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Fostering Electricity Access in Cameroon: Impeding Factors and Cost-Effective Model

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This is to certify that the doctoral dissertation by

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Walden University
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Abstract

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MSC, University of Maryland Global Campus, 2015

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Dissertation Submitted in Partial Fulfillment

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Abstract

Due to irregularities and shortages in electricity generation and distribution, 95% of Cameroon's population suffers from debilitating effects on national economic security, public health, education, safety, and quality of life. Cameroon needs a sustainable, efficient, and innovative electricity source and policy system. Failure to meet this demand forestalls the much-needed socio-economic and political development of the country. The purpose of the present study was to explore inadequacies of the current hydroelectric supply system in Cameroon, putting into perspective factors that impeded the development of a sustainable electricity supply system, strategies to alleviate these impediments, and the most cost-effective framework that could provide consistent and affordable electricity to Cameroonian communities. The qualitative research utilized von Bertalanffy's systems theory as the theoretical foundation of a qualitative systems-based approach for the research. Using a structured interview protocol, participants with expert knowledge in energy sustainability, public policy, and cost-effective policy models provided data account of their experience in energy sustainability and cost-effective policy models. Findings indicated that policymakers should take advantage of Cameroon's vast energy potentials, technological innovations, and a conscientious human resource leadership. If Cameroon's leadership and public administrators can implement cost-effective strategies for alleviating impediments to electricity access, and create a framework for the most cost-effective power generation, they can clear a path to full electricity access and positive social change through much-needed socioeconomic development of Cameroon.

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Dedication

This study is dedicated to my beautiful and beloved wife, Quen Agbor Ako, my life-long partner for over thirty-six years. You gave your all throughout this journey that took us from Yaoundé to Bamenda passing through Bali, to the United States. There were no happier moments than those days when we paraded arm in arm with our four beautiful kids, from one school graduation to another, from one cultural gathering to another, and one military academy graduation to another. We were very proud. Proud of the parents that we were and of the great performances our kids demonstrated everywhere. Everyone wanted to know how we did it. We could not wait for our kids to get married, nor to be grandparents, and to enjoy the fruits of our labor in retirement. Alas! Like a candle in the wind, you were just blown away. Snatched from us by the wicked hands of death. Since that Friday eve, of April 10, 2020, nothing, nothing has been the same again.

Oh well, the kids and I shall continue the journey. But our love for you will never perish. Until we meet again.

A Dieu! Mon amour d'enfance

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Chapter 1: Introduction to the Study

Access to electricity is critical to the well-being of rural and urban communities. While demand for this utility is growing exponentially worldwide, access remains a real challenge to many communities, especially in sub-Saharan Africa (International Energy Agency, 2014; U.S. Energy Information Administration, 2018). In an era marked by the United Nations' call for universal access to electricity for all by the year 2030, meeting this challenge is almost impossible in the case of Cameroon. According to the International Energy Agency's World Energy Database (2010) and the World Energy Outlook (2008), 14.2 million or 78% of Cameroonians had no access to electricity in 2006. The same database projected 17 million or 64% of Cameroonians could have no access to electricity by the year 2030. Current literature on electricity supply in Cameroon suggested many months of shortages and rationing of electricity in both urban and rural communities (Eneo Cameroon, 2020; Muh et al., 2018;). Every day, a household, an institution, or a community loses electricity as a result of a chronic systemic deficiency in electricity generation and supply. Electricity rationing has become a way of life for both urban and rural communities, forced to accept the reality of electricity shortage. Cameroon needs a sustainable electricity access system.

The problem of electricity access in Cameroon is acute. It is a real-time challenge and compounded by several impeding factors. The present study focused on investigating these impeding factors. Investigating these factors could help in understanding the specific challenges involved in acquiring full electricity access in Cameroon. It could also help stakeholders to appreciate the depth of the problem and envisage potential fixes.

Besides, this could initiate a causal assessment of the problem of electricity access in the country. The concept of causality, as ascertained by Aristotle, provides a substantive argumentation for sound and informed public policy decision-making (Falcon, 2019).

In addition to impeding factors, the study also focused on exploring the most cost-effective electricity model that could sustain present and future electricity access in Cameroon. Cost-effectiveness models predict the cost and effectiveness of any intervention based on the best available evidence. According to Abacus (2020), cost-effectiveness models provide robust analytical approaches to policy decisions. It is a viable system that maximizes productivity and provides good value returns to available expended resources. Cameroon needs a cost-effective public policy model that ensures and expands electricity access to all its rural and urban communities.

Fostering electricity access by investigating factors impeding this access and exploring the best cost-effective model that provides sustainable electricity access could resolve the long-standing problem of electricity in Cameroon. It could also ensure sustainable progress in the much-needed economic growth and industrialization, access to health care, education, employment, and quality of life. In a nutshell, a study of this nature could be a driver of positive social change in Cameroonian communities. The concept of social change articulates responses to social problems and guides political and economic governance policies (Callahan, 2012; McMichael, 2012; Walden University, 2015). Positive social change outcomes could close social inequality gaps. In the case of Cameroon, fostering electricity access through impeding factors and the best cost-effective model could lead to improved communications, living conditions (air-

conditioning, heating, cooling, lighting), educational performances, security, and services.

This introductory chapter provides a description of the research topic, its relevance, and social implications. This is followed by a section on the background of the study, which summarizes research literature related to the scope of the topic, the existing knowledge gap, and the rationale of the study. The research problem, question, purpose, and theoretical framework are identified, analyzed, and justified. Also, a definition of the nature of the study, key concepts, assumptions, scope, and delimitations are proposed. The chapter ends with the study's limitations, significance, potential positive social change implications, and a summary.

Background of the Problem

This background provides a brief geography of Cameroon, its energy potential, an understanding of the knowledge gap, and the rationale of the study.

Brief Geography

With a total surface area of 182,514 sq miles, Cameroon is situated between latitude 6° 0′00″N and longitude 12º 0′00″E. It is bordered by Nigeria to the west, Chad to the northeast, Gabon, the Republic of Congo, and Equatorial Guinea to the south, and the Central African Republic to the east. The country's population was estimated at 26,545,863 by the latest United Nations 2020 population data. Officially bilingual (English and French), Cameroon is often referred to as Africa in miniature because of its diversity in culture and geography. It has one of the highest literacy rates on the continent. However, its economic development has been hampered by decades of

corruption and authoritarian government (BBC, 2018). Considered a lower-middle-income country (World Bank, 2018), Cameroon faces policy and technological challenges in the expansion of its electricity access system. At the core of these challenges are several factors impeding this expansion. Moreover, electricity shortages and costs are comparatively high despite the abundant energy potential of the country.

Review of Energy Potentials in Cameroon

Cameroon possesses significant energy potential to develop full electricity access and security. Renewable energy such as geothermal, wind, solar, bioenergy, and hydropower could deliver energy needs in Cameroon. Non-renewable energy reserves including coal, crude oil, and natural gas, also constitute part of Cameroon's energy mix. However, these potentials are mostly untapped or not fully exploited and provide no guarantee for energy security.

Geothermal Energy Potential

Cameroon possesses a 933 miles long active volcanic line with more than 130 thermal springs in Ngaoundere, lake Moundou, Mounts Cameroon, Bamboutos, Oku, Etinde, and Manengoumba (GET.invest, 2020; Nemzoue et al., 2020). The mean temperature of these thermal springs is above 23°C and the highest temperatures (74°C) are found in the Center Region of Cameroon. Most of the hot springs are in the Adamawa Region and are found along the Cameroon Volcanic Line (Nemzoue et al., 2020). No known feasibility studies have been carried out to determine the full capabilities of geothermal energy access in the country.

Wind Energy Potential

Wind energy potential exists in the northern and coastal regions of Cameroon. Although the average wind speed in most of Cameroon is between 2 and 4 m/s at 100 m height, the northern and coastal areas are 5 to 7 m/s. According to Kidmo et al. (2016), the regions of Maroua and Kousseri have wind potential that could provide for large-scale electricity generation. This potential could be used to improve access to environmentally friendly cost-effective electricity. However, full investigations are yet to be conducted on wind energy potential and access in Cameroon.

Solar Energy Potential

Solar energy potential is great in Cameroon. The average solar irradiation in the country is about 5KWh/day/m2 (GET.invest, 2020; Nemzoue et al., 2020). Although the cellular telecommunications network is powered by solar, only 50 solar photovoltaic installations currently exist in Cameroon (Muh et al., 2018; Nemzoue et al., 2020). Nonetheless, the Cameroon government and the electricity distribution company Eneo are currently making strides in installing photovoltaic power plants in some communities including Lomie, Djoum, Lagdo, Garoua, Yokaduma, and Ngaoundal (Magoum, 2020). Current World Bank ratings on Cameroon energy access (2018), however, still indicated that only 62% of Cameroonians had access to electricity. Solar exploitation is still low. According to the United States Agency for International Development (USAID, 2019), Cameroon still has a large population without access to electricity. Efforts in fostering the use of solar systems only yielded a low market penetration rate of 17%. USAID (2019) also estimated a daily technical potential of 780 terawatt-hours per day, averaging 5.8

Kilowatt hours per square meter per day in the Northern regions of Cameroon. The same data indicated the southern region of the country has average insolation of 4 Kilowatt hours per square meter per day and an average of 4.9 kilowatt hours per square meter per day in the whole country (USAID, 2019).

Biomass Energy Potential

Cameroon's 25 million hectares of forest covering three-quarters of its territory makes it the third-largest biomass potential in sub-Saharan Africa (Nemzoue et al., 2020). Enormous biomass energy potential is derived from firewood, crop residues, animal manure, charcoal, sewage sludge, and municipal waste. Although biofuels constitute 64.1% of the country's main energy use, they only contribute 1.0% to electricity generation (Muh et al., 2018). Over 90% of Cameroonians use biomass in the form of firewood, for cooking, lighting, and heating. Much of the wood is also used for making local furniture or exported as timber. USAID (2019) estimates biomass residues could generate 1,050 GWh of electricity. This could reduce the import of fossil fuels. It could also reduce greenhouse gases and provide employment and electricity in areas with no grid. However, the production and use of biomass for electricity are not given much consideration in Cameroon. According to Muh et al. (2018), the under-exploitation of biomass energy is a major explanation for the existing deficit in electricity access in Cameroon.

Hydropower Potential

Cameroon has an enormous hydropower potential. Most of its electricity is generated from hydropower. As the second-highest hydropower potential in sub-Saharan

Africa after the Democratic Republic of Congo, Cameroon's electricity generation capacity is estimated at 297 TWh. However, only 13,700 MW, or 5%, of this potential is currently harnessed. With a rise in demand for electricity, Muh et al. (2018) argued, by 2030 Cameroon will need 6000 MW to meet its needs. Expanding the hydropower potential could be of great benefit to Cameroonian communities. Moreover, several clear-cut renewable energy policy guidelines, incentives, and modern technological innovations are needed to promote universal electricity access in the country.

Fossil Energy Potential

Cameroon is endowed with large reserves of fossil fuels including, coal, crude oil, and natural gas. According to Muh et al. (2017), with an estimated 200 million barrels of crude oil reserves and a production rate of 24.5 million barrels per year, crude oil accounted for 39.7% of Cameroon's energy production in 2014. Much of this crude oil (43% or 40,216 barrels a day) was exported. Proven natural gas reserves are estimated at between 157 billion and 550 billion m3. In 2014 Cameroon's fossil fuel energy consumption was 38.318%. Electricity production from coal was at 0%, while natural gas was at 5.993%. Cameroon's oil and natural gas potentials could boost its energy security and provide electricity access in communities without electricity.

Nuclear Energy Potential

Nuclear energy created through fission and fusion is a potential energy source that could boost electricity access in Cameroon. According to Love (2019), nuclear energy provides the largest source of carbon-free electricity. It is safe, dependable, cost-effective, and a clean source of power. It is resilient to climatic adversities and provides

zero-emission uninterrupted electricity access. With stringent regulatory policies, Cameroon could take advantage of the benefits of nuclear energy to provide sustainable electricity access to its communities. According to the International Atomic Energy Agency (2018), nuclear energy is an attractive option for industrializing countries in need of a clean, reliable, and cost-effective energy source. Although the Republic of South Africa is the only sub-Saharan African country with nuclear energy, other African countries (Ghana, Nigeria, Morocco, Sudan, Egypt, Kenya, Niger, Rwanda, Tanzania, and others) are currently exploring avenues for nuclear energy infrastructure installations. Cameroon could join the ranks of these countries to provide electricity access to its community.

Figure 1 indicates electricity demand growth from 2010 to 2025.

Figure 1

Bar Graph Representing Electricity Demand Projection Rates

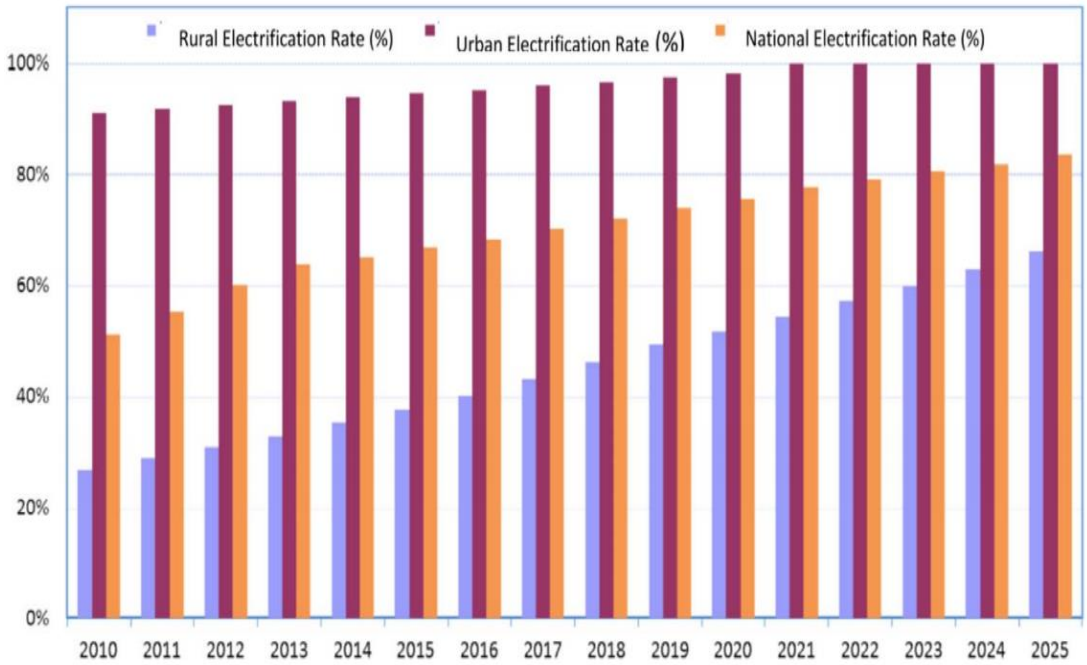

Figure 2 shows projected electricity demands in the various sectors of the economy.

Figure 2
Electricity Demand Graph Sectorial Projection

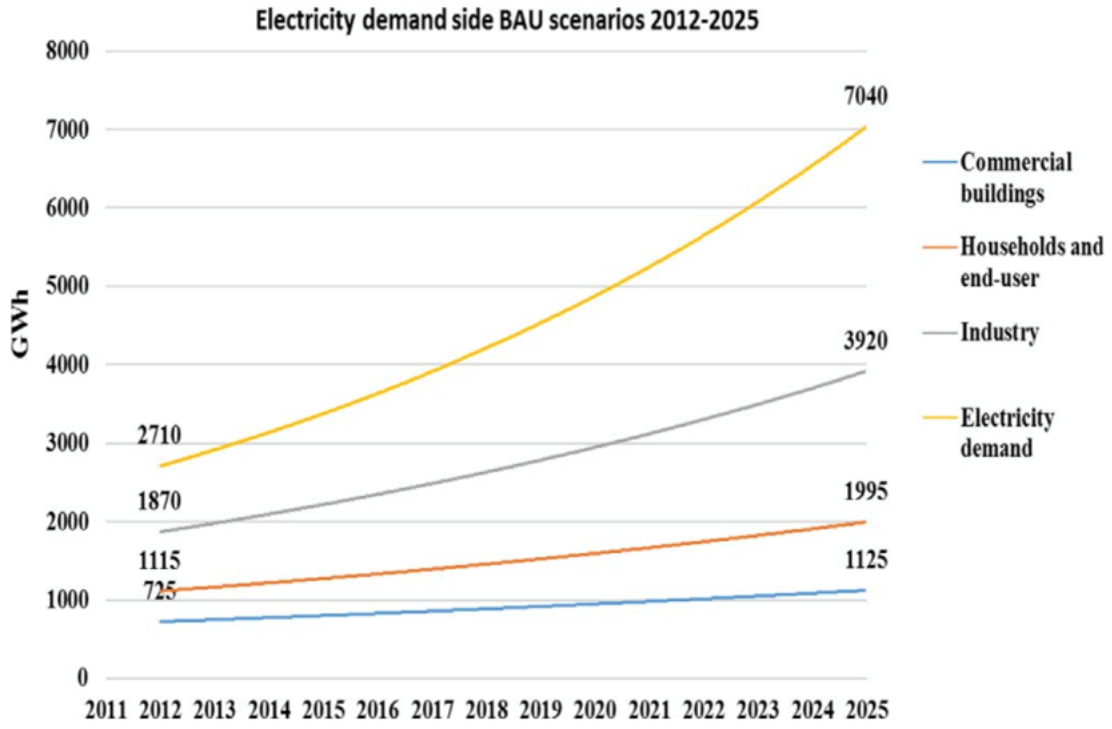

Fig. 3. Electricity demand projection for Cameroon using business as usual Scenario [9].

Knowledge Gap and Rationale

Cameroon possesses several energy potentials. Despite these potentials, full access to electricity remains a challenge. The problem of electricity access has been studied from several perspectives within the domain of public policy and administration. Polzin et al. (2015), for example, investigated the influence of public policy on renewable energy investments. Broto et al. (2018) conducted a study on energy justice and equity among rural populations of the developing world. Owusu and Asumadu-Sarkodie (2016)

also reviewed renewable energy sources, issues in their sustainability, and mitigation of climate change. Muh et al. (2018) presented an overview of sustainable energy policies in Cameroon. However, although a fair amount of research was conducted on fostering electricity access in Cameroon, no known evidence-based study addressed the issue of factors impeding electricity access and the most cost-effective electricity model.

The problem of electricity access in Cameroon is acute and a real-time challenge. It requires an in-depth approach. This study investigated in depth the various factors impeding full electricity access in Cameroon. The study further explored potential energy sources, strategies, and policies that could ensure a sustainable cost-effective energy policy model for the country. By addressing impeding factors to electricity access and the most cost-effective policy model, the study could create more awareness of the problem of electricity access and the quest for alternative solutions to the problem. It could also ignite a debate among public policy scholars and practitioners on the most cost-effective energy policy model for Cameroon. Exploring impeding factors to electricity access and investigating the most cost-effective electricity model could help energy stakeholders appreciate the depth of the problem and envisage potential short-term and long-term fixes. It could also help to influence sustainable progress in the much-needed economic growth and industrialization, access to health care, education, employment, and quality of life. In a nutshell, a study of this nature could be a driver of positive social change in Cameroonian communities.

The Problem Statement

Cameroon's hydroelectric grid supply, the country's main source of energy, is marred by the absence of a sustainable innovative power generation and distribution system. This vulnerability is impeding positive social change transformations within Cameroonian communities.

Although the Cameroon government was making efforts to improve access to electricity, current data showed that no significant progress has been made. The literature on electricity supply in Cameroon suggested many months of shortages and rationing in both urban and rural communities (Eneo Cameroon, 2020; Muh et al., 2018). The government campaign slogan, "Access to electricity for all Cameroonian communities by 2035" (Eneo Cameroon, 2020), remained an illusion. The number of electricity blackouts in urban and rural communities are increasing daily as these communities are beginning to express their frustration about the situation. An average of 10 blackouts are registered monthly. Students sitting for nationwide tests, shopping centers, financial institutions, and hospitals are unable to function regularly because of intermittent blackouts.

Access to electricity in Cameroon is a continuing problem. Of over 14,000 communities, only about 3,000 of them are electrified. This accounts for a national electrification rate of 21.5%, with only 3.5% allocated to the rural community areas (Ayompe & Duffy, 2013; Muh et al., 2018; Nkweta et al., 2010). According to recent energy reports, Cameroon is endowed with the most hydropower potential on the African continent. Nonetheless, the country is only able to harness 5% of this potential (Ayompe & Duffy, 2013; IEA, 2015; USAID, 2018). Despite potential renewable energy sources

such as biomass, geothermal, wind, tidal, and solar energy, only hydroelectric power is widely used for electricity generation (Ayompe & Duffy, 2013; Muh et al. 2018). Hydroelectric power generation, installation, and distribution are capital-intensive. Securing the necessary funds to harness the rest of the 95% hydropower potential is arduous (IEA, 2015).

Cameroon's hydroelectric grid system experiences several irregularities and shortages. In most rural communities, schools, dispensaries, financial institutions, and local administrative buildings have no form of electricity. Lighting is only possible through kerosene lamps and a few gas-powered generators (Ayompe & Duffy, 2013). In the dry season when it is hot, much of the water volume and pressure drops causing a proportionate drop in electricity generation and transmission. Consequently, Cameroonian communities with electricity access suffer from rationing effects. Moreover, the transmission infrastructure is old, and with little or no maintenance, lose power during transmission. Access to electricity is further compounded by a growing increase in population and global fossil energy prices. Any new generation of electricity is outpaced by growing demands from rising urban and rural populations. With limited supplies, an increase in demand for electricity is orchestrating price hikes in this utility (Ayompe & Duffy, 2013). Due to limited generation, in most cases, electricity is rationed from one region to another and from one part of the community to another. Power seizure is rampant, long, and without prior warning. Maintenance repairs of broken-down transformers in residential and commercial communities take weeks and months before they are scheduled. In other cases, the voltage is very low and not sustainable enough to

satisfy daily supply needs. Moreover, electricity transformers are frequently subjected to natural and technological disasters. As a consequence, homes, commercial centers, transportation, health, financial, and educational systems in the public, private, and local community sectors are exposed to unwarranted vulnerabilities. These vulnerabilities are contributing to the continuous destruction of buildings, break-down of consumer appliances, food loss, loss of revenue to businesses and households, long waiting hours in banking and financial institutions, and deaths in hospital surgery rooms (Ayompe & Duffy, 2013; Nkwetta et al., 2010). Besides, electricity installation and consumption malpractice are common in some communities. Scheduled electricity installation and maintenance timelines are often violated. Local community residents, with the complicity of some workers of the energy-providing agency (AES-SONEL, renamed ENEO) indulge in the theft of electricity in exchange for minimal sums. Often, new installations in residential communities are slow and take too long, with no follow-ups. Even when such installations were carried out, initial billing processes were slow. It takes several months and sometimes a year or two before an initial electricity bill is issued to a consumer. The situation is dire, especially within Cameroon's rural communities where sparse population density makes electricity provision less economically competitive and inaccessible (Ayompe & Duffy, 2013). This low electrification generation poses a serious handicap to the production of goods and services, the development of an industrial base, healthcare, education, and the general political and socioeconomic well-being of Cameroonians. The lack of access to electrification impedes positive social change in every facet of life within the Cameroonian community. Unemployment is rife, as no real

growth is stimulated in the production of goods. Services are stagnating, and the development of an industrial base is far from reality. Quality healthcare, education, and the general socio-economic well-being of Cameroonians are also stagnating (Ayompe & Duffy, 2013; USAID, 2018).

Investigating major impediments to electricity access in these communities is requisite. More significantly, exploring cost-effective electricity sources and sustainable policy models is indispensable in fostering electricity access in Cameroon.

Public Policy Implications of the Problem

According to Majone (1989), the dialectics of the practice of government through which citizens and policymakers arrived at moral judgments and policy choices began with expressions of general concerns and closed with concrete decisions. The author further reiterated the interconnectivity of the subject matter of public policy and administration to include problems in public utility, public health, public safety, and public education. Lane (1986) and Bardach (2012) asserted the significance of public policy and administration as an applied social science discipline using reason and evidence to clarify, appraise and propose solutions to public problems. Cherp and Jewell (2014) argued that public administration and policy in modern and postmodern societies were guided by technological advances, with energy security playing a major role. Within this context, the various rationales suggested that the focus of public policy and administration was solving problems of public nature including energy access and policies. Public policy and administration studies maintained that solutions to these

problems were derived from various processes of research, debate, argumentation, and decision-making (Gerston, 1997; Vining & Weimer, 2015)

The problem of energy access, sustainability, and cost-effectiveness occupies a primary place in the domain of public policy and administration. By implication, the problem has been studied from several perspectives within the domain of public policy and administration. Polzin et al. (2015), for example, investigated the influence of public policy on renewable energy investments. Broto et al. (2018) conducted a study on energy justice and equity among rural populations of the developing world. Owusu and Asumadu-Sarkodie (2016) also reviewed renewable energy sources, issues in their sustainability, and mitigation of climate change. The dependence on electricity systems and the growing complexities in their access (Muh et al., 2018) underlined the significance of the ongoing research in public policy. According to Walters et al. (2015), access to electricity is invaluably connected to public policy enterprise creation, increased employment, and improved productivity. The subject of public policy thus plays a significant role in promoting electricity access.

Although the problem of electricity access has been explored from different perspectives, research on the topic is by no means exhaustive. As argued by Walters et al. (2015), access to reliable and sustainable electricity constituted a daily challenge with over one billion people in the developing world expected to still lack electricity by 2030. The topic is as significant in public policy as it continues to pose challenges. Research to this end is continuing. The present study on impeding factors and the most cost-effective electricity model complements an array of public policy research studies conducted on

electricity access and sustainability. Nonetheless, the work remains peculiar because it deals with the particular case of Cameroon. Moreover, it is an evidence-based study specifically addressing the problem of electricity access through impeding factors and the most cost-effective model.

Several research endeavors have been conducted on electricity access in Cameroon. For example, Muh et al. (2018) reflected on a holistic view of sustainable energy policies in Cameroon. Nemzoue et al. (2020), for their part, argued about the potential for geothermal development in Cameroon. Kidmo et al. (2016) also assessed the potential for wind energy development and electricity generation in the northern region of Cameroon. However, although the problem of electricity access in Cameroon was explored from different perspectives, research conducted to investigate factors impeding access to electricity was not only limited but sketchy. Likewise, studies on the most cost-effective electricity system for Cameroon were unavailable. The absence of evidence-based data addressing impeding factors to electricity access and the most cost-effective electricity policy model in Cameroon created a knowledge gap. This study addressed these issues by investigating the impeding factors to electricity access, strategies alleviating these impediments, and exploring the most cost-effective electricity policy model.

Purpose of the Study

A study of impeding factors to electricity access and the most cost-effective policy model is a qualitative paradigm-based research. The purpose of this qualitative

study was to bring about effective solutions to the problem of electricity access and sustainability in Cameroon by investigating and exploring the following:

1. The factors impeding the development of electricity access in Cameroon;
2. The strategies alleviating these impediments in the current hydroelectric supply system in Cameroon;
3. The most cost-effective method of providing electricity to Cameroonian communities; and
4. The potential public policy decisions that might be recommended in providing better access to electricity.

The goal was to bring about positive social change and improve the well-being of urban and rural communities in Cameroon through the promotion of access to electricity.

The phenomena of access, sustainability, and cost-effectiveness are preponderant concepts in the field of public policy and administration. Consequently, there are a significant number of studies in public policy and administration dealing with these concepts. Petrescu-Mag et al. (2016) conducted a case study on developing public policy options regarding access to safe drinking water in rural areas of Romania. Kim and Kim (2020) reflected on the use of a cost-benefit analysis framework to assess the social cost and benefits of the public policy vehicle restriction policy. Sakah et al. (2017) also researched sustainable electrification in Ghana by reviewing that country's renewable energy deployment policies. Marino et al. (2015) further studied the effectiveness, cost-effectiveness, and sustainability of integrated care models for the elderly. Gazzeh and Abubakar (2018) equally assessed the sustainability challenge and regional disparity

involved in accessing basic public services in Saudi Arabia. Singh (2017) analyzed the cost-effectiveness of arsenic mitigation technologies and the implications for public policy. These concepts (cost-effectiveness, access, and sustainability) have constituted the hallmark of many studies within the domain of public policy.

The Research Questions

This study was guided by the following research questions:

What factors are impeding the development of electricity access in Cameroon?

What are the measures that can alleviate these impediments?

What is the most cost-effective policy model that could provide full electricity access to Cameroonian communities?

The Theoretical Foundation

The theoretical foundation broadened our understanding of this study's focus and core constructs. This research was structured within the theoretical foundation of the systems theory propounded by Ludwig Von Bertalanffy in the 1940s. According to Bertalanffy, systems theory was based on a complex, open, and continual interaction of elements with the environment (Clark, 2014; Terrel et al., 2014). Anyebe (2018) argued that systems theory applies to public policy decision-making. In other words, systems theory conceives public policy as the response of the political systems to the demands of the environment. To this end, the challenges of energy security, environmental pollution, urban sprawl, management science, food security, and communication, were resolved through system theory approaches.

Systems theory encompassed three main propositions: “systems science” or the scientific exploration and theory of systems of various sciences; “systems technology” or the problems arising in modern technology and society; and “systems philosophy” referring to the orientation of thought and world view (Clark, 2014). A more in-depth explanation of the systems theory is provided in Chapter 2 of this study. The present study dealt with problems arising in modern technology and society requiring systems theory processes to resolve. I sought the scientific exploration of the technological aspect of the electricity access system in Cameroon. I also implored the orientation of thought in the search for impeding factors, measures alleviating these impediments, and expert knowledge recommendations on what the most cost-effective electricity policy model in Cameroon could be.

Through systems theory constructs, social change and well-being, infrastructural, economic, health, education, and employment achievement gaps could be closed (Ravitch & Carl, 2016; Terrel et al., 2014). Besides, through systems theory, individuals found effective solutions to problems encountered in life. The theory engaged in investigative and exploratory studies, bringing about effective solutions to problems experienced in organizational systems (Adcock et al., 2019; Ravitch & Carl, 2016). In correlation, the present study was both investigative and exploratory. It focused on investigating the question of factors impeding the development of sustainable electricity supply in Cameroon. It also explored measures alleviating these impediments and the most cost-effective model that could provide electricity access to Cameroonian communities that were without it. The centerpiece of this study was to bring about effective solutions to the

problems of a lack of sustainable, innovative power generation, and distribution systems in Cameroon.

Nature of the Study

This study provided a rationale for the selection of a research paradigm, tradition, and design. It further briefly described key concepts and phenomena being investigated. Finally, it provided a summary of the research methodology, describing the source and type of data collected, the method of data collection, and the nature of data analysis.

The research paradigm for this investigative and exploratory study is qualitative. The purpose was to attempt to understand expert individuals and the meaning they made out of their experiences about the phenomenon of electricity access, impeding factors, sustainability, and a cost-effective model in Cameroon.

Bolderston (2012) affirmed that the qualitative tradition was ideal in looking at the perceptions and experiences of expert individuals about phenomena. Ravitch and Carl (2016) posited that the qualitative inquiry approach identified meaning-relevant action, interpreting phenomena according to how people saw it. Rahman (2016) also considered seeking a deeper understanding and providing more interpretive content and context as an important rationale of the qualitative approach. Some other qualitative research practitioners insisted on the open-ended flexible process and the small sample size nature of the inquiry as pivotal in validating the choice of a qualitative paradigm (Corbin & Strauss, 2015; Creswell, 2014; Denzin, 2014). In addition, this study contended that the qualitative inquiry approach was most suitable because it generated the appropriate data needed to respond to the research questions and goals of the present study.

The qualitative inquiry framework was culled within the purview of the basic responsive interviewing survey design. The said design adhered to a naturalist interpretivist constructionist paradigm (Rubin & Rubin, 2012). In other words, the planned responsive interview design was inductive, iterative, reflexive, and recursive. It also involved what Ravitch and Carl (2016) defined as a dialogic engagement between the researcher and interview participants in response to the research question. The design followed a dynamic, systematic, and rigorous process of contextualization, planning, and framing of data concerning the research question (Ravitch & Carl, 2016; Rubin & Rubin, 2012). Also, it ensured the study of the research problem in its natural setting, analyzing varied knowledge of individuals about a particular reality (Denzin & Lincoln, 2013; Ravitch & Carl, 2016). Through this responsive interview model, an in-depth, varied, and rich expert account of factors impeding access to electricity and the most cost-effective electricity policy model was honed from the lenses of interview participants. The design also allowed Cameroon's electricity system's failures to be analyzed much more effectively in terms of reliability, criticality, usefulness, and depth. Best practice solutions were proposed to the question of impeding factors to electricity access and the most cost-effective electricity model in Cameroon.

Operational Definitions

Key concepts and phenomena being investigated included: electricity access, impeding factors, cost-effectiveness, and model. These concepts were used as defined within the context of this study.

Electricity Access

The concept of electricity access refers to the percentage of individuals in a given location having relatively simple and stable electricity with the potential for other positive social impacts like employment, education, and health care. The phenomenon is also associated with the term reliability and affordability. In other words, electricity access connotes a reliable and affordable source of electricity. According to the International Energy Agency (2020), access to electricity refers to the minimum level of electricity access to households, safer and sustainable cooking and heating fuels, energy enabling productive economic activity, and energy for public services.

Impeding Factors

Impeding factors refer to natural, technological, and human factors hindering smooth access to electricity. Such factors might include demand and supply, gas storage, generation changes, weather forecasts, global markets, government regulations, imports and exports, and price changes.

Cost Effectiveness

The concept of cost-effectiveness accounts for the most optimum results, advantages, and profits in comparative terms with alternative propositions. It is the cheapest way of realizing a given objective. The concept also refers to cost-benefit, cost-efficient, least-cost, competitive, and budget-friendly. Its analysis could be used to identify inefficiencies and to bring out the most competitive solutions to challenges in public policy and governance.

Model

A model refers to a guide that provided a communication framework enabling analysts and experts to exercise judgment within a defined context. Several cost-effective models were suggested by public policy research practitioners as an efficient guide to predicting positive outcomes.

Research Site

The research site was based in Cameroon. Within this setting, three main interview regions (Yaoundé, Douala, and Limbe) were selected based on their pragmatic nature, their relevance to the research goals, and the research questions. Another rationale for the selection of these sites was their relative safety compared to the existing climate of insecurity in many locations in Cameroon. Traveling through Yaoundé, Douala, and Limbe by road transport required a lot of patience and time because of a multiplicity of security roadblocks and checks. Besides the danger of contracting diseases such as cholera, typhoid, meningitis, and malaria, there was a growing rate of targeted kidnapping, random armed attacks, and killings. Specific interview locations in these three main regions were determined later. The choice of such locations was determined by factors related to proximity, safety, tranquility, and overall conduciveness as agreed upon by the researcher and the participant.

Participant Selection

The selection of participants for the study was based on purposeful sampling. The goal was to purposefully select individuals with experienced knowledge about the research problem, and unique abilities to respond to the research questions. A purposeful

sample of 20 individuals was used to conduct in-depth responsive interviews. Selected participants were on-the-field energy experts and energy policy decision-makers based in Cameroon. These included adult women and men with varied knowledge of hydroelectric, alternative, and sustainable energy sources and policy experience. Targeting experts, asking them relevant questions, and seeking their feedback ensured a more rational response to the question of impeding factors and cost-effective electricity access system in Cameroon.

Participants were treated with respect, dignity, and courtesy. They were reminded of their right to freely participate and to withdraw any time they chose to. Participants also completed a confidentiality agreement form ensuring the confidentiality of their participation. While there was no potential harm perceived in their participation in this study, participants' contributions in the form of transcripts, audio recordings, and files were stored in a secure location by the researcher. Any information identifying participants' office was coded to reflect anonymity. In cases of name identification, pseudonyms were used. Participants were assured that no third party not involved with the research would gain access to the information they would provide during the interviews. Mindful of the qualitative nature of the responsive interviewing model, certain types of interview questions such as probes evolved along with the study (Rubin & Rubin, 2016). A sample of the nature of the questions asked was provided in the appendix.

The data collected for this study were from scheduled individual interviews. Semi-structured, topical, one-on-one, audio-recorded interviews were conducted. The

one-on-one interview format allowed for accurate screening of the participant and enabled the researcher to capture individual verbal and non-verbal cues. Rubin and Rubin (2012) recommended the semi-structured interview as the core form of in-depth qualitative interviews. The rationale was that this approach dealt with a specific topic, prepared a limited number of questions in advance, planned to ask follow-up questions, and focused on planned items that spoke to the research question. Moreover, the data collection approach encouraged interview participants to provide vivid details while responding to research questions (Rubin & Rubin, 2012). The interviews were based on the specific topic of impeding factors to electricity access and the best most cost-effective policy model that could foster electricity access in Cameroon. The focus of the interview questions was on the theme of impeding factors, strategies to alleviate these impediments, and the best-cost effective electricity model. The nature of the interview questions was open-ended, flexible, and evolving. Rubin and Rubin, as well as Ravitch and Carl (2016), asserted that this form of interviewing was designed to tap varied in-depth knowledge and experience of interviewees. Only data from responses that directly addressed the study's research questions were considered. Additional data were drawn from the researcher's memo, archival documents, academic and professional journals, and expert and informed opinions in the field of sustainable energy and public policy. Data were stored in secured files.

The data analysis followed an integrated approach to qualitative data analysis techniques. It was systematically scrutinized and managed in an organized and flexible manner at various levels of the research process. It was also conducted faithfully,

maintaining the fidelity of the participants' responses, as experts of their own experiences (Ravitch & Carl, 2016). The first phase of the analysis focused on issues directly related to factors impeding the development of a sustainable electricity system in Cameroon. The second phase was based on strategies to alleviate the impediments. The third phase was directed to the most cost-effective electricity policy model suitable for Cameroon. Evidence from responses that directly addressed this study's research questions was considered. Such evidence was coded, categorized, and analyzed. Data analysis processes of triangulation were engaged when necessary.

Interview questions and response transcripts were manually coded using numerical, summative, essence-capturing, and evocative attributes as codes. These codes were analyzed into categories, and subsequently, as themes related to factors impeding electricity access and the most cost-effective electricity model in Cameroon. Besides manual coding, the data analysis process took into consideration the use of Computer-Assisted Qualitative Data Analysis Software (CAQDAS). The In Vivo software was to be used to sort, organize, and manage the study's data. According to Saldaña (2016), the In Vivo coding was most appropriate for qualitative data analysis particularly when the study prioritized the participant's voice. Saldaña also agreed that this integrated data processing approach saved time and minimized threats to validity and reliability. However, this researcher was not comfortable with the use of the software. The organization and management of the data were thus manually conducted by the researcher.

Assumptions

A study of impeding factors to electricity access and the most cost-effective policy model is a qualitative paradigm-based research. The paradigm represented basic belief systems based on epistemological and ontological assumptions. These assumptions represented the worldviews of both the researcher and the research participants in this study. It was hoped that these views could be espoused in the most honest and in-depth manner to represent credible and valid data that responded to the research question. It was equally hoped that this study could provide a solution to the problem of electricity access in Cameroon. A significant assumption in this study was that the suggested research approach, the methodology, and the design represented the best approach to respond to the research question. In addition, by most indications, it was assumed that this study's findings could ignite an academic debate on impeding factors to electricity access and the best cost-effective policy model in Cameroon.

Ravitch and Carl (2016) argued that the qualitative paradigm defined the belief system of individuals, their place in it, the nature of the world, and their relationship to it. In this case, it could be assumed that the reality of the responses provided by this study's participants must be accepted simply on faith. There was no way to verify with certainty the ultimate truthfulness of these responses. For example, how could we know that the responses provided by the research participants of this study were not pure inventions of the human mind? How could we justify the veracity of the responses provided by the research participants in this study? Although there was an established relationship between the participants and their experience, the participants were all subject to human

errors and biases. Their responses were conditioned by their realities. As noted by Rubin and Rubin (2012), reality is seen only in the eyes of the interviewee. In correlation, it was also assumed that the research analyses would be subject to the research participants' responses. The reader might not be compelled to accept these analyses simply based on indisputable evidence but by persuasion. In an analogous manner, it was assumed that the interpretation of the research findings and recommendations would be guided by my analytical assumptions.

Ultimately, these assumptions had important consequences for the practical conduct of this study, its analyses, the interpretation of its findings, and recommendations. Such consequences could create opportunities for further exploration of the study or similar studies.

Scope and Delimitations

Cameroon's hydroelectric grid supply, the country's main source of energy, is marred by the absence of a sustainable innovative power generation and distribution system. This vulnerability is impeding positive social change transformations within Cameroonian communities. Investigating and exploring factors impeding the development of electricity access in Cameroon, measures to alleviate these impediments, the most cost-effective method of providing electricity to Cameroonian communities, and potential public policy decisions that could be recommended in providing better access to electricity, could lead to effective solutions to the problem of electricity access and sustainability in Cameroon. The goal was to bring about positive social change,

improving the well-being of urban and rural communities in Cameroon, through the promotion of access to electricity.

This qualitative research study focused on acquiring specific expert data from an estimated 20 participants who were experienced and knowledgeable in sustainable electricity access, impeding factors to electricity access, and the most cost-effective electricity policy model. The study precluded participants who had just general knowledge and experience with no relevance to the research problem and questions. Although the phenomenological theory appeared to be most related to this area of study, no investigations were carried out.

The problem of electricity access was common in most of the regions in Sub-Saharan Africa. The International Energy Agency (2015) argued that access to electricity remained a daily challenge to over eighty percent of people living in developing countries. The World Bank data (2018) also assessed that the Sub-Saharan African regions of Burundi, Chad, Burkina Faso, the Democratic Republic of Congo, and Central Africa Republic had less than 30% electricity access. Although the problem of electricity access was common in the Sub-Saharan African region, the research findings for this study could only be applicable within the context of Cameroon.

Limitations

Fostering electricity access in Cameroon through the most cost-effective model was specific to those communities without a sustainable electricity access system. The findings of this study were not generalizable to other communities that were not within the same contextualized setting. The unique geopolitical, socioeconomic, and historical

environment of Cameroon took preference over all other considerations in this study. As an international research study, designed to recruit participants, and collect and analyze data outside the United States, challenges abound. Cameroon was currently facing civil strife within its English-Speaking northwest and southwest regions. Separatist movements within these regions, supported by their counterparts in the diaspora were bent on restoring the independence of Southern Cameroons which they considered stolen from them by a UN forced union with French Cameroon. In northern Cameroon, terrorist activities orchestrated by Boko Haram are destabilizing the region and creating insecurity. The outbreak of the deadly coronavirus and its consequent pandemic effects was an overwhelming community challenge. These security barriers limited my movement to these areas. They also limited the participation of potential research participants coming from these regions. With the civil war in effect in Cameroon, traveling to the country was risky. Regular power shutdowns and rationing, issues with obtaining travel visas, traveling to certain regions within Cameroon, access to research participants, needed sample size, and data collection sites posed as barriers to the study.

Several biases might equally influence this study's outcome. The qualitative interview design that ensured participants' responses met the needs of the research questions could be subjective. This was because the reality expressed by the participants' experiences was mostly seen through the lens of the participants. The responses of the participants might also be subjective and biased. So too were my analyses and findings, extrapolated based on the research questions.

Several reasonable measures were used to address these limitations. To avoid the security risk involved in the ongoing civil war in Cameroon, the research instrumentation was modified to provide a secure setting in the qualitative interviewing process. In this regard, one-on-one meetings were held with individual research participants at a scheduled date, time, and place conducive to the individual research participants and myself. Attempts were made to cover at least the minimum number of required research participants for this qualitative-based study. To avoid bias and subjectivity, multiple individuals were involved in coding the data. The study's research participants reviewed the results of the analyses. More data sources and alternative explanations were reviewed for authentication. Finally, to maintain objectivity and avoid biases, the findings of this study were reviewed with other peers from Walden University.

Significance of the Study and Social Change Implications

A study of impeding factors to electricity access and the most cost-effective policy model is significant in many ways. It investigates factors impeding the development of electricity access in Cameroon. In so doing, it created awareness among public policy scholars and practitioners, stakeholders, and policy decision-makers on the inadequacies of the current electricity access system in Cameroon. The study also explored the most cost-effective method of providing electricity access to Cameroonian communities. This endeavor could sensitize many stakeholders on the potential value of the resources available to foster electricity access in Cameroon. The study could further inform on the best public policy decisions that may be recommended to provide better access to electricity in the country. The study could bridge the present knowledge gap

created by the lack of a cost-effective system for electricity access. It could promote the development of policies encouraging energy combinations that enhanced the expansion of cost-effective electricity access in Cameroon. The study could also provide public policy decision-makers and energy stakeholders with the choice of a cost-effective and sustainable electricity system for their communities. It could assist researchers and Cameroonian energy stakeholders to appreciate in great depth the problem of electricity access. Access in this case is not just for those who did not have electricity but also for those who did not have enough or could not afford it. The research could foster the expansion of electricity access in Cameroonian communities. Electricity is life. Making it available to every community in Cameroon is indispensable. A sustainable supply of electricity could ensure the efficient and smooth running of daily domestic routines and promote domestic industries. The study's outcome could ignite further research into the most sustainable and feasible combinations of energy sources in Cameroon and beyond. Since the lack of electricity sustainability was a common problem in most of Africa, the results could have a replicability effect in other regions with similar problems in Sub-Saharan Africa and beyond. A well-investigated cost-effective electricity acquisition system and policy model could enable Cameroonian communities to meet the United Nations' challenge for universal access to electricity for all by the year 2030. The results of the study could also offer the most feasible cost-effective method to provide adequate electrical power within the Cameroonian context.

The core significance of this study was embodied within the framework of positive social change. Callahan et al. (2012) defined social change as evolutionary

progress aimed at closing social inequality gaps. According to McMichael (2012), social change guided political and economic governance policies and provided a more sustainable development-oriented environment. The notion was also considered by many institutions as articulating responses to social problems and systems (Walden University, 2015; United Nations Research Institute for Social Development, 2012). The present study sought to promote progress through the idea of a sustainable cost-effective electricity source and policy system. Exploring potential cost-effective electricity power systems, strategies, and policy options could hone energy efficiency in Cameroon. Providing a policy model that could enhance a sustainable source of electricity could create multifaceted social benefits for its communities. Such benefits could include access to lighting, pipe-borne water, food conservation and storage, industrialization, refrigeration, heating, employment, health care, education, financial services, road traffic, and entertainment. The study could equally be a vehicle for positive social change in people's lives and well-being. This includes longer life expectancies, better living conditions, and access to modern technological advances. Most cost-effective models have been instrumental as a vehicle for positive social change in several communities.

Summary of Chapter 1

Cameroon's hydroelectric grid supply, its main source of electricity, is marred by the absence of innovation and sustainability. This situation was impeding socio-economic progress. The problem is compounded by an exponential rise in the demand and price of energy worldwide. In the mix of the inadequacies of the current hydroelectric system, there was a need to explore Cameroon's most cost-effective sources of electricity and

public policy decisions. Such a study could inspire positive social change and real-time socio-economic growth within Cameroonian communities. By implication, the study fell within the theoretical foundations of the systems theory: a theory that aimed at exploring social change solutions to emerging problems in communities. Through a systems approach inquiry, the views of Cameroonian energy specialists and policymakers could be described and interpreted.

Exploring factors impeding the development of electricity access could provide in-depth knowledge and understanding of the causal impact of factors preventing electricity access in Cameroon. More so, a carefully investigated cost-effective electricity acquisition system and policy strategy could foster sustainable electricity access in Cameroon. The research could serve as an evidence-based study providing advocacy in public policy research and governance. It could also catalyze positive social change in policy. Access to electricity, and its annex services underpinned progress in education, improved health, and livelihood. The demand for electricity, orchestrated by increasing demographics was an impetus in the search for sustainable and cost-effective electricity alternatives. The United Nations renewed efforts in calling for universal electricity access for all by the year 2030 further gave credence to the relevance of this study. The main objective was to bring about effective solutions to the problem of electricity access within Cameroonian communities.

While this first chapter provided an introduction and background of the research study, the research problem and question, theoretical considerations, and the significance

of the study, the second chapter reviews the research strategy and provides a more detailed analysis of the theoretical foundation, and current related literature.

Chapter 2: Review of Research Strategy and Literature

Introduction

Cameroon's hydroelectric grid supply, the country's main source of energy, is marred by the absence of a sustainable innovative power generation and distribution system. This vulnerability is impeding positive social change transformations within Cameroonian communities. Although the Cameroon government is making efforts to improve access to electricity, current data showed that no significant progress has been made. The literature on electricity supply in Cameroon suggested many months of shortages and rationing in both urban and rural communities (Eneo Cameroon, 2020; Muh et al., 2018;). The government campaign slogan, "Access to electricity for all Cameroonian communities by 2035" (Eneo Cameroon, 2020), remained an illusion. The number of electricity blackouts in urban and rural communities was increasing daily. An average of 10 blackouts was registered monthly and students sitting for nationwide tests, shopping centers, financial institutions, and hospitals were unable to function regularly because of intermittent blackouts.

The purpose of this qualitative study was to bring about effective solutions to the problem of electricity access and sustainability in Cameroon. To this end, the study investigated and explored the factors impeding the development of electricity access in Cameroon, strategies to alleviate these impediments, the most cost-effective method of providing electricity to Cameroonian communities, and the potential public policy decisions that might be recommended in providing better access to electricity. The goal

was to bring about positive social change, improving the well-being of urban and rural communities in Cameroon through the promotion of access to electricity.

This second chapter defines the literature search strategy, and more broadly, reviews the theoretical foundation, key concepts, and the related literature to these concepts. The chapter further provides a review of the current relevant literature to the study, a summary, and a conclusion.

Literature Search Strategy

The search strategy for this study involved identifying key concepts of the research question, selecting relevant library journal databases, choosing the search source, and reviewing, and refining results. Retrieving accurate data results to respond to the research question for this study required the use of several data sources. These included accessible library databases and search engines of the Walden University databases, Science Direct, Research Gate, Sage Journal, and Google Scholar. Supplementary data sources included the United Nations Research Institute for Social Development, the United States Agency for International Development, the Alliance for Rural Electrification, and the International Energy Agency databases. Relevant academic research material was also found through the Walden Library resource person and the Walden Research Writing Center. Mind mapping was used as rough notes to organize reflections on this study. A researcher notebook helped to organize thoughts and keep track of conference notes, sources, and processes.

The Boolean operator searching technique was used to eliminate irrelevant results. Key search terms used were *access*, *sustainability*, and *cost-effective*. The

combination of search terms used included *electricity access*, *electricity sustainability*, *electricity access and/or sustainability*, *cost-effective models*, and *electricity access and/or cost-effective models*. This strategy generated several peer-reviewed and academic journal articles used as references in this study.

Although a substantial amount of data was found on electricity access and sustainability, much of this data was generalized. Some of the data dealt with specific case studies, related, and sometimes, unrelated to the research topic and question. Also, research conducted on electricity access in Cameroon was relatively limited. Little research was also found on cost-effective electricity policy models. In this regard, the question of factors impeding electricity access and the most cost-effective electricity policy model in Cameroon remained relevant.

The Theoretical Foundation

The theoretical foundation broadened our understanding of this study's focus and core constructs. It also guided the selection of relevant data for the study. This research was structured within the theoretical foundation of the systems theory propounded by Ludwig Von Bertalanffy in the 1940s. According to Bertalanffy, systems theory was based on a complex, open, and continual interaction of elements with the environment (Clark, 2014; Terrel et al., 2014). Mele et al. (2010) espoused systems theory as an interdisciplinary theory about every system in nature, society, or organization, and a framework to investigate phenomena holistically. More recent systems theoreticians simply defined the concept through the example of a refinery system, the human body system, a business organization system, or a set of principles, ideas, or concepts forming

a theory such as the democratic system, the despotic system, the capitalist system, or the Marxist system. Current literature indicated systems theory evolved into an interdisciplinary field of study, derivative of several subsystems, concepts, models, and principles (Turner & Baker, 2019). Consequently, within the domain of public policy, Ramos et al. (2019) suggested systems theory had a multidisciplinary, interactive, transdisciplinary, and multifaceted theoretical foundation. According to these researchers, this foundation extended beyond fields of analysis, modeling, and the formulation of policy for the optimization of organizational performance. Complementing the same view, Anyebe (2018) argued that systems theory applied its processes to public policy decisions making. In other words, systems theory conceived public policy as the response of the political systems to the demands of the environment. To this end, the challenges of energy security and sustainability which was the focus of this study, environmental pollution, urban sprawl, management science, food security, and communication were resolved through systems theory approaches.

According to Clark (2014), there are three main propositions in systems theory: "systems science" or the scientific exploration and theory of systems of various sciences; "systems technology" or the problems that arise in modern technology and society; and "systems philosophy" referred to the orientation of thought and world view. The present study deals with problems that arise in modern technology and society that require systems theory processes to resolve. There is need for a scientific exploration of the technological aspects of the electricity access system in Cameroon. The need to orientate the study towards the search for impeding factors and the most cost-effective electricity

policy model in Cameroon is also a prerequisite to resolving the problem of electricity access in Cameroon.

There is a significant amount of literature related to the research-based analysis of how the theory was applied previously. Alter (2018), for example, focused on describing and analyzing systems theories in organizations to provide more understanding and innovation in information systems. Maes and Hootegem (2019), on their part, worked on developing a systems model of organizational change from different discourses brought together into an integrated systems model. This resulted in a systems model of organizational change adapted to the complexities of organizations. Hauman's (2015) dissertation presented an analysis of the history of flash mobs as a communication form through the application of Luhman's systems theory. At the end of the study, I concluded that both individuals and social structures interacted with other systems in the course of communicating through flash mobs. Anyebe (2018) conducted a comparative and contrastive analysis of different theoretical approaches (including the systems theory approach) to the study of public policy. My findings concluded that the choice for any theoretical approach depended on the objective association of each approach to the particular public policy problem.

The rationale for the choice of systems theory within this study was motivated by several arguments. As a framework for investigating phenomena from a holistic perspective, systems theory gives rise to the exploration of multiple feasible factors and conditions for major policy reforms (Adcock et al., 2019; Mele et al., 2010). Many current theorists advocate systems theory as the prescriptive theory in modern-day public

policy management systems. The motivation behind this perspective is because systems theory deals with complex issues and challenges of a system or systems (Chikere & Nwoka, 2015; Ramos et al., 2019). The theory is further used to consider analyzing, designing, developing, and implementing policy solutions to emerging problems within communities. Through systems theory constructs, social change and well-being, infrastructural, economic, health, education, and employment achievement gaps could be closed (Ravitch & Carl, 2016; Terrel et al., 2014). Besides, through systems theory, individuals find effective solutions to problems encountered in life. The theory engages in investigative and exploratory studies bringing about effective solutions to complex problems experienced in organizational systems (Adcock et al., 2019; Ravitch & Carl, 2016;). The present study replicated all these arguments. It focused on investigating the question of factors impeding the development of sustainable electricity generation and supply in Cameroon. It also explored the most cost-effective policy system or model that could provide electricity access to Cameroonian communities that were without it. The study's research question built upon complex problems in the public policy environment within which the systems theory focused on resolving. In correlation with the systems theory, the goal of this study was to bring about effective solutions to the problems of lack of electricity access, sustainability, innovative power generation, and distribution system in Cameroon. As suggested from the study, investigating impeding factors to Cameroon's electricity access system, and exploring the most cost-effective electricity policy model for the country could bridge the problem gap in electricity access.

Review of Key Concepts and Literature

Key Concepts

The phenomena of access, sustainability, and cost-effectiveness are preponderant concepts in the field of public policy and administration. Consequently, there is a significant number of researched studies in public policy and administration dealing with these concepts. Petrescu-Mag et al. (2016) conducted a case study on developing public policy options regarding access to safe drinking water in the rural areas of Romania. Kim and Kim (2020) reflected on the use of a cost-benefit analysis framework to assess the social cost and benefits of the public policy vehicle restriction policy. Sakah et al. (2017) also researched sustainable electrification in Ghana, by reviewing that country's renewable energy deployment policies. Marino et al. (2015) further embarked on the effectiveness, cost-effectiveness, and sustainability of integrated care models for the elderly. Gazzeh and Abubakar (2018) equally assessed the sustainability challenge and regional disparity involved in accessing basic public services in Saudi Arabia. Singh (2017) analyzed the cost-effectiveness of arsenic mitigation technologies and the implications for public policy. These concepts (cost-effectiveness, access, and sustainability) constituted the hallmark of many related studies (including this one) within the domain of public policy.

The study focused on exploring impeding factors to electricity access, examining measures to alleviate these impediments, and investigating the most cost-effective way to overcome the dearth of electricity available to the Cameroonian people. Providing the most cost-effective energy system and policy model could stimulate positive social

change within Cameroonian communities in many ways. It could significantly mitigate the problem of lack of electricity access to Cameroonian communities. It could also reduce waste and increase efficiency. It could further provide socio-economic expansion and bridge the existing research gap. Exploring impeding factors to electricity access could provide a beginning solution to the causal implication of electricity access. A carefully investigated cost-effective electricity acquisition system and policy strategy could ensure sustainable electricity access in Cameroon.

Review of Literature

A review of related literature was critical to an understanding of this study's object of inquiry. The problem of electricity access in Cameroon had been studied from different perspectives. Related studies indicated that much of the current researched data focused on access to a variety of innovative energy alternatives and policies in several settings. The peer-review academic journal article, "Sustainable energy security for India: An assessment of the energy supply subsystem," written by Narula et al. (2017), assessed the relevance of India's primary sources of energy. Using 23 selected metrics, the researchers examined a multidimensional sustainable energy security index (Narula et al., 2017). At the end of this quantitative study, the authors concluded, the assessment provided a comprehensive way to track India's energy supply performance system. Narula et al.'s article, however, fell short of determining the potential cost-effectiveness of these energy sources.

Another peer review article, "An assessment of the potential and sustainability of renewable energy sources" in Friuli Venetia Giulia by Diego et al. (2016), assessed the

current energy strategy used in the European Union. The authors aimed to understand which energy types or technologies were best used to address energy problems in the European Union. The study in its conclusion suggested making the best use of renewable energy sources and energy-related technologies available (Diego et al., 2016).

A third article written by Nkwetta et al. (2010) posited that Sub-Saharan African countries suffered from severe energy irregularities and underutilization of renewable energy sources. According to the study, energy production within Sub-Saharan African countries was primarily fueled by wood and large hydropower stations which were environmentally destructive. Moreover, recent fluctuations in crude oil and natural gas prices, and the irregular supply of electric power, fueled public dissatisfaction. As a solution, stated the authors, Sub-Saharan African countries needed to take advantage of several renewable energy technologies demonstrated by the research (Nkwetta et al., 2010). Although Nkwetta et al.'s article opened up the way to discussions on renewable energies, it did not articulate the role of public policy as a determinant in the choice of these energies. Moreover, the study appeared too generalized. Energy potentials differed from one country to another. A case-by-case study of the energy potentials of a country could provide a more plausible solution to the issue of sustainability. The article however raised a genuine concern related to the present study: The lack of diversification of energy production impeding energy sustainability in Sub-Saharan African countries.

Studies by Dincer and Acar (2015), also focused on achieving better sustainability through clean energy solutions. In their evaluation, Dincer and Acar (2015) ranked energy sources based on technical, environmental, and economic performances.

The aim was to identify the improvement potentials of each. Unlike the focus of the present study, this categorization did not take into consideration the cost-effectiveness of the energy sources.

Weldu and Asefo (2017) also provided insight into categories of renewable energy sources that could contribute to the transformation of Alberta's fossil-intensive electricity. Focusing on the most cost-effective way of achieving environmental sustainability in electricity generation, Weldu and Asefo (2017) reported that bioenergy could withstand the transformation of coal power plants to more sustainable power production.

In a related research, Terrapon-Pfaff et al. (2014), documented an empirical evaluation of the impact of small-scale and community-based renewable energy projects. The researchers suggested in their findings, the importance of affordability and reliability factors in meeting the energy sustainability needs of developing communities.

Nair and Garimella (2010), in earlier research, also examined ways to mitigate the variability and intermittency of renewables while being integrated with the power grid. It was discovered in the proposed study that incorporating a battery element within the renewable harnessing system improved technical, financial, and consumer benefits. This matrix ensured electricity sustainability and affordability in both residential and commercial dwellings.

In a later study, Narayan et al. (2019), explored the sustainability of off-grid solar home system electrification access. Examining a multi-tier matrix for measuring access to sustainable household electricity supply, the researchers underscored the

importance of optimizing the battery, photovoltaic, and converter sizes. This dimensioning exercise minimized energy dump and maximized battery lifetime and the solar home system reliability (Narayan et al., 2019).

Recent trends indicated significant research attention in innovative renewable electricity models and policies within Sub-Saharan Africa. In a qualitative study on the ethnographies of electricity scarcity and poverty, Munro and Schiffer (2019), demonstrated the role of political economy in electricity access within Sub-Saharan Africa. Both researchers found that conceptualizing access to sustainable energy within socio-economic and political dimensions required political will. The article did not however provide a determinant of political will as proposed by this study.

Panos et al. (2016), also conducted similar research from a quantitative perspective. They analyzed two energy models with an estimated financial investment to eradicate deficient electricity access in Asia, Latin America, and Sub-Saharan Africa. In their findings, the researchers asserted the need for a radical broad-based decentralized approach toward universal energy access. Such an approach according to Panos et al. (2016), considered the use of renewable options, private sector funding, provision of suitable policies, and a favorable investment climate. The scope of Panos et al.'s study, however, appeared quite broad in comparative terms with the present research study. Moreover, the quantitative approach explored by the researchers distanced the present qualitative study from the latter.

Lenz et al. (2016), equally investigated the effects of electrification on beneficiary groups in Africa. In a mixed-method approach, surveying the Rwandan

Electricity Access Role-Out Program, Lenz et al. (2016), found that the program facilitated people's well-being. As a pathway to the United Nation's Sustainable Energy for All (SE4All), the researchers informed the need for a comparative study of on-grid and off-grid electrification concerning impact potentials, and ability to pay. Although Lenz et al.'s (2016) study related to the subject matter of electricity access, its mixed-method approach sharply differed from the qualitative approach used by the present study.

In an earlier study, Walters et al. (2015) proposed fostering electricity access by engaging the support of the private sector stakeholders in a holistic manner. According to these researchers, using a holistic approach was the best way to expand electricity access especially in rural areas. Although Walters et al.'s suggestion to use the support of the private sector stakeholders to foster electricity access seemed plausible, the question of the cost-effectiveness of the energy source and policy remained unanswered. Most rural communities, especially in Cameroon, could hardly afford to pay electricity bills.

Rolland and Glania (2011), viewed access to cost-effective sustainable electricity from the perspective of a hybrid mini-grid generation. Focusing their study on rural electrification, the researchers conducted a comparative analysis of cost-effective electricity sources for rural electrification. Both asserted grid extension was too costly, and not feasible in rural areas (Rolland & Glania, 2011). Rolland and Glania's report hinged on a related aspect of the present research. Both studies focused on sustainable cost-effective models in electrification. They however differed from one another in terms of the scope, context, and research approach.

Using a similar research approach, Lecoque and Wiemann (2015) assessed the need for a reliable and successful productive use of renewable energy (PURE) access in nine developing African countries. In their findings, both researchers reported the significant role PURE played in enhancing economic growth, health, education, employment, and quality of life in rural communities.

Bhatia and Angelou (2015) focused their attention on the quality of energy being accessed. Conceptualizing a multi-tier framework for defining and measuring access to energy, Bhatia and Angelou concluded that energy access could be built around adequacy, availability, affordability, reliability, legality, health, and safety criteria (Bhatia & Angelou, 2015).

In an analysis of twenty case studies, Wiemann et al. (2014) documented a series of clean energy best practices for Africa. According to the research, challenges in energy access for rural communities in Africa could be overcome through off-grid renewables. In this case, depending on the particular context, a renewable found sustainable, could be used to provide electricity to communities without it. Wiemann et al.'s research opened the way for researching potential cost-effective renewable energy choices adaptable in different communities. The main significant difference with the present study could be found in terms of the number of case studies and the methodology considered.

Kenfack et al. (2017), emphasized the poor commitment and dedication of Central African governments in promoting renewable energy resources. Taking Cameroon as a case study, the researchers suggested actions to promote and sustain the

development of renewables. These suggestions, although related to the present study, did not however respond to the question of the most cost-effective energy model for Cameroon. The issue of factors impeding electricity access also remained unanswered.

Enongene et al. (2017) also examined the benefits of energy savings transitioning from incandescent to compact fluorescent lamp (CFL) and light-emitting diode (LED) lighting. The study produced positive cost-effective results. It nonetheless was limited to household lighting of a particular type of light bulbs and did not refer to any potential energy source nor policy model.

In tandem with evidence-based studies, while challenges in electricity access accentuated due to increase population demand and the rate of power failure and rationing in Cameroon, the number of related researched literature also surged. Muh et al. (2018) for example, conducted a holistic overview of sustainable energy policies in Cameroon. In their study, Muh et al. argued that with persistent power outages throughout the whole year, and an over-reliance on hydro power generation, it was time the Cameroonian government promoted a holistic policy that considered all of Cameroon's energy potentials. Muh et al.'s research deserves some merits. It provides an assessment of potential energy sources found in Cameroon. Such an assessment could be a determinant in the making of an energy policy choice that fosters electricity access in Cameroon. However, the problem of the lack of a sustainable and innovative electricity access system continues to intensify as the question of impeding factors to electricity access and the most cost-effective electricity policy model remains unanswered.

Conducting research on the energy sector of Cameroon, Lea and Ndjinang (2018) analyzed the production and consumption of different forms of energy in the country, advocating new strategies to foster sustainable energy policy. While Lea and Ndjinang's study promoted similar research objectives to this work, the scope and nature of their study was limited to the present trend of energy production and consumption in Cameroon. This study goes beyond the present energy trend in Cameroon. It deals with other potential energy alternatives and their cost-effectiveness.

Data analysis of literature on electricity access and sustainability revealed the existence of a significant amount of relevant related literature. Although the concept of electricity access had been studied from several different perspectives, the question of impeding factors and most cost-effective electricity policy model for Cameroon remained under-explored. Moreover, much of the existing literature related to the research question and methodology was quantitative in nature, design, and analysis. To this end, Ravitch and Carl (2016) contended that quantitative questioning was rigid, closed-ended, and lacked depth. Rubin and Rubin (2012) also asserted that such questions were not very useful in exploring new terrains. The quantitative assumption technique did not align with the type of research questions posed in this study. Notwithstanding, the existing literature did not address the specific question of impeding factors to electricity access in Cameroon. Neither did it suggest any investigation on the most cost-effective electricity model for the country. The absence of such a data, creates a literature gap that needs to be filled. This study attempts to fill this gap by responding to the question of "what factors are impeding the development of a sustainable electricity supply system, what strategies

are needed to alleviate these impediments, and what is the most cost-effective policy model that could provide electricity access to Cameroonian communities without it?"

The present study is qualitative. The qualitative-based systems paradigm is used to respond to the question of what factors are impeding the development of a sustainable electricity supply system, and what is the most cost-effective electricity policy model that could provide electricity access to Cameroonian communities without electricity. The choice of a qualitative-based systems approach in this study was more relevant and appropriate because the qualitative paradigm provided a better understanding of the richness, depth, and subtlety of individual varied expert knowledge on the question of electricity access in Cameroon. The approach further helped to guide the selection of relevant data, interpret the data, and illuminate findings from the observed phenomena. The approach was more rational to the type of research questions and design for this study. It was also more plausible with the in-depth knowledge and expertise required to respond to the complex issues of electricity access posed by the study. The purpose of this qualitative study was to bring about effective solutions to the problem of electricity access and sustainability in Cameroon. This could be achieved by investigating factors impeding the development of electricity access in the country, examining measures alleviating these impediments, exploring the most cost-effective method of providing electricity to Cameroonian communities, and suggesting the potential public policy decisions that might be recommended in providing better access to electricity. The goal was to bring about positive social change, improving on the

wellbeing of urban and rural communities in Cameroon, through the promotion of access to electricity.

Summary of Chapter 2

Cameroon's hydro-electric grid supply, the country's main source of energy, is marred by the absence of a sustainable innovative power generation and distribution system. Although the Cameroon government was making efforts to improve access to electricity, the literature on electricity supply in Cameroon suggests many months of shortages and rationing in both urban and rural communities. This study investigated factors impeding the development of electricity access, and explored the most cost-effective electricity policy model in Cameroon. The goal was to bring about positive social change, improving on the wellbeing of urban and rural communities in Cameroon.

Accessible library databases and search engines of the Walden University and other supplementary sources were used to retrieve accurate data results to respond to the research question. Search terms used included 'electricity access', 'electricity sustainability', 'electricity access and /or sustainability', 'cost-effective models', and 'electricity access and /or cost-effective models'. Some of the data generated was generalized and some was specific to the research topic and question. There was also limited research on electricity access in Cameroon.

Guided by Bertalanffy's systems theory, the qualitative systems-based study, served as a framework to investigate the phenomenon of electricity access from the stand point of impeding factors and the most cost-effective electricity policy model for Cameroon. Fundamentally, the systems theory extended beyond fields of analysis,

modeling, and the formulation of policy for the optimization of organizational performance. As a framework for investigating phenomena from a holistic perspective, systems theory gave rise to the exploration of multiple feasible factors and conditions for major policy reforms. Moreover, because it dealt with complex issues, analyzing, designing, developing, and implementing policy solutions, current theorists considered it as the prescriptive theory in modern day public policy management systems. The present study aligned with the tenets of the systems theory because of its investigative and exploratory propositions. The study's research question built upon complex problems in the public policy environment within which the systems theory focused on resolving. As the study suggested, investigating impeding factors to Cameroon's electricity access system, and exploring the most cost-effective electricity policy model for this country could bridge the existing literature gap and foster public policy decisions on electricity access in Cameroon.

Acquired from several databases, much of the relevant literature reviewed, articulated the problem of electricity access from different perspectives. For example, Ayompe et al. (2014) and Diego et al. (2016), focused on assessing the energy potentials of renewables. Duffy et al. (2015), Devin-Wright (2006), and Dincer (2015) reviewed energy solutions. Terrapon-Pfaff et al. (2014), Weldu and Assefa (2017), and Wiemann and Lecoque (2014) dwelt on the environmental impacts of renewables. However, a thorough review of the existing literature revealed that although the idea of fostering electricity access was relevant, factors impeding the development of electricity access, and the most cost-effective policy model remained unexplored. Moreover, the existing

research needs further investigation on the measures needed to alleviate the impeding factors to the electricity access system in Cameroon. Likewise, there is need to broaden the research scope on the potential public policy decisions that might be recommended in providing better access to electricity in Cameroon. This knowledge gap limits the ability of research practitioners, policy decision-makers, and other stakeholders from making informed decisions on electricity access in Cameroon. The next chapter provides the research method and design used in bridging the existing gap.

Chapter 3: Research Method

Introduction

Cameroon's hydro-electric grid supply, the country's main source of energy, is marred by the absence of sustainable innovative electric power generation and distribution system. The purpose of this qualitative study was to bring about effective solutions to the problem of electricity access and sustainability in Cameroon. This could be achieved by investigating factors impeding the development of electricity access in the country, exploring strategies alleviating these impediments, examining the most cost-effective method of providing electricity to Cameroonian communities, and suggesting the potential public policy decisions that may be recommended in providing better access to electricity. The goal was to bring about positive social change and improve the wellbeing of urban and rural communities in Cameroon. Chapter 3 proposes a selected research design and rationale identified to respond to the study's questions. The chapter also espouses the role of the researcher, the methodology, issues of trustworthiness, and a summary.

Research Design and Rationale

Articulating the research design provided the logical basis for this study's data collection, processing, and analysis in response to the research question. As stated in previous chapters, the following primary research questions guided the conduct of this study: What factors were impeding the development of a sustainable electricity supply system, what measures could alleviate these impediments, and what was the most cost-

effective policy model that could provide electricity access to Cameroonian communities without electricity?

Key concepts and phenomena being investigated included: electricity access, impeding factors, cost-effectiveness, and model.

The concept of electricity access refers to the percentage of individuals in a given location having a relatively simple and stable electricity with the potential for other positive social impact like employment, education and health care. The phenomenon is also associated with the term reliability and affordability. In other words, electricity access connotes a reliable and affordable source of electricity. According to the International Energy Agency (2020), access to electricity referred to the minimum level of electricity access to households, safer and sustainable cooking and heating fuels, energy enabling productive economic activity and energy for public services.

Impeding factors referred to natural, technological, and human factors hindering the smooth access to electricity. Among such factors are demand and supply, gas storage, generation changes, weather forecasts, global markets, government regulations, import and exports, and changes in price.

The concept of cost-effectiveness accounts for the most optimum results, advantages, and profits in comparative terms with alternative propositions. It is the cheapest way of realizing a given objective. The concept also refers to cost-benefit, cost-efficient, least-cost, competitive, and budget-friendly. Its analysis could be used to identify inefficiencies and to bring out the most competitive solutions to challenges in public policy and governance.

The idea of a model is a guide that provides a communication framework enabling analysts and experts to exercise judgment within a defined context. Several cost-effective models have been suggested by public policy research practitioners as an efficient guide to predict positive outcomes.

The phenomena of access, sustainability, and cost-effectiveness are preponderant concepts in the field of public policy and administration. Consequently, there is a significant number of researched studies in public policy and administration dealing with these concepts. For this purpose, Petrescu-Mag et al. (2016) conducted a case study on developing public policy options regarding access to safe drinking water in the rural areas of Romania. Kim and Kim (2020), on their part, reflected on the use of a cost-benefit analysis framework to assess the social cost and benefits of the public policy vehicle restriction policy. Sakah et al. (2017) also researched on sustainable electrification in Ghana by reviewing that country's renewable energy deployment policies. Marino et al. (2015) further embarked on the effectiveness, cost-effectiveness, and sustainability of integrated care models for the elderly. Gazzeh and Abubakar (2018) equally assessed the sustainability challenge and regional disparity involved in accessing basic public services in Saudi Arabia. Singh (2017) analyzed the cost-effectiveness of arsenic mitigation technologies and the implications for public policy. These concepts (cost-effectiveness, access, and sustainability) constituted the hallmark of many studies within the domain of public policy.

The approach could further help guide the selection of relevant data, interpret the data, and illuminate findings from the observed phenomena. The approach was more

rational to the type of research questions and design for this study. It was also more plausible with the in-depth knowledge and expertise required to respond to the complex issues of electricity access posed by the study. The present study aligned with the qualitative research tradition. The qualitative-based systems research was designed to respond to the question of what factors are impeding the development of a sustainable electricity supply system and what is the most cost-effective electricity policy model that could provide electricity access to Cameroonian communities without electricity. The choice of a qualitative-based systems approach in this study was more relevant and appropriate because the qualitative paradigm could provide a better understanding of the richness, depth, and subtlety of individual varied expert knowledge on the question of electricity access in Cameroon.

The basic responsive interview design was considered within the purview of the qualitative inquiry framework of the critical systems thinking methodology. As argued Rubin and Rubin (2012), responsive interviewing is a specific variety of qualitative interviewing emphasizing openness, trust, and flexibility of design. It allows the researcher to explore new areas, suggesting theories and interpretations. The said design adhered to a naturalist interpretivist constructionist paradigm (Rubin & Rubin, 2012). In other words, the planned responsive interview design was inductive, iterative, reflexive, and recursive. It also involved what Ravitch and Carl (2016) defined as a dialogic engagement between the researcher and interview participants in response to the research question. The design followed a dynamic, systematic, and rigorous process of contextualization, planning, and framing of data related to the research question (Ravitch

& Carl, 2016; Rubin & Rubin, 2012). Also, it ensured the study of the research problem in its natural setting, analyzing varied expert knowledge from individuals who had a long experience in electricity access and sustainability (Denzin & Lincoln, 2013; Ravitch & Carl, 2016). Through this responsive interview model, an in-depth, varied, and rich expert account of factors impeding access to electricity and the most cost-effective electricity policy model was honed from the lenses of interview participants. The basic responsive interview design was also more rational to the qualitative-based type of research questions and purpose for this study. The questions were open-ended and provided in-depth responses to the research questions through a dialogic engagement between the researcher and interview participants. In addition, the design was more plausible with the in-depth knowledge and expertise required to respond to the complex issues of electricity access posed by the study. The design's dynamic, systematic, and contextualized processes aligned with the qualitative-based approach of the study.

Role of the Researcher

The researcher in this study played an instrumental role through which data were generated from research participants. As posited Rubin and Rubin (2012), success in responsive interviewing requires the researcher's trust, honesty, and openness with the interviewee. I made all necessary contact with the research participants during and after the interview process. I created the interview research questions and context, set the environment, and facilitated the flow of communications with interview participants, generating data from the responsive interviewing process. As the primary instrument and observer throughout the process of this research, my identity and positionality were

central in shaping the research processes, methods, data, and findings. An intentional focus was placed on fidelity to the research participants, their experiences, and the meaning derived from these experiences in relation to the research questions. I also ensured the dialogic engagement with the research participants was conducted with respect and decorum. Besides, I conducted an analysis of these experiences in an inductive, descriptive, and contextualized manner as prescribed by qualitative research traditions.

No research participants were selected on the basis of any undue influence over family, personal, professional, instructional or supervisory affinities. I ensured that any relation with the research participants was limited to discussions on the broader processes of data generation and collection during the qualitative responsive interviewing.

Although maintaining rigor in the research instrumentation and managing the researcher bias was challenging during the data generation processes, to overcome this challenge, I conducted a pilot study to test the quality of the interview protocol and to identify potential researcher bias.

Issues of ethical challenges might be posed since the study was based in Cameroon, my birth place. In addition, providing incentives to research participants might also appear as a form of payment. These arguments had no justification in this study. Besides a few travel trips back and forth to Cameroon, I had been out of the country for more than 20 years and spent no more than a month for each of these trips. There was therefore no power differential nor conflict of interest involved in the dialogic engagement between me and the research participants. Furthermore, although I intended

to provide a gift card as an incentive to every research participant who successfully completed the responsive interviewing process, the value of such a gift card was within the required incentive amount. I also reminded the research participants that the gift card was an incentive, not a payment, and by no means conditioned the way they engaged themselves in the interview process. An area of potential ethical challenge was how to justify the authenticity of the in-depth experience of the interviewee about the phenomenon of impeding factors and best cost-effective electricity model. I assumed in this case, as asserted most qualitative researchers, that the primary focus of this qualitative interviewing was on in-depth experience from the lens of the interviewee. Moreover, the variety of participants involved in the interview process, including the flexible and open nature of the questions, provided data material for the authentication of findings.

Research Methodology

The research method proposed for this exploratory study was the qualitative systems-based approach, derived from Von Bertalanffy's systems theory. By definition, a systems approach from a qualitative perspective was an empirical inquiry of a system, consisting of investigating a contemporary phenomenon within its real-world context and depth (Harrison et al., 2017). Adcock et al. (2019) contended the approach considered alternative solutions to complex problems and models that promised to optimize efficiency and minimize cost. The method investigated multiple systems failures and conditions for major policy reforms. This included analyzing, designing, developing, and implementing solutions to emerging problems within a system.

Access to electricity in Cameroon was impeded by several factors that contributed to the complex nature of the problem. There was a need to investigate these factors to optimize efficiency and minimize impediments to electricity access. Terrel et al. (2014), suggested systems-based practitioners could identify problems, collect and analyze data, and develop existing or proposed models, best practices, and theories that addressed organizational challenges. The conduct of this study was guided by assumptions of the critical systems thinking methodology derived from the qualitative-based systems approach. These assumptions included elements of criticality, reflexivity, collaboration, and rigor. According to Jackson (2001), the critical systems thinking and practice methodology was developed to enable an analysis of complex societal problems and interventions which resolved these problems. Critical systems thinking methodology provided a framework within which appropriate soft and hard methods could be implemented to respond to complex research questions and problems (Adcock et al., 2019). The present stance aligned with the exploratory nature of the questions asked. It directed the structural framework of the study. It was also relevant to the interpretation of the research data and analysis provided. Two other major qualitative-based systems methodologies such as hard systems and soft systems methodologies were also taken into consideration. However, the rationale for a critical systems thinking methodology was to ensure a better understanding of the richness, depth, and subtlety of individual varied expert knowledge (Ravitch & Carl, 2016; Rubin & Rubin, 2012). Jackson (2001) suggested these other systems approaches were found to be limited when confronted with complex problems involving research participants with different viewpoints. Besides, the

critical systems thinking methodology complemented both hard and soft system methodologies (Adcock et al., 2019). As further posited by Ravitch and Carl (2016), the dialogic engagement potential of the approach generated comprehensive expert knowledge and informed action in response to complex research questions. The process ensured the most appropriate complimentary analysis, and interpretation of expert knowledge on factors impeding electricity access, and the most cost-effective electricity model for Cameroon. Its framework facilitated a logical alignment and analysis of data concerning the research questions.

Participant Selection Logic

The selection of participants for the study was based on purposeful sampling. The goal was to purposefully select individuals with varied knowledge about the research problem, and unique abilities to respond to the research questions. A purposeful sample participant of 20 individuals was used to conduct in-depth responsive interviews. Selected participants were on-the-field energy experts, and energy policy decision-makers based in Cameroon. These included adult women and men, with varied knowledge in hydroelectric, alternative, and sustainable energy sources and policy experience. Targeting experts, asking them relevant questions, and seeking their feedback ensured a more rational response to the question of impeding factors and the most cost-effective electricity access system in Cameroon.

Participants were treated with respect, dignity, and courtesy. They were reminded of their right to freely participate and to withdraw any time they chose to. Participants also completed a confidentiality agreement form ensuring the confidentiality of their

participation. While there was no potential harm perceived in their participation in this study, participants' contributions in the form of transcripts, audio recordings, and files were stored in a secure location by the researcher. Any information identifying the participants' office was coded to reflect anonymity. In cases of name identification, pseudonyms were used. Participants were assured that no third party not involved with the research would gain access to the information they provided during the interviews. Mindful of the qualitative nature of the responsive interviewing model, certain types of interview questions such as probes evolved along with the study (Rubin & Rubin, 2016). A sample of the nature of questions asked was provided in the appendix.

Site Selection

The study is set in Cameroon. Within this setting, three main interview sites (Yaoundé, Douala, and Limbe) were selected based on their pragmatic nature, their relevance to the research goals, and the research question. Yaoundé is an administrative headquarter and the seat of policy and decision-making. It also harbors a great scholarly and professional community. Douala is Cameroon's economic headquarter with a cosmopolitan, commercial, and industrial-based community. It is also the seat of Cameroon's lone Energy Corporation – Eneo. Limbe, formerly known as Victoria, is a touristic city. It has diverse populations, and it is surrounded by rural communities at its peripheries. It also has one of the branch offices of Cameroon's energy corporation. Two interview sites (Douala and Yaoundé) could be accessed through public roads, railways, and air transportation. The third site (Limbe) could be accessed only through public road transport. Another rationale for the selection of these sites is their relative safety

compared to the existing climate of insecurity in many locations in Cameroon. Traveling through Yaoundé, Douala, and Limbe by road transport required a lot of patience and time because of a multiplicity of security roadblocks and checks. Much of the prevailing situation was orchestrated by a degradation of the socio-economic and political climate. Besides the danger of contracting diseases such as cholera, typhoid, meningitis, and malaria, there was a growing rate of targeted kidnapping, random armed attacks, and killings. Specific interview locations in these three main sites were to be determined by each participant and myself. The choice for such a location was determined by factors related to proximity, safety, tranquility, and the overall conduciveness.

Data Collection

The data collected for this study were from scheduled individual interviews. Semi-structured, topical, one-on-one, in-person, and audio-recorded interviews were conducted. The interview format allowed for accurate screening of the participant and enabled me to capture verbal and non-verbal cues. Rubin and Rubin (2012) both recommended the semi-structured interview as the core form of in-depth qualitative interviews. The rationale was that this approach dealt with a specific topic, prepared a limited number of questions in advance, planned to ask follow-up questions, and focused on planned items that spoke to the research question. Moreover, the data collection approach encouraged interview participants to provide vivid details while responding to research questions (Rubin & Rubin, 2012). A purposeful sample participant of 20 individuals was used to conduct in-depth responsive interviewing. Selected participants were on-the-field energy experts, and energy policy decision-makers based in Cameroon.

These included women and men, knowledgeable in hydroelectric and sustainable alternative sources of energy. The interviews were based on the specific topic of impeding factors and the most cost-effective model which could foster electricity access in Cameroon. The main focus of the interview questions was on the theme of impeding factors and the most cost-effective model. The interview questionnaires consisted of three types of questions: Main questions, follow-up questions, and probes. The main questions were structured to match the interviewee's knowledge in response to the research question. The follow-up questions delved into depth, richness, and vivid detail bringing out the credibility of knowledge (Rubin & Rubin, 2012). Probe questions were relevant for clarification, details, and managing the interview conversation. The nature of the interview questions was open-ended, flexible, and evolving. Rubin and Rubin (2012) as well as Ravitch and Carl (2016) asserted that this form of interviewing was designed to tap varied in-depth knowledge and experience of interviewees. Only data from responses that directly addressed the study's research question was considered. Additional data was drawn from the researcher's memo, archival documents, academic and professional journals, and expert and informed opinions in the field of sustainable energy and public policy. Data was stored in secured files.

The Responsive Interviewing Plan

The responsive interviewing process detailing the recruitment and contacting of participants, data collection, analysis, and validation was as follows:

1. Initiated preliminary email contacts with random individual participants working in offices of the Cameroon Ministry of Energy and Water Resources

(MINEE) in Yaoundé, ENEO Cameroon head office in Douala, and the branch office in Limbe. Introduced the study, and submitted requests for interview participants with expert knowledge and experience in sustainable energy and policy.

2. Contacted interview participants via requested emails, with a letter describing the nature of the proposed study, and a consent form for their consent.
3. Scheduled individual meetings with interview participants in the three interview locations (Yaoundé, Douala, and Limbe) agreed upon.
4. Placed an email reminder to interview participants for scheduled meetings a week before the interviews.
5. Met with each interview participant, and conducted audio-recorded responsive interviews. Interview questions consisted of main questions, follow-up questions, and probes.
6. The timing was approximately an hour to ninety minutes.

Data Analysis Plan

Data for the present study were analyzed in a step-by-step manner. Rubin and Rubin (2012) recommended a step-by-step analysis of data as a more cautious way to obtain credible responses to the research questions and problem. Ravitch and Carl (2016) also contended these analytical steps must be in direct alignment with the selected research approach, the research question, and the sampling criteria. Given its qualitative responsive interviewing approach, the data analysis plan for this study comprised the following steps:

- Provided word verbatim transcriptions of questions and answers, summarizing each interview
- Defined and coded excerpts of the interview which aligned with themes and concepts relevant to, and responding to the research question
- Recognized, sorted, and combined similar codes into categories that were relevant to the research question
- Compared different excerpts, summarizing coded interview segments;
- Integrated data knowledge or description from the various interviewees, into one main narrative.

Data Analysis Process

Interview questions and response transcripts were manually coded using numerical, summative, essence-capturing, and evocative attributes as codes. These codes were analyzed into categories, and subsequently, as themes related to factors impeding electricity access and the most cost-effective electricity model in Cameroon. Although besides manual coding, the data analysis process was also to take into consideration the use of a CAQDAS to sort, organize, and manage the study's data, this particular process did not take place because this researcher was not comfortable with the said software. The whole process was thus carried out manually.

Issues of Trustworthiness

Post-positivists labeled evidence of trustworthiness in terms of credibility, transferability, dependability, and confirmability criteria. Connelly (2016) articulated the concept of trustworthiness as the degree of trust in the data, its collection, analysis, and

strategies used by the researcher to ensure that the work was worthy of consideration by the reader.

Morrow (2005) argued that sufficiency and immersion in the data, attention to subjectivity and reflexivity, adequacy of data, and issues related to interpretation were indispensable to the issue of trustworthiness, rigor, or validity, regardless of the research paradigm. Evidence of trustworthiness was demonstrable throughout this study in the nature and type of data collected, its interpretation, analysis, and findings as elucidated below.

Credibility

Morrow (2005) associated credibility with the concept of internal consistency, ensuring rigor in the research process and communicating it as it was. The credibility criterion in this research was propounded through a series of prolonged dialogic engagements with the interview participants, before, during, and after data collection. These dialogues were conducted through consent emails, phone conversations, and face-to-face interview meetings during which on-the-field energy experts and policy decision-makers, described their experiences about the impeding factors to electricity access in Cameroon and the most cost-effective system that could provide full access to all its communities. Participant checks of these described experiences were also conducted to ensure that there was no ambiguity between the original data generated from the experiences of the participants and its interpretation by this researcher. There was also a thorough and rich interpretation of the data experiences of the twelve participants about the phenomena of electricity access and the alignment between the data and the analysis

conducted. Sufficiency of the data was assessed through saturation when the participants' experiences of the phenomena of impeding factors to electricity access and the most cost-effective model became repetitive in subsequent response interviews. Although the researcher was born in Cameroon and had lived there for almost 38 years before migrating to the U.S. any personal perception or bias was regulated by the researcher's reflexivity through archives and persistent field observation memos which complemented the validity of the study. Moreso, the overwhelming and passionate desire for the researcher to find a lasting solution to the problem of electricity access in Cameroon, a country that had always been home to the researcher, overrode any presumptuous biases.

Transferability

Within the specific context of this research, adequate relevant data was provided about the researcher as an instrument, the research processes, participant descriptions, and the relationship between the researcher and the participants, to ensure the transferability of the findings. A vivid description of the twelve different interview participants, the settings, and contexts, including the transparent analyses of their experiences, allowed the reader to be able to identify with the different realities of the phenomenon of electricity access.

Dependability

The conduct of the research was consistent with the qualitative research paradigm strategies across time, processes, and explicit analysis. A draft of the interview protocol and participant selection was documented. An audit trail and detailed chronology of the various stages of the study, its processes, alignment with the data collection and analysis,

emerging themes and categories as well as analytic memos enhanced dependability. A participant check was also conducted at each stage of the interviews allowing participants to be more acquainted with the research process and facilitating the reliability of the experiences provided by the participants.

Confirmability

Morrow (2005) contended that the integrity of any research findings relied more on the data. Consistent with the qualitative research strategies through which the findings were derived, there was an alignment between this study's research problem, the research question, the purpose, and the research design. The typology of data collected for this research, its processes, and analysis also adequately aligned with the findings to ensure the reader's confirmability. This researcher analyzed the data experiences of energy and policy experts in Cameroon and brought out different perspectives in its interpretation, coding, categorization, and findings. The researcher also used the data source (of all interviewed participant experiences) triangulation process to assess the confirmability of the findings. In addition, this researcher used field notes, memos, and reflexive journals on the question of impeding factors to electricity access and the most cost-effective electricity model, as a form of triangulation to validate confirmability.

Ethical Procedures

Participants were treated with respect, dignity, and courtesy in tandem with Walden University's Institutional Review Board Approval number 11-15-22-0650521. They were reminded of their right to freely participate and to withdraw any time they chose to. Participants also signed a consent form and received a confidentiality agreement

ensuring the confidentiality of their participation. A sample confidentiality agreement form was provided in the appendix. While there was no potential harm perceived in their participation in this study, participants' contributions in the form of transcripts, tapes, and files were stored in a secure location by the researcher. Any information identifying participants' office were coded to reflect anonymity. Participants were anonymously represented alpha-numerically. In cases of name identification, pseudonyms were used. Participants were assured that no third party not involved with the research would gain access to the information they provided during the interviews. It was not possible to list in advance research participants for the interview. This could be done only as the work progressed. However, the corps of participants to be interviewed were public officials, elected, or appointed to public office with the technical knowledge, expertise, and experience of the research question. Mindful of the qualitative nature of the responsive interviewing model, certain types of interview questions such as probes evolved along with the study (Rubin & Rubin, 2016). Examples of the nature of the questions asked were provided in the appendix. These questions might not in some cases be the replica presented in the appendix. Ravitch and Carl (2016) asserted that the line of questioning sometimes changed because of the conversational nature of the responsive interviewing approach. No participants for the responsive interviewing model were in the category of at-risk or vulnerable populations. Neither the subject matter nor the line of research interviewing was expected to pose any real risk to the participants in the study. However, some ethical concerns could still emerge in the process.

Ravitch and Carl (2016) argued that the qualitative paradigm defined the belief system of individuals, their place in it, the nature of the world, and their relationship to it. In this case, it could be assumed that the reality of the responses provided by this study's participants must be accepted simply on faith. There was no way to verify with certainty the ultimate truthfulness of these responses. For example, how could we know that the responses provided by the research participants of this study were not pure inventions of the human mind? How could we justify the veracity of the responses provided by the research participants in this study? Although there was an established relationship between the participants and their experience, the participants were all subject to human errors and biases. Their responses were conditioned by their realities. As noted by Rubin and Rubin (2012), reality was seen only in the eyes of the interviewee. In correlation, it was also assumed that the research analyses would be subject to the responses of the research participants. The reader might not be compelled to accept these analyses simply based on indisputable evidence but by persuasions. In like manner, it was assumed that the interpretation of the research findings and recommendations would be guided by analytical assumptions of the researcher.

Ultimately, these assumptions had important consequences for the practical conduct of this study, its analyses, the interpretation of its findings, and recommendations. Such consequences could create opportunities for further exploration of the study or similar studies

Summary of Chapter 3

The present study aligned with the qualitative research tradition. The qualitative-based systems research sought to respond to the question of what factors were impeding the development of a sustainable electricity supply system, and what was the most cost-effective electricity policy model that could provide electricity access to Cameroonian communities without electricity. The choice of a qualitative-based systems approach could provide a better understanding of the richness, depth, and subtlety of individual varied expert knowledge on the question of electricity access in Cameroon.

The basic responsive interview design was considered within the purview of the qualitative inquiry framework of the systems theory methodology. As argued by Rubin and Rubin (2012), responsive interviewing was a specific variety of qualitative interviewing emphasizing openness, trust, and flexibility of design. The said design adhered to a naturalist interpretivist constructionist paradigm (Rubin & Rubin, 2012). It also involved what Ravitch and Carl (2016) defined as a dialogic engagement between the researcher and interview participants in response to the research question. The design followed a dynamic, systematic, and rigorous process of contextualization, planning, and framing of data related to the research question (Rubin & Rubin, 2012; Ravitch & Carl, 2016). Also, it ensured the study of the research problem in its natural setting, analyzing varied expert knowledge from individuals who had a long experience in electricity access and sustainability (Denzin & Lincoln, 2013; Ravitch & Carl, 2016). Through this responsive interview model, an in-depth, varied, and rich expert account of factors impeding access to electricity and the most cost-effective electricity policy model was

honed from the lenses of interview participants. The interview questions were open-ended and provided in-depth responses to the research questions through a dialogic engagement between the researcher and interview participants. In addition, the design was more plausible with the in-depth knowledge and expertise required to respond to the complex issues of electricity access posed by the study. The design's dynamic, systematic, and contextualized processes aligned with the qualitative-based approach of the study. Participants and site selection, data collection, processing, and analysis (all components of the research method in response to the study's questions) were conducted through the invaluable role of the researcher. The same role extended to maintaining ethical considerations, respect, confidentiality, trustworthiness, and credibility in the research study.

Through the responsive interview, a data analysis plan and process were engaged involving manual coding. The available data collected and its typology were analyzed in the next chapter.

Chapter 4: Results

Introduction

Access to Cameroon's hydroelectricity grid supply is marred by several impeding factors. This vulnerability is stalling the economic development and positive social transformation of the country. In the mix of the inadequacies of the current hydroelectric system, this study addressed the factors that impeded the development of a sustainable electricity supply system in Cameroon, measures alleviating these impediments, and the most cost-effective policy model that could provide full electricity access to Cameroonian communities. Exploring these impeding factors and the most cost-effective energy policy model could lead to public policy recommendations for providing better electricity access to Cameroonian communities. The purpose of this qualitative paradigm-based research was to bring about effective solutions to the problem of electricity access and sustainability in Cameroon with the goal of contributing to positive social change. This chapter describes the study's setting and participants' demographics. It also describes the data collected, its analysis, and evidence of trustworthiness. The chapter ends with the results of the study's findings and a summary.

Setting

The research site was based in Cameroon. Within this setting, three main interview regions (Yaoundé, Douala, and Limbe) were selected based on their pragmatic nature, their relevance to the research goals, and the research question. Another rationale for the selection of these sites was their relative safety compared to the existing climate of insecurity in many locations in Cameroon. That notwithstanding, the option of

traveling through Yaoundé, Douala, and Limbe by road transport for the interview required a lot of patience and time because of a multiplicity of mixed military, paramilitary, and police security roadblocks and checkpoints within these towns. Moreover, besides the danger of contracting common diseases such as cholera, typhoid, meningitis, and malaria, there was a growing rate of targeted kidnapping, random armed attacks, and killings. Also, although the choice of a specific interview location in these three main regions was determined by factors related to proximity, safety, tranquility, and overall conduciveness as agreed upon by the researcher and the participants, the persistence of the COVID-19 pandemic, influenced a preference to a distanced audio-recorded interview responses of participants' experiences through the WhatsApp audio which was more conventional, practical, and available.

Demographics

The selection of participants for the study was based on purposeful sampling. The goal was to purposefully select 20 adult individuals with varied knowledge, experience, and the unique ability to respond to the question about the impeding factors to electricity access in Cameroon and the most cost-effective electricity model that could provide full access to all Cameroonian communities.

A total of 20 audio-recorded interviews were conducted with 20 adult participants through the WhatsApp audio system. Most of the participants were recruited through snowball sampling. Although the initial participant demographics as cued by the study ranged from 15 to 25, the study ended up with a purposeful sample participant of 12 individual interview responses to conduct in-depth data analysis. A total of eight

interviews from eight of the participants were neither audible nor transcribable. These were discarded. The rest of the 12 selected participants were men and women, on-the-field energy experts, and energy policy decision-makers based in Cameroon. These included three adult women and nine adult men with at least 8 years of experience and varied knowledge in hydroelectric, alternative, and sustainable energy sources and energy policy management.

Participant Description

For purposes of anonymity and confidentiality, as referenced in the consent form (Appendix B), interview participants were represented alpha-numerically. Any features or positions identifying them in any way were carefully evaded. Their names, the agency they worked for, and their official positions were also consciously avoided.

Participant number 1 or P.1 was a 46-year-old woman, a college graduate in electrical engineering with 22 years of experience, working in energy management and sustainability in a Douala regional energy center.

P. 2 was also a woman, was 35 years old, was a college graduate, and had 10 years of experience working as a policy administrator in a Yaoundé regional energy agency.

P. 3 was a 48-year-old man, a graduate of the Polytechnique College, a seasoned engineer and administrator with 23 years working on alternative energy solutions contracts, and based in the Yaoundé region.

P. 4 was a 55-year-old man, Ph.D. holder in engineering, author, and co-author of several studies on renewable energy efficiency projects and policy assessment. With 25

years of experience, P. 4 was also the founder and chief executive officer of a 15 years solar energy company in Cameroon based in the Douala region.

P. 5 was a 63-year-old man, also a Ph.D. holder in mechanical engineering, who worked in the domain of energy infrastructure and design for over 30 years in the Yaoundé and Douala regions.

P.6 was a 35-year-old female electrician and graduate of a regional College of Technology with 8 years of experience in electricity installations and supply in the Limbe region.

P. 7 was a 52-year-old energy technology graduate with 25 years of experience working in various capacities including energy management and supply, scheduling, and project execution in the Douala region.

P. 8, a 38-year-old man with an on-the-field experience of 9 years, graduated with two masters of science degrees in finance and energy management working in a Yaoundé region energy company.

P. 9 was 46 years old and a graduate in electrical engineering and energy policy, based in the Limbe region, with 22 years of experience in alternative energy solutions.

P.10 was a 45-year-old man also based in the Limbe region. He was an engineering project appraiser with 18 years of expertise in renewable energy sustainability.

P.11 was a 68-year-old male technology graduate with 49 years of experience in electrical installation, transportation, coordination, and energy policy management working with a Limbe electricity installation company.

P.12 was a 52-year-old field training officer and had worked for 25 years in several energy-related capacities with a regional energy agency in Limbe.

Targeting these energy experts, asking them relevant questions, and seeking their feedback ensured a more rational in-depth response to the question of impeding factors and the best cost-effective electricity access system in Cameroon. The in-depth, open-ended dialogue with the participants also allowed them to discuss their experiences and perspectives concerning the electricity problem in the country and potential solutions.

Table 1

Demographic Representation of Interview Participants

Participant number (P#)	Gender	Age	Years of experience
1	Female	46	22
2	Female	35	10
3	Male	48	23
4	Male	55	25
5	Male	63	30
6	Female	35	8
7	Male	52	25
8	Male	38	9
9	Male	46	22
10	Male	45	18
11	Male	68	49

12	Male	52	25

Average age of Participants: 50.25 Least Age of Participants: 35 Oldest Age of Participants: 68

Average Years of Experience: 24.08 Least Years of Experience: 8 Most Years of Experience: 49

Total Participants: 12 Total Male: 9 Total Female: 3

Data Collection

Data were collected from a total of 20 adult on-the-field energy expert participants for four weeks. Before data collection, a consent form was signed by each participant through their emails. However, only data from 12 of these participants were considered. Data from eight of the participants were discarded because they were inaudible for transcription.

The data collected was from scheduled individual interviews with participants in the Yaoundé, Douala, and Limbe regions. Participants in Douala (2) and Yaoundé (2) spoke primarily French, although they understood standard English. Those in the Limbe region and some in the Yaoundé region were comfortable expressing themselves in standard English. Semi-structured, topical, one-on-one, in-person, audio-recorded interviews were conducted through the WhatsApp audio recording system. The one-on-one interview format allowed accurate screening of the participant and enabled this researcher to capture individual verbal cues. I also noted non-verbal cues in the researcher's memo. Rubin and Rubin (2012) recommended the semi-structured open dialogue as the core form of in-depth qualitative interviews. The rationale was that this approach was ideal in dealing with the specific topic of fostering electricity access, prepared in advance a limited number of interview questions on the topic, planned to ask follow-up questions, and focused on other planned items that spoke to the research

question. Moreover, the data collection approach encouraged interview participants to provide vivid details on the electricity access problems in Cameroon, while responding to the research questions (Rubin & Rubin, 2012). The interviews were based on the specific topic of impeding factors to electricity access and the best most cost-effective policy model which could foster electricity access in Cameroon. The focus of the interview questions was on the theme of impeding factors and the best-cost effective model. The nature of the interview questions was open-ended, flexible, and evolving. Rubin and Rubin, as well as Ravitch and Carl (2016), asserted that this form of interviewing was designed to tap varied in-depth knowledge and experience of interviewees. Only data from responses that directly addressed the study's research question were considered. Additional data were drawn from the researcher's memo, archival documents, academic and professional journals, and expert and informed opinions in the field of sustainable energy and public policy energy management.

Data collected from three of the interviews took 70 minutes each, and the interviews were held at the office setting of the participants. Data collected from four interviews with four other participants took 65 minutes each in my hotel conference room in Yaoundé. Data collected for three interviews took 80 minutes each, while two other interviews took 95 minutes each. The five interviews were held at a relaxed beach area resort. A participant validation check was conducted after each interview to ensure the accuracy and understanding of the full meaning of the participants' responses.

Table 2

Data Collection Participant Interview Time Location and Site

Participant #	Length of Interview Time	Location	Site
1	70 minutes	Participant's office	Douala
2	65 minutes	Hotel conf. room	Yaoundé
3	65 minutes	Hotel conf. room	Yaoundé
4	70 minutes	Participant's office	Douala
5	65 minutes	Hotel conf. room	Yaoundé
6	80 minutes	Down Beach	Limbe
7	70 minutes	Participant's office	Douala
8	65 minutes	Hotel conf. room	Yaoundé
9	80 minutes	Down Beach	Limbe
10	95 minutes	Down Beach	Limbe
11	95 minutes	Down Beach	Limbe
12	80 minutes	Down Beach	Limbe

Although the final number of recorded interviews considered for the study was below the initially proposed range of interviews (15-25) cued by the study, extrapolating from several research data analyses, Namey (2017) confirmed that six to 12 in-depth interviews produces the majority of 80% to 97% of new data required, and that this range is an ideal spot for research in the qualitative interview to reach saturation. Vasileiou et al. (2018) reiterated the need for a small sample, not only to support the capacity to

provide an information-rich investigation of the phenomenon, but also the depth of case-oriented analysis crucial to qualitative inquiries. Moreover, given the design of the study which included triangulation of the data, the 12 considered interviews enabled me to make valid judgments about general and specific trends that emerged in the data in response to the research question. Also, more participants were anticipated for recruitment if the saturation point was not reached. Interestingly, since coding, categorization, and analysis were ongoing during and after data collection, by the 10th interview, evidence of saturation had emerged with a trend of repetitive responses from subsequent participants who were interviewed.

Unusual Circumstances

Some unusual circumstances were encountered during the data collection exercise. These ranged from intermittent disconnections of the internet, power outages, participant work contract meeting appointments hold-ups, and interview postponements, to calls not going through, calls placed on hold, call break ups, call back-ups, call-backs not followed up, and background noises from the traffic and passers-by, tampering with the audio quality of the interviews. Six interview participants complained they could not make the interview appointments on time because their phones either discharged during a power outage or they could not charge their phones in preparation for the interview due to a previous power outage in their homes. In reviewing the first set of participant interview responses to the research questions, it was found that the first 8 initial audio-recorded interviews were inaudible for any transcription. These were disregarded. Two participants complained they had COVID-19 symptoms (cough, sore throat, stuffy nose,

and dizziness) that might have affected their voice responses. A majority of the participants were motivated by the $10.00 gift card. Participants who had their interviews at the beach area resort were more enthusiastic and relaxed in their responses and offered more time and information during their interviews.

Data Analysis

Saldaña (2016) argued there was no best way to analyze qualitative data. The data analysis process for this study followed an integrated approach to qualitative data analysis techniques. The data analysis process was initiated during and after the data collection. The process involved initial transcription of audio-recorded data from 20 adult participants to verbatim written narratives, conducting interpretive processes, and checking against the original data. Additional data analysis involved participant observation field notes and journal articles on fostering electricity access. This process was systematically scrutinized and managed in an organized and flexible manner at each level of the analysis. Although some of the interview responses were in the French language, this researcher is not only fluent in English and French but was a 12 years certified high school English and French teacher and a trained translator/interpreter. Audio-recorded data experiences from on-the-field energy experts and policy participants who expressed their experiences in the French language were faithfully translated into English by me in the process of data collection and analysis.

The audio interviews were transcribed and interpreted faithfully, maintaining the fidelity of the participants' expert responses, experiences, and knowledge. A thematic analysis of the data was conducted to identify common patterns and separated the data

into different groups according to found similarities or themes. Direct quotations from participants' responses were used where necessary to validate the authenticity of the data in real-time. The first phase of the analysis focused on data directly related to factors impeding the development of a sustainable electricity system in Cameroon and strategies to alleviate these impediments. The second phase was based on the most cost-effective factors for electricity access and the emerging policy models suitable for Cameroon. Evidence from responses that directly addressed the study's research questions was considered. Such evidence was manually coded using numerical, summative, essence-capturing, and evocative attributes as codes in a content analysis framework. These codes were analyzed into categories, and subsequently, as themes related to factors impeding electricity access and the most cost-effective electricity model in Cameroon. Saldaña (2016) enunciated that the codifying process permitted data to be labeled, divided, grouped, reorganized, and linked to developing explanations. Data analysis processes of triangulation were engaged as needed.

Although the initial intent of the study, as referenced in Chapter 3, was to take into consideration the use of CAQDAS for its data analysis, uncomfortable with the software, this researcher opted to analyze the data manually. According to Saldaña (2016), though time-consuming, manual coding helped the researcher streamline the analysis process, making it easier to refine, interpret and relink the whole data analysis process.

Several codes were identified as emerging from the data. Here are a few of them applied to data from the interview transcript in which participants responded to the question of impeding factors to electricity access in Cameroon:

Researcher: Q1. What factors are impeding electricity access in Cameroon?

Participant #1 R1. [1]For me, from most of the areas where cars can't reach, we need good means of transportation. [2] Also, another problem in Cameroon, there are no good jobs and no good salaries for people to make enough money to pay lights. [3]The political crises with the ongoing war have made things worse. [4] Government is not doing enough

to help us. [5] Another problem is that of high taxes imposed by government on some people who can't pay.

Researcher: Q2. What other factors if any, contribute to this problem other than these ones?

Participant #1 R2. [6]I think the government does not have the will to help us. [7]Also, there is just one company providing electricity in the whole country.[8] The system is too centralized and

[9]Monopoly is not the best because there is no competition. [10]The electricity company does what it likes, they cut lights when they want, and nothing is done.

Themes: Emerging Impediments

Category: **Socioeconomic and Political**

CODE1: POOR ROADS

CODE2: LOW WAGES

CODE3: WAR

CODE4: INEFFICIENT GOVERNANCE

CODE5: HIGH TAX

CODE6: NO GOVERNANCE WILL

CODE7:INSTITUTIONALIZED MONOPOLY

CODE8: CENTRALIZED SYSTEM

CODE9: LACK OF COMPETITION

CODE10: LAISSER-FAIRE MANAGEMENT

Evidence of Trustworthiness

Post-positivists labeled evidence of trustworthiness in terms of credibility, transferability, dependability, and confirmability criteria. Connelly (2016) articulated the concept of trustworthiness as the degree of trust in the data, its collection, analysis, and strategies used by the researcher to ensure that the work was worthy of consideration by the reader.

Morrow (2005) argued that sufficiency and immersion in the data, attention to subjectivity and reflexivity, adequacy of data, and issues related to interpretation were indispensable to the issue of trustworthiness, rigor, or validity, regardless of the research paradigm. Evidence of trustworthiness was demonstrable throughout this study in the nature and type of data collected, its interpretation, analysis, and findings as elucidated below.

Credibility

Morrow (2005) associated credibility with the concept of internal consistency, ensuring rigor in the research process and communicating it as it was. The credibility criterion in this research was propounded through a series of prolonged dialogic

engagements with the interview participants, before, during, and after data collection. These dialogues were conducted through consent emails, phone conversations, and face-to-face interview meetings during which on-the-field energy experts and policy decision-makers, described their experiences about the impeding factors to electricity access in Cameroon and the most cost-effective system that could provide full access to all its communities. Participant checks of these described experiences were also conducted to ensure that there was no ambiguity between the original data generated from the experiences of the participants and its interpretation by this researcher. There was also a thorough and rich interpretation of the data experiences of the twelve participants about the phenomena of electricity access and the alignment between the data and the analysis conducted. Sufficiency of the data was assessed through saturation when the participants' experiences of the phenomena of impeding factors to electricity access and the most cost-effective model became repetitive in subsequent response interviews. Although the researcher was born in Cameroon and had lived there for almost 38 years before migrating to the U.S. any personal perception or bias was regulated by the researcher's reflexivity through archives and persistent field observation memos which complemented the validity of the study. Moreso, the overwhelming and passionate desire for the researcher to find a lasting solution to the problem of electricity access in Cameroon, a country that had always been home to the researcher, overrode any presumptuous biases.

Transferability

Within the specific context of this research, adequate relevant data was provided about the researcher as an instrument, the research processes, participant descriptions,

and the relationship between the researcher and the participants, to ensure the transferability of the findings. A vivid description of the twelve different interview participants, the settings, and contexts, including the transparent analyses of their experiences, allowed the reader to be able to identify with the different realities of the phenomenon of electricity access.

Dependability

The conduct of the research was consistent with the qualitative research paradigm strategies across time, processes, and explicit analysis. A draft of the interview protocol and participant selection was documented. An audit trail and detailed chronology of the various stages of the study, its processes, alignment with the data collection and analysis, emerging themes and categories as well as analytic memos enhanced dependability. A participant check was also conducted at each stage of the interviews allowing participants to be more acquainted with the research process and facilitating the reliability of the experiences provided by the participants.

Confirmability

Morrow (2005) contended that the integrity of any research findings relied more on the data. Consistent with the qualitative research strategies through which the findings were derived, there was an alignment between this study's research problem, the research question, the purpose, and the research design. The typology of data collected for this research, its processes, and analysis also adequately aligned with the findings to ensure the reader's confirmability. This researcher analyzed the data experiences of energy and policy experts in Cameroon and brought out different perspectives in its interpretation,

coding, categorization, and findings. The researcher also used the data source (of all interviewed participant experiences) triangulation process to assess the confirmability of the findings. In addition, this researcher used field notes, memos, and reflexive journals on the question of impeding factors to electricity access and the most cost-effective electricity model, as a form of triangulation to validate confirmability.

Results

The main interviewing questions asked participants in this research study were:

1) From your experience what do you think are the factors that impede access to electricity in Cameroon?

2) As an expert in this field, what can be done to alleviate the problem?

3) From your experience what do you think is the most cost-effective electricity model for Cameroon?

4) From your experience is/are there any electricity model(s) you know in the world that can serve as a reference for replication?

Data in response to these questions were collected from 12 participants with on-the-field experience in energy sustainability, management, and policy. Participants who resided in the Limbe, Yaoundé, and Douala regions were male and female adults, who met the selection criteria to participate in the study.

Transcribed data responses from the participants in place of these questions were used in direct citations. Responses from prompted questions, reinforcing the in-depth and rich experiences of participants about the phenomena of fostering electricity access and the most cost-effective model were also directly cited. Some of the responses from

participants were paraphrased or translated into English from French to ensure more clarity and understanding. All these responses, from a qualitative analysis, produced 4 major emerging themes and several subthemes which were understandably intertwined and dependent on one another. The themes consisted of 1) Emerging impediments to electricity access; 2) Emerging strategies to electricity access; 3)Emerging best cost-effectiveness model; and 4) Emerging replication models.

1. Emerging Impediments to Electricity Access

Flora (2019) asserted that the current energy situation in Cameroon, which was characterized by power cuts, was creating negative impacts on the daily lives of Cameroonians. This opinion was later concurred by the African Development Bank (2021) which postulated that the power sector in the country was going through several challenges. When participants were asked, what from their experience, they thought were factors that impeded electricity access in Cameroon? All 12 participants responded overwhelmingly with enthusiasm, displaying in-depth knowledge and experience. P1 for example, argued that " in my 22 years of service in this company, I have never seen anything like this. There are so many, many problems with our electricity, that, I don't even know where to start". P2 posted that " I have only been working in this field for close to 10 years, and it does not seem things are getting better with our power supply." P3 responded, "It will take the whole morning in this conference room explaining all the factors impeding electricity access in the country". P4 postulated that "there are many factors which impede electricity access in Cameroon, but I will give you the main ones". P5 and P6 suggested that "the problem of electricity has grown from bad to worse". The

rest of the participants (P7, P8, P9, P10, P11, and P12) also agreed that the plethora of factors impeding the development of electricity access in Cameroon were the reasons why there were so many power irregularities, shortages, and rationing. They lamented the degraded services of the electricity company in the country and wished something could be done about it. Within the emerging theme of impediments analytics, were culled subthemes, generated from participants' consistent responses, and consisting of a) Economic Impediments b) Social Impediments c) Political Impediments d) Managerial Impediments e) Technological Impediments, f) Environmental Impediments, and g) War Impediments. These subthemes were analyzed as follows:

a) Economic Impediments

Following the above theme, P1 responded that "The collapse of oil prices in 2020 and the sluggishness of the economy orchestrated by the COVID-19 pandemic has greatly impeded the government's ability to invest in the electricity infrastructure." P2 argued that " Funding for electricity infrastructure that could meet the demands of the population is very limited." Moreover, P3 reiterated that "There has been a steady increase in population growth since the 1990s and this has met with a disproportionately low increase in new electricity generation and supply." According to P4, " The hydroelectricity grid potential which the country relies so much on, requires heavy capital investments for its expansion to all Cameroonian communities and beyond." Unfortunately, as opined P5, "Neither enough funding nor the allocation and management of any such funding is available, transparent, and effective." P6 also concurred that " An inefficient and slow administration engrained in corruption at all

levels, is creating a hostile business environment and discouraging investment in electricity infrastructure." Furthermore, as asserted P7:

The bureaucratic challenges in credit access, poor road infrastructure, and the ongoing fight

between Separatist and Government forces in the Northwest and Southwest regions of the

country have huge economic impacts and are impeding the expansion of electricity access

in those regions.

Besides, both P8 and P10 postulated that " the existence of only one electricity company (ENEO) enjoying monopolistic powers in electricity supply impedes electricity access in Cameroon." Such a monopoly, enjoined P 9, " leaves no room for any potential competitors who may be interested in providing alternative or better energy solutions to the Cameroonian communities." "Without any competition", added P11, "there are no choices to electricity consumers for other suppliers. And so too is the quality of services to customers declining daily. According to P9, "Electricity is seized without any explanation or notification, and sometimes for days. When it is restored, sometimes the power is too high that it damages all connected appliances." Speaking both as a field worker and consumer, P12 argued:

This leads me to the many problems that our people are facing. You cannot even take the electricity company to court to address any damage to your property. They will overwhelm you with their lawyers and the court will keep adjourning the case.

b) Social Impediments

Building on the above theme, P1 intimated that "The high rate of unemployment and underemployment is an impeding factor to electricity access in Cameroon." P2 on her part, asserted that " In a country where unemployment is high, people cannot get jobs, let alone well-paying jobs to afford for electricity." P3 on his part, affirmed that "University graduates have become permanent residents and dependents living in their parents', friends' or relatives' care with no jobs." P4 ascertained that "Those who are lucky to grab a job, soon find out that their wages can hardly afford their basic necessities, not to talk of electricity bills." P5 suggested that " The low purchasing power of Cameroonians both in rural and urban areas and the high electricity rates, impede electricity access." This point was confirmed by P7 adding that "Of course, You cannot buy what you cannot afford. So, unpaid bills keep accumulating until the meter is disconnected. Some unscrupulous customers fraudulently reconnect electricity directly from the electric poles." According to P8, one of the impeding social factors to electricity access was that

Electricity rates in Cameroon are relatively higher compared to neighboring Chad, Central

African Republic and the Democratic Republic of Congo. Moreover, average incomes are

low. It is therefore hard for most Cameroonians to afford paying their electricity bills

because of their low income. The situation is dire in rural areas and cities where people do

not have a regular job.

P9 on his part suggested “There is a disproportionate rate of electricity bill payment. For example, heavy electricity consumption companies like Alucam pay just about 12 francs cfa for a kilowatt compared to 75 francs cfa for a private individual resident.” P10 blamed the social impediment on “The absence of any consumer protection agency to ascertain the quantity and quality of electricity services provided to consumers in Cameroon. According to P12, “This has probably given a green light to the only electricity agency ENEO to care less about its customers’ demands.” In addition, P11 enunciated

To be honest with you, one of the major problems we are facing is the problem of wanton

theft of electricity. People get disconnected for not paying their bills and they get someone to

connect their light directly from the electric poles for a little amount. And for months they

consume electricity without paying any bill until they are discovered. Sometimes they even

distribute the stolen light to their neighbors for a minimal sum of money. This is so rampant

now and the company is losing money.

c) Political Impediments

Examining the above theme, P3 asserted that:

The absence of real political will by the government of Cameroon to develop the energy sector to proportionate levels of energy demands and security is an impediment to electricity access in Cameroon. For example, out of over 14000 communities in the country, records show that only about 3,700 are electrified and mostly in certain urban areas. This shows that the government is not serious enough helping people out of the electricity problems.

P1 on her part argued that "In spite of high hydroelectricity energy potentials less than 5% of these potentials are actually put into use. The rest of the 95% have not been developed, whereas Cameroonians need electricity." For P2, " Every year conventions are signed, and money disbursed for electrification projects, yet, the electricity crisis is getting worse and worse, than before. No one knows where the money is going to." As intimated P4, "Not developing these needs can only be understood as the lack of a political will by the government, since some of these resources are found in the English Speaking regions of Cameroon." Moreover, P10 suggested that "The Menchum Fall in the North West English speaking region of Cameroon for example, can provide enormous amount of hydroelectric energy to the whole of West Africa. Yet the government is adamant about developing that project." In response, P3 agreed that "This lack of political will can also be interpreted in the absence of commitment for the government to fully engage in promoting other readily available alternative energy potentials such as

solar, biofuels, geothermal, and wind." P5 on his part, insisted that "There is a very marginal usage of other sources like renewables or natural gas to diversify the country's energy sources." In addition, P6 opined that "one of the main impediments to electricity access in Cameroon is the disconnect between policy tools and goals, and the reality in the field. Not much progress has been made since the energy policy tools were elaborated." For P7,

> Access to electricity is disproportionate, and electricity expansion is too politicized. Some
>
> communities benefit from electricity access on the political whims and caprices of the
>
> government. In most cases, for a community to benefit from electricity access, a member of
>
> that community would have to be a government minister, a senator/parliamentarian, or a
>
> senior-ranking government political leader.

Furthermore, P 8 inferred that "although the Cameroon government prides itself with calls to foreign investors to assist the country in expanding its utility industries, especially the electricity utility, the government has not done enough to clear bureaucratic impediments to energy investments." According to P 9, "There are too many middlemen and paperwork. Customer service is a sham. Administrative bottlenecks discourage business endeavor." Furthermore, as accorded P11, "With no real government incentives to encourage new investments in the energy field, access to electricity will remain a real challenge in Cameroon." Moreover, P12, P10, and P6 suggested "the over-centralization

of the energy sector and monopoly management impede potential energy investment diversification and open competition that could enable better access to electricity." P4 and P7 also agreed that "the absence of any incentive by the Cameroon government in the research and development of new and alternative sources of energy as well as their management thereof is an impediment to electricity access in Cameroon." P1 added that "The inexistence of any form of government audits, reviews and assessment of standards of energy production, transportation, distribution, and supply is an impeding factor to electricity access in Cameroon." In addition, P4 reiterated that "the wanton state of institutionalized corrupt practices, bribery, favoritism, nepotism and kickbacks within the administration, gives room for inefficient and poor management decision-making, and discourages investment ventures." In conjunction, P9 posted that:

The government treats electricity apart from other energy resources. There is actually no

established correlation in the management of the various energy sources in Cameroon. That's

why the Kribi Power Plant was completed but lacked natural gas to be powered with. Furthermore, P12 purported that:

Energy contracts signed by the Cameroon government and foreign oil companies are not

usually in the best interest of Cameroon. For example, no provisions are made for domestic

consumption. Royalties from these companies, if any, are either misappropriated or

disproportionately provided to local governing communities.

d) Managerial Impediments

According to P2:

> Coupled with monopoly powers, the lone electricity company suffers from bureaucratic
>
> management due to over-centralization. Coming most of the time from the headquarters in
>
> Douala, decision-making is slow, affecting maintenance repairs, installation of new meters,
>
> transformers, and cables, or hiring new recruits, training, and supervising them on the field.

In addition, P5 stated: “Corrupt practices of employees, pervading inefficiencies in management, including long service waiting time, back-door arrangements, poor customer service, postponement of service to customers, unannounced electricity rationing and shutdowns, and a general laisser-faire management attitude are countless.” P1on her part asserted:

> It sometimes takes months and even years for customers to receive their initial electricity
>
> bills after a new meter has been installed. In most cases, when such bills are finally
>
> delivered, the amount is so enormous that the consumer is unable to pay even at
>
> prearranged installments.

Moreover, posited P12, “Electricity consumers are disproportionately billed. ALUCAM, the aluminon corporation pays 12 CFA francs a kilowatt while regular residential customers are billed CFA 75 francs a kilowatt.” Worse still, retorted P3, “Some of the big consumers like ALUCAM and the Cameroon government, owe the Cameroon Electricity Company, electricity bill arrears worth about CFA 20 billion and 45 billion francs.” P6 stated that:

> Another managerial factor impeding access to electricity is the absence of a viable preventive maintenance strategy plan that involves identifying, resourcing and executing repairs, replacements and inspections of electricity installations in the various communities which have access to electricity. This situation has created an outdated aging electricity infrastructure.

e) Technological Impediments

P7 concurred that:

> In conjunction with the aging electricity infrastructure is the issue of outdated technology and lack of innovation. The 3 separate networks consisting of RIS South, RIN North, and RIE East are yet to be connected to one another. SONATREL which is in charge of the technical capabilities of the Regional Transmission Operation (RTO), has not been able to interconnect these three networks.

P8 reported in addition that:

> The construction of the Mem'Mvele, Lom Pangar, and Natchigal dams, was delayed many years before being completed. Besides, 30% of the current generation capacity is lost due to inadequate transmission and distribution equipment. Some of these pieces of equipment have also outlasted their use.

To add to that, P2 affirmed: "The issue of lack of innovation looms. Neither the Cameroon government nor the electricity company is taking advantage of advances in technology to bring about a complete overhaul and innovation of the electricity access system in the country." According to P11, "The same dilapidated aged equipment is still depended upon. The lack of innovation impedes electricity access to Cameroonian communities." In correlation to this point, P9 stated: "There is very little consideration for alternative sources of energy and technological advances with more sustainable energy supply appliances." P1 also indicated that:

> The absence of a regular maintenance audit to ensure the quality of electricity services and products provided, as well as ascertain the efficient management of the Cameroon Electricity Corporation (ENEO), is an impeding factor to electricity access in Cameroon.

e) Environmental Impediments

P2 stated:

As you know, the environment plays a crucial role in hydroelectricity power generation

and supply. Cameroon has two main seasons which are the dry season and the rainy

season. During the dry season, the weather is hot and dry, and that causes water levels in

dams to fall drastically, reducing the amount of electricity produced.

P5 concurred that "This situation is worsened by the current global warming of the environment which at times will make it difficult to have water at the required level to operate those dams efficiently." P8 on his part, reiterated that " Dependence solely on hydroelectricity grid is very challenging, especially with climate change and all that it creates." P6 argued that:

This is one of the reasons why the electricity company resorts to the rationing of electricity

from one region to another. In the rainy season, strong tropical winds, rainfall, and floods

cause electric installations to collapse, orchestrating long hours and days of blackouts.

f) War Impediments

According to P10, "Another factor impeding electricity access in Cameroon is the prevalence of continued armed conflicts in the North West and South West regions of Cameroon, as well as the Boko Haram incursions in northern Cameroon." P12 added that "The climate of insecurity created by these two situations, makes it hard and unattractive for business and the expansion of electricity access." P9 further buttressed this idea, asserting that

> Mobility to these regions by electricity workers is unsafe. Eucalyptus trees especially from
>
> the North West region, that used to serve as electricity poles can no longer be obtained
>
> because of insecurity. This makes the expansion of electricity access difficult.

These experiential responses from on-the-field energy experts, research practitioners, and public policy decision-makers, were pivotal to the findings of this study. The responses to the question of impeding factors to electricity access were without doubt, invaluable to an in-depth understanding of the nature of the challenges confronted in providing full electricity access to the Cameroonian communities. Participants' responses articulated the main impeding factors as emanating from economic, social, political, managerial, technological, environmental, and war themes. Most of these themes were commonly expressed by all the participants and found to be interconnected in the course of the analysis.

Further qualitative analysis of these experiences, led to the second major research question in this study. When asked, "As an expert in this field what can be done to alleviate the problem of electricity access?", Participants provided a variety of responses which culminated in the major theme of emerging strategies for electricity access.

2. Emerging Strategies for Electricity Access

Odarno et al. (2017) predicated the idea of strategies for electricity access, on not just providing full electricity demand from the bottom up but linking it to catalyzing impactful development initiatives within the communities benefiting from it, alongside good governance. A qualitative analysis of the theme of emerging strategies for electricity access in Cameroon generated several subthemes consisting of a) Economic Strategies b) Social Strategies c) Good Governance Strategies d) Managerial Strategies e) Technological Strategies f) Environmental Strategies and g) Peace Strategies.

a) Economic Strategies

In correlation with the above theme, P 5 explained that "Funding more hydropower energy sources is the key to lowering electricity cost and ensuring not just a competitive economy but also an industrial-base expansion." According to P7,

Cameroon has the 3rd hydropower potential in Africa behind the Democratic Republic of

Congo and Ethiopia. The country's enormous hydropower potential can produce more

than enough hydroelectricity for its needs and export some of it to neighboring countries

like Chad and Nigeria.

P6 on her part, cited that "The Menchum Power Plant Project which has been lying on shelves should be habilitated. Cameroon's hydropotential will become a huge source of foreign and domestic revenue for the country." P4 reiterated: "While the initial investment may be substantial, its operating cost is low and it is immune to the rising fossil prices. Its generation cost is also low between 2 to 4 cents per kilowatt per hour." P9 ascertained that "It is an economical source of energy and with new technologies like marine and hydrokinetics, it will continue to serve as a great sustainable energy source." Nonetheless, P10 intimated that "Maintaining and expanding Cameroon's electric grid may not only need funding but a more transparent and judicious management of the financial resources for long-term sustainability." P3 suggested: "There is also a need for a direct correlation between the electricity policy objectives and the realities on the field." In addition, proposed P8, "There is a need for an energy strategy that ensures an equitable payment of electricity bills for all consumers irrespective of whether they are big corporations, government or residential utility users." P1 further explained that "A mechanism also needs to be set up for all unpaid bill arrears to be collected for the Cameroon electricity company to have enough liquidity to improve its services, maintain the grid and invest in a sustainable expansion strategy." P11 added that "A more sustainable electricity production and management will develop the industrial sector of the economy, increase productivity and economic growth." P5 on his part, stated that "Energy infrastructure financing agreements of electricity projects, between the government, foreign and local financing entities, need to be conducted in transparency,

good faith and equity, with no fine prints." P2 suggested that " Road transport infrastructure is also needed to facilitate access to electrical installations, billing, and maintenance." P12 proposed that "Cameroon also needs to enact policies that encourage public and private partnership ventures, setting up new electricity companies to break the monopoly of the lone electricity company and to create a competitive energy market as well."

b) Social Strategies

Alongside the theme of social strategies, P 7 revealed that "There is a need for an increase in average incomes and minimum wage standards to boost purchasing power and enable electricity utility consumers to be able to afford their electricity bills." Moreover, opined P1, "More opportunities for better-paying jobs need to be created to minimize unemployment and provide Cameroonians the basic necessity of light to improve on their welfare." P5 commented that " Electricity rates also need to be revised to reflect the income levels and minimum wage standards of the community to ensure affordability." P3 added that " Compensations also need to be promptly paid to communities whose properties are affected by the passing of electricity lines, excavation, implantation of electricity poles, transformers and dam construction." In addition, for P8, " There is a need to create a consumer advocate agency to cater for the quality of electricity needs of the consumers as well as follow up with the courts, on issues related to property damages caused by the electricity agency.

c) Good Governance Strategies

According to P3:

> Full access to electricity in Cameroon will depend for the most part on [la politique de bonne gouvernance] good governance policies. The government must have the goodwill, and provide the right tools to sort and implement the best strategies for sustainable electricity access not just for the immediate term but also for the long term.

Such policies, argued P1, " will not only favor the expansion of the hydroelectric grid but will also integrate alongside autonomous off-grid alternative energy projects." Besides, posited P6, "The government must treat the hydroelectric grid in correlation with other energy sources." P9 on his part, asserted that,

From my 22 years of experience, I think a holistic approach that integrates all the energy sources and modern technologies will resolve the problem of electricity access in the country. Currently, the government has been treating hydroelectricity separately from the other sources of energy, and as a result, upon completion, the Kribi Power Plant could not work because it lacked natural gas to be powered with.

P7 pointed out that "The government must also ensure that contracts with both domestic and international energy companies are judiciously studied and regulated in favor of national interests." P5 concurred that " Previous contracts with International oil companies are bad because they make no provision for domestic consumption. For example, Cameroon's lone oil refinery, SONARA, resorted to buying and refining crude oil from foreign sources for domestic consumption." P11 confirmed that " The refinery itself, was never modeled to refine local crude oil from Cameroon." According to P12, "This was a bad political decision and needs to be corrected either by creating an

alternative refinery that refines crude from Cameroon or by transforming the present refinery to refine crude from the country." P10 suggested, " This will reduce any negative demand and supply impact in the domestic consumption when prices of oil fluctuate in the international market, as in the case of the war in Ukraine." In addition, P5 proposed that "The Cameroon government needs to provide more security guarantees, make custom duties and tariffs competitive, and ensure better funding schemes to local entrepreneurs to make investments in electricity generation and supply more attractive." According to P3:

> My take on this question is that, in order for all Cameroonians to have access to electricity, the government has to decentralize the electricity generation and supply system operating now, and make way for other companies to operate in other regions of the country. For example, each of the ten regions in Cameroon could have its own autonomous electricity company providing electricity for that region, with its head office in the same region. This will break the monopoly in which the present company operates, solve the problem of laisser-faire, management bottlenecks, and enable a competitive market.

Such a solution, as opined P1, "can also create opportunities for the much-needed jobs, increase socioeconomic activities, financial services, education, and recreation." P4 reiterated that:

> In my opinion, the government has to set policy strategies that involve developing all the energy potentials in Cameroon, such as nuclear, oil, coal and natural gas, and renewables such as solar, wind, and geothermal to complement

short and long-term needs.

Moreover, P6 posed that:

> As far as I am concerned, the government has to set up an audit department to oversee service management and to provide recommendations for improvement. There must also be some kind of regulation to ensure quality and accountability of service.

d) Managerial Strategies

P10 commented that:

When a company is too large and the power of making decisions is concentrated in one person at the head, it becomes difficult to manage efficiently. That is the problem with our electricity company here. So my take is that the electricity company needs to create multiple smaller units with autonomous decision-making powers. This will ensure a reduction of long waiting hours to render service, review, and resolve other customer issues.

P5 also enjoined that "Multiple easy bill payment options and payment locations such as through the post office, internet sites and phones should be instituted to facilitate the payment of electricity bills and to curb consumer burden." In addition, P12 insisted that " ENEO [the electricity agency] needs to establish an accounting system to expedite billing for new customers' installations to reduce lump sum bill accumulations that are most of the time difficult to settle." On her part, P6 asserted that " There is also the need for regular in-service training as this will improve customer service needs." Moreover, P9 added,

Management must get rid of corrupt and dubious employees. This can be done through the institution of anonymous hotline communications, whistle-blowers, disciplinary councils and investigation units, to report and sanction corrupt and unprofessional conduct of all employees without exception.

In addition, P11 proposed that "I think things will be somehow better if ENEO the electricity agency can create a quality control and audit department to oversee and ensure the effective and efficient management of the company." P7 further suggested that "There is a need for the creation of a management fund within each electricity agency to indemnify customers for any damages caused in their property due to light seizures or light failure.

e) Technological Strategies

On the technological front, P8 posited, "There is a need to focus on a regular maintenance review and repair of the electricity system to prevent unforeseen loss of power, breakdowns, and power outages. A stitch in time saves nine." P2 on her part, stated that

> Thirty percent of the current energy generation capacity is lost due to inadequate maintenance, faulty transmission, and distribution equipment. You see, for example, the
>
> three separate networks in the Mem'Mvele South, the Lom Pangar North and the

Natchigal East has to be interconnected to be fully functional.

In addition, P4 argued, "The electricity company must take advantage of new technologies. There is a lot of stuff out there that can be used to ensure better sustainability and performance both in spare parts and overhauling the whole system." P7 also reiterated that "Focus must also be placed on the hiring of qualified trained manpower with technical skills adaptable to innovative technologies. You know, some of the new hires these days don't exactly know what they are doing ." P3 postulated that "The creation of a research and development department to work on the search for new cost-efficient and better-performing energy sources and technologies can be advantageous to the growth of ENEO. As I see it, ENEO is not ready to handle new challenges."

f) Environmental Strategies

P5 asserted that "Because of the environment, our power production is affected negatively. The dry season and global warming lower the water level in the dams making it hard for the dams to function fully as they should." P9 intimated that "Alternative sources of energy like solar and gas can be used to remedy the situation. Gas and sunlight are abundant in Cameroon that can be converted to generate power." P12 commented that:

> The deal between the National Oil Company (SNH) and Gazprom allows to partially address the issue of introducing more gas into the production of electricity. Under that deal, Gazprom will deliver 30,000t of gas and 5,000 bbl/day of condensate. That Gas and condensate can power both the Kribi and the Log

Baba power plants.

P8 suggested that: “Regions like the Northwest of Cameroon, where the eucalyptus trees are cut for electricity poles, can immediately be rehabilitated through the planting of young eucalyptus seedlings to replace the cut trees to protect the environment.” In addition, P11 proposed that “Off-grid electricity systems including stand-alone and mini-grid systems can complement the slow supply of hydroelectricity generation, and break the cycle of electricity poverty that holds back socioeconomic activities in Cameroon.” P1 argued that Communities that have been displaced because of new dam constructions in their areas must have to be compensated and resettled.”

g) Peace Strategies

P10 agreed that:

> Peace is a critical factor in providing electricity access not just in the crisis regions of the
>
> Northwest and Southwest but also in regions where electricity installation poles are
>
> planted to enable the expansion of the electricity grid.

P6 indicated that:

> In the northern regions of the country, terrorist activities carried out by the Boko Haram
>
> Islamic groups are threatening the security and stability of the region. A political solution is

necessary to resolve the crisis in the North-West and South-West regions. There is a need

for the government and separatist groups to hold meaningful dialogue to prevent, mitigate

and protect civilians from atrocities and bring stability to the conflicted areas. According to P7,

> Only a meaningful dialogue between the government and separatists will provide grounds
>
> for lasting peace, a more secure, stable, and inclusive community that can be attractive to
>
> foreign and domestic investments in electricity and the much-needed socioeconomic development.

P9 also affirmed that "To bring lasting peace to Northern Cameroon, the government needs to embark on sustainable socioeconomic development, plan strategies to counter the Boko HARAM terrorist movement, and strengthen effective state presence and governance in the affected region." P5 also noted that "The government must also reinforce security measures around its territorial boundaries and within socioeconomic centers like schools, religious services, restaurants, markets, and fishing ports."

These experiential responses, culled from participants were also as significant as the previous responses to the findings of this study. The responses to the question of what could be done to alleviate the problem of electricity access in Cameroon, were also without doubt, invaluable to an in-depth understanding of the potential solutions to the

challenges confronted in providing full electricity access to the Cameroonian communities. Participants' responses postulated the major solutions as emerging from economic, social, good governance politics, managerial, technological, environmental, and peace strategies. These themes were commonly expressed by all the participants and also found to be interconnected in the course of the narrative analysis.

Further qualitative analysis of these experiences, led to the third major research question in this study. When asked, from their experience what was the best cost-effective electricity model for Cameroon? Participants provided a variety of responses which culminated in the major theme of emerging most cost-effective factors for electricity access.

3. Emerging Best Cost-Effectiveness Factors to Electricity Access

The emerging theme of best cost-effectiveness, as Edge (2021) enunciated, accounts for the most optimum results, advantages, and profits in comparative terms with alternative propositions. Cookson et al. (2017) equally suggested that the concept which also referred to cost-benefit, cost-efficient, least-cost, competitive, and budget-friendly, could be used to identify inefficiencies and to bring out the most competitive solutions to challenges in public policy and governance. A qualitative analysis of the theme of best cost-effective factors for electricity access in Cameroon as generated from participants' responses revealed five subthemes consisting of a) accessibility b) reliability c) affordability d) sustainability and e) governance policy.

a) Accessibility

According to P3,

My take on this question is that electricity must be easily reachable or available to all

Cameroonian towns and villages for it to be cost-effective. People who make more money

should pay more and those who make less should pay less.

P4 on his part, argued that,

If everyone has electricity, many problems will be solved. The availability of electricity for

every community here will positively transform our lives. I also think that

providing electricity to the reach of every household will bring great improvement in our

lives.

P1 added that "In modern times, everything is virtually done by electricity, whether it is banking, lighting on the street, or at home. So, only full access to electricity that is easy to obtain will enable everyone to benefit."

b) Reliability

P5 stated that "I don't care how you look at it, we all need reliable Electricity. Access must be reliable. That is to say, the best cost-effective electricity is that electricity which is dependable at all times." P8 asserted that:

Yes, we should be able to count on its use any time we need it. To me, there is nothing as

frustrating as walking into say, a bank or a post office, and you are turned away because the

electric power just went off. So, I will say the best cost-effective electricity model is that

which is reliable or that we can count on. If it is not reliable then it is not good, talk less

about cost-effectiveness.

c) Affordability

P3 commented that "Some people may have a different opinion, but for me, the best cost-effective electricity model is that which can be readily affordable to the average income earner." P9 concurred, pointing out that,

Of course, making electricity to the reach of every pocket can be a win-win for everyone.

Both the consumers and the electricity supplier will benefit, as everyone will be able to

pay and the electricity company will also make money regularly. It is the principle of

demand and supply cost.

In P4's opinion:

Affordability is one of the best if not the best cost-effective methods of providing electricity access to our communities. That means that even people who are not

financially very viable can be able to pay their electricity bills. This also means that there

will be no stagnation and not many people will owe electricity bills.

P11 agreed with P4, asserting, " My take is that, the cost of electricity should be proportionate with people's buying power in such a way that electricity can be readily affordable without much pain in our income."

d) Sustainability

P6 indicated that:

The best cost-effective electricity access system is one which in my opinion is not only

sustainable for the short-term but also for the long-term. What I can argue is that any

reliable electricity system worthy of the term must be favorable to human, economic,

environmental, and technological conditions.

For P2, "A sustainable electricity system is certainly the best cost-effective system because it creates a better business climate, builds confidence in investors, and promotes socioeconomic development." P12 stated:

What I can confirm is that we need a system that is not just dependable and affordable to

our pockets, but can serve us for a very long time without breaking down now and then. In short, a system that is resilient and can stand the test of time.

P5 asserted that:

> If we can have sustainable electricity, then we can be sure to develop faster in all domains,
>
> be it in education, health care, employment, and our social well-being. So, to me, the best
>
> cost-effective electricity model is one that is sustainable.

e) Governance Policy

P7 propounded the idea of government policy as the springboard for a cost-effective model, advancing that:

> Personally, from experience, it is hard to even mention the idea of accessibility,
>
> Sustainability, or even affordability, and reliability without first considering governance
>
> policy. To me, good governance policies determine the best cost-effective electricity model in a country. We have to integrate the idea of accessibility, affordability, sustainability, and reliability factors into good governance policies.

P1 also intimated that "Good governance sets the appropriate framework for the best cost-effective electricity model in the country. A framework that will create an enabling environment to promote investments in electricity, energy innovations, and renewables." P6 replicated, affirming that "Governance policy should also create a regulatory framework to efficiently manage access to electricity as well as enforcement mechanisms to root out corrupt practices and maintain accountability and transparency." P7 argued

that “Good governance should integrate consumer protection commissions, audit agencies, and anti-corruption agencies to ensure compliance with regulated standards.”

Participants’ responses to the question of what was the best cost-effective electricity model in Cameroon, demonstrated a profound knowledge and experience of the factors that constituted a framework for an energy system that could be the best cost-effective model for the country. These experiences were significant to the study’s findings and reflected the realities of the energy situation in Cameroon as viewed by participants. Participants affirmed from their experiences, the tenets of accessibility, reliability, affordability, sustainability, and good governance policy, as major elements contributing to the best cost-effective electricity model for Cameroon. Additional analysis of these experiences culminated in the fourth major research question. The question of any electricity model in the world that participants could identify with, as a possible reference for replicability, was posed. The narrative analysis that followed provided evidence of the choices made through participants’ responses.

4. Emerging Replication Models to Electricity Access

The idea of a model was referred to as a guide that provided a communication framework enabling analysts and experts to exercise judgment within a defined context (USAID, 2022). Several cost-effective models were suggested by public policy research practitioners and organizations as an efficient guide to predicting positive outcomes. The World Energy Council (2023) defined a good energy model as one that enabled each country to ensure a sustainable supply of energy, creating a balance in energy security, affordability, and environmental sustainability. Based on these parameters, the same

organization, working within the auspices of the United Nations, ranked Switzerland, Sweden, Denmark, the United Kingdom, and Finland among the five best national energy systems in the world. This researcher examined the first three of these countries' electricity models and prompted the participants' observation as to their impression of these models.

a) The Swiss Model

According to the International Energy Agency's World Energy Outlook (2021), Switzerland had the lowest carbon emission among International Energy Agency countries. Its carbon-free electricity tapped mostly from hydro and nuclear sources, ranked her among the first five best energy models in the world. Its more than 680 hydroelectric plants generated 61.5% of electricity. Its 4 nuclear plants generated 28.5% of electricity while renewable-driven and conventional thermal power plants produced about 9%. About half of its total production was exported. The Swiss grid, Switzerland's national grid company was responsible for the operation, maintenance, modernization, and expansion of 6,700km of high-voltage grid. The energy sector was highly decentralized with a 99% share of carbon-free electricity mix. The country's energy policy was designed to supply its energy needs, reduce dependence on fossil fuel and CO2 emissions, increase efficiency, promote renewables, and phase out nuclear power. The policy also ensured a secure supply of affordable and environmentally friendly energy sources.

b) Swedish Model

Most of its electricity supply came from hydro and nuclear, alongside the growing use of wind. The country had huge volumes of moving water and biomass contributing to a high share of renewables. Though the country used a lot of energy, its emission was low because of its focus on renewables such as hydropower and bioenergy. Hydroelectricity production contributed 43% of Swedish electricity needs, 31% from nuclear, 16% from wind power, and 9% from biofuels. The government energy policies promoted as a priority the use of renewables. Sweden had a robust energy system with enough generation capacity to cover both domestic and foreign market exports. The country had almost fully decarbonized its electricity generation.

c) The Danish Model

Denmark's energy system ranked among the first in the world with a triple-A score according to the United Nations' World Energy Council (2021). Its power mix was largely shaped by wind energy which accounted for almost half of the total energy generated in Denmark followed by bioenergy. Much of its wind energy was exported. Each part of the country was part of a major grid system. It imported part of its electric power from Norway and Sweden. The country's energy policy had a wide range of incentives for renewable sources of energy, especially wind energy. Government policy promoted competition, renewable sources of energy to 100%, and emission reduction measures.

Participant's Responses to Observed Models

When asked, from their experiences if there was/were any electricity model(s) they knew in the world that could serve as a reference for replication, Participants responded variedly, positively approving the Swiss, Swedish and Danish models as viable electricity models. However, all the participants' responses, formed a consensus on a Cameroonian model.

The Cameroonian Model

P1, taking a look at her office laptop, strongly argued that " As much as the Swiss and these other models may be the best in the world, I still think an electricity model that reflects our Cameroonian realities will be best for us. This must be based on the available resources in Cameroon though." P2 posited that "the problem with electricity access in Cameroon, is not the lack of resources but the management of these resources. We do not need to copy these models. We only need to learn from these countries how to manage our own resources, to get to where they are." P3 suggested that "Instead of copying what these countries have we should gather all the knowledge available on all the energy resources in our country, assess them, and then, decide which ones can serve our interest most." P 4 on his part asserted that "We cannot rely on foreign models because they will not reflect our realities. We have to figure out what is best for us depending on what we have available and what we can manage." According to P5, "The reality is that countries like Switzerland, Sweden, Denmark, and others, have succeeded in setting up very good electricity models based on the goodwill and commitment of their governments, and the energy potentials they can afford." P6 opined that " the best cost-effective model for

Cameroon does not rely on what these countries have but what we can make use of, that is available in our land. You know I mean, our own resources." P7 on his part intimated that "The reality is that we have to rely on our own ingenuity and resources. I know we have abundant resources to produce the best electricity model. All that we need is a good government to bring this together." P8 postulated that "I don't really care what model we have. As long as it is sustainable, affordable, reliable, and available to all Cameroonians, rich or poor." P9 assertively and in greater detail proposed that:

> The prohibitive costs of erecting dams make them unappealing to me in terms of the country's current financial situation. Cameroon's current debt/GDP ratio is 45%. Undertaking that many dams may bankrupt the country once again after its admission to the Highly Indebted Poor Countries Initiative in early 2000. I believe that Cameroon should take advantage of its natural resources potential by using more natural gas and using more solar energy technology. To do so Cameroon will need to develop a market for natural gas and invest in pipelines to transport it, choose specific components that are necessary to build solar farms to exonerate when importing before starting producing them locally at a lower cost. The gas option to lead our energy independence will be a good thing because it will allow the country to tackle many issues like flaring and CO2 emissions at the same time and jump ahead by mastering a process like Carbon Capture and Storage (CCUS). The cost of implementing gas and solar will be less expensive than erecting dams for

sure. Those dams will cost close to XAF 1 Trillion when it will cost Cameroon half of that amount to build a new refinery, extend the pipeline network and build storage facilities all over the country to produce clean electricity. In addition, gas can be liquefied and sold in higher volumes like what is being done in Kribi by the SNH and Perenco, Cameroon to sell to Gazprom on the Hilli Episeyo**.** Cameroon has over 4.5 trillion cubic feet of proven reserves of gas. It is over 145 times its current consumption of natural gas. It means that there is more than enough natural gas to sell and use to produce clean electricity that will power Cameroon's economy for years to come and allow Cameroon to maintain its leadership role in Central Africa and usher stability and prosperity for the region. The government should take advantage by subsidizing the Carbon Capture phase to make the model attractive and allow fair competition in the industry. Competition will push progress forward and reduce costs in the long run thus reducing the electricity cost for everybody. I am confident that it is the right

approach because it will help address the issue of energy security, and develop a greener

economy that will help reduce our healthcare costs by having less cases of cancer for

example. Our climate will give us a comparative advantage compared to other places like

the US, and Canada where it snows. That means that Cameroon can produce and sell

continuously. There are so many benefits to going green. We get inspired not copied.

These observations were confirmed by P10 who emphasized that it was "just common sense for Cameroon to have its own model, taking advantage of the energy resource potentials available in the country". P11 reiterated that:

The best cost-effective model to replicate will be a Cameroonian model that is sustainable,

affordable, accessible, reliable, and makes use of all local energy sources and domestic

renewable technologies with the support of the government, private partnerships, and local

communities.

The problem, however, as posed by P12 was:

You can have all the best energy resources we have in Cameroon, but if the

government is not fully committed, it will be impossible to afford a good electricity

system. So, the best system for us is one which combines a committed good

governance policy with our available energy resources that are sustainable, obtainable,

dependable, and that the average citizen can easily pay for. This is all interconnected. They

all go together, no more, no less.

Summary of Chapter 4

The first phase of the analysis focused on data responses directly related to the factors impeding the development of a sustainable electricity access system in Cameroon, strategies to alleviate these impediments, and the best cost-effective electricity model for the country.

When asked about their experience and what they thought were factors that impeded access to electricity in Cameroon, participants' responses suggested economic, social, political, managerial, technological, and security factors as representing major impediments to electricity access in Cameroon. In response to the second question, as to what could be done to alleviate the problem of impeding factors to electricity access in Cameroon, participants' responses, predicated on economic strategies, social strategies, good governance strategies, managerial strategies, technological strategies, environmental strategies, and peace strategies as the solution to the problem.

The second phase of the analysis focused on data responses related to the best cost-effective electricity model in Cameroon. When asked from their experience, what they thought was the best cost-effective electricity model for Cameroon, participants' responses provided a combination of factors that constituted a framework for the best

cost-effective electricity access for Cameroon. These factors consisted of accessibility, reliability, affordability, sustainability, and good governance policy. In response to the fourth question as to whether from their experiences, the participants knew any model(s) that could serve as a reference for replication, participants' responses were almost unanimous. Most agreed that, although other models like the Swiss, Swedish, and Danish models were recognized among the best, replication was not the solution to Cameroon's electricity problems. The solution, according to most of the responses, was a model that integrated good governance with available energy resources that were accessible, reliable, sustainable, and affordable to every Cameroonian community.

With the narrative analysis of the participant's responses concluded, the next chapter focused mainly on the interpretations of the findings, their implications, and the conclusion.

Chapter 5: Interpretation of Findings, Recommendations, Implications, and Conclusions

Introduction

The purpose of this study was to bring about effective solutions to the problem of electricity access in Cameroon. To this end, the study explored the inadequacies of the current hydroelectric supply system, the most cost-effective method of supplying electricity to Cameroonian communities, and potential public policy decisions that could provide better access to electricity. Circumscribed within the theoretical foundations of the systems theory propounded by Ludwig von Bertalanffy, the study put into perspective what factors were impeding the development of a sustainable electricity supply system and the best most cost-effective strategy that could provide electricity access to Cameroonian communities. A qualitative systems-based approach was proposed to obtain the data required. Using a structured, one-on-one, audio interview design, selected sample participants of men and women knowledgeable in energy sustainability and public policy systems, provided data account of their expert knowledge and experience on impeding factors to electricity access in Cameroon, strategies to alleviate these impediments, and the best cost-effective policy model that could be used to have full access to electricity. This knowledge was analyzed in response to the study's question and social change implications. The main goal was to bring about positive social change, improving the well-being of urban and rural communities in Cameroon through the promotion of availability, access, and affordability of electricity. This chapter focuses on interpreting the results of the findings, limitations of the study, recommendations, implications of the study, and the conclusion.

Interpretation of the Findings

Data interpretation involves the process of using analytical methods to review data and arrive at relevant conclusions (Calzon, 2023). In this regard, this study was predicated on a qualitative-based approach. A thematic analysis focused on analyzing qualitative data from interview transcripts of participants' experience and expertise, on the problem of impeding factors to electricity access in Cameroon, strategies alleviating this problem, the best cost-effective electricity model, and potential replication models. From these analyses, the following findings were confirmed:

Theme 1: Emerging Impediments

In tandem with the question of impeding factors to electricity access, participants' responses generated the major theme of emerging impediments to electricity access. Current literature reviewed a similar theme as barriers or challenges to electricity access. However, the context differed from one another. Moreover, the nature of the responses also differed. Within the theme of emerging impediments, emanated sub-themes that responded directly to the question of impeding factors to electricity access. The following sub-themes were culled from participants' responses: economic impediment, social impediment, political impediment, managerial impediment, technological impediment, environmental impediment, and war impediment. From an analysis of these sub-themes, it was deduced that the development of electricity access in Cameroon was impeded by deep-rooted economic, social, political, managerial, technological, environmental, and security factors.

a) Economic Factors

As far as economic factors were concerned, participants were of the view that the collapse of the oil price, adverse effects of the COVID-19 pandemic, high costs of capital investments and funding, poor road infrastructures, monopolistic controls, and the general sluggishness of the economy were responsible for impeding the development of electricity access in Cameroon.

b) Social Factors

From a social perspective, participants' responses suggested that high unemployment and underemployment, low purchasing power especially in rural areas, high electricity rates, disproportionate rates of electricity payment, the absence of a consumer protection agency, and wanton theft of electricity were contributing factors impeding electricity access in Cameroon.

c) Political Factors

From a political point of view, participants' responses indicated that bureaucratic challenges in credit access, the absence of political will and commitment to promote current electricity access resources and alternatives, the disconnect between policy goals and the reality on the field, the politicization of electrical installations, lack of government incentives to encourage investment, over-centralization, and monopoly in the energy sector, lack of incentives in research and development of new energy resources, no real government audits of energy corporation, institutionalized corruption, nepotism, tribalism and favoritism, and poor energy contracts that undermined national interests, were political factors that impeded the development of electricity access in Cameroon.

d) Managerial Factors

In conjunction with political factors, participants' responses also revealed that the bureaucratic management of the lone electricity company, slow decision-making due to over-centralized management, corrupt and unprofessional practices of employees, disproportionate billing method, absence of a viable preventive maintenance strategy, tribalism and nepotism characterized impediments to full electricity access in Cameroon.

e) Technological Factors

Participants' responses equally showed that, with regards to technology, the lack of innovation, inadequate transmission and distribution equipment, lack of will to take advantage of advanced technologies, little consideration for alternative resources, outdated technology, the lack of a regular maintenance audit to ensure the quality of services and products, and the lack of research and development incentives, were factors impeding electricity access in Cameroon.

f) Environmental Factors

Participants' responses also revealed that the environment played a significant role to impede electricity access in Cameroon. Global warming and the dry season caused water levels to drop drastically, causing poor operation of hydroelectric dams, reduced electricity supply, rationing, and lack of access in many communities.

g) Security Factor

Coupled with environmental factors, responses from participants pointed to the fact that, persistent armed conflicts between separatist fighters and government forces in the North West and South West regions of Cameroon, as well as Boko Haram terrorist

incursions in the Northern regions of the country, created a climate of insecurity, making it hard for electricity expansion, acquisition of local material like poles, and workers' mobility.

Theme 2: Emerging Strategies

In the mix of responding to the factors that impeded electricity access in Cameroon, research participants also used their expertise and experience to respond to the second research question on what could be done to alleviate the problem of electricity access in the country. Participants' responses initiated the major theme of emerging strategies for electricity access. Within this theme, were generated several sub-themes, responding directly to the question of what could be done to alleviate the problem of electricity access in Cameroon. The themes included economic strategies, social strategies, good governance strategies, managerial strategies, technological strategies, environmental strategies, and peace strategies. From an analysis of these themes, it was extrapolated that the problem of electricity access in Cameroon could be alleviated through economic, social, good governance, managerial, technological, environmental, and peace strategies.

a) Economic Strategies

In tandem with economic strategies, participants' responses indicated that Cameroon had the third highest hydroelectricity potential in Africa. For this reason, although the initial cost of funding hydropower was high, it was more cost-effective in the long run due to low operation and generation costs. Participants suggested that funding more hydropower projects like the Menchum Power Plant could provide

abundant sources of electricity that could supply foreign and domestic markets and in turn, generate revenue for the country. Also, from an economic perspective, responses from participants advocated the need for transparency, judicious management, and good faith agreement in energy infrastructure financing agreements of electricity projects between the government, and foreign and local financing entities. Participants also recommended more development in road transport infrastructure, creating a mechanism that incentivized the settlement of all unpaid bill arrears, enacting energy policy incentives that encouraged public and private partnership ventures, setting up new electricity companies, and creating a competitive energy market.

b) Social Strategies

An analysis of participants' responses also revealed that social strategies could alleviate the problem of impeding electricity access. Creating job opportunities, increasing the minimum salary rate, revising electricity rates to reflect income levels to boost affordability, creating a consumer advocate agency, and compensating consumers for property damages caused by intermittent power failures were among the strategies advocated by participant responses.

c) Good Governance Strategies

In conjunction with social strategies, participants' responses also proposed the need for good governance policies that were committed, and with the right tools to implement the best sustainable strategies that favored energy expansion, autonomous off-grid alternative energy projects, and the integration of other energy sources with hydropower. Among other good governance policies, participants' responses equally

suggested the need to ensure energy contracts with both domestic and foreign energy companies were judiciously studied and regulated in favor of national interests and needs, and that the government provided security guarantees, made custom duties and tariffs more competitive, and provided more attractive energy investment incentives. The need for an autonomous audit agency to monitor corrupt practices, and inefficient underperforming practices, regulate, make recommendations, and oversee energy management in the country was also proposed through participants' responses. Other suggestions included strategies to develop other energy potentials (like solar, geothermal, wind, coal, oil, and nuclear), decentralization, and the creation of autonomous regional energy utility agencies in each of Cameroon's ten regions. The use of natural gas was highly recommended to complement hydropower because of the presence of huge amounts of natural gas deposits in Cameroon.

d) Managerial Strategies

Alongside good governance strategies, participants also proposed, at the level of energy corporations, good managerial strategies that led to the creation of multiple smaller units with autonomous decision-making powers, multiple bill payment options, and payment locations such as the post office, the internet, or phone to facilitate payment, reduce long waiting hours to render service, and resolve other customer issues. An accounting system also needed to be created to expedite billing for new customers' installations and to reduce lump sum bill accumulations that were most of the time difficult to settle. The need for regular in-service training to improve customer service demands and get rid of corrupt and dubious employees through the institution of

anonymous hot-line communications, disciplinary councils, and investigation units, to report and sanction corrupt and unprofessional conduct of all employees without exception. In addition, participants advocated that ENEO the electricity agency could create a quality control and audit department that oversaw and ensured the effective and efficient management of the company. It was equally suggested that a management fund be created within each electricity agency to indemnify customers for any damages caused to their property due to light seizures or light failure.

e) Technological Strategies

In the mix of technology, participants' responses indicated, focusing on regular maintenance and repairs of the electricity system would prevent unforeseen loss of power, breakdowns, and power outages as thirty percent of the current energy generation capacity was lost due to inadequate maintenance, faulty transmission and distribution equipment. Participants also requested the three separate networks in the Mem'Mvele South, the Lom Pangar North, and the Natchigal East be connected to be fully functional. In addition, participants recommended that the electricity company took advantage of new technologies to ensure better sustainability and performance both in spare parts and overhauling the whole system. Participants also reiterated placing focus on the hiring of qualified trained manpower with technical skills adaptable to innovative technologies. Some other participants advocated for the creation of a research and development department dedicated to the search for new cost-efficient and better-performing energy sources and technologies, which could be advantageous to the growth of ENEO.

f) Environmental Strategies

To resolve the impeding problems of hydroelectricity access influenced by the environment, participants' responses intimated that alternative sources of energy like solar and gas could be used to remedy the situation. Cameroon had an abundance of gas and sunlight that could be converted to generate power. In this regard, the deal between the National Oil Company (SNH) and Gazprom allowed it to partially address the issue of introducing more gas into the production of electricity. Under that deal, Gazprom could deliver 30,000t of gas and 5,000 bbl/day of condensate. Gas and condensate could power both the Kribi and the Log Baba power plants. Participants also suggested that regions like the Northwest of Cameroon, where the eucalyptus trees were cut for electricity poles, could immediately be rehabilitated through the planting of young eucalyptus seedlings to replace the cut trees to protect the environment. In addition, participants proposed that off-grid electricity systems including stand-alone and mini-grid systems could complement the slow supply of hydroelectricity generation and break the cycle of electricity poverty that held back socioeconomic activities in Cameroon. Some participants also argued that Communities which had been displaced because of new dam constructions in their areas had to be compensated and resettled. Participants also advocated for the installation of solar energy and other environmentally friendly energy sources to protect the environment and curb gas emissions.

g) Peace Strategies

Alongside environmental strategies, all the participants appealed for a return to calm, through a sustainable peacefully negotiable solution between the government of Cameroon and Anglophone separatist fighters. Participants also petitioned that such a deal required genuine dialogue, the rehabilitation and compensation of internally displaced persons, infrastructure reconstruction in war-affected regions, and a return to security in the two Anglophone regions of Cameroon. As for the terrorist incursions in the northern part of Cameroon by the Boko Haram radical Islamic group, participants reiterated the need for government to increase funding for border security, and to focus also on reinforcing the security of socio-economic locations such as market places, bars and restaurants, port areas, schools, and churches.

Theme 3: Emerging Best Cost-Effectiveness Factors

The emerging theme of best cost-effectiveness, as Edge (2021) enunciated, accounted for the most optimum results, advantages, and profits in comparative terms with alternative propositions. Cookson et al. (2017) equally suggested that the concept which also referred to cost-benefit, cost-efficient, least-cost, competitive, and budget-friendly, could be used to identify inefficiencies and to bring out the most competitive solutions to challenges in public policy and governance. A qualitative analysis of the theme of best cost-effective factors for electricity access in Cameroon as generated from participants' responses revealed five subthemes consisting of a) accessibility b) reliability c) affordability d) sustainability and e) governance policy.

a) Accessibility

Participants' take on the factors that contributed to the question of the best cost-effective electricity model in Cameroon was that electricity must be easily reachable or available to all Cameroonian towns and villages for it to be cost-effective. The idea propounded was that, if everyone had electricity, lives will be transformed positively, especially in modern times when everything was virtually done by electricity, whether it was banking, lighting on the street, or at home.

b) Reliability

Some participants insisted on the aspect of reliability as the best cost-effective factor for electricity access in Cameroon. Others used the term "dependable", or a system they could count on, at any time they needed it, expressing their frustration if they walked into a bank or post office and were turned away because the electric power had just gone off.

c) Affordability

A good number of participants advocated for a model that was readily affordable to the reach of average income earners. In other words, the cost of electricity would be proportionate with people's buying power in such a way that electricity could be readily affordable without much pain in the consumers' pocket. To many participants, this would be a win for all, both for the consumers and for the supplier since everyone would be able to pay and the electricity company would make more benefits.

d) Sustainability

Participants also asserted that any reliable electricity model worthy of the best cost-effective electricity model was not only sustainable for the short and long term, but

especially favorable to human, economic, environmental, and technological conditions. According to participants, the advantage of such a sustainable model was that it was resilient and stood the test of time, it created a better business climate, built confidence in investors, and promoted socioeconomic development.

e) Governance Policy

Participants propounded the idea of good governance policy as the springboard for a cost-effective model, advancing that the idea of accessibility, sustainability, affordability, and reliability would be more meaningful with good governance policies. As an integral piece, good governance combined with these other pieces to form the framework for the best cost-effective electricity system. Most participants also intimated from their responses that good governance set the appropriate framework for the best cost-effective electricity model in the country. A framework that created an enabling environment to promote investments in electricity, energy innovations, and renewables was the preference of most participants. Participants also affirmed that government should create a regulatory framework to efficiently manage access to electricity as well as enforcement mechanisms to root out corrupt practices and maintain accountability and transparency. In addition, participants argued that good governance should integrate consumer protection commissions, audit agencies, and anti-corruption agencies to ensure compliance with regulated standards.

Participants' responses to the question of what was the most cost-effective electricity model in Cameroon, demonstrated a profound knowledge and experience of the factors that constituted a framework for an energy system that could be the most cost-

effective model for the country. These experiences were significant to the study's findings and reflected the realities of the energy situation in Cameroon as viewed by participants. Participants affirmed from their experiences, the tenets of accessibility, reliability, affordability, sustainability, and good governance policy, as major elements contributing to the most cost-effective electricity model for Cameroon. Additional analysis of these experiences culminated in the fourth major research question. The question of an electricity model in the world that participants could identify with as a possible reference for replicability was posed. The narrative analysis that followed provided evidence of the choices made through participants' responses.

Theme 4: Emerging Replication Model

The idea of a model was referred to as a guide that provided a communication framework enabling analysts and experts to exercise judgment within a defined context (USAID, 2022). Several cost-effective models have been suggested by public policy research practitioners and organizations as an efficient guide to predicting positive outcomes. The World Energy Council (2023) defined a good energy model as one that enabled each country to ensure a sustainable supply of energy, creating a balance in energy security, affordability, and environmental sustainability. Based on these parameters, the same organization, working within the auspices of the United Nations, ranked Switzerland, Sweden, Denmark, the United Kingdom, and Finland among the five best national energy systems in the world. This researcher examined three of these countries' electricity models and prompted the participants' observation as to their impression of these models.

Participants Responses to Observed Models

When asked, from their experiences if there was/were any electricity model(s) they knew in the world that could serve as a reference for replication, Participants responded variedly, positively approving the Swiss, Swedish and Danish models as viable electricity models. However, all the participants' responses, formed a consensus on a Cameroonian model.

The Cameroonian Model

According to participants, although the Swiss and other electricity models were the best in the world, a model that reflected Cameroonian realities was the best for Cameroon. Participants argued that such a model would be based on the available energy resources in the country. Some participants intimated that Cameroon did not need to copy any electricity models but to learn how to manage the energy resources in the country efficiently, to get to where other prominent models were. Based on this, according to participants, it was necessary to gather all the knowledge available on all the energy resources in the country, assess them, decide which ones could serve the country's best interest, and, through good governance and commitment, will emerge the best cost-effective model for the country. Participants were unanimous on an electricity model that was sustainable, affordable, reliable, and available to all Cameroonians. A unique experience expressed by one participant, discouraged the heavy investment in hydroelectric dams, postulating instead, the need for Cameroon to take advantage of the abundant natural gas and solar energy resources that could provide the best cost-effective electricity model for the country and also generate abundant foreign revenues if

marketed. The rationale for the gas and solar option was that it would allow the country to tackle many issues like flaring, carbon capture, and storage processes. Also, the cost of implementing gas and solar was less expensive than erecting dams which cost close to XAF 1 trillion, when it will cost Cameroon half of that amount to build a new refinery, extend the pipeline network and build storage facilities all over the country to produce clean electricity. In addition, with more than 4.5 trillion cubic feet of proven gas reserves, Cameroon could liquefy its gas, sell some of it, and use some to produce clean electricity that will power its economy for many years. Participants agreed that this measure would usher stability and prosperity in the region, and encouraged the Cameroon government to take advantage by subsidizing the Carbon Capture phase to make the model attractive and allow fair competition in the industry. Competition will push progress forward and reduce costs in the long run thus reducing the electricity cost for everybody.

Participants were confident this was the right approach because it would help address the issue of energy security, and develop a greener economy that would help reduce healthcare costs, a comparative advantage in climate, and a green economy. Participants also advocated a Cameroonian electricity model that was sustainable, affordable, accessible, reliable, and made use of all local energy sources and domestic renewable technologies with the support of the government, private partnership, and local community. In a nutshell, the best cost-effective electricity model for Cameroon was one which combined a committed good governance policy with available, sustainable, and reliable energy resources that provided affordable electricity to the average Cameroonian citizen in both rural and urban communities.

Limitations of the Study

A study on fostering electricity access through the best cost-effective model was specific to those communities without a sustainable electricity access system in Cameroon. The findings of this study were also limited to the specific case of Cameroon. Hence, this study's findings could not be generalizable to other communities that were not within the same contextualized setting. The unique geopolitical, socioeconomic, and historical environment of Cameroon took preference over all other considerations in this study. As an international research study designed to recruit participants, collect, and analyze data outside the United States, challenges abound.

At the time the study was carried out, Cameroon was facing civil strife within its English-speaking northwest and southwest regions. Separatist movements within these regions, supported by their counterparts in the diaspora were bent on restoring the independence of Southern Cameroons which they considered stolen from them by a UN-forced union with French Cameroon. In northern Cameroon, terrorist activities orchestrated by the radical Islamic group Boko Haram from Nigeria were destabilizing the region and creating insecurity. The outbreak of the deadly coronavirus and its consequent pandemic effects was an overwhelming community challenge. These security barriers limited the research sites and the movement of the researcher to the regions of Douala, Yaoundé, and Limbe. They also limited the choice for the selection of research participants to these regions. With the civil war in effect in Cameroon, traveling to the country was risky. Regular power shutdowns and rationing, issues with obtaining

travel visas, traveling to certain regions within Cameroon, access to research participants, needed sample size, and data collection sites posed as barriers to the study.

Several biases may equally have influenced this study's outcome. The qualitative interview design that ensured participants' responses met the needs of the research questions, might be subjective. This is because the reality expressed by the participants' experiences was mostly seen through the lens of the participants. The researcher's analyses and findings, extrapolated from the participants' responses to the research questions, might also have been influenced by the same subjectivity. To maintain objectivity and avoid biases, the findings of this study were reviewed with other peers and participants.

Recommendations

This qualitative research study focused on acquiring specific expert data from participants, experienced and knowledgeable in sustainable electricity access, impeding factors to electricity access, and the best most cost-effective electricity policy model. The problem of electricity access was common in most of the regions in Sub-Saharan Africa. The International Energy Agency (2015) argued that access to electricity remained a daily challenge to over eighty percent of people who lived in developing countries. The World Bank data (2018) also assessed that the Sub-Saharan African regions of Burundi, Chad, Burkina Faso, the Democratic Republic of Congo, and the Central Africa Republic had less than thirty percent electricity access. Research on a similar topic could be carried out from a quantitative or mixed method approaches with a more diverse sample because of the significance of the study and subject matter. More such studies could also be

expanded to other African or developing countries with similar energy crisis problems. A comparative and contrastive study of the best cost-effective electricity models could be carried out within the Sub-Saharan African continent for purposes of replication. Further research could also be carried out on fostering electricity access in Cameroon with a focus on the energy management and administrative system. Similar research in other neighboring countries may create an opportunity for regional cooperation.

Implications

Dhanya (2023) examined the implications of a study as the impact of the findings created by a research study. Khozaei (2022) observed that implications highlighted how relevant the findings of the research were to the study. The implications of the findings from a study of impeding factors to electricity access in Cameroon and the best cost-effective model are threefold: Positive social change, public policy, and methodological and theoretical implications.

a) Positive Social Change Implications

The core significance of this study was embodied within the framework of positive social change. Callahan et al. (2012) defined social change as evolutionary progress aimed at closing social inequality gaps. According to McMichael (2012), social change guided political and economic governance policies and provided a more sustainable development-oriented environment. The notion was also considered by many institutions as articulating responses to social problems and systems (Walden University, 2015; United Nations Research Institute for Social Development, 2012). The present study

sought to promote progress through the idea of a sustainable cost-effective electricity source and policy system. Exploring potential cost-effective electricity power systems, strategies, and policy options could hone energy efficiency in Cameroon. Providing a policy model that enhanced a sustainable source of electricity could create multifaceted positive social change benefits to every level of the government, communities, families, and individuals in Cameroon. Such benefits could include, access to affordable lighting, pipe-borne water, food conservation and storage, industrialization, refrigeration, heating, employment, health care, education, financial services, road traffic, and entertainment. The study could equally be a vehicle for positive social change in people's lives and well-being. This included longer life expectancies, better living conditions, and access to modern technological advances.

b) Public Policy Implications

Investigating factors impeding the development of electricity access in Cameroon could create awareness among public policy scholars and practitioners, stakeholders, and policy decision-makers on the inadequacies of the current electricity access system in Cameroon. The study's findings also created an awareness of the different factors that impeded electricity access in Cameroon as well as the remedial strategies for these impediments. The study also explored the most cost-effective method of providing electricity access to Cameroonian communities. In this vain, factors such as affordability, sustainability, reliability, accessibility, and governance policy were found to impact the creation of the most cost-effective electricity model in Cameroon. This endeavor could sensitize many stakeholders on the potential value of the resources available to foster

electricity access in Cameroon. The findings of the study could further inform on the best public policy decisions that could be recommended to provide better access to electricity in the country. In addition, the study could bridge the present knowledge gap created by the lack of a cost-effective system for electricity access. The study's findings could ignite the promotion of policies encouraging energy combinations that enhance the expansion of cost-effective electricity access in Cameroon. Furthermore, the results of the findings could also provide public policy decision-makers and energy stakeholders with the choice of a cost-effective and sustainable electricity system for their communities. Besides, the study could assist researchers and Cameroonian energy stakeholders to appreciate in great depth the problem of electricity access. Access in this case is not just for those who do not have electricity but also for those who do not have enough or cannot afford it. The study's outcome can ignite further research into the best most sustainable and feasible combinations of energy sources in Cameroon and beyond. Since the lack of electricity sustainability is a common problem in most of Africa, the results can have a replicability effect in other regions with similar problems in Sub-Saharan Africa and beyond. A well-investigated cost-effective electricity acquisition system and policy model can enable Cameroonian communities to meet the United Nations' challenge for universal access to electricity for all by the year 2030. The results of the study can also offer the most feasible cost-effective method to provide adequate electrical power within the Cameroonian context.

c) Methodological and Theoretical Implications

A qualitative study of impeding factors to electricity access and the best most cost-effective policy model has methodological and theoretical dimensions. The research method proposed for this exploratory study was the qualitative systems-based approach, derived from Von Bertalanffy's systems theory. By definition, a systems approach from a qualitative perspective is an empirical inquiry of a system, consisting of investigating a contemporary phenomenon within its real-world context and depth (Harrison et al., 2017). Adcock et al. (2019) contended the approach considered alternative solutions to complex problems and models that promised optimization at maximum efficiency and minimum cost. This study method investigated Cameroon's electricity systems failures and proposed strategies for major policy reforms. This included analyzing, designing, developing, and implementing solutions to emerging problems within the electricity system.

Access to electricity in Cameroon was impeded by several factors that contributed to the complex nature of the problem. There was a need to investigate these factors to optimize efficiency and minimize the cost of electricity access. Terrel et al. (2014), suggested that systems-based practitioners could identify problems, collect and analyze data, and develop existing or proposed models, best practices, and theories that addressed organizational challenges. The conduct of this study was guided by assumptions of the critical systems thinking (CST) methodology derived from the qualitative-based systems approach. These assumptions included elements of criticality, reflexivity, collaboration, and rigor. According to Jackson (2001), the critical systems thinking and practice

methodology was developed to enable an analysis of complex societal problems and interventions which resolved these problems. Critical systems thinking methodology provided a framework within which appropriate soft and hard methods could be implemented to respond to complex research questions and problems (Adcock et al., 2019). The present stance aligned with the exploratory nature of the questions asked. It directed the structural framework of the study. It was also relevant to the interpretation of the research data and analysis provided. The rationale for a critical systems thinking methodology ensured a better understanding of the richness, depth, and subtlety of individual varied expert knowledge As further posited by Ravitch and Carl (2016), the dialogic engagement potential of the approach generated comprehensive expert knowledge and informed action in response to complex research questions. The process ensured the most appropriate complimentary analysis, and interpretation of expert knowledge on factors impeding electricity access, and the best cost-effective electricity model for Cameroon. Its framework facilitated a logical alignment and analysis of data concerning the research questions.

Conclusion

Access to electricity is critical to the well-being of rural and urban communities. In an era marked by the United Nations' call for universal access to electricity for all by the year 2030, meeting this challenge is almost impossible in the case of Cameroon. With comparatively high rates of electricity, only 54% of Cameroonians currently have electricity (International Energy Agency, 2023). According to The World Energy Outlook (2020), 17 million, or 64% of Cameroonians will have no access to electricity by

the year 2030. The current rationing of electricity supply in the country has become a way of life for both urban and rural communities and reflects the suggested data. This study sought to investigate what factors are impeding electricity access in Cameroon, and the best cost-effective electricity model that could provide full access in the country. To contribute to positive social change improvement in the well-being of urban and rural communities, the study aligned with Ludwig von Bertalanffy's systems theory which broadened understanding of the core construct and focus. The study also considered a qualitative paradigm-based responsive interview approach, aligning with the critical thinking system methodology. In this mix, a selected interview participants of 20 adults women and men, experienced in energy management policy, and sustainable energy solutions, provided data in response to the study's research questions. Interpretive analyses of the findings from these responsive interviews generated multifaceted implications in positive social change, public policy, methodological, and theoretical paradigms.

Although participants' responses did not provide room for any replication or copying of any foreign electricity model, the study did not only identify the impeding factors to electricity access in Cameroon but also, provided strategies to overcome these impediments. These strategies, consisting of economic, social, good governance, managerial, environmental, technological, and peace, if implemented, could go a long way to minimize if not eradicate the problems of electricity access in Cameroon. As evidence-based research, the study also provided a framework for creating a better cost-effective electricity model that reflected the realities in Cameroon. Such a framework, if

taken into consideration, could set the path for full electricity access in Cameroon. An integrated energy system with Cameroon's huge energy potentials in hydropower, biofuel, liquid gas, and solar, coupled with tenets of good governance, managerial, decentralization, and peace policies could take the country to the next level in energy security as reflected in expert participant responses throughout this study. It was time the country took advantage of not just its huge energy potential, and innovative technologies, but also predicated on a conscientious human resource leadership with the will and commitment to pilot Cameroon into an era of energy security upon which its faith depended.

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Appendix A: Letter to Participants

Participant #

Dear Sir or Madam,

My name is Jean-Jacques Enow and I am a doctoral candidate at Walden University. I am conducting dissertation research on impeding factors and the best cost-effective model to foster electricity access in Cameroon. There is abundant literature on the inefficiency and inadequacy of hydroelectricity access in Cameroon. What is however not explicit, are the causes of these inefficiencies and inadequacies. Most important, energy price hikes and growing demand, call for an investigation into the most cost-effective energy policy model which can promote electricity access in Cameroon. This research will provide insight into the expert experience of energy stakeholders, policy decision-makers, and practitioners on the field.

I do acknowledge the value of your time, and I thank you for accepting to volunteer in this study. A single interview meeting for a maximum of 90 minutes will be held with you at an agreed- upon location and time. The discussions will be based on your experiences with impeding factors and the most cost-effective policy model which can foster electricity access in Cameroon. You will not be required to do anything you are not comfortable with. All information you provide during this interview will remain strictly confidential.

Please contact me at your earliest convenience to schedule a date and time that we can meet. You can email me at …

I look forward to hearing from you.

Jean-Jacques Enow

Doctoral Candidate, Walden University

Appendix C: IRB Approval

Dear Jean-Jacques Enow,

This email is to notify you that the Institutional Review Board (IRB) has approved your application for the study entitled, "Fostering Electricity Access in Cameroon: Impeding Factors and Best Cost-Effective Model."

Your approval # is 11-15-22-0650521. You will need to reference this number in your dissertation and in any future funding or publication submissions. Also attached to this e-mail is the IRB approved consent form. Please note, if this is already in an on-line format, you will need to update that consent document to include the IRB approval number and expiration date.

Your IRB approval expires on November 14, 2023 (or when your student status ends, whichever occurs first). One month before this expiration date, you will be sent a Continuing Review Form, which must be submitted if you wish to collect data beyond the approval expiration date.

Your IRB approval is contingent upon your adherence to the exact procedures described in the final version of the IRB application document that has been submitted as of this date. This includes maintaining your current status with the university. Your IRB approval is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, your IRB approval is suspended. Absolutely NO participant recruitment or data collection may occur while a student is not actively enrolled.

If you need to make any changes to your research staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 10 business days of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB application, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained on the Tools and Guides page of the Walden website: https://academicguides.waldenu.edu/research-center/research-ethics/tools-guides

Doctoral researchers are required to fulfill all of the Student Handbook's Doctoral Student Responsibilities Regarding Research Data regarding raw data retention and dataset confidentiality, as well as logging of all recruitment, data collection, and data management steps. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,
Libby Munson
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Research Ethics, Compliance, and Partnerships
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Information about the Walden University Institutional Review Board, including instructions for application, may be found at this link: http://academicguides.waldenu.edu/researchcenter/orec

Appendix D: Sample Interview Invitation

Research topic: Fostering Electricity Access in Cameroon: Impeding Factors and Most Cost- Effective Model

Hello,

I hope this note finds you well.

As you know, I am in the Walden Ph.D. program. As part of my coursework, I'm practicing the skills I need to develop and conduct qualitative research interviews. I'm seeking friends and family members that could participate as "interviewees" for one of my course assignments. Would you be interested in assisting?

The practice will include completing an Informed Consent statement (I'll e-mail this to you); and allowing me to interview you in person. The whole process should take no more than 90 minutes of your time.

Please let me know if you would like to participate. The course has deadlines, so we'll need to begin the process by December 3rd, 2022, and finish the interview by December 20, 2022.

Appendix E: Confidentiality Agreement

Name of Signer: Jean-Jacques Enow

During my activity in collecting data for this research: "Fostering Electricity Access in Cameroon: Impeding Factors and Cost-Effective Model" I will have access to information, which is confidential and should not be disclosed. I acknowledge that the information must remain confidential, and that improper disclosure of confidential information can be damaging to the participant.

By signing this Confidentiality Agreement, I acknowledge and agree that:

1. I will not disclose or discuss any confidential information with others, including friends or family.
2. I will not in any way divulge, copy, release, sell, loan, alter, or destroy any confidential information except as properly authorized.
3. I will not discuss confidential information where others can overhear the conversation. I understand that it is not acceptable to discuss confidential information even if the participant's name is not used.
4. I will not make any unauthorized transmissions, inquiries, modification, or purging of confidential information.
5. I agree that my obligations under this agreement will continue after the termination of the job that I will perform.
6. I understand that violation of this agreement will have legal implications.

7. I will only access or use systems or devices I am officially authorized to access and I will not demonstrate the operation or function of systems or devices to unauthorized individuals.

Signing this document, I acknowledge that I have read the agreement and I agree to comply with all the terms and conditions stated above.

Signature: Jean-Jacques Enow **Date:**

Appendix F: Interview Protocol

Part 1 introductory

- In a warm, amicable, conciliatory, and clear tone, the researcher introduces himself to the interviewee
- shows appreciation and respect to the participant for honoring the interview
- Ensures participant is comfortable and relaxed
- Reminds the participant about the research topic and goals
- Provides an opportunity for the participant to understand his/her rights vis-à-vis the interview process (withdrawal, freedom to ask/respond to question or not)
- Ensures that participant signed informed consent form
- Assures participant of the confidentiality and privacy of the interview session and participant's experience provided during and after the interview
- The researcher provides a brief description of the motivations behind his decision to work on the said research study
- The researcher provides a brief description of the structure of the interview and the nature of the interview questions

Part 2 Exploring interview questions

- The researcher provides an opportunity for the interviewee (in the first main question) to give a brief description of herself/himself and years of experience in the field of energy and policy
- In the same amicable, respectful, conciliatory, and clear tone, the researcher goes through the second main question

- The researcher poses a probe up question if more information experience is desired
- The researcher continues with the same process of the main question interviewing and probing until the number of allocated questions elapses
- In the course of interviewing, coffee breaks or a few social conversations will be initiated by the researcher on the participant's accord

Part 3 Conclusion

- The researcher notifies the participant of the impending end of the interview but inquires if the participant may have more contributions that he/she would like to make to add to what has already been said
- The researcher reassures the participant of the confidentiality of the experience shared and prevention of any potential harm to the participant
- The researcher expresses appreciation to a participant for his/her participation during this interview session.
- The researcher leaves his/her contact information and requests participants contact information in case the former needs more clarification.
- The researcher promises to provide the participant with the results of the research findings if possible as the interview session is dismissed.

Appendix G: Interview Questions

Date:

Participant #

Gender:

Specialty:

Age:

Location & Time:

Name of Interviewer:

Years of Experience:

Question 1. Background of Interviewee

a. Tell me about your background (Educational qualifications, training, years of experience [technical, professional, administrative], positions held)

b. Tell me about your experience working with electricity in Cameroon

Question 2. Impeding Factors to Electricity Access

a. What is your honest assessment of the state of electricity access in Cameroon?

b. From your experience what do you think are factors that impede access to electricity in Cameroon?

b. As an expert in this field what can be done to alleviate the problem?

c. What are the intended consequences of these solutions to the Cameroonian community?

d. What are the unintended consequences of these solutions to the Cameroonian community?

Question3. Most Cost-Effective Energy Model.

a. From your experience what do you think is the most cost-effective electricity model for Cameroon?

b. Please explain with more detailed justifications how this is the best option for you.

c. How feasible is your suggested model within the context of Cameroon?

d. Describe how confident you are about your response.

e. How will this policy model impact Cameroonian communities?

f. Please include any other information you think may be useful in providing the best cost-effective electricity model.

g. From your experience is/are there any electricity model(s) you know in the world that can serve as a reference for replication?