Beyond access to electricity: how to promote equal benefit from productive uses of energy for men and women? - Evidence from Myanmar -

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Abstract

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1 INTRODUCTION

Myanmar is in rapid political and economic transition, since 2011, when their first democratic elections in 20 years occurred. Myanmar has a population of around 51.4 million people, consisting of diverse ethnic groups speaking over 100 languages and dialects. It is the second-largest country in the region, holding a rich stock of natural resources, opportunity for deep seaport development, and immense agricultural potential. Its location between the dynamic economies of Thailand, the People's Republic of China, and India enhances Myanmar's trade potential (ADB 2015). In spite of this, Myanmar has an energy crisis.

The country has one of the lowest electrification rates in Asia, as well as the highest energy investment needs as a share of the country's GDP. Less than a third of the population has access to the electricity grid (World Bank 2016). Furthermore, while 75% of the population in major cities enjoys access to electricity, only 16% of rural areas have access to electricity (World Bank 2016). Myanmar has been pushing forward the energy access for all, following the "Sustainable Energy for All" (SE4ALL) initiative.

Their recent National Electrification Plan 2016-2030 (MNEP) aims to electrify 7.2 million households and achieve universal access to electricity by the year 2030. It will support the expansion of electricity services in Myanmar through grid and off-grid solutions, and will work with all development partners and the private sector in these areas. However, in reality, Myanmar has a complex energy policy landscape, with more than a dozen government agencies involved in energy and electricity planning, and even greater numbers of actors in the private sector and civil society. This complicates implementation of the plan and often creates overlapping and at times confusing mandates and poorly coordinated efforts at promoting energy access.

While Myanmar is currently focused on providing basic energy needs, as an elemental first step for realizing other SE4ALL goals, the country must not forget other objectives such as higher incomes, longer lives, and gender equity. Myanmar remains one of the poorest members of the Association of Southeast Asian Nations (ASEAN). It is ranked 150 out of 187 countries on the Human Development Index. Furthermore, women face entrenched inequality and systemic barriers to economic, political and social leadership (Oxfam et al 2013). Women are largely responsible for caring for children, sourcing and collecting water and firewood, as well as managing households and preparing meals. Research shows without gender mainstreaming and promotion of productive uses of energy (PUE) in energy planning, the benefits of accessing energy will not be unlocked for the communities that receive it (Clancy, Ummar, Shakya and Kelkar, 2007; xxx).

We know that productive uses of energy are essential to unleash the income generation and poverty reduction potential of energy access interventions, and to achieve it, energy alone is insufficient. Enablers like skills, access to markets and finance to purchase equipment are required. Furthermore, gender blindness in energy programming leads to differential impacts of access to energy programmes since women experience energy poverty differently and more acutely than men, and face different challenges than men to get involved in paid work.

Myanmar's current political landscape offers an opportunity to include gender and productive uses related policies, that take into account women's work patterns to design the geographic and time distribution of power availability and business models that consider their ability to pay. To address this gap, this paper assesses the situation of five rural communities in Myanmar to nderstand the enablers for gendered access to energy and access to decent work to improve the planning, desing, and implementation of programmes and policies. It aims to address the following questions: 1. What is the differential benefit of the PUE for men and women? 2. What explains the differenes? And 3. Whsich interventions can successfully address the constraints that men and women face to benefit as much as men?

Qualitative methods include Semi-structured interviews (SSI) with 40 men and women workers and entrepreneurs, Key Informant Interviews (KKI) to 18 informants, and Focus Group Discussions (FGD) gathering 87 participants. The paper is structured as follows: The second section provides the background about gender, energy and entrepreneurship in Myanmar, and describes interventions in our target communities. The third section explains the methodology. The fourth section shows results for each research question. The discussion provides policy recommendations drawing from the results and the final section concludes.

2 BACKGROUND: MINIGRIDS, PRODUCTIVE USES AND GENDER IN MYANMAR

Myanmar has been embarked on an unprecedented reform agenda the last years as stated in their Myanmar Sustainable Development Plan. The reform agenda focuses on good governance and ensuring fundamental rights, economic stability and strengthened macroeconomic management, seen as indispensable prerequisite for peace and security. The recently released twelve-point summary on economic policy includes the development of infrastructure, focused on producing and distributing power, building and maintaining rural roads, and developing better port facilities (source).

Myanmar's economy grew an average real rate of 7 percent per year between 2011 and 2014. Despite these efforts, Myanmar remains a predominately poor country, with agriculture as its main livelihood. Underemployment is increasing, affecting 37% of the working population seasonally. Poverty rates have been steadily declining from 32.1% in 2004 to 19.4% in 2015, according to the World Bank. Urban poverty declined from 21.5% in 2004/05 to 9% in 2015 and rural poverty declined from 35.8% in 2004/05 to 23.3% in 2015, still high, where 70% of people live. The remote border areas, mainly populated by Myanmar's minority ethnic groups, and areas emerging from conflict are particularly poor. Agriculture is the national livelihood, employing 63% of the total labor force in 2012—the majority being landless and casual laborers (ADB 2015). These high rates of rural poverty place severe stress on Myanmar forests and mangroves for fuelwood collection and charcoal production—homes cannot afford modern energy services, so they cut down trees or scavenge for free wood (UNDP 2013).

Energy in Myanmar

Myanmar has the lowest electrification rate in the region, with current electrification around 34% nationwide, and only 16% in rural areas, relegating its remote communities to live permanently without a reliable energy supply (Greacen 2016 (World Bank). The recent census data maintains 32.4% of households in Myanmar use electricity as their main source of energy for lighting, followed by candles (20.7%). As shown, there is a big difference between urban (77.5%) and rural areas (14.9%) in the use of electricity as the main source of lighting. The proportion of households using batteries, generators, and solar systems as the main source of lighting is considerable. Four out of five households use wood or charcoal, while in rural areas up to 80% use wood or charcoal for cooking. Overall, only 17% of households use energy, such as electricity or liquefied petroleum gas, for cooking. The proportion is larger in urban areas (46%) but very low in rural areas (6%). Although the entire household is adversely affected by energy constraints, it is particularly damaging to women because they are primarily responsible for food preparation and cooking. Without access to energy, they are typically forced to spend significant amounts of time searching for firewood to meet their cooking and heating needs. According to some estimates, women spend three times the amount of time spent by men in transporting fuel and water. Thus, the opportunity costs for women are much higher. (ADB 2015)

Myanmar remains a biomass-energy centered economy, with wood alone accounting for 70 percent of all primary energy supply in 2009—almost four times the second most significant source, natural

gas. This dependence on solid fuels is largely due to the fact that 65 percent of country's population lives in rural areas. Households consume about three quarters of national energy production (76 percent). Despite such high reliance on biomass, the oil and gas, power, and mining sectors remain backbones of the national economy. Oil, gas, and electricity alone account for more than 77 percent of annual foreign investment and more than 72 percent of annual domestic investment (UNDP 2013).

The electricity sector—which has slightly more than 1 GW of capacity —remains dominated by hydroelectric power stations, which provided 61 percent of supply in 2010. However, the national electricity grid reaches only a small percentage of the population and Myanmar's hydroelectric stations become significantly constrained, operating at partial capacity for only a few hours a day, during the dry season. Off-grid energy needs, which are vast, are met by a network of diesel generators, solar energy and biomass (see table 1 below) (REF).

Table 1: Off-grid electrification by generation type and main source of lighting. Source of village-level data: Department of Rural Development and Ministry of Livestock, Fisheries and Rural Development, "Rural Electricity Access" (MoLFRD & World Bank Off-Grid Electrification in Myanmar, Naypyitaw, Myanmar, January 28, 2015). Source of household data: 2014 Myanmar Census.

Generation type (DRD data)	Number of villages	Main source of lighting (2014 Census data)	Number of households		
Category		Category	Rural	Urban	Total
Generator	13,088	Generator (private)	835,840	177,309	1,013,149
Mini-or micro-hydropower	2426	Water mill (private)	151,721	25,786	177,507
Biomass/gas	1232		N/A	N/A	N/A
Solar system	2693	Solar system/energy	902,431	42,811	945,242
Total	19,439		1,889,992	245,906	2,135,898
Total (not including solar)	16,746		987,561	203,095	1,190,656

Electricity Demand (GWh) 2010-2014

Type of Consumption	Unit	2010-2011 Year	2011-2012 Year	2012-2013 Year	2013-2014 Year
Industrial	GWh	2286.7	2727.3	2690.5	2698.9
Household	GWh	2653.5	3380.9	3649.7	3763.8
Others	GWh	1371.88	1608.579	1913.668	3149.9
Total	GWh	**6312.08**	**7716.779**	**8253.868**	**9612.6**

10000

The most common mini-grid generation technology observed in Myanmar is diesel generators. Generators are often small (under 10 kVA), using Chinese-made agricultural diesel motors. Tariffs for diesel mini grids vary considerably and are often charged per light or appliance. A 2015 study by the Asian Development Bank found monthly charges of K 2,000 ($1.82) for a single 20 W compact fluorescent light bulb and K 5,000 ($4.55) for two lights and a television set (Tharakan 2015). A 2016 study of 10 diesel mini grids by the micro-credit nongovernmental organization (NGO) PACT found monthly tariffs of K 1,000–K 1,500 ($0.73–$1.10) for a single light bulb and K 2,500–K 4,000 ($1.83–$2.92) for lighting and a television set (PACT 2016). Equivalent per kWh tariffs vary from $0.37 to more than $1.00.

Hydropower mini-grids appear to be concentrated in Shan, Mandalay, and Sagaing states. Data for fiscal 2015/16 from the DRD estimate that more than 1,200 villages have electrified at least 70 percent of their households with microhydropower. Tariffs are typically lower than tariffs charged by diesel-powered mini grids, at about K 200–K 860 ($0.18–$0.78) per kWh (Kumara 2015).Biomass gasifiers are common in the delta region, powering mini-grids as well as rice mills, irrigation pumps, saw mills, oil pressing, and ice making. DRD data show that 472 villages provide power to at least 70 percent of village households by biomass/biogas. A reference tariff for biomass gasification mini grids is K 400 ($0.36) per kWh (Royal Htoo Linn Manufacturing 2015). Solar mini grids, either stand-alone or hybrid PV/diesel are much less common. The DRD estimates that 150 villages are powered by solar mini grids, and more are in the pipeline (ADB 2013; Eco-Business 2015). Most solar mini grids have been heavily subsidized as pilot projects commissioned by nongovernmental organizations or the DRD.

The recent Myanmar's National Electrification Plan 2016-2030 (MNEP) aims to electrify 7.2 million households and achieve universal access to electricity by the year 2030. The Myanmar National Electrification Project (MNEP) will support the expansion of electricity services in Myanmar through grid and off-grid solutions, and will work with all development partners and the private sector in these areas. In the long run the extension of the Myanmar national electric grid will play a major role in meeting the 2030 target; by 2030, more than 95% of the population is expected to be connected to the national grid as a least-cost solution. In the medium term distributed electricity generation such as mini-grids and solar home systems (SHS) will play an important role in providing electricity to hundreds of thousands of households in areas that the grid will take many years to reach.

Responsibility for implementing the off-grid component of the NEP is vested with the Department of Rural Development (DRD) under the Ministry of Agriculture, Livestock, and Irrigation. DRD is a new ministry with many responsibilities and tight timelines to meet NEP targets. Within the off-grid component, case-by-case decisions will be made by the village residents, and project developers determining which households and villages will be served by community-scale mini-grids and which by household-scale SHS. The relative role of mini-grids vs. SHS depends on a number of factors including how fast mini-grid deployment can scale-up, the conditions under which mini-grids make sense compared to solar home systems, as well as the need to stretch limited resources (both time and money) for maximizing the level of quality services.

Villages will set up Village Electrification Committee (VEC) or Village Development Support Committee (VDSC) consisting of representatives of local residents, elders, and sometimes township officers/village administrators. These committees are responsible for mobilizing financing and sourcing technical assistance support needed for grid extension projects. Local communities are also responsible for hundreds of community mini-grid projects in place, including project planning, construction, operation and maintenance.

Enterprise development in Myanmar

Myanmar's economy is currently transitioning to a market-based economy which has large potential for improving economic growth. Enterprise data is scarce and only a handful of surveys of the private business sector have been completed in the country. The Myanmar Business Survey, completed by UNDP in 2015 (excluding informal and micro enterprises), found that the private sector of Myanmar is still characterized by low levels of diversification, low levels of productivity, and dominated by small businesses with less than 10 workers. The survey revealed Myanmar has an average of 2.46 registered businesses per 1,000 people (three times lower than the average for Least Developed Countries in Asia-Pacific, which is 9.0). The survey also found that the economy is dominated by very small and small businesses with less than 10 workers.

OECD (2013) estimated that Myanmar had approximately 750 000 business entities in total, while 127 000 of which were registered enterprises and 99.4 per cent of them are small and medium-sized enterprises (SMEs), including micro businesses. The share of SMEs as a percentage of all businesses is in line with international baselines. Among them, 620 000 business entities, constituting more than 83 per cent of all Myanmar businesses, are in the informal sector whose majority comprises family-based establishments and self-employed workers (OECD, 2013). As a result, the majority of business entities have not been captured by the official data. Some of the common barriers for enterprises are lack access to electricity and water, a labour market structure with low levels of education and skills, poor access to finance and technical knowledge (Soans and Abe 2015).

Besides powering standard residential loads such as lighting, cell phone charging, and entertainment electronics (which SHS can also do), mini-grids can spur local economic growth through energizing larger productive use loads such as refrigeration, water pumping, saws, and agricultural processing such as rice mills or corn shelling. Keep in mind a couple of caveats. First: local economic growth requires much more than just availability of electricity. For example, access to transportation, nearby markets, and communication are necessary. Second, many of these needs can also be met with dedicated diesel motors or diesel generators used when needed. Dedicated stand-alone solar water pumping and solar-powered agro-industrial processing equipment are also available and affordable, displacing the need for mini-grids in some cases.

Gender in Myanmar

According to the ADB (2015), over the past decade, there have been several improvements in the economic and social status indicators for Myanmar women. In particular, the labor force participation rate of women, non-agricultural wage employment, access to credit, literacy rates, primary and secondary education, and maternal mortality ratio have improved. However, the 2013 Gender Inequality Index ranks Myanmar at 83rd of 187 countries, while the 2012 Social Institutions and Gender Index places the country at 44th of 86 countries and 8th of nine countries in East Asia and the Pacific. Despite increases in women's labor force participation, women dominate the unprotected informal sector; and they continue to bear the major responsibility for unpaid care work, in addition to their paid jobs, while men are typically the household heads. Disparities based on economic status and regional and urban–rural locations shadow the improvements in female literacy. (ADB 2015)

Rural women are more likely to work on their own than urban women. Income may be generated through the sale of goods produced directly related to agricultural products (prepared meals, snacks, woven items from agricultural by-products, etc.) or on services required by other community members (tailoring, petty retail trading, mechanical repairs, etc.). Many of these economic activities also engage workers to supplement available family labor. A large proportion of women who are self-employed or contribute to family-owned enterprises are often in situations of "vulnerable employment," characterized by inadequate earnings, lack of social protection, low productivity, and difficult work conditions. Finally, on average, the ratio of women to men for hourly wages in industry remains large at 90%. Gender segregation by industry and occupation and differences in human capital or productivity are arguably some of the factors that lead to wage differentials (ADB 2015)

Women's right to access and owning land tends to be highly insecure. In farming, an activity that 47% of men and women do, there is a gender-based division of labor in crop cultivation, although it may differ according to cropping patterns by state or region. Women perform most tasks related to crop cultivation. This normally tends to include planting, caring, weeding, transplanting, harvesting, threshing, postharvest operations, and marketing. Though some of these activities are also performed by men, women tend to do more of them. In addition, women bear the major responsibility for and spend long hours in domestic and care work, such as gathering firewood and fuel, fetching drinking

water, preparing meals, and caring for children and other household members. Traditionally, men undertake plowing, land preparation, seedbed preparation, making bunds, and fencing. Women in Myanmar have a high burden of work, which includes both productive and reproductive work. Although there are regional variations, most of the rural population is engaged to some extent in subsistence agriculture, where production for own-consumption goes largely unmeasured. Women who take part in gardening, animal husbandry, cropping, and processing also manage domestic work simultaneously. There are also limitations to women's access to extension services and vocational training. According to the 2013 LIFT baseline survey, only 11% of households received any vocational or extension training.

The National Strategic Plan for the Advancement of Women (NSPAW) (2013-2022) launched by the Myanmar Government on 3 October 2013, is based upon CEDAW principles and sets out twelve key activity areas as delineated in the Beijing Platform of Action. However, it is yet to become operationalised. This offers a unique opportunity for stakeholders to leverage on this framework for women advancement, that declares women's human rights as one of its main focus areas.

2.1 Promoting rural electrification in Myanmar: a case study

GIZ's presence in Myanmar aims to hone and strengthen the competence of relevant public and private stakeholders involved in Myanmar's rural electrification process, enabling them to plan, develop and implement decentralised off-grid electrification solutions, primarily renewable energy-based mini grids. The project, "Promotion of Rural Electrification" (RELEC) supports the Government of Myanmar in achieving their targets for rural electrification GIZ aims to contribute to stimulate the social and economic development of the country. This case study will focus both on villages with some access to stable electricity and those without it, to assess the key drivers to unlock productive uses of energy for women in Myanmar.

GIZ is supporting Myanmar's government in the implementation of the off-grid component of MNEP, with a particular focus on mini-grids. Mini-grids are decentralised small-scale distribution networks that provide power to local communities for domestic and productive use. The electricity is produced from small generators using fossil fuels, preferably renewable energy, or a combination of the two (hybrid mini---grids). NEP recognises minigrids as options to electrify rural areas in parallel to the national grid roll out, stimulating economic activity before the grid arrives in these remote areas. GIZ has decided to concentrate on renewable energy-based mini grids because they can support entrepreneurship, leverage international investments, provide jobs and empower communities on several levels, advancing the country's overall economic progress; they can harness Myanmar's abundant renewable energy resources to develop commercially viable mini-grid business models will advance socio-economic (and thus rural) development - a declared priority of the current government; in the most remote areas where national grid extension is not yet an economically feasible option, renewable energy/hybrid generation is cheaper than fossil-fuel power generation; and they act as temporary options until rural areas can be hooked up to the national grid when it arrives.

Currently, RELEC is focused on advising on the national level, by assisting the Union government with designing policy and regulatory framework for rural electrification, in particular for mini-grids; and strengthening the competence of state and private sector actors to plan, develop and implement decentralised solutions for off-grid energy access, primarily mini-grids utilising renewable-energy potential. Operations started in the Shan State and are now starting to promote mini-grids in other regions.

GIZ supported DRD with their 1st Mini-Grid Call for Proposals as part of the NEP framework. A total of 36 proposals were submitted by 16 local, private mini-grid developers. In July and August, the proposals were screened by an evaluation panel comprised of national experts from the DRD and international experts from GIZ and the World Bank. 8 solar mini-grid pilot projects were selected, ranging in size from 15kWp to 120kWp and serving an estimated 1,500 households across 10 villages. Project ownership was structured as a Build-Operate-Transfer model with the period of operation determined bilaterally between the project developers and the beneficiary communities according to a cost-reflective tariff. Project financing was secured in Private-Public Partnership (PPP) arrangement between the beneficiary communities, private sector developers, and the Department of Rural Development (DRD) by 20:20:60 subsidy scheme. Initial installation verification and commissioning procedures were completed by DRD and GIZ between early July and mid-August 2017. Early conclusions advise that additional support be provided to private sector developers, community beneficiaries, and government stakeholders early and often, and especially before system designs are finalized, to ensure that the resulting mini-grids are optimally beneficial for all parties involved.

The Government of Myanmar's ambitious plan, however, only focuses on the electrification of the villages. There seems to be no plan for the promotion of productive uses in newly electrified areas, nor there is any gender mainstreaming strategy or considerations in any of the government plans. In remote agricultural communities with very low or absent productive uses of electricity, mini-grids cater for low-income household consumption, often this means that generation systems are only used for lighting and maybe cooking, with the end result of mini-grid suppliers struggling to survive financially or the government heavily subsidising tariffs but not making full use of the opportunities electricity offers. Productive uses of electricity can generate both employment opportunities and increases in income needed for rural families in poverty, and increase electricity consumption for mini-grid suppliers.

Furthermore, it has been shown that a gender perspective of PUE is necessary (Pueyo and Maestre, forthcoming). Women face gender specific constraints when setting up their own businesses or trying to find employment, that range from access to resources, time availability or mobility to reduced agency or prevailing discriminatory social norms (Maestre et al, 2017; FAO, 2014). Myanmar has a National Strategic Plan for the Advancement of Women 2013-2022 (NSPAW), with the objectives of the plan are empowering women to enjoy their rights with support of the government, and establishing systems, structures and practices for the advancement of women, gender equality, and the realization of women's rights. The importance of clean and sustainable energy services and technologies to women's economic and social development is now well established globally, with increased efforts to position access to energy services as a fundamental human right. However, only providing access to electricity is not enough to achieve women's empowerment (ILO, 2014). There needs to be a specific gender strategy in the national electrification framework. GIZ aims to develop a gender mainstreaming strategy, including women in the planning process on village level, and promoting productive use with a focus on women as entrepreneurs, this still has not happened. Part of this research is to support GIZ on their efforts to mainstream gender.

This section has broadly described Myanmar's plan for electrification in the country. However, there are no gender or PUE specific strategies within them. In addition, Myanmar's regions are diverse and a localised perspective is important to analyse the links between these three elements. The following section describes the five locations where fieldwork happened, in an effort to understand the constraints communities face when accessing electricity and benefiting from it, with a gendered perspective. It also aims to test a series of gender mainstreaming in access to electricity project tools designed. By using these cases with different electricity supply and gender circumstances, this paper aims at responding the research questions set in the introduction.

3 METHODS

This paper presents the findings of mixed methods research conducted in Myanmar as part of the 'Unlocking energy for productive uses for women' research project. The research has also been conducted in Tanzania and Ghana. This part of the research reflects the voices and experiences of men and women who live across five sites in the rural villages of Myaing, Oak Pho, Kenti, Hti Ne and Kan Gyi Taw. The research explored how men and women use different energy sources, the challenges to using their current energy systems for productive uses and potential ways forward. The research in Myanmar involved qualitative and participatory tools designed to answer the three research questions: 1. Do men and women benefit differently from the productive use of energy? 2. What explains the difference in benefits for men and women? And 3. Which interventions can work for a more gender balanced support of PUE?

3.1 Site selection

The identification strategy consists of comparing uses of energy in villages that currently have access to energy for productive uses (connected to the grid, solar or hydro power mini-grids) with those that are still not connected to any stable source of energy, with a similar socio-economic profile, at a single moment in time. The five surveyed villages are clustered in two groups, according to the electricity supply systems they are exposed to:

- Myaing, Oak Pho and Kenti village with access to stable sources of energy, being used for productive uses.
- Hti Ne and Kan Gyi Taw with no stable access to energy and no productive uses that use it.

3.2 Research tools

Methodologically, we combine qualitative analysis drawing from semi-structured interviews (SSI), key informant interviews (KII), and participatory focus group discussions (FGD).

The aims of KII were: to understand cultural and gendered norms in the region and country; to understand Government activities to promote gender equity in PUE; and to understand the approach of suppliers for meeting this goal. A diverse group of 17 stakeholders were interviewed, from the Government private and public electricity suppliers and NGOs, most of them male. Details of respondents are presented in Table 3.

Table 3- Key Informant Interview details

Role	Organisation	Type of organisation	Gender
President	Women Entrepreneurship Working Group for Shan State	CSO	Female
Entrepreneur		Private developer	Male
Township Director	Rural Development Department Taunggyi	Local Government	Male
Programme Manager	Action Aid	CSO	Male
Project Manager	Tecno Hill Engineering	Private electricity supplier	Male
Chairman	Village Electricity Committee, Kenti	Local Government - Community level	Male
Village Administrator	Kenti Village	Local Government - Community level	Male
Township Officer	Rural Development Department Palaw Township, Taninthayi District	Local Government	Male

Role	Organisation	Type of organisation	Gender
Chairman	Village Electricity Committee, Myaing	Local Government - Community level	Male
Managing Director	Talent & Technology	Private electricity supplier	Male
Assistant Project Engineer	Talent & Technology	Private electricity supplier	Female
Chairman	Village Electricity Committee, Oak Pho	Local Government - Community level	Male
Chairman	Village Electricity Committee, Le Pyin Ma, Bago Region	Local Government - Community level	Male
Managing Director	Tecno Hill Engineering	Private electricity supplier	Female
Township Deputy Officer	Ministry of Electricity and Energy, Taunggyi	Local Government	Male

Five Focus Group Discussions were conducted in the two villages with access to energy for productive uses, with a total of 87 participants, 46 women and 41 men; only three Focus Group Discussions were conducted in Oak Pho as no productive uses were identified with 50 participants, 20 women and 30 men; and three Focus Group Discussions in each village with no access to electricity for productive uses, with 35 participants, 21 women and 14 men. Participants were selected to respond to the needs of the research tools. Four different research tools were used to elicit different types of information:

- Tool 1- Community and energy mapping. The objectives of this exercise are: identifying key services and infrastructure that men and women use in the community; exploring where men and women work and the types of work they do; and discussing where men and women obtain different types of energy and who uses what and where.
- Tool 2- Activity and energy use mapping. This tool supports men and women to talk about the activities they do through the day, classifying them in three groups: unpaid care work; paid work; and leisure or community work. The tool also supports a discussion about the different energy sources men and women use for each of these activities.
- Tool 3- Access to and control over resources. This tool reveals the differences between men and women in terms of their access to and control over household and business resources, including productive assets, natural resources, family labour, income, etc. Access represents the opportunity to use a resource without having the authority to make decisions to sell, exchange or modify it. Control, on the other hand, represents the full authority to make decisions about the use of a resource.
- Tool 4- Gendered value chains. A value chain is defined as the sequence of activities required to make a product or a service from conception, through the different phases of production, delivery to final consumers, and final disposal after use. This activity aims to map the way men and women are involved in the different steps of the value chain. We selected milling and fishing to apply this tool in Tanzania, due to their economic and energy consumption importance for the region.

Table 4 shows the location and number of participants of the FGDs carried in the villages.

Table 4- FGD location and number of participants, per gender

Group	Tool	Location of the Interview	Participants	
			Female	Male
1	Tool 1	Kenti Village	7	4
2	Tool 2		7	2

3	Tool 3		7	2
5	Tool 4 (Fishery)		3	4
6	Tool 4b (Rubber)		1	7
7	Tool 1	Myaing Village	5	4
8	Tool 2		4	3
9	Tool 3		4	3
10	Tool 4 (Coffee)		3	8
11	Tool 4b (Coffee)		5	4
12	Tool 1	Oak Pho Village	12	18
13	Tool 2		4	6
14	Tool 3		4	6
15	Tool 1	Hti Ne Village	4	8
16	Tool 2		2	3
17	Tool 1	Kan Gyi Taw Village	8	1
18	Tool 2		7	2

Finally, a total of 33 men and women entrepreneurs and employees were interviewed across the five locations. We targeted a balanced number of respondents across two groups: women workers or entrepreneurs and men workers or entrepreneurs.

All tools were translated into local language, and tested prior to the beginning of fieldwork to reach a consistent meaning of terms. Training was provided to data collection teams for administering the qualitative tools. The multiplicity of research tools adds to the rigour and in-depth nature of the data that we collected. While semi-structured interview guides to better understand the motivations and constraints of women undertaking productive work, and using energy at work, as compared to men's. They explore mobility constraints, market interaction constraints, time availability constraints, gender roles and gendered division of labour, access to resources, motivations to do paid work, aspirations, etc. The participatory exercises were helpful in obtaining men and women's voices and an interplay of perspectives of different community members on a range of issues, thereby achieving scale in the research.

Research ethics, confidentiality, and permissions

We have ensured a collaborative approach to our research at all stages, which allowed contextualisation of our data collection tools and the analysis of findings. Ethical considerations have been kept foremost. Participation in the study was entirely voluntary. Informed consent was taken for all, with participants having the right to withdraw at any stage of the research.

3.3 Analysis

Data analysis included cross-fertilisation and triangulation. The information gathered through FGD, SII and KII was transcribed and then organised around themes to provide answers to our research

questions. The qualitative data analysis has been undertaken using NVivo and a purposively developed coding framework, based on our conceptual framework (Pueyo and Maestre forthcoming).

4 COMMUNITY CHARACTERISTICS: ACCESS AND USES OF ENERGY

This section describes the characteristics of communities locations, as well as the main access to and uses of energy.

Background of the research areas

The research focuses on five locations: one in Shan Estate connected to the national grid for one year (Myaning); two villages where mini-grid projects have been setup following the call for proposals as part of the MNEP (Oak Pho and Kenti); and two locations with no access to electricity yet but with plans to receive it soon, where NGOs have set up community tourism programmes (Hti Ne and Kan Gyi Taw).

The table below shows a brief description of the five locations:

Table xx- Characteristics of surveyed villages

Region	**Bago District, Bago Region (South central)**	**Myeik Distric, Tanintharyi (South - island)**	**Taunggyi District, Shan Estate (East)**	**Taunggyi District, Shan Estate (East)**	**Magway District, Magway Region (Central)**
Community	**Oak Pho**	**Kenti**	**Myaing**	**Hti Ne**	**Kan Gyi Taw**
Population	1,045 / 276 HH	1,500 / 350 HH	2,000 / 420 HH	939 / 167 HH	1,190 / 247 HH
Public services	High School, clinic, administration office, Telephone lines, water pipes	High School, Clinic (4 nurses) Telephone Lines, TV, Village Administration Office, water provision, only accessible by boat	Highway road, High School, a hospital, Telephone lines, Village Administration Office, distributed water through pipe lines (1 water post per 10 HHs)	School, No clinic, telephone line, no water	Clinic. telephone lines, school, water tanks, Community Based Tourism (CBT),
Productive activities / Livelihoods	Agriculture (rice, beans, sesame) and livestock Car workshop, grocery shops	Fishing, farming (rubber, betel, rice), rice mill, workshop	Agriculture (coffee and tea plantations), livestock, restaurants, carpentry, shops, photocopying hair saloon, tea and coffee processing	Agriculture (cheroot leaves, garlic)	Agriculture, livestock
Natural resources	Firewood, Charcoal	Firewood, Charcoal	Firewood, Charcoal	Firewood, Charcoal	Firewood, Charcoal
CSOs / Community			Social Enterprise – coffee processing	GIZ Community Involved Tourism	Action Aid Community Based Tourism

Electricity supply	Solar mini grid	Solar Mini grid	Connected to the grid	Solar Panels (lighting) / five generators	Solar Panels (lighting) / diesel generators

The economy of all villages is highly dependent on small-scale subsistence agriculture. On the island, the economy is dominated by fishing, a male dominated activity. Both men and women work in agriculture equally. The main agricultural crops vary per region. Other economic activities are small business like restaurants, retail shops, carpenters, tailors or beauty salons.

Electrification Status and Mini-Grid installation

Myaing village has connected to national grid Oak Pho and Kan Ti villages have a solar mini-grid system supplied by the private developers, while Kan Gyi Taw and Hti Ne had no connection to grid and mini-grid yet. Nonetheless, Kan Gyi Taw village has been received solar home system for just lighting purpose from their Parliamentarian and this village is under the National Grid Extension Plan and distribution lines are constructing but communities are still struggling to pay off the initial connection fees and metering device. Main sources of energy uses in Hti Ne village are candle, fire woods, limited solar home systems and small generator for lighting and cooking.

Table xx

	Oak Pho	**Kan Ti**	**Myaing**
Electricity Source	Solar and Diesel Hybrid mini grid	Solar and Diesel Hybrid mini grid	Connected to the national grid
Provider	Private Provider (T&T)	Private Provider (Tecno Hill)	Government
Capacity	20kV (30 kV diesel backup)	63kV (50kV diesel backup)	N/A
Households connected	122 HH of 276 (63 HH committed)	300 HH of 350	380 HH of 420
Installation Costs	200,000 Kyats	350,000 Kyats	N/A
Unit Costs	500 Kyats per unit	300 Kyats per unit	N/A
Year of connection	2017	2017	2016

The private sector operators installed the mini-grid under the government programme, supported by GIZ, whereby infrastructure is financed in a 60:20:20 ratio, where DRD (supported by the World Bank and GIZ) provide 60%, the community contributes 20% and the private operator the remaining 20%. Both companies tendered successfully their proposals to the government during 2016. The communities agreed to pay in instalments.

In Oak Pho, Talent & Technology (T&T) installed a solar mini-grid with capacity for 20 KV with a 30KV diesel generator back up. They are planning to hand over the management of the mini grid plant to the village after 5 years. In 2016, during the feasibility study, 185 households (out of 276) agreed to contribute the 20% (200,000 kyats/household) in a 4-stage instalments plan, with the last one to be paid once they got connected. Currently only 125 (out of the 185) households have connected to the mini grid. T&T provides two types of meters, at home use and productive use with a capacity of 1,000 Watts each. At the point of the research, the T&T Director confirmed that they had provided 33 commercial use meters and 125 'home' use meters since 2017

Tecno Hill Engineering installed the solar mini grid in July 2017 in Kenti, with a 63 KV capacity (with 50kV diesel backup) and plans to extend it to an additional 61 KV next year. Given the expansion plans, they will aim to handover the management of the plant in 15 years. They have installed 308 meters for 300 households, with a voltage capacity of 800 Watts each for home use. A commercial use meter, with higher capacity 4,500 Kyats and 3,000 Kyats for home use. Tecno Hill, together with Pact Myanmar, has provided some training for villagers in order to promote PUE, linked to access to finance to pay for installation costs or new equipment to start new businesses.

5 RESULTS (SOME QUOTES MISSING)

5.1 Do men and women benefit differently from the PUE?

Across the five sites visited in Myanmar it is clear that men and women use and benefit from energy differently. In the three communities with access to electricity, as gathered in the FGDs and interviews, the majority of energy users for businesses were men. Only a few women owned businesses and used it there. The majority of men worked in construction, as carpenters, mechanics or barbers, while women own shops, or becomes tailors. In Myaing fishing is the main productive activity, and the majority of the roles are occupied by men.

Table xx: Uses of energy by gender

	Oak Pho	**Kenti**	**Myaing**
Productive uses (male)	Construction	Trading / Shop Barber shop Fishing Transport (passengers and materials) Mechanic Electronics	Mechanic Carpenter Furniture Shop
Productive uses (female)	Tailor	Trading / Shop (with freezer) Tailor	Shop (with freezer) Tailor Beauty Salon
Home uses (male)			
Home uses (female)	Cooking Ironing Light Washing	Cooking Ironing Light Washing	Cooking Ironing Light
Leisure (male)	TV	TV	TV
Leisure (female)	TV	TV	TV

While we don't have the exact figures, we observed that men required and used more energy than women when operating their businesses. In Kenti, for example, during the FGD, the community shared that traditionally owned male businesses, such as carpentry, masonry, motorcycle workshops, fish and prawn warehouses, required of at least 1,000 KV to run their businesses. However, for traditionally owned female businesses, such as shops with refrigerators, their energy needs tend to be lower (800 kv). In Oak Pho, the community observed that mostly men use solar PV energy from the mini-grid for productive uses, as the capacity tends to be limited and the price is still very high. Finally, during a KII with a service provider it was expressed that 'since women stay at home, there will be two main points for women. Women use electricity to cook and to light oil lamps as offertory. Men used it for welding

and for their works. Women also use it for lifting water because they are always at home. Women do not use it much for business purpose but the rate of usage could be higher than men'.

In terms of the type of energy used, for women it was firewood and charcoal, as they use it for cooking and ironing. Women are the ones collecting or buying the natural resources as they are the sole responsible for cooking, cleaning, ironing and other unpaid care activities at home. The reasons for this were multiple, from the food tasting better to the fact that the energy bill was too high. In the two locations were there is no grid established, a few men used diesel to run generators [quote]. This was not common, but were present, it was clear that it was men's responsibility to do so. When asked for the uses at home of electricity, both men and women mentioned lighting, watching TV and charging their phones. This was an agreement across all the locations we visited. The energy used was either solar panels, off-grid or national grid [quote].

In terms of benefits, everyone talked about it in a positive way. Women mentioned positive impacts both at home and, in some cases, for their businesses. For example, at home, both men and women were happy to have lighting and a TV. Concerning lighting, women mentioned they could sleep less and finish their house unpaid care activities at night, rather than early morning. Also, their children were able to study now. In terms of business, the few women that use energy also claimed their benefits. For example, a woman in Kenti mentioned 'Pretty helpful. I now can freeze jelly that I buy at 50 ks in the fridge and I can sell iced-jelly now with 100 ks. With the profit I made out of it, I can pay meter bill too'. A female tailor in Oak Pho mentioned increased income as well, by doubling the amount of clothes she can finish in one day '…I could finish 3 – 4 clothes in the past, but now I can finish 5 – 6 clothes in the same time. I get more earning than the past. It is better'. A tailor and hairdresser in Kenti explained 'It is about 6 years that I started making clothes. Straightening hair is about 4 years. In the past, I use engine dynamo to straighten the hair, so it was not quite convenient. Later, I bought Honda portable generator. Now, it is so convenient that we have got solar electricity'. A male from Myaing explains 'in business sector, the carpenters are improving. Before, it takes 2-3 days to finish one task as they had to work by hands. Now, they are more convenient as they work with machines.'

However, users of the PV mini grid in Oak Pho and Kenti both mentioned that the plants did not have enough capacity installed for their businesses. The complaints were mostly about the lack of reliability of the electricity source and the lack of installed capacity. For example, in Kenti they mentioned that the capacity of 1,000 Watts is not enough for their businesses, as expressed by this male 'My daughter wants to open Beauty Saloon at for straightening hair and make-up. But it is not sufficient Watt in 24 hours. Not every people can get it for commercial.' The developer is currently trying to expand their installed capacity. In Oak Pho five carpenters use generators, as the electricity supplied is not enough. Some men mentioned their willingness to use more electricity if they could. Finally, another major challenge seems to be the costs, both the initial installation costs – which means some families cannot afford to connect, even when available, and the monthly bills.

Overall, those communities with access to the national grid or off grid PV mentioned developments in productive uses and beyond, in terms of better health, education for the children, security and lighting of their community. A male from Kenti mentioned 'Some families start making and selling ice popsicles or ice-cream. Some carpenters use solar energy for cutting and polishing woods'. A nurse said from xxx 'In the clinic, we use the electricity most when the maternity patients come who came inopportune time and we need electricity for these patients.' Another man from Myaing described the changes with this 'There are less thieves now for it is shining with lights everywhere because of the electricity. … It is also better to walk around. The businesses are also getting better…For those of us who have to depend on electricity, life become easier and better. It is quicker to do wiring. We don't have to wait for long. It improves'.

Those communities visited that are still waiting for electricity highlighted their willingness to receive it with comments like 'If we get electricity, we might benefit from it. We don't need to cut trees and less deforestation. Now, we cut firewood to cook, but there is no charcoal… If we have electricity, we can use it for cooking, woodworking, building houses with machines'. In Kan Gyi Taw, they are expecting a connection to the national grid soon. Some household mentioned they were already saving money to be able to pay the installation fees. They also mentioned, during a FGD, their plans for businesses once they are connected, such as steelwork, jewellery design, and car repairs shops.

5.2 What explains men and women's differentials in the PUE? Descriptive results

These differentiated ways of benefiting from access to energy by men and women are explained by multiple characteristics. Often, these are exacerbated by social norms determining how paid and unpaid roles are structured. These section will focused on explaining these differential characteristics and how they affect men and women's PUE.

5.2.1 Men's enterprises are bigger and more profitable than women's

Currently Myanmar is growing rapidly as a country, and it seems there are opportunities for both men and women. Though, as mentioned in the introduction, the size of businesses in Myanmar remain small as the challenges both men and women face to start and grow them are multiple. As a Key Informant confirmed 'about 80 % [is] SME in Myanmar. We can even count the real corporate just 4-5 or 10 not more than that... Small means local miniature business ... There are only a few organization that can run with thousands of employees'

Still, our data shows that the types of businesses than men start, when compared to those of women, tend to be seen as having more capacity to grow and more profitable. On the contrary, women's businesses tend to be home-based, and with no employees. Furthermore, under the same conditions, men are paid more than women as labourers, another indication that they men's role are valued more, often explained by their strength or capacity to do the 'hard work'. A key informant from a CSO mentioned 'Men are still earning more than women. There still is less job opportunities for women than men', and a female from Kan Gyi Taw explained 'Men need to use more physical strength. They do hard stuff while women's work are easier. So, they earn more. That's it'. The different roles per sector will be further explained on subsection 5.2.5 below.

5.2.2 Women and men have different access to capital, skills and other resources

In Myanmar, ownership of assets tends to be under the men's name, as the head of the household, making it difficult for women to access capital or other resources. This lower access and control over resources means that, for women that want to start a new business, they tend to require a men's permission to do so.

While both men and women mentioned there were no specific differences in decision – making, when asked about access and control over resources and assets the situation was different. Participatory focus group discussions revealed some inequalities in women and men's access and control over resources. In these discussions, access was defined as the opportunity to use a resource, while control represented the full authority to make decisions about the use of a resource (e.g. to buy, sell or modify it). Men had access to income, land and farming crops. Also, men controlled vehicles and heavy machinery, such as motorcycles, tractors, generators or cars. Women had access and control over all assets and resources related to the home, such as the cattle, income for food, firewood, charcoal, and other related home assets used for cooking and cleaning the house.

Assets such as land, the house or businesses are under the men's name, as traditionally, they are the head of the household. When talking with the government the implications of this became clear, as

one DRD officer says: 'Only One member from one household is given loan. We grant to the head of household. So heads are mainly men. So automatically the loan takers are men, heads of households… mainly under this project, women are the implementors, while men names are on the application'. This dependency can be problematic for women. As one of the KIIs mentioned, ' [the store will be under the husband's name] but in reality his wife and daughters are selling. All the sale clerks are also women… Although the titles are men's name, women are the ones who work… How can I say? Women are busy with housework and childcare, so that they don't want to get frustration with management'.

Access and control of resources by men and women in Kenti

Energy uses and resources	Access		Control	
	Male	Female	Male	Female
Motorcycle	5	3	6	2
TV/ Video	2	6	2	6
Farm	3	4	7	1
Pet	1	7	8	-
Meter Box	4	4	8	-
Music Box	5	3	5	3
Sewing machine	-	8	4	4
Home-used (solar)	4	4	4	4
Phone	4	4	6	2
Solar lantern	1	7	-	8
Savings account	3	5	2	6
Motor boat	6	2	8	-

Formal education levels are low for both men and women. Those that have higher education end up going to the city to look for a job. Traditional skills for certain businesses (tailor, carpenter) are passed on to by older generations ore given by other stakeholders, such as NGOs (Action Aid) or the government (Department of Rural Development DRD). In Kan Gyi Taw Action Aid has developed a Community Based Tourism and trained both men and women to work there. A township officer from the Department of Rural Development explained, 'Yes, we have tailor training just for women. We have such 2-month long training about three times a year. We accept 15 trainees per training and award them certificates. We also monitor what they do after training. For men, we have Motorbike repair training and carpenter training'. Roles remain gendered within these businesses, with women training for tailoring and men for carpentry.

5.2.3 Women and men entrepreneurs have different motivations

In terms of motivations, there was no major difference stated. Men and women in rural areas of Myanmar are farmers or fishermen, some of the communities visited were so remote that it was mostly subsistence farming. Entrepreneur motivations were to continue the family business; following a personal interest; and convenience. Those pursuing a personal interest were mostly men (carpenter, photographer, construction), although there were some women with higher education that also mentioned deciding their role because they liked it such as teacher or nurse. Those that chose convenience were mostly women, working from their own homes so they could earn and extra income and take care of the children at the same time. Some of the entrepreneurs had growth plans, like the owner of a beauty salon in Oak Pho 'I plan to sell clothes, buy the refrigerator and sell the drink. So I planned to use more electricity.' Another woman mentioned how she wanted to earn at least a bit less than her husband always. 'I don't want to be just a woman. If he can earn 2 lakhs, I must earn 1.5 lakhs. As I am a woman and have to do housework including cleaning, if he earns 10 lakhs, I have the courage to earn 5 lakhs. … I plan to do all the things that we can do with electricity. Currently, I still

don't have money, so I cannot show up. So, I have to work hard'. However, lack of capital seems to be a key reason not to, 'I have to do only this because I don't have money for investment. If I have money to invest, I want to expand my business'.

In the majority of the households the main breadwinner was the men. As one woman from Oak Pho said, 'He don't need to clean and look after the children, so I give in him. If I compare and compete with him, who will do all the house work? I must fulfil the duty of a wife. When I come, I must cook the rice. If my income is very much, I will take the cooked rice and curry monthly from the restaurants.' The concept that women's job is less important than the men's also came about, as one man from Hti Ne said 'The number of women who quit is more. Specially, after they get married.' In other houses, the father was the one that opposed to their daughter getting some training so the household chores will be done. A women from Oak Pho explained, 'after I had just finished my school, I want to attend the sewing class. But my father refuse to attend it as there is nobody to do house work'

5.2.4 Women and men entrepreneurs have different care responsibilities.

Across all the field sites, the social organisation of care was clearly a women's role, where men did not support women in unpaid care activities. All data collected showed that women's responsibility for care was naturalised, women considering themselves better for the role and men acknowledging they could not do it. On the other hand, there were a series of men's activities assumed to require physical strength that women were not assumed to be able to do. Women were constantly multitasking, performing multiple paid and unpaid activities at the same time: cooking, fetching water (when needed), collecting firewood, caring for the children, cleaning the house, taking care of the livestock, farming or running a businesses. Men, on the other hand, were only carrying out paid activities and leisure activities. Sometimes, they would get involved in community activities as well. Women's main activity is to complete unpaid care activities and the secondary to engage in paid work. Whereas for men, the one and only activity is to engage in paid work, hence becoming the naturalised breadwinner. As a KII mentioned 'Sometimes, there is work but low payment and it is unworthy to take up because women have to hire someone to take care of their family while they are going out to work… So, it is unworthy to take up low-paid works. Nevertheless, man gets paid like 6000 Kyats a day. So, most of the time men are the one going out to work and women taking care of all house works'

The FGD tool about activity mapping revealed the different care responsibilities that men and women undertake, with the burden clearly biased against women, as presented in table xx. When men were asked about the benefits of energy use for women, they constantly referred to women's as caretakers, not to women as entrepreneurs. This was explained as being traditional roles, a man said 'Yes. Women do house leaning, cooking and taking care of the elders at home. Men think about expanding their work such as using computer or carpenting'; another one mentioned 'At the moment, it is better for women as there is light in the house. Because they had to wake up early to make fire and cook before. Now, they do not have to do that. Some women have even prepared ready in the rice-cooker since the night before, and just switch on in the morning.' When asked, another man said 'both men and women are preparing lands and planting crops in own farm. For the care activities in the household are mainly done by the women. Cooking is women's jobs. Fetching water and cutting the cheroot plants are mostly done by women'

Table xx- Summarised care activities undertaken by men and women in field sites in Myanmar

Women's responsibility	Men's responsibility	Both men and women

• Collecting fire wood Cooking (morning and evening) • Caring and feeding the children • Feeding and herding cattle • Cutting cheroot plants (own farm) • Planting crops • Weeding • Helping at wedding, religious events in the community (preparing food, cleaning, etc.) • Cleaning household and washing the dishes • Prepare for offering • Shopping for food	• Rice harvesting (own farm) • Sow the seeds (rice) • Go to the markets to sell crops	• Request the support for better roads in the village from other organizations • Repair the roads which connect villages • Hold and attend village meetings • Prepare the land for the crops •

5.2.5 Women and men operate in different sectors of activity, and in different roles within sectors

Men and women tend to work in different sectors in Myanmar, and when these are the same, such as agriculture, they play different roles. Men's sectors tend to be more profitable and with more opportunities to grow, while women's roles are mostly lower paid, of informal nature, set at home or nearby and with less opportunities for their businesses to grow. These sectors are roles tend to be traditionally male (eg. carpenter, mechanic) or female (tailor, hairdresser, food retail). This was very clearly observed in all villages. For those working as labourers in the agriculture sector, salaries of male labourers is almost 50% more than the salary of female labourers. One man mentioned 'of course, here women cannot earn as much as the men earn. They earn 2000 for working one morning, but men earn 3000'

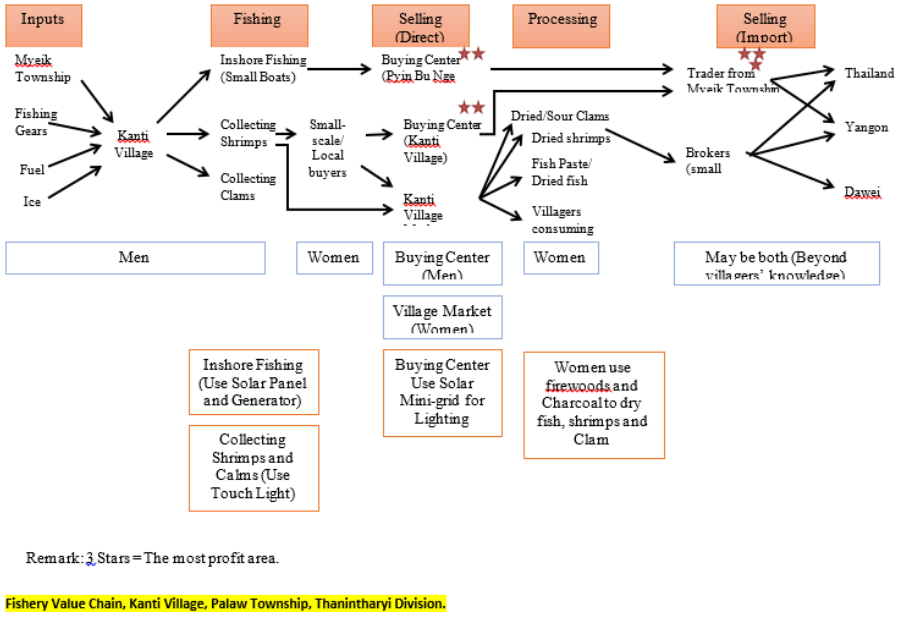
The different roles that women and men engage in is important for benefiting equally from PUE, as the more electricity you consume the better for the private sector provider, and implicitly, the more one benefits from PUE - as it may imply they are earning more income. Overall, in the communities visited, mostly men were benefiting from using electricity at work. Some men were doing carpentry or construction work, using electricity or diesel generators. Tradition and social norms seem to play an important role when deciding who will work where. One man mentioned 'the main thing is this local and tradition…They have the idea that men are the head of the family and men have to lead... This is rural region and they simply follow the tradition. The have the idea that women have to do cooking, carrying water and washing'. In Kenti, the main livelihood is fishing, a traditionally male job. As one man explained, 'here, jobs are more available for men, for women, not always. Men will go fishing in the sea. When they are back, the family will help collect fish. But for some families, as the father earn quite a decent amount; wives and kids just stay at home.' This traditional perspective also translates into less female entrepreneurs in the rural areas. One woman from Myaing explained 'very few [women are businessowners] Majority of women work as daily labourers'. Those female business owners told us they mostly use electricity for lighting, so they can keep their shop open longer or work until later sewing.

Gender Value Chains were designed and discussed during FGD as part of this research to better understand inequalities in different value chains across three villages (Coffee, tea, rubber and fishin). Value chains were defined as a sequence of activities required to make a product or a service from conception, through the different phases of production, delivery to final consumers, and final disposal after use. Using FGD involving men and women working in fishing and milling, we mapped how they

are involved in the different steps of the value chain, how they draw profits and how they consume electricity.

The image below represents the fishing industry in the island of Kenti, Southern region of Myanmar.

Image – fishing value chain in Kenti



Activities and assets in blue are dominated by men, while those in yellow are dominated by women. Mixed colours indicate equal representation. ** activities are the most profitable.

In Kenti, fishing is a job than only men do. The majority of the households in Kenti are fishermen, all male. Some couples (men and women) have shops that sell part of the materials needed for fishing. In terms of trading, there is one woman in the village who buys everything. She inherited her husbands' shop. The reasons for not allowing women to fish vary from it being dangerous, being a role that needs physical strength, being a man's job or women not being interested in this type of job. During the FGD, participants mentioned that because fishing is done at night it it not considered 'a suitable job for women'. Women are involved in those areas of the chain that can be done from the shore – not requiring to be far from home for a long period – and of lower value. Women's are involved in collecting clams in the shore, helping their husbands sort the fish once they return to shore and processing the fish. As explained by a fisherman 'no, we ask them [women] to work only to collect fish and prawn when we catch many of them'.

A picture of a woman provessing the fish

The energy used in the value chain varies, fishermen have solar panels in their boats to get light. Others use generators for refrigeration. Those who collect shrimps and clams use flashlights. Women, when processing the fish to become dried use use charcoal and firewood. Finally, traders and local brokers use solar energy from the mini-grid plant.

Interviews and other FGDs revealed that people's perceptions were that men and women's roles are not gendered. However, when asked about differences in salaries and roles take, there was a clear distinction between male jobs and female ones in all communities. In general, if large quantities of energy or heavy machinery are involved it tends to be a male role, however, if it's a caring or service type of role (cooking) then it will be predominantly female. Subsistence farming seemed to be the only sector where both men and women worked together in similar roles.

6 DISCUSSION: WHICH INTERVENTIONS CAN WORK TOWARDS GENDER EQUITY IN THE PUE?

The results of our analysis show that, in the absence activities that accompany access to electricity programmes or PUE promotions, communities may not benefit as rapidly from it. In addition, if there are no gender mainstreaming activities or indicators, men will likely benefit more and more rapidly from the promotion of productive uses of electricity. This was observed in Kenti, where in addition of getting access to the newly installed mini –grid, the NGO PACT is implementing a skill training and access to credit programmes. Many of the households borrowed money from PACT to pay the installation fees, which is one of the reasons why Tecno Hill surpassed its expected connection rate

and is now planning to expand the grid, whereas T&T in Oak Pho is still struggling to reach the 185 households required.

Another finding is that the types of energy used by men and women and the quantities are very different. Women tend to use firewood and charcoal both at home and for their businesses, while men are using diesel and electricity more. Women mentioned using electricity, once they got access to it, mostly for lighting at home. This shows how providing only access to electricity will not unlock its full benefits for men and women unless other interventions follow.

The reasons for this gender disparities are multiple. As explained, men tend to have more profitable enterprises, with more potential for growth or earn more money if they are employed by others, than women. Women, on the other hand, remain working at lower paid jobs or setting businesses at home – with less potential for growth – so they can also fulfil the care responsibilities assumed to a women's job.

In Myanmar, the research did not encounter any approaches to gender equity in PUE. However, our fieldwork shows that, as a starting point, women will have more challenges to benefit from access to electricity than men. Given the constraints explained, and the approached we have learnt from the literature, we suggest the following interventions are needed when providing access to electricity in order to ensure that men and women can benefit equally from it:

- Start with **participatory feasibility studies and diagnosis that include both men and women's stories**, so the installation of mini-grids reflects the real needs and opportunities of the communities. In some cases, the plant's capacity is not enough, and households complain of the need to have multiple meters in order to run their businesses. In other cases, some households did not have enough financial capacity to pay for the installation fees, hence the plant is running below its capacity. Furthermore, by engaging the community and empowering them from the beginning, men and women can benefit more from the access to electricity.
- **Provide trainings for men and women on how to use and develop PUE.** Overall, both men and women seemed unclear of the options and opportunities access to electricity offered them. Providing trainings on uses of electricity, accompanied by soft skills trainings such as business management, accounting, marketing among others will help increase the knowledge and confidence of people.
- **Access to finance and equipment**. Both men and women often mentioned finance as their first barrier to setting up their own business or growing. Others mentioned the lack of equipment or technology availability. According to research, providing access to finance alone is not enough to start businesses, however, it can be developed accompanied by the soft skills trainings aforementioned.
- Design a gender mainstreaming strategy, that ensures **women's perspectives** are considered and **collects gender disaggregated data**. This will include using mixed methods and participatory approaches to collect data about women's and men's ability to make real choices about the types of paid work that they engage in; mobility; women's ability to engage in community decision-making processes; women's and men's time-use
- **Challenge social norms**, starting by recognising and valuing care. By being care-responsive, interventions or policies will take into consideration some of the gender specific constraints that women face and considers having flexibility in working hours, in the location of the interventions and activities that support the reduction or redistribution of the current social organisation of care provision. By recognising the drudgery and depletion women face when balancing paid and unpaid work responsibilities, policies will be more targeted.

Provision of electricity is critical to ensuring the development of any poor area. However, ignoring existing gender dynamics when providing it can have a twofold negative impact. First, it will not allow the service provider to fully profit from its service provision, as women will, most likely, not use the service to its full capacity. Second, it will likely increase the existing unequal relation between men and women, further benefiting men. By supporting men and women when getting access to electricity for the first time, this could be transformed, building women and men's capacities and business opportunities.

7 CONCLUSIONS

Myanmar has a great opportunity to ensure universal access of stable energy, with a gender mainstreaming strategy and promotion of productive uses. This strategy can be essential to lift Myanmar out of poverty and ensure inclusive and stable growth.

This paper has gathered evidence on the challenges men and women face when using energy for productive uses in rural areas. It also has shown the role policy plays in the process. The qualitative and participatory fieldwork, involving focus group discussions, key informant interviews, and semi-structured interviews in five locations showed details about people's perceptions, motivations and aspirations. Results explain how men and women use and benefit from energy differently at home and work. Our sample showed how women mostly used energy at home, for cooking, with firewood and charcoal being the most used. Men, however, use diesel and electricity only at work, using very little energy at home.

Men's businesses tend to use heavy machinery that require energy, outside their homes, while women operate informal micro enterprises at home, requiring less energy, if any at all. This is also explained by the difference in care responsibilities, and time use, as women multitask to be able to perform their paid work and care work on time, and men are only responsible for their paid work. In terms of decision making and control over access and resources, Myanmar operates under a patriarchal system, where the head of household is always the men and everything – from loans to land – is under his name. Nevertheless, it seems both men and women struggle equally to start their own enterprises or benefit from PUE.

After presenting the results, the paper offers clear policy recommendations for the government of Myanmar and other stakeholders engaged in MNEP. In order to fully unlock the potential of the plan, a gender mainstreaming strategy must be designed. This strategy will include women's perspectives so the upcoming mini-grids installations can benefit both men and women. It also suggests a series of PUE promotion activities, such as trainings and access to finance, so communities can fully benefit from the mini-grids. Unlocking PUE for both men and women equally will mean more than just access to electricity, by engaging the community from the beginning and ensuring women's voices are, at least, as present as men's voices, gender norms can start to shift and equal benefits happen.

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