productive uses

The differences in the types of activities engaged in by men and women have clear implications for energy use in women's and men's enterprise sectors. The research in Tanzania, Ghana and Myanmar showed that in all three study locations, men and women benefited from the use of electricity at work, but men were more likely than women to be targeted by PUE interventions as they owned most enterprises, were more likely to use electricity, and were more likely to spend more on it (RA6). Women's enterprises involved a higher use of fuels and a lower use of electricity; they also had a higher occurrence of informality, a smaller scale, and an enterprise location that was closer to home, or that used energy production from home. Within the street food sector across Rwanda, Senegal and South Africa, men were found to be using a wider range of energy types than women. However, more women were found to be using gas than men, who relied more on traditional fuels. A possible explanation lies in the differences in the tasks that are part of SFS operations: women were more involved in complex preparatory tasks for food, and needed quicker and faster operations. In addition to cooking appliances, the street food vendors, both men and women, were also seen to be using other appliances, including radios, TVs, gas cookers, fans and air conditioners (RA2).

One particular area where women are engaged in large numbers is agriculture. Use of modern energy services in tasks such as land preparation, sowing, transplanting, threshing, processing, transportation, milking and bulk cooling has the potential to augment farm productivity and incomes. However, access to and use of farm machinery differs between men and women, and is determined by differences in the responsibilities of men and women in farming tasks, their access to agricultural extension services, and the inherent suitability of farm machinery to large plots of land, which are mostly managed by men. Historically, the agricultural tasks that

men are engaged in are the ones that have benefited from higher levels of mechanisation. Typically men are involved in land preparation, sowing, irrigation, harvesting and selling the crops, while women are involved in transplanting, weeding and post-harvest processing, meaning differential benefits for men and women.

In some cases, women have also benefited from farm mechanisation. RA3, in its research in India and Nepal, documented two significant changes in the study areas: social changes resulting from the migration of men for employment, and the mechanisation of agriculture. In Nepal, the migration of men on a large scale forced many women to start managing the agricultural land as the *de facto* heads of households (Tamang 2011; Paudel et al., 2012). In Kailali, Nepal, large-scale migration has led to the mechanisation of women's post-harvest tasks, such as winnowing and threshing. Electric fans are now deployed for winnowing, and threshing is carried out with diesel-powered equipment. In India, women farmers participating in focus group discussions in Odisha estimated that the use of paddy-milling technologies reduced their manual work by 90 to 120 minutes per day (RA3). In Nepal, replacing manual irrigation with small-capacity solar-powered pumps enabled women to grow high-value vegetables on their small plots of land. This type of mechanisation could increase the productivity of existing plots, while reducing the drudgery of manual irrigation and increasing household income. However, these pumps are expensive. The research found innovative approaches to ensuring access to such types of equipment. In Nepal, the Village Development Committee used a collective approach, buying the pump set and having individual users pay for its use (RA3).

Empowerment impacts of the use of modern energy services in productive activities

Statistical data from Ghana and Tanzania showed that there was a positive relationship between the productive use of electricity and women's economic empowerment (RA6). Use of electrical appliances allowed for diversification in products for sale, which positively influenced income for both women and men. Modern energy services can also increase income by enabling the provision of services that attract more customers (such as playing music), allow for variation in products (thereby adding value – for example, tailors can add different types of stitching), or enable women to grow and process cash crops (for example, mechanised grain processing).

A woman tailor in Bwisya described how, after purchasing an electric sewing machine and being trained to use it, she was able to offer more sewing styles and types of embroidery than her competitors. This allowed her to increase her income from 80,000 TZS, which she made selling children's clothes, to 200,000 TZS with her new products (RA6).

This positive relationship is not automatic, and it depends largely on the economic context of the enterprise and the skills and ambitions of the entrepreneurs. Of the 6–8% of households in Kenya, Nepal and India who were found to be using electricity for income generation, electricity was said to have doubled income in some cases, while the outcome was mixed or negligible in others. A general finding for all, however, was that access to electricity was more likely to allow for

improvements in existing livelihoods and comfort than to lead to the starting of new types of enterprise activities. In particular, electric light improved working conditions (RA1), contributing to comfort and flexibility even when this did not directly contribute to increased income.

Running a business contributes to building women's empowerment. Surveys were conducted in Senegal, Rwanda and South Africa in which SFS business owners (618 respondents in total; 393 women and 225 men) as well as employees (133) were asked about two indicators of empowerment: self-confidence and the power to make one's own decisions. Measures of self-confidence were whether or not the entrepreneur could solve their own problems and were able to set their own agenda – in other words, whether they had control over planning their life's activities; an important indicator of agency. On both counts, the majority of women thought that they were able to solve their own problems (see Tables 3 and 4). The women's scores were very similar to the men's scores. (It is, however, not possible to determine whether working in the enterprise was a determining factor in self-confidence, or whether people who already had self-confidence established enterprises). In terms of agenda-setting, again women were of the opinion that they could 'set their own agendas' – although men appeared to feel more strongly than women about their influence over their own agendas (RA2).

Table 3: Own problem solving and gender (Source: RA2)

I can solve my own problems							Total
		Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	
Gender of the owner	Women	39%	50%	7%	3%	1%	100%
	Men	49%	36%	11%	4%	0%	100%
Total		43%	45%	9%	3%	0%	100%

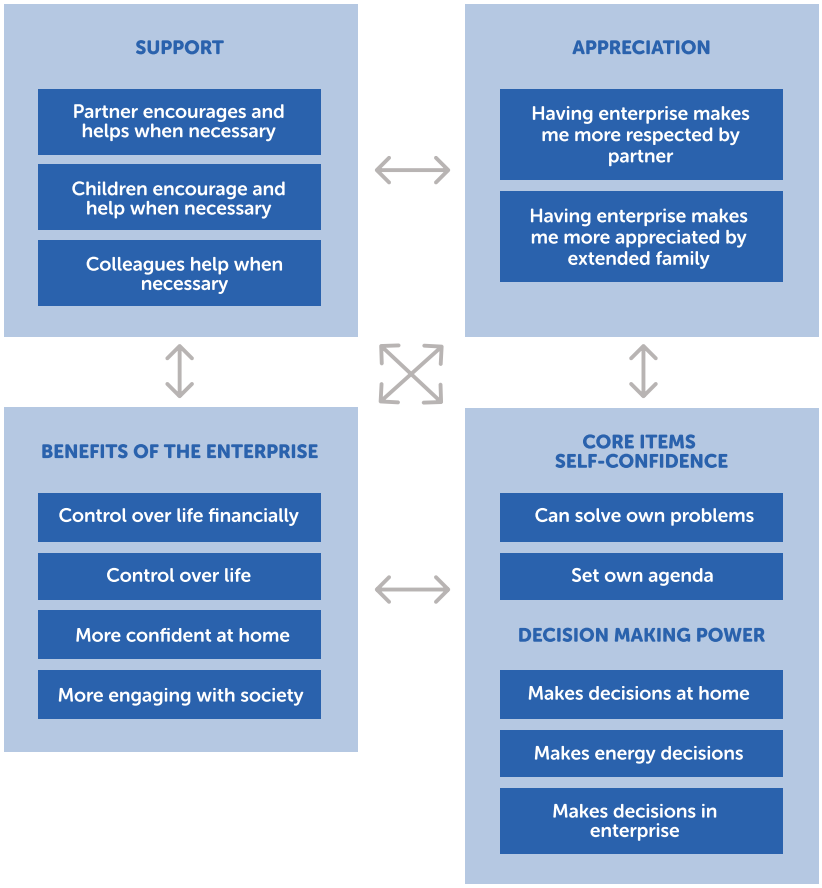
Table 4: Agenda-setting and gender (Source: RA2)

I set my own agenda (I plan my own life activities)						Total
		Strongly agree	Agree	Neither agree nor disagree	Disagree	
Gender of the owner	Women	44%	52%	3%	1%	100%
	Men	61%	33%	5%	1%	100%
Total		50%	45%	4%	1%	100%

The research showed that the direct influence of modern energy is limited to increasing the viability of businesses and increasing incomes, and is determined by the cost of energy and the efficiency of appliances. Feelings of empowerment are related to being an entrepreneur with more control over personal finances and other aspects of life, as well as being more confident at home and a having a willingness to engage more with society (RA2). Entrepreneurs were respected more by their partners and appreciated more by their extended family members for working and not staying at home. At times, this respect and appreciation translated into support for the entrepreneur (through moral support or direct help) which benefited the enterprise as well as contributed to the entrepreneur's social and

economic empowerment. Figure 6 shows the linkages between the entrepreneur, their family members, the enterprise and feelings of empowerment. Social empowerment seemed to be strongest in households where there was joint decision-making on major issues (RA2).

Figure 6: Empowerment through entrepreneurship (Source: adapted from RA2)



The research also highlighted that the availability of modern energy is not a sufficient input to establish new enterprises. A number of complementary factors are considered significant for establishing an enterprise: access to finance for electric appliances (Khandker et al., 2012); access to markets (Peters, Vance, & Harsdorff, 2011); entrepreneurial skills to identify the new opportunities electricity offers and to prepare sound investment plans (Neelsen & Peters, 2011); access to other infrastructure or services (Kirubi et al., 2009); and a high quality of electricity supplied (no power cuts or brownouts) (Kooijman-van Dijk, 2012; Kooijman-van Dijk & Clancy, 2010).

Conclusion

Women and men typically engage in different types of productive activities at different locations, and have different access to enablers such as assets, finance, markets, infrastructure and skills. For this reason, the benefits each derive from using modern energy in their productive activities differ. Since men are typically involved in larger enterprises that use more electricity than those run by women, their enterprises are more attractive to private sector suppliers. Women, on the other hand, are more reliant on fuels such as firewood, charcoal and LPG for running their businesses. In informal/street food production, sectors predominated by women, process heat and mechanical power are also significant. The research showed that there is a positive relationship between the use of modern energy and the economic performance of a business. In the case of women's businesses, this was also seen to contribute to their economic empowerment. At the same time, however, the availability of modern energy is not always a sufficient input, and a number of complementary factors need to be in place in order to maximise the empowerment impacts. Currently, opportunities to advance progress toward the SDGs through supporting the productive use of energy for women are being missed due to an incomplete understanding about the nature of women's businesses.

Sven Torfinn/ENERGIA

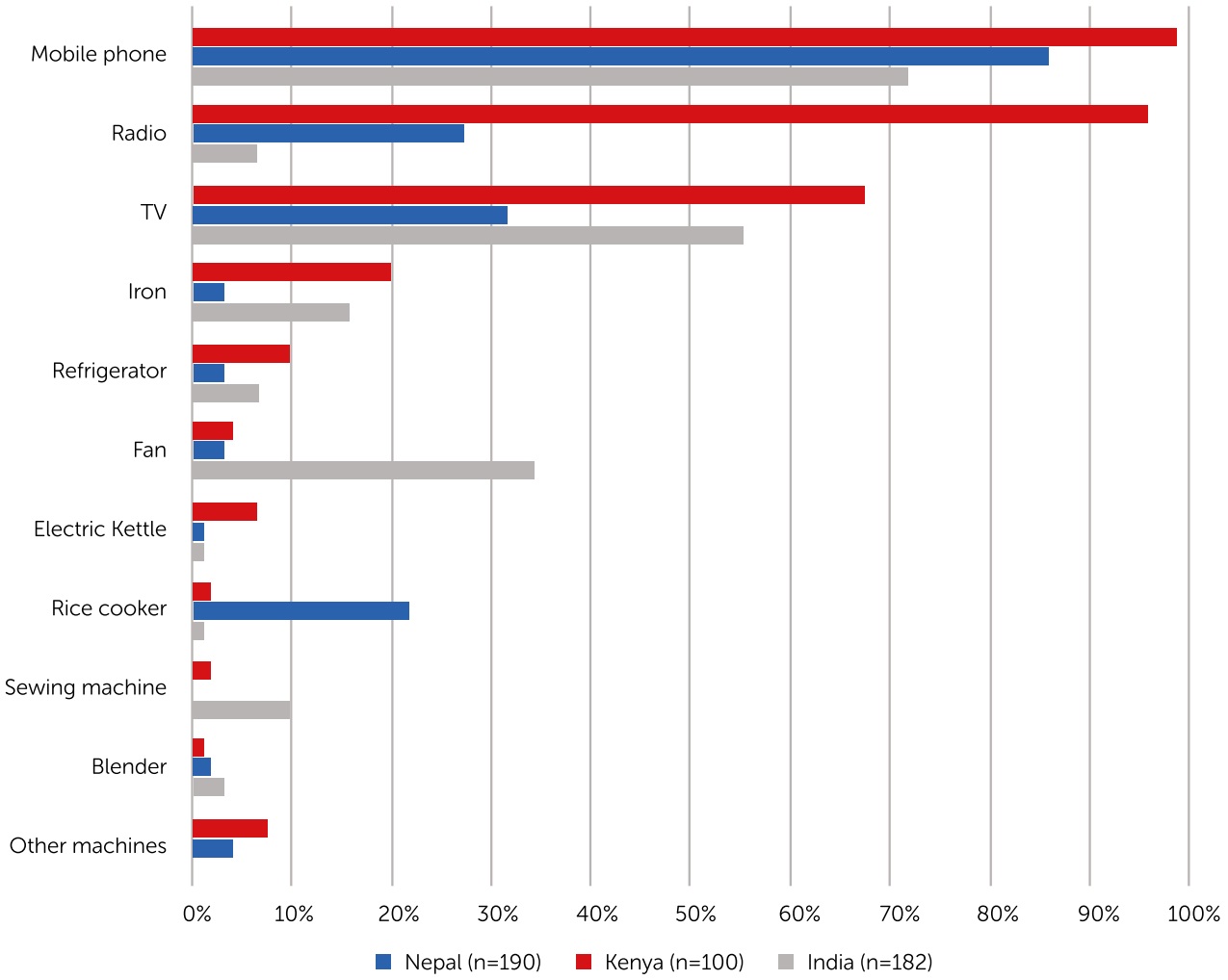
2.4 End-use appliances that deliver modern energy services to reduce drudgery and save time can transform gender roles and relations

End-use appliances are essential for the provision of modern energy services, as they convert modern energy supplies into the services required: heating, cooling, mechanical power, transport, telecommunications, and so on. The selection of appliances, and who chooses them, largely determines the impact of increased energy access. This section reviews how energy services impact the quality of life enjoyed by households, and by women in particular, and how these benefits are linked to the appliances used. It also examines what guides a shift towards these appliances, and explores the transformative impact that energy appliances can have on gender relations.

The impacts of electricity-powered appliances at household level

Electricity is bringing changes to lives, both rural and urban, and there are signs of new services appearing in remote locations. The research showed that households – particularly those using electricity – are expanding the number and types of appliances they own; these include lights, fans, mobile phones, and TVs (See Figure 7). Generally, these appliances benefit all family members (RA1). In India, because of electricity, shops are offering internet services and widening the range of goods they sell (RA1), and some shops can remain open longer.

Figure 7: Appliances kept by surveyed households with access (Source: RA1)



At the household level, the evidence showed that access to and use of modern energy brings savings in time, reduces drudgery, and provides convenience, collectively allowing for better time management. In the surveys done in Chhattisgarh and Jharkhand (India), women estimated that using liquefied petroleum gas (LPG) instead of biomass saved them around an hour per day in cooking and cleaning pans (RA4). For Nepalese women, using rice cookers instead of biomass meant that there were fewer dirty pans to clean (RA1). In Rwanda, men used portable lights to help them cut grass for cattle feed, so they were also able to manage their time use (RA5). In Kenya, men used solar lanterns while producing bricks (RA1). Electric fans create a more comfortable environment for women and children; in Chhattisgarh this was the preferred appliance, with 56% of grid households and 11% of mini-grid households owning a fan.

Good-quality light is one of the most-cited services in the research. Lighting brings about multiple changes in people's lives, including shifts in time-use patterns. How women use the saved time varies. The literature reports that women appreciate the flexibility and the convenience availed to them from having quality light to work under (Barkat et al., 2002; Annecke, 2005; Winther, 2008). A few women in Kenya mentioned that portable lights enabled them to study part-time and prepare themselves for employment (such as teaching), with the prospect of a better

income (RA1). In Nepal (Chyamrangbesi village, Kavre District), a project to promote improved cook stoves (ICSs) and biogas simultaneously promoted income-generating activities for women, who were able to use the time saved for cultivating vegetables, rearing livestock, and aquaculture (RA3). In India (Dindigul), women used the time not only for productive activities but also for leisure and for their children's education (RA3). In Rwanda, while there was no change in women's overall workload, electric light enabled them to shift some tasks, such as washing clothes, to evening hours. This enabled them to spend more time in the fields during the day, thereby increasing their income (RA5). The concern here is that while women have more flexibility and are able to work more, the body may not have sufficient time for rest and recuperation. On the other hand, women reported that spreading out these tasks over time reduced the stress of trying to finish their housework in daylight hours.

In India, watching TV (for those who own one) is appreciated as being a family activity (RA1). Access to TV has increased women's knowledge about how to take control of their bodies – particularly with respect to their reproductive rights. However, this does not necessarily translate into actual control, which is considered one of the measures of empowerment (Kabeer 1999). In Nepal, decisions about the use of contraception remain with men (RA1). Women may have to use healthcare facilities to access contraception without the knowledge of their husbands, since using contraception can be regarded with suspicion about their morality (RA1). In India, electric light, by extending evening hours, was found to aid socialisation as it allowed for marriages and festivals to go on for longer (RA1).

Water collection is a daily, time-consuming task for women, and mechanisation can play a significant role in reducing the physical labour involved. In the study area in Kenya, women reported spending 1.5 hours per day on water collection (RA1). However, rural electrification has not always focused on domestic water provision, and hence has not been successful in helping women reduce the drudgery of, and time spent on, water collection. Across the research sites in Kenya, India and Nepal, it was found that water supply was not targeted for electrification. When it was, the poor quality of service was not because of limited capacity in the electrical system, but from irregular and poor-quality supply, together with a lack of investment in water infrastructure (RA1).

The transformative impacts of appliances

There were a number of examples in the research of appliances having 'transformative' impacts. This was most clearly seen in the case of productive end-uses in Ghana, where electrification and the use of particular appliances enabled women to enter higher-paying professions as car mechanics and carpenters, jobs which were previously carried out by men as they required human strength. Similar experiences were documented in India and Nepal, where the use of pumps and farm machinery made it possible for women to do jobs that they previously could not (related partially to physical strength, but largely to norms around which jobs are appropriate for women). Renting equipment at relatively low cost enabled women to benefit from technologies that had previously been inaccessible (RA3). These changes not only increased their income, but also positively influenced gender norms.

In Ghana, women working in traditionally male trades pointed out that access to machinery could have a transformational impact for women, giving them access to activities typically reserved for men:
'If they want females to be engaged in male activities, the government must support the females with machines. The machines help, and you don't need your physical energy to cut wood. When you don't have machines, the work is so difficult. And before, you need to look for land and set up a shop. So, when women consider all these, they just settle for hairdressing... You can even operate from your veranda.' (Woman carpenter, Techiman) (RA6)

Similarly, mobile phones, made possible through electrification, can have transformative impacts. In the sample in India, two-thirds of households owned a mobile phone (RA1). Being able to charge phones at home saved both women and men time and money through not having to travel to a charging point. Phones were put to a variety of uses and benefits, which were gendered. In both Kenyan study areas, women and men used their mobile phones extensively for mobile money transfer and banking services (RA1). Health workers' ownership and use of mobile phones contributed to increased uptake of health care services among women. In Bihar (India), men obtained agricultural reports via their phones, and phones have helped women to stay connected with family members (mostly men) who have migrated to urban areas in search of gainful employment (RA1). Some appliances also come with unexpected impacts. The mobile phone has resulted in increased use of social media in Nepal by young people looking for potential marriage partners, breaking the tradition of arranged marriages. Paradoxically, this appears to be shifting the marriage age from the conventional 18 to as low as 14, which is conceivably limiting girls' potential (Matinga et al., 2019). RA1 reported that in some cases, men had negative reactions to women getting access to social networks through mobile phones. The research team was told that these reactions included accusations of infidelity, followed by increased efforts to police women's morality and reproductive rights, thereby trying to reinforce existing gender norms.

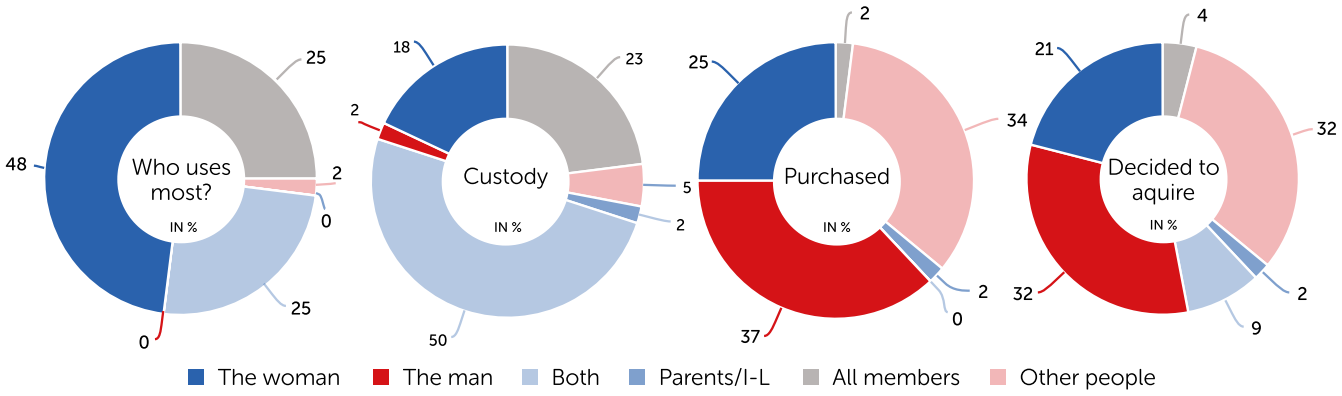
Quantitative evidence from the research on educational outcomes as a result of using electric light for studying was more elusive. Anecdotal evidence from key informant interviews in India and Nepal suggested that there was no improvement in exam results; nor – at least in the study area in Nepal – was there an increase in enrolment rates because of the electrification of either the household or the school (RA1). On the other hand, in Kenya, electric light was linked to improved school performance – at least for girls and boys attending boarding school, compared to those attending day school (RA1). Electricity access in schools was not necessarily accompanied by changes in teaching methods (for example, using computers or audio-visual equipment). In the study areas in India, Nepal and Kenya, electricity provided by the grid or by solar home systems (SHSs) appeared to allow both girls and boys to study at home, with very little gender difference in the number of hours spent studying. In Nepal girls spent slightly longer studying than boys did when at primary school, which reversed when they went to secondary school (RA1). However, it is not a given that electric light at home translates into extra study at home. In mountainous areas of Nepal, having to walk for two to three hours to get to school left students too tired and time-poor for study at home (RA1).

What drives choices about appliances

The research showed that switching to modern energy services cannot be taken as a given. Decisions about what to buy are gendered, with women having less influence than men about what is purchased, including appliances (for example, Figure 8 shows decisions about the ownership and use of rice cookers in Nepal). The ability of women to acquire the appliances they need is complex and location-specific. A particularly important finding in India is that a major determinant of whether households switch to clean cooking or not is whether women are independent income earners. Women who are independent income earners are also likely to have a stronger role in household decision-making. An increase in the opportunity cost of women's labour promotes investments in labour-saving appliances, freeing up time for those who want to earn an income – if there are opportunities available (RA3).

The survey in India indicates that of the respondents, 57% of women who were independent income earners used LPG as their primary cooking fuel, compared to 29% of women who were unpaid family workers (RA3).

Figure 8: Decisions regarding, and ownership of, rice cookers in Nepal (Source: RA1)



At the same time, it cannot assumed that women will necessarily prioritise clean fuels or improved cooking technologies over other things. For example, in India the research found that, in Odisha, women preferred to buy jewellery – the traditional 'savings bank', to provide a reserve for emergencies such as illness – rather than invest in clean energy appliances (RA3). There are also external factors that determine choices about appliances. In India, for instance, the research showed that subsidised agricultural machinery does not always reach poor women. In both India and Nepal, land ownership defines the status of a person as a farmer. A significant majority of rural women do not own land and are therefore not considered farmers, despite the fact that women carry out many tasks that would be classified as 'farming'. At the same time, it was noted that in some cases men had started transferring land into women's names – but only tiny parts. The basic purpose of these land transfers was to have access to higher subsidies for farm machinery, only available to women. These men carried out negotiations for the subsidised machines on behalf of women, with the full collaboration of local

government officers (mostly men), while women continued to remain confined to unrecognised household and agricultural work.

A more positive trend has been the spread of machine-hire centres, often run and operated by women's groups. It is important for women to have access to information and secure knowledge of the workings of new technologies (RA3). The research also found that hiring tools was prevalent among both men and women (RA6).

Even after appliances are purchased, they might not be used on a continued basis. The researchers in India found that, despite the success of the PMUY LPG programme in India, which reached a large number of low-income households, many households did not always use LPG on a continued basis – many continued to rely on biomass fuels as the predominant fuel for cooking, using LPG sparingly or for specific purposes such as making tea and snacks. The survey in the states of Chhattisgarh and Jharkhand found that more than half of the households surveyed did not use LPG (RA4). A similar situation emerged in Nepal, where there had been a number of programmes to promote biogas, and more recently LPG; yet biomass was the predominant fuel even in households with biogas and LPG. The household energy use survey conducted in 2012 in India found that rural household wood fuel use was more inelastic in response to higher household income, compared to urban wood fuel use, which was largely commercialised (RA3). In Rangpur district, Bangladesh, the research survey found that 73.8% of households were using fuel wood, of which 50% were paying for the wood (RA6).

Conclusion

End-use appliances are essential for the provision of modern energy services, as they convert modern energy supplies into the services people demand – such as fans for space cooling, phone charging for telecommunication, equipment for trades (such as sewing machines or hair clippers), mechanised water pumps for irrigation, mills for processing grain, LED lights for illumination after dark and televisions for information and entertainment. The choice of appliances, and how available and affordable they are, largely determine the impact of increased energy access. Some appliances meet women's practical needs and reduce drudgery in their current roles – both in unpaid care work and in their income-earning activities. These appliances also contribute to building women's human and social capital by replacing the need for their manual labour. In rare instances, appliances can go beyond meeting needs and bring about 'transformative' changes in gender roles and gender equality, by enabling women to undertake jobs traditionally barred from them. The use of appliances can also help transform gender relations – when drudgery is reduced, men are more willing to share household responsibilities and to take on some household tasks such as cooking (though washing clothes and dishes remain women's domain).

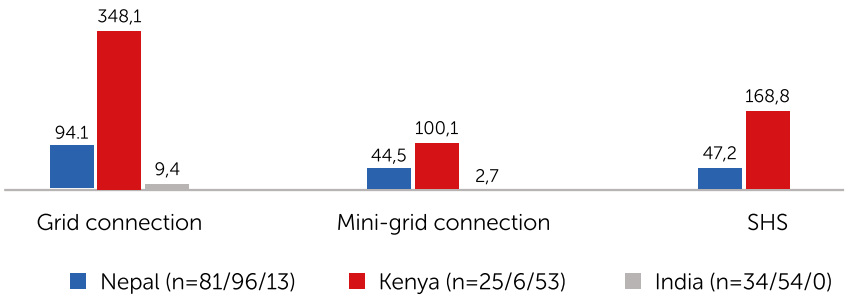
2.5 Improving the affordability, reliability, capacity and convenience of modern energy services can help achieve gender-equitable access and outcomes

The choice to acquire particular modern energy services, and the benefits of using these, depend on a range of factors beyond mere availability of energy supply. Dimensions such as affordability and quality of supply – including reliability, availability and convenience – are critical. Affordability is a significant and well-recognised barrier to access, not only for low-income households but also for enterprises, particularly those in the informal sector. At the same time, the reliability and quality of the energy supply are key influencing factors that motivate the choice to adopt modern energy services. This section looks at the evidence around how affordability, reliability, capacity and convenience influence the ways in which people, especially women, are able to access and benefit from energy services.

Affordability

The cost of modern energy services to end-users, for both connections and regular use, is a well-known barrier to access and use. Research in Kenya and Nepal showed that in Kenya, only 6% of households interviewed had a grid connection, whereas in Nepal this was 96%. This difference could be explained in part by differences in the cost of grid connections, which in Kenya was 350 USD, while in Nepal it was 91 USD (See Figure 9). In Kenya, it was particularly widows and single/divorced women who could not afford connections, and those who could kept their consumption to a minimum to keep expenditure low (RA1). The research also found that only wealthy households were able to afford SHSs that could power larger appliances such as fridges, kettles and irons. This affected women more than men, because women spent more time in the house than men.

Figure 9: Reported costs of connection/subscription in USD – averages. (Source: RA1)



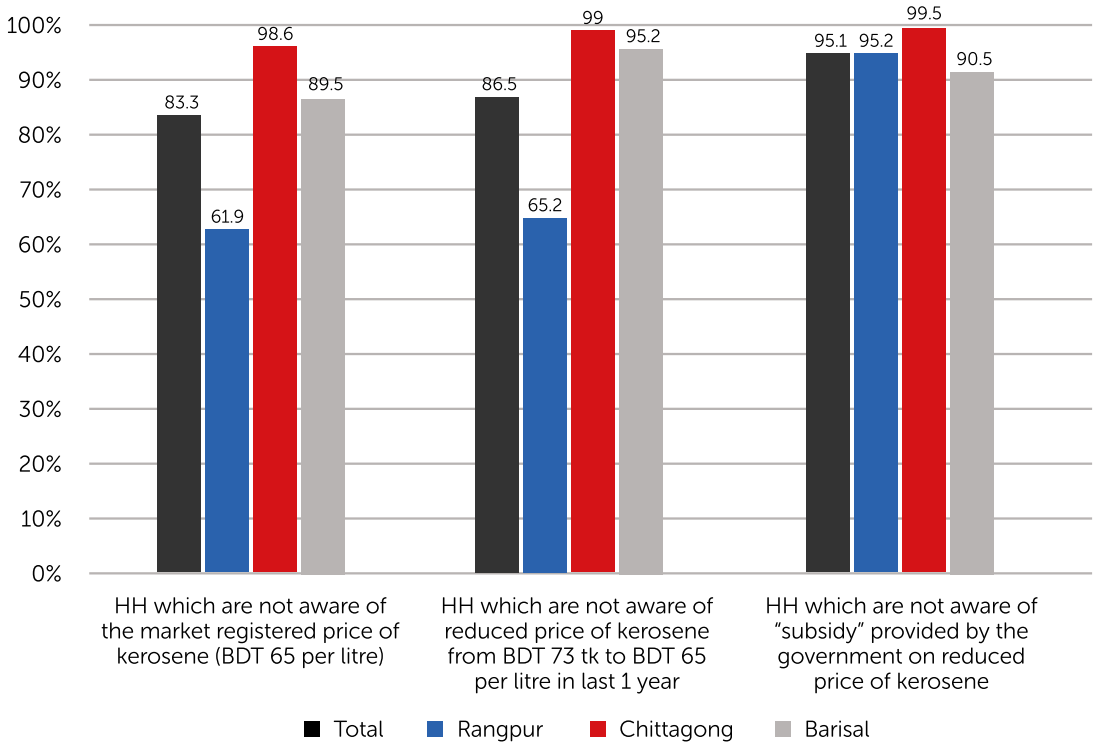
The importance of affordability as a key factor in the purchase and use of modern energy services was also shown in the research in Rwanda (RA5). The randomised control trials (RCTs) in Rwanda looked at both the influence of price on initial purchase of LED lights (by varying the price across villages), as well as the influence of the cost of recharging these lights at the village VLE. The research found that the initial take-up or adoption of LEDs was highly price-elastic: initial adoption of solar LEDs was very high at low or zero prices, and very low at market prices. At the same time, the study showed that varying upfront pricing alone did not impact the long-term usage of solar lights, disproving the notion that people value goods more when they pay for them. The RCTs also varied the recharge price of LEDs, and found that even levying very low micropayments, such as 0.20 USD per month, was found to reduce adoption and use substantially. The research found that the recharge price current at the time (RWF 100, or 0.15 USD per recharge) was perceived to be too high for consumers with liquidity constraints (RA5). Energy prices for both electricity and gas are also an issue for micro and small enterprises (MSEs) (RA6, RA2). Electricity prices in Bwisya (Tanzania) were considered sufficiently high to prevent expansion or diversification of businesses owned by both women and men – even though respondents had ideas for business development based on electricity (RA6).

Figure 10: The effect of price subsidies on adoption (Source: RA5)

2.5 Improving the affordability, reliability, capacity and convenience of modern energy services can help achieve gender-equitable access and outcomes

Traditionally, subsidies have been used to improve affordability. However, the research found that subsidy schemes in Nigeria, India and Bangladesh, meant to enable access to fossil fuels, did not always result in lower energy costs; these schemes therefore proved to be ineffective. Kerosene subsidies have been beset by problems – notably, the subsidies being lost along the supply chain, with poor enforcement by authorities. In Bangladesh, households were paying 14%, and in some cases 17% more than the official subsidised price (RA4), and awareness of the subsidy was very low (Figure 10). Similarly, in Nigeria, while there was an official government-approved price for kerosene of 50 Naira per litre until January 2016, average prices paid by consumers were significantly higher. Diversion to the black market and middlemen drove average retail prices up to 300% above the official retail price (Aramide et al., 2012). Subsidies were also found to be an ineffective instrument for assisting people who were poor, particularly women, in increasing their use of modern energy services. At the same time, however, the research found that subsidy reform was likely to especially affect women who were poor, unless mitigation measures to safeguard them were put in place.

Figure 11: Percentage of households with no knowledge of the subsidised price of kerosene (Source: RA4)



At the same time, lessons are being learned on how to better target subsidies, in particular to poor people and to women. The Free Basic Electricity Subsidy in South Africa, which provides 50 kWh per month for free (value 8 USD) to low-income households, was cited to be a key factor by poor people seeking to start their own food businesses (RA2).

74% of the respondents who reported that energy subsidies encouraged them to start food businesses were women, and 26% were men. Moreover, 38% of those who received this electricity subsidy said that their enterprises relied on this subsidy to survive (RA2).

Another programme that has had success in terms of expanding access to LPG is the PMUY scheme of India, though it remains to be seen if this has translated into regular use. The PMUY scheme provides a subsidy for the initial 'connection' to LPG for low-income households, not only for the first cylinder but also for the purchase and setup of LPG equipment, including the security deposit, the equipment costs of the regulator and hose pipe, and the installation charges. At the same time, however, there is evidence that affordability is not the only limitation for adoption, and that low-cost LPG alone is not sufficient to drive a transition away from harmful forms of biomass combustion. The availability of biomass, along with the prevalent attitudes toward, and under-valuation of, women's time and labour, are all factors that influence rates of LPG usage (RA4).

Reliability

Reliability of energy supply is a key factor in improving living standards, increasing incomes, supporting delivery of health and educational services, and improving gender equality. Research in Kenya showed that while people aspired to have a grid connection, the poor reliability of the supply made them turn to other options such as individual generators or SHSs, which limited their opportunities and aspirations (RA1).

In Bihar in India, the supply was found to be unreliable, which restricted the appliances which a household (mainly women) could use (RA1). In Nepal, in the micro-hydro villages, scheduled daily interruptions affected both women's and men's flexibility in terms of when they could use electricity. Both women and men planned their activities around the schedule; the interruptions were one of the reasons why many householders with micro-hydro said they wanted to change to the grid system (RA1). In the survey areas in Tanzania, however, mini-grids were seen to provide better quality service than the national grid (if available), but had higher tariffs (the grid tariff was 0.14 USD per kWh, the mini-grid tariff 1.18 USD (RA6). In Kenya, the reliability of the solar systems available in the market was highlighted as an issue. The quality of the products, including the batteries, was highly variable. In some cases, the lights were at lumen levels less than that of a kerosene lamp. Purchasing this technology can represent a substantial investment relative to what the purchaser earns (RA1).

Poor reliability of grid electricity supply was also highlighted by entrepreneurs as a key constraint to their business: it meant delays in production, lost customers, lower sales, and damaged equipment. As a result, those who could afford it were turning to individual generators or SHSs to bypass the grid. This starts a vicious cycle in which larger consumers abandon the grid, thus reducing the revenues of the power utility and its ability to invest to improve reliability (RA6). Supply disruptions also lead to missed delivery dates or, in service industries such as hairdressing, inability to provide the service, as well as damage to expensive equipment. This creates client dissatisfaction and potential loss of customers (RA6).

2.5 Improving the affordability, reliability, capacity and convenience of modern energy services can help achieve gender-equitable access and outcomes

Poor electricity supply was pinpointed as the biggest obstacle to growth by 25% of enterprises surveyed in Tanzania and 19% in Ghana. In Ghana, women were seen to be more affected by unreliable supply, as the distribution network was weaker outside the industrial zones, where most women work. Only 13% of enterprises in the industrial zones were owned by women, and women employees were a minority (RA6).

Reliability of supply was also seen to affect how men and women are able to benefit from public infrastructure. Findings from Kenya, Nepal and India showed variations in available services in terms of quantity and quality – not only between countries, but also within them. Surveyed respondents in Kenya and India considered that electrification had brought about an improvement in healthcare, enabling better storage of medicines, and better conditions for women at childbirth (RA1 and RA6); good-quality lighting and pumping water to clinics instead of using buckets were cited as important for safe births. Even portable solar lanterns (which in the Global Tracking Framework would be classified as below Tier 1), used during home deliveries in Kenya, were considered an improvement to the standard sources (kerosene, candles, fuel wood) (RA1). However, there were concerns about grid disruptions affecting lighting quality (with its potential influence during childbirth) and refrigeration in the health centres. In some cases, staff had to buy alternatives to ensure supply continuity (RA1).

In Kenya, fearing unreliable supply, schools were found to be reluctant to invest in more computers and other educational appliances. Electrified schools also indicated that they needed to have a backup solution to compensate for power cuts, which had to come from the education budget. In the study areas in Kenya, reliability of generators for water pumps was an issue for water supply, which meant that often water had to be rationed (20 litres per day for a typically sized household) (RA1).

In Ghana, a female paint sprayer shared her frustration: '*If power is reliable, you are able to meet the deadline as promised to your customers, thereby keeping the bond between you and the customer. He or she will pay for the services happily, but when the light goes off, they are highly disappointed and may reduce the price agreed.*' A hairdresser also explained that '*when potential customers find there is no power, they just leave, and we can spend three days without business.*' (RA6)

Capacity

The capacity to provide the desired energy services is crucial for benefits to materialise for the user, and is a determining factor in the choice between connecting to the grid or subscribing to off-grid electrification. The capacity provided by SHSs is often insufficient to allow households to use a range of appliances (TV, iron, fridge, rice cooker and kettle). Insufficient capacity provided by off-grid systems was also reported to be an issue for the expansion of businesses or the opening of new ones (RA1). Grid electricity also allows for pumped water supply, which can contribute to significantly reducing women's drudgery and saving time (RA1). In the study area in rural Tanzania, the cost of water was reduced by two-thirds when electric pumping was introduced for domestic supply, reducing the drudgery of collection and benefiting service businesses such as guest houses by enabling them to provide a higher standard of service (RA6).

Convenience and location

The research found that the location of energy supply is relevant for several reasons. First, the location influences the form of energy supply that can be made available, which in turn may influence the profitability of the enterprise. In remote locations, SHSs are often the only option for electricity access for both households and enterprises. Enterprises face challenges in the limited applications that SHSs allow for, thereby limiting the types of services that they can offer (RA6).

Second, the location influences customers' willingness or ability to pay for and use energy services. For LPG in India, an increase in the numbers of LPG distributors in rural areas has contributed to the availability of supply (RA4). In 2013, 70% of LPG distributors were concentrated in urban areas (Jain, Agrawal, & Ganesan, 2014). By 2017, the number of rural distributors had increased to 60%, with urban distributors making up 40% – that is, most new distributors were operating in rural areas (PPAC, 2018). In areas where households still had to collect a cylinder, and where they only had a single connector, they had to switch to biomass as an interim measure (RA4). In India, surveys by RA3 found a correlation between a household's geographical location and LPG access. In well-connected sites with good roads, 95.5% of households used LPG as the primary cooking fuel, against 64.7% and 28.3% in less remote and remote villages (which had poor quality roads) respectively (RA3). Remote villages can also be expected to have undeveloped labour markets, offering few opportunities for women to earn an income, which in turn influences their capacity to pay for energy services. In research with VLEs in Rwanda, inconvenience associated with recharging LED lights was found to be an important driver of usage.

Third, the location of energy supply for enterprise development has a strong gender implication, as the likelihood of a site being chosen for an enterprise because of better access to the energy supply is higher for enterprises owned by men. For street food enterprises in Rwanda, Senegal and South Africa, the location of the enterprise determined energy service availability as well as quality of supply. While energy service availability can be a reason for choosing a location, there are other, stronger, influencing variables, such as proximity to customers and regulations by local authorities (RA2). In the study on productive uses of electricity in Tanzania and

Ghana (RA6), it was found that women more frequently reported closeness to home as a reason for choosing a business location, and men more frequently chose a location on the basis of how good it was for attracting customers (Table 5).

Table 5: Reasons for choosing a business location (Source: RA6)

	Ghana		Tanzania	
	Men	Women	Men	Women
It is close to home so I can combine work with caring for my family	4%	16%	15%	29%
It is a good place to attract customers	46%	42%	69%	52%
I was told to take this location (i.e. allocated by municipality)	3%	1%	2%	3%
Available for hire	35%	19%	6%	7%
Inherited this location	5%	10%	3%	4%
Had no alternative	5%	10%	4%	3%
Other	3%	2%	1%	2%

In India, location was seen to be a key determinant of LPG usage. Remoteness increases the logistical cost and thus the supply price. Remoteness is usually also represented by undeveloped markets for labour, which affects demand for purchased fuels such as LPG (RA3).

The household survey in India showed that in well-connected sites, 95% of households used LPG as the primary cooking fuel, as against 73% and 29% in moderately remote and remote villages respectively (RA3).

Further, in rural India and especially in remote locations, the absence of doorstep delivery of LPG cylinders means that the man in the household is required to make the trip to the dealer to collect the cylinder. This represents a shift in time-use for fuel collection from women to men. However, this has other consequences; in 5 out of 16 discussion groups, women said that the trip to the dealer meant that their husbands would have to forgo their daily wage. This prompted women to use LPG sparingly, and supplement it with biomass fuels, even though they recognised the benefits of LPG (time saved and cleaner fuel) (RA4). In Nepal, however, the survey showed a higher incidence of women using clean cooking energy in remote villages than in moderately remote villages. The reason for this unexpected result is that in Nepal many NGO projects focused on clean cooking energy have been concentrated in the remote, upper areas (RA3).

One of the determinants of the choice between grid and off-grid solutions is geographical location. In Kenya, the research found that decentralised systems benefited more women than the central grid did. The obvious explanation is that in rural areas, decentralised systems provide an alternative if there is no grid; certainly in Kenya, where different types of solar-powered systems are available in rural areas. The research also found that they were used even when the grid was available. The decentralised systems give a level of access at lower cost than the grid connection. They are also seen to have other benefits. In particular, small systems are easily portable and can be carried home. They are also easy to install at home; 'plug and

play systems' can be moved from room to room, unlike the grid connection, which is fixed. Women seem to have more control over the purchase and use of these systems than over fixed connections (RA1).

Conclusion

Affordability is an important determinant of how poor people – especially women – are able to access and benefit from modern energy sources. Among the various characteristics of energy supply, affordability is well-recognised as a significant barrier for low-income households and the enterprises they run. Subsidies have been a common policy instrument aimed at helping low-income households gain access to modern energy sources, primarily for cooking and lighting, with more limited attention paid to appliances. The problems of subsidies are well known, including poor targeting, elite capture, and diversion along the supply chain, which has increased pressure to stop their use. In recent years, there have been examples of subsidised energy programmes targeting low-income households; however offering other options to enhance payment flexibility (e.g. recharges on credit, advanced payment, micropayment, fee-for-service, pay-as-you-go, etc.) could be another way of making energy services more affordable, even for the poorest.

Other important characteristics that determine energy choices include reliability, capacity and convenience of energy services. Reliability of supply can affect the use of time-saving appliances for women (e.g. LPG stoves), having implications for their workload, health, convenience and comfort. In enterprises, these choices have implications for income and profitability, as they influence energy costs and quality of production, as well as sales, customer service, and hours of operation. Poor reliability of supply also makes people turn to other, inferior (yet more reliable) energy options, which may limit their opportunities, aspirations and well-being. Inconvenience in accessing energy or recharge facilities also affects the use of energy services, with particular impacts on women. Quality of service is also seen to directly affect the quality of community services such as health clinics and schools, which can be forced into diverting operating funds from medicines and teachers' pay to cover the unexpected cost of backup diesel supply.

2.6 Engaging with political processes can help women access modern energy services and change gender norms

Introduction

There is a growing belief that many of the challenges associated with formulating and implementing effective energy policies are rooted in the area of 'the political economy', in the fact that the dominant political elites may perceive it as being in their interest to resist any proposed change, including change in the energy sector (Lee and Usman 2008). Democratic political transformations, such as those of post-apartheid South Africa and post-monarchy Nepal, can result in substantial changes in access to modern energy, as the new regimes try to establish their democratic legitimacy. In addition, catering to the energy needs of poor women, as with LPG access in India, could also be the result of women's growing importance as an electoral lobby, as has been argued in the case of India (RA3).

Traditionally, political economy analysis deals with groups that have an influence on macro policies. At best, this analysis may introduce disadvantaged or subaltern groups. But it does not capture the gendered nature of power relations and remains gender-blind, as pointed out in ESID (2014) and Bell (2015). In reality, power relations in a society go down to the household level, and affect individual women and men differently in their everyday lives. This research theme examines how socioeconomic and political processes determine access to energy for men and women at three levels: the macro level, where the formulation of energy policies and programmes by central and state governments takes place; the meso level, where energy policies are implemented and administered by networks of the state, market and community; and the micro level, where energy services are delivered and used within households. Going beyond viewing women as victims of structures dominated by men, the research also studied ways in which the structures and processes at these three levels can work towards ensuring gender-equitable energy sector interventions.

This section starts with an elaboration of gender norms and how they influence access to modern energy services, and looks at how access to, and use of, modern energy services and appliances can in turn change these roles and gender norms. It also presents, from a political economy perspective, power relations related to gaining greater access to modern energy services at the macro or national level, the meso or community level, and the micro or household level.

Gender norms, modern energy access and women's engagement in energy value chains

At the crux of the political economy discussion are the prevailing social and gender norms which, in any society, determine what it means to be a woman and what it means to be a man; they govern the roles allocated to, and the obligations placed on, each gender, as well as the rights that can be claimed. Social norms are values, beliefs and attitudes that shape practices, behaviour and institutions governing social and economic relationships between women and men (Harrison and Huntington, 2000; Boyd and Richerson, 1985).

The research found that gender norms deeply affect women's ability to access modern energy, and the ways in which women engage in energy supply chains (RA3). At the household level, decision-making power about most issues, especially financial ones, lies predominantly with men. While cultural norms differ between countries, the research showed that men continue to be the main decider for households about access to modern energy and appliances. It is usually men who make the decisions about electricity access, an entitlement they enjoy because of the social norm that the man is recognised as the owner of the house (both legally and symbolically) and hence has the authority to decide. In many cases, gendered decision-making is further reinforced at the household level by the existing biases in energy sector regulations. For instance, in Nepal and India, customer regulations require that the 'subscriber' needs to be the person registered as the owner of the premises (normally a man). This hinders married women as well as people in rented houses from being subscribers (RA1). In Kenya, a survey of 21 married couples with a grid connection showed the registered subscriber was always the man. Among 43 married couples surveyed with SHSs, 40 of the subscribers were found to be men and 3 were women (RA1).

However, when it comes to cooking fuels, there is greater variation in who decides. In Bangladesh, the research survey showed that men decided about cooking fuels in 39.4% of surveyed households (RA4). In India, the survey in Chhattisgarh showed that 74% of women reported making decisions about cooking fuels (either as a sole decision or jointly with their husbands), whereas for lighting fuels men decided in 77% of the cases (RA4). In India it is likely that women's decision-making power over cooking fuels has been enhanced by the central government's Ujjwala scheme, in which LPG connections are given in women's names (RA3). In Nigeria, 69% of the women surveyed in Lagos and 94% in Imo reported that they made decisions about cooking fuels, and slightly over half made decisions about lighting fuels (RA4).

At the household level, the two areas that influence women's use of energy are where the lights are located, and which appliances are purchased. Research showed that women prioritise appliances that make their care responsibilities easier in terms of time, drudgery and convenience (e.g. rice cookers, kettles, irons), whereas men tend to buy appliances for business and leisure activities (e.g. TVs, radios, sound systems, and refrigerators – possibly to ensure a supply of cool drinks) (RA1).

In Nepal (rice cookers) and to some extent in Kenya (kettles, irons), time-saving/convenience appliances are owned, and some Indian women have acquired sewing machines, but most other types of owned appliances are bought through men's decisions and used to meet men's needs (RA1).

When it comes to decisions about the location of lights within a house, RA1 showed that 60% of the Indian respondents and 47% of the Nepali respondents said that the man decided, unlike Kenya, where 68% reported joint decision-making. The research showed that power in gender relations is tilted in favour of men due to a number of factors, including their ownership of productive assets, including land, and their control over income, which gives them a greater say in how it is utilised. Further, social norms dictate women's responsibility for household work, which, at a political level, is manifested in the exclusion of unpaid, household activities from the domain of recognised work for macro policy formulation (RA1 and RA3).

The research showed that modern energy brings many positive changes to the lives of women, through reduced drudgery and increased convenience, and through making employment and entrepreneurship possible. However, as might be expected, and in rural areas in particular, women taking care of the household and men acting as breadwinners is still considered the natural order (RA6). Undoubtedly, there are some changes in men's behaviour towards supporting women in care work (e.g. men take their children to school), however chores like washing clothes and dishes remain women's domain. It was seen that when men experienced housework without appliances, for example if women were ill, many felt motivated to invest in appliances (RA6). In India, focus groups in Chhattisgarh and Jharkhand reported that women were now able to take short trips outside of their villages because men were willing to cook on LPG (but not with biomass because of the drudgery and time required) (RA4).

'What I can't do is washing my wife and children's clothes... For someone who is married, washing is not my work. Besides, when the neighbours see you washing, they will talk. They will say my wife has fooled me and I am now washing for her.' (41-year-old man, father of three, working on electronics in Berekum, Ghana) (RA6).

Gender norms also govern women's involvement in energy supply chains, as they determine what constitutes acceptable forms of work and employment for women and for men. Such stereotypes are rooted in attitudes that are often used to justify and maintain the historical relations of power by men over women (RA3 and RA6), reinforcing the existing political economy structures. In many cases, these norms are seen to hinder women gaining employment in electricity supply companies (RA1). The research team found strong resistance to women becoming SHS technicians, since cultural norms considered electricity-related/technical jobs as being within the 'masculine domain' (RA1), a notion held by men as well as women (RA3). The research showed that in many cases, gender norms prevailed even when women were running their own businesses: they remain in a subordinate role, accepting the gender norms that men have a better understanding of business and that they have better networks. For example, in Nepal, the research team found that women were competently running poultry businesses, however key decisions,

such as decisions about buying and selling the chickens, were taken by men. On the other hand, the men in Nepal did not appear to object to their wives running non-traditional businesses (RA1). However, as will be shown below, these norms can be challenged and changed.

The dynamic nature of gender norms

Gender norms are not static: in most societies, the attitudes of both men and women are undergoing continuous change, and the research found signs of increased agency among women (RA3). As societies undergo changes, so do gender norms. For example in Homa Bay, Kenya, there is a growing emphasis on girls' education, and a widow no longer automatically becomes a wife of her brother-in-law (RA1). In India, the research survey found that decisions regarding choice of marriage partner and education for children were mostly taken jointly (87% of respondents in Bihar and 76% in Chhattisgarh). In Ghana, higher education was one of the factors enabling women to enter occupations that could bring stable, and higher, incomes, reducing the pressures that men feel due to cultural norms that prescribe them as 'breadwinners'. In Ghana, education was helping both men and women to challenge gender stereotypes about household responsibilities and the types of businesses that men and women can and should set up (RA6). Focus group discussions in Nepal and Ghana showed a shift in perceptions in their acknowledgement of gender equality as a principle (RA1 and RA6). But in the research areas of India and Nepal, by far the biggest driver of change in gender norms was the outmigration of men (RA3).

> *'Things have greatly changed in our time. It is no longer the way it used to be where women depend on men. Now women are equally sharing in the household financial responsibilities.'* (Female hair dresser, mother of one, from Techiman, Ghana) (RA6).

In India, even in electrified areas, gender norms continue to hold girls back. While teachers reported that girls appeared to be more highly motivated than boys, their parents were still focused on early marriage for their daughters (RA1). The forms of employment open to girls and boys, and the opportunities they would like to access, are reinforced through existing gender norms. Parents who value education and have sufficient income may opt to send their children to schools in towns, as the quality of education in towns is considered better than that offered in rural schools, and higher levels of schooling are available in town schools. This can discriminate against girls, since families can be reluctant to send their daughters away, resulting in girls stopping their education earlier than their brothers. If the quality of schooling is poor, it means that girls may receive a lower standard of education, which has implications for their life chances (RA1). Indeed, there is evidence from Nigeria to suggest that the higher their level of education, the more likely women are to use modern energy (RA3 and RA4).

Girls' schooling and education, however, are dependent on a host of factors, in addition to the availability of electricity. In Nepal, teachers reported that enrolment rates and student performance (marks) were unaffected by electricity access (both in the schools and in the children's homes). The research found one school in Kenya with evidence to show that performance was better when the school had electricity. The explanation offered was that the curriculum could be completed

more quickly and the school was able to offer boarding facilities, which allowed more time for extra coaching and revision. Girls did particularly well when they boarded, since they were not burdened with the household tasks they would have had to do if living at home (RA1).

There are multiple factors causing this change, and these differ from one context to another. In some cases, changes in attitudes and norms were facilitated by changes in the national legal frameworks, while in other cases it was organisations that played the catalytic role. In India, the legal framework has been moving towards greater equality in rights to assets (for example, the Hindu Succession Amendment Act 2005 gave daughters and sons the right to inherit equal shares of agricultural land and property) (RA3). In Nepal, the government has used policy instruments to promote women's land ownership (As of 2015, a reduced level of tax is allowed on land purchase if the land is bought in a woman's name) (Acharya et al., 2015) (RA3). In both countries, the ongoing policy changes will enable women to inherit property, which in the longer term will make access to credit easier and possibly increase their social status.

In Nepal, as men have migrated out in search of employment, gender roles have undergone a seminal change (RA3). ILO data for 2014 shows that as many as 520,000 labour permits were issued to Nepalis to work abroad (ILO 2014). In Kailali district of Nepal and in Bihar in India, the high migration of men has meant that women have been forced to take on decision-making roles, which were earlier in the men's domain. This has also led to women's use of farm machinery, such as power tillers, seeders, reapers, pump sets for irrigation, powered winnowing fans and threshers, in place of traditional human-and-cattle-based agricultural tasks. During fieldwork in both India and Nepal, women were visibly carrying out land management tasks that in the past were exclusive to men. Gender roles and norms with regard to energy use have also been changed by women's collective organisations, such as SHGs, as well as, in India, women's participation in income earning and asset ownership (RA3).

Gender norms and the transformative effects of modern energy access

Perhaps one of the most promising findings of the research was that modern energy services can bring about transformative changes by enabling women to undertake jobs that were traditionally only undertaken by men, and by changing social practices. The Nepalese women's use of rice cookers and the arrival of mills for grinding spices have resulted in reductions in women's drudgery, which has increased their potential to pursue income-generating activities and have more leisure time. In Kenya, women operating businesses benefit from light, mobile phones and mobile banking facilities, potentially increasing their economic empowerment. Across the studies, women reported saving time when they no longer had to walk long distances to purchase kerosene or charge their mobile phones. In Kenya, where the risk of violence outdoors in the study areas was reported to be high, having access to services close to their homes increased women's safety. (RA1)

In the research, the team came across several organisations involved in energy supply that were working towards challenging gender norms. In Tanzania, a private company (JUMEME) was promoting productive use of electricity, including by

women entrepreneurs. In doing so, it held meetings with religious and village leaders, schoolteachers, and secondary school students to make them more receptive towards women's entrepreneurship and employment. They were also engaging men to act as champions to promote women entrepreneurs (RA6). In the case study of Bwisya island (Tanzania), cultural norms among the Kara have traditionally prevented men from allowing their wives to engage in business. However, after a gender mainstreaming intervention, women started to engage in business and men started to support their wives. Men were willing to undertake family care work on behalf of their wives during training courses that lasted between two and four months, which challenged traditional norms about the household division of labour (RA6). On their return, once villagers saw women involved in physical tasks such as climbing poles and connecting wires, perceptions changed among both women and men about what women could do in technology areas (RA6).

Further, the private sector, in the attempt to reach more clients, is making it easier for women to acquire energy services, which in turn is seen to increase their agency. In Kenya, companies have started introducing alternative credit scoring models in selling solar products to rural customers who don't have a bank account (RA1). This has made it possible for women to acquire these assets, which has increased their agency. Through the Ikisaya Energy Centre (Kitui, Kenya), women are able to rent portable lanterns for a few shillings a day, and by doing so they have more autonomy to decide whether or not to get a lamp and where to use it. Companies also provide free-to-call lines, which creates customer confidence (RA1).

Another source of transformational change is the rise in rental services for equipment throughout the developing world (described by RA3 as the 'asset-light economy'), which enables women to use this equipment by simply renting it, without the need to make big investments in capital equipment. Women in groups in India and Nepal can now transform their lives by renting machinery, including pumps, from organisations such as Machinery Service Centres and Custom Hiring Centres (CHCs). Similarly, NGOs such as SEWA and the Kudumbashree/Green Army groups have taught women to operate these machines, including land tillers (RA3).

The interplay of gender norms with the political economy at various levels

Macro level

Policies are mainly formulated at the macro level of the nation or individual states. The research showed that the drivers of change at macro level emanate from multiple sources. In India and Nepal, for example, internal drivers have brought about policy changes in favour of women, whereas in other countries, the impetus was seen to come from outside. In recent years there has been a broadening of the political settlement in India and Nepal to include not just the elite and the middle classes but also women as a political constituency. The research in India (RA3) contends that the political establishment has begun to recognise rural women voters as a key group in elections. Politicians see advantage in targeting women's needs to gain their political support. This has resulted in more gender-aware policies and practices. For instance, the Ujjwala scheme of subsidised LPG connections specifically targeted women in households that were below the poverty line. Previously, India and Nepal did not have targets for clean cooking

energy (UNDP and WHO, 2009). The neglect of the cooking sector may be explained in part by the global lack of recognition of women's work within the household as part of the economy, and consequently in national income calculations (Gill et al, 2012). But this is changing as women are seen as part of the political constituency of the organised masses of rural people who wield influence through voting rights, and who are seen as necessary for keeping a regime in power (RA3).

In other countries, the research found that the drivers of change at the macro level were predominantly external actors in the 'transnational policy space' (RA3). For instance, in Tanzania, the Rural Electrification Agency would probably not have introduced a gender action plan if a powerful donor (the World Bank) had not insisted. Similarly, Ghana's Energy Policy has been influenced by the regional organisation ECOWAS, which in 2006 set out a Regional Policy for Increasing Access to Energy Services in Peri–urban and Rural Areas. This paper specifically mandated member states to prioritise women's energy needs at the household level, and to ensure substantive women's participation in the energy decision-making process at all levels (RA6). International NGOs have also been active in pressing for more gender-sensitive policies and practices (RA3). Generally, RA1 found that decentralised electrification programmes run by NGOs were more likely to achieve gender equity than the gender-neutral programmes of the government (RA1).

Meso level

In most countries, the gender-related narrative and policy at the macro level has been improving. But the research shows that it is the meso level that is most crucial for gender equality, as this is where implementation takes place; in the present political and social environment, this is also where implementation failure is most acute. This may in part be due to weaker capacities at this level, but it is also the level at which more traditional gender norms operate (RA3).

Interestingly, it is the meso level where women's collectives, in various forms, have been effective in giving poor women a voice; in many cases, they have also helped women to gain access to public services (RA3). Generally, SHGs have been seen to build women's skills, help them access finance, educate them about their legal rights, help them overcome their subordination, and lead them into new leadership roles. Evidence of the power of such collectives is available in relation to self-help groups, cooperatives, credit circles and trade unions. However, as with all social innovations, such collective action is not always successful and can be captured by particular factions or elite groups.

The research teams found two types of organisations working to involve women in energy supply: Self-Help Groups (SHGs) and NGOs/Social Enterprises. A number of SHGs were involved in the energy sector, particularly Solar Home Systems. Many SHGs were also promoting, processing applications for, and distributing LPG cylinders (RA3). Some SHGs were using innovative approaches to challenge existing social norms. For example, in India, the research team met women's Self Help Groups involved in promoting SHS systems that required the system ownership to be registered in a woman's name, thus challenging the norm of ownership being in the name of the head of the household – usually a man (RA1). Women participating in SHGs involved in off-grid electrification were found to be confident enough to go out on their own, to call meetings, to sign documents and to negotiate with

officials. Furthermore, gaining technical skills gave women self-confidence and contributed to building their psychological empowerment (RA1, RA3).

Micro level

The research showed that insights from gender analysis at the household level can strengthen political economy analysis, which in practice has been shown to pay scant regard to gender at the micro level (ESID 2014 and Bell 2015). The research drew particular attention to the importance of power relations between men and women at the household level in influencing women's acquisition and use of energy-related appliances, particularly clean cooking fuel. In some of the research areas, for instance among indigenous and other peoples in Odisha, it was noticed that in the allocation of household income, motorcycles were acquired for men's use, rather than LPG for women's use. Providing access to LPG through a subsidised connection is not the whole story of energy use: when men control household expenditure and women's labour is not valued at all, or when it is less valued than men's, then motorcycles rather than LPG connections and cylinders are likely to be acquired (RA3).

It is therefore in the purchase and sustained use of appliances that power relations and intra-household decision-making come into play. It is at the household level that energy services save time and drudgery, or contribute to earning income, and can be shown to increase women's roles in household decision-making.

Conclusion

The research examined the complexity of gendered social norms as important determinants of energy policy formulation and impact. It showed that improved energy services can bring about significant changes in what tasks women and men undertake inside and outside the household, and, in some cases, can also bring about transformational changes in gender relations. Men's and women's roles are largely determined by social norms, but they can be influenced by modern energy services and by engagement with political processes.

Political economy analysis often focuses mainly on the deal-space at the macro level, but this research showed that in reality, the implementation of policies decided at this level are influenced greatly by micro- and meso-level drivers and actions. At the same time, meso-level organisations can trigger agential action by individual women, change norms and influence macro policies and implementation. Moving forward, energy sector policies can be made more gender responsive by understanding what drives behaviour at these micro and meso levels, recognising the role of unpaid work in the economy, creating policies that help reduce unpaid work, and redistributing unpaid work at the household level between men and women. Modern energy services also reduce the burden of household tasks, saving time and reducing drudgery. Women can use modern energy services to change gender norms and increase gender equality. Organisations delivering energy services can be more effective in achieving their objectives if they are more gender-aware and target their interventions at particular groups of women and men. To conclude, women's voices in the household, in local communities and in the policy space need further explicit support and encouragement at all three levels if their needs for modern energy services are to be met more effectively and the SDGs are to be achieved.

Bunu Dhungana/ENERGIA

3. Policy Implications and recommendations for policy, practice and research

3.1 Engage both women and men in the design, implementation, monitoring and evaluation (M&E) of energy policies and programmes to enable gender-equitable outcomes

Universal energy access for men and women calls for energy policies and practices to recognise differences between women and men in their energy needs and to be aligned to women's specific energy needs, as well as their skills and capabilities, which are currently overlooked. Energy policies, programmes and projects that do not specifically target women are unlikely to result in equal benefits and costs for women and men. 'Gender-neutral' policies fail to recognise that men and women have different energy needs, with different levels of access and control over the various energy services. As a result, transformational impacts are limited, since existing gender norms and power relations between men and women are likely to result in men capturing the majority of benefits. Context matters: socially and culturally determined gender norms often form barriers to energy access for women, and these differ between communities. These norms need to be factored in when designing energy policies and programmes that can effectively meet gender-equitable energy access targets. Gender norms are also changing rapidly in many parts of the world, especially as education of women and girls becomes more prevalent, and energy sector policies and programmes need to be aligned to these changes.

The recognition of the need to address gender issues among energy policy makers has risen in recent years, and many international as well as national mandates have set out ambitious goals for gender equality and benefits for women resulting from energy access. However, this research shows that these policies, strategies, and even, in many cases, attempted actions, have not always been translated into actual benefits for women and/or a reduction in gender gaps in energy access.

Hence:

- To overcome gender norms and barriers that differ, and are rapidly changing, in different contexts, a gender approach is a must. This means that gender assessments, targeted interventions, and gender-responsive monitoring and evaluation (M&E) are essential requirements for any energy intervention, whether in policy, programmes or projects. Social, economic, and political roles of both women and men need to be assessed, as do strategies and activities designed to engage both genders in the transformation of gender

roles and the reduction of gender gaps in energy access. To ensure progress, monitoring and evaluation of outcomes is needed, using appropriately disaggregated data and gender-sensitive indicators.

- High-level gender policies and mandates that target women as well as men need to be more effectively translated into practical strategies, gender action plans, and operational actions on the ground.

- At the same time, organisations need to set in place mechanisms and systems that encourage women to participate beyond administration. In order to facilitate this change, guidance needs to be developed, adapted and provided for specific energy subsectors and national situations, based on good practices and lessons from past experiences.

- In order to overcome gendered social norms, gender-responsive innovations at pilot level and micro level are key to the implementation of these policies. Gender mainstreaming processes imply benefits for both women and men, and both women and men need to be involved in implementation.

Sven Torfinn/ENERGIA

3.2 Support women's involvement in energy-system value chains and employment, both by overcoming gender barriers and through equal opportunity strategies

The research shows that the involvement of women in energy-system supply chains as entrepreneurs and employees – particularly in non-traditional roles – is a win-win situation. It is good for women and it is good for business. The energy supply chain offers opportunities for women to earn an income higher than they would normally earn from their traditional income-generating activities. The research shows that women entrepreneurs can be as successful as men entrepreneurs in selling solar lighting devices to the last mile. An RCT study in Rwanda that fixed quotas for women to be appointed as sales agents resulted in positive benefits for the women who were appointed (and their families), as well as for the energy business. This is an important finding and points to the potential for including more women in the renewable energy sector through quotas. Engaging in the energy supply chain also builds self-confidence, contributes to increasing women's agency, and challenges gender norms.

Women's participation in income-generation, and as ambassadors of new energy technology products or services, can contribute to increasing decent work and economic growth (SDG 8) by providing women with a sustainable income-generation opportunity; reducing poverty through women's increased incomes (SDG 1); and improving gender equality (SDG 5), as women active in the labour market are not only able to financially contribute to the family, but are also more able to communicate, negotiate, and participate in household and community-level decision-making.

Still, the research shows that women entrepreneurs may need support to overcome historical, social, and cultural barriers, and to enable their more effective participation in these roles. Under-investment in this support can frustrate efforts to improve women's livelihoods in the energy sector.

Hence:

- Both public and private suppliers can benefit from pursuing proven strategies to promote women's entrepreneurship in the energy sector, including business education and skills development, training on personal agency and initiative, access to finance and capital, and access to coaches, mentors and networks.

3.2 Support women's involvement in energy-system value chains and employment, both by overcoming gender barriers and through equal opportunity strategies

- In designing women's energy entrepreneurship models, consider that women's attitudes to risk differ from those of men. Women tend to be more risk-averse than men, so encouraging women to work collectively can provide the type of support that reduces their concerns about risk. Working in groups also enables them to target customers together, access supplies at a lower cost, or increase their bargaining power with authorities.

- Different ways of fixing quotas to include women should be tested in energy sector last-mile entrepreneurship and employment.

- Encourage recruitment of women in non-traditional employment with appropriate appliances, equipment and support, and employment models that provide female-friendly working conditions (e.g. provision of toilets for women and men, reductions in the need for overnight stays).

- Women should be assured of – and organise themselves to demand – full participation, as stakeholders and as employees, in the planning, management, and operation of energy supply in the energy sector.

3.3 Multiply social and economic impacts of energy access by targeting women's productive uses

The promotion of productive uses of electricity is gaining attention in electricity-access programmes, particularly in rural areas. However, the research shows that men are more likely to be targeted by, and benefit from, productive-use interventions, at least by electricity sector businesses and NGOs. One reason is the typically smaller size of women-led businesses, which, in some measure, results from gender barriers and norms. Smaller businesses are less attractive as clients for productive use interventions, as their electricity consumption is likely to be lower. Men are more likely to be targeted by PUE interventions as they own most enterprises, are more likely to use electricity than women, and are more likely to spend more on it (RA6). Women also, as compared to men, have considerably lower access to other complementary inputs, such as finance for electric appliances, markets, business skills and other infrastructure or services. The research shows that when women's businesses gain access to modern energy, their economic performance improves, and this contributes to their economic empowerment.

Hence:

- There is a need to raise awareness within energy supply companies about the potential of women's businesses for productive use of energy interventions. Specific efforts to target women as well as men should be included in productive-use components of electricity programmes.

- It is beneficial to improve modern energy access for businesses and sectors where women predominate. In particular, women's energy-intensive food preparation businesses need modern energy, and can be supported within cooking energy programmes or through women's entrepreneurship programmes. Specific actions to promote the use of modern energy in women's businesses include provision of information, financing mechanisms, investments in energy infrastructure, and targeted subsidies.

- Supporting groups that offer women the option of renting (instead of purchasing) energy appliances can assist women in enhancing their incomes and productivity – which may lead to the transformation of gender roles and norms.

3.4 Increase women's ability to afford energy services, through financial support, innovative financial mechanisms, and improving the enabling environment for women.

Women are involved in fewer paid activities, and when they do engage in them, they earn less than men. This results in women having less means and ability to be involved in decisions surrounding the choice and purchase of energy and energy-using appliances and equipment. This research finds that women's and men's inability to afford energy-using appliances and equipment and connections to improved energy sources, both in their homes and their businesses, is one of the most important constraints to their use of energy services.

Subsidies have been a common policy instrument aimed at helping low-income households to gain access to modern energy sources, primarily for cooking and lighting, with more limited attention paid to appliances. The problems of subsidies are well known, including elite capture and diversion along the supply chain, which has increased pressure to stop their use. Increasing fossil fuel prices can lead to households switching to biomass, with negative effects on health and the environment. Innovative ways of targeting low-income households, and specifically women users, are emerging, which enable women to benefit from access to clean energy. However, often households are unaware of their rights to subsidies or the health implications of poor-quality energy and inefficient appliances.

Hence:

- Financial support mechanisms such as subsidies or loans specifically targeted to women can be a direct way of making energy services more affordable to them. The Indian LPG expansion programme that requires government subsidies and transfers to be linked to women's bank accounts is an important example of how such targeting can be done.

- Creative financing mechanisms and business models, such as pay-as-you-go schemes that are aligned with the financial constraints and irregular cash flow streams of poor people, are among the measures that can improve affordability. Rental systems, fee-for-service, and pay-as-you-go schemes can make energy appliances more affordable for women. In some instances, the use of these appliances enables a change in gender norms. Short-run subsidies and free trial periods can increase adoption and use of energy

services for bottom-of-the-pyramid populations without jeopardising business profitability in the longer term.

- A special focus on making fuels, electricity subscriptions, and energy-using equipment and appliances affordable as well as available, especially in rural areas and especially for women, is recommended.

- Innovative and targeted ways of raising awareness, such as the recently initiated LPG panchayats in India, are useful to increase awareness of energy subsidies and the comparative benefits and costs of different energy sources. Better awareness about existing energy prices and subsidy schemes can help women demand these services rather than be at the mercy of profiteering middlemen or retailers.

- Integrated energy development programmes also need to address the enabling environment needed to increase women's ability to afford energy services:

    - Promoting women's financial inclusion through access to banking and credit facilities can assist them to save, as well as obtain loans, for energy appliances and equipment.

    - Economically empowering women by changing their labour patterns and employing them in traditionally male-dominated activities provides a means by which women can make energy-related purchases and enjoy better energy services.

    - Ensuring equal legal rights for women in having national identification, owning land and property, and having access to municipal services can improve their access to subsidies for agricultural equipment.

    - Greater mobile phone connectivity means women can call distributors for fuel refills from the convenience of their homes, or use mobile banking and money apps for energy-related purchases.

3.5 Improve reliability, convenience, and quality of energy supply to increase women's and men's access to and use of energy services

New efforts at tracking access to modern energy services globally, such as the World Bank's Multi-Tier Framework, recognise that there are important additional dimensions to enabling the use of modern energy services beyond providing mere physical connections alone. However, measuring access in terms of numbers of connections alone persists in many countries, and this is also often the only metric used to measure the efforts of programmes and projects aimed at enhancing access.

The research found that unreliable energy supply inhibits investment in the appliances required to access modern energy services in both households and enterprises. Lack of reliability imposes associated costs for installation of expensive backup systems that few can afford, resulting in reduced productivity, business output and profitability, and damage to energy-using equipment. Community services such as schools were seen to divert funds from their core business to fund backup supply systems. This research also found that improving convenience by extending networks of energy distributors or recharge agents can enable home deliveries and reduce the effort and distance needed to access energy services. The time, drudgery, and effort saved in accessing energy services can be an important consideration in the choice and use of specific energy services.

Hence:

- Policy and practice need to focus as much on the quality as on the quantity of supply, to ensure at least a minimum degree of reliability of energy supply by emphasising maintenance, monitoring and sustainability of existing systems and networks to improve the use of modern energy services by both women and men.

- Ensure provision of reliable electricity to public infrastructure services such as schools, health clinics and water supply, to increase the benefits of using these services for both women and men.

- Improve and strengthen the distribution systems for electricity and fuels, especially to more remote rural areas and to poor people, as a means to increase the uptake and use of energy services by poor women and men.

3.6 Support women's role in energy decision-making at household, organisational, and policy levels

Women's agency to engage in policy and political processes is essential. Engagement enables women to influence decisions made about the energy system so that the system better meets their needs, as well as contributes to changing gender norms around energy systems. The research shows that at the household level, energy services that save time and drudgery, or that contribute to earning income, can increase women's options and roles in household decision-making. In agriculture and formal employment, modern energy services do increase women's income and can transform gender relations. At the meso level, creating and utilising women's organisations and networks has been a successful strategy for increasing women's empowerment by enabling them to address energy challenges collectively. Programmes of this kind have also assisted women to improve operational skills and knowledge of new technology, access financial services and spread risk, resulting in women taking up new leadership roles and changing gender norms. At the macro level, external organisations have raised gender awareness, and women's associations have the potential to influence energy policy change. There is growing recognition of women as voters, and, increasingly, politicians are motivated to meet their demands.

Hence:

- Women's voices in the household, local communities, and the policy space related to energy need explicit support and encouragement from the energy sector as well as from the gender sector. Assisting women's mobilisation includes recognising women as agents of change, and supporting them to define and demand their energy priorities and interests at household, meso and macro level. It also means working together with men, to help them recognise and support the changing roles of women.

- Given the importance of context and the complexity of the policy space, political mobilisation needs to take place at the national level. Support should be provided through legitimate local organisations. Such support needs to be closely monitored to determine what is working and what is not, and to shift accordingly. Past errors underline the need for a more iterative, evolutionary approach to intervention and to adapt initial approaches if evidence emerges that they are not working.

- Policy makers and development partners should adopt a twin-track approach of supporting women's autonomous organisations and networks, known to be important for more transformative agenda-setting, while also helping women to exert greater influence in mainstream (i.e. dominated by men) energy organisations and energy policy forums where key decisions are made.

Sven Torfinn/ENERGIA

4. Conclusions

4.1 Further research needed for evidence-building

Some indicative examples of further evidence-building research needed are given below, based on research needs identified by the research teams, ENERGIA's own work and needs, and the scoping phase of the Gender and Energy Research Programme.

How can women use the policy and political space to demand the modern energy services they require?

The context specificity of successful energy programmes, and the complexity of the environments in which they operate, suggest that local (national) political processes will both drive and inhibit the implementation of energy policies. The question is, what will motivate the ruling elites to respond to the energy needs of underserved men and women? There is some evidence that ruling elites do act on some of their promises, and some governments do seem to be pursuing energy access as a vote winner. A subsidiary question is whether and how external agencies can support women's political mobilisation – and their demands for their energy needs to be met – in their own political context. Research might explore different mechanisms for providing support to energy-related women's associations, and look at how women's groups can intervene most effectively in key areas of policy discussion, formulation and implementation, where women's voices need to be heard.

How does energy access affect gender relations over time?

Electrification, and the transformations that result, are complicated, dynamic process that occur alongside other social, economic, and political processes that in turn can have both positive and negative impacts. The same is true for gender relations, as these are always dynamic and changing. This makes isolating the impacts of electricity on gender relations and women's empowerment particularly complex. Given the lack of access to electricity and the poverty and gender imbalances prevalent in many countries, a crucial question is: after how long a period is it reasonable to expect to be able to identify specific changes? This question is often neglected in the literature. A follow-up longitudinal study of how electricity access affects gender relations over time and brings about transformational changes would be useful to policy and development. This would give insights into the type, scope, and timing of the impacts of different modalities of delivering electricity access. Such a study would also enhance knowledge around what kinds of policies and strategies have gender-equitable outcomes.

How can the process heat and mechanical power needs of women and men be better met?

Many women's income-generating activities are based around process heat, for which end-use electricity is not a realistic option, particularly in terms of cost. Availability of mechanical and process heat technologies can be a stimulus to the setting up of small-scale enterprises (sawing, food processing etc.).

Which types of women's energy entrepreneurship are most effective at expanding energy access?

Research done within the Gender and Energy Research programme has presented a small number of studies that show that women energy entrepreneurs are able to effectively expand energy access for rural communities. However, more experimental and quasi-experimental research is needed to understand where within the value chain (design, production, sales) and in which mode of engagement (through self-help groups, as micro-entrepreneurs, or as owners of small/medium businesses) the skills and contributions of women entrepreneurs have the greatest potential to expand energy access. Studies should specifically compare the contributions of women and men entrepreneurs.

How can energy sector reform better meet the needs of women and men?

Power utilities continue to undergo change, in part to make them financially viable (particularly in Africa), but also to adjust to the falling cost of distributed renewable energy supplies. Many utilities are now reporting generation capacity that exceeds the power they can sell at cost-covering prices (despite major sections of the population having no access to electricity). This is likely to offer both threats and opportunities for various sections of society. Electricity sector reforms and technical innovation will benefit from a greater understanding of the different circumstances facing men and women; for example, by taking into consideration the potential for low-cost efficient electric cooking as well as the role women can play in consumer service and load promotion; and devising measures to target unserved and underserved groups such as single-parent households with connections, and so on. Electricity suppliers may well need to provide both appliances and equipment, in addition to supplying electricity.

4.2 Conclusion

In 2017, for the first time, the number of people without access to electricity dipped below 1 billion. In spite of this, it is projected that in 2040, more than 700 million people, predominantly in rural settlements in sub-Saharan Africa, will still be without electricity (IEA, 2018). At the same time, slow progress has been made in reducing reliance on the traditional use of solid biomass as a cooking fuel. Currently, three billion people lack access to clean-cooking solutions and are exposed to dangerous levels of indoor air pollution, which cause an estimated 3.8 million premature deaths per year, with women and children most at risk.

These numbers are not likely to change significantly: projections show that in 2030, 2.3 billion people will still be reliant on traditional fuels for their energy needs, and more than one billion people will still be without access to electricity (GTF, 2018). While progress is being made, the Ministerial Declaration of the 2018 High-level Political Forum on Sustainable Development, convened to review progress on Sustainable Development Goal 7 (SDG 7), noted that there is growing concern that the 2030 deadline may not be met (Ecosoc, 2018).

Further, faster action towards SDG 7 depends on enabling women's as well as men's access to energy. The interdependent link with Sustainable Development Goal 5 on gender equality and women's empowerment is clear. It will not be possible to reach the target for universal access to affordable, reliable, and modern energy services by 2030 unless the energy needs of women are met. This urgency requires a radical rethink of how women can both benefit from and contribute to the energy transition. At international and national levels, key actors including governments, donors, multilateral organisations, and civil society organisations are striving to address this need through policies and programmes. Lack of understanding of gender dynamics in the energy sector and in society at large, limited evidence on linkages between energy interventions and gender outcomes, and the absence of sex-disaggregated data, are obstacles to these efforts.

This five-year DFID-supported research programme undertaken by ENERGIA and a Collaborative Research Group of North-South consortiums is the first gender and energy research programme of this level and scale, and the first major effort to explore the linkages between SDG 5 and SDG 7 since the adoption of the SDGs in 2015. This research responds to the growing need for evidence to provide understanding of the gender aspects of energy policy, and the role of energy in decreasing gender inequality. From the seven main research reports and two commissioned reports, six key policy implications have been drawn out in this synthesis report. Action is needed to:

- Engage both women and men in the design, implementation, and monitoring and evaluation of energy policies and programmes;
- Involve women in energy-system value chains and employment, both by overcoming gender barriers and through equal opportunity strategies;
- Improve the reliability, convenience and quality of energy supply to increase women's and men's access to and use of energy services;
- Increase women's ability to afford energy services through innovative financial mechanisms and through improving the enabling environment for women;
- Multiply the social and economic impacts of energy access by targeting women's productive uses and social infrastructure; and
- Support women's role in energy decision-making at household, organisational, and policy levels.

Despite the wealth of empirical evidence and data generated as part of the research project, many questions remain for further exploration, both empirical and policy-oriented. The scope of the research themes did not cover all areas of interest, and research on cooking energy issues – a central energy need for women – was limited. Within the broader research areas, the scope was necessarily limited geographically or by subsector, and not all critical questions could be addressed. Some indicative examples of empirical questions that require further exploration, as identified by the researchers and ENERGIA as being particularly necessary in the context of advancing SDGs, include:

- How can women use the existing political and policy space to demand the modern energy services they require?
- How does energy access affect gender relations over time?
- How can the process heat and mechanical power needs of women and men be better met?
- Which types of women's energy entrepreneurship are most effective at expanding energy access?
- How can energy-sector reform better meet the needs of both women and men?

The importance of context – local, regional and national – in energy access is well established. Context can make definitive answers naive or irrelevant, and this means that local and national research must play a key role in designing local interventions. The research programme contributed further understanding of how and which aspects of context matter most. For example, economic context alone is insufficient to account for lack of access to energy supply; gender norms play a significant role and may need to be addressed to ensure gender-equitable energy access targets are met. For this reason, gender assessments, including consultations with stakeholders, are recommended as a first step in designing energy policies and programmes.

The overall message of this research is that many insights into more effectively linking gender and energy are simply not being translated into action on the ground. For this reason, in addition to the empirical research already mentioned, 'dissemination-influence-change' programmes, coupled with capacity development of target international, national, public, private and NGO stakeholders/influencers, are required to facilitate the uptake and utilisation of research recommendations. As the 2030 deadline for the SDG Agenda looms, there is a need to do better. Research generated through this programme can catalyse action to move further, faster.

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Appendices

Main research products of the ENERGIA research programme

Research reports

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Glossary of gender concepts [1]

Access to resources: access refers to the ability to use and benefit from specific resources (material, financial, human, social, political, etc.) although this can be curtailed if there is no control over resources (see below: Control over resources).

Affirmative action: is a practical measure taken to correct existing inequalities by increasing the diversity of an organisation through human resources initiatives such as quotas for hiring specific groups of people who face additional barriers to participation not experienced by other members of society, for example women, minority groups, and people with disabilities.

Agency: agency is the human capability to exert influence over one's functioning and the course of events through one's actions. It is a person's or agent's ability to act for herself or himself.

Control over resources: entails being able to make decisions over the use of resources, including whether others have the right to use or enjoy the benefits of a resource.

Empowerment: expansion in an individual's ability to make strategic life choices in a context where this ability was previously denied to them.

Equal opportunity: indicates the absence of barriers to economic, political and social participation on the grounds of sex, gender or other characteristics.

Gender and sex: sex refers to the biological differences between male and female bodies. Gender refers to the socially-constructed attitudes, values, roles and responsibilities of women and men, in a given culture and location, which are learned and which change over time.

Gender Action Plan (GAP): a plan for building capacity to mainstream gender into policy, programmes, and within organisations.

Gender analysis: the critical examination of a problem or situation in order to identify differences in the gender roles, activities, needs, rights/entitlements and available opportunities of women, men, girls and boys.

1 Adapted from: UNDP (2007), Gender Mainstreaming in Practice: A Handbook. Clancy J.S., Skutsch M., and Batchelor S (2003), "The Gender-Energy-Poverty nexus: Finding the energy to address gender concerns in development", DFID Project CNTR998521. http://doc.utwente.nl/59061/ Please note that for a number of the concepts listed, there are no universally agreed definitions. The definitions given here are the ones we use in the synthesis report.

Gender and Development Approach (GAD): an approach to development that advocates for a shift from focusing on women as a group to focusing on the socially determined relations between men and women, including the social, economic, political and cultural forces that determine how women and men can best participate and benefit from development processes.

Gender approach: the design and implementation of policies and projects in such a way that they are more gender-aware in their objectives, implementation and outcomes.

Gender audit: a tool to identify and analyse the factors that hinder efforts to mainstream gender in policy, used as part of a process in developing a more gender-aware policy.

Gender awareness: the understanding that there are socially determined differences between women and men, based on learned behaviour, that affect one's ability to take decisions and action and to access and control resources.

Gender-awareness raising: a process that aims to show how existing values and norms influence our picture of reality, perpetuate stereotypes, and support mechanisms that (re)produce inequality.

Gender-aware policy: a policy that takes into account the social relationships of women and men as well as the differences in their needs, as opposed to a policy that is gender-neutral and implicitly assumes that women and men have the same needs.

Gender-balanced participation: equal numbers of women and men (or parity) in participation in a specific activity.

Gender blindness: the failure to recognise the different roles, responsibilities, capabilities, needs and priorities of women and men.

Gender budgeting: the application of gender mainstreaming in the budgetary process.

Gender contract: a set of implicit and explicit rules governing gender relations, operating at household and societal levels, which allocates different work, value, responsibilities and obligations to men and women.

Gender Development Index (GDI): a gender-sensitive adjustment to key variables (life expectancy, educational attainment and income) in the Human Development Index (HDI), presenting these variables in accordance with disparities in achievement between women and men.

Gender discrimination: giving differential treatment to individuals on the grounds of their gender in the distribution of income, access to resources and participation in decision-making.

Gendered division of labour: an overall societal pattern whereby women are allotted one set of gender roles and men another.

Gender Empowerment Measure (GEM): a measure of the relative power of women and men in political and economic life using three variables:

- women's and men's percentage share of administrative and managerial positions;
- women's and men's percentage share of professional and technical jobs; and
- women's and men's percentage share of parliamentary seats.

Gender equality: the condition in society when both men and women are attributed equal social value, equal rights and equal responsibilities, and have equal access to the means (resources, opportunities) to exercise them.

Gender equality competence: the skills, attributes and behaviours of individuals and organisations needed in order to mainstream gender.

Gender equity: fairness and justice for women and men in the distribution of benefits and responsibilities.

Gender-equitable access (to energy services/technologies): access to energy services or technologies that are enabled in ways that ensure women's and girls' needs and aspirations to live the life of their choosing are met, and which also contribute to achieving gender equality.

Gender-equitable energy outcomes: women and girls' lives improve relative to men's as a consequence of energy investments. Women have equal opportunity relative to men to participate as managers, employees or entrepreneurs in the processes of implementing these investments.

Gender gap: an observable and sometimes measurable gap between men and women in terms of a specific societal outcome.

Gender goal: the desired state to be achieved for women and men by a policy or project.

Gender ideology: attitudes regarding the appropriate roles, rights and responsibilities of men and women in society, which generally support gender inequality.

Gender Impact Assessment: a process examining policy proposals to see whether they will affect women and men differently, with a view to adapting these proposals to make sure that discriminatory effects are neutralised and that gender equality is promoted.

Gender indicators: measures of people's situation in society that can show gender differences and gaps and identify differences that can lead to stereotypes.

Gender inequality: inequality, on the basis of a person's gender, in access to and control over the various material and non-material resources and assets of a society and the benefits which accrue from these.

Gender integration: the application of gender analysis and gender mainstreaming to work through accepted strategies and practices of international treaties (such as SEforAll and the SDGs) and regional agreements in order to promote and achieve gender equality, i.e. the promotion and protection of human rights and empowerment of women and girls.

Gender issues: identification and framing of an incidence of gender inequality.

Gender mainstreaming: a strategy for ensuring that the concerns and experiences of women and men are an integral part of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic, and societal spheres.

Gender neutral: the assumption, enshrined in gender-neutral language and concepts, that women and men benefit equally from policies, programmes, and projects with equal capacity and opportunity to respond to, and to influence and control, the processes and outcomes.

Gender norms: a wide range of socially and culturally accepted notions of what is perceived as "normal" in a community, linked to behaviour, beliefs, attitudes and practices, which determine how individuals perceive their potential and worth, and that of others.

Gender parity: the situation when women and men are able to access opportunities and resources equally.

Gender perspective: an analytical approach that helps to see whether the needs of women and men are equally taken into account and served by a proposal, by questioning the power relationships established between men and women, and social relationships in general.

Gender planning : an active approach to planning which takes gender as a key variable or criteria and which seeks to integrate an explicit gender dimension into policy or action.

Gender policy: an overarching vision or policy on gender adopted by a government, a sector or an organisation, which acts as a statement of commitment to gender mainstreaming in all their project activities.

Gender position: women's social and economic standing in society relative to men. For example, disparities in wages and employment opportunities, unequal representation in the political process, unequal ownership of land and property, vulnerability to violence.

Gender procurement: involves the introduction of gender equality requirements into public procurement, in order to use it as an instrument to advance gender equality in terms of gender-equal access to services.

Gender relations: the social relationships and power distribution between men and women in both the private (personal) and public spheres.

Gender responsive: actions that reflect an understanding of the realities of women's and men's lives and address the issues, taking into consideration the implicit and explicit social norms.

Gender roles: sets of behaviour, activities, tasks and responsibilities assigned to men and women, differentiated according to the cultural norms and traditions of the society where they live which define the perception of what it is to be male and female, and hence shape identity.

Gender role stereotyping: the portrayal, such as in the media or in books, of men and women in society occupying social roles according to the traditional gender division of labour and which work to support and reinforce notions of what can be considered as "normal" and "natural".

Gender-sensitive language: the use of written and spoken language that avoids talking in generic masculine terms (e.g. Chairman) which exclude women or reflect stereotyped assumptions about gender roles.

Gender sensitivity: the ability to recognise gender issues and the different perceptions and interests of women and men arising from their different social locations and different gender roles.

Gender-sensitive accountability: the obligation and responsibility on the part of state structures and public officials to implement gender integration and achieve gender-equality policy objectives.

Gender-sensitive evaluation: an evaluation of a policy, project or organisation as to whether or not gender goals have been reached and a gender approach has been adopted, identifying what has and has not worked well in terms of gender mainstreaming, with recommendations, where necessary, to strengthen future processes.

Gender-sensitive institutional transformation: a process that aims to integrate gender equality into the regular rules, procedures and practices of an organisation, leading to the transformation of the organisation so that gender is mainstreamed internally (employment of staff, organisational development) as well as externally (service provision).

Gender-sensitive/specific monitoring: a periodic follow-up conducted during the implementation of a policy, programme or project in order to verify whether gender goals and measures are being achieved, allowing for the identification of gaps and difficulties, so that the necessary interventions and adjustments can be made to ensure gender (and other) project goals are reached.

Gender-sensitive policies and programmes: policies and projects should use a gender-sensitive approach that takes into account the differences in women's and men's lives, while aiming at eliminating inequalities and promoting an equal distribution of resources.

Gender stereotypes: preconceived ideas whereby women and men are arbitrarily assigned characteristics and roles linked to their sex which can limit the development of natural talents and abilities, restricting life opportunities.

Gender-transformative approaches (GTA): interventions that create opportunities for individuals to actively challenge gender norms, that promote positions of social and political influence for women in communities and in social, political, and economic spheres at all levels of society, and that address gender-based power inequities.

Patriarchy: an ideology that promotes the male domination of ownership and control at all levels in society, and which maintains and operates the prevailing system of property rights and the gendered division of labour.

Practical needs: requirements that women and men perceive as immediate necessities, such as water, shelter and food, for their survival.

Productive needs: the inputs required for the work done by both women and men for pay in cash or kind, including both market production with an exchange value and subsistence/home production with actual use value as well as potential exchange value.

Quota system: a specified number or proportion of participation spaces so that various groups can share and participate in social, political and economic activities.

Self-awareness: an individual's decision to alter their attitudes, and those held by others, towards themselves or towards existing societal norms, such as gender norms.

Sex-disaggregated data: separation of data by sex as the basis of gender analysis.

(Women's) strategic interests: women's strategic interests are those related to women changing their position in society, gaining more equality with men and empowerment in all its senses.

Structural gender inequality: a system of gender discrimination practised in public or social institutions.

Women in Development (WID): an approach to development that focuses on women with the aim to improve the status of women.

Women's empowerment: a process by which women and girls gain power and control over their own lives through awareness-raising, building self-confidence, expansion of choices, increased access, and ownership and control over resources and actions, to transform the structures and institutions that reinforce and perpetuate gender discrimination and inequality.

Glossary of energy concepts [2]

Access to energy services: the ability of an end user to utilise energy services (such as lighting, cooking, motive power, etc.) that require an energy appliance and suitable energy supply. Access to energy services does not necessarily imply control or decision-making.

Access to energy supply: the ability of an end user to utilise an energy supply that can be used for desired energy services. Energy access is taken to refer to both physical availability of supply and ability to use the supply. Access to energy supply and access to appliances are necessary for access to energy services.

Attributes/characteristics of energy supply: characteristics of energy supply that influence its usability for various energy services. Attributes according to the ESMAP (2015) prioritisation for defining tiers of energy access are used: capacity, affordability, availability, reliability, quality, health and safety, legality and convenience.

Availability of energy supply: the time and duration of supply at the location of demand for energy services.

Biomass fuel: any organic material of plant or animal origin such as wood, charcoal, agricultural residues and dung, used as a fuel.

Connection: a connection entails registration as a consumer to use an energy supply infrastructure. This can be electricity or piped gas, as well as bottled gas that needs to be collected at a delivery point.

Decentralised energy supply: energy supply generated at a point near the point of use. Decentralised supply can be grid-connected or off-grid (individual or small distributed system), and can be in the form of electricity, heat etc.

End-user: the consumer who requires energy services. End-users may be members of a household, they may be enterprises using energy for productive purposes, or they may be community institutions.

Energy: energy comes in different forms, including fossil fuels, biomass fuel, power (electricity), and animate forms of energy, particularly human metabolic energy. Food energy is not included.

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2 Adapted from: ESMAP (2015) Beyond Connections, Energy Access Redefined, Conceptualisation report, Mikul Bhatia and Nicolina Angelou, The World Bank Group, Washington
UNDP (2007), Gender Mainstreaming in Practice: A Handbook
Clancy J.S., Skutsch, M and Batchelor S (2003), The gender - energy- poverty nexus: Finding the energy to address gender concerns in development", DFID Project CNTR998521. http://doc.utwente.nl/59061/

Energy forms/types: the form in which energy is delivered to the end-user, for example, fuels (biomass/ fossil fuels), batteries and electricity. The end-user has to make an additional transformation of the energy into a useful form, e.g. a radio converts electricity to sound.

Energy efficiency: the ratio of output energy to input energy gives a measure of the conversion efficiency of a particular piece of equipment. The ratio varies and can never be 100%. Engineering design aims to maximise the conversion efficiency which in turn influences the economics of use.

Energy poverty: an absence of sufficient choice in accessing adequate, affordable, reliable, clean, high-quality, safe and benign energy services to support economic and human development.

Energy results chain: the series of causal linkages from energy policy through energy interventions to their development outcomes. Energy supply and use of energy services are key elements of the energy results chain.

Energy sector reform: structural changes in the policies and institutions that govern any part – production, transmission or distribution –of the energy value chain, and any fuel within this value chain.

Energy services: the useful services that result from the use of energy; for example, illumination, refrigerated storage, transportation and appropriate heat for cooking. End-users usually express a need or desire for an energy service rather than a particular form of energy.

Energy supply: the physical availability of energy carriers at a location where there is demand. Energy supply is an insufficient indicator of access as it does not assume the ability to use the supply (for example the supply may not be affordable or appropriate for use).

Energy technology: the hardware, or end-use device, that converts an energy carrier into a form of energy useful to the end-user, thus providing a desired energy service.

Fuels: a store of energy including solid and non-solid fuels, from fossil and renewable sources.

Grid: a system of synchronised power providers and consumers connected by transmission and distribution lines and operated by one or more control centres.

Grid-connected: a physical connection to the electric power grid is in place (as opposed to off-grid). Grid connection may or may not include illegal physical connections.

Household connection: the connection (grid or non-grid) to an energy supply at household level (does not provide an indication of use, or possible differentiated use by members of the household. A household connection may be used for productive uses).

Metabolic energy: human energy, derived from the food we eat: an important energy source for completing many tasks but one that is usually ignored in energy planning.

Modern energy: there is no universally agreed definition of 'modern energy'. Modern energy includes electricity, gas (eg natural gas, LPG, biogas, producer gas) and liquid fuels for transport (e.g. petrol, diesel and biofuels). This definition separates the issue of modernity from a number of issues of sustainability, such as those related to including fossil fuels (which not everyone would agree should be included), and to including biofuels if they compete with food crops.

Off-grid: electricity supply that is not connected to a central grid system.

Productive use of energy: use of energy for income generation (in formal/ informal enterprise, home-based or in an enterprise location), including farm and non-farm income generation.

Reliability of energy supply: predictability of energy supply, entails absence of unexpected outages.

Stacking: the use of multiple energy carriers to meet an energy demand.

Useful energy: the energy that goes into an energy service, rather than being lost in conversion or transport.

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Colophon

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ENERGIA, the International Network on Gender and Sustainable Energy, is an international network of like-minded organisations, currently working with 36 partners in 18 countries in Africa and Asia.

Our vision is that women and men have equal and equitable access to and control over sustainable energy services as an essential human right to development. To achieve this, we:

- contribute to energy access for all by scaling up the delivery of energy services through women-led micro- and small businesses;
- advocate for and provide technical support to the mainstreaming of gender approaches in energy policies and programmes;
- provide, through research, an evidence base for improving energy investment effectiveness;
- raise awareness and enhance knowledge of issues related to gender and energy through networking and knowledge products.

ENERGIA is hosted by Hivos, an international organisation that seeks new solutions to persistent global issues. With smart projects in the right places, Hivos opposes discrimination, inequality, abuse of power and the unsustainable use of our planet's resources.

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