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Providing renewable energy solutions in Ghana:

Overview of the business environment regarding some selected renewable energy sources

Dramani, Iliyasu

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Iliyasu Dramani
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Laurea University of Applied Sciences **Abstract**
Laurea Leppävaara
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This thesis was prepared as part of the CONNECT project embarked on by Laurea University of Applied sciences, other Universities of Applied Sciences and other stakeholders in partial fulfillment of a bachelor's degree in business management. The main purpose of the CONNECT project is to enhance growth and speed up the internationalization within developing country markets of Finnish Small and Medium scale Enterprises (SMEs) renewable energy companies.
The main research question addressed is whether Finnish renewable energy companies should invest in Ghana or not. On this premise, the business environment of Ghana was analyzed using the PESTEL framework.

The purpose of the study is to determine the most feasible way to enter into the Ghanaian renewable energy market, to identify which renewable energy solutions would present a better opportunity and to conduct networking activity with relevant Ministries, Departments and Agencies (MDAs) of Energy (renewable energy industry) in Ghana.

The research methodology used in this thesis is qualitative research. A questionnaire was administered to solicit information from the renewable sector of the Ministry of Energy in Ghana. The questions contained in the questionnaires were mostly unstructured.
In addition, transcripts of interview with the minister for energy and the Chairman of Ghana Energy Commission were used in the analytical section of the thesis. This was considered appropriate because this is the ministry in charge of renewable energy issues in Ghana and the interview transcripts relates to the main interest of the Connect project.

The results obtained from the study are that the business environment in Ghana is viable for investment, especially in the renewable energy sector where Ghana has abundant resources but competition in the industry is low. Also, solar energy, wind energy, waste-to-energy solutions have a higher likelihood of success in Ghana.

Key words: renewable energy, developing countries, SMEs, solutions

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1 Introduction

Energy is arguably one of the most vital economic drivers in the world at large. However, when harm caused by fossil fuels to the health of humans, the environment and the ecosystem is catching up with the benefits, there should be the redirection of focus. This has resulted in a focus shift to the renewable energy, where countries in the European Union, United States, China, and others, are setting the pace in renewable energy solutions. Africa, with a huge potential of renewable energy resources such as solar, wind, waste-to-energy, geothermal, hydro, and others, is still lagging behind in renewable energy solutions. This thesis attempts to focus on renewable energy solutions in Ghana by first finding out the state of the business environment in Ghana as well as what renewable energy solutions are most likely to be successful in Ghana.

In the following sections, the business environment in Ghana will be analyzed using the PESTEL (Political, economic, socio cultural, technological, ecological and legal) framework and the energy situation of Ghana also presented.

1.1 The Background

This thesis is conducted for CONNECT project of Laurea University of Applied Sciences. The connect project to provide growth and boost up the internationalization efforts of Finnish Small and Medium Scale Enterprises (SMEs) entry into developing country markets. This thesis was based on a questionnaire administered to the renewable energy Directorate of the Ministry of energy in Ghana and interview transcripts of prominent people in the ministry. The main aim of the questionnaire is to solicit for credible information from the main ministry necessary to support the research process of the CONNECT project.

1.2 The Aim and target

The aim of this thesis is serve as part of the research for the CONNECT project. Ghana is one of the target countries of the Finnish SMEs; therefore this thesis specifically concerns Finnish renewable energy companies interested in providing renewable energy solutions in Ghana.

1.3 The Research Questions

The main research question for the thesis is Should Finnish renewable energy companies invest in Ghana? This was divided into two sub research questions. Firstly, how is the business environment in Ghana? Secondly what renewable energy sources are likely to be viable investment in Ghana? The PESTEL framework will be used to answer the first sub question and

the results of the questionnaire and other interview transcripts of prominent personnel in the energy ministry in Ghana will be used to answer the second sub question.

1.4 The structure of the thesis

Figure 1: The structure of the thesis

The figure above shows the structure of the thesis. The thesis starts with a brief introduction, followed by the theoretical framework used and the analysis of the business environment in Ghana using PESTEL model. In addition the energy market and the renewable energy market are also presented. Also, the research methodology and the analysis section of the thesis are also presented. Finally the conclusion of the thesis is presented.

2 The theoretical framework

The theories used as the basis for this thesis are the Political, economic, sociocultural, technological, environmental/ecological and legal (PESTEL) model and Geert Hofstede's five cultural dimensions model. The following sections briefly explain each of the models used and provide justification for the use of the model.

2.1 The PESTEL model in brief

The political economic, sociocultural, technological, environmental/ ecological (PESTEL) framework refers to a combination of macroeconomic or environmental influences that aim at providing potential investors or companies with reliable information to enable them assess how those factors could influence their intended purpose in a given market. (Business mate 2009)

This theory was chosen a theory because it is quite comprehensive in scope, and for the purpose of the CONNECT project, was a more suitable option.

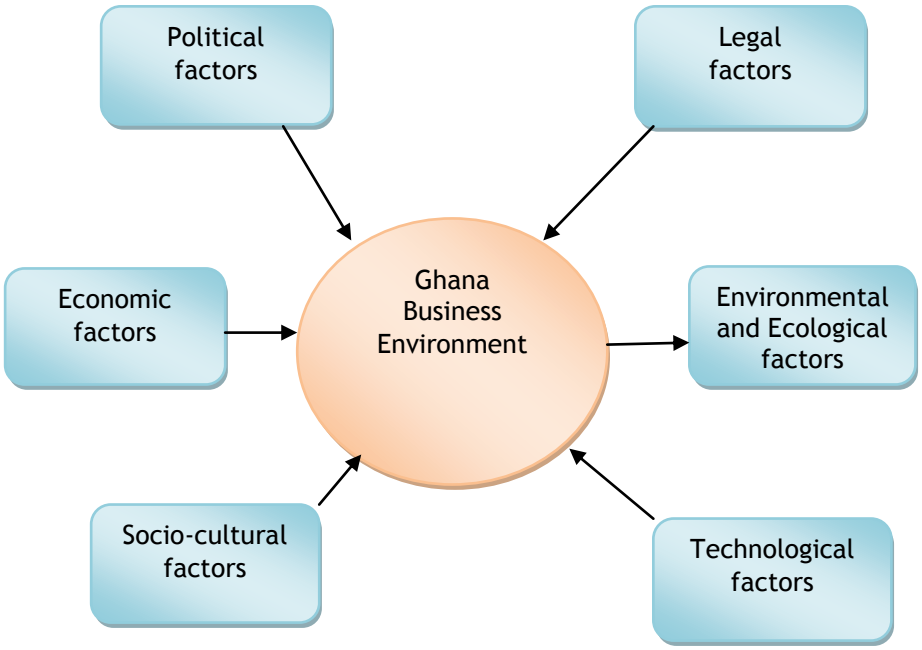


Figure 2: The PESTEL theoretical framework

2.2 Hofstede's five cultural Dimensions model

This model is used to describe the effect of the culture of a particular country on the values of the people and the relationship between those values and behavior on five identified cultural dimensions of countries. The five cultural dimensions are individualism-collectivism, power distance, uncertainty avoidance, femininity-masculinity, long term orientation. A sixth dimension indulgent – self-reliant was added in 2010. (Wikipedia 2012) These dimensions would be used to compare Ghana and Finland to ascertain the differences in culture (or business culture) which presents a challenge so as to find solutions to these challenges. However, the scope of this thesis excludes solutions to business culture challenges.

3 The Business Operating environment of Ghana

The business operating environment refers to the combination of factors, mainly macroeconomic and other factors that have the potential of affecting the operation of businesses in a given country or defined market. The PESTEL elements (of Political, Economic, Sociocultural, Technological, Ecological and Legal factors) explained above would be used to present the business operating environment of Ghana to enhance the decision making of Finnish renewable energy companies to invest in Ghana.

3.1 Political factors

Political stability

The political stability of a country refers to "the possibility that the government of a country could be overthrown or destabilize by unconstitutional or violent means including domestic violence and terrorism" (Kaufmann D.2010, 3)

The West African sub region was in a politically unstable state from 1960 to 1989, with high incidence of military coup d'états (Arthur-Kwame B. 2008, 10) which resulted in loss of lives and infrastructure in the respective countries and the sub region in general.

Arguably, the most significant era to democracy was the 1970s and early 1980s when Jerry Rawlings overthrew General Akuffo Addo's military rule on 4th June 1979. A general election was conducted which was won by Dr. Hilla Limann of Peoples National Party (PNP). During this period, democracy was at a "nurturing stage". So there were allegations of unfair treatment of some members of the opposition parties and government officials who were suspected of abusing their positions.

Ghana has a good reputation in terms of political stability mostly due to strong adherence to democratic principles and respect for human rights. Even though, democracy does not guarantee political stability (Arthur-Boafo 2008, 10), it presents a firm basis for political stability to thrive.

The president of the United States (Barrack Obama) said his visit to Ghana was as a result effective governance and adherence to democratic principles and institutions (Nossiter 2009). That is not to say that Ghana's democratic credentials are unquestionable, but adherence to democratic principles is necessary to build a politically stable nation.

Arguably, the most significant test of democracy and ultimately political stability is constitutional power transfer from one political party to another. This correlates with the study made by Yi Feng (2001, 271-294) that "political freedom promotes private investment but political instability and policy uncertainty impacts have negative impact on private investment.

According to the global competitiveness report, government instability was the least problematic in Ghana. (The Global Competitiveness report 2011-2012, 186) That is not to mean that Ghana is an absolute safe-haven in terms of conflicts. There are cases of ethnic and chieftaincy disputes in some parts of Ghana which has a long history as far as the 1960s or earlier, an example is the Yendi chieftaincy dispute (Canadian Journal of African studies,1972), and other ethnic clashes in northern Ghana (Ethnic clashes in northern Ghana 2001)

Business/trade regulations

There are regulatory authorities that ensure that companies or businesses act legally. Depending on a particular industry where a firm or investor wants to operate, there are specific authorities responsible for guiding activities of businesses. The Ministry of trade and industry is the Highest Authority in terms of trade, industry and Private sector investment issues in Ghana. This ministry is also responsible for advising the government on policies concerning the growth, development and participation of private sector in certain areas of the economy. (Ministry of Trade and Industry 2010)

The ministry is divided into 12 sections, namely: Domestic trade and distribution, SME and Technology, Standards, Trade Facilitation, Research information and statistics, Policy planning Monitoring and evaluation, Export Trade support services, multilateral Bilateral and regional Trade, import and export, legal, finance human resource management and administration, communication & public affairs. Each of these sections of the Ministry of Trade and industry performs specific functions to help it achieve its vision of Establishing Ghana as a major manufacturing, value-added, financial and commercial hub in West Africa by 2015. (Ministry of Trade and industry 2010)

There are also other authorities that assist or perform certain key functions in connection with investment in Ghana. They are Ghana Export promotion Council, Ghana Investment Centre and Ghana National Chamber of commerce.

Given the objective of this project, the regulation of energy sector is the responsibility of the Ghana energy commission and that of renewable energy by the renewable energy sector of the ministry of energy.

Political structure and institutions of political power

The political arrangement in Ghana takes place in a framework (presidential representative democratic republic) that makes the president the Head of state, government and the multiparty system. There are three divisions namely, the executive, the legislative and the judiciary. While the executive power of control is vested in the government, the legislative is both the government and the parliament. The judiciary is independent of both the executive and the legislative. This political power has been shared between the president, the council of state, the independent judiciary and the unicameral parliament (Politics of Ghana 2008).

Even though, there are many political parties in Ghana, the National Democratic Congress (NDC) and the New Patriotic Party (NPP) dominates party politics in Ghana. (The electoral commission of Ghana 2008)

The power sharing is not absolute because political power is quite centralized as the executive presidency penetrates all levels of administration and the government makes major decisions. The president appoints about 4050 individuals which including executive officials in all districts in Ghana. (Throup D.W 2011)

The implication for the connect project is that certain decisions could be delayed as decision-making is sometimes centralized and stakeholders in the project should be aware of such challenge so as to find ways of reducing its negative impacts.

The level of corruption

Arguably, corruption in Ghana started since independence where there were alleged cases of corrupt practices from traditional authorities (Chiefs and their elders) to government agencies, departments and ministries. According to Victor T. Le Vine (1975) in his book the political Corruption stated that the cause of bribery, theft and embezzlement in Ghana was attributable to the country's political administrations reversion to the traditional "winner-takes-it-all" attitude, Further, localization of the administrative system and the enlarged economic role acquired by the state. These ensured the development corruption in different forms such as bribery, nepotism, graft, favoritism and so on.

According to the Transparency International, Ghana's corruption index was 69 (37.7%) out of 183 countries and ranked eighth in Africa (Business Development profile-Ghana 2012, 9). This means corruption is quite high, and as a result the government has put certain mechanisms in place reduce the opportunities of corruption. Some of these measures are the creation of anti-corruption agencies such the Commission on Human rights and Administrative Justice (CHRAJ),

the Audit service, Economic and Organize crime Office (EOCO), Serious Fraud Office (SFO) and others.

Also, there are also non-governmental organization and pressure groups that carry on different functions to help reduce corruption from almost all sectors possible. Some of these are the Ghana Anti-Corruption Coalition (GACC) and Private Civil service Organizations under which The Center for Democratic development (CDD) Ghana, Ghana Journalist Association (GJA) and the Ghana Integrity Initiative (GII) all operate. (Anti-corruption Profile Ghana 2012) All these institutions and agencies perform various functions to combat corruption, or at least reduce it to the barest minimum.

Inefficient bureaucracy

Bureaucracy refers to the administrative organization whereby decisions are made by government or state officials instead of selected representatives. This is ensured by a definition of the hierarchical structure, written and rigid laws, and impersonal relationships in the organization. (Business dictionary 2012)

In as much as bureaucracy aims to instill compliance with official procedures, it could also create unnecessary delayance in transactions. The public offices in Ghana are somewhat inflexible to the laid down bureaucratic procedures. Bureaucratic is mostly intense in the public sector of Ghana such as the Ghana Police service, the customs excise and preventive service, political parties are perceived to be the most corrupt. (Ghana Integrity Initiative 2011)

The inefficient bureaucracy in Ghana caused Ghana to lose position from 85th to 104th in the "Doing business" ranking on starting in Africa. (Quandzie E. 2011) However, there are some governmental agencies such as the Ghana Investment promotion council, the free zones board, and others, that would facilitate the processes of doing business in Ghana. (Ghana Investment promotion centre 2012)

Environmental policies

Ghana has policies and other regulations that are aimed at protecting the environment since the colonial period. Because the environment is considered a priority in Ghana, the Environmental Protection Agency Act 490 and the Environment Assessment regulation, LI 1652 instituted the establishment of Environmental Protection Agency (EPA) in 1994. The aim of the EPA is to implement policies using the preventive (rather than curative) approach to halt the creation of environmental problems or at least reduce it to the barest minimum. Therefore any business entity (needing physical premises) that is to be established in Ghana must have the intended

premises assessed by the EPA with and permitted before the commencement of business operation. The type of assessment would depend on the type of business, the location and the intended scale of business operation.

Giving the object of this piece on energy in general and renewable energy in particular, the EPA works closely with the Energy Commission to ensure that investors in energy projects have been permitted by the EPA before the issuance of license as part of the statutory requirements of starting a business in Ghana.

Further, the EPA has a sensitization programme which invites non-environmental experts to be educated on environmental issues, what constitutes environmental offences, and understanding of the proper ways of dealing with the environment. (Tamakloe & Wilson 2004, 3-4)

Moreover, Ghana is a member of many international environmental agreements (signed and ratified). Some of them are Climate change, Climate change-Kyoto protocol, Desertification, Endangered species, Tropical Timber 83, Tropical Timber 94, Hazardous wastes, law of the sea, ozone layer Protection and so on. (CIA-Ghana 2012). All these international agreements have own stipulated environmental regulations that member countries must implement, which includes Ghana.

International relationships

Ghana has good relations with countries in Africa and the rest of the world through different arrangements, be it economic, political, development and business partnerships, and other relationships. However, Ghana's international relations is guided by the foreign policy which is further guided by the "Pan-Africanism" and the "nonalignment policy" advocated by Dr. Kwame Nkrumah in the 1960s.

The former policy guideline was an African policy that was meant to kick-start the liberation of the African continent from the colonialism which may lead to political and economic unity. The latter, however, was in regard to absolute independence in terms of policy and alliances from both "East" and "West". (Berry V.L 1994)

In the West Africa sub region, Ghana is a member of the Economic Community of West African states (ECOWAS) and African Union (AU) in the wider African continent. Further, Ghana is a prominent member strongly advocating for partnership in achieving the set objectives of the New Partnership for Africa Development (NEPAD) programme put forward by the African Union (AU). (Ghana foreign and Commonwealth Office 2010)

The membership of Ghana in organizations is not limited to Africa, but other renowned international organizations. Some of the relevant ones for the purpose of this paper are the Commonwealth of Nations, International Bank for Reconstruction and development (IBRD), International Chamber of commerce, International Criminal court (ICC), International Criminal Police Organization (Interpol), United Nations (UN), United Nations Conference on Trade and Development (UNCTAD), and World Trade Organization (WTO). (Outline of Ghana 2012)

Almost all these organizations have set rules and regulations that must be upheld by its members thereby serving as a form of "guarantee" for interaction between the countries. Organizations such as the United Nations (UN), The World Bank and Organization for Economic cooperation and development (OECD) all have regulations on foreign investment. Moreover, they also have laws on foreign investment to ensure protection against expropriation, fair and equitable treatment, Full protection and security non-discrimination and fairness.

The International Centre for Settlement of Investment disputes (ICSID) of which Ghana is a member since 1966 gives a form of "indirect guarantee" thereby boosting investor confidence in Ghana. (International Centre for Settlement of Investment Disputes 2011)

The Ministry of Foreign Affairs and Regional integration plays a very important role in assisting to create an enabling environment for foreign investors in Ghana. Not only is it responsible for creating a cordial relationship between Ghana and other countries, but also coordinates the relationship between Ghana and foreign Governments. (Ministry of foreign affairs and regional integration 2012)

Ghana Investment Promotion Centre (GIPC) also provides useful information to investors (and potential investors) regarding what investment opportunities exist and how the whole process can be started and guidance on how it can be done most effectively and efficiently. Investment opportunity in Energy is one of the viable areas of investment in Ghana, and more especially in renewable energy (Ghana Investment Promotion Centre 2012) which this paper will explain in later sections.

Role of Non-governmental (NGOs) and other support organizations

NGOs in Ghana are legally defined as "civil society organizations that are formed independently of the State but register voluntarily under specified laws in order to gain official recognition to pursue purposes that are not for profit but oriented towards public benefit" (Draft National Policy for strategic Partnership with NGOs 2004, 9)

Arguably, Non-Governmental Organizations (NGOs) have existed from the mid nineteenth century, and was later given recognition by the United Nations (UN) by in 1968. The establishment of NGOs became prominent after the Second World War, most likely due to extreme need to augment the effort of the respective governments in providing essential assistance to people. From that time on, the rate at which international NGOs are been established has increased, numbering about 90 every year. (NGO Handbook 2008)

There are different types of NGOs, classified according to Geographic area (international, regional, national or local) or by focus for instance, humanitarian, Human rights, educational, environmental, women, Children, youth, peace, etc).

Similarly, there may be grouped according to these four categories, namely; welfare, development, empowerment, and education and training. (Encyclopedia 2009)

Apart from NGOs, the contribution of civil service organizations (CSO) is also important in enhancing development efforts of government, and these two bodies have gained status as development partners with governments.

There were no clear-cut regulations for NGOs and CSOs until an attempt was made in 1993 by the Government to introduce regulations into the NGOs sector which was consequently withdrawn. Then in 2000 the government the first version of the draft national policy for strategic partnership with NGOs/CSOs was release and later revised in 2004. (Position on Trust Bill and NGO Policy Guidelines 2007, 1)

Ghana – Finland relationship

The republic of Finland is a Nordic country located in northern Europe having a land border with three countries and one across the gulf. Finland shares borders with Sweden in the west, Russia in the east and Norway in the north with Estonia in the south across the Gulf of Finland. (Finland 2012)

The history of Finland's transition from middle income to an advance economy is an impressive one that can best be described as a "giant leap" to an advance economy. This transition can be attributed to many factors, but prominent among them are improvement in the quality of education and the investment in research and development, enhancing world trade by using tax incentives and subsidized credit system. In this way, Finland was able to attract Foreign Direct Investment (FDI), especially in the in the high-technology sectors. Finland was able to accomplish such a feat, in spite of challenges, by adopting the appropriate economic reforms in accordance with political and social objectives which ultimately led to sustainable rate of

growth. According to Foxley A. & Sossdorf F (2011, 8) commented on Finland's transition as "The exceptional thing about the way that the crisis in the 1990s was handled in Finland is that the government managed to forge a broad-based political and social consensus that allowed significant macroeconomic adjustments to be made, along with reorienting the country's production and exports toward high-technology sectors".

Ghana and Finland have had a long history of recognition of each other's country status. For instance Finland recognized Ghana as a country on 8th March 1957, and diplomatic relations were established in 1977. (Ministry for Foreign Affairs of Finland 2006)

There have recently been attempts by to create business relationship between Ghana and Finland for the mutual benefit of the two countries. As a result, the Ministry of foreign affairs of Ghana and the embassy of Finland, in Abuja-Nigeria and has contributed by sharing useful information to potential investors on opportunities for investment available in Ghana.

Furthermore, the Finland-Ghana Chamber of commerce enhances the creation of business partnerships, trade and other investments relationships between Finland and Ghana by providing useful information to Finnish businesses and investors who intend to do business or invest in Ghana or vice versa. (The Finland-Ghana Chamber of commerce 2011).

There has been some active trading relationship between Finland and Ghana since 2006, at least as indicated by the data from the Finpro website. The trading was mainly machinery from some specialize industries, paper and paper board articles, electric machinery, telecommunication and sound recording equipment, plastics, as well as medicine and pharmaceutical services (Finpro 2012).

The initiative of Finland investors and the business community to invest or establish business and other commercial relationships in Ghana has been appreciated by Ghana through the Ministry of foreign affairs and regional integration and other diplomatic representatives. This has however been timely considering the Government of Ghana's initiative to "open up" the private sector participation in investment in the country. Investment opportunities' abounds in many sectors. Some of these sectors for investment are agric and agro processing, energy, financial services, Information and Communication Technology, Petroleum and Gas, as well as Textiles and Garments. (Ghana Investment promotion Centre 2012)

There are some areas that have been described as priority areas by the government to denote how "urgent and vital" they are to the developmental efforts of the country. Some of these areas for investment are Information and communication Technology, Textile and apparel manufacturing, agro-food processing, sea food processing, Jewelry and handicraft production,

metal/hand tool fabrication, pharmaceuticals, floriculture, Light industry/Assembly plant, and ethnic beauty products. (Ghana Free Zones Board 2012)

The creation of business relationships is critical, if not inevitable in ensuring the smooth entry and operation in a new market.

As a result, a trade delegation from Finland led by the Under-Secretary of State of Finland (Mr. Esko Hamilo) visited Ghana early this year (February 2012) as part of the "formalization process" of showing interest of investing in Ghana. This was also a way of reciprocating the visit by the delegation from Ghana that visited Finland last year. (The Ghanaian Deputy Minister of Trade and business delegation trade visit to Finland 2011).

To this, the Director of the Finnish Business council West Africa (Ms Tuula Saarela) mentioned some strength of Ghana business environment and other factors that contributed to the idea of investing in Ghana. The delegation with "package of investment" from Finland was however holistic as the investment was to be in many sectors such as agriculture, forestry, housing, construction, service industry, oil and energy, as well as other entities. (Finland trade delegation lauds Ghana's business environment 2012)

Million EUR	2006	2007	2008	2009	2010
Finnish Exports	17.7	13.3	15.9	41.7	18.5
Finnish Imports	2.1	0.8	1.5	1.2	2.2
Trade Balance	15.6	12.5	14.4	40.5	16.3

Table 1: Trade between Ghana and Finland in 2006–2010 (Finnish Customs)

Table 1 above shows the imports and exports of Finnish products to (and from) Ghana from 2006 to 2010. It can be seen that the Finnish exports are much higher than imports from Ghana, and all these years Finland has a favorable trade balance as her exports outweighs her imports.

Tax policies

Taxation is a significant issue in Ghana's revenue generation effort, which is used to finance Public amenities, infrastructure and services that are important for the functioning of the economy. A significant proportion of potential revenue from taxation ends up in the informal sector. According to "Doing business" (2012, 66) it is more difficult and costly to pay taxes in Ghana.

The Government of Ghana has put "systems" in place to foresee the effective payment and collection of taxes. There are Direct taxes and indirect taxes that are levied tax payers in Ghana. There two major direct taxes, the individual income tax, and the corporate tax (that is taxes paid by business and other institutions), and others such as property tax, rents and rates, and capital gains tax. However this form contributes very little to the economy due to deficient enforcement. The tax rate for the individual is progressive tax with a highest rate being 25% and there has been a reduction of tax for corporations from 32.5 % to 25 % from 2001 to 2006. Indirect taxes are in the form of Value Added Tax (VAT) and Excise duties. The VAT was introduced in 1995 as a replacement for the sales tax, and was instituted under pressure from the International Monetary Fund, who considered it prudent to revive the economy from its over indebtedness after the 1992 election.

The administration of taxes in Ghana are carried out by three institutions, namely the internal revenue service (IRS), the Value added tax and the custom, excise and Preventive service (CEPS). These three agencies are granted some form autonomy from the Ministry of Finance on issues that concern human resource policies and the retention of three percent of total collections in order to have total freedom. (Prichard W.2009)

The figure and Table 1 below depicts rank of Ghana on the ease of paying taxes compared with some selected countries and the changes rank in Ghana compared from 2006 to 2012.

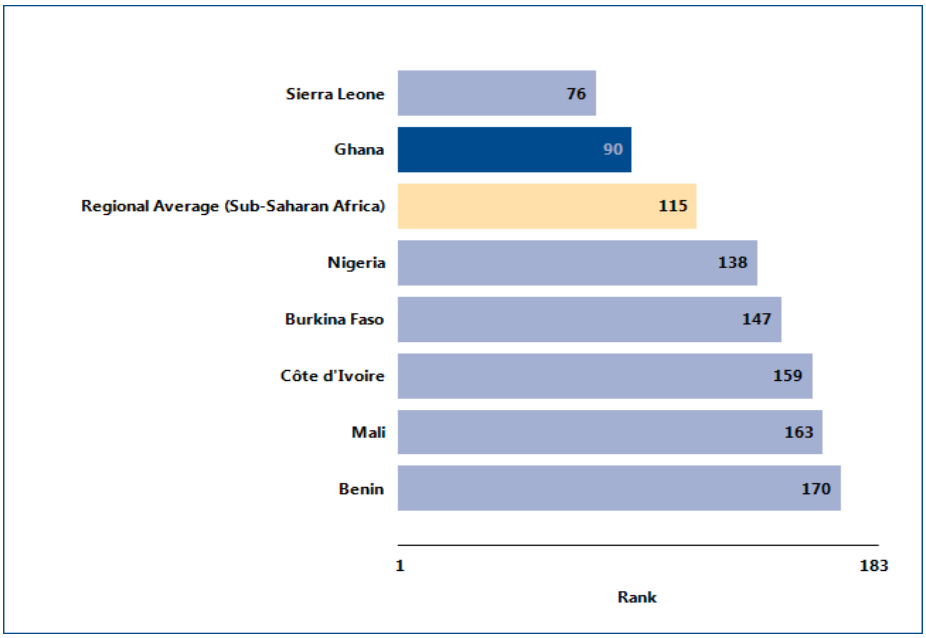


Figure 3: How Ghana and comparator economies rank on the ease of paying taxes

3.2 Economic factors

Economic stability

The economic stability of a country refers to the financial system of the nation characterized by little fluctuations in the macro economy (output growth) and fairly consistent low inflation. (Business Dictionary 2012)

The economic stability of Ghana can be attributed to many factors. However, prominent among them are the rebasing of the year and effective macroeconomic policies. These contributory factors have enhanced the economic growth of Ghana that grew almost six per cent in 2010 from that of the previous year's about 5 per cent. The economy has a high tendency of achieving a sustainable growth, at least for some time partly due to the discovery and commercial production of oil. Furthermore, investor confidence has been increased due to the government's prudent fiscal and monetary measures which resulted in decrease in interest rate with a corresponding increase in the banks' lending rate. (African economic outlook on Ghana 2011)

However, this is not to say that the economy of Ghana is "immune" from the challenges that come with economic growth and other external influences that might impact on the level of economic growth. Challenges such as domestic payment arrears and proportionally high budgetary allocation to finance some of the Governmental policies could possibly negate some of the economic growth potential of Ghana.

Notwithstanding, Ghana's economy has a high likelihood of growing steadily due to some measures undertaken by the Government. Measures such as the poverty reduction and growth facility (in 2009) and the Millennium Challenge Corporation compact (in 2006). The former was aimed at ensuring macroeconomic stability by facilitating the competitiveness of the private sector, good governance and development of human for the economy. The latter however, was aimed at ensuring the transformation of the agricultural sector of Ghana as well as empowering the Ghanaian farmers to increase their capacity. (Ghana economy 2012)

The Level and trend of Gross Domestic Product (GDP)

The Gross Domestic Product (GDP) of a country refers to an estimate of the value of all final goods and services produced in a particular economy within a particular period. GDP became a measure used to determine how well people in a given country or economy are living after the Second World War and the Great Depression. It was a measure used to justify if the economy of America could sustain spending on the Second World War while providing essential goods and

services. Additionally the Breton Woods Conference in 1944 aimed at “speeding economic progress everywhere, aid political stability, and foster peace” was monitored in these countries by the using the GDP. It has since been then been used as a “default measure” of economic wellbeing. Perhaps this measure has been assumed that so far goods and services produced in an economy is increasing, it is likely to translate to an economic well-being. GDP could give an idea of how well an economy is growing, but not that well people in the economy are doing.

For instance the GDP measures only monetary transactions related to the production of goods and services, GDP encourages the depletion of natural resources at a faster rate than replenishable, as well as not considering income inequality in an economy. For this reason, some indexes were suggested to provide a better measure than the GDP (though with some limitations), some of them are Index of sustainable economic welfare, Genuine Progress Indicator (GPI), Human Development Index (HDI), subjective well-being, Gross National happiness (GNH), etc. (Constanza R.,Hart M.,Posner S.,Talberg J. 2009, 1-14)

For the purpose of this project, GDP would be assumed as a measure of economic well being in the absence of a proven and acceptable index. The GDP could be nominal or real. The former is the GDP that includes inflation and the latter shows GDP adjusted for inflation (without inflation), therefore shows purchasing power.

According to the Central Intelligence Agency (CIA 2012), the GDP, Purchasing power Parity (PPP) of Ghana as at US $74.77 billion (2011 estimate).This figure represents an increase over the previous year (2010 estimate) of US $65.89 billion and that of two previous years (2009 estimate) of US $61.2 billion. The real growth rate of GDP as at 2011 was 13.5 % and the country Comparison to the world was second (2). Similar figure for the two previous years 2010 and 2009 were 7.7 and 4.0 percent respectively. The capita GDP (PPP) for 2011 was US $ 3100 and that of two previous years was US $ 2800 (2010) and US $ 2600. The GDP by sector are according to 2011 estimate were agriculture almost 30%, industry 21.0 % and Services sector slightly over 50%.

The above figures show that Ghana’s economy has been improving over the years (at least in the past 5-10 year), in terms of her GDP (PPP) and per capita GDP. According to African Development Bank, the economy of Ghana has been estimated to be around 8-9 percent for 2012 as reported by the Ghana Business News. (Akin-Olugbade Marie-L. 2012) This figure however confirms the target of 9 percent set by the Government of Ghana for 2012.

As can be seen from fig.2 below, the real GDP of Ghana fell from 1999 to 2000 and maintained a constant growth between 2000 and 2001. It increased significantly from 2001 to 2002 and decreased a year later after which a moderate increment occurred from 2003 to 2007. However,

a further increase occurred in 2008 and slipped a year after before increasing in 2010. The figure does not depict the real GDP growth for 2011, which was 13.7 %.(Global finance 2011)

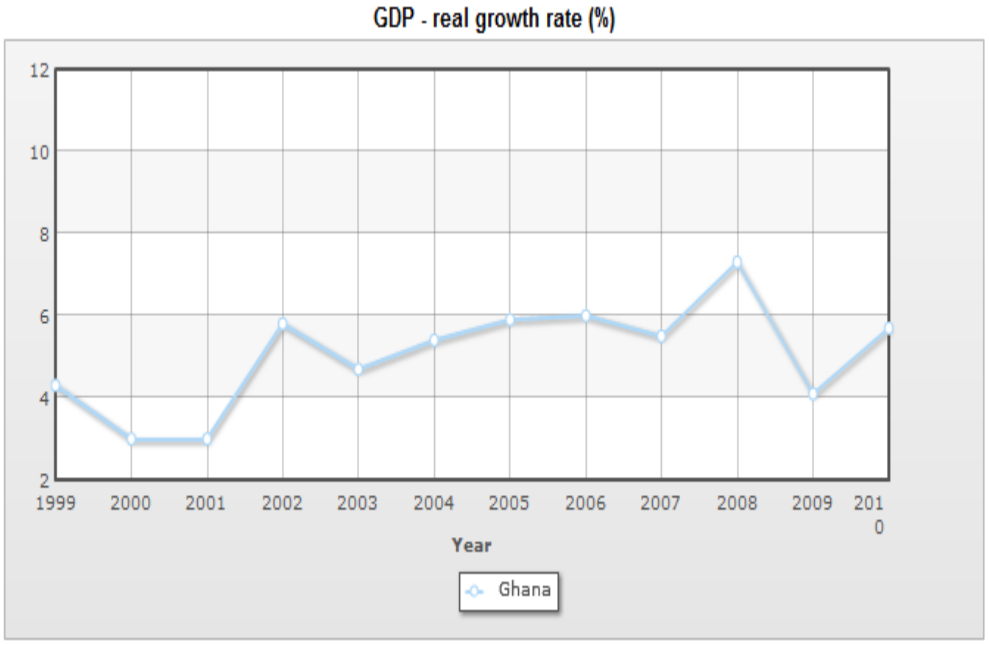


Figure 4: Real GDP Growth in Ghana 1999-2010 (indexmundi)

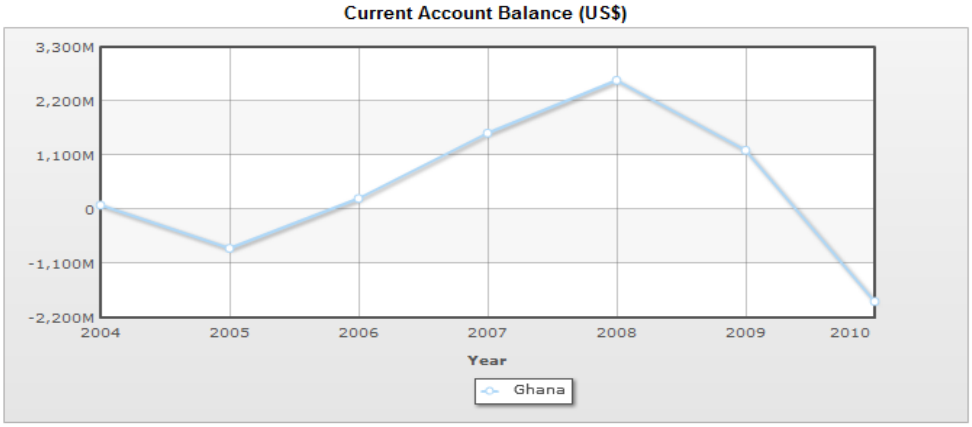
Income distribution

The income distribution of a country refers to how the national income, wealth or output is divided among the total population, usually for comparison purposes and other decision making purposes. (Business dictionary 2012)

Ghana has abundant natural resources that have the potential of enhancing the income generating capacity of Ghanaians. In spite of this, there has not been much improvement in the equitable distribution of income. There have been many reports about the causes of unequal distribution of income in Ghana. For instance, according to Aryeetey (2003, 1), the unequal distribution of income in Ghana could be partly attributed to globalization. The so called “opening up” the economy has its inherent risks which hitherto were not experienced. As a result, has contributed in handicapping the already “vulnerable” economy thereby increasing poverty and income distribution. However, the fact remains that, given a Gini coefficient of 39.4 (2005-06) from an earlier index of 40.7, means that income is not equitably distributed. The gini index measures the distribution of income using the Lorenz curve where cumulative family income is plotted against the number of families. Using an index of 100, the more equitable the income distribution (the more closer to the 45 degrees line) the lower its index and vice versa. (CIA 2012)

Current Account structure

The current account of a country refers to a record of all imports of goods and services and net returns of investments abroad less the exports of all goods and services expressed in the domestic currency in a defined period of time.



Country	2004	2005	2006	2007	2008	2009	2010
Ghana	83,870,000	-790,000,000	219,000,000	1,549,000,000	2,620,000,000	1,199,000,000	-1,871,000,000

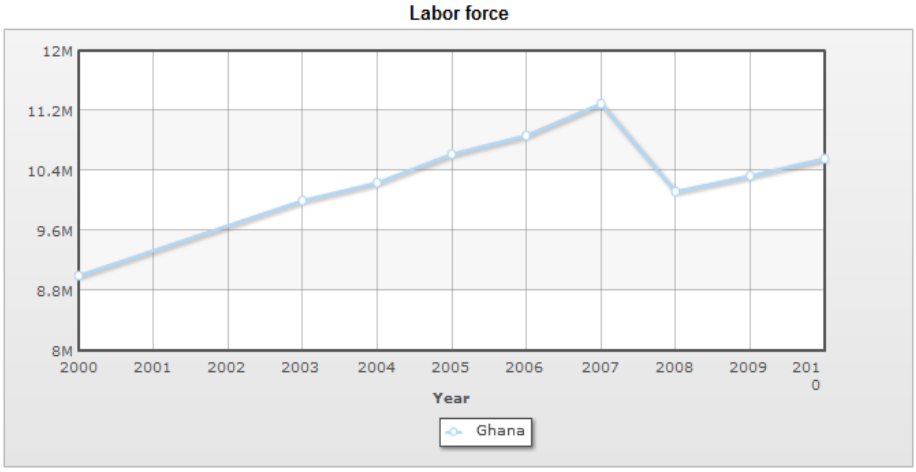
Figure 5: Current Account balance (2010)

From the graph above, it could be seen that the capital Account of Ghana has been changing between positive and negative values from 2004 to 2010. However the CIA (2012) reports the current account balance of Ghana for 2011 as -$1.438 billion. This may be caused by many factors, but a more likely one is that Ghana imported more than it exported in 2011.

The labour force and poverty level

Labor force refers to the all the people who have reached the legal working age of a country, actively working or seeking employment. However, this excludes students, retired people, discouraged workers, stay-at-home parents and people in prison or similar environments. (Wikipedia 2012)

The population of the labor force of Ghana is 10.77 million (2011 est.). The majority about 60% of labor force are employed by the Agricultural sector, 15 % in the industry and about 30% in the services sector. The level of unemployment is 11 % (2000 estimate) and about 30% of the population is below the poverty line. (CIA 2012)



Country	2000	2003	2004	2005	2006	2007	2008	2009	2010
Ghana	9,000,000	10,000,000	10,240,000	10,620,000	10,870,000	11,290,000	10,120,000	10,330,000	10,560,000

Figure 6: The trend of the labor force in Ghana

The Level of poverty refers to the use monetary or non-monetary set criteria to distinguish poor people from non-poor ones. The level of poverty can be divided into relative poverty and absolute poverty. The former is defined in the context of the overall income or consumption in a given country while the latter is defined in the context of what households need such as minimum amount of money in order to survive. (The World Bank 2011)

The World Bank in 2008 revised the 1 USD a day (minimum) to 1.25USD a day as the absolute minimum amount needed for a day to survive. (Wikipedia 2012) The poverty threshold is different from one country to another and the figure is not the same for all countries, and thus not comparable.

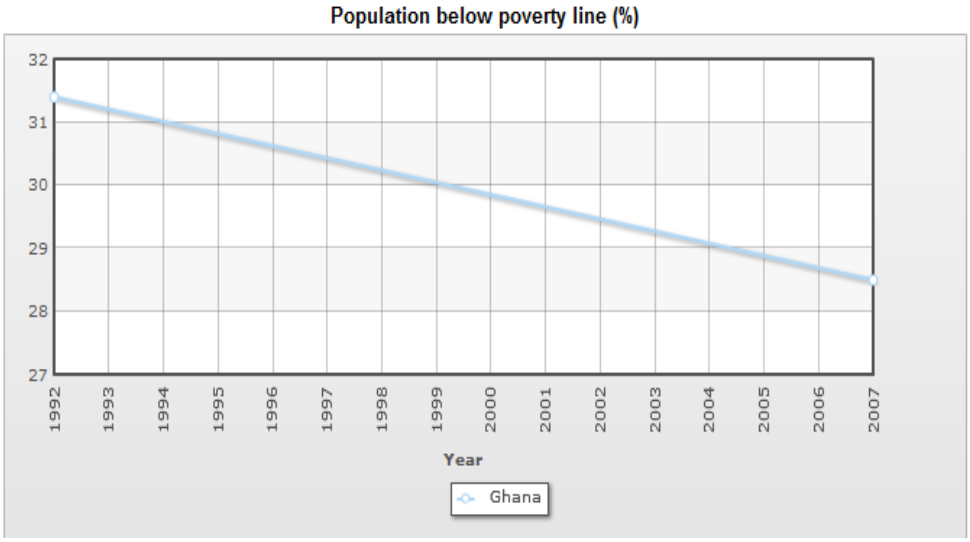
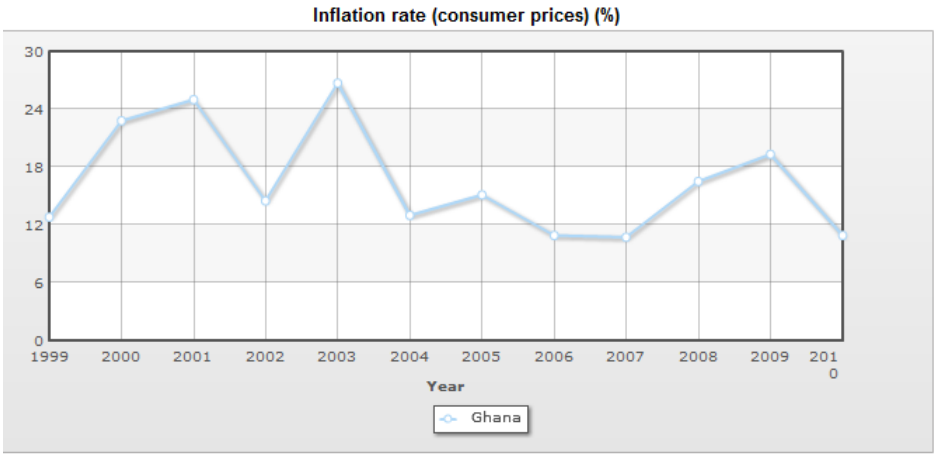


Figure 7: Population below poverty line, 1992-2007 (indexmundi, 2011)

The figure above indicates that the level of poverty is reducing in Ghana, from over thirty one per cent in 1992 to 2007. In spite of the many poverty reduction initiatives adopted by the government in reducing poverty in Ghana, about 30% of Ghana's population is below the poverty threshold.

The level and trend of inflation and exchange rate

Inflation refers to the rise in general level of prices of goods and services in an economy in a given period of time which results in the decline in the value of money. (Investopedia 2012)



Waiting

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Ghana	12.8	22.8	25	14.5	26.7	13	15.1	10.9	10.7	16.5	19.3	10.9

Figure 8: The rate of inflation 1999-2010 (indexmundi, 2011)

From the graph above, it could be seen that inflation in Ghana increased from 1999 from almost 13%, almost doubled after a year and reached a peak in 2003. Thereafter it reduced sharply a year after, and took a downward trend till it reached almost 11%. However, the current rate of inflation is 8.6 per cent (Trading economics 2012)

Exchange rate

An exchange rate is the standard value at which the currency of a given country can be exchanged for that of another country. Given the Ghanaian cedi (GHC) as the currency of Ghana, it will denote the value of the cedi which would be equal to a dollar, or euro, pounds sterling, or any other currency. The fluctuations in the exchange rate have an impact on the economy. However, this may depend on the scale of the fluctuation, whether it's temporary or

prolong period of time, and how responsive are consumers and businesses in regard to these fluctuations. (Tutor2u 2012)

The dollar surpassed the British pounds sterling during the twentieth century, becoming an "unofficial currency" of the world because of the relative rarity of loosing value as compared to other currencies. (Investopedia 2012)

Ghana cedi exchange rate has been fluctuating, though with slight margin. The changes in the rates between the GHC and other currencies, especially the dollar, the euro and pound sterling are very frequent. Depending on the exchange rate market conditions, it could be weekly, monthly or daily basis.

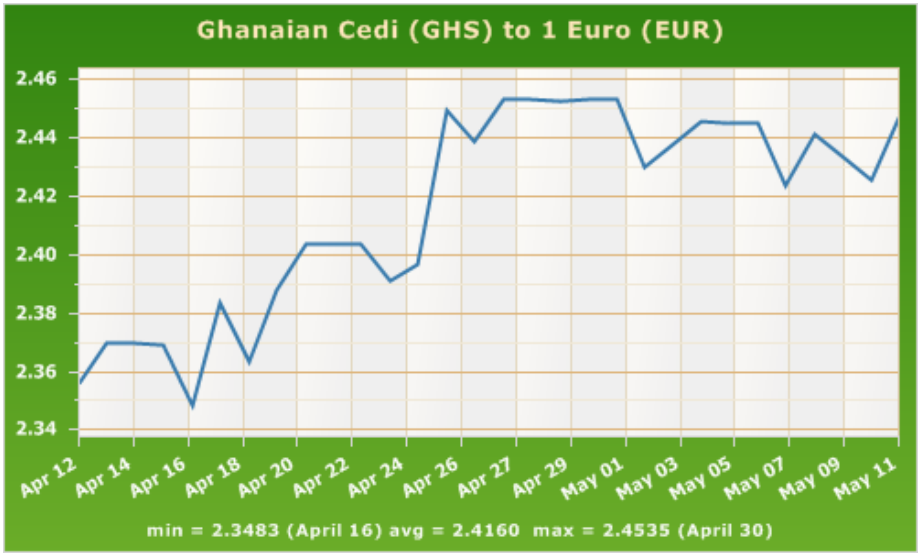


Figure 9: Exchange rate between GHC and EUR 12.4. - 11.5. 2012 (Exchange rate.org)

From the figure above it could be seen that rate fluctuated initially from almost 2.36, reached the highest point on April 27 to May 1st. After that, it took a steep downward trend and continued the fluctuation.

The level of Credit accessibility/financing

The ability of businesses to access credit, in various forms is one of the vital determinants of business success. However, given the low income levels, a high informal sector, and other reasons, obtaining credit or financing is arguably one of the biggest problems in Ghana.

However, according to "Doing business" (2012, 49), the two main vital issues financiers or lenders consider are the system of credit information and the legal rights of borrowers and lenders. The score of Ghana according to "doing business" report on credit information is 37.5 % and 62.5% on the strength of legal rights.

This notwithstanding, the financial sector in Ghana is undergoing a positive transformation with the assistance of the private sector and donors. Areas where much effort should be concentrated are the effective operation of the capital markets, the restructure of the financing for the small and medium sized enterprises, effective rural banking and microfinance schemes as well as private sector participation in insurance and pension schemes. (Bawumia M., Owusu-Danso T. & McIntyre A. 2008)

The above phenomenon about developing of the financial sector corresponds with what the United States Ambassador to Ghana said that "Ghana needs strong financial sector" in her bid of developing a strong and comprehensive financing scheme. (The Chronicle 2008)

The financial sector in Ghana is made up of commercial banks, merchant and development banks. There are also rural and community banks as well as non-bank financial institutions. Even though, financing for SMEs has primarily been the "preserve" of the purely financial institutions, there has been donor involvement in financing of some SMEs and other projects in Ghana. For instance, there has been financing schemes which has been implemented by the donors through other financial institutions. Some of them are Care-Technoserve Fund for Small Scale Enterprises, DANIDA SME Fund, GTZ Fund for the Promotion of Micro and Small Enterprises, SECO SME Financing Scheme and FMO SME Financing Scheme. Other international NGOs finance SMEs through their local offices. Despite the many options for financing for SMEs, the financing market for equity is limited. (Mensa S. 2004, 5-8)

Given the object of this project in terms of financing, there could be many financing options for energy and specifically renewable energy projects in Ghana and other donor-supported schemes. For instance the United Nation Environmental programme (UNEP) Renewable Energy Enterprise Development (REED) could be one financing option for renewable energy projects in Ghana. Depending on the company, the amount offered may be inadequate, since an SME could obtain up to 250,000 USD in loan or equity. (UNEP Renewable Energy Enterprise Development 2011)

3.3 Socio cultural factors

Population demographics

The current population of Ghana is 25,241,998 (July 2012 estimate) and the population grows at a rate of 1.787 per cent per annum. The age groups are 0-14 years, 15-64, and 65 and above. The 0-14 was 36.5 % (male 4,568,273/female 4,468,939), 15-64 was 60% (male

7,435,449/female 7,436,204) and the elderly was 3.6% (male 399,737/female 482,471) of the population.
Ghana is dominated by Christianity having almost 70% (68.8%) of the population, Islam about 16 %, traditional religion 8.5%, none 6.1% and other 0.7 per cent. The rate of birth is 26.99 births/1,000 population (2012 estimate) and death 8.57 deaths/1,000 population (July 2012 estimate).

Society structure and social groups

The social structure which comprises people divided on the basis of some elements, such as political power, other ruler-ships such as kings, chiefs, wealth and other socioeconomic factors. Respect for leadership in Ghana is has a long history which can be traced back to pre-colonial era. Even though Ghana has high democratic credentials, however, the modern political system is practiced concurrently with the traditional system which arguably started in Ghana since 1471. (Donkor J.W. 1)

The structure of the family in Ghana is almost similar, if not same, as the rest of the countries in Africa. It is mainly extended family system than nuclear family system. The former includes many generations and cousins and aunts who usually live in the same compound or close to each other. The latter however, comprises the couple and child (ren), if any, in the marriage.

Some of the significant elements of the social group are religious and ethnic groups, and other socioeconomic classification. Christians are the majority of the Ghanaian religions, followed by Islam and the traditional religions and others.

Ghana has no “official” recognition of classification of people on the basis of socioeconomic factors. However, one could for instance observe the trend of events in the socioeconomic status of Ghanaians. There are the ruling class, the royal families in almost all the regions, the upper working class, middle working class, the lower working class (all in the formal sector) and those in the informal sector.

According to the Ghana Living Standard Survey, fifth round (2008, 107) the Greater Accra region has the highest income on average, followed by the Ashanti region, Western region, Central region and Brong Ahafo region. The three northern regions; the northern region, upper east and upper west had the least level of incomes.

Human rights

Human rights can be simply defined as values and guarantees backed by universal laws which are meant to ensure the safety of everybody living everywhere. This comprises the respect and protection of one's civil, cultural, economic, political, social and development rights. (Human rights, terrorism and counter terrorism 2008, 3).

Therefore Ghana being a member country of the United Nations automatically means that Ghana has accepted regulations relating to human rights issues.

In spite of this, Ghana has encountered issues of human rights violations in various forms. The Human rights report for Ghana (2010) states cases of human rights abuses that took place in Ghana. These human rights abuses take various forms, such as child abuses, female genital mutilation, politically motivated crimes or violence, kidnaping, human trafficking etc.

That is not to mean that the government has not made attempts at respecting human rights in Ghana. The Government of Ghana holds human rights issues important and has therefore created authorities to foresee the education of the public, handling cases of human rights abuses and established commissions in this respect. For example the Commission on Human right and Administrative Justice (CHRAJ) was created to deal mainly with human rights issues.

Moreover, there are other national and international governmental and non-governmental agencies that seek to provide support to ensure that human rights are respected in Ghana. For instance, Human right advocacy Centre (HRAC), Centre for Popular Education and Human Rights- Ghana (CEPEHRG), Commonwealth Human rights Initiative (CHRI), Amnesty International and others.

The changes in lifestyles and trends

Lifestyle could be defined a way of living by individuals, families, and societies which makes them capable of meeting their physical, psychological, social and economic needs. (Business dictionary 2012)

This includes the work and leisure behavioral patterns, attitudes, values, opinions, allocation of income, self-concept and other variables. To a large extent, lifestyles are influenced by ones family, culture, reference groups and social class. The western media has contributed in certain lifestyle changes in Ghana and most countries of Africa. While some of these changes are considered as "appropriate", others are in contrast to the long held values of the society. Western influences have permeated in almost every aspect of life of African in general and Ghanaians in particular, and have been heightened during the twentieth century, mainly

through mass communication. (Wasim Akbar 2009) Some notable life style changes in Ghana could be the changes in food, clothes, houses, and so on.
For the purpose of this project, housing and other infrastructural changes could present a more meaning approach considering the energy considerations that come with housing. Hitherto, Ghanaians usually live in Compound houses, with shared bathrooms, kitchen and other common places. However, due to the influence of urbanization and Ghanaians living abroad, the trend (of compound houses) has changed towards a "westernized style" of building which includes story-building, detached and semi-detached houses. This trend has contributed in widening of the "real estate" and housing mortgage market in Ghana. As a result, the energy need for this housing is likely to be higher than that of a compound house, all things being equal. In order to have easy entry into the Ghanaian market with energy (and renewable energy) solutions, it is important to create business relationship with Ghana Real Estate and Developers Association (GREDA). This association has over hundred real estate companies as members, and therefore will provide a "one stop shop" to have access to almost all the real estate companies. (Ghana Real Estate Developers Association 2007)

The level of literacy

Literacy, according to the Merriam-Webster's Collegiate Dictionary (2002) is one's ability to read and write as well as being "versed in literature or creative writing...having knowledge or competence…"

However, Langer (1991) states that literacy is not limited to one's ability to read and write, but ones "ability to think and reason like literate person within a particular society" (Scherba de Valenzuela J. 2002). For the purpose of this piece however, the comprehensive definition stated above will be assumed.

Arguably, the level of literacy could be influenced by the educational system of a country. Therefore the Government of Ghana, in 2002, reviewed the educational system with the aim of making the new system more responsive to current challenges. Under the new system, the compulsory universal Basic Education (UBE) shall now be 11 years, made up of 2 years of Kindergarten, 6 years of Primary School and 3 years of Junior High School (JHS) (Ministry of Education 2012).

Besides, the Government of Ghana spends about a quarter of her spending on education thereby increasing literacy rates in the country. For instance according to the United Nations Education Social and Cultural Organization (UNESCO) on literacy in Ghana (2010), about 70% of adults and a little over 80% of the youth are literate. The current level of literacy in Ghana is 72%, ranked 142 out of 183 countries. (Wikipedia 2012)

However, literacy rate for year 2000 was about 58%, consisting of about 67% males and 50% females. (CIA 2012)

For the purpose of this project, there are many graduates who can be useful employees, especially when trained to carry out tasks related this project. The figure below shows the level of literacy in Ghana.

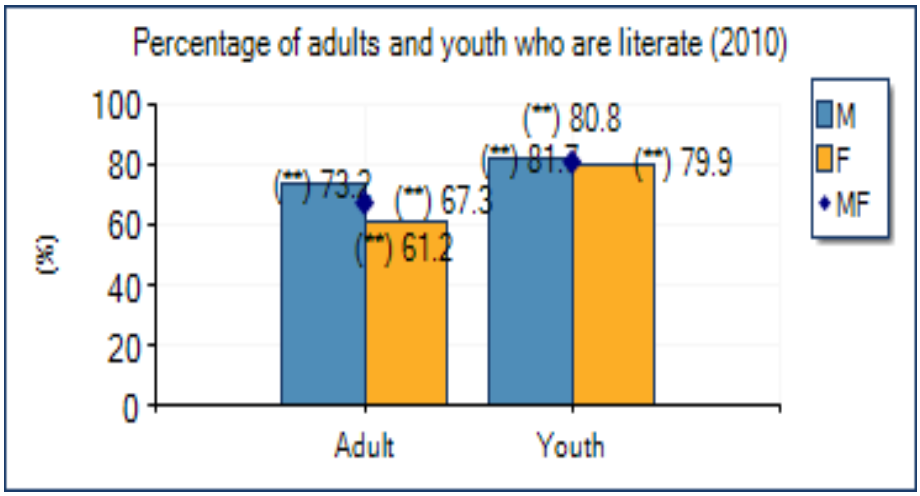


Figure 10: Literacy rate in Ghana 2010 (UNESCO, 2010)

Business culture comparison between Ghana and Finland using Hofstede's 5-D model

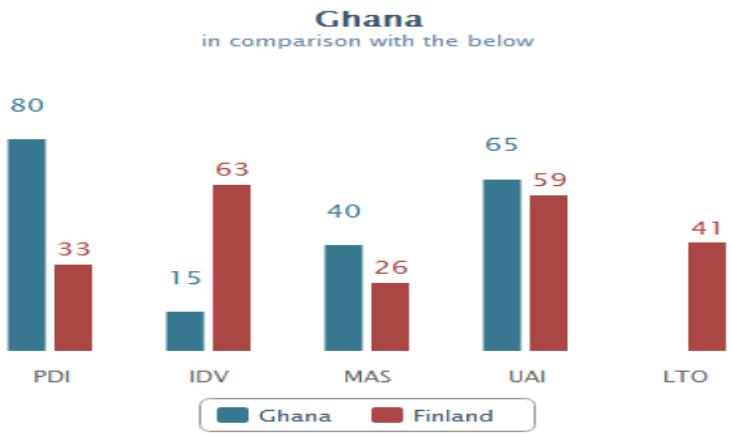


Figure 11: Comparison between Finland and Ghana on Hofstede's 5-D Model

Power distance

This refers to the extent to which power is distributed and thus accepted in a society and the attitude of the culture towards these inequalities.

Ghana has a score of 80 on Hofstede's dimension meaning that there is an unequal power distribution, and thus hierarchy is highly regarded in Ghana.
Finland on the other hand has a score of 33 meaning that there is low consideration for hierarchy in Finland. There is a decentralization of power, hierarchy is only for convenience sake and the channel of communication is direct and participative. (Geert Hofstede 2012)

Individualism

This refers to the extent to which individuals in a society depend less on others. Ghana has a score of 15 (low) means that it is a collectivist society rather than individualistic one. Individuals in collectivists' societies have a "We" feeling instead of "I" because they belong to a group, and are committed to that group. This group could be family (nuclear and extended family), tribe, culture or other similar groups. Each member of the group is responsible for the whole group, and the attitudes, opinions and values of members represent that of the group. The disgrace of a member leads to a loss of "face" and working relationships are considered in moral terms.

Finland on the other hand has a high score of 63 on individualism which means that Finland is highly individualistic country. Here individuals are very independent, hierarchy is only for sake of convenience, equality of individual rights, and leaders are for empowerment and facilitation. Showing of leadership by controlling is not admired; relationship between leaders and followers or employees is rather informal. (Geert Hofstede 2012)

Masculinity/Femininity

This refers to the extent to which social roles are defined and a person's role in a society usually depends on his/her gender. For instance in masculinistic society, males are expected to be tough, assertive, focused on material success for family and society; women are expected to be tender, modest, concentrates on roles defined by the society as feministic such as child care, keeping home in order, etc.

Femininity on the other hand refers to a society where social roles are not clearly defined, and thus roles of individuals are not determined based on gender. Here, "equal opportunity for all" concept is applied and both males and females are equally expected to be concerned about the same things such as child care, material success, modesty, quality of life, and any other values considered as good in the society.

Ghana: With a score of 40 on this dimension implies that Ghana is a relatively feminine society. Here, the main focus is working in order to live and people regard equality, solidarity and quality in their working lives. (Geert Hofstede 2012)

Finland: With a core of 26, Finland is considered a feminine society. Thus Finland shares some characteristics with Ghana on this index as described. Moreover, status is suppressed.

Uncertainty avoidance

This refers to the degree to which members of a society feel threatened by uncertainty or ambiguity related to future situations. Also, how people in a society deal with unknown situations, such as creating beliefs or value systems that serve as proof against these situations.

Ghana: has a score of 65 on the uncertainty avoidance index, and thus has high regard for avoiding uncertain situations. What could stimulate people in such a society to act in a certain way is to set rules that could guide actions. However, there is no guarantee that the rules would be followed, but it is still better to have rules than no rules.

Finland scored 59 on the uncertainty avoidance index, which is average. This means that there is a high possibility that Finns could maintain rigid belief codes. Also security and punctuality are very important in the Finnish working environment.

Long term orientation

This dimension determines the view of people in a particular society think in terms of future as compared to the presents. Thus whether they are concerned future-oriented or short-term oriented. (Geert Hofstede 2012) Ghana has a score of 16 on the long term orientation. This means that people in this society do not hold long term view of things, and thus hold short term view of things in high regard. In such a society personal steadiness and stability, regard for tradition as well as reciprocation of favors are common characteristics. (Clearlycultural 2012)

Finland has a score of 41 on the long term orientation index, meaning that people in Finland hold long term view of things in high regard. In such society, persistence, ordering relationships by status and observing that order, as well as thriftiness are common characteristics.

3.4 Technological factors

The level of technology in renewable energy

Renewable energy technology refers to the judicious and sustainable way of exploiting the renewable energy sources to produce energy for human use.
Ghana has held a policy for renewable energy for a long time. However, due to some circumstances, the technologies in some of the renewable energy sources have still not been developed.

Renewable energy became a critical source of alternative energy during the shortage of electricity in 1997. Currently, the renewable energy technologies that are in use in Ghana are solar Photovoltaic (PV), Solar Water Heaters (SWH), Wind/Electric turbines, Biogas Generators, and Biomass Fuel Sources. (Tse 2000)

The level of these renewable energy technologies would be explained a bit further in other sections of this paper.

Availability and cost of skilled labour

Skilled labor can be defined as specialized part of the labor force that is characterized by high education or level of expertise, training, experience as well as abstract thinking. (Investopedia 2012)

There are many universities in Ghana, some are public and others are privately owned ones, polytechnics, and other colleges that complement the effort of the government in education. This has contributed in producing over 30,000 graduates annually, with many not likely to get employed for quite a long time. (Ghana Labor market 2002)

Some of the probable cause of high graduate unemployment is the “quantity” and the “quality” gap. (Boateng K. & Sarpong-Ofori E. 2002, 27-28). The former refers to the situation where there is a mismatch between the number of graduates produced in the various programs, thus greater in some programs than others. The latter however, is the situation where there is a mismatch of skills required by employers in relation to what graduates need.

Arguably, the minimum annual salary in Ghana is about 700 USD (Wikipedia 2012). However, there are other different pay-scales used in Ghana for different sectors. Since salary levels depend on many factors, such as education and training, experience, sector of employment and other factors, it would be difficult to give a fixed figure to denote an average salary in Ghana. In spite of that, the minimum wage, to some extent, gives an idea of the salary levels in Ghana which is quite low.

Even though salaries may constitute a significant part of the administrative cost of firms, it would most likely not be high compared to salary levels in Finland with average wage of 2600 euro per month. (Suomen Työelämän Infopiste 2012)
The rate of technological innovations and advancements

The United nation education, Social and Cultural organization (UNESCO 1985) defined technology as "the know-how and creative processes that may assist people to utilize tools, resources and systems to solve problems and to enhance control over the natural and made environment in an endeavor to improve the human condition." On this premise, the government of Ghana has contributed significantly in improving the level of technology in Ghana. For instance the introduction of the National science, technology and Innovation policy was aimed at improvement of the human resource capacity of Ghanaians which would ensure achievement of an Emerging market economy by the year 2020. (National Science, Technology and Innovation Policy 2010, 13)

The effort of Government on research and Development

According to Robert Lucas and Eric L. Jones, “people are inherently innovative, and if the environment is conducive, technological progress is almost guaranteed” (Mokyr J. 2005, 4). Therefore technological progress is more likely to be higher in Ghana if Government and other stakeholders’ efforts toward improving the necessary conditions for technology to thrive are equally high. According to the Summit of African Heads of state of the Organization of African Unity (OAU) in 1980, resource allocation to science and technology should be at least one per cent of the country’s GDP. However, Ghana’s resource allocation for science and technology is between 0.3 to 0.5 per cent of her GDP. (National science, technology and Innovation Policy 2009, 8)

In the context of renewable energy, the Government lends her assistance through the financing and other related support to the research institutions’ in Ghana. Some of the renewable energy research institutions are Institute of industrial research (IIR), Kumasi Institute of technology and Environment (KITE), NEK Ghana limited, Africa energy Institute and other private research institutions.

3.5 Environmental factors

There is a provision in the constitution of Ghana article 36(9) on directive principle of state policy which concerns the environment. It states that “The State shall take appropriate measures needed to protect and safeguard the national environment for posterity; and shall seek co-operation with other states and bodies for purposes of protecting the wider

international environment for mankind" This provides the fundamental basis for environmental regulations aimed at protecting the environment.

This however does not mean that hitherto there were no environmental regulations, as this has been the accumulated efforts of previous Governments to put environmental issues as priority. For instance the environmental Action Plan (EAP) was adopted in 1988 and the National Environmental Policy in 1991, aimed at managing the environment properly and reduce unsustainable exploitation. (Roosbroeck Van P.2006, 33)

Geography

Ghana is located in West Africa and lies between longitudes 3° 15' W and 1° 12' E, and latitude 4° 44'and 11° 15' N. Ghana shares borders with the Togo to the east, Cote d'Ivoire to the west and Burkina Faso to the north. Ghana has a coastline of 550 km2 and a total land area of 238533 km2. The territorial area of Ghana is 110,000km2 of the sea.

There are six vegetation zones namely the Guinea savannah, the coastal savannah zone, the Sudan savannah zone, the forest-savanna transitional zone, the semi-deciduous savannah zone and finally the rain forest zone. (Wilson T, 2004) Ghana's Volta lake having a surface area of 8,482 sq km; 3,275 sq miles is the largest artificial lake in the world

Climate and seasonal changes in temperature

The climate of Ghana is tropical which is as a result of the strong west monsoon wind with the highest seasonal variations occurring in northern Ghana. (UNDP Climate change country profiles 2011) Ghana has two seasons, namely the rainy season and dry season. The rainy seasons occur from April to July and from September through November while the dry season begins from December to March. During the rainy season the minimum rainfall is 900mm/annum occurring at southeastern part and the average maximum is 2000mm/annum which occur at the southwestern part of Ghana. The temperatures vary depending on the elevation and the season even though the temperatures are quite moderate all year round. (Travel to Discover Ghana 2012)

For the purpose of the Connect project, it is possible that wind energy solutions could have fluctuating capacity during the year since wind speed is not constant all year round and similar trend could be experienced in some parts of Ghana in solar energy solutions as well.

Natural resources

A natural resource refers to anything people use to support life or provide their needs. Natural resources are gathered from nature, not man-made. Examples of natural resources are air, wood, water, oil, solar and wind energy, coal, etc. There are two types of natural resources, they are renewable and non-renewable. The renewable resources replenish itself after use, such as trees, water, and sunlight. The non-renewable resources, however does not replenish itself after use, for instance coal, petroleum and natural gas. (Wikipedia 2012)

Ghana is endowed with abundant natural resources. Some of them are gold, timber, industrial diamonds, bauxite, manganese, fish, rubber, hydropower, petroleum, silver, salt, lime stone, oil, etc. (CIA-Ghana 2012)

For the purpose of this project, the natural resources to consider are water, wind, sunlight, waste resources, etc. The total renewable water resources (2001 est.) are 53.2 cu km, potential wind resources are 1128 km2 class 3-7 wind at 50m and ranked 59th (in 1990) in the world. The potential solar resource is 706,055,035 MWh/year, with world ranking of 73rd in 2008. (Open energy info 2012). More about the potential of these and other renewable energy sources would be explained in appropriate sections of this paper.

Frequency of environmental disasters

An environmental disaster is a damage caused to the natural environment as a result of human activities. The classification of environmental disasters usually depend on the extent of damage, whether extreme, moderate or mild based on the definition of these elements.

Environmental disasters have effect on human survival in many ways, such as reduction in quality of human health, the economy, biodiversity and agriculture. Some causes of environmental disasters are depletion of natural resources, industrial activities, agriculture and pollution. (Wikipedia 2012)

Firstly pollution is arguably, one of the single most critical global problem in which Ghana is no exception. Pollution takes various forms and the degree of destruction also varies. Some of the major industrial activities which cause pollution are mining, agriculture, and manufacturing. Some other activities which cause environmental disasters are bush fire, sea spray, vehicles exhaust gases, etc. For instance Ghana imports on average 6000-8000 used vehicles annually, and the exhaust gases from these contribute to the environmental disasters. (Aboh Kwame I.J. year unknown)

Secondly, industrial activities aforementioned also cause environmental disasters in Ghana. For example mining areas in Ghana are considered one of the most degredated due to the way the

resources beneath the earth are mined; the equipment used as well chemicals used in mining. Cyanide spill from mining activities is considered Ghana's worst environmental disaster. (Modernghana 2001)
Finally, some economic activities such as hunting for "bush meat" causes fire to set the forest, the use of chemicals in fishing all contribute to environmental disasters in Ghana. The frequency of these environmental disasters varies. Others occur more frequent than others. Bush burning for hunting purposes for instance mostly occurs in the dry season.

Considering the objectives of this project, prominent among the renewable energy resources needed are sunlight, wind and waste. However, the impact, though arguable, on these resources are quite minimal.

The level of Infrastructure

Infrastructures are the "fundamental physical system of a country population, which includes roads, utilities, water, sewage, etc." (Investor words.com 2012)

From this project perspective, infrastructure could be the entire aforementioned and project-related infrastructure.

Generally, Ghana has about 40000 km as at 1997, out of which almost 12000 were paved. However, the railway sector is the least developed in the transport infrastructure of Ghana. The railway was mainly cargo which connects the main mining areas to the sea ports and also offers passenger transportation to the sea ports of Takoradi and Tema. As at 1999, Ghana had 12 airports, half out which had runways. (Encyclopedia of nations 2012)

Ghana has a quite a modest telecommunication infrastructure. About 280,000 telephone lines (ranked 119 in the world) had been installed and about 17.5 million mobile cellular connections (ranked 48 in the world) as at 2010. On broadcast media, Ghana has 2 state owned Television stations; many privately owned television stations as well as many cable and satellite transmission services are accessible. On internet usage, there are about 1.3 million internet users (ranked 93rd in the world) as at 2009. (Ghana Communications 2012)

Arguably, electric power is the most significant infrastructural problems in Ghana. There is extreme reliance on hydro source for a bulk of the country's electricity need. However, the amount of water in the dam reduces significantly during the dry season, making it almost impossible to produce at a full capacity. More explanations will be given at later sections of this paper concerning the electricity and renewable energy situation in Ghana.

Ghana spends about 1.2 billion dollars (7.5 % of GDP) per year on infrastructural development. However, a further 1.1 billion dollars will be needed in infrastructural development. (Foster V., Pushak N. 2011,)
That is not to mean that there are no infrastructural deficiencies in Ghana. There are many notable infrastructural problems in key areas such as the congestion in sea ports, physical extension of the road network, unreliable power supplies and undeveloped flight connectivity challenges among others. (Foster V., Pushak N. 2011, 13-20)

Environmental issues and effects of climate change

There are many environmental issues in Ghana. Some of them are agricultural practices that impact negatively on the environment such as deforestation, overgrazing, soil erosion and poaching. Others are gradual loss of biodiversity, killing of endangered species, improper electronic waste disposal, pollution, effluent, etc. (Index mundi 2012) However, among the aforementioned environmental issues, the most critical ones are the deforestation, the improper electronic waste (e-waste) disposal, and pollution of the atmosphere and water bodies.

The forest of Ghana has been over exploited at a higher rate that could become extremely dangerous for Ghana. For instance in less than 50 years Ghana has lost about 90% of its primary rainforest as well as loss of 26% of her forest cover. Also electronic gadgets, such as computers, Televisions, Stereos, etc needs proper waste disposal system. However, the unavailability or inadequacy of these e-waste facilities creates a situation where they need to be burnt, and the smoke from these gadgets creates health risks to people, animals and the environment thereby contributing to the global environmental problem.

The carbon-trading initiative proposed by the coalition of developing countries is one of the initiatives which were aimed at controlling the rate of deforestation in the respective countries including Ghana. For instance the indiscriminate cutting down of trees creates the drying up of water bodies which is even more critical for life. According to Karl Hamsen, Africa may be able to feed only a quarter of her population if the rate of desertification continues on the current trend, and this may create “environmental refugees” by 2025. (Mongabay.com 2006)

For the purpose of this project, the Environmental protection Agency (EPA) in Ghana is the main authority on in issues concerning the environment. Therefore environmental issues should be considered by potential investors in Ghana, especially those whose operations are directly “environmentally-linked”.

The opinion of the public on environmental issues

According to the Dunlap, Gallup and Gallup (1998) “Health of the Planet” survey, the concern about the environment is still high even in areas where the level of knowledge is low. Further, the World Summit on Sustainable Development which took place in Johannesburg (2002), sought to find a sustainable way of dealing with environmental issues along with economic and other issues. (White Michael J.2005, 1-3). Therefore environmental concerns have become a very important for Africa in general and Ghana in particular. The people in Ghana have recognized that the environmental issue is not “the preserve” of the government through her agencies; rather it is an area needing collective effort. Therefore there are many Nongovernmental (NGOs) and nonprofit organizations that have taken to educate people on the need to preserve the environment. Some of these NGOs are African Re-afforestation union, Action for Development, Africa vision 2020 Foundation, Ashaimang Neighborhood Environmental Club, etc. (United Nation Development Programme 2004)

The national Health, Environment and safety conference would be held in Accra on May 9, 2012 to address issues concerning health, environment and safety. This at least gives an idea as to how “environmentally conscious” the Ghanaian populace are, or at least becoming. (Otinkorang M.2012)

For the purpose of this project, it should however be noted that practices that could endanger the environment would be not acceptable. Also having “ethical policies” especially concerning environment could result in a positive brand image and customer loyalty in the long term. With the products of this project being renewable energy solutions which is environmentally-friendly, it is most likely to be successful.

3.6 Legal factors

General legislative system and enforcement of legislation

The legal system of Ghana is based on the English common law and the customary law. However the legal system has undergone a reform in 1968 when the Ghana Law reform commission was formed. Immediate concerns that were reformed were the inheritance and marriage law among others. The constitution of Ghana was adopted in 1992. In the constitution of Ghana article 11 lists the sources of law as Constitution, legislation (existing law and common law).

The hierarchy of the courts system is Supreme Court, Court of Appeal, High court and ten regional tribunals. The former is the highest and the latter, the lowest in that category. However there are also circuit courts and traditional courts which also settle cases in Ghana, and appropriate court would be used depending on a particular case. (Emory 2012)

Generally law enforcement in Ghana is carried out by the agencies of the ministry of interior. They are Ghana Police service (GPS), Ghana Prison service, Ghana National fire service, Ghana immigration service, Narcotic control board, National disaster management organization, and the refugee board. (Interpol 2012)

The GPS is divided into regional and divisional commands, and all report to the National Headquarters in Accra. (Wikipedia 2012)

For the purpose of this project, the legislation "systems" that would be encountered fall within the legislative framework of the ministry of energy. Also depending on the investment category, there are law enforcement agencies that ensure compliance with the law. For instance all enforcement relating to the environment is the Environmental Protection Agency, and enforcement concerning standards would be the responsibility of the Ghana Standard Authority (GSA).

International law and implementation of international regulations

Globalization refers to the interconnectedness of the world as a result of trade or cultural exchange. (BBC 2012)

In as much as globalization has merits to the national and the world economy, it has also created international fraud and other criminal activities. Some of these disadvantages are illegal narcotic trade, cyber-crime, money laundering, terrorism and other related criminal activities. Therefore in order to control such negative occurrences would involve the coordination of nations working together, rather than each handling own affairs. Ghana is a member of many international and regional organizations, such as the United Nations, World trade organization, Economic community of West African states (ECOWAS), Interpol, just to mention but few. Therefore international laws and regulation and its implementation would be ensured. For instance International laws and regulations concerning corruption, money laundering, terrorism, cyber-crime, organized crime, etc would be enforced in Ghana (Quaye Robert 2011, 50-51)

Two years ago, the ministry of environment, science and technology proposed the creation of a "body" to be called Ghana Environmental convention coordinating authority (GECCA). The main objective of GECCA is to ensure the implementation of international environmental rules. (Ghana web 2010)

Legislations related to starting a company

There are some legal procedures that should be followed before a business or investment in Ghana can begin operation. This will depend to a large extent, on the type of business or the nature of investment that one intends to undertake in Ghana. However, it has been assumed in this case that the investment involves the employment of one to fifty employees with a minimum capital requirement of 10 times the Gross national Income per capita of Ghana (GNI) of Ghana. According to the World Bank, the GNI per capita of Ghana is 1250 USD (2010 estimate), meaning that the minimum required in this case is 12500 USD. There are seven steps, briefly explained below:

Step 1: Registration of the name of the business: This will be preceded by checking for the availability of company name. The documents needed for this application for registration are company regulations, statement of shareholding structure, stated capital, and tax identification number form.

Step 2: The documents should be authenticated by the commissioner of oaths in the Registrar general department

Step 3: The certificate to start business will be issued in step 2 (usually the same day). The investor or the owner of the business should complete some specified forms within a specified time (28 days).

Step 4: The paid-in-capital should be deposited in an account. The documents required for the account opening are the company regulations, certificate of incorporation, certificate to commence business (which will all be issued in earlier steps), and signatures of the authorized company's representatives.

Step 5: Application for Business license at the metropolitan authority where the business would be located. The license would depend on the type of business and the category in which it falls under the business classification in Ghana.

Step 6: Inspection of the work premises by the Metropolitan Authority. A report about the inspection is compiled; and a further advice is given if necessary.

Step 7: Apply for a social security. The documents needed for this process are list of employees with their social security numbers, their salaries, company's certificate of incorporation and certificate to commence business. (Doing business 2012, 21-23)

The above aforementioned steps are the general steps or likely guidelines to be followed in starting a business in Ghana. Some of the steps involve payment of some specific as determined by the law.

However, depending on the sector of investment, the steps may be a bit different and some of the process in the above steps can take place simultaneously with another process.

Legislation concerning investment in energy/renewable energy

Generally, all investments in Ghana are regulated by the Ghana Investment Promotion centre (GIPC). However, these exclude investments in petroleum exploration and extraction, mineral and mining exploration and extraction, Portfolio investments, Free Zones activities, and export promotion. (Doing business in Ghana 2003)

The energy sector of Ghana is divided into two, the petroleum sub-sector and power sub-sector. The petroleum sector involves upstream and downstream activities. The power sub-sector also involves the generation, transmission and distribution of electrical energy commercial, industrial and residential. (Ghana Investment Promotion Centre, year unknown). Therefore depending on the nature and sector of the divisions in the energy industry, the legislations concerning these sectors are also different.

The renewable energy (R.E) sector falls under the ministry of energy. However, the regulations concerning this sector are the responsibility of the Ghana Investment Promotion centre. A renewable bill has been approved by parliament, but has not been passed into law. The R.E bill involves considerations about the Feed-in-tariff, obligatory purchase, and Renewable fund. (Ministry of energy 2010) However, there are no clear-cut laws concerning renewable energy (Ghana energy commission 2011)

Employment legislations

The National labor commission (NLC) in Ghana is the main authority on labor issues. NLC was established by an Act of parliament (Act 651) in 2003. The mission of the NLC is “to develop and sustain a peaceful and harmonious industrial relations environment through the use of effective dispute resolution practices, promotion of co-operation among the labor market stakeholders and mutual respect for their rights and responsibilities.” (National Labor Commission 2012)

However, the labor Act (651) 2003, is the principal document that contains all the labor laws, rules and regulations regarding employment in Ghana. The Act 651 does not include regulation of employment in the Police service, the Armed forces, the prison service, security and

Intelligence Agencies that are specified under Security and Intelligence Act 1996 (Act 526). (Labor Act 2003, 7)

Some of the useful information regarding employment legislation for the purpose of this project are, where to recruit employees, rights and duties of the employer, rights of the worker, contract of employment, how to recruit employees, the minimum wage and salary issues, termination of employment relationship by employer or employee, as well as other general issues that affect the employer-employee relationship.

Environmental legislation

The environmental laws of Ghana can be traced to the pre-independence era where laws meant to protect the elite and state factories were enacted. These laws were primarily adopted to prevent or control diseases as far back as 1897 where the Beaches Obstruction Ordinance was passed. The Stockholm convention in 1972 was aimed at devising ways of protecting the environment, in which Ghana was a signatory. Therefore two years after, the Environmental Protection Council (EPC) was formed to institute policies to protect the environment. The EPC was later named as the Environmental Protection Agency (EPA) through the Environmental Protection Agency Act, Act 490. EPA still remains the highest authority on environmental issues in Ghana to date.

Further, there are the environmental Assessment regulation and the Pesticide Control and Management Act 1996, (Act 528). The former is in charge of registration and issuance of permits to clients and other stakeholders, whiles the latter issuing of importation licenses as well as permit issues. (Environmental protection Agency 2012)

The regulation (or law) of competition and trade restrictions

The regulation or law of competition refers to all the necessary measures that ensure that all companies or businesses are accorded equal chance of operation in a particular market without hindrance. (ECOWAS regional competition policy framework, year unknown)

Therefore any action that seeks to give an undue advantage to a section of the business community would be countered if possible, or even sanctioned if necessary.

Ghana has no real competition policy in the statute books per say, however Protection against unfair competition Act 589/2000 seeks to achieve the same purpose of protection against unfair competition. There are also rules or regulations in the companies' code, investment regulations as well as the statute books which all aim at preventing or controlling anti-competition actions.

The main authority for competition rules and regulations in Ghana is the Ministry of trade and industry. (Global competition forum 2010)

The regulation of the energy industry in Ghana is the responsibility of the Ghana Energy Commission. The sectors of the energy industry which are open to private investment and those areas that have been monopolized are indicated in the energy policy document of Ghana energy Commission. The government of Ghana is putting measures to serve as incentives for private or independent power producers (IPPs) to invest in renewable sector in Ghana. The regulation of the renewable energy sector would be enforced when the renewable energy bill is passed into law. (Ministry of energy 2010)

4 Energy markets in Ghana

The energy market in Ghana comprises many different types of energy such as crude oil, natural gas, electricity, renewable energy and so on. However, the demand and supply of electricity and related energies would be the focus in this section of thesis.

The production of electricity involves generation, transmission and distribution. The sectors responsible for each of these processes are different. The generation of electricity in Ghana is done by the state own Volta River Authority (VRA), the transmission by Ghana Grid Company, and the distribution by the Electricity Company of Ghana (ECG) and the Northern Electricity Department (NED). (Sectorial overview of Ministry of energy 2010)

The renewable sector of the ministry of energy is a new sector created to boost the access and usage of renewable energy in Ghana, and thus provide an affordable and environmentally friendly source of energy in Ghana.

4.1 The general electricity situation in Ghana

The inadequate supply of electricity is one of the most critical infrastructural challenges in Ghana. This has resulted in power outages and intermittent power rationing in Ghana for some years now. The government has a policy of increasing the supply of electricity through programmes such as building additional generating facility (such as the Bui Dam Project) and public campaign about efficient ways of using energy through Ghana Energy Foundation and other agencies.

Notwithstanding, the supply of electricity is still insufficient considering the estimated annual growth of 5 per cent for the next 20 years. (Tanoh G. 2012)

Arguably, the history of electricity in Ghana can be traced to the first governments funded electricity in 1914 in Sekondi and was later extended to Takoradi in 1928. This was followed by other fuel-powered plant installations in other parts of the country, mainly in the urban and coastal areas and other regions. (Electricity Company of Ghana 2011)

The Tema Diesel Plant was constructed in 1956 before the construction of Akosombo dam in 1965 which was officially commissioned in 1966.

Ghana depends mostly on Akosombo dam for electricity .The level of electricity produced from this hydro source depends on the water level in the dam. Therefore during the dry season, the water level in the dam reduces, which makes it impossible to produce a constant rate of electricity at a fluctuating water level. The Government of Ghana embarked on the National Electrification Scheme (NES) in 1989 to increase the coverage of electricity for Ghanaians.

The development of infrastructure of a country for instance, to some extent, is intertwined with development of other infrastructures. For instance building a strong industrial or manufacturing sector in a country could depend on the readily availability of a further infrastructure such as electricity needed for machines to operate in the absence of an alternative power arrangement. As a result, the government of Ghana has created an enabling environment for private participation in the energy sector. The renewable energy resources of the country has been identified as priority areas of investment necessary to increase the energy supply of the country to ensure energy security by 2020. (United Nations sustainable energy for All 2012)

The level of electricity coverage in Ghana

Ghana is divided into ten main regions, namely the Northern (Tamale), Eastern (Sekondi-Takoradi), Brong Ahafo (Sunyani), western region (Sekondi-Takoradi), the upper east (Bolgatanga), the upper west (Wa), the Ashanti (Kumasi), the Greater Accra (Accra), the Volta (Ho) and the central region (Cape Coast).

Electricity coverage varies from region to region, and the table below shows the electricity coverage in Ghana as at 2010. (Ministry of Energy 2010)

The national coverage or access to electricity in Ghana as at 2011 is 77.2%. The portion of renewable energy in the national energy mix currently in Ghana is less than 1 per cent. (Kenneth Appiah F. & Donkor R. 2011) The figure 12 on the next page shows the national electricity coverage in Ghana.

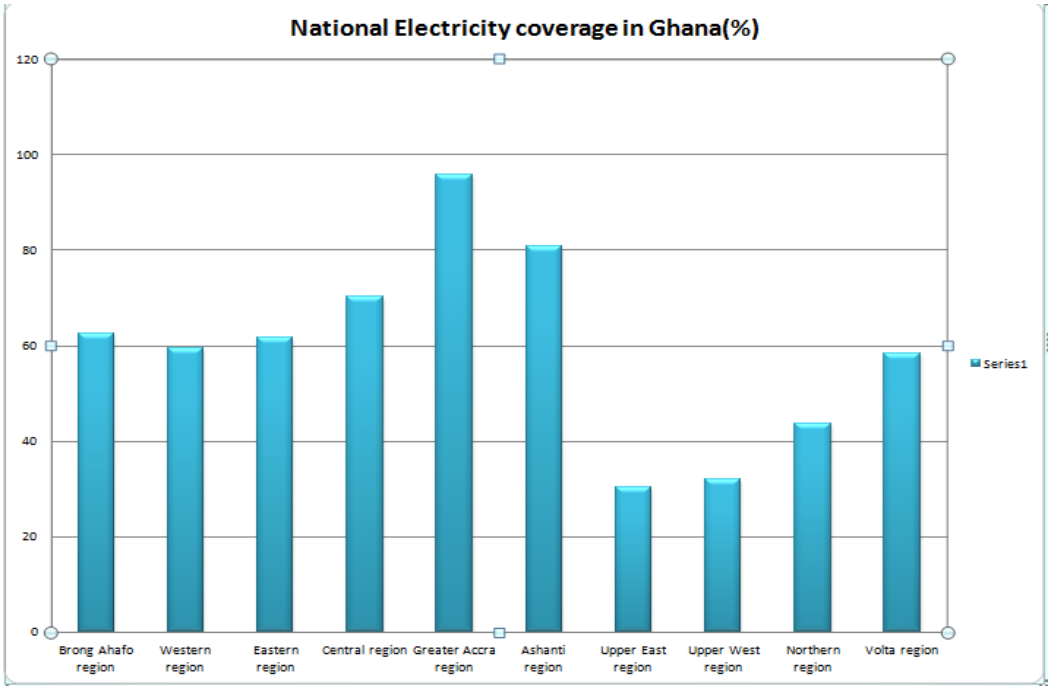


Figure 12: National electricity coverage (data taken from ministry of energy, 2010)

From the figure 10 above, it can be seen that the Greater Accra region has the highest electricity coverage followed by the Ashanti region and central region. The three northern regions (Northern region, upper east and upper west region) having the lowest electricity coverage.

4.2 The supply and demand of electricity in Ghana

The Ghana energy commission is responsible for forecasting the energy required in Ghana. They forecast the national demand of electricity, natural gas, crude oil, and petroleum products. (Ghana energy commission 2011)

The electricity requirement forecasted for Ghana was 13000 to 14000 Gigawatt-hour (GWh). About 11000-12000 GWh could be produced by public grid, and the shortfall is expected to be produced by independent power producers and back-up generation. The highest possible demand of electricity on the grid transmission is between 1610 to 1720 Megawatt. (Ghana energy commission 2011)

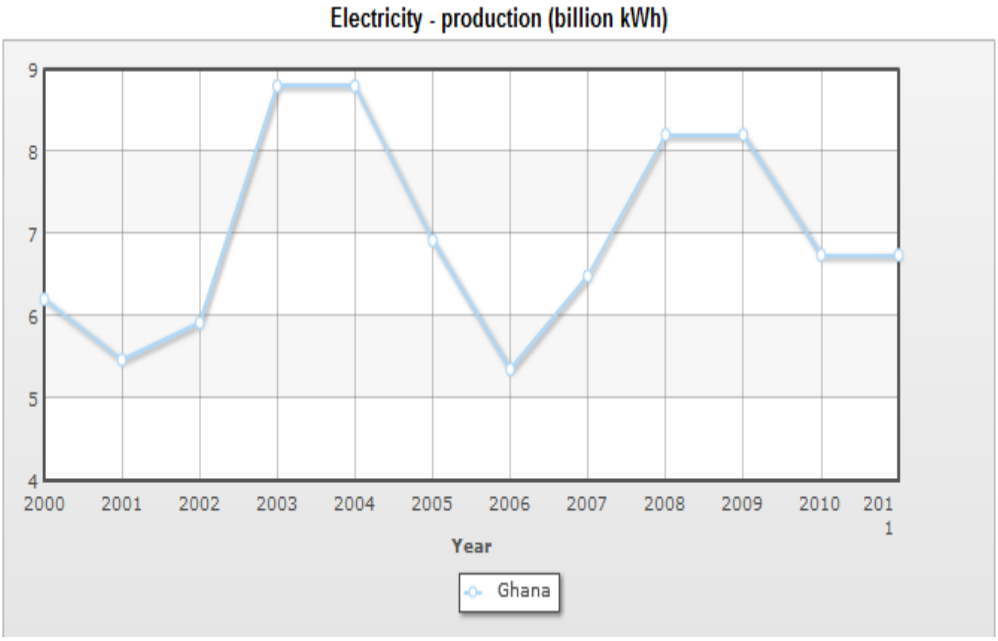
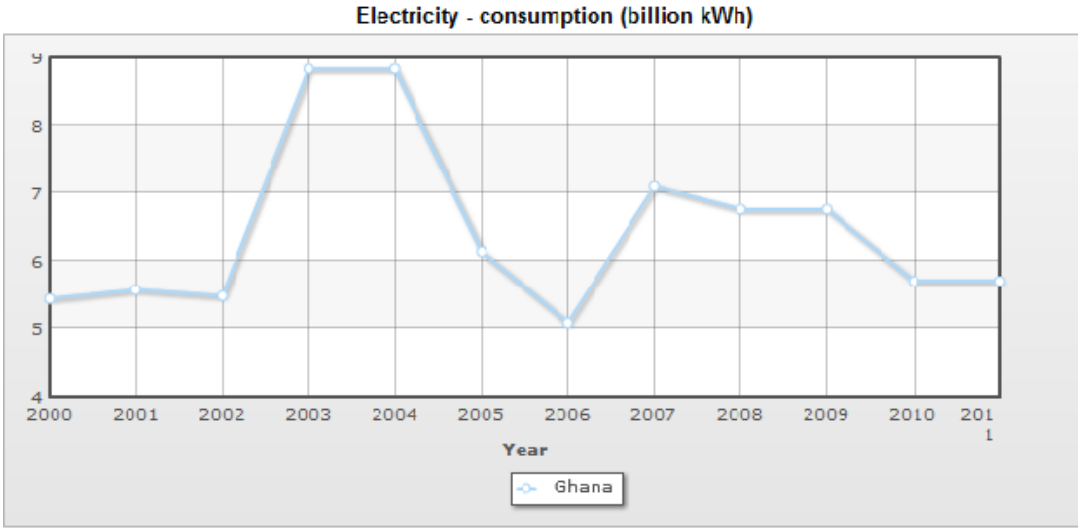


Figure 13: Electricity production (in kilowatt hours) from 2000-2011

The demand sector for electricity in Ghana is comprises the residential customers, non-residential and industrial customers. The Volta Aluminium company (VALCO) constitutes the single highest industrial consumer of electricity in Ghana with peak power demand of 320 megawatt per year. (Ghana energy commission 2011). Due to the high power need of VALCO, the company was made to shut down the production plant temporary or reduce production during the power crises in 2002 to 2004.



Waiting

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Ghana	5.44	5.57	5.48	8.84	8.84	6.14	5.08	7.1	6.76	6.76	5.7	5.7

Figure 14: Electricity consumption from 2000-2011

5 Renewable energy market in Ghana

Ghana provides a high potential for renewable energy investments due to the high renewable energy sources available, low level of renewable energy usage and governments commitment of increasing renewable energy component in the national energy mix.

There have been investments in some of the renewable energy sources, such as solar, wind, biogas, etc. For instance there are over four thousand off-grid solar Photovoltaic systems installed in Ghana as at 2001 with a total capacity of 1 Mega Watt. (Ghana energy foundation 2002)

However, in 2011 the total installed renewable energy capacity is 1,280 Mega Watt of which almost all are hydro. (Ghana renewable energy profile 2011). With renewable energy from hydro not considered in this thesis, the share of the other renewable energy sources such as solar, wind, biogas are almost negligible, thus presenting a good justification for investments in these areas.

The 10% increase needed in the renewable energy component in the national energy mix by 2020 means that 500 Megawatt of electricity would come from renewable energy sources excluding hydro. Therefore this presents a huge potential for investments in the selected renewable energies.

The table below shows the capacity of renewable energy installed from 2007 to 2011. It can be seen that there has not been any increase in capacity for the 5 year period.

Ghana Renewable Capacity over a 5 year period

Year	Installed MW	Added MW	Final MW	Growth %	% Total
2007	1,280	0	1,280	0%	59.26%
2008	1,280	0	1,280	0%	60.63%
2009	1,280	0	1,280	0%	61.54%
2010	1,280	0	1,280	0%	62.36%
2011	1,280	0	1,280	0%	63.05%

Table 2: Installed renewable energy capacity 2011 (RE intelligence, 2011)

5.1 Current situation and outlook of the renewable energy market

The renewable energies used mostly in Ghana are biomass and hydro even though Ghana has good potential for solar, wind and other renewable energy sources. There are extensive use of

biomass and hydro accounting for almost 80% of renewable energy usage in Ghana. More than 60% of electricity generated in Ghana is hydro power, with the rest being supplanted by thermal and other sources. The component of renewable energy technologies used in Ghana is less than one percent. (Seth M & Essandoh O.2011)

To achieve the universal the access to electricity in Ghana by the year 2020, the Government has instituted some policies aimed at increasing the renewable energy component in the national energy mix as would be discussed under national energy policy and renewable energy in the following section.

5.2 National Energy policy and Renewable energy

The Government of Ghana has a national energy policy aimed at providing affordable access to electricity to all communities by 2020 and becoming a net exporter of electricity by 2015. (Frederick Kenneth A. & Donkor R. 2011) This can be achieved by increasing the capacity of electricity generation (from 2000 to 5000MW by 2015) as well as updating the necessary transmission and distribution infrastructure within the power sub-sector.

The national renewable energy policy of Ghana is to increase the renewable energy components to 10% in the national energy mix by the year 2020. The renewable energy policy would be concentrate on three areas, namely solar and wind, alternative fuel for transportation and biomass pricing. The Government would institute measures to overcome the challenges in technology, market constraints and other institutional barriers inherent in investments in solar and wind. Further, the government would create a favorable regulatory and fiscal regimes as well as attractive pricing system to enhance investment in the sector. (Renewable energy policy framework for climate change mitigation in Ghana 2009, 17)

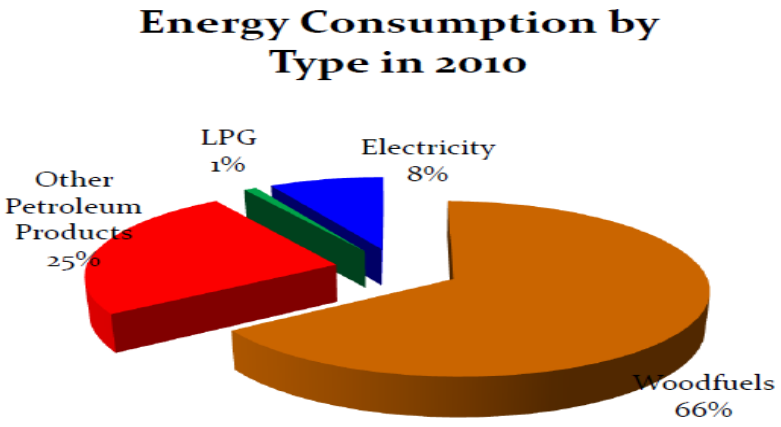


Figure 15: Energy consumption by type in 2010

It could be observed that there is an extreme reliance on wood fuels accounting for almost 70% followed by other petroleum products, electricity with Liquefied petroleum gas being the least as shown in the pie chart above. Ghana is predominantly a wood fuel based energy economy. However, to achieve the national energy policy for 2020, there has to be changes in the consumption ratio of these energy sources. Considering the environmental impact on the extensive reliance on wood fuel on the health of the people and the economy as a whole, there has to be a reduction in the use of wood fuel for liquefied petroleum gas. The pie chart below shows the anticipated consumption of energy type by the year 2020

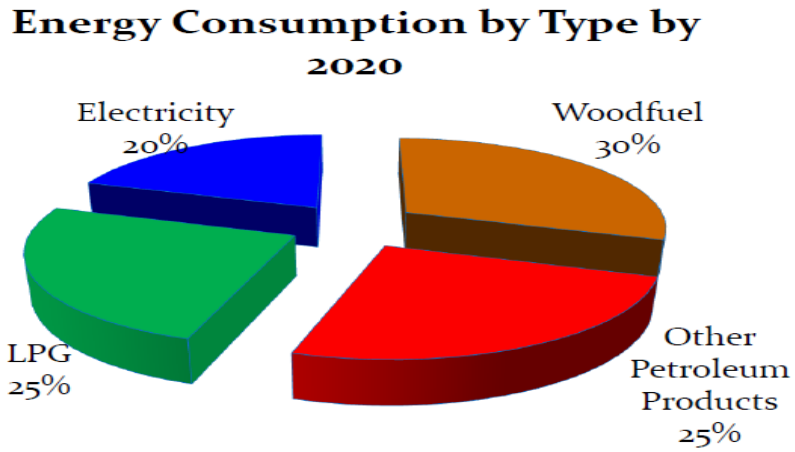


Figure 16: Proposed consumption of different types of energy by 2020

The policies would seek to reduce reliance on wood fuel (to 30%) and increase in the use of Liquefied petroleum gas (LPG) in the national energy mix by 2020 as shown in the pie chart above. Further, there are some strategies which would ensure the achievement of 10% renewable energy inclusion in the national energy mix by the year 2020. Some of these are support for feasibility assessment in grid connected renewable energy systems in areas such as solar, wind, biomass and small hydro.

Also there would be support for real estate developers to integrate renewable energy systems into their buildings as well as decentralized mini-grid and off-grid renewable energy systems for remote communities and islands that are far from the grid electricity. (Seth M & Essandoh O.2011)

5.3 Government Authorities and other supporting institutions in Ghana

The ministry of energy

This is the ministry responsible for developing and implementing the policies of the energy sectors. Also this ministry supervises the operation of some other government departments and

agencies such as the Ghana National Petroleum Corporation, the Volta River Authority (VRA), the Tema Oil refinery (TOR) and the Energy commission (EC).

Environmental Protection Agency (EPA)

This is the main government authority on environmental issues. They ensure compliance with the established impact assessment procedures and regulations in developing projects. Environmental permit is required before power generation companies can begin operation in Ghana. (Renewable energy and energy efficiency partnership 2010)

Ghana Energy Commission

The role of this institution is to prepare, review and update the national energy plans of Ghana from time to time. They further ensure that the energy needed in the country is provided in a sustainable manner through the development of strategic national energy plan for Ghana. Finally, they assess applications, grants permits to utility companies for transmission, wholesale supply and sale of electricity in Ghana (Ghana energy commission 2010)

Ghana Energy Foundation

This authority is responsible for developing programs which seek to improve the energy management as well as efficient ways of energy usage. Services of the energy foundation are targeted towards the industrial, commercial as well as the nonresidential energy consumers. (Ghana energy foundation 2005)

Public Utility and regulatory Commission

This is an independent body responsible for regulating the provision of electrical and water utility services to consumers. They are also responsible for protecting the interest of providers as well as consumers by approving of rates charged and review of tariffs. (Renewable energy and energy efficiency partnership 2010)

Ghana Investment Promotion centre (GIPC)

This is the governmental agency that tasked with the responsibility of promoting and facilitating investment in all sectors of the economy in Ghana with the exception of mining and petroleum. Therefore this agency provides all prospective investors credible information about investments in all sectors under its category. Hence investment in renewable energy in Ghana in this project falls under the domain of GIPC. (Ghana Investment promotion centre year unknown)

Kumasi Institute of technology and Environment (KITE)

This is a nonprofit organization dedicated to ensuring sustainable development through research, training, project development, environmental issues as well as implementation in energy and technology. Also KITE makes research into clean energy projects and programmes. (Kumasi institute of technology and environment 2012)

Therefore renewable the Finnish renewable energy companies could partner or seek assistance with KITE on renewable energy research and development issues.

Ghana Real Estate Developers Association (GREDA)

This is an association of real estate developers in Ghana that performs specific functions necessary for the achievement of stated goals. In this, GREDA has objectives such as providing a platform for real estate companies to deliberate on issues that affect the real estate industry, increasing stock of housing units, promote development of residential estates as well as making recommendations to the government on issues affecting real estate development in Ghana. (Ghana real estate developers association 2007)

For the purpose of this project, it would be important for the Finnish renewable energy companies to opt for membership in GREDA so that their renewable energy solutions or services and products could be considered in the planning stage of real estate in Ghana. For instance, where solar panels could be best placed, or where biogas plants could be built, as well as what factors might affect the plan of the buildings considering such as maintenance and other issues.

5.4 Supporting companies and renewable energy institutions

The renewable energy sector of the Ministry of energy

This is the main governmental agency responsible for renewable energy development and promotion in Ghana. This sector was created in 2010 to ensure increase in the rate of access of renewable energy solutions. (Ministry of energy 2010)

This would be one of the main authorities to be contacted by Finnish renewable energy companies and researchers on during this project as this is the specialized agency on renewable energy issues in Ghana.

Association of Ghana Solar Industries (AGSI)

This is an industry association formed by stakeholders of the Ghana solar industry to serve as a platform for joint discussion on issues affecting the industry. Membership of association is open to companies providing solar and other renewable energy solutions. In collaboration with the appropriate agencies, AGSI ensure the development of alternative energies as well as formulation of policies and regulations. (AGSI 2012)

The Institute of industrial research (CSIR)

This is one of the research institutes of the Centre for scientific and industrial research (CSIR). The objective of this institute is to enhance the revenue generation of the Small and medium scale enterprises in Ghana as well as assistance in the provision of efficient, environmentally-friendly and commercially viable industrial technologies for companies.

Programmes of the CSIR include the development and promotion of renewable energy technologies (RETs), industrial processed, improved sanitation, fabrication of local equipment and information and communication technology (ICT).(Institute of industrial research 2012)

5.5 Energy and renewable energy projects

There are some programmes and projects currently ongoing under the monitoring renewable energy directorate of the ministry of energy. Whiles some of these projects are financed by the Government of Ghana, others are being financed by the external parties. The following are some of the programmes and projects.

Programmes	Projects	Source of funding
Solar PV Electrification	Off-grid solar PV remote public institutions on lake side and island communities	Government of Spain
	Off-Grid Solar electrification for remote public institutions (GEDAP)	World bank-GEDAP
	Monitoring the implementation of the solar lantern and home systems by ARB APEX BANK-	
	Human Resource Development for disseminating solar PV	Japan International Cooperation Agency (JICA)
Renewable Energy Resource Assessment	Wind Resource Assessment Project	
	Hydro Power Resource Assessment Project	World Bank- GEDAP
	Biomass Resource Assessment	
Renewable Energy Business Development	Renewable Energy Law	World bank - GEDAP
	Development of Renewable Energy Feed-in-tariff methodology.	
	Matching Grant for Renewable Energy Business Development Service	
Energy Efficiency and Conservation	Electricity Audit in Public Institutions	Government of Ghana/Energy Fund
	Reducing electricity demand at the Ministry of Energy Building	
GIS Capacity Strengthening	GIS mapping for renewable energy installations and rural electrification sites nationwide.	World bank-GEDAP

Table 3: Energy and RE programmes and projects (Ministry of energy, 2012)

5.6 Renewable energy potential in Ghana

Ghana has resource potential in the production of energy through hydro, solar, wind, biomass, biogas and waste-to-energy. However, for the purpose of this thesis, solar, wind, waste-to-energy, and biogas would be considered.

5.6.1 Solar energy

Solar energy is one of the renewable energy resources in Ghana. The annual duration of sunshine in Ghana is between 1800 to 3000 hours which has a high potential for grid and off-grid connections. So far, Ghana has a total of 3.2 MW solar installations for off-grid applications (Ministry of energy 2010)

The Ghana meteorological Agency (MSA) has been collecting data about the sunshine duration and the sun´s radiation for over 50 years. The collaboration between Ghana the MSA and research educational institutions has improved the accuracy of the data collected. The level of sunshine is not even throughout the Ghana, the northern regions; northern parts of the Brong Ahafo and Volta region have higher sunshine than the southern part. On the average, the monthly solar irradiation range between 4.4 and 5.6kWh/m2/day (16-20 MJ/m2/day). Other parts, such as the Ashanti, Eastern, western, Volta and some parts of the central regions have a monthly average radiation of 3.1 - 5.8 kWh/m^2/day. The coastal regions and Greater Accra have a mean solar radiation of 4.0 – 6.0 kWh/m^2-day. (Renewable Energy Policy Framework for Climate Change Mitigation in Ghana 2009, 1)

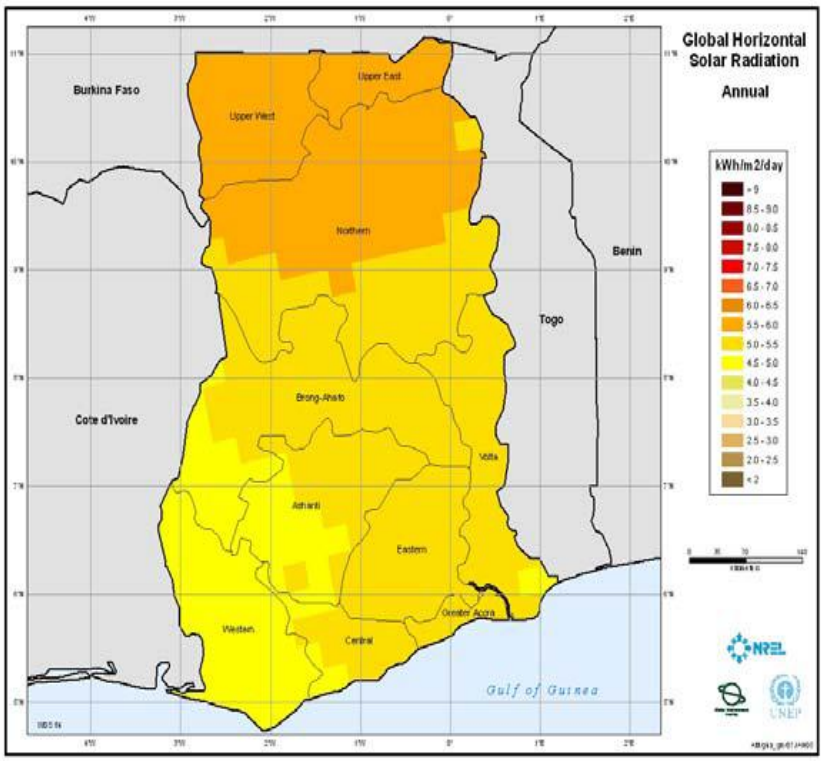


Figure 17: Annual Global horizontal radiation map of Ghana (SWERA, 2009)

Ghana's energy policy of increasing renewable energy components in the national energy has increased collaborations with stakeholders to increase investments in renewable energy projects in Ghana. The recent collaboration in this respect is a power purchase Agreement between a

Canadian company (Siginik Energy Limited) and The Electricity Company of Ghana to build perhaps the largest West African solar installation in Ghana. (Ministry of energy 2010)

Even though, the whole country has a fairly good solar energy potential, however, the northern region has more potential due to the high rate of sunshine. Besides, the level of electricity coverage for the three northern regions is rather low, providing a more justification for need of renewable energy (or solar energy solutions in particular solutions.

Some of the useful applications of solar energy are solar home systems, water pumping, vaccine refrigeration, Telecommunication through repeater stations, rural telephony systems, battery charging stations, solar street lights, schools systems, as well as grid connections. (Kenneth Appiah F. & Donkor R. 2011) See Figure 17 for the solar radiation potential of Ghana.

5.6.2 Wind energy

Wind energy potential for Ghana is mainly in some identified places with substantial wind resources that are capable of supporting the available technology. The figure below shows the wind resource map of Ghana.

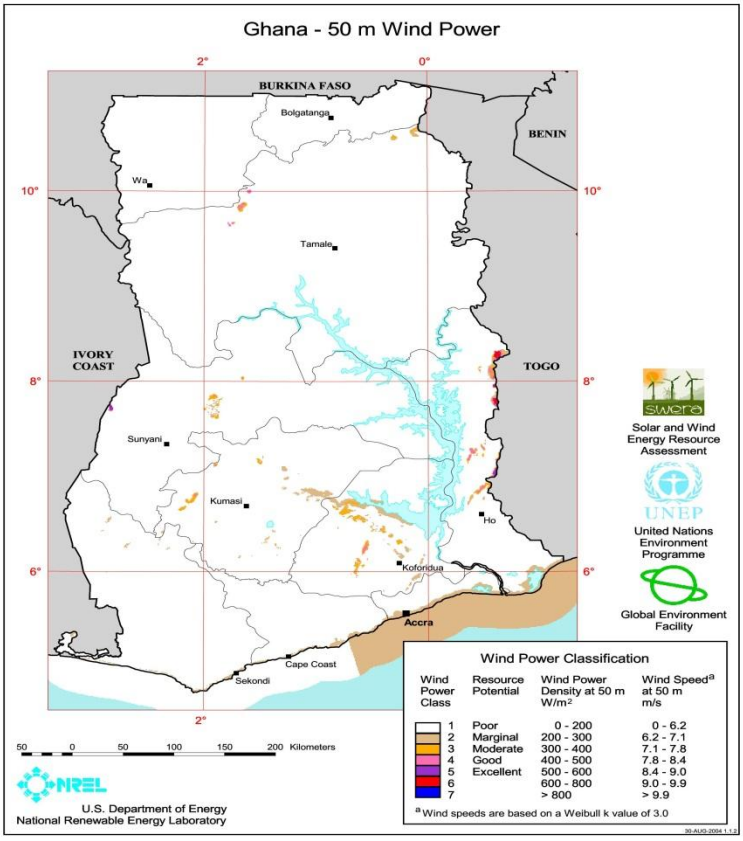


Figure 18: Wind resource map (Solar & wind energy resource assessment, 2009)

The areas around Ghana Togo border have enormous potential wind resource of 9.0-9.9 metres per second wind speed. The wind potential of this designated area is around 300MW. Also some areas along the coast (Volta region areas) have additional wind of 6.2-7.1 metres per second at the height of 50 m which is suitable for grid and off-grid connections. (Energy profile Ghana 2012)

Even though wind is limited in some areas in Ghana due to its directional based, Ghana has still has a wind energy capacity of 5,600 MW (Ministry of energy 2010).

The highest possible potential of wind that can be tapped is between 500-600GWh per year. (SWERA National report 2009)

This potential can be exploited to augment the supply of energy to schools, hospitals, other organizations and households which are far from the national grid. Figure 18 shows the wind resource potential of Ghana.

5.6.3 Waste-to-energy

The level of waste-to-energy projects in Ghana is perhaps very low due to technological and other challenges. However, there are significant amounts of waste made daily in Ghana, especially in the municipal areas which could be put to productive use. For instance the waste collected daily in the Greater Accra region only ranges between 1600 to 1800 tonnes out of the estimated 2000 tonnes of wastes made daily. (Ghana News Agency 2010)

Similar trend (though slightly lower figures) of waste collection happens also in Kumasi and other cities or municipalities throughout Ghana.

As the economy of Ghana grows, so does the need for proper management of the waste increase because the purchasing power of the people also increases. (Wikner E.2009, 11)

The issue of waste management in Ghana, hitherto, was the responsibility of the Government of Ghana. However, with the increase in population, especially in the urban areas due to rural-urban migration has complicated the proper management of waste. This is not an entirely government affair in recent times, as there has been private participation in waste collection and public awareness about the harmful effects of improper waste disposal system. Some municipal, and metropolitan assemblies contracts private waste collection companies to collect the waste to be disposed in a designated landfill sites. This site has an estimated lifespan of 15 years, depending on the daily wastes collected and the size of the designated site. (Wikner E. 2009, 14)

There have been public opinions about converting the waste into something useful. Recognizing that waste collection in Ghana is becoming a challenge and the fact that it has energy potential as well as reducing the harmful effect on the health of the people justifies the needed investment in this area of renewable energy.

There are immense potentials of converting waste to energy and other productive uses. Some of the pioneers in converting waste into useful products in Ghana are Waste Enterprisers and Zoom lion Ghana limited. (Agfax 2012)

For the purpose of the CONNECT project, the Finnish companies providing waste to energy solutions could use these companies as point of entry into the market of Ghana through negotiations, partnerships or other forms of consensus.

Figure 19: A sample municipal waste in a landfill site in Ghana

Renewable energy companies could arrange with the municipal authorities and the waste collection companies to be provided with the waste as raw material needed for their products.

5.6.4 Biogas

Biogas is a product which is obtained from the decomposition of any organic substance from plants or animals as a result of the activity of anaerobic bacteria. It has very high methane content mostly from animal excrements, waste landfills, as well as untreated organic material. The main product from this fermentation process is biogas. (Biogas Nord AG 2012)

In Ghana, the raw materials needed for producing biogas are in significant quantity. For instance cow dung, cow manure, poultry droppings, grass faecal matter, algae, kitchen waste,

etc. In northern Ghana for instance, cow dung has been used as fuel for cooking for many years, which was a good start for further study and improvement to be made on biogas usage. However, biogas was not given much consideration as a potential source of energy until the 1980s where the first biogas plant was constructed by the Ministry of energy.

Company	Date established	Workforce (full time)	Type of biodigester installed	Number of digesters installed
Biogas Engineering Ltd	2002	6	CAMARTEC fixed dome type, and effluent treatment plants	10
Biogas Technologies West Africa Limited (BTWAL)	1994	148	Fixed dome and effluent treatment plants	35
RESDEM	1996		Mostly bio-latrine digesters	25
UNIRECO	2001	5	Mostly bio-latrine digesters	
Beta Construction Engineers Ltd.[a]	1975	25	Puxin biogas digesters	12

[a] Although Beta Construction Engineers Ltd appears to be the oldest among the lot, it should be noted that the company only ventured into biogas construction in 2006.

Table 4: Some biogas service providers (Arthur R, Francisca Baidoo M, & Antwi E, 2010)

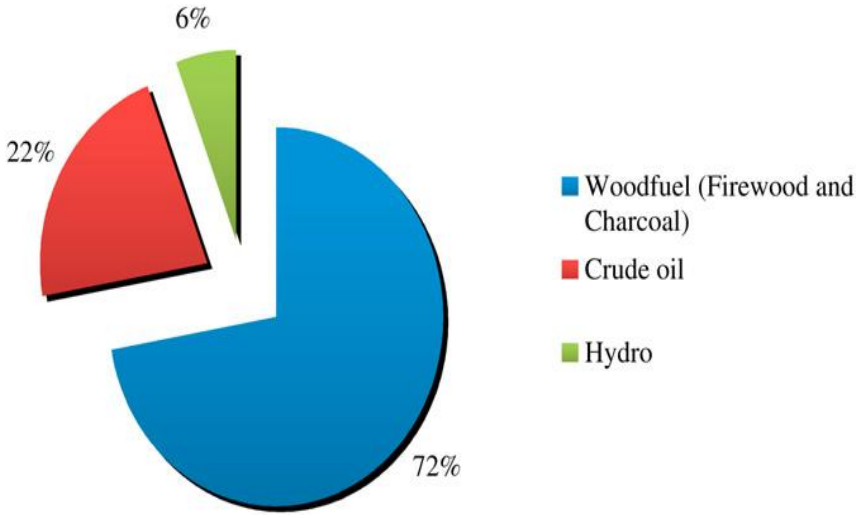


Figure 20: Contribution of primary energy supply in Ghana (%) 2008 (Arthur et al., 2010)

It can be seen from the above pie chart, that the reliance on wood fuel mainly for cooking and other heat applications is far higher than the rest of the energy sources. Therefore biogas technology in Ghana would be justified based on the fact that there is over reliance on wood fuel which has caused deforestation problems for many years. Also agriculture contributes significantly to the economy of Ghana and the effluent from the biogas digesters can be used as a fertilizer to improve the yields of farmers thereby enhancing economic growth. (Arthur R, Francisca Baidoo M, & Antwi E. 2010)

There have been many appeals from some concerned citizens, academia, energy and experts in Ghana and other international agencies, for Ghana to invest in renewable energy and harness the enormous natural resources to reduce the energy problems in the country. According to the science and development network, Ghana has abundant resources for producing about 280000

biogas plants. However, this would be feasible if the policy makers give it the needed attention and other necessary support. (Appiah B. 2011)

6 Research methodology

The research method used in this thesis is qualitative research method. A questionnaire was administered to the renewable energy ministry to collect information necessary for the thesis.

6.1 Sources of information

The sources of information gathered for this thesis was obtained from primary source and secondary sources.

Primary source

The primary source of information was obtained through the survey questionnaire which was administered to the renewable energy section of the ministry of energy of Ghana.

Secondary source

The secondary sources of information were obtained from books, articles, reports, bulletins and other electronic sources. Electronic and internet sources for instance were used quite extensively due to the need for current information related to the project as they were mostly updated than book sources.

6.2 Type of survey

A questionnaire containing 11 open ended questions was administered to the energy ministry in Ghana. This was important to the information collecting stage of the thesis because it has the possibility of giving quite detailed responses from the respondents which is important for the CONNECT project.

6.3 Sample of survey

The survey questionnaire was administered to the renewable energy section of the ministry of energy in Ghana. This was considered appropriate because it is the specific ministry which deals in renewable energy issues which is reliable, and responses are most likely to be accurate. This was important because probably some of the secondary information collected has become too old and thus less relevant for the purpose of the CONNECT project.

The questionnaire was sent to the ministry of energy in Ghana through a representative. This was considered appropriate given the importance to which Government organizations in Ghana attach to the conventional posted letters compared to e-mail.

6.4 Content of survey questionnaire

The content of the questionnaire has been attached appendix 2 in the appendices section of this thesis

6.5 The validity and reliability check

Validity

The validity check of the thesis was ascertained by using five different academically inclined people. Firstly by explaining what the thesis intends to achieve as a part of the CONNECT project. Secondly by giving out the questionnaire to them to assess whether what was understood by the verbal explanation corresponds to what the questionnaire intends to achieve.

Reliability

The reliability check for this thesis was checked by sourcing for information from the main ministry that is responsible for renewable energy issues in Ghana and interview transcripts of credible people in the energy ministry. In this way, repeated researches in renewable energy in Ghana are likely to have a particular trend of harmony of information. This would be most likely to produce useful conclusion proposed in the research due to the information gathered for the thesis.

7 Analysis

For sake clarity, the analysis section has been divided into two: namely analysis of survey results and analysis of information/responses for renewable energy solutions

7.1 Analysis of contents of questionnaire

The question number	Justifications /analysis
3, 4	Find out briefly the general business operating environment of Ghana and investment in renewable energy. This is inform the CONNECT stakeholders of any necessary changes in the PESTEL elements that can impact on the project
5, 6	To find out the demand and supply of the different renewable energy sources as well as competition in the industry. This is important in knowing what renewable energy sources or solutions are most likely to be viable and the level of competition in Ghana
7, 10	Understanding the renewable energy customers in Ghana and their likely response towards price of renewable energy solutions. This helps with customer analysis to find out what is important for designing suitable renewable energy solutions in Ghana.
8, 9, 12	Find out what investment benefits are provided by the Government of Ghana to foreign companies venturing into renewable energy. Also some of the useful organizations and ministries that could assist the Finnish companies to reduce potential challenges in Ghana.
13	To find out what other useful information, ideas or recommendations should be considered by the Finnish companies in their investment decisions. This is vital as it provides option to have access to some useful information which is covered in the questionnaire

Table 5: Analysis of contents of questionnaire

7.2 Analysis of the survey results

The general business environment of Ghana is favorable for investment as the elements of the PESTEL model showed high prospects of success. Political environment was stable, economic situation was promising as the trends of economic indicators were encouraging. Despite the low level of technological advancements, there is susceptibility to technological solutions; hence renewable energy solutions could be designed differently for different customer segments based on some identified variables such as general level of education, income, susceptibility to change, etc.

Moreover, environmental concerns in renewable energy solutions should be considered as environmental consciousness has increased in Ghana and are less likely to patronize energy solutions that are unfriendly to the environment.

Finally, laws are not changed frequently, and usually take quite long time for changes in the legal system. Thus existing laws that affects renewable energy could take a long time before changes are made. The current law that can still favor the CONNECT project is the renewable energy law in parliament.

Analysis of information for renewable energy solutions

From the renewable energy sources considered in this thesis, solar energy solutions have a higher possibility of success in Ghana. This is because the country has abundant sun throughout the country in almost the whole year round. Further, solar energy would be pivotal to the government's energy policy of increasing the renewable energy usage in Ghana by 2020.

Secondly waste to energy also has good possibility of success; however this would further need a new level of awareness creation in sorting waste in households. This is because mostly wastes are not sorted in Ghana, thus presenting a challenge. However the waste resources needed for waste to energy solutions are also abundant, and the level of technology in this area is low, and this could be a good opportunity for Finnish companies providing such solutions.

Moreover, wind energy is another potential area of consideration. However, since wind energy is directional based, this is limited to some areas in Ghana thereby limiting the amount of energy that could be obtained from this source.

Finally, biogas is another important renewable energy solution. The main challenge with this source of energy is awareness creation or sensitization efforts to increase the level of confidence in this area and discard myths about biogas solutions.

8 Conclusion

In response to the research question posed at the beginning of the thesis, Ghana has a positive business climate that makes it possible for Finnish renewable energy companies to be successful. Even though business culture challenges could be encountered, but that could be solved by understanding each other's cultural perspectives and finding a suitable balance that would be acceptable in both cultures.

Concerning the renewable energy solutions, it is highly possible to be successful in Ghana providing solutions in solar, waste to energy and wind energy for now. The environment supports these renewable energy sources and the government initiative on renewable energy is getting more intensified on the aforementioned sources.

Therefore depending on the interest of the Finnish renewable energy companies, they could start venturing into the industry by designing a befitting package of solutions based on for instance market segmentation of the customers in Ghana. Alternatively they can also some form of arrangement such as alliance or partnership with some local companies to enhance their entry into the renewable energy industry in Ghana.

8.1 Limitations of the thesis

There may be many limitations regarding this thesis. However, the following are some of them:

Firstly, the incomprehensiveness of renewable energy sources: the renewable energy sources focused on in the thesis are solar, wind, waste-to-energy, and biogas. However, these are not the only renewable energy sources in Ghana.

Secondly the high dependence on internet sources: Given the nature of the project and the country in focus (Ghana), one had to rely mostly on relevant current information from credible sources. However, the internet provided much relevant and mostly updated information than books. Some of this information was contained in reports, bulletins, interview transcripts, news, and other documents which can all be accessed via internet, hence the high dependence on electronic and internet sources.

Moreover, the incomprehensiveness of PESTEL elements: The elements considered under the Political, economic, sociocultural, technological, ecological and legal factors were chosen and explained based on the interest of the project partners and thus not complete.

Also, the brief explanations of some concepts: The explanations given in the thesis of some elements or concepts were brief due to difficulty in finding information and the limitation on the number of pages required for a thesis in Laurea.

Finally, the definitions or explanations of some concepts may differ slightly from other academic literatures. All errors relating to my own explanations of some concepts or ideas are entirely mine, and humbly admit them. This thesis is more of an overview of the guidelines in investing in renewable energy than a thorough research paper for renewable energy in Ghana.

8.2 Future research

From the various literatures and other information gathered about investment in renewable energy in Ghana, it is evident that Ghana has a significant potential of renewable energy to be explored in greater depth. Therefore future research on renewable energy in Ghana could be

focused on the study in other renewable energy sources such as wood fuels, biofuels, hydro and animal traction. Also, each renewable energy source could be studied in more detail than this thesis.

Moreover, to give a better perspective on the renewable energy industry in Ghana, analytical model such as Porters five forces could be used to analyze the renewable energy industry to Ghana.

Finally it would also be interesting into how to motivate customers to change from conventional sources of energy to renewable energy, especially in developing countries.

8.3 Recommendations

Based on the experience gained in writing this thesis and consulting other stakeholders in the CONNECT project, it would be more feasible to limit a student researching renewable in Ghana to one or at most two renewable energy sources. In this way, the study is most likely to be thorough and the findings perhaps more meaningful for the purpose of the project.

Also, the project could be divided into two with some students concentrating solely on the business operating environment and others on the renewable energy sources. This would expand the content of the research to include equally relevant information that otherwise would not be covered in “overview approach” used this thesis.

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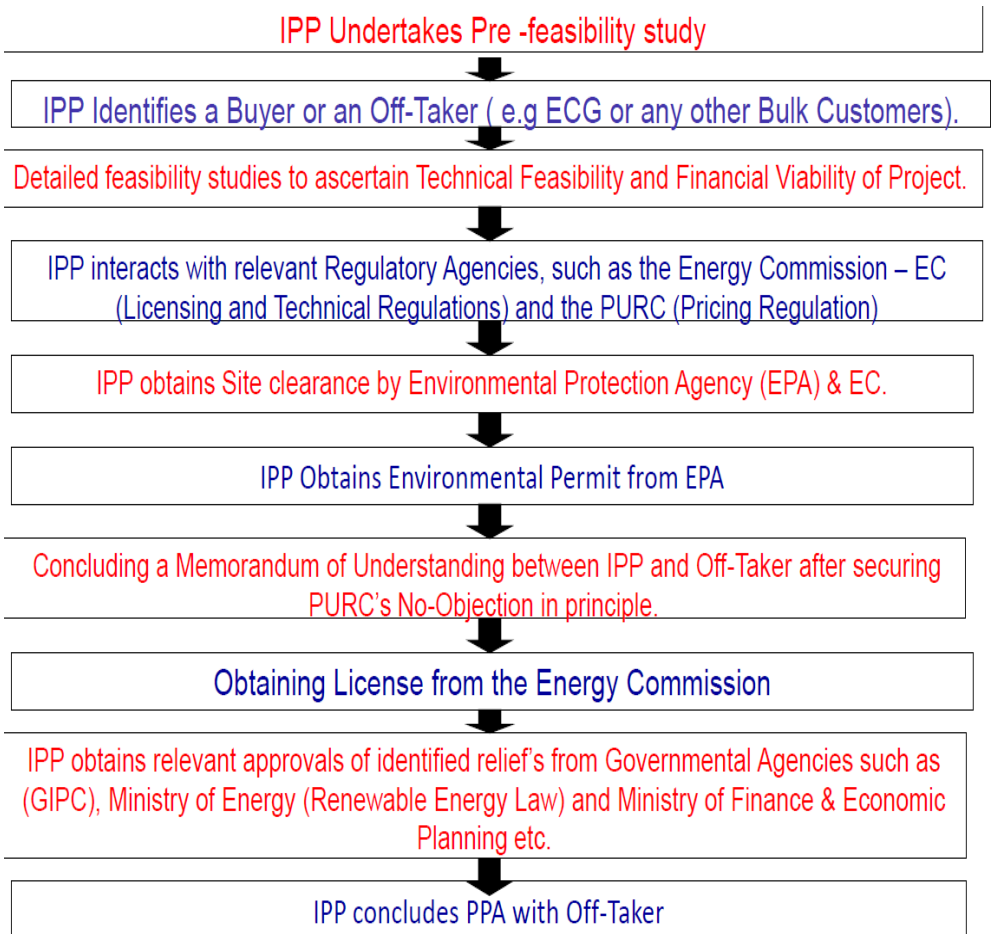
Appendix 1: Procedures for an IPP to entry into Ghana electricity market



IPP: independent power Producer
PPA: Power purchase Agreement

Appendix 2: QUESTIONNAIRE administered for the project

Introduction to the CONNECT project

The main objective of CONNECT project is to support growth and speed up internationalization of Finnish renewable energy Small and Medium scale Enterprises (SMEs) to developing countries, including Ghana. CONNECT project will examine and create new ways for providing support and access to networks, assist in development of internationalization and cultural competence.

The project combines research and experience knowledge in co-creation model. The project stakeholders consist of Finnish Universities of Applied Sciences, SMEs and support organizations. SMEs, international students and other stakeholders in the project will create new ways of building networks and develop the ability of involved businesses to enter target markets.

The student administering this questionnaire is a Ghanaian student of Laurea University of Applied sciences in Finland working on his thesis as part of the CONNECT project.

Purpose of the research

This questionnaire seeks to solicit for information from credible sources, such as government Ministries, departments and agencies and other stakeholders for the CONNECT project in order to assist the investment decision of these companies to invest in Ghana.

Questionnaire

1. Ministry/Department/Agency/other stakeholder organization
   Response:

2. Position of respondent
   Response:

3. How do you see the general business environment in Ghana?
   Response:

4. How do you see the general investment situation in renewable energy in Ghana?
   Response

5. Do you see a shortage in terms of demand and supply of energy in the following sectors in Ghana?

5.1. Solar energy
   Response:

5.2. Wind energy
   Response:

5.3. Waste-to-energy
   Response:

5.4. Biomass energy
   Response:

5.5. Other
   Response:

6. Describe the competition in the following renewable energy sources

6.1. Solar energy
   Response:

6.2.	Wind energy Response
6.3.	Waste-to-energy Response:
6.4.	Biomass energy Response:
6.5.	Other Response:
7.	How price-sensitive are the customers of renewable energy in Ghana? Response:
8.	Why should finish Finnish renewable energy companies invest in Ghana? Response:
9.	What kind of subsidies, tax reduction, tax exemption, grants, other are available for investment in renewable energy.
9.1.	Subsidies Response:
9.2.	Tax reduction Response:
9.3.	Tax exemption Response:
9.4.	Grants Response
9.5.	Other Response:
10.	Who are the main customers of renewable energy solutions in Ghana (That is who pays for the services provided by the companies)? Response:
11.	How do you foresee the future of renewable energy in Ghana? Response:
12.	What are the relevant organizations in Ghana that a foreign renewable energy company to contact when planning for market entry in Ghana
12.1.	Exporting renewable energy solutions to Ghana:
12.2.	Investing in the renewable energy sector in Ghana:
13.	Any additional suggestions, ideas, or recommendation for the Finnish companies about investing in Ghana or renewable energy in particular would be highly appreciated here:
13.1.	In Ghana (generally)
13.2.	In renewable energy sector Thank you for your assistance Iliyasu Dramani

Appendix 3: Bulk customers of electricity

PERMIT HOLDING BULK CUSTOMER REGISTER- SEPTEMBER, 2011

#	NAME	LOCATION	NATURE OF BUSINESS	YEAR OF PERMIT
1	NOBLE GOLD BIBIANI LTD (*Central African Gold)*	Bibiani	Mining	2008
2	TEMA STEEL CO. LTD	Tema	Steel works	2008
3	UNIVERSITY OF GHANA	Accra	Tertiary Institution	2008
4	GHANA WATER COMPANY LTD.	Weija, Accra		
5	ANGLOGOLD ASHANTI(OBUASI)	Obuasi	Mining	2008
6	ANGLOGOLD ASHANTI(IDUAPRIM)	Tarkwa	Mining	2008
7	GOLDEN STAR (BOGOSO/PRESTEA)	Bogoso/Prestea	Mining	2009
8	NEW CENTURY MINES	Prestea	Mining	2009
9	GOLD FIELDS GHANA LIMITED (TARKWA MINE)	Tarkwa	Mining	2009
10	GOLD FIELDS GHANA LIMITED (DAMANG MINE)	Damang	Mining	2009
11	NEWMONT GHANA	Kenyaase	Mining	2009
12	GOLDEN STAR (WASSA) LIMITED	Wassa -Akyempim	Mining	2009
13	CHIRANO GOLD MINES LTD	Kyiraa	Mining	2009
14	ADAMUS RESOURCES LIMITED	Nzema	Mining	2009

PERMIT HOLDING BULK CUSTOMER REGISTER- SEPTEMBER, 2011 C'TD

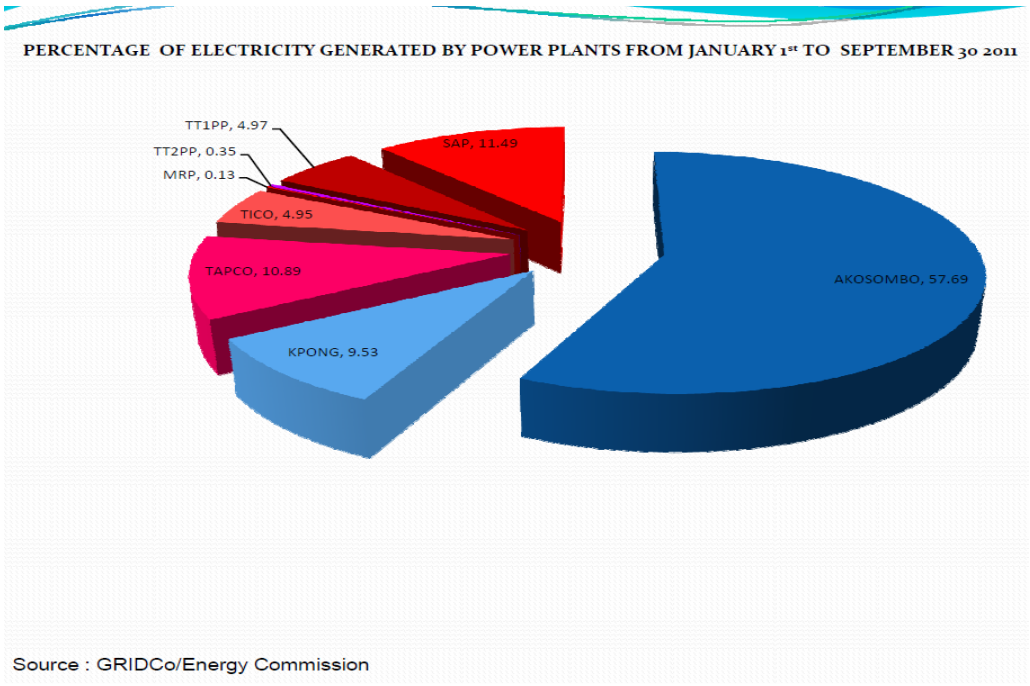
#	NAME	LOCATION	NATURE OF BUSINESS	YEAR OF PERMIT
15	SPECIAL STEEL LIMITED	Tema	Steel Works	2010
16	DIAMOND CEMENT, GHANA	Aflao	Cement Production	2010
17	SCANCOM LTD (MTN GHANA)	Accra	Telecommunication	2010
18	WESTERN STEEL & FORGINGS	Tema	Steel Works	2010
19	ALUWORKS	Tema	Aluminium Production	2010
20	AKOSOMBO TEXTILES LTD	Akosombo	Textiles Printing	2011
21	GHACEM LTD, TEMA	Tema	Cement Production	2011
22	GHACEM LTD., TAKORADI	Takoradi	Cement Production	2011
23	SENTUO STEEL LIMITED	Tema	Steel Woks	2011
24	PRINTEX LIMITED	Spintex, Accra	Textiles Printing	2011
25	FERRO FABRIK	Tema	Steel Works	2011
26	SAVANNA DIAMOND COMPANY LIMITED	Buipe	Cement and Clinker Production	2011
27	KEEGAN RESOURCES	ESAASE, KUMASI	Mining	2011

Appendix 4: Electricity selling and distribution companies

LICENCED DISTRIBUTION UTILITIES

#	NAME OF LICENSEE	TYPE OF LICENCE	FRANCHISE AREA	YEAR OF LICENCE
1	Electricity Company of Ghana (ECG)	Distribution and Sale	Southern distribution zone of Ghana comprising parts of Ashanti, Central, Eastern, Volta, Greater Accra and Western Regions of Ghana.	2009
2	Enclave Power Company (EPC)	Distribution and Sale	Tema Free Zones Enclave	2009

Appendix 5: Share of electricity generated by different plants as at September 2011



Appendix 6: Licensed wholesale suppliers of electricity

LICENCED WHOLESALE SUPPLIERS

#	NAME	LOCATION OF PLANT	CAPACITY (MW)	LICENCE TYPE	YEAR OF LICENCE	STATUS
1	Cenpower Generation Company Limited	Kpone-Tema	330	Thermal Generation	2007	Construction Yet to start
2	Tema Osonor Plant Limited	Tema	126	Thermal Generation	2008	Under Construction
3	Sunon Asogli Power (Ghana) Limited	Kpone-Tema	200	Thermal Generation	2008	In Operation
4	Takoradi International Company Limited (TICO)	Aboadze-Takoradi	220	Thermal Generation	2009	In Operation
5	Volta River Authority (VRA)- *Kpone Thermal Power Project (KTPP)*	Kpone-Tema	220	Thermal Generation	2010	Construction Yet to start
6	Volta River Authority (VRA)- *Tema Thermal 1 Power Plant (TT 1PP)*	Tema	110	Thermal Generation	2010	In Operation
7	Takoradi Power Company (TAPCO)	Aboadze-Takoradi	330	Thermal Generation	2011	In Operation