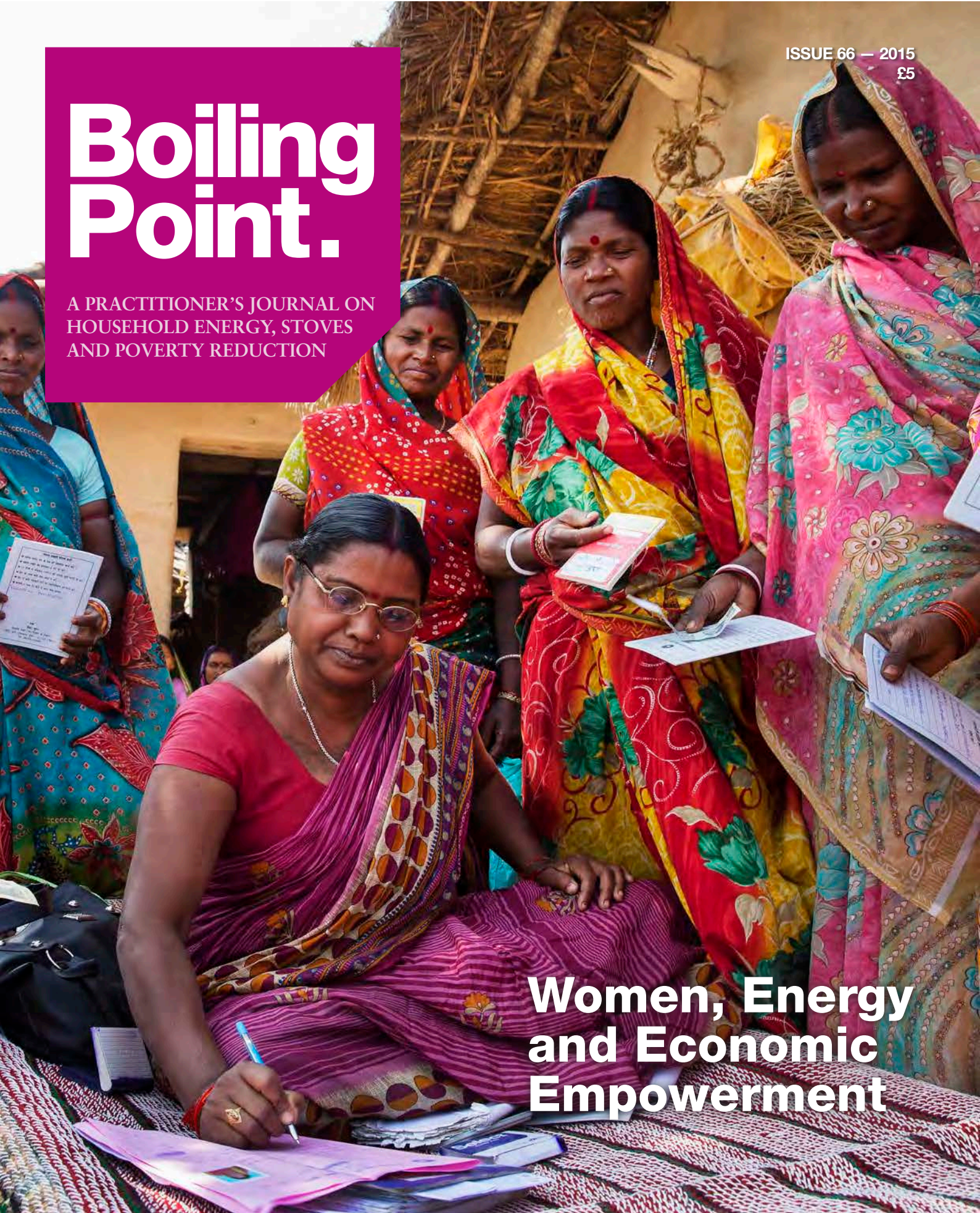


Boiling Point.

A PRACTITIONER'S JOURNAL ON
HOUSEHOLD ENERGY, STOVES
AND POVERTY REDUCTION



Women, Energy and Economic Empowerment

Unlocking women's potential towards universal energy access – p2

Impact of energy access on livelihoods of women home-based workers – p6

Establishing a women-driven clean cookstove distribution network in Eastern Indonesia – p14

The business case for women in clean energy value chains – p18

plus toolkit to empower entrepreneurs, interviews with IIED and Deloitte, helpline, sponsor news and more...

A publication of the

HEDON

Household Energy Network

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Boiling Point is a practitioner's journal for those working with household energy and stoves. It deals with technical, social, financial and environmental issues and aims to improve the quality of life for poor communities living in the developing world.

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to the latest edition of Boiling Point. We strive to make the journal as accessible and participative as possible, and welcome any comments or suggestions by email or post. Please see the inside of the back cover page for details on how to contribute papers to future issues. Boiling Point is published by the HEDON Household Energy Network (www.HEDON.info).

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Cover photo: Women end-users repaying their monthly collection in a self-help group meeting (Source: SEWA Bharat)

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Editorial

ISSUE 66

Women, Energy and Economic Empowerment



In the last few years, gender issues have increasingly been recognised as critical to energy access initiatives. Underscoring the importance of access to energy, or the lack thereof, and its impacts on women and girls, the first two years of the Decade of Sustainable Energy for All (SE4All) are dedicated to a global campaign on energy, women, children and health.

This issue's theme on Women, Energy and Economic Empowerment shines light on the role of women in reaching energy products and services to the poor and 'difficult to reach' consumers. The issue also explores the impact that women-led micro and small enterprises (MSEs) selling energy services can have, with respect to household spending, poverty, gender equality and local markets and economies. Because of their role as household energy managers and through their formal and informal networks, women are in a unique position to connect with their peers, increase awareness and deliver energy products and services. As users, they know what features energy products should have. At the same time, when women who are home-based micro and small scale business owners or workers get energy access, they stand to benefit tremendously through increased productivity and lowered costs, resulting in increased incomes benefitting families, societies and local markets. ENERGIA taps into this huge potential of women-led MSEs in scaling up energy access with its recently launched Women's Economic Empowerment Programme (WE). Read more on the background and WE programme in the article 'Unlocking women's potential towards universal energy access'.

The three theme articles that follow each focus on different aspects of women's economic empowerment in relation to energy and the energy sector. While the Self-Employed Women's

Association (SEWA) article looks at the benefits of energy access on the lives and livelihoods of informal women workers in India (95% of the female workforce), Kopernik and Solar Sister focus on women as suppliers of energy products and services in remote Indonesia and Tanzania, Nigeria and Uganda respectively. Both social enterprises work with different business models—which are explained in the articles—but the ultimate goal is the same: scaling up energy delivery in remote and hard to reach areas, and empowering women as entrepreneurs and businesswomen.

This issue of Boiling Point also includes findings from a recent study that explores how energy access programmes can be levered for women's economic empowerment. Kathleen O'Dell, Senior Manager at Deloitte Consulting LLP, elaborates on this in her interview on the study, 'Women, energy and economic empowerment: Applying a gender lens to amplify the impact of energy access.' Another viewpoint article interviews Sarah Best, Senior Researcher at the International Institute for Environment and Development, who builds on this premise and emphasises the importance of activities and supportive services needed to stimulate productive activities when working with women. These two interviews include pointers for integrating gender in energy policies, projects and programmes.

We hope you enjoy reading this issue of Boiling Point, which was pulled together with great enthusiasm, and hope it will help you derive insights and ideas that benefit your own work as practitioners in the energy sector.

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and Tjarda Muller, Communications Coordinator, ENERGIA*

Theme

Unlocking women's potential towards universal energy access

Keywords: Women; Economic empowerment; Energy; Last mile distribution; Universal energy access



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Picture 1: Young woman working at
a local mill in Macomia, Mozambique
(Source: ENERGIA)

Women are playing a significant role in reaching energy services to the poorest and difficult to reach customers, who would never gain access to modern energy otherwise, thereby making a contribution to the agenda of reaching energy access to all. Encouraging women to become energy entrepreneurs offers multiple development benefits, such as an expansion of economic activities for women, a diversification of productive options and the creation of new sources of wealth and income to support family investments in education and health. ENERGIA's Women's Economic Empowerment programme runs from 2014 to 2017, and is aimed at scaling up proven business models that will strengthen capacity of 3000 women led micro and small enterprises (MSEs) to deliver energy products and services to more than two million consumers. ENERGIA provides funding and technical support to partner organisations in Africa and Asia, who work with MSEs run by women, building their capacities through business development trainings, hand held support and technical assistance.

Energy and its transformative role: The critical enabler

The traditional narrative of the gender, energy and poverty linkage has focused on gender (in)equality which positions women as victims of energy poverty. The starting point of this narrative is that women play a significant role in energy systems as part of their subsistence and productive tasks and also carry the worst burden of energy poverty. In fetching fuel, fodder and water for homes and engaging

in micro-enterprises, women are forced to spend an inordinate amount of time and effort in fuel collection, at times resulting in missed opportunities for employment, education and self-improvement. Women also face indoor air pollution caused by smoke from burning biomass as a cooking fuel in homes and unhealthy work places. More than four million deaths every year are linked to fumes from fuels such as wood, animal waste and charcoal used for cooking and heating and these deaths are mainly attributable to women and children.

Women's vulnerability increases because even though the legal framework supports gender equality, in practice women lack awareness of their rights, have less access to productivity-enhancing resources (credit facilities, information and training) as compared to men and are poorly represented in decision making at all levels in the energy sector.

Notwithstanding the above, energy continues to be a critical enabler. When women gain access to clean and affordable energy services, they gain tremendously:

Box 1: The gender, energy and poverty linkage

- The majority of the world's poor are women
- Meeting poverty reduction goals means: economic empowerment potential
- Economic empowerment helps women achieve their potential and advance their rights
- Economically empowered women contribute to their families, societies and economies
- When women have the skills and opportunities, they help businesses and markets grow

their health improves, children are able to study, and opportunities to earn an income are enhanced. When health clinics and primary health services are energised, maternal and childbirth emergencies can be dealt with better and refrigeration of vaccines and medicines is enabled. Fifty-eight% of health care facilities in sub-Saharan African countries have no electricity, and in 2010, 287 000 women died of complications from pregnancy and childbirth (SE4All, 2015) many of which could be averted if they had access to electricity. It is significant that in the larger context, developmental benefits accruing to women almost always get translated into pro-social gains. When women earn an income, for example, they use the bulk of it in ways that benefit their families, communities and economies.

Women as game changers: The business case for engaging women in expanding energy access

For the past 19 years, ENERGIA International Network on Gender and Sustainable Energy has been working to expand access to energy in developing countries - with a specific focus on the benefits for women and girls. The experience of ENERGIA, its partners and other institutions is demonstrating that in expanding energy access and reaching the 'difficult to reach' customers, women and their partnerships, both formal and informal, can play a central role. This role goes beyond women just being the users of energy services, but as change agents in the energy sector: in selling, maintaining and financing energy products and services. Involving women in energy enterprises and livelihoods is an urgent development imperative, and at the same time, presents a huge potential for two reasons.

Recent research shows that each year, the poor spend US\$ 37 billion on poor-quality energy solutions to meet their lighting and cooking needs (IFC, 2012). More than 90% of this segment can potentially afford improved products and services, since they already spend more on

traditional energy than the commercial cost of superior, modern energy. This represents a substantial and largely untapped market for the private sector. The conventional private sector players find it difficult to tap into this potential because operating distribution channels to reach low-income markets remains a challenge: customers live in remote areas and do not shop at standard retail channels; local distribution chains are fragmented; and sales volumes are low. However, certain barriers must be addressed to tap into these- such as increasing consumer awareness, designing appropriate business models and increasing customers' ability to pay - all of which women are well positioned to contribute to.

Women and their institutions are uniquely positioned to play a critical role in increasing awareness and demand. They can serve as spokespeople for use of clean energy, endorsing marketing messages and taking advantage of women-to-women communication strategies. Women, when involved in the value chain, help ensure that energy products reflect the priorities of women users, thereby increasing the likelihood of adoption and use. With education, training and investment, women can build businesses or be employed in the design, production, marketing, sale and maintenance sectors of new technologies and services.

A large number of women work in micro and small enterprises (MSEs). Without access to energy, the productive potential of women remains largely unexploited. Given opportunities, women have demonstrated their roles as suppliers of energy products and as service providers. In most settings however, a variety of constraints impinge upon women's ability to participate in energy markets, which need to be addressed systematically if such experiments are to be scaled up. Women continue to run MSEs, critical to the family's survival, under primitive conditions and rudimentary and unsafe energy inputs. While women's enterprises account for up to as much as 80% of employment in some countries, as a group, they earn less than 10% of all income earned and own 1% of property.

ENERGIA's Women's Economic Empowerment programme

ENERGIA believes that women can play a crucial role in scaling up energy access globally. At the same time, addressing women's energy needs is a prerequisite for poverty eradication. In line with our commitment to the UN Sustainable Energy for All initiative (SE4All), ENERGIA's Women's Economic Empowerment programme (WE) strengthens the capacity of women entrepreneurs delivering energy services and products, to scale up energy access to the poor.

The WE programme runs from 2014 to 2017, and is aimed at scaling up proven business models that will strengthen the capacity of 3000 women led MSEs to deliver energy products and services to more than two million consumers. ENERGIA provides funding and technical support to partner organisations in Africa and Asia, who work with micro and small businesses run by women, building their capacities through business development trainings, hand held support and technical assistance. At the same time, the partner organisations are involved in advocacy endeavours, aimed at integrating gender objectives in energy policies and programmes at the national, regional and global level. The WE programme partners are the Centre for Rural Technology- Nepal (CRTN), National Association of Community Electricity Users Nepal (NACEUN) and Practical Action Consulting in Nepal; Kopernik in Indonesia; GVEP International and the Social and Ecological Management Fund (SEM Fund) in Senegal; Practical Action Eastern Africa, Sustainable Community Development Services (SCODE) in Kenya; and Solar Sister working in Kenya, Tanzania, Uganda and Nigeria.

Initial results and emerging strategies

Even though the programme is in early stages, we can already glean lessons, primarily from the past experience of partners. These lessons are important as we move ahead and will form the core pillars of the programme.

WE as an alternate model to reach the under- and un-served

Globally, the number of people waiting to make a transition to modern energy services is huge. Eighty-five% of the 1.2 billion strong un-electrified population live in rural areas, with 87% concentrated in sub-Saharan Africa and South Asia. The off-grid population in sub-Saharan Africa alone is forecasted to rise from 600 million people in 2011 to 698 million in 2030. For cooking, the access deficit amounts to 2.8 billion people who primarily rely on solid fuels. About 78% of that population live in rural areas, and 96% are concentrated in sub-Saharan Africa, Eastern Asia, Southern Asia, and South-Eastern Asia (SE4All, 2013). These are communities that have been bereft of the benefits of modern energy and are likely to remain so unless alternative, locally appropriate business models are promoted at scale.

The WE programme brings high quality, affordable clean energy solutions to the rural customer's doorstep where traditional distribution channels do not exist. By doing so, it is an attempt at demonstrating that upscaling these models is feasible and can be a central strategy for achieving universal access. The impact of this model is two-fold: boosting women's income and business skills, and improving the lives of customers who lack access to electricity, clean water and efficient modes of cooking.

Unleashing latent potential: Recruit-train-mentor mantra

The WE partners are creating leaders-women that start with small energy businesses, but with consistent support and mentoring, many go on to become social leaders in their communities. The process starts with a very careful selection process, clearly identifying the barriers each woman faces and systematically addressing them. A common thread in all interventions is continuous mentoring to support business development to the entrepreneurs. It is necessary to take the support package right to the door of the entrepreneur, work around their domestic chores and demystify

'business' when working with women. GVEP International in Senegal provides a range of advisory services to MSEs covering strategic planning, investments, operations and logistics, financial planning and analysis, marketing and sales and project development and training.

Customising solutions

Six months into the programme, and we are reminded time and again that while each of our country programmes is situated within the overall WE framework, there is little that is common in the problems faced and indeed the required solutions in each of the countries. Each of the partners, through years of working with communities and trialing diverse products, has evolved a carefully selected product mix suited to their specific clientele. Solar Sister, for example, partners with leading manufacturers of portable solar lamps and clean cookstoves, to provide a diverse portfolio of products for sale by Solar Sister Entrepreneurs (SSEs), providing customer choice to meet a variety of energy needs. Practical Action Eastern Africa, on the other hand, has built a movement around improved cookstoves and briquettes, even though it disseminates other products as well.

Addressing financing barriers

While a robust product is central to the model, so is ensuring that the consumer is able to afford the product, and at the same time, the entrepreneur has access to funds to meet both investment and recurring costs. Kopernik addresses the 'initial investment barrier' faced by women entrepreneurs by providing initial inventory on consignment, and a starter kit of sales and marketing materials. They also receive mentoring to support their business development. GVEP International in Senegal, along with its partner SEM Fund, tries to bridge the financing gap by facilitating access to capital by linking with local financial institutions, supporting their lending to the MSEs by a partial risk guarantee, and training.

Building on a local network of trust

In introducing new technology, gaining the trust of local communities is a must, especially true in remote villages where the social fabric is cohesive. Building on this social dynamic, the WE partners work closely with individuals, organisations and networks that enjoy local trust such as community-based organisations, cooperatives, savings and loans groups and their members, schools, churches, local government representatives and mothers' groups. The type of partner organisation depends on the local context. For example, on the Mentawai Islands of West Sumatra, Kopernik collaborates with a small kiosk willing to serve as a retailer of life-changing technologies, rather than trying to create a distribution mechanism from scratch. CRT/N in Nepal works with electricity user cooperatives that enjoy the trust of people.

Capturing programme results systematically

In order to capture both successes and failures of the programmes systematically and without doubt, the WE programme uses a Results Based Management (RBM) approach to monitoring, using performance information for effective management and accountability by:

- defining realistic expected results and indicators
- determining baseline and monitoring progress toward results
- integrating lessons learnt into management decisions
- adapting work planning and budgeting to achieve results
- evaluating the results

The RBM is embedded in a 'theory of change' mapped specifically for the WE programme. In addition to tracking project outputs, the RBM tracks immediate outcomes to intermediate and longer term impacts. Indicators track captured project reach and processes, how the women entrepreneurs perform and grow in terms of profitability and sustainability of their businesses (Economic Advancement Indicators), but they also track what this means in terms of empowerment and agency in their lives (Agency or Power Indicators).

Partner	Country	Number of women entrepreneurs	Number of consumers	Technologies
Practical Action Eastern Africa, Scode, d.Light	Kenya	730	364 200	Improved cookstoves (ICS), Briquettes, Solar lighting
Kopernik	Indonesia	600	250 000	ICS, Solar lighting, Water purifiers
GVEP, SEM Fund	Senegal	250	400 000	Solar lighting, Briquettes, ICS
Solar Sister	Tanzania, Kenya, Uganda, Nigeria	1 000	804 000	Solar lighting
CRT/N and NACEUN	Nepal	800	250 000	ICS, Productive use enterprises
Total		3 380	2 068 200	

Table 1: ENERGIA WE programme partners



Betesba Modjo runs a small shop in Waingapu, in the province of East Nusa Tenggara, Indonesia. When she heard about Kopernik's Wonder Women programme, she immediately jumped on board. She was motivated not only by the obvious business opportunities but also for the benefits she could bring to her community. Clean water, safe methods of cooking, and affordable solar lighting are perfect solutions to many of the social and economic issues in her community.



Mrs. Kandé started her dairy production in 2002 in Kolda, South Senegal. Since joining GVEP, the production has doubled, providing the community with quality dairy products, but also generating employment. Her business now employs 13 people. Her success has inspired her to share her knowledge with others during events and she received recognition as a successful woman entrepreneur from the Minister of Livestock and the President of Senegal. "I am very proud of what my business has achieved thanks to GVEP's support," says Mrs. Kandé. "I hope I will be a leading example of how women can succeed in the energy sector."



Phylister Nyaboke started producing char-briquettes in September 2014. She sells the hand-made, ball shaped briquettes at an affordable price to neighbouring households in Kawangware, about 15 kilometers west from Nairobi, Kenya's capital city. "I'm happy, because I can pay rent and buy food," Phylister says. "These briquettes are much better than charcoal. They burn much longer and keep my house warm for hours." To develop her business, Phylister receives technical and business support from ENERGIA partner Practical Action East Africa.

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Author's profile

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Impact of energy access on livelihoods of women home-based workers: SEWA Bharat's intervention in Bihar, India

Keywords: Informal economy; Women workers; Access to finance; Empowerment; Solar home systems



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Picture 1: Habibaben, from
Bhagalpur in Bihar, using a solar
home light system to weave a silk
saree (Source: SEWA Bharat)

Energy access plays a significant role in lives and livelihoods of informal economy women workers. SEWA Bharat is part of the Self Employed Women's Association (SEWA) movement. Established in 1984, SEWA organisations consist of women working in the informal economy (street vendors, domestic workers, construction workers, agricultural labourers, home-based workers). The SEWA Savera programme, implemented by SEWA Bharat, has led to increased adoption of decentralised renewable energy systems among lower income households in rural and urban areas in two districts of Bihar, India. The focus area of intervention is to address challenges emerging from awareness, affordability, and reliability of energy access and the interventions have led to increases in income of women workers and reduction of household energy expenditure. Women's roles as end-users, service providers, entrepreneurs and leaders have been leveraged in the intervention. Innovative methods of 'door step' financing, service delivery and technology has been incorporated. The process, model and ecosystem created over the years through the intervention is a step towards the creation of energy enterprise of women workers.

Energy access and livelihood: Women home-based workers

According to the International Labour Organisation (ILO), the informal workforce in India in 2000 was an estimated 370 million workers, nearly 93% of the total workforce. It is estimated that 95% of female workforce in India is in the informal economy. Work in this sector is associated with low incomes, exploitation, poor living standards and acute vulnerabilities.

Home-based work is a major source of employment for informal economy

women workers in India. As per statistical briefs developed by Women in Informal Employment: Globalising and Organising (WIEGO) and HomeNet South Asia (HNSA), women constitute 43% of the estimated 38 million home-based work in the country. Home-based workers are either self-employed, producing goods on their own or with the help of an unpaid family member, and selling it in markets; or homeworkers who source work from a contractor or middleman and are paid on a piece-rate basis. Types of work undertaken by home-based workers are: value addition in garments including

stitching or embellishment; assembling parts of electronic goods; food processing; and manufacturing incense sticks or hand-rolled cigarettes. Home-based workers are among the most vulnerable of all informal economy workers. Given that they do not work in public spaces, home-based workers' work and contribution remain invisible and unrecognised. There are therefore no specific laws and policies protecting them against exploitation.

Energy access plays a key role in sustainable development, poverty alleviation and climate change. It is well acknowledged that access to clean and

Box 1: SEWA Bharat's composite service

SEWA Bharat is the only organisation in the area which provides composite service of finance and after-sales. The three main costs incurred by the programme are: the product cost, subsidy cost and operational cost. The product cost is entirely borne by women workers through a mechanism more suitable to their cash-inflows, the subsidy cost is leveraged either from government, donors or the community (cross-subsidy) and the operational cost is supported by grants and community contributions collected in the form of fees.

reliable energy, particularly renewable energy, has a positive impact on the environment, children's education, quality of life, income and health amongst others. An impact report of a SolarAid intervention found that rural African families were saving around US\$ 70 per year from solar energy access using this saved money on better food, education and farming. Furthermore, households have been reducing 300 kilograms of carbon dioxide emissions each year.

While access to energy is instrumental in ensuring a decent standard of living, it is twice as important for home-based workers, because their home is also their workplace and energy services are a productive asset. Since the earnings of most home-based workers are on a piece rate, increased output is crucial. Erratic electricity supply and load-shedding affects production levels, sometimes leading to the cancellation of work orders. In a study conducted by HNSA in lower income households of Kathmandu, Nepal, home-based workers reported that load shedding has been hampering their work for an average of 3.75 hours per day. Almost half – 49%– of the home-based workers surveyed, reported the use of alternative energy (candles, kerosene light and power back-up/ emergency light) for their work. Access to assets, tools and equipment based on modern fuels can augment output and productivity of workers. A study by the Self Employed Women's Association (SEWA) in Ahmedabad city, India, stated that the productivity of garment workers almost tripled when a foot-pedal was replaced with a machine. This concept applies to other occupation related productive assets such as electric grinders, looms, beauty parlor equipment, and potter wheels. Since home-based workers combine their work with domestic duties, time is an important resource. However, fuel gathering and collection (wood, kerosene and gas cylinders) takes time away from income generating activities of home-based workers. According to a study in rural Rajasthan, an average household spends 50 hours per month in fuel-wood collection and transportation. Health

too is a productive asset for informal economy workers. Health issues, due to hazardous fuel, can lead to reduced working hours and increased expenditure on medication. According to the World Health Organisation, indoor air pollution is responsible for more than 1.5 million deaths in India per year.

SEWA Savera programme: Energy intervention by SEWA Bharat in Bihar, India

Bihar is one of the poorest and least developed states in India. Under the Human Development Index, Bihar ranks as number 21 out of the 23 states in India. While 84% of villages are electrified in India, the figure for Bihar is dismal, at only 40%. Even for the households that are electrified, power supply is erratic and often limited to three or four hours a day. According to a survey undertaken on Household Consumer expenditure in India by the National Sample 60th Round, expenditure on fuel and lighting amounts to approximately 25% of the overall monthly non-food household expenditure and 11% of total household expenditure in both urban and rural areas of Bihar.

The beginning

In 2010, SEWA Bharat initiated an energy intervention programme in the Munger district of Bihar. The intervention was carried out with a group of 13 women workers, organised into a self-help group by SEWA Bharat. These women were home-based workers who supplemented household income by making leaf plates, a process that was meticulous and time-consuming. Every day at dawn, this group of women would set out to the nearby forest to collect leaves and wood, returning by noon. The latter part of the day was used to process the raw materials. It was in late evening when these workers would begin making the leaf-plates by joining several pieces of dried leaves. The village had no electricity and the entire work process was carried out under the dim light of kerosene lamps, which restricted productivity and

caused strain to the women's eyes. For every 100 plates sold to the contractor, these workers received US\$ 0.39 (Rs 25). The needs of these women seemed simple. They required bright lights to produce more leaf-plates and higher rates from contractors during peak season. SEWA Bharat intervened by providing solar home light systems to the self-help group members on deferred credit and given that the cost of the product was high to bear at one time, a mechanism was created to break the cost into monthly installments.

The operational model

Since its inception, SEWA Bharat has provided energy services to over 6000 people in two districts of Bihar. The products offered cater to the domestic and livelihood needs of women workers. There are five different models of lighting systems currently being provided:

- A four light system for slightly larger houses consisting of 3.6 LEDs
- A two light system with 3.6 LEDs for medium sized shops, dairy farms, poultry farms, cow-sheds
- A two light system specifically for smaller households
- A two light system with a fan for households and small shops
- A one light system for very small shops and vendors

The home light systems consist of a battery, panel, control unit and mobile charger and the key process in provision of energy service includes creating awareness about renewable energy and decentralised energy systems.

Awareness

Limited awareness and incorrect perception hinders the adoption and usage of renewable energy systems among lower income households. Many poor quality solar products are available in the local market at cheaper rates and some users have had bad experiences with these products and therefore are skeptical to use new models. The awareness generation is focused on creating a 'positive experience' among women workers to view renewable



Picture 2: Poonamben from Vaishnavi SEWA self-help group in Munger, Bihar, has installed a light system in her shop (Source: SEWA Bharat)

energy products as an investment instead of an expenditure. SEWA Bharat has strong community networks and institutions in the form of groups, cooperatives and producer companies. Awareness generation is conducted by SEWA Sathis (community leaders) who have been part of the SEWA movement for years. End-users trust Sewa Sathis as they are part of the community and reside in the same location. The houses of the SEWA Sathis are first used for demonstration of lights in villages which enables the neighbourhood community to assess the lights better and clarify their queries. This helps end-users to evaluate and choose a durable product from several options. Regular training programmes are held with SEWA Sathis to build their capacity to create awareness and market the renewable energy products.

Access to finance

For potential end-users, affordability is the biggest challenge. A product is often considered expensive and unaffordable because of the upfront cost. SEWA Bharat addresses this by mobilising subsidy from government schemes and facilitating financing from nationalised banks and SEWA Bharat's created institution to buy products on loan. Mobilisation of subsidies for households is undertaken through dialogues and advocacy with government departments and donors. SEWA Bharat is currently linking members to the Jawaharlal Nehru National Solar Mission (JNNSM), a flagship programme of the Indian government. Since banks are reluctant to lend to poor fearing bad debts, SEWA Bharat undertakes two tasks. Firstly, it encourages banks to lend to lower income households by creating awareness among bankers through trainings, programmes and meetings and secondly, SEWA Bharat ensures full repayment of the loan by creating necessary checks and balances. Credit is provided to end-users who already have benchmark savings in either of SEWA Bharat's micro-finance models i.e the self-help groups and the thrift and credit cooperative. End-users can choose a loan scheme as per their repayment capacity

and cash flow. The loan tenure can go up to 48 months. Every month, SEWA Sathis collect the installment at the door step of the end-user and deposits the money, known as 'door step' financing. Monthly tracking of repayments is done through monitoring and information systems and fines are collected in case of default. SEWA Bharat has facilitated loans worth US\$ 143 000 (Rs 85 lakh) for 1200 households and has ensured 95% recovery of these loans. Additionally, it has mobilised government subsidy amounting to US\$ 44 000 (Rs 27 lakh) for women workers. The current default rate is 5% with the average loan amount to each individual at US\$ 100 (Rs 6000).

While at the beginning of the programme, the loan tenure was for 48 months, there has been shift towards smaller loan tenures due to two factors. Firstly, initially women workers wanted to elongate the loan period as a safeguard against product quality. Women workers believed that the organisation would swiftly respond to product faults if they were outstanding on their loan. However, with increased usage and experience of quality service from SEWA Bharat, women workers' scepticism of the durability of goods has been addressed and they willingly choose loan schemes which are of a shorter period of time. Secondly, SEWA Bharat has also incentivised early loan repayments through small discounts.

Increase in longevity of the energy systems through after-sales and servicing

There is a strong focus placed on increasing the longevity of the decentralised energy systems. The SEWA Savera programme has a technical wing which looks after installations, trainings, and after-sales services of the lights. Fixed servicing of lights is conducted every six months and after-sales service is provided for three years. Local technicians are trained in installation, servicing and complaint resolution. At the time of installation, women workers are advised on lights placement for optimum effect. Upkeep

and maintenance of lights are the primary responsibility of women workers. Usually, women members fear damaging the lights due to incorrect usage or handling. Therefore beginners and refresher technical trainings are conducted with them to acquaint them with the 'Do's and Dont's' of the products.

Impacts of the SEWA Savera programme on the economic empowerment and increased convenience of home-based workers

The use of energy products has offered new work opportunities and livelihood security to women workers.

Homeworkers

The light system has led to an increase in productive hours, particularly for workers who run small shops; stitch garments; weave clothes; and make bamboo baskets, incense sticks and leaf plates. It is estimated that a home-based worker making leaf plates is able to earn an additional US\$ 125 in income annually. Since the supply of electricity from generator operators was erratic, the presence of a lighting device has provided these women with the confidence to take more orders, produce quality products and manage their time.

Self-employed workers

The programme has provided scope for women workers to expand and strengthen their business activities. Bhagvatiben is treasurer of the Sarojini self-help group. She earns her living by running a small shop in the village Bhavikura. In 2012, Bhagvatiben installed a solar light in her house as well as the shop.

Picture 3: Anmolben, from Munger in Bihar, uses a solar home light system to stitch clothes for additional hours during late evening (Source: SEWA Bharat)



“there are 60-70 households in my village and they all come to my shop to buy goods. Because the village is away from the nearest town, my shop is a hub for people to buy daily items. I use the solar light to do the calculation as well as weigh the goods before they are sold to the customer. Now everything is done in bright light and customers are able to see the weighing process and are convinced about what I am selling. Further, during late evenings, customers are able to ascertain that my shop is opened by seeing the bright light from far.”

Bhagvatiben, Sarojini self-help group Treasurer

Service providers

While workers have benefitted from lighting devices, the SEWA Savera programme has built capacity of women workers to market, sell, and provide technical services to the end-user. SEWA Sathis are assigned a cluster of villages, around their place of habitation, to link women workers to the programme. Once a women worker buys the product, the SEWA Sathi is responsible for collecting their repayment amount. For both the tasks, SEWA Sathis are provided incentives. SEWA Sathis have begun resolving minor technical problems of lights such as fuse changes. The Sathis must ensure that women members are satisfied with the product and that their concerns are addressed quickly. Gudiyaaben is a SEWA Sathi responsible for a cluster in Bariyarpur block. She has limited literacy skill but commendable marketing and finance skills. She credits this to her responsibilities as a treasurer in her self- help group. In a span of one year, Gudiyaaben has facilitated the installation of over 200 solar home systems in the area.

Micro-entrepreneurs

SEWA Bharat is also helping women workers initiate their own micro-enterprises. This is being done by assessing specific energy needs, matching these with appropriate technology and products, and financing and building skills of the entrepreneur to run the enterprise. Chediyaaben lives in a remote corner of a village called Tetariya, in Munger district. It is an off-grid village, close to the forest, and has 150 households. Inhabitants of this village travel between five to six kilometers and pay US\$ 2 every month to get their mobile charged. Chediyaaben learnt about mobile charging stations during one of the awareness generation sessions. An idea struck her to provide mobile charging services in her village. She took a loan of US\$ 80 (Rs 5000) from her self-help group to buy a solar mobile charging station and is now earning US\$ 17 (Rs 1000) every month.

“One of the key things I explain to women during marketing is that while they have to pay endless rent to the generator operator, with the SEWA Savera programme they can have ownership over the light system at the same cost.”

Gudiyaaben, SEWA Sathi responsible for a cluster in Bariyarpur block

Business Associates

Business Associates are community leaders who market light systems as per their time convenience and willingness. These associates supplement the work of SEWA Sathis but are not responsible for repayment collections. Bobbyben is a Business Associate in the SEWA Savera programme. She supplements her household income by making incense sticks. As a Business Associate, Bobbyben's main task is to undertake marketing of energy systems and sell the product in and around the area she lives in. Through this activity, Bobbyben is able to earn an additional US\$ 10 in income every month.

The programme's impact on households

Solar home light systems have replaced kerosene lamps as a source of lighting in one room houses. As per anecdotal evidence, there has been a reduction in household expenditure on fuels by at least 80% in small houses. In slightly bigger houses, solar home light systems have reduced monthly

expenditure on fuel by 30%. Households also have the option to charge mobile phones from the light system. This has proved instrumental in reducing the cost of mobile charging by US\$ 1.50 (Rs 90) per month, in remote areas, where people had to travel between four to five kilometers every other day to get their cell phones charged.

Earlier in the programme, most of the women end-users used kerosene lamps during cooking which would get extinguished from any slight movement. The comfort gained from using a stable and bright light while performing domestic chores is profusely highlighted by women workers. Women also point out that residue from kerosene wick would often blacken the walls, making the house appear more darkened. In some cases, more lamps had to be used to offset the darkened room. However, with solar lights this problem has been resolved. Study hours of children have been extended due to solar lights and children emphasise a peculiar benefit of solar home light systems – that bending close to kerosene wick for brightness would often burn their hair. This is no longer an issue with the solar home light system. Household members also cite that the kerosene lamps would often cause fires in thatched houses, a danger now overcome with home light systems.

Women's empowerment

Women associated with this programme recognise their contribution to the reduction of household expenditure and to the increase in household income. Many of the lights have been bought by women workers and are being used in income generating activities by other earning members. Lakshmiben from the village Raithatha has bought a solar home light system which is used by her son to run a tuition centre. Due to the bright light, the teaching hours in the centre have been extended. Lakshmiben's son is able to earn US\$ 100 (Rs 6000) every month and has increased his income by US\$ 25 (Rs 1500) since the installation of the lights.

Access to credit and the acquisition of an asset in a women's name is an empowering process. At the onset of the programme,

the ownership of the lights was held by the self-help groups who lent the lights to other women for usage. However, these end-users expressed the wish to convert the rentals into instalments so that they could own the product after full-repayments. They recognised that the lights had multiplier effects in their household and it was a device they wished to have control over. It is noteworthy that credit provided to women workers for procuring light systems is approved after their credit and repayment history is assessed. While their accumulated savings is a precondition for institutions, like banks, to lend, it is also collateral used by women workers to highlight their credit worthiness in order to procure other renewable energy products. For instance, some of the women workers have expressed the desire to obtain other renewable energy products such as a fan, water pump and television.

Conclusion

The interlinkages between energy access and the livelihoods of informal economy women workers is emerging as a critical attribute in interventions and policy discourse by governments, NGOs and donors. There is a need to build the understanding of the linkages between the economy, culture, social milieu and networks in which poor women live and operate. As highlighted in this article, there are multiple ways in which lack of energy access affects women as compared to men, as women are not only primary caregivers in the household but also workers who use their home as a workplace. The SEWA Savera programme addresses such life-cycle needs of women workers through renewable energy. Women workers are at the forefront of the SEWA Savera programme. The cost required to buy energy products is borne by women workers and local women workers from the community are involved in creating awareness, financial linkages, and loan repayments. Energy products are provided in the name of the woman and the ownership of energy products ensures upkeep and proper maintenance of systems, ensuring greater accountability on usage and payments. The model is effective in its execution due to adoption of practices like

'door step' financing, 'door step' service and 'door step' products. These are significant because distance, time, energy and cost are major barriers among informal economy workers to reach out and adopt new products and services.

This model can be replicated by any organisation which has a strong community presence and network and advocates for a favourable policy environment which allows women institutions (self-help groups, associations, cooperatives, banks and unions) to directly access government schemes and incentives, saving bureaucratic delays. Through the creation of an adequate ecosystem, organisations like SEWA Bharat can bridge the gap between the technology provider and end-user.

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- * Author's profile
- * Acknowledgements

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Viewpoints

Interview with Kathleen O'Dell, Senior Manager at Deloitte Consulting LLP

Kathleen O'Dell, PMP and certified Carbon Reduction Manager, is a Senior Manager with Deloitte Consulting and has 16 years of international development experience in clean energy, energy efficiency, private sector development and the gender-energy nexus. Kathleen has managed and measured performance of USAID, EU, ADB, NORAD, and World Bank projects in Bangladesh, Ethiopia, Jordan, Kenya, Lesotho, Mongolia, Tanzania, Ukraine, Vietnam, and West Bank. Boiling Point editors sit down with Kathleen to talk about a recent report written on energy access and women's economic empowerment.

Content for this article was based on the study, published by Deloitte University Press. Authors of the study include: Kathleen O'Dell, Sophia Peters, manager with Deloitte Consulting LLP, and Kate Wharton, a consultant with Deloitte Consulting LLP.



You recently wrote a report titled 'Women, energy and economic empowerment: Applying a gender lens to amplify the impact of energy access'. Tell us what prompted this study – what exactly is the “untapped link between gender and energy”?

Gender has been examined many ways in international development programmes, from maternal health to gender-based violence to the education of girls. Where these basic needs have been met, development programming has pivoted to focus on skills development, access to finance and credit, support for female entrepreneurs, and other efforts aimed at increasing economic engagement. Other programmes tackle systemic gender issues such as land rights and property laws, political participation, and equal access laws.

Noticeably less prevalent in this discussion, however, is the topic of access to energy and its impact on women and girls. In parallel, reliable, affordable energy is increasingly recognised by the international development community as an enabler of economic growth. The United Nations launched its Sustainable Energy for All (SE4All) initiative and declared 2014–2024 the Sustainable Energy for All Decade. Likewise, in 2013, President Barack Obama launched Power Africa, an initiative to double the number of people with access to power in sub-Saharan Africa, where two-thirds of the population is currently without

access. Similarly, in Asia, the Asian Development Bank launched the Energy for All Partnership, which aims to provide access to safe, affordable modern energy for an additional 100 million people in the region by 2015.

There are two well-accepted narratives related to economic growth. First, vast gender inequalities remain throughout the world and are closely linked to poverty and instability. Second, access to modern energy enables economic advancement. Until now, however, exploration into the relationship between these two narratives has been limited. What is missing, it seems, is the linkage between energy access and women's economic empowerment.

What can you tell us about the trends in women, energy, and poverty?

Global data suggests that gender inequality (as measured by the Gender Inequality Index) is strongly correlated with national poverty levels, as measured by the proportion of the population living under US\$ 1.25 a day. Whether through causation or correlation, gender inequality and poverty are closely intertwined; tackling the former means mitigating the latter.

Therefore, energy access programmes that are coupled with meaningful income-generating activities can play a critical role on both fronts. Analysis of country-level data shows that the greater the proportion of a country's population

that has access to electricity, the greater its gender equality—regardless of the proportion of its population living under US\$ 1.25 a day.

In looking at energy usage, men and women have different energy needs, and both benefit differently from increased access to electricity. For example, improved access to time-saving electric appliances has been significantly more transformative for women than men due to women's role relative to household chores. We see this in studies examining the impact of household appliances on US women during the last century. Coen-Pirani et al. (2010) found that “diffusion of household appliances contributed to the increase in married women's labour force participation rates during the 1960s.”

Yet we also know that, while freeing up extra time for women is necessary to advance economic empowerment, it is not sufficient. Lewis (2014) shows that from 1930 to 1960 in the United States, “household electrification had no immediate impact on female employment, but is associated with increased school attendance, particularly among teenage daughters, and ultimately led to improvements in the labour market outcomes of subsequent cohorts of women.” This study highlights two important points: 1) critical indirect benefits from energy access can be delayed—and even cross-generational—in terms of economic outcomes for women;

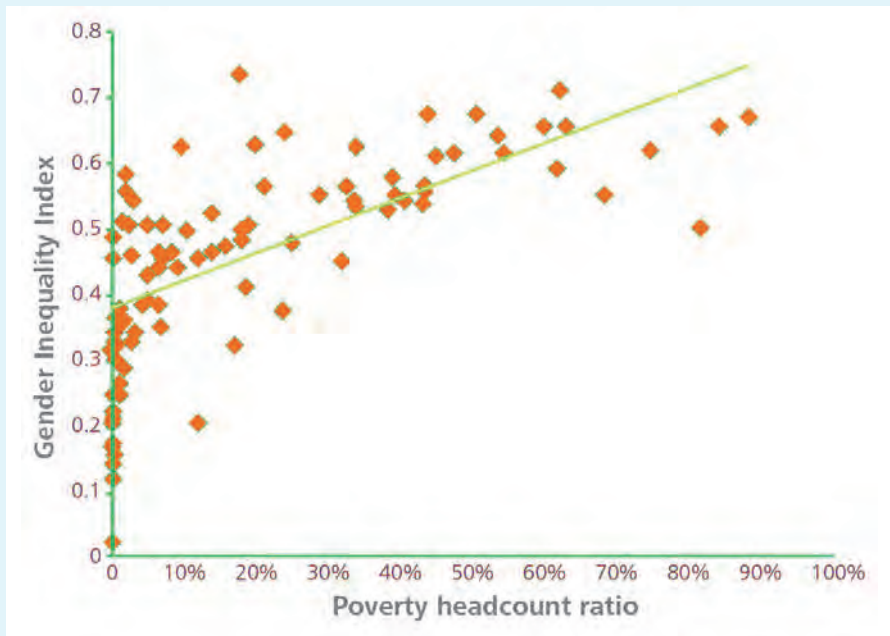


Figure 1: Poverty and gender inequality
(Source: Deloitte University Press)

and 2) improved energy access should be part of a broader strategy that enables women to spend their extra time on economically empowering activities.

With these studies in mind, how does energy serve as a catalyst for women's economic empowerment?

Our analysis draws a clear line from modern energy access to women's economic participation. From our experience implementing energy programmes in developing countries and interviewing women on the ground, there can be many ways that energy access accelerates opportunities for women by moving them into more productive activities.

Women are often disproportionately responsible for household duties. This is particularly acute in rural settings, where women spend considerable time on tasks such as collecting firewood for basic cooking, heating, and lighting needs. Access to energy allows for more efficient products—from those as basic as a solar lantern to those as advanced as a washing machine. These products can reduce the time burdens of domestic responsibilities and create time for more productive, formal engagement in the local economy outside the home. Empirical studies that have examined the impact of electrification on female labour rates in developing country settings reinforce this hypothesis.

A study executed by Taryn Dinkelman in South Africa during the mass rollout of electrification found that rural electrification raised female employment in electrified communities by 9.5%, likely because it released women from home production and enabled micro-enterprises, while having an indeterminate impact on male labour rates in the same communities. Another study by Grogan and Sadanand (2013) in Nicaragua illustrates that access to reliable electricity increases

the propensity of rural women to work outside the home by approximately 23% due to more efficient home production in the form of lighting and modern cooking appliances, while it has no impact on male employment.

Micro-enterprises are recognised as key contributors to rural job creation and poverty alleviation, and electricity is often a necessary and important input. Women are able to dedicate time to wealth-enhancing activities—whether it be starting a small franchise, selling crafts, or working in the local store—and have reliable electricity for productivity-enhancing machinery. Micro-enterprises in particular require electricity to draw in customers, extend operating hours, improve working conditions, automate production, preserve products, and communicate beyond the local market.

What about women working in the energy sector? How are women's roles changing in the electricity value chain itself?

There are opportunities to directly employ women in the electricity sector along the entire value chain, from installation and maintenance to distribution to billings and collections. Each aspect of the sector has a particular value proposition for women's involvement. For example, collection rates on electricity bills, in both urban and rural settings, are extremely low across developing countries. The fields of micro-finance and gender lens investing suggest that women are generally better credit risks for lending institutions and have better repayment rates than men. This makes them uniquely suited to be part of the collection system.

Recent evidence from a pilot programme in Ghazni, Afghanistan, shows that the local water utility was able to increase collections by 75% in the first month of a programme that employed

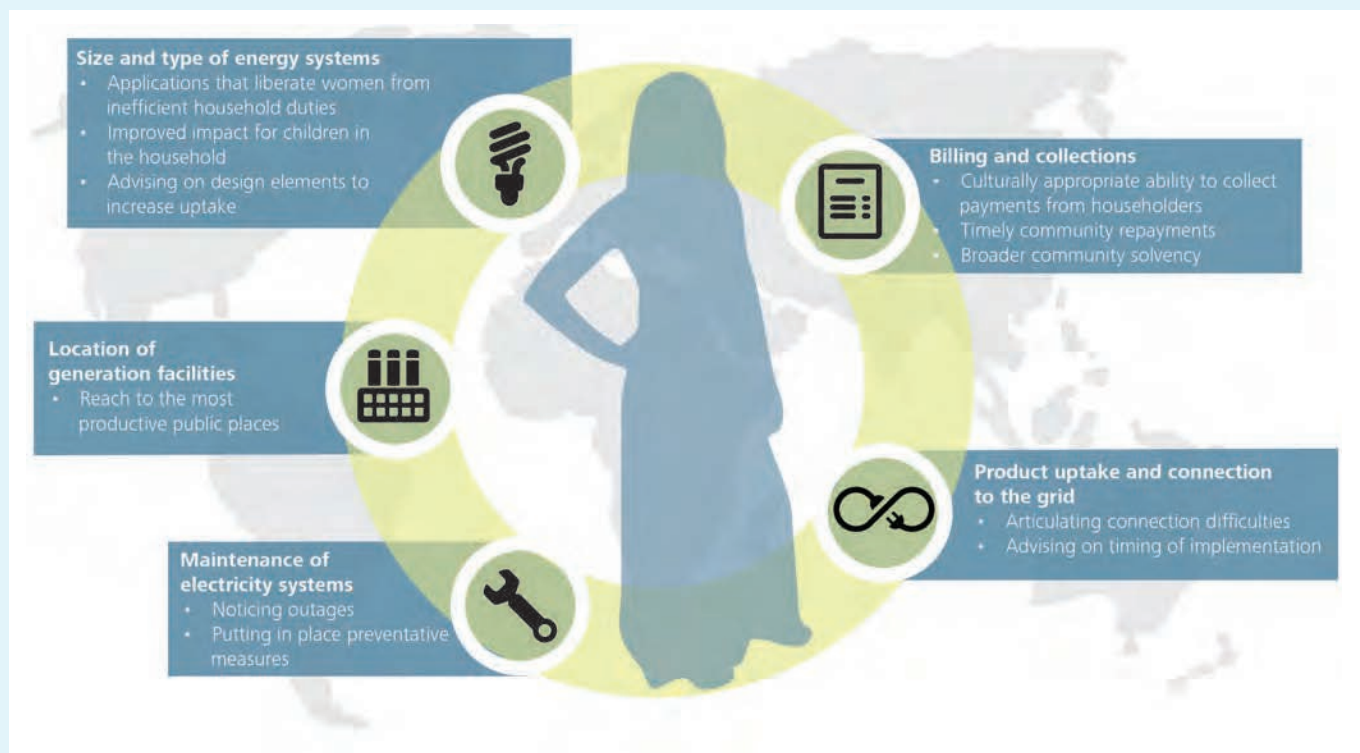
a brother and sister team to read utility meters. Among other factors, the woman was able to access meters at times when only women were home, which was culturally impermissible when the utility readers were men only.

As such, women's particular roles in their families and communities, as well as their credit risk profile, make them potentially more effective than men for specific roles within the sector. In turn, this helps women to benefit from new employment opportunities and higher incomes, as well as creating positive implications for the community at large.

How can this focus on women's economic empowerment through better energy access be sustained?

Maximising the benefits accruing to women is as straightforward as applying a 'gender lens' throughout, from the initial assessment to design and implementation, all the way through to monitoring and evaluation. In a sector that has normally not used a gender perspective, this is important. These gender-focused additions act as 'X factors' that donor institutions and host governments can layer on to expand rural energy programmes into economic empowerment programmes, thereby magnifying the impact for local communities. We offer some considerations for each aspect of the process.

Before programmes are designed, investigate the challenges of uptake in target communities, the demand factors for labour, and the potential areas for economic growth in the community, all with a gender-differentiated lens. Energy access and its potential impact on women is highly contextual to cultural sensitivities, religious beliefs, intra-household dynamics, ability to pay, and other economic and social factors.



Furthermore, demand in local economies and drivers of labour will differ across communities, states, and countries. Understanding what kinds of jobs women want and how energy programmes can be designed to foster them can enable an even more effective programme design. Gendered assessments can illustrate the nuances of the local economy and, more specifically, how women interact with that economy. This in turn can lead programme designers to better understand what type of rural electricity should be delivered, in what location, at what scale, and at what cost.

Once the initial assessment has been conducted, consult with women before rolling out an energy access programme. This can provide insights into elements such as preferred methods for delivering electricity systems, how to design communications about new energy systems, and how to price the new systems, among other important factors.

Including women in the planning stages is particularly important with electricity, which has traditionally been a male-dominated sector but is increasingly focused on the profiles of end-users. Because of this, donors and host governments should be inclusive and creative, consulting with local women on a conscious, continuous, and concerted basis.

Governments could consider reserving dedicated spots for women as community representatives and within the electricity entities themselves, whether a rural electricity cooperative board of directors or a distribution billing and collections team. Intentionally seeking women's opinions may lead to new insights and surprising innovations that can enhance a programme's effectiveness.

How do you measure the success of a programme and if it has helped empower women economically?

During and after energy access programme implementation, use gender-differentiated indicators to measure the impact. Although there has been a significant investment in rural electrification, gender-disaggregated results are rarely captured, which impedes the ability to understand effective design factors and degree of impact by gender.

Utilising a targeted M&E framework of key performance indicators not only allows gender-differentiated linkages to be drawn, but also creates space for modifications to be made over time. Rigorous, regular, and objective measurement holds donors, governments, and implementing organisations alike accountable for their outcomes. Likewise, this accountability provides motivation to review and refine implementation strategies that are not working.

What could be the impact of these programmes over the long term?

Given the global emphasis on energy access, many of these programmes are likely to be rolled out in the near future, with millions of dollars in funding being committed. This represents a rare opportunity to intentionally shape programming so that it is not only electrifying communities, but empowering women within those communities to be more efficient in their household duties, make further gains in education, enter the workforce, and start businesses. Not only will this provide opportunities for those often disenfranchised, but it will also help accelerate economic growth in developing

Figure 2: The Gender Lens: Design aspects women can influence (Source: Deloitte University Press)

countries and lay the foundation for an emerging middle class.

If done thoughtfully, spurring access to energy could spur 50% of a labour force to be more productive and more engaged. A gender lens approach to energy access programmes can be beneficial all the way around – for women, for local communities, and for emerging nations.

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Establishing a women-driven clean cookstove distribution network in Eastern Indonesia

Keywords: Indonesia; Empowerment; Women; Cookstoves; Entrepreneurship



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Picture 1: Libertina Riwu sells clean cookstoves, solar lights, and water filters from her Tech Kiosk in Kupang, the capital of East Nusa Tenggara - the Indonesian province with the highest dependency on biomass energy for cooking.

(Source: Willow Paule, Kopernik)

In order to achieve the Sustainable Energy for All (SE4All) subgoal of universal access to energy by 2030, clean cookstove distribution networks need to be established and rapidly scaled up to serve Indonesia's eastern provinces, which are dependent on biomass energy for cooking. Kopernik, an Indonesia-based non-governmental organisation, has been working with Indonesian women since 2011 to introduce and sell clean biomass cookstoves in their communities. Through three years of small-scale projects, Kopernik laid the groundwork for scaling up a women-driven distribution network in Eastern Indonesia. There have been five key steps to reaching this point: (1) understanding the context; (2) finding an appropriate cookstove model; (3) introducing the cookstove and collecting feedback; (4) building the supply chain and distribution network; and (5) preparing for scale. Now, in 2015, Kopernik is ready to jump to scale and does so with its Wonder Women programme, which aims at reaching 56 000 households in three years.

Introduction

Indonesia has undergone a cookstove revolution in recent years. Rising fuel prices in the mid-2000s resulted in a large increase in government spending on cooking fuel subsidies and the Indonesian government responded by implementing the world's largest kerosene-to-LPG conversion programme. From 2007 to 2010, 27.6 million households switched their primary cooking fuel to LPG (ASTAE, 2013). By 2012 the state's gross subsidy saving was more than US\$ 6.9 billion, as the greater cooking efficiency

of LPG had allowed a lower subsidy compared to kerosene (Pertamina n.d.). The programme encompassed 23 of Indonesia's 33 provinces, but excluded Indonesia's eastern provinces, "owing to the potentially high investment cost of developing supply networks in such sparsely populated areas," according to a 2013 World Bank report (ASTAE, 2013). A second cookstove revolution is now on the horizon for the 24.5 million households, approximately two-fifths of Indonesia's population, which continue to depend on traditional biomass energy for cooking.

In many rural and peri-urban areas across Indonesia, firewood is largely abundant and renewably harvested or purchased for significantly less than other cooking fuels (GERES, 2009). As a result, The World Bank estimates that 40% of households will continue to rely on traditional biomass energy, especially firewood, to meet their daily cooking needs for years to come (ASTAE, 2013). However, very few households use, have access to, or are even aware of, clean biomass cookstoves. Household air pollution resulting from the inefficient use of traditional biomass is linked to an estimated 165 000 premature deaths annually in Indonesia,

Picture 2: Tech Kiosk operators like Matelda sell simple technologies alongside everyday goods. (Source: Willow Paule, Kopernik)



affecting primarily women and their young children (ASTAE, 2013). In many rural and remote areas, there are no existing markets for biomass cookstoves (Apex, 2013). In order to achieve the goal of universal access to clean cooking solutions by 2030, a subset of the Sustainable Energy for All (SE4All) goal of universal access to energy, distribution networks for clean cookstoves and fuels need to be established and rapidly scaled up to serve Indonesia's eastern provinces.

Kopernik, an Indonesia-based non-government organisation, has been working with Indonesian women since 2011 to introduce and sell clean biomass cookstoves in their communities. Through three years of small-scale projects, Kopernik laid the groundwork for scaling up a women-driven distribution network in Eastern Indonesia. There have been five key steps to reaching this point: (1) understanding the context; (2) finding an appropriate cookstove model; (3) introducing the cookstove and collecting feedback; (4) building the supply chain and distribution network; and (5) preparing for scale.

Understanding the context

In designing Kopernik's distribution model, co-founders Ewa Wojkowska and Toshi Nakamura drew on seven years of experience working for UNDP Indonesia. They had an intimate understanding of the issues causing poverty in Indonesia, particularly in the remote eastern islands, and they saw tremendous potential in simple, low-cost household energy technologies to improve quality of life. They set out to develop distribution mechanisms to bridge the gap between the producers of technology innovations and the communities which would benefit the most from access to these technologies—primarily household-level solar lights, water filters and clean cookstoves.

Providing for a household's cooking, drinking water, and lighting needs is largely the responsibility of women in Indonesia. As such, it was a logical step for Kopernik to involve women in distribution efforts. Wojkowska and Nakamura were motivated by the multiple benefits that empowering women to sell technologies would bring: not only increasing adoption rates and

sales, but also creating a wider social impact as women are known to reinvest up to 90% of their income into their families and communities (Borges, 2007).

Through Wojkowska's previous work with women's groups, she was acutely aware of the limited economic opportunities available to Indonesian women. She had worked extensively with women's groups focused on the social and political empowerment of marginalised women. However, many of these groups struggled to develop sustainable economic empowerment opportunities for their members. By partnering with these groups, and lowering the economic barriers for members to become clean energy social-entrepreneurs, Kopernik could open up a new level of empowerment for women, while also improving the quality of life in their communities.

Finding an appropriate cookstove model

In their search for an appropriate cookstove, Wojkowska and Nakamura were introduced to Professor Muhammad Nurhuda, a lecturer in theoretical physics at Brawijaya University in Malang, East Java. Professor Nurhuda had been working on the development of a top-lit uplift gasifier stove, named the UB.03-01 stove. This stove used up to 80% less wood than a three-stone cookfire and produced no smoke when burning dry fuel. Made from sheet metal, the stove was lightweight and easy to transport - a valuable feature in order to expand distribution to remote islands. The factory price of the stove, less than US\$ 13, was far lower than imported cookstoves (in the range of US\$ 30-50) and there was no risk of shipments being delayed in customs.

This confluence of innovative design, fuel-efficiency, portability and affordability made the stove extremely attractive from a technical and economical viewpoint.

Introducing cookstoves and collecting feedback

Kopernik began introducing the stove to Indonesian women in 2011, through 'Tech Fairs' (community events in partnership with women's groups) where women could learn about new technologies and choose the ones they were most interested in using themselves. Based on positive feedback on the UB.03-1 stove, Kopernik decided to test the local market for the technology.

The UB.03-1 stove was regularly selected as the most popular clean cookstove at these events. In Bojonegoro, East Java, it was voted the most popular product of all technologies including solar lights, water filters and agricultural technologies. This led to Kopernik's first project that engaged women to sell the stove, supported by the Women's Economic Opportunity Initiative of the ExxonMobil Foundation. Although this area of East Java had been part of the Kerosene-to-LPG conversion programme, the cost of buying LPG for low-income families was putting pressure on household budgets. A fast-cooking stove which could be fuelled with cost-free available biomass was very attractive.

This first project verified demand and willingness-to-pay for the UB.03-1 stove. It also generated valuable feedback from the users, which Kopernik shared with Professor Nurhuda to support improvements to the stove design. For example, feedback that the stove was too small to cook meals with for large families led to the development of a 'jumbo' model which could satisfy this need.

In 2012, a second phase of this project in Bojonegoro engaged the most motivated women to become entrepreneurs in an in-depth training programme developing their product knowledge and business skills, including sales, marketing and accounting. Their product range was also



Picture 3: A woman in East Flores, East Nusa Tenggara, Indonesia, tries out an earlier model of the UB.03-1 biomass stove. (Source: Laura Surroca, Kopernik)

expanded to include a simple ceramic water filter system, produced locally in West Java. At the same time, Kopernik partnered with women's groups in Eastern Indonesia to begin introducing the UB.03-1 stove in regions reliant on firewood for cooking, which tend to have higher proportions of low-income households (BPS, 2011). Impact assessments by graduate students from leading universities provided valuable insights to refine the distribution model and support the feedback loop.

Building the supply chain and distribution network

In 2013, Kopernik concentrated its expansion efforts on East Nusa Tenggara (NTT) province, where 83.4% of households are reliant on firewood for household cooking - the highest rate in Indonesia (BPS, 2011). NTT encompasses more than 500 islands and just over one million households. Kupang, the provincial capital, is located almost 3000 kilometres away from Jakarta, the national capital. Following a familiar pattern - the further from the seat of power, the more neglected the region - NTT has one of the highest rates of poverty in Indonesia with 21.23% of households living in poverty (BPS, 2011) and an average per capita expenditure of around US\$ 40 per month (BPS NTT, 2013).

Kopernik established a technology warehouse in Kupang, and recruited owners of 'warung' (small, family-run shops) to sell cookstoves, water filters and solar lights alongside their existing range of everyday goods. Fifty 'Tech Kiosks' (small, family-run shops selling clean energy technologies alongside everyday goods) were established across the main islands of West Timor, Flores and Sumba. The most entrepreneurial Tech Kiosk owners developed their own distribution networks to reach smaller islands. For

example Libertina Riwu, a mother of three based in Kupang, ties to sell cookstoves to women on her home island of Sabu. She earned US\$ 1000 in profit in her first year as a Tech Kiosk operator.

Simultaneously in East Flores, Kopernik progressed to a new phase of collaboration with the local chapter of the Female-Headed Household Empowerment programme (PEKKA). Thirty-six women were selected to become 'Tech Agents' (women who sell technologies through their networks of family, friends, and neighbours, as well as at community events), participating in four modules of training to develop the business skills and confidence to sell technologies in their villages. The women received a starter kit of marketing material and technologies, which they would have to pay back once sold (consignment model). The kit included cookstoves, water filters, and solar lights. Selling the technologies through family, friends, neighbours and community events, the women earn a margin on every sale, repay the cost price of the technology, and request more stock. This consignment model is key to lowering barriers to entry, allowing women with very limited financial resources to start their own business without going into debt.

In the first year of establishing the Tech Kiosk and Tech Agent programmes in NTT, women had sold almost 2000 clean energy technologies, directly serving customers across 10 locations and reaching more remote islands and villages through local networks. The cookstove sells for around US\$ 25 in NTT, while water filters and solar lanterns start from US\$ 15. Women earn a margin of US\$ 3-5 from each sale.

A further key supply chain development came in late 2013 when Norwegian investment group Differ became the majority investor and distributor of Professor Nurhuda's UB.03-1 cookstove. Differ established a manufacturing facility in Surabaya to scale up production of the

stove, which they are marketing as the 'prime' cookstove. Indonesia's second largest port is located in Surabaya, and the location of the new factory streamlined logistics and reduced shipping costs to outer islands. Product improvements included new packaging, user manuals, serial numbers, and a fireproof powder coating. The quality of the product is backed by a one year warranty.

Preparing for scale

Through three years of consistent effort, Kopernik established proof of concept and was ready to expand this initiative to other provinces of Eastern Indonesia. Multi-year funding from ENERGIA, the International Network on Gender and Sustainable Energy, allowed Kopernik to plan for the next three years. This built on year-long grants from JP Morgan Chase Foundation, Development Innovation Ventures at USAID, and Empowering Indonesian Women for Poverty Reduction (MAMPU), a joint initiative of the Government of Australia and Government of Indonesia. The 2014-2017 strategy encompasses expansion to nine more provinces and recruitment of 500 women, who will boost their incomes and business skills while expanding access to clean energy technologies.

There are gaps which need to be addressed to successfully scale-up the programme. Focus group discussions in NTT, facilitated by a social marketing specialist, have shown that awareness raising and demand-generation are key to the scaling up of the programme. To address this, a marketing campaign tailored to specific market segments is being developed and will be rolled out during 2015.

In tandem with increasing the desirability of the technologies, Kopernik is working to increase the desirability of becoming a Tech Agent or Tech Kiosk operator. Under the banner of 'Ibu Inspirasi' (meaning 'inspirational women/mothers' in Indonesian), Kopernik is building partnerships with women's networks to recruit new women to the programme.

Figure 1: Map of Indonesia showing Kopernik's featured project locations



Business development support is also required to keep women engaged and motivated to increase their technology sales. Women with extremely limited economic opportunities stand to benefit the most from joining the programme, but also require significant help to overcome challenges. Identifying the support they need and finding ways to provide it efficiently is crucial. Kopernik is developing a business mentoring programme to support women along an 'empowerment journey' and Kopernik's vision is to build businesses that women can sustain independently after start-up support has ended.

Building momentum for change

Kopernik's achievements to date were recently recognised by the United Nations Framework Convention on Climate Change, which selected this women's economic empowerment initiative as a 2014 Momentum for Change Lighthouse Activity in the Women for Results category. The award recognises innovative and transformative solutions addressing climate change and broader economic and social challenges.

In the first three years, 316 women participated in training and more than 10 000 technologies were sold, reducing carbon emissions by an estimated 5000 tonnes. Clean biomass cookstoves are now available in some of the least developed regions of Indonesia, establishing a market where previously there was none. It is a promising start.

The Indonesia Clean Stove Initiative calculates that 40 million clean biomass cookstoves need to be sold in Indonesia by 2030 to achieve the goal of universal access to clean cooking solutions. Ten million stoves must be sold by 2020 to reach this target.

The market potential is huge, but much work needs to be done to overcome supply and demand-side barriers, particularly related to financing and public awareness. Kopernik's efforts to date have shown that women can and should play a pivotal role in developing the clean biomass cookstove market in Indonesia.

Box 1: Women's economic empowerment: Lessons learnt

Time pressure: We've learnt that the women engaged through this programme are pressed for time, typically managing extensive family, farming, and community commitments. We have consolidated the training programme to allow for this, and will include a session on time management to help women to plan the time they will need to set aside in order to achieve the sales targets they set for themselves.

Business growth: Beyond the initial training programme, we've learnt that many women need ongoing support and mentoring to continue to reach new customers and grow their businesses. Our business development team is providing hands-on support, such as organising 'tech fairs' where the women introduce the products in new communities. We've also introduced a system to rate performance against sales, repayment rates and motivation. The goal is for women to progress to 'gold star' status, giving them access to favourable terms of credit and taking on more responsibility for reaching new markets, such as organising their own 'tech fairs'.

Business compliance: Most women who join the programme have no formal business training, and face a steep learning curve to grasp standard business practices like stock management, cash flow, and profitability. We've designed some simple business management forms and visit the women at least monthly to reinforce the importance of these practices.

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- * Author's profile
- * Acknowledgements

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The business case for women in clean energy value chains: Insights from Solar Sister

Keywords: Sustainable Energy for All; Gender inclusive solutions; Last mile distribution; Clean cookstoves; Solar technologies



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Picture 1: Justina Gwassa Balankena owns her own hardware store where she sells lightbulbs, electrical tape, and now, solar lights. Justina is proud of the fact that this store is hers. "I run the business. The advertisements are even in my name," she says (Source: Solar Sister)

Solar Sister is a social enterprise improving last mile energy access with a gender inclusive approach in Uganda, Nigeria and Tanzania utilising a model that recruits, trains, and supports entrepreneurs selling clean energy technology directly to their communities. This article illustrates that Solar Sister focuses on empowering women, key users of energy technology and most impacted by its scarcity or availability. The organisation's approach offers some lessons for other players in the energy access sector on the importance of deliberately reaching out to and creating opportunities for women in the upstream and downstream energy value chains.

Energy prosperity and women's empowerment

Energy prosperity has a female face, both for its profound impact on women's multi-dimensional empowerment and for the positive impact that active engagement of women can have on strengthening clean energy value chains. An ESMAP survey on impact of electricity on women's lives in rural India found that "compared to women in households without electricity, women in households with electricity spend less time collecting fuels, fetching water, and cooking, and instead spend more time on earning an income, reading, and watching television" (Barnes et al., 2004). Another study in Brazil found that girls in rural areas with access to electricity are 59% more likely to

complete primary education by the time they are 18 years old than those without. The study also found that the income of self-employed rural women with access to energy is over twice that of their counterparts without access to energy. For rural female wage/salary workers, access to energy is correlated with 59% higher wages (Deloitte University, 2015).

Reinforcing the findings from earlier studies, a recent study by Practical Action commissioned by the Global Alliance for Clean Cookstoves (the Alliance) found that using improved cookstoves (ICS) frees women's time normally used on both fuelwood collection and cooking. Women are able to invest time savings in productive economic activities, supporting their children's education and playing a more active role in communities (New Internationalist, 2015).

The business case: Loud and clear

Beyond what energy access can do for women's empowerment, the business case for what women can do for the global energy access sector is loud and clear. According to the Global Off-Grid Lighting Association (GOGLA), 1.3 to 1.4 billion people at the Bottom of the Pyramid currently spend about US\$ 30 billion kerosene for lighting purposes (GOGLA, 2014). The off-grid population in sub-Saharan Africa alone is forecasted to rise from 600 million people in 2011 to 698 million in 2030. The Lighting Africa programme, a partnership of the World Bank and International Financial Corporation, estimates that US\$ 10 billion is spent annually on hazardous and low quality fuel based lighting

products, providing little value in return. Sellers and marketers of off-grid lighting products are increasingly finding it useful to integrate women in to their teams and across the value chains as distributors and resellers. There are several examples of organisations that have done this around the world— Grameen in Bangladesh; Self Employed Women's Association (SEWA), Solar Electric Light Company (SELCO) and Barefoot solar engineers in India; and the women led ICS and biogas programmes in Nepal. The Lighting Africa market research dataset suggests that women may have a greater role to play in the decision making process within a household for lighting-related purchases than many believe. This means that the design of marketing and education campaigns needs to account for women's stake by crafting messages that will be relevant and appealing to both genders (Lighting Africa, 2011). Since in many cases women are household energy managers, women's formal and informal networks also have a key role in improving the access to off-grid energy products and services at the frontier of delivery. Research commissioned by the Alliance in Kenya further shows that users who buy a cookstove from women were more likely to use it predominantly, consistently, and were more likely to promote the stove to others (New Internationalist, 2015). Without targeting women as an integral part of their value proposition, product designers, manufacturers, distributors, policymakers and donors alike will miss out on a substantial demographic of the energy market (Cecelski, 2000).

Solar Sister innovation

Solar Sister is a women led social enterprise improving last mile energy access through a gender inclusive approach. By combining the breakthrough potential of life transforming clean energy technologies with a deliberately women driven direct sales network, the enterprise is bringing light and opportunity to communities across Uganda, Nigeria and Tanzania. Solar Sister's model is rooted in a three-step mantra: recruit, train and mentor. Solar

Sister partners with grassroots women's groups, community based organisations and conservation organisations to bring a clean energy driven business opportunity to women's doorsteps. In doing so, rural women get both the 'geographical' access to clean energy and 'cultural' access with training and confidence for overcoming the barriers to take up a clean technology driven livelihood opportunity.

Implementation is a rolling process of community selection, entrepreneur identification, multi-stage entrepreneur training, mentoring and awareness building. Solar Sister provides a holistic package of inputs including: business in a bag training, an ongoing mentor support and opportunities for growth. It is the 'Sister' in Solar Sister that gives women a constant support system and community to learn from and share with. Solar Sister Entrepreneurs become role models for other women and girls. Being firmly rooted in their communities gives people without access to modern energy sources a trusted provider of quality products and services for meeting their incremental energy needs as well as after-sales support.

Women of Solar Sister

Since 2010, Solar Sister has built a thriving network of over 1200 women entrepreneurs who are selling a diverse portfolio of clean energy products comprising of solar and improved cooking solutions in their communities. Solar Sister Entrepreneurs have brought clean energy to over 200 000 people so far and the network is growing. There are four distinct ways in which women contribute to, and benefit from Solar Sister's value proposition, which advocates a greater role for women in the clean energy sector, traditionally a male dominated arena:

Women as clean tech leaders

Solar Sister is advancing women's leadership across its business where 86% of Solar Sister's staff is comprised of women driving a clean tech movement. Solar Sister's team come from across finance, engineering, economics and

business backgrounds. Hiring, training, and investing in women's leadership at the country level has been key to Solar Sister's growth. Male team members of Solar Sister have been champions and supporters of the role of women in the industry.

Women as users

Solar Sister Entrepreneurs benefit first hand as users of clean energy, and it is this first-hand experience as users which helps them convince others in the community of the benefits of products they sell.

Teresia Bagayo is a Solar Sister Entrepreneur and a dairy farmer from Hala, Tanzania. Since becoming a Solar Sister Entrepreneur, Teresia is no longer dependent on kerosene lamps, and is able to invest the savings in her dairy business. Building a gender inclusive solution means not only engaging with women but also with men in households and communities. When entering a community, Solar Sister engages with both male and female leaders to ensure there is a buy in of the programme. While Solar Sister's business opportunity is especially designed to bridge the gender technology divide, when men show an active interest in pursuing Solar Sister's business opportunity, the opportunity is open to them as well. There are also cases where a woman teams up with her husband for a Solar Sister family business. For example, in Uganda, Solar Sister Jean has teamed up with her husband Geoffrey to bring the benefits for clean energy to their own family and community alike.

Women as sellers

Solar Sister Entrepreneurs use the power of their social networks to educate their community about the benefits of clean energy. Being rooted in their communities means that they are also more trusted, and readily available for quality after-sales service. A study by Nielson found that 92% of consumers believe recommendations from friends and family over all forms of advertising (Forbes, 2014). It is powerful when a woman hears



Picture 2: Florence Ayella distributing a solar light to the last mile
(Source: Brit Liggett, Show the Good)

from another woman that her child is no longer in danger of burn injuries from a kerosene lamp, or that savings from using an energy efficient cookstove are now enabling her to pay for her children's school fees.

Solar Sister Monica Ogunde is a top seller and recruiter from Nyamidakora, Tanzania. She invests her profits in her son's school fees and proper nutrition for her family – she is HIV+. Monica's successful business inspires other women in her region to prioritise clean energy and consider pursuing economic opportunities.

Women entrepreneurs boosted by clean energy access

Clean energy access has a multiplier effect when linked with other entrepreneurial activities. Improving electricity access is one of the key strategies for increasing productivity of entrepreneurs off and on the farm.

In India, a rural electrification programme that increased coverage from 74% of rural households with electricity in 2005 to 91% in 2011 shows increased hours in employment by more than 17% for women and only 1.5% for men. Electricity extended the hours of operation of household businesses and per capita household income and food expenditures increased significantly with access to electricity. Poverty incidence decreased significantly (Women's Economic Empowerment Roadmap, 2015). Field experience from Solar Sister corroborates these findings.

Solar Sister customer Teddy from Uganda is a tailor. Earlier, Teddy had to rent a room with light in a neighbouring town to do her tailoring business. After getting her own solar light from Solar Sister, Teddy has been able to move her tailoring business to her own home, saving time and money. With the extra cash, Teddy has been able to send her children to school, grow her tailoring business and start a chapati (bread) business as well.

Solar Sister Iniobong from Nigeria is a retired nurse using solar lighting to deliver babies in her clinic, and an improved cookstove to boil the water she needs in the clinic. Access to clean energy is helping her better serve her clinic clientele, while boosting her income through incremental sales of clean energy products.

Key takeaways

Solar Sister is demonstrating that women are key users and sellers of clean energy products and services. Solar Sister's approach offers some important lessons for other players in the energy access sector:

- Promote women to leadership positions in your organisation
- Deliberately reach out to and create opportunities for women in the upstream and downstream energy value chains
- While promoting women's empowerment, engage with men as leaders, community and as family members
- Provide ongoing mentoring support to women in your supply chain encompassing business, technology and empowerment skills
- Actively use your clean energy products and services for strengthening women's enterprises in other sectors
- Continue increasing calls for continued investment in your people, systems and partnerships

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Author's profile

Neha Misra is the Co-Founder and Chief Collaboration Officer of Solar Sister. Neha is an Energy Economist with experience working globally at the intersection of women's economic empowerment, energy access and climate justice. She is a Solar Suitcase Ambassador for We Care Solar, promoting safe motherhood through clean energy access.



Picture 3: Women working as entrepreneurs in Uganda, Tanzania, and Nigeria mentor and support one another (Source: Solar Sister)

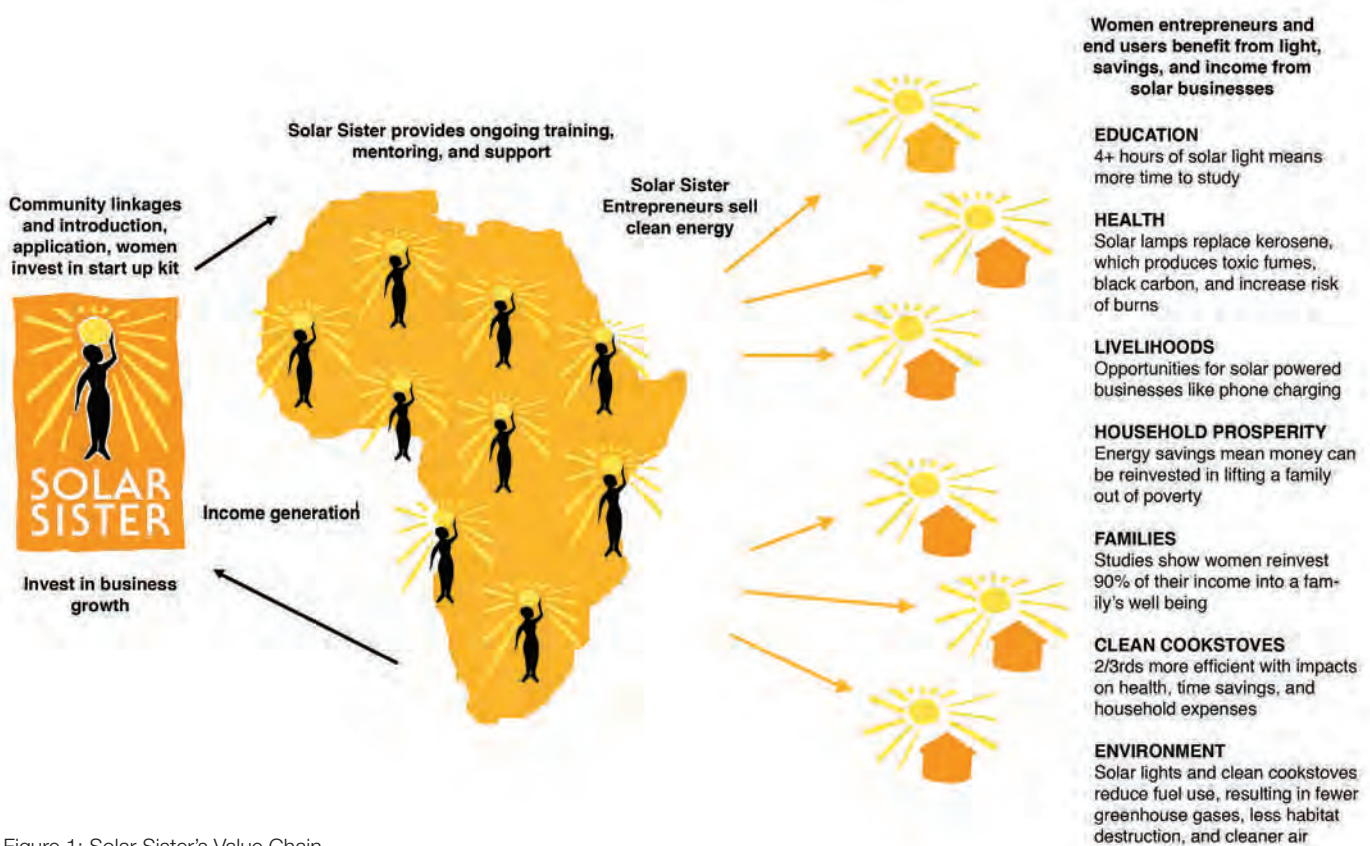


Figure 1: Solar Sister's Value Chain (Source: Solar Sister)

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- * Additional pictures
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Viewpoints

Interview with Sarah Best, Senior Researcher at the International Institute for Environment and Development

Sarah Best is a Senior Researcher for the International Institute for Environment and Development (IIED). Sarah's current work focuses on: energy access and renewable energy; productive uses of energy; citizen engagement in energy transitions; citizens' perceptions of mining; meaningful consultation; and artisanal and small-scale mining. Boiling Point editors talk to Sarah about IIED's work around energy access, women and productive uses. Sarah talks about her experience in the field and her particular work and interest in energy for productive uses for small holder agriculture businesses.



Can you tell us about IIED's work in the energy and gender space (goals, research, projects) and a bit about what you are doing specifically in this area around productive uses?

One focus of our work at IIED is on 'energy delivery models'. We're trying to understand and share knowledge around what works in providing energy products and services that meet the needs of people living in poverty. We've got quite a body of research on energy access delivery models and some of these pick up on particular gender dynamics. As part of our new five-year strategy running to 2019, we plan to make gender and youth far more central to our work.

I see it as critical to have a strong gender focus on productive uses of energy, where IIED is building a new stream of work. We started off last year mapping the global landscape around energy needs and solutions in smallholder agriculture (available @HEDON) - trying to understand what the approaches of the energy and agriculture sectors have been and what the key ingredients for a successful delivery model might be. Gender, not unexpectedly, came up as a key theme.

Women and girls tend to do many of the back-breaking manual tasks on farms - like weeding, milling, grinding and collecting water for irrigation and drinking. Modern energy services could be an opportunity to reduce that physical drudgery and free up time, whether for leisure, productive or other activities.

Women in general, however, have less access to mechanical equipment and other assets (land title, seeds, money) that would make their investment in modern energy services and equipment feasible and worthwhile. The opportunity is huge, particularly in terms of meeting the food security needs of poor farming families. The FAO estimates that if women generally had the same access to productive resources as men (including energy and equipment) they could increase yields on their farms by 20-30%.

This year, we're looking at what the emerging experience is on the ground in Kenya and Tanzania. I've recently come back from a trip to Kisumu, looking at micro-grid projects in fishing communities around Lake Victoria. These installations were either recently built, or in the early stages of design. A main interest is in electricity for chilling fish. I was struck by the diversity of experiences across different communities. In one community, there was a well organised women's cooperative involved in fish processing and they were being quite proactive in community discussions about how the electricity could be used. In another, it was the boat owners and traders, who were mainly men, who were more in the driving seat. Beyond chilling fish, people want electricity for their small shops. One woman I spoke to ran a little hair salon, braiding women's hair. With power, she would be able to use a hair dryer and bring in a bit more business by charging people for a blow dry.

What are the challenges in providing energy services that help women earn a living?

For smallholder agriculture, first you have to think about the general challenges in providing energy services in smallholder agriculture and rural livelihoods, and then the specific issues related to gender, women and girls. Starting with the general challenges, rural electrification schemes tend to focus narrowly on households, and on technology and supply-side issues, rather than ensuring that energy enables people on a low-income to earn a living. Projects flounder because the complementary measures - like market access or maintenance - which are needed to ensure that interventions are sustainable and lead to real benefits for the user, are not in place. The private sector is put off by the high risks and low returns in smallholder agriculture, and energy and agri-food sectors are often not joined up in their approaches.

There are particular constraints facing women and girls that energy services have to be tailored for. Socio-cultural constraints may limit their choices for doing paid work or running a small business. Often, it's the poorest and most vulnerable households which are headed by women - perhaps because they are widowed or male family members have migrated to the city in search of work. How can an irrigation pump or tractor hire and fuel be affordable for those households? Furthermore women often don't have access to the same assets which they

need in order to convert a new electricity connection or a piece of equipment in to a viable business opportunity. Governments are often not prioritising the small-holder sector anyway, focusing more on energy for industrial growth.

What can you tell us about the impact of energy on income generation opportunities for women? And does access to energy at the household level improve economic opportunities for women?

There's a knowledge gap around how access to energy impacts on productive activities and incomes. The gender rights community has done a lot to bring out some of the key issues, but even they say much of the evidence base on impacts is anecdotal or based on self-reported results of particular aid projects, which lack independence and depth. ENERGI's research programme has pointed out that there are many assumptions and claims made, but these need to be tested. For instance, that electricity for food processing – such as grain mills - frees up women's time for other productive activities.

The NGO SELF and their work with partners to install solar water pumping and drip irrigation in villages in Kalale District, Benin is being run in conjunction with a women's association who are cultivating vegetables on small plots of land. This is still on a pilot scale, but Stanford University found a significant increase in nutritional intake and household income from consuming and selling the vegetables, particularly during the dry season. Women are also spending 50% less time hand watering.

In terms of whether household energy increases women's income earning opportunities, there is obviously potential – but I'm not sure what robust evidence there is. The PERMER programme in Argentina is a government run programme to expand electricity to remote rural populations using stand alone renewable energy (solar, wind) and hybrid diesel-renewable mini-grids. What I saw in Jujuy, in the north of Argentina, was that the early scoping studies had identified that basic household lighting

(solar panels) might enable women to do small activities at night, like sewing handicrafts which they could sell in local markets. But 10 years down the line, this was not mentioned by the householders I spoke to as a particular benefit they'd experienced. The biggest impacts were in schools, where better lighting made a huge difference to students and teachers. One of the problems might have been that the programme was run by the energy department and energy companies, and really focused on the supply side; there was no investment in stimulating the supportive services that would be needed to stimulate productive activities, for example, in terms of improved marketing of handicrafts.

You've talked about IIED's work in designing delivery models for energy access, but what is required to design energy services that prioritise income-generation for women?

When it comes to smallholder-based agri-food chains, the types of things that we need to think about are: What part of the value chain are women involved in, from field to fork?; Where are the bottlenecks to increased production and income, and how could access to modern energy help?; What sort of interventions would be needed to overcome gender-specific constraints that women food producers face – such as access to seeds, land title, extension services, roads, markets, training in business skills or agricultural techniques?; and What kind of power and influence do women and girls have in local-level decision-making around energy investments?

Do you have any examples of energy (delivery) business models that put women as a central focus? [Do these deliver benefits above other delivery models that do not have women as a focus e.g. more sustainable models or better benefits to the entrepreneur's family?]

One well known example is the multi-functional platforms (MFPs) in West Africa. There needs to be more learning around MFPs. As I understand, these were the brainchild of UNDP and were

specifically designed to address poor people's needs on energy, gender equality and income generation. It was heavily promoted in countries like Mali. An MFP is a diesel engine on a platform that could have different equipment attached, like a grinder or phone charger. The model used was that these should be managed and run by women's associations. There was lots of positive coverage in the early years but the interest and early promise seems to have waned. Nygard (2010) suggests that many of the MFPs were not in use and part of the problem was organisational, for instance where the women's co-operatives lacked the skills or capacities to successfully run the installations, which then ended up managed by the private miller. From a technical standpoint, the MFPs were not performing all the functions anticipated.

What is your advice to Boiling Point readers who work in energy development with specific targets to increase women's economic empowerment?

As a research organisation interested in strengthening the evidence base, I would encourage readers to invest in monitoring and evaluating the impact on gender equality of their work. We really need better data to help inform policy-making and private sector investment. Practitioners and social enterprises often lack the time and resources to do this work – so the solution is often partnering with others, including research organisations, universities, gender experts and women's rights NGOs.

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Toolkit

Empowered Entrepreneur Training Handbook



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Picture 1: Different types of Kenyan improved cookstoves (Source: Practical Action)

The Empowered Entrepreneur Training Handbook provides six days of business skills, empowerment, and leadership training curricula and tools that can be implemented to better support women micro-entrepreneurs in the energy sector. The Handbook is designed to support an organisation and its trainers in empowering women micro-entrepreneurs, small enterprises, and sales agents who work throughout the value chain in the clean cooking sector. While it has been developed by the Global Alliance for Clean Cookstoves and is designed to empower women to scale adoption of clean cooking solutions globally, it has applicability throughout the household energy sector.

Why was this Handbook developed?

The Global Alliance for Clean Cookstove (the Alliance) and its partners recognise the contributions that women make in achieving wide scale adoption of clean cooking solutions and the sector's health, environment, women's empowerment, and livelihood goals. Without engaging women throughout the value chain, it is likely that global efforts will be less effective and scale less rapidly.

This Handbook is one component of the Alliance's overall gender and empowerment strategy to strengthen gender impacts and scale adoption through

gender-informed approaches. The Alliance's strategy is focused on building the evidence, evaluating effective gender approaches, building capacity of enterprises and women entrepreneurs, increasing access to finance to scale empowerment impacts, raising awareness among women and girls, and advocating for policies that will ensure impact for women and girls. The Handbook is one in a series of tools the Alliance has developed to strengthen gender-informed approaches, including the Alliance's Resource Guide on 'Scaling Adoption of Clean Cooking Solutions through Women's Empowerment', which outlines best practices to ensure women are included in every segment of the value chain.

Why does the Handbook have a focus on women entrepreneurs?

Women play critical roles in scaling adoption of clean cookstoves and fuels because of their central responsibility for cooking and managing household energy. In addition to deciding whether to use clean cooking products, women can catalyse the market as micro-entrepreneurs and small-sized enterprise owners through the distribution and delivery of clean cooking technologies and after-sales services that will contribute to the creation of a thriving global market.

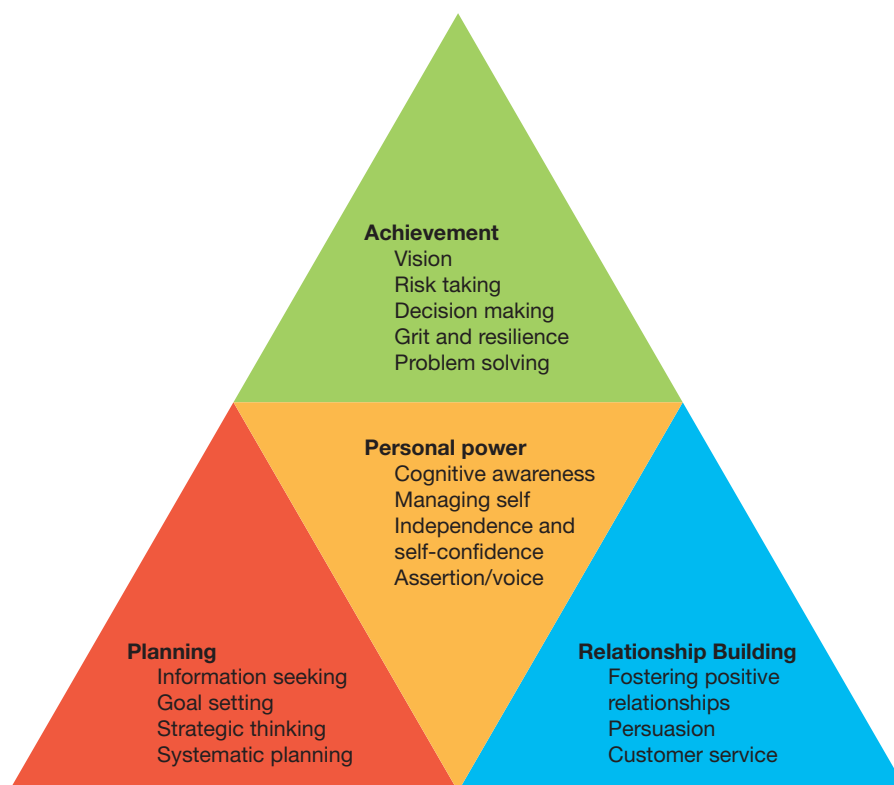


Figure 1: Core competencies

Women are well-suited to develop community relationships and conduct point-of-sale activities because of their own experiences cooking in their homes. Women can leverage their existing networks to promote the adoption of these new technologies and use their firsthand experiences in marketing solutions. In areas where there are high levels of gender inequality, female sales agents can directly reach women who cannot readily access cities or markets (Brush et al., 2011).

What does the research show?

The Alliance tested the training curriculum outlined in the Handbook in several different contexts, including a randomised control trial in Kenya with Johns Hopkins University, Envirofit, and ESVAK and a research study with Bolivian women as social change agents, as well as field testing with GIZ and the Visionaria Network in Peru and Envirofit in Nigeria. This research demonstrated that women who received this empowerment training were more likely to be high sellers of improved cookstoves than their peers who did not receive the training.

Additionally, women who received the training were two times as likely to pursue sales leads and continue their business activities when faced with challenges. We also saw that the agency-based empowerment training led to more effective women community leaders, who were able

to overcome challenges, identify new ways of promoting cookstoves, and expressed more excitement about their work.

What is the Empowered Entrepreneur Handbook and who should use it?

The Handbook is for organisations who are currently working with, or plan to work with, women entrepreneurs to produce household energy technologies or who will engage women as sales agents or entrepreneurs in rural or urban locations to market, distribute, and/or provide after-sales service. This Handbook is meant to support partners who work with women in the clean cooking value chain and can be a starting point for fostering women's empowerment and supporting women entrepreneurs. However, it does not include advice or strategies for recruitment of women. It is a tool to enable organisations already working with women to enhance the effectiveness of the entrepreneurs and agents working throughout the value chain.

Thoughtful planning and preparation by organisers is required in order to successfully implement this training. Trainers and implementing organisations should complete a Human-Centered Design (HCD) Plan (Part 1 of this Handbook), which will help prepare a successful, customised training using the

materials. Also available for download is the Participant Workbook which should be used by participants during the training, as well as evaluation templates.

Training that integrates agency-based empowerment concepts and leadership strategies has immense opportunity to strengthen the capacity and effectiveness of women entrepreneurs. Agency-based empowerment enhances an individual's cognitive capacity to create and focus on his/her goals, and leadership skills enable the tangible realisation of these goals.

The Handbook, the Human Centered Design Planning Workbook for facilitators, and the Participant Workbook (including pre and post-evaluations forums) are available @HEDON.

www.HEDON.info/YXXB

- * Access the Handbook and Workbooks
- * Author's profile

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Helpline

We're an energy access organisation that recently accepted funds from donors who would like to support our women focused projects and have requested detailed reporting on how we use this support. How do we make sure we really capture our results so that they are not too anecdotal or isolated but rather increases our credibility and prospects for further funding? What are donors looking for in reports on gendered energy projects and are there any risks or unintended negative impacts we should watch out for when accepting financial support for our projects and reporting on them?



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Expert Response by Allie Glinski

When data is collected in a systematic and consistent way, it can be used to paint a picture of a company's performance. In order for companies to actually collect and analyse data, companies need to be able to see how that data can be used to inform and improve their programmes. Here are a few key lessons that can be used to inform data collection and reporting:

Collect both qualitative and quantitative data

While quantitative data is important for showing trends, directionality, and magnitude, qualitative data provides the explanation for why these changes have occurred. Qualitative and quantitative data can be reinforcing in that quantitative data can be used to identify changes that can then be further explored through qualitative data; similarly, qualitative data can be used to determine what key metrics should be tracked through quantitative data. Additionally some concepts will be difficult to measure through purely qualitative or quantitative data and thus a mixture can help paint a more comprehensive picture of company performance.

The same data point should be tracked over time

Social change takes time; programmes should not expect to see large changes

within a few months. Tracking the same data point over a long period of time will allow implementers to see long-term trends in attitudes and behaviours. Knowing that it takes a long time for these things to shift, companies should set reasonable targets that are not overly ambitious. It is more helpful to have accurate reports demonstrate small, but real, changes than to have exaggerated data that does not reflect the reality.

Collect sex-disaggregated and gender data

As a starting point, all companies should collect sex-disaggregated data. When a company is able to look at the number of employees/entrepreneurs engaged, sales volume of sales agents, and training participation by sex, interesting findings will emerge. Analysing these trends will enable companies to create more gender equitable business practices. However, in order to demonstrate gender impacts, monitoring and evaluation efforts should not only collect sex-disaggregated data, but also collect data that measures shifts in gender relationships. For example, data can be collected around shifts in household decision making, access to and control over key resources, participation in community groups and activities, sense of status, ability to negotiate for one's desires, and sense of voice.

Customise indicator definitions

While it is helpful to have standardised indicators that can be compared across companies, it is also important to create customised definitions of what the indicator means for each company. As business models and monitoring and evaluation (M&E) systems will vary from partner to partner, it is important to work with partners to tailor data collection methods and questions as well as management and analysis systems for each company.

Reflect on and learn from data

Finally, it is important to provide opportunities for data analysis and reflection. In order to really learn from data and use it to improve programmes, companies have to analyse data on a regular basis and take a pause to reflect on trends, what is working well, what challenges are being experienced, and brainstorm around how company operations can be strengthened. It can often be helpful to have an external, unbiased party facilitate this process or at least help a company develop an unbiased system for analysing and learning from their data. This also provides an opportunity to reflect upon what is working well and identify where there are challenges with the M&E system itself. M&E systems should be constantly adapted to better reflect the direction and learning of a company.



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Expert Response by Vanessa Janik

Congratulations on receiving support to implement your project on gender and energy. It is great to see your question on how to share results – as this is often something our teams have to think through as well. Last spring, we held a workshop for ESMAP's AFREA Gender and Energy programme which is working with rural energy agencies and government partners on helping engage women and men in project design and building capacity on social issues. One of the aims of the workshop was to share project and field level results and exchange across countries. A dedicated session was focused on storytelling to help participants convey results in a meaningful way. You can find out more about the workshop at www.esmap.org.

Working through a logical framework may help your team understand how your gender activities will lead to outputs, outcomes and reach the development objectives. One lesson from our work is “what gets measured gets done”. We have learnt the importance of gender indicators within project design and results frameworks. In reporting out, it is critical to have quantitative and qualitative results. For example, it is important to carry out a baseline survey before your activity gets started so you will be able to measure the impact and provide gender disaggregated data analysis on the results. As you mentioned, gender results are often called anecdotal, but if we, as a community of practitioners

working on these issues, can continue to build the evidence than we will have a greater foundation of knowledge and cases to reference. It is also important to take stock and gather qualitative feedback from interviews or focus groups. When you are able to tell a story, backed up by data – you will be better able to convey your results.

For example, our work in Senegal has been showcased using this exact logic – a focus on data and storytelling to convey results. Launched in 2011, Senegal's Second Sustainable and Participatory Energy Management Project has been hailed for effectively mainstreaming a gender perspective into an energy project. Under the project, women have participated more in decision making; developed skills in technical production, entrepreneurship, and organisational management; and benefitted from increased incomes. The project has been able to report out on impact using:

Data: Now with training for the entire charcoal value chain supported by the project, some 1018 women have emerged as charcoal producers, while the share of total community income going to women has risen from 3% in 2009 to 12% in 2013

Storytelling: Mrs. Fatoumata Souaré is a hero in a rural, forested area located 250 miles southeast of Dakar. She and her children own and operate a sustainable charcoal production business that nets

some US\$ 2800 every three months. The income has allowed Mrs. Souaré, who lost her husband a few years ago, to build a new house, install a solar panel, send her children to school, and purchase health insurance for her family. Because of her focused efforts, not only women but also men in this region in Eastern Senegal are in awe over her accomplishments. You can read the full story @HEDON.

Lastly, in response to your point on unintended negative consequences to accepting project funding, this is also something you can think through when your team does a logical or results framework, as there is a category for risks that may create barriers to achieving results. For example, your team may have a hard time identifying the necessary talent to design the work, or there may be delays in developing local partnerships or focal points to carry out trainings or activities. In sum, to help your team report out to donors, partners and other practitioners, we have learnt the importance of developing a solid results chain that will help us track and plan our activities and clearly monitor and report on our results.

www.HEDON.info/AYXB

* Authors' profiles

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News

Editor

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ENERGIA is an international network of like-minded organisations and professionals, active in over 22 countries in Africa and Asia. It was established in 1996 to create an institutional base for galvanising action aimed at integrating gender into the energy access agenda of developing countries. Our view is that programmes, policies and markets that explicitly address gender issues will result in better outcomes in terms of the sustainability of energy services and human development opportunities available to women and men.

Scaling up energy access through Women's Economic Empowerment

Empowering over 3000 women entrepreneurs in the delivery of energy services

Reaching over two million consumers

Our Women's Economic Empowerment programme (WE) strengthens women-led micro and small enterprises that deliver energy products and services, reaching over two million consumers in poor rural and semi-rural areas. The programme runs from 2014 to 2017 and is funded by the Swedish International Development Cooperation Agency (SIDA), the Norwegian Agency for Development Cooperation (Norad), the Finnish Ministry for Foreign Affairs and the Asian Development Bank, Japan Fund for Poverty Reduction.

Our WE programme partners include: the Centre for Rural Technology – Nepal (CRT/N), the National Association of Community Electricity Users Nepal (NACEUN) and Practical Action Consulting in Nepal; Kopernik in Indonesia; GVEP International and the Social and Ecological Management Fund (SEM Fund) in Senegal; Practical Action Eastern Africa and Sustainable Community Development Services (SCODE) in Kenya; and Solar Sister working in Kenya, Tanzania, Uganda and Nigeria.

Since 2012, through local partners, ENERGIA has also been working on building the capacity of women owned energy-based entrepreneurs in Bhutan, Nepal and Sri Lanka, with support from Asian Development Bank

For more information on the programme and our partners, visit our website: www.energia.org/weprogramme



Gender and Energy Advocacy programme

In line with its commitment to the UN initiative Sustainable Energy for All (SE4All), ENERGIA's Gender and Energy Advocacy programme aims to contribute to efforts that ensure that governments and donors allocate investments to energy programmes that are gender informed. We aim to achieve this through three intervention areas:

1. To integrate gender objectives and actions in SE4All Country Action Agendas in five countries (Kenya, Tanzania, Senegal, Nepal and Indonesia)
2. To operationalise five national campaigns on women's economic empowerment through energy access, reaching out to four million people
3. To showcase the results of the Women's Economic Empowerment programme in SE4All regional and global outreach

The programme will run from 2015 – 2017 and will include general awareness raising activities, lobby and media related activities; all to put women in the spotlight and show that women, when empowered, are part of the solution. In close collaboration with their government counterparts, our five WE programme partners lead consortia which include production houses, media and marketing consultants and journalists fora, to ensure desired outreach and impact. The programme is funded by the Swedish International Development Cooperation Agency (SIDA), the Norwegian Agency for Development Cooperation (Norad), the Dutch Directorate-General for International Cooperation (DGIS) and the Humanist Institute for Co-operation with Developing Countries (Hivos).

In addition to this programme, ENERGIA is engaged with Hivos and the International Union for Conservation of Nature (IUCN) in a four year programme (2012 – 2015) to establish gender and energy networks in four Central American countries—Guatemala, Honduras, El Salvador and Nicaragua—and to advocate for mainstreaming gender in national and regional energy policies, projects and investments.

For more information on the programme and our partners, please visit: www.energia.org/advocacyprogramme.

ENERGIA

INTERNATIONAL NETWORK ON
GENDER AND SUSTAINABLE ENERGY



Gender and Energy Research programme

Empirical research is needed to inform policy and practice to realise and enhance the potential positive social and economic impacts of energy interventions. As part of its commitment to the Sustainable Energy for All initiative, DFID is funding ENERGIA to manage the Gender and Energy Research programme, which will run until end 2018.

Under this research programme, research will be conducted in the following five areas:

- Impacts of electricity
- Productive uses of energy
- Political economy
- Energy sector reform
- Private sector and business models

One consortium leads the research and dissemination efforts in each research area, and ENERGIA IS ensures synergy and synthesis of outputs.

In 2015, the start of the research was marked by an the Inception meeting in Switzerland in February, at which the research consortia, the Technical Advisory Committee and ENERGIA International Secretariat met to reach a common understanding of the research programme and its objectives, to provide feedback and discussion on proposals and to identify opportunities for synergy between the research areas and consortia. This year, the teams will be performing scoping studies based on literature studies and pilot field studies. The scoping phase will be concluded at a scoping meeting which will be held in South Africa in November.

For more information on the programme and our partners, please visit: www.energia.org/genderresearch

Mainstreaming gender in energy projects and programmes

As part of its advisory services, ENERGIA has been supporting energy projects that are both ongoing and or starting up, to:

- systematically mainstream gender considerations into their operations
- undertake gender assessments
- design and adopt gender goals
- develop integrated gender action plans (integrating them into project work plans and M&E frameworks)
- implement gender-responsive activities

www.HEDON.info/BYXB

* Access ENERGIA's publications

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Latest ENERGIA Publications



MAINSTREAMING GENDER IN THE ENERGY SECTOR

This manual is designed to support the training of planners and programme managers in energy ministries, utilities and private sector companies involved in energy infrastructure projects, so as to increase their capacity to bring gender aspects of energy into the planning cycle. There is also a need to encourage gender specialists to increase their involvement in the energy sector. The manual is written in a way that does not require a technical knowledge of energy nor a social science background. The training manual is accompanied by a trainers guide.

Author: Joy Clancy
Published by: ENERGIA (2014)

Manual (in Portuguese) Trainers Guide (in Portuguese)
available for download @HEDON

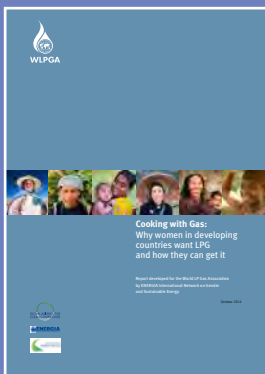


GUIDELINES ON GENDER & ENERGY FOR TRAINERS, PUBLIC POLICY MAKERS & PROJECT MANAGERS

These guidelines are unique in their effort to compile, and consolidate in a single document, a series of gender methodologies specifically designed, or modified, to support gender-mainstreaming strategies in policies, institutions and projects in the energy sector. These methodologies build on ENERGIA's experience with gender audits and implementation of energy projects, adapting these to the Latin American context. The guidelines include case studies from the energy sector in a language and format appropriate to the Latin American region. Moreover, they include recent experiences from within the region, showcasing regional case studies, know-how and best practices. The target groups for the guidelines include gender trainers, policymakers, government representatives and project managers in the energy sector.

Authors: Ana Victoria Rojas and Jackelline Siles
Published by: ENERGIA, OLADE and IUCN (2014)

Available for download (in Spanish) @HEDON

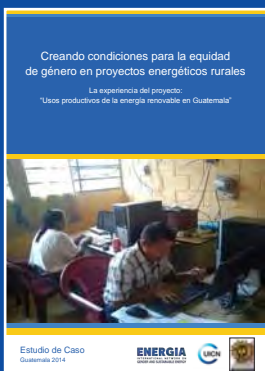


COOKING WITH GAS: WHY WOMEN IN DEVELOPING COUNTRIES WANT LPG AND HOW THEY CAN GET IT

The World Energy Outlook estimates that almost 1.3 billion people living mostly in developing Asia or Sub-Saharan Africa and in rural areas are without access to electricity. Reports estimate that another 2.6 billion people rely on traditional use of biomass for cooking and heating purposes which causes them to inhale carcinogenic smoke resulting in over four million premature deaths worldwide, affecting mostly women and girls. This new publication explores the gendered aspects in the access to energy, including the health improvements for the family and women by increasing access to LPG as cooking fuel.

Authors: Elizabeth Cecelski and Margaret Matinga
Published by: World LPG Association (2014)

Available for download @HEDON



CREATING CONDITIONS FOR INCORPORATING GENDER IN RURAL ENERGY PROJECTS

This case study, developed by Fundación Solar, showcases their experience with the Productive Uses of Renewable Energy programme (PURE) that promoted the use of renewable energy, particularly micro and small hydropower, as well as pilot projects with solar systems, biodigesters and improved cookstoves. Although the programme did not include gender considerations in its original design, these were added later by the programme team in response to the gender gaps in women's participation in decision-making processes, in access to technical training and in income-generation activities. The case study reflects on the challenges faced during implementation and the successes in achieving greater gender equality and empowerment in rural communities in Guatemala.

Author: Fundación Solar Published by: ENERGIA and IUCN (2014)
Case Study available for download (in Spanish) @HEDON

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Access to Electricity News

Solar PV-Diesel Hybrid Business Planning Checklist developed for the Philippines

GIZ Indonesia has developed a business planning checklist for solar PV-diesel hybrid systems in cooperation with the Philippine Department of Energy and the Philippine Climate Change Commission as part of the SupportCCC programme. The tool is intended to help spur investment into the hybridisation of diesel-driven off-grid energy systems by providing relevant actors with a systematic approach for the assessment and development of technically and economically sound solar PV-diesel hybrid systems. The checklist is available @HEDON.



Bhagwanti Portay's story about the impact of electricity access on her life

Bhagwanti Portay lives in one of the villages electrified as part of the project 'Renewable Energy Supply for Rural Areas' (RESRA) funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). When Bhagwanti's village was electrified with the help of a generator running on bio-petroleum, she and 11 other women seized the opportunity to install and operate an electric flour mill. Now they are producing over 100 ready-to-eat-meals a day, which they sell to mothers and child-care centres. The resulting income allows the families to improve their livelihoods and send their children to school. For Bhagwanti, her new role as a female entrepreneur has increased her social standing in the community. She now even heads the village power committee that manages the village's power supply. A video of the full story is available @HEDON.

Solar PV Systems training conducted at Bahir Dar University, Ethiopia

GIZ/EnDev Ethiopia together with Fosera and the Institute of Technology organised a three day Solar PV Systems training in March at Bahir Dar University, Ethiopia. The training was attended by 25 participants from different institutions and backgrounds (lecturers and MSc students from Bahir Dar university, energy experts from GIZ/EnDev, renewable energy consultants as well as solar technology suppliers and retailers).

The training provided a comprehensive overview over solar PV working principles, different applications, system design and maintenance. Good and bad practices from all over the world and advantages and disadvantages of different battery types were shared to benefit Ethiopians who are starting to engage in the solar energy sector. Apart from a theoretical part, the training also featured a practical component during which participants learnt how to repair damaged solar products. Such trainings are essential in creating the awareness for an emerging solar market in Ethiopia.

Contact dessaalegn.berhanu@giz.de from GIZ/EnDev Ethiopia for further information.

Andrea Reikat awarded with Honorary Medal

The former project manager of the GIZ cookstove interventions in Burkina Faso, Dr. Andrea Reikat, has been awarded an Honorary Medal by the authorities of Burkina Faso at the end of 2014. The medal was awarded by representatives of the Ministry of the Interior for services towards the protection of the environment and the fight against poverty and unemployment in the project to introduce energy saving stoves (FAFASO), but also in merit of Reikat's academic merit (six books and 25 scientific articles published about Burkina Faso) and her volunteer work.

The Governor of the Central Region personally carried out the award that took place on 5 December. Also present were the Secretary General of the Ministry of Interior, the National Director of GIZ, the director of KfW and representatives of the German Embassy. The ceremony coincided with a special sales event of energy saving stoves for employees of German development cooperation in Burkina Faso, organised by FAFASO.

GIZ would like to take this opportunity to congratulate Andrea Reikat for her outstanding work.

GIZ invited partners and friends to discuss Household Air Pollution at the Better Air Quality conference in Sri Lanka



More than 1000 delegates from different organisations participated in the Better Air Quality conference held in Colombo, Sri Lanka from 19-21 November 2014. GIZ HERA had organised a pre-event on 'Household Air Pollution (HAP) Effects on Health and Climate Change' and a panel discussion on 'Household Air Pollution - the silent killer' during the main event.

The panel of the pre-event that took place on 18 November consisted of experts and representatives from the Climate And Clean Air Coalition, GIZ, Government of Sri Lanka, Global Alliance for Clean Cookstoves (the Alliance), SolarAid, ICIMOD, RTI, World Health Organisation (WHO) and World LPG Association (WLPGA). They comprehensively established that there is a need for innovative approaches and further technology improvements. It also became clear that experiences are available within each country that could benefit the entire region and that more interactions are needed. The experts from different implementing organisations concluded that more research and evidence based initiatives are also needed for better implementation strategies.

Discussion on HAP continued during the main event. The panel discussion on 20 November aimed at identifying the key factors responsible for HAP. The panellist from WHO, Government of Sri Lanka, GIZ and the Alliance discussed how existing technologies can be made cleaner and more effective and how various technologies could be made available and affordable to more households.

Please refer to energypedia for a summary of the events and documentation of the pre-event. Presentations of the panel discussion can be accessed at the conference website (www.baq2014.org). In addition, you may contact marlis.kees@giz.de for a more detailed analysis of the conference and outcomes of the discussions.

Manual and Tools for promoting solar powered irrigation under development

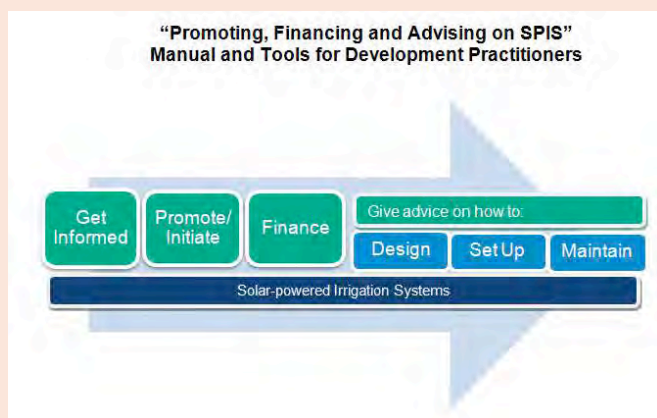


Figure 1: 'Promoting, Financing and Advising on SPIS'- Manual and Tools for Development Practitioners

The importance of solar powered irrigation is increasing worldwide. Yet, despite being increasingly affordable, the take-up of solar powered irrigation systems (SPIS) has remained low due to lack of awareness, limited access to SPIS service providers, and limited financing opportunities on the side of the farmers.

To facilitate access to and quality of solar powered irrigation systems in low-income countries, Powering Agriculture and GIZ have commissioned the development of a Manual and Tools. As a foundation, a stocktaking and analysis report was conducted with country case studies in Chile, Kenya, Morocco and India. The results of the report were discussed during an extensive workshop at GIZ headquarters in Eschborn end of March.

The workshop was divided into different thematic sessions (technology, management requirements, ecological impacts, financial viability as well as potential and barriers). Feedback provided before, during and after will now be integrated into the report and inform the process of preparing the Manual and Tools, which is expected to be released in fall 2015.

Contact caspar.priesemann@giz.de for further information.

www.HEDON.info/CYXB

* Links to extended news items

Meet us @HEDON

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Household energy specialists join Boiling Point's Editorial Board

Dr Karabi Dutta



Dr Karabi Dutta holds a PhD in Microbiology and has over 15 years experience in monitoring Indoor Air Quality (IAQ), stove testing and household energy and health related projects both in rural households and urban slums in South East Asian countries. She has worked as a technical consultant in household energy and environment related projects for a wide range of organisations in

the government, international and private sector. Karabi has designed and developed projects related to IAQ and health and has experience in project development, planning, resource assessment, community level decision making, monitoring and evaluation of cooking energy solutions related to indoor air pollution and health. She has many international publications and is also a technical reviewer of articles for the following international journals: Energy for Sustainable Development; Biomass and Bioenergy; and recently Boiling Point.

Luc Severi



Luc is a development manager with over six years of work experience in renewable and rural energy interventions, primarily for off-grid areas. He started his career with the NGO Rural Energy Foundation in Mozambique and Senegal, and contributed to the process of turning REF into the social business SolarNow. Luc also worked for Save the Children in Liberia, where he implemented

renewable energy solutions for the public health sector. He is now working in Belgium as a Project Manager for WorldLoop, an active facilitator in promoting a green and circular economy.

Luc holds a Master's in Commercial Engineering from KULeuven and a MSc Development Management from the London School of Economics.

Your organisation could be the Guest Editor for Boiling Point 68

Organisations in the household energy sector have been pairing up with HEDON as Guest Editors for our practitioners' journal. Recently Guest Editors have included: University of Nottingham for 'Barriers to Cookstoves' (December 2014); Shell Foundation for 'Building Inclusive Energy Markets' (March 2015); and ENERGIA for this issue (Women, Energy and Economic Empowerment). We are happy to announce that Boiling Point's upcoming issue 'Decentralised Energy and Climate Change' will be published in September 2015 with Guest Editors- The Climate Group.

As a Guest Editor of Boiling Point, your organisation will work with HEDON throughout the publication process- from deciding on a topical theme that aligns with your work, to sourcing and reviewing articles. Valuing Boiling Point as a platform to share their work with our worldwide readers, Guest Editors typically contribute a theme article, news pages as well as write the issue's Editorial. Boiling Point also provides Guest Editors with a unique feedback opportunity by including specific questions of their choice on our hardcopy feedback from which reaches our target audience – 15 000 off-line readers.

Boiling Point is looking for an organisation to be the Guest Editor of our December 2015 issue. Please contact bp@hedon.info if you would like to learn more about this opportunity.

Boiling Point feedback

“I am writing this application to your HEDON Household Energy Network due to the magazine I read from one of my friends here in Isoka... The magazine I read from one of my friends in Isoka had such nice information, as if you were teaching me on a board. That's why I am writing this application requesting some copies of your teaching magazine so that I can study and share them with other friends of mine. I'm studying entrepreneurship so I need more different types of magazines and books which can help me to know more.”

Simukonda Penjani

Boiling Point reader, Zambia

Interview with Kirk Smith, HEDON Patron



How did you first hear about the HEDON Household Energy Network and what made you want to become Patron of the organisation?

I believe I was at the very first meeting around 1990 when we first discussed the network. I was honored to agree to be a Patron around 2010 when asked since I had supported and been an avid reader of Boiling Point by that time.

There are several knowledge management and information sharing networks in the energy for development sector, what do you think has set HEDON apart as it continues to grow and attract both members and partners?

HEDON is recognised by many in the sector as the oldest, most experienced and most focused on grassroots groups network on household energy. The fact that Boiling Point is available in hard copy for groups with little to no internet access is probably what sets the organisation apart from many others that have similar knowledge sharing aims.

Do you think Boiling Point will face hardcopy readership challenges in an increasingly technological age or will there be a demand for offline knowledge for the foreseeable future?

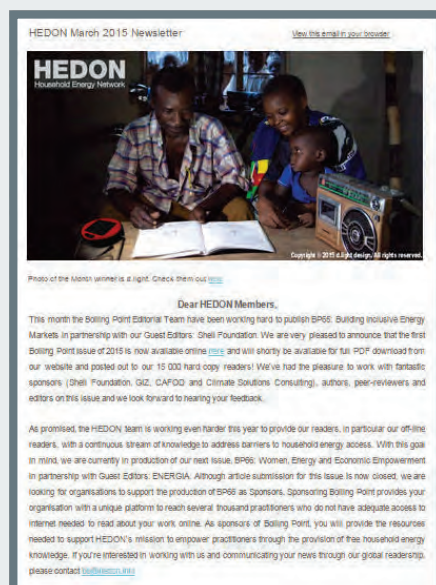
At the moment, Boiling Point is still read by 15 000 hardcopy readers worldwide and that number does seem to increase as the years go on. Many of Boiling Point's readers will not have internet access for some years and even if they do, I doubt it will be strong enough to download that amount of information. The fact that Boiling Point is in hardcopy also means it can be shared amongst friends and family which I don't think would be the case in online form. That said, I think this should be reviewed periodically to gauge internet access progress.

Boiling Point is on its way to become a quarterly journal and HEDON's network of members continues to grow. As Patron, where would you like to see HEDON in the next five years?

This is excellent development! Perhaps in five years it would be good to rely more on the website and perhaps increase the sophistication of the information management functions on it. Even though hardcopy information is important, HEDON shouldn't forget its growing online readership.

What is your advice to readers of Boiling Point in how to access household energy knowledge and benefit as much as possible from networks like HEDON?

Boiling Point is unique in the sense that it encourages any of its readers to contribute to future issues. The editorial team is great at reworking articles that don't have a high standard of English grammar and every article is also peer reviewed (twice!). I would encourage all readers to submit articles for specific themes or on anything they would like to share with the community. By contributing to the network and sharing your information, you open up channels for discussion about your work, the challenges you've faced and the lessons you've learnt.



HEDON launches new online newsletter

To kickstart 2015, the HEDON team decided to launch our new online newsletter with a fresh approach to how we deliver our own and others' monthly news. Our newsletter now provides our subscribers with more comprehensive information on our network, specific updates on Boiling Point's latest issues, upcoming issues and call for papers as well as latest news and events from the household energy sector. So far, we've had a very positive response and every month more students, researchers and practitioners are subscribing and contributing to the network by sending us news items from their organisations, photographs for our 'photo of the month' feature, and general updates on their projects.

Subscribe to our free monthly newsletter by emailing network@hedon.info expressing your interest.

www.HEDON.info/DYXB

* Subscribe to the Newsletter/Boiling Point

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GVEP's work with women

GVEP International works with small and medium-sized enterprises that deliver energy products and services to poor communities in Africa. We offer mentoring and advice in a variety of areas including business skills, technical support and financial savviness, helping these businesses grow and become sustainable. To date, GVEP initiatives have provided more than seven million people with access to clean energy. GVEP has supported around 650 women entrepreneurs who in turn have provided energy services and products to over three million people.



Women's economic empowerment

Women play essential roles both as producers and consumers of energy services and products. Yet, compared to men they have reduced access to land, technology and to services such as finance and energy.

GVEP is a partner of the ENERGIA Women's Economic Empowerment (WE) programme, which in partnership with SEM Fund will support the growth of 250 women-run micro and small enterprises in Senegal through business and technology mentoring as well as access to knowledge, local markets and financial advice. Tailored mentoring will ensure that the businesses are commercially viable in the energy market and that specific challenges facing women will be addressed.

Through the programme GVEP aims to improve access to energy for over 40 000 women, men and children.

Integrating gender issues in energy policies in Senegal

GVEP and SEM Fund have also joined forces to deliver an Advocacy and Campaigning programme to raise awareness about the importance of women's economic empowerment in the energy sector, especially at the frontier of energy delivery and to influence gender mainstreaming in energy policies and programmes in Senegal. With funding and support from ENERGIA, we will advocate for the integration of clear gender objectives and actions within the SE4All national action plan and investment prospectus; and for issues related to women's economic empowerment within the global campaign on Energy, Women, Children and Health.

GVEP training and mentoring

GVEP has been delivering training and mentoring to the WE programme network partners to increase their capacity in relation to providing business development support for women entrepreneurs.

The five-day interactive training programme was delivered in Nairobi in April 2015 and focussed on transferring GVEP's knowledge in the areas of market assessment; selecting client enterprises; how to do it and what to look for; identifying training needs of entrepreneurs; the role of ongoing mentoring; basic skills for enterprises; linking business and technical mentoring; understanding value chains; access to finance; market development interventions; and monitoring and evaluation.

The training programme included opportunities for attendees to develop a draft Business Development Support (BDS) strategy and actions plan and to share their experiences. A follow up programme of mentoring will be provided via a series of skype calls with each of the partners individually, for a period of six months.

“ Mentorship and marketing are key components of micro-enterprise development in the energy sector. The mentorship component of this training has proved to be useful and especially in helping the partners to uplift women who are in the lower levels in energy initiatives. Sustainability of these enterprises heavily rely on mentorship”

*Noah Mayieka,
Enterprise Development Officer, Practical Action*

Empowered Entrepreneur Training Handbook

GVEP took part in writing the business training section (basic business management, marketing and customer care, costing and pricing, financial planning and management, and business growth and expansion) of a new manual designed to support organisations in empowering women micro-entrepreneurs, small enterprise owners, and sales agents who work in the household energy sector. Developed by the Global Alliance for Clean Cookstoves, the Empowered Entrepreneur Training Handbook is presented in the Toolkit section of this issue.

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* Access the Handbook

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General

Engaging community based organisations in marketing of improved cookstoves in a hill state of India

Keywords: Clean cooking access; Biomass based improved cookstove; Rural entrepreneurs; Community based organisations; Rural marketing; Rural India



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Picture 1: An ICS being used for cooking (Source: TERI)

The focus of the dissemination process of improved cookstoves (ICS) is shifting from subsidy-driven approaches to market-driven solutions. The present paper presents the case of creating accessibility of biomass based ICS to the rural population in a hill state of India through local level entrepreneurs. Conventional rural marketing chains are able to influence purchase decision for products like ICS with no immediate visible social and economic benefit only when the awareness of the stove is created and the early buyers are able to accept ICS in their daily cooking. A well thought-out awareness strategy during the initial days is an important aspect in deciding the success level of the dissemination plan of ICS through market mode. A push through community based organisations plays an important role in awareness generation and subsequently influencing purchase decisions.

Introduction

In India 63% of rural households depend primarily on traditional burning of firewood for cooking (Census of India, 2011). The traditional use of solid cookfuel results in about 3.9 million premature deaths annually in the world (Smith et al., 2014). Women, who in general are the primary cooks, and their accompanying children suffer maximum health risks due to kitchen smoke. Cleaner options for cooking and heating, even partially, reduce the exposure to kitchen smoke. Interventions on cooking energy access have been on-going for the past three decades in India through government initiated programmes, such

as the National Biogas and Manure Management Programme (NBMMP), the National Programme on Improved Cookstoves (NPIC), the National Biomass Cookstove Initiatives, and the Rajiv Gandhi Gramin LPG Vitrak Yojna.

International, national and state level development organisations are working towards the goal of increasing access to clean cooking energy. Advance biomass cookstoves (biomass gasifier-operated cooking stoves run on solid biomass, such as wood chips and briquettes) are relatively common solutions in rural areas across the developing world as these stoves have higher efficiency and cleaner combustion (Grieshop et al., 2011). With time, considering the sustainability factor,

focus on the dissemination process of improved cookstoves (ICS) is shifting from charitable efforts to complementary commercial and market-driven solutions (Shrimali et al., 2011). Supply of biomass based ICS through market mode is still at the nascent stage.

This article discusses the role of local level entrepreneurs (in particular women's groups) in the supply chain of ICS in the state of Himachal Pradesh. The case study discussed in this article is part of the programme on clean energy access implemented by The Energy and Resources Institute (TERI) with support from the Department of International Development, United Kingdom (DfID).

Picture 2: Member of a women group giving a demonstration in a village (Source: TERI)



A rural cooking scenario

Sixty-four% (0.84 million) of the rural households in Himachal Pradesh depend on firewood for cooking. Usage of crop residue, cowdung cake and biogas as cooking fuel is limited to a mere 0.19 million households across the state. The cooking energy scenario in the state is considered better compared to other states of India. A primary survey capturing the pre-intervention phase scenario of 1000 households across three districts indicated that about 54% households use traditional mud stoves as their primary cooking device while another 39% report LPG as the primary cooking fuel (TERI, 2015). Villagers were comfortable using their mud stoves which had two to three pots. Being a hill state, mud stoves are used round the year for cooking as well as water heating.

The bio fuel chain has four stages: collection, processing/stacking, transportation and cooking (Parikh, 2011). The primary survey of 1000 households in the state reveals that women are solely responsible for collection and processing firewood in 84% of the households. Parikh (2011) compiles hazards of the four stages such as inflicting bruises and snake/insect bites during collection, allergy/rashes during processing/stacking, backache due to heavy load while carrying the firewood, and respiratory and eye problems during cooking along with infant mortality. The majority of the women are aware of the ill effects of smoke emissions produced during cooking but typically need to consult male decision makers in their household before making financial commitments for purchase of an improved cooking device (Bhojvaid et al., 2014).

A three step approach to dissemination

A forced draft portable steel stove model (TERI SPTL 0610) developed by TERI was introduced initially in one district of the state. The stove has efficiency of about 37% against the 5-10% (approximate) efficiency of the traditional mud stoves

commonly used by the rural households. The stove with CO level of 2.25 g/MJd and Total Particulate Matter of 147.40 mg/MJd has been approved by the Ministry of New and Renewable Energy (Government of India).

The TERI SPTL 0610 stove works on the principle of biomass gasification. A fan for clean combustion in the stove is operated using a compact power pack unit with provision of solar charging, which needs recharging after every four to five hours of usage. The power pack also comprises of a regulator to control flame. The fuel used in this top loading stove in general is firewood with an average size of 10 cm in length, 4 cm in width and 4 cm in thickness.

There have been interventions in the state with regards to ICS but all the interventions introduced natural draft mud stoves and were implemented either under government schemes or by development agencies following the subsidy approach. The portable forced draft stove was a new product in rural areas. Considering the sustainability factor, a business based supply chain model was to be developed, but the challenge was the novelty of the product and creation of a channel which can penetrate deep into the villages. The debate was whether to introduce the product through the rural retail units and follow the conventional marketing strategy or to emphasise the social and environmental benefits of the product.

The team adopted a three step approach for demand creation and marketing of the ICS. The product had two major challenges in terms of marketing:

- It was to be used by women who in general are not decision makers with regards to expenditure
- The initial cost of the ICS is much higher than its counterpart - the traditional mud stove

Step One

Initially, an enterprise was developed which closely worked with a non-governmental organisation (NGO) working in the area of environment and rural development. The enterprise initiated

demonstration meetings especially for the self-help groups for elderly people (above the age of 55) who in many cases are able to influence household decisions as well as village level decisions in 'panchayats' (a village level governing body).

Awareness was created about the health and environmental aspects related to incomplete combustion of firewood in the traditional mud stoves. The cost of a stove model, which was almost US\$ 43.38, had to compete with the traditional mud stoves which are constructed by the households almost at zero cost. However, features like a regulator for regulating flame, a fan to replace manual pumping of air and reduced soot in comparison to mud stoves attracted the consumers. Initially, due to paucity of supply of the manufactured stoves, the stoves were only supplied to the members of the self-help groups for elderly people. In a year, the enterprise was able to generate demand for about 600 ICS and realised that young and middle aged women also needed to be convinced about the benefits of ICS.

Step Two

At the next level, women's groups were engaged in the supply chain. Three different types of groups were engaged as Energy Enterprises: a self-help group federation already engaged in collection, processing and marketing of processed milk; an active self-help group engaged in monitoring of schemes implemented by state government; and a self-help group of destitute women. The groups tested the TERI SPTL stoves themselves for a month at their residence. Once they were convinced about the performance of the stoves and associated challenges, the groups started conducting demonstrations of the ICS to other self-help groups of similar type. This promotion model was able to influence women of other self-help groups in their respective households. Each village has at least two to three women's groups and from each group three to four women procured ICS. Many of the end-users who were self-help group members took credit from their group account to buy an ICS.



Picture 3: TERI SPTL0610 model of biomass based ICS (Source: TERI)

One of the positive aspects of engaging women's groups was their ability to motivate the end-users to use the stoves on a regular basis. In one instance, prizes were declared for the households who will be using ICS daily for cooking two meals a day for six months. The ICS gained popularity through word of mouth. Within a span of a year, three women's groups together were able to sell 500 cookstoves worth US\$ 21 692. One of the limitations of the women's self-help group as cookstove entrepreneurs was their mobility, however, the scope of intensifying their reach within their geographical boundaries is always there. Providing after-sale services is a challenge in a hill region and technicians were trained at central locations to provide after-sales services.

Step Three

At the third level, about 10 retail units in rural areas were engaged. Two retailers who adopted an aggressive marketing strategy were able to sell about 300 stoves in the span of six months. These two retailers conducted demonstrations in the vicinity villages and arranged to deliver the product at village centre point. The eight retailers tried to sell ICS like any other product in their retail store. A limited number of stoves were sold through these eight rural retail units as the customers looking at the portable ICS in general tend to compare the product cost with traditional mud stove. Additionally, the customers in these rural retail units in general are not the female members who are associated with cooking and such customers in majority were not able to perceive the benefits of ICS and drudgeries associated with traditional mud stoves (such as better combustion, less smoke). Again, it becomes difficult for the sales person in these retail units to conduct demonstration for a single inquisitive customer.

In total, 73% of the dissemination of cookstoves was through self-help groups, either the women groups or the groups for elderly people. Out of the 27% disseminated stoves through retail units,

about 60% were disseminated by the two retailers who conducted aggressive awareness at the grassroots level.

Awareness, affordability and acceptance

Limited awareness is one of the barriers in dissemination of cooking alternatives even if energy costs are within affordable limits (Pohekar et al., 2005). The case discussed above clearly indicates awareness creation as a determining factor in dissemination of ICS following a market-driven approach.

Economic indicators of Himachal Pradesh in general show better performance when compared to the Indian average. Only 8.5% of the rural population in the state is Below Poverty Line (BPL) (Government of Himachal Pradesh, 2013-14), and exactly the same proportion is reflected in the primary survey of 1000 end-users which says 8.52% of the end-users fall into the BPL category. The issue of affordability, particularly in this hill state seems to have limited role in the purchase decision. Fifty-six% of the respondents are willing to pay up to US\$ 64 to purchase a portable metallic biomass based ICS. The article presents the case of a state with a low proportion of poor population. However, the issue of affordability cannot be neglected for that part of the population which falls into the BPL category in Himachal Pradesh and other states or regions.

The user survey for 1000 households who purchased ICS indicated that 65% have started using the ICS as primary cooking device and another 18% uses the ICS as secondary cooking device. Prior to purchase of the TERI ICS, 60% of the surveyed households had access to LPG connections but only 39% reported usage of LPG in cooking. Cost (US\$ 7.39 for a subsidised LPG cylinder in the state) and supply of LPG are the constraining factors in usage of LPG. The ICS being able to provide a cleaner and affordable cooking option is accepted by a considerable proportion of buyers. Acceptance of the product further enhances scope for demand in the area as word of mouth is one of the critical tools in rural marketing.

Lessons learnt

- With time, the approach towards the dissemination of ICS can shift from a subsidy-driven approach to market-driven approach.
- Initially ICS compete with the traditional mud stove models which incur almost no cost to its users. The benefits of the biomass based ICS, at the same time, is not visible immediately.
- The push through rural retail units is not sufficient in generating demand and creating accessibility of ICS.
- During the initial phases an aggressive awareness creation strategy emphasising on social, environmental and health factors is required.
- Community based organisations (CBOs) in the initial stages are one of the suited channels to reach to rural communities, and in particular to the women - the primary cooks. The case discussed indicates that these CBOs not only succeeded in generating awareness and creating demand for ICS, but a step ahead, were able to motivate the primary cooks to accept ICS in their daily cooking.
- Conventional marketing through rural retail units is able to support the objective of access to ICS substantially at the later stage when the product gains some level of popularity in the area.

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- * Full list of references
- * Authors' profiles
- * Acknowledgements

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A pilot study of traditional and energy-efficient stove use in Ulaanbaatar, Mongolia

Keywords: Ger; Heating stoves; Household behaviour; Stove use monitors; Field study; Air pollution



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Picture 1: Traditional Stove in the center of a ger
(Source Agnes: Lobscheid)

To reduce levels of outdoor air pollution, new energy-efficient solid fuel stoves have been offered for sale in the ger regions of Ulaanbaatar, the capital city of Mongolia. These energy-efficient stoves should use less fuel than the traditional stove and emit a tenth of the pollutant emissions. However, because the stoves were only broadly introduced in August 2011, limited documented information exists of actual household fuel and stove use behaviours or the impact of those behaviours on emissions. During the 2011-2012 heating season (October–March), we evaluated stove use behaviour in a small subset of ger households with either traditional or an energy-efficient stove. Relying on a combination of in-person interviews and stove use monitor (SUM) technology, we observe that stove use behaviour can vary substantially between households and identify three main burn cycles related to the use of the energy-efficient stove, which may impact the degree to which PM emissions can be mitigated. We show how SUMs can play a key role in identifying the frequency of ignition and refueling events and how this data in combination with household surveys, can characterise the impact user behaviour can have on stove emissions.

Introduction

Over one million people reside in Ulaanbaatar (UB), the capital city of Mongolia (CIA, 2012). Approximately 60% of the population, or 170 000 households, live in the peri-urban ger regions of the City (Herro et al., 2003). During the heating season (October–March), high ambient air levels of PM in the ger regions of UB are common. For example, 24-hr PM₁₀ concentrations have been measured in the winter that

exceeded 3000 g/m³ and monthly average PM_{2.5} and PM₁₀ concentrations during the 2008-2009 heating season exceeding 1500 and 1800 g/m³, respectively have been recorded (World Bank, 2011). These concentrations suggest that UB may have the worst air pollution of any capital city in the world.

The primary source of air pollution in the ger regions during the heating season is attributed to coal and wood burned in the traditional Mongolian stove for heating and cooking (World Bank, 2011).

Traditionally, a stove (Picture 1) is located in the centre of each ger, and in homes located in the ger region it is commonly attached to a heating wall. Gers can have four, five, or in some cases six walls and typically have indoor floor areas ranging between 20 m² (a small four-wall ger) to 30 m² (a large five-wall ger). During the winter months, when temperatures may dip to -30°C or lower, the stove runs continuously, leading to the consumption of roughly 2.4 tons of coal and 500 kg of wood in a typical ger household (BEECS,

Picture 2: Small-Turkish Stove in the center of a ger (Source Agnes Lobscheid)



2011). Across all households in the ger region, nearly 550 000 tons of coal and over 400 000 tons of wood is consumed during the heating season (World Bank, 2009).

The US-based Millennium Challenge Corporation (MCC) funded the Energy and Environment Project (EEP) to reduce urban air pollution; in addition the project aims to increase savings resulting from reduced fuel consumption and health costs while increasing productivity. The EEP is a large effort utilising market methods to improve air quality in UB. As part of the EEP, over 70 000 project-subsidised stoves were planned for distribution during the 2011-2012 heating season (October 2011-March 2012), across five of the nine districts of UB.

Energy efficient stoves

Following a series of laboratory and field tests on a variety of improved cookstoves (ICS), the EEP selected four energy efficient stoves for distribution. At the time of our study, the most widely available of the EEP subsidised stoves is manufactured in Turkey and is referred to as the Silver-Mini model, or small-Turkish stove (Picture 2), which can be used for heating and cooking. When operated under manufacturer specifications, the small-Turkish stove uses less fuel than the traditional stove, and has PM emissions that are roughly a tenth of the traditional stove. The Silver-Mini is a top-lit updraft design (TLUD). For efficient combustion, the manufacturer specifies that the stove should be cold when loaded 2/3rd full of coal, and lit from the top using wood and paper. Based on this procedure, the stove is to be started no more than twice in a 24-hour period, which makes it ideal for space heating, rather than cooking purposes. However, if operated improperly, i.e., started more than twice in a 24-hour period and/or refueled with wood or coal while the stove is burning, the PM emissions may increase dramatically.

The combined EEP subsidy (upwards of 65% of the stove price) and Government bonus, coupled with the lower fuel

consumption, higher heating efficiency of the small-Turkish stoves and attractive design features, provides a substantial incentive for ger households to purchase a new stove. However, limited information documenting how households use these stoves exists. Our survey design provided an indication about stove use behaviour and thus potentially about stove emissions and efficiency benefits.

Stove and fuel use study overview

Our study region is confined to the Chingeltei District of UB with nearly 32 000 households and approximately 140 000 people. Moreover, it was the first district provided with the option to purchase a project subsidised stove. During the course of stove marketing, an estimated 15 000 households likely purchased a project subsidised stove in the Chingeltei District. The majority of these stoves were the small-Turkish stove sold to ger households.

Using a combination of in-person interviews and stove use monitoring technology, we collected data on fuel use and stove use behaviour patterns in a convenience sample of ger households in the Chingeltei District.

Following initial household visits in September 2011, 18 ger households agreed to monthly follow-up visits by a local technician throughout the 2011-2012 heating season (1 October- 3 March). Based on the data collected during these visits, we summarised fuel consumption and stove use patterns across the heating season and identified three general types of burn cycles associated with the small-Turkish stoves. While we briefly summarise our study design below, additional details, including the survey questionnaire and household data collected, can be found in Lobscheid et al. (2014).

Stove use monitors (SUMs)

SUMs are roughly the size of a US penny and can provide continuous time-series data on stove temperature, a surrogate for number of stove ignition and refuelling

events in a cost-effective manner with minimal intrusion and influence on households. SUMs rely on the Maxim iButtons technology, and can connect to any laptop/netbook via a probe and USB adapter. We relied on the SUM model DS1922T which can record temperatures within the range of 0°C to 125°C, at programmable intervals. The SUMs in our study were set to record temperatures at five minute intervals, allowing them to continuously record temperatures over a four week period.

SUMs were installed in four locations: on the wall opposite the door, on a pole (~ 3 feet from the stove, and 6 ft from the ground), on the leg of the stove (with heat resistant tape), and placed loosely under the stove.

Questionnaires/interviews

At our initial household visit, we collected information on the dimensions of the ger, number of insulation layers, the presence of a vestibule, the type and amount of wood and coal used, stove igniting and refuelling procedure, and demographic information including number and age of household members.

At each monthly follow-up visit, the SUMs temperature profiles of the past month were downloaded and a short questionnaire was administered, focusing on the amount of coal and wood used in the past week and the time and frequency of ignition and refueling events over the past 24 hours.

In addition, an LBNL research team member returned to UB in December 2011, to evaluate the SUM data collection and review the household SUM Temperature profile with an adult household member. Because the peaks and troughs in the temperature profile indicate start and stop times of household stove use, the SUM

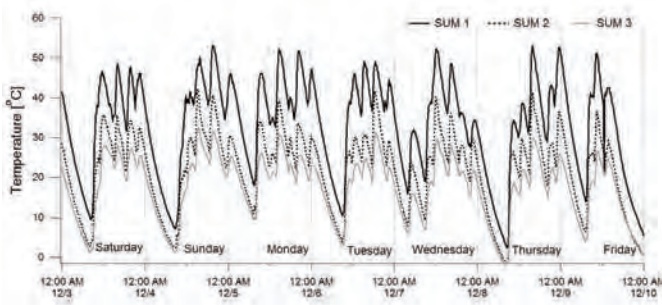


Figure 1: A typical traditional stove profile over a course of a week

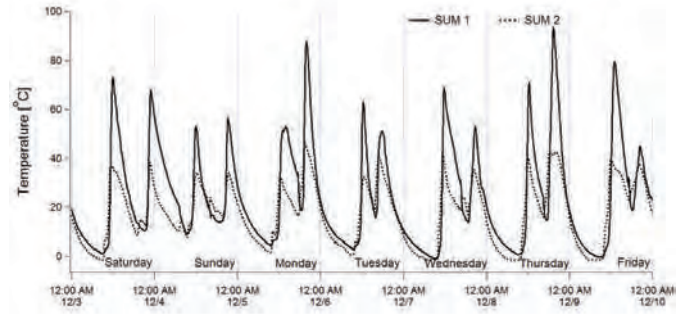


Figure 2: Small-Turkish stove temperature profile indicating use per manufacturer's specifications, over the course of a week (SUM 3 was not available in this household)

temperature profile acted as a guide for the households to provide more accurate answers to our survey questions about stove igniting and refuelling practices, including the presence or absence of hot coal in the stove prior to adding additional fuel.

The household recruitment procedure, consent forms, and survey protocols used in this study were all approved by the LBNL Institutional Review Board (IRB), Human Subjects Committee.

Stove use patterns from SUM temperature profiles

Figures 1-3 display three typical stove use monitoring temperature profiles over a course of a week that were identified during the heating season. These include a typical traditional stove use profile (Figure 1) in which the peaks show evidence of a start in the morning, followed by frequent (four) refuelling events during the course of the day. Figures 2 and 3 both display small-Turkish stove use profiles.

Burn cycles of energy-efficient stoves

From the SUM temperature profiles in combination with in-person interviews in which we reviewed the temperature profiles with the households, we identify three general stove use events, or burn cycles, associated with the energy-efficient small Turkish stoves. These include:

Cold start: The firebox is cold (no embers or flames) and empty when loaded 2/3rd full with coal (8-10 kg), then wood is added and lit from the top.

Warm start: The firebox is warm, with a few embers or smoldering flames that are insufficient to ignite the coal from the bottom. Two key variations in the warm start involve whether or not the air intake valves are cleared of the charred/smoldering material at the bottom of the firebox before coal, then wood are added (similar amounts as in a cold start), and ignited from the top.

Refuel: The firebox is hot, with embers and flames when coal or wood is added. In most cases, the stove was loaded half-way full with coal (~ 5 kg). In this case,

the coal or wood is ignited by the embers from the bottom.

Based on the SUM temperature profiles and in-person interviews, we find that refuelling and/or warm starts occur in the majority of the small-Turkish stove households in our cohort. It appears that some ger households have a tendency to use their small-Turkish stoves in the same manner as the Traditional stoves (Figure 1), i.e., with one cold start in the morning followed by frequent refuelling throughout the day.

Unlike traditional stoves, households with small-Turkish stoves in our sample appear to use the small-Turkish stoves primarily for heating and rarely for cooking, with the exception of boiling water for tea or soup. Nearly all of the small-Turkish stove households initially interviewed in September had electric woks; some even had electric stoves that were used for cooking. Only two households with a small-Turkish stove did not have an electric cooking appliance, and they are among the households that exhibit higher average temperatures in the ger and higher stove use frequencies.

Fuel use

In our ger cohort, the two main types of wood used by households are larch or pine. In the traditional stove households, larch is generally preferred over pine because it produces less ash, more heat, even though it is slightly more expensive. A few households indicated that they prefer to burn pine in the small-Turkish stoves.

Two types of coal, Alagtolgoi and Nailakh, are readily available in the Chingeltei ger region. Some households said they prefer the Nailakh over Alagtolgoi coal because Nailakh coal tends to sustain warmer temperatures for a longer period of time and it is slightly less expensive (~ 1100 Tugriks for an 8-10 kg bag vs. 1300 Tugriks). It may be that Alagtolgoi coal combusts more quickly in small-Turkish stoves, leading to a sharp increase in indoor temperatures.

Within our household cohort, we found substantial variation in fuel used. Some small-Turkish ger households

report using comparable amounts of coal as the traditional stove households (upwards of 20 kg of coal a day), while others report using less coal. A visit to a local coal distributor in the Chingeltei district revealed that coal sales were down roughly 50% from the last heating season (2010-2011), a decrease the distributor linked to the introduction of the energy efficient stoves.

We also found substantial variation in fuel use in traditional stoves. In the four traditional stove households in our cohort, one household reports using only wood as fuel and another reports using only coal. The two other households use a mix of coal and wood.

Implications for reducing air pollution levels

Laboratory tests of small-Turkish stoves conducted at Lawrence Berkeley National Laboratory indicate that emissions vary across the burn cycles and use patterns identified in our household study. For example, there is evidence that a refuelling while the stove is still burning causes peak PM emissions that exceed those associated with a cold start (Maddalena et al., 2014). Thus, identifying the frequency of refuelling events in households using the small-Turkish stove is critical to decreasing harmful emissions.

Because the initial testing of stoves using manufacturer recommended operating conditions provides idealised performance metrics, additional testing of the stoves and fuels was needed in order to determine the implications of refuelling, and also of warm starts on stove emissions. For instance, if the air intake holes are covered at the bottom of the firebox during a warm start, the emissions of PM, or other products of incomplete combustion, may be elevated (Maddalena et al., 2014).

We believe that laboratory emission tests designed to represent actual field operating conditions for the stoves, combined with household stove use behaviour surveys and SUMS temperature profiles, will allow for a more accurate assessment of emissions. Such behaviour

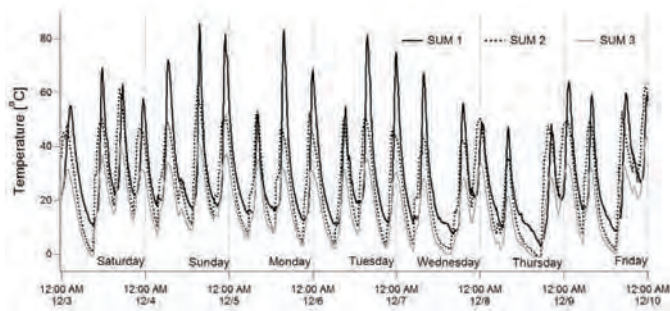


Figure 3: Small-Turkish stove temperature profile indicating refuelling and/or warm starts because of more than two peaks and troughs throughout the day, over a course of a week

based emission studies, which take into account the variability in stove use, allow project implementers and policy makers to take steps, such as increase the level of education and training offered to households on proper fuel and stove use to decrease toxic emissions.

In the UB ger region specifically, using SUMs in a larger representative behaviour study of ger households with energy-efficient stoves is recommended to confirm our initial findings. Such a study should control for the physical size of the ger (four to five, or six-wall gers), number of insulation layers, and include gers with and without a vestibule.

Conclusion

Because fuel and stove use behaviours can vary across households, it is important to understand both the prevalence, and the emissions implications of various fuel and stove use behaviour, particularly those burn cycles that lead to elevated pollutant emissions. SUMs can directly monitor stove use. SUMs, in combination with household survey data can provide key information on stove use behaviour, and identify and define burn cycles.

In the ger regions of Ulaanbaatar and elsewhere new, energy-efficient stoves are introduced, we recommend expanding the SUM technology in combination with surveys of households that have purchased new stoves. Together, this information can identify burn cycles, based on household fuel and stove use. These burn cycles can then be tested in the laboratory to obtain accurate measurements of pollutant emissions which take into account the variability in fuel and stove use patterns.

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* Authors' profiles

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Global Household Energy News

Practical Action: Poor People Energy Briefing Series

Practical Actions' Poor People Energy Briefing Series offers critical input into the fast moving and dynamic energy sector from the perspective of what matters for poor people. The series complements our flagship Poor People's Energy Outlook. Editions so far cover:

- Enabling Energy Access for the Poor: Strengthening the evidence base
- Making climate change mitigation more meaningful: The link to UEA
- Nexus of water-energy-food security

This energy briefing series will be a vehicle to share new evidence and learning. It aims to be thought-provoking and to challenge the business-as-usual approach to energy access debates. The series is a space for collaboration with energy access practitioners and policymakers. It seeks to inform how we can deliver on global, regional, and national energy access commitments, with one aim: to reach the universal energy access goal by 2030 and provide poor people with the energy services they demand, need, and have a right to.

GACC: Tackling black carbon emissions from inefficient cookstoves

In an effort to tackle black carbon emissions from inefficient cookstoves, the Global Alliance for Clean Cookstoves has partnered with numerous organisations as part of the 'Reducing SLCPs from Household Cooking and Domestic Heating' initiative, to develop a methodology for quantifying and monitoring emissions reductions and associated climate impacts from black carbon and other short-lived climate pollutants. Certified by the Gold Standard Foundation, the new black carbon methodology will help drive finance into projects that provide an immediate and measurable impact on mitigating climate change at a local level.

Carbon Expo's Global Intersection of Climate Finance, Carbon Markets and Clean Energy Event: 26-28 May 2015, Barcelona, Spain

Carbon Expo has been established as the world's largest multi-sectoral climate finance and carbon market conference and trade fair. With the evolution of the carbon markets over the years, it has become the leading platform for progressive businesses, finance and governments, facilitating innovation, promoting enhanced understanding of new policy instruments and identifying ways to access and leverage climate finance, especially between countries facing comparable challenges. Read more and register at: <http://www.carbonexpo.com>

Deloitte: New report on the linkage between energy access and women's economic empowerment

There are two well-accepted narratives related to economic growth. First, vast gender inequalities remain throughout the world and are closely linked to poverty and instability. Second, access to modern energy enables economic advancement. Until now, however, exploration into the relationship between these two narratives has been limited. What is missing, it seems, is the linkage between energy access and women's economic empowerment. Under what context does gender equality rise with access to electricity; what are the channels through which this change occurs; and how significant are the economic benefits to women? Can donor institutions and governments reap more meaningful results by targeting energy development programs that enhance benefits for women? In this report, we explore these questions. We believe that while there are many areas important for women's development, energy access programmes are an under-explored lever for women's economic empowerment. The full report is available for download @ HEDON.

UNDP: Simple solution brings light to rural communities in Nepal

Small-scale hydroelectric projects are being used to harness the power of water to produce electricity. Cheaper and faster than large hydroelectric dams, these micro-hydro projects are channeling Nepal's ample water resources to power dark villages in the nation of 27 million. During a visit to Nepal, UN Assistant Secretary General and UNDP Regional Director for Asia Pacific travelled to Pinthali village of Mangaltar Village Development Committee in Kavre District, the site of one such plant, to learn firsthand how access to modern renewable energy can reduce poverty and improve living standards.

Africa Future Energy Forum: 27-28 May 2015, Nairobi, Kenya

MCI-Middle East will be co-hosting the Africa Future Energy Forum in Laico Regency Hotel, Nairobi, Kenya. Themed as 'Unlocking Africa's Energy Potential', the forum will bring together major stakeholders to discuss the policy, technology, and financing aspects around energy in the African continent. Read more and register at: <http://africafutureenergyforum.com>

Call for papers

Boiling Point forthcoming topics:

— Decentralised Energy and Climate Change

Boiling Point is peer reviewed and published quarterly. We invite readers to submit articles, papers and news on a rolling basis at any time. So if you feel that you have something to contribute to the wider household energy community on any theme, including the above four, then please read the information below and send us your experiences – HEDON would love to hear from you!

Boiling Point looks for articles which are written in English, preferably using clear and plain language, and which can be used by other people in their own work. Do not be deterred, however, if you are not used to writing – it is the information that is important – we will review articles, edit them and return them for your approval prior to being published.

Theme articles

Each edition of the journal typically contains four to six full length theme articles which can include research papers and programme reports that are relevant to the theme topic. We encourage you to submit articles on your work on any of the above-mentioned themes at any time of the year. Each edition also contains a related Toolkit. If you are interested in contributing to these, then please contact us on the email address at the end of this page.

Viewpoints

If you feel you or someone from your organisation should be interviewed on your work in facilitating access to energy for households in developing countries, please contact us. All interviews will be published on the HEDON website and the best will be selected for publication in the Viewpoints section of Boiling Point.

General articles

We welcome submission of general articles at any time, which can cover any topic. Examples include project/programme updates, technical papers, book/report reviews, and conference and workshop

reports. Please note: technology based articles should be focused on the real life application of proven technologies.

Helpline

Would you like advice from experts on an aspect of your work in household energy? Contact us with your questions and we will strive to direct you to those who can help. Questions we feel are relevant to a wider audience are selected for publication in the Helpline section of Boiling Point. In the past, these have included dilemmas regarding marketing, emergency relief and enterprise development.

Sponsor

Boiling Point reaches over 11,000 readers globally, making it an ideal forum to get information about your project activities out to the worldwide community of practitioners and to showcase your work to potential collaborators and funders. Sponsoring Boiling Point gives your organisation a range of profile benefits; from space in the journal to communicate news, events, logos and website links; to receiving several printed copies to distribute to your colleagues. For more information, visit www.hedon.info/EYQB or send us an email.

Front cover photo competition

HEDON is offering you another fantastic opportunity to get your best image onto the front cover of Boiling Point. We are looking for a full colour photograph for the front cover that illustrates the future themes of Boiling Point. The photo must

be: of good quality format and suitable for high resolution colour printing (minimum resolution of 300 dpi and a high quality file type i.e. not .bmp); sent to us in its original format (not pasted into an MS Word file); credited to the correct person, with a caption if appropriate; owned by the person/organisation entering the competition; and preferably with a central focal point, bold composition and rich colours. The editor's decision is final and the selected photo will win absolutely nothing, apart from the admiration of thousands of subscribers and of course our thanks.

Guidelines and submission dates

We are now accepting articles and front cover photo submissions for BP67: Decentralised Energy and Climate Change. Deadline for submission is 30 June 2015 (visit www.hedon.info/boilingpoint).

We are always looking for general articles which should be submitted via email to boilingpoint@hedon.info. Articles should be around 2000 words in length. Illustrations, such as drawings, photographs, graphs and bar charts that are essential, and all references should follow the given guidelines. Articles should also include a 100-200 word summary, a 50 word profile for each author and up to ten keywords that you feel best describe your article. Files can be emailed to the editor at the below listed address. Final selection is based on article quality, originality and relevance.

Thank you for your cooperation, and please do not hesitate to contact us for any clarification.

Regards,
The Boiling Point Team

Email: boilingpoint@hedon.info

The HEDON Household Energy Network is dedicated to improving social, economic and environmental conditions in less developed countries, through promotion of local, national, regional and international initiatives in the household energy sector.

The HEDON Household Energy Network is established in the UK as a charitable limited company registered with the UK Charity Commission. It is governed by seven Trustee Directors: Grant Ballard-Tremeer (Eco Ltd), Andrew Barnett (The Policy Practice), Raffaella Bellanca (SNV), Jack Dedman (Chartered Accountant), Ben Garside (International Institute for Environment and Development), Dick Jones (Independent) and

Kavita Rai (Energy Specialist) and is managed by Karima Hirji (HEDON Executive Manager) and a team of dedicated volunteers. The network itself is comprised of thousands of active members with diverse backgrounds: practitioners, policymakers, academics, business owners and non-governmental organisations, based across the world. We exchange experiences, learn from one another and create new knowledge.

Our Vision

A world where everyone has access to clean and sustainable energy; in fairness, respecting the environment and combating climate change.

Our Mission

To inform and empower practitioners in order to unlock barriers to household energy access by: addressing knowledge gaps, facilitating partnerships and fostering information sharing.

Our Patrons

HEDON Household Energy Network has the good will and support of two patrons: Archbishop Desmond Tutu of South Africa, and Professor Kirk R. Smith, Professor of Global Environmental Health, at the University of California, Berkeley, USA.



"As a patron, I believe that HEDON, in its work to address energy and climate improves lives for people living in poverty. I am a supporter of their work and would recommend others to support their endeavours further"

Archbishop Desmond Tutu



"HEDON is the oldest international network of organisations promoting clean and efficient household energy sources for improving health and welfare. I have been involved since its inception in the 1980s and it has provided both intellectual support and inspiration in my work to understand the health and climate implications of household combustion"

Professor Kirk Smith

What the HEDON Household Energy Network offers:

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