The Gender Factor in Political Economy of Energy Sector Dynamics

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Cover Photo 1: Woman in the driving seat of the electric three wheeler in Kailali, Nepal. Photo: CRT
Cover Photo 2: Rural woman working on measuring fat content of milk in Dindigul, Tamil Nadu. Photo: MSSRF

The Gender Factor in Political Economy of Energy Sector Dynamics

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EXECUTIVE SUMMARY

This study seeks to bring gender issues into the political economy analysis of the dynamics in access and use of modern energy services, chiefly clean cooking energy, (such as LPG or biogas), and modern energy in agriculture (such as electricity, diesel and solar power).

In looking at modern energy services we distinguish between three levels of analysis—that of the availability at the macro or national level, of access at the meso or community and household level, and of use at the level of the individual woman. In each of these spheres, i.e. availability, access and use, we look at the role of women and gender relations.

The central research question is: how can rural women be empowered to gain access to and use modern energy services in both household and production activities in the rural economy? With the results of our analysis we look at the meta-question: how does the introduction of gender make a difference to political economy analysis?

In addition to a literature review and interviews with key informants at the macro and meso levels, the team also gathered quantitative and qualitative data through a questionnaire-based survey, key informant interviews and focus group discussions (FGDs). These were carried out in different types of rural areas in India and Nepal—remote and commercially poorly developed as well as reasonably connected and well-connected villages in the districts of Koraput and Mayurbanj in Odisha, Wayanad in Kerala and Dindigul in Tamil Nadu in India; and the districts of Dhading, Kailali, Kavre and Rupandehi in Nepal. Questionnaires were administered to 297 women in India and 278 women in Nepal. A total of 22 FGDs were conducted with both women and men in the two countries. The statistical analysis is not taken as evidence of causality, rather that of correlations between observable characteristics of the sample. However, the qualitative findings from the FGDs and individual discussions with key informants are used to extend the analysis of correlations to causality.

Structure of the Report

The report is divided into eight chapters. After a brief description of the subject in the Background chapter, chapter 2 analyses gender issues in the switch from labour-using traditional wood as fuel to labour-saving and relatively clean LPG or biogas. Chapter 3 deals with energy use in agricultural production, including women's access to and use of farm equipment based on modern energy services. Chapter 4 in the Section 2 of the study broadens the analysis of empirical findings in chapters 1, 2 and 3, explaining gender – income inequality and the role of women CBOs. Chapter 5 deals with discursive analysis of social norms, its challenges and changes. Chapter 6 deals with the manner in which gender makes a difference to political economy analysis, particularly in the field of modern energy services—their availability, access and use. This is followed by chapters 7 and 8 on conclusions, policy implications and policy messages.

The Transition to Clean Cooking Energy

This is dealt with in Chapter 2. The household or domestic task we focused on was that of cooking, including the collection of fuel. In India, woodfuel was the principal source of energy for cooking used by more than three-quarters (76.3 per cent) of rural households in according to the National Sample Survey (2012), the latest year for which the data is

available. In Nepal, 83 per cent of the rural population relied on woodfuel. Furthermore, the proportion of the rural population dependent on woodfuel as the primary fuel shrank by just two percentage points in the 16-year period 1993–94 to 2009–10.

Our discussions with women in villages showed that women are partly familiar with the health implications of the continued use of woodfuel and other solid biomass for cooking. What they notice is usually the burning of the eyes, but not the effects on respiratory ailments and longevity. The WHO estimates that 1.3 million people die every year from household air pollution in India and 75,000 in Nepal.

Governments, multilateral organizations, such as the World Bank, and international and national NGOs have tried to deal with this problem by providing subsidized clean cooking systems such as LPG stoves and cylinders (in India) or biogas systems (in Nepal). Earlier studies have shown that very often the primary cooking energy fuel did not change. There was no fuel switching from unclean to clean fuels; instead, there was fuel stacking, with wood remaining the primary fuel and LPG becoming a secondary fuel, used at times but not for the main part of the cooking.

Our hypothesis was that in commercially less developed areas, where women used their unvalued labour to collect wood, the movement from access to use of clean cooking fuel as the primary cooking fuel required their increased participation in income-earning activities, which would increase the value of their labour, the opportunity cost of their labour, and possible economic empowerment.

This was tested across the field sites through a survey of women, FGDs and targeted data collection. We sharpened the distinction between the use of LPG or other clean cooking energy as the primary cooking fuel and the continuation of wood as the primary fuel by including fuel stacking (i.e. the use of LPG as a secondary fuel) in the latter. This gave us a binary distinction between the use and non-use of LPG as the primary cooking fuel.

Findings: Factors Correlated with Adoption of Clean Fuel as Primary Cooking Fuel

The main results are as below. In Nepal, while there was some use of LPG and biogas, these have not become the primary cooking fuels. FGDs also showed that fuel stacking was the most common feature of the use of clean cooking energy. Since this remained the feature across all locations, it was not possible to investigate factors that might lead to fuel switching.

In India, on the other hand, almost 50 per cent of women (146 out of 297) used LPG as the primary cooking fuel. As expected, the use of LPG as primary fuel varied with remoteness, which would also mean undeveloped markets for labour. In Nepal too, the use of LPG or biogas, even as secondary fuel, varied with remoteness.

In understanding the factors that influence the use of LPG as the primary fuel, the factors considered are: women's position as independent income earners, women's membership of CBO's and women's decision making, and as explanatory context factor; the level of remoteness. In chapter 2 we present the results of detailed statistical analysis of surveys.

The survey indicates that of the respondents in India, 57 per cent of women who were independent income earners used LPG as primary cooking fuel, compared to 29 per cent

of women who were unpaid family workers. It is likely that the women who were unpaid family workers and used LPG were from economically better-off households, where there would be a household income effect in the use of LPG. A binary logistic regression showed that women being independent income earners was significant at the 5 per cent level for use of LPG as the primary cooking fuel. Women having some decision-making power within the household also had a positive effect on use of LPG as the primary cooking fuel. However, controlling for remoteness, both correlations are not significant.

Women's membership of Community Based Organizations (CBOs) such as Self-Help Groups (SHGs) was also studied as a factor in LPG use. Although there is a large overlap between membership of CBOs and LPG use, the correlation did not emerge as significant from the quantitative analysis of the survey data when controlling for remoteness. However, the qualitative research indicates that CBOs play a role in choice for LPG through their influence on strengthening decision-making (see chapter 4).

Overall, we interpret these results as a manifestation of the higher economic value of women's labour, which in our hypothesis, is important for fuel switching. An increase in the opportunity cost of women's labour promotes labour-saving activity, or a reduction in women's drudgery. Amartya Sen's theory of cooperative conflict in household bargaining predicts that an increase in women's income contribution would increase their bargaining power in household allocation.

After the field study had been designed and initiated, the Government of India's Ujjwala scheme to provide LPG to 50 million poor women through a capital subsidy had been implemented and the new reach is 80 million women of below poverty households. Our analysis led us to predict that this would result in large-scale fuel stacking in areas where women used their own unvalued labour to collect wood. This could be checked by the number of cylinder refills ordered per year. A family of four needs 8 to 9 cylinders per year where LPG is the primary cooking fuel.

A check of Ujjwala scheme LPG recipients in Mayurbhanj, where women collected woodfuel, showed that the beneficiaries ordered an average of just 3.7 cylinders per year for an average family size of 4.5 persons. Newspaper reports and interventions by government officials have confirmed that there is a low rate of refill orders from Ujjwala beneficiaries in states such as Jharkhand, Chhattisgarh, and Odisha, where women largely collect wood with their own unvalued labour and LPG cylinder refill orders average just two cylinders a year in some areas.

We see this admittedly high level of fuel stacking as further evidence that capital subsidies need to be combined with women's empowerment as income earners in order to promote fuel switching, rather than fuel stacking.

An additional factor (besides women's increased involvement in income earning activities) that could turn access into use, i.e. promote fuel switching, is the spread of the notion of clean fuel as the primary cooking fuel as the new normal. Apart from the government's current capital subsidy policies and our proposed women's increased economic involvement, one would add the nudge of an aspiration to use LPG as clean cooking energy, both to reduce women's drudgery and to promote their health through reducing household air pollution.

We have seen through discussions in the field that changes in gender relations cause a shift from the use of collected biomass to purchased clean and labour-saving fuels such as LPG. However, does such a change in energy use re-shape gender relations? Which inequalities does it help change and which inequalities does it leave in place? The switch to clean cooking fuel obviously reduces inequality with regard to exposure to pollutants. There is also more time to participate in economic activities. Women reported having more time for leisure and more time to socialize. Overall, there is a *reduction* in the time required for cooking, but almost no mention of any *redistribution* of household work between women and men.

Modern Energy Services in Agricultural Production

Chapter 3 deals with the use of modern energy services in agricultural production, which is different from that of clean cooking energy in that the former directly relates to an increase in economic productivity, while the latter relates to saving women's otherwise unvalued labour. The research question in the case of agriculture is about the constraints on women's use of modern energy-based equipment in agriculture. Again, there is a distinction between access and use in the case of modern energy services for agricultural production.

Modern energy services are used in agriculture through the machinery that is acquired and used. The end-use equipment and machinery then serves as a proxy for modern energy use. What are the constraints in women acquiring and using motorized agricultural machinery and how have these constraints been addressed in India and Nepal?

Women's and men's tasks are quite distinct in agriculture. Land preparation, transporting of produce and marketing are some of main tasks of men; transplanting, weeding, harvesting and post-harvest processing are some of the women's tasks. Two features stand out in the agricultural sector. First, there has been an increasing feminization of agricultural work, much more in Nepal than in India, with men migrating to urban jobs. Secondly, only a small proportion of women (about 12 per cent in India and 19 per cent in Nepal) own any land jointly with men or independently.

With regard to mechanization, there has been greater mechanization of men's tasks, for example, through the popularization of tractors for land preparation and transport of crops. Women's tasks are much less mechanized. There is the continued drudgery of, say, the transplanting of rice or the shelling of corn. However, where there has been mechanization of women's tasks—such as milling of grain—women in both India and Nepal have used the time saved for other production, an example being the cultivation of vegetables in Nepal.

Why are women's tasks less mechanized using modern energy sources such as electricity or diesel? Our analysis is that the low valuation of women's labour is one reason for low levels of mechanization. One would expect that low-valued women's labour would be less mechanized than the highly valued men's labour; the opportunity cost is seen to be greater for the latter. In addition, there are the stereotypes of women being unable to acquire the skills for operating fuel-utilizing machinery, their lack of ownership of land, and their related inability to access low-cost official funds from banks. This bias against women using modern energy based machines and equipment is not only the result of the operation of market-based valuation, but also of policy, both being influenced by socially

constructed gendered norms. Migration reduces the total household labour for both production and social production. This has resulted in greater mechanization of women's tasks, as through use of electricity driven winnowers and diesel-driven threshers.

More recently, governments and NGOs have taken a number of steps to address the constraints that women have faced in acquiring machinery. In India, several government schemes provide a higher subsidy for women than men in the purchase of machinery. This, however, still requires women to own some land, in order to be identified as being farmers. In turn, many men have taken to registering some land, some even small bits of land, in the name of women. In Nepal, on the other hand, women do not need to own land in order to buy machinery; they can do this with just a national identity card.

Even without land, women in groups in India can secure machinery that form part of the Machinery Service Centres/ Custom Hiring Centres (CHCs) for rental use of agricultural machinery. NGOs such as SEWA and the *Kudumbashree*/Green Army groups have taught women to operate these machines, including land tillers. Our field visits showed that women are operating these machines, which are owned by the women's groups. Successful schemes to provide machines to women have generally bundled a number of services—they provide the machines, the finance needed to acquire them, and train women to use them. The development of CHCs are part of a move towards an 'asset-light' economies, where sale of expensive technology products is replaced by sale of the agricultural services (e.g. land preparation, harvesting). It is also, importantly, a move for women to move into agricultural tasks, such as land preparation and transport that were traditionally denied to them.

The development of smaller-sized equipment has also helped to spur women's use. Solar pump sets, promoted by SEWA, have been installed in place of the earlier large diesel pump sets. Similarly there is high demand in Nepal for small solar pump sets that can be used for irrigating small patches of land for vegetable cultivation. The household survey showed that membership of CBOs and education, in both India and Nepal, were positively associated with women's ownership of motorized machines.

One seemingly odd result was that being an independent income earner did not lead to greater use of energy equipment in India, but it did so in Nepal. The reason could be that these independent ventures by women in India are small and thus do not have the scale to use, say, the electrical lighting of poultry sheds. On the other hand, individual enterprises in Nepal are large-scale, sufficient to justify investment in motorized equipment. In India too, in the case of large-scale enterprises such as cattle sheds with more than 10 animals or poultry units with 75 to 100 birds, electrical equipment was used by women.

With a combination of subsidies, providing a bundle of services, some ownership of land/access to credit through the national identity card, and training, women have been able to acquire and operate various types of electrified and diesel-powered equipment, from solar pump sets to power tillers. These show that skill-based gender identities are not rigid, but are open to interpretation and change.

What factors promoted these polices and interventions for women's increasing access to and use of motorized equipment? Large-scale male migration, leaving women to carry

out or manage most agricultural tasks (strategic decisions such as what crops are to be grown are still taken by men) forced governments and even commercial organizations to pay attention to women as buyers and users of agricultural equipment. This equipment moved beyond those related to the traditional women's tasks to encompass land preparation and transport.

The roles of NGOs, women farmers' and women's movements in general have been important, as governments have responded to these agencies/movements with supporting policies. Furthermore, international agencies have been active in spreading transnational ideas about women's empowerment, prompting women-specific agricultural technologies.

Women's Decision-making

Chapter 4 deals with women's decision-making. The statistical analysis found that, in India, women's asset ownership, time spent in production work, formal schooling and membership of CBOs are all positively correlated with women's ability to influence decisions from medium to high levels. However, the magnitude of correlation was not high. In Nepal, men's out migration was the single variable that had a positive correlation with women's decision-making.

What does come out through discussions in the field is that, in both India and Nepal, women's membership of CBOs strengthens their capabilities in many ways. They have become the vehicles for small collateral-free loans. Our field discussions found many spill over effects of membership in CBOs. Members are able to participate in household decision-making, change to clean cooking fuel and even challenge norms about fuel use and women's tasks in production. They have learnt to operate farm and post-harvest machinery. Bringing new technologies, such as solar pumps sets or biogas, they have become technological leaders in their villages. Various CBOs have also helped the emergence of rural women as distinct interest groups, with political parties having to pay attention to meeting their needs in election promises and subsequent policies.

Changes in Norms and Agency

Chapter 5 deals with changes in norms and agency. Changes in the manner or extent to which women use clean cooking energy or modern energy services in agriculture and related enterprises are not the direct outcome of women's economic activities. Women may perform the labour in running these enterprises but they may, for instance, not be able to receive the resulting money if they do not carry out the marketing of the produce. Furthermore, even where women do earn income, they may be constrained by norms that require them to hand over their earnings to their husbands or norms that do not give women any space in household decision-making. Thus, in order to understand the route through women secure their agency, namely, decision-making power, we looked at changes in norms with regard to women's use of clean cooking energy and modern energy services in agricultural production.

We look first at the factors that affect agency, defined here as women's ability to take decisions, whether about cooking, agricultural production or the household as such. Following Amartya Sen's theory of household bargaining, there is an expectation that an increase in women's income and ownership and control of assets would increase their

bargaining power in household decisions. There, however, could be different levels at which women might be able to exercise or not exercise their agency.

The choice of a motorized appliance, such as a motor-cycle, or a labour-saving LPG cooking set, is the outcome of a bargaining process within a household. The decision process may be strongly influenced by social norms; norms that give priority to appliances which men use and operate. Thus, household decisions and FGD discussions revealed a preference for motor-cycles over LPG. They also reflected a prioritizing of agricultural equipment that mechanized men's work rather than women's work. Again, norms also prioritized the use of electricity in household entertainment through a television set or children's education rather than in the kitchen.

The study looked at some key factors influencing women's agency in affecting these decisions, such as the time spent in production (a proxy for the economic value of women's labour), women's education migration in the household, women's asset positions and membership in CBOs. After statistical analysis in India, the fact of women being independent income earners and the time they spent on productive work were both positively related to an enhanced role in household decision-making. Their asset position and education were also positively related to each other.

In Nepal, statistical analysis only brought out one factor affecting women's role in decision-making, and that was migration. This is to be expected as men's migration would require and become an opportunity for women to take many day-to-day decisions, not only about domestic matters, but also about production issues. Of course, with the almost universal spread of mobile phones, particularly among the women and their husbands in taking these decisions. Discussions revealed that men continued to take strategic decisions about production, such as crops to be grown and marketing. Women took production decisions mainly in the matter of vegetable cultivation and livestock rearing, traditionally considered to be part of the woman's sphere.

Through exercising their agency, women could also bring about changes in norms, which are rules of access and thus institutions in the terminology of institutional economics. However, they are informal institutions, unlike the formal institutions of laws and official rules. At the same time, the two interact with each other. Official policies could influence norms, while norms (for instance with their gender biases) could influence official policies and rules.

The restriction on women's mobility, including to the market, is a norm in traditional agrarian society. Among indigenous communities such norms do not hold. However, in caste-based communities, as in most parts of India and Nepal, such norms against women's mobility are quite strong. Women's economic activities, however, often involve mobility and movement to markets. The migration of men, very strong in Nepal, also create a situation in which women become more mobile and where such mobility is now at least partly accepted in society.

A preference for cooking with wood was often expressed in terms of that food being tastier than when cooked with LPG. This is not the same as the norm stated in South Africa, where it was said that it was part of their culture to cook with wood. However, it still is a strongly stated cultural preference that has become a norm. Over time with SHG

meetings on a regular basis as well as with increase feminisation of agricultural work and when the convenience of LPG cooking has been realized, the norm of 'tastiness' appears to have been dropped. Along with this, a preference has even been stated by men for LPG as they can get hot snacks far more quickly along with their drinks in the evening.

Another norm about cooking has been that food must be served on time to husbands. Women's meetings are very likely to result in food being served late. Women who had obtained solar pump sets through SEWA said that when there were meetings, their husbands accepted that food would be provided late.

Both in India and Nepal there are age-old norms about women not owning land. These have begun to change in India due to the energy access policies of the government and NGOs. The government provides a higher subsidy for women than men in purchasing farm machinery, such as power tillers, tractors, pump sets, and so on. However, in order to utilize this scheme women have to be farmers, and specifically land owners, as only land owners are classified as farmers. This has led to many instances of women being given land, albeit small bits of land, by their husbands.

Similarly, the NGO SEWA in Gujarat and Bihar, and the women's collective *Kudumbashree* in Kerala help women get solar pump sets in their names. Having pump sets in their names has led to some norm changes both in their families and in the village community. These women are now accepted as leaders or innovators both in their families and in the community in general. A woman as a leader, and that too in a technology-led area, is a change in norms where men are supposed to bring change from the outside world.

The norm change about men not necessarily being operators of motorized machinery and new technology is seen in Nepal as well. The electricity or CNG-operated 'Safa tempos' are also operated by women. It is a change for new technologies to be taken up by women. As seen in the SEWA and *Kudumbashree* instances, the training of women in operating new machinery is needed in order to turn access to modern energy into use by women. With this, the gendered identification of skills has been shown to be malleable and open to change. What has enabled changes in norms? Women's participation in economic activities is a factor that would help women transgress these restrictive norms. When this is done by groups of women, as in the Self-help Groups in India or Cooperative Credit Societies in Nepal, it becomes easier to challenge gender-biased norms.

Yet another factor in helping secure a change in norms is that of the benefits from women's use of modern energy services, including clean cooking energy. The benefits in cleaner and less polluted houses, more time that women can spend helping with children's education, the benefit that men get from food and snacks being quickly available, the greater income from women's economic activities—all these benefits to other members of the household help secure acceptance of a change in gendered norms.

Gender and Political Economy Analysis

Chapter 6 deals with the manner in which gender can be incorporated in the political economy analysis of energy access and use. Political economy analysis has developed two key concepts—the political settlement and the rents space (or deals space). The political settlement refers to the political agreements between the elites but also with the non-elite in social contracts that include the choice of policies and the provision of public

services. The rents space or deals space is that of the potential increases in income which can be shared among those in the political settlements. To these two key concepts one needs to add that of the mental models of the economy, which strongly influence the manner in which deals in the rents space are translated into economic and social development policies and the related allocation of resources.

It is generally accepted that political economy analysis has been gender blind, though many feminist economists have strongly argued for the inclusion of unpaid labour into models of economic development. However, feminist analysis has only recently begun to pay attention to the manner in which gender analysis can make a difference to the two key concepts of the political settlements.

In summing up and extending the gendered political economy analysis in this report, we deal with six areas in which gender analysis makes a difference to political economy analysis. The first is in including women in political settlements, whether through organizations or otherwise. Women in different classes vie for space in political settlements. Their importance as voters makes them the target of patronage networks, fostering clientelistic policies aimed at providing certain public services to women in exchange for their electoral support. However, there is no presumption that the entry of women into politics will result in the acceptance of feminist ideas in the deals space on its own.

Gender analysis has a long history of dealing with unpaid household work. This can result in bringing such unpaid and unvalued household work into the deals space and help in providing subsidized access to clean cooking energy or using scarce resources for providing childcare. The integration of unpaid and paid work would modify the dimensions of the rents space.

Feminist ideas of justice and appropriate distributions of rents can become part of state policies, resulting in what has been called governance feminism. So far, notions of empowerment have often only partly (and at times, in misrecognition) been incorporated into the policy of many governments.

Gender analysis also insists on taking political economy analysis down to the bottom, to the micro level of not just the household, but of the individual woman in the household. Gender analysis shows that many of these ideas and influences on policy have a transnational origin. They are developed across countries in what is called the transnational policy space. Thus, gender analysis points to the limitations of methodological nationalism, both in looking at the spread of ideas about the world and at the role of transnational forces in setting or influencing agendas about the manner in which the rents space can be used by a political settlement.

The most important difference that gender analysis can make to political economy analysis is that of bringing the idea of justice into political economy analysis. This would change the nature of the political settlement and its interaction with the rents space. Much of current political economy seems to be apolitical. Gender analysis is founded on the idea that inequality is now embedded in gender relations, but that it need not remain so. The search for ways of reducing or eliminating inequality is a vital contribution of gender analysis.

This study then looks at how a gendered political economy analysis may be applied to energy policy. At the macro level of availability it is pointed out that until recently, India and Nepal had targets for rural electrification but not for clean cooking energy. There was a failure to recognize unpaid household work and cooking energy as claimants in the use of the rents space. However, a broadening of the political settlement to include not just the elite and the middle classes but also poor rural women—a change in the political settlement driven by the exigencies of universal, adult suffrage—has led to the enunciation of targets for access to clean cooking energy. Thus, rural poor women as voters have made a difference to the political settlement and this has led to a change in the use (in a clientelist manner) of the rents space to accommodate women's strategic need for clean cooking energy and modern energy in agriculture. Women's movements have also raised demands for women's access to energy for production, forcing governments to respond with policies to provide women access to modern energy services.

From the macro level of making modern energy services available, there are still steps left in providing poor rural households with access. Women's organizations and women's movements have been active in this middle-level or meso space, taking up the demand for public services, such as electricity. They have also been active in securing reliable supply or access to electricity through deals with distribution companies.

Access, however, as repeatedly emphasized in this report, does not translate into usage. The report has shown that there are gender issues affecting the importance of women's economic involvement and of social norms in converting access to LPG into regular use as the primary cooking fuel. There is also the major issue of the non-recognition of women as farmers in not providing women access to modern energy services in agriculture. This non-recognition, however, is changing with high levels of male migration and the spread of women's organizations. The equipment that a household acquires to utilize available modern energy depends on the gender relations within the household. Furthermore, women's access to modern energy sources in agriculture, in turn, enables them to acquire agency in their work in agriculture and in the household too.

Conclusions

Political economy analysis deals with agency, the power of the political settlement to impact upon structures. Gender analysis brings to the analysis of agency the issues of gendered power both in the political settlement and the rents space. It also brings in the analysis of gendered structures and the notion that inequality is to be reduced and even eliminated into the ideas that are used to fashion policy utilizing the rents space. It also points to the two-way relation between energy and agency. If women's agency enables them to turn access to clean energy into use, their use of modern energy in production, in turn, also increases women's agency or empowers them.

In the economy and in households there is both unpaid and paid work, with women performing the bulk of the unpaid and low-paid work. Once this unpaid work is recognized in policy and at the level of households, it can be reduced or even redistributed. Our findings with regard to labour-saving cooking energy showed that a reduction of work came about with paid work being the driver of changes in the reduction of unpaid work and thus the reduction of drudgery. This finding can be relevant to other forms of unpaid work too, e.g., the unpaid work of collecting water for the household could be replaced

by a commercial supply of water as women earn enough to pay for these services. Of course, these public services could also be provided as essential services by the state.

Our research shows that women's income earnings, unmediated ownership of land and other assets, and their participation in women's groups together promote the agency of women in the use of modern energy in both domestic and production tasks.

A common feature in our findings is that of the importance of collective action by women, whether through SHGs or other forms of group organization, in securing access and establishing women's use of modern energy services in cooking and economic production. For strengthening women's agency in household decision and challenging existing norms sanctioning gender inequality too, women's groups play a crucial role.

Furthermore, the development of agricultural machine service centres can be important in both developing asset-light economies in rural areas of developing countries. It will help women to overcome traditional barriers of the division of labour in agriculture and spread mechanization and higher productivity among small farm holders.

Our findings on ways to promote fuel switching to clean cooking fuels are relevant beyond the countries studied, i.e. India and Nepal, to other countries and regions in Asia and Africa where women collect wood and other solid biomass with their unpaid labour. A capital subsidy for clean energy connections, along with an increase with opportunities for women's income earning, and a concerted nudge to promote cooking with clean fuels as first, prestige goods and then the new normal – such a combination of policies would be relevant for most of rural South Asia, Africa and rural Latin America where women are engaged in collection of firewood.

Policy Implications

From the above analysis, the study makes following recommendations for increasing women's agency in order to reduce gendered inequalities in access to modern energy services

- In order to promote the transition from labour-intensive and polluting solid biomass as cooking fuel to labour-saving and relatively clean cooking fuel, the current policies of capital subsidy need to be supplemented by concerted policy measures and implementation to increase women's skills, independence through income earnings and asset holdings. Furthermore, there is a need to propagate the use of clean cooking fuel as the new normal, necessary for the well-being of women and the households.
- A formulation of policies to promote women's ownership of land and other assets and a role as independent income earners in order to promote women's agency in energy and other spheres.
- Promotion of women's groups or community-based organizations (CBOs) in enhancing women's agency and to secure and use modern energy sources, both in economic production and domestic work.
- Assess the impact of energy access and use policies on a vector of gender inequalities; accepting that energy or other may reduce some of those inequalities and not others. Thus there is a need for Capacity development and training in the use of new fuel-based technologies, domestic and farm machinery, provide knowledge that women can use to run agricultural

machinery service centres that promote both women's agency and an asset-light economy.

Suggestions for Future Research

Our report has shown the importance of women's groups in securing women's agency in access to and use of modern energy services. A few suggestions for future research are:

1. Building women's agency through the development of asset-light energy services.
2. Women's collectives in the production and consumption of modern and clean energy services.
3. Inclusive innovation, involving women both as producers and consumers, in modern energy services.

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ABBREVIATIONS

AEPC	Alternative Energy Promotion Centre
AEPC	Agricultural Mechanization Policy
ATMA	Agricultural Technology Management Agency
BPL	Below Poverty Level
BRICS	Brazil, Russia, India, China and South Africa
CBO	Community Based Organization
CCG	Cooperative Credit Group
CHC	Custom Hiring Centre
CIWA	Central Institute for Women in Agriculture
CNG	Compressed Natural Gas
DAWN	Development Alternative with Women for a New Era
EnPoGen	Energy, Poverty and Gender
ESI	Economic Survey of India
ESID	Effective States and Inclusive Development
ESMAP	Energy Sector Management Assistance Program
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GOI	Government of India
GVC	Global Value Chain
ICAR	Indian Council of Agricultural Research
ICS	Improved Cook Stove
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
KII	Key Informant Interview
LDC	Least Developed Country
LPG	Liquid Petroleum Gas
MDG	Millennium Development Goal
NFE	Non-Farm Enterprise
NGO	Non-Governmental Organization
NITI Aayog	National Institution for Transforming India
NSSO	National Sample Survey Organization
NTFP	Non-Timber Forest Produce
REDD	Reducing Emissions from Deforestation and Forest Degradation
SDGs	Sustainable Development Goals
SE4ALL	Sustainable Energy for All
SEWA	Self-Employed Women's Association
SHG	Self-Help Group
SMAM	Sub-Mission on Agricultural Mechanization
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCWA	United Nations Economic and Social Commission for Western Asia
WHO	World Health Organization
WTO	World Trade Organization

GLOSSARY

These are drawn from globally agreed concepts/definitions and are intended to serve as a basis for shared understanding of approach to gender integration in the energy sector.

Access to energy:	The ability of an end user to utilise energy services (such as lighting, cooking, motive power etc.) that require an energy appliance and suitable energy supply. Access to energy services does not necessarily imply energy use, control over equipment, energy supply and technological decision-making.
Access to resources:	Access refers to the ability to use and benefit from specific resources (material, financial, human, social, political, economic and technological) and such access can be curtailed if there is no control over resources.
Agency:	Agency is the human capability to make decisions and act on them.
Asset ownership:	Women's ownership of land and /or house. Jewellery was not included in assets.
Biomass fuel:	Any organic material of plant or of animal origin such as wood, charcoal, agricultural residues and dung, used as a fuel.
Connection to energy:	A connection entails registration as a consumer to use an energy supply infrastructure, this can be electricity or piped gas, as well as bottled gas that needs to be collected at a delivery point.
Control over resources:	Entails being able to make decisions over the use of resources including whether others have the right to use or enjoy the benefits of a resource.
Empowerment:	Expansion in an individual's ability to make strategic life choices and control over material resources in a context where this ability was previously denied to her/him.
End user:	The consumer who requires energy services. End users may be within a household, users for productive uses in enterprises or community institutions etc.
Energy services:	The desired and useful services that result from the use of energy; for example, illumination, comfortable indoor climate, refrigerated storage, transportation, appropriate heat for cooking.
Energy supply:	Physical availability of energy carriers at a location of demand. Energy supply is an insufficient indicator of access as it does not assume the ability to use the supply (for example the supply may not be affordable or appropriate for use to take place).

Energy technologies:	The hardware, or end-use device, that converts an energy carrier into a form of energy useful for the end-user to provide the desired energy service.
Energy:	Energy comes in different forms including fossil fuels, biomass fuel, power (electricity), and animate forms of energy, particularly human metabolic energy.
Fuels:	Fuels are a store of energy including solid and non-solid fuels, from both fossil and renewable sources.
Fuel switching:	It refers to replacement of inefficient fuel to clean fuels, e.g. Shift from solid biomass to natural gas or electricity for cooking.
Fuel stacking:	The use of multiple energy carriers to meet an energy demand.
Gender Analysis:	An analytical process used to identify, understand and discuss gender-specific differences, gender roles and power relations in a cultural and material context.
Gender awareness:	The understanding that there are socially determined differences between genders based on learned behaviour that affects one's ability to take decisions, and to access and control resources.
Gender blindness:	The failure to recognise the gender differential roles, responsibilities, capabilities, needs and priorities.
Gender discrimination:	Differential treatment of individuals on the grounds of their gender in the distribution of income, access, control and ownership rights and decision-making.
Gender division of labour:	Societal pattern where women, men and other genders are allotted specific set of gender roles.
Gender equality:	Refers to the equal rights, responsibilities and opportunities of women and men and girls and boys. Equality does not mean that women and men will become the same but that women's and men's rights, responsibilities and opportunities will not depend on whether they are born male or female. Gender equality implies that the interests, needs and priorities of both women and men are taken into consideration, recognizing the diversity of different groups of women and men. Gender equality is not a women's issue but should concern and fully engage men as well as women. Equality between women and men is seen both as a human rights issue and as a precondition for, and indicator of, sustainable people-centered development. (UN Women, OSAGI Gender Mainstreaming – Concept and Definitions)
Gender equitable access (to energy services/technologies):	Access to energy services or technologies that are enabled in ways that ensure women and girls' needs and aspirations are met to live the life of their choosing and which contributes to achieving gender equality.

Gender equity:	Fairness and justice for women and men in the distribution of benefits and responsibilities.
Gender gap:	An observable and sometimes measurable gap between women, men and other genders in terms of a specific outcome.
Gender ideology:	Attitudes regarding the appropriate roles, rights and responsibilities of women, men and other genders in society, results implicitly supporting gender inequality.
Gender inequality:	Inequality, on the basis of a person's gender, in access to and control and ownership rights to various material and non-material assets in a society and the benefits which accrue from these.
Gender Integration:	Gender integration is the application of gender analysis and gender mainstreaming to work through accepted strategies and practices of international treaties (e.g.SE4All and the SDGs) and regional agreements in order to promote and achieve gender equality, the promotion and protection of human rights and empowerment of women and girls.
Gender issues:	Identification and framing of an incidence of gender inequality.
Gender mainstreaming:	A recognised strategy for ensuring that the concerns and experiences of women and men are an integral part of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres.
Gender neutral:	The assumption, enshrined in gender neutral language (e.g. people, households, and communities) and concepts, that women, men and other genders benefit equally from policies, programmes and projects with equal capacity and opportunity to respond to and to influence and control the processes and outcomes.
Gender parity:	Is the situation when persons of different genders are able to access opportunities and resources equally?
Gender perspective:	An analytical approach that helps to see whether the needs of different genders are equally taken into account and served by a proposal by questioning the power relationships established between different genders, and social relationships.
Gender policy:	Overarching vision or policy on gender adopted by a government, a sector or an organisation, which as a statement of commitment to gender mainstreaming in all their project activities.
Gender relations:	The social relationships and power distribution between genders in both the private/personal and public spheres.
Gender Responsive:	Actions that reflect an understanding of the realities of

	women's and men's lives and addresses the issues taking into consideration the implicit and explicit social norms.
Gender roles:	Sets of behaviour, activities, tasks and responsibilities assigned to women, men and other genders, differentiated according to the cultural norms and traditions of the society where they live
Gender sensitivity:	The ability to recognise gender issues and the different perceptions and interests of women, men and other genders arising from their different social locations and different gender roles.
Gender stereotypes:	Preconceived ideas whereby women, men and other genders are arbitrarily assigned characteristics and roles linked to their sex which can limit the development of their talents and abilities restricting life opportunities.
Gender stereotyping:	The portrayal, such as in the media or in books, of women, men and other genders in society occupying social roles according to the traditional gender division of labour which work to support and reinforce notions of what can be considered as "normal" and "natural".
Gender-aware policy:	A policy that takes into account the social relationships of women, men and other genders as well as the differences in their needs, as opposed to a policy that is gender-neutral and implicitly assumes that all individuals of different genders have the same needs.
Grid:	A system of synchronized power providers and consumers connected by transmission and distribution lines and operated by one or more control centres.
Mechanization in agriculture:	It the process of using agricultural power (electricity, diesel) based machinery to mechanise the work of agriculture to reduce the drudgery of farm workers and increase the productivity.
Modern energy services:	There is no universally agreed definition of 'modern energy or modern energy services. '. A definition chosen by us for modern energy services includes electricity, gas (eg natural gas, LPG, biogas, producer gas, powered machinery for agriculture) and liquid fuels for transport (e.g. petrol, diesel and biofuels). This definition thereby separates the issue of modernity from a number of issues of sustainability such as related to including fossil fuels with which there is no general agreement.
Patriarchy:	Patriarchy is an ideology which perpetuates and promotes the male domination in decision-making, ownership and control, at all levels in society, which, in turn, maintains and operates the prevailing system of property rights and the gender division of labour.
Political settlement:	A settlement reached by a country's elites between themselves and possibly along with other social groups about

	the means through which profits are acquired and distributed between various interest groups, as an alternative to avoid violent conflict.
Practical needs:	Requirements that everyone perceive as immediate necessities, such as water, shelter and food, for their survival.
Productive uses of energy:	Use of energy for income generation in formal and informal enterprises, which can be home based or in an enterprise location, including on-farm and non-farm income generation.
Productive work:	Work done for economic remuneration in cash or kind, includes both market production with an exchange value, and subsistence/home production with actual use-value, and also potential exchange value.
Remoteness:	Remoteness is characterised by poor infrastructure and connectivity, a higher incidence of poverty, and an undeveloped labour market.
Rents:	The extra profits that individuals or firms obtain due to their position either from some form of monopoly, bureaucratic advantage or corruption.
Sex-disaggregated data:	Separation of data by sex as the basis of gender analysis.
Social norms:	Social norms refer to a wide range of social-cultural notions of what is perceived as "normal" in a community, linked to behaviour, beliefs, attitudes and practices, which in turn determine how individuals perceive their potential and worth.
Social reproduction:	All domestic tasks done by women, required to guarantee the maintenance and reproduction of the labour force. It includes not only biological reproduction but also the care and maintenance of the workforce (male partner and working children) and the future workforce (infants and school going children).
Strategic interests:	Strategic interests are those related to an individual or group's changed position in society, in terms of gaining equality and voice in social, economic and political spheres.
Time poverty:	Lack of adequate time for leisure and rest after work, within the home and outside.
Unpaid work	The work carried out by individuals for their own households or for others, which does not receive any direct monetary remuneration. It is a form of 'non-market work' which can fall into one of two categories: (1) unpaid work that is placed within the production boundary of the System of National Accounts (SNA), such as gross domestic product (GDP), and (2) unpaid work that falls outside of the production boundary (non-SNA work), such as domestic labour that occurs inside households for their consumption (Hirway, 2015).

Women's empowerment:	A process by which women and girls gain power and control over their own lives through awareness-raising, building self-confidence, expansion of choices, increased access, ownership and control over resources and actions to transform the structures and institutions that reinforce and perpetuate gender discrimination and inequality.
Women's position:	Women's social, economic and political standing in society. For example disparities in wages and employment opportunities, unequal representation in the political process, unequal ownership of land and property, vulnerability to violence.

LIST OF FIGURES AND TABLES

1. BACKGROUND

1.1. Introduction

The current wave of discussions on Sustainable Energy for All (SE4ALL) and on dealing with increased social and gender inequalities as part of the discourse on Sustainable Development Goals (SDGs) has brought forth a surge of reflections on inequality, exclusion, marginalisation and social norms in technological development that influence structures and processes of political and economic development.

There is increasing recognition that energy can play an important role in combating poverty and reducing inequality through (1) improved health, with reduction in the use of biomass for cooking, thereby reducing indoor air pollution; (2) increased productivity through inclusion of women in the mechanization of agricultural production activities using diesel and electricity powered machinery; and (3) reduction of labour and time spent on household activities, where the saved time can be used for income generation or leisure needed for rest and recuperation (UNDP, 2006; Clancy et al., 2011; World Bank, 2012).

Largely as a result of concerted efforts of several development partners, the World Bank and women and energy organizations like ENERGIA, modern energy has come to be seen as a critical need in the daily lives of rural women, who need modern energy to reduce drudgery (to facilitate cooking with clean fuels and grain milling, for example) and to increase their productivity and income in agriculture and rural industry (Kelkar and Nathan, 2005; Clancy and Kelkar, 2006; Kelkar, 2007; Cecelski and Dutta, 2011).

Our analysis is based on linking energy access decisions to two spheres of rural activity: household and production in agriculture. We do not treat these two spheres of work as unconnected, as decisions and changes in one sphere interact with and affect decisions and changes in the other sphere.

Gender analysis is a well-established stream of social science; but some of its main features are summarized here as a transition to the main discussion of gendering political economy. If political economy deals with overall power relations within the economy and society, gender analysis unpacks these structures to reveal their gendered nature, i.e., that women and men are unequally integrated into these structures and that the distribution of benefits from these structures is also unequal.

Gender analysis has gone beyond dealing with structures to analyse the possible agential roles of women in changing or transforming gender relations. From seeing women merely as victims of male dominant structures, there has been an emphasis on identifying ways in which these structures could be modified and changed.

The report is divided into eight chapters. After a brief description of the subject in the Background chapter, chapter 2 analyses gender issues in the switch from labour-using traditional wood as fuel to labour-saving and relatively clean LPG or biogas. Chapter 3 deals with energy use in agricultural production, including women's access to and use of farm equipment based on modern energy services. Chapter 4 in the Section 2 of the study

broadens the analysis of empirical findings in chapters 1, 2 and 3, explaining gender – income inequality and the role of women CBOs. Chapter 5 deals with discursive analysis of social norms, its challenges and changes. Chapter 6 deals with the manner in which gender makes a difference to political economy analysis, particularly in the field of modern energy services, their availability, access and use. This is followed by chapters 7 and 8 on conclusions, policy implications and messages for policy and practice in energy access.

1.2. Research Objectives and Questions

This research study is based on the premise that it is necessary to include the missing factor of gender concerns in the political economy of energy access to achieve a greater and deeper understanding of social, economic and political processes of discrimination and marginalization and to seek measures to make them transformational and inclusive. In addition to a structural analysis of power in conventional concerns of political economy, we underscore the need for a gender analysis of political and economic processes to understand the strategic energy needs of rural women (and men), who have experienced marginalization and exclusion in the development of energy infrastructure. The central research question is: How can women in remote rural areas be empowered to gain access to modern energy services in both household and production activities?

Most available research on gender and energy focuses on women's inclusion in energy policies and infrastructure development. Our focus is on how demand on women's work and time in household and agriculture facilitates energy access; and in turn, women's increased access to energy leads to their participation in productive work and manifestation of their agency. Further, the increased agency of women seeks access to modern energy use in both production (agriculture) and social reproduction (household work and unpaid care), leading to mechanisms and pathways to gender- egalitarian change in norms of the energy sector.
Under this overall research question, we have the following sub questions:

Q1: In what ways do socio-economic and political processes determine gendered access to energy in (a) household and (b) agricultural production? To what extent women are free to use energy made available by government and market agencies?
Q2: How do gendered social norms in formal and informal organizations, impact on government agencies and private sector operators in formulating and implementing energy policies and practises? Under what conditions social norms change? What policies are formulated to change these norms?
Q3: Does gendering the political economy make a difference to how we understand women's agency in energy use? What are the political economy factors that facilitate women's agency in the use of energy and how can they be strengthened?

1.3. Intersection of Gender and Energy

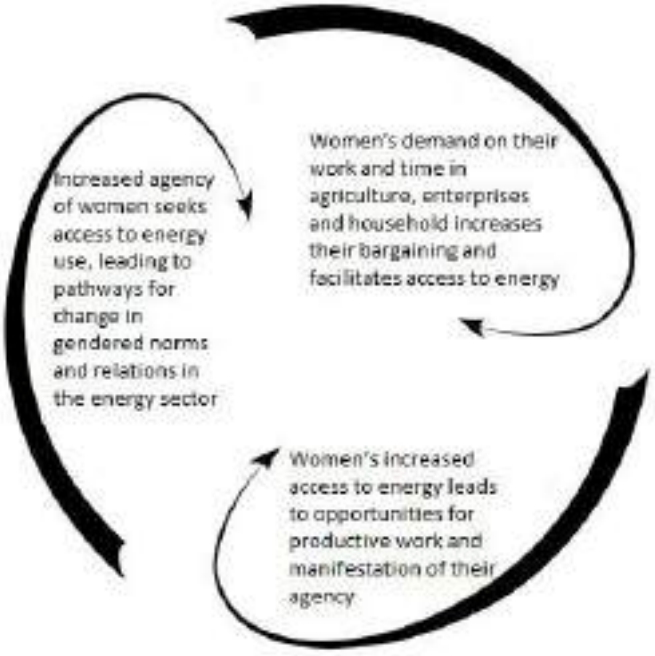
The research questions were tested through empirical research and knowledge, which was acquired through mixed methods of field data collection and analysis (qualitative and quantitative) in combination with Key Informant Interviews and end users' perspectives. The research questions were initially explored in open-ended focus group discussions to see if factors not considered so far are regarded as important by respondents. The tested

results formed the basis of policy advocacy to strengthen women's agential power to increasingly undertake production and reduce time and drudgery in household work through labour-saving, efficient and clean energy technologies.

What makes patriarchy function in the energy sphere? Does access and use of energy make any difference to improving women's agency or empowerment? Discrimination against women to their right to access, own and control resources and capabilities prevails at vertical and horizontal levels throughout the patriarchal systems of South Asia, in social institutions, as well as in policy, laws, community and household decision-making. These entail a multiple forms of unfreedoms on the basis of sex and gender which promote and perpetuate: 1) women's economic dependency on men; 2) the assumed inability to operate and manage technology and energy; 3) limits to women's mobility and access to markets; 4) gender-based violence within home and in the work place, disallowing any transgression of social norms laid down for women. Furthermore, the #MeToo movement throughout the world shows that women are seen as sexual objects, and not as professionals or legitimate workers.

Women's access to energy increases their position within the household and society. This improvement in their position and agency seeks access and use of energy leading to further change to a gender responsive social and technological system. Access to modern energy enhances the livelihoods of women (and men) through the production of foods and goods, as well as access to services related to clean fuels, water, health, education and communication, for example through the use of mobile phones.

Figure 1: Gender and Energy Nexus



We look at the gender and energy nexus as a continual two-way process. Women's demand on their work and time in agriculture and other economic activities in the informal and formal sectors as well as household work increases their bargaining power which facilitates access to energy. The increased access to energy leads to opportunities for productive work and manifestation of their agency, i.e. attempt to control their

earnings, buy land and other assets in their independent or joint names, questioning of the norms that limit women's mobility and access to markets, and negotiations to have a voice in household and extra-household decision-making. Such increased agency of women, in turn, seeks access to energy use, leading to pathways for change in gendered social position of women in the energy sector, as well as in wider areas.

There are three major issues that came up in our fieldwork conducted in the countryside of Kerala, Odisha and Tamil Nadu in India and Kavre, Kailali, Dhading and Rupendehi in Nepal during 2016-2017. First, social norms and attitudes have a powerful influence on both formal and informal structures of society. Policy makers and state officials as well as development professionals themselves believe in gender roles, and harmful customary practices and therefore carry gender-specific biases. The informal rules of the community have traditionally denied women any decision-making roles, even in the matrilineal society like that of Meghalaya in north-east India. Second, there is social reluctance to recognise women's unmediated authority in the management of energy, land and other technology resources. Third, women face many disadvantages even if they belong to a household that has access and use of modern energy, because they do not have decision-making powers to procure equipment and energy appliances they would like to use. The gender gap in energy access is not due to any disinterest on the part of women, as there are research results that show that women have demanded their right to energy and productive assets and its use in past decades (Bedford and Rai, 2010; Kelkar, 2014). Importantly, these researches also noted that social norms diminish in power when women gain independent control to productive assets and access to the use of energy infrastructure.

Gender analysis of energy is used to explore and understand socially assigned roles of women, men and other genders and the imbedded power relations in these roles, as well as access to and control of resources, productive assets, including land and energy equipment. These, in turn, lead to the questioning of the unquestioned male authority in decision-making with in the home and outside. Gender analysis further explores the cultural and modern ways to achieve gender equality, in the sense that the interest, needs and priorities of women, men and other genders are taken into consideration, recognising the diversity of different gender groups. Importantly, gender equality is not a women's issue (as is commonly understood) but concerns and fully engages with men and other genders. Equality between women and men as well as between other genders is seen both as a human right's issue and as a precondition for, and indicator of, sustainable development and energy for all.

Gender analysis makes a distinction, due initially to Caroline Moser (1989), between the practical and strategic needs of women, where the former are women's needs for food, education, etc., and the latter are factors that enable women to change their existing gendered positions that the policy and implementation for strategic needs would enable women to contest existing gender relations. Women's ownership/control of land and assets and entry into the paid labour force, for instance, has been identified as factors that made gender relations into an area of contestation. Thus, the manner in which women's agency can be crucial in negotiating and modifying structures, which is a feature of new political economy analysis, is very much there in gender analysis too.

1.4. Bringing Gender into Political Economy Analysis

There is a gendered form of power that is not captured in the conventional analysis of political economy. Power in gender relations wielded by men is due to a number of factors. The first is men's ownership of productive assets, including land. Second is their control over income and the ways in which it is utilized. Third are the social and cultural norms that dictate women's responsibility for household domestic work, or the tasks of social reproduction, which, at a higher level, is manifested in the exclusion of social reproduction from the domain of recognized work for macro policy formulation. Further, unlike in the global North where household work is generally seen as unpaid household upkeep and care work, the conceptual analysis of household work in the global South also includes a great deal of activities carried out in the production sphere, i.e., subsistence production of goods, work on the family farms, collection of goods such as water, woodfuel, fodder, raw materials for craft, and fruits and vegetables (Hirway, 2015).

Counter-posed to this structure is women's agential power, or countervailing power, one that, if brought about, can enable women to bring about some changes in outcomes, including energy outcomes. In drawing from the political economy literature, we use the term agency or agential power as the ability to make decisions and act upon them, or what is otherwise called empowerment in the gender analysis literature. Agency is sometimes held to require both resources and processes to be empowering (Sen, 1999). But rather than seeing agency as just one of many dimensions of empowerment, we see it as synonymous with empowerment. Agency itself can be used to acquire resources, such as land and financial assets, which in turn can enable women to make decisions about investment and production and the use of income. Again, agency will necessarily have to be manifested through certain processes of decision-making. In the absence of agency there may be a process of decision-making that is automatic and infused with existing social norms marginalizing women and their strategic needs. In the course of exercising agency women will necessarily have to change these processes. Resources and processes are then aspects of social relations through which agency operates, rather than aspects of agency.

While new political economy analysis has largely neglected gender analysis, except for a mention of its necessity in Barnett (2014), there is a long tradition in feminist political economy of the integration of gender in political economy analysis. This tradition goes right back to the 1990s with the writings of Elson (1995), Jackson and Pearson (1998) and the DAWN group (1985), with an initial focus on critiques of the gender dimensions of structural adjustment programs. But it would also be right to say that these analyses were more concerned with critical theory than with problem solving. At the same time, gender analysis also has a long-standing concern with understanding agency, including its influence on household bargaining outcomes (Sen, 1999; Nussbaum, 2000).

Thus, critiques of gender-exclusive political economy have developed into a feminist political economy (Bedford and Rai, 2010; Rai and Waylen, 2014) which shows how gender systems determine social and political relationships and structures of power. This gendering of political economy combines "both the structural and agential elements of social relations" (Bedford and Rai, 2010: 4). This combination of structural and agential elements should allow for its application to problem-solving as we see in respect of promoting energy access.

There are two aspects to this issue. The first is analysing ways of thinking about the world. Second is that of building a political constituency in favour of action in engendering energy policy, which is formulated and implemented at macro and meso levels. A national political constituency in favour of gender sensitive energy policy may be difficult to bring about. However, experience has shown that local coalitions, such as women's groups based on women's strategic interests, can bring about some change at local level particularly at the time of elections, as seen in the Government of India's attention to Ujjwala scheme (subsidized LPG distribution in the women's name) and clean cook stoves in the post – monarchy period in Nepal.

1.5. Research Methods and Field Sites

1.5.1. Selection of Research Sites

The criteria for selection of research sites were: (1) districts that are remote with poor infrastructure (inadequate roads and transport) development; (2) districts that are better connected and represent an intermediate level of infrastructure development; and (3) districts that are well connected with a high level of infrastructure development.

MSSRF has biodiversity centres in both Koraput and Wayanad and research projects in Dindigul, and therefore, it was possible for the research team to network with local civil society organizations such as Practical Action, Farmers Cooperatives and women's Self-Help groups (SHGs), development partners, corporate agencies and individual experts to build up policy advocacy efforts towards a gender-sensitive approach for energy access and women's empowerment through energy in rural regions. Likewise CRT has project-related activities and thus a good relationship with the administration in the 4 districts in Nepal selected for the study. Importantly, our advocacy efforts at gendering of energy policies and practices are not in contradiction with the reduction of poverty and gendered inequality and other social inequalities.

This research study was based on the premise that it is necessary to include gender concerns in the political economy of energy access. In addition to a structural analysis of power in conventional concerns of political economy, we underscore the need for a gender analysis of political and economic processes to understand the strategic energy needs of rural women and men, who have experienced marginalization and exclusion in the development of energy infrastructure. In our study areas in India and Nepal, our analysis took place at three levels: i) Macro, where the formulation of energy policies and programmes by central and state governments takes place; ii) Meso, where energy policies are implemented and administered by networks of the state, market and community and social norms that influence energy policies and practices; and iii) Micro, where energy services are delivered and used at the household level and where social norms define women's access to and use of energy. These three levels cannot be looked at in isolation, but must be viewed in terms of their interaction in energy policy and practice. Importantly, women's agency, through organizations of groups of rural women (SHGs and SCGs) and individually, were looked at to see how they could influence both energy policy and practice. Throughout the research period, an effort was to encourage government agencies and development partners as well as the private sector to recognize the potential of rural and indigenous women, to engage with their

experience and give them a voice in policy formulation, project design and the implementation of energy policies and programmes.

1.5.2. Social Context of the Research Sites

We selected rural regions for the study on the basis of their extent of remoteness or connectivity – very remote, moderately remote and well-connected (Maps- India and Nepal). Study areas in the three levels of remoteness were: (1) remote (Koraput and Mayurbhanj in Odisha, India and Dhading in Nepal); (2) moderately remote (Wayanad in Kerala, India and Kailali and Kavre Nepal) and (3) well-connected (Dindigul in Tamil Nadu, India and Rupandehi in the Lumbini tourism circuit in Nepal). We decided to concentrate on economically poor women in remote areas, because they require a resolution of the most difficult issues of dealing with gender bias in already politically marginalized remote areas with very poor human development indicators.

Figure 2 a: Research sites India

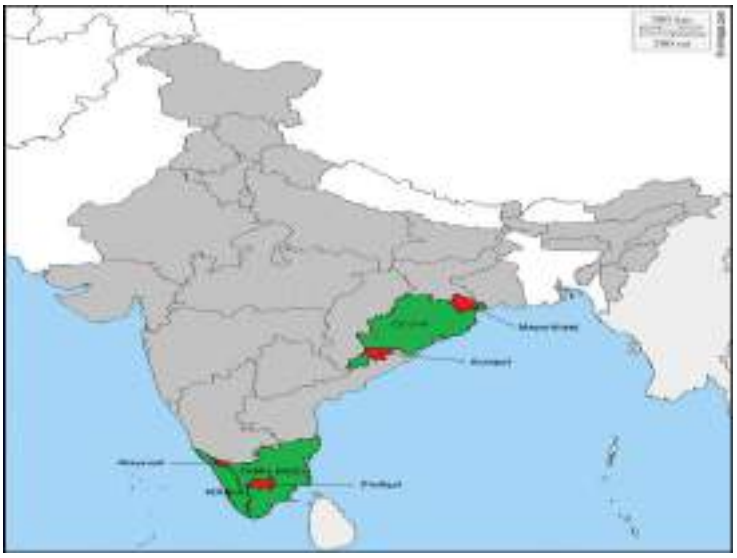


Figure 2 b: Research sites Nepal

The remote regions (Koraput and Mayurbhanj in Odisha, India and Dhading district in Nepal) were dominated by indigenous peoples and other marginalized caste groups, and are characterized by: (1) poor infrastructure and connectivity; (2) a higher incidence of poverty; (3) limited access to electricity; (4) limited agricultural seasons and high level of surplus labour; and (5) high usage of wood and crop residue as cooking fuel leading to adverse health of women, children and deforestation (as discussed in detail in chapter 3). All of this leads to lower productivity, since they mainly rely on human and animal power in un-irrigated fields. It also leads to poorer educational and health outcome, since there is both inadequate energy infrastructure and high indoor air pollution.

In Dhading district, out of 50 villages, only 44 have road connectivity, that too on seasonal roads. The district has a high level of migration. 85% of the rural households use biomass for cooking and 63% of rural households have access to electricity for lighting.

The moderately remote areas (Wayanad in India and Kailali and Kavre in Nepal) have: (1) all-weather connections with main markets; (2) high transport costs; (3) higher demand for women's labour through more agricultural seasons and related enterprises; (4) higher incidence of electricity connections than the remote areas: and (5) higher incidence of clean cooking fuel. In Wayanad, India, all villages and 81% of rural households have electricity but 87% of rural households use biomass for cooking. In Kailali, Nepal, 70% of rural households have electricity, while 86% rely on biomass. Kavre is one of the first districts where the Rural Energy Development Programme (REDP) was started in late 1990s by the Nepal government in collabouration with United Nations Development Programme with the objective to improve rural livelihoods through the promotion of rural energy systems. REDP developed alternative energy technologies such as micro-hydro plants, solar panels, biogas plants, improved cook stoves and lately LPG. Despite these efforts, only limited changes in women's access to clean energy was seen.

The well-connected rural areas (Dindigul in Tamil Nadu, India and a tourism centre in Rupandehi district, Nepal) have (1) reasonably good infrastructure and connectivity; (2) lower incidence of poverty; (3) almost universal access to electricity; (4) high demand on labour, including women's labour; and (5) low usage of wood and crop residue as cooking fuel. In Dindigul district, India, 87% of rural households have electricity but only 26% of rural households use LPG. In Rupandehi 81% of households have electricity but 61% use biomass (wood and crop residue) as fuel.

1.5.3. Selection of Villages

Selection of Villages for Micro Study: In each country, using qual-quant methods of field research were carried out in a total of 5 research sites (4 villages and one peri-urban area).

The five research sites in India include: i) A remote village, with poor infrastructure in Koraput district, Odisha; ii) A village where LPG distribution is run by women SHGs in Mayurbhanj district, Odisha; iii) A village with adequate infrastructure and connectivity in Wayanad district, Kerala; iv) a village adjacent to a market center and good connectivity in Dindigul district, Tamil Nadu; and v) A peri-urban area in Jeypore municipal center in Koraput district, Odisha.

The five research sites in Nepal include: i) A remote village, with poor infrastructure in Dhading district; ii) A village where the Smokeless Cook stove Project is run, and which has poor infrastructure and connectivity in Kailali district; iii) A village with inadequate infrastructure and limited connectivity in Kavre district; iv) A village adjacent to a tourism centre and good connectivity in Rupandehi; and v) A peri-urban area in Ghoda Ghodi municipal centre in Kailali district.

Table 1: Selection Process

Research Sites		Quant-Qual Survey at micro, meso and macro levels				
District	Village (including peri-urban)	Micro Level			Meso level	Meso and Macro level
		Households (women)	In-depth Interviews	FGDs	Interviews with SHGs/PRIs/SCGs/ village and ward leaders/small business groups	District, State and National level interviews
Koraput	2	120	4 + 4	4	5	16 (4 in each district level) 12 (4 in each state level) 6 at national level 8 business groups (2 in each district)
Mayurbhanj	1	59	4	2	5	
Wayanad	1	59	4	2	5	
Dindigul	1	59	4	3	5	
Kailali	2	113	4 + 4	5	5	16 (4 in each district level) 4 at national level 8 business groups (2 in each district)
Dhading	1	55	4	2	5	
Rupandehi	1	55	4	2	5	
Lalitpur	1	55	4	2	5	
8 Districts	10 sites	575 (297+278)	40	22	40	70 (42+28)

- The total number of villages/peri-urban were 10 (4+1 in India and 4+1 in Nepal).
- Households were selected based on information from key persons at the sub-district level in each village and peri-urban areas in each district, with a total of 297 in India and 278 in Nepal the research team interviewed a total of 620 households, 310 in each country but 13 interview results of India and 32 interview results in Nepal were found with incomplete and flawed entries and therefore were dropped from the analysis.
- 22 Focus Group Discussions, 12 with women and 10 with men (average group size of 10 participants, total 220 total Focus Group participants).
- 40 in-depth interviews at meso and macro levels with key informants across the study sites and in each district there were 5 key stakeholder/key informant interviews.
- Interviews of 70 national and state level officials and policy makers and CSO network leaders and business groups: 42 in India, 28 in Nepal

Total reach: 297+278+220+40+50 +70 = 955 persons. The qualitative and quantitative surveys were conducted with a gender lens to understand access and use of energy services by women.

The data were analysed and regressions performed. The tables and regressions are in Annex 3. It should, however, be noted that our analysis of factors in causation of changes come not from the statistical analysis, which can, at best, only show levels of correlation. Our analysis of causation comes from our qualitative data.

1.5.4. Review and Analysis of Policy Documents

A critical review of the policy documents and reports of all organizations connected with the formulation and implementation of energy policy was a key resource for the study of the political economy of energy at the macro and meso levels. Review of literature was to continue with attention to gender analysis of political economy of energy and of energy policy changes in the two countries. Attention was also paid to drawing lessons from South Africa's experience of achievements and challenges in the provision of clean and efficient energy to rural women and their households.

In each village the data was collected through:

- **Village schedule** covering population, ethnicity, connectivity, major economic activities, access to electricity, major production activities, recent changes in economic activities, migration, existence of women's groups and their activities, energy programmes in the village, role of local administration and of women in them in administering energy programmes, norms regarding decisions about energy, types of energy used, energy markets in village.
- **Focus Group Discussions (FGDs)** Two FGDs were conducted in each research site, a total of 10 with women and 10 with men in each country. The FGDs covered the major norms in the village with regard to community and household decision-making, changes in these norms, impact of improved communication and market development, migration and its effects, changes in fuel use in the village, the people's understanding of adverse health effects of woodfuel use in cooking, role of women's groups, and other civil society groups. The purpose of the FGDs was to get an idea of the processes of change in gendered norms in energy use in the village/community and in wider society in general.
- **Key Informant Interviews:** In each study area in India and Nepal these interviews included key persons from NITI Aayog (policy planning) and AEPC, Ministries of Power and Renewable Energy, other administrative and energy officials, energy supply providers and business representatives active in the area. From these interviews, we learnt some key aspects of policies and practices at macro and meso levels in the power and renewable energy organizations. Our experience of conducting a gender audit of renewable energy in India in 2009-10 helped us in our research reach, as well as in conducting our interviews with some ease and trust in a frank environment.
- **Stakeholder Interviews:** At macro-level investigation, there were key informant interviews with present and past energy planners, policy decision makers, researchers and leaders of civil society organizations active in the area of energy policy. At the meso and micro levels, our interviews with women and men village leaders, with women SHG members were conducted with a Feminist Participatory Action Research (FPAR) method as developed by Asia Pacific Forum on Women, Law and Development, Thailand. FPAR discussions with the participants itself produces research results, in terms of the reality of access through use of available energy as well as barriers of gendered norms and

culture that tend to make energy in access to women, a male biased systemic truth.

In order to strengthen the project team's political economy analysis, we engaged with three consultants, one each in India, Nepal and South Africa. They worked with the project team's own analysts to produce background papers on the gendering of political economy of energy, one each for India, Nepal and South Africa. The inputs from these papers were used in research papers produced for publication in 2016-2017.

The methodology for the macro and meso analysis is largely developed from that of the Policy Practice (2015), along with the Political Economy Analysis of Climate Change Policies (known as PEACH methodology) (Schmitz, 2012), and modified by Morris and Martin (2015) wherein they also introduce value chains into the analysis. Our important addition is the use of gender analysis to identify what benefits or constraints there are for women in these policies and practice of implementation.

1.5.5. Dynamic Factors and Complexity of Change

With regard to the potential for change, we assessed the forces for change. For example, the impact of women's collective action at micro levels, having a spread effect, both horizontally and vertically; a change in the thinking of a gender-inclusive energy policy; a change in international and national coalitions in favour of clean energy. Further it is intended to assess the probability of various outcomes under different conditions.

A crucial part of this analysis involved the linking of the different levels, macro, meso and micro, in order to see how and where changes could be introduced. Changes can start at both the macro level (changes in national policies); or, at the meso and micro levels (changes at intermediate and base levels, having an impact, over time, on macro policy).

Linking Macro, Meso and Micro levels: we put forward the following as the relational link staring from the **micro level and going up to meso and macro levels**:

- Agential action at micro level (individual women in their households) is enabled by meso-level organizations of women's groups
- Meso-level actions and organizations can change norms and in some cases macro policies and implementation, for example the power of women voters can lead to women's energy access issues becoming election issues; women mobilized in securing rights to assets and facilities, such as modern fuel, infrastructure, land, water and so on.
- Evidence-based policy advocacy as an influencing factor (SHGs starting as project at the micro level and is now macro policy)
- Macro policy can be influenced by micro- and meso-level actions, a number of policies in India and Nepal have started at the pilot levels e.g., Mahatma Gandhi National Rural Employment Guarantee Act and SHGs.

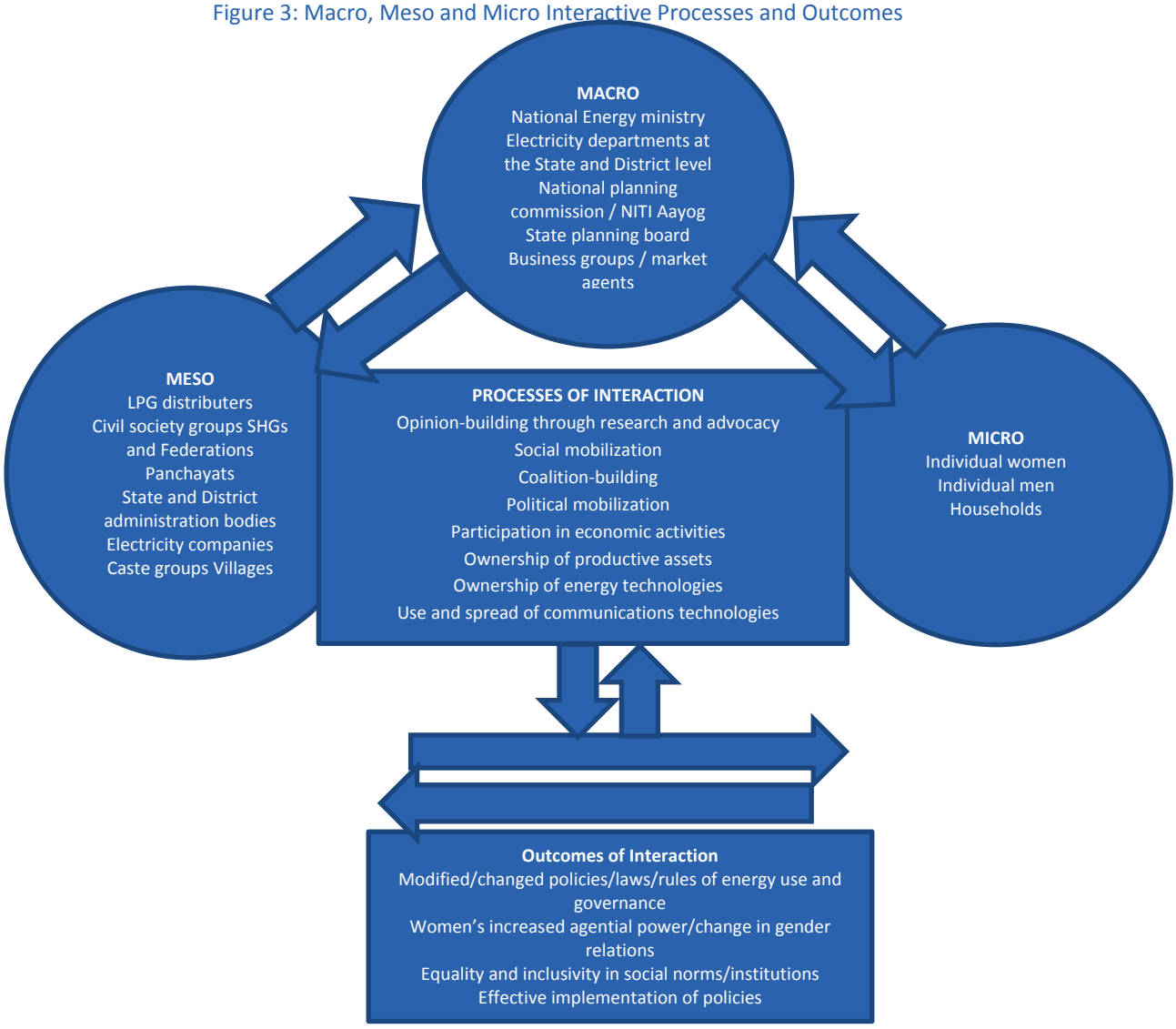
Macro policies are filtered through the meso to the micro levels. There is a top-down connection from the **macro and meso levels to micro level**

- National and international development concerns for clean cooking energy.
- The Government of India's efforts at providing subsidized LPG connections in rural areas.

- Attempts at reducing women's work burden in agricultural production.
- Gendered ways of seeing the world affect the energy policy implementation where the opportunity cost of women's labour at the micro level is low, then there have been reports of failures to sustain the change in cooking fuel. Policies for provision of electricity, however, have been more successful, but regional political factors influence the spread of rural electrification.

While we started with these approaches, we later looked into the possibility of other approaches too which were seen more appropriate in understanding the gender dynamics of change in energy policies. Of course, there is also the possibility of a simultaneous existence of both top-down and bottom-up changes. But, it is our understanding, that the role of bottom-up changes by women as a critical part of changes in policy and actions. The value chains linking the different levels (macro, meso and micro) is a crucial part of political economy analysis. This is particularly important in the use of gender analysis, since unintended consequences may not reveal themselves without such a linking up of all the three levels. But in the linking we emphasize that the relationship is not only one-way, from the macro, filtered through the meso to the micro level of women and their households; but also the other way, from initial micro actions of women at the base going up through the meso and influencing macro policies. The energy value chains are dynamic and it was important to identify the different spheres of macro, meso and micro, at which interventions can be made and can change the developmental outcomes.

Figure 3: Macro, Meso and Micro Interactive Processes and Outcomes



- **Investigation Methods for Macro, Meso and Micro Levels:** Investigation of macro, meso and micro levels, and of connections between all the three levels, was carried out through: i) review of policy documents; ii) key informant interviews; iii) village schedules, and iv) questionnaire-based individual and household surveys. The key informants were interviewed included present and past energy policy makers, officials of private sector and parastatal organizations involved at some level of the value chains, traders and energy consumers at local levels, members or officials of the SHGs and credit groups, CSOs and academic experts in energy debates.
- **Review and Analysis of Policy Documents:** A critical review of policy documents and reports of all organizations connected with the formulation and implementation of energy policy was a key resource for the study of the political economy of energy at the macro and meso levels.

1.6. Diffusion of Research Findings and Involvement of Stakeholders

1.6.1. Potential Application to Other Rural Regions:

The study has an emphasis on women's access to clean and more efficient energy in the selected remote rural regions. These remote areas are poorly connected and have low levels of economic development. The results from our research study would be applicable to other such remote rural regions, both in the two countries of our study and in other countries of Asia, Africa and rural Latin America where women are engaged in woodfuel collection.

Our analysis stresses the need to jointly consider women's activities in both household cooking and agriculture production, and the interaction of women's time in these activities with fuel use decisions, with change in social norms as the dynamic factor. This analytical approach to gendering the political economy of energy use would be of wider application in assessing improvement in agential power of women.

With good examples drawn from the functioning of SHGs in India and women collectives and women drivers of 'SAFA' tempos in Nepal, the policy advocacy workshops were conducted in cooperation and collaboration with NITI AAYOG, Rural Electrification Corporation, Ministries of Agriculture and Energy, civil society organizations, such as SEWA and Practical Action. Importantly these organizations through their practical examples demonstrated the ability to reach women and men from rural areas and have empowered the rural women with skills to install, repair and do maintenance work for clean energy infrastructure, such as various types of farm machinery, solar lighting units and fuel efficient smokeless stoves. In Nepal, such policy advocacy workshops included AEPC, civil society organizations and individual experts engaged in the promotion of innovative cooking and production uses of energy in agriculture. An effort was made to sensitize policy makers and development organizations to recognize the potential of rural women in the energy sector and engage with their experience and voice in policy formulation, project design and implementation of energy policies and programmes.

1.6.2. Tracking the Praxis of Policy Change

There were two elements to assess change: (1) advancement in women's collective and individual agency to access energy for household activities and production in agriculture; and (2) gender-sensitivity and women-specific energy supply through policies and implementation efforts at national, state and district levels. Our analysis of these two elements has shown changing gender relations and social norms as well as its limits within home and outside. The characteristic features of the gender-transformational change is explained by trends of change in social norms, individual or collective examples of such change. The context-specific direction and measure of the change were discussed twice a year with the field teams by the lead researcher and the political economist as well as the key researchers in India and Nepal.

1.7. Theory of Change

Largely drawing from the DFID examples of Theories of Change (DFID, 2012), the theory of change informing this study is that use of agential power by women's groups in economic activities, and their pressure for better connectivity and supply of non-solid fuels for household cooking and production, can result in changes in fuel use that both increase women's agency/empowerment and productivity.

The availability of clean energy for women's work in household and production such as in agriculture can result in better bargaining and decision-making within home and outside and thereby leading to an increased agential power of women. This can result in changes in fuel use that both increase women's productivity in agriculture and reduce the negative effects of smoke pollution on health of women and their infants in the domestic sphere. An improvement in women's agency in negotiating power for energy access and overcoming energy constraints is likely to lead to gender-transformational changes in terms of, a) adoption and implementation of gender-sensitive energy policies and laws and attempts at achieving gender balance in structures of energy governance at national (macro) and state/district (meso); b) social awareness about the need for women's access to clean energy for cooking as well as for production in agriculture and home-based industries; c) women's increased self-confidence and capacity to negotiate with the state and market agencies to access modern energy infrastructure for domestic cooking and production in agriculture in the households and villages (micro level) where they are located and working; and d) changes in gender norms and gender-sensitive concerns about women's ownership and control of productive assets including land, agriculture/ energy equipment and unmediated access to and use of energy.

Substantive equality in gender relations and inclusion of women require the transformation of institutions and structures (UN Women, 2015). Such transformative change requires policy and action on the following fronts: (1) redressing women's disadvantage in political economy processes with changes in policy and practice; (2) addressing stereotyping and the social norms that perpetuate and promote women's unfreedoms and gender-based violence; (3) strengthening women's agency, voice and participation, and supporting women's organizations to influence economic and energy technology policy making (Elson, 2014).

In this study, we have made an attempt to demonstrate the proof of progression in advancement of women's access to energy and related decision-making i.e., agential

power of women. There might be a picture of a 'messy reality' with some steps forward and some steps back about the gendered condition of women in access to energy and decision-making (Batliwala and Pittman, 2010: 5). Nevertheless, we accept the responsibility of following the theory of change and tracking even small positive steps as trends and good examples in advancement of women's access to energy and their social and economic empowerment, as reflected in decision-making within the household and agricultural production.

Women Self-Help-Group in Dindigul, Tamil Nadu. Photo: Elavarasan Devarajan/ENERGIA

2. THE VALUE OF RURAL WOMEN'S LABOUR IN PRODUCTION AND TRANSFORMATION IN COOKING ENERGY

2.1. The Problem: High and Persistent Use of Woodfuel

In India and Nepal the proportion of the total population (both urban and rural) relying on wood and other solid biomass such as crop residues and animal dung is 65 per cent and 74 per cent respectively (WHO, 2016, p. 103). Of these, a much greater incidence of the use of solid biomass is in rural areas. Among South Asian LDCs, 89.6 per cent of the rural population in Bangladesh relied on woodfuel, while the figure is 83 per cent for Nepal (UNDP and WHO, 2009, Table 20). In rural India, woodfuel was the principal source of energy for cooking used by more than three-quarters (76.3 per cent) of rural households in 2009–10 (NSSO, 2012). Furthermore, the proportion of rural households in India dependent on woodfuel shrank by just two percentage points in the 16-year period 1993–94 to 2009–10 (NSSO, 2012).

The continued use of woodfuel and other solid biomass as cooking fuels has health implications through household air pollution, particularly for women and children (WHO, 2016). The WHO estimates that 1.3 million people die every year due to cooking-related household air pollution in India and 75,000 in Nepal (WHO, 2016). The impact of cooking with woodfuel, however, is not restricted to household air pollution. Obviously, it would also affect atmospheric pollution through the release of carbon dioxide as a greenhouse gas. The fact that North India accounts for 15 of the 15 most polluted cities is, in part, attributed to the high incidence of burning of solid biomass for cooking (Chandrasekhar, 2017). Collecting biomass, cooking and cleaning all together is a major factor in women's drudgery and time poverty.

The inability of poor rural households to purchase clean cooking fuel such as LPG (liquefied petroleum gas) has been dealt with in a number of programmes that sought to overcome the capital barrier by providing subsidized LPG stoves and cylinders. The World Bank implemented an LPG capital subsidy, the Deepam project in India, which covered 1.2 million rural households in the erstwhile Andhra Pradesh. How did this capital subsidy project fare? A study by Rajakutty and Kojima (2002) found that 90 per cent of recipients retained their LPG connections, though it is reported in the evaluation that officials thought that the incidence of retention of LPG was much lower. The study figure was bound to be high since selling or giving away one's subsidized connection was illegal. In other areas, too, there have been reports of the diversion of LPG connections from domestic to commercial use.

However, most households—almost 90 per cent of those who retained LPG—combined it with wood as the primary fuel. LPG was used more in the monsoon months when the demand for labour was high and less in the summer when cash-earning opportunities were low.

As seen above, capital subsidies for LPG led not to fuel switching but to the use of multiple fuels, a practice identified as fuel stacking (Masera, Saatkamp and Kammen, 2000). In the cases noted in the Deepam project and in an analysis of various projects in Sub-Saharan Africa (Heltberg, 2004), wood remained the primary fuel, with LPG being used for 'other cooking', such as making tea or so that guests could be served quickly. A more recent study of Rajasthan (Nielsen, 2016) found that 24 per cent of studied households had LPG but used it very sparingly.

In 2016, the Government of India launched the UJJWALA LPG programme under which it has distributed 50 million subsidized LPG connections to women under the poverty line in their own name (irrespective of their marital status). More recently, in March 2018, this figure was revised to 80 million connections. Whether this subsidized distribution of LPG connections resulted in a shift in the primary fuel from solid biomass to LPG is a question we looked at in our empirical work and will be discussed later on in this chapter. In Bhutan, even with more than 80 per cent of rural households being electrified, woodfuel still constitutes 90 per cent of rural energy use and is the main form of energy used in cooking (ADB, 2014). In South Africa too, rural households have access to electricity, but continue to use woodfuel for cooking, though urban households largely use electricity for cooking (Matinga, 2010).

The main questions we ask in this chapter are: which analytical framework will explain the persistently high use of woodfuel and, more generally, how do gender-related factors influence cooking fuel use? The data collected both through focus group discussions (FGDs) and a household questionnaire in India and Nepal will help us understand the extent of change in household fuel use for cooking and the factors driving this change.

In the initial part of this chapter we put forward a thesis for a new framework of analysis while discussing the limits of household income as an explanatory variable. This is followed by a discussion on the role of women's unvalued labour and fuel stacking in India and Nepal. The subsequent sections deal with the opportunity costs of women's labour and the value of women's labour in production and power in household negotiations. The concluding two parts of the chapter argue for changing the choice architecture in the context specific situation of India and Nepal, and about adding a concerted nudge to subsidies and women's empowerment for promotion of clean cooking fuel as a new normal.

Ujjwala Yojna promotional poster. Poster: Government of India

Traditional cooking with fuelwood produces unhealthy smoke and fumes. Photo: Elavarasan Devarajan/ENERGIA

Young woman preparing biogas slurry in Nepal. Photo: CRT

In bringing about a fuel substitution from wood to LPG, there is clearly a role for supply-side factors. Without a reasonably stable supply of LPG or some other clean and labour-saving fuel, substitution would not exist at all or would be very limited. Our argument, however, is that supply-side conditions, though necessary, are not sufficient to bring about a fuel transition. Where woodfuel is collected by women's unvalued or undervalued labour and there is poor labour-absorptive capacity, in order for access to turn into use there is a need to transform gender relations in the household.

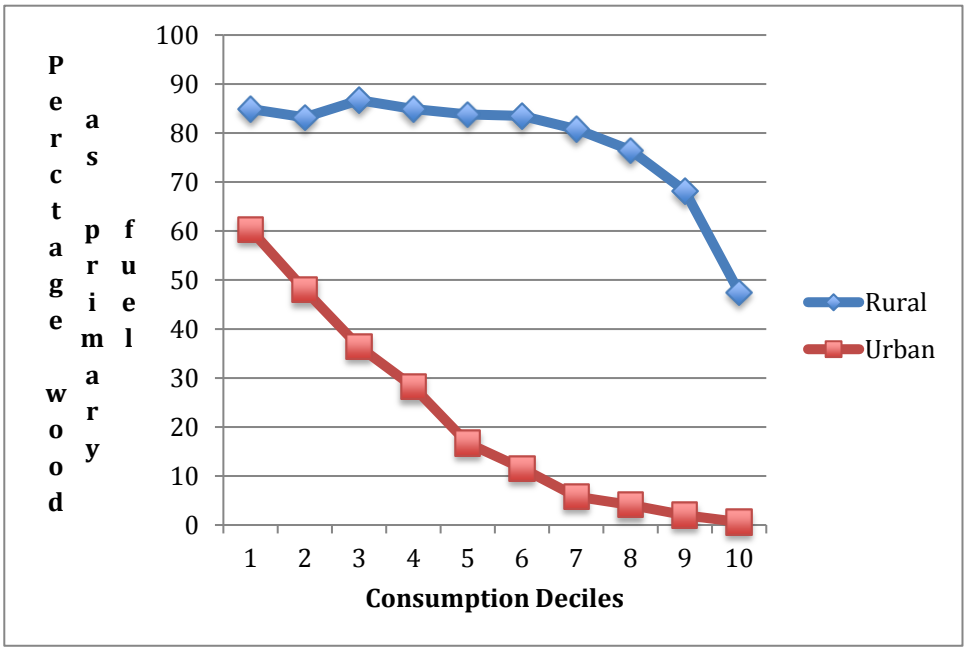
2.2. Why a New Framework is Needed: The Limits of Household Income as an Explanatory Variable

Analyses of energy access postulate that the main factor determining use of energy is household income (e.g. Leach, 1992; Heltberg, 2004); some also introduce household size and educational level into the mix (Heltberg, 2004; Rao and Reddy, 2007). These analyses were related to the concept of the *energy ladder* (Leach, 1992), where there is an income-determined switch from unclean, traditional fuels to clean, modern fuels. Did rural households behave as predicted by the above models, i.e., switch fuels due to an increase in household income? For this analysis, we utilize the large-scale sample study of the Indian National Sample Survey Organization (NSSO, 2012).

The Indian household energy use study for 2009-10 allows us to look at the relationship between household income (proxied by household consumption) and the primary fuel used for cooking—wood or LPG. Figure 4 shows that as household consumption increases in rural India, the proportion of households using woodfuel as the primary cooking fuel falls somewhat gradually, from 84.9 per cent in the lowest consumption decile to 80.8 per cent in the 6th consumption decile and 76.5 per cent in the 7th decile. It is only in the top two deciles that there is a relatively sharp fall to 68.2 per cent and then to 47.5 per cent. The income effect is clearly present only in the top two deciles. On the other hand, in the urban situation, there is a rapid fall from 60.3 per cent of households depending on woodfuel in the bottom decile, to 16.7 per cent in the 5th decile and 0.6 per cent in the top decile. It appears that rural household woodfuel use is more inelastic in response to higher household income compared to urban woodfuel use, which is largely commercialized. A reason for this inelasticity seems to be that upper-income rural households have cooking (and collecting fuel) done by a servant, often a poor relative. Women in employment, such as school teachers, on the other hand, did not want to go to work smelling of wood smoke; so they preferred LPG (Sinha, Ph.D. thesis on Odisha, full reference to be filled in).

A study of Pakistan (Ouerghi, 1993) had pointed out that woodfuel use in rural areas was not sensitive to the level of income. This was also argued in Nathan and Kelkar (1997) for India. If household income is inadequate what can explain rural cooking fuel use? We begin by looking at the role of women's labour in collecting woodfuel in rural areas.

Figure 4: Rural-Urban Use of Woodfuel by Consumption Classes (wood as % of cooking fuel)



Data Source: (NSSO, 2012)

2.3. The Role of Women's Unvalued Labour

Unlike urban woodfuel, rural woodfuel and other solid biomass fuels such as dung cakes are largely collected and not purchased (Nathan and Kelkar, 1997; ADB, 2014, for India, Pakistan and Sri Lanka; Karekazi and Kithyoma 2002, for Africa; and Kohlin, Stills, Pattanayak and Wilfong, 2011, for a global review). This means that it is not subject to the same logic of price comparison as purchased fuel. However, it is subject to the comparison of labour time spent in the collection of wood for fuel and its alternative uses. The relevant cost in this context is not that of price but of the opportunity cost of labour time (Nathan and Kelkar, 1997; Kohlin et al., 2011), which is the cost in terms of the best opportunity foregone in an alternative use.

Given that women are the main collectors of woodfuel (Nathan and Kelkar, 1997; and Parikh, 2007, for India; ADB, 2014, for Pakistan, Sri Lanka and Nepal; and more recently Nielsen, 2016, for Rajasthan, Nielsen, 2016a, for Kerala; and Karekazi and Kithyoma, 2002, for rural Africa), the comparison is between the time spent by women in fuel collection and the next best use of this time. In a labour-surplus economy where there is no alternative productive use of the labour time saved, the opportunity cost of women's labour time would be zero. Otherwise, in the event that women's labour time could be spent on collecting and selling, say, non-timber forest products (NTFP), the opportunity cost of woodfuel would be the relatively low income earned from this NTFP activity.

This opportunity cost of women's labour time, the money that could have been earned, can be compared against the monetary cost of commercial fuel. Where the opportunity cost is low, fuel switching would be inhibited. There is a difference in the opportunity cost

of women's labour in remote and poorly developed rural areas (in commercial terms) and in areas with higher levels of commercial activity. It is low in the former and high in the latter. The low opportunity cost of women's labour will inhibit the adoption of labour-saving equipment, including fuels, while a high opportunity cost will promote it.

While areas with a high opportunity cost of women's labour are also likely to have more reliable LPG supply chains, the key factor is the opportunity-cost relationship that results in the push for the adoption of a labour-saving cooking system. An important finding from our FGDs is that even in areas of reasonably reliable supply, as in Wayanad, Kerala, some women said that since they had sufficient labour time they did not use LPG as the primary fuel. However, women in the same area who worked in a 9-to-5 day job in a workshop found it necessary to save time in cooking by using LPG as the primary fuel.

This relationship between the cost of the equipment that saves labour time and the income that can be earned with the time saved was recognized by the Russian economist Chayanov (1966) over a hundred years ago in his analysis of the failure of threshing machines to spread, 'in areas in which there are no crafts and trades in winter and, apart from the threshing itself, nothing in which the population can occupy itself. It is true that the introduction of the threshing machines eases the work and frees many hands…; but since these hands can find no other work to do, this does not increase peasant family income by a kopek' (1966, 211).

This analysis can explain the success of the ICS program in China compared to its acknowledged failure in India (Nathan and Kelkar, 1997). Smith, Go, Huang and Qui (1993) argued that it was China's relatively higher income that partially accounts for the difference in success rates, the rest being due to committed implementation. The counter-argument is that the greater success of the improved cook stoves program (ICS) in commercially developed regions of China compared to less-developed regions, such as the remote uplands, or to similar regions in India, was linked to differences in gender relations in the two types of regions (Nathan and Kelkar, 1997; Kelkar and Nathan, 2005; Lucas, Barnett and Ding, 2003).

This bears out Irene Tinker's statement nearly 30 years ago that '… the central [rural] energy problem [is] of women's time' (1987, 125). We now look at some observations and case studies on women's time in relation to rural energy use.

Our hypothesis was that in commercially less developed areas, where women used their unvalued labour to collect wood, the movement from access to use of clean cooking fuels as the primary cooking fuel, required their increased participation in income-earning activities, which would increase the value of their labour, the opportunity cost of their labour, and possible economic empowerment within the household.

This was tested across the field sites through a survey of women, FGDs and targeted data collection. We sharpened the distinction between the use of LPG or other clean cooking energy as the primary cooking fuel and the continuation of wood as the primary cooking fuel by including fuel stacking (i.e. the use of LPG or biogas as a secondary fuel) in the latter. This gave us a binary distinction between the use and non-use of LPG as the primary cooking fuel.

In addition to the above hypothesis about the importance of women's economic empowerment within the household, we also made the prediction that the Government of India's Ujjwala scheme of providing capital subsidies to poor women to acquire LPG sets, would result in large-scale fuel stacking, i.e. LPG not becoming the primary cooking fuel, in areas commercially less developed areas, where women use their unvalued labour to collect wood.

We first take up evidence on the prediction about fuel stacking as a result of the Ujjwala scheme in less-commercially developed areas in India and then go on to the data about fuel switching and factors that promote it.

2.4. Fuel Stacking in India

FGDs in the Dindigul District of Tamil Nadu, Wayanad in Kerala, and Koraput and Mayurbhanj in Odisha, show that there is a pattern to rural fuel use in cooking. Where there is pressure on women's time because they are very involved in income-earning labour, as in Dindigul or some cases in Wayanad, when women were provided a capital subsidy for LPG, they tended to switch from woodfuel to LPG as the primary cooking fuel. The number of cylinders they ordered was around 10—sometimes even 12 a year.

However, in areas where women did not substantially participate in income-earning activities, as in the two districts of Odisha or some parts of Wayanad, there was a tendency for an LPG capital subsidy to result in fuel stacking rather than fuel switching. Wood remained the primary fuel for cooking the main meals, while LPG was used for re-heating food or preparing tea. The number of cylinders ordered by such women tended to be around two to four cylinders in a year. Recent field enquiries in Mayurbhanj from Ujjwala recipients, i.e. those who received free connections and equipment under the Central Government's scheme for women below the poverty line, showed that many such women had not ordered any refills at all over the period of a whole year.

The key data, which summarizes the difference between fuel stacking, where wood remains the primary cooking fuel, while fuel switching, where LPG becomes the primary fuel, is that of two to four cylinders of LPG being ordered in the case of fuel stacking and 7 to 8 being ordered in the case of fuel switching for a family of four. The central factor behind this change is that of an increase in the opportunity cost of women's labour and the resulting switch to labour-saving LPG against labour-intensive woodfuel.

A count of refills ordered by 38 families in Dharmathupatty Village, Dindigul, showed an average of 6.7 cylinders ordered per year per household, each with an average size of 4.2 persons. In contrast, 14 Ujjwala beneficiaries in Mayurbhanj District (Odisha) ordered an average of 3.6 cylinders per year per household, with an average household size of 4.5 persons. In our analysis, the Dindigul village is well-connected with a substantially developed commercial sector. The Mayurbhanj village is remote and expected to be poorly commercially developed. We conclude that Mayurbhanj is a case of fuel stacking, while Dindigul is a case of fuel switching.

Other studies corroborate our point of the problems of fuel stacking, seen by low demand for refills, among women given subsidized LPG kits. An investigation by the environmental magazine *Down to Earth* in August 2017 concluded that refilling was the toughest part.

The report quotes an LPG distributor in Shravasti district of Uttar Pradesh who says that barely half of the Ujjwala beneficiaries have come back for refills, and that too, just once or twice. Another LPG distributor in the Dindori district of Madhya Pradesh says, 'The refilling rate is quite low. It is not more than 7 per cent in the district' (Pandey, Jitendra, Sahu and Thakur, 2017). They point out that 'Officials of the LPG marketing companies admit that the low refill booking and commercial diversion of cylinders are areas of concern…' (Pandey et al., 2017). At a workshop (April 2018) the Joint Secretary of the Ministry of Petroleum and Natural Gas (the nodal ministry for the Ujjwala scheme) admitted that the rate of refills was very low among scheme beneficiaries in states such as Jharkhand, Chhattisgarh and Odisha, averaging just around 2 cylinders per year.

In line with our prediction, fuel stacking, with solid biomass remaining the primary cooking fuel, remains a serious problem in regions, such as the rural areas of Jharkhand, Chhattisgarh, and Odisha, where women continue to rely on the collection of wood with their unvalued labour. We now turn to an analysis of what promotes adoption of LPG as the primary cooking fuel using our household survey (287 women) for this purpose.

2.5. Fuel Switching in India

Overall in India (Table 2) 146 out of 297 women, 49.1 per cent, used LPG as the primary cooking fuel. In Nepal 158 out of 278 women, 56.8 per cent, used either LPG or biogas in cooking. But in the case of Nepal all those who used clean cooking energy only used it as the secondary cooking energy; the primary cooking energy remained wood. Consequently there is a difference in the discussion that follows. For India the discussion is about factors that influenced fuel switching or the move from solid biomass to clean cooking fuel as the primary cooking fuel. In the case of Nepal the discussion is about factors that promoted some adoption of clean cooking fuel, though not as the primary cooking fuel.

The household survey in India showed that LPG as the primary cooking fuel varied with location. In well-connected sites, 95 per cent of households used LPG as the primary cooking fuel, as against 73 per cent and 29 per cent in moderately remote and remote villages respectively. This is an entirely expected result.

Table 2: LPG as Primary Fuel in India

No.	**Variable**	**LPG as Primary Fuel**	
		No. of women	% of women in category
1.	Remote areas	56	29% [190]
	Moderately connected	37	73% [51]
	Well connected	53	95% [56]
2.	Unpaid family worker	66	42% [157]
	Independent income earner	80	58%[139]
3.	Non-CBO member	16	20% [79]
	CBO member	130	59% [218]

4.	No asset ownership	125	50% [248]
	Asset ownership	21	43% [49]
5.	No decision-making	73	39% [189]
	Role in decision-making, joint + sole	73	68% [108]
6.	No formal schooling	47	31% [152]
	Formal schooling	99	68% [145]

n = 297

Figures in parenthesis are number of women in that category.

Note: No role in decision-making adds none and low consultation.

Decision-making adds medium, high and sole decision-making

But, as we will spell out below, our analysis does not relate this to just supply issues, but to demand issues. Remoteness can be taken in a geographical sense as, say, distance from a town of 500,000 people, distance from a health or administrative facility. We, however, are dealing with remoteness as undeveloped markets for labour, which affects demand for purchased fuels, such as LPG. The very fact of use of LPG as a secondary fuel means that supply issues in remote areas are not something absolute. What remoteness does is to increase the logistical cost and thus the supply price. The higher price would reduce demand, but remoteness is not an absolute barrier to use of LPG as the primary fuel.

More important is that 58 per cent of women who were independent income earners used LPG as primary cooking fuel; as against 42 per cent of women who were unpaid family workers. It is likely that unpaid family workers with LPG were from the better-off sections, where there is a household income effect in the choice of LPG. Again, of those with secondary schooling 68 per cent used LPG as primary fuel; while of those without secondary schooling just 31 per cent used LPG as primary cooking fuel.

Women's membership of community based organizations (CBOs) was important; 59 per cent of CBO members had LPG as primary cooking fuel, while of those with LPG as primary cooking fuel 60 per cent were CBO members. Our field discussions showed that being in a group not only provided an income for fuel switching but also supported the action of members in fuel switching. The CBOs or SHGs that, among other things, provide a mechanism for credit to women to undertake income-earning activities.

Asset ownership (i.e. of land and houses) is taken as an indicator of women's position in the household; not as an indicator of the household's class status. It, however, did not show a higher proportion of LPG as primary fuel, compared to non-asset owners. This could be due to the difference between women who own assets being unpaid family workers, while those who own no land or house may be independent income earners.

Role in decision-making as compared to no role made a big difference in adoption of LPG as primary fuel – 68 per cent for the former against just 39 per cent for the latter.

A binary logistic regression (Annex 3) controlling for remoteness showed that women being independent income earners had a positive correlation with fuel switching, significant at the 5 per cent level. The other variables that had positive and significant

correlation with use of clean cooking fuel are membership in CBOs (at 10 per cent significance), having a 'high' decision-making power compared to no decision-making power (at 1 per cent significance level). 'High' decision-making power was defined as a situation where the woman consulted with her husband, but in the event of a difference of opinion between the two, the woman's opinion prevailed.

Women as independent income earners comes out as a key correlate of the switch to clean cooking. This is a manifestation of the higher economic value of women's labour, which, in our hypothesis, is important for fuel switching. Such income earners are also likely to have a role in household decision-making and in marketing and management. Our analysis of women as independent income earners is restricted to whether or not they are involved in income generation, either as wage earners or as self-employed running micro businesses. We have not looked into the relative earnings of women and men or the level of women's earned income.

Woman in Tamil Nadu India uses a loom that runs on electricity, thus increasing her production and income. In the back, her biogas stove is visible. Photo: MSSRF

Access to electricity and LPG strengthen women's participation in non-farm enterprises. Photo: CRT, Nepal

2.6. Fuel Switching in Nepal

In Nepal household survey data (Table 3) showed that 158 women out of 278, or 56.8 per cent of women used LPG or biogas. But this is not as primary cooking fuel, but only as secondary fuel, with wood remaining the primary cooking fuel. This is corroborated by FGDs, all of which showed that a combination of fuels was used.

Table 3: Use of clean cooking energy (LPG or biogas) as secondary fuel in Nepal

No.	Variable	CCE Use	
		No. of women	% of women in category
1.	Remote areas	58	45% [129]
	Moderately connected	53	96% [55]
	Well connected	47	50% [94]
2.	Unpaid family worker	99	54% [184]
	Independent income earner	59	69% [94]
3.	Non-CBO member	49	64% [76]
	CBO member	109	54% [202]
4.	No asset ownership	141	57% [246]
	Asset ownership	17	53% [32]
5.	No decision-making	127	59% [216]
	Role in decision-making, joint + sole	31	50% [62]
6.	No formal schooling	42	45% [93]
	Formal schooling	116	63% [185]
7.	Non-migrant HH	97	54% [181]
	Migrant HH	61	63% [97]

n = 278

Other than formal schooling and women in households with migrant men, there is no expected relation between the other variables and use of clean cooking energy in Nepal.

In Dalchowki village of Lalitpur District, the availability of electricity and investment in a milk chilling plant led to increased commercial milk production based on homestead buffalo rearing. All the women in the village had purchased LPG cylinders, but the main cooking was still done with wood, while LPG was used for making tea and snacks, or heating food. Women said that their non-domestic labour in rearing and milking buffaloes increased. However, this activity occurred in the homestead area, as men collected the fodder for feeding buffaloes. Since all the work was done in the homestead area and did not take up the entire work-day, women did not seem to find it useful to go beyond fuel stacking to fuel switching. Of course, the economic blockade on the India-Nepal border in 2015 would certainly have inhibited any complete fuel-switch to LPG.

In Chyamrangbesi village of Kavre District, Nepal, the Village Schedule showed that an eco-village project had provided improved cook stoves (ICS) to 45 households. In addition, 24 households also had biogas and some 8 households had purchased LPG on their own. Women mentioned that the ICS reduced wood requirement and thus the time spent on collecting wood by more than 50 per cent. They were able to utilize this time to cultivate vegetables, rear livestock and engage in aquaculture. These income-generating activities were promoted simultaneously with the ICS and biogas. However, all the women continued to use woodfuel, along with the ICS, as the principal means of cooking. Fuel stacking—the simultaneous use of various methods of cooking—held sway here as in Dalchowki village.

There is one unexpected result in the Nepal data. Remote villages have a higher incidence of women using clean cooking energy than moderately remote villages. The reason for this unexpected result is that in Nepal most projects by NGOs for clean cooking energy have been concentrated in the remote, upper areas.

These observations and case studies support (or, at least, do not contradict) the analysis that in the rural economies of developing countries, the value of women's labour time in production is the gender factor crucial to fuel transitions, which, for rural households, are really ways of saving women's time. In Nepal there is almost no fuel switching, so it is not possible to look at factors promoting fuel switching. But in India, where there is fuel switching, and the household survey brings out the importance of women's independent income earning status in fuel switching. An increased role in marketing and in household decision-making are the possible routes through which independent income earning status affects fuel choice and switching to primary use of LPG as clean and labour-saving cooking energy. We look into this relationship in more detail in the following pages.

2.7. Opportunity Cost of Women's Labour

The opportunity cost of labour is that which can be earned from an alternate use of the labour, either through wage employment or self-employment. A measure of the extent of wage or self-employment is captured in our household survey as the proportion of women as independent income earners.

In remote areas 36 percent of women are independent income earners; in moderately connected areas it is 52 percent of women and in well-connected areas it is 80 percent of women as independent income earners (Annex 2: Table A2-30). This shows that the extent of women as income earners goes up with connectivity. Another way of putting it

is to say that the better connected areas are more labour-absorbing, while remote areas are less labour-absorbing. Though 93 percent of women in well-connected areas do not own land or other assets, it would seem that their earning an independent income leads to high use of LPG as primary fuel. In well-connected areas 95 percent of women used LPG as the primary cooking fuel.

The opportunity cost of labour can be taken as at least the daily wage in the area. In the better-connected areas of Dindigul and Wayanad it is at about Rs. 200 and Rs. 300 respectively for women, while in the poorly-connected areas of Odisha it is just Rs.150 per day. Besides the wage rate there must also be employment available. In Kerala the wage rate is higher than in Tamil Nadu but women did mention that there was not much wage employment available, expressing this in the [paraphrased] form of "What will we do with the time we save by cooking with LPG, which we have to pay for. We might as well collect wood?" Similar statements were reported to have been made by women in rural Chhattisgarh from the University of Oslo, TERI, Seacrester Consulting and Dunamai Energy (2019) report..

In Dindigul which besides its agricultural economy, has a substantial rural manufacturing sector, there is a shortage of labour. Workers from other parts of India have migrated here for work in the spinning mills. With a higher level of urbanization, there is an overall availability of wage employment all through the year.

On the other hand, the districts of Odisha (Mayurbanj and Koraput) have single rainfed crop agricultural economies. With low irrigation there is very little of a second crop. Though some non-agricultural employment has developed in cashew nut processing, it still does not lead to an overall shortage of labour. Thus, even at the low wage rate of Rs.200 per day there is not much employment available through the year.

Currently the one way of increasing women's income is through their employment as self-employed, possibly processing tree products, such as tamarind, or cultivating vegetables on small patches of irrigated land. These activities would increase the opportunity cost of women's labour and, thus, likely to result in pressure to save women's time in unpaid tasks, such as cooking.

Women's time spent in cooking with wood includes that of collecting wood, cooking and then cleaning vessels. All this would come to about 16 hours per week for collecting wood (with wood sources within a kilometre), 3 hours per day in cooking two meals, and 1 hour per day in cleaning vessels. This gives as much as 6 hours per day in cooking.

With LPG the time on cooking would come down to 1.5 hours per day in cooking two meals, plus 0.5 hours per day in cleaning vessels. The time saved by women would be 4 hours per day by switching to LPG.

Collection of cylinders would take half a day every five weeks. This is usually done by men and would lead them to lose a day's wages, which would be Rs. 300 in Odisha. This must be added to the cost of the cylinder, which is Rs. 600 at the subsidized rate, which would make the cost of a cylinder Rs.900. On a daily basis the cost comes to about Rs. 30 per day.

This shows that just an additional income of Rs.1,000 per month, or additional wage employment for about 7days at Rs.150 per day would be sufficient to cover the monetary cost of LPG. But such wage employment must be available or self-employment must be created for women to earn this extra income. Wage employment in single crop areas, such as Mayurbanj and Koraput, are available mainly in the period June to October. After that the women have to depend on sale from collection of non-timber forest products, such as tamarind. Where wage employment is regularly available all through the year, in agriculture and manufacturing, then the monetary cost of LPG is easily covered by women's own wage income. In an economy with limited employment possibilities the importance of wage income is shown by the Chhattisgarh women saying that they did not want their men to lose even a day's income in order to get the LPG cylinder.

2.8. The Value of Women's Labour in Production and Power in Household Negotiation

An economic change, the increase in the value of women's time in production, is not automatically accompanied by a change in the type of cooking fuel used. Fuel use is a matter of household decision-making, which is a result of bargaining relationship (Sen, 1990; Agarwal, 2016). Then, the value of women's labour in production must work to affect cooking fuel use through strengthening women's position in household decision-making, as per the theory of cooperative conflict in household decision-making (Sen 1990). It would strengthen women's fall-back position (defined as the position that would result from a break-down of the arrangement) and thus also their position in household bargaining. There could also be the additional effect of the perception of an increased contribution (Sen, 1990). Thus, through strengthening the fall-back position and an increased contribution perception response, the greater value of women's time in production as income earners will strengthen their position in household bargaining. Additionally, ownership and control of land and productive assets translate into capabilities which increase their bargaining position in household decision-making (Kelkar and Krishnaraj, 2013). Other analyses have added more factors that affect women's household bargaining position, such as social norms, support from non-household sources, etc. Our analysis associated LPG as the primary fuel with women owning their own business, as independent income earners and, particularly, women as members of CBOs. Ownership of land, education and migration are all positively associated with LPG as primary fuel.

However, it is necessary to go beyond a listing of factors to develop a hierarchy or priority of factors, as also argued in Agarwal (2016). In the rural economies of the developing countries that we are dealing with, both ownership of land and other assets are important, along with access to employment and income. Of the two, the ownership of land and assets is likely to change slowly; land ownership, in Roland's term, is a slow-moving institution (2004). In India, even after changes to the law with regard to Hindu women's rights to ancestral property, there are relatively few instances of them actually securing such rights (Kelkar and Krishnaraj, 2013). In Bangladesh, despite Hanafi Islamic law giving women a share equal to half of men, social norms inhibit women from securing these rights (Nathan and Jahan, 2013). On the other hand, access to employment and income have changed rapidly in these and other developing countries, and are often a key objective of development programs.

As discussed in more detail in Chapter 5, social norms are an important factor in determining what fuel is used for cooking. However, access to employment and income could enable women to overcome the negative effect of the taken-for-granted nature of much decision-making by individuals and households based on handed-down and unquestioned norms. Thus, there is an inertia in sticking to labour-intensive fuel use, despite an increase in the value of women's time in production. Our analysis predicts that this is an unstable situation, one where the higher value of women's time is not balanced with labour-saving fuel use. Rather, this is a 'something's got to give' type of situation: there will be increasing pressure from the greater value of women's time in production to economize on time in cooking.

Why is an increase in women's labour time in social reproduction work unlikely to be the dynamic element in pushing for labour–saving devices and methods of cooking? For one, it would not have the effect of strengthening women's independent income position. Again, in a continuation of the invisibility of social reproductive labour, there would not be any increase in the perceived contribution effect. Thus, we put forward the proposition that labour in production is the dynamic element which would drive the move towards the adoption of labour-saving devices and methods of cooking. However, the change in cooking fuel is not just a passive or automatic adaptation to change in the distribution of work among different uses, as it is also created by women's agency in accessing different types of work and, through them, challenging dominant gender relations and related social norms. What this means is that the movements towards greater labour-saving in fuel use do not automatically follow a higher value of women's labour in production. Instead, they are brought about by women's increasing power or agency in household decision-making on cooking energy use.

A qualification to the preceding analysis is that some forms of women's labour in production may have less of an impact on women's power in household decision-making than others. When women work as 'contributing or unpaid family workers' their labour is subsumed under family income, and it is often understood that such labour is part of women's familial or domestic duties (Kelkar, 2016). On the other hand, women's cash earnings, either earned as self-employed workers or as wage employees, are clearly recognizable forms of women's contributions to household income and are likely to have a greater positive impact on women's power in the household than their contributions as unpaid family workers. Women in many FGDs pointed to the importance of having their own cash rather than having to ask their husbands each time they wanted some cash.

Through strengthening their position in household bargaining, women's agency in household decision-making may lead to fuel use decisions that more closely correspond to women's participation in production labour, i.e. it may move fuel use from the labour-intensive to the labour-saving kind. However, women's agency might not cause much change in fuel use when women themselves do not feel the constraint of high demand for their labour time in production. As was reported in FGDs in Kerala, women said that if they had the time available, they would use it in collecting wood for cooking.

Thus, in a labour-surplus situation, which means an economy with a low local labour-absorptive capacity, there seems to be a limit to how much difference women's agency can make to fuel use. This could be the reason why a review of fuel use in eight developing countries includes the observation that, 'fuel stacking is much more common in cooking

than in lighting, and *there is no end to fuel stacking* in this sector' (Heltberg, 2004, p. 29; emphasis added).

We have assumed all along that men's labour is not a substitute for women's labour in cooking with woodfuel; that there is no substitution of men's work for women's work. This could be due to a strong taboo or taken-for-granted notion that men should not do women's work. There is certainly strong reluctance on the part of men to perform what are socially identified as women's tasks. In the various FDGs in both India and Nepal, in only one in Tamil Nadu did women mention that with LPG, men were willing to at least heat food when women were held up in meetings. Men taking up the domestic unpaid task of cooking, traditionally women's job, is a very slow-moving process in these areas. Of course, this applies only to unpaid domestic cooking, and not for paid, or income-earning commercial cooking, which is often carried out by men.

Woman at the LPG distribution centre in Mayurbhanj, Odisha, India. Photo: MSSRF

2.9. Changing the Choice Architecture

We observed in Koraput and Mayurbhanj Districts of Odisha that in these relatively poorly-developed and remote areas there were many more motor-cycles than LPG connections. In discussions with men and women, motor-cycles were uniformly graded higher than LPG as a priority in buying assets. Some men in Pilakani village of Koraput District, when asked why they bought motor-cycles, said they bought it for status reasons and because 'everyone has it!' LPG was again uniformly last in the assets to be purchased. Gold jewellery was first in the list, the reason given was that it could be used to meet emergency needs, as in the case of illness.

What is the meaning and implication of LPG not being a prestige good, while a motor-cycle is? What can be done to make LPG reach the level of prestige goods and might that make for a more rapid rural cooking-fuel switch to LPG as a clean and labour-saving fuel? Both motor-cycles and LPG involve energy transitions. In the former it is from manual energy in walking to petroleum-based mechanical mobility. In the latter it is from manual energy in collecting wood and burning wood itself as solid bio-mass to a shift to labour-saving and healthy LPG. In both cases there is a saving of time, whether in transport or in collecting fuel and cooking. Both do not directly involve any additional productive use. Motor-cycles are used to transport family members and their goods to the market.

However, in our sample villages, neither are they used to sell transport services, nor does the volume of goods transported to the market increase significantly.

In both cases there is a saving of time. However, the value of the time saved depends on what can be done with the time saved. Men did not report any additional labour that they performed with the saved time. Instead, it seemed to go entirely into leisure activities. The benefit from motor-cycles was that of an increase in well-being, mainly that of men. The benefit from LPG is also that of an increase in well-being, in this case, mainly that of women.

In the case of where households did not switch to LPG, the reason given was that women had enough time, so why should families (read: men) spend money to save it? They could not use the time saved to produce more or earn a higher income. And women's leisure, if it had any value at all, appears to be valued less than men's leisure. The result of valuing men's leisure more than that of women was that household income was spent in buying men's assets such as motorcycles, rather than women's assets, like LPG equipment.

As our discussions with men made clear, motor-cycles are prestige goods in the purchase of which there is a bandwagon effect. Prestige goods are not necessarily the luxury goods that Veblen analysed (1899/1994), for which the demand could increase with price increases. But prestige goods are different from common goods, in that there is a status attached to their possession. Of course, the boundary between prestige and common goods would keep changing (Appadurai, 1988). Yesterday's prestige purchase, the feature mobile phone, is today's common one; and the new prestige object is the smart phone.
Prestige goods can also be looked at as aspirational—the aspiration to a certain desired type of life, which requires the use of those prestige goods or gadgets. But realizing aspirations requires having the capacity to aspire (Appadurai, 2004 and Nathan, 2005). Either through building market-based capabilities or through state provisioning, it should be possible to realize aspirations.

The importance of these aspirations, linked to buying and using prestige electrical appliances, was put forward by Thomas Edison in 1913. In an article in the *Good Housekeeping* magazine, he declared, 'the woman of the future' (the article's title) is to become 'rather a domestic engineer than a domestic labourer, with the greatest of all handmaidens, electricity, at her service' (Matly, n.d.). Thus, in the USA, the electrified home, driven by its electrical appliances, was seen as a prestige object.

The two aspirations that can be linked to cooking with LPG are those of minimizing household air pollution and reducing women's drudgery. In our FGDs, neither of these aspirations were currently recognized widely as legitimate aspirations. Household air pollution, the leading cause of death in rural India and Nepal, is not recognized for its negative effects on the health of women and infants. Similarly in the Indian villages, the reduction of women's drudgery was not articulated as a lifestyle aspiration.

The important thing about prestige goods is that in their consumption there would not be the expected cost-benefit calculation—how much does it cost and what would be the return? Rather, the choice architecture (Thaler and Sunstein, 2008) is changed by the entry of prestige goods into the calculation. Thus, prestige goods can be consumed even if there is no direct income return from their use.

Reducing women's drudgery may not be seen as providing any increase in household income. However, for that matter, men's motor-cycles do not increase household income either when they are not used for income-generating activities, like providing transport services. Economic factors are not the only ones that affect people's consumption choices; prestige is also part of consumption choices.

The status of the motor-cycle as a prestige good is the product of social interactions and the resulting social influences on people's spending decisions. These social influences come in two categories (Thaler and Sunstein, 2008). The first is information about how people regard something. For instance, we were often told in FGDs that women do not think that there is any health danger in cooking with woodfuel, though the recent report of the Lancet Commission on Pollution and Health places household air pollution from cooking with solid biomass is the main contributor to premature death in rural India (Lancet, 2017). Would information about the health hazards associated with household air pollution due to cooking and heating with solid biomass begin to affect the choice architecture? It might do so.

The second type of social influence is peer pressure. This often acts in the form of sticking to tradition, or the normal default option. Women in South Africa said that they cooked with wood because 'this is the way we do it' (Matinga, 2010). The default option is that of following the traditional social norm. This can be changed by bold individuals who can adopt a different practice. However, as seen in many indigenous societies, bold women run the risk of being denounced as witches (Kelkar and Nathan, 1991; Nathan, Kelkar and Yu, 1998). Thus, there is sense in different practices being adopted, not by individual women, but by groups of women.

Once a practice is established then the positive effect of peer pressure could be utilized. As men said, they acquire motor-cycles because 'everyone has one.' Similarly, peer pressure can work to make cooking with LPG the new normal. The Nepal Government has launched a scheme to declare villages 'indoor air pollution free'. Such campaigns would promote the adoption of clean cooking fuel.

This kind of positive effect of peer pressure can be seen in the reported adoption of household toilets in rural areas in India. There have even been reports that women have refused to marry into families that did not have household toilets. In a workshop it was mentioned that there were recent cases of women asking for LPG sets to be included in the set of goods to be acquired upon marriage. The Government of India has decided to set up 'LPG councils' (panchayats) to increase peer pressure to increase LPG adoption as the primary cooking fuel. One can say that cooking with LPG or electricity can emerge as the new normal—something that everyone does.

2.10. Conclusion: Add a Nudge to Subsidies and Women's Empowerment

Policies to induce women to undertake an energy transition from cooking with solid biomass to cooking with LPG as clean energy have focused on providing a capital subsidy as an incentive to utilize LPG. We have pointed out that this has usually failed to result in fuel-switching, instead, the result has been fuel stacking, with wood remaining the primary fuel. Our analysis has pointed out the importance of women's agency through

income-earning opportunities and the greater control possible over earnings to bring about an energy transition.

Now, we add another dimension to policies to induce an energy transition—a nudge towards establishing cooking with LPG or electricity as a prestige object/practice. A nudge, as defined in Thaler and Sunstein (2014), is not an economic incentive but a change in psychology or values that influence the choice architecture. Adding clean cooking to the list of prestige goods changes the choice architecture. LPG or electric cooking is an investment-heavy practice, in that the costs of its purchase are immediate, but its benefits are realized over a long period of time, chiefly as a health benefit to women and infants and as a reduction in women's time in cooking. Due to the delayed and often invisible benefits of this practice, it is a good candidate for a nudge.

Adding LPG or electric cooking to the list of prestige goods involves a number of steps. First is the spread of information on the negative health effects of cooking with solid biomass. As Dr. M. M. Pandey of Nepal used to say, the health impact of cooking with wood is equivalent to smoking ten packs of cigarettes in a day (personal communication).

The second step is to campaign, particularly among young women, about the benefits of switching to LPG. In the same way as it was done in the 'Clean India' toilet campaign, school children could be mobilized to spread this new thinking. The third step is to create role models of women who adopt LPG as the primary fuel. All these steps together could re-brand LPG cooking as prestige goods and lead to a bandwagon effect. This would add a nudge to the incentive and women's empowerment factors in the choice architecture.

In promoting LPG as the primary cooking fuel in order to reduce household air pollution and reduce women's drudgery, the point is not to promote the domestication of women. Instead, it is to reduce the hazard to women's and children's health due to the use of solid biomass as cooking fuel and to the overuse of women's time. Building this aspiration is additional to the necessity of women's empowerment in fuel-switching. **In rural areas where women collect wood with their own valued labour women's economic empowerment promotes fuel switching; fuel switching can reduce household air pollution, improve women's health and reduce women's time in cooking.**

3. GENDERED ACCESS TO MODERN ENERGY SERVICES IN AGRICULTURAL PRODUCTION

3.1. Introduction

The use of clean cooking energy is relevant to reducing women's exposure to forms of carbon and other toxic emissions and to reducing women's drudgery or labour time in cooking. In the case of agriculture it is a matter of the use of modern energy services, either electricity or diesel, in powered equipment. As in other cases, it is through powered end-use equipment that modern energy is used in agriculture. Thus, demand for and use of powered or mechanized equipment serves as a proxy for the use of modern energy services. We use the terms mechanized equipment and powered equipment interchangeably, to refer to the use of modern energy services in agriculture.

The difference between cooking and agricultural equipment is that the latter directly relates to an increase in productivity, while the former supports agriculture and other production, but is not recognised as productive work. In both cases, however, the question of whether there is scope to utilize the labour saved in other economic activities or the opportunity cost of labour is important in the decision to adopt labour-saving devices. As Chayanov pointed out with regard to mechanization in agriculture in nineteenth century Russia, where there was little development of handicrafts as a way of using saved labour, there was also lower mechanization than areas that had more such opportunities for the use of labour saved through mechanization of agriculture.

With regard to the use of modern energy services in agriculture, our research question is: what are the constraints to women's use of modern energy-based equipment in agriculture? How have these constraints been addressed in India and Nepal? In answering these questions we first set out the background of women's role in agriculture and the extent of mechanization of agriculture, and of women's and men's tasks, in India and Nepal. Next we set out the division of labour between women and men in agriculture in India and Nepal and how differences in women's and men's wages, combined with these divisions of labour, have shaped the course of mechanization. Other constraints analysed are: that subsidy schemes for mechanization of agriculture are provided only to owners of land (which women, by and large, are not) the intra-household decision-making system, in which men are accepted as decision makers on investments in new technology; women's poor access to information and knowledge about new technologies; social and cultural norms that define the operation of machinery as men's domain; and the gender bias in designing and implementing technology policies in agriculture.

Having set out the major constraints in women's use of energized machinery, we then look at the ways in which these constraints have been modified by market forces or dealt with by policies of government and CSOs. First is the analysis of the effect of male migration on mechanization. Next we consider different government policies and initiatives to deal with the constraints in women's use of powered equipment. The governments of both India and Nepal have instituted policies regarding women in agriculture and we look at the nature of these policies. Besides governments, there have

also been initiatives by CSOs to increase the adoption of electricity or diesel powered equipment by women through women SHGs. The move from equipment purchase to payment for the use of specific agricultural services is an important development in the market for expensive powered agricultural equipment. The development of small capacity equipment has also enabled women to use modern energy services for small-scale production. Women's groups have also taken up information, knowledge and capability development of women with modern energy agricultural equipment. After this we look at factors that promote or impede women's adoption of electricity or diesel powered equipment in agriculture. The final section summarizes the factors that have led to policies for promoting women's use of modern energy.

Women engaged in mechanical processing of harvested grain. Photo: CRT, Nepal

In India, though the share of manual and draught power in total farm power has come down by 50 percent during 1970–2012, the level of mechanization in agriculture, i.e. use of powered machines in overall farm operations from land preparation to marketing of the produce, was just about 40 percent in 2016 (Mehta *et al*., 2014). While in the case of Nepal, the level of agriculture mechanization was 23 percent in 2010–2011, with wide variations in different agro-climatic zones (92 percent mechanical power use in the Terai region), and the remaining was done with animal power (41 percent) and human power (36 percent) (Shrestha, 2012). When compared to developed countries like the United States, the level of mechanization is 95 percent, and in developing countries like Brazil, it is 75 percent, which clearly indicates the engagement of high intensity of manual labour in agricultural operations in South Asia (Mehta *et al*., 2014).

Women and men engaged in manual agricultural work in India. Photo: Elavarasan Devarajan/ENERGIA

Against this backdrop, it is important to analyse the evidence of for feminization of agricultural work in both India and Nepal and the dynamics of agricultural workers vis-à-vis women farmers. In India, the recent World Bank estimates pointed out a sharp change in percentage of agriculture workers to total workers from 55 percent in 2011 to 41 percent in 2020 and 27 percent in 2050. However, it has been projected that the proportion of female workers is likely to increase from 37 percent in 2011 to 45 percent and 60% in 2020 and 2050, respectively. In the case of Nepal, increasing male out-migration created a condition for many more women to manage the land as the *de facto* heads of the households (Tamang 2011; Paudel *et al*., 2012). In addition, it is important to note that the women-headed households have also doubled in the last 15 years from 13 percent in 1995 to 26 percent in 2010 (CBS, 2011). The recent data supported the on-going trend that 72.8 percent of women and 60.2 percent of men were primarily engaged in agricultural activities in Nepal (MoAC, 2010).

3.2. The Picture of Gendered Mechanisation in Agriculture

The gendered pattern of access to and use of farm machinery has been there since the introduction of the Green Revolution. Hansda (2018) attributed gender differences in the use of farm machinery to: (1) the prevailing gender division of labour agricultural work which limited the responsibilities in farming tasks, such as land preparation and ploughing to men and intensive back-breaking tasks such as transplanting, and weeding by women; (2) the introduced machinery was suitable for large farm holdings, was cost-intensive and required special skills to operate and maintain, which are also perceived as the domain of men; and (3) social and cultural norms encourage men to use farm machinery. They considered that the machinery, by design, suited men's physical abilities rather than those of women, who do not have the strength of men (Hansda, 2018).

As one would expect there are variations in farm mechanization, higher for men's tasks and lower for tasks carried out by women. In India the extent of mechanization was high in land preparation in all study sites, even in remote and commercially poorly developed Koraput district. Mechanization was almost non-existent in weeding and transplanting, tasks carried out by women. Our field data correspond with national figures for India – farm mechanization is 42 percent in land preparation; 32 percent in seed sowing; 34 percent in plant protection; 37 percent in irrigation; and 60-70 percent in the harvesting

of wheat and paddy (Mehta, et al, 2014). Clearly, mechanization is not based on the extent of drudgery. As we see in a very onerous task is that of shelling corn. A woman farmer who shells corn from the cob uses her finger tips on an average 522 times, fingernails 144 times and palms 55 times for every kilo of corn grain separated from the cob (Sreelatha and Naomi, 2012).

3.3. Factors in Gendered Mechanisation

We earlier explained the gendered nature of agricultural mechanization not just in our study sites but in the two countries as a whole. We now look at the factors resulting in this gendered mechanization. Identification of these factors is also another way of identifying the constraints and processes that need to be tackled in order to encourage women's access to and use of mechanized equipment.

3.3.1. Gendered Division of Labour in Agriculture

In Nepal as well as in India, women have been actively involved in different practices of crop cultivation as well as animal husbandry. Increases in farm productivity and farm income is closely associated with the use of modern energy services such as land preparation, sowing, transplanting, threshing, processing, transportation, value addition, grass chopping, milking, bulk cooling and so on. Table 4 and 5 show the division between labour-intensive women's tasks and men's tasks in the study areas.

Table 4: Labour-intensive agricultural field operations across study sites in India

India	Tasks
Koraput	***Women:*** transplanting, weeding, harvesting, threshing, drying, storage, processing, grinding and livestock shed management and head load to market
	Men: land preparation, sowing, irrigation and threshing
Mayurbunj	***Women:*** transplanting, weeding, harvesting and threshing, drying, processing and storage
	Men*:* land preparation, irrigation, harvesting and threshing
Wayanad	***Women*****:** transplanting, weeding, harvesting and threshing, livestock management – chaff cutting
	Men: ploughing, irrigation and threshing
Dindigul	***Women:*** transplanting, weeding and chaff cutting for livestock
	Men*:* land preparation, irrigation, sowing and harvesting, marketing

Source: Fieldwork

Table 5: Labour-intensive agricultural field operations across study sites in Nepal

Field sites	Tasks
Kailali	***Women**:* weeding, harvesting, transport of produces, threshing, post-harvest processing and grinding, chopping and preparation of fodder for cattle, marketing of vegetables
	Men: land preparation, sowing, irrigation, marketing, milking and milk processing
Dhading	***Women*****:** Weeding, harvesting, transport of produces, threshing, drying, post-harvest processing and grinding, chopping and preparation of fodder for cattle
	***Men**:* land preparation, irrigation, milk collection and value addition
Kavre	***Women*****:** sowing, weeding, harvesting, threshing, post-harvest processing and grinding, chopping and collection and chopping of fodder for cattle
	Men: ploughing, irrigation and transport of produces
Rupandehi	***Women*****:** weeding, harvesting, post-harvest processing and grinding, chopping and collection and preparation of fodder for cattle
	Men**:** land preparation, irrigation, transport of produces, threshing and marketing

Most importantly, the work of women workers involves drudgery, and such work takes longer to complete on a daily basis. There has not been much change in the kind of women's manual labour in the past one decade when compared with the tasks in which men are involved (Hansda, 2018, for India).

3.4. Gendered Differences in Valuation of Labour

There is a division of labour in agriculture, as in most other activities, including domestic work. This itself need not have an impact on mechanization, if activities of each gender were valued equally. In the case of cooking, it was the non-valuation of women's domestic labour that retarded the adoption of labour-saving clean cooking systems. In agriculture it is the low valuation of women's labour that results in the observed low mechanization of women's tasks in agriculture.

The differences in wages between women and men is a key factor driving differences in mechanization. The well-known gender differences in wages for women and men is reflected in our study areas, as ascertained through FGDs. In Nepal the ratio of men's wages to women's wages is 2:1, approximately uniform through all the study areas. In India wages differ from one study area to another but the ratio of men's to women's wages is also around 2:1.

Table 6: Women's and men's daily wages in agriculture in study areas

India		Wages		Nepal	Wages	
		Women	Men		Women	Men
Koraput		INR 120-160/ day	INR 250 to 300/ day	Kailali	NR 250/ day	NR 500/ day
Mayurbhanj		INR 100-150/ day	INR 300/ day	Dhading		
Wayanad		INR 200 to 300/ day	INR 500 to 600/ day	Kavre		
Dindigul		INR 180-200/ day	INR 400/ day	Rupandehi		

Source: Fieldwork

Mechanization carried out by agricultural households will be biased towards saving high-priced men's labour rather than low-priced women's labour. This is the pattern see in the account of mechanization given above from Mehta et al (2014) for India.

3.5. Women Rarely Owners of Land

One reason for women's restricted ownership of farm machinery, is that the official definition of a farmer is the owner of a farm land. Women rarely own farm land in India or in Nepal. As per Census of India 2011, of the total female main workers, 55 percent were agricultural labourers and 24 percent were cultivators. Yet, only 12.8 percent women are operational holders who have responsibility for the operations of the farm. No precise data are available on women's ownership of agricultural land. In Nepal, 67.7 percent of women are self-employed in agriculture compared with men (53.3 percent), but women own only 19.2 percent of the land in their own names. The gender disparity in ownership of landholdings and other assets in agriculture restrict their access to productive resources and services, resulting in undervaluation of the women's labour as well as in farm machinery, thereby reducing farm productivity and income.

3.6. Intra-household Barriers

Men are regularly accepted as the decision makers in the household in the purchase and use of farm machines. Male migration and the shift in men's roles to non-farm livelihoods have provided operational space for women to take some day-to-day decisions in farming operations. However, men still dominate the strategic decisions such as regarding investment in labour-saving machines, changes in the cropping pattern and marketing.

3.6.1. Women's Lack of Access to Information and Knowledge

In FGDs in both India and Nepal women pointed to the lack of information about the new technology as a factor impeding its adoption. They pointed out that they were not aware of mechanized equipment that could reduce drudgery in women's tasks, such as weeding, sowing, transplanting and even chaff cutting. Studies by Peterman et al (2010) and Ragasa (2012) also pointed to the lack of information about machinery as a negative factor in women's use of powered machines. We noticed in the fieldwork that, men have greater

access to information about land titles and finance; they are also more mobile and interact much more with government agencies and the private sector,

Gender in the use of machinery, however, is a social construction. FGDs and other discussions pointed to the existence of deep-seated ideas about women not being suited to use new technology, of women not having the strength to operate them. These attributes of machinery as being in the domain of men, however, are subject to challenge and change, as we will see later on in this chapter.

3.6.2. Gender Bias in Design and Implementation of Technology Policies

In India, the recent Sub-Mission on Agricultural Mechanisation (SMAM) policy of promoting the use of farm machines to women farmers is by providing access to SHGs of women farmers to establish CHCs. However, the choice of the existing machinery in the CHCs decides how the energy access and use empowers women in increasing productivity, reducing drudgery and saving time. In addition, the gender bias of the actors in the implementing agencies (mostly men) is considered as one of the barriers in practice. Further, the guidelines developed to access the machine is not gender sensitive and not much efforts have been taken by them to create an awareness among rural women and men about the policy provisions. From the interviews with officers of ATMA and Agricultural Engineering Department in Dindigul, who are implementers of the policy, it came out clearly that they are influence by patriarchal values in implementation which restrict women's access to and use of farm machines.

3.7. Increasing Women's Access to and Use of Agricultural Machinery

Having identified factors and processes that have led to the phenomenon of gendered mechanization in agriculture, we now turn to ways in which these factors and processes have been modified and their effects in changing the gendered patterns of mechanization.

We start with the important factor of migration, specifically the migration of men. This is followed by developments in government policy meant to facilitate women's access to agricultural machinery. Besides government policy a major role in increasing women's access to modern energy service-based machines has been played by collectives of women, whether organized in Self-help Groups (SHGs) in India or Credit Groups (CGs) in Nepal. After this we consider another market-based development, the size of equipment such that it can be used by small farmers and also easily operated by women, not requiring the kind of upper-body strength required by large machines, such as 10 or 15 HP diesel engines.

3.7.1. Migration and Mechanisation

Migration, mainly migration of men, is usually understood as part of the development process as workers move from low-productive agriculture to high-productive industry or services. This has both reduced labour supply in the rural, source areas. The resulting labour shortage has led to an increase in wages in these areas. Women have also had to

manage number of formerly men's tasks. With taboos about ploughing and stereotypes of women being unable to operate machinery, women in our study areas (other than those where CSOs had taken up the tasks) did not operate tractors or land tillers, but hired other men to perform these tasks. Women now manage the performance of these tasks on their but do not carry them out, except for notable exceptions such as SEWA where women are enabled to take up these mechanized tasks.

Owner and Manager of Solar Panels, Gujarat SEWA. Photo: SEWA

The mechanization of high-wage tasks, such as land preparation by men is commonly seen in both India and Nepal. However, what is interesting is to see the growing trend about the mechanization of women's post-harvest tasks, such as winnowing and threshing. Electric fans are now deployed for the winnowing, while threshing is carried out with diesel-powered equipment. This was observed in Kailali, Nepal, where there is a high level of migration, but not in other sites in Nepal or India. Thus, women's tasks can also be mechanized when there is an overall labour shortage within farm households.

3.8. Government Policy

Adoption of mechanized equipment is not only a matter of market-based responses to wage levels or migration. It is also a result of government policy on mechanization. Until recently the government promotion of mechanization through providing subsidies has been gender blind, in the sense that no difference was made on devices that would substitute for men's or women's work. What this means is that there was no attempt made to offset market-based choices on which labour to reduce with machines. Furthermore, while seeming to be gender blind there was actually a gender bias in the subsidy policies. Subsidies were only provided to farmers. To be recognized as a farmer a person had to own land. In general, women did not own land or have finances of their own. They, therefore, were not eligible to buy farm machinery.

More recently there have been changes in the subsidy policy. A higher subsidy is given to women who buy the machinery. Of course, there is still the requirement to own land in order to be recognized as a farmer. This has led to a number of cases in which men have registered land in their wives' names in order to be able to have access to the higher subsidy. Discussions with agricultural department officials in the areas of Dindigul, Koraput, Mayurbhanj and Wayanad showed that some 5 to 7 percent of farm equipment is now being purchased in women's names.

In Nepal there is no requirement to have land ownership in order to purchase farm machinery. It can be done on the basis of the national identity card, which all adults, women and man, possess. This is a relatively new policy and thus it is not possible to get any idea of its impact.

The question is: why are these new policies introduced for higher subsidies for women farmers? This seems to be both a response to the growing importance of women as voters and the attempts of political parties to develop a clientelistic politics and the requirement to draw women into greater managerial roles, brought about by men's migration. These issues are discussed further in Chapter 6 on gendering the political economy of energy access.

3.9. Group Initiatives

Farm equipment, such as tractors and combine harvesters are expensive. It would only be possible for large farmers to buy them. But there is no reason why they should be usable only by large farmers. The equipment can also be rented out and paid for on a use basis. Even in remote areas, such as Koraput, one can observe tractors being rented out to plough small plots of land. Since in any case, large equipment is only used for a short period of time on the owners own plots of land, their rental develops an asset-light economy. Rather than buying a bulky, non-divisible machine, one buy only its use for a period of time. Buying of a service, such as land preparation, replaces purchase of the equipment. Energy, of course, is sold as a service, paid for by the units used; now other capital-intensive products are also developing in the same direction. One buys not the equipment, but the service it provides.

The Government of India in 2011 to promote such renting of agricultural machinery promoted 100 CHCs to be set up by groups of small farmers, with substantial initial subsidy provided by the government. In the usual manner the gender identity of men with machines has continued in this scheme. But women's groups have seized the opportunity to set up their CHCs, owning the machinery and training women to operate and maintain them.

Some CHCs were set up in Mahrashtra by women's groups under the Mahila Sasakthikaran Pariyojana. But the groups in Maharashtra showed the usual gender bias in the equipment acquired (Srivinas et al, 2017). Women's groups got non-mechanized equipment such as simple hand-operated tools, rather than mechanized tools, which were given to men's groups.

In Nepal the Alternate Energy Promotion Centre (AEPC) has come up with the option of showing the citizenship card and a letter of recommendation from the Village

Development Councils (VDCs) as evidence to claim the entitlements related to renewable energy products, such as improved cook stoves, biogas plant, solar irrigation pump sets and solar home systems. This has enabled women to use clean energy technologies. Of the four products, improved cook stoves and solar home systems have been adopted by a large number of women in the remote study sites, while biogas is more common in both moderate and well-connected study sites.

However, the situation was different with the self-conscious women's empowerment CSOs. In Kerala women's groups of Kudumbashree and the Land Army have organized CHCs; while the Self-employed Women's Association (SEWA) has set up such centres in Bihar. In both cases the women's groups have acquired all the required agricultural machinery, including tractors and power tillers.

3.10. Small-sized Equipment

Women's entry into the market for agricultural machinery has been promoted by the development of small capacity equipment. Large capacity diesel pumps have been replaced by small capacity solar-powered pumps, powered by two to four solar panels of 75KW with one or two HP power.

In Nepal small capacity solar-powered pumps have enabled women to buy them for irrigation and other household uses. In Nepal fieldwork showed that women were using these small pumps to grow high-value vegetables, replacing earlier manual irrigation on small plots of land. They could bring more land under cultivation of these high-value crops, while reducing the drudgery of manual irrigation.

In Gujarat, SEWA women owned these solar irrigation sets. With this they could change their cropping system from low-value to high-value crops, increase the productivity of staples, such as of pearl millet by 30 per cent and reduce the risk of water shortage in their farming system. Women pointed out that the technology is simple and they can all learn to operate it, as compared to the older diesel engine system which was difficult to operate.

Solar irrigation sets, however, are expensive. In Nepal, women said that 'Solar is used by higher class farmers'. To overcome the cost problem, the VDCs promoted a collective approach. The group buys the set and individual users pay for its use. Here too, we see a shift from purchasing a product to paying for the services provided. This has enabled almost 90 per cent of women farmers in Pavera and Dhangadhi villagers to adopt solar irrigation technology.

Group ownership of the irrigation system removes the constraint of women's non-ownership of land, while payment per service makes it possible for even very small farmers to utilize irrigation to cultivate high-value crops. One can see this as an approach that can be generalized to support women's use of modern energy services removing the asset constraint and enabling women farmers, even small farmers, to adopt irrigation to switch to higher value crops.

In SEWA, India, cash loans for the solar irrigation systems, when owned by an individual woman were secured through group collateral, rather than the land collateral. In addition,

the cost for irrigation systems used were paid by group members. Different methods of financing and group payment for use of the modern energy services is a manner in which poor women farmers, lacking ownership of land, could extend their use of modern energy services in agriculture. Our field reports showed that women are operating these machines. Successful schemes to provide such machines to women have generally bundled a number of services; they provide the machines and the finance needed to acquire them as well as train women to use them and form the groups that can buy and sell energy services provided by the machines.

3.11. Size of Unit

There can be some development of payment for modern energy services, rather than energized machinery. But where the service required is continuous then there may be a limit to how small the unit can be to utilize modern energy. In Dindigul, India, women maintain very small livestock production, such as with 75 to 100 birds in a unit. At this size they say that it is not profitable for them to invest in setting up electrical incubation or hatchery units. In Kailali, Nepal, however, livestock units are larger and there is investment on electrical equipment for units with 300 to 500 birds. Interestingly, women have included energy-consuming appliances, such as fridges and hair dryers, in the small eateries as well as in beauty parlours in Nepal. But generally, despite high demand for use of electricity for productive work, the shortage and irregular supply means that these anticipated benefits are attained to an insufficient extent.

There is a similar scale effect in dairy farming and milk production. Most women have one or two animals and carry on with manual cleaning and milking. On the other hand, in Wayanad, India, where units had around 15-20 animals in a unit there was scope for investing in mechanized milking and cleaning equipment. While in solar irrigation there can be a rotation of the time when the service is supplied to different users, in the case of dairy equipment all production units would require the electrical equipment, such as milking equipment, at about the same time. In such a situation of simultaneous use, the units have to be large enough to individually invest in electrical equipment.

Subsidized household electricity supply, as in Dindigul, India, was used not only for domestic purposes but also for production. A women's group there had taken up production of bio-fertilizers, which required both electricity powered equipment and refrigeration.

Box 1: Kudumbashree Programme – Agricultural Machinery Service Centres

Kudumbashree, a poverty eradication and women empowerment programme started in 1997 under State Poverty Eradication Mission, Government of Kerala, India. It provided an enabling environment for women's participation in the grassroots through the network of Community Based Organizations called Neighbour Hood Groups as the primary unit. Though it started off with thrift and credit activities, in the later stage, economic production led strategic advancement became a guiding force to consolidate the movement in the grassroots. Now, Kudumbashree is an important player of the State that is involved in micro enterprises development, collective farming and solid waste management. This initiative has grown to be one of the largest women's CBOs in Asia with a membership of about 4.3 million women.

Some of the groups run Agricultural Machinery Service Centres. The women have learnt to operate and maintain various agricultural machinery, such as power tillers, weeders, seeders and so on. These agricultural services are provided on payment to farmers. As a result the capital investment in these machines is more intensively used than would be the case with farmer-owned equipment. This promotes the development of an asset-light economy, while women are able to overcome traditional norms of not undertaking land preparation or operate energized machines.

Regular and reliable access to electricity can make it possible to undertake fairly large-scale investments. In Lalitpur district of Nepal, a reliable road and electricity connection led to group investment in a milk chilling plant. This benefited families rearing buffaloes in some ten villages surrounding the chilling plant as they sold larger quantities of milk through the chilling plant. Even though the electricity was not so regular, it was sufficient to enable the chilling to be run as required.

3.12. Information and Capabilities

Besides not owning land, lack of information and knowledge was also found to be an impediment to women's use of modern energy services in agriculture. On the contrary, women's acquisition of knowledge, such as that of the System of Rice Intensification (SRI) was seen in South India to have a positive effect on women. With this knowledge they could participate in household decisions on the adoption of new technology, something from which they were earlier excluded (Nathan et al, 2018).This account allows us to add another factor influencing women's use of mechanized equipment, their knowledge of the new technology.

The SEWA units in both Bihar and Gujarat provided women with access to information, knowledge, extension services and institutional linkages that enabled women to learn about, acquire and then operate the new machines. The individual managed rural enterprises by women in the study sites have shown that they acquired their agential power over a period of years through a combination of actions and by developing their technical capabilities, rather than just their access to energy-based services alone.

Box 2: Women's Use of Farm Machinery in SEWA Kendra- Munger District, Bihar
Manju Behn, a mother of 3 children, has 5 bigha of land in her husband's name. She bought 2 bighas of land in her own name from her savings from agricultural work. Importantly, productivity from land from using machines is much higher than manual cultivation. While manual cultivation yields 40 kg of paddy on average, the use of farm machinery yields 20 to 21 percent more per bigha.

SEWA Sahara Kendra (SSK) has the machines supported by SEWA (One SSK serves four villages). They are planning to buy a weeder. Women can give these machines on rent to other farmers. Women hire these machines on a membership basis on a daily rent of INR 300 per bigha. Non-members can hire these machines for INR 400 per bigha.

Manju Behn is the treasure of SSK. The centre has two transplanters, one zero tillage (which is always operated as an attachment to tractors), two reapers for harvesting, one pump set, one thrasher and one sprayer. There are 113 members in SSK of which 19 members regularly operate these machines, except the zero tillage. Women find it difficult to drive tractors in small fields but they hire men to operate the tractors and zero tillage. Of the 113 members, 61 women regularly operate machines. They find it easy to operate reapers, pump sets, thrashers, sprayers and diggers except the zero tillage which is attached to tractor and they find it difficult to manoeuvre.

Another woman member bought 15 cents of land in her name for INR 6000. Now women are buying land in their own names. All of these are married women: 15 from this village and 25 from other three villages bought land in their own names. A total of 40 women bought land though in tiny parts. On a query asking they bought land, Manju behn said "We can sell this land, and support myself and live with dignity, in case the husband throws me out". SEWA has trained them to have their own accounts which women find very useful for their independent savings and buying land. They manage their own accounts and have refused their husbands' demand to use their ATM cards.

For example, the production units run by the Self Help Groups (bio inputs production, milk value addition units, coir rope making units, etc.) gained their agential power by accessing associated productive resources and services of which access to energy is a key factor. Similar cases were observed in the study sites of Nepal. The access to productive resources such as technology, credit, market, knowledge and skills and backward and forward linkages were made possible through collective power.

3.13. What Drives Agricultural Mechanisation by Women?

The machinery use at the individual level is largely based on gendered access to and control over resources and services and perceived increase in farm profitability. The field studies in all three different contexts (remote, moderate and well-connected areas) in both the countries reveals the gender-based variations in access, use and adoption in farm machinery, which is primarily due to cost, lack of access to corresponding information, lack of knowledge and awareness of women farmers on the benefits of machinery in reducing the labour and drudgery in their work, lack of institutional linkages to access the machines, and constraints in their skills to use the machines.

Our FGDs with women farmers during the fieldwork indicated a general lack of awareness on their entitlements to farm machines in all the field sites in India and Nepal. They expressed that without knowing the details of the available options they were not in a position to make a demand for accessing and using the machines to reduce drudgery in the work in which they are currently engaged in such as weeding, sowing/transplanting and chaff cutting.

The field experiences in Koraput, Odisha, indicated that the use of paddy milling technologies reduced the manual work by 90 to 120 minutes per day, which was productively spent on establishing home gardens with vegetables for self-use and in collecting non-timber forest products from nearby forests. In the Dindigul site, women used the time saved due to the use of clean cooking solutions (through LPG) on taking additional productive work as well as spending on well-being and leisure or with children's education.

Similarly, in the case of Nepal, the time saved by the use of improved cook stoves (biogas, biomass and LPG) was observed to be used in different ways benefitting the household. In Dhading and Kavre in Nepal, this time saved was used in vegetable farming for self-consumption rather than marketing of all the produce. In addition, the women had formed groups for large-scale vegetable farming with the produce being marketed in neighbouring districts as well. In Rupandehi, women were weaving baskets, beads and other crafts that were fetching cash through selling around the major pilgrimage and tourist centre of Lumbini (the birth place of Buddha).

The household survey revealed that in India, women in well-connected areas have a greater use of farm machinery (36 percent) as against 14 percent and 11 percent in moderately remote and remote areas (Table 7). For the rest of the variables, it is only formal schooling and being an unpaid family worker that relate to women's greater access to agricultural machinery. That unpaid family workers have more access to farm machinery than independent income earners could be due to the former being bigger farmers with somewhat mechanized farms, while independent income earners operate micro, unmechanized enterprises.

Table 7: Use of Farm Machinery by Women: India

No.	Variables	No. of women	% of women in category
1.	Remote areas	21	11% [190]
	Moderately connected	7	14% [51]
	Well connected	20	36% [55]
2.	Unpaid family worker	36	23% [156]
	Independent income earner	12	9% [139]
3.	Non-CBO member	11	14% [79]
	CBO member	37	17% [218]
4.	No asset ownership	45	10% [249]
	Asset ownership	4	8% [48]
5.	No decision-making	30	16% [189]
	Role in decision-making, joint + sole	18	17% [108]
6.	No formal schooling	13	9% [152]
	Formal schooling	35	24% [145]

n = 297

Numbers in brackets are of women in that category

Source: Household survey

Table 8: Use of Farm Machinery by Women in Nepal

No.	Variable	No. of women	% of women in category
1.	Remote areas	10	5% [129]
	Moderately connected	5	9% [55]
	Well connected	25	27% [94]
2.	Unpaid family worker	12	7% [184]
	Independent income earner	28	30% [94]
3.	Non-CBO member	20	10% [202]
	CBO member	20	26% [76]
4.	No asset ownership	26	11% [238]
	Asset ownership	6	15% [40]
5.	No decision-making	36	17% [216]
	Role in decision-making, joint + sole	4	6% [62]
6.	No formal schooling	10	11% [93]
	Formal schooling	30	16% [185]
7.	Non-migrant HH	30	17% [181]
	Migrant HH	10	10% [97]

n = 278

Numbers in brackets are of women in that category.

Source: Household survey

In Nepal women's agency parameters such as women's asset ownership, decision-making power and role in management and marketing are not substantially related to their access to energy in productive work. However, as independent wage earners, women had higher rates of access to energy for productive work (69 percent) when compared with unpaid family labour, which is contrary to the Indian context. It would mean that independent earners in Nepal (Table 7) operate mechanized enterprises compared to independent earners in India who may operate non-mechanized enterprises.

3.14. Conclusion

Migration reduces the rural work force. This both leads to greater operational responsibility for women, though not greater decision-making power in strategic areas such as crop selection or investment. However, the reduction of the work force does seem to have an impact on mechanization of formerly neglected women's tasks, such as threshing and winnowing. High male migration in Nepal has been a major driver of agricultural mechanization; though less so in India. Migration is an important market related factor directly impacting on use of modern energy service-based equipment in agriculture.

Government policy to provide higher subsidies for women has led to some registration of small plots of land in women's names in order to secure those higher subsidies. More important has been the spread of women's groups of different types in promoting adoption of mechanized machinery in agriculture. The development of machine hiring centres, often run and operated by women's groups, has promoted the development of

an asset-light economy, utilizing equipment for longer periods of time and reducing investment. This is likely to be the direction in which agricultural mechanization will proceed, extending from upper income rural households to draw even small holders into the mechanization process. It is important for women to have access to information and secure knowledge of the working of new technologies.

BROADENING THE ANALYSIS

4. GENDER INCOME INEQUALITY, DECISION-MAKING AND ROLE OF WOMEN'S COMMUNITY BASED ORGANISATIONS

In this chapter we undertake the analysis of gender factors affecting women's use of LPG or biogas and agricultural machinery. First we draw out what is common in terms of gender inequality in the valuation of labour. Since reductions of gender inequality in wages and other incomes do not automatically translate into increased use of clean cooking energy or mechanized equipment we look at factors that affect women's agency in decision-making. This is followed by a discussion of the different ways in which membership of women's CBOs affect women's functioning in different socio-economic spheres.

4.1. Gender Income Inequality

In Chapters 2 and 3 we have looked at two different issues – that of the switch from cooking with solid biomass to clean cooking energy, whether LPG or biogas; and that of constraints in the adoption of mechanization by women in carrying out work in agriculture. The first issue deals with labour in care work and the second with labour in the production sector of agriculture.

In cooking women's adoption of clean cooking energy is not beneficial to their health and that of children, but also reduces the time spent in cooking, which includes the time spent in collection of wood or other biomass and in cleaning vessels after their use in cooking. This saves women's otherwise unpaid labour and reduces their drudgery in the performance of care work. In the case of the mechanization of women's work in agriculture, there is also a saving of labour. But we saw that there is a connection between women's low wage and men's high wage and the greater mechanization of men's work compared to women's work.

What unites women's labour in the two domains of cooking as part of care work and work in agriculture? What we are dealing with are gender inequality in wages and income, including in the latter income from self-employment or own account work. In the case of cooking and care work in general, women's labour is unpaid or has a zero payment. In the case of conventionally called economic work, women's wages or incomes are lower than those of men. Both of these cases, unpaid and low-wage work of women compared to the high-wage work of men, are instances of gender inequality in income. In fact, one might say that unpaid labour is an extreme case of low wage work.

Thus, we are dealing with what are two different types of gender inequality in the valuation of labour – zero value for women's work in care work, and low value for women's work in agriculture compared to high value for men's work. In each case an important finding in our analysis is that it is necessary to increase the value of women's work, the wages or income that they earn.

Given that wages influences the extent of mechanization or the adoption of labour-saving devices, a reduction of wage inequality is likely to reduce the inequality in the adoption of labour-saving devices. Thus, it is important to reduce gender inequality in income in order to reduce gender inequality in the use of modern energy.

An increase in women's economic involvement, however, may not necessarily lead to an increase in their use of modern energy. Two factors are necessary to translate greater economic involvement into greater use of modern energy. One is the translation of women's greater economic involvement into agency, meaning the ability of women to take and implement decisions. The second factor is that of a change in norms that restrict women's use of modern energy, whether in care work or in agriculture.

4.2. Women's Decision-making

The persistent inequality of women in political economy is reflected in the pervasive gendered systems in the ownership of productive assets and property, the opportunity to participate in production, control over the results of production, control over household and personal decisions about access to energy. The inclusion of the variable membership of women in CBOs stems from the theoretical proposition that women are in a better position to influence their environments through participation in formal and informal institutions. Women's collective voices are said to be significantly contributing to changes in laws, policies, services, institutions and social norms, which in turn will lead to an increase in women's individual agency (World Bank, 2012). The analysis is based on the primary data collected from the research sites in India and Nepal.

Table 9: Details of Variables Included in Analyses of Women's Decision-making

Variable	Nature of Variable	Sub Categories	Description
Outcome Variable: Women's overall decision-making			
Women's overall decision-making position (This is based on women's decision-making position in household management & personal decisions) **Reason**: 1) Household management is where women have some decision-making authority in the study sites. 2) Decision-making power in personal decisions reflects a high level of individuality and decision authority	Categorical	0=None 1= Low 2= Medium 3= High 4 =Absolute	0= Women have no decision power in either household/personal decisions or in both decision spheres 1 = Men take decisions on aspects related to household management/personal decisions without consulting women 2 = Women provide consultation to men while men take the lead in decisions related to household/personal aspects or in both 3= Women take decisions in consultation with men in either household/personal decisions or in both the decision spheres 4 = Women take decisions without consulting men in either household/personal decisions or in both decision spheres
Explanatory Variables			
Women's membership in CBOs	Categorical	0/1	0 = Not a member of a CBO 1 = Is a member of a CBO
Status of education of respondents	Categorical	0/1	0 = No Formal Schooling 1 = Formal Schooling
Migration for employment by any of the adult primary member(s)	Categorical	0/1	0= No migration 1 = At least one adult primary member has migrated for employment
Women's Asset Ownership—House/Land or Both	Categorical	0/1	0 = Women do not own houses or land 1= Women own houses, land or both

4.2.1. Women's Overall Decision-making Power

It is observed from Table 8 that in remote locations in both India (Koraput and Mayubhanj) and Nepal (Dhading and Kavre), the majority of respondents reported low- and medium-level decision-making capacity. In India, as we move to moderate (Wayanad) and well-connected (Dindugul) regions, larger numbers of respondents report medium- and high-level decision-making capacities. However, in Nepal, even in moderately (Rupandehi) and well-connected (Kavre) locations, a predominantly low level of decision-making was reported.

Table 10: Women's Overall Decision-Making Power (in numbers)

Decision-Making Level	India			Nepal		
	Remote	Moderately Connected	Well Connected	Remote	Moderately Connected	Well Connected
None	59 (31)			5 (4)	28 (51)	13 (14)
Low	103 (54)	4 (8)	23 (41)	88 (68)	15 (27)	67 (71)
Medium	7 (4)	15 (29)	16 (29)	17 (13)	3 (5)	8 (8)
High		20 (39)	13 (23)	13 (10)	8 (15)	3 (3)
Sole	21 (11)	12 (24)	4 (7)	6 (5)	1 (2)	3 (3)
Figures in parentheses are percentages to total						

Interestingly, a higher proportion of women reported sole decision-making power in remote and moderately connected districts in India. These regions, namely, Koraput, Mayurbanj and Wayanad, are districts with predominantly rural indigenous peoples. A moderately connected district in Nepal (Rupandehi) has a relatively high proportion of respondents reporting in the decision-making category 'none'—no decision-making capacity, followed by the 'low' decision-making capacity. Interestingly, this is the district which also reports the largest number of male out-migrations (32 out of 55 respondents).

Table 11: Women's Membership in CBO's (In numbers)

Remoteness	India		Nepal	
	Yes	No	Yes	No
Remote	124 (65)	66 (35)	117 (91)	12 (9)
Moderately Connected	38 (75)	13 (25)	36 (65)	19 (35)
Well Connected	56 (100)		49 (52)	45 (48)
Figures in parentheses are percentages to total				

Across locations in both India and Nepal, a higher proportion of women were members of CBOs. In India, the proportion was highest in the well-connected district Dindigul, while in Nepal it was the highest in the remote districts of Dhading and Kavre. In Nepal NGO activities are concentrated in the remote districts, which have a higher incidence of poverty.

4.2.2. Determinants of Women's Decision-making

The signs of the multi-nomial logistic (MNL) coefficients obtained for the explanatory variables in the analysis for India are in conformity with the *a priori* expectation of the factors that contribute to women's decision-making power. In India, women's asset ownership status, the time spent by women in income earning work, the membership in CBOs and women's formal schooling were all observed to positively relate to women's ability to possess a higher level of decision-making, ranging from the 'medium' to the 'sole' levels. However, the statistical magnitude of correlation is significant at the 1 percent level across all the variables. On the other hand, Nepal showed a different picture with outmigration of adult male member(s) in the household being the only variable that was observed to have a positive correlation with women's decision-making capacity. Women's membership in CBOs is observed to correlate only to the 'low' level of decision-making.

Our discussions across FGDs and key individuals, shows the relevance of CBOs in challenging gender norms. An individual woman increasing her earning power may find it difficult to individually challenge established gender norms, such as men's role in household decision-making. Such challenges are more likely to be made and are more likely to succeed when they are undertaken by groups of women. The role of CBOs has been highlighted in another study of the Indian Himalayas, where the SHGs are reported to have been successful in reaching poor women, especially in terms of building their financial skills and economic agency for small-scale group-based income generation (Kooijman-van Dijk, 2008).

The role of the time spent by women in productive work comes from a feminist analysis that gives central importance to women's involvement in paid employment. Ester Boserup argued that women are marginalized in the economy because they earn less than men as workers or farmers. (1970). Women, however, participate in the market economy not only as employees, but they are also what is commonly called 'self-employed'. It should be noted that a large number of women in developing economies are actually self-employed or work in the unorganized sector, where the unorganized sector accounts for more than 70 percent of the GDP. The positive and significant influence of the time spent by women in productive work is corroborative of the decision-making power gained through participation in the market economy, not essentially as paid workers, but also as self-employed individuals.

Furthermore, empirical evidence exists in other studies too for asset ownership by women, increasing women's agency and contributing to reducing domestic violence. Women's independent ownership of assets play a key role in deciding women's ability to influence intra-household decision-making (World Development, 2012; Deere and Doss, 2006) which includes access to modern energy for cooking and agricultural production. Factors like out-migration of the adult primary male member(s) of the household are said to result in deliberative decisions by women in the household in contrast to automatic default decisions dictated by gender and social norms. The positive influence of the explanatory variable 'migration from household' on women's agency in Nepal has to be viewed in this context. Nepal's high rates of out-migration of men (annual average of 60,000 men, MoLE, 2014/15) is a pervasive feature of the rural economy. This, then, leads to many changes in the roles of women in the rural economy, enabling them to assert their decision-making by taking household economic decisions.

An overall inference that can be drawn from the results is that women's asset ownership, their level of education and their productive engagement can result in the increased active participation of women in the consultative decision-making process at the household level, though it may not always lead to 'sole' decision-making authority. The increased bargaining position of women within households is also a reflection of women's agential power—especially in societies where intra-household decision outcomes are skewed unfavourably towards increasing women's well-being. A first step towards gender equality in a society/household would be for women to i) have the space to express themselves, ii) actively participate in intra-household decision-making processes and iii) through their informed counsel as educated individuals with high levels of awareness gained through both education and participation in community engagements, influence decisions as well as the outcome of decisions in the household.

As stated above, women's membership of CBOs comes forward as a factor related to many outcome, such as adoption of clean cooking fuels. In the next section we consider in more detail the role played by CBOs as agents of transformative change.

4.3. Role of Women's Community Based Organisations

By CBOs we mean those organizations that are based on membership. They are also called membership based organizations (Chen et al 2007). They can include cooperatives, trade unions, credit and savings groups, women's neighbourhood, and similar organizations. They are distinct from NGOs, which are mainly advocacy and research organizations, though they often support the setting up of CBOs. CBOs "straddle and interact with, but are distinct from the market and the state" (Chen et al, 2007, 4).

Initially CBOs were the groups that were set up to overcome the problem of providing relatively small loans to women without collateral, through developing a collective collateral pioneered by the Bangladesh micro-credit organizations, such as Grameen Bank and BRAC. Given this origin there function was to provide credit. Over time, however, they have evolved into carrying out a number of other economic, social and technological functions. In our understanding women's CBOs play a key role in the overall advancement of women, including in the use of modern energy. Below we outline some of these major functions.

The very requirement of recovering loans given to women, required some support for these women entrepreneurs in utilizing technology that would provide the income for repaying the loans. For instance, in Koraput some women CBOs took up de-seeding of tamarind as a means of securing a higher income or value addition from tamarind collection and sale. This required the use of mechanical equipment, though not electrified, for compressing the tamarind into uniform weight blocks. Women had to be trained in the use and maintenance of this equipment.

Such technological transfer functions are involved in most of the CBOs in India and Nepal studied for this project. In the Maa Santoshi SHG in Mayurbanj, the women had to learn about the operation of a medium-scale electrical crusher for preparing fortified food for school children; though they did engage some men to actually operate this crusher (as our case study 1 shows). The Kudumbashree groups in Kerala ran agricultural machinery service centres, including operating the tractors and transplanters. Some groups in dairy farming acquired electrical equipment, including high-pressure hoses for washing buffaloes and mechanized milking equipment. The SEWA groups also operated agricultural machinery service centres in Bihar and solar-powered pump sets for irrigation and household water in Gujarat. In Dindigul, Tamil Nadu, an MSSRF-supported SHG set up a bio-fertilizer unit that requires refrigeration and other electricity-based equipment. Another unit in Dindigul set up a chilling plant for collecting milk.

In Nepal, though the production units are individually owned, the acquisition of the equipment is facilitated by the CBOs. The CBOs, in the form of cooperative credit groups, are active in accessing credit and securing equipment. In Lalitpur district an electrified chilling plant was set up.

In bringing these energy and other technologies there is a reversal of the traditional gender roles in introduction of new technology. Men, who have dominated external contacts, have been the conduits through which new technologies in agriculture and allied production have been introduced into rural areas. This has been so for energy appliances too. But with women's CBOs bringing new technology, women have come to the fore as technological leaders. As a leader of one of the SEWA solar pump set groups, put it, "We are now seen as leaders (*ageyee*)" both in their families and villages.

Besides the above direct benefits of women's CBOs there are also other spill-over benefits, often unintended consequences. CBO membership leads to greater economic involvement as independent income earners and increases pressure on their use of time. Together these are expected to promote women's use of labour saving energy systems, such as LPG and biogas.

In Nepal, however, the picture is somewhat different (Figure 6). 53.6 percent of women CBO members had access to bio-gas or LPG; while it was 64.4 percent for non-CBO members. Since bio-gas is usually taken up through a CBO, one would expect that the higher proportion of non-CBO members using clean cooking energy would be of LPG users. In Nepal, as mentioned earlier, the decisive factor seems to be men's migration, reducing labour time available to the household. In migrant households 63.5 percent used bio gas or LPG; while in non-migrant households it was 10 percentage points less at 53.5 percent.

In India CBO members do better than non-members in using LPG as the primary fuel, in using modern energy in overall production activities (including shops and similar service enterprises) and in agriculture, as independent income earners, in having roles in household and community decision making (Figure 5). The one characteristic in which CBO members do worse than non-members is in ownership of assets (i.e. land and house). This could well be due to CBO members being largely from among the landless or marginal farmers. In addition CBO activities result in joint rather than individual assets – the agricultural machinery in the service centres, the fortified meal grinder, the chilling plant, etc.

In Nepal, on the other hand, CBO members do not fare better than non-members in accessing clean cooking energy, modern energy in production and farming, or as independent income earners. In household decision making both members and non-members are lower than those in India. It is only in asset ownership and community decision making that members do better than non-members. Doing better in community decision making is to be expected as that is the role of CBOs. Overall, however, CBO membership does not seem to play the same roles in Nepal as in India; which takes us back to the finding that migration is the main factor making a difference in energy use, whether in cooking or production, and related aspects of women's lives.

Figure 5: Comparative Characteristics of CBO members and non-CBO members in India

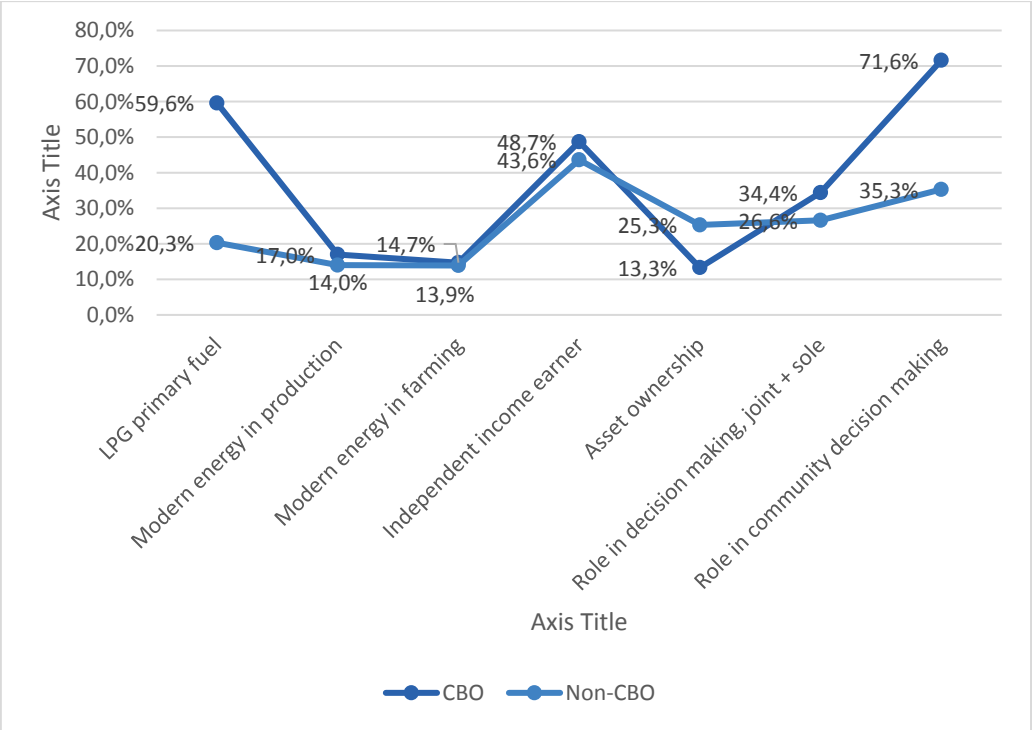
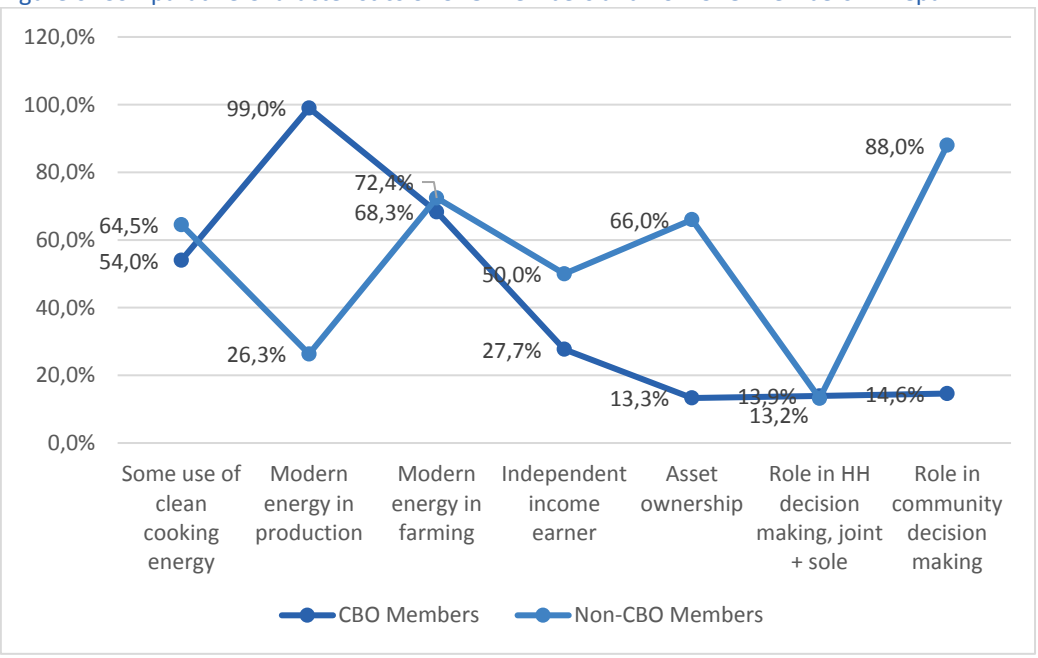


Figure 6: Comparative Characteristics of CBO members and non-CBO members in Nepal



In challenging traditional norms, whether it is about giving up solid biomass in cooking or in opposing domestic violence, it would seem that there is strength in numbers. As pointed out in Ensminger and Knight (1997) norms are more likely be changed when they are challenged by large numbers of people.

Women's CBOs have also emerged as actors in demanding provision of various public services (Mahendra Dev at al, 2014). As discussed in Chapter 6, the electoral system has

also provided a way for women's CBOs to emerge as an electoral constituency to which attention needs to be paid. With a longer history of electoral democracy, these processes seem to be more advanced in India and are taking off in Nepal.

SHG meeting explaining accounts in Dindigul, Tamil Nadu. Photo: MSSRF

5. SOCIAL NORMS AND ATTITUDES IN ACCESS TO ENERGY

5.1. Introduction

In recent decades, Asia pursued an economic model which showed high and sustained levels of economic growth; between 1990 and 2015, the average growth per year was six percent (Jain-Chandra et.al, 2016). However this economic model also showed a rise in income inequality, which included a pervasive gender inequality (UN Women 2015). According to India Human Development Survey 2017 and Thomas Piketty's analysis concentration of wealth among the top few has increased in the recent decades in India since 1990's (IHDS 2017; Chancel and Piketty, 2017). In feminist political economy analysis, women's economic inequality is seen as largely driven by socially entrenched cultural norms in patriarchal attitudes which entail multiple forms of unfreedoms on the basis of sex and gender, which in turn promote and perpetuate: the dependency of women on men with marginal rights over property, productive assets and new technology, their lack of the right to decision-making, limits on women's mobility and gender-based violence, disallowing any transgression of norms laid down for women and men.

In this analysis, we conceptualize social norms as values, beliefs and attitudes that result in shaping practices, behavior, symbols and institutions governing social, economic relationships between women and men (Harrison and Huntington, 2000; Boyd and Richerson, 1985). Norms are socially determined rules that 'specify certain behavior to be proper and legal, but they also specify the penalties for breaking them and the rewards for meeting them' (Mokyr, 2017, p. 10). In a given cultural context, conformity to social rules and to claim rights can be general responses to avoid punishment. The extent to which the forces of social norms produce and shape political and technological development is evident by two major factors: 1) women's lack of rights to access modern energy services and other productive assets; and 2) women's marginal representation in decision–making structures of energy and technology.

Furthermore, throughout Asia, a man is considered to be the head of the household: therefore, all decision-making power lies with him. Until very recently, states and development agencies made no efforts to treat women as citizens with their individual rights and independent agencies. Nor have they questioned that socio-cultural norms are historically constructed by a patriarchal order which has used women as symbols of beliefs in gender inequality and upholders of values. Strangely, these social norms provide the deciding power to institutions which determine women's secondary social status. However, the governments in India and Nepal have introduced some gender-specific policies recently for changes in norms, including energy policies for clean cooking and for facilitating women's access to powered agricultural machinery. The questions we raise here are whether these policies have been effective in changing gender inequality norms and practices, whether these policies have succeeded in changing cultural obstacles to women's freedom and whether it has led to greater independence.

Throughout the research process, our effort was to identify and interact with individuals and groups who were articulate and reflective on the influence of social norms and

attitudes in the context of energy access and use. Furthermore, we made an attempt to understand fragmented voices of women and men on women's unmediated rights to access and use modern energy services. During the fieldwork and in focus group discussions, we noted that there were women and men who would view their rights within existing gendered norms, such as a preference for motorbikes (used by men) over LPG (liquefied petroleum gas) connections for the household and for leisure. Importantly, against a minority of opinions expressing their preference for the male right to access energy infrastructure first, many women and a few men in the states of Odisha, Kerala and Tamil Nadu (in India) and Kailali and Kavre districts in Nepal explicitly stated their interest and support of women's rights to energy infrastructure in households and small enterprises. Usually, such responses were 'deliberative', which were stated after careful thinking about the position of women. The influence of social norms led to a narrow framing of options in favor of the men of the household as part of automatic thinking—this default option was expressed keeping in mind what others in the community thought about male superiority, and by implication, the neglect of women's entitlement in social preferences for gendered norms (World Bank, 2015). Such default options, of course are gendered, even when women themselves make such decisions.

In a majority of the cases, however, such accepted norms were noted to be changing in the cases of a number of women who preferred to have their independent right to modern energy equipment and also for an equal share of land and property as inheritances.

This chapter is divided into six sections. The introduction outlines the conceptual framework of the study. Section 2 discusses gendered social norms in India and Nepal. Section 3 describes policy changes for women's rights to energy, followed by Section 4, which deals with major drivers of change in policies, practices and social norms. Section 5 discusses the impact of policy changes on social norms. In conclusion, Section 6 sums up the complexity of social norms while connecting the dots of energy policies with practices of energy use.

5.2. Gendered Social Norms and Attitudes in India and Nepal

The traditional structures of gendered norms in India and Nepal are grounded in the beliefs that men have pre-eminence over women in both domestic and public spheres. We did not include the norms of matrilineal systems of India and Nepal in this study, where women determine the lineage and land ownership of the household (Kelkar, Nathan, and Walter, 2003). Energy services, technology and land/property management are considered to be in the male domain, and domestic work, care, cleaning, washing, water and firewood collection (all non-monetized) are considered to be in the women's domain. Increasingly, in both India and Nepal, most of the agricultural work, with the exception of ploughing and marketing of the produce, is also considered to be the 'household work of women'. In the case of Nepal, Samuels and Ghimire noted the following norms for a good wife and good daughter-in-law: 'she is an expert at domestic tasks; obeys husband and in-laws; silent about personal needs; wears traditional clothes; hard-working; does not leave house except as required; cares for husband, in-laws and children; does not interact with non-related males' (2018, p. 162). The Indian social system prescribes similar norms for girls and women. These norms influence practices where women have lower social positions without independent rights to energy,

technology and productive assets. Admittedly, many women are complicit in upholding these norms where they tend to deny themselves the right to exercise agency and voice.

Recent studies of rural India, Nepal and other South Asian countries have shown: 1) a slow breakdown of caste hierarchies and associated occupations; 2) the declining importance of agriculture in its association with power and prestige linked to land ownership; 3) The state's disregard for agricultural and rural distress. Low growth, low returns and depressed prices for the farm produce as the 2018 farmers' protest across six major states of India showed. The protesting farmers demanded economic visibility of agriculture through waivers of bank loans and electricity bills as well as for the policies to make their aspirations of social and economic mobility possible; 4) the large-scale involvement of rural women in agricultural work and farm management, though in most cases the ownership of land has continued to lie with men; and 5) women organizing Self-Help Groups (SHGs) or other collectives and thereby acquiring more visible roles and increased access to markets and financial institutions (IDFC Rural Development Network, 2013; Shah, Rao and Vijay Shankar, 2009; Rodgers and Rogers, 2011; Jodhka, 2018).

However, the institutional structures of agrarian political economies make it especially difficult for women to be recognized as farmers and make decisions on use of energy infrastructure, and to acquire labour-saving technologies and productive assets that have potential for both increasing productivity and enhancing women's agency.

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 (World Bank, 2015; UN Women, 2015). 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 within home and outside At the same time, however, social norms diminish in power due to women gaining independent rights to productive assets and energy infrastructure. Based on a study of Master Card 2017 and Global Entrepreneurship Monitor 2017, it was observed that "women who build businesses are overcoming greater bottlenecks than their male peers, including lack of financing, regulatory restrictions, discriminatory cultural and gendered norms…. And competing demands of household and family responsibilities without access to child care." (ENERGIA' SE for All and UK Aid 2018, p. 7 & 8).

There are two troublesome issues that have come to the fore in our analysis. First, there is social reluctance to recognize 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 (AEPC, 2012; Barnett, 2014; Bedford and Rai, 2010; Kelkar, 2014). Second, women face many disadvantages, even if they belong to a household that has access to and uses modern energy, because 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 larger study on 'The Gender Factor in Political Economy of Energy Sector Dynamics' showed. (Kelkar et al., forthcoming).

The significance of women's work in both households and agricultural/industrial production is being increasingly accepted by the state. This acceptance, however, does not necessarily translate into women being recognized as workers, producers and legitimate farmers, with the entitlement to own land and manage production. Such a denial of the right to energy infrastructure and productive assets is likely to have adverse economic implications not only affecting productivity and food insecurity, but also for women's agency, which is crucial for both productivity and food security (FAO, 2011; Kelkar and Krishnaraj, 2013).

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 make women transgress gender norms and challenge the male authority within the home, (ii) social norms that have systematically instilled in them '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).

Women waiting for contractors to visit and hire them for daily-wage farm work, Dindigul, Tamil Nadu. Photo: Elavarasan Devarajan/ENERGIA

5.3. The Policy Change for Women's Rights to Modern Energy Services

Overturning its earlier neglect of gender inequalities in policy designs and its analysis, contemporary scholarship and policy-making started acknowledging the role of rural women as a decisive advantage, 'a political advantage that pays and in turn, pays economic dividends' (Scott, 2009, p. 193). Hence, policy efforts were made to overcome traditional norms that limited women's use of new technologies. However, the policies for improving the position of women tried to balance local traditions and norms of

women's, 'duties for housework and unpaid domestic care' on the one hand and catalyzing change in women's secondary social status on the other (Samuels et al., 2018). Therefore, these policy formulations and actions were limited and subservient to social norms, denying women recognition and reduction of their work. The redistribution of housework and care, though part of the SDG mandate, failed to make any significant changes in social thinking and redefining women's work. In the following section, we will take two examples of gender-specific policy changes in clean cooking and increasing women's access to powered farm machinery.

In preparation of India's National Energy Policy in 2016–17, it was noted that close to, '500 million people were still dependent on solid biomass for cooking' (NITI AAYOG, 2017, p. 1). In India, most of these cooks were women. In recognition of this household work by women and the consequences of cooking with solid biomass in terms of building up of GHG emissions, adverse health and air pollution, in 2016, the Government of India launched the Ujjwala LPG program under which it was expected to distribute 50 million subsidized LPG connections to women under the poverty line in their own name (irrespective of their marital status). More recently, in March 2018, this figure was revised to 80 million connections. Prior to this, in 2013–14, the Government of Nepal announced the mission of 'clean cooking solutions for all by 2022', ensuring reductions in indoor air pollution and improvement in women's health and labour-saving technologies.

The Ujjwala scheme is certainly the largest program for the subsidized distribution of LPG connections in women's names in India (and probably in the world). Efforts are being made to make this scheme viable and sustainable with its promotion through LPG panchayats in rural areas and state directives to gas distribution agencies for more effective implementation.

Box 3: LPG Panchayats

The newly introduced LPG Panchayat (in March, 2018) functions through organizing village leaders, health workers, and primary school teachers, in order to promote LPG adoption. Their role is to call regular meetings of the villagers (both women and men) and explain the health and drudgery reduction benefits of LPG use. LPG Pachayats brings together about 100 LPG customers together near their living areas on an interactive platform to discuss about safe and sustainable usage of LPG, its benefits and the linkage between use of clean fuel for cooking and women empowerment**. 100,000 LPG Panchayats will be conducted across India before 31st March 2019.**

In our field study in 2016, in a village in Dindigul, Tamil Nadu, and all 30 SHG women had LPG and used it as the primary cooking fuel. This was important in saving labour and time. Women said that they would never go back to cooking with wood, because cooking with LPG enabled them to work on farms as waged employees. Like in the case of SHG – based microfinance, there is a link between women's involvement in SHG facilitated/ wage employment and reshaping of gender identities through women's assertion of the right to use LPG as the primary cooking fuel**. (**For a study on SHGs, see Kalpana, 2016) Interestingly, as part of the election strategy in 2007, these Dindigul women had received free or highly subsidized LPG connections from the AIADMK political party leader Jayalalitha, who was the Chief Minister of Tamil Nadu at that point. These LPG connections allowed women much-needed freedom from long hours of drudgery collecting of firewood and cooking in smoke-filled spaces.

A major policy change in Nepal in 2015 was to promote women's land ownership rights. The government policy of land administration has a tax exemption provision in the range of 25 to 40 percent if land was bought in a woman's name (Acharya et al., 2015). In India, an agricultural policy was launched to highlight national commitments to the empowerment of farm women, and to address the male bias in tool use and norms where machinery was regarded as the exclusive domain of men. In 2016, the Ministry of Agriculture and Farmers Welfare introduced the policy of the 'Farm Women Friendly Handbook'. The handbook included a number of agricultural technologies for women farmers under eight schemes and missions related to agricultural technology and food security. The numerous technologies under the 8 schemes and missions for women farmers included: 1) Agricultural technology management agency; 2) Mission for Integrated development of horticulture; 3) National mission on oilseeds and oil palm; 4) Integrated scheme for agricultural marketing; 5) National food security mission; 6) National mission for sustainable agriculture; 7) Sub-Mission on agricultural mechanization; and 8) Agricultural insurance. Under these schemes a woman farmer could approach local governments at the block or district level to buy any modern agricultural machinery on a woman-specific subsidized rate that would be 20–60% higher than what a male farmer would get. The amount of subsidy depended on the type of machinery and its use in agriculture. Importantly, the sub-mission on agricultural mechanization listed two 'only for women' provisions: 1) training programs on equipment for women farmers would be conducted by the farm machinery training and testing institutes; and 2) 30 percent of the allocated funds was to be used for women farmers.

What these policies show is the two-way relationship between women's agency and energy access: the demand on women's work and entitlement in agriculture (i.e., access to waged work and ownership of productive assets) facilitates energy access, and in turn, this increased access leads to their participation in productive work and other manifestations of their empowered agency. The increased agency of women seeks access to energy use, leading to changes in gendered norms and relations in the energy sector.

One question that comes up is: why these policies now? In recent years, India's agricultural policy has been plagued by a deficit in production, farmers' protests caused by poor returns, indebtedness and suicides, the withdrawal of men from agriculture and the feminization of agricultural work. However limited and populist such measures might be in creating a favorable change, they seem to be a propelling factor leading to some policy effects at the transnational level and in creating a message with the purpose to seek rural women's votes in the forthcoming election in India in 2019.

5.4. Drivers of Change: Policies, Practices and Social Norms

Changes in social norms, preferences and beliefs are seen as the key factors in correcting power imbalances in the policy arenas (World Bank, 2017). Further, Roland (2004), in his analysis of policy changes and practices points out that the former is, 'fast-moving institutional change', while the latter, including culture, social norms and values, is a 'slow-moving institutional change'—what Bourdieu (1978) conceptualizes as 'doxa', where attitudes and habits are taken for granted while norms and customs are handed down and regarded as the only way of seeing persons and their entitlements. Importantly, the persistence of social norms and values can be a result of the persistence of male dominance causing patriarchal neglect of women's strategic needs for household and

agricultural work. 'Whatever group holds power, will use that power in its best interest. Thus ruling elites who have a vested interest in maintaining their power in societies with inefficient institutions may not agree to give up that power because the winners of the institutional change may not be able to commit to compensation schemes for the losers' (Roland, 2004, p. 115).

Compared to the slow change in norms and values, fast-moving policy changes are seen as a better alternative to influence women and men to cast their votes in favor of the ruling elites and also acquire a good international image of the state for implementing gender–sensitive policies in the age of 'Sustainable Energy for All' and in following the commitment to 'leave no one behind' while pursuing the 'Sustainable Development Goals'.

An analysis of gender-specific energy policy changes in India and Nepal shows that the state agencies speak simultaneously to two groups; the elite citizens nurtured with gendered norms and forms of power who exercise influence through access to political and economic institutions, and the political constituency of the organized masses of rural women and men who wield influence through voting rights, who are seen as necessary for keeping a regime in power. The contradictory power bases of these two groups tend to result in rhetoric-implementation gaps in policy or implementation gradualism hiding under the pretexts of social norms and values. These policy measures are not due to any isomorphic mimicry (where a government would copy a good practice to make itself look more capable than it is); instead, such policy measures are introduced to create a fog of entitlement for women and men to keep them in power with their support and the exercise of voting rights (Andrews, Pritchett, and Woolcock, 2017; Kelkar, 2016).

5.4.1. Relevance of Feminist Ideas in Energy Research

Feminist researchers and women's organizations have been voicing concerns about the persistence of gender-differential development outcomes. Some recent studies directly focusing on women's rights have questioned the policy silence on gender-based disadvantages in energy access, rights to land and productive resources; these severely limit women's ability to address vulnerability and manage economic options, and thereby prevent women from existing violent relationships within the home and outside (Clancy, Winter, Matinga, and Oparoacha, 2011; Sharma, 2008; Kelkar, 2017).

As is evident from recent examples in India, this research has provided inputs for policy. In the preparation of the National Energy Plan 2017, the NITI AAYOG of India invited a number of feminist policy analysts to critically review the plan document through a gender-specific lens. Likewise, India's Ministry of Women and Child Development requested various civil society organizations and gender experts to provide their inputs for the Draft National Policy for Women (Draft National Policy for Women, 2016). A large number of respondents appreciated the Draft Policy, and several of them pointed out some gaps that needed to be addressed for effective implementation to take place. These led to a discourse on policy failures in three areas:

- 75 percent of rural women work in agriculture but their ownership rights to land and energy in rural households range between 6–11 percent.
- The Ministry of Agriculture has 55 schemes for mainstreaming gender concerns in agriculture, but only 14 schemes have had funds allocated.

- The technological changes in favor of male tasks have worked much faster than for women's tasks in agriculture, which shows pervasive patriarchal norms and male bias in policy implementation.

These points were aimed at strengthening objectives to facilitate policies and practices which would ensure equal rights and employment opportunities for women and for stronger energy access for production and social reproduction activities. It is to be noted that these inputs to the draft policy were appreciated with a promise that they would be incorporated in the final policy.

5.4.2. Feminist Advocacy on the Importance of Energy Access for Women

At the regional and national forums on energy linkages with gender and social transformation, we will attempt to sum up what the feminist discussions pointed out (UNDP, 2006; Clancy et al., 2011): that there is increasing recognition that energy can play an important role in combating women's marginality and reducing gender inequality through (1) improved health, with reduction in the use of biomass for cooking, thereby reducing indoor air pollution; (2) increased productivity through the mechanization of agricultural production activities using diesel engines and electricity; (3) reduction of labour and time spent on household activities, where the saved time can be used for income generation, asset building and for leisure needed for rest and recuperation.

A quick review of South Asian countries shows that gender mainstreaming of the energy sector has been introduced in the last 5 – 6 years. And in most cases, this has been accompanied by non-implementation and disregard for gender-specific energy needs (ENERGIA, 2015; Kelkar, 2014). In the emerging economy of these countries, a very large number of women suffer from lack of land ownership rights, energy insecurity and income poverty, as the feminization of agricultural work shows. Institutional rules, based on norms and values, tend to perpetuate the gender division of labour, disallowing women access to and ownership of land and energy equipment, and devaluing their social reproductive work.

This is done under the framework of rationality and justice for concentration of women in the informal sector (including lease farming). The patriarchal legal philosophy has nurtured, directly and indirectly, the ideology of superiority of men over women in the spheres of land and energy rights. In many state programs, women's rights related to land and energy fall short of full ownership and substantive equality.

Globally, the persistent inequality of women in the political economy is reflected in pervasively gendered systems of ownership of productive assets and property, financial services, time use, and access to energy. Substantive equality in gender relations requires the transformation of institutions and structures**.** Such transformative changes require policy and action on the following fronts: (1) redressing women's disadvantage in political economy processes with changes in policy and practice; (2) addressing stereotyping and social norms that enable gender-based violence; (3) strengthening women's agency, voice and participation, and supporting women's organizations to influence economic (and technology) policy making.

5.4.3. Civil Society's Engagement with the State

The post-2015 process of SDGs with promises and monitoring of efforts to achieve reduction of poverty and inequality through distribution of political power and energy at various levels (including between women and men), and the on-going decade of 'Sustainable Energy for All' are seen as contributions to social transformation as part of national and international development agendas. At the national level in India and Nepal, women's organizations and feminist academics were often invited to engage with policy drafts on energy and agriculture and give their inputs on clean cooking energy and farm machinery as well as its linkages with women's empowerment. It is important to note at the outset that most of their recommendations were accepted and included in the two national policies which recognized women's strategic needs for clean cooking energy and the delinking of farmer status with land ownership to enable women to access powered farm machinery (Draft National Energy Policy, 2017; Report of the Committee on Doubling Farmers Income, Vol XI, 2017). It is to be noted that only one year has passed since this implementation, so we cannot yet see any changes in terms of implementation.

In a similar vein, at the regional and international levels, some noticeable contributions were made by ENERGIA International and its Gender and Energy Research team. A series of workshops/meetings were organized by UNESCAP, Bangkok, the gender energy experts meetings organized by UNESCWA, Beirut and by the UN Energy Heads in Oslo and Nairobi to discuss the linkages of energy with water and gender. In these meetings a number of presentations centered on how to correct three policy failures of the past: **redistribution** of power, adequate representation of women in energy decision-making and legal measures to have their asset ownership rights. There was general agreement that the **ownership and management** rights of women to energy infrastructure and productive assets would contribute to eliminating gender-based violence against women and enable them to lead lives with freedom and dignity; **recognition** of women's work in social reproduction, with the state facilitating clean cooking, subsidized training and capacity-building to access and use new farm machinery and energy infrastructure; and **reduction** of women's household work and unpaid care by promotion of sharing of this work by the men of the household and by provisioning of energy infrastructure for unrecognized and unpaid work of women in the household, agriculture and informal sector (for a conceptual discussion on the three failures, see Fraser, 2009).

5.4.4. Role of Citizens and Elites

As researchers, we have often engaged in critical analysis of the role of the elites in changing power structures. However we noted here that policy changes are likely to happen when powerful citizens and elites influence such a change, especially when they come to understand that their resistance to change would be detrimental to their own interests and views of national development (World Bank, 2017). In such a policy change, elites would influence formal rules and even give up their control over resources or the benefits they have had from existing policies. A case in point is the Government of India's policy for clean cooking energy with 80 million subsidized connections in the names of women of households under the poverty line. Significantly, in response to the government call for the 'give it up' campaign, 10.5 million economically better-off citizens/elites gave up their cooking gas subsidies and voluntarily opted to buy LPG cylinders at market prices. From this 'give it up' action, over 200 million people benefited from the LPG subsidy, resulting in 1200 villages becoming 'smokeless villages'. Following

this, we will try to see if there are other areas where policy change has influenced a positive change in gendered norms.

5.4.5. Factoring Gender Concerns in Energy Development

Globally, the visibility of gender concerns in energy emerged in the 1990s with the World-Bank sponsored EnPoGen studies. In discussions on energy policies, it was often assumed that household incomes and consumption patterns were a critical factor in bringing about a rural energy transition (Piana, 2003). In our earlier study, 'Gender Relations and Energy Transition in Rural Asia' (Kelkar and Nathan, 2005) we maintained the position that gender is not a subset of poverty and cuts across both class and ways of organizing knowledge/ideas. A feminist analysis of political economy calls for a radical methodology grounded in the observation that the interlinked systems of class-, caste-, race-, or ethnicity-based bias and sexism in attitudes and actions, 'are not merely intellectual affairs, and these systems are both structured by and structure the world' (Crary, 2018, p. 48). Thus, there is the need for changes in policies with mandated rigorous implementation to refashion the political economy that keeps women confined to secondary social positions by force and the barriers of social norms.

Thoughout our research period (2015–2018), we noted that in the given system of class, caste and ethnicity in India and Nepal, there is a common factor of hierarchy and power between women and men, with men as the decision-makers of women's work in the social reproduction and production spheres. This study (Kelkar, Nathan, Mukhim, and Dzuvichu, 2017) 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 unpurchased collection of firewood.
- The critical area of policy intervention is in providing clean fuel for cooking and for production activities 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 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 approach, 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 households and communities, as we see in the case of policy for subsidized farm machinery at a higher rate for women farmers in India.

Socio-cultural norms about women's dependency shape attitudes and habits in making flawed policies such as the provision of subsidized agricultural machinery for women

farmers without delinking the status of farmer with land ownership. The charitable distribution of certain assets to woman-headed households in the case of Nepal implies that a woman without a man in the household has no independent right to own and manage productive assets and energy infrastructure. Rural Nepal seems to be no different than rural India in overall male dominance in terms of control of economic resources and energy governance. A change, however, is seen in a larger representation of women (40–50 percent) at various levels in decision-making bodies. Furthermore, there is greater manifestation of women's agency in male migrant households, where women, in the absence of men, have been noticed to access inanimate energy with ease and as a routine engagement with the operation of powered farm machinery. Nevertheless, the male ownership and control of land has continued and perpetuated gender-specific discrimination.

5.5. The Impact of Policy Change on Gendered Social Norms

There has been limited research on the impact of policy changes on social norms and attitudes, particularly in the area of gendered norms in the political economy of energy access. Admittedly, some notable contributions were made earlier by Akerlof (1997), Becker and Murphy (2000), and Manski (2000). This section intends to provide examples of how policy has influenced individual and collective norms and the attitudes of women and men with regard to the access and use of energy and related productive assets.

Recently, the 2015 World Development Report and World Economic Forum (and more recently, the G7) played a role in drawing attention to the role of social norms and attitudes into the economic theory of development. Through forums like the Women Major Group and the BRICS Feminist Watch, women's groups and feminist academics raised questions about women's structural inequalities and the need to allocate financial resources for increasing women's access to energy services and developing their capabilities with regard to management of energy infrastructure and decision-making. A question that was iterated in various meetings was: Have the state policies and development partners, including the World Bank, the G7 and the Gates Foundation, created the collective and/or social space encouraging people to realize their views and attitudes towards women and girls who have demonstrated their agency against normative disapproval of their actions? (Jodrell, 2015; World Bank, 2015; G7, 2018).

During our fieldwork in Koraput district (Odisha) in July 2015, we heard from thirteen SHG women who had used diesel motor pumps to irrigate their vegetable farms and used an auto-rickshaw to transport vegetables to weekly markets at a distance of 5-6 kms: 'before engaging in this enterprise we used to ask our husbands for money in order to meet household and personal needs. Now we give pocket money to our husbands to meet their petty expenses. Most of us bought fancy clothes and jewelry from the savings we made from the vegetable sale. All of us have a mobile phone and a cycle at home.' Previously, this buying and selling happened at an individual level and was not a group activity, as Ensminger and Knight point out that some actors, 'will eventually focus on a particular outcome and others will in time follow suit, establishing a convention' (1997, p. 3). With many women establishing economic enterprises, their deviation from the older norms, 'makes possible the assertion of a new one' (Keesing, 1981, p. 140).

Both in India and Nepal, women in discussions with us referred to ways in which their bargaining power increased. In a village in Kailali district of Nepal, women pointed out that as a consequence of women's groups, they have acquired a new freedom from the traditional norms of 'asking men for everything' and now have the capability to make decisions and manage resources on their own. Of course, these included women from a number of male migrant households. This sequence of the breach of an older norm and the consequent establishment of a new norm has been noted in the context of micro-credit in Bangladesh, where the older norm of women being economically dependent has been replaced by the norm of women becoming income earners (Kelkar, Nathan, and Jahan 2004; Kabeer, 2001).

Based on recent changes in India's public policy for women's access to energy infrastructure and to energy based farm machinery and land, four possible mechanisms for such influence are outlined. These included: 1) The **Hindu Succession Amendment Act 2005**, a revolutionary legal reform measure which introduced daughters as coparceners (having the right at birth) to share the agricultural land and property equal to that of sons; 2) Unlike the earlier laws on land acquisition which have ignored the girls/women's right to land, the new **Land Acquisition Act of 2013** removed male bias in the entitlement of girls for separate units for rehabilitation of household members displaces due to governmental acquisition of land; 3) The **Ujjwala** scheme, and 4) '**Farm Women Friendly Handbook**' policy.

Admittedly, the implementation of these laws has been limited; however, they have provided a legal platform to women and girls to claim their rights to assets and property. During field work, we noted cases where girls claimed their share of inherited land from their brothers and other villagers supported these claims. In an earlier study in Gurthur village in Telengana in India, in a focused group discussion with men of the village, the leaders affirmed that, 'women should get their share of land because such entitlement would enable them to more efficiently and effectively manage their household resources… women's voice will matter as it may bring equality with in the household and increase nutrition and wellbeing of all family members' (Kelkar, Gaikwad, and Mandal, 2016, p. 4).

Box 4: Changes in norms

- **Mobility:** increased by economic activities and migration in Nepal
- **Cooking preference:** men accepting less tasty food that takes less time
- **Serving food to men on time:** changes with women in CBO participation
- **Women as owners of land:** Government policies led to some changes in the norms
- **Women's equipment ownership:** LPGs, solar panels and machine centres owned by women's groups
- **Women's technological leadership:** 'Safa' tempos (three wheeler vehicle) in Nepal, In India women operate solar panels and farm machinery
- **Women SHGs are engaged in processing applications and distribution of LPGs as case studies in Annex 1 shows**
- **Importance of group changes**: individual women may attract more resistance
- **Little change in redistribution of cooking**: men work only in the absence of women

We also observed in Odisha (India) and Kailali (Nepal) that women SHGs and other rural women's collectives have played a major role in bringing in new norms of energy access. Two factors of particular importance are: 1) the social network that describes their day-to-day interactions on access and use of energy infrastructure and services; and 2) the

new norms of land and asset management by women, largely in the absence of men in male migrant households. The operation of farm machinery—for example, electrically operated pump-sets for irrigation, the powered winnowing fans and thrashers by women were seen as the new normal in these villages of Kailali in Nepal. Elsewhere in Bihar and Gujrat in India, where the male migration is very high, SEWA (Self- Employed Women's Association) noted "Examples of breakdown of the traditional divide between 'male' and 'female' activities" (SEWA, 2018. P. 5). For example, in Munger district of Bihar, SEWA introduced a shift in the traditional practices of farming. Importantly, 1418 semi – literate and non – literate women agricultural workers were trained in operation of powered (electricity and diesel) machinery, i.e. use of paddy transplanters, zero tillage, reaper and thrasher, which resulted in increasing women's skills and agency and agricultural "productivity by 36 percent in paddy and 28 percent in wheat" (SEWA, 2018. p. 5). During a field visit in August 2018, we noted that 1) this use of farm machinery by women resulted in their households having LPG as their primary fuel for cooking; and 2) about 10 – 12 percent of women farm workers use their savings to buy land in their own name, after successful negotiations with the husbands. Furthermore, by no account these women were shy in discussing their personal struggles and efforts at acquiring skills and in exercising their agency. The promotion, processing of applications and distribution of LPG cylinders by women SHGs in Mayurbhanj in Odisha resulted in promotion of clean cooking fuel and entrepreneurial activities of women.

Women operating Paddy transplanters in Munger, Bihar. Photo: SEWA Bharat

5.6. Conclusion: The Complexity of Norm Change

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 and Nepal that indicates a thin spread of subversive change in norms as a result of energy access and utilization in women's work, creating relatively favorable circumstances for dislodging the 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 on the basis of 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 traditional hold of norms and also expose the persistence of patriarchal control and limits over access and use of modern energy.

Male-centered 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 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 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, processing of milk and testing of fat content in Tamil Nadu, Kerala and Nepal; electrical sewing machines for garment-making for commercial use in Tamil Nadu and small livestock units, poultry units and tea and snack shops Tamil Nadu and Nepal. Some women also operated power tillers, small trucks and transport vehicles. In Terai area of Nepal, the high cost of solar powered irrigation pumps was addressed by offering grant loan schemes at 10 percent discount to women who owned or jointly owned land. As a result many households transferred land to women in order to take advantage of the scheme. This resulted in expanding both women's access to energy for agricultural production and change in social norms in terms of their legal standing with ownership rights to land. (Mukherji, et al 2017) .

However, all is not well. Our empirical findings from field studies in India and Nepal 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 a very low priority to LPG connections, more so for refilling of LPG cylinders. Surprisingly, in some cases, LPG refills were needed 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, scanty orders of new LPG refills. This is despite the fact that social approval for such subsidized LPG distribution was obtained through the 'Give It Up' campaign. The interdependencies of gender norms and household poverty for access to clean cooking energy appeared to threaten the sustainability of the policy.

Furthermore, our research showed that subsidized agricultural machinery has not reached women. A significant majority of rural women do not own land and are therefore not considered farmers. In both India and Nepal, land ownership defines a status of a person as a farmer. At the same time, we also noted that in some cases, men have started transferring land in the women's name, but only tiny parts. The basic purpose of these land transfers was to have access to women-specific higher subsidies for farm machinery. These men carried out negotiations for the subsidized machines on behalf of the women with the full collaboration of the local government officers (mostly men), while women continued to remain confined to unrecognized household and agricultural work.

Generally speaking, in India and Nepal, 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 woman chief minister of the state). However we saw a difference in Kerala, in its Kudumbashree collectives of women, where they were engaged in non-household income-earning agricultural work, increasing their bargaining power in decision-making to buy agricultural equipment and other items for their use and had some control over finances.

Our analysis has summarized the complexity of gendered social norms as important determinants of policy formulation and impact. Therefore, we therefore are 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 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). Our research underscores the need for a continued dialogue and research-based advocacy on gender justice at both national and trans-national levels, questioning masculinist energy policies that tend to promote social and cultural drivers of gendered norms.

Of course, men and boys have to be engaged in promoting non-masculinist norms and gender equality by deconstructing social norms of inequality, economic dependency and lack of dignity in gendered structures of governance and energy institutions. The policy enactments for gender equality and empowerment of women through access to energy infrastructure and ownership of productive assets and new energy technology have to continue and are to be followed by rigorous and regular implementation for transformative norm changes in gender equality and attitudes favoring the dignity and the right to access resources for all women and men, with particular attention to women who have been traditionally trapped in unfreedoms and denied human rights.

Gender transformative work goes beyond simply including women in project designs. It attempts to change gendered norms and power relations in order to achieve equitable outcomes for energy access and use, ownership and control of resources and substantive participation in governance. Women's secure rights to energy and land are a means to increase women's agency to overcome inequality and poverty and dignity in their life.
This means a policy and practice to increase access to energy requires attention to gendered norms that limit women's right s to access and use energy and ownership with control over productive resources in customary and codifies laws, as well as in the informal community, caste, class rules for women.

6. GENDER IN POLITICAL ECONOMY ANALYSIS OF ENERGY AVAILABILITY, ACCESS AND USE

6.1. Introduction

Does gendering political economy make a difference to how we understand women's agency in energy use? We start with briefly reviewing the political economy analysis of policy adoption, laying stress on the two key concepts of and *political settlement and rents and space*. The notion of the political settlement between elites is extended to include non-elites in *social contracts* that include the provision of various public services. The distribution of deals depends on the political settlement that is reached. Deals have to be translated into economic development policies, which are strongly influenced by the mental models we have of the economy. 'Rent' has many definitions, but is usually taken to mean the extra returns or returns over competitive profits that firms or individuals obtain due to their position either from some form of monopoly, bureaucratic advantage, or corruption. However, rents have also been used in political economy analysis to refer to changes in the flow of income (Khan, 2017, 15). In that case, the rent space (or the deals space as in Pritchett, Sen and Werker, [2018]) is the space of potential income growth and the political settlement leads to a particular distribution of the income growth.

Political economy analysis, however, is well-known for having been gender blind. We consider the manner in which gender analysis can make a difference to political economy in six areas; i) the role of women in political settlements; ii) the modification of the rents space by including household work and unpaid care; iii) the introduction of feminist ideas into governance; iv) taking political economy analysis down to power at the level of the individual women, not even the household; v) the trans-nationalization of both the political settlement and of ideas of women's empowerment; and vi) the introduction of the idea of justice in the use of the rents space.

After setting out the key features of political economy analysis, we consider the ways in which they can be utilized to understand the spread of modern energy services, e.g. of electricity and other forms of motive power, and LPG in rural areas of developing countries. The analysis distinguishes between availability at the macro level, access at the meso level and use at the micro level. At each level we look at the role of women and women's empowerment in securing and using modern energy services. In the concluding section we see how introducing gender into political economy analysis makes a difference to its two key concepts of the political settlement and the rents space.

6.2. Institution, Rents and Political Settlement

Following Douglass North (1990), institutions in economic analysis are the rules of access to various resources that count for economic performance. The kind of access rules that come about are, however, the result of a political process, involving the elites and other sections of society, yielding some form of the extent of power. Finally, political power counts, but it is not simply a question of identifying the dominant power groups in an economy. Political economy analysis brings in the notion of a macro-level description of

the ‘political settlement’ reached by each country’s elites between themselves (and possibly along with other societal groups) about the means through which ‘rents’ are acquired and distributed between various interest groups, as an alternative to violent conflict (Bell, 2015).

Thus, there are two key concepts in political economy analysis, that of rents, or the deals space, as Pritchett et al. (2018) call it, and the political settlement. While the analysis above concentrates on the role of elites and elite agreement in reaching a political settlement, there is need to modify the political settlement as one between sections of elites, to bring non-elite actors into the discussion. In an electoral system, voters play a crucial role in influencing the political settlement. The extent to which public services such as electricity or roads are provided or promised can play a role in the choice of the political alliances that rule. This does not negate the role of elites, but points to the manner in which elites will need to address the issue of public services in order to establish the rule of their political settlement. Earlier, this used to be referred to as the social contract.

All societies have some form of political settlement or social contract, otherwise they would fall apart or be threatened by rebellion. Even autocratic polities have some form of social contract between the rulers and the ruled. In China, for instance, one can articulate a clear social contract to both provide fast rates of growth of income and to restore ‘China’s place in the world’. In this development project there are also ‘ideological commitments to rural development’ (Oi, 1985).

This social contract between rulers and ruled, even in autocratic settings, can be seen even in microcosms, as in the Nathan and Kelkar study of collective villages in China (1998). In the village of Nanjie in Henan Province, China, the Secretary of the village party said that in general village meetings he had promised the village that his policy of high investment would yield very substantial benefits within a few years in terms of high incomes and social welfare for all (Nathan and Kelkar, 1998). Other village party leaders have pointed out how, in order to sustain their local social contracts, they even went against provincial or central government policy. As one party secretary put it, ‘How can I stop my people from violating the rule on not selling timber when that is the only way they can keep from starving?’ (Authors’ fieldwork, China, 1998).

6.2.1. Ideas and Development Policy

Having come to a political settlement, there then have to be ways of formulating and implementing policies corresponding to that political settlement. These resultant policies depend on the interaction of the political settlement with our ways of thinking about the world and our ways of understanding what policies are required to achieve the goals of, say, development. Thus, in order to comprehend the influence of the political settlement on the pattern of rent distribution, it is necessary to bring in an understanding of the nature and tasks of economic and social development. Ideas of the nature of development policy need to be brought into political economy analysis (Lavers, 2018). The political settlement may result in a developmental state (Chalmers Johnson, 1982) or may fail to adequately deal with the issues of development, including that of energy access and use.

Lenin had famously declared that socialism was 'Soviet power plus electrification'. De-colonization in the 1950s led many ex-colonial countries to adopt forms of development centered on the spread of electricity. The historian Dipesh Chakraborty named this 'fossil fuel democracy' and geologists now date the Anthropocene from the 1950s, when energy use began a 'hockey stick' growth around the world (Steffen et. al., 2015). As emphasized in the 2015 *World Development Report*, our ways of thinking about the world, or our mental models, profoundly affect what we do. Our ideas about the world include the recognition of what is considered work in a particular society. Thus, both the recognition and non-recognition of different types of work, will affect the manner in which the resources are allocated and policies decided. This is particularly important with regard to women, much of whose labour is not recognized as work. This is a point to which we will return later.

6.2.2. Key Concepts in Political Economy Analysis

This brief survey of the development of political economy analysis has yielded a number of key concepts that can be applied to understand developments in a field, such as that of modern energy policy. The key notions are those of the rent or deal space, political settlements between elites, and social contracts between the elites and the rest, including the provision of various public services, such as modern energy and transport infrastructure. We will see how these are applied to the political economy analysis of modern energy as a public service. Modern energy is an important instrumental or intermediate good, important not for itself but for the manner in which it contributes to the attainment of more fundamental goals of society, related to its reigning social contract.

Along with the ideas about what constitutes development policy, there is the idea that there is a limited 'rents space'. What the rents space refers to is, 'the incremental changes in benefits associated with particular institutions or policies' (Roy and Khan, 2017). There is a limited set of policies, including subsidies and investments that can be adopted and implemented within what one may call the fiscal space of a state and the economy. The choice among these limited policies or deals is essentially the outcome of the interaction between the political settlement and the rents space (Pritchett et al., 2018, p. 23).

An example can illustrate the nature of the political settlement that results in a deal. Let's say that there is a choice between investing the limited resources between extending the grid in an area that has a high economic potential (like a fertile plain area), or a mountainous region with little labour-absorbing capacity, which is a low growth area. With the goal of maximizing GDP growth and with the likely higher political clout of plains-dwellers compared to those living in the mountains, it is almost certain that priority will be given to the investment in the plains. This, however, could also change in the event that the remote, mountainous region is also the site of an insurrection, in which case the state may prefer to make some investment there, despite it being a potentially low-growth area.

6.3. Gendering Political Economy Analysis

From the summary of political economy analysis in the preceding section, it is seen that it is gender blind, as also pointed out in ESID (2014) and Bell (2015). There is a gendered

form of power that is not captured in the conventional analysis of political economy. Power in gender relations wielded by men is due to a number of factors. First, is men's ownership of productive assets, including land. Second, is their control over income and the ways in which it is utilized? Third, are the social and cultural norms that dictate women's responsibility for household domestic work, or the tasks of social reproduction; which, at a higher level, is manifested in the exclusion of household activities from the domain of recognized work for macro policy formulation?

In Chapter 1 of this study, we pointed out the neglect of gender analysis in the political economy scholarship. Admittedly, the feminist scholars have tried to make this right, there have been gendered analyses of political economy issues, such as in the collection edited by Kate Bedford and Shirin Rai (2010), and in various contributions in the recent *Handbook* edited by Juanita Elias and Adrienne Roberts (2018). They, however, have not had an impact on the central core of political economy analysis, which is that of the political settlement and the rent or deal space. Christine Bell (2015) suggests that this is due to the narrow preoccupation of political economy analysis with elites. However, as shown previously, political economy analysis can bring non-elite social groups into the settlement process, where the elites come to an agreement on the manner of incorporating non-elite groups (which could also include women) into the political settlement and also allocate women a portion of the rents space, whether as subsidies for clean cooking energy or support for women's businesses. This could occur in a competitive electoral system resulting in clientelism—that is, the exchange of non-programmatic distribution of services for electoral support (Stokes, Dunning, Nazareno, and Brusco, 2013).

The Effective States and Inclusive Development Research Project attempted to bring gender into political economy analysis (ESID, 2014). It pointed out that feminist analysis has not dealt with the new literature on political settlements, 'particularly regarding the extent to which the informal and clientelistic form of politics that characterize most political settlements in developing countries closely shape the prospects for women's empowerment' (ESID, 2014).

6.3.1. Women in Political Settlements

In many developing countries there are not only elite organizations of men. Political parties usually include women having the women's wings of these political formations. In addition there are also associations of women in business. Women-centric NGOs and credit organizations, whether in the form of India's Self-help Groups (SHGs) or the Nepalese Cooperative Credit Groups (CCGs), are also quite widespread, if not ubiquitous. Women's unions such as the Indian Self-Employed Women's association (SEWA) or the Bangladesh Garment Workers' Unions also exist. In India and Nepal, women have quotas for shares of positions in local government. All these organizations of women embedded within different classes also jostle for a presence in the political settlements. In electoral democracies, the importance of women as voters also makes them the target of patronage networks, fostering clientelistic policies, where allocation of resources are exchanged for political support.

The various organizations of women and women's representatives can make women part of the political settlement as a distinct interest group, but intersecting with class,

ethnicity, or location. In a sense, this is a way of bringing the subaltern, i.e. those who are socially, politically, gender-wise or geographically not part of the hegemonic political power structure.

The ESID approach points to the need to analyze the 'gendered nature of state formation over time … focusing on critical junctures [and] the role played by women' (2014). In the two countries that we are analyzing, India and Nepal, there are different ways in which the gendered nature of state formation has played out. In Nepal, women were part of the peasant insurrection, as also of the overall middle strata that has come to play an important part in Nepali politics (Roy and Khan, 2017). In India, in the state of Tamil Nadu, there has been a woman Chief Minister, one who deliberately cultivated a constituency of women in the competitive electoral system leading to competitive provision of public services or competitive clientelism that has held sway in that state. In carrying out a gender-specific political economy analysis of energy, we will look at the manner in which the political settlement has or even has not been affected by the entry of women into political organizations and coalitions. There is no presumption that the entry of women into political settlements will necessarily result in the acceptance of feminist ideas in the deals space.

6.3.2. Modification of the Rent Space by Bringing in Unpaid Household Work

Feminist political economy has grappled with the problem of 'the exclusion of social reproduction from what is recognized as work' (Bedford and Rai, 2010, p. 7) and the resulting invisibility of much of women's work (Waring, 1989). The manner in which production and social reproduction (household work) can be combined in political economy analysis remains a challenge. By taking up the interaction between the two, i.e. by seeing the manner in which women's roles in the economic deals space is constrained by the unpaid work of social reproduction—and by the reverse, how women's participation in the economic deals space can change unpaid work in social reproduction—these interactions can show the manner in which women's empowerment is or is not included as part of the agenda of the political settlement. Becoming part of the agenda of the political settlement will then affect the manner in which the rents space is used. There will need to be a policy for this and some resources will need to be allocated for its implementation.

Across Asia, women on an average spend 4.1 times more time in household unpaid care than men (1 hour and 4 minutes), who spend the lowest share of cooking, cleaning and unpaid care, with only 31 minutes in India (ILO, 2018 pXXVII). The regional average for women in 4 hours 22 minutes in household work and care. Household work with unpaid care consists of two overlapping activities: cooking, cleaning, feeding children, and nursing of an ill spouses or a member of the household. This not only involves a high degree of drudgery but also limits economic opportunities for women who in most cases are engaged in the household work and unpaid care along with other work such as self-employment, contributing family workers in agriculture and in the informal sector with poor working conditions. The gendered nature of this work is "a key factor in determining whether women enter into, and stay in, employment and the quality of jobs they perform" (ILO, 2018 pXXVII).

Political economy has dealt with the economy, i.e. the production of goods and services that either are or can be marketed. Gender analysis, on the other hand, points out that reproductive labour or so-called domestic and care work in the household is essential to the functioning of the productive economy. This calls for the extension of political economy to cover both the productive and reproductive economy and their interaction. In a sense, this brings the household into political economy; something that is conspicuously absent in mainstream political economy. One might say that bringing household and other unpaid work into economic analysis changes the dimensions of the rents space or the structure of economic opportunities in the economy. It means recognizing that the relation between paid and unpaid work can itself change the economic opportunities and the dynamics of energy access to women and men.

6.3.3. Governance Feminism and Justice in the Distribution of Rents

A political settlement that includes women can adopt energy policies based on notions of justice or reducing gender inequalities. This can be in the realm of both the household work of unpaid cooking and in the realm of paid or income-earning work in agriculture and related enterprises. At a broad level, such policies embody a notion of justice or reducing gender inequalities. The introduction of such feminist ideas into legal and other ways of the conduct of people (to paraphrase Foucault) has been termed *governance feminism* by Janet Halley and her colleagues (2018), who refer to the realm of laws and legal thoughts. However, we can extend this to refer to the introduction of feminist ideas, usually incomplete and often inconsistent, to policies, including those with regard to women's use of energy. For instance, the notion of empowerment, popularized at the 1995 Beijing World Conference on Women, is turned into attempts to provide market-based solutions to providing women the use of resources that, in an earlier era in the Global North, may have been provided by the state. Finance, provided through SHGs is one such measure explicitly put forward in Indian policy as a measure of women's empowerment (Sharma, 2008).

6.3.4. Taking Political Economy Down to the Micro Level of Individual Women

Political economy analysis deals largely with big groups that have an influence on macro policies. At best it may introduce disadvantaged or subaltern groups. However, power relations in a society do not end with these horizontal groups. Power relations, as gender analysis emphasizes, go down to the household level, affecting individual women in their everyday lives. The outcomes of political settlements about allocating rent have to be seen, in the end, at the level of individual citizens and children. Access to services even at the level of the household does not necessarily translate into use by women. For this reason, the manner in which household power relations affects the outcomes of political settlements needs to be examined. As a methodological consequence, political economy analysis would require gender analysis method to proceed not just from the macro (the country) to meso (groups) levels, but also go down to the household and the individual woman and man.

6.3.5. Transformational Policy Space

The ideas that come into play in governance feminism are developed not just in national political and economic discussions. They are developed across countries in what has been described as the transnational public space. The transitional public space includes that of discussions in various forums, including those of the UN and their influence on national policies through, for example, the SDGs, World Economic Forum and Sustainable Energy for All Forum. It also includes multilateral finance organizations such as the Bretton Woods organizations, the IMF and the World Bank, and their powerful influence on policies in developing countries or the Global South. The Sustainable Energy or All report highlights future work to promote gender responsive and socially inclusive approaches to energy access through women's empowerment and effective engagement in the energy sector (SEforAll, 2018). With the old Bretton-Woods polarization of the world being challenged, new Shanghai-based multilateral finance organizations have come up. The transnational public space also includes the IPCC and the various climate change accords, most recently the Paris Accord.

The transnational policy space also includes critical analyses of various multilateral organizations. There are well-known feminist critiques of the World Bank, Asian Development Bank, African Development Bank and so on. The newly-formed BRICS' New Development Bank in Shanghai is also facing critiques of its gender policy or absence of one (Kelkar et al., 2018). Besides these multilateral organizations, bilaterals too play an important role in the transnational policy space. Through their programmes they can set the agenda for discussion, and issues to be foregrounded. As developing economies have grown, their role in providing resources is limited; but their agenda-setting roles can still be quite important.

It also includes academia in various forms and interactions. NGOs of various persuasions are part of the transnational public space. Importantly, for our analysis, feminist forums, academic discussions, and journals all form part of this transnational public space. The process of the analysis of social phenomena and the formation of ideas are themselves not just part of national processed but come up within the transnational space. For instance, the idea of women's empowerment has a long history, going back to Caroline Moser's distinction between practical and strategic needs, more explicitly put forward in the context of what was then called the Third World in the DAWN (Development Alternatives for Women in a New Era) manifesto, which was given international recognition in the 1995 Beijing Conference on Women. Empowerment of women in the context of market economies has become part of the conceptual framework of gender policies in India, Nepal and other countries of South Asia.

This discussion of transnational policy spaces points to the need for political economy to be set in a transnational or international framework. Climate change brings out the limitation of the national framework—with climate-changing modes of existence in any part of the world, say, in the Global North, connected to modes of existence in countries in the Global South. With value chains becoming global in nature (the WTO estimates that more than 60 percent of world trade is in the form of global value chains or GVCs), sectors of industry are themselves becoming transnational. The transnational nature of energy issues was dramatically brought out in the India-Nepal border blockade of a couple of years ago and, of course, in the continuous impact of oil prices on all national political economies. While we may be interested in the differential

impact of transnational factors on energy in particular countries, our analysis cannot be confined to the conventional framework of the nation. The political economy analysis of energy also needs to be set in a transnational frame, as the increasing trend of SDG reporting through High Level Political Forum shows.

The transnational policy space is itself the site of power relations. But the power relations are not just those between the Global North and the Global South. They also exist within the South itself. For instance, Nepal's high dependence on imports from India, makes that country vulnerable to policy pressures on the energy front. Power, however, is not only a matter of economic strength. It is also a matter of the creation and propagation of knowledge. The policy of market fundamentalism or what is usually termed neo-liberalism of the Washington Consensus was pushed by the economic clout of the World Bank-IMF combine. However, it was also of a model of the world that seemed to work. Thus, at that time, the dominant paradigm was that of power sector reform. This has since been abandoned, as it was not seen to serve the interests of providing modern energy services to the poor and disadvantaged regions. What this means is that the centers of knowledge production that gain traction are no longer located in the Global North, but also exist in numerous places in the Global South.

In the area of gender policies in the energy sector, the centers of knowledge production also exist in the Global South. Not just experiences with government policies and projects, but also policies for women's access to and use of modern energy are produced in the Global South. The old monopolies of knowledge creation for production have been broken.

6.3.6. Justice in Distribution of Rents

The sixth and, perhaps, the most importance difference that gender analysis can make is that it would change the nature of the political settlement in the distribution of rents. Gender analysis is based on the foundation of existing inequalities as being embedded in social norms and to a large extent in laws and policies, thus requiring different forms of action to reduce and even eliminate inequality. The political settlement discussion is confined to one about deals, particularly between elites. The non-elite population enters as part of the required economic program, the development model. This development model has been extended from concentrating on economic or GDP growth to that considering broader human development. The notion of justice, however, goes beyond instrumentalism and asks for distributive justice to be considered as part of the agenda of political economy. This can also be described as a 'rights-based' approach to development. Basic services for food, education and health services are all part of right-based policies. Can access to and use of modern energy services also be similarly considered in a rights-based approach?

Gender analysis is not alone in making social justice part of its analytical agenda. Studies of other subaltern groups, such as indigenous peoples, Dalits, and religious and ethnic minorities all have social justice as part of their analytical agenda. The SDGs have explicitly introduced justice in development by the political principal 'leave no one behind' and the notion of gender justice is an important component of social justice overall.

6.4. A Political Economy Analysis of Energy Policy

How can the basic political economy concepts of political settlements and the rents space be specifically articulated in the analysis of energy issues? Dubash, Kale and Bhavrikar identify four areas that need to be taken into account. They deal with electricity but their approach can be extended to modern energy services, including in that clean cooking energy, besides electricity. The four factors are: (1) the demand for access and quality of modern energy services; (2) the demand for subsidies arising out of social welfare concerns; (3) the cost of energy; and (4) the financial space. The last factor, the financial space, is a part of the rents space that is allocated in the political settlement for modern energy services.

The three main groups of actors in the political settlements are (1) the urban lobby of industrialists, who are consumers of electricity and could also be suppliers of the same; (2) the rural lobby of farmers; and (3) the voters who are those who demand and receive social welfare in the form of subsidies. We would break-up the group of voters into women and men, with the former having specific practical interest related to their major unpaid task of cooking.

The political actors, political parties and possibly also bureaucrats, have to balance the interests of the three groups of actors in the available financial space. If these interests are balanced in a manner that provides the political actors the political capital, then the settlement can be stable and even be, as it is called, virtuous in the sense of leading to a cycle of expansion. For instance, if the cost of supply of electricity could be brought down through the substitution of thermal by hydro-power then there is more power to be shared between the three interest groups. However, the growth of crony capitalism may dictate a shift from hydro to thermal capitals, as indeed has happened in India. Similarly, the dominant position of Indian exporters of gasoline products (diesel and LPG) could be held to restrict the development of hydro power, despite Nepal having abundant water resources (Binayak Bhadra, 2018).

To utilize the Dubash, Kale, Bhavrikar analysis in another manner, the political support garnered by supply of electricity needs to lead to an economic sustainability of the electric supply. This depends very substantially on two factors – inexpensive supply and cross-subsidization with industry paying higher rates that can be used to support discom companies in the subsidy for social welfare reasons. Bihar neither secured inexpensive electricity nor was it able to attract industrial investment. As a result, the cycle of development prompted by the electorally beneficial provision of electricity, has not been sustained. On the other hand, in Tamil Nadu the large industrial and modern services (ICT, banking, insurance) enabled cross-subsidization of agriculture and domestic use of electricity. But the continued expansion of subsidies to farmers and fishers has brought the fiscal situation under strain.

There is an important lesson from the above examples. Subsidies for connections to modern energy services (electricity and LPG) can be carried out and provide substantial political benefits. However, continued subsidy for the use of the services (e.g. subsidies for LPG refills or electricity consumption) depend on the growth of economy with increasing returns as can be secured through the development of industry and modern services. Consequently, a political settlement that requires a subsidy has to be allied to economic development push for the subsidy to be sustained.

How the political class earns its rents is part of the settlement. Where the political class requires broad electoral support, then we see a move to what is sometimes called populism or clientelism, or the exchange of electoral support for provision of public services. The political class and bureaucracy, in addition, may get a share of government expenditures. But, as was argued to be the case in the mineral-rich state of Jharkhand (Nathan and Dayal, 2018) the political and bureaucratic classes secured their rents from the mineral industry. In addition, a community based system of voting, where voters followed their community leaders, meant that parties did not need to secure broad based political support. The kind of provision of public services that characterized states such as Tamil Nadu and Maharashtra and secured the return of parties that provided these services did not exist in Jharkhand.

Applying this analytical schema to the case of Nepal, it can be pointed out that the actors in the political settlements have increased substantially with the introduction of electoral democracy. As pointed out by Roy and Khan (2017) the middle class, both urban and rural, is now an important constituent of the political settlement. Women are rising in their own strength, as discussed in Chapter 7. In addition, there are the regional and caste /community groups. All of this makes the actors in the political settlements quite numerous with complicated interactions.

At the same time, the rents or fiscal space is somewhat limited. Nepal's very large inward remittances (25 per cent of Gross National Income) flow into private accounts and are used for private housing, medical, educational and agricultural developments. It does not seem to flow into the growth of industry and modern services. If the political settlement could come to some agreement on using some of these remittances for industrial and modern service development, then there would be more space for subsidies to provide basic modern energy services.

6.4.1. Modern Energy Provisions: Availability in Rural Economies

The political economy analysis of the slow spread of electricity and other modern energy services such as clean cooking fuel was initially made in terms of the urban bias of development policies (Lipton, 1977). Urban industry with increasing returns to scale drove economic growth (Kaldor, 1967). The role of the rural economy in this process was to provide wage goods at low prices to keep urban wages low and increase industry profits, and also to provide surplus labour that could be absorbed in a growing industry. The most extreme kind of policy supporting urban industry through a rural program of providing cheap labour was that of South Africa's apartheid system, where rural migrant labour settled in temporary urban hostels.

The early models of economic development in India, and the developing world as a whole, thus assigned a subordinate role to the rural economy, not trying to increase its productivity but focusing only on supplying cheap food and cheap labour to industry. Keeping the price of food low was a way of transferring surplus from the agricultural sector for accumulation in industry. This process faced challenges in the inability of the rural sector to provide cheap food in the quantities required. Attention then spread to the role of rural lobbies in increasing agricultural productivity. Rural lobbies, such as those

of the big farmers in developing countries, also controlled large segments of voters through clientelist relations with the rural poor and middle classes. Continuing rural distress in large parts of the rural economy in India and Nepal fuelled peasant insurgencies. In Nepal, it would seem that policies for rural development were probably adopted in order to reduce the rural base of peasant insurgencies. Thus, rural electricity coverage in Nepal increased from 30 per cent in 2002 to 80 per cent in 2007 i.e. even before the fall of the monarchy.

This experience of Nepal in rapidly extending rural electrification could be contrasted with that of South Africa. In South Africa rural electrification took off only after the fall of the apartheid regime, when the new majority-based democratic regime responded to the needs of its majority constituency and sought legitimacy by the spread of rural electrification.

In political economy terms, these developments are a result of a broader political settlement, including not only the urban but also the rural elites and farmers, the intermediate classes. Increasing agricultural productivity through the adoption of irrigation technologies required broad rural electrification. As analyzed in detail in Sunila Kale (2014) those states in India which had politically strong rural lobbies, such as Punjab and Maharashtra, favored the subsidized spread of rural electrification, while states such as Odisha, with a weak rural lobby, adopted the World Bank-supported reform of the electricity sector that increased electricity prices and inhibited the spread of rural electrification.

Along with the broader political settlement, there is also a change in the deals space or the rents to be earned from different policies. Earlier rents were earned by urban industrial lobbies through cheap labour, based to some extent on the low prices of food. Then, rural lobbies were also provided new economic opportunities and new avenues for accumulation through the irrigation/inorganic-fertilizer based Green Revolution technologies. Electricity (or diesel power) was an essential enabling factor for the adoption of Green Revolution technologies, because of the spread of groundwater rather than surface water utilization for irrigation.

6.4.2. Political Factors in Extending Supply of Electricity: The Role of Lobbies

A key issue discussed in the political economy analysis of energy is that of political factors in determining or extending the supply of electricity at the macro-level. An analysis of the political economy of energy reform in India points out that politicians speak simultaneously to two groups—the political and financial elite, who wield influence 'mainly through access and money' and the political constituency of rural men and women who wield influence mainly 'through the vote' (Lall, 2006, p. 19). Sometimes the contradictory power of these two groups can lead to pulls that result in a "rhetoric-implementation gap" and result in what Lall calls "stealthy gradualism" in energy policy reform (2006, p. 1, p. 22).

More recently in 2018, however, this stealthy gradualism has been replaced by an overt emphasis on rapid and time-bound rural electrification programs. The government in power in India has adopted the policy of providing electricity to every rural household

within a very short period of time. The World Bank reported that all households in India would have electricity well before the target year of 2030 (https://www.thehindubusinessline.com/economy/india-doing-extremely-well-on-electrification-world-bank/article23768986.ece) Of course, this builds on earlier decades of rural electrification, but carries it forward by compressing the time taken to cover the last miles. This, we would agree, is the result of a broadening of the political settlement to include not just the rural elite and middle classes, but also the rural poor and women—a change in the political settlement driven by the exigencies of universal suffrage.

How does the existence of a universal electoral system affect the state provision of, say, electricity or LPG? Before going on to consider contemporary developments, we should refer to an earlier and still-continuing difference within South Asia, between Sri Lanka and the rest. Sri Lanka is well-known for historically performing better than other South Asian countries in education, health and other human development indicators. It has been argued that this is due to the adoption of universal suffrage way back in 1935 itself, at a time when the British colonies of India, Pakistan and Bangladesh had a very limited electorate, based on property and education. Universal suffrage pushed the adoption of universal education in Sri Lanka from the late 1930s, while India adopted universal primary education only in 2003 (Lindert, 2004). Differences between Sri Lanka and the rest of South Asia in the provision of electricity have not been examined. However, one can say that there is a connection between universal suffrage and the universal provision of education and health services as basic public services. We now look further into the role of voters in the political economy of electricity provision.

6.4.3. The Provision of Public Goods Such as Electricity Generates Political Externalities: The Role of Voters

A comprehensive analysis of electricity access across the world starts with the premise that the provision of public goods such as electricity infrastructure generates not only economic externalities, but also political externalities (Min, 2015. These political externalities are the political support that can be gained by delivering electricity to the rural periphery. Such political externalities can be consolidated in electoral politics, as Min argues that electoral democracies provide more electricity to the rural periphery than autocratic rule. Using sophisticated analysis of statistical data lights, Min finds that electoral democracies provide 10 per cent more electricity to rural areas than autocratic rulers.

The findings mentioned in the preceding pages may be correct at a broad global level, in that electoral democracies have done better than autocracies. But there are some crucial differences, though, that cannot be explained by Min's electoral model. Min dismisses the China-India difference as being due to China's grossly exaggerating its achievement of more than 90 percent electricity coverage. However, it is not only China as an autocratic country that is said to have achieved such coverage. Other parts of East Asia such as South Korea and Taiwan also achieved similarly high levels of electricity coverage even before they became electoral democracies. In South Asia, as mentioned above, Nepal too more than doubled electricity coverage from around 30 to 80 percent between 2002 and 2007, before the fall of the monarchy and the setting up of electoral democracy. If we consider the Soviet Union to have been an autocracy, it had a policy of

electrification. As mentioned earlier, Lenin's explicit slogan was 'Socialism is Soviet power plus electrification.'

The exceptions listed here show that it is necessary to have more than a one-size-fits-all 'electoral democracy vs. autocracy' model to explain the expansion of rural electricity. In fact, even in the USA, which had been an electoral democracy from the late eighteenth century, it was in only the 1930s that rural electrification received a push. The USA's commercialization of electrification meant that high-density urban areas got priority in electrification. However, in the Great Depression of the 1930s, as Roosevelt sought new sources of demand during the depression, rural electrification was given priority with state support through rural cooperatives, particularly aimed at providing energy services to women (Matly, n.d.). It was the need to create new sources of growth that led to women-oriented rural electrification.

Min (2015) identifies the possibility of electoral loss as the disciplining factor requiring elected leaders to try to stick to their promises and mandates. He explicitly shows the correspondence between voting patterns and the spread of electricity, not only as connections but down the wire in the Indian state of Uttar Pradesh. It is true that in an autocracy there is no such quick-acting disciplining factor. But this can also happen when the ruling elite depends not on taxes but on rents from oligopolies, particularly in mining, for its revenues. This was noted in the Indian state of Jharkhand, where rents from mining led to governments not even spending grants they got from the central government. In comparison to what they would have got from the usual corruption in spending money, rents secured from the mining oligarchy were much more.

While the share of agriculture in GDP has declined substantially in both India and Nepal, the share of the rural electorate in the total electorate has not declined proportionally. This has profound effects on the behavior of the elite. Rural purchasing power may not count as much as urban purchasing power in economic deal-making, but with the one-person-one-vote system, the rural electorate becomes important in an electoral system, changing the political settlement. In addition, the deal-making rents space has also expanded with the rural economy gaining in purchasing power and capital accumulation. At the margin and in times of urban industrial stagnation it becomes important; there is a base of the pyramid effect in terms of the importance of even the lower sections of the rural market.

Within universal election systems there can be differences between regions based on the nature of the local political settlement. Kale's analysis (2014) points to the importance of rural lobbies, such as the sugar lobby in Maharashtra, with accumulative policies for the spread of rural electrification. Kerala and Tamil Nadu, however, show that polices aimed at securing the rural electorate's support can spur rural electrification. In Kerala there was a popularly elected Communist government in the 1950s that put Kerala on the path of rural provision of basic public services, including electricity, education and health. Having started down this path of broad provision of public services, it remained a virtually permanent feature of the political settlement in Kerala.

In Tamil Nadu governments, based on the anti-upper caste social movement and then the electoral support of the middle castes—the intermediate sections as it were—also led to policies for the provision of electricity and other public services in rural areas. In fact,

Tamil Nadu was the one Indian state that had a high level of rural electrification even in the colonial period. We would surmise that this was the product of the non-Brahmin movement of that period, in response to which the colonial government extended the provision of electricity in the region.

What the above shows that it is necessary, in a country as diverse as India, to look at state specific political economy factors driving electricity access. It varies from the power of the sugar lobby in Maharashtra, and the expansion of groundwater extraction in Green Revolution, to growing subsidies in Tamil Nadu. As Dubash, Kale and Bharvikar argue in their 2018 book say that it is necessary to understand the state-level connection between political settlements and electricity provision in the different states. For instance, in Bihar the party of Nitish Kumar was able to garner political support (political externalities) from the provision of electricity and other basis public services (Dubash, Kale, Bharvikar, 2018).

Is there no specific all-India level political economy factor driving the push for rural electrification? Two clear factors come to mind in the current context of a growth that has precariously been combined with slowing private investment. First, is that India's current high growth trajectory has become dependent on high levels of public investment. Second, is the fact that such investment has to be undertaken mainly in areas of infrastructure development. Transport and electricity are two major areas of infrastructure in which there is a clear deficit. The deficit, leading to higher costs of logistical and energy costs have been estimated to result in an increase in costs of from 7 to 10 per cent. One can well argue that the current push for rural electrification is driven by the need to have an avenue for public spending that can prop up growth rates of the Indian economy.

6.5. Linking Macro, Meso and Micro Levels

Political economy analysis generally stops at the macro level of the political settlement and the manner in which the deals space is distributed. But the translation of policies decided at the top do not necessarily flow down in a smooth manner down to the bottom. In the case of India, power and agriculture are both concurrent subjects, meaning that policies can be decided at both central and state levels. In Nepal a federal structure is now being put in place and it remains to be seen how it will develop.

In our political economy analysis, however, the macro level is the decision-making level. As discussed in Chapter 1 of this study, both central and state decision-making come within the macro level. The meso level is that of the implementation of policies, in which the energy producers and distributers, come into play. The meso level is also that of local government, including village government and organizations, where policies are implemented. The micro level is that of the household where individuals move from access or supply to actual use. There are two-way interactions between these levels.

The manner in which interpretations at the meso level change the impact of policy is seen in the study of RA4 on the Ujjawala scheme of distribution of LPG connections to women from below the poverty line households. Their study of Chhattisgarh found that only 25 per cent of the women who received the subsidized connections were actually poor. There clearly is a high level of political and patronage factors that come into play in deciding on who is or is not below the poverty line. This then considerably dilutes the

policy aimed at targeting women from poor families. The political along with caste, community and related factors are at play in Nepal too. Where projects, such as for biogas, are implemented through CBOs, it is likely that they are confined within certain community groups.

In addition to the above societal group factors, there is also the factor of gendered interpretations of policies. As discussed in detail in Chapter 7 on Social Norms, officials own thinking about gender relations come into play in their interpretation of projects. In going to the micro level there is the influence of gender relations at the household level. The intention of giving subsidised LPG connections is to enable a switch to clean cooking fuels. But, as discussed in Chapter 2, gender relations in the shape of women's unpaid work, gender inequality in earnings and a general lack of women's rights to land, property and voice in governance, all come into play in restricting fuel switching, leading instead of solid biomass remaining the primary cooking fuel.

In overcoming micro-level or household constraints the analysis in both Chapters 2 and 3 show that the meso level organization of women in CBOs plays a major role. This is discussed in more detail in the box on CBOs in Chapter -.

The above discussion looked at the manner in which the implementation of policies and practices change as one moves from macro to meso and micro levels. What about movements in the other direction? First actions of individuals can have an influence on the meso level. For instance, individual champions of clean cooking can lead to more women challenging gender norms at the village or meso level, as discussed in the study of University of Oslo, TERI, Seacrester Consulting and Dunamai Energy (2019) report and our analysis of norms change in Chapter 7. There have even been initiatives that were started by individual district-level officers at the meso-level and then became national programmes. The well-known example is that of community-based Joint Forest Management (JFM) which was initiated by s District Forest Officer in a district of West Bengal and then went on to become a national programme. The biogas way to clean cooking in Nepal was taken up a number of national and international NGOs and has now become a national programme in Nepal.

There are also influences from meso level practices to macro policy. The forerunner of the Ujjwala scheme was a World Bank project in one state to distribute free connections to women from poor households. This has now become a macro-level national programme gaining a share of the rents space. The Direct Benefits Transfer (DBT), a euphemism for direct cash transfer, was also tried out in a few villages by SEWA, before being rolled out as a national programme.

What we see from the above is that political economy analysis needs to move both ways – from macro through meso to the micro and the other way around. Such an exercise is complicated but can help elucidate the two-way and changing connections between policy and practice. Policy can inform practice and practice can lead to policy changes. In addition, policy can be changed through its gender-specific policy formulation and implementation by meso and micro level actors, as discussed in Chapter 2 in the analysis of the clean cooking fuel experience.

6.6. Gendering the Political Economy Analysis of Energy

We now turn to the manner in which the political economy of energy can be gendered. This begins with the fact that a large areas of women's use of energy, which is in cooking, has basically unrecognized in energy policy.

6.6.1. Recognition of Failure: Unpaid Household Work and Cooking Energy

At the broad macro level of policy in provision of modern energy services, the gender factor enters in the distinction between having a policy for modern energy in production but no such policy for modern energy in cooking. Traditional cooking with solid biomass, mainly wood, animal dung and crop residues, is both labour-intensive and a health hazard as it leads to household air pollution (WHO, 2016; Balakrishnan et. al., 2014). While having a policy for the supply of electricity for production in agriculture and lighting in the house, a policy to provide clean cooking fuel is a much more recent development. Until recently, rather than the state it was NGOs who took up the design and popularization of so-called Improved Cook Stoves (ICS). These were just somewhat improved variants of solid biomass stoves. They did not involve the switch to clean cooking fuel, such as gas or electricity.

While having targets for electrification, until recently neither India nor Nepal had targets for clean cooking fuel (UNDP and WHO, 2009). In Nepal, a gender-targeted approach with subsidies for women was adopted within the renewable energy sector in 2012 (NNREP, 2012). India adopted the Ujjwala scheme of subsidized LPG connections for women of households that are below the poverty line in 2016. This has since been extended to cover women of 80 million households.

Why has there been a long-standing neglect of the need for clean cooking energy? The importance of one's mental model is seen in the non-recognition of women's work in the household, specifically in cooking, as part of the economy. If you cannot recognize a component of women's work as valuable, then you cannot have a policy for it. The political settlement cannot include it within its agenda the switch from solid biomass to clean cooking energy for sharing the rent space. Household and unpaid care work does not enter into the national income calculations of any country. It is then an easy transposition to being absent at the policy level The invisibility of women's work in cooking then is translated into neglect of cooking energy at the policy level (Gill et al, 2012). The dominant model that excludes women's unpaid work in the household from GDP calculations is seen as resulting from a *recognition* failure (Fraser, 2009) resulting in the policy neglect of cooking energy needs, specifically the transition from labour-intensive and unclean solid biomass fuels to labour-saving and relatively clean fuels such as LPG or electricity.

Why has there been recent recognition of the necessity of shifting to cooking with clean cooking energy? At one level, it is the work of Balakrishnan and others (Balakrishnan et. al., 2014), as also the documents of the WHO (WHO, 2016) which showed that cleaner cook stoves do not end the problem of household air pollution due to burning solid biomass. In the case of India, the subsidized LPG connection for BPL women is generally attributed to the importance of rural women as an electoral constituency. In fact, the victory of the ruling Bhartiya Janta Party (BJP) in the 2017 state elections in India's largest

state, Uttar Pradesh (UP), is attributed, at least in part, to support from women who had benefited from this scheme (Times of India, 2018). This is an example of what Min (2016) had termed the political externality of energy provision.

In the state of Tamil Nadu, the proliferation of LPG use and a partially free supply of household electricity can be seen as the result of the competitive electoral politics in that state. The two major political parties of the state both base themselves on the support of intermediate sections of society. Discussions with key informants, in academia and the bureaucracy, showed that electoral competition has given rise to competitive clientelism, with LPG and electricity, along with cheap rice, becoming a now necessary part of the use of the rents space. How and why women voters emerged as an electoral lobby is a factor that we need to explicate.

6.6.2. Women Voters as an Electoral Lobby

In the 2016 elections in the Indian state of UP, it was thought that the ruling party's scheme of distributing LPG connections to poor women had an impact on the election results. The fact that women's practical needs such as electricity had come into election politics much earlier in the state of Tamil Nadu and the later developments up to UP is something that needs explanation. How did women voters emerge as a clear constituency requiring attention to be paid to their issues, though women have had the vote since the Indian Constitution was adopted in 1950?

One may identify two stages in the growth of women as an electoral lobby. First, is that of the weakening of the traditional rural elite and upper castes in the wake of land reforms in many parts of India. With this, and later with the Green Revolution, there was also the growth of the rural accumulating lobbies, such as the Maharashtra sugar lobby referred to in Kale (2014) and the Green Revolution farmers in various parts of India. With these developments, the traditional elite no longer could hold the old patronage system with which they had controlled rural votes. Second, since in the 1990s and later there was the development of women's micro-finance groups, taken up with international finance and government in the form of the Self-Help Groups (SHGs). These SHGs formed under the Mahila Samakhya had an explicitly stated objective of empowering women, and not just treating them as receivers of state hand-outs (Sharma, 2008). Once formed, however, these groups had many unintended effects, such as their self-mobilization for political demands, such as the provision of various public services (Mahendra Dev et al, 2012). Often they were linked to electoral support being conditional on the provision of these public services.

The SHG movement, or as we may term it in a broader manner, the development of women's CBOs took place first in South and West India. They took a number of forms, including those of the SHGs and even the explicit union of Self-Employed Women's Association (SEWA). Their electoral importance was recognized by the late Jayalalitha, who as the first woman Chief Minister, won an election with her promise to provide free household electricity and electrical appliances, such as the ubiquitous wet grinder and mixer. What we can then see is that the organization of women in CBOs of one form or the other has had beneficial but unintended consequences of bringing forward the importance of women as an electoral force.

With the shift to electoral democracy in Nepal, some similar processes can be observed there too. Women's groups, whether credit cooperatives or mothers' groups, have spread across the country. In addition, the Nepal Constitution provides for reservation of 50 per cent of local government offices for women. There are also other reservations for women. All these together point to the likely development of political lobbies based on issues articulated by women; making women a part of the political settlement in Nepal.

6.6.3. Meso Level: From Availability to Access

If availability is a macro factor, the next question is: how do women and their households gain access to modern energy services? In terms of the supply of energy services, this is what is referred to as the 'last mile' problem. Villages may be connected, but not all households, particularly those from poor or otherwise disadvantaged groups. What is needed to turn availability into access? There is an economic problem in that the cost of the last mile connectivity in a remote part of a village may be more than that of the better-connected part of the village. However, this economic problem is outweighed by a moral problem: is it acceptable to leave behind some in the attempt to secure faster growth? Yet another economic problem is that of overcoming the stealing of electricity. This leads to a poor recovery of costs, which in turn leads distribution companies to suspend service to such areas or households with poor payment of charges. On the other side, the poor quality of electricity supply, voltage fluctuations and frequent and unpredictable blackouts, means that the affected households are also less concerned about securing legal supply.

Experiences in India have shown that organized women's groups have often taken up the demand for public services, such as electricity infrastructure to be provided to their households. They have even been issues in local elections. In the case of Rajasthan, in a case of non-supply due to stealing, the women of the village stepped in. They persuaded their men to pay the electricity bills, securing a commitment from the distribution company to reciprocate with a regular supply (Hindustan Times, 2018).

Thus, women's groups and their mobilization can support a movement from availability to household access. However, there is still the problem of moving from household access to individual women's use of modern energy services. As a recent paper on electricity provision in Kenya posed the question, 'If You build It [electricity infrastructure], Will They Consume?' (Taneja, 2018). This is with regard to not just electricity but also for clean cooking energy, as discussed in some detail in Chapter 2. Access to clean cooking fuel does not necessarily mean that women will use it. There are issues of the valuation of women's labour and of household power that need to be overcome in order to turn access into use. The political economy analysis has to be taken down to gender relations and its analysis at the household level, which is something that we have not seen any political economy analysis do.

6.6.4. Micro Level: Women's Agency in Energy Use

Access at the household level does not necessarily translate into women's use of energy. Despite household access to clean cooking energy, the stubbornly high incidence of women's labour-intensive and household-polluting cooking with solid biomass in rural

areas of developing countries in Sub-Saharan Africa and South Asia points to the necessity of bringing household-level gender factors into the analysis of energy use.

Having secured access to an energy system (electricity, diesel, LPG) the next question is: how is that energy system used? What are the gender factors in the use of energy? This depends on the appliances that can be run with that energy and, crucially, on the energy appliances (or end use) that the household acquires. Some of these appliances may be provided by state provisioning, as is the case with bulbs and a fan being supplied as part of providing poor rural households in India with electrical connections (personal communication, officials of the Rural Electrification Corporation, India). In a broad sense it is the appliances that a household acquires that leads to impact and the sustained use of, for instance, cleaner cooking fuels, the mechanization of agricultural tasks carried out by women.

What a household acquires, however, depends on gender relations within the household, dictating priorities in the acquisition of energy-based equipment. In some of our field areas, among indigenous and other peoples in Odisha, it was noticed that in the allocation of household income, motorcycles were acquired for men's use, rather than LPG for women's use. Providing access to LPG through a subsidised connection did not end the story of energy use. When men control household expenditure and women's labour is not valued, or less valued, then motorcycles rather than LPG connections and cylinders are likely to be acquired. This example illustrates the manner in which gender relations in the household impact the use of energy equipment. In other words, to put it in terms of the role of gender analysis: without gender analysis it would not be possible to understand household decisions on energy use and women's marginal role in energy governance right at the household level.

The state's provision of energy, whether electricity or LPG, is restricted to the extent of providing access. Thus, in some parts of India (e.g. Tamil Nadu), a certain amount of electricity is provided free to the household. South Africa's Free Basic Energy also provided some electricity free to the household. How the household uses this electricity, i.e. the appliances purchased and used with the electricity, is something left to the household to decide. The case of LPG provision is similar, where the connection is provided free, but its sustained use is left to household decision-making. Consequently, in order to turn access into use, it is necessary to empower women to make decisions about household purchases of appliances. One way to do this is to re-shape gender relations through unmediated asset rights of women and policies to address and overcome gender norms. In a reflexive manner, women's energy access and use, whether that of electricity or LPG, can itself further re-shape gender relations.

Both political economy and gender analysis deal with agency, the power of people to influence or even create structures. The terms 'agency' or 'agential power' can be understood as the power to make decisions and act upon them as we discussed in the preceding pages. Gender analysis also has a long-standing concern with understanding agency, including its influence on household bargaining outcomes (Sen, 1999; Nussbaum. 2000).

6.6.5. Recognition of Women Farmers

Besides the non-recognition of unpaid household work, there is also the non-recognition of women as farmers. In many developing countries, including India and Nepal, women rarely own land and land ownership is essential for being recognized as farmers. Women's non-recognition as farmers affects the rents space, as the opportunity for returns as investments are restricted by this non-recognition. They are unable to participate in government schemes or secure government subsidies for investment in agricultural equipment based on modern energy sources.

Recent policy developments have partly mitigated these effects. In India some small plots of land are being registered in women's names in order to enable those to utilize the higher subsidy in modern based agricultural equipment provided for women. In Nepal, some small loans do not require land as collateral and can be secured merely against a citizenship card. Women's unions, such as SEWA, have enabled women to secure Solar Pumps in their own names, even without holding land titles. Nevertheless, recognition of women as farmers would expand the rents space by increasing women's economic opportunities to increase their productivity and agency.

6.6.6. Interaction of Macro, Meso and Micro Levels

We have so far dealt with the three levels of macro, meso and micro levels separately or, in isolation from each other. But the three do interact as argued above and in Chaper 1. In Nepal till recently there were only the central government and then the local governments. But the three regions of Nepal, the high mountains, middle mountains and the Terai (or the low hills going into the plains) are different in terms of physical connectivity and economic development. Central policies, however, were sought to be implemented in a common manner, disregarding the need for local adaptation. More recently, Nepal has been divided into provinces. It is likely that these provinces would have some power to interpret national energy policies in their specific contexts. This would link the macro and meso levels in Nepal.

In India, on the other hand, there is strong structure of national government and state governments, occupying the macro and meso levels of energy policy and intervention. Besides national policies, state politics, and politics related to the party in power at the centre and the politics of regionalism have combined to make policy effective or ineffective (Dubash et. al., 2018). Importantly, transnational forces have brought down the costs of solar and new forms of grid energy, making coal powered electricity less attractive. These problems have been further complicated with "problems of theft, poor management, inefficiency, debt and high costs" of electricity at meso level in rural India (Dubash et al, 2018: 4).

Thus there influences that move from the macro to the meso and the micro, such as in the formulation and implementation of policies for electricity access and use. Again, there are influences that flow in the reverse direction. For instance, action at the meso level, by women's CBOs in their demand for public services, has been translated into macro policies to provide electricity to households and appliances to women in Tamil Nadu and, more recently, to the national policy to provide LPG connections to women from under poverty households across India.

6.6.7. Conclusion

Gendering political economy makes a difference to how we understand women's agency in the use of modern energy services in a number of ways. Gender analysis points to women as a distinct interest group in the political settlement, along with the intersections with class, caste and location. Women as political actors, even in clientelistic politics, whether competitive or autocratic, can secure recognition of their particular gender-based situation. The growing importance of rural women in developing countries as voters can lead to the framing of clientelistic policies to meet their needs for modern energy services, both in production and household work.

Gender analysis points to a recognition failure in the neglect of women's cooking in energy policies in the rural areas of developing countries and thus the necessity of dealing with both unpaid and paid work in defining the rents space. To the extent that women become part of the political settlement, there can be (1) a recognition of the role of unpaid work in the economy; (2) a modification of policies that assign part of the rents' space to reducing unpaid work (e.g. through the adoption of labour-saving technologies such as LPG or electricity for cooking); and (3) a redistribution of the unpaid work of cooking between men and women. The recognition of the role of unpaid work in the economy, followed by policies to both reduce and redistribute this unpaid work, then becomes a result of the political settlement, using part of the available rents' space.

In addition, gender analysis points to the problem of non-recognition of women as farmers. Such recognition would reduce existing constraints faced by women in accessing income opportunities or increasing their productivity. This modifies our understanding of the income-increasing possibilities or the nature of the rents space. Gender analysis points to the need to carry the examination of power relations in political economy analysis from the macro to the meso and then the micro (or household) level. Women's empowerment at all these levels will promote the movement from the availability of modern energy services to access and then to use by women within households.

Ideas are important in the manner in which political settlements utilize the rents space. Gender analysis points to the role of feminist ideas of empowerment in utilizing the rents space. Furthermore, it also points out that ideas and even pressures are not just national but transnational. Thus it is necessary to go beyond methodological nationalism to bring the transnational policy space and even political settlements into the analysis of energy policies.

Most important of all is perhaps the introduction of justice into the programs drawn by political settlements in using the rents space. While economics as such sets itself as morally neutral, many strands of political economy analysis, such as those based on Marxism, have generally taken moral stands. Gender analysis starts from identifying inequalities and thus, in its foundation, has a moral compass of reducing and even eliminating inequality as Marxism and some strands of heterodox economics too have. This idea of justice as the elimination of inequality needs to be incorporated into the programmatic formulations of the political settlement. Political settlements would then be judged not just on their ability to formulate policies for growth, but also for their treatment of various forms of social and gender inequality.

7. CONCLUSIONS AND POLICY IMPLICATIONS

How policy focused efforts should be measured and assessed? We understood at the initial stage of this research that quantitative methods used in this research would help in generating statistical evidence for change in gender relations, a consequence of clean and modern energy policies in household and agricultural fields launched by the governments of India and Nepal. And qualitative methods like interviews and focus group discussions in the field would help in gathering nuanced information of the experiences of women and men in the ways and processes of transformation gendered norms in access and use of energy services. A crucial part of this analysis involved the linking of different levels, macro, meso and micro, in order to see how and where changes were introduced. During the course of research we noticed that changes can start at both the macro level, i.e. change in national policies, or at the meso and micro levels, i.e. change as a result of forces of demands generated by women's collectives and civil society groups, having an impact over time on macro policy.

An analysis of political economy of energy shows that the dynamics of forces for change in policies and implementation can be identified with changes or potential for changes in the political regimes. For instance, in the case of Nepal, the period after the end of the monarchy saw the growing importance of various types of inclusivity in energy policy. With regard to the potential for change to include women's strategic and practical needs – such as clean cooking energy with LPG and/or women's access to farm machinery at a higher subsidized rate than that for male farmers – were seen to acquire policy importance in the periods preceding elections, an important part of the vote catching strategy. Clearly these can be identified as a new gender-sensitive energy policy period in the political economy of India.

Women's time at work is divided into two types: cooking and the household work and production, whether it is unpaid, unrecognized household work in household agriculture or paid work with market linkages as wage-earning employees or self-employed. Integrating these two types of work into women's time is the basis of our analysis of the manner in which time use interacts with energy alternatives. Importantly, the high migration of men in Kailali district of Nepal and in Bihar in India, has reduced the household time available for subsistence rice production, leading to women's use of farm machinery, such as power tillers, seeders, reapers, pump sets for irrigation, powered winnowing fans and threshers, in place of traditional human-cum-cattle based agricultural tasks.

Despite these, women have faced the male-centric policy of non-recognition of women as farmers. Land ownership is the criterion for recognizing a person as a farmer. Generally speaking, women in policy and practice do not have land ownership rights.

As women increase their time in production, they are compelled to reduce their time in household work and resort to time-saving and clean cooking. This, in turn, pushes them from collecting firewood to buying or switching to kerosene or LPG use; with even further increased time and saving from daily work wages to adopt labour-saving and clean technologies. Such LPG we saw in case of Dindigul villages in Tamil Nadu, India, that an

increase in women's time in agricultural waged work created pressure to economize on time in cooking with woodfuel and to switch to labour-saving and efficient clean technologies, such as LPG.

Changes in women's energy use patterns resulted in improving women's time and agency in accessing different types of paid work and decision-making at the local level, such as leadership roles in farmers' cooperative and village councils (Panchayats). These roles of women resulted in challenging dominant gender relations and women's use of multiple strategies within the family and community to assert their rights and negotiate for ownership and control rights over resources, such as land, equipment and skills. Women's organizations, SHGs and other such collectives have also become a way to turn political attention to some issues, such as policy change for women's land and asset ownership, eliminating domestic and public violence, and providing subsidized clean fuel for cooking, such as LPG, to improve health conditions of women and infants around them. Thus, these SHGs have not only responded to the structures of neglect of the poor, but also through their agential actions modified these structures in terms of drawing attention to make and implement economic and energy decisions about women's work and entitlements in agriculture and fuel use.

One of the tasks of a political economy analysis is to identity the distribution of power and resources between different groups and individuals and the processes of contestation and bargaining between interest groups with competing claims over rights and resources. Also, how these processes tend to create, sustain and transform these relationships of power and resource control. Agency is related to power, but agency itself is the ability to create space for the exercise of power and its use in terms of influencing development outcomes. Women's agency comes into play in modifying the male-centric structures which are sustained by patriarchal social norms, including those of ownership of resources, productive assets and institutional rules that guide day-to-day functions. The complexity of rules is further made difficult to change by many women's complicity in upholding the norms of male superiority, including in energy access and in control of other resources.

Unlike Booth (2014) who dismisses the idea of agency as "an academic affectation that does not help development practice," we saw however, the manifestation of women's agency in changing social norms of resource control that have constructed women's unfreedoms in rights and resources, while sustaining and nurturing women's economic, technological dependency. A gender-responsive 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 LPG distribution in India. In Nepal such change is seen in a larger representation of women (40 – 50 per cent) at various levels in decision-making bodies. Furthermore, there is greater manifestation of women's agency in male migrant households, where women in the absence of men, have been noticed to access farm machinery with ease and as a routine engagement with the operation of powered farm machinery.

However, in spite of these changes in rural India and Nepal, social and cultural norms about women's economic dependency shape attitudes, and as a result of flawed policies such as the male head of households with all the decision-making power, and a total disregard for recognition of women's household and agricultural work and status as

farmers and their strategic need of the ownership and control rights to land and productive assets have continued.

In this study we have put forward a framework for the analysis of women's labour in household and agricultural production and valuation of women's labour in relation to changes in fuel use in and access to farm machinery in rural India and Nepal. In analyzing this issue we utilize a gender inclusive political economy framework, in contrast to the prevailing technocratic or household income solutions. We have identified women's participation in production, their ownership and control over earnings and productive assets, which increase the opportunity cost of their labour, as the crucial gender factor in promoting a fuel transition; and the importance of women's organized groups in changing power relations and enabling conditions for improvement of their agency/empowerment.

Women's unvalued or undervalued labour promotes collection of wood and other non-monetised solid biomass for cooking and retards mechanization of women's tasks in agriculture. Changes in gender relations, in the form of an increase in the value of women's labour and predicted increased economic empowerment in the household, however, promote the shift from use of collected biomass to purchased, clean and labour-saving fuels, such as LPG. A higher value of women's labour, sometimes brought about by men's migration, also promotes mechanization of women's tasks in agriculture.

This is the primary position looked into and taken up by this research project. There, however, is a second-order question: Does such a change in energy use re-shape gender relations? By re-shaping gender relations is meant a reduction in gender inequalities and revised sharing of power in various spheres, such as household decision-making or power, distribution of domestic responsibilities, including men's sharing of household and care work, parity in distribution of access to paid work, leisure, social networking and so on. Paraphrasing Janet Halley (2018: 253), we ask the question: what distributions (or inequalities) does access to clean cooking energy and increased mechanization in agriculture shift, and what distributions (or inequalities) does access to clean cooking energy and increased mechanization leave in place?

One type of inequality that is definitely positively impacted by fuel switching is that of women's exposure to household air pollutants. Women, as cooks, are much more exposed to these pollutants, leading to the WHO estimate of 1.4 million annual premature deaths of women and children in India. So as the opportunity cost of women's time increases we would expect them to use cleaner fuels and suffer less from pollution.

There is gender inequality with regard to leisure, with women routinely working more hours, whether in household work or production work, than men. In our study they worked at least an hour each day more than men. But with LPG cooking requiring less time than cooking with solid biomass, women in a national workshop (March 2018) on LPG use in India, said that they now had more time to rest than before. Women in Dharmathupatti, India, pointed out that they could now get up at 6am, rather than at 3.30 or 4am as they used to before switching to LPG. In Nuagada, Odisha, India they pointed out that they had more time to relax. In Nepal, women in the village Pavera said that they used time saved from cooking (and collecting woodfuel) and the reduction of drudgery to

spend more time with their children, leisure or a different type of productive work, or an investment in human capital.

In the above manner, use of LPG reduces what is referred to as women's time poverty. University of Oslo, TERI, Seacrester Consulting and Dunamai Energy (2019) also reported that with access to (greater use of) electricity and the extension of the day women used the extra time available to relax, socialize, and be better connected (through mobile phones) with the outside world, besides increased safety with street lighting. Similar changes have been reported for electricity providing streetlights in other studies (Jagori for UN-WOMEN 2009). These are all reductions in various gender inequalities – in access to leisure, to social connections and safety in public spaces.

Thus, a *reduction* in time required for cooking (and extension of the working day with light) enabled women to reduce gender inequalities in access to leisure and household air pollution. But there was little mention of any *redistribution* of household work with men. In Dharmathupatti, Tamil Nadu and Mayurbanjh, Odisha, India, women said that with LPG men would now be willing to cook when women went for a meeting. But such instances of men being willing to undertake a redistribution of household work were not mentioned in other FDGs.

Gender relations shape or frame the manner in which energy is used within the household by women and men. Our concluding finding is that the use of modern energy services, whether of clean energy in cooking or modern energy in agriculture, in turn, also enables women to re-shape gender relations. This re-shaping of gender relations occurs through reduction in drudgery, and increase in leisure time. They have more time to socialize. There is some reduction in unpaid work. However, there is little evidence of a redistribution of unpaid work between women and men. By using a vector of gender inequalities, we are able to get a nuanced view of changes that occur or do not occur in these inequalities. This makes it analytically preferable to an 'all or nothing' approach to gender inequality.

In this research we noted that gendered norms and attitudes change through: a) women's unmediated asset ownership rights to land, house, energy equipment and new technology; b) organising and self- organising of women as SHGs and other such collectives; c) training and capacity development of women in new knowledge, financial skills and operation of new technology; c) policies that have addressed gendered social norms , such as the Hindu Succession Amendment Act of 2005 for equal inheritance rights of women in ancestral property; Ujjwala program for clean cooking energy, with LPG connections in the woman's name, regardless of the marital status; d) women's quotas (33 to 50 percent) in political governance in India and Nepal; and e) agricultural policies of higher subsidies for ownership of farm machinery by women farmers in India.

A four-pillar strategy for gender transformational change is likely to redress women's gendered exclusion from modern energy, an exclusion that is particularly acute in remote rural areas, and promote gender equality: (1) changes in macroeconomic policies that recognize both women's household and agricultural work and address gendered norms and practices at local levels and beyond; (2) social mobilization as a form of power intervention to realize women's access to production activities; (3) women's equal access to ownership and management of productive assets i.e. land, house, new technology; and

(4) gender sensitive concerns and sharing, by both women and men, of roles and responsibilities addressing adverse social norms and attitudes that promote women's economic dependency, lack of mobility and unfreedoms within home and in wider society.

There is a need for capacity development at the village cluster/ Panchayat or sub-district level to provide technical assistance and training through hands-on advice, training on women's rights and resource control and peer-to-peer learning in operation of farm machinery, accounting and management skills to operate their bank accounts and how to buy and /or hire farm equipment from the government or privately run centres, as is done by SEWA in Munger district of Bihar in India.

The complexity of social norms and doxa of attitudes can be addressed through continued national and transnational dialogues on the need for change in gendered norms and attitudes. Such dialogues are to be based on research-based advocacy on gender justice followed at tandem by concerted nudge towards a gender equality and women's empowerment shift in policies and practices of energy services and infrastructure for household, agriculture as well as other production spheres.

8. MESSAGES FOR POLICY AND PRACTICE

Way forward for women's empowerment. Photo: Elavarasan Devarajan/ENERGIA

Given the varied and complex forces of economic growth models and social norms at play, women's empowerment and gender equality is still a long way off. While the scale of challenge is there, there have been some strides made. Importantly this suggests that many of the answers lie in the policy help, in the sense that the gender- responsive policies with effective implementation advance women's agency /empowerment and overcome underutilization of human potential and capacities for economic growth. Listed below are some messages from our research on factoring gender in the political economy of energy sector in India and Nepal:

- Policies to induce women to undertake an energy transition from cooking with solid bio-mass to cooking with LPG as clean energy have focused on providing a capital subsidy as an incentive to utilize LPG. We have pointed out that where bio-mass is collected by women's unvalued labour, this has usually failed to result in fuel switching; rather the result has been fuel stacking with wood remaining as the primary fuel. Our analysis has shown that the importance of women's agency through income earning with greater control over earnings and land ownership to bring about an energy transition. Furthermore, another dimension to policies to induce energy transition is a concerted nudge by campaigns to establish cooking with LPG, or electricity as the new normal, a prestige good for the wellbeing of the household.
- The asset light economy, like in case of SEWA (in Bihar) and solar pump sets (in Gujrat) where an individual user can pay for the services on an hourly or daily rate, and not have to buy the equipment. This can go a long way in building an inclusive energy technological change in rural India and Nepal as well as in other developing countries.
- It is necessary to assess the impact of energy and other interventions on a vector of gender inequalities, not all of which may be affected by an intervention of energy policy. For example, policy for delinking the status of a farmer from land ownership and thereby recognition of all women (and men) engaged in farming as farmers. Such a recognition would allow their access and use of the subsidized farm machinery, as promoted by the Agricultural policy in India.

- Admittedly, several policies for energy access do include gender considerations at macro level, the outcomes at micro levels are often made ineffective by gendered social norms. Gender-responsive innovations are key to implement the policies, which can create access and develop capacity to use powered (electricity or diesel) machines.
- The importance of networks for women's economic empowerment, such as in accessing financial support and credits, improving the operational skills and knowledge of new technology plays a major role in overcoming traditional constraints usually ridden with gender norms. Organizations of women as active agents in agriculture and allied enterprises has been shown to lead to access to productive resources such as land and clean cooking energy for its members. Successful examples are the Kudumbashree women's collectives in Kerala, SEWA (Self Employed Women's Association) in the states of Bihar and Gujrat, which promote women's skills for operation and management of powered farm machineries in agriculture and women's groups in Kailali district of Nepal which have acquired CNG powered auto rickshaws and other powered agricultural equipment.

Emerging Areas for Future Research

Our report has shown the importance of securing women's access to, and use of, modern energy services, however some gaps still exist which indicate the need for future research:

1. Building women's agency through the development of asset-light energy services.
2. The role of rural women's collectives in the production and consumption of modern and clean energy services.
3. Inclusive innovation, involving women both as producers and consumers, in modern energy services.
4. Policies for setting up rural women's business enterprises to understand how they contribute to the economy.

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Annex 1 : **CASE STUDIES**

Case Study 1

Self- Help Groups Enable Rural Women to go for Clean Cooking Energy in, Mayurbhanj, Odisha

The village of Tulasichoura of Betnoti block inhabits 259 households, out of which 26% of households belong to ST category, less than 1% belong to SC category and the rest belong to OBC category. The people of this village are small and marginal farmers, weavers, casual labourers and daily wage earners. Situated barely 30 km away from Baripada district headquarters of Mayurbhanj, Tulasichoura village of Betnoti has an active group functioning as the Maa Santoshi SHG. They have been instrumental in facilitating the accessibility of the women for using LPG gas in their kitchens. The usual scenario seen in this village is that, the women do all the household work starting from cooking, agricultural work and taking care of the children, ailing and elders. However, they are dependent on their husbands for their livelihoods. This dependence starts ranges from food to clothes, medical treatment, educational expenses of the children and even their petty day to day needs.

This village has been traditionally using firewood as a source of their fuel to cook food. While, the men have been the primary collector of the firewood, they do it at their own whims and fancies. The problem that women face with the firewood is their scarcity and its being wet, which makes it difficult for them to cook food with it. The time and effort that goes into cooking food with firewood often goes unacknowledged. The women are not appreciated or understood for their contribution; instead the family members seldom understand the situation and blame the women for not preparing food in time.
The two alternatives that are available are Kerosene stoves and electricity. In open market a litre of Kerosene costs Rs. 30. The average consumption per family is approximately one litre per day. Other than the cost factor, the availability is also a constraint due to its limited supply and the kerosene shop not being in the village the second is electricity which could be alternatively used for cooking. But it is very costly and unaffordable for the villagers.

In the year 2000, Kausalya Mohanta, a housewife organised 14 women from the village formed the SHG, called their Group “Ma Santoshi SHG. The members further decided to earn money so that there will be no dependency on men. They started saving small amounts of money and started rope making and selling it in the local market. They have received a revolving fund from Community Development Programme and managed a credit of Rs. 2, 20,000 from the District Rural Development authority of which Rs.1, 00,000 was subsidy amount. . Gradually they refunded the loan amount excluding the subsidy. Later in 2003, the SHG members set up a small Public Distribution Shop and sold kerosene to the nearby village. In the year 2006, “Shaktigram Yojana” was started and Ma Santoshi SHG took the opportunity to implement the programme. They mobilized 100 Gas connections initially and gradually the number of connections increased.

From the year 2011, the SHG started Chatua production under Supplementary Nutrition programme and supplied packaged Chatua to 143 Aaganwadi workers received the best SHG award at the district level in 2008 and 2013. The SHG members reported with pride”

Before the SHG, we were dependent on our husbands for money and now our husbands are asking money from us". They are now able to provide good clothing and education to their children. They are also able to take decision about the education of their children.

The women faced many obstacles from their husbands in forming the SHG and setting up the shop. They reported many incidents of incidents of scolding and beating, physical violence by their husbands. When they started opposing such behavior as a group, the incidents gradually decreased. And 2017 when we visited this SHG there are no such incidents of domestic violence anymore. Two other benefits of this being in the SHG were reported: the drinking of men has been substantially reduced; and unlike the pre-SHG period, the husbands were now engaged in some income earning activities.

Now all the Group members have LPG connections in their houses. After getting the LPG connection, their working time in the kitchen has reduced and the cleaning of utensils became easier, which helped them to get sufficient time for the SHG related activities and opportunity to earn more from working outside the home. However, there was a challenge in the supply of LPG cylinder while they periodically required 600 refills, they barely got 140 refills. As a result, they are not able to sell adequate number of gas to their consumers.

Kausalya with her machine for Chatua griding, Mayurbhanj, Odisha. Photo: MSSRF

Case Study 2

Moving Away from Patriarchal Control: Women Managed LPG Distribution Agency in a Village in Odisha

The village of Sindurgoura in Mayurbhanj district of Odisha has 271 households, of different caste groups, with a majority of the "Backward "castes. The people of this village are small and marginal farmers, weavers, casual labourers and daily wage earners. The village has an active group women functioning as the Maa Durga SHG. They have been instrumental in facilitating women's access and use of LPG for cooking. The usual picture seen in this village is that of the women do all the household work including cooking, care of the children and ailing elders and most of the agricultural work. However, they are economically dependent on their husbands for all the needs, food clothing, medical treatment, educational expenses of their children and so on. Further women are not appreciated for their work and contributions to the agricultural economy. Rather they counter shouting and beating by men for not cooking hot food in time. The situation becomes worse during the rainy season, when the wet firewood take time to be lighted and become usable for cooking

For generations the village has used firewood as a source of their fuel to cook food. .The two alternatives that are available are Kerosene stoves and electricity. However these alternative were found to costly and were located at a distance from the village. Interestingly, one small incident within the household of Dipika Mohonto triggered the use of LPG and women's coming together as a SHG. One day in the year 2002, the husband of Dipika refused to give Rs. 500 to buy a doll for their daughter. To move away from her dependence on the man, Dipika organize the village women for a SHG for economic independence "I earn and control money and take decisions on its use"

At the outset, she mobilised 13 women in her village and started Maa Durga SHG in the year 2002. They started saving small amounts of money and started share cropping in the fields of some farmers. Subsequently they received an amount as the revolving fund of Rs, 220, 000 from Community Development Office with a 40 percent subsidy on the repayment. This allowed the women to expand their area of share cropping. The loan amount was Rs.2, 20,000 out of which Rs.1, 00,000 was subsidy amount.

In the year 2006, as an applicant to the "Shaktigram Yojana", The Women SHG t mobilized 100 LPG connections and a mid-day meal program for 200 students. Later all the SHG acquired more LPG connections for distribution in the local area. At the time of our discussion with the SHG in April 2017, we learnt that each of the SHG member has had a saving of Rs.50000 in their Bank account. Further, the SHG women reported about their achievements in terms of economic independence and unmediated authority in decision-making in running the household and min managing children's education as well as in spending on themselves Further, their husbands were no longer in a position to scold and engage in domestic violence, as they did earlier in the formation stage of the SHG. A number of SHG women have encouraged their husbands to stop heavy drinking. Also a number of men got engaged in the economic activities.

Now all the group members have LPG connections in their houses. For cooking, and as a collective, they managed the LPG distribution agency. Reportedly, during the promotion of LPG adoption, they shared their personal experience how after getting LPG connection, their work burden in the kitchen has come down and they spent much less time in cooking

and cleaning of utensils. Reportedly, the LPG connection gave them sufficient extra time for the SHG related activities and opportunity to earn more income.

Case Study 3

Breaking Gender Stereotypes in Dairy Farming through Energy Access, Dindigul, Tamil Nadu

Veeramani is a member of the Lakshmi Milk Producer Group of Kulumai Diary Producer Company at Thiruvalluvar Nagar, Kadiranampatty Village, Kothapulli Panchayat. She manages and runs an automated milk collection centre at Kadanampatty Village and has a dream, "My dream is to start two more milk collection centres".

Compared to farming, women are responsible for more than 90% of the work and management in animal husbandry. But their participation in the milk value chain mostly stops with production. Collection and sale of milk are areas that women in the region usually do not engage in. The local procurement agents of big milk companies and the private small scale wholesalers of milk in the area are all men.

The Kulumai Dairy Producer Company (KDPC) under the Kulumai Women SHG Federation in Kanniwadi region, attempted to break the gender barrier for women in entering the collection and sale of milk by promoting electrified, automated milk collection centres in the region with the support of ABT group of Industries.

This case describes the case of Veeramani who manages and runs one of the 16 automated milk collection centres operating under KDPC.

Veeramani, 25 years old is a mother of two children. She is studied till 7th standard. Her husband is physically handicapped and is into retailing of rice and other provisions within the village. He cannot go out for any other work. Before running the milk collection centre, she worked at the cotton mill, as an agricultural wage labour and in the government's rural employment scheme, NREGA. The cotton mill work would fetch her Rs.30 per 8 hour shift (now Rs.250-300 per 8 hour shift). Agriculture wage labour would fetch her Rs.150/day, and NREGA Rs.150/day. Wage labour is highly seasonal and NREGA is available only 6 days/month on an average.

At the milk collection centre she earns Rs.6500/month on an average @ of Rs.0.65 per litre. The commission amount is paid by the milk procuring company. Around 42 dairy farmers supply milk to this centre. Milk supplied to the centre ranges from 250 litre per day (lpd) to 450 lpd. The milk collection centre is run on solar power and consists of a SNF (fat) analyzer, weighing machine, printer and an inverter. The instruments in the collection centre are supplied by ABT, a business group, which has dairy as one of its business interests. The Kulumai Women SHG Federation stands as guarantor and provided a cheque of Rs.1 Lakh to ABT and also pays a caution deposit of Rs.5000/- on behalf of the Diary producer group. The centre was started in the year 2015.

In addition, the centre also retails cattle feed concentrate supplied by ABT. She earns a commission of Rs.10 on sale of a 70 kg bag of feed concentrate. On an average about 35 to 40 bags are sold through the centre per month. Veeramani prefers running the milk

collection centre over other forms of employments. The reason articulated was that it gives her a lot of flexibility in managing her time in both productive activities and household work. She spends in total about 3 hours/day at the milk collection centre. She has two very small children and a physically handicapped husband and hence needs to spend a substantial amount of her time caring for them. She also has milch animals at home, which need to be tended to.

Veeramani uses gas for most of her cooking, which includes cooking rice. Firewood is used only for boiling water and preparing cattle feed (gruel). She refills her gas once in 50 days. She said almost 99% of households in the village have gas. Some of them got it through the Government of Tamil Nadu scheme in 2007. The village experienced severe scarcity of firewood since the last two years and many houses got gas connection in the past two years. Veeramani's house has a mixer, grinder, TV and fan .She said she had bought the mixer and grinder from savings from the mill work and the rice retailing business of her husband. They got the TV, fan, and other household appliances supplied through the various government schemes too. The milk collection centre is run on off-grid solar power. The solar panels were supplied by ABT.

Veeramani or her husband don't own any immovable property like land or house. The house and the land on which the house is built is in the name of the father-in-law. Even the gas connection to the house is in the name of the father-in-law. The land and house deed is yet to be transferred to their names.

She said that money earned by her in whichever employment she was in was handed over to the husband and saved in his bank account. This includes the money got from the milk collection centre too. Her husband is the decision maker in the household. She acknowledges that it is through his encouragement and consent that she got into managing the milk collection centre. Similarly, her husband is the decision maker in all matters related to the household, especially those related to buying and selling.

Her husband is related to her. Everyone in the village is married to his or her relative and hence a very close knit kinship control prevails in the village. Even members in the milk producer group as well as the members in the Kulumai group are either related to each other or belong to the same caste group. This limits their chances of interactions outside kinship and caste group even in a common forum like the SHG group. This also in a way results in reinforcing the existing social norms and values, limiting the chances of any woman challenging the established patriarchal systems.

Veeramani's aspiration is to run two more milk collection centres. Running milk collection centres offers her flexibility in balancing work and home. And the state of the art milk collection centres offers her comfort of work. The work at the milk collection centre does not involve drudgery inducing labour and she is not tired or has body aches by end of day.

Veeramani's case shows that breaking gender stereotypes in production doesn't automatically result in changes in other gender norms. The lack of control over household or individual decisions by Veeramani, while being the manager of the automated milk collection centre, shows that being engaged in productive work or being able to access clean energy for productive work does not necessarily mean that women evolve as decision makers or are able to challenge the established patriarchal norms and values.

Nevertheless, according to her articulation, access to clean energy based productive work has offered her a less labour intensive means of earning income, has reduced drudgery related physical illness, and helps her have a better work-home balance.

Case Study 4
Gender Factors in the Perpetuation of Fuel Stacking, Lalitpur, Nepal

Fuel stacking is the phenomenon of households a number of different fuels, often ranging from collected woodfuel, to kerosene, LPG or electricity. Why does fuel stacking exist? Why do households not switch fully from an unclean (unclean in the sense of leading to indoor air pollution in the deposit of black carbon) fuel, such as wood, to LPG? In this short note we look at why the phenomenon of fuel stacking persists in a village in Nepal. From the example of this village we identify some gender factors in the perpetuation of fuel stacking. Of course, we do not claim that these are the only factors that lead to and perpetuate fuel stacking, but the gender factors identified here (of relatively low involvement of women in non-homestead labour and women's limited say in decisions on household expenditure) would have a wider relevance.

The village of Dalchowki, Lalitpur District, Nepal, sits on top of a ridge from which, some claim, on a good day you can see Mt. Everest. That view might in the future help develop tourism; though there is already some tourism as 'Dalchowki Rising Homestay' provides services to those who visit a nearby temple. At present, however, the village economy has already been somewhat transformed by the development of milk production, made possible by access to electricity and all-weather road access to the Kathmandu Valley, but sparked off by loan for installing a chilling plant to cool milk. Running this plant with the available electricity, the family collects milk from this village and another nearby village and sell it in the nearby town.

With the chilling facility being available, farmers increased their production of milk from about 500 litres/day to 1,200 litres/day in the peak season, October to March. The resulting income of (Nepali) Rs. 1,200/day is higher than the daily wage rate of Rs.500/day for unskilled and Rs.1,000/day for skilled work in Kathmandu. Electricity was available in the village for 15 years, but it was only when a saving and Credit Cooperative (SCC) loan was secured that the economic transformation took place. SCCs are meso-level organizations that allow the poor to access loans, despite not having the required assets as collateral. SCCs are the Nepali equivalent of micro-credit groups.

The first loan for the chilling plant was taken in the man's name; but when another loan was needed for a truck, this was in the woman's name. Correspondingly the chilling plant and truck are registered in their respective names. All households in Dalchowki are involved in rearing buffaloes for milk. Women and men share the main job of collecting fodder, but caring for the buffaloes is mainly the task of women. Men, however, take the milk to the chilling centre, and the money is paid into an account in the man's name. With the increase in income in the village, all houses now have LPG. But wood still remains the main fuel for cooking and heating; while LPG is only used occasionally for making tea or snacks. People say that the recent blockade of LPG supplies from India has made them wary of relying on LPG; but there clearly are gender factors at work inhibiting a full transition from woodfuel to LPG or electricity for cooking.

As mentioned above, women have the main responsibility of caring for the buffaloes. This animal care work keeps them within the homestead. As result, though the milk production has increased women's labour in income production, since this increased labour is within the homestead, it is possible for women to combine it with using wood for cooking.

Only in two cases was there a full switch to LPG. One case is a woman who runs a shop-cum-eatery. Being fully engaged in this all through the day, and requiring quick service LPG is used to the fullest. In a second case, a woman has switched to LPG after she saw its beneficial health effects in Kathmandu. When her children offered to get her a TV, she asked them to instead give her a LPG cylinder and stove.

These two examples of a full switch to LPG illustrate two different points. The first is that when there is a high demand for women's labour in income generation, then women are likely to go in for investment in labour-saving equipment, such as LPG is. The second is that even when women do see the health benefits of LPG as against wood, they can make the switch when they do not have control over expenditure. We saw in Dalchowki's main income earning activity of milk production that the money from milk is deposited in men's accounts. In this situation, women would have a possibly difficult negotiation to carry out in securing LPG for its benefits to women's health. Since men stay away from cooking they may not even see the ill-effects of wood smoke on health.

In the absence of two conditions, that of a high demand for women's labour in income generation and of a significant role of women in deciding on use of household income, one would expect that the fuel-stacking (viz. the simultaneous use of various types of fuel, wood, electricity, LPG, with wood remaining the primary cooking fuel) would continue to be a feature of energy use in Dalchowki.

Case Study 5

Women Drivers of the three Wheelers in Nepal

In Nepal, an overwhelming majority of women are engaged in household works. In the 21st century, by the change of time and development, the women have started thinking their career beyond domestic works. Because of literacy, poverty and the urge to do something different women have endeavoured to advance their status. Other driving factors such as political situation, domestic violence, migration with urbanization and modernization and the available opportunities. One such sector is the transport sector where we can observe a number of women driving the three-wheelers, otherwise primarily a male dominant area.

A current example of this is the "woman tempo driver." A tempo is a three-wheeled battery-powered vehicle used as a taxi. Women tempo drivers have been increasing in number in Kathmandu. Running at an average speed of 60 kilometre per hour, safa tempos serve at least 127 thousand people every day transporting individuals to their destinations. This is quite a challenge for a country that has been constantly confronted with power cuts that reach sixteen hours a day especially during winter season.

The number of women drivers in Nepal has climbed over the last few years, and some women have even been driving for international organizations like the UN and foreign embassies. This sudden surge of women drivers is breaking gender barriers and proving that there is nothing stopping women from working in fields traditionally dominated by men. There are more than 700 electric tempos in Kathmandu valley and about 150 regular female drivers, and 350 are part-time women drivers. Among them are around 70 women who own tempos which they have bought on a loan. The tempo, a three-wheeled, battery-powered taxi is a common sight in the streets of Kathmandu, but people are only now getting used to the sight of women in the driver's seat even in cities outside the Kathmandu Valley.

Sarita Dagaura Chaudhary: Seated in the driving seat of the electric three wheeler, waiting to drive customers to their destination is Mrs Sarita Dagaura Chaudhary. The 42 year old mother of three children and a grandmother of three grandchildren clads herself appropriately in salwar suit and takes on to the driving wheel. This woman from an ethnic group of far western region of Nepal has learnt to concentrate hard as she accelerates, brakes and then backs the electricity-powered vehicle the highway of Ghodhaghodi Municipality and dusty lanes of Sukhad. She has successfully stepped into this male dominated sector the transport sector in one of the least developed regions of Nepal, Kailali District. Sarita is the only female electric tempo driver of the 29 that are operating along the roads of Ghodhaghodi Municipality since last seven months.

She has been driving the vehicle for last 18 months and managed to collect some money for paying back the loan, maintaining the rickshaw, household expenses and making some savings as well. Now driving has become her principal source of income. "My work is my savour, and no work is wrong as long as it is done with honesty" Sarita says when I ask about her work. Sarita, a farmer, farming in her own land and helping others in seasonal farming was her regular work. However, once her husband left for another woman, she was left alone. Her children and husband provided no support but instead depended on her for their expenses. With the hard earned money dwindling and no one in the family respecting her valuable time, she looked around for different means of income. She then noticed women driving the e-rickshaw in Dhangadhi, the nearest city, and decided to try her hand at it. With the help of her brother, she bought a new e-rickshaw. However she had no formal training, she learnt driving from her brother. Despite the fact that she did not have any formal training it was easy for her to start her new profession as the e-rickshaw also known as "Tempo", does not require any license and her registration at the e-rickshaw Association provided her necessary support for insurances.

She purchased the auto with a loan, Rs.250, 000, from Sunrise Bank. The necessary collateral, land was provided by her brother, Bhishnu Kant Chaudhary. At 12 per cent interest, she is paying a monthly instalment of Rs. 10,200. The repayment period is 3 years and she continues the repayment at present.

“If there is some support I would like to brush up my driving skill, so far the only training I had is a one day training from Bajaj, it was more of an introduction to the vehicle”

She begins her day at 6 AM remaining at the wheels till 7 PM. Charging Rs 10 per passenger and driving around for nearly 11 hours, she is able to earn Rs. 800 to 1200 per day. With an income of Rs 25,000-28,000 per month, she has a monthly savings of 15,000. To date her largest expense is Rs. 1500 per month for charging the battery used to run this electric vehicle. The vehicle needs to be charged daily for nearly 8 hours. Besides, she also deposits Rs. 100 per month to the Three-Wheelers’ Association set up to help its members in case of any accident. She has also initiated a daily saving of Rs 500 at a cooperative. The income from the three-wheeler has met the household expenses especially for electricity and school fees of children. Sarita living has been improved. With her income, she is able to take care of her family.

To save time from household chores, over the last few months she has even switched her cooking fuel from traditional fuel wood to improved cook-stoves. She has just recently begun using LPG. “I understand the benefits of reducing the use of fuel wood and the impact of clean fuel on health and the environment. For me this change in the cooking fuel comes from the need to be on the road before the other drivers.”

She further goes on to say, “Tempos are easy to operate and are safe, and one can earn good money from driving it, this is one thing I have learnt over this period of 18-months.” The tempo working day is from 7 AM to 7 PM, which is also comfortable time for her. She is able to have enough time for lunch and to prepare dinner in the evening after work.

This is also true that being a woman in the driving industry is not so easy in this society. They have to face rude passengers and the public. If they make some mistakes, people say it is due to gender differences. There are some challenges too, for example; people think that women in this profession are not good- morally. She vehemently expressed the need for literacy and training program which would have made it possible to understand the terms in this field. Having taken up this profession she says “I do not accept that men are born stronger and women are weak and are not able to do these challenging jobs’.

“This driving profession has made me more confident and capable of managing my family even better’ states Sarita. She agrees that women are brought up in an environment where women are taught that they are only born for household work, not for outside jobs. But working in this field for the last few years, “I am happy” she states however, I would like to learn many more things such as fixing mechanical problems of the vehicle and if possible assembling it as well.”
In the early days she commonly heard people say “Females are no less capable of operating automobiles, yet the stereotype that they are still exists. In the beginning, people used watch me driving the tempo. It was difficult to get them sit in my vehicle. But now they are more willing to let me drive them to their destination”.

For encouraging women to take up this job, she states, “the government also should give more facilities for women, so they have easy and affordable access to learn to drive and be in this growing profession. The women in the driving industry are a testimony to the empowerment of women in this country where women have been discriminated in many

ways. If people accept women in as tempo drivers more easily, then this can encourage women to enter into many other fields where women have traditionally been excluded".

Annex 2 : **TABLES (INDIA AND NEPAL)**

INDIA

Tables for Clean Energy for Clean Cooking Energy

A2-1	Time Spent by Women in Household Work (in hours)			
Access to Clean Cooking Energy	Min.	Max.	Mean	CV
Yes	2	9	4.4	43.18
No	2	9	4.6	26.09

A2-3	Time Spent by Women in Productive Work (in hours)			
Access to Clean Cooking Energy	Min.	Max.	Mean	CV
Yes	1	10	6.6	31.82
No	1	10	6.4	20.31

A2-5	Time Spent by Women in Leisure (in hours)			
Access to Clean Cooking Energy	Min.	Max.	Mean	CV
Yes	1	7	2.6	50.00
No	1	7	2.1	57.14

A2-7 Status of Women's Asset Ownership (in numbers)		
	Women Owns Asset	
Access to Clean Cooking Energy	Yes	No
Yes	21 (43)	125 (50)
No	28 (57)	123 (50)
Figures in parenthesis are percentage to Column total		

Tables for Modern Energy for Production - Agriculture

A2-2	Time Spent by Women in Household Work (in hours)			
Access to Modern Energy for Production	Min.	Max.	Mean	CV
Yes	2	9	4.6	32.61
No	2	9	4.5	26.67

A2-4	Time Spent by Women in Productive Work (in hours)			
Access to Modern Energy for Production	Min.	Max.	Mean	CV
Yes	3	9	6.8	19.12
No	1	10	6.4	28.13

A2-6	Time Spent by Women in Leisure (in hours)			
Access to Clean Energy for Production	Min.	Max.	Mean	CV
Yes	1	4	2.6	38.46
No	1	7	2.3	56.52

A2-8 Status of Women's Asset Ownership (in numbers)		
	Women Owns Asset	
Access to Clean Energy for Production	Yes	No
Yes	4 (8)	44 (18)
No	45 (92)	204 (82)
Figures in parenthesis are percentage to Column total		

A2-9 Women's Overall Decision-making Power (in numbers)		
	Access to Clean Cooking Energy	
Level of Decision-making	Yes	No
None	24 (16)	35 (23)
Low	49 (34)	81 (54)
Medium	29 (20)	9 (6)
High	31 (21)	2 (1)
Absolute	13 (9)	24 (16)
Figures in parenthesis are percentage to Column total		

A2-10 Women's Overall Decision-making Power (in numbers)		
	Access to Clean Energy for Production	
Level of Decision-making	Yes	No
None	4 (8)	55 (26)
Low	26 (54)	104 (12)
Medium	12 (25)	26 (12)
High	6 (13)	27 (13)
Absolute		37 (17)
Figures in parenthesis are percentage to Column total		

A2-11 Women's Role in Management and Marketing (in numbers)		
	Access to Clean Cooking Energy	
Responsibility Level	Yes	No
None	41 (48)	57 (59)
Low	35 (41)	26 (27)
Medium	9 (11)	14 (14)
High		5 (5)
Absolute		5 (5)
Figures in parenthesis are percentage to Column total		

A2-12 Women's Role in Management and Marketing (in numbers)		
	Access to Clean Energy for Production	
Responsibility Level	Yes	No
None	16 (47)	82 (52)
Low	12 (35)	49 (31)
Medium	4 (12)	19 (12)
High		5 (3)
Absolute	2 (6)	3 (2)
Figures in parenthesis are percentage to Column total		

A2-13 Women's status in Primary Occupations (in numbers)		
	Access to Clean Cooking Energy	
Status in Primary Occupation	Yes	No
Unpaid Family Labour	66 (45)	91 (61)
Independent Wage Earner	80 (55)	59 (39)
Figures in parenthesis are percentage to Column total		

A2-14 Women's status in Primary Occupations (in numbers)		
	Access to Clean Energy for Production	
Status in Primary Occupation	Yes	No
Unpaid Family Labour	36 (75)	121 (49)
Independent Wage Earner	12 (25)	127 (51)
Figures in parenthesis are percentage to Column total		

A2-15 Women's Educational Status (in numbers)		
	Access to Clean Cooking Energy	
Educational Status	Yes	No
No Formal Schooling	47 (32)	105 (70)
Formal Schooling	99 (68)	46 (30)
Figures in parenthesis are percentage to Column total		

A2-16 Women's Educational Status (in numbers)		
	Access to Clean Energy for Production	
Educational Status	Yes	No
No Formal Schooling	13 (27)	139 (56)
Formal Schooling	35 (73)	110 (44)
Figures in parenthesis are percentage to Column total		

A2-17 Household Report Migration		
	Access to Clean Cooking Energy	
Migration Status	Yes	No
Yes	15 (10)	3 (2)
No	131 (90)	148 (98)
Figures in parenthesis are percentage to Column total		

A2-18 Household Report Migration		
	Access to Clean Energy for Production	
Migration Status	Yes	No
Yes	5 (10)	13 (5)
No	43 (90)	236 (95)
Figures in parenthesis are percentage to Column total		

A2-19 Women's Membership in CBOs		
	Access to Clean Cooking Energy	
Membership Status	Yes	No
Yes	130 (89)	88 (58)
No	16 (11)	63 (42)
Figures in parenthesis are percentage to Column total		

A2-20 Women's Membership in CBOs		
	Access to Clean Energy for Production	
Membership Status	Yes	No
Yes	37 (77)	181 (73)
No	11 (23)	68 (27)
Figures in parenthesis are percentage to Column total		

Cross Tabs With Remoteness

A2-21	Time Spent by Women in Household Work (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	2	8	4.7	21.28
Moderately Connected	2	9	5.1	29.41
Well Connected	2	4	3.4	23.53

A2-22	Time Spent by Men in Household Work (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	1	5	2.3	52.17
Moderately Connected	1	2	1.3	38.46
Well Connected	1	8	1.7	58.82

A2-23	Time Spent by Women in Productive Work (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	1	9	5.9	27.12
Moderately Connected	1	10	7.4	27.03
Well Connected	3	9	7.8	14.10

A2-24	Time Spent by Men in Productive Work (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	5	10	7.6	11.84
Moderately Connected	2	10	8.7	18.39
Well Connected	6	10	8.4	13.10

A2-25	Time Spent by Women in Leisure (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	1	7	2.2	63.64
Moderately Connected	1	4	1.9	47.37
Well Connected	1	5	3	33.33

A2-26	Time Spent by Men in Leisure (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	1	8	2.4	62.50
Moderately Connected	1	4	1.7	41.18
Well Connected	1	4	2.8	35.71

A2-27 Status of Women's Asset Ownership (in numbers)			
	REMOTENESS		
Women Owns Asset	Remote	Moderately Connected	Well Connected
Yes	21 (11)	24 (47)	4 (7)
No	169 (89)	27 (53)	52 (93)
Figures in parenthesis are percentage to Column total			

A2-28 Women's Overall Decision-making Power (in numbers)			
	REMOTENESS		
Level of Decision-making	Remote	Moderately Connected	Well Connected
None	59 (31)		
Low	103 (54)	4 (8)	23 (41)
Medium	7 (4)	15 (29)	16 (29)
High		20 (39)	13 (23)
Absolute	21 (11)	12 (24)	4 (7)
Figures in parenthesis are percentage to Column total			

A2-29 Women's Role in Management and Marketing (in numbers)			
	REMOTENESS		
Responsibility Level	Remote	Moderately Connected	Well Connected
None	65 (51)	18 (45)	15 (63)
Low	38 (30)	17 (43)	6 (25)
Medium	15 (12)	5 (13)	3 (13)
High	5 (4)		
Absolute	5 (4)		
Figures in parenthesis are percentage to Column total			

A2-30 Women's status in Primary Occupations (in numbers)			
	REMOTENESS		
Status in Primary Occupation	Remote	Moderately Connected	Well Connected
Unpaid Family Labour	122 (64)	24 (48)	11 (20)
Independent Wage Earner	68 (36)	26 (52)	45 (80)
Figures in parenthesis are percentage to Column total			

A2-31 Women's Educational Status (in numbers)			
	REMOTENESS		
Educational Status	Remote	Moderately Connected	Well Connected
No Formal Schooling	134 (71)	7 (14)	11 (20)
Formal Schooling	56 (29)	44 (86)	45 (80)
Figures in parenthesis are percentage to Column total			

A2-32 Household Report Migration			
	REMOTENESS		
Migration Status	Remote	Moderately Connected	Well Connected
Yes	5 (3)	4 (8)	9 (16)
No	185 (97)	47 (92)	47 (84)
Figures in parenthesis are percentage to Column total			

A2-33 Women's Membership in CBOs			
	REMOTENESS		
Membership Status	Remote	Moderately Connected	Well Connected
Yes	124 (65)	38 (75)	56 (100)
No	66 (35)	13 (25)	
Figures in parenthesis are percentage to Column total			

A2-34 Women's Decision-making role in Production			
	REMOTENESS		
Responsibility Level	Remote	Moderately Connected	Well Connected
None	121 (92)	33 (65)	33 (60)
Low	4 (3)	13 (25)	20 (36)
Medium	1 (1)	2 (4)	
High	2 (2)	3 (6)	2 (4)
Absolute	4 (3)		
Figures in parenthesis are percentage to Column total			

A2-35 Women's Decision-making role in Household management			
	REMOTENESS		
Responsibility Level	Remote	Moderately Connected	Well Connected
None	59 (31)		
Low	104 (55)	9 (18)	29 (52)
Medium	6 (3)	8 (16)	13 (23)
High		23 (45)	10 (18)
Absolute	21 (11)	11 (22)	4 (7)
Figures in parenthesis are percentage to Column total			

A2-36 Women's Decision-making role in community work			
	REMOTENESS		
Responsibility Level	Remote	Moderately Connected	Well Connected
None	22 (24)		
Low	10 (11)		
Medium	22 (24)		
High			
Absolute	37 (41)		
Figures in parenthesis are percentage to Column total			

A2-37 Women's Decision-making role in personal decision			
	REMOTENESS		
Responsibility Level	Remote	Moderately Connected	Well Connected
None	160 (84)	6 (12)	13 (23)
Low	7 (4)	8 (16)	28 (50)
Medium	9 (5)	25 (49)	6 (11)
High		7 (14)	8 (14)
Absolute	14 (7)	5 (10)	1 (2)
Figures in parenthesis are percentage to Column total			

A2-38 Household Asset ownership- House			
	REMOTENESS		
Ownership Level	Remote	Moderately Connected	Well Connected
Own	190 (100)	51 (100)	50 (89)
Rent			6 (11)
Figures in parenthesis are percentage to Column total			

A2-39 Household Asset ownership- Land			
	REMOTENESS		
Ownership Level	Remote	Moderately Connected	Well Connected
Yes	121 (64)	41 (80)	16 (29)
No	69 (36)	10 (20)	40 (71)
Figures in parenthesis are percentage to Column total			

A2-40 Access to Clean Cooking Energy			
	REMOTENESS		
Access Status	Remote	Moderately Connected	Well Connected
Yes	56 (29)	37 (73)	53 (95)
No	134 (71)	14 (27)	3 (5)
Figures in parenthesis are percentage to Column total			

A2-41 Access to Clean Energy for Production			
	REMOTENESS		
Access Status	Remote	Moderately Connected	Well Connected
Yes	21 (11)	7 (14)	20 (36)
No	169 (89)	44 (86)	35 (64)
Figures in parenthesis are percentage to Column total			

NEPAL

Tables for Clean Energy for Clean Cooking ENERGY chapter

Tables for Modern Energy for Production - Agriculture Chapter

A2-42	Time Spent by Women in Household Work (in hours)			
Access to Clean Cooking Energy	Min.	Max.	Mean	CV
Yes	4	6	4.5	13.33
No	4	6	4.2	11.90

A2-43	Time Spent by Women in Household Work (in hours)			
Access to Modern Energy for Production	Min.	Max.	Mean	CV
Yes	4	6	4.5	15.56
No	4	6	4.3	13.95

A2-44	Time Spent by Women in Productive Work (in hours)			
Access to Clean Cooking Energy	Min.	Max.	Mean	CV
Yes	0	9	6.1	26.23
No	0	9	6.2	25.81

A2-45	Time Spent by Women in Productive Work (in hours)			
Access to Modern Energy for Production	Min.	Max.	Mean	CV
Yes	6	8	6.5	10.77
No	0	9	6.1	27.87

A2-46	Time Spent by Women in Leisure (in hours)			
Access to Clean Cooking Energy	Minimum	Maximum	Mean	CV
Yes	0	3	1.4	85.71
No	0	3	1.1	118.18

A2-47	Time Spent by Women in Leisure (in hours)			
Access to Modern Energy for Production	Minimum	Maximum	Mean	CV
Yes	0	3	1.6	68.75
No	0	3	1.2	108.33

A2-48 Status of Women's Asset Ownership (in numbers)		
	Women Owns Asset	
Access to Clean Cooking Energy	Yes	No
Yes	17 (53)	141 (57)
No	15 (47)	105 (43)
Figures in parenthesis are percentage to Column total		

A2-49 Status of Women's Asset Ownership (in numbers)		
	Women Owns Asset	
Access to Modern Energy for Production	Yes	No
Yes	6 (19)	34 (14)
No	26 (81)	212 (86)
Figures in parenthesis are percentage to Column total		

A2-50 Women's Overall Decision-making Power (in numbers)		
	Access to Clean Cooking Energy	
Level of Decision-making	Yes	No
None	37 (23)	9 (8)
Low	90 (57)	80 (67)
Medium	7 (4)	21 (18)
High	18 (11)	6 (5)
Absolute	6 (4)	4 (3)
Figures in parenthesis are percentage to Column total		

A2-51 Women's Overall Decision-making Power (in numbers)		
	Access to Modern Energy for Production	
Level of Decision-making	Yes	No
None	8 (20)	38 (16)
Low	28 (70)	142 (60)
Medium	2 (5)	26 (11)
High	1 (3)	23 (10)
Absolute	1 (3)	9 (4)
Figures in parenthesis are percentage to Column total		

A2-52 Women's Role in Management and Marketing (in numbers)		
	Access to Clean Cooking Energy	
Responsibility Level	Yes	No
None	89 (56)	47 (39)
Low	42 (27)	27 (23)
Medium	23 (15)	32 (27)
High	4 (3)	9 (8)
Absolute		5 (4)
Figures in parenthesis are percentage to Column total		

A2-53 Women's Role in Management and Marketing (in numbers)		
	Access to Modern Energy for Production	
Responsibility Level	Yes	No
None	25 (63)	111 (47)
Low	13 (33)	56 (24)
Medium	2 (5)	53 (22)
High		13 (5)
Absolute		5 (2)
Figures in parenthesis are percentage to Column total		

A2-54 Women's status in Primary Occupations (in numbers)		
	Access to Clean Cooking Energy	
Status in Primary Occupation	Yes	No
Unpaid Family Labour	99 (63)	85 (71)
Independent Wage Earner	59 (37)	35 (29)
Figures in parenthesis are percentage to Column total		

A2-55 Women's status in Primary Occupations (in numbers)		
	Access to Modern Energy for Production	
Status in Primary Occupation	Yes	No
Unpaid Family Labour	12 (30)	172 (72)
Independent Wage Earner	28 (70)	66 (28)
Figures in parenthesis are percentage to Column total		

A2-56 Women's Educational Status (in numbers)		
	Access to Clean Cooking Energy	
Educational Status	Yes	No
No Formal Schooling	42 (27)	51 (43)
Formal Schooling	116 (73)	69 (58)
Figures in parenthesis are percentage to Column total		

A2-57 Women's Educational Status (in numbers)		
	Access to Modern Energy for Production	
Educational Status	Yes	No
No Formal Schooling	10 (25)	83 (35)
Formal Schooling	30 (75)	155 (65)
Figures in parenthesis are percentage to Column total		

A2-58 Household Report Migration		
	Access to Clean Cooking Energy	
Migration Status	Yes	No
Yes	61 (39)	36 (30)
No	97 (61)	84 (70)
Figures in parenthesis are percentage to Column total		

A2-59 Household Report Migration		
	Access to Clean Energy for Production	
Migration Status	Yes	No
Yes	10 (25)	87 (37)
No	30 (75)	151 (63)
Figures in parenthesis are percentage to Column total		

A2-60 Women's Membership in CBOs		
	Access to Clean Cooking Energy	
Membership Status	Yes	No
Yes	109 (69)	93 (78)
No	49 (31)	27 (23)
Figures in parenthesis are percentage to Column total		

A2-61 Women's Membership in CBOs		
	Access to Clean Energy for Production	
Membership Status	Yes	No
Yes	20 (50)	182 (76)
No	20 (50)	56 (24)
Figures in parenthesis are percentage to Column total		

Cross Tab With Remoteness

A2-62	Time Spent by Women in Household Work (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	4	6	4.4	13.6
Moderately Connected	4	6	4.4	15.9
Well Connected	4	6	4.2	11.9

A2-63	Time Spent by Men in Household Work (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	0	5	2.1	61.9
Moderately Connected	0	5	2.4	58.3
Well Connected	0	5	2.6	53.8

A2-64	Time Spent by Women in Productive Work (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	0	9	5.8	36.2
Moderately Connected	6	9	6.6	12.1
Well Connected	0	8	6.4	17.2

A2-65	Time Spent by Men in Productive Work (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	0	10	6.5	36.9
Moderately Connected	3	10	7.3	27.4
Well Connected	0	10	7.4	31.1

A2-66	Time Spent by Women in Leisure (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	0	3	1.3	100
Moderately Connected	0	3	1.4	78.6
Well Connected	0	3	1.1	118.2

A2-67	Time Spent by Men in Leisure (in hours)			
Remoteness	Min.	Max.	Mean	CV
Remote	0	3	1.4	100
Moderately Connected	0	3	1.5	80
Well Connected	0	3	1.3	107.7

A2-68	Total Work Leisure Hour Women			
Remoteness	Minimum	Maximum	Mean	CV
Remote	4	17	11.5	24.34782609
Moderately Connected	10	16	12.4	14.51612903
Well Connected	4	15.5	11.7	17.09401709

A2-69	Total Work Leisure Hour Men			
Remoteness	Minimum	Maximum	Mean	CV
Remote	2	17	10.1	34.65346535
Moderately Connected	4	16	11.2	27.67857143
Well Connected	3	17	11.4	33.33333333

A2-70 Status of Women's Asset Ownership (in numbers)			
	REMOTENESS		
Women Owns Asset	Remote	Moderately Connected	Well Connected
Yes	17 (13)	4 (7)	11 (12)
No	112 (87)	51 (93)	83 (88)
Figures in parenthesis are percentage to Column total			

A2-71 Women's Overall Decision-making Power (in numbers)			
	REMOTENESS		
Level of Decision-making	Remote	Moderately Connected	Well Connected
None	5 (4)	28 (51)	13 (14)
Low	88 (68)	15 (27)	67 (71)
Medium	17 (13)	3 (5)	8 (9)
High	13 (10)	8 (15)	3 (3)
Absolute	6 (5)	1 (2)	3 (3)
Figures in parenthesis are percentage to Column total			

A2-72 Women's Role in Management and Marketing (in numbers)			
	REMOTENESS		
Responsibility Level	Remote	Moderately Connected	Well Connected
None	52 (40)	34 (62)	50 (53)
Low	30 (23)	15 (27)	24 (26)
Medium	37 (29)	6 (11)	12 (13)
High	9 (7)		4 (4)
Absolute	1 (1)		4 (4)
Figures in parenthesis are percentage to Column total			

A2-73 Women's status in Primary Occupations (in numbers)			
	REMOTENESS		
Status in Primary Occupation	Remote	Moderately Connected	Well Connected
Unpaid Family Labour	93 (72)	35 (64)	56 (60)
Independent Wage Earner	36 (28)	20 (36)	38 (40)
Figures in parenthesis are percentage to Column total			

A2-74 Women's Educational Status (in numbers)			
	REMOTENESS		
Educational Status	Remote	Moderately Connected	Well Connected
No Formal Schooling	45 (35)	16 (29)	32 (34)
Formal Schooling	84 (65)	39 (71)	62 (66)
Figures in parenthesis are percentage to Column total			

A2-75 Household Report Migration			
	REMOTENESS		
Migration Status	Remote	Moderately Connected	Well Connected
Yes	37 (29)	32 (58)	28 (30)
No	92 (71)	23 (42)	66 (70)
Figures in parenthesis are percentage to Column total			

A2-76 Women's Membership in CBOs			
	REMOTENESS		
Membership Status	Remote	Moderately Connected	Well Connected
Yes	117 (91)	36 (65)	49 (52)
No	12 (9)	19 (35)	45 (48)
Figures in parenthesis are percentage to Column total			

A2-77 Women's Decision-making role in Production			
	REMOTENESS		
Level of Decision-making	Remote	Moderately Connected	Well Connected
None	42 (39)	4 (13)	27 (54)
Low	33 (31)	9 (28)	10 (20)
Medium	20 (19)	19 (59)	7 (14)
High	12 (11)		6 (12)
Absolute			
Figures in parenthesis are percentage to Column total			

A2-78 Women's Decision-making role in Household management			
	REMOTENESS		
Level of Decision-making	Remote	Moderately Connected	Well Connected
None	6 (5)	31 (56)	22 (23)
Low	95 (74)	16 (29)	70 (74)
Medium	12 (9)	1 (2)	2 (2)
High	16 (12)	7 (13)	
Absolute			
Figures in parenthesis are percentage to Column total			

A2-79 Women's Decision-making role in community work			
	REMOTENESS		
Level of Decision-making	Remote	Moderately Connected	Well Connected
None	57 (50)	14 (33)	44 (76)
Low	48 (42)	11 (26)	13 (22)
Medium	8 (7)	14 (33)	1 (2)
High	1 (1)	4 (9)	
Absolute			
Figures in parenthesis are percentage to Column total			

A2-80 Women's Decision-making role in personal decision			
	REMOTENESS		
Level of Decision-making	Remote	Moderately Connected	Well Connected
None	55 (43)	46 (84)	47 (50)
Low	44 (34)	2 (4)	31 (33)
Medium	17 (13)	3 (5)	7 (7)
High	7 (5)	3 (5)	3 (3)
Absolute	6 (5)	1 (2)	6 (6)
Figures in parenthesis are percentage to Column total			

A2-81 Household Asset ownership- House			
	REMOTENESS		
Ownership level	Remote	Moderately Connected	Well Connected
Own	129 (100)	54 (98)	94 (100)
Rent		1 (2)	
Figures in parenthesis are percentage to Column total			

A2-82 Household Asset ownership- Land			
	REMOTENESS		
Ownership level	Remote	Moderately Connected	Well Connected
Yes	2 (2)	7 (13)	4 (4)
No	127 (98)	48 (87)	90 (96)
Figures in parenthesis are percentage to Column total			

A2-83 Access to Clean Cooking Energy			
	REMOTENESS		
Access Status	Remote	Moderately Connected	Well Connected
Yes	58 (45)	53 (96)	47 (50)
No	71 (55)	2 (4)	47 (50)
Figures in parenthesis are percentage to Column total			

A2-84 Access to Clean Energy for Production			
	REMOTENESS		
Access Status	Remote	Moderately Connected	Well Connected
Yes	10 (8)	5 (9)	25 (27)
No	119 (92)	50 (91)	69 (73)
Figures in parenthesis are percentage to Column total			

Annex 3 : **REGRESSION TABLES**

Results of Binary Logit Analysis: Factors Determining Clean Energy Use for Cooking & Production in India

Methodology: Binary logit regression models are employed to carry out the political economy analysis of factors determining clean energy use in production and social reproduction. Table 1 provides details on the dependent and independent variables used in the binary logit analysis on understanding the factors determining clean energy for cooking and production. The set of independent/explanatory variables used in the analysis are common across the logit model for cooking as well as production, the outcome variables.

Table R1 Framework for Analysis: Factors determining clean energy use for cooking and production			
Dependent Variable Nature of Variable		**Nature of Variable**	
Access to clean cooking energy (0 if there is no access to clean energy for cooking; 1 otherwise)		Categorical	
Access to clean energy for production (0 if there is no access to clean energy for production; 1 otherwise)		Categorical	
Independent Variables	**Nature of Variable**	**Expected Influence**	**Rationale for Inclusion in the model**
Remoteness	Categorical	+ve	Well connected areas compared to remote areas, will have positive influence on access to clean energy for cooking and production given their better infrastructure, better LPG distribution networks, better access to implements & machinery and the higher opportunity for wage earning employment
Women's employment status in	Categorical	+ve	Women being an independent wage earner compared to being an unpaid family labour is expected to

primary occupation			increase the chances of clean cooking energy use and clean energy use for production
Membership in CBOs	Categorical	+ve	Women being members in CBO is expected to increase the chances of clean cooking energy use at household level & clean energy for production. Reasons being members of CBOs have increased opportunity to participate in income generating activities, report higher savings/thrift, report higher levels of awareness and have better decision-making power
Time spent by women in household work	Continuous	+ve/-ve	The influence of time spent by women in household work on clean energy access is ambiguous as far as literatures on cooking energy choices and clean energy for production are considered.
Time spent by women in production	Continuous	+ve	The longer the time women spent on production, the greater is the chance of clean cooking energy use for cooking and production
Women's decision-making power	Categorical	+ve/-ve	Women with higher decision-making power are expected to have greater influence on shifting the household to clean cooking energy use & clean energy for production and vice versa
Women's asset ownership	Categorical	+ve	Women with high level of asset ownership is expected to have greater intra-household decision-making authority and hence expected to have greater chances of shifting the household to clean cooking energy use & use of clean energy for production
Women's role in marketing	Categorical	+ve	Women playing key role in marketing and management aspects of production are expected

and management			to have better control over the income earned from productive enterprises and hence better decision-making power. Thus women with a say in marketing and management in production are expected to positively influence clean energy use in production as well as social reproduction.

RESULTS:

I. Clean Energy for Cooking: Results and Interpretation India

Factors Determining Clean Energy for Cooking in India:

Table 1 gives the results of the binary logit analysis for clean energy for cooking. The outcome variable whether the household has access to clean energy or not is a dichotomous variable. The explanatory variables included Model 1 is run with remoteness and model 2 without remoteness as an explanatory variable. Since the coefficients of the binary logit estimates reflect only probabilities, the coefficients cannot be interpreted directly in terms of magnitude of effect. The signs of the coefficients of the binary logit output are useful in informing the sign/direction of influence of the explanatory variables on the dependent variable. In logistic regression models, marginal effects are estimated to provide a measure the magnitude of effect of the explanatory variables on the dependent variable. Marginal effect can be interpreted as the effect of a one unit change in a continuous independent variable on the probability of choice of the dependent variable. In the case of categorical/dummy variables, marginal effect measures the effect of switch from one category to another on the probability of choice of the dependent variable.

Table 2 shows the results of both the logistic regression as well as the marginal effects. Interpretation of the coefficients is provided followed by interpretation of the marginal effects. (**The figures highlighted in yellow in the table are the coefficients which are significant, while the figures highlighted in blue are the marginal effects which are significant)**

Model 1: Interpretation of coefficients: (highlighted in yellow in table 2)

Degree of remoteness has a positive and significant effect on the choice of clean cooking fuel in the study area in India. Being well connected and moderately connected compared to being in a remote location had a positive and significant correlation with clean energy use at 1% and 5% level respectively in the model where remoteness was

added as an explanatory variable. The other variable which was significant in model 1 was the 'time spent by women in productive work'. This variable was observed to be negative and significant at 10% level for choice of clean energy for cooking.

Table R2. Factors Determining Choice of Clean Cooking Energy: Results from Binary Logistic Regression				
Explanatory Variables	**Coefficient**		**Marginal Effects**	
	Model 1	**Model 2**	**Model 1**	**Model 2**
Remoteness*				
Moderately Connected	2.4** (0.819)		0.46** (0.134)	
Well Connected	4.4*** (1.147)		0.68*** (0.075	
Women's status in primary Occupation#				
Independent income earner	-0.18 (0.640)	1.33** (0.485)	-0.02 (0.088)	0.25** (0.083)
Membership in CBO^				
Yes	0.59 (0.510)	1.03* (0.482)	0.08 (0.073)	0.18* (0.077)
Time spent by women in household work (in hours)	0.06 (0.160)	-0.16 (0.148)	0.01 (0.023)	-0.03 (0.026)
Time spent by women in productive work (in hours)	-0.31* (0.129)	-0.18 (0.124)	-0.04* (0.017)	-0.03 (0.021)
Women's decision-making Power@				
Low	-0.36 (0.619)	0.28 (0.657)	-0.06 (0.099)	0.05 (0.120)
Medium	-0.35 (0.943)	1.06 (0.792)	-0.05 (0.145)	0.21 (0.152)
High	1.97 (1.231)	3.96*** (1.060)	0.33* (0.191)	0.63*** (0.125)
Absolute	0.56 (1.389)	0.19 (0.959)	0.09 (0.237)	0.03 (0.179)

Women's asset ownership$				
Yes	-1.41 (1.013)	-0.94 (0.714)	-0.17* (0.102)	-0.15 (0.102)
Women's role in marketing/ management+				
Low	0.67 (0.452)	0.82* (0.424)	0.10 (0.072)	0.15* (0.077)
Medium	-0.56 (0.788)	-0.35 (0.610)	-0.07 (0.096)	-0.06 (0.097)
High	0	0	0	
Absolute	0	0	0	
Constant	0.05 (1.187)	-0.45 (1.171)		
Pseudo R^2	0.34	0.22		
Observations (N)	167	167	167	167
Prob > chi2	0.00	0.00		

Source: Results of Binomial Logistic Regression
* Excluded category: Remote
# Excluded category: Women work as unpaid family labour
^ Excluded category: Women not a member in CBO
@ Excluded category: Women's absolute decision-making power, i.e., women take decision without consulting men
$ Excluded category: No asset ownership by women
+Excluded category: Women has no role in marketing/management
Note: *** p<0.01, ** p<0.05, * p<0.1. Figures in parenthesis are standard errors

Model 1: Marginal Effects: (highlighted in blue in Table R2)

It can be observed from the table R2 on marginal effects that shifting out of a remote location to a moderately connected location correlates with an increase in the probability of clean cooking energy use by 46% in model 1, where the variable is included. While a shift out of remote to well-connected correlates with an increase in the probability of clean fuel choice to the tune of 68%., However, a 1% increase in production work correlates with a reduction of the clean cooking fuel use probability by 4%. Women with 'high' (including absolute or sole) decision-making level compared to 'none' have probability of 42% for using clean cooking energy. Women owning assets compared to not owning assets reduced the probability of choosing clean fuel by 17%.

Model 2. Interpretation of Coefficients: (highlighted in yellow in Table R2)

Women being independent income earner compared to wage labour had a positive influence on choice of clean cooking fuel at 5% level. The other variables that has positive and significant influence on choice of clean cooking energy are membership in CBO (at 10% significance), having a 'high' decision-making power compared to no decision-making power (at 1% significance), and having at least a 'low' role in marketing and management compared to 'no' decision-making role (at 10% significance).

Model 2. Marginal Effects highlighted in blue in table 2)

Shift from being an unpaid family worker to an independent income earner increase the probability of clean cooking energy choice by 25%. Shift from not being a member to being a member in a CBO increase the probability of clean energy choice by 18%. Shift from a position of 'no' decision-making to a 'high' decision-making power increases the choice of clean cooking energy by 63%. Similarly shift from 'no' role in marketing and management to at least a 'low' role increases the probability of clean cooking energy choice by 15%.

II. Modern Energy for Production: Result & Explanation – INDIA

Explanation: Factors Determining Modern Energy for Production in India:

Table R3 gives the results of the binary logit analysis for modern energy for production. The outcome variable whether the household has access to modern energy for production or not is a dichotomous variable. The explanatory variables included are remoteness, women's status in primary occupation, membership in CBO, time spent by women in household work, time spent by women in productive work, women's decision-making power, women's role in marketing and management and women's asset ownership. Since the coefficients of the binary logit estimates reflect only probabilities, the coefficients cannot be interpreted directly in terms of magnitude of effect. The signs of the coefficients of the binary logit output are useful in informing the sign/direction of influence of the explanatory variables on the dependent variable. In logistic regression models, marginal effects are estimated to provide a measure the magnitude of effect of the explanatory variables on the dependent variable. Marginal effect can be interpreted as the effect of a one unit change in a continuous independent variable on the probability of choice of the dependent variable. In the case of categorical/dummy variables, marginal effect measures the effect of switch from one category to another on the probability of choice of the dependent variable.

Table R3. Factors Determining Choice of Modern Energy for Production In India (Results from Binary Logistic Regression)		
Explanatory Variables	**Coefficients**	**Marginal Effects**
Remoteness*		
Moderately Connected	1.81* (1.073)	0.28 (0.176)
Well Connected	3.02** (1.144)	0.49*** (0.140)
Women's status in primary Occupation#		
Independent income earner	-2.45** (0.884)	-0.26*** (0.063)
Membership in CBO^		
Yes	-0.63 (0.498)	-0.10 (0.081)
Time spent by women in household work (in hours)	0.39* (0.202)	0.06* (0.029)
Time spent by women in productive work (in hours)	0.20* (0.118)	0.03* (0.017)
Women's Decision-making Power@		
Low	-0.21 (0.633)	-0.03 (0.100)
Medium	0.07 (0.910)	0.01 (0.148)
High	-1.18 (1.108)	-0.14 (0.128)
Women's asset ownership$		
Yes	-0.48 (0.863)	-0.06 (0.100)
Women's role in marketing/ management+		
Low	0.19 (0.460)	0.03 (0.068)
Medium	-0.12 (0.842)	-0.02 (0.113)
High		
Absolute	0.28 (1.064)	0.04 (0.169)
Constant	-3.97** (1.499)	
Pseudo R^2	0.11	

Observations (N)	155	155
Prob > chi2	0.24	

Source: Results of Binomial Logistic Regression
* Excluded category: Remote
# Excluded category: Women work as unpaid family labour
^ Excluded category: Women not a member in CBO
@ Excluded category: Women's absolute decision-making power, i.e., women take decision without consulting men
$ Excluded category: No asset ownership by women
Note: *** p<0.01, ** p<0.05, * p<0.1. Figures in parenthesis are standard errors

Table R3 gives both the coefficients and marginal effects of the binary logistic regression. Interpretation of the coefficients is provided followed by interpretation of the marginal effects.
(The figures highlighted in yellow in the table is the coefficients which are significant, while the figures highlighted in blue are the marginal effects which are significant)

Interpretation of Coefficients: (highlighted in yellow in table 3)
The variables moderately and well connected compared to remote positively and significantly correlates with the choice of modern energy for production at 10% and 5% significance level respectively. Being an independent income earner has a negative and significant correlation with the chance of modern energy use for production. Time spent by women in productive work positively and significantly correlates with the choice of modern energy for production.

Marginal Effects: (highlighted in blue in table 3)
Shifting from a remote location to a well-connected location correlates with the probability of use of modern energy for production by 49% and the effect is significant at 1% level. One more hour in productive work correlates with the choice of modern energy for production by 3%, while on the other hand, shift from an unpaid family worker to an independent income correlated with the probability of using modern energy for production by 26%.

3. Factors Determining Women's Decision-making: Results from Multinomial Logistic Regression

This section discusses the results of the multinomial logit analysis (MNL) for determining women's Decision-making. The value of coefficients reported in the multinomial logit output cannot be interpreted directly, while the signs of the coefficients are useful in

informing the nature of influence of the explanatory variables on the log odds of choice of the dependent variable. Marginal effects are estimated and presented subsequently to convey the magnitude of impact of the explanatory variables on the dependent variable.

As explained in methodology section, the dependent variable 'women's overall decision making power' has five mutually exclusive and exhaustive decision categories. In an MNL model with five categories of dependent variables, one of the categories is considered as the base outcome. The choice of the base outcome does not change the predictors, but it greatly influences the interpretation of the results. In this model the decision making level 'low' is considered as the base outcome. The regression coefficient of the base outcome 'low' was normalized to zero to estimate the model. In a model with *'j'* categories of dependent variables, the multinomial logit regression estimates *j*-1 coefficients. In this analysis, with five 'decision making capacities/level' the model estimates four coefficients.

Results for India:

Table R4 provides the coefficients from regression output for India. It can be observed from the table # that the log-odds of women who are members in CBOs to exercise 'medium' and 'high' decision power over 'low' decision power (the base category) is positive and significant at 10% level. The log odds of higher time spent by women in production on exercising 'medium' 'high' and 'absolute' decision power over the base category 'low' decision power is negative and significant at 10%, for medium and 5% level for high and absolute.

Similarly, the log-odds of women owning assets on exercising 'medium' 'high' and 'absolute' decision power over the base category 'low' decision power is negative and significant at 1% level across decision categories. The log odds of women with some formal schooling compared to those with no formal schooling on having improved levels of decision making capacity is positive and significant at 1% level for decision making levels 'medium' and 'high' is significant at 1% level across all decision levels. On the other hand, log odds of women with some formal schooling compared to no formal schooling on having 'no decision making' power ('none') is negative and significant at 1% level. Migration of adult primary member from the household was found to have positive and significant effect on decision category 'high' compared to decision level 'low' and the effect was women's decision making. The signs of the MNL coefficients obtained for the explanatory variables included in the analysis for women's agential power are in contrast to the apriori expectation of the nature of influence of the variables on women's decision making.

Table R4 . Factors Determining Women's Decision-making: MNL Results for India

Explanatory Variables	Women's Decision Making @@			
	None	**Medium**	**High**	**Absolute**
Membership in CBO^	Coefficients	Coefficients	Coefficients	Coefficients
Yes	-0.28 (0.364)	1.52* (0.752)	2.23* (0.989)	0.75 (0.794)
Time spent by women in productive work (in hours)	-0.07 (0.120)	0.25* (0.126)	0.55** (0.174)	0.81** (0.241)
Women's Education#				
Formal Schooling	-2.19*** (0.481)	1.88** (0.593)	4.35*** (1.214)	0.21 (0.712)
Migration reported in household@				
Yes	0.50 (1.002)	1.10 (0.868)	1.81* (0.871)	0.90 (1.252)
Women's asset ownership$				
Yes	0.24 (1.449)	4.74*** (1.284)	7.24*** (1.361)	7.25*** (1.279)
Constant	0.42 (0.810)	-5.98*** (1.224)	-11.73*** (2.019)	-9.29*** (1.931)
Observations (N)	281			
Pseudo R^2	0.34			
Log likelihood	-264.22			

Source: Results of Multinomial Logistic Regression

@@ base/reference category is decision choice 'low'

^ Excluded category: Women not a member of any CBO

#Excluded category: No formal schooling

@ Excluded category: No migration reported from the household

$Excluded category: No asset ownership by women

Note: *** p<0.01, ** p<0.05, * p<0.1. Figures in parenthesis are standard errors

Marginal Effects:

Table R5 gives the marginal effects of the explanatory variables included in MNL on women's decision making. Women who are members in CBOs compared to those who are not members have an increased probability of enjoying 'medium' and 'high' decision powers by about 7% and 8% and the result is significant at 10% and 5% level. One unit increase in women's time spent on production increases the probability of women being 'high' and 'medium' decision makers by 2% and 3% and the result is significant at 10%. On the other hand, it reduces the probability of women being 'low' level decision makers by 3%.

Table R 5. Marginal Effects of Factors Determining Women's Decision-making: India					
Explanatory Variables	**Women's Decision Making Power**				
	None	**Low**	**Medium**	**High**	**Absolute**
Membership in CBO^	ME	ME	ME	ME	ME
Yes	-0.06 (0.050)	-0.08 (0.061)	0.07* (0.036)	0.08** (0.030)	-0.01 (0.031)
Time spent by women in productive work (in hours)	-0.02 (0.015)	-0.03* (0.017)	0.00 (0.009)	0.02* (0.010)	0.03* (0.011)
Women's Education#					
Formal Schooling	- 0.31*** (0.044)	0.07 (0.055)	0.14*** (0.037)	0.19*** (0.032)	-0.08* (0.033)
Migration reported in household@					
Yes	0.04 (0.125)	-0.17 (0.127)	0.04 (0.079)	0.09 (0.065)	0.00 (0.060)
Women's asset ownership$					
Yes	- 0.23*** (0.032)	- 0.52*** (0.037)	0.00 (0.054)	0.26*** (0.061)	0.49*** (0.063)
Observations (N)	281				
Source: Results of Multinomial Logistic Regression ^ Excluded category: Women not a member of any CBO #Excluded category: No formal schooling @ Excluded category: No migration reported from the household $Excluded category: No asset ownership by women Note: *** p<0.01, ** p<0.05, * p<0.1. Figures in parenthesis are standard errors					

Women with some level of formal schooling compared to those with no formal schooling have increased probability of 'medium' and 'high' level of decision making by 14% and 19% with the result being significant at 1% level. However, women with formal education have reduced probability of 30% and 8% for decision levels 'none' and 'absolute' at 1% and 10% significance level. Women who own assets, compared to those who do not own assets have increased probability of 26% and 49% to enjoy 'high' and 'absolute' decision power respectively. However, asset owning women, have reduced probability of 23% and 52% respectively for 'none' and low level decision making authority respectively.

Summary: Determinants of Women's Decision-making

The signs of the MNL coefficients and the marginal effects obtained for the explanatory variables in the analysis for India are in conformity to the apriori expectation of the factors that contribute to women's agential power. In India, women's asset position, time spent by women in productive work, membership of women in CBO and women's formal schooling were all observed to positively women's higher level of decision making capacity ranging from 'medium to absolute' decision powers. On the other hand, Nepal threw up a different picture with outmigration of adult primary member in the household being the only variable that was observed to have a positive influence on the women's higher level of decision making capacity. Women's membership in CBO is observed to influence only 'low' level of decision making capacity, while time spent by women in productive work is observed to negatively influence women's higher level of decision making capacity.

An overall inference that can be drawn from the results is that women's asset ownership, their educational attainment and their productive engagement can result in increased active participation of women in the consultative decision making process at the household level. The increased bargaining position of women within household is also a reflection of women's agential power - *especially is societies where intra-household decision outcomes are skewed unfavourably towards increasing women's well-being*. Factors like education, asset ownership, and time spent on productive work does contribute to building this agential power for intra-household bargaining positions, at different levels as is evident from the above analysis. A first step towards gender equality in a society/household would be for women to have i) the space to express themselves, ii) actively participate in intra-household decision making processes and iii) through their informed counsel – *as educated individuals with high levels of awareness gained through both education and participation in community engagements*- influence decisions as well as the outcome of decisions at the household.

Annex 4 : **CHARACTERISTICS OF THE STUDY SITES**

Indicators	**India**			
	Remote		**moderately remote – Wayanad, Kerala**	**Well connected - Dindigul**
	Koraput, Odisha	**Mayurbhanj, Odisha**		
Total number of households *(Million)	0.34	0.59	0.19	0.56
Total Population (Million)	1.38 (Male- 0.68 and Female 0.7)	2.52 (Male – 1.26 and 1.26)	0.82 (Male –0.4 and female – 0.42)	2.52 (Male – 1.08 and female – 1.08)
Population density/sq.m	157	242	384	358
Percentage of Scheduled tribe and Scheduled caste population[1](%)	ST -50.56 SC- 14.25	ST - 58.72 SC - 7.33	ST – 18.53 SC – 3.99	ST - 0.37 SC- 20.95
Sex ratio (Per 1000)	1032	1006	1035	998
Average literacy rate(%)	49.21 (M- 60.37 and F- 38.55)	89.03 (M -92.51 and F -85.70)	89.30 (M – 92.51and F- 85.70)	76.26 (M – 84.23 and F- 68.33)
% of families Below Poverty Level	85.00#	57.46#$	78.00#	28.50##
Percentage of households using Fuel wood for cooking including crop residue and cow dung to the total number of households*	84.8	88.53	84. 83	55.25
Percentage of households using LPG for cooking	11.72	4.94	12.42	37.22
Percentage of households using Biogas				

[1]In case of Nepal we do not have scheduled class we have Dalits and marginalized groups.

for cooking – Nepal alone				
Percentage of villages electrified (Odisha till 2013-14	62.7	96.1		100
Percentage of Households with electricity as main source of lighting out of total households @	25.36	23.86	80.83	88.79
Percentage of households have mobile phone connections	21.55	25.81	49.41	59.57
Cropping intensity (%)	134.7	133	180	103.3
Percentage households have access to banking services	36.00	56.55	49.41	59.5

Indicators	**Nepal**			
	Remote – Dhading	**moderately remote –**		**well-connected - Rupandehi , Lumbini**
		Kailali	**Kavrepalanchowk**	
	0.07	0.14	0.11	0.16
Total number of households *(Million)	0.34(Male – 0.16 and Female – 0.18)	0.78(Male – 0.38 and Female – 0.40)	0.47(Male – 0.24 and Female – 0.23)	0.88(Male – 0.43 and Female – 0.45)
Total Population (Million)	174.49	239.79	1,215.93	647.20
Population density/sq.m	Dalits15.33%** Marginalised – 0.48%**	Dalits 11.83%** Marginalised 2.73%**	Dalits-0.26%** Marginalised Groups 9.6%**	Dalits 30.25%** Marginalised 0.23%**
Percentage of Scheduled tribe and Scheduled	886	953	1035	965

caste population[2](%)				
Sex ratio (Per 1000)	62.86% (M-33.09%,F-29.77%)**	66.32% (M-36.94%, F-29.38%)**	69.80% (M-37.87%, F-31.93%) **	69.78% (M-38.66%, 31.12%)**
Average literacy rate(%)	18.8%*#	33.6%*#	13.9%*#	17.3%*#
% of families Below Poverty Level	84.46	85.91	17.86	34.34
Percentage of households using Fuel wood for cooking including crop residue and cow dung to the total number of households*	10.18	6.80	77.18	34.22
Percentage of households using LPG for cooking	3.98	5.83	0.29	3.16
Percentage of households using Biogas for cooking – Nepal alone	62.6**	70.49%**	87.31%**	80.61%**
Percentage of villages electrified (Odisha till 2013-14	62.64%**	62.64%**	62.64%**	62.64%**
Percentage of Households with electricity as main source of lighting out of total households @	63.51%**	65.77%**	66.75%**	77.34%**

[2]In case of Nepal we do not have scheduled class we have Dalits and marginalized groups.

Percentage of households have mobile phone connections	NA	NA	NA	NA
Cropping intensity (%)	30%*$	30%*$	30%*$	59%*$
Percentage households have access to banking services				

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