UiT The Arctic University of Norway

School of Business and Economics

The impact of Electricity insecurity on the performance of small and medium size enterprises-The case of Cameroon

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Abstract

Electricity is an important resource for an economy and its demand for the last decade have witness a significant increase. This work has as aim to study the impact of electricity insecurity on the performance of small and medium scale businesses in Cameroon within the period of 1980 to 2018. The study made use of time series data within the period of the study and uses two methodological approaches; the time series data are analyze using a multiple linear regression for the first method of the work with statistical package SPSS, STATA for treatment. The work also made use of a survey analyzes which helps in the collection of field data which are treated using the statistical package SPSS version 27. The result showed that electricity consumption and petroleum consumption which both constitute elements of energy have a positive relationship with Gross domestic product (GDP) in Cameroon. Survey result from this study also showed that small and medium scale businesses in Cameroon perceive insufficient electricity supply from the energy company which render their business activities difficult. Based on findings from this work, it is suggested and recommended that, the government of Cameroon with the energy company should expand the source of energy to meet up the high electricity demand. A move to the renewable sources such as solar and wind energy will help to boost the energy sector and improve on the economic growth of the country.

Key words: **Electricity insecurity, SMEs performance, Electricity consumption, GDP**

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Chapter 1: Introduction

Electricity is a fundamental resource in an economy, electricity consumption as the main energy sources serves as a great indicator of economic growth. High electricity demand is expected as a country's economy is growing. Therefore, access to a reliable electricity supply is widely considered to be vital to all businesses, but even more important for the operations of many small and medium-scale businesses wherein a great portion of their daily activities are highly dependent on reliable electricity supply. With the ALUCAM industry consuming about 60% of the total electricity supply in Cameroon, many small and medium-scale businesses suffer a great deficit of available electricity supply and hence causing a negative impact on their activities.

The relationship between electricity consumption and the growth of small and medium size enterprises which is directly linked to economic growth has been investigated so many times, but more research work still needs to be done at the level of low-income countries on this aspect. Some empirical studies show a positive correlation between electricity consumption and economic growth(Morimoto & Hope, 2004).

The Survey results in the study of Scott, Darko, Lemma, & Juan-Pablo (2014) suggest that, in middle and lower income countries, firms themselves consider access to electricity to be one of the biggest constraints to their business. Inadequate electricity services can constrain business operations because a supply of electricity may simply be unavailable and, if it is available, securing a connection may be difficult and the supply unreliable, even before its cost is considered. High quality and accessible infrastructure encourage productivity, business growth and investment, but when it is poor and unreliable, businesses' productivity and growth suffer. An unreliable electricity supply can affect several aspects of business operations. The most significant impacts to productivity can be due to forced and unexpected halts in manufacturing processes, including running assembly lines, using machine tools, or producing textiles. Communications, delivery times, lighting and refrigeration are also affected by electricity insecurity, with consequences for the routine operation of businesses and their ability to ensure delivery times.

Further research on the obstacles to SMEs growth and development in the Sub-Saharan African countries emphasized that, weakly financial markets and unreliable electricity supply were the most obstacles to SMEs growth. These findings show that the electricity problems

have been with the SMEs in developing countries for a longer period. Also the study on the issue of electricity supply and SMEs growth in the Sub-Saharan African countries indicated that, inadequate electricity supply and its attained high tariffs acted as an impediment to business operations and also increased the cost of operations, forcing some SMEs into complete oblivion. This study revealed that the current electricity crises in the country were costing the SMEs over US $686.4 million of annual sales. Based on previous research finding using a population of over 4 million SMEs in Ghana with a sample size 1250, micro businesses were the most affected by the electricity problems, recording a loss of around UD $2.2 Million daily, which represented over 50% of their daily sales(Forkuoh & Li, 2015).

Electricity insecurity is defined as the regular experience by firms of interrupted electricity supplies, and is measured in terms of the frequency of interruptions (or outages) and their duration. (Doe & Asamoah, 2014) reveals that electricity insecurity has a great impact on small and medium size manufacturing enterprises in middle and low income countries; for high level of production are highly related to high returns on assets and returns on investments for small and medium size enterprises. It means a reliable electricity supply have positive effects on the returns on assets and investments for small and medium size manufacturing enterprises in middle and low-income countries.

To address the electricity insecurity problem, many small and medium-scale enterprises invest in their own production of electricity with the use of stand-by generators to ensure an electricity supply. However, these are often expensive compared to electricity from the grid hence any alternative of electricity supply will eventually reduce cost of production for these enterprises and create more wealth for the society(Kam Yogo, Ruppel, Kam Yogo, & Ruppel, 2018). Moreover, generators also require some technical expertise as well as reliable supplies of fuel and spare parts.

1.1 Problem Statement

The Republic of Cameroon also popularly known by the name “Africa in miniature” for its great abundance of diver’s natural resources is also well rich in divers’ energy power sources which if well exploited and managed will lead to great developmental projects and achievements. Cameroon is the second nation in terms of hydroelectric power sources after the Democratic Republic of Congo in Africa, the country also great sources of renewable energy potentials that can generate enough energetic power supply for the entire nation as well as neighboring countries. But despite these great potentials of energy sources, the country still suffers from frequent power outages which is negatively affecting the economic and social life

of its society; coupled with the fact that energy is needed for every aspect in daily events, many organizations and enterprises which are significantly influence by these power outages tend to witness interruption in their business activities in the production, distribution, transportation and marketing process. Such a problem has however contributed to the low competition rate of local enterprises with foreign enterprises in the international market thus constituting a reason for low GDP.

Small and medium size enterprises constitute a greater portion of industries and hence gross national product (GDP) in Cameroon, same as in most middle and low-income countries. This means GDP has a positive relationship with electricity supply in small and medium size manufacturing enterprises in Cameroon(M. C. Sama & Tah, 2016).

The absence of competition in the electricity supply sector in Cameroon has been blamed as a possible cause of poor performance by the lone electricity Company of Cameroon(Eneo). The monopoly power enjoyed by this company has led to high prices per kwh and poor quality of service delivery which in the long run affects consumers negatively. Secondly, the interests of the general public, especially SMEs who rely significantly on electricity will be put to risk through higher prices and degradation of quality of supply and customer service. Also the non-regulation of electricity supply has leave the electricity company to take on drastic decisions which greatly affects its consumers.

Considering the fact that electricity plays an important and significant role in the establishment and growth of SMEs and that there are no prudent alternatives, small and medium size enterprises in Cameroon needs good reliable and sustainable electricity supply in order to carry out their production, distribution, transportation as well storage services. There is therefore a need to study in to this field of electricity insecurity supply and their effects of small and medium size enterprises in Cameroon which is a necessary step to influence governments decision on electricity supply.

1.2 Research Question

This research study is based on looking on the main research question of finding out the impact of electricity insecurity on the performance of small and medium size enterprises in a middle and low-income country with case study Cameroon. Due to the absence of good empirical evidence on the impact of electricity insecurity and its impact of small and medium size enterprises, we will better evaluate this study by looking at the following specific research questions.

- what are the impact of electricity insecurity on SMEs in the following four aspects?
  - Productivity
  - Cost competiveness
  - Investment
  - Decision making
- how do these industries mitigate electricity insecurity?

This work is carried out base on two methodological approaches to help us answer the research question; we employ a multiple linear regression model to analyse bench desk data for the first approach, the second approach consist of a survey carried out in the industrial zones of Cameroon to get SMEs view on electricity insecurity.

This work also looks at the electricity generation, transmission and distribution in the main industrial zones of Cameroon, the work also looks at the effect this electricity shortage cause on the level of production and cost of production of these small size firms using data from both the energy sector and these enterprises. The work further looks at the different renewable energy sources and the possibility of mitigating the energy problem in Cameroon by exploiting these renewable energy sources such as solar and wind.

1.3 Significance of the study

The choice of such a theme for a master study by the researcher has for reasons many significant factors. The great number of small and medium size businesses in Cameroon and their survival is of great importance not only to the owners of the business but to the entire nation as a whole for their divers' contribution in different aspects in the nation. Small and medium size enterprises contribute greatly in the GDP of Cameroon hence it is of great importance that studies related to the availability and reliability of energy for these enterprises be carried out to help improve on the energy needed by these enterprises to stay in line with growth. This study is also of great significance as it looks at the different potentials of energy sources and help bring out data that can be used by policy makers in times of decision making which will positively assist in the fight against frequent power outages.

1.4 Thesis outline

This thesis is made up of 6 chapters which constitutes the introduction, research background and literature reviews, methodology, data analysis, results, interpretation and conclusions.

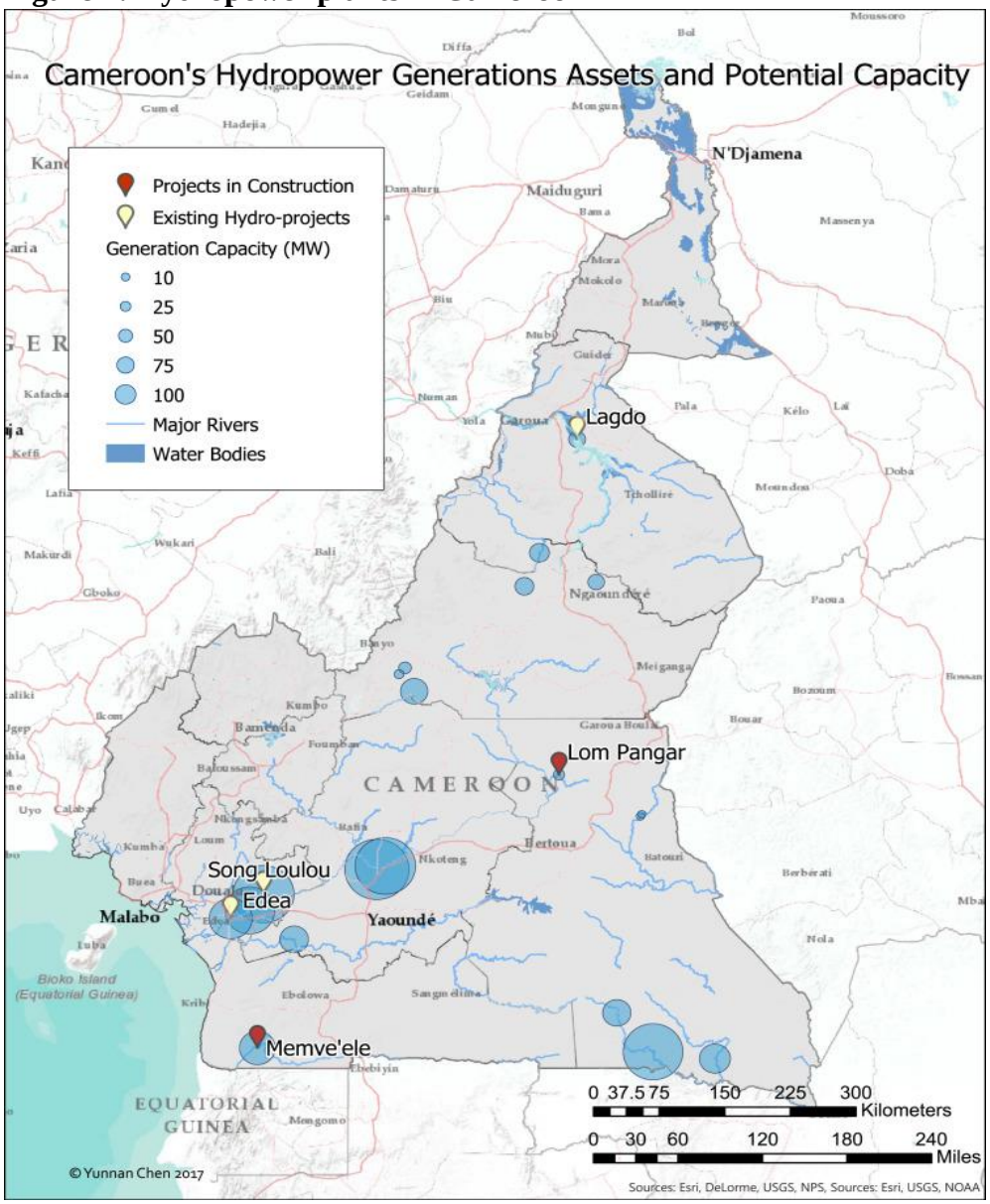
The first chapter is the introductory part of the study which provides the general introduction of the study, the problem statement, the research question, significance and the outline of the

study. The chapter set the stage for readers to easily understand what the study stands to achieve. Chapter two of this study looks at the research background and literature review sections. This chapter looks at literature reviews of articles related to the theme of this study, it also looks at the case study which in our case is Cameroon, the energy situation of Cameroon as well as the renewable energy potential of Cameroon which can be a means of mitigating power outages in the country and improving growth rate. In chapter three, we will be looking at the methodology of the study which comprise the various methods in which findings will be gotten with respect to our research question, data collection and presentation as well as the software and questionnaires for the thesis. This chapter identifies the independent and dependent variables used in carrying out our multiple linear regression analysis and the survey data presentation. Chapter four covers the results of our findings and interpretations, the second section of this chapter further examines wind and solar energy as possible means of mitigation for electricity insecurity. Lastly but not the least, chapter five looks at the recommendations made on this studies as well as conclusion on electricity insecurity on performance of small scale businesses in Cameroon.

1.5 The Republic of Cameroon

The republic of Cameroon is a country in central and west Africa with surface area of 475 422 Km^2 with 0.57% occupied by water. It is boarded by Nigeria to the west and north; Chad to the northeast; the Central African Republic to the east; and Equatorial Guinea, Gabon and Republic of Congo to the south. The country is often referred to as Africa in miniature for its geographical and cultural diversity with natural features including beaches, deserts, savannas, mountains and rainforests with the highest point at almost 4100 meters mount Cameroon in the south west region of the country; The official languages of Cameroon are French and English and is home to over 250 native languages spoken by a population of about 25 million people(Kouega, 2007) and divided into ten regions. Over 60% of Cameroon's active population is involved in agriculture representing 42% of it GDP, while mining and industry accounts for 22%. Cameroon is endowed with significant natural resources like oil and gas, great species of timber, uranium, iron, hydropower and agricultural products such as cocoa, coffee, cassava, banana, maize, cotton. It is governed by a unitary presidential republic and has good relations with major powers of France, United Kingdom, USA and China; Cameroon is also a member state of the African Union, the United Nations, the common wealth of nations, the Non-Aligned movements and the Organization of Islamic Cooperation.

Figure 1: Hydropower plants in Cameroon



CHAPTER 2

Research Background and Literature Review

2.1 Research Background

The inadequate supply of electricity in Cameroon have for long been a major problem affecting its economic and social life; on the economic point of view, unreliable electricity supply has greatly influence most industries and small firms who greatly contribute to the economic growth of the country. Despite the great potential of energy resource poses by Cameroon, the total energy supply still leads to power outages which is also due to other factors such as the poor maintenance of equipment, the recent harsh climatic conditions affecting the entire globe.

Cameroon's long dependence on hydroelectricity as the main source of energy generation has been reasons for it poor energy supply and reliability. But due to harsh climate change which has led to global warming and increase sunshine, a move to renewable sources of energy like solar energy will be a good solution to Cameroon's energy problem.

2.1.1 The climate of Cameroon and surface meteorology

The climate of Cameroon is tropical and semi-arid in the North and humid and rainy in the rest of the country. In the north, the climate is hot and semi-arid with a rainy season from mid-May to September while the rest of the year consists of hot and dry weather. In the winter months, the dry harmattan winds blow from the desert rising dust creating a typical mist. These northern zones are characterized by cold nights and belongs to the climate zone known as the sahel. The south central plateau is characterized of longer rainy seasons with less intense heat due to cloud cover and early rains which prevents the temperature from rising in spring and also due to altitude. The coastal zones of Cameroon are made up of warm and humid weather with heavy rainfalls exceeding 2000mm per year, the rainy season here starts from May to October and with decrease in rainfall from mid-June to mid-August in the southern part. This zone is also characterized of strong solar radiation.

2.1.2 Energy situation in Cameroon

Energy plays a vital role in every economy in its economic as well as social development and Cameroon being a less developed country definitely needs more of energy supply in order to boost up its economy. Great supply of energy facilitates industrial constructions and attraction of foreign investments as well as local investments. Cameroon's energy consists of energy generated from hydroelectricity, oil, natural gas, biomass and many others; with the main sources being hydroelectricity which produces about 57% of electrical energy and the rest from thermal power plants mostly based on fuel and gas. The hydroelectric production in Cameroon

is mainly based on it most popularly two dams which produces the hydroelectric energy used by the entire nation; with about 60% of the total energy being used by the aluminium smelter company in Edea (ALUCAM). The hydroelectric energy production in Cameroon for the past years have been witnessing some progress due to high demand from both households and industrial purposes, this progress has led to some few expansion of businesses and a source to attract foreign investors. But not-withstanding, this progress is not still good enough to prevent power outages which retards production processes for these small firms and industries.

Biofuels and combustible waste today still remain the major source of energy which include the use of fire wood by a great majority of households especially in the rural areas for cooking and drying. Oil remains the second largest with 20% as oil products such kerosene are on high demand in areas experiencing frequent power outages such as the rural areas as well as about 10% of the urban areas due to lack of electricity. Hydropower which is known as the main source of electricity generation for many years contribute only 5%, this serves as one of the main reasons why there is always shortage of electricity. The main power supplier in Cameroon which is responsible for generating, transmitting and distributing electrical energy ENEO in 2019 had an installed generating capacity of 998939 MW; the generating capacity consists of a total of 37 generation power plants of which 13 grid power plants and 24 remote power plants. It production sources consist of 73.30% hydropower, 26.66% thermal and 0.04% solar.

The Distribution network consists of 11,450 kilometres of lines ranging from 5.5 to 33 kilovolts and 11,158 kilometres of lines from 220 to 380 kilovolts. As at 31 December 2018, ENEO had more than 1,258,340 customers, of which approximately 45% are located in the cities of Douala and Yaoundé (*Eneo is Transforming the Electricity Service*, 2019).

The Cameroon government with its emergency plan of 2035 has consider looking into its energy sector by taking considerable decisions so as to address the electricity deficit situation so as to meet up with the high demand and current economic growth. To this effect, the renewable sources of energy will be good alternatives for electricity insecurity problems.

2.1.2.1 Renewable Energy

Renewable energy refers to the energy generated from natural sources which get to replenished itself naturally. In 2016, about 18% of global energy consumption came from renewable energy sources with hydroelectric constituting about 15% of the total 18% of global renewable energy share. Other sources of renewable energy include solar, wind, biomass.

The energy situation in Cameroon is also characterised by the different sources of energy generation though not all of them are fully in utilization, the different sources of energy include hydropower, biomass, solar, oil and wind.

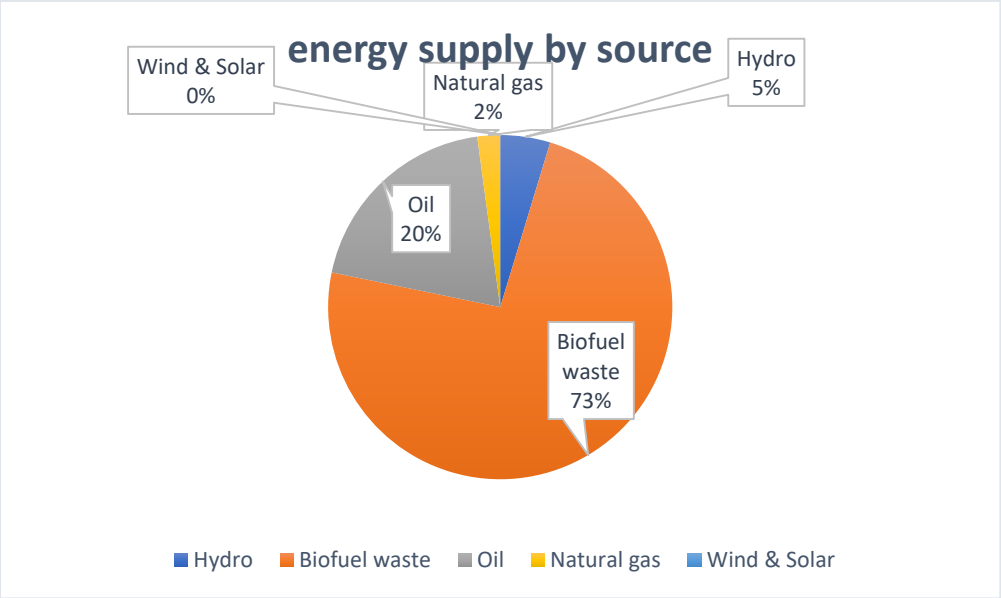
Hydropower generation is the main source of electrical generation in Cameroon, coupled with the fact that the country is enriched with great hydropower potentials and is second in Africa after the Democratic Republic of Congo. The hydropower potential in Cameroon is estimated at about 23GW but despite this great potential only about 5% of it is fully utilized with the rest still under exploitation process. The main hydroelectric generating facilities include Edea, Song Loulou and the Lagdo power stations accompanied by micro generating dams who are under construction to assists the country meet its 2035 emergency plan.

Biomass energy consumption in Cameroon account for about 66.7% as wood is mainly used by a great majority of the people for cooking and heating. The country has the third largest potential of biomass energy in sub-Saharan Africa from both agriculture and forest exploitation. Biomass energy is fully utilized by both residential and industrial sectors particularly for cooking and heating.

Cameroon is found within the tropical zone and is therefore well enriched with solar energy potentials throughout the entire nation. In the country's northern part which is consider the sunniest parts of the country, the solar capacity is estimated at 5.8 Kwh/day/m2 and 4.9 KWh/day/m2 for the rest of the country. Hence, the major reason for the under-development of this energy source is the poor of commitment on the part of the government to take great steps in order to boost the sector, notwithstanding there exist some solar electric poles in some towns of the country like Yaoundé, Baghangte.

Wind energy is still under thorough study in Cameroon but few research on this sector show the potential of the wind energy capacity in the northern regions with annual mean wind speed of 4m/s for 80% of the time. The other part of the country from the Adamawa down to the southern regions have annual wind speed of 3-2m/s for 60% and 50% of the time respectively(Muh, Amara, & Tabet, 2018).

Figure 2: Energy supply by source



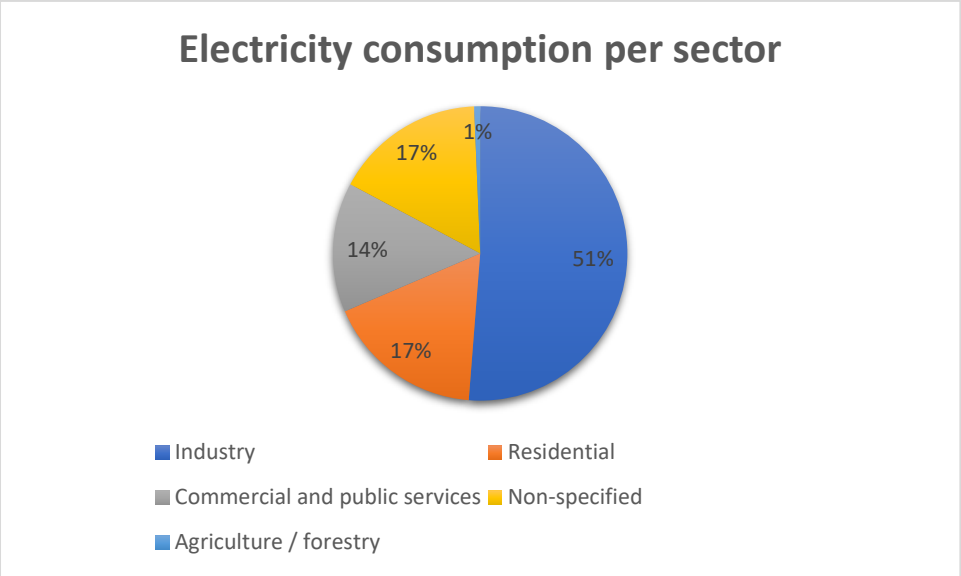
Source: IEA World Energy Balances 2020 https://www.iea.org/subscribe-to-data-services/world-energy-balances-and-statistics

2.1.3 Electricity consumption per sector in Cameroon

Figure 3 below shows the share of electricity consumption per sector, from this figure we realise more than 50% of electricity in Cameroon is consumed by the industrial sector for heating, cooling and powering equipment. But due to the fact that the ALUCAM industry in Cameroon consumes more than half of this electricity for it melting activity, this lead to the high electricity deficit for many other small and medium scale businesses. Households consume the second greater part of electricity for cooking, heating and other daily household choice. Commercial and public services including education, healthcare business and administration deal with 14% while a very insignificant portion as 1% is left for agricultural and forestry industries which are for recent years have been increasing in number but suffer great constraints due to very low electricity available for their activities.

However, we notice from figure 2 that biofuels and wastes have the greater portion of energy supply which accounts for 73%; this is explained by the low rate of exploitation of the other sources of energy causing the local population and other local craft SMEs to depend on the utilization of biofuels and wastes such woods burning for melting and heating purposes in order to meet up their daily tasks as seen in figure 3 below with the industrial sector consuming 51% of total energy supply.

Figure 3: Electricity consumption per sector



Source: IEA World Energy Balances 2020 https://www.iea.org/subscribe-to-data-services/world-energy-balances-and-statistics

Figure 4: Electricity consumption per source

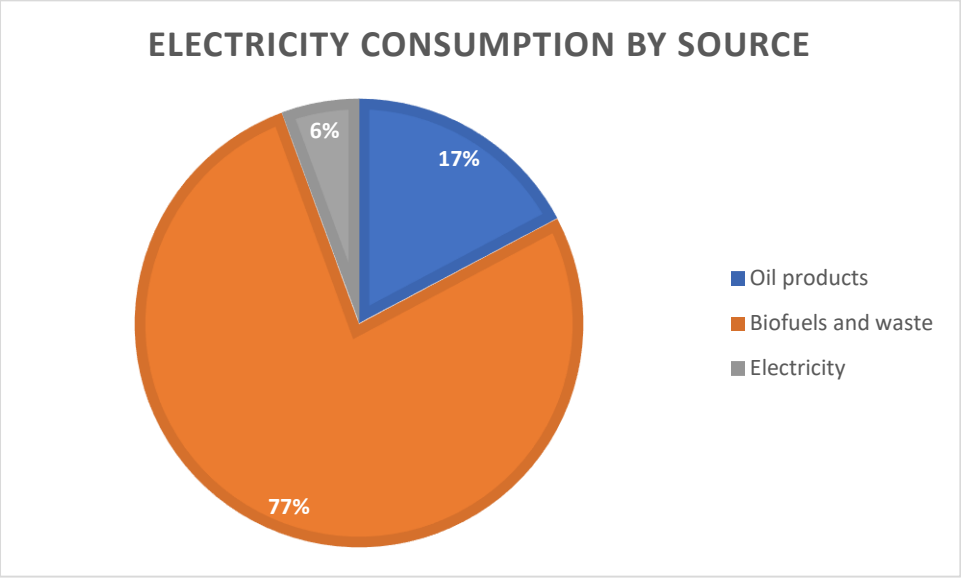


Figure 4 shows the different source by energy is being consumed; the 6% for electricity here is made up of electricity consumption from hydropower which indicates very low level exploitation from the hydropower potential the country has. Oil products such as kerosene and petrol account for the 17% of oil product energy mostly consume by companies for transportation purposes. Consequently, we realise the low usage of modern clean energy by the

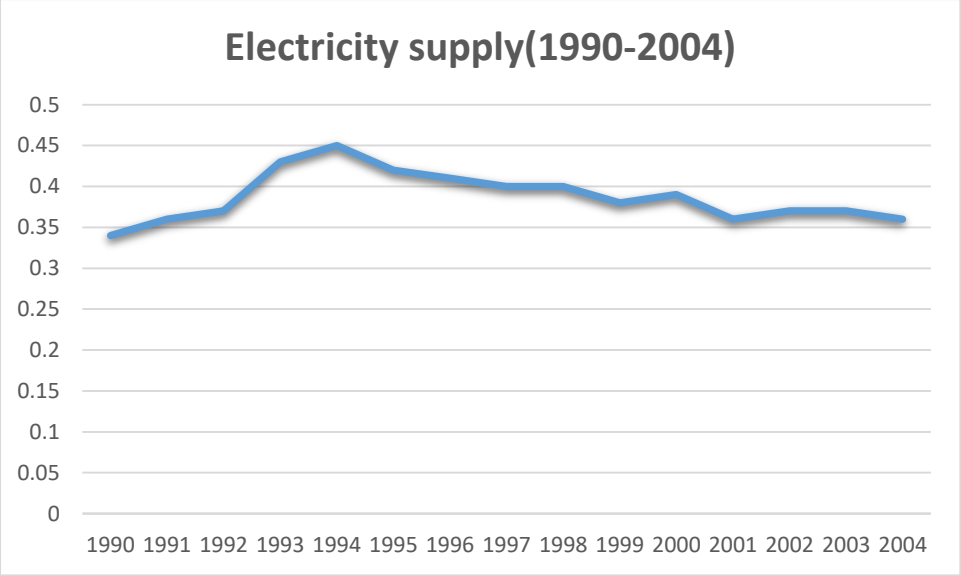
country which has highly contributed to the energy crisis faced by the SMEs sector for a very long time now.

2.1.4 Final electricity supply over the periods 1990-2018

Figure 5 and 6 below shows us the final supply of electricity over the periods 1990-2004 and 2005-2018 respectively; from figure 5, we notice an increasing graph in the early years of 1990 to 1995 where in there was good and reliable electricity supply. This increase basically is being explained by the just then build electricity dams which could supply good amount of electricity needed by the nation. But we obviously witness a gradual decline in this supply from 1996 to the years 2004 but the supply line managed to stay within 0.35toe.

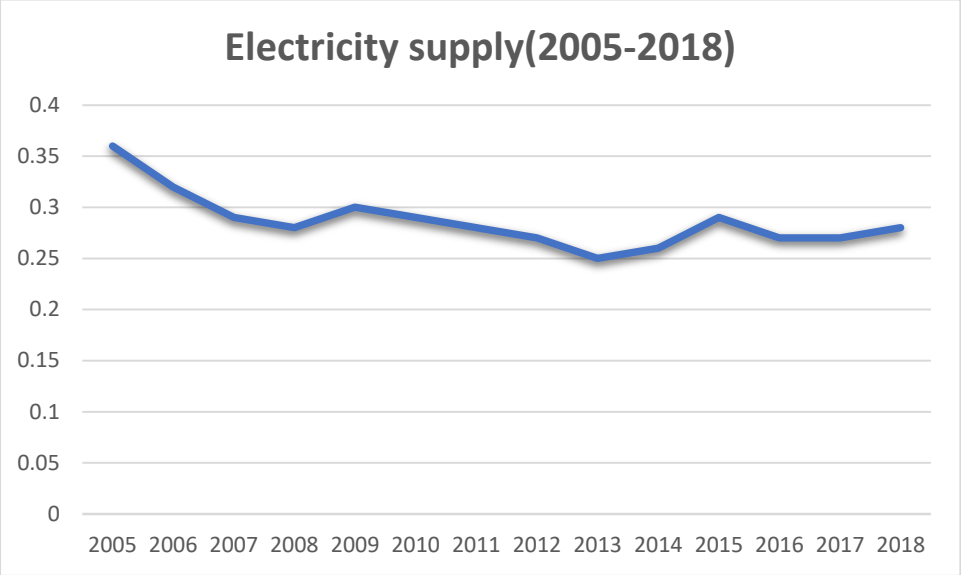
Figure 6 on the other hand shows a significant decline in the final electricity supply from the years 2006 right up recent years 2018. This figure shows a great shortage in electricity coupled with the increase demand over recent years; given reasons of poor management of the electricity supply body, poor maintenance of installed equipment, inadequate governmental policies to boost the energy sector as well as less exploitation of the numerous electric potentials in Cameroon.

Figure 5: Final electricity supply for 1990-2004



Source: IEA IEA Data Services https://www.iea.org/subscribe-to-data-services/world-energy-balances-and-statistics

Figure 6: Final electricity supply for 2005-2018



Source: IEA Data Services https://www.iea.org/subscribe-to-data-services/world-energy-balances-and-statistics

2.2 Literature Reviews

The great impact of energy in every economy has always push on researchers to carried out studies on energy related topics with respect to economic and social lives. Literature reviews on electricity insecurity and impact on small and medium size enterprises has been researched on in both highly developed and less developed economies but limited studies have been carried out in the less developed economies as concerned this topic. Hence for this study, important literature reviews were looked at to get a view of what has been discovered by other researchers in some less developed economies on energy related topics, on electricity insecurity and SMEs productivity, electricity insecurity and SMEs cost competitiveness, electricity insecurity and investment decisions as well as how these SMEs cope with these shortages.

Using electricity consumption and petroleum consumption as two energy elements, M. C. N. R. T. Sama, 2016 examined the factors that influence these two elements and their impact on the economic growth of Cameroon. Result from this study showed that electricity consumption and petroleum consumption both have a positive relationship with economic growth. The study also recommended for more attention to be paid in these two sectors of energy so as to boost the energy situation of the country.

Doe & Asamoah, 2014, carried out a study to examine the effect of electricity power supply on the profitability level of small and medium scale businesses within the Accra

business district of Ghana using a cross sectional survey method. Findings from his work showed that high fluctuation in electricity power supply negatively affected the profitability level of SMEs within the zone and hence led to poor firm's competitiveness. Also poor power supply led to low level of production by the firms which made them to have less returns on assets and less return on investments.

Further study such as that of Forkuoh & Li, 2015 examine the effects of electricity outages on the growth rate of SMEs operating in the cold store sector within the Asafo market area of Kumasi Ghana. This study used both qualitative and quantitative method for data collection and a sampling survey as methodology. Results from the study indicated that, high electricity insecurity greatly affected these firms and lead to poor growth rate level; this cause the cost of operating businesses to increase and hence push many SMEs in the sector out of business.

Jibrilla, 2018 examined the impact of electricity power supply on the performance of small and medium scale businesses in Mubi region Nigeria, the study made use of descriptive analysis, correlation analysis and a regression analysis as methodology. Also a questionnaire survey method was employed to collect first hand data. Result from the study showed that electricity power supply and performance of SMEs are negatively correlated, also electricity supply had a positive correlation with the performance of SMEs within the zone. The study recommended for steady electricity power supply to enable SMEs to grow.

2.2.1 Electricity insecurity and Productivity

Productivity in enterprises is highly linked to the use of machineries which in general are high consumers of many watts of energy, thus great production levels necessitates maximum and reliable electricity supply. Studies prove that firms with reliable electricity supply tend to have high labor productivity and factor productivity than firms with unreliable electricity supply(Rud, 2012). Small and medium size enterprises experiencing low electricity supply are faced with frequent halt in production process(Sveinung, Fjose, 2010).

Productivity is this regard can be defined as the measure of the volumes of inputs and output ratios of small and medium size enterprises; these inputs consist of resources such as the labor, capital and particularly with respect to this study energy (electricity) used by SMEs for manufacturing process.

A positive correlation has been established between electricity usage by firms and higher growth in firm's productivity. Hence poor and interrupted electricity supply and its

accompanied high tariff leads to lower performance and productivity (Adenikinju et al., 2005). This has highly accounted for the low productivity level of SMEs in middle and low income countries where these enterprises tend to incurred very high costs of production with possibly low returns.

There is an ample evidence that, poor and high tariff electricity supply affects the growth of firms negatively, empirically, the on-going electricity power load limiting exercise in Cameroon, has led to several companies laying off its employees, with one of the country's main commercial bank laying off more than half of its working force, all because businesses are slow. In 2009, similar electricity challenges in Tanzania, led to the laying off several employees both in the public and private sectors (Burlando, 2012). In measuring the effect of electricity insecurity on productivity, poor electricity supply has negative effect on firm's growth. This is because most firms rely on electricity for production and cannot substitute it cheaply and easily in Cameroon. Another research on the effect of the electricity outages on the operations of businesses in Ghana, posited that, SMEs are unable to improve on both quantity and quality of their produce, leading to low profit and negative Return on Assets and Investment (Doe & Asamoah, 2014), this implies that, firms with higher access to electricity tend to have a higher productivity than those with poor power supply.

2.2.2 Electricity insecurity and Cost competiveness

Small and medium size enterprises also faced another problem of high costs in their business linked from the process of production right up to the distribution stage. These high cost is incurred in the production, storage as well as distribution which has made cost competitiveness and electricity insecurity to show a positive correlation. This is due to the fact that many SMEs have financial difficulties in affording alternative sources of electricity supply(Abeberese, 2017).

These high cost of production caused by unreliable electricity supply, high cost of repairing or replacing damaged equipment, the cost of spoiled goods and the additional cost of alternative sources of energy, such as generators have all greatly contributed in the high total costs suffered by these enterprises. Reliance on generators for electricity during outages can be expected to increase the cost of electricity, and the effect on cost-competitiveness is related to the proportion of total costs accounted for by electricity (Scott et al., 2014).

According to the Manufacturing Association of Nigeria (MAN), 820 manufacturing companies in Nigeria between 2000 and 2008 were forced to close down their activities and shut down

business, and in 2009, a total of 834 small size business also went out of business; all of which were linked to the high costs of infrastructure (Akuru, Okoro, Maduko, & Mbunwe, 2014). Another study showed that, a survey published by MAN in 2005, which found that the costs of generating power account for about 36% of production costs, may help explain the impact on company closures (Moyo, 2012).

2.2.3 Electricity insecurity and Investment decision

Electricity insecurity have a great impact on the growth of small and medium size enterprises and on the location of investment of small and medium size enterprises in middle and low income countries. Enterprises in these highly affected zones of electricity insecurity do not have incentives of increasing their economies of scale since their activities greatly rely on energy(Kanti Bose, Uddin, & Mondal, 2013).

Another study found out that in developing countries with a high frequency of power outages, electricity-intensive sectors have a low proportion of small firms since only large firms are able to invest in generators to mitigate the effects of outages. Also, for sectors that are very reliant on electricity (e.g. chemical and textile industries), a high prevalence of outages affects the return to investment so badly that small firms without enough initial assets to invest in a generator end up being squeezed out of the financial market and unable to borrow to expand production their businesses(Adenikinju et al., 2005).

Further research study on the impact of unreliable electricity supply on investment decisions of enterprises in Nigeria revealed that 40% of electricity consumed is produced through own-generation, firms spend up to 20-30% of initial investment on measure to enhance the reliability of electricity supply. Banks also insist that firms in Nigeria seeking project loans must make provisions for investments in captive generating equipment. Self-generated electricity is generally more expensive than electricity from the public grid; it adds to capital and operating costs, affecting the range of investment opportunities available to prospective entrepreneurs, raising production costs, lowing competitiveness of local products and blocking the achievement of economies of scale. Firms demonstrate high willingness to pay for reliable power through their investments in self-generation (Scott et al., 2014), which made other researchers to suggest that this is an opportunity for government and the private sector to charge higher prices for electricity in order to fund investments that will make power supply more reliable.

2.2.4 Role of Electricity in Business

There is a significant relationship between electricity and business. Clean and reliable electricity supplies have always had a great impact on SMEs. This is because it is used for varied purposes ranging from production, storage, powering of office equipment and product display. Consequently, the use of electricity serves as input for production. This makes electricity an essential commodity for all industry types including the manufacturing, service and distribution(Doe & Asamoah, 2014). In many less developed economies, various sectors of the economy such as manufacturing and transport use enormous amounts of electricity for operation processes including storage, production hence making electricity a critical resource needed to make products. In this respect, electricity as a "transformed unity" serves as a great input resource for a smooth functioning of most SMEs and make them to have a high dependency on electricity as a standardised input, without it they cannot produce to satisfy their customers. According to the works of Haanaes et al., (2011)this dependency on suppliers therefore explains the value of electricity to SME operations along two trajectories which include supply risk and reliability of supply.

Supply Risk

The supply risk trajectory is a very important factor as to concerned electricity as a resource for the operation of SMEs. Research works on electricity supply and business growth shown that, in spite of the abundant resources Africa is endowed with, it still struggles with supply challenges in electricity and only about 26% of households have electricity making Africa the lowest in electricity penetration in all the continents. United Nations report in 2009 shows that an estimate of 547 million people in Africa lack access to electricity. Further research and conference works of Mkhwanazi, (2003) point some reasons for this high electricity supply risk which include:

- Poor performance, resulting in poor quality of supply and service and an inability to meet the growing electricity demand
- Insufficient managerial and technical skills to do the job
- Inadequate government actions to motivate private investors into the electricity sector
- Inadequate financial means to maintain the functioning tools
- Poor governance on decision taking electricity issues due to regional and ethnic conflicts
- Inadequate revenue collection mechanisms, and therefore credit unworthy businesses

Reliability

Reliability of electricity supply is another trajectory that is closely linked to the supply risk trajectory. Reliability as define by the works of Dabholkar, Thorpe, & Rentz, (1996) is consider to be the degree to which the retail service provides what was promised and when it was promised. Electricity service providers have since measured system performance using reliability as an index (that is the proportion of uninterrupted customer hours provided per year out of a total number of customer hours provided per year). The poor electricity reliability has hence for many years been the focus of most researchers due to the very poor level of management and maintenance of the electricity sector by both the government and the managing authorities.

These electricity supply risk and poor reliability have mostly lead to frequent power interruptions which in this case have made SMEs to witness two types of interruptions which include planned interruptions and unplanned interruptions.

Planned interruptions have a mitigating effect on business operations because potential damage to semi-finished goods or materials can be minimised through the switch to alternative sources of electrical power such as generators and solar panels. Cost incurred due to delayed or cancelled orders or equipment repairs can also be avoided because production and delivery schedules can be adjusted ahead of time. However, the costs of alternate power sources such as power generators, as well as expenditure on overtime pay to staff and some lost in total sales due to interrupted supply of services cannot be avoided.

Unplanned interruptions, however, have unmitigated and sometimes unforeseeable effects on business operations. Often, there are damages that tend to affect product quality, semi-finished goods and costs incurred in repairing, and in delays in the delivery of orders. The cancelations in delivery are borne by businesses and that increases the operation and maintenance costs hence high total cost for these SMEs which directly influences their profitability levels.

CHAPTER 3

Methodology and Data presentation

3.1 Methodology

Methodology comprise the process or procedures employed to seek answers for a research question(Bogdan, R.,& Taylor, 1975). The choice of methodology should always relate with the research question, assumptions and main objectives of research; for this plays an important role in result determination.

The methodology employed in this thesis comprise of two stage methodological approach; we first employ an econometric system or model of analysis which would be used to examine and analysed findings gotten from bench desk data from the IEA and world bank and our second approach will consist of an interview method from important stakeholders from the small and medium-scales businesses as well as state holders.

This study covers a period of 38 years (1980-2018 inclusive), this is due to the availability of data and also for the period is long enough to take control of any reforms in the energy sector. The method uses a time series data which comprises yearly aggregated data for electricity consumption, petroleum consumption, GDP, GDI and population growth rate. This is due to the lack of regional data which could be more appropriate for the study hence the country level data might give some errors in the findings. In this stage we run a linear regression model to examine the level at which our independent variables influence the dependent variables. With focus on the electricity consumption and petroleum consumption variables for they constitute elements of energy which is our consent in this work; and GDP the growth variable. As per other studies like that of (M. C. Sama & Tah, 2016) which examine electricity insecurity with two major equations; GDP as the dependent variable for the first equation and electricity consumption as dependent variable for the second equation, this study lay focus on GDP alone as the dependent variable.

In this model, it is also worth knowing that GDP which is our dependent variable is affected by the rate of electricity consumption and likewise electricity consumption can be influence by the GDP of a country; therefore, the model has the problem of endogeneity. The model excludes other factors that affect GDP such as inflation rate for the data on electricity consumption and petroleum consumption are incorporated with both the prices of electricity and the prices of petroleum. These prices are already inflationary thus including inflation rate in the model will lead to errors in the findings. The limitation of this model will include the

non-consideration of return on assets for these SMEs which better evaluate their performances, this is due to the non-availability of regional data for SMEs in Cameroon. This return on assets could help in getting real electricity consumption level of these SMEs that could best suit the data we could use for better analysis. Other limitations include the time and data limitation hence, the choice of this model to be use for the analysis of this work. Though results from this model might not be concrete enough, we hope it can still be appropriate and helpful for policy makings as concern the electricity sector for SMEs firms in Cameroon. The multiple linear regression equation in this part is as follows and is treated using the statistical package Stata and SPSS.

$$GDP_t = \beta_0 + \beta_1(ELECT)_t + \beta_2(PCON)_t + \beta_3(POP)_t + \beta 5(GDI)_t + U$$

Where in:

ELECT implies the electricity consumption level and in this case is our independent variable and is measured in kilowatts per hour;

PCON implies petroleum consumption in terms of fuel and gas products used for thermal electricity production and transportation measured in kiloton of oil equivalent (Ktoe);

GDP is the Gross Domestic Product of the periods within which the work is done measured in US Dollars and represents the total money value of all the goods and services produced in a country;

GDI is the gross domestic investments which represents the additional capital for both public and private sectors within the country;

POP is the change in population growth rate over time and is measured in percentages in this study.

t here represented time

It should be noted that a simple linear specification could not provide suitable results; hence, the natural log of the variables was used. The variable population growth was not logged because it is in percentage and we do not log variables in percentages.

This second stage consist of a survey methodological approach. A total population of 102 was used for the study which represent the number of small and medium-scale businesses within the main industrial zones of Cameroon and which use electricity as a core resource for their businesses. A multi-sampling method was employed. We first carried out a purposive sampling technique which permit us to identify the SMEs using electricity as major resource for their businesses, a total of 350 were identified. Out of the 350 SMEs identified, 102 SMEs participated in the survey with a self-administered business questionnaire. The self-administered business questionnaire (see appendix) was used to collect primary data from these

102 SMEs on electricity outages problems related to their business activities. SPSS and Stata software will be use to analyse the data collected from the self-administered questionnaire so as to get the correlation between electricity insecurity and SMEs growth. Respondents to this survey included owners of businesses, managers, accountants as well as other employees in the companies, enterprises with an experience from 10 years of business (see table 1 below in data presentation) were our target so as to get valuable information that could help the analysis of data collected for this work. Both manufacturing and service rendering enterprises formed a great part of the participants for their involvement in daily usage of electrical energy.

Respondents of this survey decided to keep their personal identification hidden but however gave their position in the different companies identified; a mixed value of gender participated in the survey as can been in figure 7 below in data presentation section. Also got a set of the SMEs in the survey as seen in the appendix.

To conclude on the methodological section of this research study, the findings obtained from using both methodological approach shall be merged in order to permit us draw out concrete conclusions on the effects of electricity insecurity on the performance of small and medium size enterprises in Cameroon.

3.2 Data presentation

Data for this study was gotten from the International Energy Agency (IEA), the world data base, the U.S Energy Information Administration(EIA), Energy of Cameroon (ENEO) and other stakeholders such as some small and medium size enterprises. Data on energy consumption gotten from IEA are measured in TWh, petroleum consumption data was a combination of petroleum energy used for transportation, industrial purposes, residential, commercial and public services; and was measured in Ktoe (Kiloton of Oil Equivalent). The tonne of oil equivalent is a unit of energy defined as the amount of energy released by burning one tonne of crude oil(Al., 2018). GNI data was gotten from world bank data base and is measured in US Billions of dollars while population growth rate was measured in percentages. Due to the availability of data from both data sources, I was able to get data within the period of 1980 to 2018. Other statistics on access to electricity and number of subscribers to electricity in Cameroon was gotten from ENEO.

Another data for this study will also be gotten from self-administered business questionnaires. This data will be extracted form answers given to the researcher by the different participants of the survey; these will include responses from the selected SMEs management

board like managers, directors, shareholders. Response from trade SMEs trade union organizations will also serve as good data for this study as well as not forgetting the ministry of energy and the electricity supply company. The survey was carried out within the period of this study and some will be effectuated by mail.

Figure 7: Gender

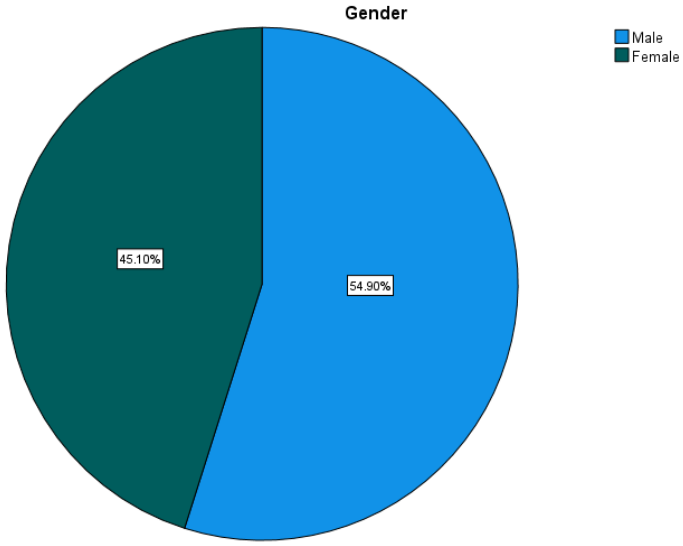


Figure 7 above shows the difference in gender of the total number of our respondents in which most of the respondents were male with a total level of 54.90% and females with 45.10% hence, the gender figure was not too dominated by one gender type making the sample size proportionately equitable.

Table 1: Sample survey data

Educational level of manager or owner of business?			
		Frequency	Percent
Valid	High school diploma	11	10.8
	Bachelor's Degree	55	53.9
	Master's degree and above	19	18.6
	Others	17	16.7
	Total	102	100
What is your position in the business?			
		Frequency	Percent
Valid	Owner	12	11.8
	General manager	41	40.2
	Operational employee	44	43.1
	Accountant	5	4.9
	Total	102	100

For how long has your business been in existence?			
		Frequency	Percent
Valid	For 10 to 15 years	5	4.9
	For 15 to 25 years	38	37.3
	For 25 years and above	59	57.8
	Total	102	100

From the table above we realise a good part of the respondents in the survey had good educational background which was a good significance for the data collected; majority of the enterprises had a long term experience in businesses which works along with the time series data collected for the regression analysis section permitting a good linkage of both methodology and data analysis.

CHAPTER 4

RESULTS AND DISCUSSIONS

In this part of the thesis, we look at the results obtained after analysis of data and the response gotten from our interview guide carried out. The first part will consist of the results we obtained after carrying out our regression analysis to get the coefficients and understand the significance relationship between the dependent variable and the independent variables; data analysis here was done suing SPSS statistical package version 27 and Stata.

The other part of result, we will be looking at the response we obtained from our interview guide. These responses were analyse using the SPSS statistical version 27 were in responses were inputted and statistical summary of all responses obtained.

4.1 Regression results

In this part we present results obtained after analysis of data using the SPSS and Microsoft excel. Results here comprise testing the correlations between the different variables, level of significance and other various tests presented in tables.

Table 2: Correlation of estimated variables

Correlations

		lnGDP	lnELECT	lnPCON	lnGDI	POP
lnGDP	Pearson Correlation	1	.951**	.637**	.962**	-.552**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	39	39	39	39	39
lnELECT	Pearson Correlation	.951**	1	.623**	.926**	-.644**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	39	39	39	39	39
lnPCON	Pearson Correlation	.637**	.623**	1	.650**	-.428**
	Sig. (2-tailed)	.000	.000		.000	.007
	N	39	39	39	39	39
lnGDI	Pearson Correlation	.962**	.926**	.650**	1	-.548**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	39	39	39	39	39
POP	Pearson Correlation	-.552**	-.644**	-.428**	-.548**	1
	Sig. (2-tailed)	.000	.000	.007	.000	
	N	39	39	39	39	39

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2 above shows us the correlations between the dependent variable and the independent variables. The pearson correlation was very important to measure in this step to permit us determine the strength of relationship that exists between the explained and explanatory variables. The results show us a very good relationship between the GDP, GDI, ELECT and PCON but a poor relationship between the GDP and the POP.

The correlation coefficient between the GDP and GDI gives a positive result of 0.962. This coefficient value is significant at 1% which indicates a good relationship between the two variables implicating that they both move on same direction. Hence, a positive change in the GDI will result to a positive change in the GDP.

Electricity consumption which is our main focus for this study shows a good relationship with GDP; GDP and ELECT presents a correlation coefficient of 0.951 which is highly significant at 1%. This without doubt indicates how important electricity consumption is necessary as a growth variable for a positive change in the level of electricity consumption will lead to a positive increase in the value of the growth product for SMEs sectors in the country.

We also notice a highly significant and positive correlation coefficient value between the GDP and the petroleum consumption parameter. The correlation result shows a positive coefficient value of 0.637. This value is significant at 1% and very important in economic growth.

The correlation coefficient between the GDP and POP shows us a negative and less significant value at -0.552. This implies that population growth parameter and the growth parameter have an inverse relationship. Hence, from our data analysis increases in population growth only leads to decrease in the national growth of the country. This is also due to other factors which are not the focus of this study.

Table 3: Adjusted R square result

Model Summary

			Change Statistics					
R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
.952	.947	.12222	.952	169.961	4	34	.000	.733

a. Predictors: (Constant), POP, lnPCON, lnGDI, lnELECT

b. Dependent Variable: lnGDP

The adjusted R^2 was used to show the extent to which changes in the dependent variable are cause by joined variations in the independent variables. In this study, computed probability values were used to test the statistical significance of the estimated coefficients. From table 3 above we notice our model gives us an R square value of 0.952 and adjusted R square value of 0.947 which is greater than 0.5 hence our R square value shows a good level of significance and validity of the variables in the model.

Table 4: Regression result for estimated model

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.690	.477		-1.445	.158
	lnELECT	.422	.097	.479	4.360	.000
	lnPCON	.020	.084	.012	.237	.814
	lnGDI	.715	.137	.543	5.220	.000
	POP	.158	.133	.059	1.183	.245

a. Dependent Variable: lnGDP

Table 4 above shows the regression result for our estimated model, it gives the coefficients of the independent variables which explains their influence on the dependent variable.

The results indicate that electricity consumption has a positive coefficient of 0.422. This result is supported by the economic a priori expectation. This implies that electricity consumption has a positive relationship with economic growth. An increase in electricity consumption will lead to an increase in GDP. Hence a 1% increase in electricity consumption will lead to a 0.422% increase in GDP. The statistical test of hypothesis reveals that the result is statistically significant even at 1%. We therefore reject our null hypothesis and accept the alternative hypothesis that electricity consumption is a significant determinant of the growth of small and medium size enterprises in Cameroon as well as growth in GDP within the period of this study.

Result on petroleum consumption show a positive coefficient of 0.020 This is also in conformity with our economic expectation. This implies that petroleum consumption has a positive influence on economic growth. An increase in petroleum consumption will lead to an increase in GDP. Alternatively, a 1% increase in petroleum consumption will lead to a 0.020% increase in GDP. The statistical test of hypothesis reveals that the result is statistically

significant at 1%. We therefore reject our null hypothesis and accept the alternative implying that petroleum consumption is a significant determinant of economic growth in Cameroon within the period of study

The above result on gross domestic investment shows a positive value of 0.715 which is in conformity with our hypothesis expectation. This implies that gross domestic investment has a positive and great role to play as to concern the growth of small and medium scale businesses as well as economic growth. Thus a 1% increase in the gross domestic investment of the country will lead to a 0.715% increase in GDP. This value is highly significant thus very important and a good determinant of economic growth in Cameroon.

The result on population growth rate indicates a positive value of 0.158 coefficient. Hence a 1% increase in population growth rate will definitely lead to a 0.158% increase in the gross domestic product. This value is significant and shows that population growth rate is an important determinant of economic growth and should be taken into consideration when making growth policies.

From table 4 above, we notice the coefficient value of electricity consumption is higher than the value of petroleum consumption (0.422>0.20) yet figure 2 above shown that the petroleum supply share of energy is greater than that of electricity. This indifference can be explained by the greater usage of petroleum products mostly for transportation reasons by these SMEs and other sectors hence, petroleum product for electrical generation constitute a minor portion.

The result of this study goes in line with result of other research studies carried out on electricity and its effects on economic growth such as that of (M. C. N. R. T. Sama, 2016) who did a study on the effect of electricity consumption on economic growth in Cameroon. The results from survey guide also work in line with results from the research studies carried out by (Forkuoh & Li, 2015) on electricity power insecurity and SMEs growth. Hence results from both model used for this study indicates that electricity insecurity has a great effect on SMEs as well as economic growth.

4.2 Results from Survey

Results in this part are express with aids of charts and brief discussions. A total of 102 survey guides were distributed and all 102 participants gave varied responses to the questions posed in the questionnaires.

On the part of awareness of electricity shortages, a total of 65.69% of the interviewers were aware of this insecurity in electricity while a total 28.43% of respondents cited that they were very much aware of the great shortages of electricity for their businesses. This high number of positive awareness about electricity outages shows that there is truly a problem of electricity insecurity in the sector of small and medium scale businesses.

Table 5: Awareness of electricity outages by SMEs

Are you aware of power outages?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	29	28.4	28.4	28.4
	Agree	67	65.7	65.7	94.1
	Neutral	6	5.9	5.9	100.0
	Total	102	100.0	100.0	

The survey guide also assists this research study in getting information about the frequency of electric power outages within the business sector in which a total of 73.5% of respondents gave feed backs of very frequent power outages (table 6). Result on dependence of electricity by these businesses also showed that 73.5% of the sample size indicates a high dependence on electricity for their business to fully operate without interruptions (table 8); whereas, 75% of the respondents reported of not receiving enough electricity for their businesses (table 7) hence indicating a great problem of electricity insecurity.

Table 6: Frequency of electricity power outages

Are power outages frequent?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	75	73.5	73.5	73.5
	No	3	2.9	2.9	76.5
	Neutral	24	23.5	23.5	100.0
	Total	102	100.0	100.0	

Table 7: Rate of power supply perceived by SMEs

Do you get enough electricity supply for your business?

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	yes	15	14.7	14.7	14.7
	No	77	75.5	75.5	90.2
	Neutral	10	9.8	9.8	100.0
	Total	102	100.0	100.0	

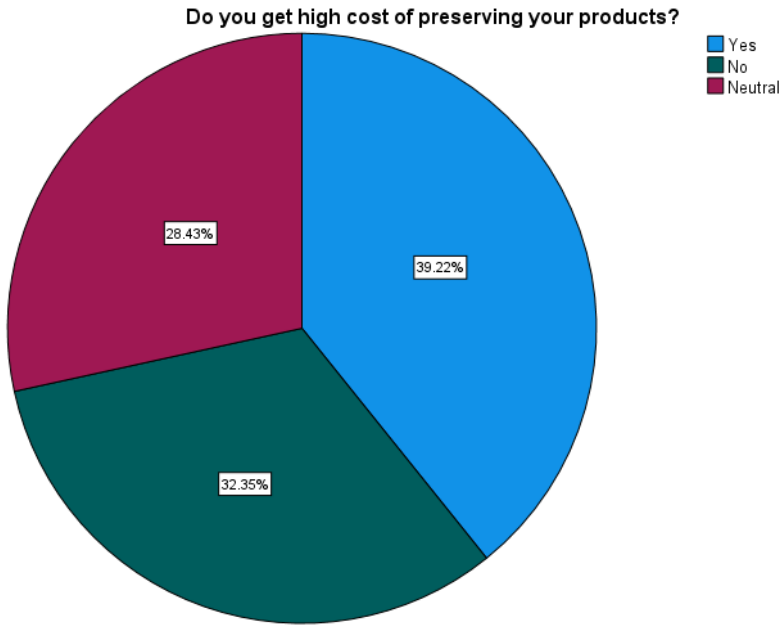
Table 8: Business dependency rate on electricity

Does your business depend on electricity supply?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	75	73.5	73.5	73.5
	No	1	1.0	1.0	74.5
	Neutral	26	25.5	25.5	100.0
	Total	102	100.0	100.0	

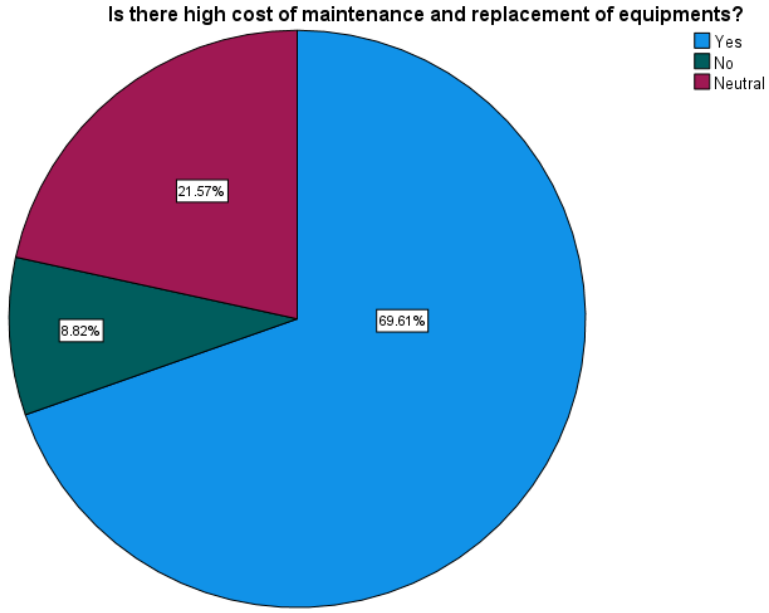
Result from cost related problems with links to electricity power outages from our survey guide also showed a positive feedback of electricity insecurity. Small and medium scale businesses who produced perishable products faced great loses when interrupted power supply is experienced hence, our interview guide shows a 39.2% of respondents agreeing to high cost of preserving their products. Also according to our survey some of these SMEs were consists of service rendering organizations which constitutes a proportion of 32.4% of respondents not facing the problem of high cost in preserving products (figure 8). Hence, this contribute to high cost suffered by these SMEs leading to low cost competiveness with other foreign organizations in same sector.

Figure 8: Cost of preserving products



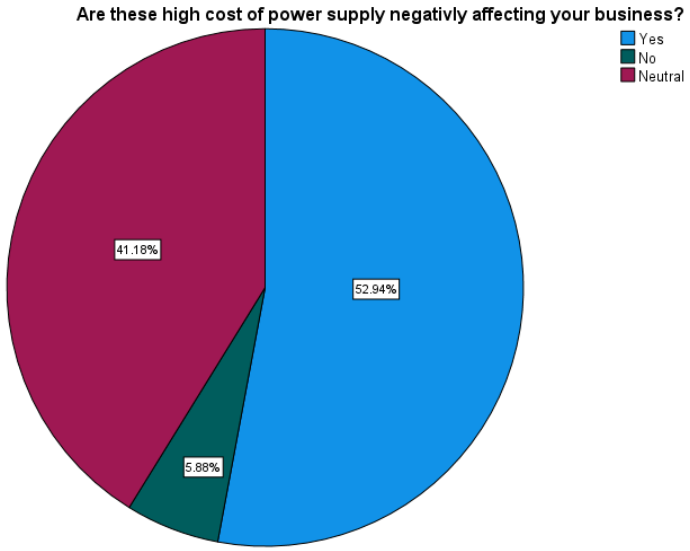
Another cost problem faced by these SMEs had to do with the high cost of maintenance of damaged equipment as a result of unplanned interrupted power outages. Responses from our survey show a great number of SMEs witnessing this problem with 71% of respondents acknowledging the fact that interrupted power supply has increase cost of maintenance and replacement of damage equipment. This point indicates that, the hypothesis of electricity insecurity affecting cost competiveness is greatly felt by SMEs in Cameroon as shown in figure 9 below.

Figure 9: Cost of maintenance and replacement of equipments



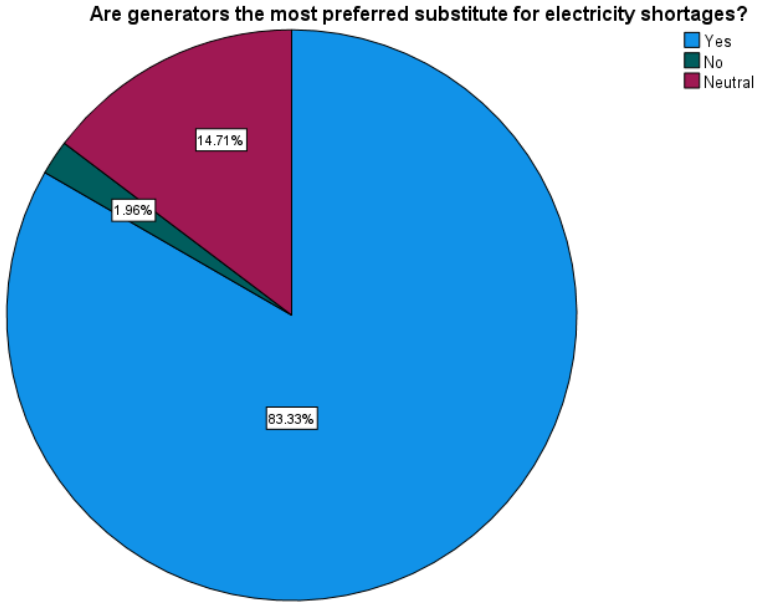
High tariff cost of KWh of electricity was also another problem that contributed to the high cost of running the operations of these SMEs. Despite the problem of insufficient power supply of the electricity supply company, SMEs also decree the problem of high tariffs charged per KWh of power supply as 52.9% responded to agree to increase cost related to electricity (figure 10). All these factors contributed to high cost which is directed to the final consumers thus making local SMEs to be less competitive with foreign companies.

Figure 10: High cost of power supply



The research findings from the survey also found out that a great majority of the SMEs count on the use of generators to mitigate the frequent electricity outages and meet up with insufficient electric supply. Our result showed a good number of SMEs using generator as a substitute for insufficient hydropower supply but decree this as another means of increasing cost of running their businesses due to high prices of fuel to run the generators; hence still affecting the cost competiveness of these SMEs. Figure 11 below shows 83.33% of respondents choosing generator as perfect substitute for insufficient power supply.

Figure 11: **Frequency rate of generators as electric shortage substitute**



The result from both methods used for this study clearly indicates that there is a problem of electricity insecurity in Cameroon which is negatively affecting the SMEs and the economy

as a whole. This problem is linked to the inadequate electricity power supply from hydropower which is the main source of electricity supply of only 5% as seen in figure 2 above. From the result obtained using the regression method analysis, we realize electricity consumption in Cameroon plays an important role in the GDP of the nation but yet its supply is insufficient; result from our survey also shown that most SMEs complaint of inadequate electricity supply for their daily activities. This insufficiency has led to the slowing down of activities of these SMEs likewise their contribution rate to the GDP. The rate of petroleum consumption which plays a good role also in the GDP of Cameroon with a positive result in the regression model can be linked to the preference in the use of generators by SMEs to curb electricity shortages noticed in the survey result seen in figure 11.

4.3 Analysis of Wind and Solar Energy potentials

In this part of this study, we will be looking more deeply into renewable energy potentials in Cameroon as a means to mitigate the electricity insecurity suffered by the country. Our results from research analysis and treatment of our data in the previous sections have already shown that the total energy supply mostly from hydropower sources is very insufficient to accompanied Cameroon towards a more favorable business productivity and economic growth. Hence, perhaps exploitation of the renewable energy potentials mostly will be of great assistance. Due to availability of meteorological data, we will be looking at the potentials of the solar and wind energy.

4.3.1 Solar energy

The republic of Cameroon is located within the tropical zone of west and central Africa; hence, due to its geographical location the country is enrich with high solar radiation that can be well exploited to assist boost the energy sector in the country as shown in table 9 and 10 below. The entire country witness good annual solar radiation ranging from 5-6.5 KWh/m2/day in the northern zones of the country and 4-5 KWh/m2/day in the southern zones of the country (figure 12). Despite these great potentials, little or nothing has been done on the part of the government of Cameroon to encourage investment into the solar energy sector so as to boost the sector. Little research has as well been carried out by researcher to access this sector due to lack of reliable network surfaces on collecting weather data. But due to insufficient electricity supply from hydropower, the government have decided to launch a solar energy program known as Cameroon 2020 Photovoltaic Power Project(Kidmo1, Deli1, & and Bachirou Bogno, 2021). This initiative by the government of Cameroon is to help target grid unconnected rural villages as well as grid connected urban areas suffering from insufficient electricity supply. The

initiative of this program is to generate and install solar PVs in the targeted zone, the program is to generate about 500MW of energy from a total production of 750GWh of energy per year from the total installed capacity. With such an initiative on the part of the government, the energy sector in the country is expected to witness an improvement that will assist in business building and economic growth.

Figure 12: Photovoltaic power potential in Cameroon

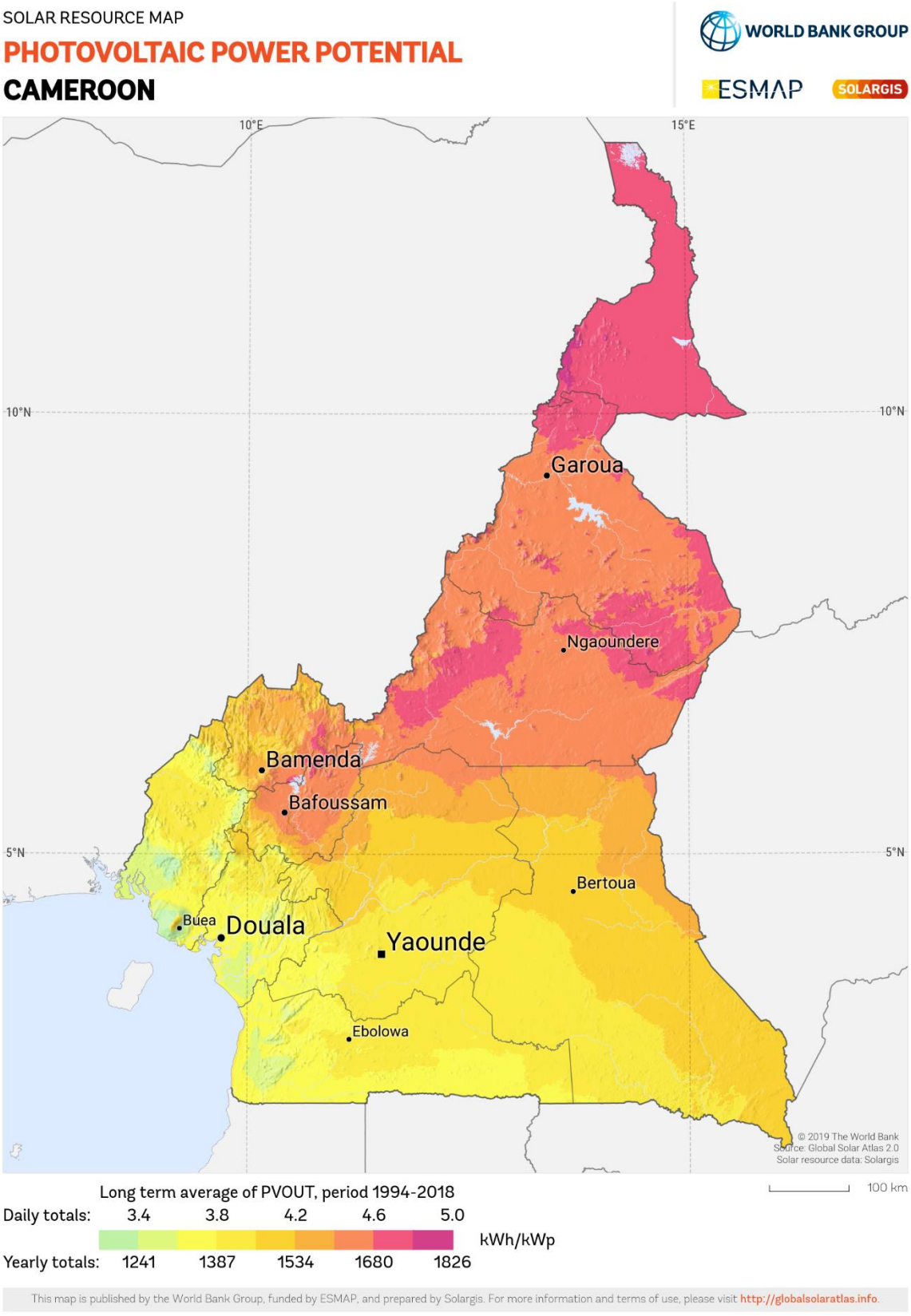


Table 9: Climate data for solar and wind in Northern zones of Cameroon

	Maroua		Garoua		Ngaoundere	
	Solar	Wind	Solar	Wind	Solar	Wind
Jan	5.61	4.1	6.07	3.8	6.48	3.4
Feb	6.24	4	6.36	3.8	6.74	3.4
Mar	6.56	4.4	6.5	4.1	6.53	3.7
Apr	6.31	4.6	6.24	4.3	5.83	3.9
May	5.96	4.2	5.78	3.9	5.42	3.6
Jun	5.5	3.5	5.37	3.3	5.02	3.1
July	5.03	3.2	4.94	3.1	4.6	2.9
Aug	4.85	3.1	4.83	2.9	4.66	2.8
Sep	5.34	2.8	5.16	2.7	4.85	2.6
Oct	5.7	3.2	5.7	3	5.25	2.8
Nov	5.85	3.8	6.17	3.5	6.16	3.2
Dec	5.56	4.3	5.93	4	6.27	3.5

Table 10: Climate data for solar and wind in Southern zones of Cameroon

	Bamenda		Bafia*		Yaounde		Douala		Bertoua	
	Solar	Wind	Solar	Wind	Solar	Wind	Solar	Wind	Solar	Wind
Jan	6.14	2.1	5.73	2	5.43	1.7	5.41	2	5.86	2.2
Feb	6.19	2.2	5.86	2.1	5.49	1.9	5.36	2	6.01	2.4
Mar	5.5	2.1	5.45	1.9	5.2	1.6	4.88	1.8	5.6	2.3
Apr	5.01	1.9	5.19	1.8	4.97	1.3	4.55	1.5	5.29	2.1
May	4.83	1.8	4.94	1.6	4.65	1.2	4.37	1.5	4.83	1.9
Jun	4.42	2	4.61	1.7	4.26	1.4	3.91	1.8	4.36	1.8
July	4.02	1.9	4.33	1.8	4	1.5	3.41	2.1	4.2	1.8
Aug	3.92	2	4.37	1.9	3.98	1.7	3.04	2.2	4.35	1.8
Sep	4.21	1.8	4.63	1.8	4.27	1.6	3.44	2	4.62	1.8
Oct	4.39	1.6	4.55	1.6	4.14	1.3	3.7	1.6	4.56	1.7
Nov	5.21	1.7	4.97	1.5	4.56	1.2	4.3	1.5	5.04	1.7
Dec	5.79	1.8	5.46	1.7	5.12	1.3	5.05	1.6	5.54	1.9

4.3.2 Wind Energy

The topographical nature of Cameroon is made up of coastal, high lands, plateau and desert lands, these natures have good characteristics for generation and installing of wind energy potentials. The northern zones of Cameroon are made up of plateau and high lands that blow massive harmattan winds from the lake Chad and Logone & Chari division in the north down to the south of the country, the annual wind speed in these regions rang around 4m/s for about 80% of the entire time. The other part of the country from the Adamawa down to the southern regions have annual wind speed of 3-2m/s for 60% and 50% of the time (table 9 and 10). Despite these wind energy potentials, very little work has been done in the past years in order to exploit electrical energy from this sector. Notwithstanding, in order to meet up with its 2035 emergency plan; the government of Cameroon has launch an initiative towards this sector so as to curb the deficiency felt in the energy sector. An assessment work has been launch in order to determine the feasibility of generating and installing wind turbine in the different possible zones, areas such as Maroua and Garoua in the North of Cameroon as well as the high lands of Bamboutos in the West regions have all been selected for a starting point of the wind energy project. The first phase of this project which is an initiative of public private partnership has objective to generate about 42MW of energy in the Bamboutos highlands which will contribute to about 4-6% of the total energy of the country.

Hence, continuous assessment and generation of wind energy potentials all through the national territory will greatly contribute to boosting the energy sector in Cameroon and push in business growth as well as serves as means of attraction for foreign investors leading to improve economic growth. Other research findings like the work of Kidmo1 et al., (2021) also analyse the wind potentials and show possible wind energy generation in the northern zones of the country.

The technical analysis of the two source of renewable energy above show without doubt that Cameroon is greatly enriched with good potentials of renewable energy sources. The solar potentials in the North and Far North regions will be an interesting factor in which the government of Cameroon should look into in order to curb the electricity crisis the country is going through. Also the strong speedy winds blowing in the Northern and Western region will as well serves as great energy potentials for the government to exploit to improve its electrical supply of energy.

Chapter 5

Recommendations and Conclusion

5.1 Recommendations

The aim of this work was to examine the impact of electricity insecurity on the growth of small and medium scale businesses in Cameroon and results obtain indicate that insufficient power supply has a great negative impact on the growth rate of businesses in Cameroon as well as the economy as a whole. Hence, recommendations drawn from this research work lies on the part of the government of Cameroon to improve the exploitation of the full potentials of energy sources in Cameroon so as to be able to meet up its high electricity demand. To realize this goal, the government of Cameroon needs to first of all identified the constraints that hinders this full exploitation and amend especially those that can be amended such as policy decisions, regulations, financial constraints and not geographical constraints. Hence, the following recommendations are proposed:

Increase exploitation capacity

The government of Cameroon needs to improve the generation force of hydropower production to meet up demands. Certainly, Cameroon is the second largest in terms of hydropower potential in Africa but yet still suffers from great power failure. This is due to inadequate exploitation of these potentials which has led to the electricity insecurity problem faced by the country for a long time now. Hence, the government should encourage the exploitation of its full potential in order to help improve on the social lives of its citizens.

Implementation of direct energy policies

The government needs to work also on its policies as to concern energy; there is need to improve on the policies that hinders exploitation of different sources of electrical energy in the country. Also the government needs to put in place policies that will attract both local and foreign nationals to invest in energy businesses so as to provide good and clean energy to its consumers

Diversify sources of energy

The high dependence on hydropower as the main source of electrical energy in Cameroon has as well contributed to its great electricity failure that has affected its economy. The Cameroonian government needs to encourage electricity generation from different sources of energy such as solar and wind energy in which it also has great potentials; this move to these renewable energy sources will greatly assists the country in curbing its electricity insecurity problem and hence improve it economic growth rate.

Encourage research and support expertise

For great changes to be made on the energy situation in Cameroon, the government needs to encourage concrete research works within this domain before taking good policy decisions. Also, there should be training of expertise in the electrical domain for all the different sources of energy available so as to carried out good works and maintenance in the field.

Encourage and improve awareness and interest in energy investments

There should be improvement of awareness and interest in the investment of electrical business in Cameroon; solar and wind energy should be considering good base of encouraging investors to invest in these other sources of electrical energy. Also the government should improve on the commercialization of hydropower all through the nation with different companies.

De-monopolized the electricity supply company

The lone electricity supply company has for long enjoyed monopoly power over the supply and commercialization of electricity in Cameroon but yet its consumers have always given negative feedback on the services provided by the company. Hence, there is need for the government to cancel this monopoly power and encourage other companies to join the supply market; this will encourage the provision of good and affordable services by these companies.

Implementation of good pricing policy

The electricity supply company should put in place a good electricity pricing policy that will be affordable to the different group of consumers with respect to income levels. There should be a follow up in the price fluctuations and changes in the metering pricing practiced by the commercialized company. The government should as well reduce the high tax levied on electricity consumption as well electric meter maintenance.

5.2 Conclusion

The aim of this research was to examine the impact of electricity insecurity on the performance of small and medium size enterprises in Cameroon using a two methodological approach. The first approach which consists of using data from the IEA and world bank data base was analyzed using a multiple regression model; result from our model showed that electricity consumption and economic growth which was consider the growth factor for SMEs have a positive relationship. Hence, any negative change in the level of electricity consumption will directly have a negative effect on the performance level of small scale businesses in Cameroon. The result as well as showed that petroleum consumption which is one of the source of energy in Cameroon also have a positive relationship with economic growth implying any positive or

negative change in the level of petroleum consumption will as well lead to a positive or negative change in the growth factor. With such findings, the government of Cameroon needs to exploit at an adequate level its full potentials of electrical energy in order to curb the electrical crisis faced by the country for many years now.

The second methodological approach which was consists of the establishment of questionnaires and distributed to selected enterprises in Cameroon and stakeholders also came out with positive findings. Responses gotten from these questionnaires showed that a good majority of enterprises in Cameroon suffer great negative effects due to insufficient and very frequent electrical power failures. Our respondents indicated that the poor and highly charged electricity supply in Cameroon was contributing to one of the main reasons why they choose to close down their businesses which also leads to massive unemployment thus influencing the economy of the country. Findings from these respondents also showed that, the use of generators is the most common means of mitigating the frequent power failures these enterprises were facing; though the high prices of petroleum products were still another problem they cried out.

Further analysis of other sources of energy such as solar and wind were also examined. Findings indicates that, Cameroon has good renewable energy potentials especially in solar and wind. There is great solar potential all through the country which if well exploited will help in mitigating the frequent power failures. Also the good wind speed in the North and West regions of Cameroon can as well serve as a good mitigating factor for the electricity insecurity problem.

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Appendix

Research Questionnaires

This research work is undertaking in order to evaluate the impact of electricity insecurity(shortages) on small and medium scale businesses in the main industrial zones of Cameroon.

All information you provide will be treated as confidential and anonymous, and also will be used for academic research only. Thanks for your collaboration.

Please tick (√) the most appropriate that describe your correspondence.

Power outage experience

1. Are you aware of the power outages?
    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree
1. Are the power outages frequent?
    - Yes
    - No
    - Neutral
2. Do you get enough electricity supply for your business?
    - Yes
    - No
    - Neutral
3. Does your business depend on electricity supply?
    - Yes
    - No
    - Neutral
4. Do intermittent power outages affect your business?
    - Strongly agree
    - Agree
    - Neutral
    - Strongly disagree
    - Disagree
5. Has your cost of materials gone up?
    - Yes
    - No
    - Neutral
6. Have employees' wages gone up?
    - Yes
    - No
    - Neutral
7. Do you get high cost of preserving your products?
    - Yes

- No
- Neutral

8. Is there high cost of maintenance and replacement of equipement?
   - Yes
   - No
   - Neutral
9. Are these high cost of power supply negatively affecting your business?
   - Yes
   - No
   - Neutral

11. Are generators the most preferred substitute for electricity shortage?

    - Yes
    - No
    - Neutral

12. Have you reduce the number of employees due to this problem?

    - Yes
    - No
    - Neutral

13. Do you think your sales have drop due electricity problem?

    - Yes
    - No
    - Neutral

20. Have you close down some branches due to electric shortage?

    - Yes
    - No
    - Neutral

21. Have you reduce your product line due to electricity shortage?

    - Yes
    - No
    - Neutral

22. Do you suffer from products perishability due to shortage of electricity?

    - Yes
    - No
    - Neutral

General questions

Please provide one answer to each of the following general questions on your business.

25. Gender?

    - Male

- Female

26. What is the highest educational level of the owner or general manager of the business?

- Less than high school diploma
- High school diploma
- A bachelor's degree
- A master's degree or above
- Others

27. What is your position in the business?

- Owner
- Manager
- Accountant
- Operational employee

28. For how long has your business been in existence?

- 0-5 years
- 5-10 years
- 10-15 years
- 15-25 years
- 25 and above

Sample of Small and Medium scale businesses in the survey

Name	**Industry**	**Sector**
Unoin bank of Cameroon	Financials	Banks
Camtel	Telecommunications	Fixed line telecommunication
Dove supermarket	Consumer goods	Commercials
Christ Cosmetics	Beauty fashion	Production & Commercialization
Credit commaunte d'Afrique	Financials	Banks
Lewat Hotel	Logistics	Tourism
Santa Lucia	Consumer goods	Commercials
Nikki	Consumer goods	Commercials
New Life supermarket	Consumer goods	Commercials
Deksons Depot	Consumer goods	Brewers
Brasseries du Cameroon	Consumer goods	Brewers
Guiness Cameroon	Consumer goods	Brewers
Commercial Bank of Cameroon	Financials	Banks
House Innovation	Customer Service	Technology
Green future consulting	Customer Service	Business Management
Claudice Business service	Customer Service	Business Management
ST Afilec SARL	Consumer goods	Commercials
Wakyshare	Consumer goods	Commercials
WATS Telecoms	Telecommunications	Mobile telecom operator

Bekora Miners	Extraction	Industrial gold mining
M & M Products	Beauty fashion	Production & Commercialization
Cocopharma	Beauty fashion	Production & Commercialization
Nature Care SARL	Beauty fashion	Production & Commercialization
Vision Comfort	Customer Service	Advertising and Publicity
Italia Décor SARL	Consumer goods	Commercials
Wood Equatorial company	Extraction	Forestry
Electronic ESO	Consumer goods	Production & Commercialization
ST ICE	Consumer goods	Production & Commercialization
Techno Press	Customer Service	Printing
Awa and Sons	Customer Service	Printing
Progrs SARL	Customer Service	Printing
Polymaf SARL	Consumer goods	Production & Commercialization
Numrus SARL	Consumer goods	Production & Commercialization
Marche.cm	Consumer goods	Commercials
NES-C	Consumer goods	Production & Commercialization
KFT Magnet Ltd	Consumer goods	Production & Commercialization
Vision Future SARL	Customer Service	Technology
Biopharma	Beauty fashion	Production & Commercialization
Lana Cosmetics	Beauty fashion	Production & Commercialization
Santarde SARL	Beauty fashion	Production & Commercialization
EDS Cameroon	Consumer goods	Production & Commercialization
CENAME	Customer Service	Medical
MESSINA Industrelle	Consumer goods	Production & Commercialization
CECEC	Consumer goods	Production & Commercialization
Ets Esprance	Consumer goods	Production & Commercialization
Socit Nkoutche	Consumer goods	Production & Commercialization
Chez Eugne	Consumer goods	Production & Commercialization
Ets Karthik	Consumer goods	Commercials
Odysse	Consumer goods	Commercials

St Gobino SARL	Consumer goods	Production & Commercialization
Super Dcor	Consumer goods	Production & Commercialization