

Bachelor's thesis

Business Administration

Marketing

2016

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# CAPACITY BUILDING OF RENEWABLE ENERGY EDUCATION -EDUCATION EXPORT FROM FINLAND TO GHANA



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BACHELOR'S THESIS | ABSTRACT

TURKU UNIVERSITY OF APPLIED SCIENCES

Business Administration | Marketing

Spring 2016 | 50

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# CAPACITY BUILDING OF RENEWABLE ENERGY EDUCATION

## -EDUCATION EXPORT FROM FINLAND TO GHANA

The aim of this thesis was to point out the need for renewable energy education in Ghana and to study the possibilities of education export from Finland. Ghana was chosen as the target country based on personal and professional interest. Ghana is currently facing a severe energy shortage due to inefficient energy resources and growing consumption. In order for new energy technologies to work education is needed. BioSampo, a vocational education provider from Kouvola, was chosen as a case subject to review the possibilities of education export from Finland.

The information in this thesis was discovered through interviews with the manager of Atlas Business and Energy System Limited (ABES) and the head of BioSampo Training and Research Centre. Various research papers and internet sources were also consulted.

The results of the study indicate that the demand for renewable energy education in Ghana is high. The government's target is to include new renewable energy technologies to the energy mix. In result the demand for education increases drastically. A remarkable amount of barriers to the dissemination of renewable energy technologies may be overcome if the potential stake holders are made energy conscious by providing them all the relevant information about various issues involved.

In addition the results indicate that education export from Finland has huge potential. Finland has an excellent selection of educational programs, renewable energy being one of them. The analysis of the case study deepens the understanding of the education export. Based on the information obtained, it is advisable for Finnish educational institutions to turn their focus on Ghana in the education export market.

### KEYWORDS:

Renewable energy education, Education export, Ghana

OPINNÄYTETYÖ (AMK) | TIIVISTELMÄ

TURUN AMMATTIKORKEAKOULU

Liiketalous | Markkinointi

Kevät 2016 | 50

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# CAPACITY BUILDING OF RENEWABLE ENERGY EDUCATION -EDUCATION EXPORT FROM FINLAND TO GHANA

Tämän opinnäytetyön tavoitteena oli osoittaa koulutuksen tarve uusiutuvien energialähteiden käytössä Ghanassa ja tutkia Suomen mahdollisuuksia koulutusvientiin mainitulla aihealueella. Ghana valittiin opinnäytetyöntekijän henkilökohtaisen ja ammatillisen kiinnostuksen vuoksi. Ghanassa on tällä hetkellä vakava energiapula energian käytön lisääntymisen vuoksi. Koulutusta tarvitaan, jotta uutta energiateknologiaa voidaan hyödyntää mahdollisimman tehokkaasti. Ammatillinen oppilaitos Biosampo valittiin tapaustutkimuskohteeksi.

Työn tietopohjana on asiantuntijahaastattelu BioSampo-hankkeen johtajan kanssa sekä Atlas Business and Energy System Limited (ABES) johtajan kanssa. Työssä on myös käytetty useita kirjallisuus-, lehti- ja verkkolähteitä, kuten Suomen ja Ghanan ministeriöiden tutkimuksia.

Selvitystyön tulokset osoittavat, että koulutuksen tarve Ghanassa on korkea. Ghanan hallituksen tavoitteena on lisätä uusiutuvien energialähteiden käyttöä jo olemassa olevaan energiamixiin. Koulutuksen merkitys uusien teknologioiden omaksumisessa on huomattava. Sidosryhmiä kouluttamalla voidaan voittaa useita asenteellisia esteitä. Tämän lisäksi selvitystyön tulokset osoittavat, että Suomen mahdollisuudet koulutusvientiin ovat merkittävät. Suomella on erinomainen valikoima koulutusohjelmia myös uusiutuviissa energialähteissä. Tapaustutkimus syventää ymmärrystä koulutusviennin potentiaalista. Tuloksien pohjalta on suositeltavaa, että oppilaitokset harkitsevat vakavasti koulutusvientä Ghanaan.

ASIASANAT:

Uusiutuvat energialähteet, koulutusvientti, Ghana

# CONTENT

<b>1 INTRODUCTION</b>	<b>6</b>
<b>2 COUNTRY ANALYSIS</b>	<b>8</b>
<b>3 SETTING THE SCENE -THE ROLE OF ENERGY</b>	<b>17</b>
3.1 Sources of electricity	17
3.2 Potential of Renewable Energy	20
3.3 Act 832	21
<b>4 THE NEED FOR EDUCATION</b>	<b>23</b>
4.1 Challenges of Renewable Energy Education Programs	24
4.2 The education scene in Ghana	26
4.3 Mapping renewable energy education	26
<b>5 GETTING TO THE CORE OF EDUCATION EXPORT</b>	<b>30</b>
5.1 Education export in Finland	30
5.2 Education export support scheme	31
5.3 Vocational education export	32
<b>6 CASE – BIOSAMPO</b>	<b>34</b>
6.1 BioSampo – FREES	35
6.2 Cooperation with CREEI	36
6.3 SWOT Analysis of BioSampo education export	37
<b>7 OBSERVATIONS AND RECOMMENDATIONS</b>	<b>42</b>
<b>REFERENCES</b>	<b>45</b>

## APPENDICES

Appendix 1. Interview questions

## FIGURES

Figure 1 GDP per capita current US\$ (The World Bank 2015)	11
Figure 2 Export of goods and services % of GDP (The World Bank 2015)	12
Figure 3 Unemployment % of total labor force (The World Bank 2015)	14
Figure 4 Ratio of female to male primary enrollment (%) in Ghana (Trading Economics)	15
Figure 5 Energy consumption by sector (Energy Commission of Ghana 2015)	18

# 1 INTRODUCTION

“Bioenergy and education of its use has the potential of solving numerous problems in the developing countries including poverty and lack of food.” This was an idea introduced to me by one of the pioneers of bioenergy programs, Juha Soilio. The concept of bioenergy interest me highly and as a marketer, finding a solution to the big issues through business and marketing was an intriguing thought.

Today the importance of energy has become more and more discussed in the public. A growing amount countries have become energy conscious setting energy goals in a result of decreasing energy sources. The concept of energy is important because it affects a country as a whole. Energy consumption effects productivity, economic growth, global networking as well as its adverse effects on climatic change. How does energy link to education? The power of education can also be considered as important or even more important. The need for renewable energy education and training at all levels is globally recognized. During the last three decades a large number of countries across the globe have initiated academic programs on renewable energy technologies and related aspects. Without sufficient training or education innovative energy solutions can't be used effectively. In a nutshell education also effects a country as a whole, linking to a country's economic growth, employment and productivity.

The aim of this thesis is to point out the need for renewable energy education in Ghana and to study the possibilities of education export from Finland. BioSampo, a vocational education provider from Kouvola, was chosen as a case subject.

Ghana was chosen as the target country based on personal and professional interest. Ghana is currently facing a severe energy shortage as a result of inefficient energy resources and growing energy consumption. If new technologies are applied the need for education is inevitable. There is ongoing cooperation with Ghana from a handful of schools in Finland but more can be done. In general African countries have not been included in high demand business plans. It is

important to include Africa to the scene and examine the potentials while still remaining relevantly untouched by the big masses.

The first chapters of this thesis work will review the energy situation in Ghana and provide insight to the role of renewable energy sources as well as the importance of education in the renewable energy scene. The following chapters will issue the education export situation in Finland and provide the reader with an example case, BioSampo. In conclusion this thesis work provides suggestions for Finnish educational institutions in marketing educational programs in Ghana.

Qualitative research method was chosen for this thesis. The method was chosen because qualitative research aims for studying the object or subject comprehensively. Qualitative research methods usually include inductive approaches and information is often gathered through interviews, documents or discussions. Compared to the quantitative research method, the qualitative research provides the researcher flexibility to change plans according to circumstances.

It is important to note that previous studies regarding education export to Ghana have not been presented. On the other hand numerous studies about renewable energy solutions and about the severe energy shortage have been published. The studies include, among others, numerous PhD, Thesis and Masters works. The information in this thesis was discovered through various sources. Multiple internet sources were consulted including various research papers. I visited the premises of BioSampo in October 2015. The head of BioSampo, Juha Soilio, introduced and explained the concept of BioSampo and their different education packages. I was also able to travel to Accra, Ghana during December 2015. I was able to observe the culture and fortunate to interview Sakeena Twumasi from CREEI (Center for Renewable Energy Entrepreneurship and Innovation). Mrs. Twumasi is the Production Manager of Atlas Business and Energy System Limited (ABES) as well as a Principal Lecturer for CREEI. She is an expert in photovoltaic system, design and installation. Her expertise in the renewable energy education scene enabled me to understand the energy situation in Ghana thoroughly.

## 2 COUNTRY ANALYSIS

The Republic of Ghana is located in West Africa with a coastline of over 550 km with the Atlantic Ocean. Ghana is bordered by the Ivory Coast in the west, Burkina Faso in the north, Togo in the east and the Gulf of Guinea and Atlantic Ocean in the south. Being the first black African nation in the region to achieve independence from the British colonial power, Ghana gained independency March 6<sup>th</sup> 1957 (BBC 2015). With a population of 27 million (2014 est.), Ghana has a population growth rate of 2% (2014 est.) (The World Bank 2015).

Ghana is known for its rich natural resources such as Petroleum, Gold, Bauxite, Manganese and Diamond. The principal agricultural exports include also Cocoa, Timber, Horticultural Products, Fish/Sea Foods, Game and Wildlife. Ghana is the world's second largest cocoa producer behind Ivory Coast, and Africa's biggest gold miner after South Africa. It is one of the continent's fastest growing economies (BBC 2015).

### **Culture and business**

Everyday life is guided by culture in societies. Norms, beliefs, behavior and basic values are shaped by the surrounding society. Attitudes toward other people, institutions and to the environment are defined by unique perceptions of the world. Values are also crucial and often defined by the community's opinion of what is acceptable and important. The understanding of values is important since behavior and attitudes towards companies are based on individual values. People tend to create perceptions about companies based on commonly respected values. For example ethical factors may guide people to choose ecological products and solutions. (Bergström and Leppänen 2009, 61.)

Culture shapes our social habitat as well (Bergström and Leppänen 2009, 61). Ghana is considered as a collectivistic country. Family, extended family, friends and other relationships are cherished and everyone takes responsibility for fellow



group members. Family life is valued highly thus making it hard to separate personal life from business. Getting to know your colleagues and business partners is very important, and topics which are almost always brought up also include one's personal life such as family, health, or social life. It is typical that the first business meetings might include little or no talk about business but rather about family and general issues. (InterNations.)

The collectiveness of the society brings responsibilities to individuals as well. A possible loss of face or embarrassment is dreaded as the values of honor, dignity and good reputation are valued. In the Ghanaian culture an embarrassment is not taken lightly bringing shame and dishonor to the whole family. Uncomfortable situations or embarrassments are most likely dealt with silence. If a business associate is uncomfortable with a question or they feel their answer wouldn't be appreciated, they will rather stay silent to avoid creating an uncomfortable situation. (Expatriate Arrivals 2015.)

Hierarchy is highly emphasized in Ghana. People tend to accept a hierarchical order in which everybody has a place and which needs no further justification. The respect of a higher social status is very important, and not addressing higher-ups in the appropriate manner can be a very serious fault. An individual with wealth, age, experience and position is usually the most respected. Age especially is an important factor since decision-making power typically lies with the most senior person in the company. Senior business partners are expected to make decisions but also taking into consideration the group consensus. Professional and academic titles are also in connection to hierarchy. It is expected to accost individuals with the titles they hold. (InterNations.)

The Ghanaian culture of timekeeping is drastically different from the Western culture. Time isn't viewed as an absolute value and punctuality isn't overly emphasized. On the other hand it is still important to schedule an appointment, even if you aren't present at the agreed time. (Expatriate Arrivals 2015.)

## **PEST Analysis**

Macro environment signifies the major external factors that influence an organization's decision making, more or less. These factors include the political and social conditions, technological and ecological environment, demographics as well as economical and cultural factors. These factors influence performance and strategies, create possibilities, challenges, threats and restrictions. (Bergström and Leppänen 2009, 50.)

The following paragraphs will provide a general analysis of the external business environment in Ghana in selected factors. The PEST analysis is the most common approach for analyzing how Political, Economic, Social and Technological factors will affect the performance and activities of a business in long-term.

### **Political context**

The political context refers to the actions of the government, parliament or other decision makers who control, regulate and enable the business environment. The actions of these stakeholders can enable or disable a company's activities. (Bergström and Leppänen 2009, 50.)

It is important for companies to analyze and study political changes in a country. Political conditions and a stable development of a country is important to companies investing in the country. When choosing a country to cooperate with and when making decisions, companies must consider whether the political environment in the country corresponds to the company's values and goals. The possible risks should also be considered. (Bergström and Leppänen 2009, 52.)

Ghana has made major efforts to achieve a solid democracy. The country enjoys a more open society and a vivacious media with radio being the most far reaching

medium of communication (The World Bank 2015). The presence of public dialogue is also strong and the country is constantly ranking among the top three in Africa for freedom of the press and freedom of speech (The World Bank 2015). As a result of these and other political achievements, “Ghana outperforms most countries in West Africa and in the continent on measures of civil liberty, political rights and political stability” (Country Operations Department 2012, 1).

## Economical context

The economical context refers to the purchasing power of the inhabitants in the country. It is influenced by economic growth and productivity. A commonly used indicator to analyze the economic health of a country is the GDP (Gross domestic product) and GDP per capita. Simply put, GDP is the monetary value of all the finished goods and services produced in a country, an extensive measurement of a nation’s overall economic activity. GDP per capita is the gross domestic product divided by midyear population. It is favored when comparing one country to another because it shows the relative performance of the countries. GDP per capita can reach up to 50 000 US\$ in leading European countries whereas in developing countries the amount might reach only to two hundred dollars. For example the GDP per capita in Ghana was about 1400 US\$ in 2014 which is relevantly lower when comparing to Finland (figure 1). A rise in per capita GDP signals growth in the economy and tends to translate as an increase in productivity. (Bergström and Leppänen 2009, 52.)

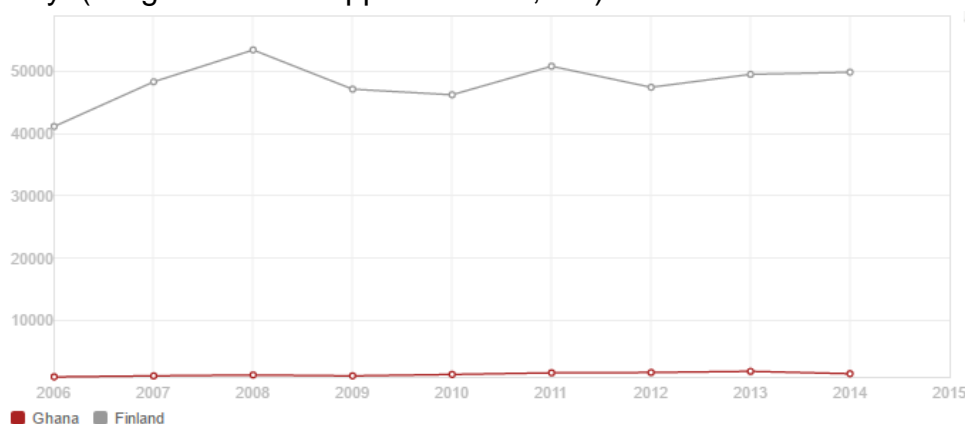


Figure 1 GDP per capita current US\$ (The World Bank 2015)

The Republic of Ghana is West Africa's second largest economy after Nigeria, and Sub-Saharan Africa's twelve largest (Country Operations Department 2012, 1). There are three key sectors in the Ghanaian Economy which are made of Agriculture, Industry and the Services. According to the 2010 population census the contribution to total employment in agriculture is 42%, industry 15% and service 43%. (Ministry of Food and Agriculture 2013, 10.)

On the 15th of December 2010 Ghana joined the league of oil producers. Ghana's oil reserves amount to about 500 million barrels being relatively modest still when comparing to other major oil producers. Production reached to a significant number of 80 000 bpd in 2011 and at its best peaked up to 120 000 bpd. Although the development is significant, neighboring country Nigeria scores about 2 million bpd with 38 000 million barrels. (Country Operations Department 2012, 2.)

Currently Ghana is among the most promising economies in the continent of Africa and has recently been growing faster than the average. After a slowdown of economic activity in 2009, the economy picked up in 2010 and grew with a notable 8%. In 2012 a real peak was achieved following with a slower year and yet again with significant growth (figure 2). The growth was aided by oil revenues and strong export performance of cocoa and gold in volume and prices. (Country Operations Department 2012, 2.) In 2014 the GDP of the country was roughly 38 billion US\$ (The World Bank 2015).

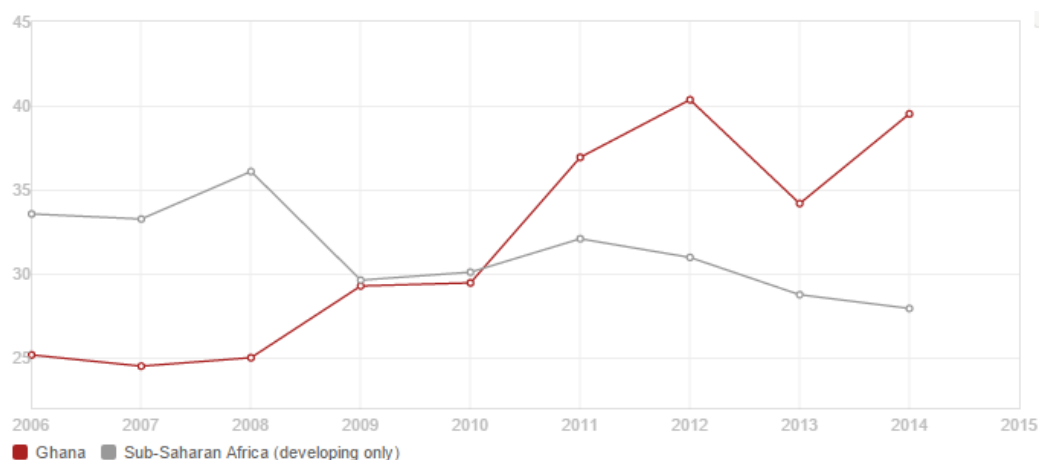


Figure 2 Export of goods and services % of GDP (The World Bank 2015)

In addition, the government has actively improved the country's business environment and as a result Ghana has been ranked increasingly better by the World Bank's Doing Business team. The report is one of the world's most influential policy publications. It is an annual report on the state of health of economies based on detailed diagnostics such as the regulatory system, the efficacy of the bureaucracy and the nature of business governance. For example during the years 2014-2015 Ghana made a significant improvement in trading across borders. The country reduced the documentary and border compliance time for importing by developing electronic channels for submitting and collecting the final classification and valuation report. (The World Bank 2016, 175.)

Even though enormous steps of advancement have been noted by the global audience some infrastructural weaknesses are heavily present. For example burdensome public administration and land tenure system, underdeveloped financial systems, wide interest rate spreads, weak human capital, and low access to technology challenge the business environment. The government is developing a Public-Private Partnerships (PPP) regulatory framework towards further instilling confidence in the business environment and manage fiscal commitments. (Country Operations Department 2012, 4.)

## **Social context**

The social context analyzes the demographic and cultural aspects of the market. Cultural aspect such as attitudes, values, trends and lifestyles affect businesses directly or indirectly. These aspects may vary by locale and change over time. For example the trend toward healthier lifestyles can shift consumer interest and purchases toward exercise equipment and health clubs thus cutting sales from alcohol and snack foods. (Arline 2014.)

Demographic factors like income distribution, population size and growth, age distribution and aging, are considered extremely important when analyzing con-

sumer and market needs. (Arline 2014.) For example hospitals and health agencies may find important information from the population age data, information that might determine staff and product needs.

With a population growth rate of 2 % in 2014 (The World Bank 2015) the population of Ghana has exploded during a time period of 60 years. The population has grown from around 4 million people to more than 25 million, partly due to prenatal care and efforts made to stop birth mortalities. It is projected to keep growing to around 50 or even 60 million people by 2050 and the explosion of numbers is not going away anytime soon. Even though women have fewer children the issue of family and child bearing is cultural. The pressure from family and the society is intense to have children. The population growth in turn puts immense stress on numerous factors, health service being one of them. (Vidal 2011.)

Another important demographic factor, unemployment was estimated at 2% in 2014 (World Bank 2015). Compared to the average of the continent, Ghana scores inclusively (figure 3). However, the official rate may disguise the high level of underemployment and unemployment inherent in the informal sector, as the government's definition of unemployment excludes the large number of jobless people who may be available for work but do not necessarily seek work. Targeted measures to increase job creation content will be necessary to curb the scourge of unemployment (Country Operations Department 2012, 4).



Figure 3 Unemployment % of total labor force (The World Bank 2015)

Gender equality, like in many countries, has not been obtained. Social and cultural norms change rather slowly thus making gender equality harder to attain (Country Operations Department 2012, 4). However, significant progress is being recorded in education with primary education gender parity improving markedly (see figure 4).

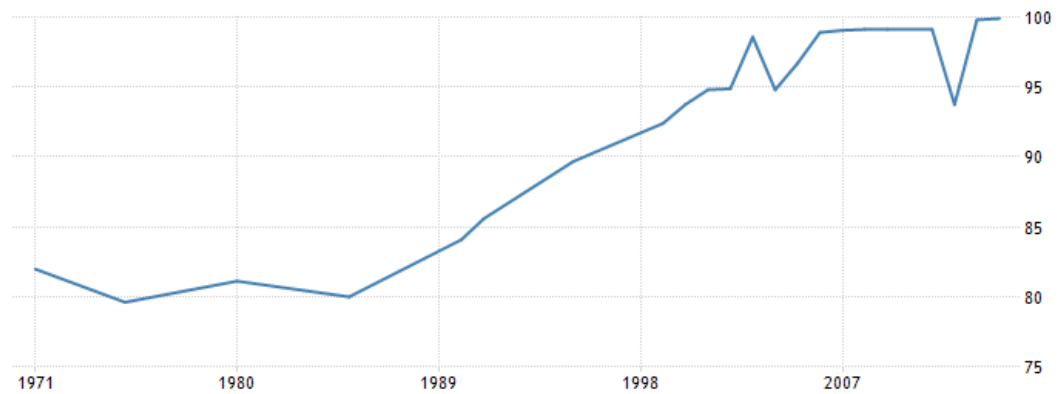


Figure 4 Ratio of female to male primary enrollment (%) in Ghana (Trading Economics)

## Technological context

The technological context measures a country's ability and desire to acknowledge the power of technological solutions in business decision making. The development of technology creates continuously new opportunities to develop and improve business practices. Technological development has created new opportunities to communicate, develop products and enhance production methods. Environmental issues are also easier to address with new technologies and procedures, for example in improving recycling methods or renewable energy technologies. (Bergström and Leppänen 2009, 54.)

On the other hand, technology might reshape industries completely. As a result products, procedures or sectors can disappear as a whole. In addition, a large portion of the world population do not know how to read or have access to electricity making the technological advancement useless. (Bergström and Leppänen 2009, 55.)

Ghana was the first country in sub-Saharan Africa to launch a cellular mobile network in 1992. It was also one of the first countries in Africa to be connected to the internet and to introduce ADSL broadband services. In January 2013 Ghana was ranked as the country with the highest mobile broadband penetration in Africa (Van Zyl, 2013). In 2014 the ratio of mobile cellular subscriptions was 115 (per 100 people) whereas the ratio of Internet users (per 100 people) was 19 (The World Bank 2015).

Cellular network has changed the life of many inhabitants in developing countries as a whole. Mobile phones have made it easier to keep in touch with family members all over the globe. Calling is cheaper than travelling which revolutionizes the lives of many villages when networks are obtained. Mobile phones have political power as well. Opinions and knowledge spread faster. Mobile phone networks also benefit villages when mobile companies build networks thus having to care for the roads in the village. (Bergström and Leppänen 2009, 55.)



### 3 SETTING THE SCENE -THE ROLE OF ENERGY

Today the importance of energy has become more and more discussed in the public. Energy consumption enhances productivity, economic growth, global networking as well as its adverse effects on climatic change (Essah 2011, 3). More efficient ways to produce energy has always been a goal of man and the need to explore new energy supplies has become crucial in today's world.

#### 3.1 Sources of electricity

Most of the electricity generation in Ghana is primarily obtained from hydropower generation at Akosombo and Kpong Dam located in the Eastern Region of Ghana and another two thermal power plants using light crude oil at Aboadze near Takoradi in the western Region of Ghana (Gand 2009, 2). The energy scene is highly operated by the government. The Dams at Akosombo and Kpong and the Takoradi Thermal Power Plant (TAPCO) at Aboadze are own and operated by the state-owned Volta River Authority (VRA). VRA is also a minority joint partner with TAQA, a private sector company which owns and operates the Takoradi International Power Company (TICO) thermal power plant also located at Aboadze. (Ministry of Petroleum 2015.)

The distribution of electricity is done by the Electricity Company of Ghana (ECG), a state-owned company, and the Northern Electricity Department (NED), a subsidiary of the Volta River Authority (VRA). The Energy Commission (EC) and the Public Utilities and Regulatory Commission (PURC) regulate the electricity supply industry. The Energy Commission, in addition to being responsible for technical regulations in the power sector, also advises the Minister for Energy on matters relating to energy planning and policy. The PURC on the other hand is an independent regulatory agency responsible for the economic regulation of the power sector with the mandate to approve rates for electricity sold by electricity distribution utilities. (Ministry of Petroleum 2015.)

Energy consumption can be divided into 5 major sectors: transport, residential, commerce & service, industry and agriculture & fisheries. In 2014 peak consumption was noted in the transport and residential sector (figure 5) (Energy Commission of Ghana, 2015.) Residencies use energy the most for refrigerating, freezing, electric stove and microwave usage and for ironing (Essah 2011, 9).

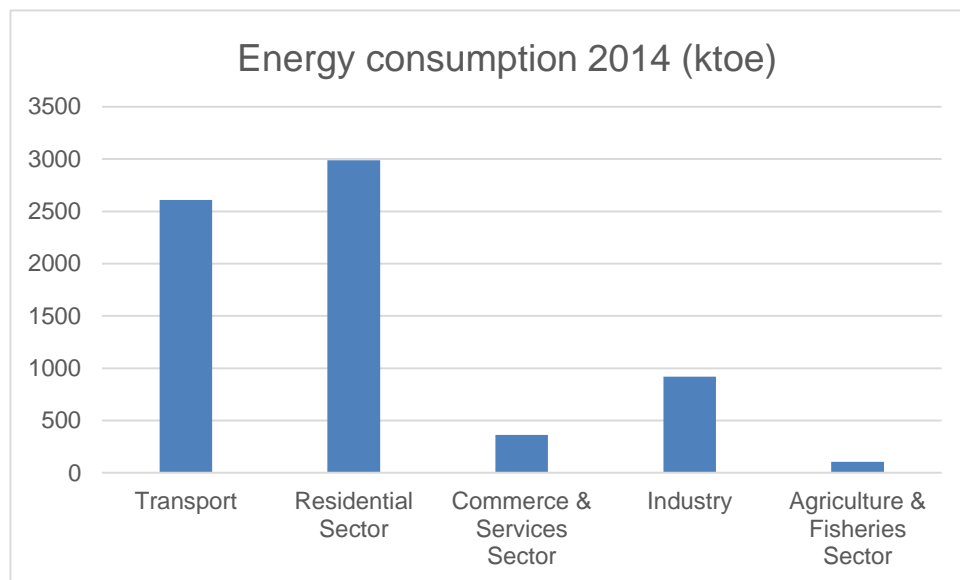


Figure 5 Energy consumption by sector (Energy Commission of Ghana 2015)

What then is hydropower, mentioned earlier? In simple Hydropower is electricity generated using the energy of moving water. Hydropower as an electricity source enables huge benefits to a country in areas like transportation, tourism, fishing and farming activities along the shorelines. Hydro sources produce near zero carbon emissions. In result it can be listed as an environmentally sound and eco-friendly energy source. This makes hydropower an attractive energy source. Hydropower has also benefited Ghana's industrial and economic activities, growth and expansion. For example the Akosombo Dam has lifted Ghana to an national platform of business, giving the country a product to export to neighbouring countries like Togo, Benin and Burkina Faso. (Iddrisu 2015.)

In addition to hydropower Ghana relies heavily on thermal sources of electricity generation. Gas and light crude oil are the primary thermal sources. These sources however rise serious concerns. The gas supply is insufficient and

unreliable. The cost of light crude oil is also a major aspect to take into consideration. According to estimates it costs almost 3 million dollars per day to produce the thermal electricity using light crude oil. The cost in result is on to household and corporate consumers. (Iddrisu 2015.)

More challenges have been faced and will be faced in the future. The demand for energy especially electricity has been increasing at an average annual rate of 10% since the last 10 years (Essah 2011, 3). This has created an energy and capacity deficit crises which has necessitated regular power import from neighboring countries such as Ivory Coast and Burkina Faso to supplement power generation at peak periods (Sakeena Twumasi 27.12.2015). Also the poor rains of recent years has led to a drastic reduction in hydropower generation from the Akosombo Dam (Iddrisu 2015). The situation is at its worst in the dry season causing numerous black outs even up to 48 hours (Sakeena Twumasi 27.12.2015).

Ghana relies solely on imported petroleum product in the form of crude oil from Middle East and Nigeria (Gand 2009, 2). However, current baseline production sources generate only 66% of the current demand (Essah 2011, 3). Depending on the source from which information is obtained, values of those who have access to electricity are quoted between 50-70%. From this, it is estimated that the access to electricity in the urban areas is 70 % and that to rural areas is approximately 30%. (Essah 2011, 4.)

Additionally challenges are faced in the inadequate power supply infrastructure which require huge investments, inadequate access to electricity and high cost of fuel for electricity generation (Sakeena Twumasi 27.12.2015). Constant "black-outs" torment the inhabitants with an ongoing worry of electricity supply. The blackouts are a result of insufficient wholesale electricity supply which is eventually costing the nation between \$320 million and \$924 million annually or 2 - 6% of Gross Domestic Product (GDP) (Essah 2011, 3). At the moment, the Ghanaian power sector cannot meet the demand for electricity.

### 3.2 Potential of Renewable Energy

In addition to hydropower Ghana has several other renewable energy resources that serve as a huge potential for electricity generation. These resources include: wind, solar and modern biomass. The total share of these resources in the electricity generation mix is currently amazingly negligible at 0.15%. (Gyamfi ym. 2014, 1038). According to Essah (2011, 4), there is enormous potential for Ghana to address the pressures of energy demand by investigating ways in which similar or other resources or technologies could be viably adopted to supplement and provide energy to meet the needs of the growing population . In the following paragraphs each of these resources and their potential are briefly introduced.

#### **Wind**

One of the most promising alternative energy sources is wind energy. It has huge potential due to its ability to meet the rising demands for energy at a relatively economical cost compared to other renewables. In 2002 U.S. National Renewable Energy Laboratory (NREL) conducted a research as part of a global project to supply high quality renewable energy resource information. NREL found approximately 413 km<sup>2</sup> area with good-to-excellent wind resource, which could support a little over 2000 MW of wind power development, and if moderate to excellent wind resources were included, that could go up to 5640. This result among others suggests that wind energy as an energy resource should be taken seriously. (Gyamfi ym. 2014, 1038.)

#### **Solar energy**

The fact that a considerable part of the country receives 5–8 h of sunshine per day is a huge advantage and potential for Ghana. It is estimated that solar energy can provide an amount of 1 kW/m<sup>2</sup> for electricity generation. Extremely large solar radiation resources are available in many parts of the country, especially in the

northern regions where the electrification rate is very low. (Gyamfi ym. 2014, 1040.)

## **Biomass**

At the moment biomass resources cover about 21 million hectares of the total of 24 million hectare land mass of Ghana. Biomass can be used in various ways in the domestic scene, for example for cooking and water heating. The country's land mass has the potential for the cultivation of crops and plants that can be converted into a wide range of solid and liquid biofuels. (Gyamfi ym. 2014, 1040.)

As learned in the previous chapter, agriculture is a major industry in Ghana resulting in large amounts of by-products. It has been estimated that there are 553,000 tons of maize cob and stalk produced and 19 tons of paddy rice husks with huge potential for energy generation. In addition 193,000 tons of oil palm shells, 136,000 tons of sorghum stalks, 150,000 tons of millet stalks and 56,000 tons of groundnut shells are also produced. (Gyamfi ym. 2014, 1040.)

### **3.3 Act 832**

In view of the facts mentioned above it is evident that there is a need for more efficient energy sources. It is also evident that there exists numerous options available for energy generation. In line with the thought, the government of Ghana set an act in 2011 to increase the contribution of renewable energy sources by 10% of the country's energy mix by the year 2020. (The Parliament of the Republic of Ghana 2011.) The Renewable Energy Act 832 aims to promote, develop, manage, utilize, sustain and ensure adequate supply of renewable energy resources for power and heat and other related purposes. Renewable energy as defined by the Act includes wind, solar, hydro, biomass, biofuel, landfill gas, sewage gas, geothermal energy and ocean energy (Parkers 2013).

The Act provides the necessary fiscal incentives for renewable energy development by the private sector. The key provisions include:

- Feed-in-Tariff Scheme under which electricity generated from renewable energy sources would be offered a guaranteed price
- Purchase Obligation under which power distribution utilities and bulk electricity consumers would be obliged to purchase a certain percentage of their energy required from electricity generated from renewable energy sources
- Net Metering (distributed generation) under which renewable energy generated on site may be delivered to the local utility to offset the cost of electricity provided by the utility
- Renewable Energy Fund to provide incentives for the promotion, development and utilization of renewable energy resources.

(Ministry of Petroleum 2014, 10-11.)

Numerous institutions also collaborate with the objectives of the act:

- Energy Commission: Technical regulation and licensing for RE electricity generation, transmission and distribution
- PURC: Economic regulation and setting tariffs for electricity including the Renewable Energy Feed-in Tariff
- Environmental Protection Agency: Environmental regulation
- Ghana Investment Promotion Centre: Assist and facilitate incentives for private sector investments.

(Ministry of Petroleum 2014, 12.)

In a nutshell The Act presents unique opportunities for the private sector to harness the benefits of renewable energy in Ghana. Ghana has the right enabling environment for attracting private sector investment in sustainable energy solutions. The country offers political stability and good governance as well as strong and independent institutions. The government is committed to the development and promotion of renewable energy with an open and transparent way of communication. (Ministry of Petroleum 2014, 20.)

## 4 THE NEED FOR EDUCATION

The development of renewable energy technologies has been prioritized by the government of Ghana aiming to provide environmentally sustainable energy supply options to meet their energy demand. Realizing that there is a need for new energy technologies brings though another concern to the picture. Having the tools to satisfy growing energy requirements and economic growth is not enough. Imagine the following scenario: New renewable energy technologies are brought to a village in rural Ghana. After two years of usage and the expiration of warranty the technology doesn't work as smooth as before. Having no adequate training nor personnel, the renewable energy technology is abandoned. In worst cases the investment that was meant to help people and the quality of life has just become another forgotten experiment. Thus leading the village back to square one, without adequate energy sources and a lack of electricity and power. Thus leading the development of the village and the nation as a whole to zero.

The need for renewable energy education and training at all levels is globally recognized. During the last three decades a large number of countries across the globe have initiated academic programs on renewable energy technologies and related aspects (Kandpal and Broman 2014, 2). The unavailability of human resources with required knowledge and skills is often identified as one of the key reasons for poor dissemination of renewable energy technologies. For example some of the technologies developed to harness new and renewable source of energy do not satisfy the perceived needs of the end users while some of these are not yet cost effective. Thus new renewable sources of energy that could make significant contributions to the global energy scene, still need tremendous technological efforts. Development and dissemination of appropriate renewable energy technologies would also require an adequate number of well trained and competent personnel in all countries of the world. (Kandpal and Broman 2014, 4.)

In addition, a majority of socio-cultural and institutional barriers to the dissemination of renewable energy technologies may be overcome if the potential end users, policy makers and other stakeholders are made energy conscious by providing them all the relevant information about various issues involved. The attitudes and preferences of the common public as well as of the decision makers have to be changed for wider acceptance of renewable energy technologies. Education and training in the area of energy in general, and new and renewable sources of energy in particular, is therefore, of prime importance. (Kandpal and Broman 2014, 4.)

Well trained and competent personnel are needed for various tasks, for example:

- Technology development
- Installation
- Operation
- Repair and maintenance
- Performance monitoring
- Information processing
- Planning and etc.

The development of the workforce is one of the critical factors in making any renewable energy strategies and investments successful. (Kandpal and Broman 2014, 5.)

#### 4.1 Challenges of Renewable Energy Education Programs

Renewable energy education is a relatively new and emerging concept. Thus challenges are inevitably being faced. The issues can directly or indirectly affect the development and establishment of renewable energy education programs (Kandpal and Broman 2014, 33). The following paragraphs focus on challenges faced especially in developing countries since Ghana being one of them.



It is important to realize that sustainability and the improvement of life quality is a large part of renewable energy ideology. Most of the developing countries face the problem of unemployment or underemployment. At its best renewable energy education can drastically reduce these problems thus making it crucial that renewable energy education is directly linked with employment opportunities. It is important to carefully plan and implement the education program, making the skills learned and the diplomas or degrees suitable for employment. When planning an education program the institution should carefully identify and analyze the potential job opportunities in the field of renewable energy. It is necessary to implement an in-depth analysis of the job requirement for each job opportunity since the education program must provide a cognitive, psychomotor and affective domain. After conducting the analysis the course or program can be formulated. (Kandpal and Broman 2014, 33.)

Additionally it is important to note that in most of the developing countries the problem of energy is related to other socio-cultural issues like health and nutrition. Therefore it is important that the renewable energy education is suitably linked with relevant aspects as well. (Kandpal and Broman 2014, 33.)

Another challenge common in the majority of developing countries is the lack of resources. One of the major challenges in promoting renewable energy education programs on a large measure is the unavailability of funds with the schools, colleges, universities or other institutions. Renewable energy education and training require a considerable amount of teaching material and hardware to implement the programs. These teaching materials can be unavailable for the teaching institutions due to the lack of adequate funds. According to Kandpal and Broman, there is a serious lack of trained teachers, suitable text books and other teaching-learning resource materials in the area of renewable energy in most of the developing countries. (Kandpal and Broman 2014, 33.)

The lack of resources touches a country as a whole also. In most of the developing countries a large portion of the population still does not receive information through educational institutions. This implies that there is a need for informal education programs in renewable energy. (Kandpal and Broman 2014, 33.)

## 4.2 The education scene in Ghana

The first schools in Ghana were established by European merchants and missionaries. This began the chain of events for the country's educational platform. During the colonial period by the British, a formal state education structure was modelled. After 1957 when Ghana gained its independence this structure has been molded several times. In the 1980s the education structure became closer to an American model. (Volunteer Partnerships for West Africa.)

Ghana's educational system is highly centralized. The Ministry of Education and its agencies are responsible for the entire educational system in the country. (Volunteer Partnerships for West Africa.) In 2015, Ghana had 18,530 primary schools, 8,850 junior secondary schools, 900 senior secondary schools, 28 training colleges, 20 technical institutions, four diploma-awarding institutions, six public universities and over 10 private universities. Most Ghanaians have relatively easy access to primary and secondary education and the government has played a positive part in making primary education free. (The Royal Geographical Society.)

Though these facts, education is far from the reach of every citizen. The cost of books, uniforms and other relevant school equipment is often more than expensive making it hard for families to afford to send their kids to school and thus blocking many children from enrolling in primary schools. The cost of losing a family member from a source of labor is also a concern for families especially in the rural areas. Many families need their children as labor to contribute to the family income. Thus the "compulsory and free" education is not forced actively. (Scott 2013.)

## 4.3 Mapping renewable energy education

Finding information about Ghana's renewable energy education scene was not easy. Official researches or studies have not been conducted and the information search can be very time consuming. Renewable energy education is only taught in Universities. When it comes to the primary level or college level to secondary

schools there is no education or training available, meaning vocational education is lacking entirely (Sakeena Twumasi 27.12.2015). In the following paragraphs some relevant information for this thesis is introduced.

### **The Kwame Nkrumah University of Science and Technology- The Energy Center**

The Kwame Nkrumah University of Science the Technology (KNUST) is located in the city of Kumasi, about 250km from the capital Accra. The University has become an important center for the training of scientists and technologists not only for Ghana, but also for other African countries as well as from other parts of the world. (The Energy Center.)

The University established TEC (The Energy Center) to provide a platform to training and renewable energy. TEC initiated activities in 2006 and was formally approved by the Academic Board of Kwame Nkrumah University of Science and Technology (KNUST) in 2009. It was recognized that a need for training and backup for R&D and expertise for efficient energy management and policy analysis is necessary for sustainable energy usage to support the developmental needs of Ghana. (The Energy Center.)

The center offers various courses including: Solar Photovoltaic (PV) Design and Installation, Biogas Technology, and Renewable Energy Project Analysis. Additionally numerous short courses have been already organized in areas like, Bio-energy/Biogas/Biofuels and Energy Policy and Planning with an introduction to Long-range Energy Alternatives Planning (LEAP). (The Energy Center.)

Additionally TEC has been established as regional center for West Africa and is already involved in ECOWAS activities (The Energy Center).

## **DENG Solar Training Center**

Deng Solar Training Center (DSTC), an internationally certified training was founded in April 2005. It is an expansion of DENG limited, a company that offers engineering and technology solutions and supplies equipment in Ghana. The company states at their website that one of the reason for the training center was the recognition of the needs in the industry. "Solar Industry is growing slowly but steadily and with it the need for trained solar technicians will increase." The training center was created to help expand the solar market in Africa by providing as many stakeholders as possible with the much needed technical training in the design, installation and maintenance of Stand Alone Solar Systems. (DENG.)

The training center was established in technical collaboration with: Global Sustainable Energy Solutions (GSES) of Australia, and the Department of Mechanical Engineering and Agriculture of Kwame Nkrumah University of Science and Technology (KNUST). It offers training courses in the design, installation and maintenance of solar systems, as well as Solar Water Pumping training courses. (DENG.)

The training is available to all stakeholders within the solar industry. This includes private companies and individuals, Government institutions, NGOs as well as to students from the KNUST and the Polytechnics. Technical training consists of both class room courses and practical training, which includes a Demo installation. The courses end with an examination after which certificates are issued to successful students in three categories: Pass, pass with credit, and pass with distinction. (DENG.)

## **Center for Renewable Energy Entrepreneurship and Innovation (CREEI)**

CREEI is the daughter company of ABES (Affordable Solar Energy Systems Ltd.). ABES is a leading solution provider in Accra for renewable energy solutions. The company offers innovative energy solutions and technologies in the field of

solar, wind and bioenergy. In addition to renewable energy technologies the company offers education in energy savings and efficiency as well as technical support. (Sakeena Twumasi 27.12.2015.)

CREEI was launch as a result of funding obtained from Ecowas Renewable Energy and Energy Efficiency (ECREEE). The main objective of CREEI is capacity building in renewable energy systems as well as entrepreneurship and innovation of renewable energy products. (Sakeena Twumasi 27.12.2015.)

CREEI was started in 2010 but finally established in 2013 in order to fill the gap between training technicians and entrepreneurs in the renewable energy business (Sakeena Twumasi 27.12.2015). CREEI has acknowledged the importance of education in the field of renewable energy. The importance of development and implementation of appropriate courses for the professionals in the business is viewed important in the company. CREEI provides training in design, installation, operation, maintenance and marketing of renewable energy technologies. CREEI targets numbers of clients including technicians, educational units, and organizations, and students who have completed their secondary school (SS). (CREEI 2015.)

As their philosophy the company states a practical approach in the design and development of renewable energy technologies such as bioenergy, hydro, solar and wind. CREEI also provides field experiences for our clients and run public courses, and in-house customized training. (Sakeena Twumasi 27.12.2015.)

## 5 GETTING TO THE CORE OF EDUCATION EXPORT

It is inevitable that Ghana has a serious need for new energy technologies and energy generation. New technologies in return bring other needs, education being one of the most important ones as learned. It has been often realized that a need of a country may bring business opportunities to another country. The case of Ghana is no exception. But how is Finland connected to the energy shortage of Ghana? First of all it is important to examine the financial status of Finland and its consequences.

### 5.1 Education export in Finland

The Finnish society lives in an outbreak of restructuring. The economic structure is changing fast and has been changing for some years now. In recent years over 60 000 jobs have vanished (according to the 2013 census). At the same time the population is growing older and the elderly need more services that are difficult to finance. The Finnish government has noticed the importance to use all means possible to generate new business opportunities. The government has acknowledged the importance for new job opportunities and export products. (Lipponen ym. 2013, 9.)

When it comes to education, Finland stands at the head of the class – and the world has noticed. The exceptional quality of Finland's education system has been recognized time and again in PISA studies (Programme for International Student Assessment) and by other internationally renowned organizations such as WorldSkills. In the PISA survey of 2012, Finland ranked fourth among all OECD countries and first in Europe in the problem-solving assessment. Seven Finnish universities ranked in the top 400 in the Times Higher Education World University Rankings 2014–2015. (Future Learning Finland 2016.)

The government woke up to the opportunities of Finnish education in the early 21<sup>st</sup> century and active education export has been developed since 2010 when

the government made decisions on the strategic guidelines of the export of Finnish education. In 2011 Future Learning Finland was established. Future Learning Finland is a national education export programme that offers Finnish educational know-how and learning solutions globally. It is powered by three Finnish government ministries: Ministry of Education and Culture, Ministry of Employment and the Economy, Ministry for Foreign Affairs and it is lead and coordinated by Finpro (Future Learning Finland 2016).

It is important to notice that the field of education export is relevantly new. Just a few years ago educational intuitions did not have marketing plans or strategies for international education export. Individual teacher were the primary speakers for the product. Now there has emerged companies within the educational institutions that specialize in education export. They treat the market as any other business opportunity. (Kohola 2015.) In 2014 the amount of education export was about 270 million euros (Tekes 2015). The biggest education export customers located Europe: Sweden, the Netherlands and the UK (Tekes 2015). In the same year, the total amount of service exports summed up to 20 billion euros, which equals to almost 30% of all export income (Elinkeinoelämän keskusliitto). The number emphasizes the newness of the field of education export. Education export still plays a relevantly small part in the service exports.

## 5.2 Education export support scheme

Various forms of export supports are mainly directed to companies. Educational institutions are not allowed to receive incentives or financial support that are intended to companies. According to the guidelines of the Ministry of Employment and Economy, the receiver of the support must be a professional in the line of business. For example Universities, Universities of Applied Sciences or other educational institutions and their joint projects or products can't receive export support. In line with the guideline, a public operator, a government agency or depart-

ment, municipality or city are also banned from all forms of export support. Educational institutions that receive support from the government are also considered public operators regardless of the ownership. Enterprises owned by educational institutions are also considered public operators because their background communities receive government grants. (Lipponen ym. 2013, 32.)

Even though sources of financial support are limited there are a few options to consider. If education export and promotion are a part of the regional development goals, educational institutions may apply for county development funds or financial aid from the EU funding programmes. Another source to consider is the international network of projects of the National Board of Education or the EU project Cross Border Cooperation. The project aims to promote economic and social development in border areas. (Jansson ym. 2015, 11.)

### 5.3 Vocational education export

One of the most wanted product is Finnish vocational education. The vocational education provides top-quality teaching to a profession as well as the skills and knowledge to advance to a higher education degree. The vocational education also includes numerous opportunities to co-operate with businesses and hands on experience to working life. (Kohola 2015.)

In 2013 The Finnish National Board of Education established a project aiming to advance the education export of vocational education. The project included 14 different partners from vocational schools. This network of associates produced a current state analysis based on their own experiences and a survey made by AMKE (The Finnish Association for the Development of Vocational Education and Training) in 2013 to their members. There were 35 different education providers who answered the survey. (Jansson ym. 2015, 2.)

According to the report education export interest vocational schools and there is a clear desire to develop it. Over half of the members have included education export to their organization strategies and almost one third of the schools have a



license to arrange foreign language studies. The organizers of vocational education already have some experience that supports education export. They have some good relationships to other countries and experience of arranging education in different cultures. (Jansson ym. 2015, 4.)

At the moment the biggest problem in vocational education export is the legislation of selling education. The Finnish schools can export education but they can't issue a certificate of a degree to the student. Another challenge is seen in the lack of a national strategy, cooperation and long-term commitment. A concern is also been perceived in lack of commercial thinking and productization. In addition some concerns were raised in the lack of experience in international business. It was also perceived difficult to find financial as well as staff resources to invest in education export without risking the organizations core operations. (Jansson ym. 2015, 18-19.)

According to the survey a lot of strengths and potential was also seen. Language skills, enthusiastic staff, working life skills as well as practical skills training were viewed as strengths. Vocational schools also have a comprehensive selection of education programs, from digital content to consultation. The vocational education providers also have a close network and they are used to working together. They have a common understanding and desire to develop the business of vocational education export globally. (Jansson ym. 2015, 17.)

Vocational education export was also viewed as a great potential source of funding. Education exports give a platform to build profitable business actions and to obtain additional funds to core activities and education development in both national and international field. Finnish education is now in demand around the world and the positive image of the Finnish vocational education contributes to the national and international image. (Jansson ym. 2015, 20.)

## 6 CASE – BIOSAMPO

The previous chapter discussed the interest of education export from vocational education providers/institutions. One of these institutions is BioSampo. In the following chapters the institution will be introduced.

Kouvola Region Vocational College is a multi-disciplinary college where about 2,000 young people study. The vocational College offers almost 50 different vocational upper secondary education programs. The staff amounts to nearly 300. The Adult Education Centre offers also numerous education programs for more than 1000 students. (BioSampo.)

In 2007 some of the staff members, Tomi Höök and Juha Soilio, focused on a thought that in Finland and abroad, there is a great need to develop the bio-economy local production model into more versatile. It was understood that the only way to achieve a permanent change, where a single bio-producer or rural entrepreneur is in the focal point, is education. These two specialists decided to put their ideas into action and created BioSampo, with the support from the Regional Council of Kymenlaakso, The Centre for Economic Development, Transport and the Environment (ELY Centre) and the City of Kouvola. (Juha Soilio 20.10.2015.)

BioSampo Training and Research Centre is part of the Kouvola Region Vocational College (KSAO) and is located in the school's Natural Resources training unit in Anjala. The aim of BioSampo is to advance the competitiveness of the countryside and the regional environment and bioenergy development goals in Finland. The Training Center is one of a kind in Finland with zero equivalent concepts. They train local youth and adult education with different educational levels. The training includes the following three levels: user training for bioenergy plant employees, operations training and local energy entrepreneur training. BioSampo also plans to connect bioenergy production oriented training into the youth education. In addition the training center is developing a global export product, targeting to launch educational school programs and the BioSampo satellite school network abroad. (BioSampo.)

The BioSampo project is the biggest ones in the education scene and the overall cost has been estimated to be around 2 million euros.

*“At the BioSampo Training and Research Centre the aim is to train hands-on experts and practice experimental research in order to develop ethical bio-economy. BioSampo is a practical learning environment, where one learns to do by practicing and to understand by practice. The execution of training is possible in the innovative BioSampo learning environment, thanks to a solid experience of our training team, their high motivation and multi-disciplinary professional skills.*

*What do we train? Decentralized local production, renewable energy sustainable usage, co-production of electricity, heating and cooling, manufacturing important environmental commodities such as bio char and purified drinking water. The process in whole we call the BioSampo process.” (BioSampo.)*

## 6.1 BioSampo – FREES

BioSampo – Frees (Finnish Renewable Energy Export School) is Biosampo Centre’s currently running export school project. According to the project guidelines, BioSampo solutions will be proposed on partner school’s demands. The school’s export project follows clear steps on the implementation of the education program. The steps include export schools teachers’ training period in Finland, an introduction of a new learning environment in the target country and the BioSampo Satellite School. The Satellite School is one of the core elements of the BioSampo education program. Its purpose is to enable teaching activities with complete audiovisual elements in real time via internet. The remote connection enables BioSampo to help teachers in problem situation or organize additional training. The Satellite School also helps equipment suppliers to arrange maintenance and remote support in technical troubles. (Juha Soilio 20.10.2015.)

The specialists of the project, Juha Soilio and Tomi Höök, mention as one of the goals “to enable renewable energy sources sustainable utilization in favor of local people and set up new power generation and production of environmental commodities”. In a best case scenario, if the target country makes us of Biosampo

solutions to the full, it is possible to improve local energy independence, educational level, employment and standard of living by new kind of power production and distribution, and training method – regardless of geographical location (Juha Soilio 20.10.2015).

## 6.2 Cooperation with CREEI

CREEI (Center for Renewable Energy Entrepreneurship and Innovation) offers various education programs one of them being in cooperation with BioSampo. The training program, Diploma in Renewable Energy Entrepreneurship, is made of two parts. The first part, Solar Energy Entrepreneurship, is studied and lectured in Accra when the second part, Bio Energy Entrepreneurship, is attended in Finland. (CREEI 2015.)

The program is designed to educate students in the emerging field of renewable energy entrepreneurship and innovation. The program aims to create opportunities for underprivileged individuals in building intellectual capacity in developing countries and to advance skills and competence for the working pool in the renewable energy industry. The program advances opportunities for graduates and trains for experts in the renewable energy systems for both private and public sectors. The program also gives training and competence for numerous tasks such as technical sales expert in systems sizing and installation, troubleshooting, system maintenance and repair expert and entrepreneur in renewable energy systems. (Sakeena Twumasi 27.12.2015.)

The curriculum states:

“This program is geared to prepare students with the knowledge required for starting business in the field of solar and bioenergy as well as developing projects in renewable energy. Students will be provided with training in building energy auditing, and with the ability to work with different green building systems and have an understanding of such systems. Furthermore in Finland, for an effective implementation of bioenergy training, the module is arranged in small groups by working with practical case exercises and projects. A complete student group, up

to 15 students, is divided into smaller groups with at least 3 to 5 students per groups. Each group will gather all required skills of Bio module by going through the three cumulative study modules. A learning evaluation process is based on a demonstration of the skills. Project development is an important part of the strategy of working in small groups and the required knowledge is gathered by developing case projects through the study modules. Also economical and safety knowledge requirements are carefully considered as an integral part of the learning process in the course modules.” (CREEI 2015.)

### 6.3 SWOT Analysis of BioSampo education export

The following analysis reviews BioSampo’s strengths, weaknesses, opportunities and threats in the field of education export in Ghana. Each factor has been reviewed in its own section. The analysis has utilized the current state analysis made by a network of associates in vocational schools (Jansson ym. 2015). The observations in the current state analysis have been noted in the following SWOT analysis.

#### **Strengths**

**Good reputation as an education provider:** Finland enjoys a good reputation globally thanks to the good PISA results. The reputation supports the Finnish education sector as a whole and forwards internationalization.

**Training expertise:** Teacher training, pedagogical knowledge and cultural cooperation is on solid bases in Finland. In return it offers a good environment to commercialize, develop and test training innovations. In addition BioSampo key partners Juha Soilio and Tomi Höök share an experience and expertise of numerous decades in renewable energy solutions.

**Comprehensive education package:** BioSampo offers an innovative and out of the box solution to renewable education seekers. In addition to teaching materials

and curriculum, BioSampo offers teacher education and online support. The Satellite School doesn't only enable real time teaching via internet but also the possibility for equipment suppliers to arrange maintenance and remote support in technical troubles.

**Network in Ghana:** BioSampo already enjoys a partnership with and Ghanaian education provider (CREEI) in Accra, Ghana. Having a business partner in a target country is a remarkable advantage and gives BioSampo a key advantage to the education markets.

**Little competition:** At the moment there are now foreign institutions offering renewable energy education in a large scale.

## **Weaknesses**

**Legislation** limits education export and business opportunities for degree education.

**The availability of finances:** In a national level the availability of finances can be viewed as a serious weakness that affects BioSampo as well. National forms of education export support are disjointed and not suitable for the sector of vocational training. Research funding is focused on the higher education sector and financing as a whole is fragmented.

**Strategy and Branding in Finland:** The National Vocational Education and Training export strategy is missing. Enough work hasn't been put in the branding work of Finnish education export. Finland is competing with world leading educational export countries like UK and New Zealand making it harder to stand out as a primary education business partner for countries.

**Lack of business skills:** The lack of examples in global education export makes it hard to enhance business skills. Skills in sales, promotion, agreements and risk management are limited.

## Opportunities

**The demand of Vocational Education** is huge globally and especially in African countries. It has been acknowledged that good vocational skills and skilled labor is one of the keys to solve youth unemployment and to issue structural change. Good training guarantees a job and that is what the young population needs.

**Fresh markets:** At the moment Ghana, and other African countries, are relevantly untouched with a lot of potential for doing business. Previously the focus has been in Asia.

**Large target group:** The concept of renewable energy technologies is relevantly new in Ghana. Renewable energy technologies are only taught in universities thus making it a huge potential market in the state owned public vocational institutions. There is a huge potential clientele for renewable energy education also in private schools, villages, individual home owners, estate developers and NGO's.

**Digital solutions:** Digital technology, such as the BioSampo Satellite School, opens possibilities for quick experimentations and easily duplicable concepts with less risks. The Satellite School is a potential export product for other African countries as well.

**Other business opportunities:** Renewable energy education may open a path for other business as well. Educating people of renewable energy may change attitudes and open interest for renewable energy technologies.

## Threats

**Competitors overwhelm the markets:** The international demand potential will be exploited if the organization and branding of Finnish education export remains weak.

**Scarce resources in target country/markets:** Infrastructure and learning environments are often underdeveloped in the countries where the need for vocational education and training is the biggest, Ghana being no exception. Typically, the responsibility for education development is divided among various ministries. It is essential to understand who is the real decision-maker or client and who has the ability and desire to pay for the product.

### **Observations**

Reviewing the SWOT analysis makes it clear that BioSampo, a vocational education provider, has a lot of potential to operate in the Ghanaian market and in the other African countries as well. BioSampo has an innovative product ready to hit the export markets. The product is easy to duplicate to other African countries also.

On the other hand some concerns rise as well. Even though increasing education export is one of the targets of the Finnish government, few advancing steps have actually been made. The Finnish legislation restricts significantly education exports sending mixed messages to potential business partners. Education packages can be sold but serious restrictions prevail in selling complete degrees. The financing for education export, especially for vocational education is limited. The governments focus has previously been on financing higher education and only recently realizing the potential of vocational education export.

The Ghanaian markets offer challenges as well. The Ministry of Education and its agencies are responsible for the entire educational system in the country, including financing. This might be a challenge to foreign education providers. It is essential to understand who is the real decision-maker or and who has the ability and desire to pay for the product. It is important to note that not everyone has the knowledge about renewable energies and its huge potential in Ghana. In some cases it might be necessary to educate the decision makers as well. It is also worth considering the fact that numerous countries have invested in training and branding in collaboration with companies first and then addressing government



owned institutions. This is an important angle to consider for BioSampo and other institutions or companies targeting Ghanaian education markets.

## 7 OBSERVATIONS AND RECOMMENDATIONS

The severe energy shortage in Ghana is a current issue that needs to be addressed, education being one of the key factors. Without adequate education it is impossible to use new technologies. Well trained personnel is needed for various tasks. In addition education must be extended to a wider audience than just possible employees. To change energy consumption attitudes and to adapt to new ways, the nation as a whole must be educated. A large amount of barriers to the dissemination of renewable energy technologies may be overcome if the potential end users, policy makers and other stakeholders are made energy conscious by providing them all the relevant information about various issues involved. This in turn brings business opportunities to other countries, Finland included. The demand for education clearly exists and Finland has the keys to meet the constantly rising demand.

It is important to note that entering to a new business environment is always challenging, Ghana being no exception. Cultural issues may also arise, taking into consideration that Ghana is a high hierarchical country compared to Finland which is low hierarchical. It is important to understand who the right person to approach is when doing business. Having contacts to the market and a possible delegate in the target country is essential. Inside information is essential since unofficial regulations and fees exist. It is highly advisable that educational institutions targeting Ghanaian markets work on relationships and finding a local delegate. The example partnership of BioSampo and CREEL can be recommended for other educational institutions as well. Cooperating with a smaller organization in the beginning brings hands on information about local markets and customers. In return it is easier to target larger markets when local relationships have been established.

## **Benefits of partnership**

Education export has been mentioned numerous times in the Finnish government's goals to refresh the export markets. In addition The Finnish education system is highly respected globally and Finland enjoys a good reputation as an education provider. Time and time again Finland has scored among one of the best countries in the PISA studies. A business relationships with Ghana opens up the opportunity for Finnish educational institutions to sell their products and services to a large market area. Considering the population in Ghana, investing in the country would be a unique avenue for educational institutions to market their products and services since the need for educational solutions in the country is high. In addition providing education to a less developed country, especially to stakeholders and individuals who have a position to influence the masses on the importance of education promotes the economic growth of the country. This in return enhances possible business opportunities in other sectors.

Recently the demand for vocational education in particular has increased drastically and especially in African countries. It has been acknowledged that good vocational skills and skilled labor is one of the keys to solve youth unemployment and to issue structural change. Good training guarantees a job and that is what the young population needs. Once again Finland has something to offer. The Finnish vocational education has become more and more recognized and wanted across the world. Finnish vocational schools have a comprehensive and excellent selection of education programs, from digital content to consultation. Thus Ghana and Finland can be seen to be possible business partners, having their needs meet each other.

## **Conclusion**

This research provided insight to the demand of renewable energy education. Even though study results point out the need for education in Ghana it might not be enough to convince Finnish educational institutions or investors. Due to lack

of resources and time this research provides only a scratch to the surface in the issue. To gain a comprehensive look to the markets it is advisable to continue this research with an in depth market research.

Finnish institutions should also bear in mind the social and economic context of Ghana for the education programs to succeed. As mentioned in chapter 4, it is important to note that in most of the developing countries the problem of energy is related to other socio-cultural issues like health and nutrition. Therefore it is important that the renewable energy education is suitably linked with relevant aspects as well. In addition it is important to realize that the renewable energy ideology is very much linked to the improvement of life quality. Even though Ghana scores inclusively in unemployment rates, the country faces the problem of “disguised” unemployment. At its best renewable energy education can drastically reduce these problems thus making it crucial that renewable energy education is directly linked with employment opportunities. Thus, Finnish educational institutions should carefully plan and implement the education programs, making the skills learned and the diplomas or degrees suitable for employment.

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# Interview questions

## Basic information

Is there RE education programs in Ghana? If yes, where? And What? Solar, Wind, Bioenergy?

What is basic knowledge about renewable energy in Ghana? -> How is it viewed by the public, attitudes?

## Competitors

Who are the main institutions providing RE education/training in Ghana?

Is there a lot of foreign institutions marketing education programs (RE)?

If so, how do they market their product (education programs) and to whom?

What are their strengths and weaknesses?

## Customers

Who are the potential customers for training in RE? (Public schools, private schools, individuals, villages?)

What is the potential price range for the training?

How would customers finance their school program?

What kind of RE training programs are the potential customers interested in?

## Product

Is there interest for the programs?

## Case CREEI

When was established?

What training programs have been provided?

How many students have been trained so far?

What time are the training programs held?

Where is the training held?

Do you have on line training?

Are the students interested in online training?