



# Gender and Fossil Fuel Subsidy Reform: Current status of research

GSJ REPORT

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## Gender and Fossil Fuel Subsidy Reform: Current status of research

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## Executive Summary

This research project aims to investigate the impacts from fossil fuel subsidy reform on poor women in Bangladesh, India and Nigeria. This initial scoping report finds no primary, quantitative research on the question of the gender-differentiated impact of fossil fuel subsidy reforms. However, there is a large body of literature linked to energy access and gender; growing research surrounding energy subsidies, access and impacts on the poor; growing research regarding solar energy and cook stoves and gender; and a body of research assessing targeted cash transfers (sometimes used as mitigation measures to energy sector reform) from a gender perspective.

The report explores the literature by first providing a global picture of energy subsidies, energy access and gender empowerment as background to the research. It then reviews the literature regarding access to energy and gender empowerment (Section 3.1), fossil fuel subsidies and gender (Section 3.1.1), subsidy reforms and gender (Section 3.1.2), and mitigation measures such as cash transfers and targeted energy interventions (Section 3.2). Finally, it provides an overview of energy subsidies and reform with implications for gender across this project's three focus countries: Nigeria (Section 3.3.1), India (Section 3.3.2) and Bangladesh (Section 3.3.3). Case studies on Peru, Mexico and Morocco on the impact of energy subsidies, their reform and potential targeted mitigation opportunities for women are also included in Appendix I.

The literature review reveals that the impacts of energy subsidies, the impacts of energy sector reform, and workable or appropriate mitigation measures associated with any reforms are extremely context specific. Nonetheless, strong evidence indicates that in many countries a significant proportion of subsidy benefits are captured by well-off households, suggesting a general phenomenon of energy subsidy inefficiency if the desired policy objective is to target income and energy access benefits to women and men living in poverty. As a result, the research covers a broad range of fuel types and potential interventions, investigating these from the perspective of income, energy use and energy supply effects on gender (see Figure ES1 for a summary of likely impacts). The literature review synthesises a fuller body of research undertaken by national project partners in this project's three focus countries: the Bangladesh Institute of Development Studies (BIDS) in Bangladesh, Integrated Research and Action for Development (IRADe) in India, and Spaces for Change (S4C) in Nigeria. It is also based on a global review by the Global Subsidies Initiative (GSI) of the International Institute for Sustainable Development (IISD) on the literature on gender and energy sector reform and possible methodologies for exploring this area.

The report then sets out the main research questions and sub-questions for the next phase of work in this project, through the lens of women's welfare, productivity and empowerment. Subsequent research will focus on specific fuel types, including kerosene (for lighting and cooking in Bangladesh and Nigeria) and liquefied petroleum gas (LPG, for cooking in India). All of these countries have undergone or will experience energy sector reforms in these fuels (for example, LPG in India in 2015, and kerosene in Nigeria in 2016) and may see subsidies appear or disappear as an item of budgetary expenditure depending on world oil price fluctuations (for example, kerosene in Bangladesh in 2015). Two of these countries (India with the Direct Benefit Transfer for LPG and Pratyaksha Hastaantarit Laab schemes, and Nigeria with the Subsidy Reinvestment and Empowerment Programme) implemented specific mitigation measures to reduce the impact of rising prices due to subsidy reform across the population.

This research is focused in countries with key energy access issues, and in countries where governments are currently designing and implementing substantial energy sector reforms. We hope that the outcomes from this research will enable governments to understand and make informed choices regarding energy sector reform policy implementation and improved development outcomes for women. This research reviews the likely impacts from fossil fuel subsidies and their reform on gender, as well as how subsidies can be better targeted and distributed to increase gender empowerment and for the benefit of poor women in the future.

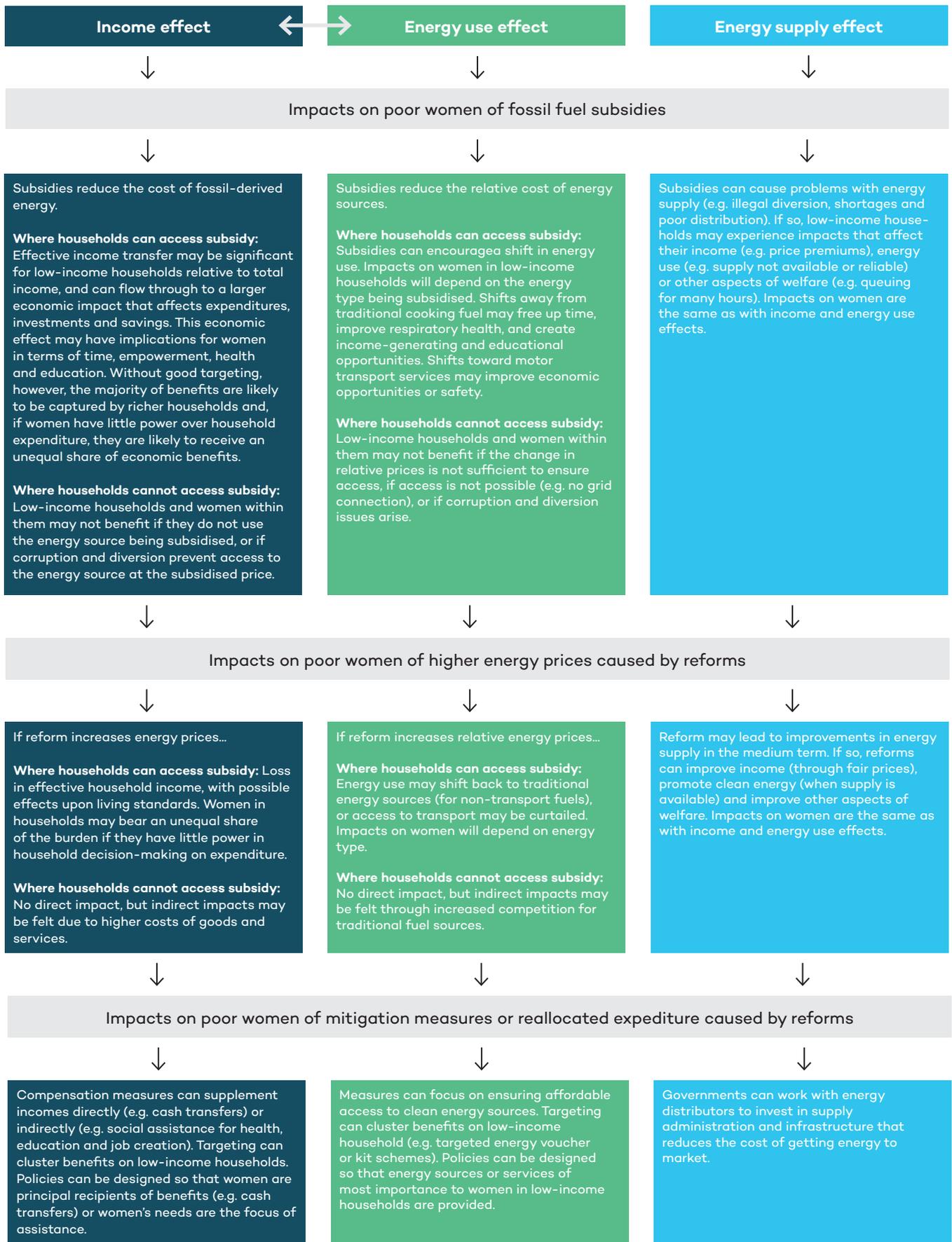


Figure ES1: Likely impacts on poor women from fossil fuel subsidies, their reform and mitigation measures.

Source: Authors

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## Abbreviations

ADB	Asian Development Bank
APEC	Asia-Pacific Economic Cooperation
BIDS	Bangladesh Institute of Development Studies
BPDB	Bangladesh Power Development Board
CCT	conditional cash transfers
DBTL	Direct Benefit Transfer for LPG
DFID	Department for International Development
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
ESMAP	Energy Sector Management Assistance Program
FEPC	Fondo de Estabilización de Precios de Combustibles
FGD	focus group discussion
FISE	Fondo de Inclusión Social Energético
FOSE	Fondo de Compensación Social Eléctrica
GETAT	Gender and Energy Technical Advisory Team
GSI	Global Subsidies Initiative
HKK	household kerosene (Nigeria)
ICSPWS	Improved Cookstoves for a Peru without Smoke
IDCOL	Infrastructure Development Company Limited
IEA	International Energy Agency
IFAD	International Fund for Agricultural Development
IISD	International Institute for Sustainable Development
IMF	International Monetary Fund
IRADe	Integrated Research and Action for Development
kgoe	kilograms of oil equivalent
LPG	liquefied petroleum gas
MPEMR	Ministry of Power, Energy and Mineral Resources (Bangladesh)
NGO	non-governmental organisation
NNPC	Nigerian National Petroleum Corporation
NORAD	Norwegian Agency for Development Cooperation
PDS	Public Distribution System (India)
PNSEE	National Program for the Substitution of Electrical Appliances
RAMED	Regime d'Assistance Medicale
S4C	Spaces for Change
SHS	solar home system
SREDA	Sustainable and Renewable Development Authority
SURE-P	Subsidy Reinvestment and Empowerment Programme
toe	tonnes of oil equivalent
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
WHO	World Health Organization

## Glossary of Key Concepts

Clean cook stoves	The Global Alliance for Clean Cookstoves (n.d.) rates cook stoves as clean if they meet minimum standards on efficiency, indoor emissions, total emissions and safety.
Empowerment	Empowerment is defined as ‘the process through which people take control and action in order to overcome obstacles of structural inequality which have previously put them in a disadvantaged position’ (ENERGIA, 2012).
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.
Fossil fuel consumer subsidy	A fossil fuel consumer subsidy is a policy that reduces the retail price of fossil-derived energy by shifting part of the cost burden onto other actors in the economy. Most often, the cost burden is shifted onto the public budget, where taxpayer money or foregone tax revenue is used to keep energy prices low. But costs can be shifted in other ways too: for example, by requiring energy distributors to operate at a loss. The economic cost of energy includes opportunity costs, so it is still a consumer subsidy if countries provide domestically produced energy at prices below the international market level. Fossil fuel subsidies do not truly reduce the cost of energy for a country; they simply alter who pays and how.
Fossil fuel producer subsidy	A fossil fuel producer subsidy is a policy that shifts the cost of energy production away from the companies that find, extract, refine and generate fossil energy and onto other actors in the economy. Most often, the cost burden is shifted onto the public budget, including where taxpayer money is used to provide project infrastructure or guarantees, tax cuts are provided to incentivise investments, and access is granted to government land or goods and services for free or at below-market prices.
Gender	Gender ‘refers to the socially-constructed attitudes, values, roles and responsibilities of women and men, in a given culture and location. These attitudes, values and roles are influenced by perceptions and expectations arising from cultural, political, economic, social and religious factors, as well as from custom, law, class, ethnicity and individual or institutional bias. Gender attitudes and behaviours are learnt and change over time’ (ENERGIA, 2012). As a social construct, gender is often defined in contrast with sex, which refers to the assignation of ‘male’ or ‘female’ to a body based on the identification of physical, biological differences.
Gender equality	Gender equality is a state where ‘there is no discrimination on grounds of a person’s sex in the allocation of resources or benefits, or in the access to services. Equality exists 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 may be measured in terms of whether there is equality of opportunity, or equality of results’ (ENERGIA, 2012).

Gender equity	Gender equity refers to ‘fairness and justice in the distribution of benefits and responsibilities. Gender equity is the process of being fair to women and men. To ensure fairness, measures must often be available to compensate for historical and social disadvantages that prevent men and women from otherwise operating on a level playing field. Equity leads to equality’ (ENERGIA, 2012).
Modern energy access	There is no universally accepted definition of modern energy access. Sustainable Energy for All (2013) states that there is growing consensus that ‘access’ should not be defined as a binary state (access or no access) but as a continuum of improvement against a number of metrics. This scoping paper defines modern energy access as the supply of fuels and combustion technologies that are reliable, convenient and do not cause indoor air pollution, as well as the increased rate of consumption of such fuels and combustion technologies. By this definition, improving modern energy access might include expanding the supply and increasing the consumption of electricity among households, as well as liquefied petroleum gas, clean cooking fuels, clean cooking stoves, advanced biomass cook stoves and biogas systems.
Non-solid fuel	Non-solid fuels include liquid fuels like kerosene, ethanol and biodiesel, and gaseous fuels like LPG, natural gas and biogas. This is in contrast to solid fuels like wood, charcoal, agricultural residue, dung and coal.
Pre-tax subsidy	A pre-tax consumer subsidy is one that reduces the retail price of energy before any kind of taxation is taken into account. Pre-tax subsidies can take many forms: for example, direct budgetary transfers to state-owned enterprises; legislation that requires energy marketers to operate at loss, with or without compensation; or the provision of domestically produced energy and prices below the international market level.
Tax subsidy	A tax subsidy is one that shifts the burden of energy taxation onto other actors. Opinion differs as to what should be included in this category. It is generally accepted that deviations from the established tax structure, such as exemptions from value added tax, are a subsidy. More controversial, but argued by the International Monetary Fund, is the idea that tax rates should reflect the full cost of a good or service to society, and any taxation below this rate is a subsidy. By this definition, tax rates that do not cover the costs of road infrastructure, local air pollution and greenhouse gas emissions are conferring a subsidy.

## 1.0 Introduction

The research area presented in this scoping report—energy sector reform, and specifically subsidy reform, and its gender-differentiated impacts—is rarely considered in the literature on energy, gender or subsidies. However, building on the premise that men’s and women’s experiences of energy are different, energy policy measures have the potential to have a different impact according to gender. Furthermore, given the centrality of energy in the daily lives of both men and women, there is every reason to expect that this impact could be considerable.

Fossil fuel subsidies are significant in both monetary terms and in terms of their impacts upon economic, social and environmental well-being. These impacts are increasingly well understood; furthermore, a significant and growing body of evidence shows that fossil fuel subsidies are, in the main, captured by the wealthier sections of society and provide less benefit to the poor and vulnerable. However, within this body of evidence, there is little examination of how specifically fossil fuel subsidies and their reform have gender-differentiated impacts.

This scoping paper is the first publication in a project that aims to examine these gender-differentiated impacts. Recognising that women are largely under-represented in decision-making processes relating to energy, and that women typically experience high levels of intra-household inequality, the research focuses specifically on exploring the impacts of fossil fuel subsidies and reform on women. In doing so, the aim is to identify how policies can best take account of how women experience and use energy, and ensure that the opportunities for improved gender equality and welfare gains are realised. The research focuses on low-income households in low- and middle-income countries, where the impact of subsidies and their reform on development in general, and on women’s development in particular, is likely to be greatest.

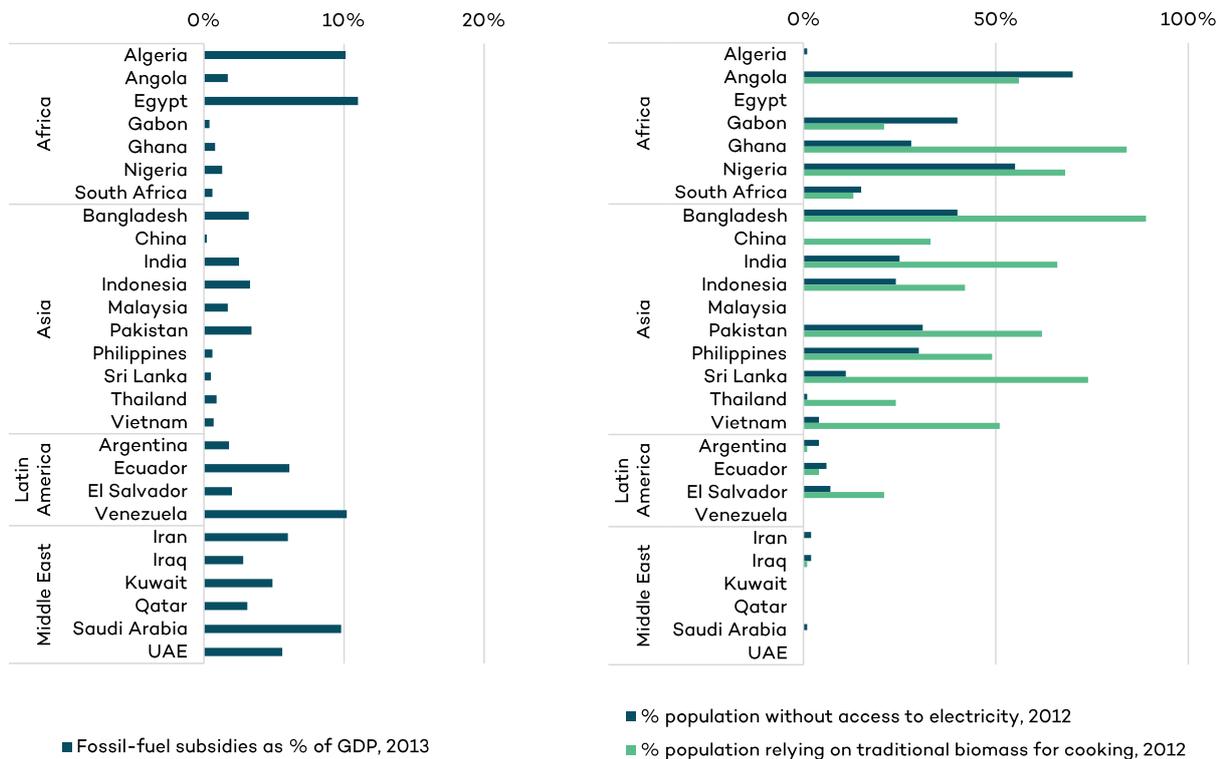
The first phase of work in this project (the scoping phase, described in this report), comprised a literature review of the existing work on gender and subsidy reform. The review summarises the state of knowledge and pinpoints the areas where further research could be of greatest value (see Section 3). The review confirms that existing research in this area is very limited and that the most appropriate course is to address some fundamental questions, namely: What are the impacts of fossil fuel subsidies and their reform in terms of women’s welfare, productivity and empowerment? Within this, the exact subsidies under examination and the possible reform options can be expected to vary according to the country in question. The second part of the scoping phase work was a methodological review aimed at identifying how best to explore these research questions (see Sections 4.2 and 4.3). This concluded that all country partners should aim to collect data on linkages between fuel subsidies, reform and energy consumption choices, and women’s welfare, productivity and empowerment, based on an initial exploration of existing secondary data and a mixture of survey, interview and focus group discussions (FGDs).

These research plans will be implemented in phase 2 of the project in Bangladesh, India and Nigeria. In Bangladesh, the research will focus on kerosene subsidies; in India, on liquefied petroleum gas (LPG) subsidies; and in Nigeria, on kerosene subsidies. In all three countries, the research will focus on how the existing subsidies affect poor women and the potential impacts upon women of reforming these subsidies.

## 2.0 Background and Methodology for Scoping Phase

Globally, governments spend around US\$550 billion every year subsidising fossil fuels to consumers (International Energy Agency [IEA], 2014a). With a high oil price, this can sometimes reach around 30 per cent of government spending, more than many governments spend on health and education combined (Merrill, 2014a).

Fossil fuel consumer subsidies lower the retail price of fossil fuel products (such as cooking fuels) or fossil-derived energy services (such as electricity), so a positive correlation between subsidy expenditure and energy access might be expected. However, with the exception of resource-rich North African and Middle Eastern countries—where historical patterns of development have generally resulted in almost universal access to electricity—the provision of significant government subsidies to fossil fuels is rarely well correlated with high levels of electricity access and low levels of traditional biomass usage (see Figure 1). For example, Bangladesh, India and Nigeria are all large subsidisers of fossil fuels, with 2013 expenditure on subsidies amounting to 3.2 per cent of GDP in Bangladesh (including electricity and kerosene subsidies), 2.5 per cent of GDP in India (including electricity and LPG subsidies) and 1.3 per cent of GDP in Nigeria (including kerosene subsidies).<sup>1</sup> Yet in Bangladesh in 2013, 40 per cent of the population lacked access to electricity, with 89 per cent relying on the traditional use of biomass for cooking; in India, 25 per cent of the population lacked access to electricity, with 66 per cent relying on biomass for cooking; and in Nigeria, 55 per cent of the population lacked access to electricity, with 68 per cent relying on biomass for cooking.



**Figure 1: Fossil fuel subsidies (2013) compared to shares of the population without access to electricity and using traditional biomass as their primary cooking fuel (2012).**

Source: Authors, based on IEA (2014b, 2014c).

<sup>1</sup> In many countries, kerosene is used primarily as a lighting fuel, but in both Bangladesh and Nigeria it also used in kerosene cook stoves.

Often, fossil fuel subsidies found within the energy sector can be ill-targeted, benefiting richer sections of the population that can afford to purchase larger volumes of energy products and services, rather than being aimed at the energy needs of the poor (del Granado et al., 2010). In 2014, almost 30 country governments attempted to remove and reform energy subsidies to fossil fuels (IEA, 2014a). Typically, governments argue that they are doing so in order to provide greater fiscal space and in order to release savings for reinvestment into more productive sectors—for example, in Indonesia most savings were reinvested into increased budgets for ministries, state-owned enterprises, and transfers to regions and villages, with much of this linked to poverty reduction and infrastructure (Pradiptyo et al., 2016). Based on a sample of 109 countries, Ebeke and Ngouana (2015) found that governments with high government spending on fossil fuel subsidies display consistently lower government spending on health and education by 0.6 percentage points of GDP in countries where energy subsidies were 1 percentage point of GDP higher.

**Box 1: The many faces of fossil fuel subsidy ‘reform**

Countries often announce the ‘reform’ of fossil fuel subsidies, and yet subsidies continue to burden budgets year after year. Why is this? In literature on fossil fuel subsidies, ‘reform’ is a broad term that can capture a wide range of possible policy changes, including the following:

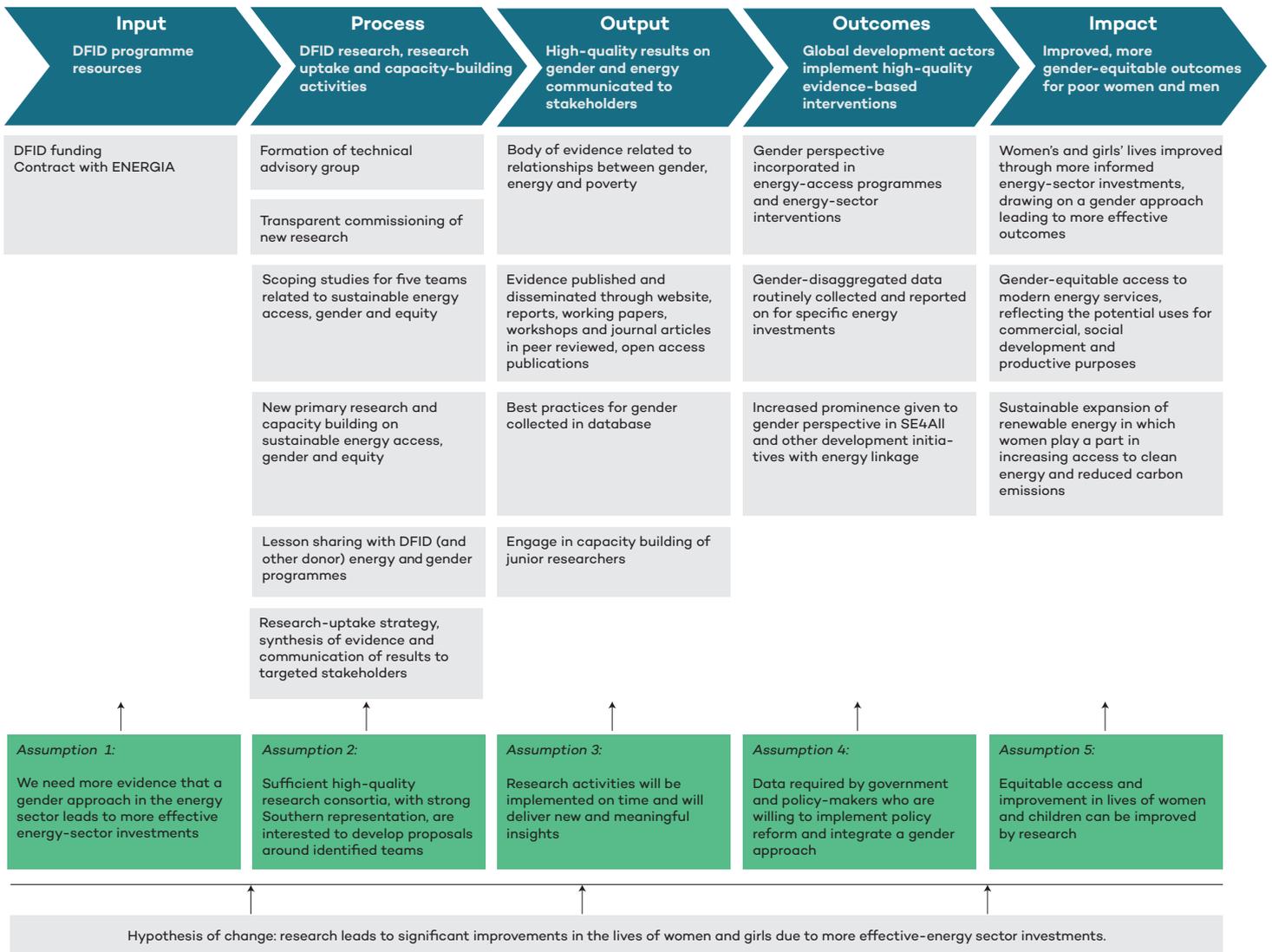
- Attempts to redesign or ‘rationalise’ subsidy policies (often in order to improve their targeting or to cut smuggling and leakage).
- One-off price-increases (often only partial increases that do not fully close the gap to cost-covering prices—even where the price gap is completely closed, the subsidy may not be ‘removed’, because subsidisation will be required if world oil prices rise high enough).
- The introduction of structural changes that permanently alter how fuel is priced and give the government non-subsidy options to assist households and businesses (this includes new pricing mechanisms and social assistance policies).
- Institutional changes (such as dismantling oil price funds or liberalising state-owned enterprises).

While many countries have ‘reformed’ their subsidies, then, it is easy for reversal to take place or for world oil prices to fluctuate in ways that effectively undo policy change. Structural and institutional reforms represent a longer-term exit from ineffective and inefficient subsidy policies, if well designed.

In almost all policy changes referred to as a ‘reform’, it is implicitly understood that the policy change will result in fiscal savings. In some cases, reform has taken place because subsidy expenditure must be reduced in order to prevent a fiscal crisis, so a large share of savings is not used elsewhere. In other cases, a large share of savings becomes available to invest in other development priorities. Any attempt to anticipate the impact of ‘reform’ ought to define exactly how savings are expected to be used: to pay down deficits and debt, to be redistributed elsewhere, or a combination of the two?

In reality, then, there is no such thing as ‘one’ reform. Reform has many faces, and research intended to explore the impacts of reform must be specific about the policy changes and the reallocation options under consideration.

Reforms can have a range of different impacts on different groups. They generally offer an opportunity for domestic debate—based on sound evidence—as to how government resources can be most effectively used, including investments in social assistance and providing an affordable and clean energy supply, both of which have implications for gender equality (see ENERGIA [2015], Figure 2. Theory of change for integrating a gender approach into energy sector interventions.). There is a significant and growing body of research regarding the impact and benefit of energy subsidies and reform with regards to the poor, but there is very little information or research regarding the impact and implications from energy sector reforms on gender equality.



**Figure 2:** Theory of change for integrating a gender approach into energy sector interventions.

Source: ENERGIA (n.d.)

This research builds on expertise within the Gender and Energy Research Programme of the International Network of Gender and Sustainable Energy, ENERGIA. As part of its Energy Sector Reform work stream, this research aims to look at the impacts and opportunities from energy sector reform and the removal of fossil fuel subsidies on gender, especially from the perspective of women in low-income households. The research identified examples of best practices from across the globe for implementing energy sector reform policies that have worked well for women, as well as exploring those that have not worked well. This research also reviewed methods that have been used to analyse the impacts of energy sector reform on different sections of society and gender, and drew from lessons learned in other sectors such as health and education. From this understanding, phase 2 of this project will include working with partners to build detailed plans for primary research to be undertaken in three countries undergoing active energy sector reforms (Bangladesh, India and Nigeria).

The scoping phase in 2015 was based on the following methodological approaches with various outputs:

- **Literature review:** Five internal papers, one reviewing the literature around gender and energy sector reform internationally, and the remainder across the three countries (one for Bangladesh, one for India and two for Nigeria, including one focused on cash transfer mitigation schemes).
- **Methodology review:** Four internal methodological papers looking in depth at the methodological approaches applied to such research (one for each country and one at the international level). These scoping papers are consolidated within this single scoping paper to provide an overview of the existing literature in each country and the potential methodologies to be employed. In 2016 some of these country papers are expected to be finalised and published for a domestic audience.
- **Research questions:** Discussion and agreement within the research area as to the specific research questions and how they apply within each country. Each country is very context-specific in terms of energy mix, timing, and type of energy reforms and gender empowerment. Identifying an overarching research framework and questions has been key, while also enabling partners to identify specific policy changes and energy issues that are pertinent and relevant to their country situation.
- **Initial outreach:** Outreach to many organisations through interviews, webinars and workshops in the process of exploring areas and opportunities for research and collaboration.
- **Internal collaboration:** Ongoing collaboration and sharing of information across the research team and the ENERGIA consortium as a whole throughout the year.

In 2015, the Global Subsidies Initiative (GSI) of the International Institute for Sustainable Development (IISD) coordinated and undertook research through in-country research partnerships with the national research institutes Integrated Research and Action for Development (IRADe) in India and Bangladesh Institute of Development Studies (BIDS) in Bangladesh, and the non-governmental organisation (NGO) Spaces for Change (S4C) in Nigeria. Research is planned to last from the beginning of 2015 until the end of 2018.

## 3.0 Review of the Evidence and the Latest Developments on Energy Sector Reform and Gender

This review of existing work on the gender impacts of fossil fuel subsidy reform confirms that, as set out in the proposal to ENERGINIA, little analysis exists in this area. There is, however, a body of literature exploring the gender aspects of energy use, and we briefly describe this literature below. In addition, research exists on the broader impacts of fossil fuel subsidy reform. Our literature review brings together these two areas of knowledge, along with evidence from country cases, to identify what is known about the gender impacts of subsidy reform, what can be hypothesised, and gaps to be addressed by further research. In turn, this review informs the methodology for the next phase of work—the primary research phase—which is described in Section 4.

Section 3.1 sets out the state of knowledge on the gender dimensions of energy use and the state of knowledge on energy sector reform, focused specifically on fossil fuel subsidy reform. Section 3.2 considers how adverse gender impacts of reform can be mitigated. Section 3.3 surveys the state of knowledge in the three partner countries: Bangladesh, India and Nigeria. Section 3.4 concludes by identifying more precisely the gaps in existing research and by setting out the research agenda, which is further explored in Section 4. In addition to detailed consideration of Bangladesh, India and Nigeria, our literature review draws on case studies of relevant reform attempts in other countries, namely Morocco, Peru and Mexico (see Appendix I).

### 3.1 The Energy Sector and Its Reform: Women's experiences

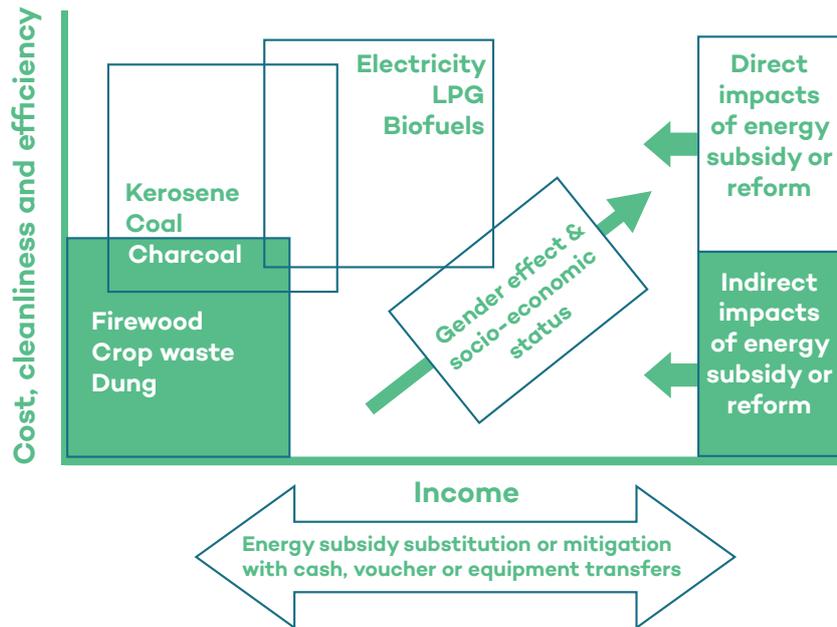
Existing literature on the gender dimensions of energy use points toward the different roles men and women take on—in the household, in the workplace, and in social and political spheres. Since the experience of energy varies depending on gender roles, changes in energy policy are likely to have impacts that will also vary according to gender (Skutsch, 2005). Frequently, women are excluded from decision-making with respect to energy: at the household level, where they may lack the power and resources to make decisions with respect to which energy sources are procured and used; at the political level, where they are often under-represented in policy-making and in decision-making bodies; and at the economic level, where they accrue less of the benefits associated with national energy resources. This section explores the gender-differentiated effects of energy use, focusing on how improved access to modern energy sources can affect women's welfare.

While literature on the gendered dimensions of energy use has a global span, encompassing countries at all income levels, the focus for our research and the following review is predominantly on low-income households in lower- and middle-income countries. This focus reflects the underlying motivation for the research: promoting gender equality in the development and implementation of policy as a fundamental prerequisite for sustainable poverty eradication (that is, poverty reduction which does not compromise economic, social or environmental health). Further, in these countries, energy policy and availability are changing rapidly as these economies develop, and the principle that securing women's access to modern energy sources as part of this development can further their economic, physical and social well-being is widely documented (see, for example, reviews by Haves [2012] and Köhlin et al. [2011]). We intend to continue this focus on low- and middle-income countries in the second phase of the project, which will involve primary research in Bangladesh, India and Nigeria.

Traditionally, in these countries most women's experiences with energy products and services revolve around domestic chores, in particular collecting fuel and using it in cooking (United Nations Industrial Development Organization, 2013).<sup>2</sup> With a shift from traditional fuels such as biomass to transitional

<sup>2</sup> This is, however, highly dependent on any given context: For example, men may also play an active role in fuel collection where it involves long-distance travel and purchases, or in cultures where women are restricted from leaving their homes (Khamati-Njenga and Clancy, 2005).

fuels such as kerosene, and from there to modern fuels such as LPG, piped natural gas, biogas, solar and electricity, women reduce the time spent on collecting biomass and also gain access to more efficient fuels and possibly labour-saving appliances. This progression was initially described as an energy ‘ladder’, with households moving sequentially through the fuel types and using only one fuel type at a time. Subsequent work has since developed the concept of an energy ‘stack’ or portfolio, which recognises that households are likely to use a range of fuels at any one time. The proportion of different fuels in the stack may vary according to needs and exogenous factors (van der Kroon et al., 2013) (see Figure 3).



**Figure 3:** The energy stack in relation to cooking fuels and energy subsidy receipt or reform.

*Source: Authors, adapted from Duflo et al. (2008), Holdren and Smith (2000), Merrill (2014b), and van der Kroon et al. (2013).*

Existing work traces a range of potential effects on women as households progressively use a larger share of modern energy sources. Following the approach used by the Gender and Energy Technical Advisory Team (GETAT) to the Norwegian Agency for Development Cooperation (NORAD) (GETAT, 2010), these effects can be broadly grouped into those on welfare (quality of life), productivity (income-generating potential) and empowerment (power in decision-making, control of assets, participation). Below, we describe and further discuss the primary effects that have been ascribed to access to modern energy sources in terms of improving women’s standard of living, grouped under these three headings.

Many of the effects described below relate to time savings that arise as a result of improved access to modern energy sources. A range of sources document the existence of these time savings and the pathways through which they occur (see, for example, Khandker et al. [2014] on solar lighting in Bangladesh and IRADe [2014] on the switch from kerosene to LPG in India). First, it may take less time to secure energy products or services—for example, the collection of firewood. Second, it may take less time to execute chores as a result of using more efficient energy products and services. Cooking with natural gas, for example, is more efficient and takes less time than cooking with kerosene, due to the higher heating value of the former, while electrification of water pumping may reduce the time spent by women and girls collecting water (Koolwal and van de Walle, 2010). Finally, access to lighting reduces the need to collect lighting fuel (Clancy et al., 2012), extends the working day and thus allows for other activities, and reduces the time needed for other tasks such as cooking (Winther, 2014).

**Box 2: The role of labour-saving devices**

Electrification opens up the possibility for the introduction of labour-saving devices, which can be significant in reducing the time allocated to household chores. However, in the early stages of development, the primary uses of electricity tend to be for lighting and then television (Independent Evaluation Group, 2008).

The introduction of community-level projects that use electricity can have a significant impact in terms of saving time for women. Evidence from Tanzania shows that following the introduction of electric milling equipment, the increased time available to women was sufficient for establishing small enterprises (Maleko, 2005).

At higher income levels, access to time-saving technologies and infrastructure is likely to be better, and women are more likely to benefit from access to modern energy sources (Budlender, 2008). For example, a study of the impact of household appliances on women in the United States in the 20th century found that the diffusion of appliances contributed to increased participation in the labour force in the 1960s (Coen-Pirani et al., 2010).

The extent of time savings for women will vary depending on the energy source introduced and how this relates to women's responsibilities.<sup>3</sup> While lighting in particular can lead to time savings (through extended working hours or greater efficiency in performing tasks), it is often suggested that the time savings associated with more modern cooking fuels such as LPG and natural gas are more significant for women, because cooking is predominantly the responsibility of women in many cultures (Köhlin et al., 2011).

However, the ability of women to direct energy consumption choices in line with their best interest is dependent upon their position in the household. Where women have no authority to make decisions, and where they have limited bargaining power vis-à-vis male members of the household, their interests may not be reflected in the energy source used. Doss (2011) surveys the literature and confirms that intra-household dynamics affect household decision-making, including consumption choices. In particular, if decisions about energy type and how this energy type is used is made by the male member of a household, the priorities of women may not be taken into account (Danielson, 2012). For example, although improved cook stoves can have greater impacts on health and living conditions than improved lighting, a male head of household may choose to prioritise lighting, since the stove does not relate to his area of responsibility (Baruah, 2015).<sup>4</sup>

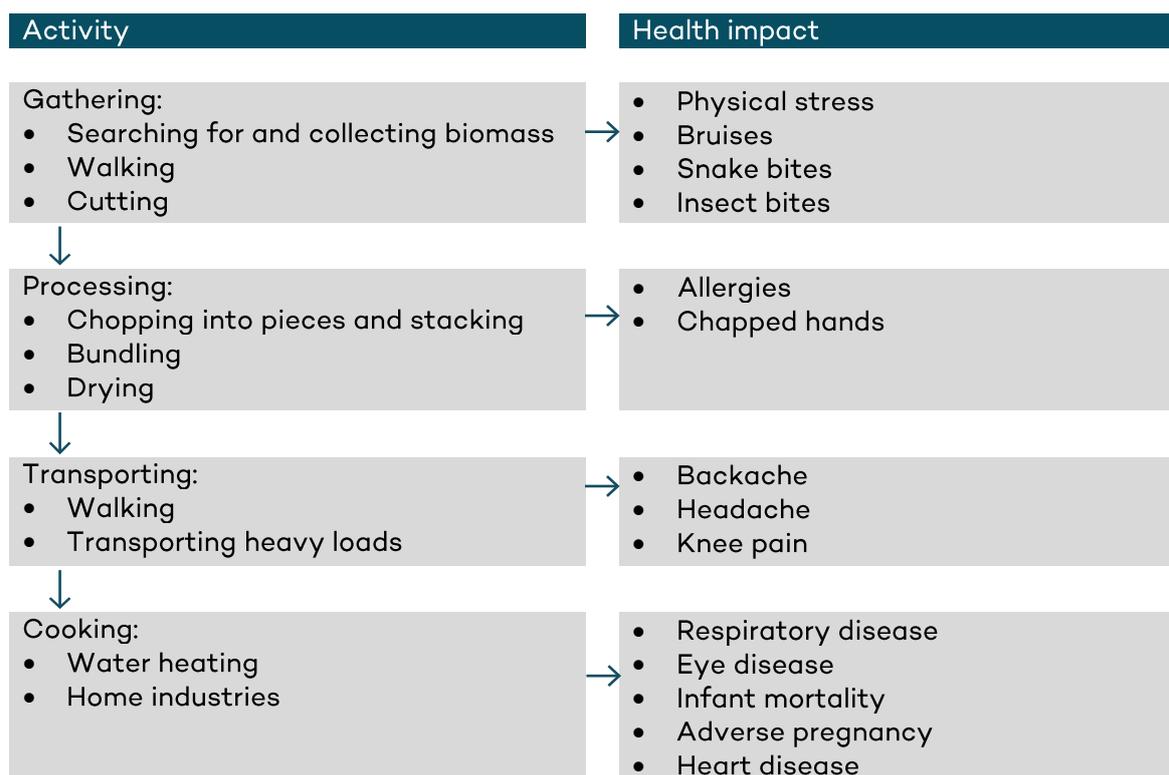
Assuming that women do realise time savings from the introduction of modern energy products and services, the way in which women reallocate time savings will depend upon the specific needs and preferences of the population in question, and the effect of these allocations on women's welfare will vary. Clancy et al. (2012) cite a range of studies that show differing responses by women in terms of how they use the time previously spent collecting firewood: whereas women in South Africa used the time to rest, women in Tanzania engaged in income-generating activities. Moreover, the effects of better access to modern energy sources may be an increased workload for women. Clancy et al. (2012) cite a study in Sri Lanka showing that women allocated time savings to housework and childcare, a finding replicated in a study of electrification in Peru (Fernandez-Baldor et al., 2014). A study in China found that women were able to take over more of the tasks previously allocated to men, thus enabling migration of men to urban areas, leaving women with more household responsibilities and fewer resources (Institute of Development Studies, 2003). These findings suggest that access to modern energy sources has the potential to add to the burden of labour for women and to intensify the gendered division of household

<sup>3</sup> In some cases fuelwood collection is the responsibility of men, and women will not necessarily experience time savings in this respect, (see, for example, Khamati-Njenga and Clancy, 2005). Relatedly, it has been observed that in some cases, increased access to modern fuels is associated with a declining role in fuel management for women and an increasing role for men (Parikh, 2011).

<sup>4</sup> Danielson (2012) also notes that women themselves may internalise social norms regarding their place in society and give lower priority to their own needs and wishes than to those of other household members, and similarly choose not to invest, even where they are the primary decision-maker.

tasks. Reflecting this diversity of responses to increased time savings, the outcomes discussed below should be considered as a list of possible effects, not all of which will apply.

**Welfare.** There is substantive evidence showing that indoor air pollution from biomass fuels is a cause of respiratory health problems (Fullerton et al., 2008). One estimate suggests that in 2012, 4.3 million deaths were attributable to household air pollution from cooking with solid fuels (World Health Organization [WHO], 2014), and as a result of pneumonia (12 per cent), stroke (34 per cent), ischaemic heart disease (26 per cent), chronic obstructive pulmonary disease (22 per cent) and lung cancer (6 per cent). Adverse health outcomes associated with indoor air pollution include asthma, bronchitis, tuberculosis, eye conditions such as cataracts, low birth weight and heart disease (Ndwiga et al., 2014). Since women and children tend to spend more time indoors than men, and because they are responsible for cooking, they are more likely to experience these effects (see, for example, WHO [2004] and Fullerton et al. [2008]). Women exposed to indoor smoke are three times as likely to suffer from chronic obstructive pulmonary disease, such as chronic bronchitis, than women who use cleaner fuel types (WHO, n.d.). Further health impacts are associated with the collection of biomass fuels. In a case study of the north Indian state of Himachal Pradesh, Parikh (2011) found that biomass fuel collection was primarily performed by women and included risks such as spinal, neck and head injuries, bruising and cuts, and exposure to attacks by animals (see Figure 4). The introduction of modern energy sources which reduce the reliance on biomass can address these adverse health consequences.



**Figure 4: Biomass fuel chain and health impacts.**

*Source: Adapted from Parikh (2011).*

Kerosene is sometimes grouped with ‘clean’ fuels (along with LPG, natural gas and electricity) and sometimes with polluting fuels (along with coal and biomass). An extensive literature review of the health impacts of kerosene in cooking, heating and lighting found that when using kerosene for cooking, there was ‘some evidence that emissions may impair lung function, promote asthma, and increase infectious illness and cataract risks’ and that for kerosene lighting there were very few (two) studies with links to tuberculosis risk and acute lower respiratory infections (Lam et al., 2012, p. 424–425). The

review highlighted that kerosene ‘may have some health consequences, not only because of poisonings and fires, but also because of exposure to emitted pollutants. Given the widespread use of kerosene lamps and stoves, these exposure sources should be much more extensively investigated’ (Lam et al., 2012, p. 426). With respect to subsidies for kerosene, the study concluded that given ‘the potential risks of kerosene, policymakers may consider alternatives to kerosene subsidies, such as shifting support to cleaner technologies for lighting and cooking’ (Lam et al., 2012, p. 426).

Positive health outcomes have also been reported as a result of refrigeration following the introduction of electricity. In the home, refrigeration lowers the risk of food poisoning (O’Dell et al., 2014). In healthcare facilities, refrigeration enables conservation of vaccines and medicine (Cecelski et al., 2005). In the work environment, refrigeration can facilitate viability of microenterprises focused on preparing and selling food and drink (for example, a study of Senegal showed that electrification allowed women to set up businesses selling cold drinks [Raub, 2013]). However, empirical evidence on these outcomes has not been identified, and it is not clear that these benefits have different outcomes for women and men (Haves, 2012)

Another positive effect on welfare that has been attributed to the introduction of modern energy sources is reduced levels of drudgery. A wide range of evidence suggests that women’s working days tend to be longer than those of men: for example, data from the United Nations suggests that in developing regions, the average working day is 50 minutes longer for women than for men (United Nations Department of Economic and Social Affairs [UNDESA], 2015). For further examples see Cecelski and Matinga (2014) and Gelb and Palley (2009). Reducing the burden associated with collecting, preparing and using traditional fuel sources may shorten the length of the working day. Further, it can reduce the intensity of the working day by alleviating physical stress and hardship (Ndwiga et al., 2014; Parikh, 2011), with the introduction of labour-saving devices further enhancing these positive effects. Finally, the time savings associated with the transition to modern energy use may enable women to spend more time resting (see Green [2001] on South Africa).

**Productivity.** One of the effects ascribed most frequently to improved access to modern energy for women relates to their ability to engage in income-generating activities—in the home, in the informal sector or in the formal sector. Possible pathways for this effect include increased supply of female labour to the employment market as the time spent on household chores, particularly fuelwood collection, reduces. Two empirical studies looking at employment effects of increased electrification in South Africa (Dinkelmann, 2011) and Guatemala (Grogan and Sandanand, 2009) found that electrification leads to an increase in female employment in the order of 9 percentage points, and attribute this to women spending less time on domestic chores. Other studies similarly highlight the increased opportunities for income-generation activities that result from spending less time on household chores, including Sankrit (2015), who identified increased incomes for women home workers after electrification in Bihar, and Barkat (2002), who found that electrification increases the time that women spend on income-generating activities in Bangladesh.

Alternative pathways by which modernisation of energy services could lead to increased opportunity for income-generating activities include increased demand for labour as a result of electrification in the local community (see Köhlin et al. [2011] for general discussion), opportunities to participate in the energy value chain (see Baruah [2015] on the renewable energy sector in India specifically as well as O’Dell et al. [2014] more generally), and availability of energy to run small businesses or work at home (see Sankrit [2015], who describes how access to light enabled homeworkers and self-employed workers in Bihar, India, to extend and enhance their business activities). However, ability to realise and profit from these potential opportunities depends upon whether women are empowered to do so (see following discussion).

**Empowerment.** Empowerment has been defined as ‘the ability of women to access the constituents of development—in particular health, education, earning opportunities, rights, and political participation’ (Duflo, 2012, p. 1053). Educational opportunities and outcomes have been closely linked to women’s empowerment, by enhancing their bargaining power within a household (Duflo, 2012).<sup>5</sup> Looking at the direct effect of energy access on educational outcomes, there is some anecdotal evidence suggesting that access to modern energy products and services improves educational opportunities for girls—for example, a study in Tunisia suggested that, as street lighting was introduced, parents became more likely to send girls to school, as they were less concerned about security (Cecelski et al., 2005). However, there is little empirical evidence substantiating a gender-differentiated effect (that is, boys seem equally likely to benefit from modern energy access). With respect to women’s educational advancement, again, there is little empirical evidence suggesting that this is enhanced by access to modern energy, although some studies indicate that women use time savings and the extension of the day to study (see Energy Sector Management Assistance Program [ESMAP] [2004], which found that electric lighting made it more likely that women will read in the evening).

Access to modern energy sources directly enables empowerment in several ways. The first is access to televisions, which increases awareness of gender rights and issues (see, for example, the Asian Development Bank [ADB] [2010] in Bhutan, and Matly [2003] in Indonesia and Sri Lanka). Empowerment also comes through improved security as a result of street lighting and thus greater mobility (see, for example, United Nations Development Programme [UNDP] (2013) on India) and reduced vulnerability when collecting fuelwood (see, for example, Matinga [2010] on Kenya, Sudan, Uganda and Ethiopia). Finally, increased time availability results in greater participation in social and civic life (see, for example, Katuwal and Bohara [2009] on the impacts of biogas installations in Nepal).

However, most commonly, the relationship between empowerment and modern energy access has been considered in terms of access to income-generating activities and thus to financial resources (see, for example, ECOWAS Centre for Renewable Energy and Energy Efficiency [ECREEE] [2014] on West Africa, and Sheikh [2014] on India). The effect that increased access to modern energy has upon women’s economic empowerment will depend upon the specific structures governing the household and the society in question. First, there are a number of proximate conditions that need to be met if women are to participate in the labour force—amongst others, these include ensuring that women have the required level of education and that women have access to credit needed to set up businesses (ECREEE, 2014). However, more fundamentally, social and cultural factors may hinder women’s empowerment—in some contexts, women may not be permitted to enter employment (O’Dell et al., 2014) or, if they do, any income they earn may be considered the property of male members of the household and a woman may not have discretion over how this income is used or the right to accumulate assets (Standal and Winther, 2015). If women’s empowerment is incomplete, their ability to realise fully the benefits of improved access to modern energy sources will be curtailed—restricted to allowing them to perform their traditional roles as caregivers more efficiently, and possibly with a greater degree of comfort (Standal and Winther, 2015). Sustainable improvements in women’s lives require that both types of needs are addressed, with interventions not only addressing the ability of women to cope with their daily lives but also the empowerment of women (Elson, 1995).

There is some evidence that access to modern energy sources can improve women’s empowerment, either as a result of their direct participation in the energy sector or where access improves incomes by extending working hours or enabling more lucrative economic activities. A study in West Africa found improved participation by women in decision-making as a result of their role in community-level energy projects (ECREEE, 2014), while Standal and Winther (2015) found an improvement in women’s status and their participation in public and family decision-making following the introduction of women solar

<sup>5</sup> Empirical evidence suggests that the strongest effect relates to improved control over reproduction. See, for example, Mocan and Cannonier (2012) on Sierra Leone and Osili and Long (2008) on Nigeria.

engineers in Bamiyan, Afghanistan. However, realising the transformative potential of modern energy access is likely to depend upon identifying and addressing the unequal relations and structural barriers that exist, and incorporating these into the design and implementation of energy policies (Standal and Winther, 2015).

In summary, existing work shows that increased access to modern energy sources can have a positive effect on women, with a range of effects being identified. In particular, access can result in increased time for income generation and improved health as a result of reduced exposure to indoor air pollution, while there is less complete evidence on the effects upon women's empowerment. While the existing evidence does not always fully explain the causal pathways that apply, it does appear evident that the effects that apply, and how they apply, are highly dependent upon which energy sources are introduced, and, in particular, the context in which they are introduced (further discussion in Clancy et al. [2012]; Haves [2012]; Köhlin et al. [2011]). Correspondingly, designing and implementing energy interventions (including subsidy reform and any mitigation measures) needs to take into account the specific characteristics of a population if positive outcomes for women (and men) are to be realised and maximised.

A challenge for policy-makers is that context is rarely homogenous across an individual country. Rather, subcultures related to geographical area, ethnicity, religion, education, employment and other characteristics may lead to subtle or dramatic changes in the interrelationships of men and women in one household and another. In particular, while there is some evidence that women's empowerment can be improved through better access to modern energy, this cannot be presumed, and it will be dependent upon the social and cultural factors that apply at a community and household level. Policy measures need to consider this carefully if the traditional roles of women as caregivers and household managers are not to be further entrenched, and if women are to fully access the long-term benefits of modern energy.

### **Box 3: Gender inclusion in access to energy: The Indian experience**

India has the largest concentration of population (841 million) using biomass for cooking—including partial users—with inefficient stoves (IEA, 2015a). The 2011 Census (Census of India, 2011) shows that solid fuels are the main source for cooking in 67 per cent of households in India. Access to clean cooking energy is an issue where a gender-differentiated approach matters, since traditionally women are responsible for cooking. As men and women take up different roles in society and the household, usage of energy also varies to a large extent (Skutsch, 2005). The quality and quantity of available energy sources impact the lifestyle choices and daily activities of both men and women.

Parikh (2011) points out that the widely prevalent biomass fuel chain in India consists of four stages: gathering or collection, processing (chopping, stacking, drying, etc.), transportation, and cooking. This is predominantly managed by women where they work as gatherers, processors, carriers or transporters. Further, they also take up the role as end users or cooks. A largely patriarchal society compels women to do arduous, time-consuming, and in many cases unhealthy but essential 'survival work' (ESMAP, 2004). Several studies have been carried out across India in different regions quantifying the time allocated and distance travelled by women and children for fuel collection (Agarwal, 1986; Laxmi et al., 2003; Parikh, 2011; Parikh and Laxmi, 2000; Shailaja, 2000). The drudgery, hardship and economic losses caused due to lost time spent on fuelwood collection and commuting long distances have not yet been examined in quantitative terms (Laxmi et al., 2003; Parikh, 1995; Parikh et al., 1999). Globally, 4.3 million deaths were attributable to household air pollution in 2012 (WHO, 2014). Balakrishnan et al. (2002) found that among 436 households in Tamil Nadu State in India, cooks experience statistically significant higher exposure to respirable particulate matter compared to non-cook men and women.

The traditional approach to energy and development policy has assumed gender neutrality, assuming that energy policies affect women and men equally, and as a result energy policy has been gender-blind. This fails to recognise that the needs of men and women are different (Clancy and Feenstra, 2006). The gender-differentiated impact of policy can be analysed using gender analysis to ensure that differences between genders are not inadvertently omitted (Skutsch, 2005).

### 3.1.1 Gender Dimensions of Fossil Fuel Subsidies

While there is a substantial and growing body of evidence on how women and men use energy differently, the evidence of the impact of energy policy on gender equality is limited, both in terms of establishing causality between energy policy and witnessed impacts, and in terms of estimating the magnitude of impacts once controlling for other possible variables. In particular, there is almost no readily available information directly examining the gender-differentiated effects of fossil fuel subsidies. However, while expenditure on subsidies is not gender-specific, it can, in common with other types of public expenditure, have gender-differentiated effects, and may help or discriminate against women. These discriminatory effects arise where policies fail to address the social barriers that women and girls face in accessing services or fail to take into account women's and girls' different needs and priorities (Elson, 2006).

Here, following one of the few studies looking at the impacts of energy subsidies on women (Merrill, 2014b), we draw on studies that assess how energy subsidies affect the overall population of a country and then infer how women may be affected as a result, based on knowledge about women's roles and equality within the larger population. We consider subsidies in two groupings: subsidies to fuels that are primarily used for transport, and subsidies to fuels that are primarily used in non-transport applications.<sup>6</sup> For each of these we identify three possible effects: an 'income effect', where the subsidies represent an effective transfer to household incomes due to lower fuel prices; an 'energy use effect', where the subsidies may influence the type or quantity of fuel that is used by the household to meet its needs; and an 'energy supply effect', where the subsidy changes the availability of an energy source for a household.

The analysis focuses, in the main, on the direct benefits and costs that accrue as a result of fossil fuel subsidies: namely, benefits such as decreased fuel prices for households that are in receipt of the subsidy and switching of fuel types by those same households. Indirect impacts may also take place, however, where energy pricing has a significant influence on the price and availability of other goods and services. For example, the reform of subsidies for vehicle fuels is often associated with an increase in public transport prices (where these are not also controlled) and an increase in inflation, affecting basic commodities like food (Beaton et al., 2013). Such indirect impacts can be associated with both subsidies and subsidy reforms. For example, in India, Parikh et al. (2012) found that diesel price increases created a short-term inflationary impact because of a knock-on impact on the cost of freight and commodities that are transported, but that diesel subsidies themselves had a long-term inflationary impact, due to impacts on the fiscal deficit and the government's monetary policy.

While we draw some general conclusions, it is important to be mindful that impacts are dependent upon a wide range of variables, including the specific fuels that are being subsidised, patterns of energy use in a particular country and the specific design of any subsidy system (see Section 3.1.1, where the importance of context is also discussed). For a diagram summarising the following discussion, see Figure 7.

**Subsidies to non-transport fuels.** Subsidies to non-transport fuels—fuels used primarily for lighting, heating and cooking—can have i) an income effect by reducing the price of the fuels in question, ii) an energy use effect by changing the relative prices of fuels such that use of the subsidised fuel increases, and iii) an energy supply effect by influencing incentives for fuel distribution and diversion.

The income effect suggests that by reducing the price of fuels (and goods and services using these fuels as inputs), the effective income of households already using that fuel should increase, thereby contributing to poverty reduction. As such, subsidies can act as a type of social security mechanism by

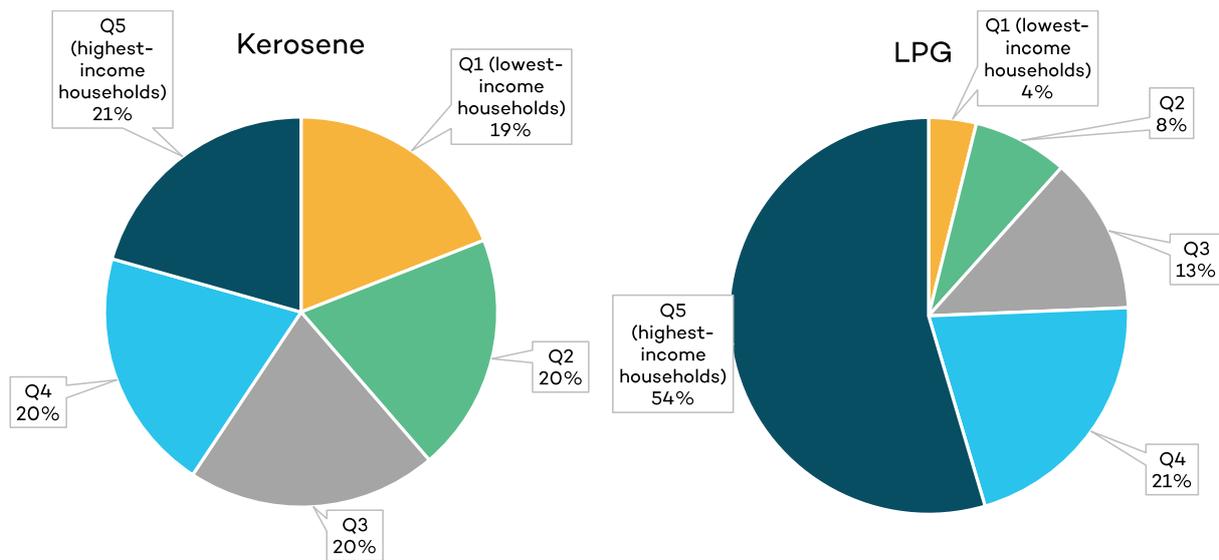
<sup>6</sup> However, note that in some cases the distinction is not clear. For example, kerosene is often used to adulterate diesel and in some countries (e.g. Thailand), LPG is also sold as an automotive fuel.

transferring income from government budgets to the wider population. There is evidence that subsidies can be instrumental in reducing poverty amongst the recipients. The International Energy Agency (IEA) et al. (2010) cite evidence from Yemen where petrol subsidies were estimated to reduce the incidence of poverty by 8 percentage points, as well as evidence from Morocco showing a reduction in the incidence of poverty of about 5 percentage points. Analyses looking at the impact of removing fossil fuel subsidies also show that, unless compensation mechanisms are introduced, this is associated with an increase in poverty levels (Beaton et al., 2013; Coady & Newhouse, 2006; and del Granada et al., 2012).

Despite this effect, it is widely recognised that richer sections of society (who typically consume a larger volume of energy products and services) often receive a greater proportion of the financial benefit than poorer sections of society. Subsidy benefits can also be diverted when subsidised fuels are illegally diverted for adulteration or resale in black markets. In cases where most low-income households do not use the subsidised energy source, or use only a very small amount, the associated income benefit will be limited (for example, where households continue to rely entirely or predominantly on traditional biomass). This tends to occur with respect to subsidies to energy sources further up the energy stack (LPG, natural gas and electricity). There is often inadequate supply of such energy sources to poor communities, a lack of purchasing power among poor households and a higher demand for these more modern fuels among richer households, each of which restricts the extent to which poorer households can benefit from the increased income.

The empirical evidence that exists confirms that fossil fuel subsidies tend to be highly regressive, with subsidies to energy sources further up the energy stack being more regressive. The IEA (2011) estimates that in 2010, the poorest 20 per cent received only 5 per cent of subsidies for LPG, 9 per cent of subsidies for electricity, 10 per cent of subsidies for natural gas and 15 per cent of subsidies for kerosene. Del Granada et al. (2012) conclude that ‘universal fuel subsidies are an extremely costly approach to protecting the welfare of poor households’. Their review, including 19 countries with LPG subsidies and 19 countries with kerosene subsidies, found that the direct benefits of LPG subsidies are badly targeted to the poor (the bottom 40 per cent receiving only 11.4 per cent of benefits and the top 40 per cent receiving 74.6 per cent of benefits) and that while kerosene subsidies are relatively more progressive, they are still poorly targeted, with direct benefits shared roughly evenly across all quintiles—the equivalent targeting performance that would be achieved by distributing benefits to households at random across a population (see Figure 4). An update to this analysis has since been published as a working paper (Coady et al., 2015), extending the sample to 23 countries for LPG subsidies and 31 countries for kerosene subsidies. It finds some marginal deviations around point estimates for specific quintiles, but confirms the same broad findings as regards the distribution of subsidy benefits: the bottom two quintiles receiving only 12.7 per cent of LPG subsidy benefits and the top two quintiles receiving 73.9 per cent; and a largely proportional distribution of kerosene subsidy benefits across each quintile. In many countries with a poor electricity supply, diesel is commonly used to power small-scale generators. No data exists on the regressivity of this specific usage of diesel, but it can be assumed to be significant, given the fact that low-income households will not own generators and can only benefit from such diesel use indirectly. Case studies of individual countries confirm this general trend: Section 3.3 reviews the evidence for Bangladesh, India and Nigeria, while Appendix I corroborates for Peru, Morocco and Mexico.<sup>7</sup>

<sup>7</sup> It should be noted, however, that the benchmark for regressivity will vary country by country. Aramide et al. (2012) note that in Nigeria about 68 per cent of the population lives on less than US\$1 a day and about 85 per cent on less than US\$2 per day. As a result, it may be appropriate for several quintiles to be the target of government assistance.



**Figure 5:** Share of direct kerosene and LPG subsidy benefits captured by different income quintiles.

**Source:** Authors, based on del Granado et al. (2012). Estimates for kerosene and LPG based on a summary across 20 country studies: Cameroon, Gabon, the Central African Republic, Senegal, Ghana, Mali (kerosene only), the Republic of Congo, Burkina Faso and Madagascar (kerosene only) from Africa; Bolivia (LPG only), Peru, El Salvador and Honduras from South and Central America; Bangladesh, Sri Lanka, Cambodia, India and Indonesia from Asia and the Pacific; and Jordan and Lebanon (LPG only) from the Middle East and Central Asia. Analysis based on household surveys and input-output matrices ranging from 1993 to 2007.

The **energy use effect** assumes that by decreasing the price of modern energy products and services, subsidies will result in an increase of modern fuels and a decrease of traditional biomass fuels in households' energy stacks, creating associated welfare, productivity and empowerment benefits. There is some evidence for the existence of this energy use effect. Anecdotally, Laan et al. (2010) report government claims that the introduction of LPG subsidies in Senegal resulted in an annual reduction of 70,000 tonnes of wood-fuel and 90,000 tonnes of charcoal, but it is not clear what share of this can be attributed to below-market pricing and what share to improved availability of supply, improved awareness and shifting cultural norms. Empirically, Kojima et al. (2011) conducted a Heckman-type regression model using household expenditure surveys in six countries (Guatemala, India, Indonesia, Kenya, Pakistan and Sri Lanka) to identify the variables of greatest significance in determining levels of LPG selection and consumption, and concluded that the most powerful effects on selection and consumption are household income, the price of LPG relative to other fuels, and level of education. Other studies of factors affecting fuel choice in particular countries also conclude that the relative price of fuels—amongst other factors such as education levels—are an important influence on the take-up of cleaner energy sources. For example, Hassen (2015) found that the price of liquefied natural gas affected take-up in urban China, and Alem et al. (2014) found that the relative price of coal and electricity affected the adoption of electric cook stoves in urban Ethiopia.

Nonetheless, many countries that subsidise non-transport fuels continue to see reliance on traditional biomass fuels as an energy source (see Figure 1), suggesting that subsidies are not wholly effective in driving a shift away from biomass and toward modern energy products and services for most poor households. This may be because subsidised prices are not low enough to fully enable energy access. It may be because of other barriers to access that must be tackled simultaneously. Ekholm et al. (2010, p. 5706), for example, observe that '[price] subsidies alone may be inefficient for promoting modern fuels, as the steep upfront investment costs are not affected', while development agencies have noted LPG start-up costs present a 'serious barrier to the uptake and regular use of LPG by low income households' (UNDP and ESMAP, 2003, p. 20). It may be due to linkages between energy subsidies and problems with energy supply (see subsequent paragraphs on the supply side effect for more information). It may also reflect instances where the consumption of modern energy products and services increases but the consumption of traditional biomass fuels remains fixed or diminishes disproportionately, due to cultural of traditional preferences for biomass fuels and a lack of knowledge about their risks.

In addition to their limitations in changing fuel use, the general regressivity of subsidies previously described also suggests that energy subsidy policies in many countries are highly inefficient: that is, there is a high absolute cost per low-income household converted to modern energy use. This is an opportunity cost for energy access and other development priorities. The efficiency of any given subsidy policy is not, however, a fixed characteristic, and energy subsidy ‘reform’ is a concept that includes policy changes intended to improve efficiency. Toft et al. (2016) describe recent LPG subsidy reforms in a range of countries (El Salvador, India, Mexico, Peru and Thailand) where subsidy removal has not been considered due to energy access concerns, and so reforms have instead focused on improving efficiency. The review found that the most promising schemes have used new technology such as mobile phones and smart cards to manage registries of beneficiaries, confirm the identity of eligible beneficiaries, track transactions and reduce abuse by unintended beneficiaries, typically reducing expenditure by a modest degree. In theory, such systems could be used to reduce expenditure significantly if they restricted benefits to only low-income households, but in practice Toft et al. (2016) identified no such case studies: most efforts to improve targeting were focused on preventing illegal diversion, while only minimal efforts were made to reduce the pool of total beneficiaries, largely due to political sensitivities.

Finally, subsidies may also have an effect on the **supply side** if they lead to illegal diversion, corruption and poor distribution that impairs the availability of fuels, potentially worsening access to modern energy sources for some households. The first of these problems, illegal diversion and corruption, can be substantial in scale and in severe cases entirely prevent low-income households from accessing energy products at subsidised prices. In India, for example, the National Council of Applied Economic Research (2005) found that 38 per cent of subsidised kerosene was diverted to the black market. In Nigeria, black market diversion of kerosene created shortages that led kerosene to be typically sold between ₦100 to ₦250 (US\$0.62 to US\$1.55) per litre, far above the official subsidised price of ₦50 per litre and, at the upper end of this range, above free market prices (Aramide et al., 2012).<sup>8</sup>

The second of these problems, poor distribution, can take place if it becomes uneconomic for distributors to serve remote or rural populations. In turn, this can create costs related to access or simply prevent some households being able to purchase subsidised fuel at all. In India, Shenoy (2010) found that inefficiencies in kerosene distribution resulted in some consumers in the city of Mysore in India queuing four to five hours for kerosene for days at a time until a supply cart arrived, while Merrill (2014b) reports that poor distribution networks means that many households in rural areas of India cannot purchase LPG. In a qualitative review of LPG markets in 20 countries, Kojima et al. found that subsidies are ‘an important cause of LPG shortages’ (2011, p. 2). On the side of electricity, incomplete recovery of subsidies can impair the ability of the sector to invest in extending and upgrading the generation and distribution assets, with consequences for both access and reliability of supply (Kojima et al., 2014).

The extent to which women in low-income households benefit or otherwise from fossil fuel subsidies depends upon the generalisations that can be made about women as a share of the population living in poverty. Data collected by country-level statistical agencies suggest that there are only marginal differences in the rate of poverty between men and women (UNDESA, 2010).<sup>9</sup> However, his data defines poverty at the household level and does not take account of intra-household poverty where women may receive an unequal share of household income or opportunities and may not be able to

<sup>8</sup> Estimates of subsidy regressivity—such as those calculated by del Granado et al. (2012)—are based off consumption data and typically assume that consumption takes place at subsidised prices. Where corruption leads low-income households to pay above-official prices, it is likely that subsidies are more regressive than estimated.

<sup>9</sup> Disaggregating poverty by the sex of the household head, UNDESA (2010) found different trends across 41 countries in Africa, Asia, and Latin America and the Caribbean. Female-headed households had higher poverty-rates than male-headed households in 4 of the 16 African countries in the sample, 2 of the 5 Asian countries, and 12 of the 20 countries in Latin America and the Caribbean. Disaggregating the data further revealed other patterns. For example, female-headed households with children but no partner had consistently higher poverty rates across the Latin American and Caribbean region. The authors caution, however, that the reliability of such data depends on the criteria by which the household head is identified.

meet their basic needs. UNDESA argues that non-consumption indicators such as women's educational attainment, employment status, time use, experience of domestic violence, participation in household decision-making on expenditure, inheritance rights and entitlement to land ownership are the best means to identify the scale of intra-household poverty. Such data indicate a substantial level of inequality for women within poor households, meaning that they are likely to be disproportionately represented amongst the world's poor.

This suggests that, at a global level, while women nominally benefit from the **income effects** bestowed by subsidies to the same extent as men, intra-household factors may prevent women from realising this benefit, and thus the benefit will accrue disproportionately to men. This will apply where women do not procure or are barred from accessing subsidised fuels and thus do not receive a direct benefit, and where women have unequal status and bargaining power within a household, and are thus less likely to benefit indirectly from how household budgets are reallocated in the light of household savings on energy expenditure.

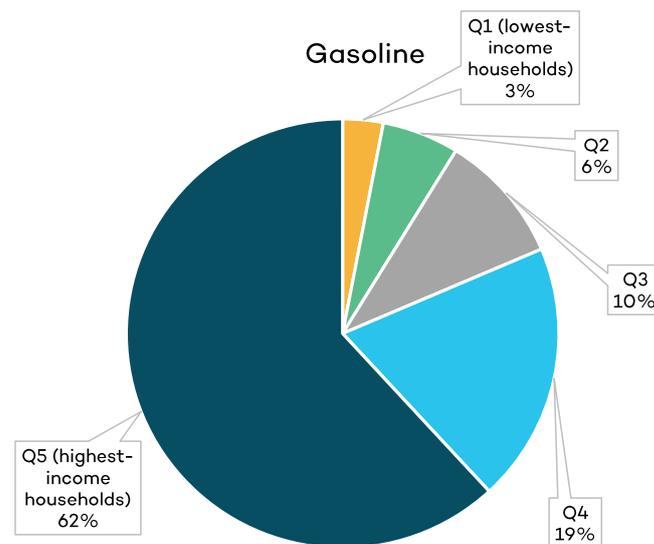
On the **energy use effect**, the benefit received is dependent upon whether the household can purchase fuel at the subsidised price, the fuel type subsidised and the extent to which the subsidised price drives fuel switching (including not only *increases* in consumption of the subsidised energy product or service, but also *decreases* in consumption of traditional biomass fuels). The differentiated magnitude and nature of benefits for men and women that will result from improved access to different fuel types is not homogenous and will depend upon any given context and the population and subpopulations therein. For example, in some cases women spend more time collecting water than firewood, and will thus experience a greater benefit from availability of electric water pumps than clean cook stoves in terms of reduced drudgery (Cecelski, 2006).

The decisions on household usage of different energy products and services will also reflect how decisions are made at the household level, which itself is dependent upon the relative bargaining power of men and women. Where women do not have discretion over energy choices or lack bargaining power, the male head of household may not prioritise expenditure on energy choices that benefit women (see also Section 3.1.1). A meta-analysis of factors influencing the adoption of clean cooking technologies concludes that there is evidence in some cases of female-headed households being more likely to adopt clean cooking fuel than male-headed households (Lewis and Pattanayak, 2012). Individual country-level studies also found evidence of the importance of women's ability to take decisions and direct household resources in influencing uptake of clean energy sources. For example, evidence from China suggests that adoption of clean cooking fuels is greater in female-headed households than in those with a male head (Hassen, 2015). A study of rural Indian households shows improved and modern cook stove adoption to be dependent upon women's empowerment (Mohapatra and Simon, 2014). Finally, a study in Senegal found that clean fuel uptake was positively associated with women's bargaining power, showing that bargaining power leads to an increase of clean fuel adoption and that households using a clean fuel are those where women have a high level of bargaining power (Wang Sonne, 2015).

**Transport.** As with non-transport fuels, the effects of fuel subsidies can be considered under the headings of income effect, energy use effect and supply effect. This discussion focuses on the first two categories, since the supply effect can be expected to be similar to that applying in the case of non-transport fuels.

On the **income effect**, the same mechanisms apply as for non-transport fuels, with a subsidised price leading to an increase in effective household income. However, the extent to which low-income households are direct beneficiaries of the subsidy is likely to be even more limited than in the case of non-transport fuels. This is because subsidies to transport fuels are typically found to be more even regressive than non-transport fuels, since households living in poverty cannot afford to own vehicles

and richer households are likely to significantly increase their consumption of transport fuel in line with their wealth. The IEA (2011) estimates that only 6 per cent of subsidy benefits reach the bottom 20 per cent of households for both gasoline and diesel fuels. From a sample of 20 countries, del Granado et al. (2012) found that only 8.7 per cent of gasoline subsidy benefits reached the bottom 40 per cent of households by income, while the top 40 per cent received 80.7 per cent of benefits (see Figure 6).<sup>10</sup> A working-paper update to this analysis, extending the sample to 35 countries, finds the same broad pattern of distribution, with the bottom two quintiles receiving on average 7.4 per cent of benefits and the top two quintiles receiving on average 83.2 per cent of benefits (Coady et al., 2015). However, while the direct income benefit may be limited for low-income households, the indirect benefit that can arise from changes in public transport prices may be significant, particularly as regards their impacts on transport services and food prices (Beaton et al., 2013; Parikh et al., 2012).



**Figure 6:** Share of direct petroleum subsidy benefits captured by different income quintiles.

*Source: Authors, based on del Granado et al. (2012). Estimates for gasoline based on a summary of 19 country studies: Cameroon, Gabon, the Central African Republic, Senegal, Ghana, Mali, the Republic of Congo, Burkina Faso and Madagascar (kerosene only) from Africa; Bolivia, Peru, El Salvador and Honduras from South and Central America; Bangladesh, Sri Lanka, India and Indonesia from Asia and Pacific; and Jordan and Lebanon from the Middle East and Central Asia. Analysis based on household surveys and input-output matrices ranging from 1993 to 2007.*

On the side of the **energy use** effects, the change in fuel prices may encourage take-up or greater use of motorised transport. However, for many low-income households, the barrier to use of private transport is the cost of purchasing a vehicle, rather than running costs. Thus, it is likely that the impacts on low-income households in terms of increased use of motorised transport will result indirectly through increased take-up of public transport.

The benefit that accrues to women—both in terms of income and energy use—will be highly dependent upon the context in which the subsidy is implemented. In some contexts, women’s access to transport is limited and thus the benefit from the subsidy is similarly limited. A World Bank report on the Middle East and North Africa suggests three primary reasons for this: women’s limited control over household resources may mean that they have more limited access to private transport than their male counterparts; women may be either legally barred from driving private vehicles or excluded to varying degrees by sociocultural norms (as, for example, in Saudi Arabia); and sociocultural norms in many countries may restrict women’s ability to travel by public transport, meaning that they do not benefit from heavily subsidised transport fuel (World Bank, 2011). In these cases, the benefits of the income

<sup>10</sup> In some countries, such as Thailand, LPG is also used as an automotive fuel, but no data exist on the regressivity of automotive LPG as a subset of LPG subsidies. Automotive LPG subsidies are likely to be more regressive than standard LPG subsidies because vehicle ownership is a prerequisite for receiving direct benefits. Some indirect benefits, however, are likely to reach low-income households who use LPG-fuelled transport services.

effect are likely to be felt through an increase in household income as the cost of transportation for male members of the household decreases, and in turn, the effect upon women will depend on how much influence they have over allocation of household expenditure. By contrast, on the energy use side, the proportion of a benefit that accrues to women in such cases will be much more limited, particularly for low-income women.<sup>11</sup>

In other instances, where women are able to use private or public transport, the benefits of a subsidy to transport fuels may accrue directly. On the income side, subsidies can lead to an increase in effective income, although again, the extent to which this benefits women will depend upon their household bargaining power. On the energy use side, an increase in the use of motorised transport can reduce the time spent commuting to work or other activities, enhance mobility with associated welfare and productivity benefits, and reduce physical hardship (ADB, 2013a).

### 3.1.2 Gender Dimensions of Subsidy Reform

Reflecting the absence of studies on how fossil fuel subsidies affect women and men differently, there is little work on how *reform* of these subsidies affects men and women differently. There is, however, significant work on the general effects of subsidy reform, particularly focused on the effects that occur at the household level in instances where ‘reform’ is defined as an energy price increase. In short, households may choose to substitute with cheaper fuels (fuel switching), maintain use at levels that incur a higher cost (an increase in expenditure), or reduce use but without substitution—for example if alternative sources such as biomass are not readily available (total energy use declines).<sup>12</sup> These three responses are not mutually exclusive, and households may combine all three in different proportions.

This section discusses the effects of subsidy reform on households, focusing on low-income households and on subsidies to non-transport fuels. Based on the discussion in preceding sections on how access to modern energy and fossil fuel subsidies may benefit women, we suggest some potential effects that fossil fuel subsidy reform may also have on women, particularly women in low-income households. The discussion focuses on those cases where reform leads to an increase in energy prices, since this is the case that is most widely discussed in existing work. However, subsidy reform can encompass a range of actions (as described in Box 1), which may have different effects on women. The following section discusses further some of these other actions, and how they can affect women, most notably better targeting of subsidies.

When subsidy reform causes a price increase, the effects can be categorised as income effects, energy use effects and energy supply effects. On the **income effect**, an increase in the price of fuel purchased by households can be expected to lead to a fall in effective household income, and thus a fall in expenditure on goods and services, with associated welfare impacts. There are a range of modelling studies substantiating this effect at the economy level: in Ghana, Cooke et al. (2016) model a rise in poverty of 1.5 percentage points following removal of fuel subsidies; in Nigeria, Rentschler (2015) found an increase in the poverty rate of 3.3 per cent as a result of removing subsidies; and in Libya, Araar et al. (2015) found that the poverty rate would more than double from its pre-reform level of 8.5 per cent.

Although low-income households receive less of the total benefits associated with a subsidy, a reduction in subsidy benefits can have a more significant impact on the poor, since it may represent a larger proportion of their income than that of higher-income groups. In addition, the impacts of higher fuel prices will be felt indirectly through higher prices for goods and services that use fuel as an input, often including public transport (where prices are not separately controlled) and food prices. For example, Coady et al. (2006) estimate that the percentage increase in household expenditure as a result of subsidy

<sup>11</sup> Women in higher-income households may have access to a driver and may thus benefit from lower fuel prices, even if they cannot drive themselves or use public transport.

<sup>12</sup> This may be the case in, for example, an urban setting, where access to biomass is much more limited than in a rural setting.

reform would be greater for the lowest-income quintile than the highest-income quintile in Ghana (9.1 per cent reduction in real income for bottom income quintile versus 8.2 per cent for the top quintile), Bolivia (5.4 per cent versus 4.7 per cent), Jordan (5.4 per cent versus 4.7 per cent) and Sri Lanka (2.9 per cent versus 2.1 per cent). Similarly, Bacon et al. (2010), reviewing household expenditure surveys from Bangladesh, Cambodia, India, Indonesia, Kenya, Pakistan, Thailand, Uganda and Vietnam, found that expenditure on food is typically more than an order of magnitude higher than expenditure on petroleum products, such that if a 10 per cent increase in petroleum product prices leads to a 1 per cent increase in food prices, the indirect impact would be larger for the bottom quintile in all countries except one (Thailand).

Further, the introduction of market-based pricing will expose households to fuel price volatility. No research exploring the impact of this volatility—essentially requiring households to bear an increased level of risk related to their living costs—was identified, although further research could usefully explore comparisons with literature on food price volatility, particularly given the fact that one of the principal indirect impacts of higher energy prices can be on inflation and food prices. The risks of increased volatility are not entirely negative: prices can be adjusted down as well as up. With current low oil prices, for example, recent subsidy reforms in Indonesia (gasoline and diesel, January 2015) and in India (diesel, late 2014) have resulted in declining retail prices (Casier and Beaton, 2015) (Clarke, 2015). Nonetheless, subsidizing countries often adjust prices downward during periods of low oil prices, so such benefits may accrue to consumers in subsidising and non-subsidising countries alike.

In many countries that have reformed their subsidies, a negative income effect has been anticipated, and reform has included one or more complementary measures to compensate low-income or politically powerful groups, thus resulting in reduced, neutral or even progressive net impacts on household incomes. Such complementary policies are described in detail in the subsequent section of this review, Section 3.1.2.

On the **energy use side**, the concern frequently highlighted is that an increase in the price of fossil fuels will cause a change in the energy mix, with greater reliance on less-advanced energy sources (that is, a shift down the energy stack), and with energy poverty increasing. Existing work suggests that this hypothesis is borne out by evidence, with increases in the price of LPG, kerosene or electricity encouraging substitution towards cheaper, more traditional energy sources like biomass, charcoal or dung. For example, Vagliasindi (2013) found that an increase in the price of LPG in Morocco led to an increase in the use of wood among the rural poor and charcoal among the urban poor, while Lampietti et al. (2007) found that increases in the price of electricity in Armenia led to a fall in consumption in 80 per cent of households and an increase in the reported consumption of wood and natural gas. However, little extensive research was identified on the degree to which subsidy reforms cause households to substitute away from modern energy products and services, the key factors that determine the degree of this substitution and how behaviour shifts over different timescales.<sup>13</sup>

On the **supply side**, possible effects include improved availability and reliability of fuel as the economic viability of investments in expanded or more reliable energy supply improves, but no research exploring this impact pathway was identified.

The extent to which subsidy reform in general and fuel switching in particular affects women is not clear. There is little qualitative or quantitative evidence on this question. Box 4 describes one exception, a recent qualitative study by the World Bank which explored the extent to which energy subsidy reforms in Europe and Central Asia impacted men and women differently (World Bank, 2015a). A second study, carried out in India, examined how fuel switching from kerosene to LPG has affected the time demands upon women (IRADe, 2014). Also on India, Merrill (2014b) reviewed the existing literature on subsidy

<sup>13</sup> Where subsidies have created illegal fuel markets, the true degree of demand reduction may be difficult to parse out from reduced diversion and smuggling.

reform in India, and concludes that the direct price impact of LPG subsidy reform would be small for poor rural women, but more significant in urban areas and on wealthier women. The same study concludes that kerosene subsidy reform would have a small impact on rural women who use kerosene as a lighting fuel, but a much more noticeable impact for urban women using it as a cooking fuel, especially where they do not have recourse to LPG or biomass.

**Box 4: Gender impacts of subsidy reform in Europe and Central Asia**

The World Bank (2015a) conducted a series of FGDs across European and Central Asian countries, identifying how price changes resulting from subsidy reform have had different impacts according to gender, and considering which policy measures could facilitate a smooth adjustment for men and women to these price rises.

The study concluded that gender impacts are highly dependent on the context in which reforms are implemented and that, consequently, universal recommendations are likely to be problematic. Nevertheless, for the region and populations in question, the study identified a range of mechanisms through which gender differences are likely to manifest themselves, including vulnerability of female-headed households due to women's overall lower incomes, vulnerability of elderly women living alone and managing a fixed income, lack of information and awareness amongst women on reforms and rights, and greater likelihood of women to sacrifice well-being and time to cope with higher energy costs.

Despite the paucity of literature focused on this exact topic, we can hypothesise that price changes caused by subsidy reforms are likely to have impacts that are different for women and men. Drawing on the existing literature describing the gender effects of increased access to modern energy sources, we can identify some possible effects that may occur in response to fuel price change. The direct impacts of the price change will be felt only by those households that are in receipt of the subsidy: in less-developed countries, lowest-income households do not use modern fuels and are therefore generally unaffected directly by subsidy reform to these fuels, while middle-income households in such countries may have adopted LPG or kerosene and can be affected by rising energy prices associated with reform (see Section 3.3.2 for discussion with respect to India). In middle-income countries, uptake of modern household energy is more widespread, and women in the lowest-income families are likely to be the most adversely affected by reform. However, even where a household and the individuals within it do not experience a direct impact, the indirect impacts—such as higher prices for goods and services that use fuel as an input or higher public transport prices—may be significant.

On the **income side**, if households spend more on energy products and services, this leaves less income to meet other needs such as nutrition, health and education, with knock-on impacts on welfare. The redistribution of spending, and how this affects women, will depend on the status of women in the household and their bargaining power vis-à-vis male members of the household. Where women's status is weaker, the likelihood is that the changes that are made will have a disproportionately negative effect on women. Further, even where women have discretion over how household income is spent, they may voluntarily choose to sacrifice spending that enhances their well-being in favour of spending that enhances the well-being of other members of the household. This is one of the findings of the World Bank study described in Box 4, where women chose to sacrifice well-being and time to cope with higher energy costs.

On the **energy use side**, a switch to less advanced fuel sources is likely to affect women disproportionately (just as a switch to advanced fuel sources is also likely to affect women disproportionately). In particular, if households are pushed toward greater dependence upon biomass, women are likely to spend more time on fuel collection (and correspondingly less time on other activities), as well as being exposed to higher levels of indoor air pollution. For example, LPG has many benefits for women in terms of efficiency (reduced cooking time) and cleanliness (reduced indoor

air pollution). A reform that increases LPG prices and does not attempt to prevent reduced LPG consumption among low-income households can therefore be expected to have a disproportionately adverse impact upon women (Cecelski and Matinga, 2014). Equally, a reform that increases LPG prices but reallocates savings to policies that ensure a larger share of women can access LPG at a lower overall cost may be able to disproportionately improve the welfare of women.

In summary, the work to date on the impacts of subsidy reform—where this is understood as a removal of subsidies and a consequent increase in price of fossil fuels—shows an adverse impact on household income, particularly the income of the poorest households. Further, there is evidence to suggest that increasing the prices of fossil fuels can lead to a substitution of energy sources toward less advanced fuels. The impact upon women has not been explored in the literature, but we hypothesise that in general this may be disproportionately negative compared to the impact upon men, reflecting the fact that women on average in low- and middle-income countries have less influence over household decisions and are on average responsible for the majority of household chores.

### **3.2 Addressing the Effects of Reform: A gender-sensitive approach**

Recognising the adverse impacts on the poor, existing work on subsidy reform recommends the introduction of mitigation measures. These mitigation measures could include better targeting of existing subsidies such that the benefits accrue to the vulnerable sections of society, cash or near-cash (for example, vouchers or smart cards) transfers, or indirect transfers (for example, reduction or removal of fees for health or education services). For cross-country analysis see, for example, Beaton et al. (2013), IEA, OPEC, OECD and World Bank (2010), and the International Monetary Fund (IMF) (2013), all of which note the importance of establishing appropriate compensation mechanisms to protect the vulnerable, ensuring incomes are maintained and modern energy access is not impaired. At the country level, Cooke et al. (2016) found that the adverse impacts of subsidy removal in Ghana can be reversed through extension of existing social security programmes; in Nigeria, Rentschler (2015) shows that replacing fuel subsidies with a cash transfer can improve welfare. In addition to compensation measures that directly address the effects of removing subsidies, the fiscal savings from reducing fuel subsidies can be used to increase expenditures in other areas that can enhance social and economic well-being, such as health and education (Coady et al., 2006).

Despite this substantial body of work identifying the need for mitigation measures and how best to design these measures, there has been little research on how these measures can be constructed and implemented so as to protect and further women's interests and thereby contribute to improving gender equality. Rather, with a few exceptions described below, subsidy reform policies are typically gender blind and do not differentiate between men and women. Designing policies that address the gender impacts of energy subsidy reform is dependent upon a number of preconditions being met. First, recognition that reform does indeed have gender impacts, and a belief that policy should address these impacts. Second, an assessment—qualitative or quantitative—of how reform can impact differently upon men and women, addressing both the direct and indirect impacts of reform, and taking into account a range of characteristics such as location, income, household structure, cultural and religious groupings.

In instances where subsidies for some fuels are highly regressive on a relative level—such that the benefits received by low-income households are only a small share of their total income—it may be most practical to sequence reforms, such that subsidies for the most regressive fuels are reformed first. This allows for more time to assess the impacts of reforms that are more likely to affect low-income households and the women and men within them. For example, in Morocco it was estimated that less than 1 per cent of total subsidy spending on gasoline and diesel accrued to the poorest quintile, so these subsidies were reformed initially, while subsidies for LPG—of which around 30 per cent accrued to the

poorest two quintiles—were left untouched (Verme et al., 2014). Such decisions should, however, be informed by estimates of the indirect impacts of reforms, which can affect all households through, for example, food prices, and may be considerable (Bacon et al., 2010; del Granado, 2012).

The gender impacts of reform—and more specifically the impacts on poor women—can be mitigated by addressing the income, energy use and energy supply effects as outlined above. Typically, a range of targeted social protection measures are employed to mitigate the adverse **income effects** that reform can have on household incomes. Across 28 energy reforms that the research reviewed, 18 relied on targeted mitigation measures, including expansion of public works, education and health programmes in poor areas. Gender-sensitive policy-making can consider the extent to which such policies can be designed to compensate for inequalities in intra-household decision-making. This might include the use of universal or conditional cash transfers (CTTs), structured in such a way that is more likely to increase the power of women in determining household expenditure decisions (for more detail, see Section 3.2.1). Alternatively, they might include social assistance policies intended to meet women’s essential needs, such as healthcare, or to enable their participation in the labour market, such as infrastructure programmes or microloans targeted at women.

Generally, **the energy use effect** is given less attention by governments attempting to mitigate the impacts of fossil fuel subsidy reforms. In some cases, governments increase the provision of public transport services, although it is more common to see transport providers prohibited from increasing their fares, which effectively clusters the impacts of higher energy prices onto the transport sector, often leading to problems with supply (Beaton et al., 2013). Gender-sensitive policy-making can consider mitigation policies that ensure energy affordability and access for fuels or services of particular importance for women, without sacrificing the viability of supply. Mitigation measures in this case include systems that allow the reform of the subsidy to consist of improved targeting, so that it is received only by intended beneficiaries, such as through coupon or voucher schemes (for more detail, see Section 3.2.2). Alternatively, it can consist of the direct provision of equipment or services. This might consist of the provision of clean cook stoves or chimneys (see Section 3.2.3) or the provision of public transport on routes or at times that are particularly important for women.

Reform can result in efficiency improvements and the expansion of distribution networks that naturally help to mitigate both the income and energy use effects described above. Governments can attempt to accelerate and magnify this energy supply effect by—in addition to simply reforming subsidies—working with distribution companies in anticipation of reforms to make investments in supply infrastructure that will reduce the costs of bringing energy to market and thereby at least partially counteract price increases. For example, Kojima et al. (2011) summarise various strategies that can be used to reduce the distribution costs of LPG, including bulk and joint purchase to increase economies of scale; hospitality arrangements, where LPG companies can share reciprocal access to storage capacity in different parts of the country; investing in port capacity to reduce demurrage costs; and improving regulatory functions.

### 3.2.1 Unconditional and Conditional Cash Transfers

Unconditional cash transfers transfer money to recipients, usually a subsection of households with a low income or located in a certain geographic area, although in some cases unconditional cash transfers are ‘universal’—that is, available to all, with no targeting. Where unconditional cash transfers are received by the household head—often a male—there exists a risk, for reasons previously discussed, that women will not benefit equally from the transfer. This effect may be mitigated by targeting the universal cash transfer to women (for example, many child benefit schemes are transferred to mothers rather than fathers). While this may enhance the likelihood of the woman benefiting, household dynamics may be such that the woman is forced to surrender any income.

Universal cash transfers were used as a mitigation measure by Iran during major reforms of subsidies to many goods and services in 2010, including fossil fuel subsidies. The transfer was equivalent to US\$45 or US\$90 purchasing power parity dollars per month per person (Salehi-Isfahani et al, 2015). Bank accounts were opened for most citizens prior to the reform, and the cash transfers were deposited but frozen until the implementation of reform (Clements et al., 2013). Research finds that rural families that had less access to banks actually participated in greater numbers, the poorest and the richest income deciles participated the least, and in the early phases of the programme the impact was pro-poor. However, those households headed by women showed lower participation rates and a significant gender effect: a 17 per cent lower probability of participation for female-headed households (Salehi-Isfahani et al., 2015).

Conditional cash transfers (CCTs) also transfer money, but the transfers are dependent upon recipients meeting certain behavioural criteria related to human development, typically maternal healthcare, childhood nutrition and children's attendance in school. CCTs aim to tackle poverty in two ways: the cash transfer will supplement the incomes of households; but the conditionality will create investments in human capital that are intended to break intergenerational cycles of poverty. There are a number of ways of introducing a gender dimension into CCTs. Most commonly, the money will be transferred to a woman on the assumption that a woman will purchase goods and services that enhance children's wellbeing, or the conditionality element will focus on gender-specific vulnerabilities (e.g. attendance at prenatal and postnatal clinics).

Various CCTs have been implemented in a range of countries, particularly in Latin America, but also in East and South Asia, Africa and Central Asia (see Appendix I for a review of CCT schemes in Morocco and Peru). Some of these schemes have been linked to energy use and outcomes. Examples include the Oportunidades scheme in Mexico, which had a specific energy component (see Box 4), and the Nigeria SURE-P scheme, which aimed to use savings from energy subsidies to improve maternal health through a CCT scheme (see Section 3.3.1). Elsewhere, the Bolsa Familia scheme in Brazil incorporated an earlier LPG coupon scheme into its structure, and Juntos in Peru doubled the size of monthly transfers during recent subsidy reforms.

Reviews of CCTs across a range of sectors suggest that they can be instrumental in improving children's health and educational indicators, but that there is less evidence on how successfully they address women's needs and rights (CARE International, 2011). Rather, CCTs have been criticised for exacerbating women's time poverty and for being unsuitable in instances where women work out of the home in low-paid employment (Bradshaw and Quiroz Viquez, 2008). Further, CCTs reinforce existing gender roles and stereotypes by linking payments to women with childhood outcomes (Molyneux, 2008). Under these schemes, mothers are conceived of as a conduit for improving their children's life chances (Bradshaw and Quiroz Viquez, 2008), rather than as individuals with their own needs and rights.

Further, it has been questioned whether cash transfers are truly effective in empowering women, and thereby enabling them to escape poverty. Instead, it is argued that cash transfers—even where they do target women—simply give women the means to manage poverty (Molyneux, 2012). For CCTs to be successful in improving women's welfare, they need to focus on addressing women's social and economic empowerment, rather than simply increasing their domestic purchasing power (Lief Benderly, 2011).

However, despite this, it is understood that the targeting accuracy of such cash transfers in supplementing the incomes of intended beneficiaries is far higher than the use of blanket commodity subsidies such as food and fuel (Grosh et al., 2008). Moreover, when well designed and implemented, cash transfer schemes can be effective in transferring the majority of funds to the poor. One study

examining the performance of 24 countries with respect to cash transfer schemes showed that 16 of these countries were successful in transferring over 50 per cent of funds to the poorest 25 per cent of the population (IEA, OPEC, OECD and World Bank, 2010). Success in reaching the poor is, however, dependent upon the effectiveness of targeting and administrative capacity.

#### **Box 5: CCTs in Mexico**

Examples of CCT schemes include Oportunidades in Mexico (see Appendix I), which aims to alleviate poverty by providing cash transfers to women in eligible poor and vulnerable households, while also increasing the levels of human capital by making these transfers conditional on school attendance for children and regular health clinic visits for children and pregnant or nursing women. In 2007, an energy component named Oportunidades Energéticas was introduced to the existing cash transfer programme. This was not linked to fossil fuel subsidy reform—it was introduced during a period when subsidies were increasing rapidly—but did reflect government concerns about the negative health and financial impacts of certain kinds of household energy use.

In a literature review of the gender-specific impacts of Oportunidades, Molyneux (2008) summarises the gender outcomes of the programme and reports a decreased gender gap in school attendance, decreased maternal mortality, an increase in well-being and status, improved self-perceptions of welfare, and better credit access.

There has been relatively little research on the gender impacts of the Oportunidades energy component. An early study found that the monthly energy transfer of MXN\$50 covered only 17 per cent of spending on energy and that while the rate of electricity connection was high (over 95 per cent of households), around 73 per cent of them continued to use biomass (Gertler et al., 2009). Subsequent research assessed the causal impact of large increases in household income on asset accumulation and energy use, and found that Oportunidades cash transfers had a large effect on asset accumulation, and that this drove increases in household electricity usage (Gertler et al., 2012). As such, it is possible that by allowing beneficiary households to accumulate domestic appliances, Oportunidades cash transfers have resulted in positive outcomes for women by reducing the proportion of biomass in the household energy mix.

### **3.2.2 LPG Coupon or Voucher Schemes**

LPG coupon schemes can directly address the concern that an increase in LPG prices will result in a substitution toward traditional fuels, with adverse effects on women in terms of fuel collection time and impaired health as a result of higher levels of indoor air pollution. Under these schemes, targeted recipients—for example, women in low-income households—receive a coupon entitling them to free or subsidised cylinders or equipment.

As with CCTs, LPG coupons can be targeted to specific recipients and can thus be used to ensure LPG take-up in low-income households or rural areas. If the policy objective is energy access, LPG coupons have some advantages in comparison with CCTs, in that they can only be spent on LPG, are simpler and cheaper to administer, and do not require a complex organisational structure. Further, while there may be time costs associated with registering with the programme and purchasing LPG according to programme requirements (for example, at certain pre-defined vendors), this is likely to be less severe than the time costs associated with CCTs.

#### **Box 6: LPG coupons in Peru**

The Fondo de Inclusión Social Energético (FISE) in Peru was created in 2012 with the aim of encouraging households to shift away from traditional biomass energy sources in favour of modern clean fuels (Asia-Pacific Economic Cooperation [APEC], 2015). Eligible families receive a coupon by text message if they choose. This entitles them to a monthly discount on a first refill of a 10 kilogram LPG cylinder, and free cooking equipment—a two-burner stove, 10 kilogram LPG canister and hose—where they do not already own these. This latter provision is intended to make the programme accessible to families for whom the fixed cost of this equipment represents a large sum of money.

The coverage of the scheme has expanded from 24,000 households (2012) to 710,000 households (2014) (APEC, 2015). While there is little specific assessment of the gender benefits of the scheme, in general terms it is widely regarded as being very successful. A recent review concluded that the 'FISE programme does not significantly increase fossil fuel consumption' APEC (2015, p. xi), and that recipients 'appreciate the programme and confirmed that it is very beneficial to them, both financially and in terms of the health benefits that the scheme provides' (APEC, 2015, p.60-61). Further, data from consecutive National Household Surveys indicate that the number of poor and very poor households using firewood to cook decreased from 2012 to 2013 (APEC, 2015; Murillo, 2014). Assuming that women and girls were responsible for most household tasks linked to cooking, this is likely to have had a positive impact in terms of time available and health outcomes.

Although the FISE LPG programme has expanded rapidly, it has not effectively reached households in isolated rural areas. There are a limited number of LPG distribution points, and LPG canisters are heavy, so transporting them significant distances beyond road networks is often problematic. With this constraint in mind, the Peruvian government and a number of NGOs have developed programmes that facilitate the distribution of improved cook stoves. Between 2009 and 2014, a total of 287,000 improved cook stoves were installed at a cost of approximately US\$30 million (Cocinas Mejoradas, 2014).

### **3.2.3 Direct Provision of Equipment: Cook Stoves and Chimneys**

Provision of clean cook stoves and chimneys has frequently been highlighted as one of the most effective interventions in terms of enhancing women's welfare. Shankar (2015) reports that a standard improved cook stove can reduce cooking time by 50 per cent and increase fuel efficiency by 30 per cent, while a high-efficiency cook stove can lead to even greater benefits in time and fuel savings as well as significantly reducing harmful emissions. The time saved in fuel collection and cooking has been shown to add up to more than 60 days a year. Provision of cook stoves free of charge or at subsidised rates has thus been considered as an intervention that is particularly beneficial to women: redirecting and targeting fossil fuel subsidies to this end has the potential to yield significant welfare benefits.

However, care needs to be taken in conceiving and designing such a scheme. Previous work shows that interventions have not always been effective. A range of reasons have been cited for this, including the cost of investment and upkeep, lack of information on the health consequences of using traditional stoves, and aversion to using new technologies. Box 7 describes the challenges encountered in the implementation of a cook stoves project in Nigeria (from S4C, forthcoming).

Further, intra-household dynamics also need to be considered. Where equipment is subsidised, rather than free (and thus there is still a price to pay), distribution of household assets and decision-making power becomes key (see previous discussion). In Bangladesh, for example, Miller and Mobarak (2013) report that women show a preference for improved cook stoves but lack the authority to make purchases. Even where technology is fully subsidised, the distribution of power within a household may prevent its use if introduction upsets traditional roles and responsibilities (see Clancy et al. [2012] for examples).

**Box 7: Cook stove provision in Nigeria**

Over 60 per cent of Nigerians depend on traditional biomass fuels for cooking and other domestic purposes, with adverse consequences in terms of time, health and the associated social burden of health problems. Addressing a gap in previous energy policies, Nigeria's 2013 Energy Policy aimed at developing appropriate technologies for the use of alternative energy sources to fuel wood and fossil-based fuels. Subsequently, the government launched the National Clean Cooking Scheme in November 2014, a ₦9.2bn (US\$51.5 million) project described as an 'aggressive drive to reduce and eventually eliminate cooking with solid and fossil fuels such as firewood and kerosene, which are expensive and difficult to source while being detrimental to our health and the environment at large' (Federal Ministry of the Environment, Nigeria, n.d.). The National Clean Cooking Scheme is expected to provide 750,000 clean stoves and 18,000 Wonderbags (a non-electric slow cooker), which will be distributed free of charge to women (Bureau of Public Procurement, Nigeria, 2014). To enhance job creation through the scheme, the project contractors, Integra Renewable Energy Limited, were to assemble the stoves locally in order to provide jobs for Nigerians.

Although the intervention is a bold step toward expanding women's access to cleaner cooking fuels, gaps in implementation remain. First, the programme is being hampered by litigation between the project contractors and the Nigerian government amid claims of funds misappropriation, threats of contract cancellation and contractual underperformance (Lawal and Babayemi, 2015; S4C, forthcoming). This includes civil society claims that only 45,000 cook stoves had been purchased by Integra Renewable Energy Limited and these were imported (S4C, 2015a). The specifics of the contract awards and distribution mechanism are still unclear. As a result of these developments, there are delays in making the products available to the target beneficiaries—rural women.

Second, civil society groups claim that no needs assessment exercise took place to map women's energy needs and preferences and to generate evidence of the potential that exists for a successful switch to cleaner fuels (S4C, 2015a). A needs assessment would show how receptive households would be to replacing traditional cook stoves with improved or advanced biomass cook stoves and also highlight the suitability of any given technology to Nigeria.

In summary, there is a substantial body of knowledge examining the range of measures that can be implemented to address the adverse impacts of increased energy prices resulting from subsidy reform. This knowledge is drawn from analysis of previous reform attempts, as well as more theoretical analyses. However, to date, few of the measures implemented or discussed with respect to fuel subsidy reform consider how the specific effects on men and women can be addressed. As with fuel subsidy policies themselves, reform policies are rarely gender specific and can thus have unintended impacts upon gender equality (see previous discussion). If the government objective is to promote gender equality, reforms should be designed and implemented so as to not only counteract potentially negative effects upon women, but also to maximise opportunities for improving women's lives.

### **3.3 The Political and Economic Context of Energy Sector Reform, in Relation to Women, in Bangladesh, India and Nigeria**

This section looks at the specific experiences of the countries where partners in the research project are based— Bangladesh, India and Nigeria—with respect to gender and its links with the energy sector and its reform. This review, together with the broader review of the general literature, is aimed at setting out the background in each country, and at informing the research questions and methodology identified in Sections 4.2 and 4.3. For each country, we consider the following: the status of energy and fossil fuel subsidies in the country and their gender dimensions, recent reform attempts and how these reform attempts have impacted upon gender, and associated mitigation efforts.

#### **3.3.1 Nigeria**

Nigeria has significant fossil fuel and renewable energy resources. Most notably, its deposits of crude oil and natural gas place it among the top 10 reserve holders globally (Energy Information Administration,

2015). Oil revenues contributed 13 per cent of the country's GDP in 2013, and the sector is a critical source of revenue and foreign exchange (IMF, 2015). Nigeria's refining capacity is limited, and as a result it has to import refined petroleum products.

Biomass fuels and waste made up over 80 per cent of the total primary energy supply in 2013 (Energy Information Administration, 2015; IEA, n.d.(b)). Biomass is used by a large share of households, with over 60 per cent of Nigerians depending on traditional biomass fuels, especially fuel wood for cooking and other domestic purposes (Energy Commission of Nigeria, 2013). The next most important energy sources in the primary energy supply are oil products and natural gas (Energy Information Administration, 2015). Gasoline and diesel are used in transport, while kerosene is used by households for cooking and lighting. Natural gas is largely used for electricity generation and the energy industry (IEA, n.d.(b)). Access to electricity remains very low, with only 50 per cent of the country having access to electricity in 2014 (KPMG, 2014).

Poor access to energy supply contributes to Nigeria's high rate of poverty, at around 33.1 per cent for 2012–2013 (World Bank, 2014). It also has particular implications for women, who are largely responsible for domestic tasks such as cooking and who therefore bear a significant share of the burden of energy poverty. This situation is compounded by lower literacy levels among women,<sup>14</sup> high income inequalities<sup>15</sup> and higher levels of unemployment.<sup>16</sup> The health burden associated with using traditional fuels also falls heavily on women: the World Health Organization (WHO) found that smoke from firewood and traditional biomass stoves during cooking is the third-highest killer of women in Nigeria, after malaria (WHO, 2009).

Prevailing energy policies pay little attention to these different experiences of men and women. In addition, women are under-represented in influential decision-making roles in the energy sector. For instance, despite reforms in the petroleum sector, the Nigerian National Petroleum Company (NNPC, the national oil company) currently still has all-male leadership (S4C, forthcoming).

### 3.3.1.1 Fossil Fuel Subsidies in Nigeria

The Nigerian government has controlled the pricing of petroleum products since 1973, in order to artificially keep costs low in the domestic market, cushion the inflationary impact of high energy prices, bolster domestic industrialisation efforts, and expand the access of the poor to petroleum products and energy resources. Gasoline, kerosene and electricity—which is predominantly generated by fossil fuels—are all subsidised (Aramide et al., 2012). Notably, however, LPG is not subsidised but is sold at international rates, and this has been a factor—together with safety concerns and upfront costs—that have limited its uptake.

The vast majority of Nigerians do not share in the country's oil wealth, making the country a common reference point in literature on the so-called resource curse, which posits a causal relationship between rich natural resources and poor development outcomes (Collier and Goderis, 2007; Watts, 2004; Xavier and Subramanian, 2008). On top of these larger, structural factors, few jobs are created locally because most production and technical expertise in the oil sector are located and retained abroad, reducing the value added from producing refined products for the domestic economy (Heum et al., 2003; Oyejide and Adewuyi, 2011).

<sup>14</sup> The 2010 National Literacy Survey gave the male adult literacy rate as 79.3 per cent, compared to the female adult literacy rate of 63.7 per cent (National Bureau of Statistics, 2010)

<sup>15</sup> The UNDP ranks Nigeria's income inequality between men and women at 152 out of 182 countries surveyed (UNDP, 2014).

<sup>16</sup> Data from Q1 2015 show higher unemployment and underemployment for women than for men (National Bureau of Statistics, 2015). While 8.9 per cent of women in the labour force (those aged 15–65, willing, able and actively working or searching for work) were unemployed in Q1 2015, up from 7.5 per cent in Q4 2014, another 19.6 per cent of women in the labour force were underemployed in Q1 2015. On the other hand, 6.3 per cent of males were unemployed in Q1 2015, up from 5.4 per cent in Q4 2014, while another 13.9 per cent of males in the labour force were underemployed.

Nigeria has typically spent between 1 and 2.5 per cent of its GDP on fuel subsidies over the past decade, with the exception of 2011, when the government reported US\$14.1 billion of expenditure on fuel subsidies, equivalent to more than 3.4 per cent of GDP (see Table 1). This outlier is believed to be due to extremely high levels of subsidy-related corruption in 2011 that were subsequently the focus of a high-level inquiry (Aramide et al., 2012). Beyond the high expenditure and associated corruption, the subsidy scheme in Nigeria is vulnerable to misappropriation, encourages smuggling activities, is prone to significant leakages and is very difficult to budget (Aramide et al., 2012).

**Table 1:** Subsidy incidence in Nigeria

Year	Subsidy Type	Subsidy (% GDP)	Subsidy (US\$ billions)	Population (million ppl)	Subsidy (US\$/per capita)	Reference
2006	Fuel	1.40	2.0	143.3	14.2	Iweala (2011)
2007	Fuel	1.33	2.2	147.2	15.1	Iweala (2011)
2008	Fuel	2.55	5.3	151.2	35.1	Iweala (2011)
2009	Fuel	1.83	3.1	155.4	19.9	Iweala (2011)
2010	Fuel	1.21	4.5	159.7	27.9	Iweala (2011)
2011	Fuel	3.41	14.1	164.2	85.6	Sweetcrude Reports (2013)
2012	Fuel	1.33	6.1	168.8	36.2	Sweetcrude Reports (2013)
2013	Fuel	1.01	5.2	173.6	30.1	BusinessNews (2014)
2014	Fuel	0.97	5.5	178.5	31.0	George and Payne (2015)
2005	Electricity	2.05	2.3	139.6	16.5	IISD (2012)
2007	Electricity	0.90	1.5	147.2	10.2	IISD (2012)
2008	Electricity	0.82	1.7	151.2	11.2	IISD (2012)
2009	Electricity	1.00	1.7	155.4	10.9	IISD (2012)

In line with international experience, Soile and Mu (2015) found that petroleum and kerosene subsidies are regressive in Nigeria. Based on an analysis of household expenditure data, they found that petroleum subsidies are most regressive, with the top 20 per cent receiving twice as much benefit as the bottom 20 per cent, while kerosene subsidy benefits are distributed more evenly but still regressively. Literature also confirms that an energy supply effect prevents some of Nigeria's subsidies from flowing through into lower prices. Disputes with distributors over subsidy payments and problems with black market diversion mean that the product is often scarce and sold at prices significantly higher than the subsidised price of ₦50 per litre (Aramide et al., 2012). Supply problems can result in long queues and associated discontent (Ehinomen and Adeleke, 2012). Problems with kerosene access are most likely to focus on low-income women, who must queue for many hours to purchase the fuel or resort to the traditional use of biomass. These problems are recognised at a political level, but a number of attempted reforms have simply not been implemented or have been reversed in the face of public protests (Aramide et al., 2012). For example, in a motion to the Nigerian Senate, Senator Babajide Omowore argued that the value of the kerosene subsidy amount is 'more than double the aggregate annual budget for education, health, roads, security and agricultural sectors' and only less 'than 10 per cent of Nigerians benefit from this heartless massive scheme that drains the nation's treasury' (The Senate, Federal Republic of Nigeria, 2014, p.121).

LPG currently sells in the domestic market at prices that reflect international rates (Kojima, 2013b). The initial costs of acquiring LPG stoves and cylinders have been high until recently. This is because LPG cylinders were historically available only in 12.5 kilogram sizes, with 3 kilogram cylinders having been first introduced in 2012 (Okafor, 2012; Oteh, et al., 2015). The relative price difference between

LPG, kerosene and biomass fuels is one factor that has kept LPG use limited, especially among low-income earners, with only 250,000 tonnes being supplied in 2013 (Ahmed, 2015). Other factors cited in the media include poor distribution infrastructure (including storage, filling stations and retail sales network), uncertain regulation and enforcement (potentially leading to poor quality and safety standards), and perceptions that the fuel may be unsafe (Amconsul Lagos, 2009; Salau, 2015). There have been some efforts at specific gender-targeted programmes to ensure that women earning low incomes adopt LPG for their domestic cooking in place of kerosene and biomass. Notably, in Lagos, a programme aimed at encouraging uptake in rural areas gave LPG gas cylinders and accessories to women free of charge (The Nation, 2015).

### *3.3.1.2 Subsidy Reform Attempts and Their Impacts*

An official attempt was made to remove kerosene subsidies via a presidential directive in 2009. Despite this, the NNPC continued to heavily subsidise kerosene and to be reimbursed for this subsidisation (Arimide et al., 2012).

With the new government led by President Muhammadu Buhari, elected in March 2015, there has now been a change in policy. In January 2016, the Petroleum Products Pricing Regulatory Agency removed the fuel subsidy on kerosene and increased the price of household kerosene (HKK) from ₦50 to ₦83. In response, the media speculated that ‘The official price difference is not expected to matter much to millions of poor Nigerians who are used to buying the product at over ₦100 per litre.’ (Premium Times, 2016) Discussants at a forum on women and energy poverty held by S4C (2015) reported that kerosene had been being sold up to 10 times higher than official subsidised prices.

Prior to this recent change in policy, the last major attempt to reform gasoline subsidies took place in January 2012. These reforms were greeted by nationwide protests, and the government partially reversed the withdrawal of subsidies on petroleum motor spirit and initiated the Subsidy Reinvestment and Empowerment Programme (SURE-P), as described in Box 8 (Aramide et al., 2012). One key issue for protestors was the large-scale corruption associated with the subsidy. Subsequently, a presidential committee (the Aig-Imoukhuede committee) indicted 21 oil firms that made fraudulent claims for petrol subsidy and directed them to refund ₦382 billion wrongly collected as subsidy in 2011 (Adetayo, 2012).

Studies that have evaluated the effect of petroleum product pricing reforms on household welfare found that petroleum subsidies are an ineffective mechanism for protecting the income of poor households. A study that evaluated the equity and efficiency implications of subsidy reform in Nigeria found that the subsidies may have macroeconomic benefits (Adagunodo, 2013), but this does not necessarily create a benefit for households. The study’s consumption survey indicates that an overwhelming number of households do not have access to petroleum products at the government’s subsidised prices and that they spend less than 10 percent of their total expenditure on consumption of petroleum products. Furthermore, the study affirms that petroleum product subsidies are inherently biased toward urban households, while the majority of households in rural areas use traditional biomass for cooking, heating and lighting.

**Box 8: SURE-P**

SURE-P's stated objectives included mitigating the immediate impact that the discontinuation of the petroleum subsidy would have on the population, particularly for the poor and vulnerable; accelerating economic transformation through investment in critical infrastructure projects; and laying a foundation for the successful development of a national safety net programme that is better targeted at the poor and most vulnerable on a continuous basis (Pate, 2011).

SURE-P included a strong focus on women, with a dedicated programme of intervention exclusively targeted at women, youth and vulnerable groups in rural areas. Intended as a short-term job creation measure, the Community Services Women and Youth Employment project was designed to provide opportunities for target groups to acquire skills for future employment. Efforts were made to account for women's needs through a range of measures, most notably a quota system. The government claims to have created 123,049 jobs through the scheme and to have 118,984 beneficiaries still participating, 64 per cent of whom are men and 36 per cent of whom are women (SURE-P, n.d.), although it is not clear how 'job' is defined nor the exact dates that these figures refer to.

In 2012, the Maternal and Child Health Initiative was introduced under SURE-P to reduce maternal and child mortality. In addition to upgrading health facilities and recruiting and training healthcare personnel, the initiative introduced CCTs for pregnant women on the condition that they register at a participating primary healthcare centre to receive health check-ups, and deliver and immunise their babies at the centres where they registered. Observed improvements include improved access to quality healthcare, leading to significant improvements in maternal mortality. For example, Williams (2014) reports that 'Monitoring data suggest that SURE-P MCH (Maternal and Child Health) has generated a 19 percent increase in uptake in antenatal care and a 9.5 percent increase in the utilization of SBAs (Skilled Birth Attendants) at the PHCs (Primary Healthcare Centers) in communities hosting them' (p. 27).

In November 2015 it was announced that SURE-P operations would be wound down, with a probe into activities, funding and expenditure following allegations of corruption (Babalola, 2015). Ongoing governance problems in Nigeria were also cited as a reason for the failure of an earlier Petroleum Trust Fund. Indeed, Nigeria is not alone in governance issues, and research has found that fossil fuel subsidies and countries with weak institutions tend to be linked. Also, there are strong links between countries that have energy resources and the presence of subsidies. This is partly because 'Governments have recourse to subsidies because they lack other effective levels or institutional capacity within which to implement policy' (Commander, 2012, p. 8). The author goes on to note that '[t]his association between weak institutions and subsidies, when disaggregated by energy type, appears particularly strong for oil' (Commander, 2012, p. 9). He also finds that there is a 'clear, negative association between

**3.3.2 India**

India has limited reserves of crude oil and imports 80 per cent of its consumption demand (Petroleum Planning and Analysis Cell [PPAC], 2015). However, it has increased its processing capacity in recent years and is now a net exporter of petroleum products (PPAC, 2015). The country also has reserves of natural gas—largely consumed by fertiliser plants—and is promoting further exploration activities.

Access to modern energy is limited: the 2011 Census of India found that more than a third of the country's households rely on fuels other than electricity for their lighting needs and that two-thirds of households rely on firewood, dung, charcoal and agricultural residue for their cooking needs. Per capita energy consumption is only 0.58 tonnes of oil equivalent (toe) per person, compared to the world average of 1.8 toe per person and the African average of 0.67 toe per person (Ahn and Graczyk, 2012).

Energy use in India has a very marked gender dimension. Traditionally, cooking is seen as a female responsibility, meaning that women bear the burden of gathering and stacking cooking fuel, leading to time poverty and an inability to participate in other economic and social activities (Waris and Antahal, 2014). Furthermore, using low calorific traditional fuels increases the time actually spent in cooking, thus compounding this time poverty impact. Because switching to cleaner fuels like LPG requires an upfront capital cost and continued expenditure, women in low-income households are often unable

to escape this trap. Moreover, low levels of empowerment prevent women from partaking in decision-making on switching to cleaner fuels like LPG. Consequently, poor women are often not able to benefit from the subsidies granted to fuels such as LPG (Nayak and Aggarwal, 2013).

### 3.3.2.1 Fossil Fuel Subsidies in India

The government of India provides subsidies to shield consumers from high and volatile energy costs. In the past, the government subsidised petrol, diesel, LPG and kerosene (see Table 2). Prices for petrol and diesel were converted to market prices in 2009 and 2014 respectively, but subsidies for LPG and kerosene continue. In the past, kerosene subsidies were larger than LPG subsidies, but rapid urbanisation has led to a reversal of this situation, since LPG is largely an urban cooking fuel. Since 2009–10, LPG subsidies have been the larger of the two (Clarke, 2014). LPG is predominantly used for cooking. Kerosene is predominantly used for lighting, though it is used for cooking by a small share of households (Clarke, 2014). Subsidies for both fuels may directly affect the energy sources being used by women, although there has been little research examining how this plays out.

**Table 2:** Subsidy incidence in India, petroleum products (2013–14) and electricity (2011–12).

	Subsidy (% GDP)	Subsidy (US\$ billions)	Population (million ppl)	Subsidy (US\$/per capita)	Reference
PDS superior kerosene oil subsidy (2013–14)	1.40	2.0	143.3	14.2	IRADe calculation
Domestic LPG subsidy (2013–14)	1.33	2.2	147.2	15.1	IRADe calculation
Diesel subsidy (2013–14)	2.55	5.3	151.2	35.1	IRADe calculation
Electricity subsidy (2011–12)	1.83	3.1	155.4	19.9	IRADe calculation
Food subsidy (2013–14)	1.21	4.5	159.7	27.9	IRADe calculation
Fertiliser subsidy (2013–14)	3.41	14.1	164.2	85.6	IRADe calculation

Source: Authors' calculations.

Note: Diesel subsidies were fully phased out on October 18, 2014.

### 3.3.2.2 Subsidy Reform Attempts and Their Impacts

The government of India has recognised that subsidies in the country are often regressive (Table 3). In the 2015 budget session of the parliament, the finance minister noted that 'price subsidies are often regressive in nature... a rich household benefits more from the subsidy than a poor household' (Indian Express, 2015). Concerns that subsidies are an inefficient instrument in poverty reduction and that they result in a significant financial cost for the government have led to a range of reform attempts.

**Table 3:** Energy subsidies benefit for the poor.

Product	Consumer subsidy	What share of benefits accrues to the poor?
LPG	Households receive cash transfers after purchasing LPG (the Direct Benefit Transfer for LPG [DBTL])	The bottom 50 per cent of households consume only 25 per cent of LPG.
Kerosene	Households can purchase low-cost kerosene sold through the Public Distribution System (PDS)	41 per cent of PDS kerosene allocation is lost as leakage, and only 46 per cent of the remainder is consumed by poor households.
Electricity	Capped below market price	Average monthly consumption of the bottom quintile is 45 kilowatt-hours, versus 121 kilowatt-hours for the top quintile. The bottom quintile captures only 10 per cent of the total electricity subsidies, while the top quintile captures 37 per cent of subsidies.

Source: Government of India (2015a).

There have been several attempts at reforming LPG subsidies. Some aimed at limiting the number of subsidised cylinders annually available to every household. Others focused on increasing or decreasing the price of the cylinder. The latest reform has altered the subsidy delivery mechanism and is called the Direct Benefit Transfer for LPG (DBTL).<sup>17</sup> This is a cash transfer scheme that directly deposits the value of the subsidy into a consumer's bank account after they have bought LPG at market prices. After the scheme was launched in 2014, it was shut down due to administrative problems that created issues for low-income households related to access and affordability. The scheme has recently been relaunched across India, making it the world's largest cash transfer scheme. It has contributed to removing several duplicate and fake registrations for LPG subsidies. The government claims it has saved it over INR127 billion (Government of India, 2015b) but this figure is in fact a projection of what would have been saved through an entire year of the DBTL in 2014 and not reflective of actual savings to date (Clarke et al., 2015).

While LPG subsidies are managed by the central government, kerosene subsidies are co-managed by central and state governments, resulting in a range of policy approaches in different jurisdictions. In 2013, for example, kerosene subsidies were completely removed in the capital city of New Delhi, and replaced by a scheme to provide a free LPG cylinder and stove for eligible low-income households. Based on this experience, the government is pushing other state governments to reform kerosene subsidies and the infrastructure of the PDS, through which kerosene is delivered. Government officials have been quoted stating a cut-off date of April 2016 for rolling out reforms, but commentators in India have speculated that policy changes are unlikely to take place by this time—for example, see Sahu (2015).

There have been a few evaluation studies by research institutes and the government examining the impacts of the DBTL on lower income households. The GSI of the IISD was among the first to release an evaluation of the scheme soon after it was launched in the city of Mysore (Sharma, 2014). Although gender-differentiated impacts were not explicitly examined, the study did result in some findings of relevance to gender. Notably, the subsidy had to be transferred to the bank accounts of the person holding the gas connection—usually the male head of household—and was not always passed on to the female head of household, despite the fact that in most households in Mysore it is women who are responsible for managing household expenditure.

IRADe (2014) evaluated the reform of kerosene subsidies in New Delhi. The study found the scheme performed well in lower-income households using kerosene, since the high capital cost of the replacement LPG stove and cylinder was waived and the economic shock was therefore constrained. The study identified several benefits to low-income households in terms of convenience, saved cooking time, cleaner indoor air quality and overall higher quality of life from a switch from kerosene to LPG. Although the study did not target women in particular, some of its findings are of particular relevance when looking at gender dimensions, such as the average of two hours per week of time saved with LPG as a cooking fuel.

In short, while there has been no systematic examination of the gender-differentiated impact of subsidies, there are studies that confirm that subsidies do indeed have different impacts on women and men, and insights into this dynamic could have significant implications for policy design.

### 3.3.3 Bangladesh

Energy consumption has been growing rapidly in Bangladesh over the past two decades, and Bangladesh faces a serious energy crisis due to an inadequate supply of energy resources. Average per capita consumption of energy is very low, at 160 kilograms of oil equivalent (kgoe), compared to

<sup>17</sup> The government has recently renamed this scheme Pratyaksha Hastaantartit Laab.

530 kgoe in India, 340 kgoe in Nepal and 640 kgoe in Asia as a whole (Planning Commission, 2011). Reliance on traditional fuels is high, and in 2010 Bangladesh had an electricity access deficit of 66.6 million people (or around 45 per cent of the 2010 population) (Bangladesh Bureau of Statistics, 2011; Sustainable Energy for All, 2013). Progress has been made with the implementation of the Power System Master Plan (Ministry of Power, Energy and Mineral Resources [MPEMR], 2011), and the Ministry reports that there were 17.8 million consumers or 74 per cent of the population with access to electricity in 2015 (MPEMR, 2016). This implies a drop in electricity access deficit figures to 26 per cent of the population. The non-solid fuel access deficit (i.e. those using biomass such as wood or dung for cooking) stood at 134.9 million people in 2010 (or around 91 per cent of the 2010 population) (National Institute of Population Research and Training, 2009; Sustainable Energy for All, 2013).

In the past decade, due to poor pricing policies, state-owned energy enterprises have experienced long-term deficits that have been paid through subsidies. The recent fall in international oil prices has allowed the government to maintain a stable price level, and state-owned companies now operate at the break-even point. However, there is no clear-cut policy in determining the oil price level, and an increase in international oil prices would lead to the reintroduction of subsidies.

### 3.3.3.1 Fossil Fuel Subsidies in Bangladesh

In 2013 energy subsidies in Bangladesh stood at US\$4.5 billion, which is 3.2 per cent of GDP (IEA, 2014b) or almost US\$30 person. Subsidies apply to petroleum products (petrol, diesel and kerosene), natural gas and electricity.

**Table 4:** Fossil fuel subsidies in Bangladesh, by year and fuel type.

Fuel and Year	Subsidy (% GDP)	Subsidy (US\$ billions)	Reference
<b>Electricity</b>			
Electricity 2011	2.63	3	IMF (2013b)
Electricity 2012		4.2	IEA (2014b)
Electricity 2013		1.7	IEA (2014b)
Electricity 2015		0.96	IMF (2015a)
<b>Petroleum</b>			
Oil 2011		1.2	IEA (2014b)
Oil 2012		0.9	IEA (2014b)
Oil 2012		0.892	Mujeri et al. (2014)
Oil 2013		0.6	IEA (2014b)
Petroleum 2015		0	IMF (2015a)
<b>Gas</b>			
Gas 2011		2.6	IEA (2014b)
Gas 2011	1.6	1.824	IMF (2013a)
Gas 2012		3.2	IEA (2014b)
Gas 2013		2.2	IEA (2014b)
Gas 2015		1.52	IMF (2015a)

**Table 5:** Fossil fuel subsidies in Bangladesh compared to subsidies for clean cooking technologies.

Fuel and year	Subsidy (% GDP)	Subsidy (US\$ billions)	Coverage (million ppl)	Subsidy (US\$/person)	Reference
Total fossil fuel energy subsidies 2013	3.2	4.5		29 (per capita)	IEA (2015)
Biogas plant 2014–15	0	0.007	177	39	BIDS from Infrastructure Development Company Limited (IDCOL)
Improved cook stove 2014–15	0	0.001	508	1	BIDS from IDCOL
Solar home system			3 million households (10% of off-grid population) (2013)	23 per unit (2013)	Khandker et al. (2014)

Bangladesh has used subsidies as a policy instrument for many years in agriculture, health, education, food and exports, as well as in the energy sector. While energy subsidies have been cited as important in facilitating energy access for the poor, they disproportionately benefit the wealthier sectors of society. Moreover, despite ongoing subsidies to gas and electricity, there are still serious deficits in access to electricity and non-solid fuel cooking fuels across Bangladesh. Indeed, Bangladesh is third in the world for the largest number of people without access to electricity (after India and Nigeria) and to non-solid fuels (after India and China) (Sustainable Energy for All, 2013).

**Table 6:** Energy access in Bangladesh.

Electricity access deficit (Sustainable Energy for All, 2014a)	Access to electricity (World Bank, 2015b) (MPEMR, 2016*)	Non-solid fuel access deficit (Sustainable Energy for All, 2014b)	Total population (2010) (World Bank, 2015c)
66.6 million people (2010) (44% of population)	55.2% (2010) 59.6% (2012) 74% (2015)*	134.9 million people (2010) (89% of population)	151 million (2010)

**Electricity.** Over half of the population has access to electricity, and the government is aiming for universal access by 2021 (MPEMR, 2011). In 2013 around 83 per cent of electricity was generated from gas (IEA, n.d.(a)). The government plans to increase coal-fired generation over the longer term, but in the short term rental power plants—based on liquid fuels—have been installed with a consequent increase in the subsidy on imported liquid fuel. Other electricity subsidies include setting electricity tariffs for groups of customers at a level below production costs, resulting in losses in the Bangladesh Power Development Board (BPDB), which generates 60 percent of total electricity (Mujeri et al., 2014).

Retail electricity prices were raised by 64 per cent to BDT6.15 (US\$0.08) per kilowatt-hour on average between March 2010 and March 2014 (IEA, 2014a). The IMF notes that the cost of electricity subsidies (transferred to the BPDB by the government) was reduced in 2013 because authorities raised the tariffs paid by distributors to the BPDB and because retail tariffs were also increased in September 2012 by 16 per cent (IMF 2013).

**Gasoline, diesel and kerosene.** The authorities have not yet put in place an automatic fuel price mechanism (a 2012 IMF condition) but agreed to adjust fuel prices to limit the difference with international prices and to stay within budgeted limits on fuel subsidies (IMF, 2014). Fuel price adjustments have been made since 2006, with the last adjustment being made in January 2013 (Mujeri et al., 2014). For example, kerosene doubled in price from 33 BDT/litre in 2006 to 68 BDT/litre in

2013 (Mujeri et al., 2013), but has been stable since then.<sup>18</sup> However, with the lower oil price since mid-2014, fuel subsidies have effectively turned negative and the authorities have not indicated plans to adjust prices in the near future. Thus, while the government covered the losses of the Bangladesh Petroleum Corporation in periods of high oil prices, the corporation has benefited during periods of low oil prices and has started making a profit for the first time in 15 years (World Bank, 2015).

**Natural gas.** Bangladesh's economy is tied to its natural gas reserves. Currently, all production is from onshore gas fields, but the government is hoping to exploit offshore reserves in coming years. A large part of this production is dedicated to power generation (in 2013, gas accounted for 83 per cent of power generation (IEA, n.d.(a)), but demand from the power sector outstrips supply. Private cars and public transport also run on gas: notably, auto-rickshaws have been converted to compressed natural gas in response to high levels of pollution in Dhaka in the 1980s and 1990s, and this has led to improvements in air quality (Ullah, 2012). Gas subsidies reached US\$2.2 billion in 2013 (see Table 4), with the electricity sector, fertiliser industry and household consumers receiving a large part of the benefit.

### 3.3.3.2 Subsidy Reform Attempts and Its Impacts

Despite agreeing a significant IMF loan (IMF, 2012) linked to energy sector and subsidy reform, the government's current approach to energy subsidy reform is one of containment rather than reduction or removal. In 2015, the impetus to remove subsidies was reduced, since a sharp fall in international oil prices has helped reduce government losses from diesel and petrol subsidies, and by association electricity. However, this current low oil price is a good opportunity for the government to plan and prepare for a switch to an automatic pricing mechanism for the long term, and to assess energy subsidy policies from a gender and access perspective.

While subsidies in Bangladesh have not been assessed from a gender perspective, there have been a number of studies in Bangladesh assessing energy interventions from a gender dimension. These studies have focused on micro-manufacturing of direct current lamps (ESMAP and Bank Netherlands Water Partnership Program, 2004), renewable energy services (Berthaud and Delescluse, 2004), renewable energy value chains (Yunus, 2014) and solar home systems (SHSs) (Khandker, et al., 2014). Each study considers renewable energy and the link to gender, often with links to the private sector and finance.

The review of the literature suggests that targeting of women is more likely to be considered through decentralised and renewable energy services, where microcredit has been key for off-grid electrification, and where women can be effectively included in community-driven, cooperatively owned, decentralised rural electricity services. Gender is not addressed in the conventional energy sector and through energy supply interventions, nor is any effort made to target poor or marginalised groups. New institutions such as the Sustainable and Renewable Development Authority (SREDA, 2012) and the Infrastructure Development Company Limited (IDCOL) do target donors and international financial institutions for support for cook stoves and SHSs in households, but this is separate from conventional government energy subsidies. A key study describing the impact, including for gender, of the development of SHSs for 3 million households since 2003 is described in Box 9.

<sup>18</sup> The government planned to increase the price of kerosene in 2014 for the fiscal year 2015–16 to reduce the subsidy burden. This did not take place, because the sharp decline in international oil prices in late 2014 allowed the government to maintain the existing price level.

**Box 9: Gender impacts of solar home systems in Bangladesh**

The installation of SHSs in Bangladesh has been very successful. An SHS is a system that offers households a 'supply of electricity for lighting and running small appliances (e.g., small television set, radio, and mobile phone charger) for about 3–5 hours a day, using energy from sunlight' (Khandker et al., 2014, p. 11).

The initiative has been developed through the World Bank but also through IDCOL, a government-owned financial intermediary and project implementing agency. The work started in 2003 and as of 2014 had provided 3 million rural households with SHSs. This is around 10 per cent of people in off-grid areas. The current grid system faces many constraints: limited supply, growing dependence on power plants running on high-cost liquid fuels and lack of funds. BIDS undertook research for the World Bank in 2012 to understand and assess the success of the scheme through household surveys. The survey took place across all seven divisions of the country across a total of 4,000 households, of which 1,600 were treatment households and 2,400 were control households.

**Kerosene-use implications:** The work found that, with an SHS, kerosene consumption is reduced: 'Compared to non-adopter households, households that adopt SHS consume an average of 2 litres less kerosene per month (1 versus 3 litres), and this difference is statistically significant.' (p. 35). The research also found that 'overall, kerosene lighting is more than 35 times as expensive as SHS-powered electric lighting' (p. 43).

**Gender implications:** The study considered many factors linked to gender, including household consumption of kerosene, hours spent collecting fuel, hours spent studying in the evenings, incidences in morbidity among household members, women's decision-making power and household per capita expenditure. Some of the findings linked to gender from this study are described briefly below.

- **Education.** The research found that 'children's study time and completed schooling years are better in SHS households than in their counterpart non-SHS households,' but the difference was not statistically significant in the case of school enrollment. 'Children's evening study time increases because of SHS adoption, and it appears to increase more for boys than for girls' (p. 47). At the same time, SHS adoption increases women's study, reading and tutoring children time by 0.36 hours per day or 65 minutes of reading per week.
- **Health.** The study found no consistent pattern in the incidence of diseases among women and children by SHS adoption, and statistically significant higher contraception prevalence amongst married women in those homes without SHSs (seemingly counter-intuitive). The study found that SHS adoption alone had yet to make any difference in health and reproductive outcomes. But when SHS adoption was combined with television ownership, this did lower the respiratory disease rate among women by 1.7 percentage points and gastrointestinal disease rate by 3.3 percentage points, and women's fertility was found to decrease by 6.3 percentage points. The findings validate a 'hypothesis that knowledge and information gathered from television backed by electricity can indeed contribute to welfare enhancement' (p. 51).
- **Time.** In terms of time, the study found that SHS-adopter women spent less time collecting fuel: 0.11 hours less per day on fuel collection, or a weekly saving of 46 minutes. Yet, SHS adopters consume more fuel, likely buying more fuel and collecting less. But 'Somewhat surprisingly, SHS adoption decreases women's leisure time' (p. 53).

**Costs and subsidies:** The upfront costs of an SHS are high. The system is made affordable through a partly subsidised delivery scheme with an institutional framework (IDCOL) and firmly linked in with microcredit organisations so that families pay the cost of the system off over time. The SHSs are an argument and evidence for well-targeted energy subsidies, in this case based on donor financing. Donors cover the cost of programme administration. The subsidy consists of a capital buy-down grant so that SHSs can be purchased for a lower unit price. The subsidy also covers institutional development grants to build capacity of the partner organisations (e.g. Grameen Shakti, Rural Services Foundation and BRAC). Yet the subsidy has also reduced over time to reflect reductions in the cost of equipment. In 2003–2004, the total subsidy per unit was US\$90 (\$70 capital buy-down and \$20 institutional development), and by 2013 the total subsidy had dropped to \$23 (\$20 buy-down for only smaller systems and \$3 institutional development).

### 3.3.4 Summary

Although each of the three countries varies substantially in terms of energy production and consumption, and in terms of the politics and economics that influence energy policy, there are some important points of commonality. First, in all three countries, a large proportion of the population continues to rely on biomass as its primary fuel, with implications for women's lives and livelihoods in as far as they remain responsible for domestic chores. In all three countries—particularly Nigeria—kerosene remains an important fuel for households, but use has been declining in both India and Bangladesh over the last decade. LPG use has risen significantly in India since the 1980s and is much higher than in either Bangladesh or Nigeria.

In each country, decades of subsidies to various energy sources have failed to provide significant benefits to the poor, be they urban or rural, female or male. Rather, many of the benefits have accrued to the wealthier sections of society and the political elite. Reform of energy subsidies, although often fiercely contested in these countries as elsewhere, has the potential to open debate on how best to use public resources, and offers the opportunity to use these resources to benefit the poor in general and poor women in particular. The fact that to date women have been sidelined in the distribution of wealth is indicative of yet another common characteristic: that women often lack the resources and authority to participate fully in decisions relating to energy.

### 3.4 Progressing the Knowledge of Energy Sector Reform and Gender: Agenda for Phase 2

This literature review has examined the link between current subsidies to fossil fuels and gender, the potential impact of reforms on women in low-income households, and the potential options that governments have available for the mitigation of negative impacts, including in Bangladesh, India and Nigeria. Figure 7 summarises some of these findings.

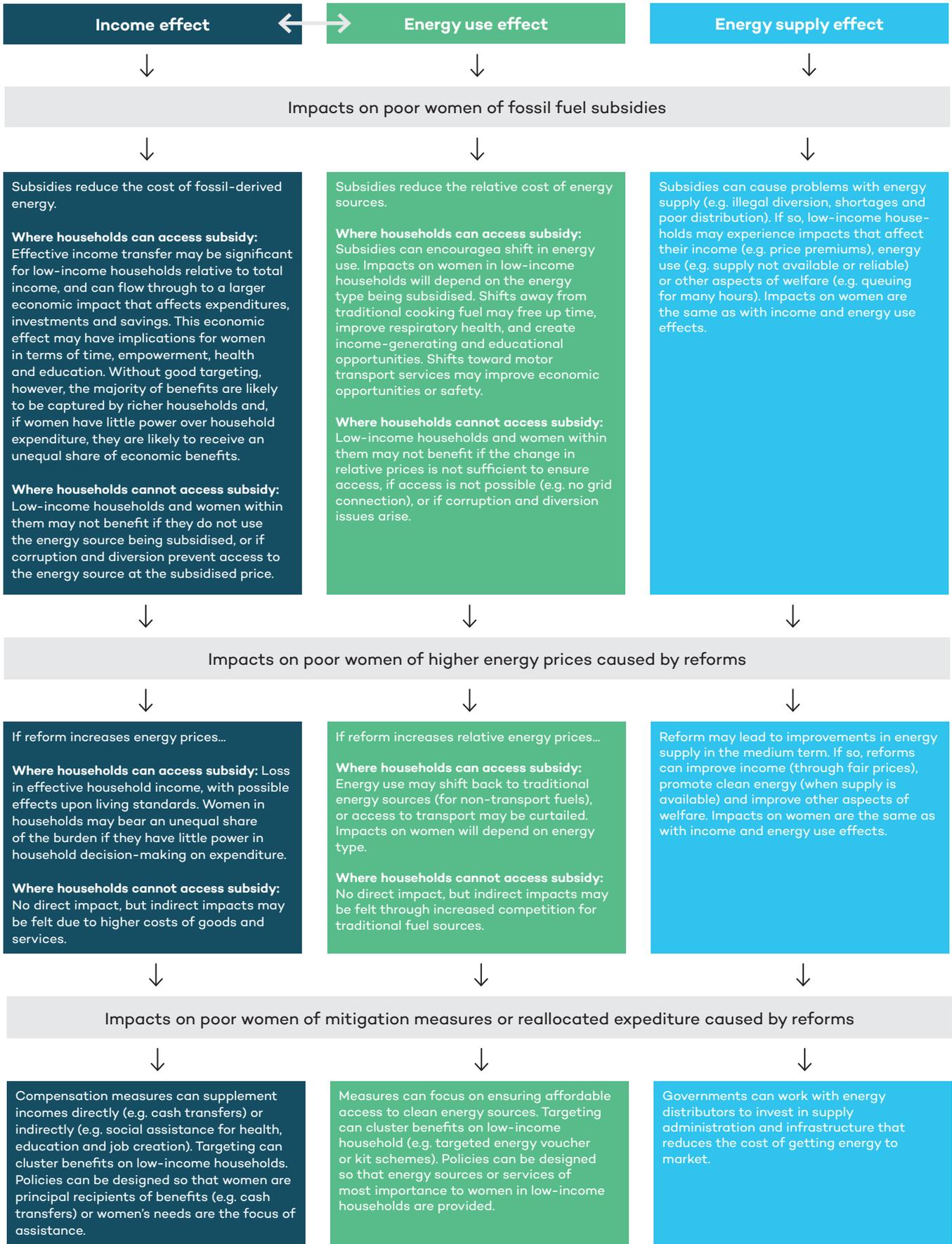


Figure 7: Likely impacts to poor women from fossil fuel subsidies, their reform and mitigation measures.

Source: Authors.

Despite the emergence of these broad theoretical ideas on the linkages between subsidy reform and gender, there is only a very patchy empirical understanding of how subsidies, higher energy prices and mitigation measures affect women. Box 10 describes these gaps in more detail. The research programme in Phase 2, described in Section 4, aims at addressing some of these gaps by conducting rigorous and robust empirical work on two fundamental questions: i) how subsidies affect women's welfare, and ii) how subsidy reform (higher prices and alternative policies) affects women's welfare.

#### Box 10: Gaps in existing knowledge

In the course of the literature review, we identified the following gaps in existing research on the gender-differentiated effects of fossil fuel subsidies and their reform. Some of these gaps will be filled over the course of the research programme, while others should be the subject of further research.

- On **the gender-differentiated effects of access to modern energy sources**, we found limited empirical research on how this affects women's empowerment, the pathways that can apply and how policies can be formulated to maximise the positive effects.
- There is very little existing work on **how women are affected by fossil fuel subsidies**. This study will begin to address this gap by identifying the effects of consumer subsidies to non-transport fuels on women in lower-income households, focusing on kerosene and LPG in three countries (Bangladesh, India and Nigeria). However, many significant gaps will remain, particularly with respect to fuel types and geographies considered.
- Relatedly, we found almost no studies of **how women are affected by fossil fuel subsidy reform**. Again, this study will begin to address this gap, but significant gaps will remain.
- In general terms, we found little discussion of the **effects that subsidies have on the supply of fuel**, either in general terms or how this affects women specifically.
- Reflecting the lack of knowledge on the effects of subsidies and their reform on women, we found no studies that consider **the impacts of subsidies and reform upon men specifically**.
- On the political economy of reforms, further work could usefully address the **political economy of addressing women's needs through energy policy** and the impact of gender-sensitive reform on the political viability of larger reform plans.

The first research question, how subsidies affect women's welfare, is aimed at identifying the pathways by which existing subsidy policies are affecting women and the outcomes of these pathways, as well as determining the baseline against which reform can be assessed. The second element is aimed at assessing how women will be affected by a reform that leads to higher energy prices and reallocates a share of savings to mitigation measures or alternative policies, particularly in order to identify ways that could maximise the benefits of reform for women. Together, the two elements offer an opportunity to understand the effects of current policy and to design a more effective set of policies in terms of enabling women's potential.

These two elements could be usefully extended by considering a range of sub-questions to give further insight into the policy tools that could be employed in the design of reform efforts. In particular, understanding how women benefit or otherwise from subsidies could usefully look at both the direct and indirect impact of subsidies, while understanding how subsidy reform affects women's welfare can be extended into a set of sub-questions examining how different mitigation policies, as described in Section 3.1.2, can affect women and men.

While these research gaps apply to all three of the countries under consideration, ensuring relevance will require that the precise fuel types, subsidy policies and reform strategies vary. Furthermore, and reflecting both the limited evidence on how subsidies and their reform affect women and the more substantive evidence on how the energy environment bears on women's livelihoods, the findings will be highly context dependent. Specifically, while research can tell us about the effect of subsidies and their reform in any one population at any one time, and identify the factors that underlie these effects, this cannot necessarily be generalised outside of that population.

Examination of these questions is subject to data being both available and in an appropriate format. This is not currently the case—data on energy use is rarely disaggregated according to gender, and this literature review has identified almost no data sets on subsidies and their effects that are broken down by gender. The research programme will therefore need, as a first step, to develop the data sets to be used in subsequent analysis.

## 4.0 Proposal for Phase 2

Section 4 sets out the proposal for the second phase of project activities. It begins by setting out a problem statement derived from the literature review. Research questions are then formulated for project partners in Bangladesh, India and Nigeria. The section then sets out a research plan, including major generic steps in each partner's research process and key indicators that they will attempt to incorporate into their work.

### 4.1 Problem Statement

Many governments around the world provide subsidies to lower the retail price of fossil fuels (or energy derived from fossil fuels). Typically, such policies have technical objectives (they are intended to benefit the economy and low-income households) as well as political objectives (to increase the popularity of the government). A large body of evidence has shown that they perform very inefficiently against their technical objectives and that this causes crises that compromise their political objectives (Bacon and Kojima, 2008; Beaton et al., 2013; IMF, 2013a; Kojima, 2009; Vagliasindi, 2013). It is argued that reforming fuel subsidies will free up resources that governments can use to invest in the economy, social welfare and sustainable energy, thereby promoting sustainable development more effectively and efficiently. As a result, many governments have introduced reforms in recent years, and many of the world's major development agencies and donors strongly back fossil fuel subsidy reform.

Most governments, development agencies and donors also strongly back development activities that promote gender equality because, in the words of UK Department for International Development (DFID), 'poverty will not come to an end until women have equal rights with men', and gender equality can accelerate poverty reduction, as well as being a necessary condition for its sustainability (DFID, 2008). As a result, most humanitarian and development activities are supposed to consider their impacts on gender equality—including subsidy reforms. There is, however, limited evidence about the ways that both fossil fuel subsidies and reform affect the welfare of women and men in low-income households.

There are two major areas where knowledge gaps exist, as described in Section 3.1:

- **Understanding the impacts of subsidies:** Little research has been conducted on the way that fossil fuel subsidies affect women and men differently. Further, we can expect that the effects will vary depending upon context and that generalising from one case to another has limitations.
- **Understanding the impacts of subsidy reform:** The lack of baseline understanding about the effects of fossil fuel subsidies on gender equality makes it difficult to explore the impacts of reforming subsidies. This is particularly the case because there is no such thing as a generic 'reform' (see Box 1). Depending on the design of any reform that is considered, it is possible to anticipate negative, neutral or positive impacts on women, men and gender equality, or a mixture of negative, neutral and positive impacts in different areas related to any one policy change. In order to understand the impact of reform, some understanding is required of the gender impacts of specific alternatives to existing policy.

In sum, this knowledge gap is a problem for two reasons. First, it prevents governments from considering how women and men will be affected by planned subsidy reforms; and second, it prevents governments from adapting policies in ways that will promote improved gender equality as a result of reforms.

**Box 11: Household energy needs and reform plans in Bangladesh, India and Nigeria—A knowledge gap on gender impacts**

- Bangladesh:** In Bangladesh, the government subsidises kerosene through a fixed pricing system, where government announcements are required for prices to go up or down. Households in Bangladesh use kerosene for both lighting and cooking, representing over half the expenditure on energy among poor households in rural areas. The subsidies are universally available and, as a result, regressive. Due to the low level of world oil prices in 2015, Bangladesh's fixed pricing system is incurring no subsidies; but without some kind of reform, it is unlikely that the government will increase domestic prices once world prices increase again. The subsidies do not appear to have been successful at promoting broad levels of energy access, as reports estimate low access to modern cooking fuels (MPEMR, 2011; Planning Commission, 2011). Possible alternatives to fixed pricing for kerosene include improving and expanding the provision of electricity or SHSs to rural communities for lighting, and the provision of natural gas and electricity supplies to urban communities. The government is also developing social protection programmes targeting mothers, and non-gender-specific assistance related to employment, food and relief (World Bank, 2014a, 2014b). No research appears to have been conducted on how fossil fuel subsidies in Bangladesh affect women and men differently, although a number of studies have differentiated by gender the impacts of various kinds of energy manufacture and renewable energy applications and systems (Barua, n.d.; Berthaud and Delescluse, 2004; Khandker et al., 2014; Yunus, 2014).
- India:** In India, the government subsidises LPG through a system first introduced as the DBTL and recently renamed Pratyaksha Hastaantarit Laab. Households are allowed to purchase up to 12 subsidised 14.2 kilogram LPG cylinders per year, upon which a subsidy is transferred into their bank accounts. According to government estimates, around 156 million of India's roughly 250 million households (about 60 per cent of households) are registered to purchase subsidised LPG (PPAC, 2015). Nonetheless, the 2011 census indicates that around 65 per cent of urban households use LPG as their primary cooking fuel, while only around 11.4 per cent of rural households do the same, suggesting that the benefits of this policy may differ significantly depending upon geographic location (GSI, 2014). The subsidies are universally available and as a result are costly and benefit wealthy households more than the poor. A number of policy recommendations have been made for better targeting the LPG subsidies and otherwise improving the efficiency of the DBTL system. Little is known about the exact impact of subsidies and reform on women: existing research is limited to noting that the subsidies have failed to reach many rural households and that women report having limited access to the DBTL transfer because most bank accounts are in the name of male household heads (Sharma, 2014).
- Nigeria:** In Nigeria, household kerosene (HKK) has until recently been subsidised. Kerosene is commonly used by low-income households for cooking, lighting and heating needs. At the same time, Nigeria has experienced large governance problems with the kerosene subsidy policy resulting in many households being unable to access HKK at official price levels. Rather, subsidies have often been captured by middlemen, with fuel sold at prices that may even rise above market levels (Aramide et al., 2012). A number of efforts have been made in recent years to cut fuel subsidies in Nigeria, including an official removal of subsidies to HKK, the most recent attempt being in January 2016. Despite previous executive orders for policy change, HKK subsidies have continued. With the announcement from the current Buhari government of the removal of kerosene subsidies, the coming year will determine how this policy change impacts prices in the marketplace and whether there will be attempts to reinstate subsidies in the future or efforts to target a shift toward alternative household cooking fuels, such as LPG. Little is known about the extent to which the presence of HKK subsidies affect women or how women may be affected by the recent reforms.

**4.2 Main Research Questions and Sub-Questions for Phase 2**

The literature review confirms that the lives and welfare of women in low-income households are intimately connected with the availability and use of fuels for cooking. Further, cooking fuels are frequently subsidised, implying that women are directly affected by these subsidies in a way that men are not. Accordingly, the research teams will focus on the way that energy subsidies related to cooking fuels affect women in low-income households. Impacts on men will be taken into account, but only to the extent that they help identify the ways in which women are affected. Research will focus on three fuels:

- LPG, predominantly used for cooking
- Kerosene, predominantly used for lighting, though in some contexts for cooking
- Electricity, used for a range of purposes and appliances

The pathway of causation from the existence of a subsidy policy through to its impacts on women is a complex one that includes several factors: how subsidy policies affect fuel distribution; the extent to which subsidy expenditure flows through into lower retail prices (due to high-level corruption or low-level diversion by black marketeers); the extent to which lower prices influence fuel use; the extent to which fuel use affects the lives of women; and, finally, the policy efficiency, which is to say the cost per unit of any positive impacts observed, taking into account the expenditure that is frequently captured by higher-income households (see Figure 7).

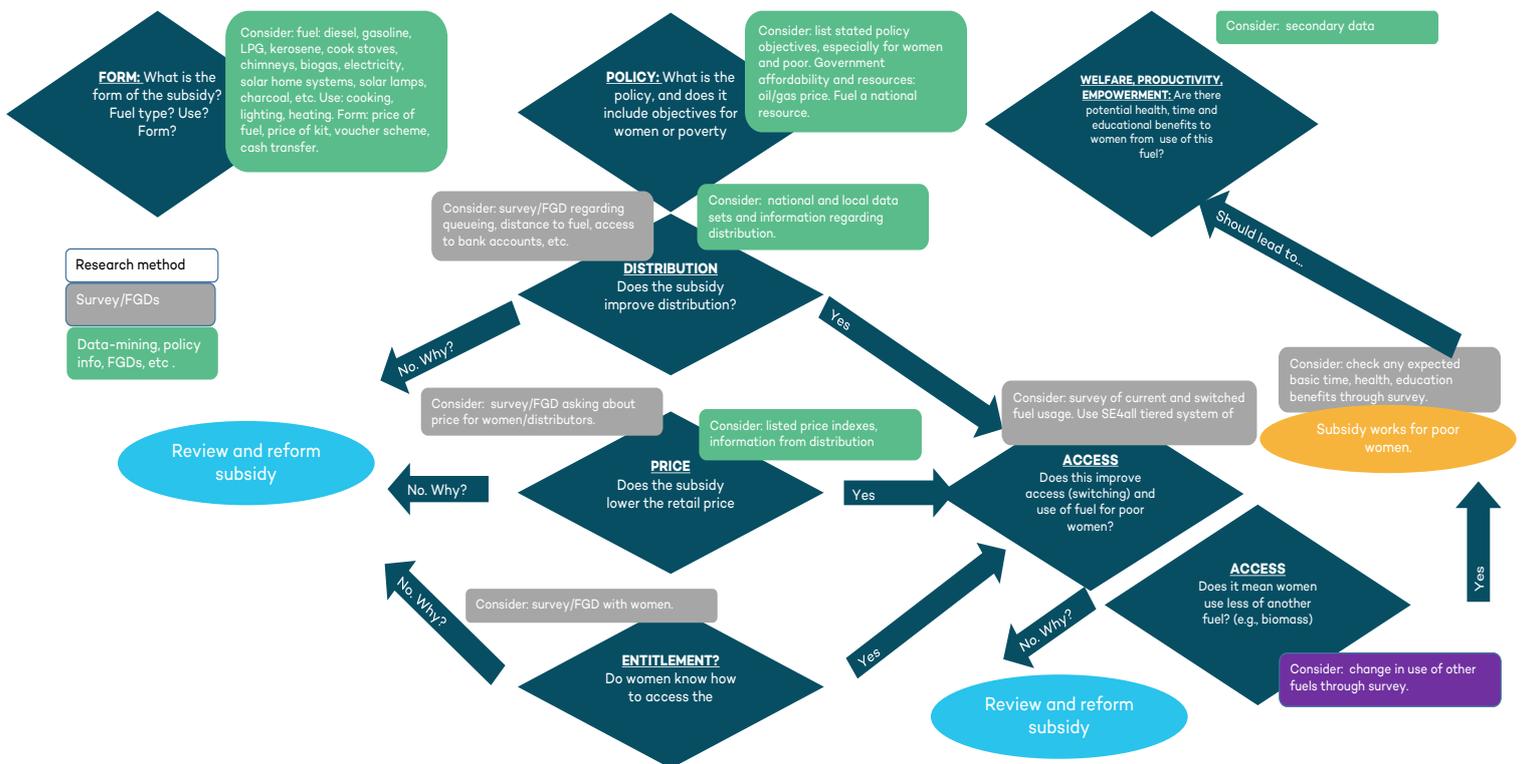


Figure 8: Pathway of causation from fuel subsidy policy to impacts on women.

Source: Authors.

Note: 'Reform' subsidy may mean subsidy redesign as well as subsidy removal. See Box 1 for more information.

The research teams will attempt to address each stage in this pathway, but, given its complexity, and the project's focus on subsidy policy, they will focus in particular on establishing a thorough understanding of the earlier parts of this chain of causation, which test the extent to which (and the conditions under which) subsidy policies actually influence fuel use. The latter parts of the chain—the impacts of changing fuel use on women—will be explored with a greater reliance on secondary data. These impacts will be categorised according to the terms 'welfare', 'productivity' and 'empowerment', as defined in Box 12. This results in the following generic research question structure, which will be adjusted as necessary to suit each country context:

1. How do existing [energy type] subsidy policies affect the welfare, productivity and empowerment of women and girls in low-income households, taking into account:

- Impacts of the subsidy on [energy type] distribution?
  - The extent to which the subsidised price is actually reflected in [energy type] retail prices paid by consumers?
  - The extent to which lower [energy type] retail prices influence household fuel use?
2. How might the welfare, productivity and empowerment of women and girls in low-income households change as a result of specific, nationally relevant proposals for the reform of existing [energy type] subsidies, namely:
- List of one or more specific reforms that could happen in the country that are considered of value to investigate, possibly including design change of existing policies (e.g. influencing distribution, pass through to retail prices), partial or full removal of existing policies with no compensation, a shift to subsidising different energy products, and a shift away from subsidised energy products and toward alternative social assistance policies.

These questions will be defined as well as possible during the first year of the project but will continue to be refined and adapted as necessary as more knowledge is accumulated.

#### Box 12: Impacts of energy subsidies on women: Welfare, productivity and empowerment

In exploring the impacts on women of cooking fuel use change, the research partners will categorise impacts across the three broad groups put forward by GETAT to the Norwegian development agency NORAD, and as described in Section 3.1: 'welfare', 'productivity' and 'empowerment' (see Table 7). Indicators will be developed to help define and collect consistent data across each theme in Bangladesh, India and Nigeria.

Table 7: Gender impacts and energy interventions

Gender goal	Types of needs/issues addressed	Possible energy intervention
<b>Welfare</b> <ul style="list-style-type: none"> <li>• Reduce drudgery associated with collection and use of biomass fuel</li> <li>• Reduce health problems associated with biomass fuel</li> </ul>	<ul style="list-style-type: none"> <li>• Practical need</li> <li>• Health</li> <li>• Quality of life</li> </ul>	<ul style="list-style-type: none"> <li>• Improve access and affordability of clean cooking alternatives—possible link to energy subsidies</li> <li>• Reduce time taken to collect fuel</li> <li>• Reduce load to be carried</li> </ul>
<b>Productivity</b> <ul style="list-style-type: none"> <li>• Free up women's time for income-generating activities</li> <li>• Improve women's economic output and thereby incomes</li> </ul>	<ul style="list-style-type: none"> <li>• Productive need</li> <li>• Economic power</li> </ul>	<ul style="list-style-type: none"> <li>• Free up women's time by improving access and affordability of energy related to time-intensive, non-economic and menial activities—possible link to energy subsidies</li> <li>• Improve access and affordability of energy related to women's employment needs—possible link to energy subsidies</li> </ul>
<b>Empowerment</b> <ul style="list-style-type: none"> <li>• Promote women having an equal voice in decision-making</li> <li>• Promote women's ownership and/or control of assets</li> <li>• Safeguard women from violence and harassment</li> </ul>	<ul style="list-style-type: none"> <li>• Representation need</li> <li>• Equality in governance</li> <li>• Ownership</li> </ul>	<ul style="list-style-type: none"> <li>• Introduce minimum requirements for female members of decision-making bodies</li> <li>• Provide capital or transfers related to energy use—possible link to energy subsidies</li> <li>• Improve street lighting</li> </ul>

Source: Adapted by authors from GETAT (2010).

This results in the following research questions for each country:

### Bangladesh

1. How do existing kerosene subsidy policies affect the welfare, productivity and empowerment of women in low-income households in villages and urban slum areas, taking into account:
  - Impacts of the subsidy on kerosene distribution?
  - The extent to which the subsidised price is actually reflected in kerosene retail prices paid by consumers?
  - The extent to which lower kerosene retail prices influence household fuel use?
2. How might the welfare, productivity and empowerment of women in low-income households change as a result of the following policy reforms:
  - a. Replacing kerosene subsidies in villages with policy interventions intended to promote solar homes, biogas and LPG?
  - b. Replacing kerosene subsidies in urban slum areas with policy interventions intended to promote natural gas and electricity?

### India

1. How do existing LPG subsidy policies affect the welfare, productivity and empowerment of women and girls in urban, peri-urban and rural low-income households in two districts—preliminarily identified as Ranchi (in the state of Jharkhand) and Raipur (in the state of Chhattisgarh)—taking into account:
  - Impacts of the subsidy on LPG distribution?
  - The extent to which the subsidised price is actually reflected in LPG retail prices paid by consumers?
  - The extent to which lower LPG retail prices influence household fuel use?
2. How might the welfare, productivity and empowerment of women in low-income households change as a result of the following policy reforms:
  - a. Modifications to the structure of the DBTL scheme.
  - b. Earnest monthly instalment facility for availing LPG connection.
  - c. Implications of distribution of free LPG ‘connection’ (registration and starter kit) to below-poverty-line households.

### Nigeria

1. How do the changes\* in subsidy policies on kerosene affect the welfare, productivity and empowerment of women in low-income households in urban slums and rural areas in different geographical zones in Nigeria, taking into account:
  - Impacts of the subsidy on kerosene distribution.
  - The extent to which the subsidised price is actually reflected in kerosene retail prices paid by consumers.
  - The extent to which lower kerosene retail prices influence household fuel use.
2. How might the welfare, productivity and empowerment of women in low-income households change as a result of the following policy reforms:
  - a. Policy interventions intended to promote renewable energy.
  - b. Policy interventions intended to promote LPG.

*\* In January 2016, the government of Nigeria announced the removal of subsidies for HKK. In order to adapt to this changing policy environment, the research team has had to adapt its research questions to examine the impacts of this change, as opposed to an ‘existing’ subsidy policy. The research team in Nigeria will need to remain flexible in its approach, since it is difficult to determine the stability of the new policy environment: previous reforms have been quickly rescinded or simply not implemented.*

## 4.3 Methodology for Phase 2

### 4.3.1 Overall Approach and Geographical Focus

Following a review of possible analytical approaches for exploring linkages between energy policy and gender (see Appendix II), the research teams have agreed to adopt a mixed-methods approach that will consist of an audit of secondary data, interviews, a survey and focus group discussions (FGDs), in addition to the literature review that has been completed during the first year of analysis. Interviews and FGDs are to be sequenced so that they can take place both before and after the survey research is conducted, as necessary, while dissemination and stakeholder engagement will take place throughout the project (see Figure 9).

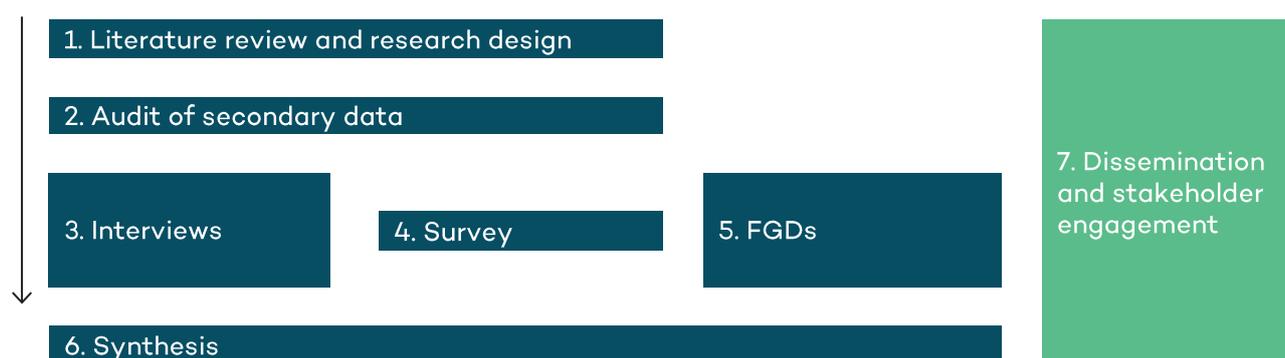


Figure 9: Staging of research methods.

In each country, the research activities will be conducted in a small number of subnational locations, resulting in in-depth studies of subsidy performance in these areas. In each country, this consists of the following:

- **Bangladesh:** In Bangladesh, precise country locations have not yet been identified, but the criteria for choosing appropriate locations have been established. First, separate rural and urban locations will be researched, as it is hypothesised that many stages in the impact pathway from policy to impacts may vary depending on this characteristic. Second, separate locations will be researched to cover the varying availability of grid electricity and solar homes systems (both, only one, neither), as it is hypothesised that the availability of alternative fuels may influence in particular consumer responses to subsidised retail prices. Urban locations will likely be in Dhaka.
- **India:** In India, research will focus on the district of Ranchi in the state of Jharkhand and the district of Raipur in the state of Chhattisgarh, because these districts include a balanced mix of urban and rural populations (Ranchi: 43 per cent urban, 57 per cent rural; Raipur: 36 per cent urban, 64 per cent rural), again a characteristic that is hypothesised to influence subsidy policy performance. In addition, both states have some of the lowest shares of LPG consumption in India (in Jharkhand only 11.66 per cent of households use the main cooking fuel, and in Chhattisgarh 11.18 per cent use it), suggesting that analysis of these regions will help to identify possible barriers to subsidy policy effectiveness, including issues related to LPG supply and the availability of subsidised prices for end users.
- **Nigeria:** In Nigeria, research will focus on the suburbs of Ebutte Metta and Badia (informal urban settlements) and Egbeda (semi-urban settlement) in the South West state of Lagos; the villages of Ogwa and Uzoagba in the South East state of Imo; and Ogoni (a village) and Abonema Wharf (informal urban settlement) in the South Rivers State. Again, locations are chosen to cover a range of urban and rural areas. The spread of locations is chosen in order to allow for a cross-comparison of three different geographical zones, thereby teasing out differences due to cultural,

religious and geographical diversity in these areas, as well as allowing the synthesis of findings to speak more broadly about experiences across South Nigeria.

#### 4.3.1.1 Indicators for Data Collection

In order to adequately explore the stated research questions, research teams will aim to collect data across a wide range of indicators, including the impact of subsidy policy on energy use, and then subsequently the impacts of energy use on women in low-income households. This is summarised in Table 8, where indicators related to the impacts of subsidy policy are captured under the themes of ‘distribution and diversion’ and ‘energy usage’, while the impacts of energy use follow the three categories set out by GETAT (2010) for categorising the various possible impacts that energy policy might have on women: welfare, productivity and empowerment. The table also lists which indicators will be targeted by which research activities: largely, interviews and FGDs aim to cover most indicators, the survey being focused on understanding the impacts of subsidy policy up until the point of influence of relative prices upon fuel use, and the data audit will be used in cases where secondary data is thought likely to exist. Indicators are not yet expressed in the form that they will be directly measured. It is anticipated that this will be refined as teams finalise work plans, and subsequently improved on an iterative basis throughout the project lifetime as more information is accumulated.

**Table 8:** Indicators for researching impacts on welfare, productivity and empowerment.

Theme	Possible areas to establish indicators	Related research activity
<b>Distribution and Diversion</b>		
Distribution	<ul style="list-style-type: none"> <li>Extent of [kerosene/LPG] distribution in a given area</li> <li>Causes of any distribution problems (e.g. cost, infrastructure, low demand, supply chain gaps, diversion)</li> </ul>	Data audit, interviews, FGDs
Diversion	<ul style="list-style-type: none"> <li>Purchase of subsidised [kerosene/LPG] by non-intended beneficiaries (e.g. small businesses, hotels, automotive sector, small industry)</li> </ul>	Interviews, survey, FGDs
Retail prices	<ul style="list-style-type: none"> <li>Difference (if any) between official price and retail price (including delivery charges)</li> <li>Reports (if any) of other premiums on the purchase of subsidised [kerosene/LPG] not factored into the retail price (e.g. bribes, mandatory bundling)</li> </ul>	Interviews, survey, FGDs
<b>Energy Usage</b>		
Access	<ul style="list-style-type: none"> <li>Availability of clean fuel options</li> <li>Affordability of clean fuel options (with reference to a benchmark or based on perceptions)</li> <li>Barriers (if any) to increased use of cleaner fuels</li> <li>Understanding of policies to enable clean fuel use</li> </ul>	Interviews, survey, FGDs
Consumption	<ul style="list-style-type: none"> <li>Average household energy consumption mix: energy sources used for cooking, lighting, household appliances (including mobile phones)</li> <li>Amount of fuels consumed (per week or month)</li> <li>What household appliances are used and how they are powered.</li> </ul>	Data audit, interviews, survey, FGDs
Budgets	<ul style="list-style-type: none"> <li>Amount spent on fuels used in household energy mix (per week or month)</li> <li>Willingness to pay for clean fuel options</li> <li>Responses to changing relative fuel prices (fuel switching, reduced consumption or reduced expenditure elsewhere)</li> <li>Women and men’s roles in household budgetary decision-making</li> </ul>	Data audit, interviews, survey, FGDs

Welfare Indicators		
Quality of life	<ul style="list-style-type: none"> <li>Perceived drudgery of daily activities</li> <li>Time on spent on leisure (with family, radio, television, etc.)</li> <li>Access to media</li> </ul>	Data audit, interviews, FGDs
Health	<ul style="list-style-type: none"> <li>Perceived exposure to indoor smoke</li> <li>Incidence of respiratory illness in women, men and children</li> <li>Perceived risks related to the collection and use of fuel</li> </ul>	Data audit, interviews, FGDs
Education	<ul style="list-style-type: none"> <li>Enrolment levels and sex of children at school</li> </ul>	Data audit, interviews, FGDs
Income	<ul style="list-style-type: none"> <li>Income levels</li> </ul>	Data audit, interviews, FGDs
Finance	<ul style="list-style-type: none"> <li>Access to government subsidies via bank accounts</li> <li>Access to a bank account</li> </ul>	Data audit, interviews, FGDs
Productivity Indicators		
Reliability	<ul style="list-style-type: none"> <li>Perceived reliability of supply of different kinds of energy sources in use by household</li> </ul>	Data audit, interviews, FGDs
Time use	<ul style="list-style-type: none"> <li>Time spent on different household activities, including studying</li> <li>Perceived link between time use and different kinds of energy sources for conducting household activities</li> </ul>	Data audit, interviews, FGDs
Economic status	<ul style="list-style-type: none"> <li>State of women's employment</li> <li>Energy needs in women's employment</li> </ul>	Data audit, interviews, FGDs
Empowerment Indicators		
Gender relations indicators	<ul style="list-style-type: none"> <li>Women's ownership of assets (household appliances [cooking stove], land, home, farming equipment, etc.)</li> <li>Women's registration as named beneficiaries of energy access policies (name on subsidy schemes, identity cards, subscriptions, etc.)</li> <li>Ability to travel to visit relatives alone</li> </ul>	Data audit, interviews, FGDs

### 4.3.2 Research Methods

As stated in Figure 4.2, four main research methods will be used to accumulate data: a secondary data audit, interviews, a survey and FGDs.

#### 4.3.2.1 Audit of Secondary Data

The purpose of the secondary data audit is two-fold: first, to identify existing secondary data of relevance to the project's key indicators, thereby avoiding replication of effort and maximising the project's added value; and second, to forge relationships with existing government agencies and non-government stakeholders that are the custodians of existing data, to allow for better framing of research and dissemination, thereby improving the likelihood of policy influence. In general, official data sources tend to involve very little gender disaggregation, but understanding their current structure and remit will allow for more targeted recommendations as to how governments can better incorporate gender differentiation into their existing metrics.

Data and related metadata will be compiled into a spreadsheet and where appropriate manipulated using basic statistical summary methods such as frequency distribution and cross-tabulation. This will be used to develop baseline reports on the geographic locations of focus in each country.

- **Bangladesh:** In Bangladesh, this will include a review of data in the *Household Income and Expenditure Survey 2010* and engagement with the Bangladesh Bureau of Statistics, the BPDB, the Bangladesh Petroleum Corporation, the World Bank, the Asian Development

Bank (ADB), SREDA, Grameen Shakti, BRAC, Bright Green Energy Foundation and IDCOL.

- **India:** In India, this will include the *District Level Household and Facility Survey*, *National Family Health Survey*, *Household Consumer Expenditure Survey* and *Employment and Unemployment Survey* conducted by the National Sample Survey Office, as well as the 2011 census and the PPAC database. IRADe will also collect information on LPG consumers and public distribution system cardholders from the State Department of Food and Civil Supplies. Non-government data on energy policy and household cooking practices will also be reviewed
- **Nigeria:** In Nigeria, this will include official data released by the National Bureau of Statistics on household living standards, expenditure surveys, the consumer price index, job creation, GDP and inflation. Other data points for analysis include national census data, the *National Demographic and Health Survey 2013*, and the UN databases on population and human development.

#### 4.3.2.2 Interviews

Interviews will be used primarily with reference to three groups: officials in government at the central, state and local levels; officials from oil companies and fuel distribution networks; and women from low-income households. The aim of interviewing the first two groups will be primarily data collection related to policy performance (i.e. from distribution through to influence of below-market pricing on fuel use), although it will also serve a secondary aim of understanding these stakeholders' views on energy policy and gender, feeding into research design and dissemination strategy. The aim of interviewing the third group will be to produce highly textured data on women's experiences procuring cooking fuels. This will serve to identify inaccurate or omitted factors from the larger research design, as well as give a 'human face' to the aims of this research project that can be drawn on in national and international dissemination.

An interview guide will be developed to set out common procedures for how interviews will be conducted, including for background information, anonymity and confidentiality. Interviews will follow a semi-structured questionnaire and be audio recorded and transcribed wherever possible. Patterns or themes in the data will be identified, consistently coded and categorised using a framework analysis made up of five key stages: familiarisation, identifying a thematic framework, indexing, charting, and mapping and interpretation.

- **Bangladesh:** Around 26 interviews in total will be conducted. Ten interviews will be done at the central level, including government officials, energy company officials and relevant experts from international agencies. A further 8 interviews will be done in each of the urban and rural areas chosen as geographical focus with local government officials, energy company and distribution employees, and individual women from low-income households.
- **India:** Around 30 interviews in total will be conducted. Ten interviews will be done at the central level, including government officials and officials from the oil marketing companies. A further 5 interviews will be done at the state level in both Jharkhand and Chhattisgarh, including government officials and OMC employees; and a further 8 interviews each at the district level in Ranchi and Raipur, including government officials, OMC employees and individual women from low-income households.
- **Nigeria:** Around 34 interviews in total will be conducted, consisting of 10 interviews at the central level, including government officials and NNPC officials. A further 8 interviews will

be done in each of the states of Lagos, Imo and Rivers State, including local government officials, NNPC and distribution employees and individual women from low-income households.

#### 4.3.2.3 Surveys

Surveys will be used to collect primary data related to policy impacts upon fuel use (i.e. from distribution through to influence of below-market pricing on fuel choice). They may also be used to collect data on key indicators related to women's welfare, productivity and empowerment, but it will likely be infeasible to use survey data to explore causal relationships between fuel use and these indicators because very large sample sizes would be required to test such relationships. The exact indicators to be surveyed and their form (means, proportions) will be determined as teams develop their work plans, though budgets indicate that research will have to be structured such that statistically significant results can be produced from total sample sizes of between 600 and 1,200.

For research partners who are investigating district-level populations (India), basic stratified sampling will be used to divide households into rural and urban strata. For research partners who have identified much smaller initial populations of analysis that are already defined by their urban or rural status (Nigeria), random sampling will be used. It is estimated that surveys will have roughly 20 to 35 questions with sub-sections, consist of both multiple choice and open-ended questions, and take roughly 30 to 40 minutes. Questions will be mainly addressed to female members of surveyed households, though some questions may have to be answered separately by male and female respondents from the same household.

Surveys will be piloted to get direct feedback from respondents about the structure and content of the questionnaire. In particular, this will identify time taken to answer the questionnaire, difficulty of the questions and ability of questions to address the study objective. The questionnaire will then be improved to carry out the final survey. Enumerators will be given training before and after the pilot survey and overseen by members of the core research team to help ensure quality control. A 'lessons learned' session will be held following the pilot for trainers, pilot enumerators and non-pilot enumerators to discuss their experiences.

The data will be recorded using a structured paper questionnaire. In terms of questionnaire design, quality control will include the use of verbatim questions and explicit skip patterns. Survey modules will provide the interviewer explicit suggestions for further probing. Spot checks will also be used to improve data quality by identifying common problems and poor skill. Data will be transferred into an excel sheet template specially designed according to the survey questionnaire, SPSS or an equivalent appropriate statistical package (R, Mathcad). Data entry will be double-checked and cleaned. Statistical analysis will be carried out using the aforementioned appropriate software. Qualitative assessment will relate the survey findings to the views and concerns of various stakeholders identified elsewhere in the project, including consumers, energy companies and fuel distributors.

#### 4.3.2.4 Focus Group Discussions

FGDs will be used to collect data across all the categories of indicators identified In Table 8, in addition to capturing the perceptions of end users on energy policy reforms and programmes. Open discussion among community members and the various interest groups increases the chances of obtaining credible and relevant information, allowing biased or incomplete answers to be challenged by group dynamics. This will provide a rich and textured understanding of complex issues and situations. FGDs will also be used as a platform to discuss preliminary findings and seek feedback on the study, thus contributing to stakeholder engagement.

Country partners will conduct 10 to 20 FGDs, with the group make-up in each case to be determined as appropriate to the discussion's theme. For example, some discussions will feature an equal divide of sexes, while others will feature same-sex groups. In other cases, discussions will feature an equal divide of government officials, energy company employees, businesses and households, while other discussion will focus only on participants with the same institutional background. FGD participants will be identified with the help of relevant institutional figureheads, such as industry associations for fuel distributions, local administration or civil society groups for households, and community representatives. Groups will be facilitated using a structured outline of questions and discussions will last around two hours. Data will be recorded manually, including non-verbal data, and also in audio format where possible. As with interviews, patterns or themes in the data will be identified, consistently coded and categorised using a framework analysis.

- **Bangladesh:** In Bangladesh, FGDs will focus predominantly on fuel end users.
- **India:** In India, FGDs will focus predominantly on fuel end users.
- **Nigeria:** In Nigeria, FGDs will focus on fuel end users, but also a number of religious and professional women's organisations, including the Catholic Women's Organisation of Nigeria, teachers' unions, women's cooperatives and community associations. In Nigeria, crowdsourcing may also be used as a secondary way to collect a breadth of views and experiences.

#### 4.3.2.5 Data Analysis

Data gathered through the research methods and against different indicators will be analysed using different analytical frameworks. These frameworks have been reviewed by IISD as part of the literature review. Possible frameworks that can be used include gender, institutional or policy analysis.

There will also be an attempt to map data collected from this research to Sustainable Energy for All's multi-tier tracking framework, which measures energy access or consumption against the following eight attributes: capacity, duration and availability, reliability, quality, affordability, legality, convenience, and health and safety. Categorising data into Sustainable Energy for All's framework will enable international comparisons and increase dissemination and usage of the insights from this research into other future studies.

#### 4.3.2.6 Responsibilities

IISD will share responsibility for research design with each of the country partners (BIDS, IRADe and S4C), with IISD taking on overall responsibility for final quality control of research plans and the promotion of research design harmonisation and cross-learning between partners. As the most experienced of the three national research partners, IRADe will act as the 'first mover' within the consortium, so that it may share its experiences with other teams. Each of the country partners will be responsible for accurate budgeting, scheduling, risk assessment, data collection, data entry, draft analysis, draft finalisation and dissemination, and national stakeholder engagement. IISD will be responsible for overall project management, quality control of analysis and international stakeholder engagement, as well as providing support as necessary on an ad hoc basis to the country partners.

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## Appendix I Country Case Studies

This section provides case studies from Peru, Morocco and Mexico. These case studies are examples of countries that have undergone fossil fuel subsidy reforms in parallel or directly linked to the implementation of targeted welfare policies to improve energy access, provide conditional cash transfers (e.g., linked to education or health) and energy voucher schemes.

### Case Study 1: Peru

Fossil fuel energy subsidy spending in Peru peaked at 1.4 per cent of GDP in 2008 (APEC, 2015). This represented an average transfer of US\$55 per person, although it is well documented that a disproportionate share of this accrued to higher-income households (e.g. Clements et al., 2013). A series of changes to Peru's fuel pricing mechanism led to significant increases to domestic fuel prices between 2009 and 2012. Gasoline increased by around 75 per cent, and diesel by 50 per cent. The gender impacts of increasing fuel prices during this period have not been investigated.

The Peruvian government introduced a cook stove distribution programme (LPG and improved biomass stoves) in 2009 and a targeted LPG voucher scheme in 2012. An existing conditional cash transfer programme (Juntos) was expanded significantly, and monthly payments to beneficiary families were doubled in December 2009. By the end of 2014, around 1 million low-income families had been provided with an LPG or improved biomass cook stove, 900,000 families were receiving monthly LPG vouchers and 800,000 families were benefiting from regular cash transfers. It is unclear whether funding for these programmes was sourced directly from fiscal savings associated with subsidy reform or whether they were diverted from elsewhere in the budget. Nevertheless, these measures have served to soften the impact of energy price increases on women and the poor. The annual per person transfer for a household receiving cash transfers and LPG coupons was approximately US\$200.

Based on a series of interviews, APEC (2015) found that the FISE LPG voucher scheme had 'allowed for increased penetration of LPG and the shift away from traditional fuels.' With regards to the Juntos CCT scheme, Perova and Renos (2012) found that the programme significantly increased the use of medical services for children, who were 65 per cent more likely to receive health checks, and for women, for whom the likelihood of a doctor-assisted delivery increased by 91 per cent. Perova and Renos (2013) state that Juntos 'has contributed to decrease physical and domestic violence against women and girls'. Finally, programmes providing improved cook stoves to isolated rural households have made significant progress. Data from The Peru Without Smoke Initiative indicates that the percentage of families with improved cook stoves increased from 3.6 per cent in early 2010 to 11.5 per cent in mid-2012 (Sustainable Energy for All, 2013), with well-documented attendant health benefits.

**Table A1:** Evolution of fossil fuel subsidies in Peru, 2008–2013.

	Subsidy (% GDP)	Subsidy (US\$ billions)	Coverage (million ppl)	Subsidy (US\$/person)	Reference
Total fuel subsidy (2004–2011)		2.50	30.8	-	Kojima (2013a)
Total fuel subsidy (2008 peak)	1.40	1.70	30.8	55	Vagliasindi (2013)
Total fuel subsidy (2011)	0.51	0.87	30.8	28	Clements et al. (2013)
Diesel subsidy (2011)	0.26	0.44	30.8	14	Clements et al. (2013)
LPG subsidy (2011)	0.15	0.26	30.8	8	Clements et al. (2013)
Gasoline subsidy (2011)	0.06	0.11	30.8	3	Clements et al. (2013)
Industrial fuel subsidy (2011)	0.02	0.03	30.8	1	Clements et al. (2013)
Total fuel subsidy (2012, 2013)	0.00	0.00	-	0	APEC (2015)
Electricity subsidy (2011–2013)	0.00	0.00	-	0	Di Bella et al. (2015)

## Background: Energy Pricing and Fossil Fuel Subsidies

Peru has been a net importer of oil since 1994. The oil trade balance deteriorated steadily throughout the late 1990s and 2000s, and by 2011 Peru was importing 2.94 million tonnes of oil per year (IEA, 2015b). In contrast, the development of the large Camisea gas field during the early 2000s increased Peru's natural gas production by an order of magnitude. By 2012, Peru was producing 12 million toe of natural gas per year and exporting about 40 per cent of this (IEA, 2015b).

The share of natural gas used in electricity generation in Peru increased from around 15 per cent prior to the development of Camisea to around 60 per cent from 2005 to 2015. The benefits of affordable electricity have not generally extended to the rural poor; Peru has one of the lowest rural electrification rates in Latin America, with around 30 per cent of rural communities lacking electricity access (Murillo, 2014). Biomass is a widely used energy source. A national household survey undertaken in 2012 indicated that 66 per cent of households classified as extremely poor used biomass for cooking (APEC, 2015).

Peru adopted a smoothing rule, known as the Fondo de Estabilización de Precios de Combustibles (FEPC), for gasoline, diesel, LPG and fuel oil prices in 2004. The objective of the FEPC was to protect domestic consumers from international fuel price volatility. Under this system, international price changes were fully passed through to domestic consumers as long as the latter fell within a band defined by the government. Refiners received government transfers when prices exceeded the upper price limit, and a liability was created for refiners when the lower limit was crossed (Clements et al., 2013; Vagliasindi, 2013). Importantly, the reference price bands were frozen until 2008, resulting in increasing fuel subsidisation as international oil prices rose in 2006, 2007 and 2008. Subsidies peaked at US\$1.7 billion, or 1.4 per cent of GDP, in 2008. Reductions in fuel excise taxes between 2004 and 2008 are estimated to have cost an additional 0.5 per cent of GDP per year (Vagliasindi, 2013).

## Subsidy Reform and Price Increases

An analysis of the distributional impact of Peruvian fuel subsidies in 2008 confirmed their highly regressive nature; the wealthiest 20 per cent of the population received eight times the benefit received by the poorest 20 per cent (Clements et al., 2013). This finding provided impetus for reform, beginning in 2008 when FEPC price bands were increased several times (by a cumulative 28 per cent). Excise tax reductions introduced between 2004 and 2008 were also rolled back. The fuel pricing system was further updated in April 2010 when a rule-based system was introduced (Clements et al., 2013). Price bands were updated every two months but with changes limited to 5 per cent for all fuels except LPG, whose maximum price change was 1.5 per cent. High octane gasoline and regular gasoline were removed from the FEPC in late 2011 and August 2012 respectively, with international price movements subsequently passed through to domestic consumers (Clements et al., 2013). Domestic diesel and LPG prices remain under the remit of the FEPC, but a move to better align the reference price bands with market prices has meant that the cost of the smoothing mechanism is significantly reduced. The IEA estimates that pre-tax subsidies represented only 0.2 per cent of GDP between 2011 and 2013 (Di Bella et al., 2015).

Taken together, these measures led to significant increases in domestic fuel prices. Gasoline increased from around US\$0.8 per litre to US\$1.4 per litre during the space of one year, while diesel increased from US\$0.9/litre to US\$1.1 per litre (Vagliasindi, 2013). Diesel prices increased an additional 20 per cent to US\$1.29 per litre in mid-2012 (Kojima, 2013a). Finally, domestic LPG prices increased by around 5 per cent during the first six months of 2013 (APEC, 2015).

## Safety Nets and Energy Price Increase Mitigation

Peru enacted LPG and improved cooking stove distribution programmes (Project Nina) in 2009 and an LPG voucher scheme (FISE) in 2012. An existing CCT programme (Juntos) also expanded significantly: monthly payments to beneficiary families were doubled at the conclusion of 2009. It is unclear whether funding for these programmes was sourced directly from fiscal savings associated with subsidy reform or whether they were diverted from elsewhere in the budget. However, all three measures have served to soften the impact of increasing energy prices on the poor and particularly on women.

### Juntos CCT

The Juntos CCT programme was created in 2005. It was launched during a period of increasing implicit fuel subsidisation from the FEPC and was not related to fossil fuel subsidy reform. Eligible families received PEN100 (US\$34) per month until December 2009, and PEN200 (US\$68) per month thereafter (Dasso and Fernandez, 2014). According to Perova and Renos (2012), PEN100 represented around 15 per cent of an average beneficiary family's budget. Monthly payments are contingent on several key conditions, including regular health and nutrition checks and immunisations for children under 5, greater than 85 per cent school attendance for children aged 6–14, and pre- and postnatal checks for pregnant and breastfeeding mothers.

Since its inception in 2005, Juntos has expanded its coverage from 37,000 to 833,000 families (Peru This Week, 2015). It is particularly notable that the size of the programme increased significantly following fuel price reforms in 2009. Not only did the monthly transfer amount double, but the total number of beneficiary households increased by around 30 per cent in the four years leading to 2013. This represents an increase in total spending from US\$210 million in 2008 to US\$430 million in 2013. The annual transfer for a beneficiary household in 2013 was around US\$720, which is more than three times the average transfer provided by blanket fuel subsidies in 2008 (assuming a four-person household).

**Table A2:** Evolution of Juntos CCT programme size.

	Subsidy (% GDP)	Subsidy (US\$ billions)	Coverage (million ppl)	Subsidy (US\$/person)	Reference
Juntos programme (2005)	0.02	0.01	0.15	90	Perova and Renos (2013)
Juntos programme (2008)	0.17	0.21	1.82	114	World Bank (2011)
Juntos programme (2013)	0.21	0.43	2.40	180	Perova and Renos (2013)
Total social spending (2015)	0.99	2.00	?	-	Peru This Week (2015)

### FISE LPG Coupon System

The Fondo de Inclusión Social Energético (FISE) was created in 2012 in response to a census finding that 37 per cent of the population used traditional fuels (biomass), and that 60 per cent of these households were situated in rural areas. FISE is an LPG voucher scheme that targets vulnerable rural and urban households. It is intended to encourage households to shift away from traditional biomass energy sources in favour of modern clean fuels (APEC, 2015). Eligible families receive a coupon entitling them to a monthly discount of PEN16 (US\$5.70) on a first refill of a 10 kilogram LPG container. FISE is revenue neutral, as it is funded via surcharges on industrial electricity users, liquid fuel producers and importers, and natural gas consumers. According to APEC (2015), the total cost of the FISE programme is PEN230.4 million (US\$82 million), and the programme reaches 1.2 million households each year. APEC (2015) also notes that 'the full economic costs of this cross subsidy are not understood, and a full cost-benefit analysis would help identify the magnitude of these economic costs.' FISE has grown significantly in the three years since its creation and reached around 200,000 households at the end of 2012 (APEC, 2015).

**Table A3:** Evolution of FISE LPG coupon programme size.

	Subsidy (% GDP)	Subsidy (US\$ billions)	Coverage (million ppl)	Subsidy (US\$/person)	Reference
FISE (2012 launch)		*	0.1		APEC (2015)
FISE (March 2014)		*	3.0		APEC (2015)
					Murillo (2014)

\*APEC (2015) states 'the full economic costs of this cross subsidy are not understood, and a full cost-benefit analysis would help identify the magnitude of these economic costs' (p. xi).

The FISE LPG coupon scheme has two additional notable components. First, the programme has incorporated a digital system whereby beneficiaries can receive and use their monthly voucher via text message. Secondly, FISE provides LPG cooking equipment—a two-burner stove, 10 kilogram LPG canister and hose—to eligible families who don't already own these. This provision is intended to make the programme accessible to families for whom the fixed cost of this equipment represents a large sum of money. Around 240,000 LPG stoves were given away in 2013. The programme aims to have reached one million households by 2016 at a total direct cost of US\$55 million (Sustainable Energy for All, 2013). This builds upon an earlier programme (Project Nina), launched in 2009, that distributed 45,000 LPG stoves nationally.

### Improved Cook Stove Distribution

Although the FISE LPG programme has expanded rapidly, it has not effectively reached households in isolated rural areas. Besides the limited number of LPG distribution points, LPG canisters are heavy—transporting them significant distances beyond road networks is often problematic. With this constraint in mind, the Peruvian government along with a range of NGOs has developed programmes that facilitate the distribution of improved cook stoves (see Global Alliance for Clean Cookstoves, 2012). An initiative named Cocinas Mejoradas por un Peru sin Humo or Improved Cookstoves for a Peru without Smoke (ICSPWS) was launched in 2009 with the intention of bringing disparate cook stove programmes under the same umbrella. By 2014, a total of 287,000 improved cook stoves had been installed at a total cost of approximately US\$30 million (Cocinas Mejoradas, 2014). Based on this data, the average cost of an improved cook stove during this period was US\$90, which is similar to information published by Sustainable Energy for All (2013), which estimates the direct, indirect and administration costs at US\$80 per stove. The stated aim of the ICSPWS initiative is to reach 500,000 households.

**Table A4:** Evolution of improved cook stove programmes in Peru.

	Subsidy (% GDP)	Subsidy (US\$ billions)	Coverage (million ppl)	Subsidy (US\$/person)	Reference
ICS (2009–2011): Nina			0.3		United Nations Framework Convention on Climate Change, 2012
ICS (2009–2012): ICSPWS			0.9		Sustainable Energy for All, 2013
ICS (2009– 2014): ICSPWS	0.00	0.03	1.1	22	Cocinas Mejoradas, 2014

### FOSE: Lifeline Electricity Tariffs

The Fondo de Compensación Social Eléctrica (FOSE) is an electricity cross-subsidy that provides discounted electricity tariffs for households consuming less than 100 kilowatt-hours per month. FOSE is revenue neutral; reduced rates for small consumers are funded by a surcharge on larger electricity users.

Tariff rates for usage of less than 100 kilowatt-hours are staggered, with the first 30 kilowatt-hours of consumption charged at the lowest rate, and gradual tariff increases after this. Vagliasindi (2013) states that 60 per cent of Peruvian households benefit from FOSE cross-subsidies.

### Mitigation Measure and Gender

The Juntos CCT scheme, like other CCT programmes, has a strong gender component. Cash transfers are made primarily to female beneficiaries, and the key conditionalities relate to childhood education and maternal health. Juntos is a relatively young CCT scheme by Latin American standards, and has not been as thoroughly evaluated as other comparable programmes in Mexico and Brazil. A series of papers from Perova and Renos provide some insight, and the following summary draws heavily on Perova and Renos (2012):

- **Income:** Overall consumption increased by 33 per cent for beneficiary families. Non-food-related consumption increased by 65 per cent, while food spending increased by 15 per cent. The poverty headcount decreased by 14 per cent.
- **Health:** Children from beneficiary households were 69 per cent more likely to have received health checks and 55 per cent more likely to have sought medical attention when ill.
- **Maternal health:** Among women of childbearing age, the likelihood of doctor-assisted delivery improved by 91 per cent, and contraception use increased 12 per cent.
- **Education:** No significant effects were found on the incidence of school registration or child labour. However, the likelihood of registered children attending school increased by 25 per cent.
- **Violence:** Physical and domestic violence against women and girls decreased.

Two sources of information suggest that the FISE LPG coupon scheme has had a positive gender impact. First, beneficiary interviews undertaken as part of Peru's voluntary fossil fuel subsidy peer review process indicate that FISE has substantially improved the accessibility and the efficiency of purchasing LPG, particularly in rural areas. APEC state that beneficiaries 'appreciate the program and confirmed that it is very beneficial to them, both financially and in terms of the health benefits that the scheme provides' (2015, p. 60–61). Secondly, data from consecutive national household surveys indicate that the number of poor households using firewood to cook decreased from 43.5 per cent in 2012 (APEC, 2015) to 36 per cent in 2013 (Murillo, 2014). Similarly, 66 per cent of households classified as very poor used firewood to cook in 2012 (APEC, 2015) compared to 53.1 per cent of households in 2013 (Murillo, 2014). Although the gender effects of changing household energy mix are poorly documented in Peru, a number of studies elsewhere have documented the positive health impacts of a shift away biomass for cooking (see above).

The percentage of Peruvian households that have improved cook stoves increased from 3.6 per cent in early 2010 to 11.5 per cent in mid-2012 (Sustainable Energy for All, 2013). This impressive increase is in large part due to ongoing programmes by government and NGOs, particularly in rural areas where LPG distribution is relatively difficult. Adrianzen (2011) found that the use of improved cook stoves in the northern Peruvian Andes reduced fuel costs by around 40 per cent and, for stoves with an operative chimney, reduced the incidence of self-reported respiratory illness and eye discomfort symptoms. Despite these benefits, and the relatively low costs of improved cook stoves, they remain unviable in Peru without subsidisation (Sustainable Energy for All, 2013). Rural households tend to use their scarce resources for subsistence or investment in capital items for productive activity.

## Case Study 2: Morocco

Energy reform in Morocco reduced fuel subsidy spending from 5.3 per cent of GDP in late 2011 to 1.1 per cent of GDP in early 2015. Subsidies on gasoline, diesel and fuel oil have been completely eliminated, resulting in annual fiscal savings of about US\$3 billion relative to 2011. Indexation of the domestic prices of these products to their international counterparts is noteworthy in the Middle East and North Africa context; recent subsidy reform elsewhere in the region has generally combined ad hoc price increases with ongoing government pricing control. Subsidy removal has led to increased domestic energy prices; between 2011 and early 2015, gasoline and diesel increased by 25 per cent and 35 per cent respectively. LPG subsidies, which were not included in recent reforms, amounted to approximately 1.1 per cent of GDP in 2015; the price has been frozen since 1995.

The Moroccan government has adopted a dual approach to mitigating the adverse impacts of energy price increases on low-income households. First, two existing nationwide social safety nets were significantly enlarged. The Tayssir CCT programme targeting poor rural households expanded from 80,000 families in 2009 to 466,000 families in 2014. Similarly, a health insurance scheme for the poor, Regime d'Assistance Medicale (RAMED), increased its coverage from 5.1 million beneficiaries in mid-2013 to 8.4 million beneficiaries in early 2015. Secondly, reforms have been decidedly 'pro-poor' in that the most regressive subsidies—those that benefit the poor the least—have been eliminated. For example, Verme et al. (2014) estimate that only 1 per cent of gasoline and diesel subsidies accrued directly to the poorest 20 per cent of the population; low-income households were therefore relatively unaffected by the removal of this subsidy. Subsidies have been retained on products which, in Morocco, make up a larger share of household expenditure for the poor than for the rich; LPG, basic food items and electricity.

The gender impact of recent subsidy removal in Morocco has not been assessed. However, the targeting of reform may have successfully sheltered women in low-income households from any adverse impacts. In particular, the retention of LPG and electricity (for the lowest consumption block) subsidies reduces the likelihood that low-income families will revert to biomass or kerosene for household cooking and lighting. Increased transport prices are also unlikely to significantly impact women, particularly in more rural parts of the country where women are generally excluded from public transport use (e.g. Grun, 2011). The Tayssir CCT programme has had a significant impact on educational indicators since its creation in 2007. One study by Benhassine et al. (2014) found that over two years the Tayssir labelled cash transfers for educational support 'reduced the dropout rate by 76% among those enrolled at baseline; increased reentry by 82% among those who had dropped out before the baseline; and cut the share of neverschooled by 31%' (p. 4).

### Background: Resource Wealth, Energy Pricing and Subsidy Reform

Morocco has few domestic oil and gas reserves and is highly reliant on imports for its energy requirements. In 2012, approximately 92 per cent of its total energy supply was imported, with the largest contributions from oil imports (36 per cent), refined product imports (34 per cent) and coal imports (15 per cent) (IEA, 2015b). This makes Morocco the largest energy importer, in relative and absolute terms, in North Africa (Vagliasindi, 2013). The electricity generation mix is dominated by coal, fuel oil and gas, which account for 52 per cent, 27 per cent and 17 per cent of total generation respectively (IEA, 2015b). Electricity access in Morocco has grown rapidly, increasing from around 20 per cent of the population in 1995 to almost 100 per cent in 2005. This was in large part due to government support for the Rural Electrification Global Program.

Morocco has experienced several phases of fossil fuel energy subsidy reform and reintroduction. Fuel prices were fully liberalised between 1995 and 1999, but subsidies were reintroduced in 2000 as increasing domestic fuel prices became politically difficult to sustain (Verme et al., 2014). Significant

subsidy reform was undertaken again in 2006 and 2007, but the fiscal cost of subsidisation continued to grow during 2007 and 2008 as international oil prices rose. By 2011, annual subsidies on petroleum products had grown to US\$5.4 billion, or 5.3 per cent of GDP. Diesel subsidies accounted for approximately half of this spending, with the remainder split between LPG (29 per cent) and fuel oil (16 per cent) subsidies (Kojima, 2013a); gasoline subsidies had largely been phased out during the 2006–2007 reforms. By comparison, Morocco’s budget deficit amounted to 6.8 per cent of GDP in 2011 (IMF, 2013b).

Subsidy reform began in mid-2012 when the government increased the prices of gasoline, diesel and fuel oil by 20 per cent, 14 per cent and 27 per cent respectively. More fundamental reform took place in September 2013 when a new pricing system allowing for the full transmission of international price changes to the domestic market was introduced. This is noteworthy within the Middle East and North Africa context. Subsidy reform in the region has been widespread recently, but has mostly involved ad hoc price increases with a continuation of government pricing control. Implementation took place during 2013 and 2014; gasoline and fuel oil subsidies were eliminated by January 2014 and diesel subsidies by January 2015. In total, between 2011 and early 2015, gasoline and diesel prices increased by 25 per cent and 35 per cent respectively (Kojima, 2013a; Verme and Massnaoui, 2015).

**Table A5:** Evolution of Moroccan fossil fuel subsidies.

	Subsidy (% GDP)	Subsidy (US\$ billions)	Coverage (million ppl)	Subsidy (US\$/person)	Reference
Fuel subsidy (2009)	1.0	0.9	34	27	Kojima (2013a)
Fuel subsidy (2010)	3.2	2.9	34	87	Kojima (2013a)
Fuel subsidy (2011)	5.3	5.4	34	161	Kojima (2013a)
			0		
Fuel subsidy (end 2011)	4.9	4.8	34	143	IMF (2013a)
Gasoline (end 2011)	0.2	0.2	34	7	IMF (2013a)
Diesel (end 2011)	2.4	2.4	34	72	IMF (2013a)
Fuel oil (end 2011)	0.8	0.8	34	23	IMF (2013a)
LPG (end 2011)	1.4	1.4	34	42	IMF (2013a)
			0		
LPG subsidy (November 2014)	1.1	1.2	34	35	Verme and Massnaoui (2015)
Food subsidy (November 2014)	0.4	0.4	34	13	Verme and Massnaoui (2015)
Electricity (November 2014)	1.5	1.6	34	48	Verme and Massnaoui (2015)

LPG remains exempt from the new pricing scheme, and subsidies as of early 2015 are estimated to cost around US\$1.2 billion, or 1.1 per cent of GDP (Verme and Massnaoui, 2015).

### Safety Nets and Mitigation Measures

Morocco took a dual approach to mitigating the adverse impacts of energy price rises associated with subsidy reform. Several existing safety net programmes were expanded and reforms were targeted so as to have a minimal effect on lower-income families.

#### CCT: Tayssir

The Tayssir CCT programme targeting poor households in rural areas was launched as a pilot programme targeting 80,000 households in 2008. Transfers are made to either the father or mother of each family and are conditional on primary school attendance. Payments increase with the age of

the children; those in grades 1 or 2 receive MAD60 per month (US\$7), while those in grades 5 or 6 receive MAD100 (US\$12) per month (Gattioui, 2014). According to Poverty Action (2015), the average payment amount represents around 5 per cent of typical household monthly spending, putting the Tayssir scheme at the lower end of the spectrum for CCTs in lower-middle-income countries. Beneficiary households can choose to collect the bi-monthly payment from an accredited outlet or have it delivered to them by post.

Tayssir has expanded significantly since its creation, reaching 466,000 households, or about 5 per cent of the population, by 2014 (Morocco Ministry of Finance, 2015). Total programme cost has grown to US\$70 million per year, with the transfer for a beneficiary household coming to approximately US\$153 per year. This is a similar amount to pre-reform (net) household fossil fuel subsidies (assuming a family of four) but is much better targeted, costing around 0.1 per cent of GDP as opposed to 1.7 per cent.

**Table A6:** Evolution of Tayssir programme.

	Subsidy (% GDP)	Subsidy (US\$ billions)	Coverage (million ppl)	Subsidy (US\$/person)	Reference
Tayssir (2008–2009)	0.02	0.02	0.40	46	World Bank (2015)
Tayssir (2013–2014)	0.07	0.07	1.72	42	Ministry of Finance (2015)

### Health Insurance: RAMED

The RAMED programme was announced in 2005 and launched in 2008. RAMED is a health insurance programme funded by the government and designed to protect low-income households from catastrophic health expenses. There are two categories of beneficiary. Households with monthly income of less than MAD300 per month receive a ‘carte d’indigence’ which entitles them to free health insurance. Households with monthly income of between MAD300 and MAD600 are eligible to purchase insurance on a sliding scale between MAD100 per year and MAD600 per year (Access Health, 2015). The programme aims to eventually reach 8.5 million people, or around 28 per cent of the population.

By February 2015, 8.4 million people, or 25 per cent of the population, had registered for RAMED. This represents more than 95 per cent of the people eligible for the programme. The estimated annual cost of RAMED is unclear, but several recent publications put it at MAD2.7 billion, of which 75 per cent is covered by the government (Kirat, 2012)

**Table A7:** Evolution of the RAMED programme.

	Subsidy (% GDP)	Subsidy (US\$ billions)	Coverage (million ppl)	Subsidy (US\$/person)	Reference
RAMED (July 2013)			5.10		African Development Bank (2013)
RAMED (August 2014)	0.19%	0.2	7.28	28	Ministry of Finance (2015)
RAMED (2015)			8.5 (forecast)		Ministry of Finance (2015)

### Reform Targeting: Pro-Poor Subsidies on LPG and Basic Food Retained

Subsidy reform in Morocco targeted the most regressive subsidies, petrol and gasoline, while subsidies on LPG and a number of basic food products were left untouched. Prior to reform, it was estimated that less than 1 per cent of total subsidy spending on gasoline and diesel accrued to the poorest quintile. This is in contrast to the wealthiest 20 per cent of the population, who received around 75 per cent of this spending (Verme et al., 2014). Although LPG subsidies are also regressive, a higher proportion of

this spending (around 30 per cent) accrues to the poorest two quintiles. Perhaps the strongest argument for retaining LPG and basic food subsidies is that low-income households spend a greater proportion of their monthly income on these products than wealthier households (Verme et al., 2014). Poorer families would be disproportionately adversely affected by price increases on these products.

As of early 2015, domestic consumers continued to pay MAD40 for a 12 kilogram LPG refill. Verme and Massanaoui (2015) estimate that this represents one-third of the LPG cost recovery price, with the total annual LPG subsidy coming to MAD11.8 billion, or 1.1 per cent of GDP. Food subsidies continue to be dominated by flour and sugar; consumers pay 60 to 90 per cent of the market price for flour and around two-thirds of the market price for sugar. Verme and Massanaoui (2015) estimate that total subsidy spending on flour and sugar came to MAD4.4 billion in 2014.

### **Reform Targeting: Pro-Poor Lifeline Electricity Tariffs Retained**

Subsidies on industrial fuel oil used in electricity generation were included in the 2014 subsidy reforms. An agreement between the government and the state-owned electricity generator allows for gradual increases to retail electricity prices between 2014 and 2017. The one exception to this is for the lowest consumption bracket (monthly use of less than 100 kilowatt-hours), which will remain exempt from tariff increases (Verme and Massanaoui, 2015).

### **Mitigation Measures and Gender**

The Tayssir CCT has fewer gender elements than other CCTs; payments are not specifically channelled to mothers, and there is no conditionality surrounding maternal health checks. Relative to CCTs in other countries, Tayssir seems to have been designed more as a tool for encouraging school attendance than for alleviating poverty. Almost all the evaluation of Tayssir has focused on its impact on educational performance. Benhassine et al. (2014) compared the difference between a labelled cash transfer (aimed at education) and a conditional cash transfer and found that the Tayssir labelled cash transfer scheme had a significant increase in re-enrolment for girls who initially dropped out of school of 11.2 percentage points (labelled cash transfer to fathers) and 13.9 percentage points (labelled case transfer to mothers).

The gender impact of subsidy reform has not been investigated. Nearly all households (99 per cent), both urban and rural, use LPG primarily for cooking and, in rural areas where electricity is not available, also for lighting (Vagliasindi, 2013). Recent surveys indicate that the poorest households, especially in rural areas, would switch from LPG to charcoal, wood or kerosene if the price of LPG increased to market prices. Households in rural areas stated they would mostly change to wood, whereas those in urban settings stated that they would mostly switch to charcoal (Vagliasindi, 2013). Given this finding, it is likely that the retention of LPG and electricity (for the lowest consumption block) subsidies has successfully sheltered women from the adverse impacts of cooking with biomass.

Increased transport prices are also unlikely to significantly impact women, particularly in more rural parts of the country where women are generally excluded from public transport use (e.g. Grun, 2011).

### CASE STUDY 3: MEXICO

Mexico has successfully phased out implicit subsidies on gasoline and diesel from a peak of 1.8 per cent of GDP in 2008. Vagliasindi (2013) estimates that subsidy spending amounted to US\$35.4 billion during the period 2007 to 2011, or around US\$7 billion per year. Subsidy removal led to a period of increasing energy prices: gasoline and diesel prices increased by around 12 per cent year on year between 2010 and 2015, while annual LPG price increases were in the order of 7 per cent. Fuel subsidies were highly regressive, with higher-income households receiving the vast majority of benefits, particularly for gasoline. The gender impact of rising energy prices remains unclear; very little effort has been made to assess the possible effects on women and girls. This is despite women being the primary collectors and users of household energy.

Mexico has a relatively progressive set of social safety nets from a gender perspective. The Oportunidades CCT has a strong gender element, and a large body of empirical work documents causal improvements in female health, education and general well-being. The energy component of Oportunidades has been less studied, but two pieces of research suggest that cash transfers have led to increased uptake of durable household goods such as stoves and refrigerators. Where these appliances run on clean forms of modern energy, there are health- and time-saving benefits for women. Lifeline electricity tariffs serve to make electricity more affordable for low-income consumers, with obvious gender benefits where households substitute away from traditional sources of cooking and lighting fuel. Unfortunately, they are poorly targeted, with higher-income households receiving the majority of the subsidy—the high upfront fixed cost of modern electric appliances is one obvious limiting factor for poorer households. Finally, a broad set of efficiency initiatives serve to make electricity increasingly cost competitive with respect to traditional sources of household, again with clear attendant benefits for women.

#### Background: Resource Wealth, Energy Pricing and Fossil Fuel Subsidies

Mexico has significant oil and gas reserves: in 2012 it was the 9th largest producer of oil and the 18th largest producer of natural gas in the world. Mexico's energy balance has broadly deteriorated since the early 2000s; by 2012 it was exporting 45 million tonnes of oil (down from a peak of 98 million tonnes in 2004) and importing 18.5 million toe of natural gas (up from 2.2 million toe in 2000) (IEA, 2015b). A lack of domestic refining capacity has meant that Mexico has been a net importer of refined petroleum products during the two decades leading up to 2016. Data from the Energy Ministry indicate that in 2014, imported LPG, diesel and gasoline accounted for 30 per cent, 30 per cent and 50 per cent of domestic consumption respectively (SENER, as cited in Lajous, 2014).

Mexican gasoline, diesel and LPG prices are determined on an ad hoc basis by a committee made up of the Secretary of the Economy, Secretary of Energy and an advisory panel (Di Bella et al., 2015). This committee has historically used a varying rate of excise tax, the IEPS, to smooth the impact of international price volatility on domestic retail prices. Government revenues from the IEPS averaged 1 per cent of GDP between 1980 and 2005, but since 2006 domestic fuel price increases have failed to keep pace with their international counterparts, resulting in negative collections (Secretaría de Hacienda y Crédito Público, 2014). The largest revenue gap occurred in 2008 when implicit fuel subsidies cost the Mexican government around US\$20 billion, or almost 2 per cent of GDP. Cumulative subsidies during the period 2007–2011 amounted to about US\$35.4 billion (Vagliasindi, 2013).

In 2010, the Mexican pricing formula was adjusted so as to increase gasoline, diesel and LPG retail prices by about 1 per cent a month, to phase out subsidies (Di Bella et al., 2015). A further adjustment was made in 2014 when the formula was changed so that fuel prices would reflect inflation. These policies have significantly reduced fuel subsidies, which accounted for less than 1 per cent of GDP by

2013. It is widely expected that subsidies will be eliminated in 2015; Mexico expects a positive revenue of around MXN10 billion (0.1 per cent of GDP) from the IEPS in 2015 (SHCP, 2014).

**Table A8:** Evolution of Mexican fossil fuel subsidies.

	Subsidy (% GDP)	Subsidy (US\$ billions)	Coverage (million ppl)	Subsidy (US\$/person)	Reference
Gasoline and diesel subsidy (2008)	1.8	19.8	123.8	160	Di Bella et al. (2015)
Gasoline subsidy (2011)	0.5	5.3	123.8	43	APEC (2012)
LPG subsidy (2011)	0.3	3.2	123.8	26	Kojima (2013a)
Electricity subsidy (2011)	0.5	5.9	123.8	47	Clements et al. (2013)
Electricity subsidy (2011–2013)	0.7	8.3	123.8	67	Di Bella et al. (2015)
Fuel subsidy (2013)	0.7	8.8	123.8	71	Di Bella et al. (2015)
Fuel subsidy (predicted, 2015)	0.0	0.0	123.8	0	Di Bella et al. (2015)

### Energy Price Increases and Mitigation Measures

Reform of Mexico's fuel pricing rule led to domestic price increases, from almost MXN8 per litre for gasoline in mid-2010 to MXN14 per litre in mid-2015. LPG prices increased by a similar ratio to those for gasoline; from MXN8,000 per tonne in early 2010 to almost MXN12,000 per tonne in early 2014 (SHCP, 2014). Fuel price increases were implemented in a gradual but consistent way, which perhaps offers some explanation for the absence of any public protest. Besides the introduction of a specific energy component to the existing Oportunidades conditional cash transfer scheme in 2007, the fiscal savings from subsidy reduction have not been explicitly channelled toward mitigation programmes. For example, the coverage and budget of the Oportunidades programme remained reasonably constant between 2010 and 2012, and although two new energy efficiency programmes were created, it is not clear that the funding for these came directly from subsidy savings.

**Table A9:** Evolution of Oportunidades CCT programme and other energy-related social safety nets.

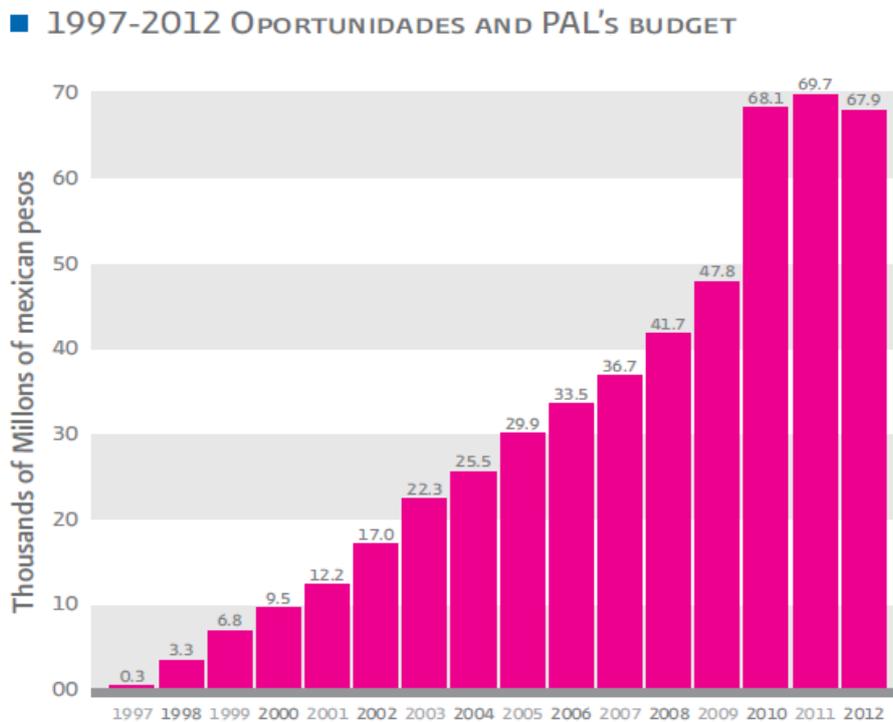
	Subsidy (% GDP)	Subsidy (US\$ billions)	Coverage (million ppl)	Subsidy (US\$/person)	Reference
Oportunidades (2000)	0.14	1.0	10.0	95	SEDESOL (2012)
Oportunidades (2009)	0.40	3.6	20.8	172	SEDESOL (2012)
Oportunidades (2012)	0.45	5.3	26.0	204	SEDESOL (2012)
Oportunidades Energy (2007)	0.04	0.40			
Oportunidades Energy (2011)	0.03	0.35	23.2	61	APEC (2012)
Lifeline electricity tariffs (2013)	0.7	8.8	120.7	73	SHCP (2014)
EE, fridges (2009–2012)	0.01	0.1	3.4	38	Davis et al. (2014)
EE, air conditioning (2009–2012)	0.00	0.0	0.4	34	Davis et al. (2014)
EE, light bulbs (LUZ) (2011–2012)	0.01	0.1	45.0	2	World Bank (2012)

### Oportunidades CCT and the Energy Component

Mexico launched a CCT programme called Progresá (whose name was subsequently changed to Oportunidades) in 1997. The programme, which continues to operate today, has two central goals: to alleviate poverty in the short term by providing cash transfers to women in eligible poor and vulnerable households, and to increase the levels of human capital by making these transfers conditional on school

attendance for children and regular health clinic visits for children and pregnant and nursing women. In 2010, three years following its inception, Oportunidades had a total budget of MXN9.5 billion and reached 2.5 million households located in rural areas. The programme expanded rapidly, and by 2009 had a budget of MXN47.8 billion reaching 5.2 million households in rural and urban areas (SEDESOL, 2012). By 2012, around 30 per cent of Mexican households received average monthly transfers of US\$204 at a total cost of US\$5.3 billion, or about 0.45 per cent of GDP.

In 2007, an energy component named Oportunidades Energéticas was introduced to the existing cash transfer programme. In addition to monthly transfers for nutrition (US\$19.50 per family), education (US\$12.60–US\$80.10 per student) and the elderly (\$26.60 per adult over 70), an additional payment of MXN\$50 (US\$4.80) was made to all existing beneficiary families (APEC, 2012; Vagliasindi, 2013). The energy component of Oportunidades was not linked to fossil fuel subsidy reform; it was introduced during a period when blanket gasoline, diesel and LPG subsidies were increasing rapidly. That said, the introduction of the energy component reflected government concerns about the negative health and financial impacts of certain kinds of household energy use.



**Figure A1:** Growth of Oportunidades budget between 1997 and 2012. The additional increment in 2010 reflects the inclusion of a pre-existing food programme Programa de Apoyo Alimentario within the Oportunidades umbrella.

Source: SEDESOL (2012)

### Lifeline Electricity Tariffs

Electricity subsidies decreased significantly throughout the 2000s but continued to account for 0.7 per cent of GDP in 2012 and 2013 (Clements et al., 2013; SHCP, 2014). Electricity tariffs are highly complex, with 43 tariff rates available. Block pricing is an important component of the system, with household and small agricultural tariffs set at below-market rates that are not fully offset by cross-subsidisation from commercial and industrial users (Di Bella et al., 2015). As of 2013, more than 80 per cent of total electricity subsidies were received by domestic consumers (Di Bella et al., 2015), but these are acknowledged as being highly regressive, with higher-income households receiving a larger share of the benefits (Clements et al., 2013; Vagliasindi, 2013).

### Energy Efficiency: Cash for Coolers Program (PNSEE)

In 2009, Mexico launched the National Program for the Substitution of Electrical Appliances (PNSEE) as part of broader energy efficiency reforms. The PNSEE offers government-funded subsidies to households to replace their old refrigerators and air conditioners with new, more efficient models. On average, the subsidies covered around one-third of the cost of a new appliance. To receive the subsidy, consumers were required to surrender functioning refrigerators and air conditioners that were more than 10 years old (Davis et al., 2014).

In the 24 months between May 2009 and April 2011, the PNSEE reached almost one million households and resulted in the replacement of about 850,000 refrigerators and 100,000 air conditioners. The total cost of the program, excluding administration costs, during this period was US\$142 million, or around 0.01 per cent of GDP (Davis et al., 2014). The reach of the programme expanded further in 2012, having reached a total of 1.9 million households by the end of 2012 (Davis et al., 2014). Davis et al. evaluated the programme and found that it reduced refrigerator electricity consumption by only 7 per cent and actually increased air conditioning electricity consumption because of a rebound effect: consumption increased as a result of energy efficiency

### Energy Efficiency: Light Bulbs (LUZ Sostenable)

Between 2010 and 2012, a joint World Bank–Mexico Government project, LUZ Sostenable, distributed 46 million free energy-efficient fluorescent light bulbs to 11 million Mexican families. The total cost of the programme was US\$70 million. These bulbs consume only 20 per cent of the energy of a traditional light bulb and last 10 times longer (World Bank, 2012). For households, that translates into savings of \$20 over the lifetime of one fluorescent bulb (at average electricity prices).

In addition to the LUZ Sostenable programme, the Mexican government legislated a gradual phase-out of incandescent light bulbs. Sales of 100 watt incandescent bulbs were banned from December 2011, 75 watt bulbs in December 2012, and 40–60 watt bulbs in December 2013 (Poverty Action Lab, 2013).

### Mitigation Measures and Gender

The Oportunidades CCT has a strong gender component; transfers are channelled to female beneficiaries, education grants are larger for girls and part of the conditionality relates to mothers' attendance at health clinics. It is not surprising that there is a significant body of literature assessing the gender-specific impacts of the programme. The following draws from a literature review (Molyneux, 2008) which summarises gender-specific research spanning the first decade of Oportunidades.

- **Education:** The gender gap in school attendance narrowed and disappeared completely in grades 7 to 12. This is due to a combination of lower dropout rates and higher enrolment (girls' enrolment rates increased by 20 per cent in beneficiary families)
- **Well-being:** Surveys reveal that women in the Oportunidades programme consider that their self-esteem and their status in the household and community are enhanced by their custody of cash transfers.
- **Welfare:** Cash transfers to women translate into increased sense of well-being through the satisfaction of basic needs. Qualitative surveys reveal that women felt that they were better off (defined as nourishment, education and healthcare).
- **Credit access:** Women were better able to access credit and therefore make longer-term financial plans.
- **Health:** Pregnant women and mothers of infants had improved access to free health services. Several studies document reductions in maternal mortality, although the magnitude of this effect is unclear. Dorantes (2006) found an 11 per cent reduction of maternal mortality for beneficiary families.

Relatively little research has assessed the gender impacts of the Oportunidades energy component introduced in 2007. An early study by Gertler et al. (2009) found that energy represented the second-largest source of spending for Oportunidades households (after food), but that the monthly energy transfer of MXN50 covered only 17 per cent of this spending. Secondly, the authors noted that although Oportunidades households had very high rates of electricity connection (over 95 per cent), around 73 per cent of them continued to use biomass for cooking, lighting or heating purposes. Finally, although this work did not assess whether the introduction of the energy component led to changes in household energy mix, it did conclude that the short-run income elasticity of demand for energy was very low for Oportunidades households. In effect, the fact that few beneficiaries owned electrical or gas appliances meant that increasing incomes did not translate into increased energy consumption. Subsequent research by Gertler et al. (2012) assessed the causal impact of large increases in household income on asset accumulation and energy use, and found that Oportunidades cash transfers had a large effect on asset accumulation, and that this drove increases in household electricity usage. As such, it is possible that by allowing beneficiary households to accumulate domestic appliances, Oportunidades cash transfers have resulted in positive outcomes for women by reducing the proportion of biomass in the household energy mix.

The gender impacts of government spending on lifeline electricity tariffs, energy efficiency initiatives and rural electrification programmes in Mexico is unclear. All three measures represent energy subsidies targeted at low-income households and intended to make electricity more affordable. To the extent that this leads to substitution away from traditional household sources of energy, it will have positive impacts on women who continue to bear the majority of responsibility for household work.

## Appendix II Review of Research Methodologies

In order to select an appropriate analytical framework for the second phase of this project, partners identified various possible approaches for exploring the relationships between energy policy and gender. The literature review identified a broad selection of frameworks, summarised here.

The term ‘gender analysis’ is used to describe the basic approach of ‘analyzing the way in which women’s and men’s, or girls’ and boys’ experiences and needs differ’ (GETAT, 2010), usually by disaggregating data by gender and analysing the causes of differences. This can be applied to numeric data sets, such as household survey data, or to data embedded in personal narratives and testimonies, such as FGDs or interviews. It may apply to data on tangibles (consumption levels, employment status and sex) as well as intangibles (perceptions, willingness to pay and preferences). In its initial applications, gender analysis was often applied to data on labour (who engages in different kinds of activities, and where and when?), the control of resources (who has access to resources, control over resources and makes decisions?) and the benefits created by resources (who benefits from resources and how?) (ADB, 2006; Cecelski, 2006).

Applying gender analysis to standard statistical data sets on energy and poverty is difficult because most existing government data on energy use are not structured in a way that makes it possible to disaggregate meaningfully by gender, either because they use ‘the household’ as their primary unit of reference, or because they do not collect data of importance to a gender analysis. A limited degree of disaggregation may be possible by disaggregating data on household energy use by the sex of the household head, but this will still be limited in capturing intra-household poverty. National data sets on health—which may reflect the impacts of energy use—are, however, often structured to identify the varying health problems experienced by women, men, girls and boys, and may include data on household fuel use. Other national data sets—such as on enrolment and achievement in education, employment, or experiences of domestic violence—may yield useful proxy information about the relative poverty and power of women in low-income households compared to men, but cannot typically be linked to energy. In light of such deficits, it is common for a gender analysis framework to begin with methods for primary data gathering. This includes a number of specific approaches that seek to create and disaggregate data on gender and energy and analyse them in specific ways.

Among the most prominent of these are surveys, FGDs and interviews designed to identify the following:

- **Energy-use**, including women’s and men’s energy needs, the roles of women and men in the household, the different energy products used to meet needs, and the logic by which energy options are stacked to meet any given need.
- **Time-use**, typically including the average time taken up by men’s and women’s market and non-market activities, the determinants of this time allocation, and how households resolve challenges such as competing demands or trade-offs (Blackden and Wodon, 2005; Ilahi, 2000).
- **Perceptions**, including perceptions of drudgery and household roles, as well as preferences for different kinds of energy products and the rationale for those preferences.

While some facets of gender equality lend themselves to measurement (e.g. income generation), others, such as the state of women’s empowerment, may be more challenging to measure. Malhotra et al. (2002) reviewed various theoretical approaches and found general agreement on the need to measure ‘process’ (a shift to a state of greater power) and ‘agency’ (the ability to formulate strategic choices and control important resources and decisions), classifying ‘resources’ as a catalyst for empowerment or a condition under which empowerment is likely to occur. Frameworks for measuring empowerment include Longwe’s (1991) Women’s Empowerment Framework, which assigns values of ‘positive’,

‘neutral’ or ‘negative’ to five indicators related to welfare (basic needs), access (to resources, services and assets), conscientisation (awareness of structural and institutional discrimination), participation (equality in decision-making) and control (over decisions). Another framework is CARE’s (2014) Women’s Empowerment Framework, which measures changes in agency (aspirations and capabilities), structure (the environment that surrounds and conditions choices) and power relations, measured on a context-by-context basis, but often drawing on a range of 23 key indicators of social change including self-image, a range of legal rights and representation in various spheres of governance. Finally, the UNDP’s (1995) Gender Empowerment Measure is designed to measure ‘whether women and men are able to actively participate in economic and political life and take part in decision-making’ through parliamentary representation, senior economic representation and relative income to men, although Klasen (2007) has subsequently criticised this for its elite bias and problems with data availability.

The type of specific methods identified above are often synthesised partially or entirely into a broader approach, such as Parker’s (1993) Gender Analysis Matrix, which collects data on indicators like labour, time, resources and other sociocultural factors, with reference to women, men, households and the community. Similarly, the ADB’s gender toolkit encourages the collection of data on indicators related to four key areas: human capital (such as access to health and education), economic empowerment (such as access to and control over productive resources), voice and rights, and gender capacity building of development actors (ADB, 2013b).

Gender analysis can also be used to modify analytical frameworks that have been primarily developed to understand poverty reduction and economic decision-making. For example, the International Fund for Agricultural Development (IFAD)’s Sustainable Livelihoods Framework collects data on various forms of capital (human, natural, financial, social and physical) and relates this to an individual’s ‘vulnerability context’ and government policies, institutions and processes (IFAD, n.d., 2002). The data collected in such an approach can be disaggregated by gender and combined with other tools developed for gender analysis. Similarly, various methods to assess an individual’s willingness to pay can be employed to help understand how energy price changes will affect energy consumption, including direct and indirect surveying techniques or simulated price-response data, as set out by Breidert et al. (2006). Adaptations may require the systematic introduction of gender-specific and energy-specific forms of analysis, since non-gender and non-energy-focused analytical frameworks may fail to adequately understand the roles and needs of women and how these relate to energy (Cecelski, 2006).

In theory, gender analysis could also be used to adapt standard approaches for projecting the impacts of energy subsidy reform, namely price-shifting models (Coady and Newhouse, 2006), computable general equilibrium models, other macroeconomic models, energy system models and opinion surveys (Beaton et al., 2013), though in practice little such work appears to have been conducted. In part, this reflects the reliance of modelling on complex standard data sets that focus on households and that would be prohibitively costly to disaggregate to account for women and men. In some cases, survey research approaches related to public opinion could be adapted to explore women’s and men’s attitudes toward reform, but to an extent that would essentially require reinvention of the approach. Typically, existing opinion survey literature on subsidy reform does distinguish between male and female respondents—such as Tambunan (2015) and Pradiptyo et al. (2015) in Indonesia—but only to indicate differences in general perception (such as whether or not respondents support reform) and not to identify and understand specific impacts and preferences that relate to women’s and men’s individual experiences.

Beyond gender analysis, a second analytical approach to researching energy policy and gender is an institutional or policy analysis. Rather than examining the lives of women and men directly, this seeks to analyse institutional structures or policy design. It explores the extent to which these recognise the different needs of women and men and the impacts they are likely to have on gender equality. For example, IRADe (2009) conducted a gender audit of renewable energy policies in India, asking ‘to what

extent do national-level investments directly address women’s needs?’ and examining the programmes of the Ministry of New and Renewable Energy for their relevance to women. The authors developed a weighting system to rate programmes according to how well they address gender concerns. Similarly, gender-responsive budget analysis is an approach that seeks to analyse the extent to which budgetary allocations reflect gender needs and promote gender equality. As set out by Budlender and Hewitt (2003), this approach typically involves either a three-way categorisation of expenditure (gender-specific expenditure; equal opportunity expenditure for civil servants; and general expenditure, in terms of its gendered impacts) or a five-step approach that begins by analysing the situation of women, men, girls and boys and then moves through an assessment of policies, budget allocations, spending, service delivery and, finally, outcomes.

A third analytical approach, the experimental approach, attempts to understand how women and men are affected by a specific intervention, comparing data between a control group and a group or groups subject to one or more interventions. The impact of an intervention may be measured in reference to many of the same themes as gender analysis, such as energy use, time use, perceptions and willingness to pay. This approach is typically linked to actual pilot policy implementation, making it often complex, multi-year, resource-intensive and requiring formal training in the employed methodology. For example, the World Bank has launched a programme to evaluate over 2012–2016 the impact of the SURE-P Maternal and Child Health Initiative described in Box 8 (World Bank, n.d.(a)). The evaluation programme is designed to use several methods. It uses cluster-level randomisation to examine the impact of various incentives on midwives across 250 public health facility ‘clusters’. Each cluster contains four clinics, and the midwives in each clinic receive different possible combinations of incentives. In addition, clusters are randomly assigned to one or two groups: those in which pregnant women receive CCTs and those where they do not. Finally, a difference-in-differences approach is used to compare areas of Nigeria that receive the programme to areas that do not. The programme uses surveys to collect comparable data on intervention and non-intervention groups about the experiences of mothers, households, midwives, health facility managers and local leaders.

Broadly speaking, all of the above-listed analytical approaches are based on a limited number of methods for collecting data, summarised below. Based on a combination of country research questions and work plans, different countries may choose a combination of these methods.

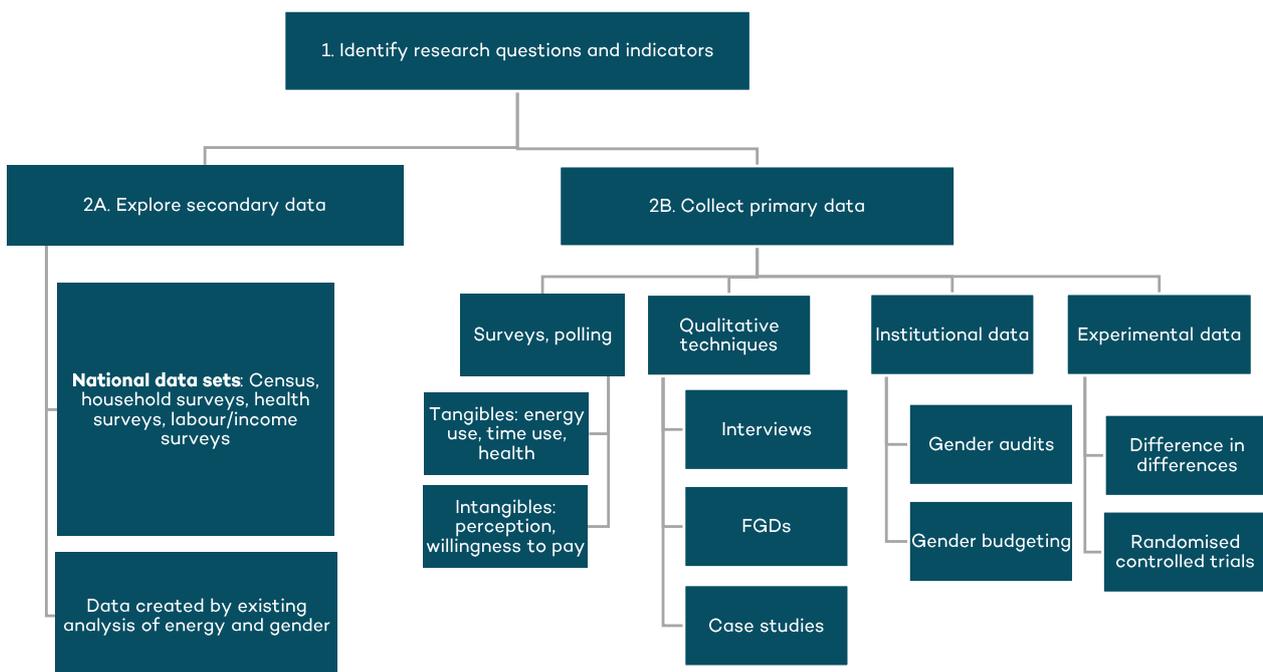


Figure A2: Overview of main methods of data collection associated with gender-energy research.

Source: Authors.

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