



MECS-TRIID Final Report (public version)

Identifying drivers and barriers to sustained adoption of LPG as clean cooking energy: applying lessons from India's LPG programme to Nepal and Myanmar.

GenDev Centre for Research and Innovation



Strengthening Drivers and Barriers to Sustained adoption to LPG and Clean Cooking Energy: Applying Lessons from India's LPG Programme to Nepal and Myanmar

Contact Details: Dr Govind Kelkar

Produced for : DfID and Loughborough University

GenDev Centre for Research and Innovation LLP,
122 National Media Centre, Shankar Chowk, DLF,
Gurgaon, Haryana, India- 122002

Ph: +91 124 2357847

M: +91 9811556515

www.gendevcri.com

govindklkr@gmail.com

govindkelkar@gendevcri.com

Document Control Sheet

Issue Status	Author(s)	Reviewed By	Loughborough University Approved By	Issue Date
Draft version V1	Govind Kelkar			13/02/2020
Final Version	Govind Kelkar	Simon Batchelor	Jane Spencer	May 2020

Executive Summary

The main purpose of this research is build a platform of governments and societies, small businesses and development partners that engage with supply and use of clean cooking energy in India, with attention to lessons from achievements and challenges in India's LPG programme to Nepal and Myanmar. The three objectives of the study are:

- To identify and analyze drivers and barriers to sustained adoption of LPG as the primary clean cooking energy in India, underpinning values and norms in 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 that might lead to both strengthening women's agency and improvement in implementing clean cooking energy policies and programmes
- To understand and explore the applicability of lessons from India's LPG Programme to Nepal and Myanmar

In 2016 the government of India launched the Pradhan Mantri Ujjwala Yojna (PMUY), and within a period of 4 years provided 80 million LPG connections to women under the poverty line households, covering 95 percent of the households. To strengthen women's agency and reduce health hazards associated with cooking with solid biomass, these connections were given to women in their own names, irrespective of their marital status.

However, this success in supply of LPG in rural areas has some challenges in use and demand for LPG. Based on field survey, with research reach to 410 Ujjwala consumers (330 women and 80 men) in 5 states of India (Jharkhand, Maharashtra, Meghalaya, Puducherry and Uttar Pradesh). We noted 5 barriers to sustained use of energy, these include: 1) **Low valuation of women's work and time**: a general reluctance of household decision-makers in adopting clean cooking energy due to unvalued labour of women in collecting wood and in spending much time in cooking, care and cleaning in the household; 2) **Affordability**: the cash of INR 640 for a cylinder refill was seen as unaffordable; the preferred and affordable price was stated to be INR 300-350 in all research sites. 3) **Accessibility**: a problem stated that very often the time taken to get a refill would be 2 to 3 days, or with a week in some rough terrains. 4) **Men's control on household finances**: in mainstream communities in India (also in Nepal and Myanmar) men control household finances. With this patriarchal authority they utilize finances to give priority to what they consider their own priorities. 5) **Social masculine norms and attitudes**: support male control over household resources and finances; give a low priority to women's needs and health care. At the same time, there are also signs of

women contesting this authority, and some cases seen tough bargaining and negotiating with households for Ujjwala connections and refills.

Following the study, we organized two policy workshops one in Nepal and another in Myanmar, to discuss clean energy for cooking situations in their countries as well as the applicability of lessons from Ujjwala programme of India. The specific subjects of discussions in two workshops were to have an innovative approach: a strategy for an ecosystem of women's agency, health and wellness. As part of approach in India, we discussed in this workshop to have an innovative approach, a combination of short-term and medium-term interventions for promoting women's agency and income. Such approach is also to overcome last minute supply problems.

Our innovation strategy is based on three principles: **incentivizing last mile efficiency of LPG supply, promoting sustainability of LPG use; and, improving women's agency** and their position in household and community power relations. In drawing from the feminist analysis of political economy, we have used term **"agency" as the power to make decisions and act upon them**, leading to their negotiation power for freedom and dignity, and redefining the priority for clean cooking. There are four components of our proposed innovation strategy for clean cooking policy: (1) Set up LPG distribution center within 10 km of any village and pay local, small dealers transportation rate based on distance from centers; (2) Provide a subsidize second cylinder in order to overcome delay gaps in securing refilled cylinder; (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) Awareness building and advocacy for policies to change masculine social norms.

The first two measures would eliminate last mile connectivity problems, while the third and fourth measures will in the medium term, lead to improvement in women's decision-making and in masculine social norms regarding women's economic dependency on men. In conclusion we would like to suggest some concurrent measures to achieve effective policy implementation for sustained use of LPG and clean cooking energy. These include

- Assisting the policy efforts in 3 countries (India, Nepal and Myanmar) on how to formulate and interpret gender and socially inclusive clean energy for cooking policy.

Addressing the most significant barriers in consultation with government, civil society groups including women's organizations as well as rural and indigenous women's groups, local key decision-makers and institutions; and development partners. They would include research-informed advocacy through a series of workshops and discussions on 1) adverse effects of cooking with solid biomass and gender-specific and environmental benefits of cooking with clean energy.

- Identifying masculine norms and values that underlie current sociotechnical clean energy for cooking system and provide analysis, tools and advice how to counteract them.
- Creating research based knowledge on how the barriers are being addressed and what further research and actions are needed, in terms of doable strategies that could appeal to local leaders (most being men with patriarchal mindsets) to implement measures for women's strategic needs of cooking with clean energy.
- Building and scaling women's economic and social agency in consultation with governments and oil companies and development partners, that is likely to result in making sustained use of clean energy for cooking a new normal in the near future.
- Develop tools of data analysis in algorithms to aid oil and gas agencies in making more inclusive and gender aware interventions.
- Constructing pilots on women's agency, health and wellness model through clean energy for cooking, at least one in each country of study.. Some of the identified 'reasons for not using LPG a cooking fuel in India' (CRISIL, 2016:97), are there also in Nepal and Myanmar. The two workshops in Myanmar and Nepal clearly pointed out men ignoring the strategic interests of women and making no efforts to reduce women's work loads and recognizing their contributions.
- Building a network of researchers, policy-makers/governments, oil-companies and civil societies groups, including women's organizations that are interested and engaged with raising gender awareness/ gender sensitization through policies and practices in development of clean cooking energy..

Introduction

The overall purpose of this research is to build and/or strengthen a platform of government, civil societies, small businesses and development partners that engage with clean cooking energy in India and other developing countries in Asia, with attention to Nepal and Myanmar. We centre our discussion and analysis of energy policies for moving forward towards an effective supply and use of modern energy for cooking. We understand that across the world, close to 3 billion people, largely women in rural and indigenous areas, are dependent on solid biomass fuel for cooking and space heating (IEA, 2017). These have serious health implications and environmental risk, resulting in close to 4.6 million people die each year from causes attributable to household air pollution (WHO, 2013). In India 50 percent households use solid biomass as the primary cooking fuel (NSS, 76th Round, 2019). In rural areas of Nepal and Myanmar over 90 percent households (91.4 percent in Nepal and 93 percent in Myanmar) use solid biomass fuels (Clean Cooking Alliance, 2019). The adverse health impact associated with the use of solid biomass for cooking is reported to be 1.2 million deaths on India each year (HEI, 2017) and large number of deaths in Nepal and Myanmar.

In recent years, however, the concerned governments and International agencies like Sustainable Energy for All, World Health Organization, Energia International and Department of International Development of U.K have drawn attention to health and environmental hazards and promoted policies and measures for clean energy for cooking, primarily LPG and electricity. Issues of gender have recently been prioritized in energy research. However, there is a gap between knowledge and practice. With this background, we have a three-fold objective of this study:

- To identify and analyze drivers and barriers to sustained adoption of LPG as the primary clean cooking energy in India, underpinning values and norms and 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 that might lead to both strengthening women's agency and improvement in implementing clean cooking energy policies and programmes;
- To understand and explore the applicability of lessons from India's LPG Programme to Nepal and Myanmar.

Research Methods and Field Sites

While some research has focused on empowering women for their role in the energy field, but only limited research has drawn attention to barriers to entry of women that manifest in the

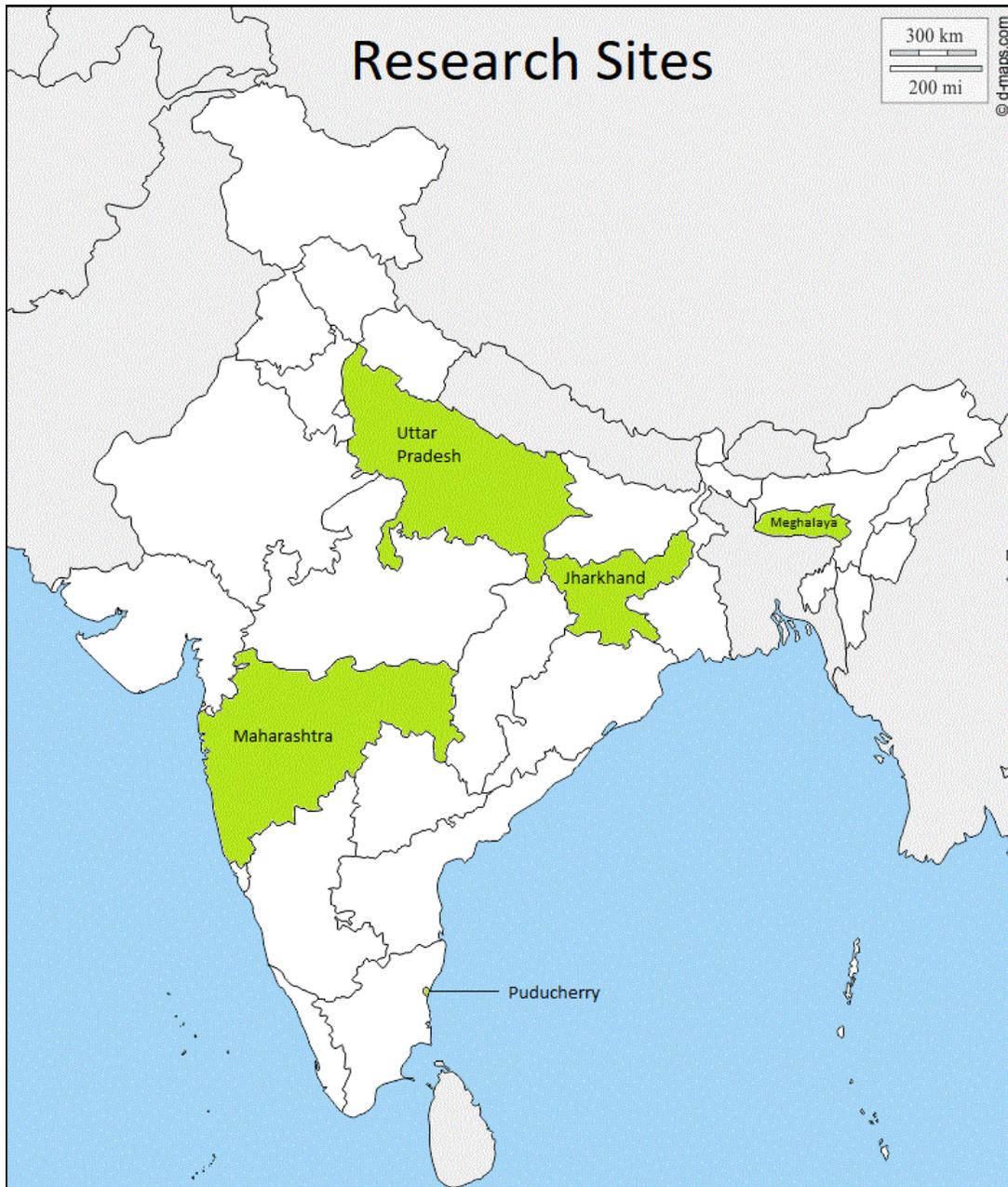
current transition to clean energy for cooking. This research is based on the premise that it is necessary to include gender concerns in policies and programmes for access to modern energy. Hence our framework of data collection and its analysis is influenced by gender analysis of energy access in rural and indigenous areas to assess the last mile delivery. To understand voices of women and men as well as to see the policy reach in rural and indigenous areas, we used qualitative-quantitative methods through a brief questionnaire for quantitative analysis of LPG supply and its use in the two research sites: 10 villages in the district of West Garo Hills in northeast India and 2 villages in Pune district of Maharashtra in western India. We used qualitative methods of data collection (Focus Group Discussions (with 10 to 12 women or men in each Focus Group (FGD)), individual interviews, and free flowing discussions with individuals as well as implementation related issues with village 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. Our 5 research sites included a total of 21 villages:

- 10 villages in the district of West Garo Hills of Meghalaya,
- 6 villages in Khunti, Ranchi and Simdega districts of Jharkhand
- 2 villages in the Pune district of Maharashtra
- 2 villages in the Etawah district of Uttar Pradesh
- 1 village in Puducherry district of Puducherry Union Territory

The total research reach was 410 people: 330 women and 80 men. With the exception of West Garo Hills (180 households), research team conducted survey and discussions with 30 households in each village with women LPG owners under (Pradhan Mantri Ujjwala Yojana (PMUY) in India.

Table 1: Research Sites

State/Union Territory	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



The brief questionnaire -cum- checklist was shared with our partners (along with in-person meetings and skype discussions) in Nepal and Myanmar. In these meetings we explained the purpose and objectives of research and suggested to them to make context specific changes in the questionnaire-cum-checklist. The two research partners are: Centre for Rural Technology, Kathmandu, Nepal (CRT/N) and Community Care for Emergency Response and Rehabilitation (CCERR) in the Yangon/ Hakha Myanmar. CRT/N conducted a field survey of 30 households in

Province 3 and CCERR did the LPG survey in 10 households in Hakha region of the Chin State in Myanmar.

Following the field surveys in the 3 countries (India, Nepal and Myanmar), we organized two workshops: one in Kathmandu, Nepal and another in Hakha in Chin state of Myanmar.

Experiences of Government Programmes in India

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 under the poverty line households. 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 1,600 (USD 22.5) is provided out of the cost of about Rs 2,300 of the new connections, not including regulator and stove which would be Rs 1,200. The cost of refilled cylinders comes to roughly Rs 650 per cylinder. Thus, initially the poor woman who gets the subsidy would have to bear an additional initial expense of Rs 1,600 equal to the amount of subsidy and recurring cost of Rs 650 per cylinder. As I was drafting this study, on 12th February 2020, the LPG prices across the country saw a steep rise in the unsubsidized 14.2 Kg cylinders (from INR 714 to INR 858 in Delhi). This price hike was attributed to the rise in the Saudi Aramco's propane price, based on which LPG pricing is done in India. Importantly, in case of Ujjwala consumers, this increase is reported to be absorbed by the rise in government subsidy, from INR 174.86 to INR 312.48 per 14.3 Kg cylinder (The Hindu, 2020).

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 meet the initial subsidy of INR 1600 for an LPG connection.

The Ujjwala programme has the following objectives:

- 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.

Importantly, prior to the launch of Ujjwala programme, in March 2015 the government of India launched 'Give it up Campaign' motivating the economically better-off LPG users to voluntarily surrender their LPG subsidies in order to provide LPG connections to under poverty line households 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 under 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 of clean cooking energy.

The Ujjwala programme is largest programme for the subsidized distribution of the connections. But it is not the first such scheme. In view of earlier such programmes it is important to see whether this programme would be adequate to switch from solid biomass to primary reliance on LPG.

Transition to Clean Cooking Energy

The World Bank Deepam project launched in 1999 covered 1.2 million rural households in the state of Andhra Pradesh in India. A study of Rajakutty and Kojima (2002) found that 90 percent of recipients retained their LPG connections. But officials also reported that they thought the actual incidence of retention of LPG was much lower. The study figure was likely to be high since selling or away one's subsidized connection was illegal. In other areas too there have been reports of diversion of LPG from domestic to commercial use. More important, most households, almost 90 percent of those who retained LPG combined it with wood, which continued to be the primary fuel. LPG was used more in the monsoon months when demand for labour was high, and less in the summer when cash earning opportunities were low. A 2016 study of Rajasthan (Nielsen) also found that 24 percent of studied households had LPG but used it sparingly in making tea and snacks for guests.

The Rajiv Gandhi Grameen Vitran Yojna (RGGVY) was launched in 2009 to ensure LPG connections to rural households who were facing trouble in accessing LPG because of lack of distributors in their area. Following the launch of RGGVY in five years 4,000 LPG distributors were set up under the reduced infrastructure requirement. Importantly, a number of Self Help Groups (SHGs) were given training and responsibility for promotion, management and distribution of LPG in neighboring village. However, soon after the launch, it was argued that the highly subsidized household LPG was diverted to higher priced commercial and automobile sectors (Shenoy, 2016), later this scheme was stopped. To correct the general situation of misuse of subsidized LPG for domestic use, the Modi-led government introduced PAHAL (Pratyaksh Hanstantrit Labh) in November 2014, initially in 54 districts and late in January 2015 throughout the country. These efforts were followed by 'Give it Up' campaign and the Prime Minister Ujjwala Yojna (PMUY), commonly known as the Ujjwala programme.

Problem of sustained use of LPG

Under the current LPG programme, the number of households with connections increased from 61.9 per cent in May 2016 to 94.3 per cent in April 2019 (CAG, 2019). However, the number of cylinder refills purchased by the 19.3 million 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 and the primary fuel remained some form of solid biomass, mainly wood. The CAG further reported, on the basis of data from LPG supply agencies, that on December 31, 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.

The Comptroller and Auditor General (CAG) report itself and later large-scale sample data from the National Sample Survey (NSS) for 2017-18 showed that the low purchase of refills was mainly a rural phenomenon. The NSS data showed that LPG was the primary fuel for 48.3 per cent of rural households, while 50 percent still 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 2017-18. In addition, the extent of use of LPG had also fallen among poor households in rural India, with the drop in LPG refills 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 take the second point for a brief analysis. A recent paper Ashutosh Sharma, Jyoti Parikh and Chandrasekhar Singh (2019) finds that “sustained LPG transition may happen over time, since 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 behavioral 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. The 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 2017-18 consumption figures, these have been in the public domain and show an unprecedented fall in per capita consumption between 2014-15 and 2017-18 (Abhijit Banerjee, 2019). It is also known that the rural economy has been more affected than the urban economy. The former is a largely cash economy and was hit by the late 2016 demonetization. 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 shift to LPG as the primary cooking energy. Rather than fuel switching what is happening is 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) and Kelkar et al (2019) 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.

Since LPG connections have reached almost all (95 per cent of households), the main policy challenge is to support a transition to use of 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 needs to be identified.

Before proceeding, it must be pointed out that the Niti Aayog, the Government of India's policy think tank, in collaboration with the Council on Energy, Environment and water (CEEW) has come out with 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 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 accessible to virtually the whole population. The 5 per cent not yet reached, can either easily be reached by identification of those left out. In any case, it is important to design policies for promoting a switch to LPG as the primary cooking fuel for the 50 per cent of the rural population that have not yet switched. TERI, has designed a policy for promoting the move to adoption of LPG as the primary fuel by the poor women and their households, i.e. by the beneficiaries of the PMUY (Palit, Shardul and Brahmachari, 2019). We will discuss this proposal later on in this report.

In earlier work for ENERGIA (Kelkar et al, 2019) it was argued that flawed policies, social 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 which are considered valid; and they result in creating gender-differential effects to the disadvantage and exclusion of women, both within and outside the sector.

In particular, women's lack of rights to ownership and control of 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.

Women's Agency

In drawing from the feminist analysis of political economy, we have used to term **"agency" as the power to make decisions and act upon them**, leading to their negotiation power for freedom and dignity, and redefining the priority for clean cooking. Above we have referred to the importance of women's ownership of and control over assets and also their independent income earning. Women in India, in general, do not own land and work largely as what is called 'unpaid family workers'. Moving to being owners of land or independent income earners can both help increase women's agency in the energy sector. Women's agency, defined briefly as their ability to both take decisions and act on them to realize

desired outcomes in well-being and capabilities. In the case of the adoption of clean cooking energy, the question can be posed as: since women are the ones who carry 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?

The discussion on women's agency goes back at least to Amartya Sen's 1990 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) 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 asset or independent income, but also by qualitative factors. Women's ability to argue as 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 that can also play a role in enhancing agency.

Building the context of women's agency, health and wellness

The two workshop discussions in Nepal and Myanmar centred on India's example of LPG programme, and on building the context of women's agency, health and wellness, as an innovative approach. In India and most of South Asia, masculine norms and male dominance in formal institutional structures tend to deny women individual identities, and the ownership of assets and access to rights, including access to clean cooking energy infrastructure. Women's poverty and inequality is not only due to gender deficits in asset rights, but also in decision-making in households and community matters. Yet, counter posed to these structures of power, is women's agency, a countervailing power that enables them to bring about changes in gender relations.

The introduction of the 2016 Ujjwala programme for the subsidized distribution of LPG connections in women's names has resulted in new normal practices within poor households throughout the country. Our attention in this study is to draw attention to our innovative strategy for making this programme more effective and sustainable. At the same time exploring the ways of transition from solid-fuel based cooking, to LPG-based cooking and other reproduction work, which is so essential for human existence and can give way to flatten hierarchies in the household power structure and thereby provide more space for women's autonomy and agency.

This innovative approach includes women's agency with health and wellness workshops in Nepal and Myanmar, which were organised to increase social understanding and policy receptivity with attention to both **drudgery free household workplace, and improved health of women and other members** of the household, the major cause being the inhalation of smoke caused by cooking with solid biomass. **The concept of wellness has two major components:** improvement in the **quality of life**; and **financial gains** made from eliminating likely expenditure to address poor health of women and other members of the household.

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 income. Such approach is also to overcome last mile supply problems. Our innovation strategy is based on three principles: **incentivizing last mile efficiency of LPG supply**, and **promoting sustainability of LPG use**; and, **improvements in women's agency** and their position in household and community power relations.

There are four components of our proposed innovation strategy for clean cooking policy: (1) Set up LPG distribution centres within 10 km of any village and/or pay dealers transportation rate based on distance from 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) Awareness building and advocacy for policies to change gender norms.

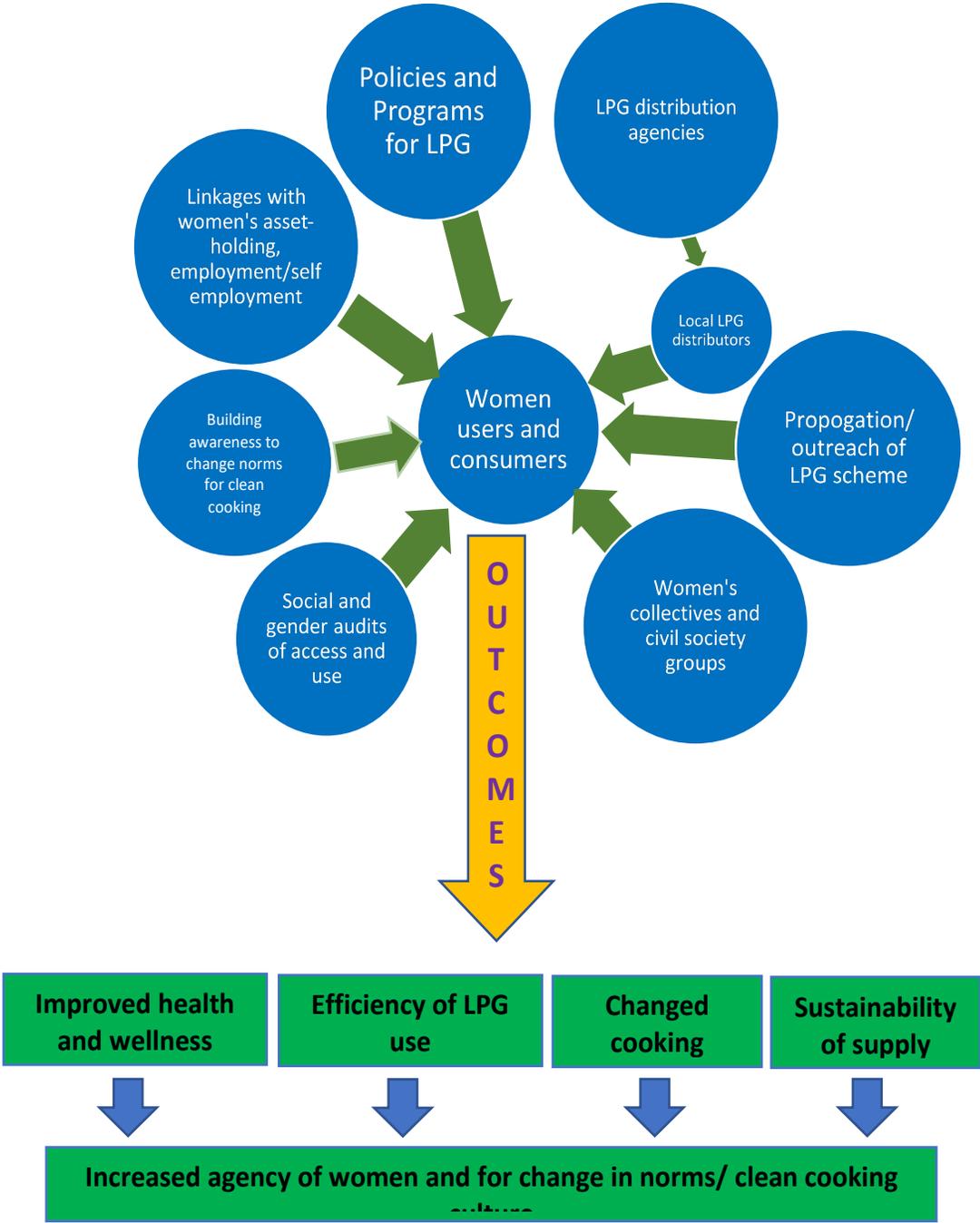
The first two measures would eliminate last mile connectivity problems, while the third and the fourth measures will, in the medium term, lead to improvement in women's decision-making and weakening masculine social norms regarding women's economic dependency on men. The first innovation would provide 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 their 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), 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 communication with Kirk Smith, also see Pillarisetti et al., 2019). Our earlier study with ENERGIA (Kelkar et al., 2019), showed that rural women's economic dependency and low income earning opportunities were key barrier 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 of kitchens that are not smoky by the whole household and that, women in particular, value the time made available for either income-earning, leisure or helping children with school work.

The medium-term interventions are expected to be (1) increasing women's asset (land and house) ownership and income so as to empower women in household decision making, to have sufficient income to sustainably purchase LPG, and to feel the pressure (i.e. as a result of women's employment or self-employment) to economize on women's time in cooking; and (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 knowledge building, technology operation skills and management should concentrate attention to women's empowerment and transformation of gendered systems.

It is likely that a subsidized LPG for four to five years, simultaneously with projects to address the barriers and strengthen drivers, will bring about a change in masculine norms, bring in income under women's control, empowering women to regularly buy LPG and change current norms around cooking. In this period, the use of LPG for cooking is likely to become the new normal.

Strategy for Women’s Agency, Health, and Wellness Ecosystem



Field Findings

What were the manifestations of women's agency?

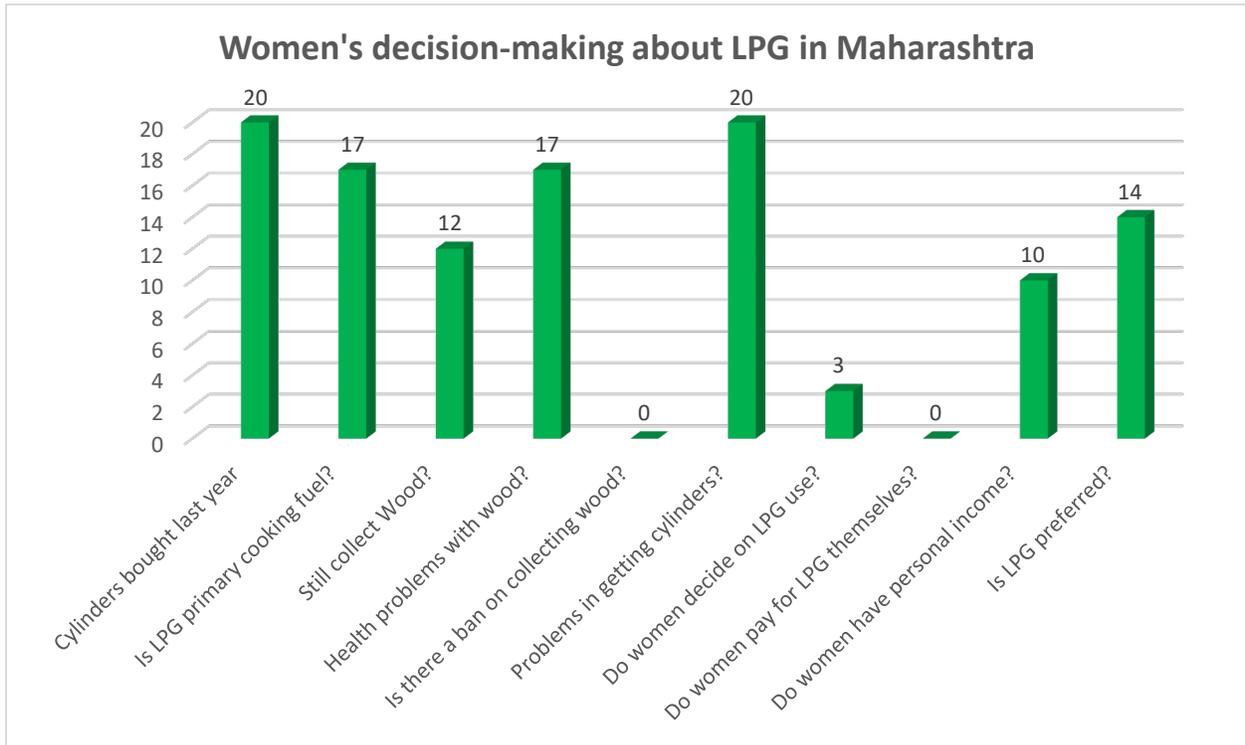
After four years of PMUY, and 'Give it Up' and other campaigning around LPG usage, the benefits of it are quite well known. We found in all the areas of the fieldwork that women, and men too, were quite aware of LPG and its benefits. In that sense it has become an aspirational commodity, something that women would like to have. We did not once hear a reference to the supposed cultural preference for wood-cooked food. What women did not have was control over finances and income of their own to realize their aspirations to have LPG, as we heard from the FGD (with 12 women in this group) conducted in Hamirpur village in Uttar Pradesh: " We have all comfort in cooking with gas, but lack funds to regularly buy refills.... We need only money to refill our cylinders" (MECS Field Notes, 2019).

In the household-based field survey in West Garo Hills in Meghalaya, the question of who took the decision about buying LPG refills was put to the women and men. Among the Garo, (matrilineal community, with finances under women's control) out of 180 women only 26 (14 per cent) said that their husbands decided on LPG expenses, and 151 women (84 per cent) said that they alone decided on LPG expenses.

In Puducherry, in all the 30 households interviewed, all the women said that the decision to get LPG was their own or they demanded that their husbands give money to get the LPG refill. The primary source of women's income ,who independently decided on getting LPG from their own earnings, one-third of all interviewed women) was from agricultural wage labour, and a dairy unit managed by women.

In Maharashtra 18 of the 30 women interviewed said that the men took the decision on whether to buy LPG refills, while 12 women said the decision was jointly taken; though of these, 5 women also said that the final decision was taken by men.

Figure 1



In the Jharkhand field sites, where it was said that it was a joint decision of both husband and wife, the money for the LPG came out of the household's joint income.

In a UP village, 5 of 30 women interviewed said that they had quarreled with their husbands in order to get an LPG connection, i.e. it was the husbands' decision which they had to influence, since they did not finance in their control. Men have control over household finances, but it could be influenced by women's arguing and nudging on a daily basis, as explained by Zarina, "Everyone else is getting it, we will also have a gas connection". This was Zarina's nudge for a month before her husband agreed for a LPG connection under Ujjwala scheme (MECS field notes, 2019).

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 (refer to Figures 2,3 and 4). In the households near the distribution centre, which was the down the hill, 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 get 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 still living in the forested areas, did collect wood from their family forests.

Figure 2

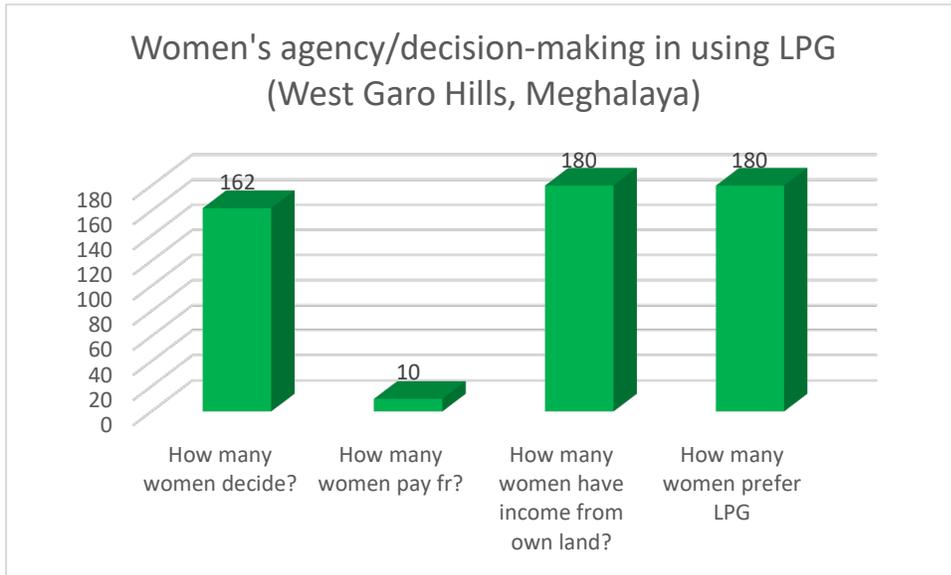


Figure 3

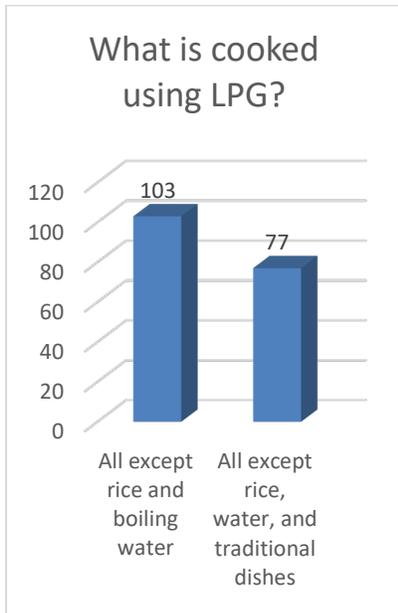
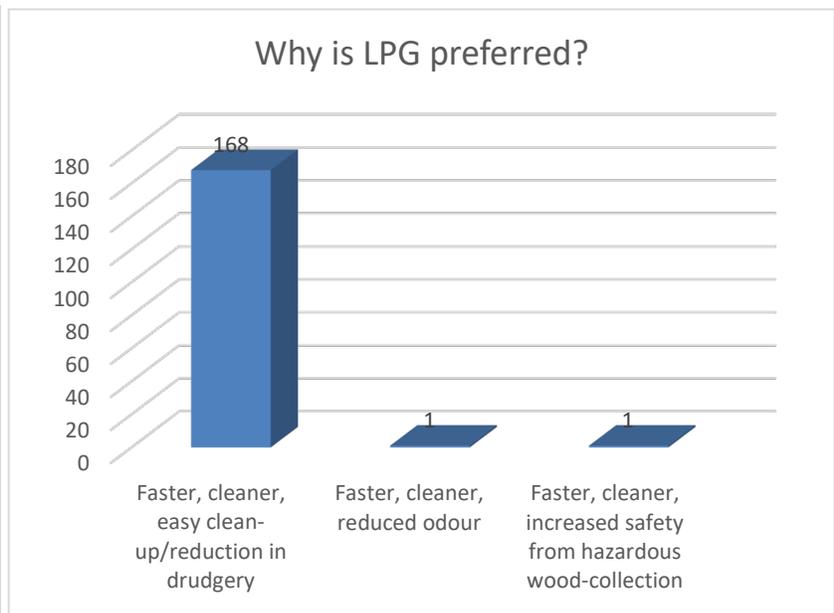


Figure 4



About an hour's distance from the town, women had not fully adopted LPG (as explained in Figure 3). 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 refills in a year. There was a substantial expense involved in getting 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 per cent (of 200 households), in the second village 30 per cent (of 50 households) and in the third only 3 per cent (out of 300 households) had switched to LPG for the main cooking. In two villages in Khunti District, many used it regularly. But, 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 2 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 having a role in decision-making and the adoption of LPG as the primary fuel. But in the case of UP, where women had no direct role in household decision making, there were only 2 (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. 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.

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. But women have a greater say than men in the use of the money. In particular, 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". **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 the household decision-making.**

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 head 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, in particular, attention is not paid 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 of these 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 agency. Throughout our field sites, in all the five states, women who used Ujjwala LPG for primary cooking mentioned that 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.

As we noted above, in some cases in UP, women were emboldened to argue with their husbands for an LPG connection since "everybody else has one." LPG was certainly the occasion for them to take up an argument with the 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.

Barriers to Sustained use of Energy

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 per cent 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 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.

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, 2019). Certainly for Ujjwala consumers, one needs to consider ways of making the refills available, fully or partially subsidized as in the case of Maharashtra pilot study by Kirk Smith and his research team (Pillarisetti, 2019).

Accessibility: A problem referred to very often was the time taken to get 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.

Men's Control over Household Finances: In mainstream communities in India (also in Nepal and Myanmar) 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). This is certainly a barrier in households' regular use of LPG.

Social Norms and Practices: Social norms support men's control over resources and household finances and 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).

Efforts at understanding and promoting sustained use of LPG and clean energy for cooking

A way is to increase subsidies depending on the income level of the household, as is currently done under the National Food Security Act, where the 10 per cent of poorest households are given a higher subsidy, which would make the cylinders virtually free (Gupta and Vyas, 2019). Accepting that clean cooking energy with its health benefits is a social investment, as is argued for health improving expenditures by Peter Lindert (2004), there is a strong case for fully subsidized clean cooking energy for

the poorest. This would benefit not only the poor households but also the region and the country as a whole. Chowdhury et al (2019) calculate that by completely mitigating emissions from household sources India can meet its annual ambient air quality standard. This strengthens the case for fully subsidizing LPG to at least the poorest 20 per cent.

Given the important health benefits for women and children, and the national benefit in terms of an improvement in ambient air quality, there is a strong case for extending the subsidy to one of no cost supply to PMUY consumers. Palit, Shardul and Brahmachari (2019) have put forward an interesting way of financing such a solution without additional fiscal burden. They suggest a cross-subsidy through a cess on piped natural gas (PNG) mainly supplied to middle-class urban consumers. This could also be supported by a small additional cess on petrol and diesel for automobiles.

Income through rural employment scheme: A novel suggestion is to overcome the cost barrier by providing extra days of work under the public works programme such as National Rural Employment Guarantee scheme in India to those women who buy a cylinder. This came up in discussions in Jharkhand. The wage for these extra days can be given as an LPG voucher. This is being considered in Jharkhand policy circles.

Second cylinder: A frequently mentioned constraint in poorly connected rural areas is the number of days it takes to get a refill. In the interim, women would have to cook with traditional stoves using solid biomass. In Garo Hills, a number of women said that they were saving money to buy a second cylinder.

A pilot in Maharashtra provided a smaller, second cylinder free of cost during pregnancy (Pillariseti et al, 2019). In addition, households were asked to symbolically break the old clay stoves. Of course, the discarded clay stoves could easily be replaced, if households wanted to. The study found that 65 per cent broke and did not replace their wood stoves. Further, after the pregnancy, 85 per cent of households were willing to pay for the second cylinder. These results show that small changes, or nudges (as in the case of UP women), could be successful in promoting the fuel switch to sustained clean cooking energy.

Role of Self-help Groups: Our earlier studies of ENERGIA of Tamil Nadu, Kerala and Odisha (Kelkar et al, 2019) have showed that women's collectives in the form of savings and credit associations, also called Self-help Groups (SHGs), are important in promoting women's access to LPG. In this current study, in Garo Hills women mentioned that an SHG could be given a sub-dealership to handle orders and deliveries at the village level. This could be a way of dealing with last-mile delivery problems, which again showed up frequently in FGD discussions in Jharkhand. SHGs do not have a role in just solving logistical problems of delivery. They play an important role in enabling women to develop a voice, both collectively and individually. They promote women's agency by discussing about the ease in cooking with LPG and its health benefits to the entire household.

Exploring Applicability of India's Lessons from LPG Programme in Myanmar

The CCEAR workshop in Hakha (on 4th December 2019) was conducted in the local language, with the exception of Govind Kelkar's presentation and interactive discussion. However, the workshop had very

engaging discussions on prospects of LPG or electricity as the future fuel for cooking in Myanmar and Chin State. Participants with good representation from the government of the Chin State, including the Chief Minister's office showed a great interest in knowing details and problems of India's LPG programme. This was followed by the discussion on the problems they were likely to face in case of introducing LPG in their area. These problems were stated: 1) Lack of access in the region living at a great distance from Yangon; 2) lack of men's support, with low valuation of work and time; they were encouraged to continue to fetch wood from 'the good forest cover' in the region. Women participants are keen for a cooking future with LPG and showed a visible angry response to a male participant's remark about 'tradition of women's work, and lack of taste about food cooked on LPG stove'. There were four important takeaways from this workshop: 1) Need for raising gender awareness in communities and government agencies, 2) having smaller size of LPG cylinders in the market which women could transport themselves and did not have to depend on men to carry cylinders; 3) having a distribution agency in local area, currently those few households who has gas connections, have to drive 150 km. or more to get gas connection or a cylinder refill; and 4) more important, ways of introducing development projects for women that can provide them some income of their own . In the existing social norms women are 'the holders of household money, men decide on its use ', and cooking with LPG was not seen a priority by men.

Exploring Applicability of India's Lessons from LPG Programme in Nepal

The CRT/N workshop was organized on 18th December 2019, with presentations from CRT/N on their field-based work in Province 3 and by the government representatives as well as by the concerned civil society leaders, the private sector and academics. Two presentations were made by the GenDev CRI and another by the Clean Cooking Alliance. Some major points of the field survey report included; 1) 22.5 percent of the surveyed households were using LPG for primary cooking, others used biomass energy such as wood , agricultural residue and dung cakes, like the 91.4 percent rural people are using solid biomass fuels in Nepal. Nepal does not have any fossil fuel based energy sources; demand for LPG is met by import from India. According to a Memorandum of Understanding (MOU) between India and Nepal, the later is obliged to import petroleum products only from India, and reportedly Nepal Oil Corporation has taken a loss of an estimated figure of NPR 800 per cylinder; 2) There is limited usage of LPG in rural areas and lack of LPG distributors was reported to be another problem; so it was suggested that policies should be such that the households are encouraged to buy two cylinders to avoid a 2-3 day gap in getting the cylinder refills. 3) the high cost of cylinder has driven away rural people's interest in LPG for cooking; 4) men exercise their authority and influence the household on whether to buy cylinder or continue cooking with solid biomass fuels even so in case in of the female-headed households. 5) However, when women have their own sources of income, they make decisions to buy LPG.

The workshop participants were divided in their opinion on LPG or electricity as the future cooking fuel of Nepal. Reportedly, the Government of Nepal is importing 30tons of LPG every month from India, thus spends 2.5 percent of total import bill of NPR 1.5 trillion to buy LPG. Furthermore, in the last several years the local demand for LPG has increased by four times. The Government of Nepal therefore has

made some policy change for electricity as the preferred clean fuel for cooking and with a target to achieve this by 2030. The workshop concluded with suggesting the policies for wellbeing of rural communities and to introduce measures for making clean energy available for cooking. Nepal is reported to be progressing well in terms of generating more electricity for the country but until the required infrastructure is in place, the best available option would be to make LPG available for cooking.

Conclusion: Towards Effective Policy Implementation for Sustained Use of LPG and Clean Cooking Energy

In the preceding pages of this study, we analyzed the reach of clean cooking energy, mainly LPG. In remote rural and indigenous areas.. Following this, in the two policy workshops in Nepal and Myanmar, we discussed the applicability of the known Ujjwala programme in India, to understand lessons from its achievements and challenges in India's experience, in the context specific situations of the two countries. Throughout this period, we concentrated our efforts at understanding the process of sustained access and use of clean energy for cooking, and outlining a strategy to overcome barriers and to build an ecosystem of women's agency, health and wellness. In view of sustained access and use clean energy for cooking, we would like to suggest some measures to be undertaken in a concurrent fashion by the concerned stakeholders: government ministries, development partners, oil and gas companies, civil society groups including women's organizations and individual academics. These policy and practice measures include:

- Assisting the policy efforts in three countries (India, Nepal and Myanmar) on how to formulate and implement gender-responsive and socially inclusive clean cooking energy policies.
- Addressing significant barriers in consultation with government, civil society groups women's organizations, , local key persons and institutions; and development partners. These would include research-informed advocacy through a series of workshops and discussions on 1) adverse effects of cooking with solid biomass, and 2). gender-specific, environmental benefits of cooking with clean energy.
- Identifying masculine norms and values that that underlie the current sociotechnical clean energy for cooking system and provide analysis, tools and advice on how to counteract them.
- Creating research based knowledge on how the barriers are being addressed and what further policies and strategies are needed that could appeal to local leaders (most being men with patriarchal mindsets) to implement measures for women's strategic needs of cooking with clean energy.
- Building women's economic and social agency in consultation with governments and partners in Nepal and Myanmar, that are likely to result in making sustained use of clean energy for cooking a new normal in the near future.
- Developing tools of data analysis in algorithms to aid oil and gas agencies in making more inclusive and gender aware interventions.

- Building pilots on women's agency, health and wellness ecosystem through clean energy for cooking. These can be one in each country of study. . Some of the identified "Reasons for not using LPG as cooking fuel in India" (CRISIL, 2016:97), are evident in rural India, and also in Nepal and Myanmar. The two workshops in Myanmar and Nepal clearly pointed out these reasons as that of related to male dominance in institutional structures of energy and masculine social norms. These need to be addressed through systemic change in institutions and positive messaging about women's agency, health and wellness benefits.
- Building a network of researchers, policymakers/governments, development partners, oil-companies and civil societies groups, including women's organizations that are interested in issues of gender-responsive policies and practices for modern energy for cooking.

Dissemination

So far I have done dissemination on India's Clean Energy Cooking Programmes at the following forums:

- Within the country, shared the research approach and findings in institutions and organizations such as TERI, CEEW and Niti Aayog of the Government of India.
- Presentation on the research findings and interactive discussions on women's agency, health and well being with women's organizations, civil society, local leaders, academics, and government agencies in Myanmar workshop.
- Presentation on the research findings on India's clean energy for cooking programme and interactive discussions on women's agency, health and wellbeing model with civil society, government agencies, the private sector, donor partners, Asian Development Bank, and advisors to the government energy development in Nepal, in Kathmandu Workshop, Nepal.
- Presentations (2) on this research and research findings at UN regional meetings UNESCAP and UNESCWA in Bangkok in October 2019.
- Presentation on Clean Cooking Programme in India, MECS networking meeting, in Nairobi Kenya (5-6 November 2019).
- Proposed plan for March 2020 includes to share the current research findings at the Commission on the Status of Women (CSW) in New York City, and also present in a meeting organized by Heinrich Boll Foundation in Washington D.C.
- We have been approached by Chalmers University of Technology, Sweden, to join the research team of Users TCP (User Centered Energy System). However, this is only a knowledge partnership with no financial support.

Notwithstanding the above, continuing work of dissemination on research findings and on women's agency, health and wellness model is needed to share at local, national, regional and international level.

References

Alexander, Sneha and Vishnu Padmanabhan. 2020. The PMUY's Cooking Gas Refill Issue. *Mint*. 9 Jan 2020.

Chowdhury, Sourangsu, Sagnik Dey, Sarath Guttikunda, Ajay Pillarisetti, Kirk Smith. 2019. India annual ambient air quality standard is achievable by completely mitigating emissions from household sources. *Proceedings of the National Academy of Sciences*.
www.pnas.org/cgi/doi/10.1073/pnas.1908888116

Comptroller and Auditor General of India (CAG). 2019. PMUY Audit and Performance Report. <https://cag.gov.in/content/report-no14-2019-performance-audit-pradhan-mantri-ujjwala-yojana-ministry-petroleum-and>, last accessed January 16, 2020.

CRISIL. 2016. Assessment Report: Primary survey in Household Cooking Fuel Usage and –to con- to LPG. Ministry of Petroleum and National Gas, Government of India.

Gupta, Aashish and Sangita Vyas. 2019. Communicating harm, reducing prices and challenging inequality should be central to a redesign of the Ujjwala program. Collaborative Clean Air Policy Centre. *From Access to Sustained Use: A Policy Brief*. CCAPC/2019/03.

Health Effects Institute. 2017. State of Global Air 2019.

International Energy Agency (IEA). 2017. Energy Access Outlook 2017: From Poverty to Prosperity, Energy Pr. 94, 144. [https:// doi: org/10.1787/9789264285564](https://doi.org/10.1787/9789264285564).

Jain, Abhishek, Sudatta Ray, Karthik Ganesan, Michael Aklin, Chao-yo Cheng and Johannes Ureplinen. 2015. *Access to Clean Cooking Energy and Electricity*. New Delhi: CEEW.

Kelkar, Govind, Dev Nathan, Rengalakshmi R, Manjula M, Indira Shakya, Purushottam Shrestha and Ashma Pakhrim Tamang. 2019. *The Gender Factor in the Political Economy of Energy Sector Dynamics*. Amsterdam: Energia. www.energia.com

Kumar, Bharat K. 2020. "Why have LPG prices seen a sharp rise?". *The Hindu*. 20 February 2020.

Nathan, Dev., M Manjula., R Rengalakshmi., Govind Kelkar. 2018. Reducing Greenhouse Gas Emissions: Energy Use and Women's Work in Agriculture. *Economic and Political Weekly*, 53:17.

Nielsen, AC. 2016. Rajasthan and Kerala Consumer Segmentation Study, Final Report. [http:// cleancookstove.org/about/news/04-15-2016-new-studies-reveal-deatiled-data-on-cooking-behavoirs-of-indian-consumers-in-kerala-and-rajasthan.html](http://cleancookstove.org/about/news/04-15-2016-new-studies-reveal-deatiled-data-on-cooking-behavoirs-of-indian-consumers-in-kerala-and-rajasthan.html), last accessed January 17, 2017

Palit, Debajit, Martand Shardul and Deborshi Brahmachari. 2019. *Clean Fuel for Cooking: Solution to Achieve Better Air Quality*. New Delhi: The Energy and Resources Institute.

Patnaik, Susmita, Saurabh Tripathi, and Abhishek Jain. 2019. *Roadmap for Access to Clean Cooking Energy in India*. New Delhi, CEEW.

Pillarisetti, Ajay, Makarand Ghorpade, Satish Madhav, Arun Dhongade, Sudipto Roy, Kalpana Balakrishnan, Sambandam Samkar, Rutuja Patil, David Levine, Sanjay Juverkar, Kirk Smith. 2019. Promoting LPG usage during pregnancy: A pilot study in rural Maharashtra. *Environment International*.

Rajakutty, S. and M. Kojima. 2002. "The Rural Poor: An Evaluation of the Deepam Scheme". [http://site resources .worldbank.org/EXTSOCIALDEVELOPMENT/Resources/244362-1164107274725/3182370-1164201144397/3187094-1173195121091/Energy-Gender-Development-SD125.pdf](http://site.resources.worldbank.org/EXTSOCIALDEVELOPMENT/Resources/244362-1164107274725/3182370-1164201144397/3187094-1173195121091/Energy-Gender-Development-SD125.pdf)

Sharma, Ashutosh, Jyoti Parikh, Chandrasekhar Singh. 2019. Transition to LPG for cooking: A case study of two states of India. *Energy for Sustainable Development*. 51: 63-72.

Shenoy, Bhamy V. 2016. Deconstructing Government's LPG Subsidy Savings Claim. *Economic and Political Weekly*. Volume 51, No. 46, 15-17.

Somanathan, E. 2019. Raising awareness for clean cooking. Collaborative Clean Air Policy Centre. *From Access to Sustained Use: A Policy Brief*. CCAPC/2019/03.

WHO. 2016. *Burning Opportunity: Clean Household Energy for Health, Sustainable Development, and wellbeing of Women and Children*. Geneva: WHO.