

Photo: Veronica Mendizabal



From the Lab to the  
Field and Back

## GUIDANCE NOTE ON GENDER INTEGRATION

*Social Context, Gender, and User  
Needs in the Design and Promotion  
of Clean Stoves in Indonesia*

This note is part of a program on social and gender aspects of the development and promotion of clean stoves. Grounded in extensive research in Indonesia, the series consists of practical documents that can be used to integrate social and gender dimensions into work on clean stoves in East Asia and the Pacific and beyond. The target audience is clients and development partners active in the development and promotion of clean stoves. The documents produced by the work program may be downloaded from <https://www.astae.net/publication/social-gender-support-to-indonesia-CSI>.

### East Asia and Pacific

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In Indonesia, approximately 25 million people continue to cook their meals and heat their homes by burning biomass fuel in open fires or inefficient stoves. Globally, the number of people who use biomass in this manner is as high as 2.8 billion. Open fires and traditional stoves release high levels of black-carbon particulates, which are associated with poor health in cooks and their children. The World Health Organization (WHO) estimates that globally, some 4 million premature deaths were attributable to household air pollution in 2012.<sup>1</sup>

Improved cookstoves that burn biomass more efficiently and produce fewer emissions are considered to have a high potential for reducing indoor air pollution (IAP) and its negative health and environmental effects. Improved cookstoves are also considered critical to reducing women's burdens (for example, gathering fuel) and their exposure to risks, including sexual violence during fuel collection.

The Indonesia Clean Stove Initiative (CSI) aims to promote the large-scale uptake of improved biomass cookstoves by enhancing national stove-testing capacities, building value chains, developing a local market for clean stoves, and raising awareness about the risks of exposure to IAP and the benefits of clean stove technologies among government officials, market aggregators, and the general public.

1. <http://www.who.int/mediacentre/factsheets/fs313/en/> (accessed on June 1, 2015).



Despite the potential positive impacts of clean stoves on biomass users' health and the environment, the sustained use of clean stoves remains low in Indonesia and elsewhere. To enhance the potential for large-scale adoption, the CSI is experimenting with approaches that integrate social and gender dimensions into testing, marketing, and promotion of clean stoves.

Field work conducted in Indonesia between 2012 and 2014, followed by an experimental social assessment of improved stoves conducted in 2014 and 2015, have produced a level of understanding of the social and gender aspects that may affect the adoption of clean stoves in Indonesia. Insights into the division of labor as it relates to the cooking and fuel systems and control over decision-making in the household have also served to provide a preliminary assessment of how clean stoves improve women's lives.

### Gender Relations in the Cooking-Fuel System in Indonesia

Indonesia is a diverse country, and its cuisine reflects that diversity. Nonetheless, the field-work in two very disparate areas (Java and Sumba Island) found important similarities. For example, a meal is generally composed of four elements (vegetables, rice, fish, meat or tofu/tempeh, and a chili sauce). These dishes require heat outputs from very high to very low for boiling, simmering, and deep- or stir-frying. To penetrate this market, stoves will have to achieve at least some of these variations in output. Furthermore, changes in temperature have to be achieved rapidly in order for the dishes to be cooked properly.

Another similarity between Java and Sumba Island is the way in which people integrate cooking into their daily tasks. A long cooking session involving all elements of a meal occurs once daily, with leftovers being reheated once or twice for the other meals. The availability of time determines when the long cooking session takes place. Some women participating in our exploratory study indicated that cooking must be finished by 6:00 am so that children can get to school. Women who have accessed the paid labor market cook in the evenings, when they have more time, storing the food for the next day.

Some similarities were also found in relation to gender roles. Tickamyer and Kusujarti (2012) analyzed gender relations in Java within a larger framework of social relations based on two key elements: hierarchy and equilibrium. Javanese society is highly hierarchical, and individuals assume the roles and responsibilities expected of them according to their status, predetermined obligations, and innate nature, all of which must be followed in order to maintain equilibrium. Maleness is traditionally seen as powerful and dominant, while womanhood has been associated with the responsibilities for motherhood and for the husband—the “mother-wife” or *Ibu*. This view of women as a nurturer of family and husband is central to understanding gender practices that permeate women's lives. In Sumba, a traditional patrilineal society, the concepts of hierarchy and equilibrium are also present. In both areas,



women's domain is the domestic space, and cooking for the household falls squarely within their realm of responsibility.

Rapid economic changes in the country over the past decades, including women's inclusion in the labor market, have not fundamentally challenged gender roles. The result is the disconnection between women's actual economic contribution and the perception of women's work outside the home as secondary to their main mother-wife tasks (Niehof 1998). To a great extent, women have continued to assume primary responsibility for household chores, including cooking and related activities—now in addition to productive/economic activities.

Our observations of gender roles as they relate to fuel and stoves have nonetheless identified areas where men are also involved. For example, collecting firewood is a task performed by both men and women. It is not considered arduous. Chopping, on the other hand, is considered hard work and is usually dealt with by adult males, who prepare the wood for storage. Women do chop the wood further at the point of use, if necessary. We have already indicated the predominant role of women as primary cooks, but we also found that in rural areas where large homemade traditional stoves are still the norm, it is men who build and repair them, and stove building is a special traditional responsibility.<sup>2</sup>

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2. This was also the case among Savu men surveyed during fieldwork in Sumba Island in December 2013, who take special pride in knowing how to construct the traditional Savu cookstove.

Changes in urbanization are affecting this division of labor. Fieldwork suggests that among urbanized households, particularly in Java, men have lower responsibilities for stove building and repairing, as the stove has changed from a large multiple-burner stationary stove to the smaller and portable clay stove manufactured by local craftsmen (called Keren). Where Keren stoves are used men have maintained only the role of chopping gathered wood. In these areas, the entire cooking process has for the most part become a women's affair. This may indicate that changes in stove type do affect the distribution of labor within the household.

While the physical involvement of men in cooking tasks may have diminished, their role in choosing stoves has not. In fact, as new and more expensive cooking technologies appear, their decision-making role has actually increased. Our fieldwork identified a marked division of responsibilities for the allocation of household financial resources. Household finances are indeed managed by women, who must ensure that the household's needs are met. Yet, the broader decision of allocating resources is the prerogative of men. Women have thresholds of control that vary from urban to rural areas, and from central islands such as Java to isolated ones such as Sumba. But in general the thresholds are low. Thus, purchasing a kerosene stove in Sumba, or a liquefied petroleum gas (LPG) stove or an electric rice cooker in Java would require the consent of the husband, as the expenditure exceeds the threshold of women's control. Access to credit also requires the husband's consent.

Such limited decision making over resources is an important area for policy action, in particular as our fieldwork suggests that men may not consider the purchase of a "cleaner" cookstove a priority for the household. Men in our sample were not aware of the negative effects of IAP and considered the current traditional options appropriate (from 3-stone fires in Sumba to brick and mortar or clay stoves in Java). Women interviewed indicated that obtaining a new, modern stove is not easily negotiated. Sometimes, women's efforts to obtain a new stove fail (box 1). During the social assessment of clean stoves, one of the questions asked of testers was whether they would need their husbands consent to purchase the stove. Among married women the answer was affirmative in every case.

Similar findings have been reported in other countries. Miller and Mobarak (2013), for example, conducted a field experiment in Bangladesh to explore "intra-household externalities" (competing needs within the household) and tradition-based aversion, two possible reasons for the low adoption of stoves. Their findings suggest that while in principle women may have a stronger preference for stoves promising lower levels of smoke, they are limited by their lack of authority over household financial allocations to act on their preferences. The findings strongly suggest that targeted marketing and outreach strategies will have to be developed to engage household decision-makers who are not directly affected by the

**Box 1. An Example of a Failed Attempt to Change Stoves**

In a focus group discussion with peri-urban women in Sumba in 2013, women reported what happened when they organized to use their savings and credit to buy kerosene stoves in bulk for all the members. They consulted their husbands, as is common practice. The husbands, however, believed that kerosene stoves were extremely costly (\$48), and that other expenditures were more urgent. This created a sense of frustration among the women.

At a subsequent focus group discussion the men in the same village were asked about the kerosene stoves. Their view was that it did not make sense to buy a kerosene stove that would require recurrent fuel purchases as long as it was possible to cook for free. One of the participants summarized their perspective by saying, “For Rp 500,000 it is better to continue using the [three] stones.”

negative outcomes of stove smoke and thus may not see any concrete need or benefit in acquiring cleaner stoves. At a higher strategic level, cookstove promotion cannot be decoupled from work aimed at raising women’s economic empowerment and improving gender equality.

## User Preferences

One of the key areas of inquiry during the fieldwork in Indonesia was to define what cooks seek in a stove. What we found is that while the development community is interested in the common good and long-term benefits such as reducing harmful exposure to smoke, boosting energy efficiency, and lowering environmental impact, stove users want direct, immediate, and concrete benefits—among them stoves that are powerful enough to cook food quickly, that are easy to light, and that can operate on wood of varying quality (table 1).

Price did not rank among the top areas of interest for respondents, although it was still important for 60 percent of the sample. Aesthetics and a modern look were important for almost 40 percent. In focus group discussions it was men who mentioned these aspects, rather than women, the primary users, who were far more interested in the functional aspects of the stove. The safety aspects mentioned during groups discussion referred to the potential risk to children, the cook, and the household as a whole. Traditional stoves are considered generally safe, while some people are afraid of metal stoves that could burn children or cooks. Accidental LPG explosions during the early days of the national program to promote its use instilled fear among users. That fear appears to have subsided in urban and peri-urban areas, while some people in rural communities are still afraid of LPG.

How do available clean stoves perform in light of these preferences? The key issue is that, presently, clean stoves have not been designed specifically to meet user preferences, but rather to reduce emissions and improve heat transfer efficiency; current evaluations of these stove focus on these two aspects. This means that users' needs are not leading the design of improved stoves.

**Table 1. The Top 10 Features Cooks Seek in Stoves in Sampled Sites, in Order of Importance**

	Stove feature	Percentage of respondents ranking feature very important or important	Responses from focus group discussion
1	Powerful/fast	99	Ranked first in preference among focus groups.
2	Rapid/easy ignition	99	The largest amount of smoke is produced when lighting the stove.
3	Durable	99	Important in peri-urban areas where the Keren clay stove is prevalent (Keren stoves last only a year on average.)
4	Fuel efficient	97	Although firewood is available at little or no cost, households are interested in using it more efficiently.
5	Convenient/easy to operate	90	Cooks want stoves that are easy to operate, ignite, regulate, and clean.
6	Less smoke/no smoke	90	Cooks consider smoke uncomfortable but do not perceive it as a major threat and are not aware of the long-term effect of sustained exposure.
7	Uses any type and size of firewood	90	Stoves that require good-quality wood to operate are considered less attractive, as hard wood has to be purchased rather than collected.
8	Can operate with damp wood	59	Humidity directly affects combustion, ignition times, and levels of smoke. Stoves capable of burning damp wood would be useful during the long rainy season (which lasts up to seven months in Java).
9	Portability	58	Fixed stoves are nontransferable and cannot be resold or given away as household assets, reducing their value once purchased or built.
10	Multiple burners	49	Important for preparing dishes simultaneously, saving time, and using firewood more efficiently.

Source: EAP Gender and Energy Facility and CSI (2015a, 2015b, 2015c).

To improve our knowledge of how to bridge the present disconnection between users' needs and the process of stove design, the Indonesian CSI conducted experimental tests under field conditions on five clean stoves that had performed well on emissions and efficiency criteria in the lab. The results are reported below.

### **Speed/Power**

Although a few stoves were as fast as the most widely used traditional stove, most were slower, in extreme cases requiring as much as 90 percent more time to cook the same meals. How would the use of such stoves affect women? In Indonesia some of the testers indicated that they would be unable to use such a stove owing to their other family and work commitments. (Some of the women in our sample work more than one job outside the home.) They need speed and power in a stove if they are to perform their household as well as productive activities. A study in Nepal found that women wanted a stove to be fast because if cooking took too long, they might experience verbal or physical abuse from their husbands. A delayed meal could then have serious consequences (Rhodes and others 2014).

### **Ignition**

Women want a stove that lights quickly. Some of the improved stoves we tested in Indonesia perform well in this regard—but not all. Some are difficult to light, requiring additional materials such as kerosene that are considered expensive, and some stoves produce large amounts of smoke upon ignition, which could offset gains in reducing IAP during operation.

### **Efficiency and Smoke**

Clean stoves do seem to use fuel more efficiently, with gains of up to 35 percent during our field tests in Indonesia. This is important, as males are involved in fuel collection and, although this task is not considered difficult, lightening it could still provide an argument for investment.

### **Fuel Requirements**

This is another area in which some clean stove designs, particularly the “rocket” designs that require top loading, may not meet the expectations of women and could in fact add to their burden. During the social assessment of stoves, the chopping, sawing, and splitting involved in preparing rocket stoves took up to 28 minutes and was a physically demanding task. Because women are responsible for preparing the fuel at the point of use in Indonesia, women would have to perform this preparation.



### Other Observations

Another observation regarding fuel comes from fieldwork in Sumba Island where biogas is being introduced for household energy—mainly to power cookstoves. In this context, it is women, particularly girls, who are in charge of small animals such as pigs and chicken, as well as for firewood collection. It was observed that while biogas reduces the burden on firewood collection to a certain degree (the feed for the pigs that produce the biogas manure is still cooked with biomass collected by girls), any gains in free time that could be used for other activities such as school homework are transferred to the cleaning of pig stalls.

These are some examples of how design and technology could have unexpected effects on women and gender roles. Further evidence is needed to understand these potential effects, positive and negative, as well as the determinants of cookstove use and adoption. In their review of 57 studies, Rehfuss and others (2014) identified 7 domains possibly affecting the use of stoves.<sup>3</sup> Their model suggests that social and cultural characteristics may be more important in inducing initial adoption, while fuel and technology characteristics play a critical role in sustaining use and in fostering wide adoption.

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3. The seven domains are: (i) fuel and technology characteristics, (ii) household and context, (iii) knowledge and perceptions, (iv) financial, tax, and subsidy considerations, (v) markets, (vi) regulations and standards, and (vii) programmatic and policy mechanisms.



Our experience in Indonesia suggests that cultural, social, and specific gender aspects may play a role at all stages. Consider the case of adoption of the clay Keren stove in Java. Although this stove is inefficient and smoky, it has become popular over the years, especially in peri-urban areas. Its use in rural areas remains sporadic. Some possible drivers of its success are that it is the cheapest stove and falls within the threshold of women's control. (Its fragility is one of its main constraints, but because it is relatively cheap it can be easily replaced.) It is small, light, and portable, allowing it to be used in smaller kitchens in densely populated peri-urban areas and to be moved as needed, making it attractive for people renting living space rather than owning a house. It is also offered in three sizes to suit families of various sizes. The Keren is also flexible in that it burns twigs and leaves, as well as firewood, damp or dry. The Keren is widely distributed and available at most corner stores and markets. The broad distribution network means that no additional costs for transport are incurred when purchasing one. Local artisans produce the stove, maintaining low prices. The Keren has successfully addressed contextual and gender aspects, as well as lifestyle changes among people moving from rural to peri-urban communities. A cleaner successor will have to mimic the factors that contributed to the Keren's success.

## Conclusion

Clean cookstoves are a promising solution to the problem of IAP and its negative effects on human health and the environment. However, to ensure their adoption and sustained use, more work is needed to integrate users' preferences into their design. This means, first, understanding the context in which the stoves will be used and the needs and aspirations of intended users. But more is required. Specifically, users must be engaged at various stages of product design, development, and testing to be sure that stoves address felt needs, are functional and understandable to users, and present no negative trade-offs. This work, in turn, will require feedback mechanisms that report to stove manufacturers and promoters what works and what does not in terms of design, development, distribution, and retailing.

While much has been done in recent years to develop a wide range of advanced stoves, it remains important to consider investing in a new generation of stoves that are easy to use, fit the context of use, are validated by users, and do not have negative effects on women. Few technologies are gender neutral. Even one that appears at first glance to be of obvious benefit to women should be assessed for potential differential impacts. To what extent does a proposed stove empower women by reducing the time they must spend cooking and collecting fuel? Because household roles are gendered, it is possible that a stove that reduces smoke may also increase women's work in the kitchen by requiring small cuts of wood or increased attention during operation. Stoves should be assessed in terms of their effects on pertinent gender roles and responsibilities to determine the extent to which stoves affect gender equality in positive or negative ways.

The role of men as decision-makers in matters of household resources should also be considered. Some stove makers have begun to address this by bundling their products with additional benefits such as mobile phone chargers as a way to create incentives for men to purchase a clean stove. Targeting men in awareness-raising campaigns should also be explored. Disincentives need to be considered as well. Stoves that appear to add work for men (for example, more time spent preparing fuel) are likely to be unappealing or, worse, may lead men to transfer the additional tasks to women or children. Beyond the analysis of gender roles lies a better understanding of how such roles are reproduced through the family and institutions, including social norms. This is a work in progress.

Another important area is the search for actions that multiply the impact of clean stoves—such as improving kitchen ventilation. Although it is reasonable to expect that efforts to promote the uptake of improved stoves will increase their use in the short and medium term, it is equally reasonable to believe, based on the practices reported here, that people will continue to “stack” stoves and fuels rather than switching completely to a clean stove, at least initially. Thus cooks will continue to be exposed to various levels of harmful emissions. Although kitchen ventilation may be outside the scope of clean stove programs, outreach and awareness-raising activities could beneficially include information on the benefits of kitchen ventilation and information on how to increase it in the most effective manner. In addition, findings indicate that, if they can afford to do so, households will make kitchen improvements following the acquisition of a cleaner stove. Credit schemes for improving kitchens could be used as an incentive for early adopters.

Another area to explore is the potential for fuel diversification. The impact of efforts to reduce exposure to IAP could be increased by promoting the use of efficient energy mixes that combine LPG, firewood, and electricity. What is currently lacking is a full understanding of what the most promising energy mixes might look like and what gains they could bring in resource use and costs in different contexts. In this connection, the potential benefits of the already popular practice of stacking fuels should be explored with a view to the possibility of subsidizing the adoption of a set of devices powered by a variety of fuels, including electricity (for rice-cookers). Subsidies would reduce the upfront costs for households ready to jump into more advanced and cleaner cooking solutions.



Photo: Veronica Mendizabal

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