

## Article

# Cultural and Economic Barriers in Switching to Clean Cooking Energy: Does Women's Agency Make a Difference?

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**Abstract:** The major objective of this study is to identify and analyze cultural and economic barriers to sustained adoption of LPG (liquefied petroleum gas) as the primary clean cooking energy in India, and examining underpinning values and norms in socio-technical energy system of the country. In 2016, the Government of India introduced a mega scheme called Ujjwala for clean cooking energy with LPG connects in women's name. This policy, however, experienced limited implementation, but did lead to enhancing women's agency in many areas. Women's agency is defined briefly as their ability to set goals, develop capacities, and act on their defined goals to realize desired outcomes in wellbeing and capabilities. In the case of switching to clean cooking energy, the question can be posed as: as women are the ones who carry out most of the onerous work of collecting and cooking with wood, are they able to make decisions on the adoption of clean cooking fuel, that enhance their agency and the wellbeing of their families? Male-centred cultural and economic norms can be changed by the exercise of women's agency, when (1) women have unmediated asset ownership rights to land, houses, and energy technology; (2) they are organized in groups for earning cash incomes and energy access; (3) they have acquired new knowledge, skills, and finances to acquire and operate new technologies; and (4) women have experienced the effects of policy change addressing gendered norms.

**Keywords:** energy barriers; cultural and economic norms; innovation; clean cooking; energy; agency; transformation



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## 1. Introduction

Across the world, close to 3 billion people, largely women in indigenous and other rural areas, are dependent on solid biomass fuel for cooking and space heating [1]. Burning these solid fuels has serious health implications, resulting in close to 4.6 million deaths each year from causes attributable to household air pollution [2]. In India, over 50 percent of rural households use solid biomass as the primary cooking fuel, as reported in NSS, 76th Round, 2019 [3]. The adverse health impact associated with the use of solid biomass for cooking is estimated to be 1.2 million deaths in India each year as stated by Clean Cooking Alliance and Health Effects Institute [4].

In recent years, however, the concerned governments and international agencies, such as Sustainable Energy for All, the World Health Organization, Energia International, and Department of International Development of the UK, have drawn attention to health and environmental hazards and promoted policies and measures for switching to clean energy, primarily LPG and electricity, for cooking. Issues of gender justice have recently been prioritized in energy research.

Discussions on these issues also pointed out the research deficit in the area of clean cooking energy and in knowledge on policies and practices in the industrializing world. With this background, we decided to undertake this research on India's policy experience,

known for addressing this gap through its countrywide mega-scheme called Ujjwala for clean cooking.

We have a two-fold objective of this study:

- To identify cultural and economic barriers to switching to, meaning sustained adoption of, LPG as the primary clean cooking energy in India, underpinning the roles of values and norms in the socio-technical energy system of the country;
- To understand the effects of clean cooking energy policy on women's negotiating power and decision making in intra-household dynamics, which might lead to both strengthening women's agency and an improvement in implementing clean cooking energy policies and programmes.

In our research period (2019–2020), we noted that in the given system of class, caste, and ethnicity in India, there is a common factor of hierarchy and power between women and men, with men as the decision-makers about women's work in the spheres of social reproduction and production. A study by Kelkar et al. (2017) [5] drew attention to the following considerations:

- Women's work burden in rural societies in Asia is derived from their gendered responsibility for providing cooked food and water to the household;
- A large part of women's productive work in agriculture and household industry or self-employment is made invisible as 'household work', and not recognized as productive work;
- However, these gender responsibilities can change when the opportunity cost of men's labour is much lower than that of women, which would promote the substitution of men for women's unvalued household work or commercialization of the latter;
- The critical area of policy intervention is in providing clean fuel for cooking and for production activities by women in agriculture, enterprises, and other income-earning activities. The likely increase in the opportunity cost of women's work and the need to reduce and redistribute women's labour in the household is also likely to promote the household adoption of modern and commercial labour-saving fuels with their attendant health benefits.

A gender-sensitive energy policy approach is likely to be most effective where women's ownership of land and/or housing and energy equipment is part of the policy design and implementation—as we see in the case of subsidized LPG distribution in India. The policy for clean cooking, however, does not result in gender-equitable outcomes where women do not have the right to own and control assets, and are seen as dependents on the male heads of household and communities.

## 2. Research Methods and Field Sites

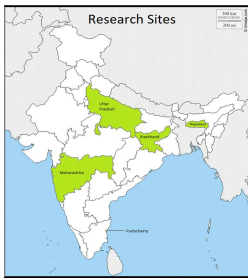
Some research has focused on empowering women for their role in the energy sector, but only limited research has drawn attention to barriers to entry of women that manifest in the current transition to clean energy for cooking. This research is based on the premise that it is necessary to include gender concerns in policies and programmes for access to modern energy. Hence, our framework of data collection and analysis is influenced by gender analysis of energy access in rural and indigenous areas to assess last mile delivery. To understand the voices of women and men, as well as to see the policy reach in rural and indigenous areas, we used qualitative-cum-quantitative methods through a brief questionnaire for analysis of LPG supply and its use in the five research sites.

Our checklist for the households included 10 questions: (1) dealing with description of the area, village, block, and the district; (2) When a particular household received the LPG connection under Ujjwala; (3) was the LPG used for primary cooking; (4) What were the health problems experienced due to cooking with wood; (5) What problems the women faced in obtaining cylinder refills; (6) Who decides on buying a cylinder; (7) Who pays for the cylinder; (8) How did the women cover the cost of cylinders and its refills; (9) Does she

have income of her own; (10) The benefits of cooking with LPG, in terms of better health or the opportunity to rest and take care of herself and children.

Our research sites in remote rural and indigenous areas were: 10 villages in the district of West Garo Hills in northeast India and 2 villages in Pune district of Maharashtra in western India. In addition, we used qualitative methods of data collection (Focus Group Discussions) with 10 to 12 women or men in each FGD, individual interviews, and free flowing discussions with individuals, as well as implementation related issues with village headmen (Pradhans) and local LPG distribution agencies in 3 research sites: 6 villages in 3 districts of Jharkhand (Simdega, Ranchi, and Khunti), 2 villages in the district of Etawah in Uttar Pradesh in north India, and 1 village in the district of Puducherry in Puducherry state in southern India (see Table 1). Our 5 research sites included a total of 21 villages in five states of India. The total research reach was 410 people: 330 women and 80 men.

**Table 1.** Research Sites.

States/Union Territories	Districts/Regions	Villages	
Meghalaya	West Garo Hills	10	
Jharkhand	3 districts (Khunti, Ranchi, Simdega)	6	
Maharashtra	1 district (Pune)	2	
Puducherry	1 district (Puducherry)	1	
Uttar Pradesh	1 district (Etawah)	2	

### 3. Cultural and Economic Norms

The traditional structures of gendered norms in India are grounded in the belief that men have pre-eminence over women in both domestic and public spheres. Energy services, technology, and land/property management are regarded to be men's domain, and domestic work, care, cleaning, washing, water, and firewood collection (all non-monetized) are regarded to be women's domain. Increasingly, most agricultural work, except for ploughing and marketing of the produce, is also considered to be women's work. These norms influence practices where women have lower social positions, without independent rights to energy, infrastructure, and productive assets. Admittedly, some women are complicit in upholding these norms where they tend to deny themselves the right to exercise agency and voice.

Social norms and attitudes have a powerful influence that is reflected in formal structures of society and in its informal rules concerning day-to-day practices. Policy makers, state officials, and development professionals are themselves subject to gender-specific biases and neglect that arises from thinking embedded in discriminatory social norms and harmful customary practices (UN Women, 2015 [6]; World Bank, 2015) [7]. Both the state and society define what is seen as appropriate and desirable for women and men with regard to social actions and legal rights to resources, within and outside the home. At the same time, however, patriarchal cultural and economic norms have been diminishing in power due to women gaining independent rights to productive assets and energy infrastructure.

There are two troublesome issues that have come to the fore in our analysis. First, there is social reluctance to recognize the need for women's unmediated authority in the management of energy, land, and other factors of production. It is often argued that women who have productive resources/energy infrastructure titles in their names are likely to be in a stronger bargaining position vis-à-vis their husbands, than women who do not formally or informally have such rights (Barnett, 2014 [8]; Bedford & Rai, 2010 [9]; Kelkar, 2013 [10]). Second, women face many disadvantages, even if they belong to a household that has access to and uses modern energy, as they do not have decision-making powers to procure appliances they want and use them. This gender gap in the acquisition and use of

modern energy services is not due to disinterest, as there are research-based results that show that women have demanded their right to energy use in the past few decades, as our study on the 'Gender Factor in Political Economy of Energy Sector' showed [11].

Within given patriarchal social norms, women often lack the confidence to discuss energy access and energy management issues with government officials and, in some cases, they have preferred to transfer their rights to male family members and not daughters. Furthermore, women have had limited support for their rights to own and manage energy infrastructure from community institutions. Two possible explanations could be: (i) social definitions of patriarchal power, whereby it is assumed that management of energy services should not enable women to transgress gender norms and challenge male authority within the home, and (ii) cultural and economic norms that have been systematically instilled in them about 'what you cannot do' (e.g., argue with the man in power), and thus risk the consequences for being blamed or penalized for misdealing with the officials (who are mostly men).

#### 4. India's Partly Subsidized LPG Programme

In 2016, the government of India launched the Pradhan Mantri Ujjwala Yojna (PMUY), under which it was expected to provide 50 million LPG connections to women in households below the poverty line. These connections were given to women in their own names, irrespective of their marital status. Later, this figure was revised to 80 million connections. A subsidy of Rs 1600 (USD 22.5) was provided out of the cost of about Rs 2300 for the new connections, not including regulator and stove, which would be Rs 1200. The cost of refilled cylinders comes to roughly Rs 650 per cylinder. Thus, initially the poor woman who is awarded the subsidy would have to bear an additional initial expense of Rs 1600, equal to the amount of subsidy and recurring cost of Rs 650 per cylinder. As we were drafting this study, in May 2021, LPG prices across the country saw a steep rise in the price of unsubsidized 14.2 kg cylinders, rising from INR 714 to INR 858 in Delhi. This price hike was attributed to the rise in price of propane supplied by Saudi Arabia's Aramco, based on which LPG pricing is calculated in India. According to a February 2020 report by SBI Ecowrap [12], when cylinder prices rose from Rs 714 to Rs 858 last year, the subsidy offered to Ujjwala beneficiaries were raised from Rs 175 to Rs 312 per cylinder.

Reportedly, as of September 2019, the LPG connections supplied by the government were over 80 million, covering 715 districts in the country. Importantly, the oil companies, under the Corporate Social Responsibility Initiative were asked to cover the initial subsidy of INR 1600 for an LPG connection, so that there would be no requirement for government revenue to pay for the subsidy.

In the process of implementation, the Government of India stated the following broader objectives of the Ujjwala Programme:

- To empower women and protect their health;
- To reduce serious health hazards associated with cooking with solid biomass;
- To reduce the number of deaths due to unclean cooking fuels;
- To prevent growing children from acute respiratory illness caused by indoor air pollution.

Prior to the launch of Ujjwala programme, in March 2015 the Government of India launched the 'Give it up Campaign' motivating economically better-off LPG users to voluntarily surrender their LPG subsidies in order to provide LPG connections to households below the poverty line in rural areas. Significantly in one year, over 10 million households voluntarily gave up their subsidies. These surrendered subsidies were redistributed by the government to provide LPG connections to below the poverty line households in the name of women, irrespective of their marital status. The LPG connection in a woman's name was a significant step towards acknowledging women's strategic interest and right to access and use clean cooking energy.



## 5. Problem of Sustained Use of LPG

Under the current LPG programme, the proportion of households with connections increased from 61.9 per cent of all households in May 2016 to 94.3 per cent in April 2019 (CAG, 2019) [13]. However, the number of cylinder refills purchased by the 19.3 million Pradhan Mantri Ujjwala Yojna (PMUY) beneficiaries who had completed a year on 31 March 2018 was just 3.66 refills per year. This means that LPG was not their primary fuel, with the primary fuel remaining some form of solid biomass, mainly wood. The Comptroller and Auditor General (CAG) further reported, based on data from LPG supply agencies, that on 31 December 2018, some 31.8 million PMUY beneficiary households purchased an average of 3.21 refills, pointing to a fall in the average number of refills being purchased by poor women. This means that fuel stacking, that is, using multiple fuels with solid biomass remaining the primary fuel, was widespread.

The CAG report itself and later large-scale sample data from the National Sample Survey (NSS) for 2017–2018 showed that the low purchase of refills was mainly a rural phenomenon [3]. The NSS data showed that LPG was the primary fuel for 48.3 per cent of rural households, while over 50 per cent continued with solid biomass as the primary fuel. What this means is that of 180 million households in rural India, about 90 million households were not using clean cooking energy in 2017–2018. Moreover, the extent of the use of LPG had also fallen among poor households in rural India, with a drop in LPG refills per household from 3.66 on 31 March 2018 to 3.21 on 31 December 2018.

Two points, then, need explanation. First, the persistence of high proportions of rural households using solid biomass as the primary fuel, despite having LPG connections. Second, the drop in LPG refills by poor rural households through the year 2018. We first take up the second point for a brief analysis. A recent paper by Sharma et al. (2019) [14] finds that “sustained LPG transition may happen over time, as they understand the costs and benefits of clean fuels” (ibid, 71). From this, they argue that “even if beneficiaries of PMUY scheme may have low uptake of LPG refills; over time behavioural change will push them for sustained usage” (ibid). Unfortunately, that seems to have not been the case. It should be noted that the data showing a decline usage of LPG cylinders by PMUY consumers is not from some sample survey. It is all-India data, as secured by the highest government accounting body, the CAG, from LPG suppliers, which are almost entirely public sector units. This drop in LPG refills does require some explanation.

It is likely that the drop in refills purchased by poor rural households is related to the post-2016 slowdown in the Indian economy. Though the government has refused to officially release 2017–2018 consumption figures, these have been in the public domain and show an unprecedented fall in per capita consumption between 2014–2015 and 2017–2018 [15]. It is also known that the rural economy has been more affected than the urban economy. In a situation of a fall in per capita rural income, one would expect that poor women would substitute LPG paid for from cash earnings with wood, collected with women’s unvalued labour.

This, however, may not be a longer-term effect; the revival of rural growth may see a change in the trend. More important is the difficulty in bringing about a switch to LPG as the primary cooking energy. Rather than fuel switching, we are instead seeing fuel stacking, with solid biomass remaining the primary cooking fuel for 59 per cent of rural households. In a paper written at the start of the PMUY programme, Nathan et al. (2018) [16] and Kelkar et al. (2019) [17] had predicted that there would be high levels of cooking with solid biomass, particularly where women’s unvalued or undervalued labour is used to collect wood.

As LPG connections have reached almost all below poverty line households, the main policy challenge is to support a transition to use of or switch to LPG as the primary fuel. To fashion such a policy, both drivers of and barriers to a switch to LPG as the primary cooking fuel need to be identified.

The Niti Aayog, the (Government of India’s policy think tank), in collaboration with the Council on Energy, Environment, and Water (CEEW) developed a roadmap for clean

cooking energy in India (2019). Unfortunately, this brings back improved cook stoves (ICS) into the mix of clean energy, neglecting all the data that have shown that ICSs are not quite so clean. Reducing indoor air pollution, which is what clean stoves are meant to achieve, does not reduce household air pollution (HAP) and, therefore, does not have much of a health benefit. Once again promoting ICS would also amount to wasting the investment already made in making LPG available to virtually the whole population. In any case, it is important to design policies for promoting a switch to LPG as the primary cooking fuel for the more than 50% of the rural population who have not yet switched.

In earlier work for ENERGIA by Kelkar et al. (2019) [17] it was argued that flawed policies, cultural and economic norms, and unequal household gender relations were barriers in switching to LPG. These masculine norms, inherent to the energy, field are often considered by energy managers and users as ‘gender neutral’ technology norms. What is not realized is that these norms influence the validity of energy policy solutions; they result in creating gender-differential effects to the disadvantage and exclusion of women, both within and outside the sector.

Women’s lack of rights to ownership and control of productive assets and their low independent income were key barriers in being able to purchase LPG refills. On the other hand, women’s membership of collectives, such as credit and savings group or what are called Self-Help Groups (SHGs) in India, and their independent income earning, with measures for women to control the use of their income, can both promote women’s agency resulting in sustained adoption or switching to LPG as the primary cooking fuel. In addition, there are some supply side barriers that need to be dealt with, such as the delays and high transport costs in cylinder refills in remote rural areas.

## 6. Cultural and Economic Barriers to Sustained Use of Clean Energy

We were able to identify some of the barriers that prevented a switch to the use of clean cooking energy. They are briefly described below.

### 6.1. Low Valuation of Women’s Work and Time

Women’s labour, as is well known, is usually valued lower than that of men. In rural areas, which we surveyed in this study, women’s wages are close to 30% lower than those of men. More important, in the matter of adopting modern clean cooking energy, is the unvalued labour of women in collecting wood and in spending more time in cooking and related activities, such as cleaning. This is understood to be part of unpaid care work that women are supposed to do as their duty, and is not recognized as work. In addition, in not-so-well-developed rural areas, where there is limited scope for wage labour or self-employment, the opportunity cost of women’s labour is also very low. This is a strong inhibiting factor in the adoption of LPG, which involves monetary cost among forest dwellers and other rural households.

### 6.2. Affordability

A problem raised in all sites is that the cylinder refills are not affordable. They found Rs. 650 per cylinder too much. In various field discussions, a figure of around Rs. 300 to 350 per refill often came up as an affordable price. We repeatedly heard this figure in UP villages. A 2016 study by CRISIL also had a figure of Rs. 313/month as an affordable cost in rural India in 2016, with a similar figure in the CEEW report (both quoted in Palit et al., 2021) [18]. Certainly, for Ujjwala consumers, one needs to consider ways of making the refills cheaper, fully or partially subsidized, as in the case of the Maharashtra pilot study by Kirk Smith and his research team (Pillarisetti, 2019) [19].

### 6.3. Accessibility

A problem referred to very often was the time taken to obtain a refill. It can take from three days to a week, particularly in remote rural areas with rough terrain. Further,

the delay is not known in advance. This forces women to keep the wood cooking system available and thus hampers a switch to LPG as the primary fuel.

#### 6.4. Men's Control over Household Finances

In mainstream communities in India, men control household finances. With this patriarchal authority, they utilize these finances to give priority to what they consider their own priorities. For instance, purchase of a motorcycle or television set is usually given preference over LPG for women's cooking, as we noted in our earlier study for ENERGIA in the case of Odisha villages (Kelkar et al., 2019) [17]. This is certainly a barrier in households' regular use of LPG.

#### 6.5. Cultural Norms and Practices

Cultural norms support men's control over resources and household finances, and the low valuation of women's time and work. They also support a low priority for women's needs, whether it is for clean cooking or even clear health requirements. Women are expected to be submissive, with no independent voice of their own, and accept men's authority. At the same time, there are also signs of women contesting this authority, either through negotiations within the household, or taking resource-management decisions in the absence of men (when they are away for seasonal or long-term work in cities).

How can these barriers to fuel switching be overcome? This is an important question to be answered in fashioning a policy for sustained fuel switching by rural women, particularly those in remote rural areas. How can women's agency be fostered to overcome these barriers?

### 7. Women's Agency

In drawing from the feminist analysis of political economy, we have used the term agency, which is the ability to define goals; having a sense of agency (one's perception to have control over decisions and the ability to achieve goals); and act upon goals. Agency is essential for shrinking gender disparities and advancing gender equality, as well as the empowerment of women. Agency enables women to create space for their own decision making and thereby brings about a shift in power relations, enabling women (or men) to step out of traditional behaviour and change their environment. Admittedly, women's increased agency could face backlash from men who feel threatened and tend to reassert their authority.

The discussion on women's agency goes back at least to Amartya Sen's (1985) [20] characterization of household decision making as one of cooperative-conflict, where the bargaining positions of women and men depend on their relative asset and income positions. We draw upon the Special Issue of Feminist Economics (January 2016) [21] on voice and agency. In a summary paragraph on women's agency, it is said that the income positions may be filtered through 'perceived contributions' that, for instance, undervalue women's work. Social norms also come into the picture, as in setting certain boundaries to what may be the object of bargaining. These norms themselves then become the object of bargaining. Thus, even when the concentration is on bargaining in the household, socially embedded masculine norms, which exist at the level of communities or societies, also come into play. The households and communities together contain structures of constraint; and agency becomes a way of dealing with and, in the process, modifying these structures of constraint. Structures of constraint may be modified by not only quantitative factors, such as ownership of assets or independent income, but also by qualitative factors. For instance, women's ability to argue against silently accepting decisions can also be a manifestation of agency. Further, social processes, such as membership of collectives and the spread of gender-responsive new masculine norms can also play a role in enhancing agency.

Feminist analysis is constructed on gender analysis of the political economy of resource control and exclusion of women from knowledge, both traditional and modern, as stated in Kelkar (2011) [22] and Kelkar and Jha (2016) [23]. In line with the above conceptualization

of women's agency, our definition of women's agency has five major dimensions: having unmediated (that is, not through the household or its head) right to own and control productive assets; freedom from fear of violence within the home and outside in streets and workplaces; ability to think and act to secure their strategic interests and capability to change gender norms; decision making over their reproductive work, including birthing and care work; and having representation and voice in society and influencing policy as pointed out by Kelkar & Nathan [24].

Our concern here is to question women's 'domesticated agency' [25]. Domesticated has different meanings in different cultural economic systems. Women have been asked to give up their rights to own and control resources in favour of their brothers or husbands; and if they dared to oppose this, have been denounced as 'selfish', facing eviction from their homes and even villages. However, there were some women who were able to successfully resist these attempts at 'domesticated agency', i.e., to do what they wish, provided they do not act against cultural and economic rules or practices of the community, in most cases led by men.

Agency can be transformative, in that it can change the existing decision-making structures according to one's thinking or preferences, whether she is successful or not. Amartya Sen's concept of 'agency achievement' in 1985 [20] and 2002 [26] also discusses agency as a process freedom, where there is "the procedure of free decision by the person herself", no matter how successful she is in securing what she would like to achieve. Kabeer (1999) [27] takes the concept further, in that agency can be non-transformative, with the ability to make one's own choices within hierarchical decision-making structures, or, in a more passive way within a social or cultural situation. On the other hand, transformative agency involves an underlying shift in power relations.

Above, we have referred to the importance of women's ownership of and control over assets and their independent income earning. Women in India, in general, do not own land, and work largely as what are called 'unpaid family workers'. Moving from that to being owners of land or independent income earners can both help increase women's agency in the energy sector. In the case of the adoption of clean cooking energy, the question can be posed as: women are the ones who carry out most of the onerous work of collecting and cooking with wood, are they able to take decisions on the adoption of clean cooking fuel, that enhance the well-being of themselves and their families? Below we look at this question in the varied contexts of our field sites.

### 7.1. Did Women's Agency Make a Difference to LPG Adoption?

Among the Garo women in the matrilineal state of Meghalaya (where finances and household decision making are the domain of women) there was a relatively high adoption of LPG. In the households near the distribution centre, women used LPG as the primary fuel. They purchased at least 10 refills in a year. Being near the town, it was relatively easy to secure refills. The households nearest the town had converted all their forest lands into horticulture plantations and thus had no available forest from which to collect wood. Those who were still living in forested areas did collect wood from their family forests.

About an hour's distance from the town, women had not fully adopted LPG. Wood accounted for about half of their fuel use, as they continued to regularly collect wood from the forests. Those yet more distant from the town barely purchased one or two LPG refills in a year. There was a substantial expense involved in securing refills from the town.

In Puducherry, 20 of 30 the women interviewed stated that LPG is the primary fuel used for all the main cooking. In Maharashtra, 17 of 20 women said that they used LPG as the primary fuel. In Jharkhand, in three villages (Kotari, Bucha Opa, and Chainguda) of Ranchi District, almost all households had LPG connections. In one village 5% (of 200 households), in the second village 30% (of 50 households), and in the third only 3% (out of 300 households) had switched to LPG for the main cooking. In two villages in the Khunti District, many used it regularly. However, as they said that a refill lasts about two to three months, this means that LPG is not the primary fuel. It is used to cook a specific

meal, for instance, making breakfast before children go to school. However, in two villages in a thickly forested district, Simdega, few had received PMUY connections, and none reported switching to LPG as primary fuel.

In Uttar Pradesh as well, only two out of 30 women said that LPG was the primary fuel. These two women were agricultural wage workers, while their husbands had migrated to cities for work. However, all the interviewed women confirmed the benefits of cooking with LPG: that meals are prepared quickly, ease in cleaning utensils, drudgery reduction and safety from collecting wood from forest, and “have no irritation in eyes” which comes with “smoke filled cooking”.

What we see is that where women had a direct role in production and decision making over income, as among the Garo people, then there was a high level of LPG use as the primary fuel. In Maharashtra and Puducherry as well, we find a correspondence between women earning cash income, leading to a role in household decision making, and the adoption of LPG as the primary fuel. However, in the case of UP, where women had no direct role in household decision making, there were only two (out of 30 women interviewed) who used LPG as fuel for primary cooking, these were cases of the women who were independent wage earners, and where their husbands had migrated to urban areas, thus leaving the women with considerable power in decisions on regular consumption expenditure. In Jharkhand, in the joint consultation and negotiations with husbands, women were able to have LPG connections, but were unable to use it for primary cooking. The control of finances by men came up as the major barrier in the switch from solid fuel to LPG for cooking. Further, as we noted above, in Odisha, there were cases where men preferred to buy motorcycles or TVs rather than LPG.

### *7.2. What Promoted Women's Agency?*

The Garos are a matrilineal community and women own the land, house, and other ancestral property. Men do the marketing of the horticultural produce, and they keep the money earned. However, women have a greater say than men in the use of money. Women decide on expenses on education and health. LPG expenditure comes under the category of health expenses.

In Jharkhand, women earn an income through sale of forest products/NTFP and through performance of wage labour. This independent income gives them a role in household decision making, even through consultation. Independent income provides a direct role in joint decision making.

In the cases in Puducherry, Maharashtra, and UP, we find that women who earned an independent income, even as a daily agricultural wage, were mainly the ones who adopted LPG as the primary cooking fuel. Earning an independent income seems to increase women's say in the manner in which household income is used. Migration, in the case of UP, meant that women were able to make their own decisions on a number of regular consumption matters, such as buying LPG refills. As one woman in the FGD said “[Even when the husband comes home] he does not have the time to see what all is going on”. Thus, the three factors that were evident in increasing women agency were (1) unmediated ownership of land and other property, (2) earning an independent income, and (3) men's migration, or being away from household decision making.

Women's agency helps in making the switch to clean cooking energy. However, does a switch to clean cooking energy have, in turn, a reflexive effect in reducing gender hierarchy? We go into this question next.

## **8. Has LPG Flattened Household Gender Hierarchy?**

The PMUY LPG connections are all given in the name of women. This is important, in that most other government entitlements, such as house building allowance and electricity connections, are given in the names of men as the supposed heads of the household. LPG connections in the women's name is a small step, but a step nonetheless, in the direction of reducing gender hierarchy in the household.



A major aspect of gender hierarchy is that the strategic needs of women are not paid attention to, either the health effects of cooking with solid biomass or to women's need for leisure or time for rest. LPG helps in both aspects of women's wellbeing. That women's access to LPG has become a part of the household decision making means that there is some rise in women's status. Throughout our field sites, in all the five states, women who used Ujjwala LPG for primary cooking mentioned that 'now they have more time for rest' besides also increasing their income, through daily wage work or agriculture, and spending more time with their children. All this is likely to decrease the well-being inequality within the household.

In some cases, in UP, women were emboldened to argue with their husbands for an LPG connection as "everybody else has one." LPG was the occasion for them to take up an argument with their husbands. Arguing with one's husband is certainly a bold action, and mentioning that in front of them to a stranger (an outside interviewer) may be a small step, but, again, it is certainly a positive step in reducing gender hierarchy within the household.

What we notice is that, in a number of small, but nevertheless important ways, LPG connections in women's names and the ways in which they could use time saved in cooking, and in the attention to women's wellbeing in household expenditure decisions, all point to the switch to LPG promoting a reduction in gender hierarchy within the household. We now turn to what interventions can be undertaken to promote the switch to clean cooking.

### 9. Innovations for Sustained Switch to Clean Cooking

The introduction of the 2016 Ujjwala programme for the subsidized distribution of LPG connections in women's names has resulted in a new normal of practices within poor households throughout the country. What innovations can make this programme more effective and sustainable?

The focus of our innovative approach is to develop a combination of short-term and medium-term interventions for promoting LPG as the primary cooking fuel of resource-poor rural women through enhancing women's agency and own income. It is also necessary to overcome last mile supply problems. Our innovation strategy is based on three principles: incentivizing last mile efficiency of LPG supply; promoting sustainability of LPG use; and securing improvements in women's agency and their position in household and community power relations.

There are four components of our proposed innovation strategy for increasing the switch to clean cooking: (1) Set up LPG distribution centres within 10 km of any village and/or pay dealers a transportation rate based on the distance of villages from the centres; (2) Provide a subsidized second cylinder in order to overcome delay/gaps in securing refilled cylinders; (3) Link the LPG distribution with income generating programmes such as the rural employment guarantee, MGNREGA in India, or credit-based income generating activities with women's control over their earnings; and (4) Build awareness and carry out advocacy for policies to change cultural and economic norms through bold policies and unconventional practices. All the above innovations to be based on women's collectives, which can support individual women in asserting their agency.

The first two measures would eliminate last mile connectivity problems, while the third and the fourth measures will, in the medium term, lead to an improvement in women's decision making, while weakening patriarchal norms regarding women's economic dependency on men. The first innovation would provide an incentive for dealers to distribute LPG in remote rural areas. The second will help to overcome the problem of women having to go back to solid biomass while waiting for a cylinder refill. The third will enable women to increase income under their control, leading to an increase in their capacity for decision for sustained LPG-use. The fourth will promote women's agency for using LPG as primary cooking fuel, as noted in our earlier study with ENERGIA in Tamil Nadu (Kelkar et.al., 2019) [17], as well as in this current study in Uttar Pradesh villages.

The second innovation has been tried as a pilot in the state of Maharashtra and is reported to have reduced fuel switching due to non-availability of LPG (personal commu-

nication with the late Kirk Smith, also see Pillarisetti et al., 2019) [19]. Our earlier study with ENERGIA (Kelkar et al., 2019) [17], showed that rural women's economic dependency and low-income earning opportunities were key barriers resulting in the continuing use of solid biomass; while women's income and asset ownership and membership of women's collectives are associated with a switch to LPG as the primary cooking fuel. Anecdotal evidence, from discussions in several LPG conferences, show that when women have been cooking with LPG, there is an appreciation by the whole household of kitchens that are not smoky. Further, women in particular value the time made available for either income-earning work, leisure, or in helping children with schoolwork.

The medium-term interventions are expected to be (1) increasing women's asset (land and house) ownership and control rights to their own and household income so as to empower women in household decision making, and to have sufficient income to sustainably purchase LPG. With the increased use of their time in in employment or self-employment to earn an income, there will also be pressure to economize on women's time in cooking; (2) Change in masculine social norms to favour the sustained adoption of LPG as the primary cooking fuel through rights-centred discussions in women's collectives and gender sensitization of policy makers, implementers, and community leaders (mostly men) on how the building of knowledge, technology, operational skills, and management should concentrate attention on women's empowerment and transformation of gendered systems.

It is likely that a subsidized LPG entitlement for four to five years, simultaneously with projects to address the barriers and strengthen drivers, will bring about a change in masculine norms and increase income under women's control, thus empowering women to regularly buy LPG and change current norms around cooking. Over this period, the use of LPG for cooking is likely to become the new normal, and not require any further subsidized support.

## 10. Conclusions: The Complexity of Norm Changes

This analysis shows our effort to dig deeper into the complexity of norm change and connect the dots of energy policies with the practice of its access, governed by gendered norms and power relations. There is evidence from the fields in India that indicates a thin spread of subversive change in norms due to energy access and utilization in women's work, creating relatively favourable circumstances for dislodging earlier, patriarchal norms. It may be arbitrary and pointless to identify the norm change as a result of a singular policy or legal measure. Instead, we have argued based on field evidence reflecting the scattered processes of women's agency in accessing and using modern energy infrastructure and services. Such access and use of energy both defy the hold of traditional norms and expose the persistence of patriarchal control and limits over access and use of modern energy.

Male-centred attitudes and gendered norms change when (1) women have unmediated asset ownership rights to land, houses, energy equipment, and new technology; (2) They are organized or self-organized in groups for production, earning cash income and energy access; (3) They have acquired new knowledge, finances, and skills in operating new technology; and (4) Women have experienced the effects of policy change addressing gendered norms, (as we see in the Hindu Succession Amendment Act, 2005, the recent Ujjwala scheme, and the agricultural policy for women farmer-specific higher subsidies for ownership of farm machinery).

We also noted in the field that enterprises relying on commercial energy have been set up by women in the production of agricultural inputs such as bio-fertilizers in Tamil Nadu; processing of agricultural raw material to produce fortified food for school children and electrical grinders of spices in Odisha; production and processing of milk and testing of fat content in Tamil Nadu and Kerala; electrical sewing machines for garment making for commercial use in Tamil Nadu; and small livestock units, poultry units, and tea and snack shops in rural areas of Tamil Nadu.

However, all is not well. Our empirical findings from field studies in India also show some mixed changes in the gendered norms. As we have argued earlier, asset ownership

and/or income earning engagement enable women to have access to clean cooking fuels as the primary fuel. In the absence of these rights, men tend to decide on major household spending, assigning an exceptionally low priority to LPG connections, more so for refilling of LPG cylinders. Surprisingly, in some cases, LPG refills were needed mainly to provide 'hot and quick snacks to men in the evening, when they sat down for drinks with other men' as we learned from discussions with men in Mayurbhanj villages in Odisha.

At the macro and meso levels, the LPG distribution agencies expressed their concern about the unsustainability of the Ujjwala programme, in view of the low, scant orders of new LPG refills, despite the social approval for such subsidized LPG distribution being obtained through the 'Give It Up' campaign. The interdependencies of cultural, economic norms, women's access to finance, and poverty appear to threaten the sustained switch to clean cooking energy.

Generally speaking, across the country, men in households, communities, and government offices tend to reinforce the social norms that energy technology and decision making are the domain of men. Women also hired men to operate tractors, power tillers, and combine harvesters. Unsurprisingly, in a case in Tamil Nadu, an agricultural officer frankly stated in his interview with us, 'We should not make women too powerful, otherwise they will rule over us' (pointing to a picture of the then woman chief minister of the state). However, we saw a difference in Kerala, in its Kudumbashree collectives of women, who were engaged in non-household income-earning agricultural work, increased their bargaining power in decision making to buy agricultural equipment and other items for their use and had some control over finances.

During the time of writing an early version of this paper, we read Deepa Narayan's recent book: CHUP, Breaking the Silence About India's Women (2018, p. 249) [28]. Discussing the power of social norms, Narayan noted that the cultural indoctrination of women starts with childhood, trains women 'to be deleted' in the power scripts and prepares them to live without power and freedom and live wilfully diminished lives. All this is carried out as part of systemic rule and the morality that makes power over land, energy infrastructure, and other resources wrong for women. This, in turn, results in a culture of inequality and unfreedoms of women, 'an accumulated cultural dirt' that kills society and its institutions.

Our analysis has summarized the complexity of gendered social norms as important determinants of policy formulation and impact. We are therefore not surprised to see that change in gendered norms is a 'longer-term process of wider social change, some of which can result from deliberative action' of policy-makers and implementers, as well as of feminists and other social activists, 'but much of which flows from unpredictable events and opportunities' in the wider social, political and economic context (Harper and Marcus, 2018, p. 22) [29]. Further research is needed to:

- (1) identify masculine norms and values that underlie the current socio-technical clean energy for cooking systems and provide analysis, tools, and advice on how to counteract them;
- (2) create research-based knowledge on how the barriers are being addressed, and what further policies and strategies are needed that could appeal to local leaders (mostly being men with patriarchal mindsets) to implement measures for women's strategic needs for cooking with clean energy;
- (3) develop gender analytical tools of data analysis in algorithms to aid oil and gas agencies in making more inclusive and gender responsive interventions; and
- (4) understand the relative importance of economic and cultural factors and their interactive decision making in clean cooking energy.

Our research underscores the need for a continued dialogue and research-based advocacy on gender justice at both national and transnational levels, questioning masculinist energy policies that tend to promote social and cultural drivers of gendered norms and halt the process toward a gender just transformative change.

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## Abbreviations

The following abbreviations are used in this manuscript:

UP	Uttar Pradesh
LPG	Liquefied Petroleum Gas
FGD	Focus Group Discussions

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