Study of current energy efficiency status and the barriers to effective energy efficiency practices for low-income households in Myanmar

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Abstract:
In Myanmar, only 30% of the total population has an access to electricity and still utilizing the direct burning firewood-Biomass energy (65.5%) as the main source of energy at most of the rural areas. This study find out the evidence base current household energy usage and to identify the barriers to adoption of Energy efficiency technologies, measures and policies amongst the low-income households in Myanmar.

The result indicated that the decision of how much percentage of the income will be spending for energy and what type of appliance will be used for low-income household including the barriers such as; electricity distribution system, bill payments, financial matters, educational level, information, availability of EE appliances in the market and their prices etc.

As a conclusion, this study reveals the current status of energy use, the energy efficiency status and barriers for the effective energy efficiency practices for the low-income households in Myanmar and lead to find out the best solutions in order to reduce the energy poverty in the country. The energy policy makers could refer on this study when they consider the suitable policies for the low-income households.

Keywords: *Energy Efficiency; Energy Efficiency status of Low-income households; Energy Efficiency awareness in Myanmar; Barriers to Energy Efficiency Practice and Policies*

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1. Introduction

Energy efficiency improvements offer multiple benefits, such as reduced household energy expenditure and improved productivity. Moreover, EE can make it easier for lower income households to pay energy bills, freeing up funds for other needs (Sarkar and Singh, 2010). Awareness on Energy Efficiency and conservation is presently very low in Myanmar because of the government subsidies in energy sector. However, government is trying to set EE target to be increase 12% in 2020, 16% in 2025 and 20% in 2030.

The aims of this study were to establish an evidence base on household energy use, and to identify the opportunities and barriers to the adoption of EE technologies, measures and policies amongst new modern energy consumers in Myanmar. This research was driven by the following objectives:
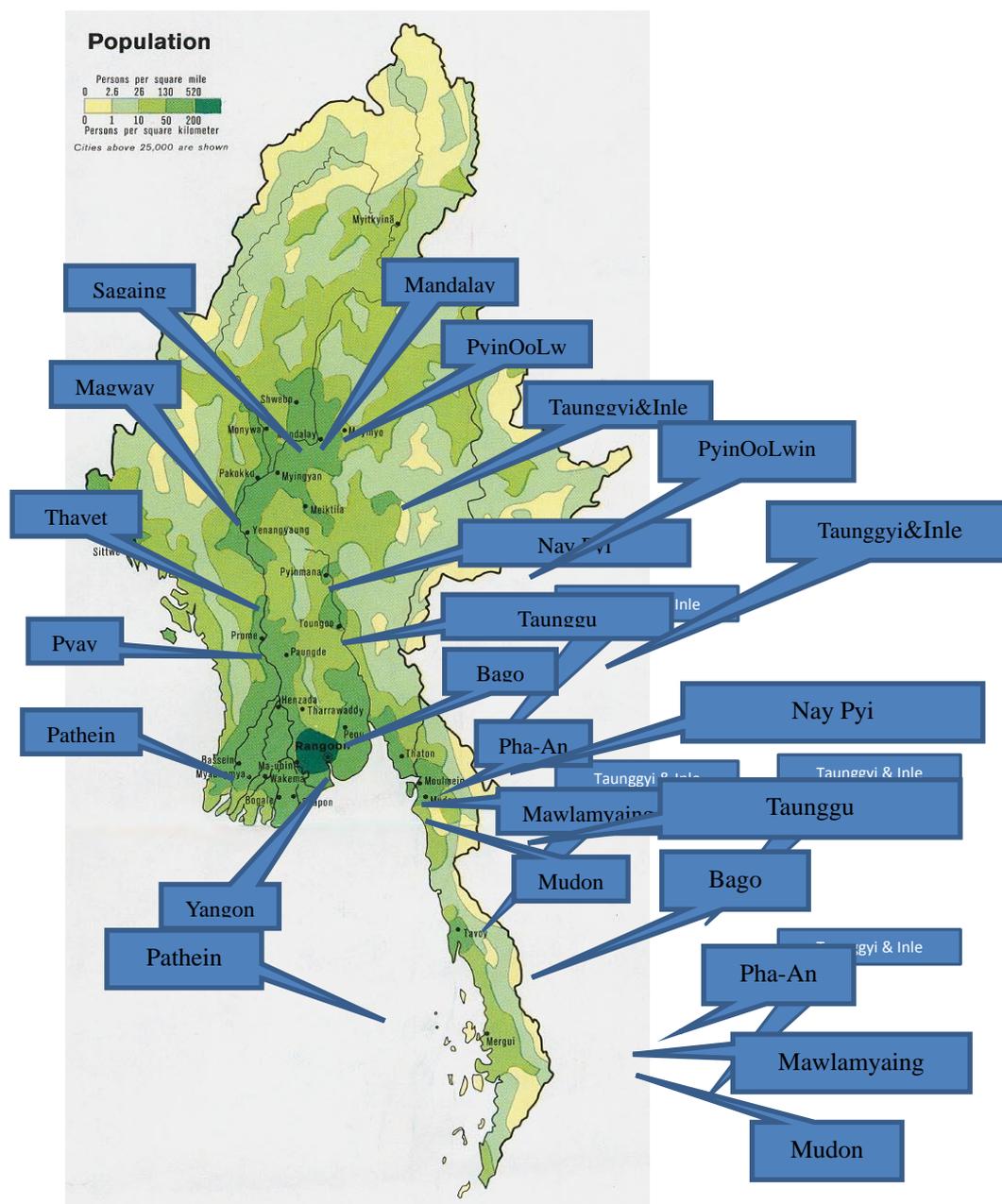
1. To collect information about the household characteristics of the survey population i.e. the new modern energy consumers;
2. To determine how new modern energy consumers currently use energy;
3. To understand household energy aspirations;
4. To identify the opportunities and barriers for energy efficiency amongst new modern energy consumers; and,
5. To analyse the commonalities and differences between rural and urban new modern energy consumers.

2. Material and methods

The primary data was obtained from socioeconomic questionnaires carried out with households in both rural and urban areas in Myanmar. Total of [334] questionnaires were carried out face-to-face during March to May 2014.

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2.1 Survey sites

The field research was conducted in nine regions out of fourteen regions namely; Nay Pyi Taw, Yangon, Mandalay, Sagaing, Bago, Magwayn, Ayeyarwady, Shan, Kayin and Mon, as shown in Fig. 1. The selection of survey sites is based on the availability of electricity and population of the region. Due to the novelty of the research, the complexity of the research topic and resource constraints, a non-probability sampling strategy was adopted. While a representative sample aims to accurately reflect the whole population, (i.e. through random, or probability, sampling so that each household has an equal chance of being selected), non-probability samples are not generalizable since they imply that some households are more likely to be selected than others. Households were selected on the basis of communicating local administrative offices that can arrange the household having characteristics of MECON household. All surveys were carried out face-to-face in order to encourage a higher response rate and higher quality responses.

Fig. 1 The field research was conducted in nine regions out of fourteen regions

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2.2 Design of the socio-economic questionnaire

The design of the questionnaire was an iterative process. The research aims and objectives were initially translated into a rough questionnaire draft, which was then discussed amongst the project partners and subsequently revised. The questionnaire was then trialled with [334] households, and further revisions made.

The questionnaire was written in English and translated into [language]. In order to enable a comparison across the five GMS countries, the questions were translated using a back translation approach (Chapman and Carter, 1979; Birbili, 2000). This approach was taken to ensure the translation was as consistent as possible across the partner countries. Back-translation involves one person translating from English into the 'target' language, a second person then translates back into English. These translations are then compared and retranslated until ambiguities or discrepancies are clarified or removed. The translations were not literal, but rather culturally appropriate to allow comparability of meaning.

2.3 Outline of the socio-economic questionnaire

The questionnaire was comprised of three sections, and a total of 100 questions:

- **Section A**: The first section aimed to elicit information about the respondent and their household, including gender, age, education, income, household size and who in the household made decisions about energy.
- **Section B**: The next section investigated current household energy use, including electricity and other fuels that households use for different energy services, as well as energy aspirations.
- **Section C**: The final section focused on energy efficiency, investigating, for instance, the importance of different types of information in making decisions about whether to buy or rent an appliance, and their knowledge of energy efficiency.

The survey included mainly closed questions and some open-ended questions; the final question was also open-ended to provide respondents with the opportunity to raise any energy-related issues that had not been raised. All survey data were inputted using the online survey tool, Survey Monkey. Having outlined the materials and methods used to investigate household energy use; the next section presents the results of the household survey.

Survey Sites	Population (000s)	No. of HH interview
Naypyitaw	930	20
Yangon	4480	42
Mandalay	1210	136
Sagaing	80	25
Magway	100	7
Bago	240	14
Pathein	240	29
Taungyi & Innle	70	19
Mawlamyine	440	10
Pha-an	50	5

3. Results

3.1 Background information of surveyed households

In this research, 148 numbers of males and 181 numbers of female respondents are included which are 45% and 55% each of the total respondents 334 numbers. The age range is between 18 to 60

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years old but 8.2% is over 60. Nearly half of the household interviewed have an income between 240,000 MMK to 350,000 MMK. And the chief wages earners are College graduates.

3.2 Household energy consumption

We have collected a vast amount of information about household energy consumption by the MECON, which includes: access to electricity, types of fuels, cooking, lighting and EE aspirations. From the survey results, 99.4% of the low income households have access to electricity and 98.1% of them have access electricity from National Grid and 0.9% of them access from Stand alone. In the Stand alone system, 42.9% of the respondents used solar home system and 57.1% of them used gasoline and diesel generator. 76.1% users have access electricity more than one year and 98.1% of them paid by post for the bill. From the table below, it is moderately acceptable from 34.5% of respondent's perspectives as they can get electricity more than 12 hours per day whenever they needed.

Some of the households still using candles for lighting which is 48.4% of respondents and 51.7% are using battery and torch. 50.3% use incandescent light bulbs and they normally change to replace at every six months so that most of the people prefer to use florescent light although fluorescents also need to change and replace roughly between 6 to 8 months. CFL bulbs (Compact Fluorescent Lamps) are used 47.1% of respondents as it is more sustainable according to the quality and energy efficiency but CFL also still need to change and replace. LED (Light Emitting Diodes) users are 23.4% of respondents.

From the survey, 70.5% of low income households are still using Box TV with high power consumption and they don't have concept to change a new one even which are Energy saving products and 76.6% are watching television one to six hours per day. Only 34.7 % of the households use flat screen TV for their relaxation. And most of the people which are 93.3% of the participants using mobile phones and they owned.72.3% of the households owned refrigerator, 88.7% of them are owned DVD, Video players and 34.4% of them owned or rent the computers. Most of the low income families which is 76.5% use Electric Fan and only 21.9% are used Aircon. 26.1% of households use Washing machine and 50.6% of them use Electric water pump. The other townships in urban and rural area used motorbike and which is 66.9% of the participants.

In the next five years, 20.1% of respondents want to own Refrigerator and the next most important products are Aircon, which is 24.7% of respondents want to own. The next one product which they (27.3% of them) want is Washing machine. According to the survey result, 57.8% of people would be willing to pay more for a product initially if it cost them less money to run.

3.3 Barrier to Energy Efficiency

The followings are barrier to Energy Efficiency in Myanmar:-
- Less income for household, difficult and unable to use Energy Efficiency electrical applicants because most of the EE inverter type electrical applicants are a little expensive by the comparison with conventional one.
- Most of the household perspective thinks that what they spend on electricity and other fuels as a proportion of their total household income is not so much acceptable.
- There is a lack of increasing awareness EE knowledge not only household's level but also the staffs in Retailer and Wholesaler shop because they don't understand very well the meaning EE labels.

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4. Discussion and conclusion

- Some households in Shan State face the problem for the high payment cost for electricity bill depending on the usage of electrical applicants and there is no exactly Kilo-Watt Hour meter for their household electricity.
- Limit of capacity building and training program to enhance the respective capabilities of public awareness including the level of household, retailer, and wholesaler for efficiency improvement for Energy Efficiency, Energy Conservation and Energy Intensity.
- The role of media (newspaper, articles, TV, radio, journals) should be more included in the capacity building program for knowledge sharing session in EE as public entertainment program like intellectual talk.
- According to the request from some of the retailer and wholesaler, there is limitation and lack of technical assistance, limited skillful labors availability for installing and maintaining EE products at their shop.
- Poor Knowledge/skills of customers on EE products and most of the Customers are not familiar with EE technologies.
- There is a lack of policies, procedures and Lack of government EE&C policy/strategy Energy efficient technologies/benefit Environmental / Energy management systems
- To establish Energy efficient technologies, to control Environmental degradation / Energy management systems on EE product business networks.
- The weakness of cooperation between government .private, and public participation.