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GENDER AND FOSSIL FUEL SUBSIDY REFORM: IMPLICATIONS FOR INDIA, BANGLADESH AND NIGERIA

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ABSTRACT

This paper reviews the available literature on the impacts of fossil fuel subsidies on women and gender empowerment. It is an input to a four-year research program on the issue coordinated by the Global Subsidies Initiative (GSI) of IISD. The review, undertaken in 2015, attempts to assess the impacts of fossil fuel subsidies on women as well as the mitigation measures implemented during reforms.

The paper reviews literature under two categories: research that explores the gender aspects of energy use and research on the broader impacts of fossil fuel subsidy reform, including mitigation measures such as cash transfers. It finds clear linkages between energy access and gender empowerment, especially regarding access to solar energy and improved cook stoves. However, it finds that, despite much research on subsidies' regressive nature, there is very little dedicated analysis of how subsidies and subsidy reform affect women (beneficially, detrimentally, or otherwise).

The review focuses in particular on existing subsidies and recent energy policy changes in Bangladesh, India and Nigeria, where access issues are significant and policy is highly dynamic. The review is designed to inform further field research with women in these countries that will begin in 2016. It also includes case studies on other countries through a gender lens. It concludes with suggestions for greater consideration of gender impacts within fiscal reforms.

Keyword: *gender, fossil fuel subsidies, subsidy reform, energy access and empowerment*

1. INTRODUCTION

This literature review summarizes the state of knowledge on fossil fuel subsidies and their reform with respect to low-income households in low- and middle-income countries. It focuses particularly on how women are affected— given the importance of ensuring that policy change does not entrench existing inequalities—with respect to their welfare, productivity and empowerment. This includes an examination of energy sector reform policies that have and have not worked well for women.

This review reviews literature on two themes: the gender aspects of energy use and the impacts of fossil fuel subsidy reform. It then proposes a framework for understanding the impacts of fossil fuel subsidies on women, split into an "income effect," "energy use effect" and "energy supply effect." It finds that existing research does point to evidence of gender-differentiated impacts, but that further research is needed to better understand their significance in different country contexts.

2. BACKGROUND

Until the recent period of low world oil prices, governments spent around USD 550 billion every year subsidizing fossil fuels for consumers (International Energy Agency [IEA], 2014a). Consumer subsidies lower the retail price of products (such as cooking fuels) or fossil-derived energy services (such as electricity), so a positive correlation between subsidies and energy access might be expected. However, except for resource-rich North African and Middle Eastern countries—where historical patterns of development have generally resulted in almost universal access to electricity—significant subsidies are rarely well correlated with high rates of electricity access and low levels of traditional biomass usage (see Figure 1).

Often, fossil fuel subsidies are universally accessible and therefore ill-targeted, benefiting richer sections of the population that can afford to purchase larger volumes of energy products and services, rather than targeted at the energy needs of the poor (Arze del Granado, Coady, & Gillingham, 2010). This has prompted many governments to attempt to reform subsidies, including over 30 in 2014 (IEA, 2014a; Terton et al., 2015). Typically, governments argue that they pursue reform to provide greater fiscal space and release savings for reinvestment in more

productive sectors—for example, in Indonesia recent 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) find that governments with high spending on fossil fuel subsidies have consistently lower spending on health and education by 0.6 percentage points of GDP in countries where energy subsidies were 1 percentage point of GDP or higher.

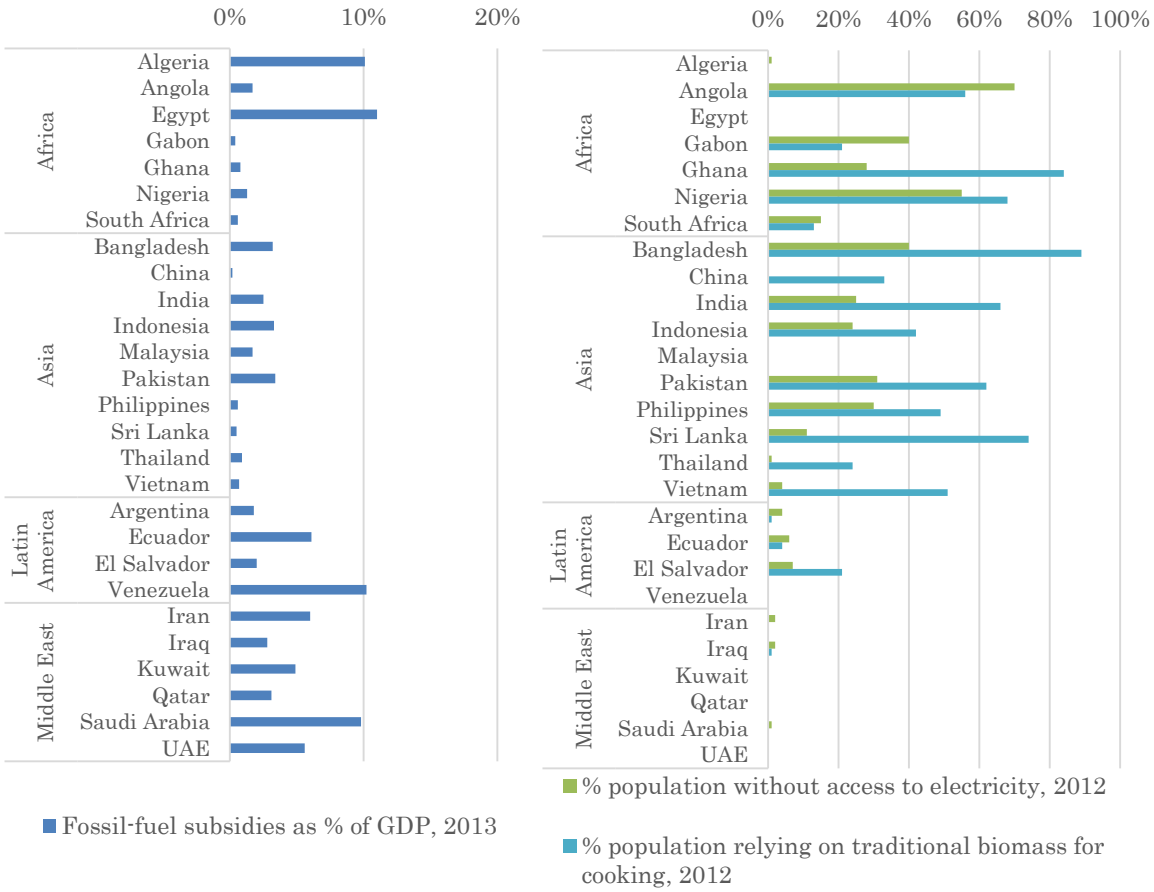

Figure 1. Fossil fuel subsidies (2013) compared to shares of the population without access to electricity and using traditional biomass as their primary cooking fuel (2012)

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

Reforms can have a range of impacts on different groups. This is generally the source of a domestic debate on 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).

3. THE ENERGY SECTOR AND ITS REFORM: WOMEN'S EXPERIENCES

3.1 Gender Dimensions of Energy Use

The impacts of any energy policy on women can be categorized according to how they influence women's *welfare, productivity and empowerment* (GETAT, 2010).

Welfare includes issues such as health, drudgery and leisure. With respect to health, substantial evidence shows that indoor air pollution from traditional biomass fuels is a cause of health

problems (Fullerton, Bruce & Gordon, 2008), while energy access can improve health in other areas, such as the use of refrigeration being able to lower the risk of food poisoning (O'Dell, Peters & Wharton, 2014). With respect to drudgery and leisure time, modern energy may save time previously spent on traditional fuel collection and activities involving energy (such as cooking), reducing hardship and freeing up time for alternative activities. Clancy, Winther, Matinga, & Oparaocha (2012) cite studies that show impacts on time use differ by context and are not restricted to leisure: finding, for example that women in South Africa used free time to rest (Annecke, 1999), while women in Tanzania engaged in income-generating activities (Maleko, 2006). Energy access may also determine whether women can use appliances that may be used for leisure or to reduce drudgery, such as radio and television (Budlender, 2008).

Productivity relates to women's ability to engage in income-generating activities. This is linked predominantly to changes in time use that, as noted above, may differ significantly by context. For example, two empirical studies looking at employment effects of increased electrification in South Africa (Dinkelmann, 2011) and Guatemala (Grogan & Sandanand, 2009) found that electrification led to an increase in female employment in the order of 9 percentage points, attributing this to women spending less time on domestic chores. In contrast, Clancy et al. (2012) found in Sri Lanka, that women allocated energy-related time savings to housework and childcare. This was replicated in a study of electrification in Peru (Fernandez-Baldor, Boni, & Lillo, 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 (IDS, 2003). These findings suggest that access to particular energy sources can significantly influence women's participation in paid work, but that exact outcomes are likely to depend on a complex interplay of factors. In other cases, access may enable or make more efficient specific kinds of income-generating activity. For example, lighting may allow women to extend their hours of income-generating activity. Sankrit (2015) finds that light enabled home- and self-employed workers in Bihar, India, to extend and enhance their business activities.

Empowerment relates to issues such as women's safety, education, rights, political and social participation and the control of resources. For example, access to television has been shown to empower women in Bhutan (ADB, 2010) and Indonesia and Sri Lanka (Matly, 2003) by increasing awareness of gender rights and issues. In India, street lighting has been found to improve security and thus enable greater mobility (UNDP, 2013). Similarly, in Bangladesh, when solar home systems were installed, researchers found women had stronger say over purchasing decisions and visitation to their parents' homes (Khandker, et al., 2014).

3.2 Gender Dimensions of Fossil Fuel Subsidies

While there is substantial literature on gender and energy, there is almost no readily available information directly examining the gender-differentiated impacts of fossil fuel subsidies.

The impact of energy subsidies and their reforms can be separated into *direct* and *indirect* effects. *Direct impacts* relate to costs when households purchase subsidized fuels. *Indirect impacts* relate to costs when households purchase any good or service in which energy costs are embedded. 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 the price of basic commodities such as food (Bacon, Bhattacharya, & Kojima, 2010). Furthermore, fossil fuel subsidies can be split in two rough groupings: subsidies to fuels that are primarily used for transport, and subsidies to fuels that are primarily used in non-transport applications. For each, we can identify three possible effects: an "**income effect**," where subsidies represent an effective transfer to household incomes due to direct and indirect impacts of lower prices; an "**energy use effect**," where subsidies may influence the type or quantity of fuel that is used by a household because of the change in relative prices for substitutable energy products; and an "**energy supply effect**," where subsidies influence the availability of an energy source for a household.

3.2.1 Subsidies to non-transport fuels

Literature shows that the **income effect** of non-transport fuel subsidies is highly regressive, with

regressiveness increasing for energy sources further up the energy stack. From a sample of 20 country studies, Arze Del Granado et al. (2012) find that over 50 per cent of direct LPG subsidy benefits accrue to the richest 20 per cent of households; and that while the distribution of direct kerosene subsidy benefits is less distorted, it is roughly equally distributed across all wealth quintiles—the same performance as cash distributed to households at random (see Figure 2). Similarly, 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.

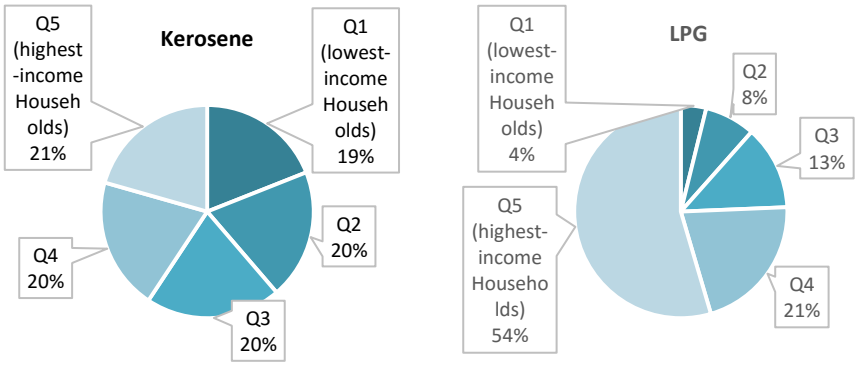

Figure 2. Share of direct kerosene and LPG subsidy benefits captured by different income quintiles

Source: Authors, based on Arze del Granado et al. (2012). Estimates based on a summary across 20 countries based on household surveys and input–output matrices ranging from 1993 to 2007.

The extent to which poor women benefit or not from this regressive income effect depends upon the generalizations 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). However, his data defines poverty at the household level and does not take account of intra-household poverty: within a household, women often receive an unequal share of income and may be unable to meet their basic needs. 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 realizing this benefit, and thus it will accrue disproportionately to men. Lack of hard data on intra-household inequality makes this difficult to quantify.

Evidence suggests that non-transport fuel subsidies do have a significant **energy use effect**—they encourage uptake of modern fuels. 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. There is also evidence for the existence of an energy use effect in studies on LPG subsidies in Senegal (Laan, Beaton and Presta 2010). No work, however, was conducted on the extent to which such an increase in modern energy fuel was matched by a decrease in the use of traditional biomass fuels. National consumption patterns, however, make it clear that countries with significant subsidies have not succeeded in driving a complete shift away from biomass and toward modern energy products for most poor households. This may be because subsidized prices are not low enough to fully enable energy access. It may also be because there are other barriers to access or drivers of biomass consumption that must be tackled simultaneously.

Differentiating the energy use effect of non-transport fuels by gender is likely to see the greatest impacts on women, as in many cultural contexts women are traditionally expected to be responsible for fuel collection and cooking. However, the exact magnitude and nature of these impacts are 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). Intra-household inequality may also influence energy use choices. Where women do not have discretion over energy choices or lack bargaining power, the male head of household may not prioritize expenditure on energy choices that benefit women. 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 those with a male head (Hassen, 2015).

Subsidies may also have an effect on the **supply side,** with a number of studies indicating a trend of worsening access to modern energy sources for some households. Supply issues can arise if subsidies lead to illegal diversion. In the case of Nigeria, black market diversion of kerosene is reported to have created shortages that led kerosene to be typically sold between ₦100 to ₦250 (USD 0.62 to USD 1.55) per litre (Aramide, et al., 2012). Subsidies can also lead to corruption and poor distribution that impair the availability of fuels. 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.

3.2.2 *Transport Fuel Subsidies*

Literature shows that the **income effect** of transport fuel subsidies is even more regressive than non-transport fuels. From a sample of 19 country studies, Arze del Granado et al. (2012) find that over 80 per cent of direct gasoline subsidy benefits accrue to the richest 40 per cent of households (see Figure 3). 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. Despite this high inefficiency, studies nonetheless indicate that transport fuel subsidies do sometimes have a significant absolute impact on poverty reduction. This is typically because the small benefit that accrues to low-income households is nonetheless large relative to their total income. The IEA et al. (2010) cite evidence from Yemen where petrol subsidies are estimated to have reduced the poverty rate by 8 percentage points; and from Morocco, showing a reduction of about 5 percentage points. This means that the removal of transport fuel subsidies—in the absence of any kind of mitigation measures—could increase poverty rates. As with non-transport fuels: this income effect is likely to provide disproportionately fewer benefits to women in low-income households than men, due to intra-household inequality; though lack of data makes this difficult to quantify.

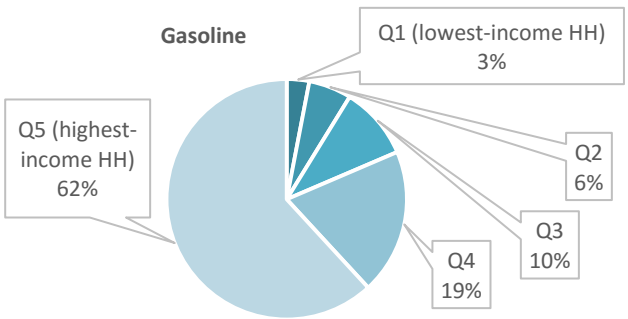

Figure 3. Share of direct petroleum subsidy benefits captured by different income quintiles

Source: Authors, based on Arze del Granado et al. (2012). Estimates based on a summary of 19 countries 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 motorized 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 will result indirectly through increased take-up of transport services. The benefit that accrues to women will be highly dependent upon context. In some

countries, women's access to transport is limited and thus benefits are 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 male counterparts; women may be legally barred from driving private vehicles or excluded to varying degrees by sociocultural norms (as, for example, in Saudi Arabia); and norms in many countries may restrict women's ability to travel by public transport (World Bank, 2011).

3.3 Gender Dimensions of Subsidy Reform

When subsidy reform causes a price increase, the effects can also be categorized as income effects, energy use effects and energy supply effects.

In terms of **income effects**, 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. Further, the introduction of market-based pricing can introduce volatility to fuel prices. 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 low-income households receive fewer 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. 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.

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. Reallocation 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 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, as observed in World Bank (2015).

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). Existing work suggests that this hypothesis is borne out by evidence. 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.

On the energy use side, a switch to less- or more-advanced fuel sources is 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 & Matinga, 2014).

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. No research exploring this impact pathway was identified.

4. ADDRESSING THE EFFECTS OF REFORM: A GENDER-SENSITIVE APPROACH

Recognizing the risk of adverse impacts on the poor, existing literature on subsidy reform recommends the introduction of mitigation measures. These measures could include better targeting of existing subsidies such that benefits accrue to the vulnerable sections of society, cash

or near-cash transfers (for example, vouchers or smart cards) 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 IMF (2013), all of which note the importance of establishing mechanisms to protect the vulnerable, ensuring incomes are maintained and energy access is not impaired.

Despite this substantial body of work identifying the need for mitigation measures and their design, there has been little research on how these measures can be constructed and implemented so as to protect and further women's interests. With a few exceptions, subsidy reform policies are typically gender-blind and do not differentiate between men and women.

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 (see Table 1). Typically, a range of targeted measures are employed to mitigate the adverse **income effects** that reform can have on household incomes. Across 28 energy reforms that were reviewed, 18 relied on targeted mitigation measures, including expansion of public works, education and health programs in poor areas. Gender-sensitive policy-making can consider the extent to which such policies can be designed to compensate for intra-household inequality. This might include the use of universal or conditional cash transfers (CCTs), structured in such a way that is more likely to increase the power of women in determining household expenditure decisions.

Generally, the **energy use effect** is given less attention. 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, which can lead 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 improve targeting of financial assistance for energy access, so that only intended beneficiaries receive it, such as through coupon or voucher schemes. Alternatively, it can consist of the direct provision of equipment or services, such as clean cook stoves or chimneys.

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 counteracting price increases. For example, Kojima et al. (2011) summarize various strategies that can be used to reduce the distribution costs of LPG, including bulk and joint purchase to increase economies of scale etc.

Table 1. Options for targeting compensation to women

Compensation Tools	Design Features to Cluster Benefits on Women
In-kind transfers, e.g., free or low-cost food, water, transport services, education, healthcare, assets	• Transfers are targeted at women's needs, e.g., women's healthcare (like Mexico's *Oportunidades*); retaining women's school attendance; public transport services at night; etc. • Women can be made recipients of transfers.
Cash transfers: conditional (CCTs) or unconditional (UCTs)	• Make conditionalities relevant to women's needs as well as children's • Make women recipients of transfers (e.g., Mexico's *Oportunidades*, *Juntos* in Peru or the *Bolsa Familia* Scheme in Brazil).
LPG coupons or vouchers	• As with CCTs, LPG coupons can be targeted to women and thus promote take-up in low-income households or rural areas (e.g., *Fondo de Inclusión Social Energético* (FISE) in Peru).
Infrastructure programs (e.g., electrification, water, roads, public transport)	• Make a fixed share of employment opportunities focused on women • Build infrastructure of key relevance for women's needs, e.g., wells to save time on water collection; street lighting to reduce violence etc.
Promote other clean fuels,	• Automatically targets women if it enables access to clean cooking fuel.

Compensation Tools	Design Features to Cluster Benefits on Women
e.g., distribution, provide equipment, targeted subsidies.	• Make women recipients and owners of any assets, e.g., stoves, cylinders. • Make women recipients of subsidy.

Sources: On Mexico (Molyneux, 2008), On Peru (Perova & Renos 2012)

5. WAY FORWARD: IMPROVING THE KNOWLEDGE OF ENERGY SECTOR REFORM AND GENDER

The key findings of this review are summarized in Figure 4. Despite the identification of these broad theoretical linkages, there is only a very patchy empirical understanding of how subsidies and subsidy reform affect women.

Income effect	Energy use effect	Energy supply effect
Impacts on poor women of fossil fuel subsidies		
An effective income transfer, to reduce the cost of fossil fuels, may be significant for low-income households relative to total income. Lack of targeting causes benefits to be captured by richer households. **Where households can access subsidy:** If women have little power over household expenditure, they are likely to receive an unequal share of economic benefits. **Where households cannot access subsidy:** Low-income households and women within them may not benefit if they do not use the energy source being subsidized, or if corruption and diversion prevent access to the energy source at the subsidized price.	Subsidies reduce the relative cost of energy sources and encourage a shift in energy use. **Where households can access subsidy:** Impacts on women in low-income households will depend on the energy type subsidized. Shifts away from traditional cooking fuel may free up time, improve respiratory health, and create income and educational opportunities. Shifts toward motor transport may improve economic opportunities or safety. **Where households cannot access subsidy:** Low-income households and women within them may not benefit if the change in relative prices is not sufficient to ensure access, if access is not possible (e.g., no grid connection), or if corruption and diversion issues arise.	Subsidies can cause problems with energy supply (e.g., illegal diversion, shortages and poor distribution). If so, low-income households may experience impacts that affect their income (e.g., price premiums), energy use (e.g., supply not available or reliable) or other aspects of welfare (e.g., queuing for many hours). Impacts on women are the same as with income and energy use effects.
Impacts on poor women from higher energy prices caused by reforms		
If reform increases energy prices... **Where households can access subsidy:** Loss in effective income, with possible cascade effects. Women may bear an unequal share of the burden if they have little power in household decision making on expenditure. **Where households cannot access subsidy:** Indirect impacts may be felt due to higher costs of goods and services.	If reform increases relative energy prices... **Where households can access subsidy:** Energy use may regress to traditional fuels (for non-transport fuels), or access to transport may be curtailed. Impacts on women will depend on energy type. **Where households cannot access subsidy:** No direct impact, but indirect impacts may be felt through increased competition for traditional fuel sources.	Reform may lead to improvements in energy supply in the medium term. If so, reforms can improve income (through fair prices) and promote clean energy (where available). Impacts on women are the same as with income and energy use effects.
Impacts on poor women of mitigation measures or reallocated expenditure caused by reforms		
Can supplement incomes directly (e.g., cash transfers) or indirectly	Measures can focus on ensuring affordable access to clean energy	Governments can work with energy

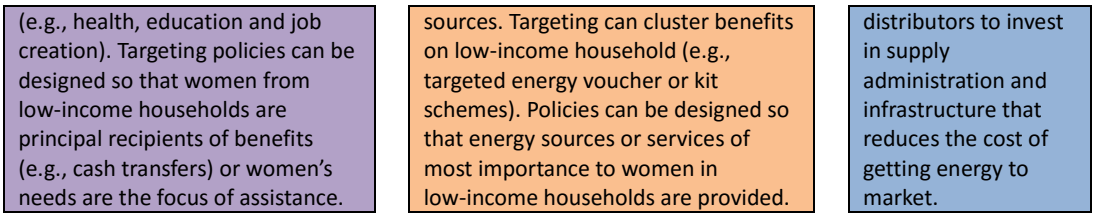

Figure 4. Likely impacts on poor women: fossil fuel subsidies, reform and mitigation measures.

Source: Forthcoming Scoping Report on Gender and Fossil Fuel Subsidy Reform

Further research could seek to address existing 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.

The first research question should identify 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 should assess 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 maximize benefits and limit adverse impacts. Together, the two strands of research offer an opportunity to understand the effects of current policy and to design a more effective set of policies for promoting efficient energy access at the same time as improved gender equality.

6. CONCLUSIONS AND RECOMMENDATIONS

The review has found a lack of systematic examinations of the gender-differentiated impact of energy subsidies and their reform, and that impacts and policy responses are very context-specific. Nevertheless, it is clear that subsidies and their reform do have implications for poor women.

There are gender dimensions to energy policies. These gender dimensions can be captured by examining links between energy policies and women's welfare (like time savings), productivity (like income generation) and empowerment (like increased decision making). An examination of the impact of fossil fuel subsidies and their reform reveals the potential for them to affect women through income effects, energy use effects and energy supply effects. Income effects (where subsidies or reform alters households' effective incomes) can result in women experiencing a disproportionate share of benefits or losses, since women typically experience inequality within households. Energy use effects (where subsidies alter energy consumption by changing the relative prices of energy sources) may affect women more than men, particularly in the case of non-transport fuels, where they may influence decisions whether or not to shift away from traditional fuels, with implications for women's time and respiratory health, in addition to income-generating and educational opportunities. Lastly, an energy supply effect (where subsidies can impact the distribution and availability of an energy source) has the potential to further influence income or energy use effects.

Examination of these effects and their implications for women's welfare, productivity and empowerment can systematically generate evidence about the gender-differentiated impacts of fossil fuel subsidies and their reform. Such evidence could then be used to help improve the design of policy with respect to subsidies, gender equality and energy access.

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References

Annecke, W.J. (1999). *Concept paper for energy and women: Lessons learned.* Cape Town: EDRC University of Cape Town.

Asian Development Bank (ADB). (2010). *Asian Development Bank's assistance for rural electrification in Bhutan—Does electrification improve the quality of rural life?* Asian Development Bank.

Aramide, J., Beaton, C., Ejekwumadu, I., Gbadebo-Smith, F., Solanke, O., Vis-Dunbar, D., et al. (2012). *A Citizens' guide to energy subsidies in Nigeria*. Geneva: GSI.

Arze del Granado, J., Coady, D., & Gillingham, R. (2010). *The unequal benefits of fuel subsidies: A review of evidence for developing countries.* Washington D.C.: IMF.

Arze del Granado, J., Coady, D., & Gillingham, R. (2012). The unequal benefits of fuel subsidies: A review of evidence for developing countries. *World Development, 40*(11), 2234–2248.

Bacon, R., Bhattacharya, S., & Kojima, M. (2010). *Expenditure of low-income households on energy.*

Beaton, C., Gerasimchuk, I., Laan, T., Lang, K., Vis-Dunbar, D., & Wooders, P. (2013). *A guidebook to fossil-fuel subsidy reform for policy-makers in Southeast Asia.* Winnipeg/Geneva: IISD/GSI.

Budlender, D. (2008). *The statistical evidence on care and non-care work across six countries.* Geneva: United Nations Research Institute for Social Development (UNRISD).

Cecelski, E. (2006). *From the Millennium Development Goals towards a gender-sensitive energy policy research and practice: Empirical evidence and case studies.*

Cecelski, E., & Matinga, M. (2014). *Cooking with gas: Why women in the developing world want LPG and how they can get it.* World LP Gas Association.

Clancy, J., Winther, T., Matinga, M., & Oparaocha, S. (2012). *Gender equity in access to and benefits from modern energy and improved energy technologies* (World development report background paper).

Cooke, E., Hague, S., Tiberti, L., Cockburn, J., & Lahga, A. (2016). Estimating the impact on poverty of Ghana's fuel subsidy reform and a mitigating response. *Journal of Development Effectiveness, 8*(1), 105–128.

Dinkelmann, T. (2011). The Effects of Rural Electrification on Employment: New Evidence from South Africa. *American Economic Review, 101*(7), 3078–3108.

Ebeke, C., & Ngouana, C. L. (2015). *Energy subsidies and public spending: Theory and evidence.* IMF.

ENERGIA. (2015). *Theory of change – ENERGIA Gender & Energy Research Programme.* Presentation to Gender and Energy Research Programme inception meeting February 11–13, Geneva.

Fernandez-Baldor, A., Boni, A., & Lillo, P. (2014). Are Technological Projects Reducing Social Inequalities and Improving People's Well Being? *Journal of Human Development and Capabilities, 15(1)*.

Fullerton, D., Bruce, N., & Gordon, S. (2008). Indoor air pollution from biomass fuel smoke is a major health concern in the developing world. *Transactions of the Royal Society of Tropical Medicine and Hygiene, 102(9), 843–851*.

GETAT. (2010). *Gender and energy toolkit: Support for NORAD's Energy Department under frame agreement 'Gender mainstreaming in energy projects (clean energy and petroleum)*.

Grogan, L., & Sandanand, A. (2009). *Electricifcation and the Household.* University of Guelph.

Hassen, S. (2015). *On the adoption and dis-adoption of household energy and farm technologies*. (PhD Thesis). Sweden: University of Gothenberg.

IDS. (2003). *Energy, poverty gender: A review of the evidence and case studies in rural China.* The World Bank.

International Energy Agency (IEA). (2011). *2011 world energy outlook.* Paris: IEA/OECD.

IEA. (2014a). *World energy outlook.* Paris: IEA/OECD.

IEA. (2014b). *WEO 2014 fossil fuel subsidies database.* Paris: IEA/OECD.
IEA, OPEC, OECD, World Bank. (2010). *Analysis of the scope of energy subsidies and suggestions for the G-20 Initiative.*
International Monetary Fund (IMF). (2013). *Energy subsidy reform: Lessons and implications.* International Monetary Fund.
Khandker, S., Samad, H., Sadeque, Z. K., Asaduzzaman, M., Yunus, M., & Enamul
Haque, A. (2014). *Surge in solar-powered homes: Experience in off-grid rural Bangladesh*. World Bank Group.
Koehlin, G., Sills, E., Pattanayak, S. K., & Willfong, C. (2011). *Energy, Gender and Development: What are the linkages? Where is the evidence?* Washington: The World Bank.
Kojima, M., Bacon, R., Zhou, X., Matthews, W., & Zeissig, H. (2011). *The role of liquefied petroleum gas in reducing energy poverty.* Washington: World Bank.
Laan, T., Beaton, C., & Presta, B. (2010). *Strategies for reforming fossil fuel subsidies: Practical lessons from Ghana, France and Senegal.* Geneva: GSI/IISD.
Maleko, G.C. (2006). *Impact of electricity services on microenterprise in rural areas in Tanzania*. Enschede: University of Twente.
Matly, M. (2003). *Rural Electrification in Indonesia and Sri Lanka: From social analysis to reform of the power sector.* The World Bank.
Miller, G., & Mobarak, A. M. (2013). *Gender differences in preferences, intra-household externalities, and the low demand for improved cook stoves.*
Molyneux, M. (2008). *Conditional cash transfers: A pathway to women's empowerment?*
O'Dell, K., Peters, S., & Wharton, K. (2014). *Women, energy and economic empowerment.* Deloitte University Press.
Perova, E., & Renos, V. (2012). *5 years in Juntos: New evidence on the program's short- and long-term impacts.* World Bank.
Pradiptyo, R., Susamto, A., Wirotomo, A., Adisasmita, A., & Beaton, C. (2016). *Subsidizing Development: The reallocation of Indonesia's gasoline and diesel subsidies in 2015.* Geneva: GSI.
Sankrit, R. (2015). Impact of energy access on livelihoods of women home-based workers: SEWA Bharat's intervention in Bihar, India. *Women, Energy and Econ. Empower, 66*, 6–13.
Sharma, S., Kitson, L., Beaton, C., & Merrill, L. (in press). *Scoping report on gender and fossil fuel subsidy reform.*
Shenoy, B. (2010). *Lessons Learned from attempts to reform India's kerosene subsidy.* Geneva: GSI/IISD.
Terton, A. Gass, P., Merrill, L., Wagner, A., & Meyer, E. (2016). *Fiscal instruments in INDCs: How countries are looking to fiscal policies to support INDC implementation*. Winnipeg: IISD.
United Nations Department for Economic and Social Affairs (UNDESA). (2010). *The world's women 2010: Trends and statistics.* New York: United Nations Department for Economic and Social Affairs.
United Nations Development Programme (UNDP). (2013). *Better lighting, wider pavements: Steps towards preventing sexual violence in New Delhi*.
Vagliasindi, M. (2013). *Implementing energy subsidy reforms. Evidence from developing countries.*
World Bank. (2011). *Making transport work for women and men: Challenges and opportunities in the Middle East and North Africa*.
World Bank. (2015). *Toward gender-informed energy subsidy reforms: Findings for qualitative studies in Europe and Central Asia.* Washington, D.C.: The World Bank Group.