Solar Home System Market Practices, Opportunities and Challenges: the case of Private Importer Companies in Addis Ababa

A Thesis Submitted to the School of Graduate Studies of Business and Economics College, Jimma University in Partial Fulfillment of the Requirements for the Award of the Degree of Master of Business Administration (MBA)

By:

Loza Tamirat

Advisors

Main Advisor - Dr. Leta Sera (PHD)

And

Co-advisor - Mr. Achalu Berecha

Jimma University, Business and Economics College, Department of Management, Jimma, Ethiopia

May, 2020

Solar Home System Market Practices, Opportunities and Challenges: the case of Private Importer Companies in Addis Ababa

By:

Loza Tamirat

Advisors

Main Advisor: Dr. Leta Sera (PHD)

And

Co-advisor: Mr. Achalu Berecha

DECLARATION

I declare that the research Report entitled "**Solar Home System Market Practices, Opportunities and Challenges: the case of Private Importer Companies in Addis Ababa**" submitted to Research and Postgraduate Studies' Office of Business and Economics College is original and it has not been submitted previously in part or full to any university.

By: Loza Tamirat

Date: May 20, 2020

CERTIFICATE

We certify that the Research Report entitled **" Solar Home System Market Practices, Opportunities and Challenges: the case of Private Importer Companies in Addis Ababa"** was done by Ms. Loza Tamirat for the partial fulfilment of Masters Degree under our Supervision.

Dr. Leta Sera (PHD)	_____	_____
Main Advisor	Signature	Date
Mr. Achalu Berecha	_____	_____
Co- Advisor	Signature	Date

ACKNOWLEDGEMENT

First and for most I give gratitude for almighty God for his mercy and grace following me throughout my life path.

My sincere thanks go to my advisors Dr. Leta Sera and Mr. Achalu Berecha for their support and guidance to conduct this research.

Next, I am grateful for my parents, my sister and brother for their unwavering encouragement and prayers.

Last but not list, I would like to thank Dr. Deresse Mersha who is Research and PG Coordinator at Jimma University. He played the major role for me and my batch MBA students to be able to finalize our research.

Abstract

The main objective of the research is to assess the Solar Home System (SHS) market practices, opportunities and challenges in the case of private importer companies in Addis Ababa. The research type is descriptive and exploratory. Primary data were gathered through questionnaire and interview. Thirty private importer companies and ten major stakeholders of the sector participated on the study. From the result of Exploratory Factor Analysis: i) Government role on regulation and market control, ii) Promotion, price and aftersales service, iii) Access to finance and foreign currency and iv) Infrastructure and skilled workforce have been identified as the four underlying factors on the challenges of SHS market. The practice and opportunities of SHS market are assessed through interview of ten major stakeholders. The foremost opportunities for private importer companies engaged on importing SHS products are National Electrification Program, government policy and attention towards clean energy i.e. solar, large off-grid area, growing demand for the products and availability of different supports for the sector. The practices of SHS in respect to private importer companies is viewed in two aspects: the engagement with stakeholders and their participation in the SHS market. The regulatory framework of SHS market is complex. The participation of private sector in SHS market with all the bottlenecks, has a promissory start but not adequate in comparison to the high market demand. It is recommended for the private sector to undertake market assessment and disseminate products to underserved regions. It is also essential for ESEDA to aggressively work for on boarding members to enrich its resources and finally projects implemented by international development organizations needs to focus on local skill transfer to create long lasting impacts on the sector.

Keywords: Opportunities, Challenges, SHS, stakeholders, private importer

Table of Contents

List of Tables

List of Figures

Acronyms and Abbreviations

DBE: Development Bank of Ethiopia

ESA: Ethiopian Standards Agency

ESEDA: Ethiopian Solar Energy Development Association

GOE: Government of Ethiopia

GTP: Growth and Transformation Plan

HH: House Hold

KWh/m2: Kilowatt hour per meter square

LG: Lighting Global

MFI: Microfinance Institution

MoU: Memorandum of Understanding

MoWIE: Ministry of Water, Irrigation and Electricity

NEP: National Electricity Program

NGO: Non-Governmental Organization

PnP: Plug and Play

SHS: Solar Home System

USAID: United States Agency for International Development

USD: United States Dollar

WB: World Bank

Chapter One: Introduction

1.1. Background of the Study

According to Power Africa 2016 report, Ethiopia having above 100 million population and 80 percent dwelling in rural area, it has been challenging for the government to avail electricity throughout the country. Up to 2018, the national electricity coverage is 57 percent. The rural electricity coverage is only 8 percent. In the Growth and Transformation Plan (GTP), Ethiopian government foresees transitioning from a developing country to a middle-income country by 2025 (World Bank, 2019). The transformation to achieve this goal is additional challenge for the power sector.

Ethiopia has enormously untapped renewable energy potential. However, 92 percent of the total national energy consumption is biomass in 2010. In respect to solar energy, the national average radiation received at ground level is estimated at 5.2 kWh/m2 per day. This potential however varies from season to season, with lowest potential being 4.55 kWh/m2 per day, and the highest potential being about 6.25 kWh/m2 per day (MoWIE, 2013).

The government of Ethiopia has set plan for achieving universal electricity access nationwide in 2025 though National Electrification Program (NEP). The updated version of NEP 2.0 has been launched in 2019 (Fanabc, 2019). The NEP targeted to provide access for 7 million rural and deep rural households without grid connectivity (individual solar systems and isolated mini/micro-grids), which is equivalently 35 percent of the population in 2025 (MoWIE, 2017). The Ethiopian government actively promotes a private-sector based approach to off-grid solar through its Electricity Network Reinforcement and Expansion Project (Overseas Development Institute, 2016).

Solar Home Systems (SHS) are becoming ideal products for rural households (HH). SHS is associated with a significant reduction in Kerosene use and the transition to modern electric lights as a household's dominant lighting source. The cost benefit analysis of SHS is far better than substitute energy sources throughout the product life time. From the government point of view, SHS is easier way to avail energy to rural HH in comparison with the costly hydro power generating plants which is currently the main source of electricity in Ethiopia, about 83 percent of electricity is from Hydro plant (Japan International Cooperation Agency, 2010). Hydro

Projects; at remote sites, without adequate local infrastructure and located far from existing transmission networks, can cost significantly more than USD 3500/kW (IRENA, 2012).

The advantage of SHS goes beyond availing light, it is a clean, reliable and efficient source of energy. Thus, enables it to be the preferable energy source for off-grid households. The SHS available in Ethiopian market are Pico solar devices, plug-and-play solar home systems (PnP SHS), and component-based systems. The demand for these products differs in each region, though are all distributed throughout Ethiopia (World Bank, 2013).

The Pico solar devices are lanterns and simple multi-light systems ranging 0-10W which may enable phone charging. PnP SHS, is all-in-one packaged SHS kits with a power rating greater than 11W, typically powering several lights and might include energy-efficient appliances (FM, MP3) and phone charging. The component-based system is a device in which components (i.e. PV module, battery, lights, inverter, wiring, etc.) are compiled independently (Lighting Global, 2019).

The overall solar lighting market size in off-grid and grid-connected areas of Ethiopia is estimated at 4.6 million units. About 60 percent of this demand would come from off-grid rural households and 28 percent from grid connected urban areas. Small and micro enterprises (mainly retail shops, cafes, and restaurants) are estimated to make up 13 percent of this demand, of which nine percent is from those in off-grid rural areas and the rest from those in urban areas (World Bank, 2013). However, the actual quality certified SHS imported in to the country from 2015 to 2019 are only 2.56 million units (Lighting Africa, 2020) which accounts for 55 percent of the total demand.

Private sectors are the key role players in importing and distributing Solar Home Systems (SHS) in Ethiopia. It can be seen that their participation is not matching the demand of the market. This indicates that the SHS sector requires in depth study. In this research the challenges of private companies and the market practice are analyzed to identify the bottlenecks and experiences on the sector. To provide overview of the sector attractiveness the opportunities available for the sector are also assessed.

1.2. Statement of the Problem

UN General Assembly in 2015 has set Sustainable Development Goal number 7 to be access to Affordable and clean Energy. The goal is to ensure universal access to affordable, reliable and modern energy services by 2030. The Ethiopian Government also sets its plan to electrify 7 million rural HH through solar products. Ogen, Mark and Frank (2017) forwarded insights on the role of SHS for providing clean and modern lighting at HH level in East Africa. They concluded that SHS products has health and environmental benefits on the top of availing light.

With high percentage of off-grid HH there is a large potential market in Ethiopia for SHS products. To enhance reachability of this market the related policies and regulatory environment in distributing SHS needs to be in place (ODI, 2016). Engida (2016) undertakes a study on challenges and prospects of SHS dissemination taking the case of an NGO. In his findings he discussed that there is a gap between the demand and supply of SHS.

Different researches have been conducted regarding market intelligence, policy recommendation, analyzing the gap in distribution, end-user characteristics and distribution channels. However, most of the study areas are assessed from government and end-user's perspective, there exists a gap on researches focusing on private sector engagement on the sector. Little is known about the aspects of SHS market in relation to private sector.

As the major players of SHS market being private sectors, study needs to be undertaken analyzing Private importer companies' participation, challenge and opportunities in the SHS market. Therefore, the purpose of this study is to examine the SHS market holistically from the perspective of private companies taking in to consideration the practices, opportunities and challenges of the sector.

1.3. Research Questions

1. What are the current regulatory and market practices of SHS in the case of private importer companies?
2. What are the underlying challenges of private importer companies in SHS market?
3. What are the opportunities available for the private importer companies to participate in SHS market?

1.4. Objectives of the Study

The General objective of the study is to examine the practices. opportunities and challenges of solar home system market from the perspective of importing companies.

1.4.1. The specific objectives

1. To assess the participation of SHS private importer companies in the sector and the stakeholder's engagement
2. To assess the opportunities of SHS market for private importer companies
3. To identify and sort out the underlying challenges of private importer companies in SHS market

1.5. Significance of the Study

SHS market is not well developed in Ethiopia. Given its complex structure and number of stakeholders the reason behind this needs to be assessed from different point of view. It requires researches focusing on the different players in the business. This research aims at explaining the current business practice, challenges and opportunist in SHS market from the perspective of private sector, private importer companies. Thus, the main significance of the study is for SHS importing companies by reflecting the actual practice, indicating opportunist and identifying the challenges in the business. The outcomes of the study can also be applicable for new entrants as secondary information for their feasibility analysis.

In addition, it discloses relevant information for the public which can be used by private Financial Institutions, NGOs, Technology providers and researchers.

1.6. Scope of the Study

The solar energy products can range from single hand torch up to large scale grid connected systems. The stakeholders in SHS market can range from international organizations to rural dwellers. However, this study targets at assessing the practice, opportunities and challenges of SHS market in respect to private importer companies in Addis Ababa. Importing Private sectors are purposely selected, as the majority of suppliers of SHS are importing companies. This

research conducted in Addis Ababa. It focuses on private companies engaged in importing SHS products. As it can be referred from World Bank list, majority of the importing companies are based and registered in Addis Ababa (World Bank, 2017) even if their business operation is in regional market. Addis Ababa, being a capital city has the major governmental and international offices within it. Customs Commission, MoT, MoWIE, ESA, DBE, WB, Power Africa, Ethiopian Conformity Assessment Agency and ESEDA are based and operating in Addis Ababa.

1.7. Operational definitions

Solar Home System (SHS) market – the system in which Solar home system products are imported and distributed through different out lets to the rural community.

Private importer companies – Private companies registered by Ethiopian Ministry of Trade and are licensed to import solar products in to Ethiopia Market.

Lighting Global (LG) – is a World Bank Group's platform to support a stainable growth of the global off-grid market.

Lighting Global Certificate – is a quality standard for solar products issued by setting the base line level of quality, durability and truth in advertising.

Off – grid – is a situation where an area is in rural and lacks access to the power grid.

ESEDA – Ethiopian Solar Energy Development Association is an independent non-profit association, which is focused on supporting the growth and development of solar energy companies in Ethiopia.

1.8. Organization of the Paper

The study is organized and presented into chapters and sections detailed as below.

Chapter one the introduction section contains background of the study, Statement of the problem, research questions, general and specific objectives of the study, Significance of the study, scope and limitation of the study and organization of the study.

Chapter two is the literature review is organized in to Theoretical literature and Empirical literature. The theoretical section is consisted of the basic concepts of SHS, access to electricity and solar power and rural electrification. The empirical literature reviews studies in the SHS market trend, stake holder analysis, barriers in the SHS market.

Chapter three of the research covers Research design, sources of data and data collection techniques, study population, sampling methods and method of data analysis and presentation.

Chapter four presents the result of descriptive analysis, correlation analysis and the underlying factors in challenges SHS market. It also contains the discussion for the findings of the practices and opportunities of SHS market. The demographic data of respondents and background data of participated companies is included in this section.

Chapter five is conclusion and recommendation with the subsections of summary, conclusion, recommendation, limitation of the study and future research areas. Finally reference and annexes are listed.

1.9. Limitation of the Study

The major limitation of the study is sample size; with the maximum effort only 155 responses were valid for analysis. Exploratory factory analysis requires large sample size, the result will be more appealing if it was possible to get larger number of responses.

Chapter Two: Literature Review

2.1. Theoretical Literature

2.1.1. SHS Market Studies in Ethiopia

It is inevitable that development can't be secured without access to electricity. Provision of electricity is a recognized development agenda item and one of the key pillars of the Sustainable Energy for All (SE4ALL) Initiative of the United Nations. Ethiopia's economy experienced strong, broad-based growth averaging 10.3 percent a year from 2006/07 to 2016/17, compared to a regional average of 5.4 percent. As the economy is growing and more communities and individuals are demanding access to electricity (ODI, 2016). The case gets critical in rural areas, where people living in poverty are more likely to access to electricity.

The Ethiopian National Electrification Program (NEP) sets target of availing electricity throughout the country by 2025. The grid connection rollout program executed by Ethiopian Electric Utility (EEU), designed to scale up connectivity to over 14 million HH by 2025 (equivalent to 65 percent of estimated population in 2025). The remaining 35 percent of HH are planned to be addressed by off-grid programs, Rural Electrification program (MoWIE, 2017). In their working paper of SHS contribution (Andrew, Leah and Jesper, 2017) indicated that SHS are increasingly seen as a route electrification in rural areas of Sub-Saharan Africa and Asia.

The access to affordable and reliable energy source for rural HH can have impact on betterment of life standard. It brings vast direct and indirect benefits. SHS is sustainable modern energy service for rural HH with no environmental impact compared to conventional energy sources. As ODI working paper of 2017 cited (World Bank, 2008; Pueyo et al., 2013; Bonan et al., 2014; Pueyo and Hanna, 2015; Lemaire, 2016) Rural electrification in this case SHS, developmental impacts can be described by social, economic and environmental opportunities. Five main categories of impact from the use of electricity can be sorted out. These are:

- Saving on expenditure for energy services substituted by SHS (i.e. Kerosene, Candles, Batteries and phone-charging fees).
- Changes in time use (i.e. time spent on studying, working and leisure)
- Social welfare impacts (i.e. educational and health benefits, entertainment, and better access to information and knowledge)

- Reduction in greenhouse gas and black carbon emissions from kerosene, wood, charcoal, ... through generating energy form renewable energy
- Changes in productivity and income (for home-based business)

Over the past five years, the SHS shows tremendous market growth as the technology being developed and the product cost going down (IRENA, 2018).

2.1.2. Solar Home System Overview

Solar energy can be utilized through stand-alone systems and grid connected solar systems. The stand-alone are independent systems. Solar Home System (SHS) are stand-alone home usage appliances. SHS is reliable and cost-effective energy source for off-grid House Holds (HH). It generates electricity from sunshine and stores in the battery for consumption. According to latest Lighting Global specification, SHS is generally categorized into two. Pico (with peak power rating of 10W or less) and SHS kits (above 11W systems) (LG, 2019).

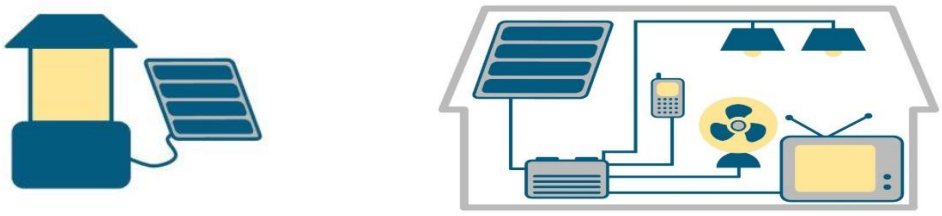

Figure 2.1: Pico system and SHS Kit (Image credit: LG website)

SHS can range from lighting and mobile phone charging to small televisions, radios, fans or other appliances. Currently off-grid HH uses kerosene, wood, charcoal, candle and dry batteries as a source of energy. By replacing these fossil energy sources SHSs have the potential to reduce air pollution, avoid health impacts and substitute energy expenditures.

According to Ethiopian Standards plug-and-play SHS can range 10W – 30W. The plug-and-play system can be defined as end users can connect the kit without the requirement of tool or technician. The system can simply be installed and operated. The required components in SHS kits includes PV module, Charge Controller, Battery, Cable, Switch, Connectors and load (TV, fan, radio, etc.) if any (ESA ES6087, 2017).

2.1.3. Access to Electricity

Access to electricity has been measured based on the HH connection to the national electric grid of their respective country. However, this approach doesn't consider the service available, affordability likewise the legality of connection. Also, it ignores energy for cooking and heating needs, as well as for productive engagements and community facilities. The quality of electricity consumed determines which of the services (i.e. lighting, heating, cooling, phone charging and production) and how much of a particular service, is available to a HH.

The Multi-Tier Framework (MTF) was developed by World Bank to provide means to measure access across a range of the services, referred to as tiers (Bhatia and Angelou, 2015). MTF for electricity access, seeks to understand electricity access not in binary on or off terms, but as a continuum of service levels that may be satisfied by a range of technologies. The energy services available at each tier are shown in Figure 2.2 below, ranging from task lighting and phone charging at Tier 1 to the full range of possible energy services, including the use of appliances with high power ratings, at Tier 5. The main objective for the development of MTF is to have a global baseline of energy access.

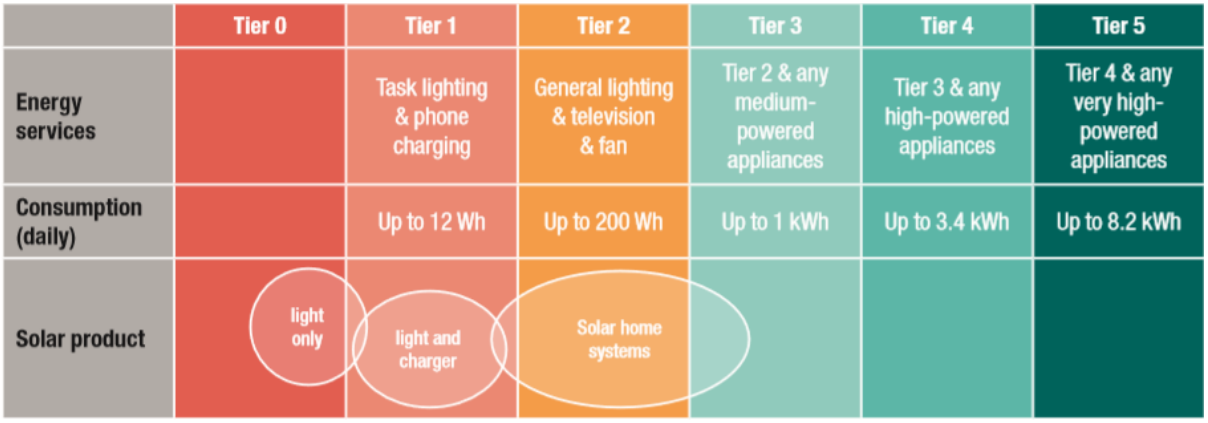

Figure 2.2: Services and consumption levels at different tiers of access to electricity

Source: Andrew, Leah and Jesper, 2017 (P-7)

2.1.4. SHS Market

2.1.4.1.Market

SHS was first initiated in Ethiopia by the government and international NGOs in 1980s. From data gathered by Lighting Global, from manufacturing companies Ethiopia is one of the top 10 countries by volume of products sold in the second half of 2017. Ethiopia still remained important markets, accounting 160,000 units and generating around $4.92 $6.23 million in cash sales revenues in July – December 2017 sales record. (GOGLA and LG, 2017). A substantial proportion (85 percent) of the rural households is interested in buying solar lighting products. (World Bank, 2013).

Table 2.1: Top 10 Countries Markets by Volume of products sold from July – December 2017

Country	Volume of Products Sold	Global Volume Share	Cash sales Revenues of Products Sold	Global Revenue Share	Newly Installed Capacity (MW)	Global Newly Installed Capacity Share
India	1,255,174	30.29%	$36,381,387	31.61%	2.45MW	11.06%
Kenya	502,099	12.12%	$6,268,277	5.45%	4.26MW	19.27%
Congo, Dem. Rep	242,271	5.85%	$7,427,996	6.45%	0.56MW	2.54%
Uganda	224,074	5.41%	$4,923,699	4.28%	2.41MW	10.89%
Ethiopia	158,634	3.83%	$6,230,026	5.41%	0.46MW	2.08%
Malawi	125,640	3.03%	$4,109,099	3.57%	0.3MW	1.37%
Bangladesh	119,050	2.87%	$6,313,809	5.49%	0.4MW	1.80%
Nigeria	107,576	2.60%	$1,225,914	1.07%	3.11MW	14.04%
Tanzania	103,299	2.49%	$778,221	0.68%	2.8MW	12.65%
Indonesia	100,650	2.43%	$3,046,945	2.65%	0.3MW	1.37%

Source: Adopted from (GOGLA and LG, 2017)

2.1.4.2.Product

The stand-alone SHS products available in Ethiopian market ranges from single lantern to SHS with Fan, TV and Satellite. These days the technology is developing rapidly and more appliances are introduced in to the market. As the rural community in Ethiopia is BoP (Bottom of Pyramid) the economy status is low. As a result, their purchasing ability is low. The demand

for the product will be the once with lowest price which is lantern. But due to end-users financing available through MFIs the higher demand is for lantern with mobile phone charging.

WB categories the demand in to four groups. The first group are off-grid HH who require basic lantern without mobile charging just for lighting purpose. The second group is the once who want lantern with mobile charging. The third groups are requiring two or more lights with mobile charging and additional services. The fourth group requires two or more lights with charging for two mobile phones and radio or MP3 player. The percentage of each category is enshrined below in figure 4.

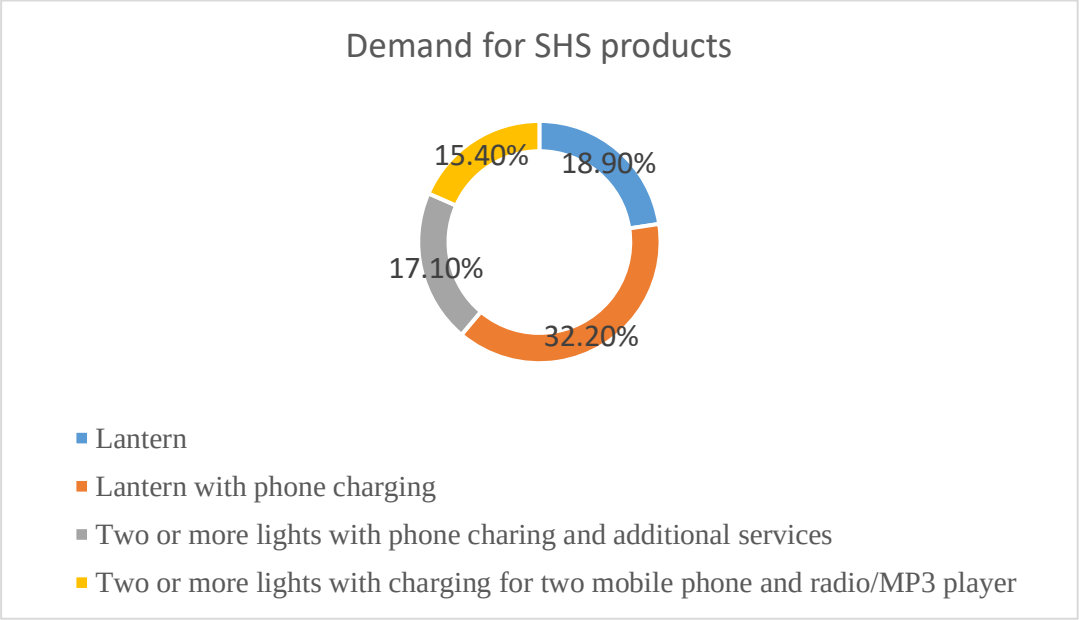

Figure 2.3: Percentage of SHS products demand

Source: Adopted from (World Bank, 2013)

2.1.4.3.Distribution Channel

Different distribution channels have been developed through time in dissemination of SHS with new entrants. However, the Private sector importer-wholesalers with distribution partnerships is the most effectively operating distribution model in Ethiopian SHS market. In this model private sectors import SHS products and transfer it to retailers in different regions. The retailers will be responsible for distributing the products to end-users as a sales point.

There are four major distribution channels accounting 90% of SHS distribution in Ethiopia (WB, 2013). The first as discussed in the above paragraph is the private sector SHS importer – distributor model. The second is distributors of other products selling SHS incorporating with

other products. The third channel is through consumer cooperatives like farmer cooperatives. The fourth is through MFIs.

Private importer of SHS, use different channels to reach to end-users. These includes distributing products through Gas stations like Total Ethiopia, Ethiopia Postal Service and Commission based sales agents. To distribute SHS in whatever channel it is a must for the private sector to present the products and associated certification and documents to the regional respective Energy and Mine Bureaus.

2.2. Empirical Literature

2.2.1. SHS Market in Ethiopia Market Studies

Ethiopia's Growth and Transformation Plan II (GTPII) includes ambitious plans for the dissemination of off-grid solar technology (3.6 million lanterns/pico-PV systems and 400,000 solar home systems by 2020 (ODI, 2016). The GOE has a positive attitude towards SHS in its national strategic polices of access to electricity. To achieve this ambitious plan, it is clear that private sectors will be accounted for the dissemination of the majority of these systems. Regardless, most researches don't give emphasis on private sector role on their studies.

Joseph (2015) on his paper titled Solar Energy in Sub-Saharan Africa has done analysis on Ghana, Nigeria, South Africa and Kenya. He indicated that the challenges of the solar energy in these countries are affordability of products and reluctant of global companies for technology transfer. The recommendation forwarded is the sector demands capacity enhancement through local research and development.

Melessaw (2009) reviews the solar energy as while having a huge demand in the market, the major solar energy challenges incorporates: shortage of working capital, access to foreign exchange, managerial skill gap, lack of specialization and limited network recommending that local capacities and skills needs to be developed.

On the study of Ethio Resource Group (2012) titled Solar Energy Vision for Ethiopia, success stories of Germany, Chinese, Bangladesh and India was presented recommending the Ethiopian solar energy market to develop a regulation which promotes domestic market and above that guide industries to global competitiveness.

The World Bank Report (2013) discusses that the overall solar lighting market size in Ethiopia for off-grid and grid-connected areas is estimated at 4.6 million units. There is a large potential market for SHS products in Ethiopia. The estimated market share of the different product categories, based on incomes, is presented as in figure 2.4 below. Even if this report is the first holist report on SHS market, it doesn't assess the changes of the market and on what assumption or primary data the conclusions are obtained.

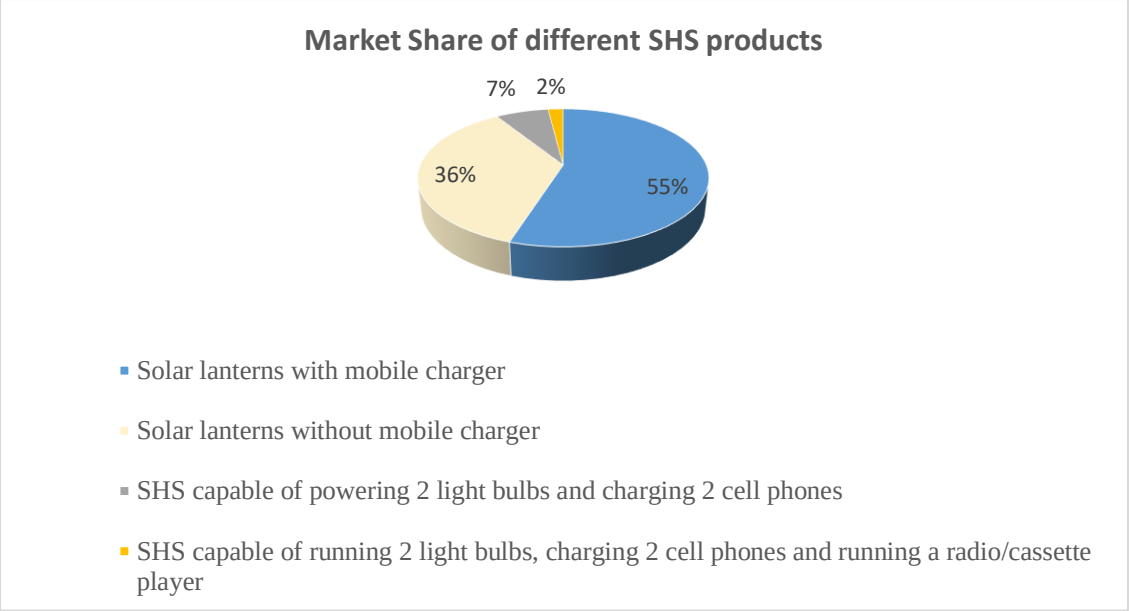

Figure 2.4: Market share of different SHS products

Source: Adopted from (World Bank, 2013)

In his research of Challenges and Prospects of Solar Home System Dissemination in Rural Parts of Ethiopia Engida (2016) assessed the SHS market challenge and proposed that the GoE should give emphasis for solar sector. Being the research conducted only on one solar NGO; it doesn't provide the overall picture of the private sectors experience.

Delbert Advisors and Lighting Global (2018) indicated that there is also a significant potential to expand the SHS market in Ethiopia, which is starting to take off with several private sector players active. Potential Market for SHS is defined by the overall market of households (or people) that either lack access to an electricity connection (off-grid) or have a poor-quality electricity connection (unreliable-grid), forming the total potential customer base for SHS products. This estimate includes customers that currently use SHS products, as they continue to be a market for additional sales, replacements, and upgrades. This study is specifically done on the potential market of SHS, it doesn't assess the role of the private sector in the market.

Power Africa (2019) on its Off-grid Solar Market Assessment of Ethiopia has done in-depth research including sector overview, policy and regulation overview, financing overview and gender mainstreaming. It covers all the three major solar sectors i.e. SHS, mini-grid and productive use SHS. However, the study doesn't give emphasis for SHS market.

2.2.2. Challenges of SHS market in Ethiopia

From literature review of different researches and studies the general challenges of private sector engaged in SHS market are access to finance, frame work and implementation of policy and regulations, consumer capabilities, local technical skill, infrastructure, public and private sector relation and marketing and promotion.

2.2.2.1.Access to Finance and foreign currency

In the current economic situation of Ethiopia, the negative trade balance creates shortage of foreign exchange (Power Africa, 2019). As per CDNK (2017) and Engida (2016) private sectors are unable to import SHS into the country due to foreign exchange unavailability. This situation is seen to get worst over the years. Another issue regarding finance in SHS market is working capital. Private sectors are challenged due to inadequate working capital Melessaw (2009) to efficiently import and distribute SHS products. Engida (2016) indicated that there is unavailability of enough funds for solar projects.

2.2.2.2. Tax and Regulation

Despites the GoE ambitious plan for vast dissemination of SHS the appropriate policy and regulatory environment are not in place ODI (2016). Engida (2016) described that there is no workable regulatory frame work in SHS import and tax and duties exemption are not well-defined as Power Africa (2019). As per the ODI (2016) report the regulatory frame work for SHS market is also very complex. In addition, there are ambiguities in implementing the duty-free regulations TERI (2014) although the import regulations are not clearly communicated to private sectors.

2.2.2.3.Consumer Capabilities

The consumer capabilities in SHS market are described in finance and technical aspects. As most of the consumers are rural dwellers the prices of SHS are high (ODI , 2016). Microfinance Institutions allocate loans for consumers to purchase SHS however the funds are not adequate.

Lack of proper management in recollecting loans from end-users creates inefficiency in their operation. On the other side of the coin, the low purchasing power of rural consumers requires subsidy and financing schemes (Sebsibie, 2016).

Consumers don't have technical knowhow in identifying quality products and as per World Bank (2013) report poor quality products are affecting the market. The consumer knowledge in product handling and usage is also low.

2.2.2.4.Local Technical Skill

The technical skill gap on SHS is reflected both in company employees and at local retailer level. Melessaw (2009) indicated that a gap exists on managerial skill and technical skill in private companies. The accessibility of technical training is insufficient resulting low level of skill available (ODI, 2016). Generally, the SHS market technical capacity constraints are not strategically and widely addressed as per Ethio Resource Group (2012) report. CDNK (2017), stated that most of local retailers are not technical equipped in installation and service provision for consumers. Further to these, Engida (2016) underlined that not having enough technical trained technicians as retailers create constraint in provide after sales services. Thus, as Power Africa (2019) highlighted the development of skills to support the off-grid sector remains a crucial challenge in local communities.

2.2.2.5.Infrastructure

Inaccessibility of road and telecommunication infrastructure hinders the SHS market performance. Most rural areas are difficult to access and lack of infrastructure to transport products to rural communities is challenging (TERI, 2014). Engida (2016) discussed the off-grid areas are remote which is impeding the SHS dissemination. In addition, due to telecommunication infrastructure gap introducing new telecom-based market technologies is challenging.

2.2.2.6. Public and Private Sectors Relation

Ethiopia solar market lacks harmony of private and public sectors (TERI, 2014). The involvement various agencies in the importation process creates communication gap (CDNK,

2017). More than six agencies are involved in licensing and permitting private companies. The inconsistency in their administration regulation is a difficult to deal with for the private sector. The lack of harmonization between the regional and federal government is another hassle in SHS market, different regional level energy related offices implement different policies and regulations (ODI, 2016). According to Engida (2016) smoothening this public and private relation is a responsibility of the solar association (ESEDA).

2.2.2.7.Marketing and Promotion

The marketing and promotion of SHS market is affected by low quality products, resource requirement, lack of effective distribution channel, high cost of setting retail outlets and business skill gaps. Though the issue of quality is a common problem of imported products the impact get worst in SHS market as the consumers are BoP population. The entrance of low quality /grade/ products is increasing (ODI, 2016). Mainly the products are imported contraband and being sold in shops without proper license (Engida, 2016). The poor-quality products are affecting end user's satisfaction and trust in SHS products. Some of the products even look similar to Lighting Global approved products as per World Bank (2013).

The marketing and promotion of SHS to low income consumers is hectic and resource consuming (ODI, 2016). As a result of technical and financial capabilities there exists lack of effective distribution network. Importing companies distribute SHS products through distributors and retailers. However, most distributors and retailers at Regional and Woreda level are not financially capable of effectively distributing the products for consumers (World Bank, 2013). TERI (2014) discussed retail setting up in target market is high cost. In a nutshell, Private companies have vast challenges in addressing the market and business development challenge of SHS market (Ethio Resource Group, 2012).

Table 2.2: Summary of related literatures

Related Literature	Variables	Findings and Recommendation
CDNK (2017)	- Complex regulatory framework	Achieving GoE NEP plan will require a huge private sector investment. Improved policy
	- Foreign exchange unavailability	

	- Lack of sufficient consumer financing	for private sector participation needs to in place.
Engida (2016)	- Foreign exchange unavailability - Low grade product in the market - Unavailability of funds for solar projects - Road accessibility - Engagement of ESEDA - Regulatory framework - Availability of local technician	There exists a gap between the demand of SHS and supply. The WB IFC program and GoE needs to cooperatively work to address the issue. Training facility is required to address the skill gap in the market.
Ethio Resource Group (2012)	- Regulation are not constantly applied -Few financing schemes available - Delivering aftersales service -Limited private companies' specialty on the sector	The regulation and sector support are required to open-up the market and guide the industry to competitiveness. The private sector should expand market coverage.
Light Africa (2013)	-Private sector has limited skill capacity -Limited access to finance -Tax exemption is not clear -Tax exemption is not uniformly implemented -Low-grade products are available in the market	Rural population accounts for 83% in Ethiopian. Off-grid rural areas use kerosene and dry cell for light source. To catalyze the solar market different financing schemes are required in addition to policy revision.
Power Africa (2019)	-Lack of Infrastructure development for introduction of new technologies - Inadequate policy and regulation support -Low local skill development -Lack of foreign exchange	The duty-free framework needs to be implemented uniformly and clearly. E-waste regulations is required to be developed and private companies are advised to assess the market for other category of solar products.
Melessaw (2009)	-Inadequate working capital for private sectors	The Ethiopian solar sector is still on development stage.

	-Limited managerial skill on the sector`	Small business and HH are the end users of SHS. Companies needs to closely evaluate the market.
	-Shortage of foreign exchange	
	-Lack of trained work force	
SNV (2016)	-Road inaccessibility of off-grid areas	Educational facilities should get upgrade for technical skill development of the sector.
	-Technological gap	
TERI (2014)	-Cost of promotion to rural areas	There exists a huge demand of SHS products in off-grid areas. The low-grade and poor after sales service are disrupting the market. Annual track record must be placed so that policy briefs will be prepared according to the outcome.
	-Complex regulatory frameworks	
	-Lack of harmony between the private and public sectors	
	- Lack of infrastructure to rural areas	
	- Consumer buying ability	
	-Poor after sales service	
Sebsibie (2016)	-Low purchasing ability of rural consumers	The SHS market requires subsidy for the low-income consumers

Source: Adopted from different studies

2.3.Conceptual Framework

The conceptual frame work for the challenges of private companies engaged on SHS market is developed from different researches as shown below.

Conceptual framework of challenges of SHS market

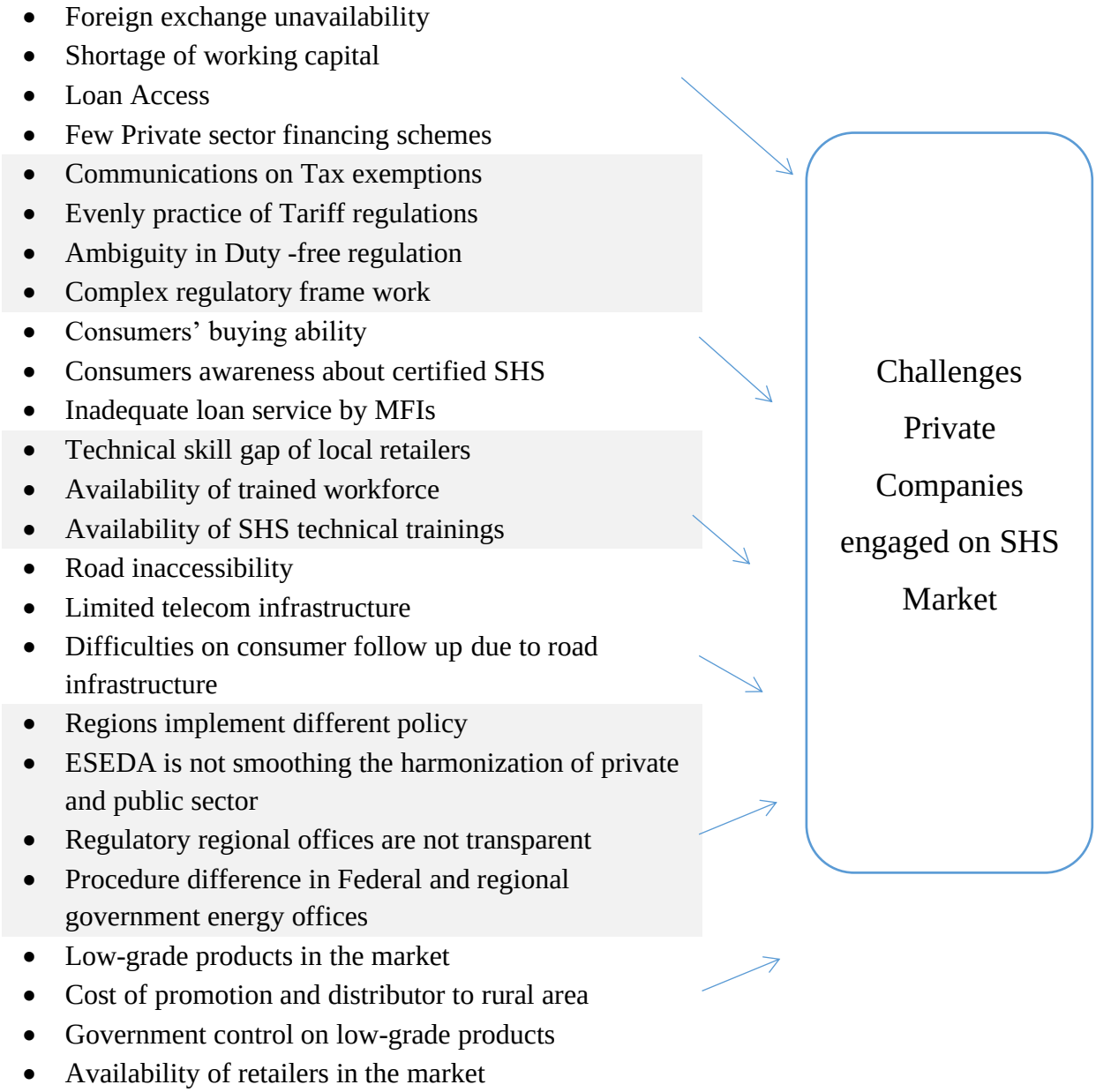

Figure 2.5: Conceptual Frame Work (Adopted by researcher)

Source: Related literatures

Chapter Three: Research Design and Methodology

3.1. Research Design

The research design is exploratory and descriptive using both qualitative and quantitative approach. To determine the underlying challenges of SHS market Exploratory Factory Analysis (EFA) was deployed; as per Fatih (2018), EFA is a statistics technique used to determine underlying latent variables (factors). EFA is selected from different types of factor analysis as a prior model or a structure to the variable's relationship cannot be assumed (James, 2014). Interview and secondary data were utilized to assess the practices and opportunities of SHS market.

3.2. Data types, sources of Data and collection method

The study utilized both primary and secondary data. The primary data was collected using questionnaire and Interview. The questionnaire is close ended and Likert Scale. It is designed in optimized order and same topics are grouped together (Jon A. & Stanley, 2009). The first part of the questionnaire is the general content which is the section to build rapport with the respondents. The next sections include practical and experience related questions. Interview was conducted with ten major stakeholders of the SHS market. The interview is semi-structured to enable interviewer to expand the interviews response and get in depth view; as per Hamza (2014).

The secondary data has been drawn from several sources; reviewing documents and data from Ministry of Trade regulations, Customs Office procedures and tariff codes, Government National Electrification Program implementation, Ethiopian Standards Agency requirements, and national and international reports and researches on SHS market in Ethiopia.

The study population is discussed as the group from which the data is collected in order to attain the required information (Ranjit, 2011). The target population for this study is private companies in Addis Ababa which have license and are currently importing SHS products in to the country. These companies are registered and still active in business. According to Lighting Africa (2017) market Intelligence report there are a total of eighty companies engaged in SHS importing business from which fifty-five are active in business on 2019/20 fiscal year.

The study population has been completely included in the study. Since the total study population is small to take sample from data collection has bee undertaken from the total population. However, Exploratory Factor Analysis will be implemented. According to Hair (2014), the minimum number of respondents for factor analysis should be fifty and preferably hundred or more; the number of observations per variable as general rule is 5:1. The total variables determined on the conceptual framework of this study are twenty-five. Thus, for the Exploratory Factor Analysis result to be valid the observations (responses) with twenty-five variables must be at least one hundred twenty five. To get these responses multiple questionnaires have been distributed to each company participated in the study.

The responses from ten key stakeholders was systematically examined for the purpose of identifying patterns and team.

3.3. Method of Data Analysis

The quantitative data is analyzed using SPSS v.23 software through descriptive, scale measurement and inferential analysis.

3.4.1. Descriptive Analysis

Research involves descriptive analysis and provides valuable information about the nature of the particular group of individuals (Best & Kahn, 2003). In this study, descriptive analysis in terms of percentage and frequency is used to present the demographic data in tables, graphs and written form as appropriate. These demographic data include gender, education background, position and company general information.

3.4.2. Normality Test

Measures of variability including Skewness and kurtosis is used, which are necessary to determine the normality of distribution as the inferential analysis depends on the characteristics of data. According to Curran, West & Finch (1996), for multivariate normality problem exists when the univariate value approaches Skewness of 2.0 and Kurtosis of 7.0, accordingly the variables has been analyzed for normality test.

3.4.3. Reliability Test

Reliability is a measurement of stability and consistency of research tool (Ranjit, 2011). The most commonly used reliability test is Cronbach's alpha (Hair, 2010) has been used for this study. The acceptable cut-off point for Cronbach's alpha is 0.7; however, some suggest that value of 0.5 is sufficient at early stage of research (Field, 2013). Cronbach's alpha reliability test has been used for this study.

3.4.4. Inferential Analysis

3.4.4.1. Correlation Analysis

Correlation analysis is used to determine the relationship between all possible pairs of variables included in the analysis. In this study Pearson Correlation analysis will be used to examine the association between two variables which are X and Y (Goodwin & Leech, 2006). Besides, it is used to determine the relationship of strength and direction between two variables.

3.4.4.2. Factor Analysis

Exploratory Factor Analysis is used to determine the latent variables (factors) in SHS market challenges. On conceptual framework the factors are adapted from different researches and reports. Principal Component is used for factor extraction. Eigen values has been used to determine the number of factors to retain. Eigen value or Latent Root Criterion sets factors are considered significant when their Eigen Value > 1, this cut-off is reliable for variables between 20 and 50 (Hair, 2010).

3.4.5. Triangulation Data Analysis

Triangulation data analysis method is a process of incorporating different data analysis method to increase the validity of results (Sabrina & Khan, 2012). On this study, the result of the interview analysis was used to determine the practice and opportunities of the SHS market in triangulation with secondary data sources. The interview results are also used to further discuss the underlying challenges determined by Exploratory Factor Analysis.

3.5. Ethical Consideration

In data collection phase, for both interview and questionnaire every respondent was informed about the research through a written and oral Consent. Any responses included in the final report will be kept anonymous and will not include any identifying information about the respondent. Only the general list of companies participated in the study is included in the annex. The information considered critical by the respondents will be kept confidential.

Chapter Four: Result and Discussion

4.1. Introduction

In this chapter the analysis of data collected through Questionnaire and Interview with the results are presented to explain the SHS market practices, opportunities and challenges.

The questionnaires were collected in ten weeks through drop & pick method and Google sheet survey. From a total of 180 questionnaires distributed for 40 willing companies, 165 was collected from 30 companies. The response rate is 92 percent. From 165 questionnaire responded 10 was found with missing data and discarded from analysis. Thus, the final valid responses used in the analysis is 155.

The interviews were conducted with ten major stakeholders of SHS market: Ministry of Water Irrigation and Energy, Ministry of Trade, Customs Office, Ethiopian Solar Energy Development Association, Development Bank of Ethiopia, Ethiopian Standards Agency, Ethiopian Conformity Assessment Enterprise, Power Africa, World Bank Lighting Ethiopia Program and PEACE Microfinance Institution. These interviews were electronically recorded, transcribed and thematically analyzed.

4.2. Descriptive Analysis

4.2.1. Demographic Profile of Respondents

The purpose of this section is to provide some basic background information about the study population.

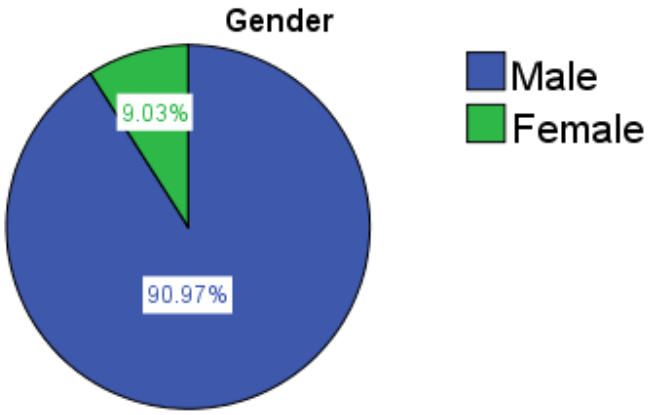

Figure 4.1. Distribution of respondent by Gender

Source: Survey Data (2020)

As it can be referred in the above chart, the respondent distribution in gender is displayed. From the surveyed SHS market sector professionals, above 90.97 percent are Male, which is 141 respondents in number. From a total of 155 respondents only 14 were Female which is only 9.03 percent.

Table 4.1. Respondents' Age, Education level, Profession, Job level and Years of experience

Variables		**Total Respondent**	
		Frequency	**Percentage (%)**
Age bands in Years	25-34	78	50.3
	35-49	49	31.6
	50-64	22	14.2
	65 & above	6	3.9
	Total	155	100
Education level	TVET/Diploma	11	7.1
	Bachelor Degree	101	65.2
	Masters	39	25.2
	PHD	4	2.6
	Total	155	100
Profession	Procurement & Logistics	5	3.2
	Accountant/Finance	15	9.7
	Marketing, Sales or Business development	78	50.3
	Operation/Administration	18	11.6
	General Manager/Owner	38	24.5
	Other	1	0.6

	Total	155	100
Job Level	Officer	32	20.6
	Supervisor	46	29.7
	Team leader	17	11
	Manager/Head	58	37.4
	Other	2	1.3
	Total	155	100
Years of experience in SHS market	1-3 Yrs.	84	54.2
	4-6 Yrs.	53	34.2
	7-9 Yrs.	10	6.5
	10 Yrs. & above	8	5.2
	Total	155	100

Source: Survey Data (2020)

Half of the respondents are in 25-34 age band (Youth) which is 50.3 percent of total. The next age band, 35-49 with 31.6 percent and a frequency of 49. The third age band, 50-64 is 14.2 percent with a frequency 22. The last age band 65 & above has the fewest frequency i.e. 6 and 3.9 percent.

The education level which has the highest frequency is Bachelor degree with a 65.2 percent and 101 count. The second is Masters, with 25.2 percent and frequency of 39. TVET/Diploma level has a frequency of 11 with 7.1 percent. The last in frequency is PHD with 4 counts and 2.6 percent. Thus, 93 percent of the respondents has Bachelor degree or above.

As the study is market focused, half of the respondents' profession is Marketing, Sales or Business development with a frequency of 78 and 50.3 percent. The next category is General Manager and/or owners with a frequency of 38 and 24.5 percent. Operation and Administration has 11.6 percent and a frequency of 18. The third category, Accountant and Finance has a frequency of 15 and 9.7 percent. The procurement and logistics professionals have a frequency of 5 and 3.2 percent.

In regards to Job level, 58 are managers or head of departments including owners which is 37.4 percent of total respondents. The next group is supervisors with a frequency of 46 and 29.7 percent Officers are third in number with a frequency of 32 and 20.6 percent. There are 17 team leaders with 11 percent. Finally, there are 2 respondents in other job level with a 1.3 percent.

Professionals' years of experience in SHS sector in relative to other business are few. Above half of the professionals i.e. 54.2 percent (84 in counts) have 3 and less years of experience, which is considered as junior level. The next category with 4-6 years of experience has 34.2 percent with a frequency of 53. Professionals with 7-9 years of experience are 10 with 6.5 percent. The most experienced group, 10 and above years are 8 with 5.2 percent this shows there are few senior level professionals in the sector.

4.2.2. Descriptive Summary of Companies

4.2.2.1. Regions the companies operating

The responses of the 30 companies for the cities administration and regions they are activity operating is shown in the figure 4.2. The region which companies operate highly is SNNPRs with a total of 13 companies. The capital city, Addis Ababa has 11 companies operating companies, also the market is populated with variety products. Next is Amhara region with 10 companies. The regulatory framework, market sizes and buying ability are the major factors for companies to select operating regions. Regardless of its largest population, there are seven companies operating in Oromia region. From the 30 respondent companies six operate in Tigray region. Two companies operate in Somali region. The next underserved markets are Afar, Benishangul-Gumuz and Gambella with one company operating in the region. As it can be referred no company is operating in Harrai region and Dire Dawa city administration. This can be related to illegitimate product route as the areas have high market of contraband products.

This summary is taking in to consideration that one company can operate in more than one region and city administrations.

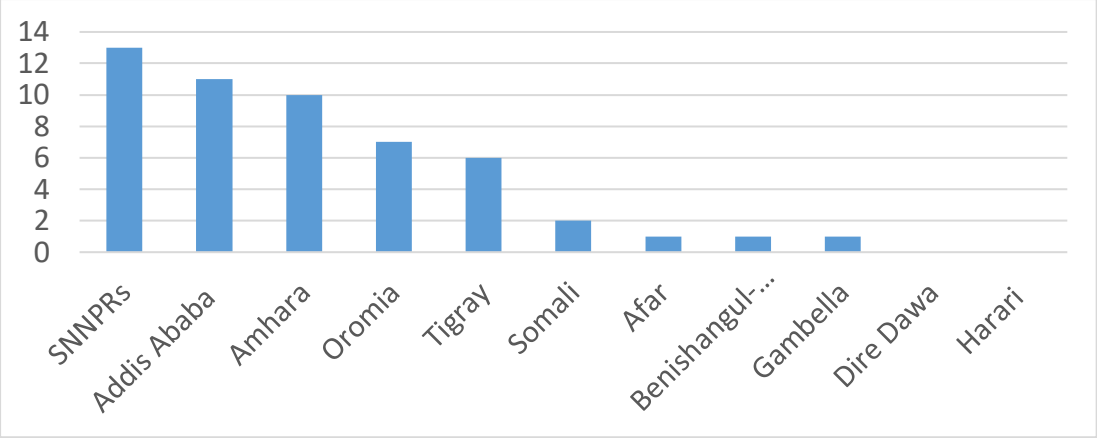

Figure 4.2. Regions and City Administration Companies operate

Source: Survey Data (2020)

4.2.2.2. Membership of ESEDA

From the total of 30 respondent companies 20 companies are members ESEDA. The total ESEDA's member list is 20. Hence, all the members of ESEDA are included in research. The percentage of members and non-members is shown in the below figure.

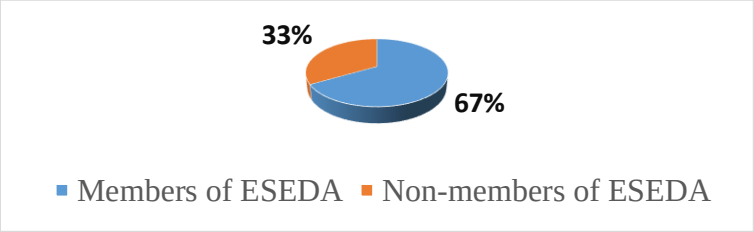

Figure 4.3. Percentage of Members of ESEDA from respondent companies

Source: Survey Data (2020)

4.2.2.3. Product line overview

Private solar importing companies can be categories in to two based on their product lines. The first one is companies with only SHS revenue stream while the second category have other related and non-relate product or service lines. 50 percent of the respondent companies i.e. 15, have only SHS product line and the other 50 percent have another product and service lines.

4.2.2.4. Profitability of SHS market

The profitability of SHS is summarized from the 155 professional responses. It was measured in order from nominal to very profitable. The responses frequencies is listed as follows.

Table 4.2. SHS market profitability rating of respondents

Profitability rate	Frequency	Percent
Nominal	42	27.1 %
Average	43	27.7 %
Profitable	62	40 %
Very profitable	8	5.2 %
Total	155	100 %

Source: Survey Data (2020)

With all the challenges of the SHS market 62 respondents with 40 percent of the respondents still consider the business profitable. From the respondents, with a frequency of 43 and 27.7 percent considers the profitability of SHS market average. 42 respondents with 27.1 percent rated the profitability nominal. Only 5.2 percent with a frequency of 8 respondents rate the SHS market very profitable in comparison to other sectors.

4.2.2.5. Market Competition

43.2, 22.6 and 21.9 percentage of respondents consider the market competitive, normal and with nominal competition respectively. The market competition includes the low-grade products and other certified brands of SHS available in the market. The summary is enshrined in the below table.

Table 4.3. Market Competition is

Market Competition	Frequency	Percent
Low	34	21.9 %
Normal	35	22.6 %
Competitive	67	43.2 %
Highly competitive	16	10.3 %
Extremely Competitive	3	1.9 %
Total	155	100 %

Source: Survey Data (2020)

4.2.3. Descriptive Statistics of Variables

The standard deviation represents how well the mean represents the data while the mean is simply average score (Field, 2013). Thus, the mean indicates to what the level the respondents agree or disagree. For the response of the 5 level (1- strongly disagree and 5- strongly agree) of a Likert scale questionnaire the mean and standard deviation is show in the below table 4.4 for the 19 variables included in the factor analysis.

Table 4.4. Standard deviation and mean

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Foreign exchange unavailability is the main hindering issue in SHS product importation.	4.69	0.65	155
Low-grade products are disrupting the SHS market.	4.61	0.826	155
MFIs services in availing loan to end-users are not adequate.	4.16	0.639	155
Distribution and promotion of SHS product to rural community is expensive.	4.15	0.854	155
Regulatory regional offices are not transparent on their working procedures.	4.13	0.827	155
Private sector financing schemes are few in SHS business.	4.12	0.789	155
Regions implement different policy and work procedures in SHS business.	4.08	0.997	155
Consumers of SHS are willing but not able to purchase products.	4.07	0.988	155
There exists ambiguity in Duty -free regulation implementation.	4.05	0.878	155
The regulatory framework in SHS business is complex.	4.05	0.9	155
Availability of SHS technical training is insufficient.	4	0.721	155
Federal and regional government energy offices follow different work procedures.	3.98	1.01	155
Local retailers have technical skill gap in delivering after sales services.	3.97	1.093	155
Introducing some of the new technologies is difficult due to limited telecom infrastructure.	3.95	0.893	155
Road inaccessibility hinders SHS dissemination.	3.88	0.832	155

Shortage of working capital is a major problem of SHS companies	3.75	0.93	155
Government control on entrance of low-grade products in to the market is not efficient	3.73	1.053	155
It is difficult for private sectors to access loan for SHS business.	3.72	1.074	155
It is difficult for SHS companies to get a trained work force.	3.68	0.828	155

Source: Survey Data (2020)

According to the result of the descriptive statistics the first variable strongly agreed by respondents as challenge of SHS market is foreign exchange unavailability for the sector. The second variable is low-grade products entering into the market and the third is MFI service availing loan to end users.

4.3. Correlation Analysis

For a sample size less than 300, correlation between variables must be analyzed before factor extraction to screen the data (Field, 2013). Therefore, Pearson Correlation Analysis was conducted for the 25 variables identified in the conceptual frame work. Six variables with few numbers of significant value were omitted from further analysis. Multicollinearity ($r > 0.8$) and Singularity ($r = 1$) were check from the correlation values of R-matrix. Then the remaining 19 variables were analyzed by factor analysis. Correlation was again calculated for the 19 variables which can be referred at Appendix three.

4.4. Underlying factors in challenges of SHS market

Before proceeding to factor extraction first KMO test which is a measure of sampling adequacy must be checked. The KMO statistics varies between 0 and 1 (Field, 2013). It is recommended to accept values greater than 0.5 (Kaiser, 1974). As the KMO and Bartlett's Test is shown in the below table KMO has a value > 0.5 which is acceptable. Bartlett's test finds that the correlations, when taken collectively, are significant at the .00001 level. As it is shown in Appendix three, the correlation matrix determinant is .00008634 which is greater than .00001 (Hair, 2010). Thus, it is safe to consider that correlation matrix is significantly different from identity matrix.

Table 4.5. KMO and Bartlett's Test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.582
Bartlett's Test of Sphericity	Approx. Chi-Square	1373.945
	df	171
	Sig.	.000

Source: Survey Data (2020)

The factor extraction method selected was Principal Component Analysis based on Eigen value or Latent Root Criterion sets factors are considered significant when their Eigen Value > 1, this cut-off is reliable (Hair, 2010). Accordingly, 7 components had Eigen value over Kaiser's criterion of 1 and in combination explained 70.64% of the total variance.

Table 4.6. Factors Extracted

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.177	27.246	27.246	5.177	27.246	27.246
2	2.262	11.904	39.150	2.262	11.904	39.150
3	1.658	8.726	47.876	1.658	8.726	47.876
4	1.408	7.412	55.288	1.408	7.412	55.288
5	1.320	6.949	62.237	1.320	6.949	62.237
6	1.145	6.027	68.264	1.145	6.027	68.264
7	1.021	5.373	73.637	1.021	5.373	73.637
8	.939	4.943	78.580			
9	.737	3.880	82.461			
10	.608	3.201	85.662			
11	.553	2.910	88.572			
12	.537	2.825	91.397			
13	.387	2.039	93.436			
14	.326	1.716	95.152			
15	.322	1.693	96.845			
16	.200	1.051	97.896			
17	.186	.980	98.877			
18	.130	.686	99.563			
19	.083	.437	100.000			

Extraction Method: Principal Component Analysis.

Source: Survey Data (2020)

To improve the interpretability of factors rotation was conducted. As the factors are independent orthogonal Varimax rotation was selected. The result from the rotated factors are presented in the table 4.7. Factor 1 to Factor 7 has 4, 3, 4, 3, 2, 1 and 2 variables respectively. Factors with three variables and above with factor loading greater than 0.4 (Peters, 2016) are selected for further analysis, which are Factor 1, Factor 2, Factor 3 and Factor 4. The reliability test for each factor is assessed Cronbach's alpha and can be referred from section 4.3.1 and Appendix four.

Table 4.7. Rotated Matrix

Rotated Component Matrix[a]

	Component						
	1	2	3	4	5	6	7
Foreign exchange unavailability is the main hindering issue in SHS product importation.			.792				
Shortage of working capital is a major problem of SHS companies			.740				
Private sector financing schemes are few in SHS business.		.482	.409				
There exists ambiguity in Duty -free regulation implementation.							.793
The regulatory framework in SHS business is complex.							.730
MFIs services in availing loan to end-users are not adequate.					.754		
Local retailers have technical skill gap in delivering after sales services.		.756					
It is difficult for SHS companies to get a trained work force.				.441	.537		
Availability of SHS technical training is insufficient.						.828	
Road inaccessibility hinders SHS dissemination.				.792			
Introducing some of the new technologies is difficult due to limited telecom infrastructure.				.640			
Regions implement different policy and work procedures in SHS business.	.778						
Regulatory regional offices are not transparent on their working procedures.	.750						
Federal and regional government energy offices follow different work procedures.	.852						
Low-grade products are disrupting the SHS market.	.460	.626					
Distribution and promotion of SHS product to rural community is expensive.	.496	.508					
Consumers of SHS are willing but not able to purchase products.					.718		
Government control in entrance of low-grade products in to the market is not efficient.	.581					-.490	
It is difficult for private sectors to access loan for SHS business.			.710			.413	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 8 iterations.

Source: Survey Data (2020)

The factors extracted are interpreted

Factor 1: Government role on regulation and market control

Variables

- Regions implement different policy and work procedures in SHS business.
- Regulatory regional offices are not transparent on their working procedures.
- Federal and regional government energy offices follow different work procedures.
- Government control in entrance of low-grade products in to the market is not efficient.

Factor 2: Promotion, price and after sales service (Market related)

Variables

- Local retailers have technical skill gap in delivering after sales services.
- Low-grade products are disrupting the SHS market.
- Distribution and promotion of SHS product to rural community is expensive.

Factor 3: Access to finance and foreign currency

Variables

- Foreign exchange unavailability is the main hindering issue in SHS product importation.
- Shortage of working capital is a major problem of SHS companies
- Private sector financing schemes are few in SHS business.
- It is difficult for private sectors to access loan for SHS business

Factor 4: Infrastructure and skilled workforce

Variables

- It is difficult for SHS companies to get a trained work force.
- Road inaccessibility hinders SHS dissemination.
- Introducing some of the new technologies is difficult due to limited telecom infrastructure.

4.4.1. Reliability Test

The reliability test for each extracted factor has been analyzed. The acceptable cut-off point for Cronbach's alpha is 0.7; however, some suggest that value of 0.5 is sufficient at early stage of research (Field, 2013). The Cronbach's alpha of Factor 1, Factor 2, Factor 3 and Factor 4 are 0.79, 0.64, 0.71 and 0.64. Consequently, the Cronbach's alpha value of each factor is found to be reliable. The reliability table can be referred from appendix five.

4.5. Discussion of Results

4.5.1. Challenges of SHS market in the case of Private Importers in Addis Ababa

The underlying challenges of private companies importing SHS products are categorized in to four major factors.

Government role on regulation and market control: The challenges of SHS market in regards to government role is summarized in to regulation and market control. Complex and different regulatory system of regions is experienced by private sectors engaged in SHS Business. The policies to be practiced includes performance certification, importation procedures, taxes, quality issues, licensing and distribution. The difference in regulatory frame of regions creates difficulties for private companies to operate in multiple regions. Some regions have complex and bureaucratic procedure while other are transparent and supportive. This can be seen from the number of companies operating in a specific region. Lack of coordination between the federal offices and regional offices creates hassle for private companies. The other issue is government market control which is specifically for entrance of low-grade products into the country. Some of the low-grade products are coming through a legal channel using some loopholes of customs clearance procedures.

Promotion, price and after sales service: Regional energy bureaus and MFIs states that private companies are not delivering effective after sales service for end-users. However, the availability of local retailers and technicians in deep rural area is low which hinders the private company from delivering efficient after sales service. The main factor behind not addressing the markets in deep rural areas is the cost of distribution and promotion. The high cost of distribution and promotion to rural areas is added up on the end-user's price which makes the product expensive resulting high competition with low grade products. After passing all the

bottlenecks in finding forex, importing, tax, getting permit and promoting not being able to be competitive in these areas is which causes discouragement in the private importing companies.

Access to finance and foreign currency: As any other sectors in Ethiopian, private companies importing SHS face difficulties in accessing foreign currency. The SHS business is risky as its operation is in rural areas it has high cost and is exposed to political instability. These creates challenge for private companies to access loan. Also, there is no private sector financing scheme for SHS business section. In addition to these, the working capital of SHS business is high. Usually the consumers of SHS products are BoP. They don't have the ability to pay on cash and mostly use MFI loan services. Private companies are supposed to claim their payment from MFIs which might take time. These all issues create shortage of working capital for the private companies.

Infrastructure and skilled workforce: Road inaccessibility in rural and deep rural areas hinders the dissemination of SHS products. New business models like PAYGo requires telecom infrastructure. Unavailability of the infrastructure in these areas limits the private companies from implementing the model. The last issue is the availability of skilled workforce in the areas both as retailers and agents.

4.5.2. Practice of SHS market in the case of Private Importers in Addis Ababa

The thematic analysis of interviews of major stakeholders in the SHS market are summarized and presented in this section. The general market practice of private importer companies can be reviewed in to two major sections which are stakeholders' analysis and engagement with private importers and the second section is reflection of stakeholders on the participation of private importers.

4.5.2.1. Stakeholders' analysis and engagement with private importers

The engagement of private sector with the major stakeholders is presented in this section. As it can been seen from the figure 4.4 the SHS market stakeholder engagement is complex. The engagement with government stakeholder i.e. MoT, Customs, ESA… holds mandatory

procedures to be followed by private companies in order to be able to participate in SHS market.

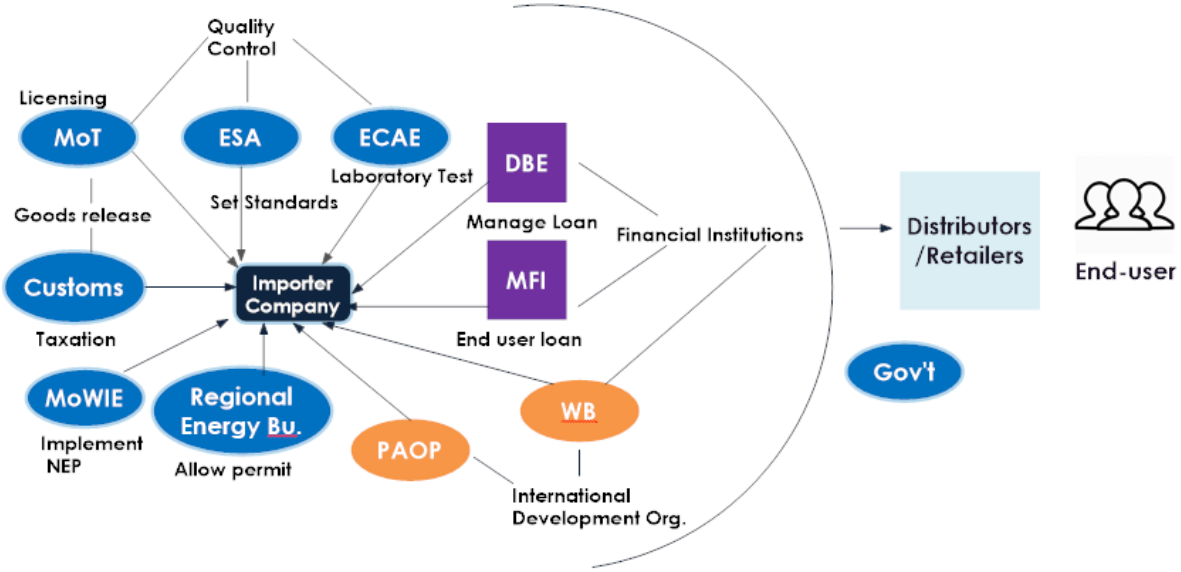

Figure 4.4. SHS market major Stakeholders overview

Source: Survey Data (2020)

Ministry of Trade

The Ministry of Trade is authorized by GoE to issue license for private importer companies. The requirement to acquire license for importation of SHS use to include Performance Certification from Ethiopian Energy Authority. Starting from 2018, this requirement has been lifted. As the information gathered from information desk of MoT the current major requirements to get license of import are Tin number, Bank statement, renewed ID card or passport and passport size photograph.

The Import and Export Goods Quality Control Directorate Director discussed that; MoT also has a mandate to control quality of products with mandatory standard. SHS products fall under the mandatory standard requirement category. MoT has 16 branch offices in Custom Centers to control the quality of products being imported in to the country. The Ministry provides information about the quality and certification requirements of SHS products before imported in to the country.

The MoT controls product quality through third party conformity certificate and if possible, send the products to ECAE for test locally. Products found low-grade are returned to country

of origin or destroyed locally. For SHS it has environmental impact to destroy the batteries as a result will be sent to country of origin.

The director elaborated that challenges of the MoT in relation to private sector includes information gap, importers without adequate skill of products, importing product using Diaspora account, and fully implementing PVOC (Pre-Export Verification Conformity) with third party conformity body.

Ministry of Water, Irrigation and Electricity

Ministry of Water, Irrigation and Electricity started that the Rural Electrification program and was able to effectively promote SHS for off-grid areas. In this program it was possible to distribute 50,000 units of SHS throughout the country. In 2010, the ministry has signed a Memorandum of Understanding with the Lighting Africa program. Based on this MoU, the Ministry of Finance and Economic Development directed that off-grid solar products with Lighting Africa, or other third-party certification, should be eligible for duty-free status.

The major role of MoWIE in SHS market is to provide support for the private sector. These supports include delivering support letters to regional energy offices, through USAID fund covering expenses of private companies for road promotion of SHS products for the past 3 years and through USAID fund providing guarantee support for private companies working capital loan.

The challenges of MoWIE in relation to private sector engagement are also indicated by the officer. The major challenges include private companies don't provide information on their place of work and quantity disseminated which is required for planning and assessing performance, private companies not being willing to operate in deep rural areas, private companies are not providing the aftersales services even if the mandatory warranty period is two years and private importer companies import combining certified products with uncertified products.

Customs Commission

Customs commission role in SHS market is controlling the release of imported products. The requirements for private sector to import products are import trade license as per customs law, fulfilling the standard of products, other declaration documents as per customs regulations

including invoice, packing list, bank permit etc. The duty-free products based on the customs tariff code are solar panels, torches and lanterns.

The director discussed that customs try to implement tariffs uniformly and regularly as it has international agreement on the classification of goods. Nevertheless, there might be a gap due to capacity limitation of personnel in customs branch offices. Customs is trying to circumvent this issue by equipping the officials and building their capacity. Any private importer dissatisfied with the branch office can submit their complaints to head office and will be resolved.

Challenges of the customs commission in relation to private companies importing SHS products are product knowhow both from customs personnel side and the private company importing the products. Although it is being provided by customs office, private companies are not requesting advice from customs ahead of importation.

Development Bank of Ethiopia

DBE manages the fund provided by WB, in providing loan to private sectors. The basic requirements for loan application are sector licenses (trade license, tax clearance…), business plan, proposing to import certified products, operating in off-grid market area, 25% equity contribution and providing collateral. On basis of confirming to these requirements DBE provides loan for private companies. The bank will process Letter of Credit for private importer company and provide six months grace period. The loan is to be repaid within two years with local currency.

The External Fund & Credit Management officer added that taking long time to qualify the criteria and changing product types are the main challenges DBE faces in providing loan for private importer companies. This loan program started in 2015 and it is still on-going. In total through this program, loans have been appraised for 35 private importer companies and 14 MFIs.

Ethiopian Standards Agency

Ethiopian Standards Agency sets the standards for the confirmatory assessment. SHS mandatory standard is developed up to 300W solar systems. MoT and ESA are in a process of implementing PVOC. PVOC is an agreement of GoE with an international ILAC (International

Laboratory Accreditation for Conformity) accredited laboratory like SGS and Intertek. These laboratories will test the products at the country of origin and ship it with Certificate of Conformity.

The technical team leader of ESA, also discussed currently quality control for imported SHS products is done by SGS certificate. But there are cases manufacturer tricking importer or even the importer not being genuine. Previously, up to 15W solar lanterns were tested locally which causes difficulties for private importers and the procedure is amended.

Ethiopian Conformity Assessment Enterprise

The Ethiopian Conformity Assessment Enterprise (ECAE) responsible to test the products quality in its laboratory. The laboratory is not capable of testing SHS products. The laboratory manager indicated that due to insufficient test equipment, lack of trained personnel, space and tests taking longer time it's difficult to undertake the SHS product test locally. There are two types of laboratory test: Market Check Test which might take up to 45 days and Quality Test Method which takes almost three months.

Testing SHS products locally was costly for private importers. There was a consignment fee of 0.05% of shipment value, customs demurrage fee and payment for test which can cumulatively came up to 200,000ETB per shipment. Currently, the goods are released based on SGS certificate as it was impossible to test all the shipments.

Ethiopian Solar Energy Development Association

As per the President, Ethiopian Solar Energy Development Association was first established as an NGO named Solar Energy Development Association. Now, it's operating as trade association with a member of 20 private importer companies. Anyone who is in solar business can be a member of the association. There are three main pillars of the association: Providing information, Policy advocacy and creating B2B networks.

The association was successful in granting the WB fund to be utilized as a loan for private SHS importing companies, develops duty free proposals for the GoE for SHS products, to get the local test requirement lifted, policy lobbying and providing training to its members. The president added that the major challenge of ESEDA is resource of finance and manpower.

Microfinance Institutions

From MFI engaged on SHS end-user financing service, PEACE MFI was interviewed for this research. MFIs avail end-user financing mechanism. MFIs have access to the loan facility of DBE so that they will allot loan to end-users. The major MFIs have branch and sub-branch networks in all Woredas and most of the Kebeles in the region they are operating. The MFI will sign MoU with private importers of SHS and provide loan for end-users. Up to now, PEACE MFI was able to provide loan for 5,000 units of SHS. The manager reflected that the loan repayment for SHS products is even better that other credits lines.

The challenges of MFIS operating with private importers by providing end-user financing are more or less similar. The main challenge faced in operating with private companies is that they are not providing the aftersales service as promised. The next issue that was pointed out is private importer companies are not willing to operate in deep rural areas.

World Bank

The WB began operating in Ethiopia starting from 2010 in supporting the private sector to create markets for SHS products. Stating from 2015 it provides fund to give access to finance for quality products dissemination. The fund is managed by DBE. WB groups through DBE provides loan for private importing companies in hard currency. The fund is revolving and the loan repayment is in local currency. The returned loan will be utilized to avail loan for MFIs.

The first-round fund by WB was 20 million USD which was completed on 2017 and the second-round financing started with 20 million USD which is still on-going. The WB support also includes basic business and technical training for retailers and MFIs entering to SHS market. In addition, WB in collaboration with MoWIE, regional Energy Bureaus and other stakeholders undertakes periodical market intelligence report. These reports assess the demands in different regions, development of distribution channels, customer awareness and market trend. The Lighting Ethiopia program of World Bank was started in 2015 and completed in 2019 achieving its objective of electrifying 12 million people through quality verified products.

Power Africa

Power Africa Off-grid Program (PAOP) is a four years contract program of USAID and RTI. According to the Country Advisor the project is provides five main supports for private sectors;

Policy and regulatory smoothening, market intelligence, enhancing business performance, access to finance and integrate the agriculture and energy sector. The program started in 2019 and it's at its earliest stage to evaluate the impacts. Through this time PAOP, was able to provide consultancy service for private importer companies in developing proposals for fund applications and publish market intelligence report.

4.5.2.2. Reflection of stakeholders

ESEDA's president points out that the role of private companies in SHS product distribution is very high and undeniable. Due to competition in price and quality the product diversity is increasing from time to time. In the case of ESEDA members, all the members are importing LG certified products which are considerably quality products. The MoWIE also tried to disseminate SHS products but the private sector was able to provide more that 90% SHS products in the market.

This reflection is shared by Power Africa Country Advisor. Participation of the private companies in availing SHS products is 100%, because currently there is no other sector providing the products. NGOs deliver solar lanterns to refugee camps but the products are still purchased locally from private companies.

The MoT official indicated that the participation of private companies in SHS market is fine but compared to the demand of the market it's not satisfactory. With the appropriate support of GoE a lot can be achieved. PEACE MFI has the same opinion. The number of private importer companies in SHS market is increasing also the quantity of import but still with the growing market demand it is not adequate.

Further DBE officer discoursed that private companies are actively participating in SHS business. Nevertheless, as the demand of the market new entrants are not seen and the participation of existing companies is mainly in peri-urban areas.

In conclusion, the participation of private importer companies of SHS is promissory. Most of the SHS importing companies can be considered as social enterprises. With all the complex structure and challenges of the market they are serving the end-user even if it is no adequate enough specially in deep rural areas.

4.5.3. Opportunities of SHS market in the case of Private Importers in Addis Ababa

The opportunities available for SHS importing companies includes:

- Due to the GoE National Electrification Program and Green economy policy the solar sector is given attention by the Government.
- GoE has planned to electrify 7 million HH through SHS which creates a huge market to be addressed by private companies.
- The large off-grid population of Ethiopia results large potential market for SHS products.
- The market demand is not fully served, there is a huge demand for SHS product especially in deep rural areas.
- Power fluctuation in urban areas also creates demand for SHS product.
- Demand of consumers is growing to the larger systems of SHS.
- Availability of loan from DBE in Foreign currency gives better chance of access to Forex than other sectors.
- Availability of grants and funds from different international organizations for the private sector.
- New business models like (PAY-Go) are emerging in the sector which eases loan recollection and encourages MFIs to provide end-user financing in vast scale.
- Mobile money companies are emerging in Ethiopia to implement technologies like PAYGo platforms.
- The opportunities in SHS sector are increasing from time to time globally due to environmental protection and promotion of renewable energy.
- New technologies and new product developments are emerging.
- It is one of the few sectors with available end-user financing
- Duty tax exemptions policy for the basic SHS products imported in to Ethiopia.

Chapter Five: Summary, Conclusion and Recommendation

5.1. Summary

SHS products has vast benefit socially, environmental and in health impact. The GOE has set incentives in allowing SHS to be imported duty free. The regional Energy Agencies also give support in promotion and distributions of the products. International organizations like World Bank and Power Africa also give financial and technical support schemes for private sectors. Regardless of the supports and incentives private companies are not aggressively participating in SHS business. Currently, only twenty certified solar importers are member of the Ethiopian Solar Development Association (ESEDA).

Most companies engage in the business as one area of their operation while the others are not utilizing their full capacity. From the list of SHS suppliers acknowledged by World Bank 99% are importer while the rest are assemblers and semi-assemblers. As the main players for availing SHS are private importer companies i.e. private sectors, identifying their practice, opportunities, challenges and proposing solutions is vital.

Accordingly, based on different analysis conducted by the researcher the following major findings were found.

- The SHS market involves different stakeholders more than other sectors. It has a complex structure and procedures. From the thematic analysis of ten major stakeholders' interview, it is concluded that the participation of private importer companies in SHS market is good but not adequate with the demand of the market.
- From the Exploratory Factory Analysis Conducted; four underlying factors: Government role on regulation and market control, Promotion, price and after sales service, Access to finance and foreign currency and Infrastructure and skilled workforce were extracted as the major challenges of private companies engaged on SHS market.
- The opportunities of SHS market can be generalizes as market related (existing demand and growing demand for the product), government support (NEP and duty tax exemption), technology development (product), new emerging business models (PayGo) and internationally available financial supports (grants and funds).

5.2. Conclusion

This study was undertaken to assess the SHS market practices, opportunities and challenges in the case of private importer companies in Addis Ababa. To achieve the set objectives the research deployed different analysis tools.

The first objective which is to assess the actual practice of SHS market was achieved through thematically reviewing and presenting interview of major stake holders. The practice of SHS market is presented in terms of stakeholders' engagement and participation of private companies in the sector. The stakeholder overview shows that the SHS market has complex structure. The participation of private companies is not adequate for the market demand.

The Second objective, identifying opportunities is achieved through data collection from stakeholder and reviewing past practices. It is concluded that the SHS market is very attractive and with vast opportunities to tap. The opportunities are available in national and international level.

The third objective which is to identify underlying challenges was accomplished by qualitative analysis through Exploratory Factor Analysis. For the variables listed on the conceptual frame work the Principal Component Analysis factor extraction and rotation results four underlying components as challenges of the SHS market. i.e. Government role on regulation and market control, Promotion, price and after sales service, Access to finance and foreign currency and Infrastructure and skilled workforce.

5.3. Recommendation

Private companies

- The private sector needs to be mainly engaged on assembly and manufacturing of SHS which creates job opportunity and minimizes the hassle for accessing foreign currency.
- By aggressively utilize opportunities available for the sector the private companies can overcome shortage of working capital.
- Undertake market study and operate in underserved regions to satisfy the market demand.

- Collaboration within the sector through ESEDA to resolve common challenges of the business and lobbying the improvement of government regulations.

GoE

- Create harmonization between the Federal and Regional Energy offices to ease the bureaucratic procedures.
- Providing incentives for private companies to engage in manufacturing and assembling rather that importing to minimize the challenge of shortage of foreign currency.
- Initiate Foreign Direct Investments on SHS sector to enhance knowledge transfer to local technicians operating as retailers and agents.
- Enforce market control mechanism to minimize entry of low-grade products into the market.
- Providing all the information of the requirements and deliver the licensing procedures in one hub for private companies.

ESEDA

- Creating digital platforms for companies to access different information and communicate upcoming opportunities.
- Recruiting and onboarding more members to enhance financial capacity and effectively address policy advocacy.
- Explore and utilize supports available from international organizations for trade associations in solar sector.

International Organizations

- Organize skill development programs to enhance the local technician.
- Design projects with long lasting impacts (Job creation, knowledge transfer etc.).

5.4. Future Research

This research has wide room for further researches. These includes:

- ✓ Value chain analysis of SHS market from import to point of sales.
- ✓ Assessing the market gap between the demand and supply of SHS products.
- ✓ Assessing the SHS market progress and private companies' participation with in specific regions.
- ✓ Assess the impact of WB fund managed by DBE in the SHS market.
- ✓ Case study on the challenges and achievements of Ethiopian Solar Energy Development Association.

References

Andrew, S., Leah, W., Jesper, H. & Long, S. (2017). How Solar Household System Contribute to Resilience.

Andy Field. (2013). Discovering Statistics using IBM SPSS Statistics. 4th ed. P. 807-840

Best, J. W. & Kahn, J. V. (2003). Research in Education. 9th ed. P.

Bhatia, M. and Angelou, N. (2015) Beyond connections: Energy access redefined Energy Sector Management Assistance Program & Sustainable Energy for All Conceptual Report.

CDNK. (2017). A Climate for solar power: Solutions for Ethiopia's Energy Poverty.

C.R Kothari (2004) Research Methodology New Age International (P) Ltd. P.55

Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to non-normality and specification error in confirmatory factor analysis. Psychological Methods P.1, 26

Dawit Hailu. (2010). Ethiopian Energy Systems – Potentials, Opportunities and Sustainable Utilization.

Delberg Advisors & Lighting Global. (2018). Off-Grid Solar Market Trend Report.

Engida Mekuria. (2016). Challenges and Prospects of Solar Home System Dissemination in Rural Parts of Ethiopia: The Case of Solar Energy Foundation.

Ethio Resource Group. (2012).Solar energy vision for Ethiopia: Opportunities for creating a photovoltaic industry in Ethiopia.

Ethiopian Electric Power. (2015). The Ethiopian Energy Sector – Investment Opportunity: UK-Ethiopia Trade and Investment Forum.

Ethiopian Standards Agency. (2017). Requirements for DC Solar Home System Kit: ES6087.

Fatih ORÇAN. (2018). Exploratory and Confirmatory Factor Analysis.

Fanabc, (2019 last update). Retrieved from,

https://fanabc.com/english/2019/03/ethiopia-launches-2nd-national-electrification-program/

GOGLA & Lighting Global. (2017). Global Off-Grid Market Report: Semi-Annual Sales and Impact.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate data analysis (7thed.). Upper Saddle River, NJ: Pearson Prentice Hall. P.107-145

Hamza Alshenqeeti. (2014). Interviewing as a Data Collection Method.

Hana Girardeau. (2017). Household Solar Adoption: A Systematic Review.

Henery F.Kaiser. (1974). An index of Factorial Simplicity.

IRENA [International Renewable Energy Agency]. (2012). Renewable Energy Technologies: Cost Analysis Series.

IRENA [International Renewable Energy Agency]. (2018). Off-Grid Renewable Energy Solutions.

James Baglin (2014). Improving Your Exploratory Factor Analysis for Ordinal Data: A Demonstration Using Factor.

Japan International Cooperation Agency. (2010). Energy Policy of Ethiopia: Country Paper.

Jon A. & Stanley, 2009:3 Question and Questionnaire Design

Joseph Amankwah-Amoah. (2015). Solar energy in sub-Saharan Africa: The challenges and opportunities of technological leapfrogging.

Laura D. Goodwin & Nancy L. Leech (2006). Understanding Correlation.

Lighting Africa. (2020 last update). Retrieved from,

https://www.lightingafrica.org/country/ethiopia

Lighting Global. (2019 last update). Retrieved from,

https://www.lightingglobal.org/quality-assurance-program

Melessaw Shanko. (2009). Ethiopia's Solar Energy Market.

Ministry of Water Irrigation Energy. (2013). Ethiopian National Energy Policy (2nd Draft).

Ministry of Water Irrigation Energy, (2017 last update). Retrieved from,

https://mowie.gov.et/rural-electrification-project

Ognen Stojanovski, Mark Thurber & FrankWolak. (2017). Rural energy access through solar home systems: Use patterns and opportunities for improvement.

Overseas Development Institute. (2016). Accelerating Access to Electricity in Africa with Off-Grid Solar.

Peter Samules. (2016). Advice on Exploratory Factor Analysis.

Power Africa in Ethiopia. (2016). Ethiopia Country Fact Sheet.

Power Africa. (2019). Off-grid solar market assessment of Ethiopia.

Ranjit Kumar. (2011). Research Methodology. P.58, 65 & 168

Sabrina Yeasmin & Khan F. Rahman (2012). 'Triangulation' Research Method as the Tool of Social Science Research

Sebsibe Woldeyes. (2016). Assessment of Stand-Alone Solar Photovoltaic Power Systems Performance and Reliability for Rural Electrification in Ethiopia.

SNV. (2016). Off-grid Rural Electrification in Ethiopia.

TERI (2014). "National Workshop on Dissemination of Solar Energy Technologies in Ethiopia: Successes, Challenges, and Opportunities".

The Energy and Resource Institute Africa Program. (2015). Dissemination of Solar Energy Technologies in Ethiopia: National Workshop.

World Bank. (2013). Ethiopia: Market Intelligence.

World Bank. (2017). Report on Ethiopian Electrification Program.

World Bank. (2019 last update). Retrieved from,

https://www.worldbank.org/en/country/ethiopia/overview

Appendix

Appendix One: Questionnaire

Questionnaire for Solar Home System Market practice and challenges: the case of private importer companies in Addis Ababa

Informed Consent

Greetings! My name is Loza Tamirat and I am a graduate student of Masters of Business Administration at Jimma University. I am conducting a research on the title "Solar Home System Market practice, opportunities and challenges: the case of private importer companies in Addis Ababa" for partial fulfillment of the requirements for the Award of the Degree of Masters of Business Administration. Accordingly, this questionnaire is to be used as one of data collection tool.

To this purpose, I politely request you to participate in this research. Participation in this study is voluntary and I hope that you will participate in this study.

Thank you for participating in this research. All of the responses will be anonymous and confidential. The data is used only for research purpose. Therefore, honest and genuine responses are encouraged.

The questionnaire will take about 30 minutes to complete.

ID._____

Part I. General Questions

Please check the one that applies or specify your response

Q1. Gender

1. Male ☐ 2. Female ☐

Q2. Age

1. 25 – 34
2. 35 – 49
3. 50 – 64
4. 65 and above

Q3. Education level

1. TVET/Diploma

2. Bachelor

3. Masters

4. PHD

5. Other, Please specify _____

Q4. Profession

1. Procurement and Logistics

2. Accountant, Finance

3. Marketing, Sales or Business Development

4. Operation Manger

5. General Manger /Owner

6. Other Please, specify _____

Q5. Job level

1. Officer

2. Supervisor

3. Team Leader

4. Manager/Head

5. Other Please, specify _____

Q6. How many years of experience do you have on Solar Home System market?

1. 1 -3 years
2. 4 - 6 years
3. 7 - 9 years
4. 10 and above years

Q7. In which city administrations and regions is your company distributing SHS products?

1. Addis Ababa
2. Dire Dawa
3. Oromia
4. Amhara
5. Tigray
6. SNNPRs
7. Somali

8. Benishangul-Gumuz
9. Gambella
10. Harari
11. Afar
12. All regions in Ethiopia

Q8. Is your company a member of the Ethiopian Solar Energy Development Association?

1. Yes ☐ 2. No ☐

Part II. SHS Market

Q9. Is SHS product the only product line in your company?

1. Yes ☐

2. No ☐

Q10. How do you rate profitability of SHS products in comparison to the other product lines?

1. Nominal
2. Average
3. Profitable
4. Very profitable
5. Extremely profitable

Q11. Based on your experience how do you evaluate the SHS market in terms of market competition?

1. Low

2. Normal

3. Competitive

4. Highly Competitive

5. Extremely Competitive

Please check the choice which applies most

Part II

Access to finance	1.Strongly disagree	2.Disagree	3. Neutral	4. Agree	5.Strongly agree
Q12. Foreign exchange unavailability is the main hindering issue in SHS product importation.	☐	☐	☐	☐	☐
Q13. Shortage of working capital is a major problem of SHS companies.	☐	☐	☐	☐	☐
Q14. It is difficult for private sectors to access loan for SHS business.	☐	☐	☐	☐	☐
Q15. Private sector financing schemes are few in SHS business.	☐	☐	☐	☐	☐

Policy and Regulation	1.Strongly disagree	2.Disagree	3. Neutral	4. Agree	5.Strongly agree
Q16. Tax exemption in SHS is not clearly communicated to the private sector.	☐	☐	☐	☐	☐
Q17. Tariff regulations on SHS are not evenly practiced by custom offices.	☐	☐	☐	☐	☐
Q18. There exists ambiguity in Duty - free regulation implementation.	☐	☐	☐	☐	☐
Q19. The regulatory framework in SHS business is complex.	☐	☐	☐	☐	☐

Consumer capabilities	1.Strongly disagree	2.Disagree	3. Neutral	4. Agree	5.Strongly agree
Q20. Consumers of SHS are willing but not able to purchase products.	☐	☐	☐	☐	☐
Q21. Consumers' awareness is low in regards to identifying LG certified products.	☐	☐	☐	☐	☐
Q22. MFIs services in availing loan to end-users are not adequate.	☐	☐	☐	☐	☐

Local Technical skill	1.Strongly disagree	2.Disagree	3. Neutral	4. Agree	5.Strongly agree
Q23. Local retailers have technical skill gap in delivering after sales services.	☐	☐	☐	☐	☐
Q24. It is difficult for SHS companies to get a trained work force.	☐	☐	☐	☐	☐
Q25. Availability of SHS technical training is insufficient.	☐	☐	☐	☐	☐

Infrastructure	1.Strongly disagree	2.Disagree	3. Neutral	4. Agree	5.Strongly agree
Q26. Road inaccessibility hinders SHS dissemination.	☐	☐	☐	☐	☐
Q27. Introducing some of the new technologies is difficult due to limited telecom infrastructure.	☐	☐	☐	☐	☐
Q28. Consumer follow-up is difficult due to road infrastructure.	☐	☐	☐	☐	☐

Government & Private Sector relation	1.Strongly disagree	2.Disagree	3. Neutral	4. Agree	5.Strongly agree
Q29. Regions implement different policy and work procedures in SHS business.	☐	☐	☐	☐	☐
Q30. The Solar Association is not smoothing the harmonization of private and public sector.	☐	☐	☐	☐	☐
Q31. Regulatory regional offices are not transparent on their working procedures.	☐	☐	☐	☐	☐
Q32. Federal and regional government energy offices follow different work procedures.	☐	☐	☐	☐	☐

Marketing and promotion	1.Strongly disagree	2.Disagree	3. Neutral	4. Agree	5.Strongly agree
Q33. Low-grade products are disrupting the SHS market.	☐	☐	☐	☐	☐
Q34. Distribution and promotion of SHS product to rural community is expensive.	☐	☐	☐	☐	☐
Q35. Government control on entrance of low-grade products in to the market is low.	☐	☐	☐	☐	☐
Q36. There are few local retailers available in the market.	☐	☐	☐	☐	☐

Thank you for your time.

Appendix Two: Interview Questions

Interview Questions

Consent

I ……voluntary agree to participate in this research study. The main objective of the study has been discussed to me verbally. I understand that I can with draw from the interview at any time. I understand that for the quality of work the interview will be recorded electronically. However, the vocal interview as well the transcribed data will be kept confidentially.

1. Ministry of Water, Irrigation and Energy

1. What supports does the MoWIE give for private companies engaged in Solar Home System business?
2. How do you evaluate the participation of private sectors in respect to the National Electrification Program plan in availing Solar Home System?
3. What is the role of MoWIE in Solar Home System market in respect to engaging with private companies?
4. What are the main challenges faced by the Private companies in distributing Solar Home System?
5. What are the main challenges faced by MoWIE in availing Solar Home System through private sector?
6. Is there a licensing procedure for Private companies, to import and disseminate Solar Home System? If yes, what is the procedure?
7. What are the upcoming opportunities for Private sectors engaged in supplying Solar Home System?

2. Ministry of Trade

1. What are the roles of MoT in in Solar Home System market in respect to engaging with private companies?
2. Is there a licensing procedure for Private companies, to import and disseminate Solar Home System? If yes, what is the procedure?
3. What supports does MoT give for private companies engaged in Solar Home System business?

4. How do you evaluate the participation of private sectors in respect to availing Solar Home System?
5. What are the main challenges faced by the Private companies in distributing Solar Home System?
6. How MoT does control the SHS quality being imported?
7. What are the main challenges faced by MoWIE in availing Solar Home System through private sector?
8. What are the upcoming opportunities for Private sectors engaged in supplying Solar Home System?

3. Custom Commission

1. What are the requirements for custom clearing to import Solar Home System?
2. Which products are duty free and what are the procedures to import duty free?
3. Is the tariff regulation practiced regularly and uniformly?
4. What are the major challenges of private sectors in importing and distributing Solar Home System?
5. What are the challenges of custom bureau in relation to monitoring and controlling SHS importation?
6. What are the opportunities available for Private sectors engaged in supplying Solar Home System Products?
7. How does the office control low-grade products in the market?

4. Development Bank of Ethiopia

1. What is the role of DBE in allocating loan for private importer companies to import SHS?
2. What support does DBE provide for private importer companies?
3. What are the requirements to access loan from DBE?
4. What are the challenges of DBE in availing loan for private importer companies?
5. What are the challenges of private importer companies in disseminating SHS products?
6. How DBE does assures the quality of imported products through the loan scheme?
7. What are the opportunities available for Private sectors engaged in supplying Solar Home System Products

5. Ethiopian Standards Agency

1. How ESA does controls the quality of SHS products being imported in to the Country?

2. Are there standards set for SHS products?
3. What are the challenges of ESA in quality assurance of SHS products?
4. How does the SHS products get release from customs?

6. Ethiopian Conformity Assessment Enterprise

1. What is the role of ECAE in quality testing of SHS products?
2. Which category of SHS got test in ECAE?
3. What are the challenges of ECAE in testing SHS products
4. What are the procedures for SHS testing?

7. Ethiopian Solar Energy Development Association

1. What is ESEDA? Who can be a member? How many members do you have?
2. What supports does ESEDA gives to its members?
3. What achievements does ESEDA has in supporting private companies?
4. How do you evaluate the participation of private sectors in availing Solar Home System?
5. . What are the main challenges faced by the Private companies in distributing Solar Home System?
6. What are the main challenges of ESEDA?
7. What are the upcoming opportunities for Private sectors engaged in supplying Solar Home System?

8. Peace MFI

1. What are the requirements for signing of MoU with private sectors to distribute SHS?
2. What are the major challenges faced by MFIs in allotting loan for SHS products?
3. What are the challenges of private companies engaged in SHS business?
4. How do you evaluate the participation of private companies in availing SHS
5. How do you control the quality of products being distributed?
6. How do you evaluate loan return for SHS products?
7. What are the opportunities for private sectors in SHS market?

9. World Bank - IFC (Lighting Africa-Ethiopia)

1. What is Lighting Africa? What supports does it provide for private companies engaged in SHS business?
2. What impact does Lighting Africa (Ethiopia) creates on SHS market up to date?
3. How do you evaluate the participation of private companies in availing SHS?

4. What are the main challenges faced by private companies in importing and distributing SHS?
5. What are the opportunities available for private companies engaged in SHS business?

10. World Bank - IFC (Lighting Africa-Ethiopia)

1. What is Lighting Africa? What supports does it provide for private companies engaged in SHS business?
2. What impact does Lighting Africa (Ethiopia) creates on SHS market up to date?
3. How do you evaluate the participation of private companies in availing SHS?
4. What are the main challenges faced by private companies in importing and distributing SHS?
5. What are the opportunities available for private companies engaged in SHS business?

Appendix Three: Correlation Matrix

Correlation Matrix[a]

		Q12	Q13	Q15	Q17	Q19	Q22	Q25	Q26	Q27	Q28	Q29	Q31	Q33	Q34	Q35	Q36	Q20	Q37	Q14
Correlation	Q12	1.000	.332	.311	.150	-.198	-.066	.107	.010	0.000	-.227	-.024	-.243	-.215	-.286	-.035	-.147	.156	-.123	.441
	Q13	.332	1.000	.297	.165	.169	.167	.109	.284	.174	.228	.151	.252	.085	.064	-.147	.327	.246	.195	.396
	Q15	.311	.297	1.000	.395	.230	.362	.275	.126	.331	.140	.229	.088	.186	.150	.360	.445	.239	.069	.568
	Q17	.150	.165	.395	1.000	.318	.114	.157	.091	.082	.159	.177	.152	.180	.023	.168	.276	.124	.063	.179
	Q19	-.198	.169	.230	.318	1.000	-.069	.140	.150	.230	.294	.197	.401	.376	.237	.094	.151	.186	.088	.208
	Q22	-.066	.167	.362	.114	-.069	1.000	.257	-.087	.169	.159	.229	.123	.206	.085	.195	.335	.383	.220	.067
	Q25	.107	.109	.275	.157	.140	.257	1.000	.336	.041	.082	.358	.210	.140	.211	.384	.338	.146	.259	.066
	Q26	.010	.284	.126	.091	.150	-.087	.336	1.000	.414	.320	.315	.195	.325	.257	.140	.309	-.131	.140	.344
	Q27	0.000	.174	.331	.082	.230	.169	.041	.414	1.000	.227	.111	.452	.381	.223	.218	.200	.219	-.094	.394
	Q28	-.227	.228	.140	.159	.294	.159	.082	.320	.227	1.000	.465	.301	.334	.244	-.099	.328	.263	.192	.157
	Q29	-.024	.151	.229	.177	.197	.229	.358	.315	.111	.465	1.000	.391	.245	.215	.126	.299	.276	.360	.230

		Q31	Q33	Q34	Q35	Q36	Q20	Q37	Q14
	Q31	-.243	.252	.088	.152	.401	.123	.210	.195
	Q33	-.215	.085	.186	.180	.376	.206	.140	.325
	Q34	-.286	.064	.150	.023	.237	.085	.211	.257
	Q35	-.035	-.147	.360	.168	.094	.195	.384	.140
	Q36	-.147	.327	.445	.276	.151	.335	.338	.309
	Q20	.156	.246	.239	.124	.186	.383	.146	-.131
	Q37	-.123	.195	.069	.063	.088	.220	.259	.140
	Q14	.441	.396	.568	.179	.208	.067	.066	.344
Sig. (1-tailed)	Q12	.000	.000	.000	.031	.007	.206	.092	.451
	Q13	.000	.000	.000	.020	.018	.019	.089	.000
	Q15	.000	.000	.000	.000	.002	.000	.000	.059
	Q17	.031	.020	.000	.000	.000	.079	.026	.129
	Q19	.007	.018	.002	.000	.000	.196	.041	.031

		Q45	Q30	Q39	Q10	Q55	Q54	Q32	Q41	Q44	Q43	Q15
	Q31	.452	.301	.391	1.000	.555	.543	.329	.413	.443	.435	.154
	Q33	.381	.334	.245	.555	1.000	.710	.227	.477	.235	.368	.268
	Q34	.223	.244	.215	.543	.710	1.000	.521	.501	.229	.404	.181
	Q35	.218	-.099	.126	.329	.227	.521	1.000	.419	.234	.302	.152
	Q36	.200	.328	.299	.413	.477	.501	.419	1.000	.210	.437	.339
	Q20	.219	.263	.276	.443	.235	.229	.234	.210	1.000	.175	.258
	Q37	-.094	.192	.360	.435	.368	.404	.302	.437	.175	1.000	.046
	Q14	.394	.157	.230	.154	.268	.181	.152	.339	.258	.046	1.000
Sig. (1-tailed)	Q12	.500	.002	.382	.001	.004	.000	.333	.034	.026	.063	.000
	Q13	.015	.002	.031	.001	.147	.215	.034	.000	.001	.007	.000
	Q15	.000	.041	.002	.139	.010	.032	.000	.000	.001	.195	.000
	Q17	.155	.024	.014	.030	.013	.388	.018	.000	.063	.220	.013
	Q19	.002	.000	.007	.000	.000	.002	.122	.030	.010	.137	.005

Q22	.206	.019	.000	.079	.196		.001	.141	.018	.024	.002	.064	.005	.146	.008	.000	.000	.003	.203
Q25	.092	.089	.000	.026	.041	.001		.000	.305	.155	.000	.004	.041	.004	.000	.000	.035	.001	.208
Q26	.451	.000	.059	.129	.031	.141	.000		.000	.000	.000	.007	.000	.001	.041	.000	.052	.042	.000
Q27	.500	.015	.000	.155	.002	.018	.305	.000		.002	.085	.000	.000	.003	.003	.006	.003	.122	.000
Q28	.002	.002	.041	.024	.000	.024	.155	.000	.002		.000	.000	.000	.001	.110	.000	.000	.008	.026
Q29	.382	.031	.002	.014	.007	.002	.000	.000	.085	.000		.000	.001	.004	.060	.000	.000	.000	.002
Q31	.001	.001	.139	.030	.000	.064	.004	.007	.000	.000	.000		.000	.000	.000	.000	.000	.000	.028
Q33	.004	.147	.010	.013	.000	.005	.041	.000	.000	.000	.001	.000		.000	.002	.000	.002	.000	.000
Q34	.000	.215	.032	.388	.002	.146	.004	.001	.003	.001	.004	.000	.000		.000	.000	.002	.000	.012
Q35	.333	.034	.000	.018	.122	.008	.000	.041	.003	.110	.060	.000	.002	.000		.000	.002	.000	.030
Q36	.034	.000	.000	.000	.030	.000	.000	.000	.006	.000	.000	.000	.000	.000	.000		.004	.000	.000
Q20	.026	.001	.001	.063	.010	.000	.035	.052	.003	.000	.000	.000	.002	.002	.002	.004		.015	.001
Q37	.063	.007	.195	.220	.137	.003	.001	.042	.122	.008	.000	.000	.000	.000	.000	.000	.015		.283
Q14	.000	.000	.000	.013	.005	.203	.208	.000	.000	.026	.002	.028	.000	.012	.030	.000	.001	.283	

a. Determinant = 8.634E-5

Where:

Q12 Foreign exchange unavailability is the main hindering issue in SHS product importation.

Q13 Shortage of working capital is a major problem of SHS companies

Q14 It is difficult for private sectors to access loan for SHS business.

Q15 Private sector financing schemes are few in SHS business.

Q17 There exists ambiguity in Duty -free regulation implementation.

Q19 The regulatory framework in SHS business is complex.

Q22 MFIs services in availing loan to end-users are not adequate.

Q25 Local retailers have technical skill gap in delivering after sales services.

Q26 It is difficult for SHS companies to get a trained work force.

Q27 Availability of SHS technical training is insufficient.

Q28 Road inaccessibility hinders SHS dissemination.

Q29 Introducing some of the new technologies is difficult due to limited telecom infrastructure.

Q31 Regions implement different policy and work procedures in SHS business.

Q33 Regulatory regional offices are not transparent on their working procedures.

Q34 Federal and regional government energy offices follow different work procedures.

Q35 Low-grade products are disrupting the SHS market.

Q36 Distribution and promotion of SHS product to rural community is expensive.

Q20 Consumers of SHS are willing but not able to purchase products.

Q37 There are few local retailers available in the market.

Appendix Four: Normality test

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Foreign exchange unavailability is the main hindering issue in SHS product importation.	155	2	5	4.69	.650	-2.460	.195	6.363	.387
Shortage of working capital is a major problem of SHS companies	155	2	5	3.75	.930	-.458	.195	-.573	.387
Private sector financing schemes are few in SHS business.	155	2	5	4.12	.789	-.852	.195	.697	.387
There exists ambiguity in Duty -free regulation implementation.	155	2	5	4.14	.806	-.779	.195	.286	.387
The regulatory framework in SHS business is complex.	155	2	5	4.05	.900	-.523	.195	-.691	.387
MFIs services in availing loan to end-users are not adequate.	155	3	5	4.16	.639	-.154	.195	-.595	.387
Local retailers have technical skill gap in delivering after sales services.	155	1	5	3.97	1.093	-1.249	.195	1.039	.387
It is difficult for SHS companies to get a trained work force.	155	2	5	3.68	.828	-.673	.195	-.027	.387
Availability of SHS technical training is insufficient.	155	2	5	4.00	.721	-.843	.195	1.344	.387

Road inaccessibility hinders SHS dissemination.	155	2	5	3.88	.832	-.519	.195	-.118	.387
Introducing some of the new technologies is difficult due to limited telecom infrastructure.	155	1	5	3.95	.893	-.966	.195	1.479	.387
Regions implement different policy and work procedures in SHS business.	155	1	5	4.08	.997	-1.113	.195	.934	.387
Regulatory regional offices are not transparent on their working procedures.	155	2	5	4.13	.827	-.803	.195	.242	.387
Federal and regional government energy offices follow different work procedures.	155	1	5	3.98	1.010	-1.342	.195	1.754	.387
Low-grade products are disrupting the SHS market.	155	1	5	4.61	.826	-2.660	.195	7.478	.387
Distribution and promotion of SHS product to rural community is expensive.	155	2	5	4.15	.854	-1.001	.195	.629	.387
Consumers of SHS are willing but not able to purchase products.	155	2	5	4.07	.988	-.881	.195	-.228	.387
Government control on entrance of low-grade products in to the market is not efficient.	155	1	5	3.73	1.053	-.926	.195	.241	.387
It is difficult for private sectors to access loan for SHS business.	155	2	5	3.72	1.074	-.273	.195	-1.185	.387
Valid N (listwise)	155								

Appendix Five: Reliability Test

Factor 1

Reliability Statistics

Cronbach's Alpha	N of Items
.794	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Regions implement different policy and work procedures in SHS business.	11.84	5.500	.625	.733
Regulatory regional offices are not transparent on their working procedures.	11.79	5.987	.678	.718
Federal and regional government energy offices follow different work procedures.	11.94	5.256	.678	.705
Government control on entrance of low-grade products in to the market is not efficient.	12.19	5.893	.472	.813

Factor 2

Reliability Statistics

Cronbach's Alpha	N of Items
.636	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Local retailers have technical skill gap in delivering after sales services.	8.76	2.001	.429	.590
Low-grade products are disrupting the SHS market.	8.13	2.555	.486	.494
Distribution and promotion of SHS product to rural community is expensive.	8.58	2.570	.446	.540

Factor 3

Reliability Statistics

Cronbach's Alpha	N of Items
.713	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Foreign exchange unavailability is the main hindering issue in SHS product importation.	11.58	4.829	.467	.680
Shortage of working capital is a major problem of SHS companies	12.52	4.095	.433	.695
It is difficult for private sectors to access loan for SHS business.	12.55	3.067	.630	.566
Private sector financing schemes are few in SHS business.	12.15	4.249	.528	.638

Factor 4

Reliability Statistics

Cronbach's Alpha	N of Items
.635	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Introducing some of the new technologies is difficult due to limited telecom infrastructure.	7.56	1.819	.480	.485
Road inaccessibility hinders SHS dissemination.	7.64	1.947	.487	.478
It is difficult for SHS companies to get a trained work force.	7.83	2.179	.371	.633

Appendix Six: List of Private Companies participated in the research

S.No.	Company Name
1	Acme Engineering and Trading Plc.
2	Africa Green Tech
3	Alviol General Trading Plc.
4	Azur Technologies
5	Beta Engineering Services Plc.
6	Biftu Adugna Business S.C
7	Brosol Engineering Plc.
8	Dlight
9	Epherata solar
10	Ethio-Addis Trading Agency
11	Euer Bright Plc.
12	Fosera Manufacturing Plc.
13	Green Hope Trading
14	Green Scene Energy Plc.
15	Hello Solar
16	Hidase Telecom S.C
17	Ketir Solar
18	Lydetco Plc.
19	Maty Trading
20	Meseret Mare
21	Modify Electromechanical System
22	Rensys Engineering and Trading Plc.
23	Sat Import Trading Plc.
24	Solar Development Plc.
25	Solar Kiosk Solutions Plc.
26	Solartech Plc.
27	Solar women/ Tigist Tadesse Import

28	Universal Electronics
29	Vera International Business Plc.
30	Wondoson Electric