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## GENDER AND ENERGY: OPPORTUNITIES FOR ALL

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# ENERGIA's Gender and Energy Research Programme: Findings and Experience from Research for Policy<sup>\*†</sup>

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**Abstract** It has long been understood that energy is a key contributing input to reaching development goals, but little is known about the extent to which energy supply benefits men and women equally, and how interventions could contribute to a reduction of any gender inequalities. Filling in gaps in knowledge on the gender equality of benefits of energy supply and providing insights for policy and practice were the starting points for ENERGIA's Gender and Energy Research Programme. This article has a dual objective: highlighting findings and policy implications from the research programme and reflecting on aspects of programme design on doing research for policy. Findings from the nine research projects in the programme illustrate the links between energy interventions and impacts along an adapted energy results chain. Reflection on research programme design is based on the experiences in this international multimethod interdisciplinary programme.

**Keywords:** gender, energy, policy research, multimethod, interdisciplinary, research programme.

## **1 Introduction: the need for policy-relevant research on gender and energy and the ENERGIA Gender and Energy Research Programme**

### **1.1 The need for evidence on gender issues to reach energy objectives for development**

A landmark achievement in energy access was reached in 2017 when the number of people without electricity access fell below one billion for the first time (IEA 2018). With 99 million people gaining access to electricity during 2017, the international goal of achieving universal electricity access by 2030 is coming closer to being achieved. Progress in access to clean cooking also appears to be gaining pace, with 525 million people gaining access since 2011, but continued

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acceleration is needed as currently nearly 2.7 billion people still rely on biomass, coal, or kerosene for their daily cooking needs (*ibid.*).

In this dynamic context, it is clear that effective policies to reach targets are crucial. As energy access is a prerequisite for many aspects of human development and for reducing inequities, current policy decisions can have a big impact on the equality of men and women in benefiting from energy supply interventions. However, little is known about the extent to which energy supply benefits men and women equally, and how interventions could contribute to a reduction of any gender inequalities. Development of evidence to inform policy on gender issues in energy is therefore urgent.

The topic of gender in energy supply is typically associated with access to clean cooking. The explicit separate measurement of access to clean cooking for Sustainable Development Goal 7 on energy reflects the increased attention for policy priority on this topic. Indeed, cooking is a key nexus topic within the gender and energy space, as in nearly all countries in the world women have a higher responsibility to prepare family meals than men. However, considering cooking on its own is insufficient to capture gender issues. Firstly, many different household and productive tasks such as water collection or pounding grains may also be gendered, and especially for such heavy work, mechanisation can have a significant impact. Secondly, even when energy supply is in principle available at household level, regulations and social norms form barriers to equal access to energy services for women and men. Together, these two sets of factors lead to inequity of access to energy supply and inequity in benefits from energy use between men and women.

Taking a deeper look at energy access, energy use, and how benefits are obtained can uncover the occurrence of gender inequity and its reasons. This includes recognising that energy access in itself does not contribute to reaching development outcomes, but that this involves several causal steps from energy supply, through, for example, use of energy services, and changes in economic and social status and agency. An in-depth study should also include insights into contextual factors, including gender norms, which influence uptake of energy supply and benefits of use. Finally, gender issues exist in the energy supply chain, where women, as entrepreneurs and employees, have a role to play in reaching the energy access targets and objectives for development outcomes.

### **1.2 Which evidence has policy relevance?**

For evidence to have policy relevance, it is important that it is credible, and that the mode of communication is appropriate to the targeted audience. In the gender and energy nexus, the audience ranges from international policy level for the Sustainable Development Goals, in which energy is an instrument to broader development, to national governments' departments of energy, gender, or economic

development, but also to utilities, energy supply businesses, non-governmental organisations (NGOs), advocacy organisations, civil society organisations, and academic audiences. Each of these has a direct or indirect role to play in influencing the gender benefits of energy supply. Although what is seen as credible research may differ depending on the audience, for research in the complex and dynamic multidisciplinary field of gender and energy, ‘credible’ research is seen to have several key elements (in agreement with Crewe and Young (2002) and DFID (2014)):

- Engagement between researchers and stakeholders both in the phase of development of research and in the dissemination phase, if possible by researchers with an established credibility for their target audience.
- Multidisciplinary or interdisciplinary research, where specific expertise on the topic or topics of study includes gender expertise.
- Multimethod research, in which quantitative and qualitative methods are designed as appropriate to specific research questions, for triangulation of findings, but also to increase local and policy relevance of research in the design phase.
- Transparency of methodologies, assumptions, deduction of conclusions, and data.
- Careful consideration of contextual factors and especially cultural factors, (gender) power relations, to ensure validity of the research both from a local perspective, and to establish the relevance of findings to different geographic, social, and economic contexts.

These elements of credible research for policy were incorporated in the design of the ENERGIA Gender and Energy Research Programme. Section 3 of this article presents experience with two of the above topics for which consensus may be less definite: multidisciplinary research and multimethod research.

### **1.3 The ENERGIA Gender and Energy Research Programme**

Filling in gaps in knowledge in the gender and energy nexus to provide insights for policy and practice were objectives for the ENERGIA Gender and Energy Research Programme. This five-year programme (2014–19), funded by DFID, was implemented by ENERGIA, International Network on Gender and Sustainable Energy, and was carried out by nine teams with 26 partners in 12 countries in Africa and Asia.

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

In total, five research projects (RA1–RA5) were developed following a call for proposals, each defining specific research questions within these

Table 1 Overview of the projects in the ENERGIA Gender and Energy Research Programme

| Research theme   | Project   | Research area | Project research reports                                 |
|--|---|---------------|--|
| Electrification  | Exploring factors that enhance and restrict women's empowerment through electrification   | RA1           | University of Oslo <i>et al.</i> (2019)                  |
| Productive uses of energy                              | Productive uses of energy in the street food sector   | RA2           | University of Twente <i>et al.</i> (2019)                |
|  | Unlocking the benefits of productive uses of energy   | RA6           | IDS and GIZ (2019)                                       |
| Energy and related sector policy dynamics              | Gender factor in political economy of energy sector dynamics  | RA3           | MSSRF and CRT Nepal (2019)                               |
| Energy sector reform                                   | Gender and fossil fuels subsidy reform  | RA4           | GSI-IISD <i>et al.</i> (2019)                            |
| Role of the private sector in scaling up energy access | Female micro-enterprise creation and business models for private-sector distribution of low-cost off-grid light-emitting diode (LED) lighting | RA5           | EPRU UCT and IPA (2019)                                  |
|  | Building the evidence base for women's empowerment and entrepreneurship to improve energy interventions' effectiveness: a literature review   | RA7           | Johns Hopkins University, Babson College and ICRW (2019) |
| Gender mainstreaming approaches                        | Lessons learned on gender approaches in energy sector policy and practice   | RA8           | Clancy <i>et al.</i> (2016)                              |
| Trends in gender and energy                            | How global trends impact gender equality and social inclusion in access to sustainable energy   | RA9           | SEforALL (2018)  |

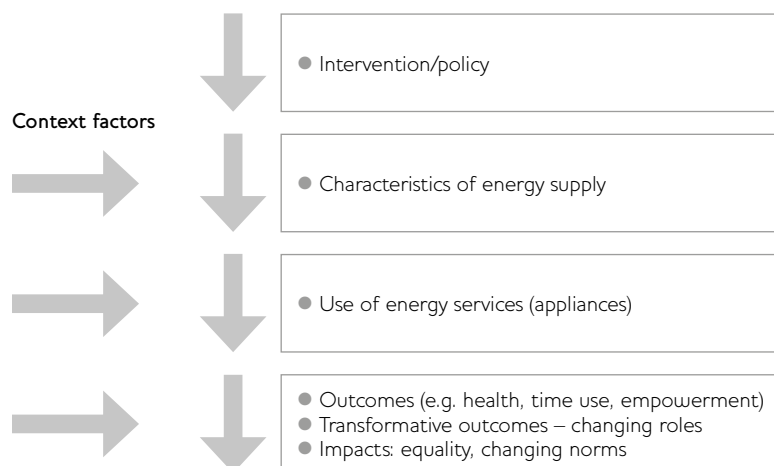
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thematic areas. Two further projects (RA6, RA7) were developed within two of the thematic areas to fill in remaining high-priority questions, and two projects were commissioned separately (RA8, RA9). Table 1 provides an overview of the projects and their abbreviated names according to research area (RA) numbers for reference in this article.

The research projects used a multimethod approach and stakeholder engagement, which was achieved through the establishment of consortia with a broad representation of expertise across research disciplines and countries, and from universities, research institutes, and NGOs.

Through its large capacity and focus on creating evidence for policy, the ENERGIA Gender and Energy Research Programme has been able to contribute substantially to the availability of evidence within a large variety of topics within the gender and energy nexus and to the visibility and awareness of the gender issues in energy.

This article presents selected findings on cross-cutting issues from the research programme in Section 2, and in Section 3 it also provides a reflection on doing research for policy in this multidisciplinary and multimethod programme.

**Figure 1 The energy policy to impacts chain in context**

Source ENERGIA (2018).

## 2 Findings and policy implications

### 2.1 The energy policy to impacts chain as a framework to structure findings

In this article, highlights of findings from the research reports and the synthesis report of the research programme are presented following the framework of the energy policy to impacts chain shown in Figure 1. The ENERGIA research programme adopted this framework to introduce and discuss key issues of commonality and cross-cutting learning. The chain illustrates a causality logic from energy policy interventions to outcomes on users of energy. It is essentially an adapted energy results chain, such as that used in the Multi-Tier Framework (Bhatia and Angelou 2015).<sup>2</sup> During the research programme, each of the research teams mapped early findings against an elaborated template of the chain, which provided additional linkages including opposite directions of causality.

Looking at the simple framework in Figure 1, a key observation is that gendered energy uses of energy services are central in the chain. The term ‘energy service’ is used to reflect the user’s perspective related to the function, such as lighting, milling, or cooking, rather than the access to energy sources such as electricity or liquefied petroleum gas (LPG) since it is the service that people ultimately aspire to rather than energy sources. On the supply side of the chain, energy policy influences the provision of physical infrastructure and, importantly, also the characteristics of the energy supply, such as price, capacity, and reliability. The supply influences not only initial access to energy connections but also the choices and extent of uses of energy for energy services. Further, energy policy and interventions can encourage women playing a role in energy supply.

On the use side of the chain, the different roles of men and women and power relations within households and communities are relevant factors

that influence access to energy services and also the differences in outcomes of energy use between men and women. These outcomes can be direct benefits such as in health or reduced time poverty, but they can even be transformative when roles of women in their household change and, eventually, social norms shift. A key element of this approach is that the understanding of use and energy demand looks beyond the level of 'connection' or 'household', which is the typical unit of data collection for both researchers and policymakers.

Key to the ENERGIA Gender and Energy Research Programme is the consideration of context factors. The framework illustrates that both supply and demand (including use) are influenced by many different context factors. Making explicit geographic, socio-political, and economic factors and how they interact with the decisions and links throughout the chain provides necessary insights for the interpretation of findings.

## 2.2 Gendered differences in energy demand and use of energy services

To highlight the perspective of women and men as energy users, we start the presentation of findings in the middle of the chain, with the topic of gendered differences in the current use and aspired use of energy services. It focuses on questions of how gendered differences in roles, responsibilities, and norms between men and women influence access to energy, energy demand, and use of energy services. An important finding from the research programme is that energy demands are not necessarily met equitably for men and women, even when energy supply is physically available at household or community level, for agriculture or for income generation. These gendered differences are evident not only in households, but also in income generation in agriculture and in non-farm activities.

**Within the household**, cooking is one of the energy services that is highly gendered. However, ownership and use of other appliances is also gendered. Use of lighting, for example, can be gendered depending on the location of the light – especially in households where men and women spend significant amounts of time in separate locations – such as the kitchen or separate living quarters. In many contexts where women have limited income and decision-making power, priority appliances for women are those that save time, increase convenience, and reduce drudgery, such as rice cookers, kettles, and irons, whereas men tend to buy appliances for business and leisure activities (e.g. TV, radio, sound systems) (RA1, University of Oslo *et al.* 2019). Nevertheless, there are signs that men are getting involved in domestic activities, such as cooking and ironing, when modern appliances are available in the household (RA6, IDS and GIZ 2019). As evidence on these changing roles was found only in the RA6 study in Ghana, it appears that the relatively more equitable norms facilitated this unlocking of gendered tasks.

**Agriculture** is the largest sector for women's employment in a great part of the southern hemisphere, and in northern Africa, Oceania, southern Asia, sub-Saharan Africa, the Caucasus and Central Asia and western



Asia, women are more likely than men to be working in this sector (UN 2015). Research in India and Nepal (RA3, MSSRF and CRT Nepal 2019) indicates that the agricultural tasks that men are engaged in (land preparation, sowing, irrigation, harvesting, and selling crops) are the ones that have benefited from higher levels of mechanisation, while tasks traditionally performed by women (transplanting, weeding, and smaller-scale post-harvest processing) are only recently becoming mechanised to some extent. The research found that in Nepal, a contributing factor to the mechanisation of women's tasks was the social change following out-migration of men.

**In enterprises**, it was found across research projects that gender differences in energy use between men and women follow largely from differences in the type of enterprise men and women own and run. For example, in Homa Bay, Kenya, women's income generation is often through small shops while men's income is from involvement in fishing, working as casual labourers, or through employment in larger enterprises (RA1, University of Oslo *et al.* 2019).

IDS and GIZ in their RA6 research report present the following finding:

Case studies of PUE [productive uses of energy] interventions in Ghana and Tanzania... showed that male-dominated sectors were more likely to benefit than female-dominated ones from improvements in electricity supply. This is because men typically operate more and larger enterprises, which consume more electricity than female-owned enterprises, which instead dominate cooking fuels such as firewood, charcoal and liquefied petroleum gas (LPG) (IDS and GIZ 2019: 39).

However, within a certain sector and type of enterprise the differences in energy use and preferences for energy services between men and women were found to be small. The example of the African street food sector (RA2, University of Twente *et al.* 2019) illustrates the remarkably small differences in wants and aspirations between the majority of women and the men in the small enterprises in this sector. Stereotyped gender differences obviously get lost in the pre-selection of people choosing a type of enterprise (sector, scale of operation) to engage in (RA2). The policy implication is that, while supporting such a female-dominated sector in the first place is highly gender relevant, there seems to be no need in this particular sector to differentiate the policy interventions by gender.

### 2.3 Outcomes of energy use

Once appropriate forms of energy supply are available and energy services are used, these can lead to outcomes such as time savings and reduction of drudgery. These in their turn can induce second-order outcomes (impacts at individual level) depending on how the time saved is used and whether this changed status, roles, or negotiating power. Even transformative changes are possible.

The evidence on saved time and reduced drudgery confirms that these are a priority outcome of use of energy services.

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) (ENERGIA 2019: 50).

It is relevant to note that there are other areas of potential demand for time saving and reducing heavy work that can be supported through energy services. An example is the 1.5 hours per day on water collection reported by the women in the study area in Kenya (RA1, University of Oslo *et al.* 2019). Although increased income through improved energy supply is not an outcome for the majority of modern energy users, statistical data from Ghana and Tanzania showed that there was a positive relationship between productive use of electricity and women's economic empowerment (RA6, IDS and GIZ 2019). The evidence illustrates that the use of electrical appliances allowed for diversification in products for sale, which had positively influenced income for both women and men.

**In the final stage of the chain, transformative changes in gender roles or even norms as an outcome of energy interventions are considered.** The evidence in the research programme indicates that this is not a typical outcome of energy interventions. Where changes in gender ideologies and norms and ability to influence life decisions have taken place, this is mainly related to women being socially and economically empowered. Evidence of structural or increased empowerment was found in cases in which women were involved in energy supply (RA1, University of Oslo *et al.* 2019), or when modern energy services and appliances enabled women to undertake jobs that were traditionally 'male' (RA6, IDS and GIZ 2019). The evidence of transformative changes was found mainly in contexts where gender norms were less inhibiting to women making choices. Such norms may have been undergoing change as part of societal processes, but also evidence was found where energy interventions themselves supported wider acceptance of women taking up new roles (RA6, *ibid.*).

#### 2.4 Characteristics of energy supply

The precondition for meeting energy demands leading to the potential outcomes presented above is that an appropriate energy supply is in place. The characteristics of energy supply itself have a big influence on the use and benefits of supply. Starting from the need to understand energy supply beyond the level of 'numbers of households connected', the Gender and Energy Research Programme has explored different

characteristics of supply. The findings (e.g. in Rwanda, Bonsuk Koo *et al.* (2018)) indicate that the attributes of supply in the Multi-Tier Framework<sup>3</sup> are useful indicators to uncover issues of access from a gender perspective.

Gender analysis in energy access typically takes place at household level, although gender issues also occur within households. Gender analysis at household level compares female-headed households with male-headed households. Understanding the differences between these categories is essential. For instance, many male-headed households include at least a husband and wife, while female-headed households have only one adult of working age, and single adult households (such as the divorced or widowed) are often relatively poor. Further, women (irrespective of civil status) may face difficulties in meeting requirements for registration for formal energy access. Therefore, improvements to the attributes of energy supply (not only affordability but also, for instance, availability, reliability, quality, formality, and health and safety) for poor households have a strong relevance to reducing gender differences at household level.

Additionally, characteristics of supply influence access to energy of men and women *within* households and taking a gender perspective may shed light on how changes in energy attributes can contribute to improving women's quality of life. Examples illustrate the need for gender analysis to go beyond the inter-household level.

#### **Affordability**

Affordability is not only related to levels of household income, but to the value given to women's time. Where biomass cooking fuel is collected by women it is perceived by the household to be 'free', i.e. there is no monetary cost, while cleaner alternatives will have a financial cost, which is likely to be high relative to household income even with subsidies. Hence for low-income households it is possibly considered 'unaffordable' (RA3, MSSRF and CRT Nepal 2019, and RA4, GSI-IISD *et al.* 2019). Specific targeting of poorer women in the case of India's scheme for LPG connections (Pradhan Mantri Ujjwala Yojana (PMUY)) is shown to reach women in low-income households and to lead to uptake of LPG, which earlier schemes had failed to achieve.

#### **Location of energy supply**

The urgency of providing energy sources to the location of use is especially striking in areas where violence outside the home is common. The example of Homa Bay, Kenya (RA1, University of Oslo *et al.* 2019), where 43 per cent of respondents said that women members of their household have been victims of violence when going to fetch firewood, provides an indication of the difference that supply of fuel to the household could make.

Even when electricity supply is available in a household, the research found gendered differences in use of lights related to the location of lights in the household (RA1, University of Oslo *et al.* 2019). Lights were

most common in the kitchen in India and Nepal where the person installing the systems advised on suited locations for light.

Also for productive uses of energy, it was found in Rwanda and Senegal (RA2, University of Twente *et al.* 2019), and in Tanzania and Ghana (RA6, IDS and GIZ 2019) that the location of electricity supply has a gender dimension, where women's considerations for the choice of a business location more frequently include being close to home, while men more frequently choose based on how likely the location is to attract customers. The same consideration was not found to be significant for the male or female entrepreneurs in the street food sector in South Africa (RA2, University of Twente *et al.* 2019).

### **2.5 Gender-sensitive energy interventions including women in energy supply**

At the top end of the energy policy to impacts chain, energy policies and interventions provide opportunities to create gender equality through the whole chain.

As women are underrepresented in energy supply, from a gender equality and women's empowerment perspective, the research looked at opportunities and pathways to include women in the energy supply chain. The research finds that women sell energy products as successfully as men (LED lights in Rwanda) (RA5, EPRU UCT and IPA 2019) or outperform men (solar systems in Kenya) (RA1, University of Oslo *et al.* 2019). The results of the randomised controlled trial (RCT) in 272 villages in Rwanda (RA5) show that business performance is similar across gendered micro-enterprise groups: female teams of entrepreneurs perform as well as male teams. To support women in overcoming challenges induced by gender norms, the literature identifies four types of support that significantly enhance the performance and sustainability of women's energy businesses: at the individual level, (a) business education and skill 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, Johns Hopkins University *et al.* 2019; Dutta 2018).

However, it is clear from the findings presented above that making energy more gender sensitive also goes beyond including women in supply. To capture the potential contribution of energy on reducing gender inequality, gender-sensitive policies would address issues of energy supply and demand, and even go beyond the energy sector. Clancy *et al.* (2016) state that for effective gender mainstreaming in energy policy, each project should be contextualised in the design phase in terms of both the political economy and the local culture, particularly in respect of gender norms and values.

### **2.6 Synthesis messages for policy**

The implications for policy are captured in six main messages cross-cutting the research programme in the synthesis report:

- 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.
- 2 Involvement of women in energy-system supply chains is good for women and their families, and it is good for business.
- 3 Modern energy services for women's productive uses contribute to women's empowerment.
- 4 End-use appliances that deliver modern energy services to reduce drudgery and save time can transform gender roles and relations.
- 5 Improving the affordability, reliability, capacity and convenience of modern energy services can help achieve gender-equitable access and outcomes.
- 6 Engaging with political processes can help women access modern energy services and change gender norms (ENERGIA 2019).

### **3 Reflections on doing research for policy**

#### **3.1 Introduction to highlighted approaches used in the ENERGIA research programme**

As conducting research to contribute to policy is an ambitious endeavour, considerations on doing research for policy were taken into account in programme design, from the preparation of commissioning research projects and throughout the programme. This section reflects on learnings from experiences with multimethod approaches, the use of a framework, and the development of common indicators. Finally, lessons may be taken from experiences with the development of a new research community in the gender and energy nexus, where collaborations between researchers from diverse disciplines and countries were both a challenge and a rich resource. The analysis is presented from the perspective of programme coordination and management, and builds upon feedback provided by the researchers, Principal Investigator and the Technical Advisory Group in programme meetings, reporting, and anonymous reviews.

#### **3.2 Reflection on multimethod approaches**

The research programme supported a multimethod approach to optimise relevance of research for policy and practice. The experiences of the original proposers of the research programme had led them to conclude that credible and convincing evidence for policymakers would not come from a single discipline. The collection of quantitative data was emphasised as a priority for this research programme, as the availability of quantified evidence and quantitative analysis was identified as a gap in literature studies on gender and energy. The complementary use of qualitative data collection served as triangulation and to look into questions of understanding phenomena and uncovering new or local perspectives. The experiences with this approach have been positive, and the reflection presented here indicates possible lessons for other multimethod programmes.

Across the projects in the research programme, quantitative data were drawn from surveys (covering over 11,000 people in total), including a longitudinal survey, and also from a systematic literature study, analysis of national statistical data, and experiments. One of the teams used RCTs with 1,072 enterprises and 5,000 households that allowed for deeper levels of quantitative analysis. The range of quantitative outputs includes quantitative analysis, correlation analysis, and quantified descriptive findings. The qualitative outputs range from in-depth case analysis and stories to quotes and photographs. Also for qualitative data, the number of cases studied at different levels of detail was substantial, as indicated by the listing of methods for qualitative data gathering: semi-structured interviews (547), key informant interviews (188), participatory focus group discussions (293), and stakeholder meetings ranging from workshops to discussions with experts, and literature studies. A combination of methods was used within each team and with different focus methods across the research programme.

One of the objectives for the use of qualitative methods was to refine research questions to stakeholder demands and detailed study of available evidence. Together, the interaction with stakeholders as key informants, the qualitative literature reviews allowing for gathering of insights from 'grey' literature including programme experiences, and the early field research provided a more in-depth understanding of priority research questions and hypotheses to be tested, of local context, and of the guiding contrasts for purposive sampling methods. Without such flexibility to adapt, the validity of the research would have been lower, especially for the research projects where differences between research sites were large – such as the energy sector reforms in Nigeria, Bangladesh, and India (RA4, GSI-IISD *et al.* 2019), and the productive uses of energy in South Africa, Senegal, and Rwanda (RA2, University of Twente *et al.* 2019).

In terms of the content of the research, the combination of both qualitative and quantitative methods was found to be essential to this research programme. Both qualitative and quantitative research enriched the understanding and provided eye-openers. Both qualitative and quantitative methods were effective in giving women 'voice'. For example, quantitative data on aspirations of men and women in the study on the street food sector (RA2, University of Twente *et al.* 2019) provided innovative findings that are not found in many qualitative studies, and qualitative methods were effective in learning from exceptions that would be lost in presenting only the averages, such as the stories of women who venture into 'male' professions or how men experience their gender roles (RA6, IDS and GIZ 2019).

Quantitative data in the study based around an RCT provided evidence on both business development and social impacts. The development of quantitative data for technical, social, and economic aspects of the research programme has been useful, and an added contribution to the gender studies field.

National-level statistics were hardly used for analysis in this research programme. An exception is the R4 study on LPG in Indonesia (Kusumawardhani *et al.* 2017), in which a quantitative analysis of macro-level national statistics was performed on the topic of income groups reached through subsidy mechanisms. However, the existing macro-level data, and the lack of gender-disaggregated data for the topics studied, do not allow for useful analysis for many urgent questions in the field of energy and poverty. Finally, also for the communication of findings, the multimethod approach is beneficial in targeting different audiences, both in numbers and through stories or quotes.

### 3.3 Framework development

The development of a framework had the objective of instigating and providing inputs to discussions of generalisation for each project and of developing cross-cutting findings, especially for the development of a synthesis report that targets a broad and international audience.

The framework was adapted from standard causal energy chains, from energy intervention to socioeconomic impacts. Such chains are also used by the World Bank, including the prominent central positioning of the Energy Results Chain in the background document to the Multi-Tier Framework (Bhatia and Angelou 2015). The simplified framework as presented in this article was used for the development of common concepts and indicators and used, for example, for both the call for proposals in 2014 and the presentation of findings, such as at the Sustainable Development Goals High-Level Political Forum (ENERGIA 2018). Participatory sessions at annual meetings to elaborate and detail the framework to capture more in-depth insights led to the identification of common research interests in a very complex mapping of interlinkages of factors, effects, and mechanisms of influence. However, it was found that a single framework was not appropriate to capture the essence of each of the studies. For instance, the energy chain focuses on energy supply characteristics as a major factor in reaching outcomes, while some studies used (complementary) frameworks that focused more on issues such as social norms, power relations, and political economy.

The experience with the participatory development of an emerging framework is that differences between disciplines and selected theoretical frameworks can be too large to bridge. If a common framework for analysis had been a priority, for example to ensure options for cross-cutting analysis and the presentation of overarching findings, the selection of projects would have been based on a predefined detailed framework. However, the flexibility of the approach used had the advantage of allowing learnings from diverse disciplines and of introducing local perspectives.

A common aspect of the frameworks and approaches was the attention to context and relevance from the target group perspective. Even more than expected, the local and personal perspective steered the research well beyond case study level. The approaches based on local

perspective led to findings that would not have emerged or might not have been prioritised through the use of predefined questions. An example of a grounded approach is the role of appliances as central from a user perspective (rather than only energy supply). The women's perspective brings a much stronger focus on social norms, gender roles, and traditions associated with ethnicity and religion rather than with technology or economic issues.

### 3.4 Indicators on gender and energy

One of the initiatives cross-cutting the research projects was the development of harmonised *indicators*<sup>4</sup>

- To develop a common language and interpretation of indicators, both to stimulate discussions between teams and for use in joint outputs of the programme such as the synthesis report;
- To provide a platform for the sharing of experiences with methodological, conceptual, and contextual issues between research teams; and
- To develop policy messages on the priority indicators on gender and energy.

The discussions on indicators made very clear that 'going beyond access' to dive into understanding of benefits of energy supply required the development of indicators at every level.

At the level of the attributes of energy supply, indicators provided a clearer profile of gender issues that can be addressed through energy supply – such as the location of energy supply in relation to the use by women for cooking and for productive uses. Such indicators could be added to the attributes of energy access mentioned in the Multi-Tier Framework.

Within the level of outcomes, general indicators such as agency, economic empowerment, social empowerment, and transformative change were earmarked as relevant cross-cutting concepts rather than as indicators for specified causal links. The metrics for such indicators are largely context specific. Typical indicators such as time use per energy service (e.g. the use by women of light in the evenings for productive uses) may reflect increased opportunities at the individual level but are not necessarily related to positive developments at the societal level. For most energy services, ownership of appliances such as rice cookers or mobile phones (rather than time use) was seen to provide a first impression of their potential benefits. Gender-disaggregated data on such indicators can provide an idea of the extent of inequity. However, to capture the nature and occurrence of outcomes, and to understand their attribution to energy supply, evidence from the perspective of the user on benefits and barriers is needed to optimise the validity of findings.



To facilitate discussions on external validity between research areas, the research programme also endeavoured to identify a priority list of indicators for three categories of context factors – social (gender), geographic/infrastructural, and economic – and to position these in national-level statistical data on the same indicators. Eventually, such data were mainly presented as background information while discussions on external validity and comparisons between field study areas were based on case studies with indicators specific to the research questions. The availability of national-level data relevant to the gender and energy nexus such as the level of electrification, the United Nations Development Programme Gender Inequality Index, or the female share of employment in senior and middle management was found to be low. To add to the potential for learning from cross-country comparisons, a ‘wish list’ of priority indicators was developed by the members of the research programme, compiled from different sources and based on programme experience. This list included aspects of gender sensitivity of the energy chain, such as specification of gender issues in energy policy documents and the minimum cost of a unit of cooking fuel.

### **3.5 Developing a gender and energy research community**

The establishment of a research community in a new nexus of expertise, at the interplay between very different sciences, has been an important outcome of the Gender and Energy Research Programme. The research programme stimulated and developed an active learning agenda, for instance by organising webinars and annual workshop sessions on gender concepts, indicators, and policy influencing, by organising inputs to projects from members of the programme with different fields of expertise, and presentations and discussions with all programme members. An even more important factor in learning, though, has been the high level of collaboration between researchers from different organisations, from different disciplinary and country backgrounds, with the objective of optimising the credibility of research.

Whereas research in the field of energy is typically characterised by ‘a worryingly low number of women publishing in the field, a possible underrepresentation of social science and humanities disciplines and methods, and a lack of interdisciplinarity’ (Sovacool 2014), the experience in the Gender and Energy Research Programme has been very different, with a shifted balance on each of these topics.

Collaboration between disciplines may be one of the main innovations of the research programme. Owing to the nature of the research field, each project was multidisciplinary, with collaboration between disciplines, and first steps were made into the development of a new trans-disciplinary discourse. At the same time, in developing a framework and indicators across the research programme, as illustrated above, the collaboration between disciplines was a major challenge. In energy research, collaboration between researchers from different disciplines is most common in the fields of economics and engineering (Sovacool 2014), while the disciplines represented in the Gender and

Energy Research Programme ranged from anthropology and political sciences to econometrics and engineering, presenting a large range of priorities and research methods, and even convictions about the essence of science.

Collaboration between disciplines took place mainly within research consortia. To address the multidisciplinary nature of research questions, consortia were formed of experts from different disciplinary backgrounds. Research consortia used a variety of approaches to bridge disciplinary differences. These ranged from consecutive, or parallel, approaches – with the research framework defined from one main discipline – to ones using an integration of concepts and research methods. For instance, as in the literature survey performed as part of the RA6 project:

The combination of insights from different disciplines informs a framework of analysis that challenges the predominant neoclassical view of electricity as a gender neutral technological shock to households and enterprises... We use concepts such as occupational segregation, agency, or the care economy from feminist economics, as well as social norms, from anthropology (Pueyo and Maestre 2019).

At the programme level, collaboration between research teams was supported in a number of ways. One innovative approach was the development of smaller collaboration projects between research teams on topics of shared interest. This collaboration further extended the level of learning from research disciplines (e.g. political economy) and comparisons between contexts and energy sources, and through sharing of literature and data.

Whereas Sovacool (2014) identifies a general underrepresentation of women in energy research, the gender distribution of researchers within the programme was balanced, with in total 71 female researchers and 56 male researchers (with 88 per cent of researchers from the South). With eight of the nine research teams being led by women, it is safe to conclude that the gender balance was not biased towards men. As gender is not an issue only for women, we consider it at least as relevant that many male researchers have developed or built on their practical experience in gender research. It is the quality of the findings, the good reputation of researchers, and the networks of the researchers that are currently influencing policy.

Another dimension of diversity of the members of the research programme that contributes to the quality and credibility of the research was the high level of representation of Southern partners. Of the 26 research organisations that constituted the research consortia, 19 project partners were from the South. One consortium was entirely Southern based. All partners (both Northern and Southern) had experience with research in a country that was part of the fieldwork.

As the overview in this article clearly profiles, the number of different perspectives for the development of synergies, reflections, and learnings is substantial. While many researchers indicated that they appreciated the opportunities for collaborations and exchange (as evidenced by this anonymous quote from a programme review: ‘Love the diversity of academic and policy perspectives and research methods! Excellent basis for generating rich and practical considerations for policymakers and future research’), others experienced the collaboration and level of exchange, especially the cross-project initiatives, mainly as a burden. Indeed, it requires substantial effort to bridge gaps to other geographic areas, research methods, and even disciplines. The results from the programme reflect that the many gaps have been bridged, following on from the personal curiosity of the researchers to explore beyond boundaries and facilitated by the level of trust between the members of the research programme. As Robert Chambers states in his plea for a fundamental reflection on ‘knowing’ about development:

This entails epistemological, behavioural, and experiential transformations through synergies: of vocabulary and concepts; participatory ground-truthing; the behaviours, attitudes, and relationships of good facilitation; critical reflection and reflexivity; and principles, values, commitment, and energy (2017: 149).

#### **4 Concluding notes**

Developing evidence for policy on the gender equality of benefits of energy is an ambitious endeavour. In the ENERGIA Gender and Energy Research Programme, multimethod and multidisciplinary approaches have been essential in developing insights into mechanisms and factors that form and influence the links between energy policy interventions and outcomes on gender equality. By viewing the energy chain from the perspective of gender issues as experienced by men and women, the findings reflect the dynamic local reality of power relations and norms, and provide some indications of external validity. The research has contributed to the evidence base on gender differences in benefits from energy services related to gendered requirements and desired uses of energy services within households and between types of enterprises. The benefits of appropriate energy interventions can be significant and increase through targeted characteristics of energy supply and involvement of women in supply, but for effective approaches it is seen that contextualisation is needed to support the shifting of norms to increasing gender equality. The gender and energy research community that has been established is well positioned to contribute to furthering the messages that emerged from this research programme, and welcomes further expansion of the evidence base to increase the effectiveness of energy policy in optimising development outcomes for all.

### Notes

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- † This article is based on the findings and experiences of all the research teams in the Gender and Energy Research Programme, the Principal Investigator of the programme, and the members of Technical Advisory Group. With special thanks for feedback on a draft of this article by Joy Clancy, the Principal Investigator, and Soma Dutta.
- 1 Annemarije Kooijman-van Dijk, Research Programme Coordinator, ENERGIA, International Network on Gender and Sustainable Energy, The Netherlands.
  - 2 The Multi-Tier Framework (MTF) was developed under the SEforAll initiative by the Energy Sector Management Assistance Program (ESMAP) to monitor and evaluate energy access based on multidimensional aspects of quality of supply. It distinguishes between tiers of access, from Tier 0 (no access) to Tier 5 (the highest level of access).
  - 3 The MTF specifies the following attributes of energy supply:
    - (1) For electricity – capacity (to supply the loads for different energy services), availability, reliability, quality, affordability, formality, and health and safety. These attributes are used to define the tier of access that is available at local or country level, ranging from Tier 0 (no access) to Tier 5 (full access) where higher tiers stand for larger versatility of the supply to meet energy demands at household level.
    - (2) For cooking, the MTF defines a separate set of attributes that describe the combination of fuel and stove: fuel availability, affordability, convenience, cookstove efficiency, and health related: cooking exposure, and safety.
  - 4 We use the term 'indicators' to refer to the specific factors that are studied under general issues of interest, and the term 'metrics' to refer to the measurable quantification/qualification of the indicator. For example, the Multi-Tier Framework (Bhatia and Angelou 2015) assesses the level of energy access, where availability of supply is one of the indicators and the metric provided is the number of hours per day for household electricity.

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