SOUTH SUDAN: MAPPING THE SUPPLY CHAIN FOR SOLAR LIGHTING PRODUCTS

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ACRONYMS

BPL	Battery Powered Lighting
FGD	Focus Group Discussion
FMCG	Fast Moving Consumer Goods
FSL	Finance (South) Sudan Limited
GDP	Gross Domestic Product
GEF	Global Environment Facility
GOSS	Government of South Sudan
HFO	Heavy Fuel Oil
IDA	International Development Association (World Bank Group)
IFC	International Finance Corporation (World Bank Group)
KII	Key Informant Interview
kWh	Kilo Watt per Hour
LA	Lighting Africa
LED	Light Emitting Diode
m	million
MDTF	Multi Donor Trust Fund
MFI	Micro Finance Institution
MOED	Ministry of Electricity and Dams
MT	Metric Ton
mth	Month
MW	Mega Watt
NFI	Non-Food Item
NGO	Non-Governmental Organization
PSI	Population Services International
PV	PhotoVoltaic
RUFI	Rural Finance Initiative
SEDC	State Electricity Distribution Companies
US$	US Dollar
SLED	Solar and LED
SLP	Solar Lighting Product
SME	Small and Medium Enterprise
SSDP	South Sudan Development Plan
SSEC	South Sudan Electricity Corporation
SSMDF	South Sudan Microfinance Development Facility
SSP	South Sudanese Pound (3 SSP = US$1)
SUMI	Sudan Microfinance Institution
TEU	Twenty-Foot Equivalent (Unit)
UAE	United Arab Emirates
VAT	Value-Added Tax

1. INTRODUCTION

1.1. CONTEXT[1]

Lighting Africa is a joint IFC and World Bank program that seeks to accelerate the development of commercial off-grid lighting markets in Sub-Saharan Africa as part of the World Bank Group's wider efforts to improve access to energy. The Lighting Africa program is mobilizing the private sector to build sustainable markets that provide affordable, modern, off-grid lighting to communities across Africa that are not on the electricity grid. The program and its partners had by July 2013 brought cleaner, safer, and better lighting to close to 7.7 million (7.7m) people and are working to increase energy access, and to provide better lighting to 250m people by 2030.

Improved lighting provides significant socio-economic, health and environmental benefits, such as new income generation opportunities for small businesses. Lighting Africa is a key element of the Global Lighting and Energy Access Partnership (Global LEAP), an initiative of the Clean Energy Ministerial[2].

As part of a broader scale-up strategy, the Lighting Africa program is responding to internal and external demand to integrate Lighting Africa program activities into World Bank-financed energy operations. In South Sudan, this engagement includes on-going discussions with the Government of South Sudan (GOSS) and preliminary background work in preparation for Technical Assistance projects.

In support of the activities to be financed under the upcoming Technical Assistance in South Sudan, the Lighting Africa program is carrying out a number of upstream analytical studies that will collectively inform the selection and design of market development and product development activities for products that have undergone quality testing and meet Lighting Africa's Minimum Quality Standards.

The present "Mapping of the Supply Chain for Solar Lighting Products" provides the private-sector context into which such activities will need to be integrated.

1.2. PROJECT OVERVIEW

OBJECTIVES

Altai Consulting (Altai) was commissioned by the World Bank's Lighting Africa program to carry out a study into solar power supply chains in South Sudan. The study took place between 13th May and 28th June 2013. The general objective of the study was to conduct an assessment of the supply chain for products that met LA's Minimum Quality Standards, other solar lighting products, and comparable consumer goods such as mobile phones in South Sudan.

The specific objectives of the study are the following:

- undertake a bottom-up forensic mapping of the current purchasing and distribution/supply chains for products that have met Lighting Africa's Minimum Quality Standards, other

[1] Source: Mapping of the Supply Chain for SLPs - Terms of Reference (World Bank, 2013)
[2] Lighting Africa is implemented in partnership with: the Africa Renewable Energy and Access Grants Program; the Climate and Development Knowledge Network (CDNK); the Global Partnership on Output-Based Aid; Italy; Luxembourg; the Netherlands; Norway; the Public-Private Infrastructure Advisory Facility (PPIAF); the Renewable Energy and Energy Efficiency Partnership (REEEP); and the United States.

portable lighting products, or comparable consumer goods (i.e. mobile telephones) in South Sudan from retailer to manufacturer, identifying the actors involved in each phase

- assess the bottlenecks/pinch-points along the supply-chain that are contributing to the lack of products that have met Lighting Africa's Minimum Quality Standards available on the local market, and document the main obstacles preventing large-scale commercialization of solar-lanterns in South Sudan.

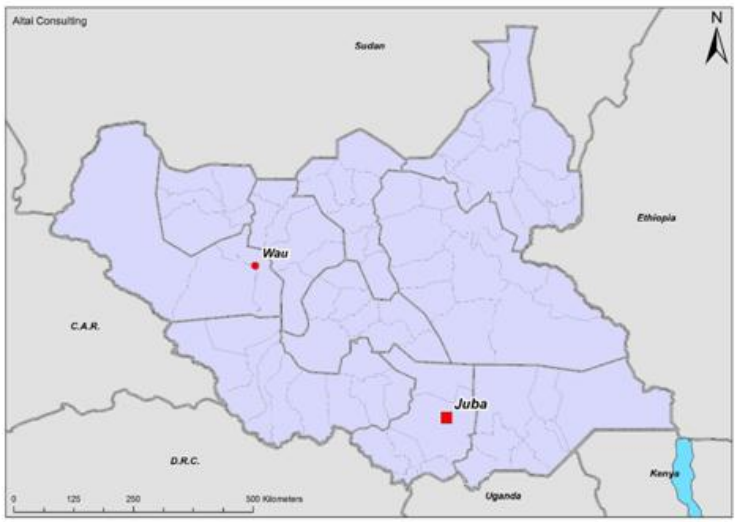
METHODOLOGY

A complete end-to-end assessment of the supply chain, both inside and outside South Sudan, was carried out to meet these objectives through Focus Group Discussions (FGDs) with final consumers in combination with Key Informant Interviews (KIIs) with actors at each of the key points along the complete supply chain. FGDs and KIIs were conducted in urban and rural areas:

- Juba and Wau as urban fieldwork locations: Juba is the capital and primary trade hub, where the majority of businesses and solar power providers and located; Wau is located several hours north of Juba and is the key trading hub / distribution point for the north-west of South Sudan
- Two rural locations close to Juba (Kororomula) and Wau (Bringi)

Interviews with actors outside of South Sudan were carried out via telephone.

Figure 1: Fieldwork Locations



To select interviewees, the research team 'followed the supply chain', to ensure that solar power users formed part of the sample group. Solar power retailers were used as a starting point: from these retailers, the supply chain was traced backwards and forwards, to identify other key actors and consumers. Given the context of South Sudan and the small size of the market, it is believed that this 'snowball' approach enabled the research team to build a comprehensive understanding of the supply chain.

- Key Informant Interviews (KIIs):
  - A total of 41 KIIs were conducted: 30 with actors in the solar power product supply chain, 5 with actors in the mobile phone supply chain, and 8 in the battery powered lighting products chain (some actors were present in more than one of these chains)
  - Interviews consisted of up to 55 open and closed questions
  - A detailed list of key informants interviewed is in Annex 2

Table 1: Distribution of KIIs and FGDs

	Juba		Wau		Regional	Total
	Urban	**Rural**	**Urban**	**Rural**		
KIIs	22		7		12	**41**
FGDs	1 (+ 1 paired interview with 2 SME owners)	1	1 (+ 2 one-to-one interviews with SME owners)	1	n/a	**4**

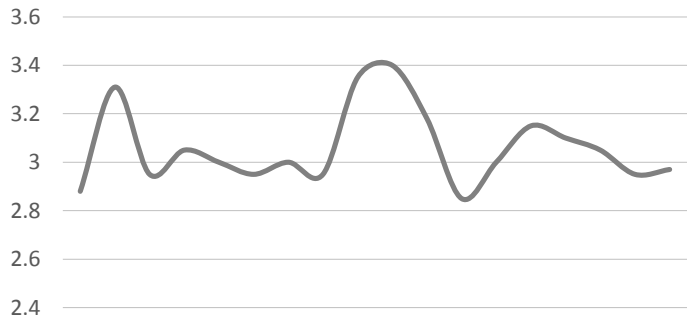
- Focus Group Discussions (FGDs) with lighting product consumers:
  - A total of six FGDs were planned but only four were eventually conducted. In each rural location, 1 FGD was planned and carried out with users and non-users of solar powered goods. In each of the 2 urban locations, 1 FGD was planned with individual users and one with SME owners. However, it was not possible to hold focus groups of 4-6 people with business owners, as some of them were not willing to come away from their business to participate in FGDs. Instead, 2 business owners were interviewed via a paired interview and an additional 2 via 1-on-1 interviews. The remaining business owners were incorporated into FGDs with individual users
  - Each FGD comprised 4 - 6 individuals
  - The FGD consisted of 26 open-ended questions

2. COUNTRY CONTEXT[3]

2.1 ECONOMY AND KEY DEVELOPMENT INDICATORS

The Republic of South Sudan gained independence on 9 July 2011. It is a post-conflict state, which is embarking on the process of building its government and economy to foster growth and development. The country's GDP is about US$19bn with a population of 10.3m. South Sudan is a large country (647,095 km²), which possesses considerable natural resources, including oil, gas and hydropower. Most of the country's growth comes from petroleum revenues, which account for 80% of GDP and 98% of exports. GDP has been growing at 1.9% in the past year and is highly dependent on the political situation remaining stable enough to keep pipelines open and to achieve full oil production. There is also a great deal of fluctuation in the value of the South Sudanese Pound (SSP) depending on the political situation and oil production, directly impacting the costs of imported goods.

Figure 2. SSP/US$ exchange rate (January 2011 – June 2013)[4]



South Sudan is grouped into three regions, which are divided into 10 states. The region of Bahr el Ghazal in the northwest contains four states: Northern Bahr el Ghazal, Western Bahr el Ghazal, Lakes and Warrap. The Equatoria region includes three states: Western Equatoria, Central Equatoria and Eastern Equatoria. The Greater Upper Nile region lies in northern and eastern South Sudan and comprises the three states of Jonglei, Unity and Upper Nile.

It is estimated that 51% of the South Sudanese population lives below the poverty line with rural poverty more pronounced (55.4%) than urban poverty (24.4%) and with clear regional disparities in poverty levels. Poverty levels range from as low as 25% of the population in the Upper Nile State to 75% of the population in Northern Bahr el Ghazal State. States such as Warrap, Unity and Northern Bahr el Ghazal, which were substantially isolated by conflict and remain disconnected from the relatively prosperous areas, are the most affected by poverty. Currently, subsistence agriculture (farming and livestock) provides a living for the vast majority of the population. However, the agricultural sector is not well developed and the country still relies on imports to meet its food requirements. Furthermore, poor infrastructure makes transportation of agricultural and animal products to market very difficult.

[3] Sources : www.africaneconomicoutlook.org and World Bank (2013)
[4] Source: UN operational rate of exchange (June 2013)

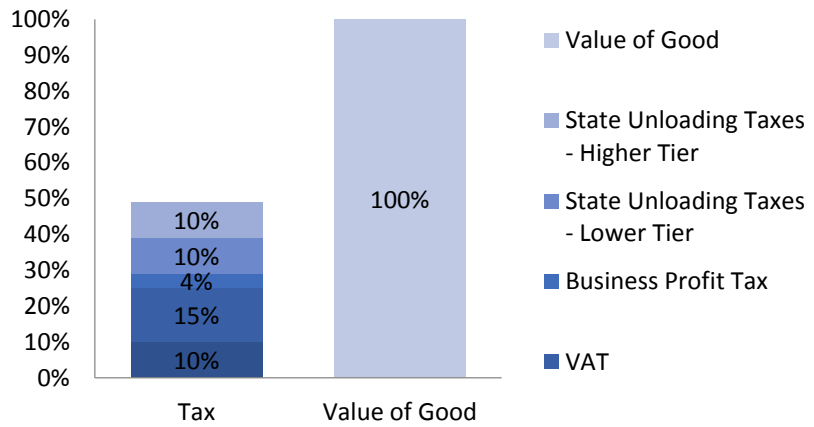
Only 27% of the population aged 15 years and above is literate; 53% of the urban adult population is literate, compared to 22% of the rural adult population; and 40% of the population between ages 15-24 is literate. South Sudan has one of the worst health indicators in the world: in 2011, the infant mortality rate was 102 per thousand live births, the under-five mortality rate was 135 per thousand live births and the maternal mortality rate was 2,054 per one hundred thousand live births; only 17% of children were fully immunised. A full 45% of the overall population has no access to improved sources of drinking water; 67% of the urban population has access to improved sources of drinking water, compared to 53% of the rural population; and 80% of the population does not have access to any toilet facility. Malnutrition remains a big challenge and the single biggest contributor to child mortality, even though the prevalence of severely undernourished children (under five years) declined in the then-state of Southern Sudan from 131 per thousand children in 2006 to 122 per thousand children in 2010.

2.2 BUSINESS CLIMATE

South Sudan has one of the most constraining business climates in the world: in 2011, it ranked 159th out of 183 economies in the World Bank's Doing Business 2011 study. It suffers from a high degree of socio-economic fragility, overlapping legal and regulatory instruments, weak institutional and human capacities, dilapidated infrastructure, a weak financial sector and extremely low social development indicators, as well as a lack of clarity among federal, state and county jurisdictions over business licensing, taxes and customs. The lack of an environment propitious to business activities means that many South Sudanese are on the public sector payroll.

Official taxes are high for an undeveloped economy, and can reach 49% of the value of a solar powered good. According to the national customs department, import duties are between 3%-20% (food products are charged 3%, cigarettes and liquor are charged 20%, and solar powered goods are charged 10%). General sales tax is set at 15% for all goods, products and services. Similarly, business profit tax is fixed at 4%. State unloading taxes, however, vary between 10%-20% of the value of a good. It is at the discretion of the state to set the tax rate within this range. Unloading taxes are only levied in the final destination state, not in the states the goods pass through en route.

Figure 3: Official Tax Rates[3]



According to information provided by the central government Customs Department, government regulations for border clearing are relatively uncomplicated. Whether entering South Sudan by land,

[3] Sources: KIIs with Central Government Customs Department

air, or water, a maximum of three documents are needed to cross the border. Government officials, transporters, and retailers reported that goods clear all borders within a few days. Goods arriving from Kenya were reported to clear in 2 days (official clearing time is 1-2 days), whilst goods imported from Uganda could take up to 2-4 days (official clearing time is 1-3 days). Clearing times by water transportation were reported to take a maximum of 3 days (official clearing times are 1-2 days).

Figure 4: Required Border Clearance Documents

Air	Water	Land
Invoice	Invoice	Invoice
Manifesto	Letter of authorization	Manifesto
Airway Bill	Form 15	Bond document

Figure 5: Official Border Clearance Times

	By air	By water	By land
Sudan	1 - 2 days	1 - 2 days	2 - 3 days
Uganda	1 - 2 days	1 - 2 days	1 - 3 days
Kenya	1 - 2 days	1 day	1 - 2 days
Ethiopia	1 - 2 days	No goods entering	1 day
CAR	No goods entering	No goods entering	No goods entering
DRC	No goods entering	No goods entering	No goods entering

3. Energy Sector Overview

3.1 Household Energy Consumption Patterns

Most of the energy consumed at the household level in South Sudan is used for basic needs such as cooking and lighting. According to the National Baseline Household Survey, 96% of the population used firewood or charcoal as the primary fuel for cooking (which typically constitutes 90% of the energy used in a rural household)[4]. For lighting, over 50% of the population used firewood as the primary source, 20% depended on kerosene, etc. and 2% use generators[5]. Of the remaining population, 27% have no access to a lighting source, and only about 1.2% of the population have access to grid electricity (7.1% of urban dwellers and 0.2% rural dwellers). A small proportion of the population, 0.9%, are solar power users (2.5% of urban dwellers and 0.5% of rural dwellers).

[4] Source : National Bureau of Statistics (2009)
[5] Source : Statistical Yearbook for Southern Sudan (2010)

Figure 6: Lighting Sources Used (% of population[6])

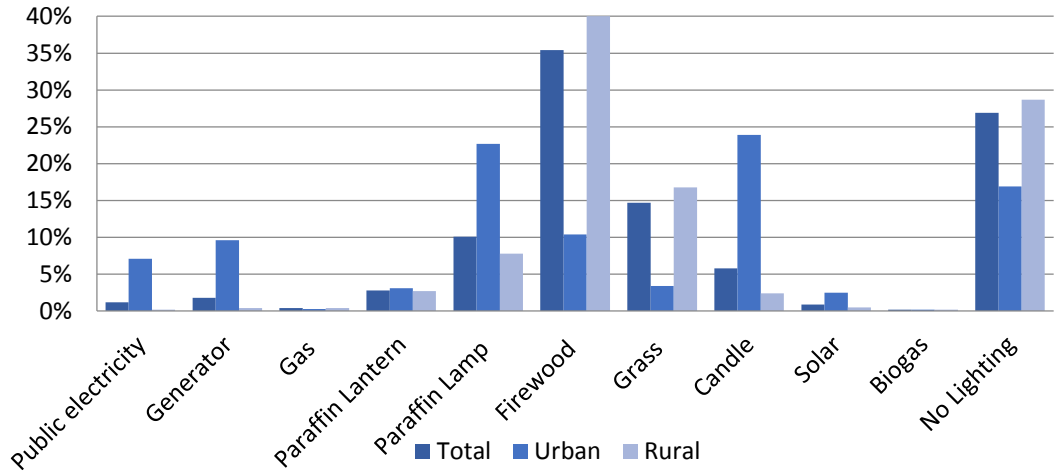
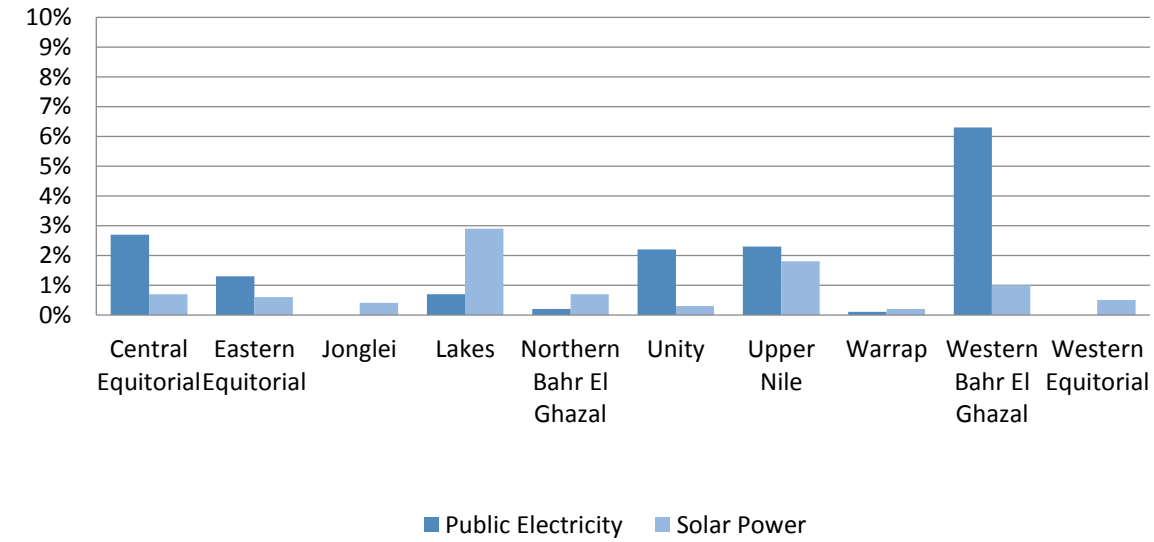


Figure 7: Public Electricity and Solar Power Usage per State (% of population[9])



The population with no access to electricity also pay a high premium for alternative sources of lighting (kerosene, candles, low quality dry-cell based light emitting diode (LED) lanterns) due to frequent, small volume purchases and poor distribution networks that add a huge overhead to the price. They also rely on inefficient tools for combustion that do not produce the best lighting possible. In some Sub-Saharan Africa surveys, the cost of lighting has been estimated to be between about US$50 - US$80 per household per year, broadly in line with data collected by the National Bureau of Statistics in South Sudan, which estimates total expenses on utilities (including energy, water, waste management, etc.) as US$80 - US$100 per household per year.

[6] Source: GOSS Census (2010)
[9] GOSS Census (2010)

3.2 PUBLIC ELECTRICITY

South Sudan not only has low access and low consumption rates (about 10 kWh per capita per year against an average 80 kWh in Sub-Saharan countries), but those who are connected to the grid have to pay a high cost for the service: a household connection costs US$500-600 and the average tariff is US$0.25/kWh). This is twice as much as the average African consumer pays, five times what is paid in other developing countries, and more than double what is paid in Sudan. The electricity supply generally services wealthier residential customers and some commercial centres in the cities, whereas most businesses (93%) rely on generator power for their electricity needs. Overall, 87% of firms identify the lack of electricity as a major impediment for their business[10]. The high costs are a major hindrance to the growth of industrialization in South Sudan.

Access to electricity is currently concentrated in a few areas of the country (mostly in Juba with the rest in Malakal, Wau, and Renk[7]). Total installed capacity for the country is 30 MW, of which, only 22 MW is currently operational, consisting exclusively of thermal generators (diesel and heavy fuel oil, HFO).

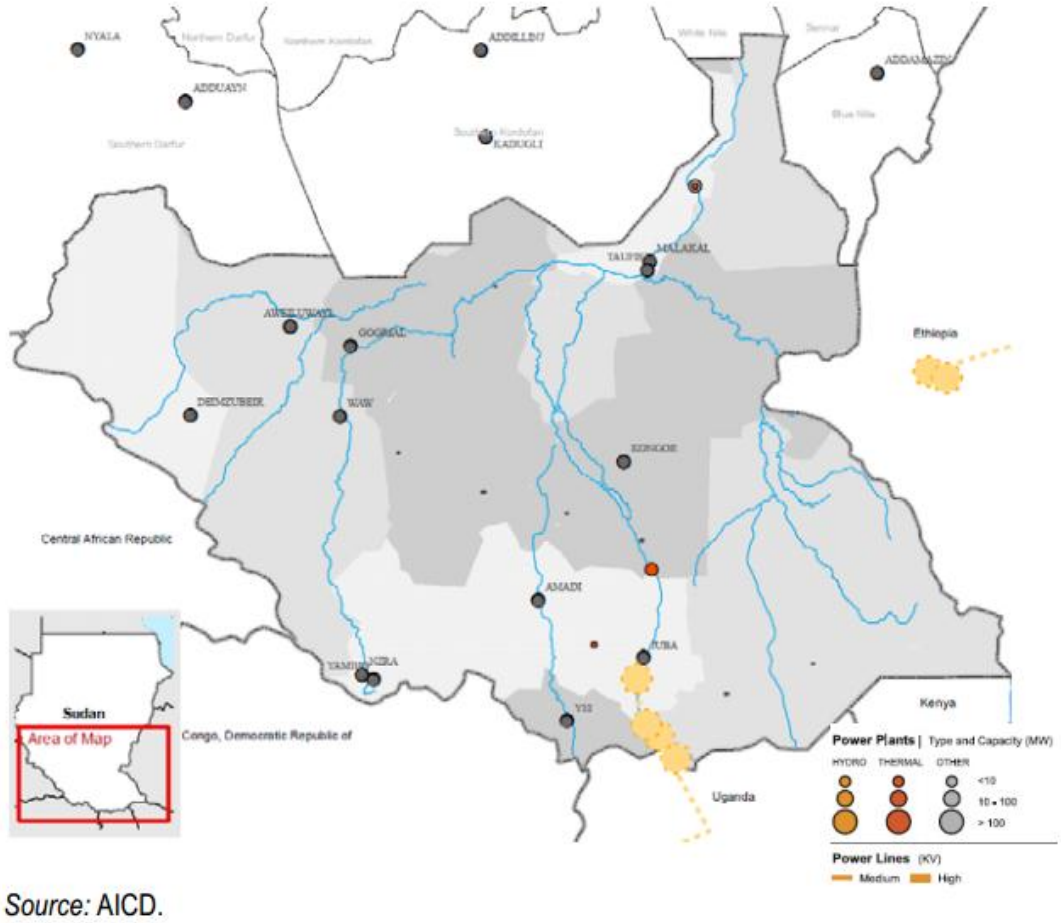
Table 2: Electricity Generation in South Sudan

Location	Total capacity (MW)	Status
Juba (Wartsila)	12	Operational
Malakal	5	Operational
Wau	2	Operational
Yei	1	Operational
Kapoeta	1	Operational
Maridi	1	Operational

[10] Source: Doing Business in Juba (World Bank, 2011) and World Bank's Investment Climate Assessment

[7] There is an existing 40 MW interconnection with Sudan to the town of Renk but the consumption from the line is limited to local demand (only an estimated 1.5% of supply is used).

Figure 8: Power Infrastructure in South Sudan



Source: AICD.

3.3 INSTITUTIONAL AND POLICY FRAMEWORK

The key institutions in the electricity sector are:

- The Ministry of Electricity and Dams (MOED) which is responsible for overall sector policy and strategy and is also involved in major projects in transmission and other large hydropower and regional integration projects.
- The South Sudan Electricity Corporation (SSEC), which is deemed an autonomous national utility acting as a public sector undertaking. However, at the moment it functions as a unit of the MOED. It will become involved in electricity generation, transmission and distribution, and access related projects in South Sudan, along with its current role of operations and maintenance.
- The State Electricity Distribution Companies (SEDC): the Government plans to include the SEDC to manage local electric power distribution services (such as rural electric cooperatives) that can obtain supply from SSEC.

In 2011, the Government of the Republic of South Sudan (GOSS) announced the South Sudan Development Plan (SSDP) FY 2011-2013 to promote growth and development. The objective is to recover from conflict and move to a fast-track development path by leveraging the country's vast natural resources. Under this development plan, large-scale infrastructure development is planned, particularly focusing on rapid expansion of the road network and provision of electricity.

The Ministry of Electricity and Dams (MOED) and the South Sudan Electricity Corporation (SSEC) plan to increase South Sudan's installed capacity to 100 MW by 2015. Yet to date, there has been limited or no progress on implementation of any of the sector projects contained in the SSDP. This is notably due to budgetary constraints, which have limited the availability of funds for long-term infrastructure projects. The long-term goal of the GOSS is to heavily invest in hydropower generation. The potential for hydroelectric power is anticipated to be concentrated on the stretch of Nile between Nimule and Juba. The exact scale of the resource has not yet been completely studied but based on preliminary information, there are about 2,105 MW of potential hydropower project sites under various stages of pre-feasibility and feasibility studies.[8]

The GOSS has plans to build one small and four large hydropower dams along the river Nile by 2018. At present, contracts for three of the dams have been signed and work is scheduled to start in the upcoming months. The GOSS is still looking to secure funds to for the remaining hydroelectric projects. The capacity of the dams is planned to be as follows:

Table 3: Planned Hydropower Projects

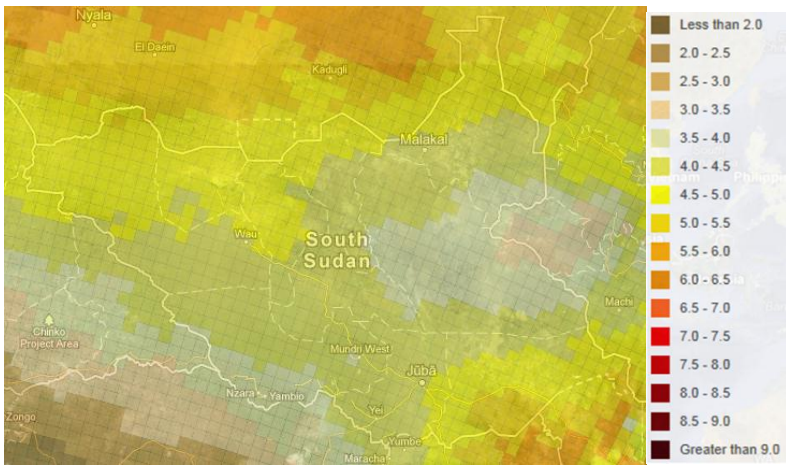
Location	Installed Capacity (MW)	Production (GWh)
Lakki	410	1,848
Shokoli	253	1,049
Fula	890	3,946
Bedden	570	2,595

Under the rural electrification section of the National Electric Sector Policy, the GOSS plans to improve access to electricity through extension of grid networks, construction of isolated grid systems powered by thermal and small hydroelectric plants, and implementation of solar powered systems. Cooperatives are encouraged to own and distribute electricity. According to the MOED, large-scale solar projects are currently not a priority because of their high up-front costs. The Ministry is, however, interested in experimenting with smaller-scale solar projects. In the past, some programs have provided solar street lighting in Juba, solar home systems, as well as solar lanterns to a few rural communities.

Amongst the renewable energy generation resources in South Sudan, solar energy has good prospects. The country has potential for stand-alone solar photovoltaic (PV) units and possibly for large-scale solar thermal generation as well. Across the country, solar radiation ranges from 5.5 – 6.0 kWh/m²/day and proximity to the equator means long daylight hours throughout the year. The north-eastern part of the country experiences approximately 12 hours of sunshine per day year round.

[8] Source : Electricity Sector Strategy Note for South Sudan (World Bank, 2013)

Figure 9. Direct Normal Irradiation (kWh/ m² / day) in South Sudan[9]



4. Solar Lighting Energy Sector

4.1 Main Actors of the Solar Lighting Product Market Chain

Two types of commercial distribution models were identified in South Sudan for solar lighting products (SLPs): (i) the wide majority of SLPs are sold through **retailer networks** whereby products are directly imported into South Sudan by retailers via traders and sold to customers by retailers themselves; (ii) there is only one manufacturer which uses its **own distribution channel** through a dedicated retail outlet in Juba selling its products directly to customers.

Main actors of the solar product market chain, further described below, are: manufacturers, retailers, training providers, and suppliers of financial and transportation services. Yet, it is important to note that Juba and Wau have separate supply chains with differing characteristics:

Juba is situated close to the Ugandan border. Goods are trucked into the city from both Kenya and Uganda via the official border post at Nimule, on the Uganda / South Sudan border. Nimule is connected to Juba by one of the few major paved roads in the country, which means that land transport is possible even during the rainy season. The supply chain of goods coming into Juba is fully commercialized, with a variety of different transportation companies providing trucking services, clearing services and a number of manufacturers supplying Juba markets, via sub-offices in the region. It is estimated that 80% to 90% of SLPs are sold out of Juba. Retailers often reported that out-of-town customers come to their store to take products back to their states.

Wau, on the other hand, is situated closer to the border with Sudan and the supply chain of solar powered goods involved trucks smuggling goods through the unofficial border crossing between Sudan/South Sudan, called New Sudan, to reach Wau. Goods are then taxed when they reach Wau. The road network on this route is not good and is not passable by truck during the rainy season. Solar power retailers in Wau are Sudanese and a significant portion of the supply chain to Wau is made up of Sudanese individuals. Retailers in Wau place orders in groups of up to 20 people per truck, to Sudanese traders located in China and Dubai. These products are then shipped to Port Sudan in Sudan, driven overland to Khartoum, and then trucked to Wau. Solar powered products are trucked along with other goods coming in from the countries of origin. Retailers reported that kinship is a defining feature of this particular supply chain.

[9] Source: International Renewable Energy Agency, Concentrated Solar DNI Map for Multiple Countries at 40km

Figure 10: Solar Product Market Chain in Juba

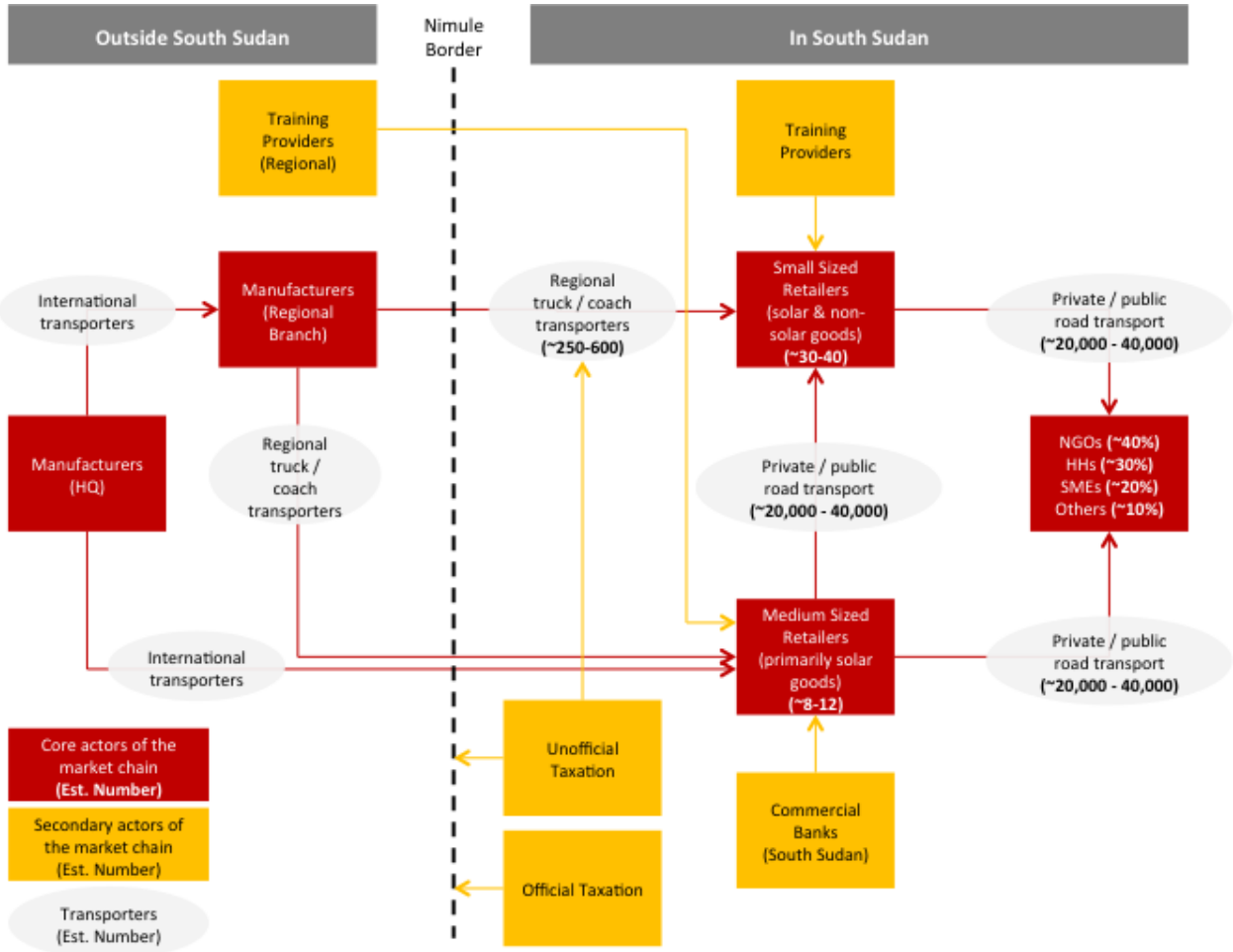
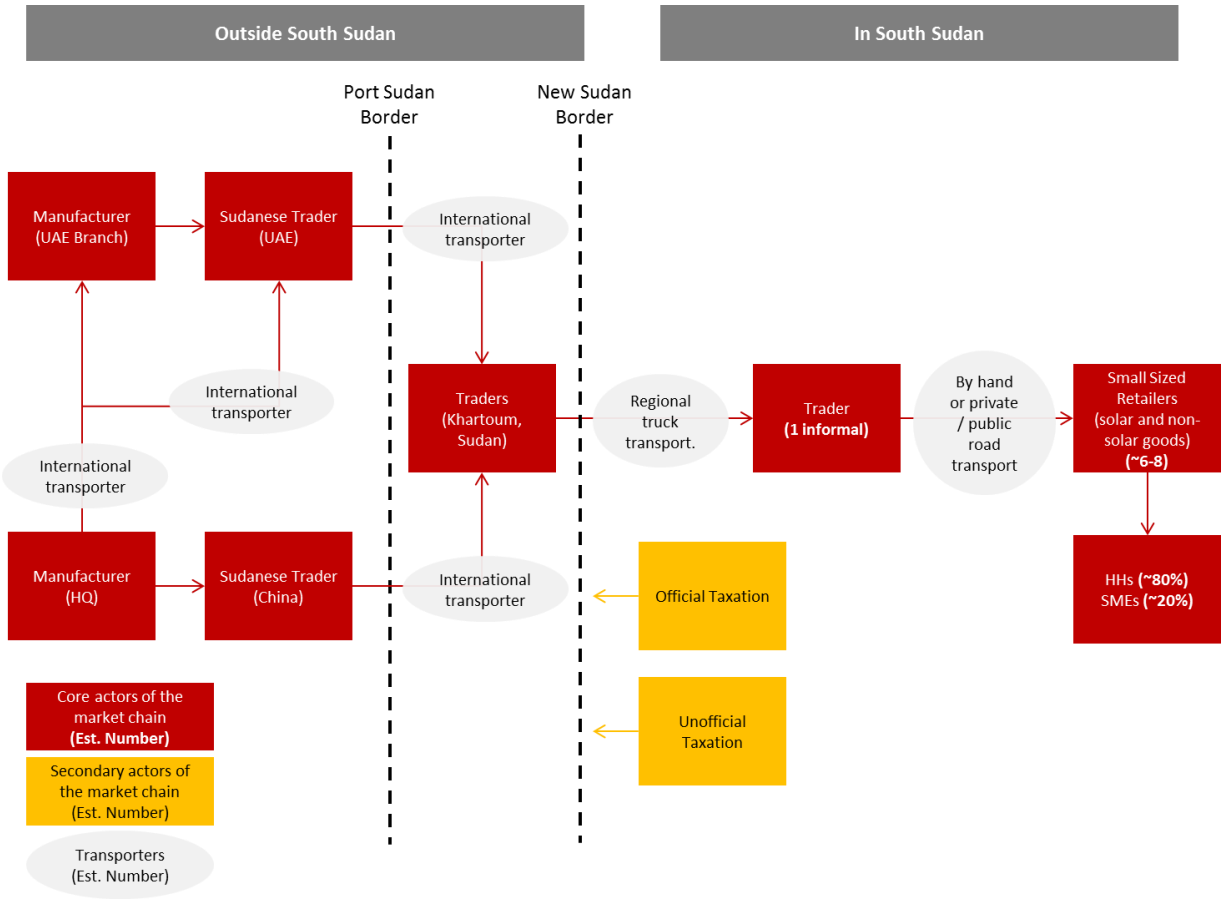


Figure 11: Solar Product Market Chain in Wau



MANUFACTURERS

Interviews were conducted with two manufacturers whose products had undergone quality testing and met Lighting Africa's Minimum Quality Standards, to gather information on their activities in South Sudan and their opinions on the SLP supply chain. The manufacturers in question were selected as they hold a significant portion of the market share in South Sudan. A manufacturer whose products had not met the Minimum Quality Standards was also interviewed.

Table 4: Portable Solar Lighting Products Covered in the Study

Manufacturer	Model	Product Type	Regional Manufacturer Price (US$)
Solar World	1w Solar Table Lamp	Table lamp	11
Solar World	Solar Power Rechargeable Lantern	Lantern	50
Barefoot	Firefly lamp	Table lamp	15-20
Barefoot	Junior pack	Small solar pack	37-49
Barefoot	Powerpack 5W	Medium sized solar pack	72-69
Trony	Sundial 01	Table lamp	23-35
Trony	Sundial 02	Table lamp and torch	20-55

Of two of the more commonly found brands across the sample retailer group, neither manufacturer has branches in South Sudan. Both have permanent offices in Kenya, Uganda and in one other East African country, respectively. Another company headquartered in Kenya with a branch in South Sudan, has a regional sales volume that is significantly lower than the other two companies without branches in South Sudan. In South Sudan, one company only sells their products from one authorized outlet, whereas two other commonly found products are sold in a number of outlets that sell different solar products. Only one of the manufacturers interviewed completes final assembly of some products in country.

One company has an agent on the ground in South Sudan who collects market information, does marketing and provides support to retailers. Another uses a marketing model, whereby a retailer or distributer who comes to them to buy products is given training on how to market their products. They have no formal partnership with any distributer/retailer in South Sudan, nor do they have a permanent agent on the ground. Whilst they are one of the brands that have most successfully penetrated into South Sudan's markets, they consider themselves as not having yet "heavily moved into the South Sudanese market".

Customer preferences for particular brands may also be attributed to their pricing models. At the manufacturer level, one company's products are comparatively cheaper than those of two others'. Yet, the two companies with the comparatively more expensive products offer flexible payment terms to distributers/retailers, which may also impact the desirability of their products to these customers. These two companies also give returning customers discounts of up to 20% and payment grace periods of up to 30 days, and discounts of up to 9% and payment grace periods of up to 15 days, respectively. On the other hand, the company with the cheaper product sells one of their sample products at a fixed price, regardless of their relationship history with distributers/retailers, requests an 80% deposit and asks for 100% payment upon delivery of services.

Another factor to consider is quality. Of the 3 manufacturers interviewed, only one said their sales were impacted by seasonal changes. Another company reported no seasonal changes in sales and said they had developed products that are able to generate electricity, even during cloudy weather.

RETAILERS

It is difficult to know exactly how many retailers in South Sudan are selling solar powered products, because of the lack of official data. According to the Ministry of Justice, who keep data on all registered companies, only one solar power retailer is registered. Those who are registered to sell another type of good and have since changed their business type, or those who sell multiple different types of goods, including solar powered products cannot be tracked under the current system at the Ministry of Justice. Through visits to market hotspots, the research team estimates that there are 8-12 retailers in Juba selling exclusively solar powered products and 30-40 selling a combination of solar and non-solar products; and 6-8 retailers in Wau selling a combination of products.

The solar powered product retail market in Juba is significantly more developed than the market in Wau. In both cities, research teams approached the largest and most well-known solar powered product retailers. Of those retailers interviewed in Juba, 5 of the 7 are selling exclusively solar powered products and services. In Wau, however, no retailer selling only solar powered products was identified, and retailers instead were found to be selling a wide variety of products, including electrical goods, toys, and mattresses. The relatively low sales volumes of the stores in Wau (between 10 - 15 of each lighting product sold per month) suggest that it is not possible for them to rely on selling solar powered products alone. According to one retailer in Wau: "The markets are slow. We would prefer to sell goods at a constant flow, but it isn't possible - there is not enough demand".

Several retailers said that NGOs and international agencies were preferred clients, as they typically place large orders[10]. NGOs use SLPs both to cut down on costs in their own offices, and for community development programs, notably to set up solar powered water pumping stations, etc. One such organization, which specifically distributes SLPs does not procure lamps locally through retailers: instead, SLPs are imported directly through their regional office in Uganda (see box 1).

Retailers in Juba are more sophisticated than those in Wau not only in terms of products sold, but also in terms of after-sales services. None of the retailers interviewed in Wau provide installation services, maintenance services, or gave customer warranties. All retailers interviewed in Juba provide these services and some have stronger linkages with manufacturers/suppliers present in the region (e.g. Kenya), which means they are able to honour warranties by rapidly sending back defective products to be repaired or replaced. Two retailers in Juba, however, did report facing challenges honouring warranties. According to one of them, "warranties are just on paper and cannot realistically be honoured. We give our customers refunds instead of sending the product to be fixed. If we try to send back products, the companies always think the problem lies with the customer, instead of with the product". Another retailer said that they do not send products back to manufacturers, as the shipping costs are too expensive. Instead, they replace products, if they cannot fix the malfunction themselves.

[10] NGOs supplied to by the sample group include Norwegian Peoples Aid, Norwegian Church Aid, Oxfam, GOAL, Save the Children and Plan International.

Table 5: Main SLP Retailers in South Sudan[11]

Retailer Name	Profile
Go Solar	**1 branch, exclusively sells solar powered products** One of the better-established retailers in Juba, sells a variety of goods and gets support from a regional office in Kenya.
Ap-Tech	**2 branches, exclusively sells solar powered products** A well-established retailer with one outlet in Juba and one in Western Bahr el Ghazal state.
Global Trading Agency	**2 branches, sells solar powered products, stationary and sports equipment** This organization sells large volumes to NGOs and international organizations. They have a relatively long history in country, but no permanent presence outside of Juba.
M&E Trading Company	**2 branches, exclusively sells solar powered products** The only retailer interviewed who had managed to secure loans from local banks. The retailer had proactively approached a bank to propose a partnership whereby the bank offers potential customers small loans in order for them to purchase solar power products.
Solar World	**1 branch, exclusively sells solar powered products** Limited products available in store and do not seem to have tapped into the SLP market in South Sudan.
Technical Security Support	**5 branches, sells solar powered products and security systems** Only a small volume of products sold in Juba, this retailer already has the largest number of outlets nationwide and sells mostly lighting products to areas outside of Juba. The retailer also delivers directly to rural areas close to Juba.

The marketing techniques employed by retailers correspond to the different levels of access to information in the different states. In Central Equatoria, where illiteracy is 61%, and 45% of households own a radio, 9% a television and 2% a computer, marketing techniques are more sophisticated. Retailers are using a combination of radio, newspaper, magazine and brochure advertisements, along with door-to-door marketing to NGOs and big businesses. In Wau, however, only one retailer (through door-to-door visits to market traders) was carrying out any marketing in order to increase business.

[11] Contact information for these companies is available in Annex 2

Box 1: Example of Non-Fully Commercial Distribution Model in South Sudan

One social enterprise business is using a market based "last mile" distribution model for solar portable lights and solar mobile phone charging solutions while providing income to women entrepreneurs. It builds market linkages for enhanced solar power penetration by creating woman-centred direct sales networks, which can reach to remote rural locations. The organization provides women with a package of US$500 worth of working capital, business training, and marketing support to help them create their own sustainable income generating business. They are currently active in 3 countries (Rwanda, Uganda and South Sudan) and have supported more than 400 women entrepreneurs who have sold SLPs benefiting close to 54,000 people. In South Sudan, a pilot was completed in Yambio, Western Equatoria involving 45 women who were identified via mothers' groups. The women sell solar powered products on to members of their communities and NGOs operating locally. Following the pilot, plans are to put activities in South Sudan on hold until 2014 mostly because of supply challenges: products need to be imported as there is no manufacturer and very few local suppliers in South Sudan, which is driving up product prices. High prices of SLPs are identified as the main barrier for potential customers.

TRAINING PROVIDERS

In South Sudan, only one training provider was identified, which offers this service alongside their retail services. Clients can receive practical training of up to a week on product installation. None of the retailers interviewed however, reported having used their services. Instead, employees of solar power retailers had received their training from the following institutions within the region:

Table 6: Solar Power Training Providers in South Sudan

Institution	Location	Subject	Length
Kife Mission School	Nairobi	General electrics, with a sub-topic on solar power	3 years
Uganda Polytechnic	Kampala	Diploma in Electrical engineering	2 years
Muranga Technical Institute	Nairobi	General electrics, with a sub-topic on solar power	3 years
Kahaya Institute College	Kampala	Electrical engineering	2 years

The retailer that also provides training reported having received training on installation and maintenance best practices directly from solar battery and inverter manufacturers in Kenya. Another company mentioned that they typically provide basic maintenance and installation training to retailers, however, they were unable to verify whether or not they had provided such training to any retailers based in South Sudan.

TRANSPORTATION SERVICES

In total, 5 companies transporting solar powered goods were interviewed. All of these companies work in overland transportation, except for one, which also provides air services (although not to solar power retailers). In order to capture the full spectrum of transportation services in South Sudan (particularly considering that not all areas are accessible by road) one additional barge company was also interviewed. However, none of the interviewed retailers in either location reported bringing in goods by air or water. This is most likely a reflection of the high costs associated

with air cargo, the limited number of shipping companies fully operational in South Sudan, and the perception that water transportation times are very lengthy.

All transportation companies offered services both inside and outside South Sudan and all, besides one, only had offices located in Juba. This reflects the limited development of markets outside of the capital city. The transporter that did not have an office in Juba was smuggling goods between Wau and Khartoum. Of the 5 overland transporters interviewed, 3 offer services to all ten states, whilst the remaining two focus their activities on importing from other capital cities in the region (Nairobi, Kampala), into Juba/Wau. All offer clearing services.

The table below shows sample internal transportation times and costs from one shipping company and one trucking company.

Table 7: Transportation Time and Costs from Juba to Other Destinations in South Sudan

From Juba to:		Journey Times and Costs			
Destination State	**Destination Town / City**	**Ship US$/MT**	**Truck US$/TEU**	**Trucking Time (dry season)**	**Shipping Time (rainy season)**
Eastern Equatoria	Torit	n/a	3,000	1 day	n/a
Jonglei	Bor	473	3,000	1 day	3 days
Jonglei	Adok	1,732	n/a	n/a	2 days
Lakes	Shambe	1,103	n/a	n/a	4 days
Lakes	Rumbek	n/a	14,500	7-8 days	n/a
Northern Bahr el Ghazal	Aweil	n/a	13,500	6 days	n/a
Unity	Bentiu	n/a	4,500	7 days	n/a
Unity	Kilo 29	1,890	n/a	n/a	5 days
Upper Nile	Kodok	2,835	n/a	n/a	8 days
Upper Nile	Renk	3,623	n/a	n/a	8 days
Upper Nile	Malakal	2,678	4,500	7 days	9 days
Upper Nile	Melut	2,993	n/a	n/a	10 days
Western Bahr el Ghazal	Wau	n/a	11,000	4-5 days	n/a
Western Equatoria	Yambio	n/a	5,000	2-3 days	n/a

The table below shows sample regional transportation costs and times for one commercial trucking company, one commercial coach company and one trucker using a smuggling route.

Table 8: Transportation Time and Costs to Juba from Neighbouring Countries

To Juba from:	Truck / TEU US$	Coach (per seat) US$	Coach Drive Time (dry season)	Trucking Time (dry season)
Nairobi	6,630	n/a	n/a	6 - 7 days
Kampala	4,800	24	10 hours	5 days
Khartoum (smuggler route)	6,349	n/a	n/a	2 - 3 days

FINANCIAL SERVICES

Access to financial services is a bottleneck which exists all along the SLP value chain: at the distributor end through lack of credit for business expansion and at the final consumer point of the chain due to high up-front acquisition costs of SLP devices.

Box 2. The Financial Sector in South Sudan[12]

The financial sector in South Sudan is in its very early stages of development and access to finance remains very limited: only about 1% of the total population was reported to have a bank account in 2009. Banking services are mostly limited to foreign exchange, bank transfers, and remittance services. Only a handful of banks provide loans, trade finance, or savings accounts. Most of the lending activity is concentrated in short-term lending, with very few loans attributed to small and medium enterprises, as most banks prefer lending to well-known and well-established customers. Limited regulatory power, weak investor protection and the lack of a credit bureau and collateral registry further limit access to credit. According to the World Bank's report, "Doing Business in Juba 2011", in terms of ease of getting credit, South Sudan's capital ranked 176th of the 183 economies included in the Doing Business studies.

The microfinance sector, while expanding, remains limited. The "Doing Business in Juba 2011" report found that microfinance institutions reached only about 5% of potential clients in Juba, and less than 1% of the potential clientele in the entire region. The Government of South Sudan (GOSS) with support from the Multi Donor Trust Fund (MDTF) and the Central Bank of South Sudan established the South Sudan Microfinance Development Facility (SSMDF), which aims to promote and support the emergence of a strong microfinance sector in South Sudan. The SSMDF is partnered with 14 MFIs with outreach in 7 states[13]. Main institutions include the Bangladesh Rural Advancement Committee (BRAC South Sudan), Finance South Sudan (FSL) and the Rural Finance Initiative (RUFI) which is the only organisation developing rural activities in South Sudan. Indeed, the development of financial services in rural South Sudan faces many challenges, including limited commercial activity and associated revenues, which make it very difficult for rural community members to be able to pay back loans; in addition, communities have wealth in the form of assets such as cattle, which can be difficult to use as collateral. BRAC South Sudan recently experienced difficulties and had to downsize due to high operating costs, turnover of its staff and resulting high default payments. Others, such as the Sudan Microfinance Institution (SUMI) financed by USAID and operated by Chemonics, had to close down altogether.

Most of the lending activity in South Sudan is concentrated in short-term lending with a preference for well-known and well-established customers rather than local small and medium enterprises (SMEs). The research found that there is limited access to finance for solar powered retailers operating in South Sudan, in part, because lending to SLP dealers is considered risky by financial institutions due to their lack of experience in the sector. Of the 10 retailers interviewed, only one had received a loan from a bank operating within South Sudan, within the past 3 years. This was a 1-year loan, with a value of US$30,000 and an interest rate of 18%. When the other retailers were asked why they had not taken commercial loans, 6 retailers said they had no need for them. One respondent said that solar start-up companies must base their business models on the assumption that they will not get access to finance from a local bank, as the likelihood of receiving a commercial loan is very slim. According to another respondent, "commercial banks are not willing to give loans out easily. Also, the cost of getting a loan is high and if you are not South Sudanese, commercial banks here will not give you a loan". Another interviewee said he didn't understand the application process and therefore, did not consider applying for a loan and one retailer felt that it was not worth applying for a loan because "the application process is difficult, we do not have the correct

[12] Making Finance Work For Africa: www.mfw4a.org (last accessed in June 2013) and Altai Consulting interviews

[13] The three Equatorias, Western Bahr el Ghazal, Northern Bahr el Ghazal, Jonglei and Upper Nile

collateral, we do not have government connections and solar is perceived to be a high risk industry". Two retailers said they receive commercial financing from outside of South Sudan.

One South Sudanese bank which was interviewed for the purpose of this study mentioned that it had been approached by solar system dealers to set up a facility to provide access to credit to final customers using the solar system devices themselves as collateral. Yet, the bank considered that the default risk on such loans would be too high, notably because solar systems are not valuable collateral and collateral is difficult to claim back due to the weak legal environment and security risks in some rural areas in South Sudan. This bank had also been approached by an entrepreneur who wanted to set up solar franchises throughout the country, by identifying local entrepreneurs with business potential and training them in Juba on sales, maintenance and installation. According to his business model, products were to be sold to these franchises at a 30% discount with bank loans to the franchises financing 50% of the remaining cost, which they would then repay having sold their products. The 30% discount would mean that products could be sold across the country at a similar price as sold in Juba, which would attract more customers. The bank however, considered the project to be too high risk, as they felt that borrowers in rural areas could easily disappear with the loans and never be seen again: “lending to small businesses in rural areas is "dangerous" for debt collectors, as borrowers in default can use violent means to prevent debt collectors from collecting collateral”.

Financial institutions in South Sudan, including MFIs, have extremely limited uptake in rural areas where a large share of potential SLP product customers are living. Rural households’ limited and seasonally dependent income deter financial institutions from lending to SLP end customers; the lack of assets which can be used as collateral (land title, salary, car, generator) and the difficulty for financial institutions to enforce their rights against collaterals due to a weak legal environment, further discourage them from extending credit to such client profiles. Providing financing to household-level customers is also considered risky as the main source of employment in South Sudan is agricultural, which is itself considered a high-risk sector.

Commercial financing for end-user appears to be only provided by the retailers themselves (in the form of repayment schedules).

Similar to other actors in the supply chain, none of the transporters interviewed had received loans from banks in South Sudan in their recent history.

4.2 PRODUCTS TYPES AND BRANDS

PRODUCT TYPES

The most popular products sold are torches (flashlights), followed by lamps: together, these items make up almost 80% of all SLPs sold by retailers interviewed for the purpose of this study. Torches are the cheapest products across the sample group, which is likely a contributing factor to their popularity. A consolidated average of 900 SLPs are sold by the interviewed retailers each month, which is an approximate annual average of over 10,000 per year, as of June 2013. It should be noted that the size of the solar market is growing at a very fast rate, so this average may have significantly increased by next year. According to one retailer in Wau, 2 years ago, solar powered products were not available on local markets and were only used by NGOs and international organizations.

Figure 12: Market Share of Different Solar Product Categories among Retailers Interviewed[14]

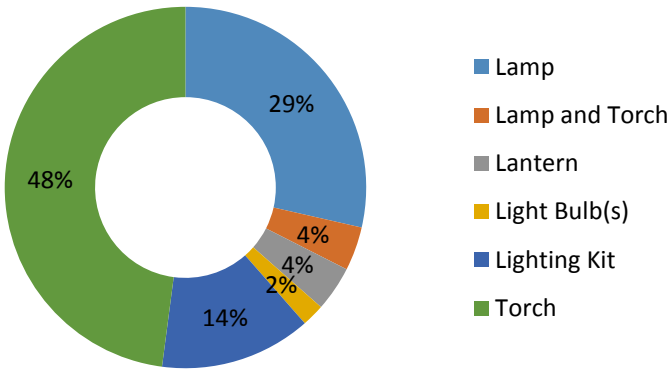
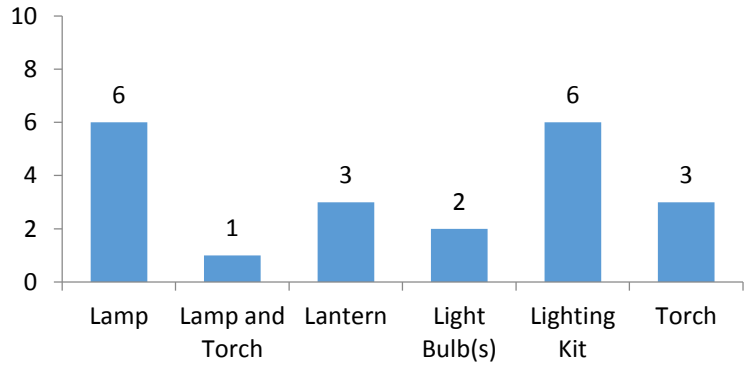


Figure 13: Number of Distinct Solar Products Available under each Product Category[15]



The table in Annex 1 below gives a complete overview of the different products sold across the sample retail group.

[14] Sample size: 10 retailers
[15] Sample size: 10 retailers

BRANDS

In total, there are 21 different lighting products, from 15 different brands sold by the retailers interviewed which shows considerable diversification in the market. Of these, 6 brands have met LA's Minimum Quality Standards. Only one brand was found in both Wau and Juba, which reflects the different supply chains used to bring goods into each of these locations. The brand with the largest market share sells 28% of the lighting products sold within the sample group. Bulk orders from NGOs contribute to this brand's market share, as it sells 70% of their products directly to NGO clients. Two additional unbranded products were found on the market: these had no branding labelled either on the products or the packaging; their countries of origin were also unclear. Company information for two other branded products could not be found[16].

Table 9: Solar Product Brands Available in South Sudan

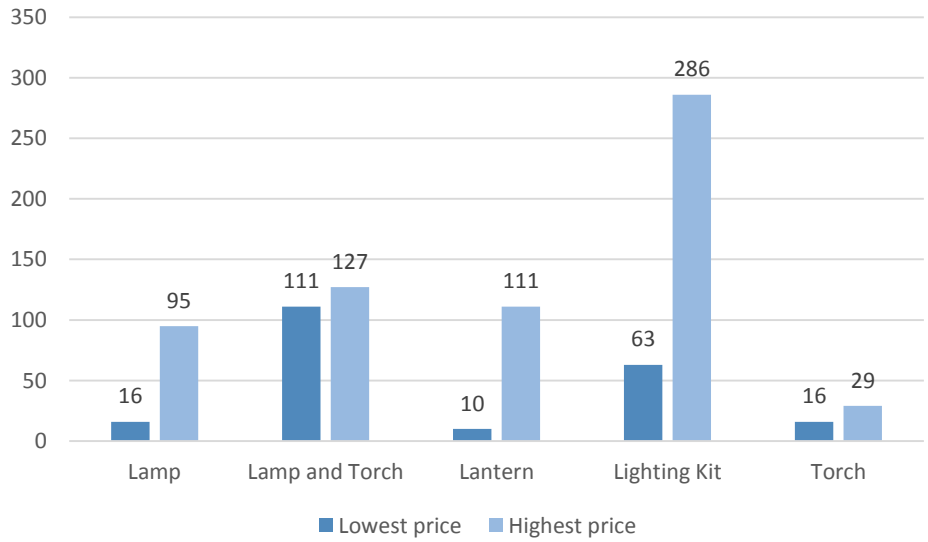
Brand	Number of products identified	Meet Lighting Africa's Minimum Quality Standards
ASE	5	
Barefoot	5	Yes
Trony	5	Yes
Unbranded	2	
D-Light	2	Yes
Solar World	2	
Sunshine Solar	1	
C.Point	1	
Nippotec	1	
Jarrett	1	
King Canada	1	
Nokero	1	
Minda NexGen Tech Ltd	1	Yes
Captain Green	1	
Goal Zero	1	
Sola Viva	1	
Deutrex	1	Yes
Bettalights	1	Yes

[16] Possible explanations for this are that these brands are small companies, or that the products were re-branded at some point along the supply chain and actually originate from larger, well known manufacturers. Another possible explanation is that these products are fake replicas of popular products and, therefore, manufacturer information is not readily available. One of the manufacturers interviewed during the research said a common problem they face is fake replicas of their products, often from China, appearing on markets. The supply chain for Wau does lead back to China, so this may also be a possibility.

PRICING

Overall, the price of solar powered lighting products ranges from 30 - 900SSP (US$10 - US$300). In Wau, product prices range between 150 - 750 SSP (US$50 – US$250). Torches are the cheapest SLPs starting at US$10 while products combining a lamp and a torch are the most expensive (almost US$130).

Figure 14: Prices of Different Categories of Products (US$)



BRAND AND QUALITY AWARENESS

When asked about the quality characteristics they consider when purchasing products, only two retailers reported testing products to measure quality. These retailers test for lifespan of light and luminosity/wattage. Other retailers make quality assumptions based on the country of origin of goods (Chinese products are considered to be low quality whilst American, German and Korean products are considered to be higher quality), the price of the good, how frequently customers return the product, and the warranty package. One retailer said that he selects goods solely based on the product features and did not consider any quality characteristics at all.

Retailers also showed limited awareness about brands. When asked "what factors influence your decision in brand and product choice for solar powered lighting products?" only 1 of the 10 retailers named a specific brand they preferred to purchase. Other factors they consider, are the quality of the product, the speed at which it can charge, the wattage and whether it will be able to withstand the hot climate of South Sudan. When asked which specific brands they believe are higher quality, 8 out of 10 retailers named specific brands[19], and the remaining 2 said they chose brands based on their country of origin.

Overall, retailers thought that customers would be interested in products that have met Lighting Africa's Minimum Quality Standards, because they are cheaper than solar panels and appear to be relatively easy to use. Perceived negative aspects of these quality-verified products were that most of them don't offer many features such as mobile phone charging, which is a common customer

[19] Each brand was named once.

request, and that retailers prefer to focus on selling higher value goods (panels), as the profit margins are higher.

Box 3: Battery Powered Lighting Products

Battery powered lighting (BPL) products in the sample studied generally have lower up-front costs than their solar counterparts. BPL torches ranged from 10 - 40SSP (US$3.50 – US$13.50) and lamps ranged from 10 – 45 SSP (US$3.50 – US$15) (wholesale and retail prices). Batteries cost 7 SSP (US$2.25) per unit on average.

Many of the BPL products on the market appear to be flimsy and low quality. However, according to one wholesaler "people here do not care about quality, they care about price. They would prefer to buy a 30 SSP (US$10) product that breaks after a few weeks, than buy a 100 SSP (US$33.50) product that will last for a long time". The retailers themselves also appeared to be unconcerned/uninformed about product quality characteristics or brands. No retailer interviewed could specify any brand they considered to be high quality, or even any brand at all.

BPL product retailers know little about the characteristics of their products (e.g. brightness, battery length). This may also be a reflection of their customers; unlike SLP customers who spend time selecting products and discussing with retailers which product is best suited to them, BPL customers are already familiar with torches/lanterns, know what to expect from them and, therefore, typically buy with minimal discussion with the retailer. As a result, BPL retailers have no need to become 'specialists' on the lighting products they sell.

4.3 Customer Usage and Attitudes

Sources of Lighting Used

Due to the limited access to the public electrical grid, most people interviewed in the focus group discussions use individual or shared generators as a primary source of electricity. For lighting purposes specifically, interviewees mention using lamps/lanterns including kerosene lamps and battery-powered lamps as well as candles, torches, etc. The use of solar powered lighting is still very limited among the group of people interviewed, mostly because there seems to be limited knowledge and understanding of solar solutions both in urban and rural areas, but also because most people perceive it to be very expensive. It has been very difficult to identify small businesses using solar powered lighting systems in areas where the fieldwork was conducted (i.e. in and around Juba and Wau).

Table 10: Indicative Lighting Energy Costs

	Upfront investment (SSP / US$)	Fuel costs (SSP / US$ per month)		
		Number of units (per mth)	Cost per unit	Total Fuel Costs
Battery lamp	15-50 / 5- 16.75	2-4 Batteries	7 / 2.25 p. Battery	14-28 /4.50 - 9
Torch	10-20 /3.25 - 6.75	1 battery	7 /2.25 p. Battery	7 / 2.25
Oil lamp	5 / 1.75	1.5-3 litres	2 / 0.75 p. Litre	3-6 / 1 – 2.25
Paraffin lamp	40 / 13.25	1 litre	4 / 1.25 p. Litre	4 / 1.15
Solar lantern	50 / 16.75	0	0	0
Solar table lamp	25-35 / 8.25 – 11.75	0	0	0

AWARENESS OF SOLAR POWER

Overall, awareness levels of solar powered products in both Juba and Wau are low. This was reflected both in the focus group discussions and in retailer interviews. When retailers were asked to rate awareness levels of solar powered products in households and small businesses on a scale of 1 to 5 (with 1 being not at all aware and 5 being very aware), the average response was 2. Some respondents differentiated between rural and urban areas, saying that awareness was even lower in rural areas than in urban areas. Conversely, when asked if they felt that households and businesses were aware of the potential savings of using solar powered products, the average response was 3 out of 5. This may be a reflection of the perception that once individuals become aware of what solar power products are, the longer term cost savings become evident to them.

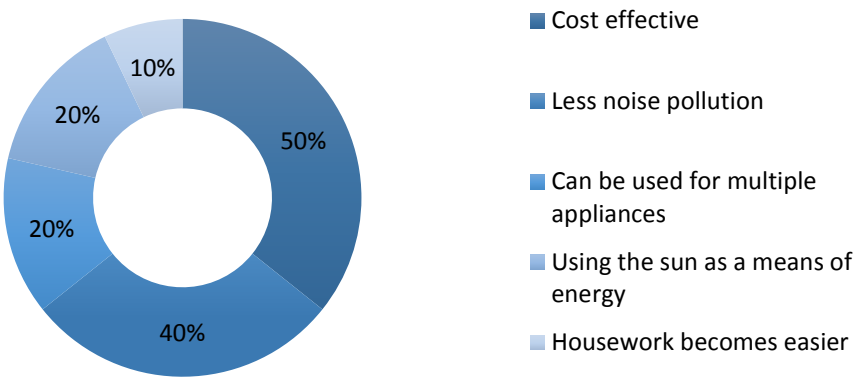
Lack of exposure to solar powered products, both in person or through the media, may be responsible for this limited awareness of solar powered products. According to the 2010 census, less than 1% of the population were using SLPs. In Western Bahr Al Ghazal, less than 1% of households owned a television, 0% owned a computer, 27% owned a radio and 30% could read or write. Whilst the solar market has grown since 2010, these statistics suggest that the average access to learning about solar power products in person, or via printed or non-printed media, is limited.

For those who know about solar powered lighting products, the products seem to be fairly easy to find as both urban and rural respondents reported knowing where to buy them. General city markets in Juba (e.g. Konyo Konyo market) and Wau seem to be the most obvious places to find solar products. For quality products, respondents mentioned that solar products could also be bought outside South Sudan, in Nairobi (Kenya) and Kampala (Uganda). Only one respondent mentioned the existence of a retail outlet in Juba. Furthermore, some solar products, of lower quality, are sold by roadside hawkers in urban centres.

In this context of globally limited awareness and knowledge about solar powered products, unsurprisingly, respondents show no specific brand awareness. Solar products are mostly differentiated by their country of origin: ‘Chinese’, ‘Japanese’, ‘German’, or ‘Italian’ products, as opposed to specific brands. While Japanese, German and other European products are considered to be of good quality, respondents are very dubious about the quality of Chinese products, which are generally considered to be of bad quality, ‘fake’ and cheap. Retailers themselves as well as sector experts such as electricians are considered as the most trusted source of advice in the selection of solar products. Alternatively, respondents test the products in the shop or use price as a proxy to assess the quality of the products. Similarly, respondents would naturally turn to solar product retailers and professionals such as electricians if they need maintenance or repair services.

The general experience with solar products is globally positive as it is considered a reliable source of energy not just for lighting but also for electrical appliance charging purposes (e.g. mobile phones). The single most important positive point about SLPs according to respondents is that it enables them to save money on generator fuel. The absence of noise was also frequently raised as a positive aspect of solar powered systems confirming the frequent use of generators as sources of lighting/energy. Interestingly, the multi-purpose usage of solar powered products for lighting purposes and also to charge electrical appliances such as mobile phones and computers was noted as a major advantage, highlighting the importance of not just lighting needs but also of mobile phone usage. Solar powered systems are also used as backup solutions to lower fuel consumption. Finally, the reliability of solar energy as compared to traditional grid electricity was underlined, which contributed to the improvement of living conditions including ability to work at night, notably for children, and improved health conditions thanks to the use of clean fuel.

Figure 15: Positive Feedback on Solar Powered Products from Customers[17]



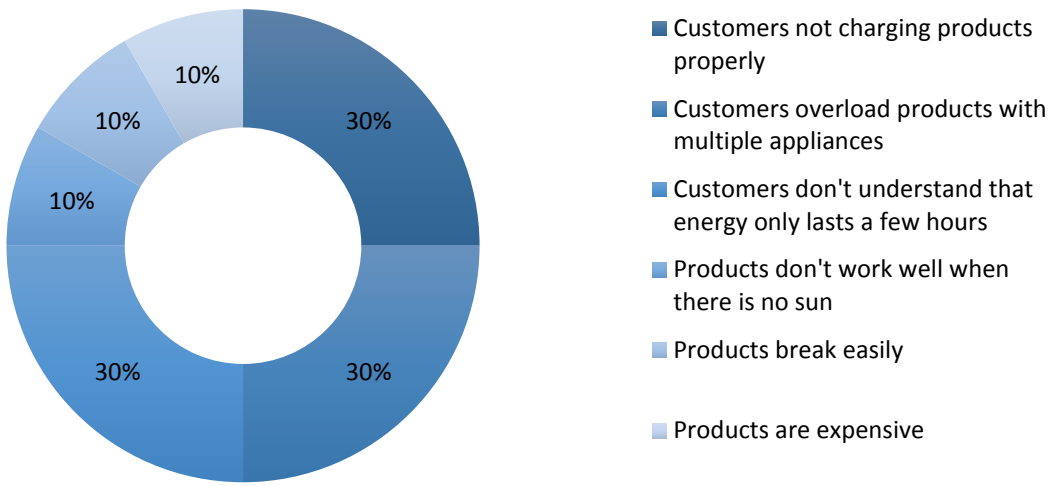
Yet, a few negative points regarding solar powered systems were also raised, starting with the high upfront investment needed to acquire them. Several respondents reported that people in their communities would be interested in purchasing solar powered products if they could afford the initial buy-in costs. The relatively higher prices of products in Wau was one factor that can be considered to be impacting sales. Due to the different supply chains for Juba and Wau, no single product was found in both locations that could be used to do a direct cost comparison.

In addition, solar products are considered fragile, and the problem can even be more acute in remote rural areas where environmental conditions (heat, dust, etc.) can be particularly harsh. Technical issues have also been raised regarding the quality of the batteries and their short life span (also linked to fragility) and the absence of energy after a few days of bad weather. The most common problem experienced by users are issues with the batteries not charging properly, followed by damage through overuse (trying to charge too many products at once).

Three-quarters of the negative feedback retailers receive from customers is related to limited customer understanding of products. This considered, awareness campaigns will be most effective if they disseminate information not only on the benefits of solar powered products, but also on correct usage and typical characteristics of the products.

[17] Sample size: 10 retailers

Figure 16: Negative Feedback on Solar Powered Products from Customers[18]



WILLINGNESS TO PAY FOR SOLAR PRODUCTS

Indications given by respondents on their willingness to pay for solar powered lighting products show important discrepancies from one respondent to another as not all of them are necessarily well aware of the concept of solar energy and the products available on the market.

Generally, willingness to pay is higher among solar powered product users than among non-users, and more so among business users than non-business users. Urban and rural responses do not show significant differences, nor are there significant differences in responses between Juba and Wau.

Interestingly, willingness to pay for lighting and charging products is comparable among non-business user respondents and among business user respondents, although slightly higher for the latter. This shows respondents' interest in not just lighting products but also in chargers. Moreover, willingness to pay is significantly higher for solar energy storage systems in line with users' needs to have access to energy when they need it and not just when it is available, offering them more flexibility: this may notably relate to the issue raised by interviewees regarding the unavailability of energy during cloudy/rainy days.

Table 11: Willingness to Pay for Solar Powered Lighting Products[19]

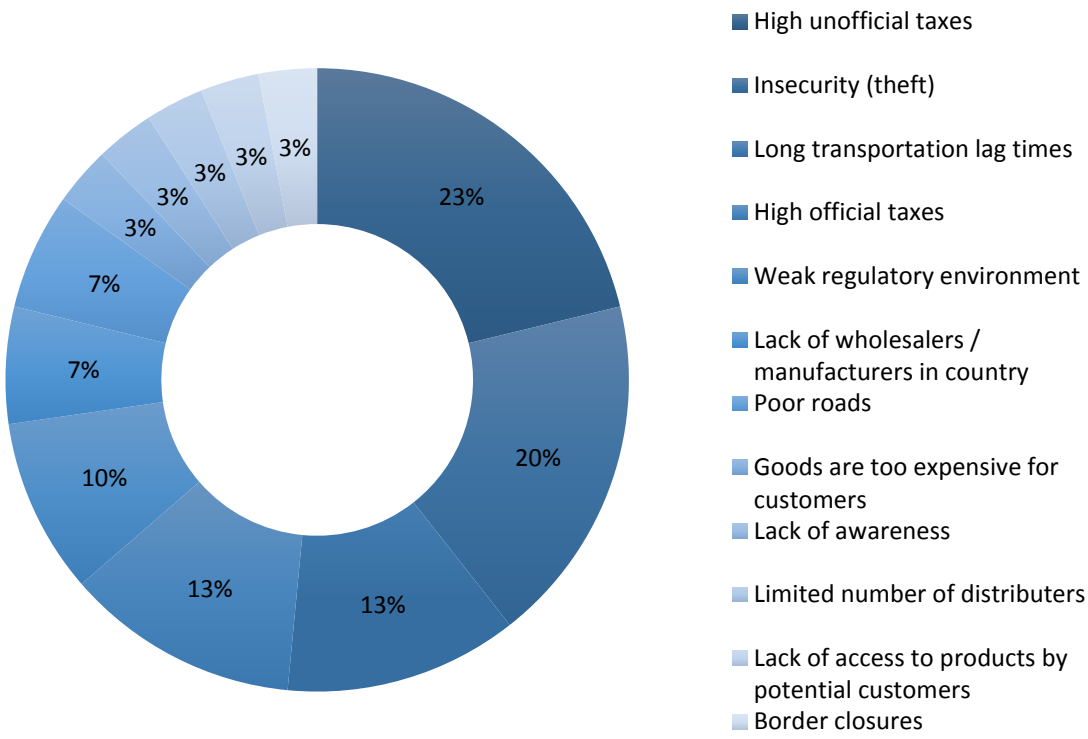
	Solar lighting (SSP / US$)	Solar charger (SSP/ US$)	Solar energy storage system (SSP / US$)
Non-business users	20-60 / 6.75 - 20	10-50 / 3.25 – 16.75	100-3,000 / 33 - 1,000
Business users	50-150 / 16.75 – 50	150-200 / 50 – 66.75	500-1,500 / 167 – 500

[18] Sample Size: 10 retailers
[19] Sample size: 30 respondents

5. ASSESSMENT OF THE SOLAR LIGHTING PRODUCT MARKET CHAIN

Due to challenges facing the energy sector, and the lack of access to electricity in South Sudan, both in urban and rural areas, market opportunities for SLPs are huge. However, these opportunities are not yet being tapped into as South Sudan is a relatively new market and specific market strategies have not yet been developed to address the challenges arising in the country. The following bottlenecks were identified in the South Sudan supply chain:

Figure 17. Bottlenecks in the Supply Chain[20]



5.1 DISTRIBUTION CHANNELS

Distribution channels in South Sudan are underdeveloped with no structured channels or actors such as wholesalers. Consumer goods are imported into South Sudan through different supply channels: from Sudan (Khartoum) for the Northern parts of the country and from neighbouring countries (Kenya and Uganda) for the Southern regions. Main South Sudanese market centres such as Juba and Wau are in fact the terminus of foreign supply chains, which do not continue on to secondary urban centres let alone the peri-urban and rural areas of South Sudan. As a result, the main actors of the supply chains (importers, traders, wholesalers) are located outside South Sudan. Within South Sudan, market chains are not developed beyond the main urban centres (Juba, Yei, Wau, Malakal, etc.) where markets are located: customers interviewed for the purpose of this study confirmed that they have to travel to those market centres to buy consumer goods such as mobile phones, lamps and other electrical appliances, etc.

[20] Sample size: Consolidated data from KIIs

Box 4: Lessons from other Consumer Goods' Supply Chains

Battery Powered Lighting Products

The market for BPLs is large and well established. Torches can be found in most corner stores alongside other low cost essential goods. Lanterns can be easily found in the main commercial hubs in both cities sampled.

In Juba, a number of importers/wholesalers were identified, selling BPLs alongside other products such as radios, basic household goods (e.g. coat hangers, clothes pegs, and dishcloths) and small toys.

BPL products are sold at genuine 'wholesale' prices, making them accessible to small-scale retailers. Rural retailers report transporting these goods to their stores themselves via public or private transport (motorbikes/cars).

Mobile Phones

Unlike the SLP market, the mobile phone market is demand driven (22% SIM penetration[21]), with customers requesting specific brands and models from retailers. Quality and brand awareness amongst sample retailers is also found to be high.

Mobile phones primarily come in to Juba via wholesalers travelling to Dubai and bringing goods back as hand luggage on commercial flights; they come into Wau via the same route as SLP products, through Khartoum.

Despite strong demand for mobile phones in rural areas, mobile phones are not available in local stores. Consumers travel to Juba/Wau to buy their phones:

- Demand is not high enough to justify stocking phones locally: rural consumers may not have enough disposable income to be able to buy new phones regularly. According to one retailer in Wau, "there are huge opportunities, because people need to communicate. All that is missing is regular salary payments". Two FGD mobile users reported having SIM cards, but not enough money to buy a phone: instead, they would borrow phones from other people to make calls/send text messages.
- Lack of capital among rural retailers means they do not have enough money to purchase high value goods like mobile phones. Rural retailers typically only sell low value goods such as soft drinks, water, biscuits and phone cards with values of 2 - 5 SSP (US$0.75 – 1.75). The mobile retailers sampled were paying a minimum of 80 SSP (US$26.75) to suppliers to purchase mobile phones. One retailer in Juba reported that the main challenge he faced was not having enough money to buy more phones. He said, "the more phones I have, the better my business" and his supplier had enough confidence in his business, that the supplier was paid as the mobile phones sold.

Lessons:

Support emergence of SLP wholesalers: The existence of wholesalers in Juba for BPLs or mobile phones makes it easier for small- scale retailers to buy and sell on these products. The capacity of some existing retailers to become wholesalers could be reinforced with financing, technical expertise and supporting the creation of market linkages. The SLP market would benefit from supporting the emergence of wholesalers into the supply chain, both to make SLP products more accessible to small-scale retailers and to facilitate lower cost products being available on the market.

Leverage existing supply chains: In order to facilitate penetration of SLP products in South Sudan in general and to rural areas in particular, it would be beneficial to make SLP products not only available via SLP wholesalers, but via wholesalers of diversified household products from whom small retailers buy basic goods such as torches and batteries. SLP products would then become more visible and easily accessible to rural retailers.

[21] Source: GSMA Intelligence (Q4 2012)

Only two types of commercial distribution models were identified in South Sudan for SLPs: Only one manufacturer uses its own distribution channel through a dedicated retail outlet in Juba selling their products directly to customers. While this model enables the manufacturer to keep control over its distribution network (price, quality/brand image, proximity with customers, etc.) it entails a relatively high fixed costs investment and means that outreach is limited by the number of outlets.

In South Sudan, the wide majority of SLPs are sold through retailer networks whereby retailers directly import products into South Sudan, via traders based outside, and then sell them to customers themselves. While this model leverages existing channels which are common and well understood by customers, the limited sophistication of these networks in South Sudan can constrain volume of sales: import is done on an ad hoc scale and none of the interviewed manufacturers mentioned any major solar product warehousing facilities in-country, nor any wholesalers they could approach in South Sudan to sell their products. According to one manufacturer, "if there were 2 or 3 distributors with good networks, who could work with us on a wide scale, we would be very happy". This model enables manufacturers to share marketing and logistics expenses but the lack of financial and technical capacities of retailers can constrain volume of sales in country: retailers often are SMEs with limited working capital and no qualification to offer sales guidance or after sales services for SLPs. Two companies try to address this issue by providing support to retailers on sales and marketing as well as training on SLPs. Yet, these efforts are still very much scattered along the supply chain and support is not provided through formal partnerships with promising retailers to build up their capacities in the long term.

This distribution model of almost exclusively relying on retailers further suffers from constraints faced by the retailers themselves (e.g. small-scale activities, lack of access to finance) and from issues resulting from the limited engagement of manufacturers with end customers (e.g. on marketing, communication, control of pricing, quality, brand image, after sales support, etc.).

Box 5: PSI Strategy to Access Rural Markets

Population Services International (PSI) has been operating in South Sudan since January 2005. They primarily provide Non Food Items (NFIs) such as mosquito nets, condoms, and water purification tablets as part of health and population control interventions, to rural areas of South Sudan. PSI is known for having successfully penetrated into rural areas with NFIs. The research team met with a representative from PSI to gather information on their rural penetration strategy. PSI reported that they identify areas that are vulnerable to high levels of illnesses such as malaria / HIV / Aids, then supply local stores with the NFIs necessary to combat these. Local stores are provided with enough items to serve the community and these items are given to the stores for free. It is then at the discretion of the storeowners whether to sell these items, or give them to the communities for free.

Using community level retailers should be considered to access rural markets as local storeowners can easily distribute to community members. This model could also have a positive micro-economic impact. If storeowners are also trained in basic maintenance, community members would have easy access to a repair person when products malfunction. Furthermore, working through local storeowners may reduce the impact of insecurity. Whilst retailers in Juba reported that theft had a negative impact on their businesses, those in Wau were not affected by theft because "we know everybody here and everybody knows us”.

5.2 Marketing and Promotion

Customer awareness on the concept of solar power and on the different products available, as well as on the long term cost benefits, is limited in South Sudan. As one company highlighted, "even in sophisticated markets like Uganda and Kenya, customer awareness is low and in South Sudan it can be expected to be even lower". This can be said for both individual customers and SMEs. One reason

for this is the lack of promotion and marketing efforts from manufacturers: most of them have no permanent presence in South Sudan and leave it to their distributers to promote SLPs. Yet, these distributers are small-scale retailers, with limited outreach and capacity to conduct marketing and promotion campaigns. This creates a negative dynamic wherein lack of customer awareness leads to limited sales volumes, which in turn does not encourage manufacturers to invest in local marketing and promotion campaigns, combining to perpetuate low customer awareness.

5.3 Access to Finance

The lack of access to financial services in South Sudan represents an opportunity cost for retailers who are not offered a chance to increase the scale at which they are operating, constraining volumes of sales. It limits the storage capacities of retailers, possibly resulting in disruption on the SLP market. This lack of access to financial services is also a constraint for customers at the end of the market chain as customers at the base of the pyramid may not be able to pay for such an investment upfront. According to one company, “people without electricity and in need of solar are the poor, however, they are not able to afford the products".

5.4 Logistics and Security

The high expense of transporting goods into South Sudan presents a business challenge for manufacturers and one issue contributing to the expensive transportation costs is the small scale on which retailers bring in products. The majority of solar sales outlets rent cross-border transportation -- often only a small portion of trucks importing goods -- contributing to higher cost overall. In addition, the road network in South Sudan is poor, which means that moving goods around the country is expensive in general. Many parts of the country are less accessible, or even inaccessible, by road during the rainy season. The transporter interviewed in Wau, for example, said, "the roads are completely closed during the rainy season. Around this time next month we will have no movement at all". Overland transporters experience decreases in business of between 15 - 100% during the rainy season and increased journey times, to the extent they are possible at all, of up to 3 days. The air and water cargo transporters interviewed, however, see their business increase during the rainy season. According to the shipping company interviewed, water transportation becomes easier during the rainy season, as water levels are higher. As a result of this and because some areas are no longer accessible by road, their business increases by 10% during the rainy season.

Furthermore, insecurity is considered to be another major bottleneck in the transportation chain. According to one transporter, "insecurity hurts our business a lot. When clashes occur, we have to stop our trucks from continuing or divert them onto a longer route instead. This always disappoints our clients". Other transporters report theft en route, or drivers finding themselves in dangerous situations when not having enough money to pay their way through checkpoints. The impact of insecurity is reported by both overland and water transporters.

5.5 Legal and Regulatory Environment

The difficult business environment in South Sudan discourages private companies from entering into the market. High taxes (both import and domestic, official and unofficial) are considered to be the

single major regulatory constraint in South Sudan impacting all business operating in the SLP supply chain.

SLP retailers report that the combination of unofficial and official taxes collected by customs, police, and traders could reach far above the official tax rate of 50%. For example, according to the National Bureau of Customs, the state unloading tax rate is 10 - 20%. In Wau, however, the transporters claimed that they were taxed 50% of the value of goods to unload their products[22]. In addition, regardless of the different levels of commercialization, transporters and retailers in both supply chains said that one of the biggest issues they face is the high amount of unofficial taxes that are paid when bringing goods into the country. As a result, transportation costs are high, as commercial transporters need to make provisions to cover the costs of unofficial taxes that they may have to pay en route. The average unofficial tax rate for the border crossing at Nimule was reported to be 6% of the total value of the goods (with a range of 4% - 8%). Additional unofficial taxes of a few hundred SSPs are then charged by police at various checkpoints along the Nimule - Juba road. Truck transporters operating on non-smuggling routes report paying fees of between 1,000-3,000 SSP (US$ 333 - US$1,000) per journey. Unofficial taxes paid by the coach company was significantly less, at between 150 - 300 SSP (US$50 – US$100) per journey. Unofficial taxes paid by the largest transporter was very high: according to the respondent "we normally set aside between 30,000-40,000 SSP (US$10,000 – US$13,333) for unofficial charges". Unofficial taxes on the smuggling route between Wau and Khartoum were not disclosed.

Whilst official and unofficial taxes are considered high overall, neither retailers nor transporters believe that bringing goods into South Sudan is very difficult. When asked to rate this difficulty on a scale of 1 to 5 (with 1 being very easy and 5 being very difficult), the average response was 3 out of 5. Factors cited for ease of import was the border control and the short amount of time in which goods can be cleared at the border. In fact, it appears that the absence of a strong regulatory framework actually makes bringing goods in and out of the country relatively straightforward. According to one transporter, "it is extremely easy. There are no legal articles in place for the transportation business. Companies have to get certificates and licences for their business and that is it. The government does not do follow ups after companies have this documentation. Also, clients here do not know their rights".

[22] It is not clear whether the mark-up in Wau is being charged by traders bringing in goods, or by customs officials. The local research team in Wau did ask several local customs police what the official tax rate was, but none were able to give an official response.

6. CASE STUDIES

During the preliminary research phase, lessons were drawn from other countries, which have implemented rural electrification and renewable energy programmes in the face of similar challenges to those of South Sudan. These provide additional insight, which is useful to consider when seeking to increase the availability of products in South Sudan that have met LA's Minimum Quality Standards.

6.1 MONGOLIA[23]

Key features of the National 100,000 Solar Ger Electrification Program, funded by the World Bank including grants from the International Development Association (IDA), the Global Environment Facility (GEF) and the Government of the Netherlands:

Context	- 1/4 of the population a re **nomadic herders** with little/no access to electricity - Over 250 sunny days per year
Access to Markets	- 50 sales and service centres, with **coverage in all 21 provinces** - Sales and service centres frequently **partnered up with community administrations in order to reach herders in remote areas**
Affordability	- **50% subsidy** on equipment available to herders - The Mongolian government supported the program by **purchasing bulk orders of household systems** in order to get lower, more competitive prices; these were then sold to community administrators and private retailers
Quality Control & Maintenance	- Under the program, all **equipment was inspected and certified**, giving herders confidence in their purchases - Each system included a **warranty** and could be returned for a replacement at one of 50 sales outlets nationwide - Private **after-sales services operators trained, certified and supported across the country**; their national spread means that herders do not have to make expensive journeys to the capital city for repairs
Results	- 60-70% of nomadic herders now have access to electricity - Solar power has created new markets for light bulbs, radios, satellite dishes, televisions and cellular phones, etc.
Challenges	- Private solar power outlets **not commercially sustainable**, without the subsidies provided to customers by the program and the bulk purchases made by the government. The program design means that a self-sustaining solar power market has not been created.

[23] Capturing the Sun in the Land of the Blue Sky - Providing Portable Solar Power to Nomadic Herders in Mongolia (Jayawardena, Migara S.; Rivera, A. Salvador; Ratnayake, Chrisantha, 2012)

Lessons Learnt:

A significant proportion of South Sudanese are pastoralists. This group is typically difficult to provide assistance to, because of their nomadic lifestyle. The 100,000 Solar Ger Electrification Program successfully reached nomadic herders by providing a large national network of outlets and penetrating into rural areas through partnerships with community leadership.

The average South Sudanese lives on less than US$1 per day, so affordability will be a major consideration for the design of this program. In Mongolia, a subsidy of 50% made the solar system accessible to herders, whilst still ensuring financial commitment from them. An alternative to this would be to provide small loans to herders to enable them to purchase equipment. However, the micro-finance market is currently not well established in South Sudan and a trusted micro-finance provider is key to community buy-in. The subsidy approach taken in Mongolia then, may be more appropriate for the context of South Sudan.

6.2 BANGLADESH[24]

Key features of the Rural Electrification and Renewable Energy Development Program, supported by the World Bank:

Context	- 1 in 3 Bangladeshis has access to electricity
Community Education	- Program focus on **'creating a market'** for solar power through educating potential consumers and investing in training of vendors - Awareness campaign included **demonstrations, pilot set-ups and advertisements**
Access to Markets	- A range of organizations were eligible to be vendors; private businesses, NGOs, MFIs and community organizations to provide systems to consumers. **NGOs and MFIs in particular, had already established trusted relationships with communities** and had a wide reach - Participating vendors purchased **equipment directly from private retailers**, in order to stimulate sustainable growth in the industry
Affordability	- **Subsidies were provided to vendors** to reduce costs of purchasing solar household systems. These subsidies were given via grants that were disbursed after the implementing agency verified that the solar system was properly installed and functioning - Subsidies to vendors were reduced over time and as initial start-up costs decreased - **Loans of up to 80% were given to customers, via the vendors**. Vendors needed to demonstrate previous experience in micro-finance lending and a good business record to be eligible for participation in the program
Quality Control & Maintenance	- Vendors supported by the program also responsible for installation and maintenance of the systems - Participating vendors to be **compliant to quality standards**
Results	- 2 million solar systems installed - Program successfully stimulated the market; now over 50,000 solar home systems are installed each month in Bangladesh

[24] Bangladesh: Solar Home Program on Credit Sales (World Bank, 2005)

Challenges	- Loans typically repaid by customers over a 3-year period at a rate of 26%. Bringing **customers into long term debt, with high interest rates** may reduce their ability to cope with household shocks and / or invest in other family interests, such as education

Lessons Learnt:

Working through organizations, such as NGOs that already have national networks and are trusted by communities may be a good model in the context of South Sudan, where the government is relatively new and still undergoing significant capacity building. Other options for government involvement can be incorporated, such as the government linking communities to solar power providers.

Whilst loans to customers ensure investment from end-users, research will need to be done to determine how much debt is feasible in a country where environmental, security and political shocks remain common. Levels of debt should not undermine households coping strategies.

6.3 SRI LANKA[25]

Key features of the Energy Services Delivery Program, supported by the World Bank and the Global Environment Facility (GEF):

Context	- 70% of households outside of Colombo and the Western Province without access to national power - Government estimated that it was only feasible to connect 42% of rural households to national power grid in the 8-10 years ahead
Community Education	- The program conducted **village-level workshops**, in addition to TV, radio, newspaper and **door-to door campaigns**
Affordability	- **Import duties on solar powered products decreased from 30% to 10%** - **The program financially supported banks, leasing companies and MFIs**, who in turn, provided credit to vendors. Loans with 6-8 year maturity were provided at 10% interest plus the average weighted deposit rate. Project assets were used as collateral - **Sri Lanka's oldest microfinance institution**, Sarvodaya Economic Enterprise Development Services, who have extensive networks in rural areas, provided micro credits to consumers - **A subsidy of US$100 per system** was given to end customers
Quality Control & Maintenance	- Government took responsibility for monitoring compliance to quality standards and regulations - Dealers were responsible for installation and maintenance of systems - **Villagers were also trained in maintenance** of systems
Results	- 21,000 solar home systems installed in 6 years - Sales of solar powered products remain strong in Sri Lanka
Challenges	- **Industry experienced saturation** and many solar power outlets collapsed

[25] Harvesting the Elements, The Achievements of Sri Lanka's Energy Delivery Project, I.M Drupady and B.K Sovacool, 2011

	- In country manufacturing capacity not built up, so **cost of solar power systems remained high**

Lessons Learnt:

Considering the low levels of literacy in South Sudan, extensive awareness campaigns would need to take place to persuade communities to invest in solar power. Village level workshops may be a strong option, as only 3% of South Sudanese own a television set and just 25% own a radio.

The limited infrastructure in South Sudan means that transporting goods internally is very costly. One way to offset this could be reduce import tax on solar power goods, as was done in Sri Lanka. Another option for reducing costs could be to establish in-country manufacturing of parts. This would both contribute to reducing costs and generate local employment.

7. RECOMMENDATIONS

By supporting the development of commercially viable distribution models and also by fostering the emergence of a more conducive business environment in which actors of the market chain operate, access to SLPs can be increased in South Sudan.

7.1 DEVELOPMENT OF COMMERCIALLY VIABLE DISTRIBUTION MODELS

There are three main options to upgrade SLP distribution channels in South Sudan. These are not mutually exclusive and can be implemented sequentially as the SLP market matures as they imply different level of investments. The development of these different distribution models can be supported in a variety of ways as described in Table 12 below.

Table 12: Options to Upgrade SLP Distribution Models in South Sudan

Distribution model	Description	Benefits	Challenges	Possible Actions
Build capacity of existing commercial distribution channels	• Broad range of complimentary, competitive and sometimes unrelated products • Marketing and logistics borne by distributer/retailer • Final sales and sometimes after sales support handled by retailer	• Most common and well-understood model • Leverage existing infrastructure and market penetration	• Lack of product knowledge, expertise of retailers • Shared margins • Lack of control over end customer relationship including pricing, quality, brand image and after sales support	• Encourage retailers to create an association/ consortium to group orders and lower import costs (product prices, transportation costs, etc.) • Build capacity of retailers: help some of them to upgrade to wholesaling activities with increased sales volume, storage capacities (notably to be able to quickly replace defective products to better honour warranties and guarantees) • Train retailers on product characteristics, after sales support, repair & maintenance, etc.
Establish partnerships with alternative distribution systems	• Exclusive or limited to other non-competing/unrelated products • Marketing and Logistics shared • Final sales and after sales support handled by partner	• Rapid implementation: potential for high volume with lower operating costs • Leverage existing networks and capacities to access hard-to-reach areas/customers	• Subsidised NGO activities may distort the market and undermine other commercially-viable distribution models • Clear and transparent agreement re. cost and risk sharing, roles and responsibilities, etc. • Shared margins • Reliant on partner's capacities, reputation, etc.	• Provide financial and technical support to scale up existing regional initiatives • Facilitate access to products that have met LA's Minimum Quality Standards by strengthening the supply chain at the regional level e.g. create regional storage capacities to supply Kenya/Uganda/South Sudan markets

Create a new distribution network from scratch	• Exclusive to manufacturer • Marketing and Logistics borne by manufacturer • Final sales and after sales support handled by sales team	• Complete control over pricing, quality and brand image • Margin maintained in house • Proximity to customer, after sales support • Inventory control	• High fixed cost investment • Difficult to adapt quickly • Difficult to establish the network (hire personnel, comply with legal and regulatory environment, etc.)	• Encourage the establishment of one or two manufacturing sub-offices for products that met LA's Minimum Quality Standards: 'market' South Sudan to manufactures who already have a presence in the region, or to those whose products are already popular on local markets

Box 6: Alternative Distribution Models used by FMCG Companies

Consumer goods and other companies that routinely serve hard-to-reach populations offer useful insights and examples for developing commercially viable distribution channels for SLPs. One company, for example, has set up distribution systems for remote areas by working with local women's self-help groups in India (**Shakti Model**). One social enterprise in Uganda has developed a micro-franchise model used to distribute consumer goods and life-changing products such as solar lamps in remote places through a network of individual women retailers. In addition to accessing hard-to-reach customers, this model offers a commercially-viable solution by enabling women retailers to sell a basket of goods that enables cross-subsidies: consumer goods usually are small price items bought on a regular basis while products such as solar lamps are one-time larger investments.

This social enterprise reaches out to people living in remote areas, underserved by traditional retail distribution networks. Today, they reach over 100,000 households in slums and rural areas through a distribution network of 800 Community Health Promoters (CHP), women serving their own communities. CHPs offer a basket of over 90 diverse products, including consumer goods (e.g. sanitary pads, diapers, toothpaste, laundry soap, etc.) and life-changing products such as SLPs, water filters, etc. These women retailers have been trained to offer basic health services and advice, as well as to educate their female customers on products and services. CHPs reach women via multiple distribution points in order to increase cost-effective coverage. These distribution points include door-to-door, SMS orders, home-based kiosks, and pop-up stores during women's group meetings and on market days.

7.2 IMPROVEMENT OF SOLAR LIGHTING PRODUCT BUSINESS ENVIRONMENT

Bottleneck	Mitigation / Solution
Poor solar product awareness	**Organise consumer and retailer education campaigns to grow and sustain consumer confidence in the SLP market sector and to encourage populations to adopt solar lighting**. Campaigns should target both households and small businesses and teach them how solar lighting solutions can reduce spending on expensive fuels, provide better illumination and more productive time in their homes, schools and businesses, and improve their health. The campaign should also help consumers become knowledgeable buyers and be able to distinguish between substandard products and good quality lamps. One key consideration should be access to the various forms of media that communities have. Particularly outside of Juba, where access to print and non-print media is typically lower, demonstrations may be the most suitable awareness raising strategy. Campaigns should also be organized to introduce and promote products to retailers as is done by mobile phone importers who often select products abroad and bring them to the market to showcase to local retailers. This approach could be replicated for SLPs: small retailers who have limited/no knowledge of SLPs cannot be expected to approach larger solar power goods retailers to purchase SLPs.
High product pricing	**Promote alternative solutions such as Azuri's Indigo pay-as-you-go solar technology, which was introduced in South Sudan (Nimule) in 2012 in partnership with Luminance12 to provide rural households with clean lighting and mobile phone charging services.** Indigo allows users to buy scratch cards to pay for their energy, just as they would for their mobile phones. After a period of time, customers have paid

	off the cost of their unit and can upgrade to a larger system and access more energy.[26]
Insecurity (theft)	**Create a directory of trusted business partners/forum to exchange opinions** Encourage retailers to work with reputable partners and in particular transportation companies, who are able to provide secure vehicles with trusted drivers. A forum where retailers could share their experience of working with specific partners could be created. This forum could also be used by retailers to coordinate their orders in order to share import costs, notably transportation expenses.
Limited manufacturing activities in country	**Determine the cost effectiveness of assembling solar products in South Sudan and determine whether or not the model could be replicated and/or expanded.** Asses the economic and technical viability of assembling products in South Sudan taking into account labour costs, technical capacity, etc.
Lack of access to finance	**Engage with banks and MFIs to build their knowledge of the SLP sector, to demonstrate that it is a viable, fast-growing economic driver and to encourage them to develop adapted financial services for both traders/distributers and consumers.** A guarantee scheme could be put in place to encourage financial institutions to provide trade finance to importers/distributers and enable them to bring in larger consignments, more frequently, in order to ensure a sustained supply of SLPs and in turn reduce import costs through economies of scale.
Long transportation lag times	**Increase storage capacities** The road network in South Sudan is poor and there is no quick fix for this issue. Instead, efforts focusing on increasing warehousing for products in country and strengthening the capacity of key distributers, to ensure that retailers have easier and quicker access to products, could prove beneficial.
High taxes	**Support the GOSS to establish clear regulations and processes to import SLPs and lobby to reduce taxes on SLPs** GOSS may be open to working on reducing import duty and VAT on SLPs: lobbying the government to reduce the import duties on solar power imports down to 3% or beyond should have a positive impact on market prices.

[26] Source : http://www.azuri-technologies.com/indigo/

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ANNEX 1: PRODUCT MATRIX

Brand	Model	Description	Price range	# of Retailers Selling Product	Volume Sold Per Month	Locations of Retailers Selling Product
ASE	TPS-205 : 15W Solar DC Lighting Kit	Lighting kit	500	2	34	Juba
ASE	Solar Lantern With Mobile Phone Charging	Lantern	200	1	25	Juba
ASE	TPS-206 : Portable Lighting Kit	Lighting kit	750	1	10	Wau
Barefoot	Firefly Mobile Lamp, Gen 2.5	Lamp	50-110	3	45	Juba
Barefoot	Matrix Gen 2.5	Lighting kit	900	1	7	Juba
Barefoot	PowerPack Junior Matrix Gen 2.5	Lighting kit	200-250	2	45	Juba
Bettalights	Betta Two	Lighting kit	350	1	10	Juba
C.Point	Ep-650	Lamp	150	1	15	Wau
Captain Green	Solar Powered Torch	Torch	90	1	78	Juba
D-Light	s300	Lamp	150-240	2	35	Juba
Duratex	S18	Lamp	250	1	15	Juba
King Canada	KC-005	2 Light Bulbs	500	1	10	Wau
Minda	2w LED Lantern	Lantern	30	1	10	Juba
Nippotec	NP-365	Lighting kit	200	1	15	Wau
Nokero	N100	Light Bulb	30	1	8	Juba
Solar Viva	3 Led Torch	Torch	50	1	250	Juba
Solar World	1W Solar Table Lamp	Lamp	50	1	60	Juba
Solar World	Solar Power Rechargeable Lantern	Lantern	350	1	1	Juba
Sunlight solar	SN – 2	Torch	80	1	100	Juba
Trony	Solar Sundial TSL 01	Lamp	150-300	3	85	Juba
Trony	Solar Sundial TSL 02	Lamp & Torch	350-400	2	35	Juba

ANNEX 2: PHONEBOOK

Category	Company Name	Contact Name	Contact Position	Contact Phone	Email	Location of branches in South Sudan	Mother company (if any)	Location of mother company
Retailer (small)	Amasina	Dawud Lali	Shop Assistant	+2110921105025	n/a	Central Equatoria	n/a	n/a
Transporter (commercial)	Amoo Holdings International	Emoit Evans Lojore	CEO	+211920529835	evansemoit@amooholdings.com	Central Equatoria	n/a	n/a
Regional Trader	Ap-Tech	Ghirmay Zerai	Managing Director	+971566721552	gh.zeray8@gmail.com	Central Equatoria, Western Bahr el Ghazal	n/a	n/a
Retailer (medium)	Ap-Tech (Juba)	Metkel Zerai	Marketing Manager	+211956392412	aptech.africa@gmail.com	Central Equatoria, Western Bahr el Ghazal	Ap-Tech	UAE
Transporter (commercial)	Baby Coaches	Ali Mohammad	Driver	+211955012986	n/a	n/a	n/a	n/a
Manufacturer	Barefoot	Jackson Machuhi	Sales Manager E. Africa and S. Africa	+254202529115	info@barefootpower.com	n/a	Barefoot	Australia
Transporter (commercial)	CEE Express S. Sudan LTD	Moses Makau	Deputy Director	+211956070156	Moses-makau@cee-express.co.ke	Central Equatoria	n/a	n/a
Transporter (commercial)	Corazon Freight & Parcel Services	Aquinas T. Kamau	Operations Director	+254727486300	aquinas.t.k@gmail.com	Central Equatoria	n/a	n/a
Government	Customs	Major Orag Oywac	Customs Official, Tariffs Department	+211915478010	n/a	n/a	n/a	n/a
Retailer (medium)	David Shop	Maria Lee	Shop Assistant	Withheld	n/a	Central Equatoria	David Company	China
Financier	Equity Bank	Peter Kitheka	Head Marketing	+211956105605	peter.kitheka@equitybank.co.ke	Central Equatoria, Western Equatoria, Eastern Equatoria, Jonglei, Upper Nile	Equity Bank	Kenya
Financier	Finance South Sudan	Fasto Amonda	Operations Manager	+211955029186	n/a	Central Equatoria, Western Equatoria, Western Bahr el Ghazal, Upper Nile	Letsehgo Holdings Ltd.	Botswana
Transporter	Fly Dubai	Naresh Kumar Meena	Sales Manager	+211954539060	naresh.meena@flydubaijuba.com	Central Equatoria	Fly Dubai	UAE

Retailer (medium)	Global Trading Agency	Fekria Joyce David	Operations Manager	+211977456214	info@gtasssudan.com	Central Equatoria	n/a	n/a
Regional Trader	Go Solar	Robert Omwando	Director	+254722895922	robert@gosolarltd.com	Central Equatoria	n/a	n/a
Retailer (medium)	Go Solar	Lillian W. Ngugi	Marketing Executive	+211955891781	lillian@gosolarltd.com	Central Equatoria	Go Solar	Kenya
Retailer (medium)	Kunyar Investments	Emmanuel Louis	Owner	+211955584241	n/a	Central Equatoria	n/a	n/a
Retailer (small)	M&E Trading Company	Justus Wambugu	Solar Technician/ Manager	+211955319015	justus@metradingjuba.com	Central Equatoria	Giraffe Investments	Kenya
Retailer (small)	Machakols Solar Centre Ltd	Kamihingo Ishaak	Operations Manager	+211926880723	kamihingo82@yahoo.com	Central Equatoria	n/a	n/a
Retailer (small)	Mahalat Abu Sharif Store	Adil Aubagar	Manager	+211912121555	n/a	Western Bahr el Ghazal	n/a	n/a
Government	Ministry of Dams and Electricity	Samuel T. Youziel	Director General	+211955501835	syouziel@hotmail.com	n/a	n/a	n/a
Government	Ministry of Justice	Aleu Garang	Attorney for Ministry of Finance	+211955170742	n/a	n/a	n/a	n/a
Retailer (small)	Orowtomer Company	Musa Abdullah	Manager	+211912126244	n/a	Central Equatoria, Western Bahr el Ghazal	n/a	n/a
NGO	Population Services International	Mr Scofus	Logistics Assistant	+ 211977123455	admin@psi-southsudan.org	Central Equatoria, Western Bahr el Ghazal	Population Services International	USA
NGO	Solar Sister	Evelyn Namara	Country Director	+256792790183	enamara@solarsister.org	n/a	n/a	n/a
Manufacturer	Solar World	Michael Omondi	Marketing Manager	+254203599699	solar@wananchi.com	Central Equatoria	n/a	n/a
Retailer (small)	Solar World	Solomon Ngoge	Country Manager	+21195333710	solomonngoge@yahoo.com	Central Equatoria	Solar World	Kenya
Trainer	Solar World	Solomon Ngoge	Country Manager	+21195333710	solomonngoge@yahoo.com	Central Equatoria	n/a	n/a
Financier	South Sudan Microfinance Development Facility	Elijah Chol Yak / Charles Benson Data	Credit & Risk Manager / Team Leader	+211955408493	charles.data@gmail.com / silnchol@yahoo.com	Central Equatoria	n/a	n/a

Transporter (commercial)	South Sudan Transnile Company	Edward Lomelie	Business Development	+211927064447	lomelingedward@yahoo.com	Central Equatoria	n/a	n/a
Retailer (small)	Technical Security Support	Jacob Robert Lam	Store Manager	+211955247097	Jacobrobertlam@yahoo.com	Central Equatoria, Jonglei, Upper Nile	n/a	n/a
Manufacturer	Trony	Wyecliffe Nyamanya	Sales and Marketing Manager	+254203741699	nyarienga@gmail.com	n/a	Trony Solar Holdings Co Ltd	China
Retailer (medium)	Unnamed	Bushira Bashar	Owner	+211955812361	n/a	Central Equatoria	n/a	n/a
Retailer (small)	Unnamed	Abdullah Ali	Owner	+211954110219	n/a	Central Equatoria	n/a	n/a
Retailer (small)	Unnamed	Kenyi John	Shop Assistant	+211956903063	n/a	Central Equatoria	n/a	n/a
Retailer (small)	Unnamed	Al Rashid Abdul Rahim	Manager	+21192986875	n/a	Western Bahr el Ghazal	n/a	n/a
Retailer (small)	Unnamed	Michael Vinancio	Owner	+211956062290	n/a	Western Bahr el Ghazal	n/a	n/a
Retailer (small)	Unnamed	Abdullah Adam	Owner	+211920460278	n/a	Western Bahr el Ghazal	n/a	n/a
Transporter	Unnamed	Ali Massa	Driver	+211956468289	n/a	Central Equatoria	n/a	n/a
Transporter (informal)	Unnamed	Mohammed Salah	Truck Owner/Clearing Agent	+211911851354	n/a	Western Bahr el Ghazal	n/a	n/a