



Transitioning to Modern Energy Cooking Services in Cameroon

*A policy review of the energy sector
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LIST OF ACRONYMS

AA	Sustainable Energy for All Action Agenda
CAEMC	Central African Economic and Monetary Community
EDC	Electricity Development Corporation
ENEO	Cameroon national electricity company
DSCE	Strategic Document on Growth and Employment
DALYs	Disability Adjusted Life Years
DHS	Demographic and Health Survey
GDP	Gross domestic product
GLPGP	The Global LPG Partnership
HV	High Voltage
HAP	Household Air Pollution
LPG	Liquefied petroleum Gas
LMIC	Low- and Middle-Income countries
MINEE	Ministry of Water Resources and Energy
MINFI	Ministry of Finance and the Budget
MINEPDED	Ministère de l'Environnement, de la Protection de la Nature et du Développement Durable
MSW	Municipal solid waste
MW	Megawatts
NAPCC	National Adaptation Plan for Climate Change
PAOP	Power Africa Off-grid Project
PDSE	Electricity Sector Development Plan
PDER	Master Plan for Rural Electrification
PM _{2.5}	Fine particulate matter
SDG	Sustainable Development Goals
SEforALL	Sustainable Energy for All
SONARA	“Societe Nationale de Raffinage” (the state oil refinery company)
SONATREL	National society of transport of electricity

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EXECUTIVE SUMMARY

Access to modern energy services in resource-poor countries has become a necessary condition for the achievement of development objectives such as poverty reduction, access to drinking water, improvement of health and education, a greater socio-economic role for women and greater agricultural production.

Cameroon is a lower-middle-income country located in Central Africa. It had a population of 24.8 million in 2018, with more than a half residing in urban areas. Its electrification rates are relatively high compared to other Central African countries. Latest data from the Cameroon National Institute of Statistics shows that around 60% of the population had access to electricity (90% of urban and 26.7% of rural) (1).

As of 2018, 69% of the population relied on polluting fuels for cooking (1). Associated mortality and morbidity linked to exposure to household air pollution (HAP) generated from incomplete combustion of solid fuel and kerosene burnt in rudimentary devices is an important problem for the country. In 2019, HAP accounted for 12,067 premature deaths (5.8 % of all deaths) and 624,292 (4.6% total) DALYs (disability adjusted life years) (2). Stratified by sex, it represented 5,847 deaths and 297,484 DALYs in women and 6,220 deaths and 326,807 DALYs in men (2).

The widespread reliance on biomass fuels across Cameroon's national territories not only increases the risk of development of diseases from HAP and domestic accidents such as burns and scalds from use of these fuels, but also has a negative impact on economic development (through time lost gathering wood fuel – typically by women and children) and the environment (through deforestation and emissions of short-term climate forcing pollutants such as black carbon).

As of 2018, only 0.8% of the population reported using electricity as a primary fuel for cooking (1) and there is no policy commitment to expand its use for the cooking sector as evidenced by this policy review and stakeholder interviews.

A number of national energy master plans have been drawn up by Cameroon ministerial actors between 2013 and 2016 to support the expansion of the energy sector. These include the electricity transmission network development plan within the framework of the *Electricity Sector Development Plan* (PDSE), the *Master Plan for Rural Electrification* (PDER) and the *liquefied petroleum gas (LPG) Master Plan* to bring clean cooking to 58% of the population by 2030. The latter plan was led in process by the Ministry of Water and Energy (MINEE) with the goal of promoting adoption of LPG to 18 million more Cameroonians by the target year (3). Key main financial investment actions recommended by the LPG Master Plan, together with regulatory and other recommendations, included: (i) increase the rate of investment in cylinders to bring the fleet from 2.3 million cylinders in 2016 to nearly 9 million cylinders by 2030; (ii) more than double the filling capacity to serve an expanded LPG demand, and (iii) multiply

the number of points of sale in order to increase access to cylinder refills and make LPG more easily available to households.

The public health and environmental priorities for scaling adoption of LPG for clean cooking in the medium term is recognized by both health and developmental communities. This is driven by the positive impacts from transition from pollution solid fuels to LPG in terms of (i) reduced mortality and morbidity from reductions in exposure to household air pollution, (ii) the substantial saving in productive time, typically for women, from reduced time harvesting fuel wood and cooking, (iii) reductions in deforestation from reliance on fuel wood and (4) reduction in global warming potential from reduced emissions of climate forcing emissions of methane and black carbon from combustion of wood (4-8).

However, affordability of LPG, particularly in term of initial start-up costs to get the full cooking equipment plus the initial gas, is a documented important barrier to adoption of this clean form of energy. This is even more the case in rural areas, where access to free firewood is usually the norm and road quality and supply infrastructure may be scarce.

With regards to creating demand for electricity for cooking, even though Cameroon has outlined a detailed and ambitious development plan to make electricity available for a large proportion of the population, the use of electricity as a clean energy for cooking is not currently promoted and not included in any national policy target. The main goal of the electrification masters plan is to attain the capacity to produce and expand the electric grids to provide enough energy for the industrial sector and for future exportation. The main challenges for incorporating electricity into the cooking routine of Cameroonian families include overcoming barriers to access related to the cost of electricity rates, the reliability of service provision (there are frequent "blackouts" of electricity supply that make cooking with electricity troublesome) (9), and certain reluctance of the population to adopt it as a replacement of traditional fuels or even LPG for cooking. For large-scale adoption of electricity for cooking, educational programs and awareness raising will be needed, including on behavioral changes to have cooks (mainly women) be able to cook traditional meals with electric stove/ cooking appliances.

It may be possible that a transition to electric cooking may receive attention over a longer time frame (and likely post-2030) given the electricity network expansion in Cameroon, in terms of hydropower plans and mini grids expansion. At the same time, prospects for fully renewable "green LPG" or "bioLPG" produced from municipal solid waste in main cities of the country are becoming real. Local production of bioLPG may influence the choice of key fuels to be promoted and may continue to make of LPG the preferred cooking fuel of choice for the country over the long-term given the existing extensive LPG supply infrastructure and distribution network.

INTRODUCTION

Close to 4 billion of the world's population lack access to modern energy cooking services (MECS) (10) although more than three quarters of these people (some 3.2 billion) have some access to electricity, following a decade of steady progress in the electrification sector (11). In the absence of MECS, households rely on solid fuels (coal, wood and other forms of biomass) and kerosene for cooking with the majority of populations in lower-and-middle income countries (LMICs) relying on these fuels for everyday household energy needs (12). Combustion of these fuels creates substantial levels of health damaging household air pollution (HAP) including respirable particulate matter (PM_{2.5}), exposure to which is known to be causally associated with a number of respiratory and cardiovascular diseases (13). According to the World Health Organization (WHO), HAP was responsible for 3.8 million premature deaths in 2016 from these diseases and therefore has become a global public health priority. The regions with the greatest clean modern energy deficits are Sub-Saharan Africa and South East Asia (14). In addition to emissions of health damaging PM_{2.5}, reliance on solid fuels and kerosene also negatively impacts the climate through emissions of climate forcing products of incomplete combustion (e.g. black carbon and methane) and through deforestation/ forest degradation from the unsustainable harvesting of fuelwood and charcoal production.

Over the last decade, many LMICs have been seeking to address the negative public health, environmental and climate impacts from reliance on solid fuels and kerosene by prioritizing the 2030 Sustainable Development Goal 7 (SDG7) to scale access to clean modern and efficient household energy for all (15). In Cameroon the government is committed to this agenda with promotion of LPG as a household MECS in the country to aspirational levels of adoption within the SDG7 time frame (3, 16).

A key driver for this action has been the concern by the Cameroon government to reduce deforestation and forest degradation in the country from unsustainable harvesting of fuel wood (17). Cameroon, in the Congo Basin, hosts the second largest rainforest area after the Amazon. Forests cover about 20 million hectares (approximately 42% of the total land area) in the country. Use of wood for domestic energy contributes to serious loss of forest cover in the country through unsustainable harvesting of wood fuel. Other key drivers include land change from expansion of palm oil production, particularly affecting the Southwest region (18).

Deforestation has been increasing steadily in Cameroon since the 1980's with the loss of between 40,000 to 80,000 hectares (ha) of primary forest annually between 2015 and 2018 (19). Cameroon is a Forest Carbon Partnership Facility (FCPF) country participant, a partner country of the United Nations Collaborative Programme on Reducing Emissions from Deforestation and forest Degradation (REDD+) in developing countries and is involved in the Central African Forest Initiative (CAFI). These are all initiatives designed to protect forest cover. In addition, the Cameroon government has embraced

initiatives including forest decentralization (community forestry), certification schemes and the Forest Law Enforcement, Governance and Trade (FLEGT) processes of the European Union (EU) aimed at achieving legal and sustainable forest management (17).

This report provides detailed information from a review of the current Cameroon ‘energy system’ in relation to the potential for MECS and the policies and initiatives that are being carried out in relation to scaling cleaner energy for cooking and lighting, in line with the 2030 Sustainable Development Goal 7 target. To supplement this review, qualitative semi-structured interviews have been conducted with key stakeholders involved in the ‘energy system’ and decision making for related policy, including the Ministry of Ministry of Water Resources and Energy (MINEE) directorates for electricity and petroleum as well as local members of the Cameroon Power Africa Off-grid Project (PAOP)(20) – a USAID-funded four-year program launched in November 2018 to accelerate off-grid electrification across sub-Saharan Africa, to understand local perspectives and thinking behind current national energy policy goals and priorities (21). To inform an access perspective for acquisition of MECS appliances for consumers, guided visits to the main electrical retail outlets of Douala and Yaoundé were carried out (and cost of available electrical appliances in the two major cities of Cameroon documented).

1. CAMEROON: COUNTRY OVERVIEW

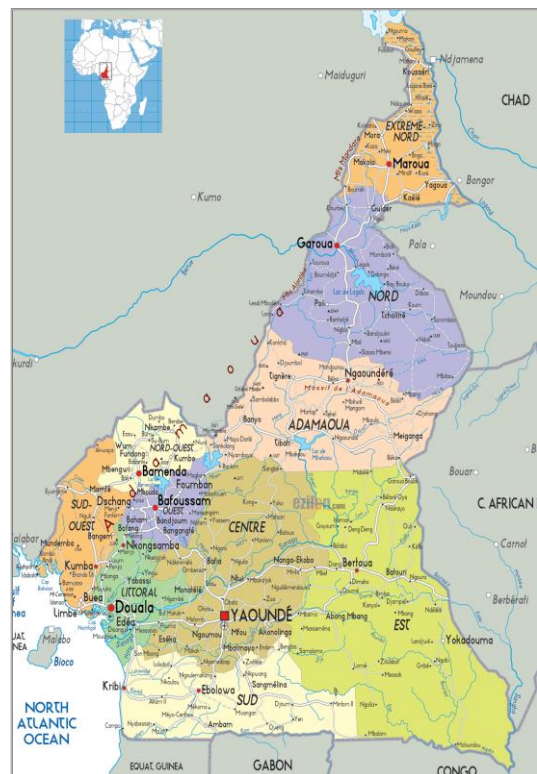
1.1. GEOGRAPHICAL, POLITICAL AND ADMINISTRATIVE CONTEXT

Cameroon is a Central African country with a geographical area of 475,442 km², and a population of 27.2 million in 2021 (22), representing a population density of 56 per km² with a median age of 18.7 years.

Cameroon borders Nigeria to the Northwest and Chad, Central African Republic and Republic of Congo to North East, East and South respectively (Figure 1). The country is coastal with access to the Atlantic Ocean (Gulf of Guinea) in the Southwest. The Northwest and Southwest (at the borders with Nigeria) are Anglophone, while the rest of the country is Francophone. Since 2016, the country has been affected by a crisis with armed conflict impacting Cameroon's two main English-speaking regions and causing significant socioeconomic disruption (23).

Cameroon is physically and ecologically heterogeneous across its national territories and is rich in natural resources, including oil and gas and mineral resources. It is largest economy in the Central African Economic and Monetary Community (CEMAC) (24). The manufacturing sector has been growing strongly in the late 20th century, and in the early 2000s it accounted for almost one-fifth of the GDP. The industry is chiefly centred on the processing of the country's various agricultural commodities including sugar refining, cotton spinning, wood pulp production and tobacco processing (25).

Figure 1: Administrative Map of Cameroon



Source: Ezilon maps (26)

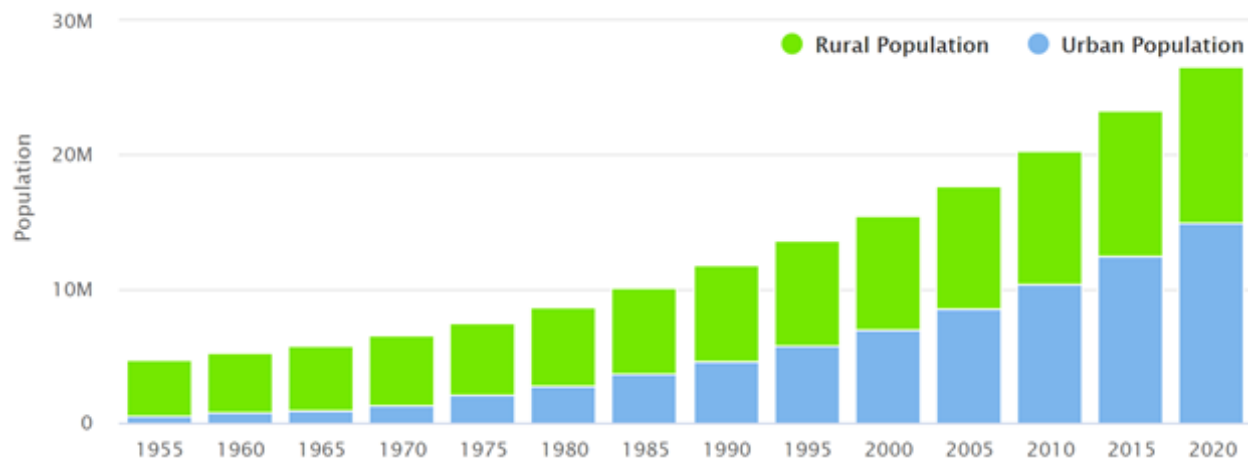
Politically, Cameroon is a presidential type Republic, led by President Biya, from the Cameroon People's Democratic Movement (RDPC), who has held office since 1982. The Legislative Power is exercised by two chambers, the Senate and the National Assembly. The national/ political capital is Yaoundé in the central region of the country and the commercial capital is in the littoral region (Douala). Administratively, its territory is divided into ten regions (Figure 1): Adamaoua (Ngaoundéré), Center (Yaoundé), Est (Bertoua), Far North (Maroua), Littoral (Douala), North (Garoua), North-West (Bamenda), West (Bafoussam), South (Ebolowa), South-West (Buea). These regions are divided into 58 administrative "divisions" (26).

1.2. DEMOGRAPHIC AND SOCIO-ECONOMIC CONTEXT

Cameroon's population is projected to increase from 27.2 million in 2021 (currently 50% males and 50% females) to 33.1 million by 2030 and to 73.1 million by 2050 (27). The average population age of Cameroon is young with more than 60% being under 25 years of age (median age for males 18.4 years and females 18.7). Accordingly, the average life expectancy in 2020 was approximately 58.5 years (58 for males and 59 for females) (28).

More than half (14.4 million people - 55.7%) of Cameroon's population resides in its urban cities and conurbations (22), increasing with proportionately with an increase in overall population over the last decade (Figure 2). This urbanization is consistent with other countries of sub-Saharan Africa due to economic migration to cities (22, 27).

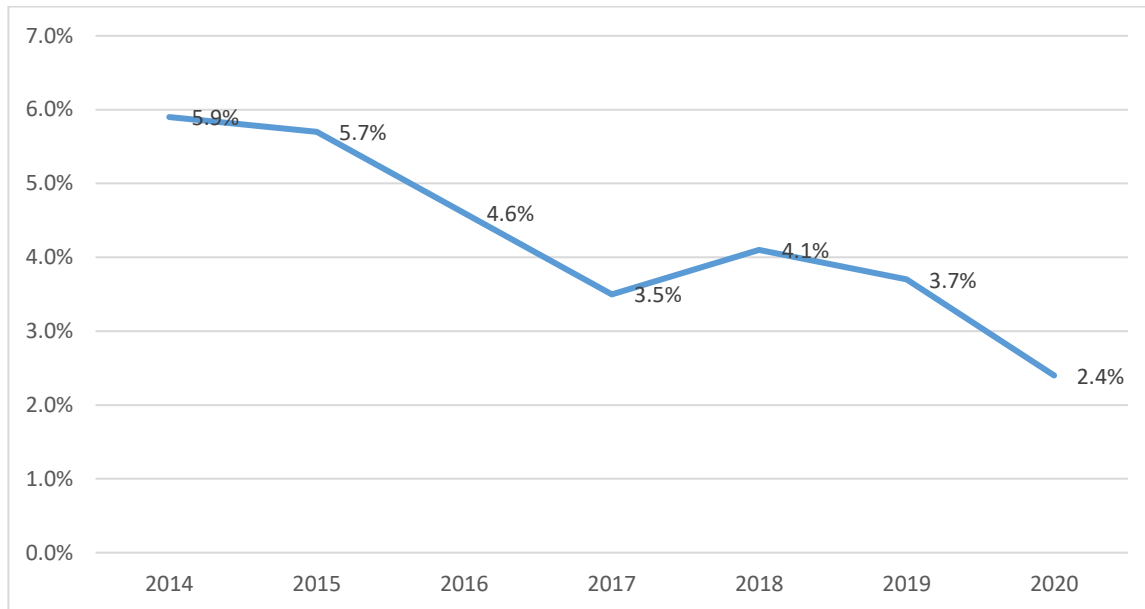
Figure 2: Cameroon Urban vs. Rural Population (1955-2020)



Source: Worldmeters (22)

In terms of Cameroon's economy, whilst growth has increased year on year over the last two decades, this slowed from 5.9% in 2014 to 3.7% in 2019 (Figure 3) and the impacts of the Covid-19 pandemic on GDP in 2020 have further negatively impacted on economic growth, with GDP reaching only 2.4% in 2020 (24).

Figure 3: Cameroon Gross Domestic Product (GDP) growth rate from 2014 to 2020



Source: Adapted from National Institute of Statistics and IHME (1, 2)

Economic growth is primarily driven by domestic consumption and investment with inflation at 2.4% in 2019 (29), lower than that of the CEMAC standard of 3%.

Fluctuations in world crude oil prices can negatively impact economic growth in Cameroon because of its reliance on oil exports. The country was hardest hit by the Covid-19 pandemic in 2020, from a health and economic perspective (24). Since 2016, there has also recently been political instability through conflict between Anglophone (Southwest and Northwest) and Francophone regions of Cameroon (23). This coupled with safety concerns in the Extreme North of Cameroon from Boko Haram (as a terrorist organization) is likely to have impacted economic growth and might potentially impact on future investment in MECS in the country.

With a current (2021) population of 27.2 million, Cameroon has an ambition to become an 'emerging country' by 2035 - guided by Vision 2035, an initiative that aims to make Cameroon an emerging country (30). This objective is expected to be achieved in four stages:

1. The eradication of poverty, by reducing it to less than 10% through accelerated growth that creates jobs and an ambitious income redistribution policy;
2. The move towards becoming a middle-income country, facilitated through increases in average income due to further diversification of economic activities;
3. Reaching the stage of 'New Industrialized Country' with manufacturing output contributing to over 23% of GDP;
4. Access to the 'Emerging Country Stage', which will ensure integration into the world economy through

significant exports and the opening of financial markets to foreign capital.

To implement this vision, the government developed a detailed report entitled the 2010-2020 Strategic Document on Growth and Employment (DSCE) (31). The DSCE highlighted infrastructure development (relevant to scale of MECS) as one of the proposed growth strategies for the country highlighting associated investment as crucial for facilitation of trade and in promoting strong and sustainable growth through the competitiveness. The Cameroon government intended to invest heavily in infrastructure during the implementation period of the DSCE strategy (31).

In relation to improvement/ development of energy infrastructure, Cameroon has a focus to successively and permanently reduce its structural deficit with a stated aim to support energy requirements following growth in internal demand for clean modern energy. In addition, the country aims to become a net exporter of electricity to contribute to the balance of trade for Cameroon. Associated investments in electricity production and transmission have been established (with further investment planned) and additional investment is earmarked for rural electrification.

In addition to infrastructure development, part of Cameroon's growth strategy is focused on its modernization of the apparatus of production, including the rural sector, mining, crafts and social economy, industry and services. The Cameroon Government intends to carry out the necessary reforms required to make the environment for these sectors more attractive, and then to put in place an operational mechanism to encourage and support private investment, so this sector can effectively play a driving role in the country's economic growth.

1.3. NATIONAL ENERGY SUPPLY

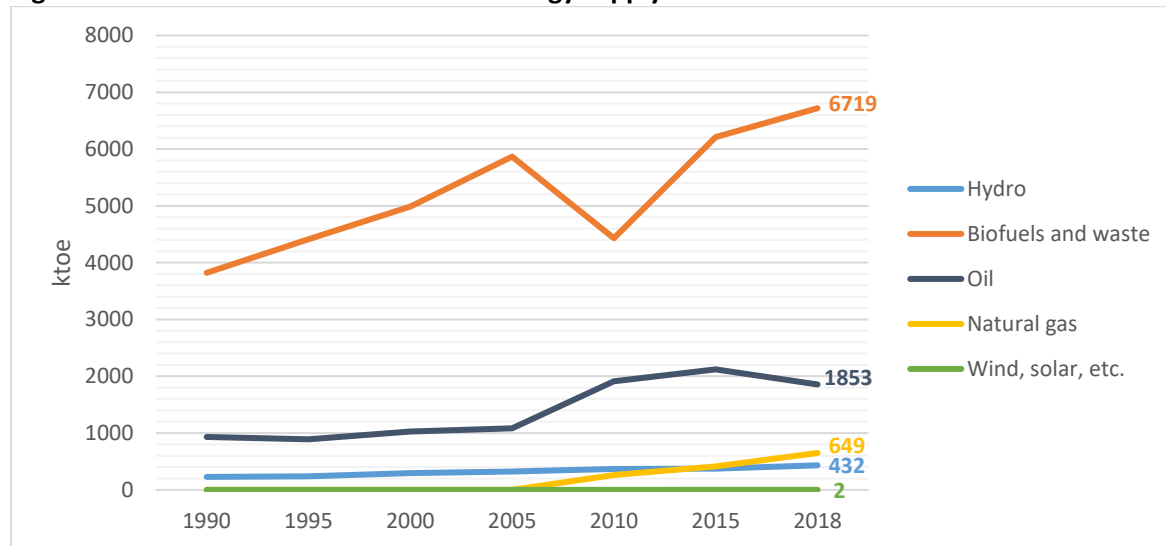
Cameroon supply of energy includes hydroelectric power (4.5%) and natural gas (6.7%) in addition to non-renewable biomass (69.6%) and fossil fuels (19.2%)(32). By far the main source of domestic energy in homes is firewood primarily used for cooking (1, 17, 32). Whilst the proportion of renewable energy's production through hydro and wind power has remained static over the last two decades, there has been a substantial increase in energy derived from biofuels and waste (Figure 4).

Over the last decade, Cameroon has committed to sustainable development, adhering to international agreements including Sustainable Energy for All (33), United Nations Partnerships for Sustainable Development Goals (SDGs), EU-Central Africa Economic Partnership Agreement(34), UK-Cameroon Economic Partnership Agreement (35), REDD+ Readiness Plan (36), with a focus on the SDGs.

In relation to SDG7 with a focus on improving access to a clean modern energy system, Cameroon's strategy has four elements: (i) Improving access to electricity; (ii) Improving access to clean fuels and technologies for cooking; (iii) Increasing production of renewable energy, and (4) Improving energy

efficiency. These strategies are described in detail in Section 2.5.

Figure 4: Evolution of Cameroon's total energy supply 1990-2018



Source: Adapted by The International Energy Agency, Cameroon energy balances (32).

1.4. POLICY TO ADDRESS CLIMATE CHANGE IN CAMEROON

Cameroon is susceptible from the effects of climate change with desertification in its northern region (the semi-arid zone of the Sahel), deforestation in central regions of the country due to harvesting of wood fuel and the rise in sea level on its coasts. The Cameroon government has responded to these environmental impacts with adherence to the United Nations Framework Convention on Climate Change (UNFCCC) and representation on international climate negotiations (37).

In 2015, the government's Ministry of Environment, Protection of Nature and Sustainable Development (MINEPDED) in partnership with international organizations, such as the Global Water Partnership (GWP), the United Nations Development Program (UNDP), and with financial support from the Government of Japan, developed the first National Adaptation Plan for Climate Change (NAPCC) (38).

The NAPCC sets out efforts to adapt to climate change with 4 strategic foci: 1) Improve knowledge on climate change; 2) Public information, education and mobilization in order to adapt to climate change; 3) Reduce major sectors and agro-ecological areas vulnerability to climate change and; 4) Integrate climate change adaptation into national sectoral strategies and policies. Of relevance to 3 and 4, a bespoke program (Project 12) has been developed for the diversification of the energy supply in the context of climate change. This has specific objectives to (i) strengthen the supply of hydroelectric energy through the creation of micro-dams, (ii) diversify sources of energy and promote alternative energies (solar, wind, biogas, etc.), (iii) promote the use of energy saving technologies (e.g. improved stoves, use of low energy consumption light bulbs, etc.), and (4) promote consideration of the effects of

climate change in the concession contract for the production, distribution and transmission of electricity.

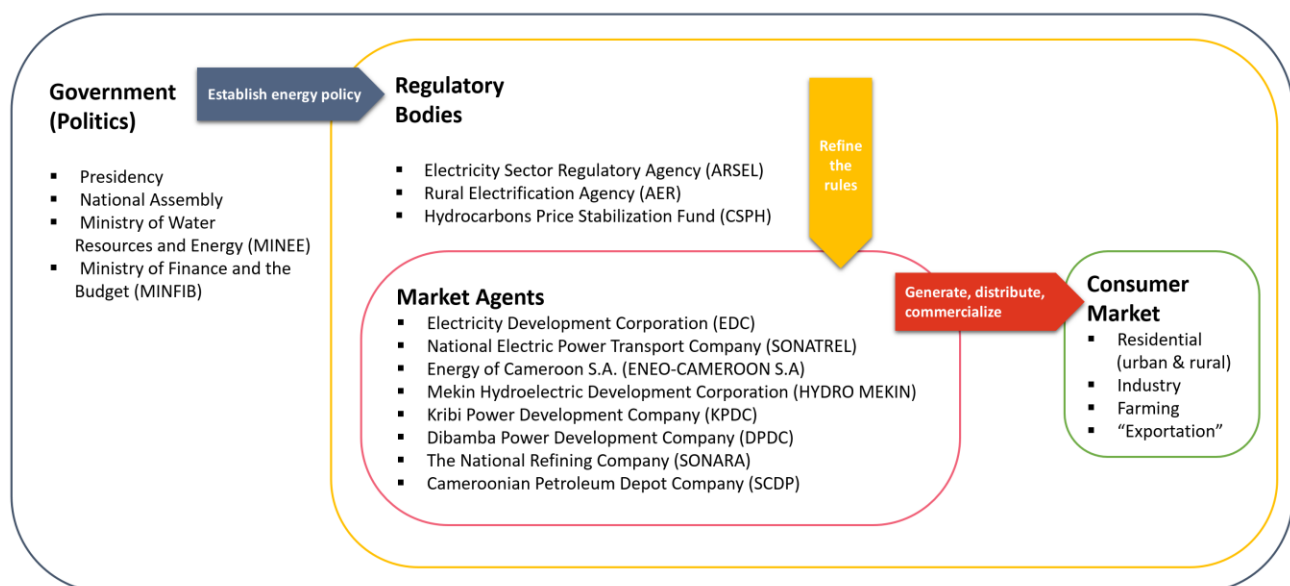
Recent evidence, evaluating the relationship between fossil fuel consumption and economic growth in Cameroon during the period 1996-2013, suggests that the design and implementation of effective policies to promote investment in the renewable energy sector would reduce the challenges related to climate change and global warming (39).

An in-depth analysis of strategic policy documents published by the government of Cameroon covering different aspects of climate adaptation highlights the significant progress that has been made into the forestry and energy sectors, and that this has been facilitated by putting in place national policies that consider climate change impacts and mitigation/adaptation in these sectors. Yet, many obstacles such as the lack of human and financial resources still exist (40).

1.5. CAMEROONIAN ENERGY SECTOR STAKEHOLDER MAPPING

There are three main sectors in Cameroon that control the strategic direction of the country's energy system: (i) Government authorities and regulatory bodies, (ii) the market sector in relation to supply (marketers and agents) and demand (consumers) and (iii) Investors (Figure 5).

Figure 5: Key stakeholder groups influencing the Cameroon energy system



Source: Author's own compilation; information from various sources MINFI, ENEO and others.

Production and distribution of electricity in Cameroon was liberalized in terms of market distribution under a 2011 electricity bill but production and transmission of electricity remains the sole responsibility of the government. SONATREL is the government company (100% owned by the state) tasked with sole responsibility of distribution of electricity across the country. There are plans for future liberalisation for this element of the electricity supply chain (distribution), confirmed through the stakeholder engagement (interview with MINEE but to date the only non-state company distributing electricity in the country is the ENEO Company, which is a public-private partnership company which generates and distributes electrical energy in Cameroon. The British investment fund, Actis has a 51% stake in the company, the State of Cameroon 44% and the personnel of the company 5% (57).

To understand the current energy system in Cameroon, including the composition of key actors within the system, a detailed stakeholder mapping exercise was conducted including desk-based review, and interviews with key informants. Findings from this mapping exercise are summarized in Table 1 and further reported below.

Table 1: Stakeholder mapping of the Cameroon energy system

Category	Stakeholder	Function
Government (Politics)	Presidency	Establishment of energy policies and goals: social, economic, environmental)
	National Assembly	
	Ministry of Water Resources and Energy (MINEE)	Development and implementation of the Government's policy in terms of production, transport, distribution of water and energy.
Regulatory Bodies Refine the rules (legal and regulatory aspects)	Ministry of Finance and the Budget (MINFI)	Preparation and implementation of the budget. Monitoring the performance of the public and semi-public sector and the subsidies granted by the State.
	Electricity Sector Regulatory Agency (ARSEL)	Regulation, control and monitoring activities of the electricity sector operators, within the framework of the policy defined by the Government.
	Rural Electrification Agency (AER)	Promotion of rural electrification throughout the country.
Market Agents Generate, distribute, commercialize energy	Hydrocarbons Price Stabilization Fund (CSPH)	Regulation and equalization of the prices of hydrocarbons on the national territory.
	Electricity Development Corporation (EDC)	Management public assets in the electricity sector on behalf of the state. Promotion and development of citizenship and private investments in the electricity sector.
	National Electric Power Transport Company (SONATREL)	Management of the transportation of electrical energy and the transportation network for the state account.
	Energy of Cameroon S.A. (ENEO-CAMEROON S.A)	Management of the production and distribution of electrical energy.
	Mekin Hydroelectric Development Corporation (HYDRO MEKIN)	Design, finance, build and management the operation of the Mekin hydroelectric plant.
	Kribi Power and Dibamba Development Company (KPDC)	Management of the gas power stations of Kribi and Dibamba (a subsidiary of GLOBELEQ)
	The National Refining Company (SONARA)	Refine crude oil and supply petroleum products such as butane, gasoline, kerosene, jet fuel, diesel and fuel oil to the national market.
Consumer Market	Cameroonian Petroleum Depot Company (SCDP)	To ensure the storage of petroleum products necessary for national consumption.
	Residential (urban & rural) Industry Farming "Exportation"	Access to clean, safe energy at reduced costs
Investors Funders	Public / Private / Banks Research	Find legal security, political stability for investing in the energy sector

Source: Author's own compilation with information from MINEE, MINFI and Market Agents

Government

At a government/ state level, there are two ministries responsible for the development and implementation of the government's policies overseen by the Presidential National Assembly. The **Ministry of Water Resources and Energy (MINEE)**, which is in charge of the production, transport and distribution of water and energy and includes the Directorate of Electricity (41), the Directorate of Renewable Energies and Control of Energy (DERME) and the Department of Petroleum Products and Gas (DPPG) and the **Ministry of Finance (42)**, which is in charge of preparation and implementation of the budget, monitoring the performance of the public and semipublic sector as well as the subsidy policies granted by the state.

Regulatory bodies

There are three major bodies of regulation: The **Rural Electrification Agency (43)**, created in 1999, is responsible for promoting rural electrification throughout the country. As such, it grants operators and users technical and possibly financial assistance, necessary for development of rural electrification. The Rural Energy Fund was created in 2009 as an instrument for financing of rural electrification, designed to drain all resources intended for this sector of activity.

The **Electricity Sector Regulatory Agency (44)** ensures the regulation, control and monitoring of the activities of operators and operators in the electricity sector. Created by the law of 1998 governing the electricity sector, it is responsible, among other things, for ensuring the compliance with the laws and regulations applicable to the electricity, as well as concession, license, authorization and any other form of contract adopted in this context.

The **Hydrocarbons Price Stabilization Fund (45)** is a public administrative establishment created in 1974, endowed with legal personality and financial autonomy under the supervision of the Ministry in charge of Trade, including the Ministry responsible for Energy (MINEE) and the Ministry responsible for Finance (42) as partners. The main missions of the CSPH are to (i) regulate the prices of hydrocarbons on the whole of the national territory through the partial or total support of the increases in the prices of the products and (ii) to monitor the prices of the products ensuring they are the same throughout the country.

Market agents

Several market agents are in charge of generation, distribution and commercialization of energy. The **Electricity Development Corporation (46)**, created in 2006, is responsible for managing on behalf of the state, public assets in the electricity sector. EDC can also study, prepare or carry out any infrastructure project in the electricity entrusted to it by the state, participate in the promotion and development of

public and private investments in the electricity sector. EDC is a public heritage company with competence in the field of water rights regulation for hydroelectric production. EDC is responsible for the construction and the operation of the Lom Pangar control dam on the Sanaga River, and should take over the asset and technical management of three other dams' regularization that will be transferred to it from the ENEO concession.

The **National Electric Power Transport Company** (SONATREL), established in 2015, is the national electricity transmission company, a public company who has been the concessionaire of the electricity transport networks with the responsibilities of managing, maintaining and extending state-owned transport network infrastructure. She took over all transport activities in March 2019.

Energy of Cameroon S.A. (ENEO-CAMEROON S.A) is the leading national electricity company, established in 2014 and substituting for AES-SONEL. ENEO manages production (capped at 1000 MW) and electricity energy distribution in Cameroon.

Mekin Hydroelectric Development Corporation (HYDRO MEKIN), created in 2010, is responsible for designing, financing, constructing and operating the hydroelectric power station of Mekin and other developments in the Dja basin in the South region of Cameroon as well as the establishment of associated equipment and infrastructure, linked to their operation.

Kribi Power Development Company (KPDC), created in 2013, manages the gas power station of Kribi. KPDC is a subsidiary of GLOBELEQ, which is owner and operator of the Kribi gas-fired power station (219 MW). Dibamba Power Development Company is also a subsidiary of GLOBELEQ, which owns and operates the Yassa gas thermal power plant in Douala (88 MW).

The National Refining Company (SONARA) created in 1973, has a refining capacity of 2,100,000 tonnes per year. The refinery is located in Limbe. It primarily refines crude oil and supplies the finished petroleum products like butane, gasoline, kerosene, jet fuel, gas oil and fuel oil to the national market.

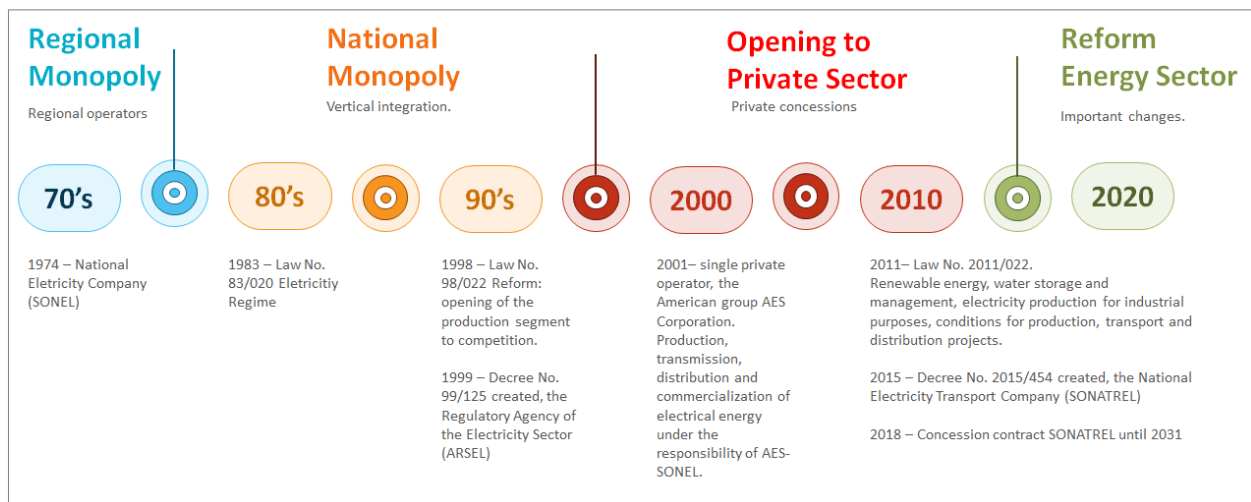
The **Cameroonian Petroleum Depot Company** (SCDP) is a public limited company (the State holds 51% of the shares), whose mission is to ensure the storage of petroleum products (gas in our case) necessary for national consumption, the establishment of security stocks, state property, and coverage of the entire territory by its network of depots.

Historical overview of the electricity sector

Since the 1970's, the Cameroonian electricity sector has undergone significant change moving from a regional monopoly exercised by three operators (POWERCAM, ENELCAM, and EDC) to a national monopoly with vertical integration in the 1980's/90's (Figure 6). In 2000 the market was opened up to the private sector. And in 2011 publication of a bill (law n ° 2011/022) regulating the electricity sector

allowed creation of a transmission system operator distinct from the state, which had managed production, transport, distribution and supply of electricity in an integrated way. This bill was designed to attract more private investors into the production segment of the electrical energy system. It is now recognised that further Energy Sector reform (Figure 6) is required to align the countries energy system with its aspirations under SDG7 towards a significant proportion of the country having access to (and using) clean modern energy.

Figure 6: Synthesis of institutional evolution regulatory context of the Cameroonian electricity sector



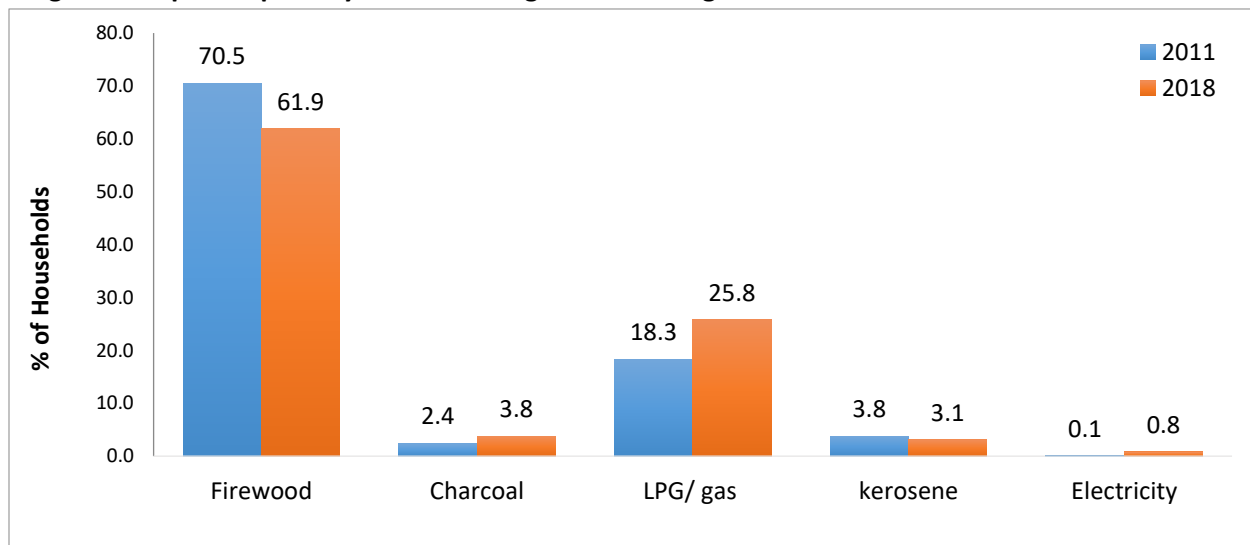
Source: Author's own diagram created with information from various sources.

2. POLICY ASSESSMENT OF THE MODERN COOKING SERVICES SECTOR IN CAMEROON

2.1. FUELS AND ENERGY SOURCES USED FOR COOKING

Whilst there are a diverse range of potential energy/ fuel sources available for household cooking in Cameroon by far the majority of the population relies on firewood. Data from the latest 2018 Demographic and Health Survey (DHS) in Cameroon reported that almost two-thirds of the population (61.9%) indicated firewood as their primary cooking fuel with almost half (48.8%) of urban households and almost all of rural households (96.3%) indicating being reliant on the fuel (Figure 7) (1). There has only been a modest decrease in reliance on firewood since the 2011 DHS, approximately 10% (Figure 7), and this has been matched with an increase in LPG for cooking over the same time period - from 18.3% in 2011 to 25.8% in 2018 (again with the geographical split: 43% urban, 3% rural). Primary use of charcoal and kerosene for cooking did not really change between the two DHS at approximately 3% of the population.

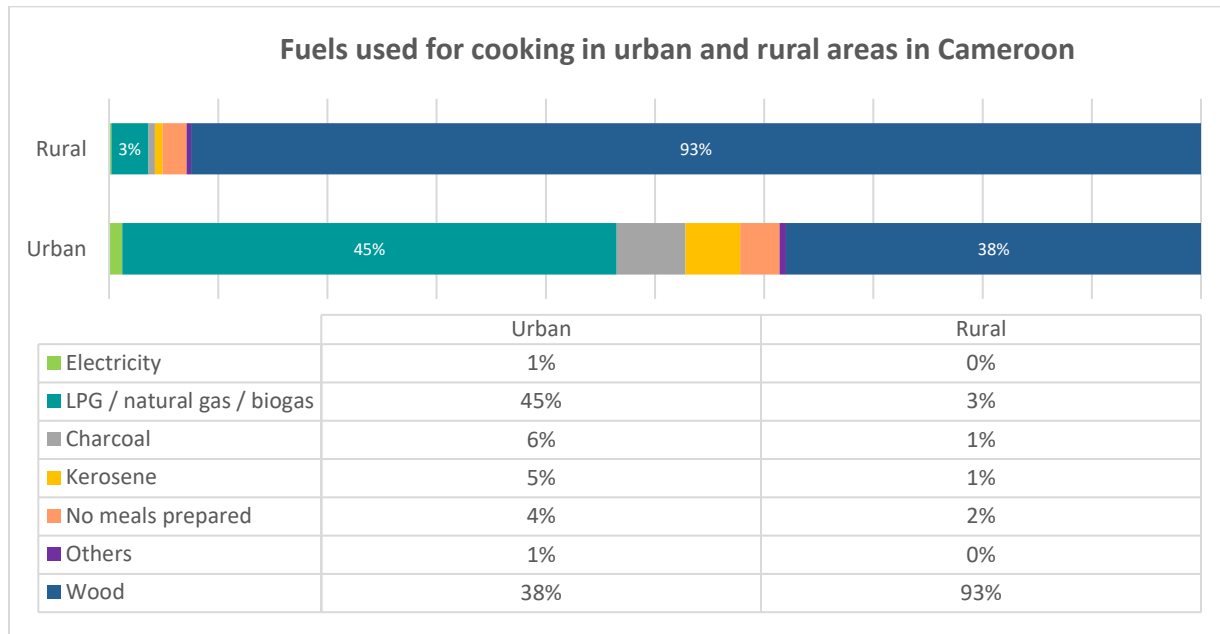
Figure 7: Reported primary use of cooking fuel according to Cameroon DHS data



Source: Demographic and Health Survey 2018 (1)

It is clear that there is very little use of electricity as a primary source of energy for cooking with less than 1% (1.2% urban, 0.2% rural) indicating using electricity for cooking in 2018. By contrast access to electricity for lighting is widespread with 90% of urban households and 26.7% of rural households having access (1) (Figure 8).

Figure 8: Main fuels used for household cooking by geographical context based on 2018 DHS data



Source: Demographic and Health Survey (DHS) (1)

2.2. HEALTH AND GENDER IMPACTS OF RELIANCE ON POLLUTING FUELS

Combustion of solid fuels for cooking is associated with very high levels of household air pollution (particularly PM_{2.5} which is causally associated with COPD, ischemic heart disease, stroke, diabetes, and lung cancer in adults, pneumonia in children and also adverse pregnancy outcomes (2019 GBD Data – reference to Lancet Global Burden of Disease). Indeed, in Cameroon it is estimated that 12,067 premature deaths (5.8% of all deaths with an incidence rate of 41.4 / 100,000 for both men and women) and 624,292 disability-adjusted-life-years (DALYs) were directly related to exposure to PM_{2.5} from HAP in 2019 (47). Recent data taken in Cameroon found levels of PM_{2.5} in households relying on solid fuels to be substantially greater than safe WHO target levels for health and much greater than in households reporting to primarily use LPG for cooking (as a clean MECS) (48). The public health priority for scaling transition to MECS is therefore a crucial driver in Cameroon in relation to modern energy policy.

Energy access and usage is closely correlated with economic development. Access to and adoption of clean modern energy is intrinsically linked to social development, gender equality, quality education, job opportunities, health, security and economic growth. Population transition to clean modern energy is therefore a fundamental aspiration in the ambitions of many African countries, alongside economic development.

Since the legislative reforms in production/ distribution of electricity in 2011 in Cameroon, reliable and sustainable supply of energy to all people has become a priority in the country, matching expectations of economic expansion and improvements in the quality of life (49-52).

Policies in relation to energy access have differential gender impacts due to traditional domestic roles involved in cooking (including acquisition of fuel wood) and technical and economic options that underlie them. Due to these gender roles, women and children are disproportionately affected by the health effects of household air pollution from reliance on polluting solid fuels. Women also have little autonomy in relation to decisions for household energy, typically decided upon by the male household head. It is therefore important to consider gender in relation to policy for scaling access to and adoption MECS. Expanding access to clean cooking (through adoption of electricity and/or LPG) requires consideration of the positive impact on gender inequalities including increases in productive time from reductions in lost time from cooking and fuel acquisition (harvesting of firewood). This productive time can be translated to commercial empowerment for women (e.g. insertion of women in the labor market and development of income generation activities) and educational opportunity for girls (53).

The complex relationships between economic development, energy use and gender inequalities in lower-and-middle-income countries (LMICs) has been highlighted by research conducted in 91 LMICs, including Cameroon. The research highlights higher levels of economic development leading to reductions in reliance on solid fuels for household energy and improved status for women (14).

Empowerment of women is stressed to be an important factor in addressing the burden of disease from household air pollution *“the level of deaths among women due to indoor air pollution conditions is most prominently influenced by the intensity of exposure in a population, but solid fuel use itself is largely determined by levels of women’s empowerment”* (14).

2.3. DOMESTIC ENERGY MASTER PLANS FOR ELECTRICITY AND LPG EXPANSION

Energy policy in Cameroon has been driven by a number of intersectoral, national Energy Master Plans developed and published between 2013 and 2016 by Ministries tasked with steering the country’s transition to clean modern energy (including MECS). These include three primary strategies, briefly described in the sections below:

- The Electricity Sector Development Plan (PDSE) - published in 2013 (54);
- The Master Plan for Rural Electrification (PDER) - published in 2016 (55);
- The LPG Master Plan – published in 2016 (3).

2.3.1 ELECTRICITY SECTOR DEVELOPMENT PLAN (PDSE)

The Electricity Sector Development Plan (PDSE), drawn up in 2013 with a current plan for implementation by 2030/2035 (54), aims to attain the capacity to produce and expand electric grids required to provide enough energy for the industrial sector and for future exportation. Under this plan, increased transmission lines, including medium and low voltage lines are being targeted for improvement.

The specific goals of the PDSE (i.e. acquisition of different production capacities), include:

- for the interconnected network south (13), a total of 4,157 MW, including 159 MW of thermal gas, by 2034 at a cost of 7,415 billion FCFA,
- for the interconnected network north (RIN), a total of 458 MW, including 10 MW of thermal-diesel, by 2032 at a cost of 877 billion FCFA,
- for the interconnected network east (56), a total of 913 MW, all hydroelectric, by 2026 at a cost of CFAF 1,795 billion.

It also provides detailed information for (i) the construction of kilometers of High Voltage (HV) lines and the installation of capacitor banks for the three networks by 2035, (ii) an interconnection of RIS and RIN by 2029 starting from the NACHTIGAL and BAYOMEN dams to that of MBAM-AMONT and (iii) the introduction of the 400.000 volts voltage level by 10 High Voltage lines from 2024.

2.3.2. RURAL ELECTRIFICATION MASTER PLAN (PDER)

Developed in 2016 with a time horizon of 2035, the Rural Electrification Master Plan/ “Plan Directeur de l'Electrification Rurale” (PDER) focuses on the provision of access to electricity for rural localities in the country (55).

The plan highlights that only 4,487 of Cameroon’s 14,207 rural localities (31.6%), had access to electricity in 2015. By the end of 2018, 5,461 localities (38.4%) had access to electricity leaving 8,746 (61.6%) localities without access to electricity (intended to be supplied by 2035) although 2,078 will not be able to be given access because of their distance from the electricity grid. For these localities, access to electricity outside the national grid (e.g. mini-grids) will need to be explored. The PDER has planned 4 five-year implementation periods that will achieve an access rate of 95% in 2030, and 98% in 2035. Table 2 below gives the number of localities to be electrified per five-year period.

Table 2: PDER distribution of localities to be electrified by five-year period until 2035

PERIOD	NUMBER OF LOCALITIES	POPULATION IN 2015
2016 - 2020	1,888	2,383,322
2021 – 2025	2,753	2,032,506
2026 - 2030	1,572	919,541
2031 - 2035	1,429	289,392
TOTAL	7,642	5,616,761

Source: Rural Electrification Master Plan (PDER) (55)

This distribution ignores the 2,078 localities with more disparate communities and with a smaller number of inhabitants (less than 150 inhabitants per locality) – a total of 153,985 inhabitants in 2015.

As described by one of the stakeholders interviewed by the research team,

“In the PDER, there’s extension of the medium voltage and low voltage lines, as well as mini grid supply network with small hydro power plants and small solar or thermal plants are targeted for development. Mini and off grid electrification is not yet well developed in the country. We are still planning to introduce some new off grids but thus far there’s none.” (MINEE representative)

2.3.3 LPG FOR CLEAN COOKING MASTER PLAN

The LPG for Clean Cooking Master Plan(3), led in development by the Ministry of Water and Energy (MINEE) in collaboration with the Global LPG Partnership (GLPGP), defines the actions required to achieve an aspirational target of 58% LPG adoption by 2030 (from less than 18 % in 2014) (57).

The drivers behind the development and adoption of the LPG master plan are *“to increase access to clean energy resources, improve public health, reduce deforestation and the adverse effects of climate change caused by deforestation, while increasing economic development”* (48).

The plan was developed through coordinated work of four sub-committees focusing on different aspects of LPG market scale-up: pricing and transport; supply chain and filling; distribution and licensing; and safety and norms. Another sub-group liaised with the private sector, dealing with finance and communications. The plan sets out the investment, conditions and infrastructure required to achieve its 2030 aspirational target of 58% adoption. It was documented that since early 2020, the two main cities of Cameroon (Douala and Yaoundé) have accounted for 87–88% of LPG consumed in the country. Building on the current level of infrastructure (filling plants and LPG transportation) which has nearly reached saturation in Douala and Yaoundé, the plan focuses on areas where cylinder availability and an extensive network of sales outlets with reliable distributors are lacking (48). Indeed, a key consideration to achieve the country’s target of LPG expansion (resulting in 400,000 tons of LPG consumption per year) is to dramatically increase the availability and distribution of LPG cylinders yearly up to 2030.

Key recommended actions from the LPG Master Plan include:

- Increase the rate of investment in cylinders to bring the fleet from 2.3 million cylinders to nearly 9 million cylinders, an increase of around 400,000 cylinders per year;
- Multiply the number of points of sale (from 4,766 in 2015 to 11,000 points of sale in 2030) in order to have at least one point per 3,000 persons (with a goal of accessing cylinder refills within 5 minutes from home).
- Increase filling capacity from 104,000 tons / year in 2015 to 373,000 tons / year in 2030, requiring an increase in filling capacity of 269,000 tons over the period.
- Reinforce regulation in order to guarantee safety in filling and distribution and promote brand-

exclusive distributorships.

- Reduce the taxation on cylinder importation, accessories, and gas cookers as much as possible.
- Keep a regulated LPG price across the country as currently and avoid higher costs for areas further away from LPG depots, placing rural consumers at a disadvantage.
- Establish a national LPG regulatory entity with responsibility for coordinating inter-ministerial actions on LPG covering supply, standards, safety, pricing, distribution, and retail, etc.
- Promote educational/awareness raising campaigns on benefits and safe use of LPG and offer consumer financing (e.g. through microfinance) to assist with the initial purchase of LPG cylinders and cookers.

2.4. PROSPECTS FOR OFF-GRID AND MINI-GRIDS ELECTRIFICATION

While there are plans underway to expand mini-grid and off-grid projects to stabilize electricity grid voltage and increase access to electricity in rural areas, there is no government budget directly allocated to expansion of mini grids in the country.

One such project is the *POWER AFRICA off-grid project* (20, 56), a USAID-funded four-year program launched in November 2018 to accelerate off-grid electrification across sub-Saharan Africa. It provides technical assistance and targeted grant funding to support the development of Africa's off-grid solar home system and mini-grid sectors and seeks to introduce interested companies and individuals in the solar and electricity sector businesses to investors (20). According to Power Africa representatives, 132 mini grids have been constructed in the first phase of the project (over the past five years) and there are plans in place to build additional 184 mini grids nationwide as part of the second phase of the project (58). However, some of the mini grids installed during the first phase are not operational to date, with one of the main reasons being lack of funds for full operations.

In addition, the electricity generated by the operational mini-grids is used mostly for lighting and not to power heavy equipment like generators in healthcare facilities. It has also been observed that the lighting from the mini grids is rationed from 10:00am to 8:00pm and mostly available per a scheduled time frame in the rural areas and suburbs.

In terms of mini grid development in the country, the Renewable Energy Innovators Cameroon Company will be conducting feasibility studies on the installed mini grids in Cameroon over a course of 18 months funded by the US Trade and Development Agency (59). The Cameroon government may further contribute by co-financing feasibility study or sourcing funding to finance such projects (21).

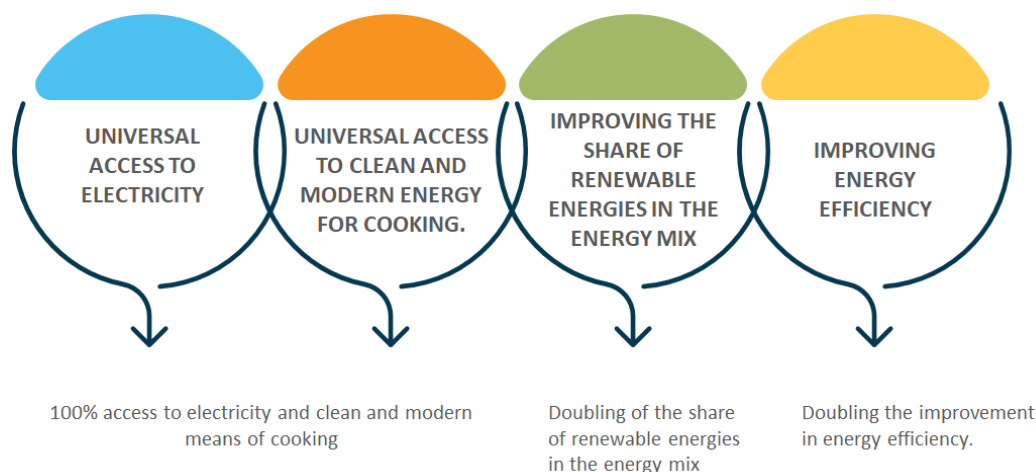
From a policy enforcement perspective, the Agence de Régulation du Secteur de l'Électricité (44) is responsible for following up and ensuring regulations in the different mini grids and evaluating them on a case by case basis. Challenges have been witnessed in ensuring strict abidance to the policy framework put in place. Overall, implementation of solar-powered mini grids for electricity generation is envisaged

to be progressing gradually over the next decade and there is optimism for future growth.

2.5. CAMEROON SUSTAINABLE ENERGY FOR ALL ACTION AGENDA: GOALS AND PRIORITIES

The three energy master plans described in Section 2.2 are consistent with the objectives of international initiatives such as Sustainable Energy for All (33), which have been driving Cameroon country planning and actions in recent years. The Cameroon SEforALL Action Agenda (60) was published in 2019 and presents the 2030 vision for the countries energy sector. It describes the actions that Cameroon should implement to achieve the main initiative objectives and priority actions by 2030 as summarised in Figure 9 and Table 3.

Figure 9: SEforALL initiative and priority actions for Cameroon by 2030



Source: SEforALL Initiative (33)

Table 3: SEforALL initiative and priority actions for Cameroon by 2030

UNIVERSAL ACCESS TO ELECTRICITY
<ul style="list-style-type: none"> ▪ Development of production facilities - The aim is to build electricity production facilities to meet the demand forecast and taking into account rural electrification efforts to ensure universal access by this time. ▪ Reinforcement and extension of transport structures - This involves building, reinforcing existing structures and constructing new lines to serve areas insufficiently covered by electricity networks. ▪ Reinforcement and extension of distribution structures - It is about improving the quality of service by strengthening the structures and extending the networks to serve new households. ▪ Rural electrification - Electrification projects for all 14,207 localities in Cameroon. ▪ Development of isolated networks (mini-grids) - Since the interconnected networks will not be able to connect all households, this program will encourage and implement isolated networks to cover one or more localities from production sources from renewable energies. ▪ Facilitation of electrical connections - This is to make electrical connections accessible to households through incentives to reduce the rate of households per connection from 2, according to the 2014 ECAM4 national survey, to 1 by 2030.

Table 3 (cont.): SEforALL initiative and priority actions for Cameroon by 2030

UNIVERSAL ACCESS TO CLEAN AND MODERN ENERGY FOR COOKING
<ul style="list-style-type: none"> ▪ Dissemination of improved stoves and ecological charcoal - On the one hand, improved stoves will provide efficiency in the use of wood, and if combined with charcoal from household waste or an efficient carbonization process, the devastating effects on biomass and health will be reduced. This program is aimed at both rural and urban areas. ▪ Distribution of LPG - As one of the clean means par excellence for cooking, it will be about increasing the share of households that will use LPG. Although the AA program is primarily aimed at urban areas, rural and peri-urban areas will be targeted by the projects. ▪ Diffusion of biogas - This action aims to exploit the enormous potential of household, agricultural and pastoral waste to produce gas intended to be burned for cooking in the same way as LPG. This program is geared towards rural and peri-urban areas. ▪ Dissemination of ecological methods of carbonization and processing of sawdust - Wood and charcoal are the most widely used solid fuels for cooking in Cameroon, and this program will introduce and disseminate modern methods of carbonization and processing of sawdust from sawmills into charcoal for both rural and urban areas.
IMPROVING THE SHARE OF RENEWABLE ENERGIES IN THE ENERGY MIX
<ul style="list-style-type: none"> ▪ Substitution of diesel thermal power stations by solar power stations - This is the replacement of thermal electricity by renewable energy available and at a lower cost. ▪ Rural electrification by solar power plants - This action aims to electrify localities not planned in the rural electrification master plan or planned after 2030 because of their remoteness from the interconnected networks. ▪ Development of small hydro plants - This involves building around twenty small hydro plants to supply one or more localities through isolated networks. These small hydro plants will also be able to connect to the interconnected network. ▪ Development of wind power plants - It is about building wind farms on sites already identified. ▪ Electrification by individual and collective solar kits - This is to facilitate the acquisition of these kits. In particular, all establishments open to the public (airport, hospitals, schools, town halls) will be encouraged to have a solar energy equipment plan. ▪ Wind, small hydro, biomass and geothermal potential evaluation program - Little is known about the potential of renewable energy deposits and this action aims to fill this gap and will focus in particular on controlling hydrological regimes and winds as well as meteorological characteristics. ▪ Local industrial manufacture of renewable energy equipment - This program will encourage the establishment of local industries for the manufacture of solar modules, inverters and batteries.
IMPROVING ENERGY EFFICIENCY
<ul style="list-style-type: none"> ▪ Energy efficiency in industries - This will involve conducting energy audits and making corrections to reduce the various energy consumption, in conjunction with manufacturers. ▪ Reduction of losses in the electrical network - The actions are intended to reduce technical and non-technical losses in order to reduce demand from the electricity sector. ▪ Energy efficiency in public and tertiary buildings - This involves supporting and implementing actions to reduce electricity consumption in these buildings. ▪ Energy efficiency in residential buildings - As in the above program, these are residential buildings. ▪ Energy efficiency in land transport - This essentially involves finalizing the master traffic plans in the two main cities of Yaoundé and Douala, notably by introducing a collective transport plan to reduce the total consumption of fuels.

Source: Republic of Cameroon Action Agenda for Sustainable Energy for All by 2030 (33)

In summary, the strategic priorities for the Cameroonian energy sector are as follows:

1. Prioritisation of acquisition of new electricity production capacities
2. Development of electricity transmission networks
3. Priority to access to electricity, especially in rural areas
4. Development of renewable energy
5. Energy efficiency improvements and energy savings
6. Better use of biomass (through more efficient combustion technologies)

1. Priority to the acquisition of new electricity production capacities

Energy supply is based on the Master Plan for the Electricity Sector (PDSE) with the time horizon of 2030, encompassing the generation, transmission and distribution of electricity. The strategy is mainly concerned with hydroelectric projects, for which production of electricity in the country has great potential but has been little exploited – production through hydroelectric initiatives will make it possible to both fill the energy deficit and to export electricity to neighboring countries (e.g. Nigeria, Chad) (54).

2. Development of electricity transmission networks

Transport priorities are based on three domains: (i) securing electricity supply to the main cities of Yaoundé and Douala, (ii) the interconnection of the east (56), north (RIN) and south (13) networks, (iii) the extension of networks to the least served regions to achieve rural electrification objectives. SONATREL was created in October 8, 2015 to implement these priorities and operate the transport networks (61).

3. Priority to access to electricity, especially in rural areas

Universal access objectives have been set for 2035, but subscription to the SEforALL initiative requires them the time frame to be hastened to 2030. These objectives require households to be connected both through interconnected networks and isolated networks, especially in rural areas. In the absence of regulations of their own, isolated networks have experienced very little development. Particular emphasis is placed on this form of electrification to accelerate the development of access to electricity. Likewise, an emphasis will be placed on facilitating the payment of connections to allow as many people as possible to obtain connections.

4. Development of renewable energy for electricity generation

Cameroon has preserved its desire to develop and exploit its potential for production of renewable energies now written in law focused on electricity, in particular solar and small hydroelectricity for decentralized production in order to provide rural areas with access to this clean modern energy for lighting and related development of income-generating activities. The creation of an Agency in charge of the promotion and development of renewable energies is foreseen (if necessary) by the law on electricity.

5. Energy efficiency and energy savings

A National Energy Efficiency Plan has been developed and implemented since 2014. It relates in particular to energy efficiency in the industrial sector, public buildings and the residential sector. In electrical networks, the focus is on reducing loss of electricity. The transport sector is concerned by transport plans in the two largest cities (Yaoundé and Douala) and the substitution of conventional fuels

by natural gas for public transport vehicles.

6. Better use of biomass

The Cameroon SEforALL Investment Prospectus sets out strategies focused on reducing the consumption of wood energy through the dissemination of improved stoves, efficient carbonization and the dissemination of LPG and biogas. Also, it is planned to manufacture charcoal in forest areas and transport it to the North and Far North regions in which logging for harvesting fuel wood for cooking is having a significant negative impact on deforestation.

Several facilitations and incentives are deployed in Cameroon to support energy projects. However, the promoters of private projects and decentralized local authorities do not always present projects that meet the technical and financial criteria guaranteeing their success.

The priority actions in terms of technical and financial planning of projects concern: 1. Electricity production from renewable energies and distribution in isolated powered networks; 2. The distribution of LPG and solid fuels for cooking; 3. Energy efficiency; 4. The concession of conventional electricity production work. Table 4 below classifies these actions by SEforALL objectives.

Table 4. Actions needed to meet the SEforALL objectives (target 2030-time horizon)

Implementation of the SEforALL initiative	<ul style="list-style-type: none"> ▪ Clarification and information on the rules and methods of use in the Energy sector, of the different forms of public-private partnership. ▪ Support for the constitution and start-up of energy management companies through access to financing, the establishment of a program of testing-certification and labeling of electrical devices, adopting and imposing minimum energy efficiency standards for electrical appliances and in buildings, development and implementation of minimum energy efficiency standards applicable to public procurement. ▪ Simplification of investment procedures, guaranteed stability of returns to reduce the risks (perceived or real) of investments in energy infrastructure.
Access to electricity	<ul style="list-style-type: none"> ▪ Concession of conventional electricity production works.
Access to clean and modern means of cooking	<ul style="list-style-type: none"> ▪ The manufacture and distribution of improved stoves; ▪ The production and distribution of charcoal from efficient carbonization as well as briquettes from sawdust; ▪ The production and distribution of charcoal from urban and agricultural waste; ▪ The distribution of LPG in rural areas.
Increase in the share of renewable energies	<ul style="list-style-type: none"> ▪ The construction and operation of electricity production plants from renewable energy (ENR) sources as well as the isolated distribution networks which are supplied.
Improved energy efficiency	<ul style="list-style-type: none"> ▪ Support for the development and implementation of budgetary mechanisms to finance and implement energy efficiency measures in the industrial, tertiary and public sectors.

Source: Republic of Cameroon Agenda of Actions for Sustainable Energy for All by 2030 (33)

As a result of its adherence to the SEforALL initiative and taking into account the energy situation of Cameroon, population growth and continued urbanization, the Government's vision and the specific objectives in the energy sector is summarised in Table 5 below (33).

Table 5. Cameroon's SEforALL objectives for 2030 (33)

ACCESS TO MODERN ENERGY SERVICES		2014 (BASELINE)	2030 (OBJECTIVE)
Access to Electrical Services	National	62.1%	100%
	Urban	95.9%	100%
	Rural	35.1%	100%
Access to clean and modern means of cooking ¹	National	25.1%	100%
	Urban	48.8%	100%
	Rural	6.2%	99%
CONTRIBUTION OF RENEWABLE ENERGIES		2014 (BASELINE)	2030 (OBJECTIVE)
Electricity production		0.1% (small hydro & solar)	25% (small hydro: 1.4%; solar: 0.9%)
Cooking / Heat Uses		72% (solid biomass)	>90% (LPG, biogas and improved biomass stoves)

The peak electrical demand forecast in 2030 amounts to 2,242 MW in the median scenario (54, 61), and these forecasts rely on inputs from hydroelectric or thermal sources. Likewise, it is planned to build 4,997 km of high voltage lines over the same time horizon, for the three interconnected networks (54). As the law on electricity only recognizes hydropower plants of less than 5 MW, solar, wind power, biomass, etc. as renewable energies, the share of these renewable energies is therefore irrelevant in the reference year of 2014. Studies are currently being conducted to take into account recent developments and may be the subject of a master plan for production, transport and distribution of renewable energy in the future.

2.6. SEforALL PROJECTIONS OF ACCESS TO MODERN AND CLEAN COOKING ENERGY

The Cameroon Sustainable Energy for All Action Agenda (60) promotes the following actions to obtain universal access to cleaner and modern clean solutions for cooking are as follow:

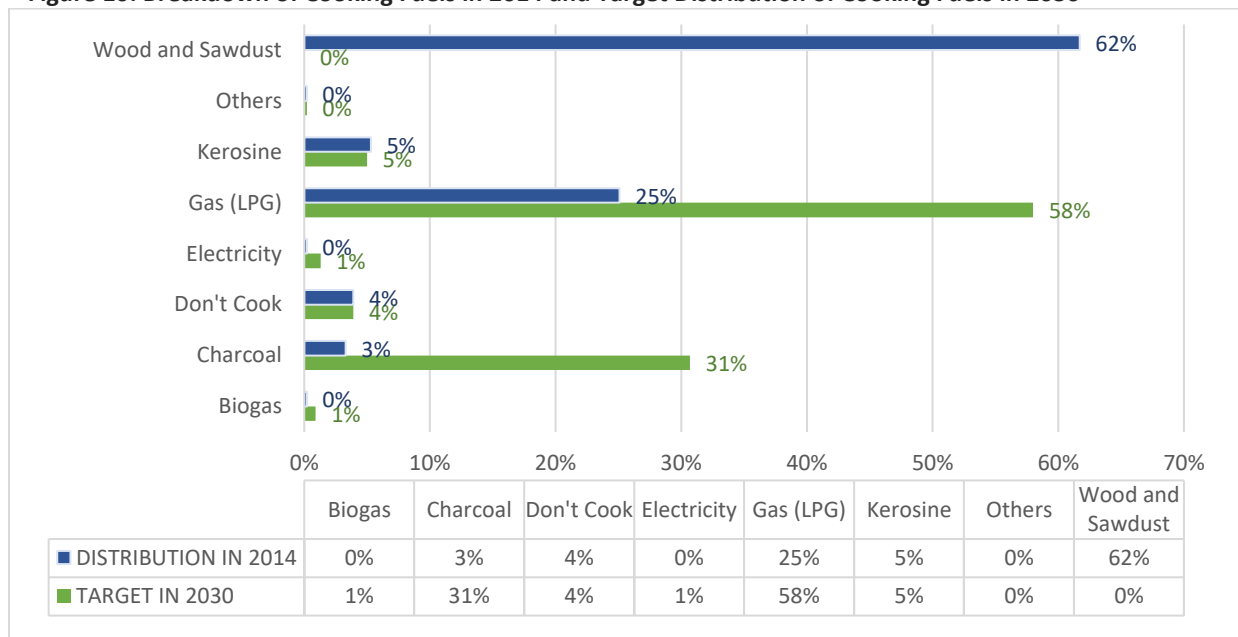
1. Substitution of firewood by cleaner and modern fuels such as LPG in particular, followed by electricity and biogas;
2. Dissemination of improved cleaner cook stoves burning solid biomass (firewood, charcoal from efficient carbonization, biomass residues, sawdust briquettes, etc.);
3. Introduction of more efficient carbonization methods for charcoal production.

¹ Note: According to the SEforALL document, access to modern energy services includes access to electricity and access to clean, modern means of cooking. Access to electricity is defined by the connection of a household to the electricity grid, whether it is interconnected or isolated, but also through individual solar solutions. Access to clean and modern means of cooking refers to cooking with non-solid fuels, but also through improved stoves and charcoal from modern carbonization

The document recommends that these actions are supported by an improved regulatory framework (e.g. minimum efficiency standards, labeling and certification, support for producers and distributors) and by an information campaign and demonstration of the benefits of using cleaner cooking methods. The specific targets in terms of achievement of scaling adoption of cleaner Modern Energy Cooking Services (MECS) proposed by 2030 are summarised in Figure 10.

Wood and sawdust are the predominant cooking fuel(s) in Cameroon used by two-thirds (62%) of the population and almost all households (95%) residing in rural areas. The main goal proposed in the AA, aligned with the LPG Master Plan (3, 33), is to replace wood and sawdust with LPG, as well as to increase uptake of so-called ‘green’ charcoal. As of 2018, LPG represented 25% of all fuels used for cooking in Cameroon, used by 43% of the population in urban areas and by only 3% in rural areas. The national SEforALL target for 2030 is to increase the proportion of LPG use to 58% of the population aligned with the LPG Master plan. For the remaining segment of the population, manufacture and distribution of improved biomass-burning stoves will be promoted, as well as production and distribution of charcoal from efficient carbonization (i.e. derived from urban and agricultural waste (green carbon)). There are also plans for production of charcoal briquettes from sawdust as an efficient fuel source for cooking.

Figure 10: Breakdown of Cooking Fuels in 2014 and Target Distribution of Cooking Fuels in 2030



Source: Republic of Cameroon Agenda of Actions for Sustainable Energy for All by 2030 (33)(28)based on 4th Cameroonian Household Survey (33).

3. ACCESS TO ELECTRICAL SERVICES AND ELECTRICAL COOKING APPLIANCES: CURRENT STATUS AND PROJECTIONS

Even though Cameroon has outlined a detailed and ambitious development plan to make electricity available for a large proportion of the population, the use of electricity as a clean energy for cooking is not included in the SEforALL AA. Today, electricity is virtually not utilized for cooking (only 0.8% of households use it) (1) and there is not a specific target defined for 2030.

Table 6 presents the baseline (2014) and the most recently available information (2018) for the electricity sector in Cameroon. Production capacity has increased from 1,354 MW to 1,586 MW during this time and the number of subscribers to low voltage electricity has increased from 949,890 to 1,300,000 within the four-year period.

Table 6. Status of electricity sector in Cameroon between 2014 and 2018

Indicator	2014	2018
Length of Low Voltage LV networks (km)	17,377	
Length of Medium Voltage MV networks (km)	17,473	
MV / LV transformation capacity (kVA)		
Length of High Voltage HV networks (km)		
90 KV	1,210	1,210
110 KV	338	338
225 KV	795	795
HV / MV transformation capacity (kVA)	972,000	972,000
Production capacity (64)	1,354	1,586
Hydro	732	958
Thermal	622	617
Solar	0	11
Electricity subscribers		
Low Voltage (63)	949,890	1,300,000
Average Voltage (AV)	1,606	1,800
High Voltage(HV)	4	5
Subscribers to solar power plants		25,236
Electrified localities	4,487	

Source: Republic of Cameroon Action Agenda for Sustainable Energy for All (33). Note: Households supplied by generators or individual solar kits are not counted.

A recent report by the University of Strathclyde for the MECS consortium (62), presented the estimated demand profiles of low voltage (63) and microgrid networks for electric cooking in sub-Saharan Africa. Models for the LV networks were primarily based on literature outlining design guidance, standards and practices, with input from a Power System Planning Engineer from the Electricity Supply Corporation of

Malawi (ESCOM), whereas the microgrid network models were designed using data available from Powergen microgrids in Kenya and Tanzania. The models showed that the principal technical challenges for the adoption of electric cooking are load flows, voltage profile distributions and transformer/power inverter requirements. The report highlights that “it is estimated that LV networks could serve up to 45% of households equipped with 1kW Electric Pressure Cookers (EPCs), 75% with 600W EPCs and 100% with 300W rice cookers without exceeding maximum capacity limits of the transformer”(62). The off-grid microgrid systems showed limited capacity to support electric cooking demands since they are sized to serve basic access to electricity for lighting, and appliances requiring substantially lower power and energy than electric cooking devices. The report concludes that for constantly falling costs of photovoltaic systems, lithium-ion energy storage devices and power inverters, the potential for introduction of electric cooking on off-grid solar microgrids is expected to increase in the coming years, although it will require microgrids designed and built to consider larger loads than currently considered.

The projected rate of access to electricity in Cameroon is presented in Table 7 below, followed by the number of electrified localities.

Table 7: Electricity access trajectory in Cameroon by 2030

	YEARS					
	2014	2018	2021	2024	2027	2030
Population	21,657,000	24,863,337	26,765,522	28,758,503	30,859,142	33,113,220
Number of Households	4,010,556	4,875,164	5,248,142	5,638,922	6,050,812	6,492,788
▪ Urban	2,085,489	2,730,092	2,938,959	3,157,796	3,388,455	3,635,961
▪ Rural	1,925,067	2,145,072	2,309,182	2,481,126	2,662,357	2,856,827
Access rate %			74	82	91	100
▪ Urban			97	98	99	100
▪ Rural			50	65	82	100
Number of households connected			3,883,625	4,623,916	5,506,239	6,492,788
▪ Urban			2,850,791	3,094,640	3,354,570	3,635,961
▪ Rural			1,154,591	1,612,732	2,183,133	2,856,827
Number of households/connection			1.9	1.6	1.3	1.0
Total number of connections			2,044,013	2,889,948	4,235,569	6,492,788
Interconnected networks (95%)	949,890	1,300,000	1,941,812	2,745,450	4,023,790	6,168,149
Mini-grids (5%)	268	25,504	102,201	144,497	211,778	324,639
In need of connection			718,509	845,935	1,345,621	2,257,220

Interconnected networks (95%)			641,812	803,638	1,278,340	2,144,359
Mini-grids (5%)			76,697	42,297	67,281	112,861

Source: Republic of Cameroon Action Agenda for Sustainable Energy for All by 2030 (33).

The main indicator is the percentage of access rate which is calculated by dividing the number of households with access to electricity by the total number of households in the country. A secondary indicator is the coverage rate (number of households that are connected) which gives the proportion of electrified localities out of the total number of localities. Progress towards the goal of universal access is given in the Table 8 below.

Table 8: Progress towards universal access to electricity in Cameroon

Access Rate (65)	YEAR				
	2015	2021	2024	2027	2030
Urban	95.9	97	98	99	100
Rural	35.1	50	65	82	100
National	62.1	74	82	91	100
No. of Electrified Localities	4,487	5,207	8,207	11,207	14,207

Source: Republic of Cameroon Action Agenda for Sustainable Energy for All by 2030 (33).

The regulations for connecting isolated networks to interconnected networks have just been put in place and many measures and procedures currently deployed by the distribution network provider. Indeed, the low rate of access to electricity in rural areas (35.1% against 95.9% in urban areas) can be explained by the mismatch between the cost of the connection and the income of the resource poor rural households.

3.1. ELECTRICITY PRICES

Prices for electricity in Cameroon vary based on the level of consumption and are publicly available from the national electricity company ENEO (66). Residential tariffs for 2021 are as follows:

1. Consumption less than or equal to 110 kWh: 50 CFAF/kWh (equivalent to USD 0.09/kWh).
2. Consumption between 111 and 400 kWh: 79 CFAF/kWh (equivalent to USD 0.14/kWh).
3. Consumption between 401 and 800 kWh: 94 CFAF/kWh (equivalent to USD 0.17/kWh).
4. Consumption between 801 and 2000 kWh: 99 CFAF/kWh (equivalent to USD 0.18/kWh).

3.2. ELECTRICAL COOKING APPLIANCES

Guided visits to the main electrical retail outlets of Douala and Yaoundé were conducted in February, 2020 and January 2021, respectively, as part of this research to understand the availability of electrical cooking appliances in the market in Cameroon's main cities.

Whilst electrical appliances for boiling water (e.g. kettles, coils) and for steaming rice are popular and widely available, electrical hotplates and induction cookers are extremely rare (sales staff indicated that infrequent purchase was made only by wealthy customers). See Figures 11 and 12.

Figure 11: Examples of electrical cooking appliances sold in retail outlets in Douala, Cameroon



Kettle



Rice steamers



Coil water boilers



Double coil stove



Single and double electric hotplates



High-end gas



Electric hob

3.2.1. Appliances prices and usage

At the time of data collection in Yaoundé (January 2021), the seven largest retail shops were visited and the following appliances and costs were identified in the field:

- The cheapest gas hob models with electric ovens cost around CAF 44,850/ USD 81 but usually these costs more.
- EPCs were sold in very few shops and their price range from CAF 36,058/ USD 65 for the

cheapest EPC to CAF 179,000/ USD 323 the most expensive depending on the brand and capacity (from 7 to 28 L).

- Rice cookers ranged from CAF 21,400 to 39,500 (USD 39 to 71) based on the size (1.8 to 5 L).
- Electric kettles were sold for CAF 7,250 up to 15,600 (USD 13 to 28).
- Water heaters were sold in larger shops/supermarkets and their price ranged from CAF 10,500 to 49,000 for 1 or 1.5 L (USD 20 to 88).
- Microwave ovens price ranged between CAF 42,000 and 58,000 (USD 75 to 104).
- Electric ovens embedded in multi burner gas units (with 4 or 6 burners) ranged from CFA 121,300 to 495,000 (USD 220 to 895).
- Induction stoves were available for CAF 172,000 - 210,000 (USD 310 to 380).

Figure 12: Examples of electrical cooking appliances sold in retail outlets in Yaoundé, Cameroon



Multiburner hotplate with electric hob



Electric pressure cooker

Some of the stakeholders interviewed, reported that cooking with electricity is commonly practiced among university students when the upfront cost of electricity is included in the house rents and sometimes fix rate payment are put in place irrespective of actual consumption. For example, it is common to see students using electricity for cooking quick foods for one or two persons, boiling water with heaters and sometimes making use of bread toasters for those that can afford the appliance.

Another stakeholder and user of electrical cooking appliances reports:

"From the Electrical Connections Facilitation Program, I have read that this involves making electrical connections accessible to homes through incentives by 2030. Lowering the cost of electricity is the main incentive I envisioned, but it has yet to be done. ENEO runs some campaigns to allow people to register and get meters at an affordable price for the promotion. Subsequently, it helps to incorporate those who are "stealing" electricity from the national grid to become meter owners and thus reduce the loss". (KII with EPC user).

3.2.2. Availability of used electric cooking devices

Electrical hot plates and other electric cooking appliances are sporadically available at a considerably reduced cost from **second-hand retailers** (imported used hotplates are sold alongside a variety of pre-used equipment/ items as part of shipped container packages from Europe (Figure 13). This sector is an important source of electrical cooking appliances. These second hand shops are highly variable and typically depend on imported second hand goods from the West shipped in containers to Cameroon, whose content will vary considerably but typically include many electrical appliances (including those for cooking). Prices are not set and are sold to an agreed price between the retailer and the customer.

There are no formal descriptions of these items (including about their features, model numbers or any other details) and the products are not available with boxes or packaging. There is no guarantee on the functionality of products sold by these retailers (or safety checks).

Based on observations made at 2 second-hand shops in Yaoundé, the costs of second hand appliances highlighted the savings that can be made over official retailers:

- Electric hotplate plus ovens ranged from CFA 3,400 to 9,500 (USD 6-17)
- Electric hotplate plus mini oven ranged from CFA 1200 to 2300 (USD 2-4).

Figure 13: Second-hand hotplates available from ‘informal’ retail points as part of shipping container sales imported from Europe (January 2020)



Used electrical 4 burners hotplate available at 30,000 CFA (put of container shipment) – ½ price of equivalent from major retailer.

4. LPG: A PRIORITY FUEL FOR CLEAN DOMESTIC HOUSEHOLD ENERGY IN CAMEROON

Since publication of the LPG Master Plan in 2016, the Cameroon Government has made a clear commitment to scaling LPG as the preferred household cooking fuel in Cameroon, with the target of 58% of population using LPG in 2030 (3). The focus of clean energy policy on LPG is largely due to its wide global and local availability and its potential for speedy implementation of scale, as demonstrated by recent large-scale national efforts in India (68) and Indonesia (69), and past examples from Latin America (63) and Morocco (70).

The positive health impacts from scaling adoption of LPG in Cameroon to this aspirational target have been estimated alongside the climate co-benefits from reductions in short term climate forcing products of incomplete combustion from reliance on wood fuel (black carbon and methane). The University of Liverpool and the Center for International Climate Research (CICERO) in Norway, quantified these potential impacts from the planned LPG expansion in Cameroon to the 2030 government target of 58%. The results show that successful implementation of the LPG Master Plan to this target would result in 28,000 saved lives and 770,000 averted disability-adjusted years (DALYs). This substantial health gain is not at the expense of climate through increases in CO₂. In fact, it was estimated that corresponding reductions in fuel wood would lead to more than one third reductions in short term climate forcing pollutant emissions (e.g. black carbon and methane) from combustion of this wood. In addition to estimated impacts on deforestation from this transition to LPG was estimated lead to a global cooling of -0.1 milli C in 2030 compared to business as usual (60).

About 20% of national LPG demand in Cameroon is met through local production at the SONARA refinery in Limbe, with the rest of LPG being imported. The LPG market in Cameroon has a number of strengths, including (i) a moderately strong implementation of the branded cylinder recirculation model whereby cylinders are owned by marketers who are responsible for their maintenance and replacement, (ii) low fragmentation of the supply chain; (iii) relatively good regulation and enforcement (4) and a well-defined price regime supplemented by fuel subsidies (71). One documented weakness is that cylinder wholesalers are involved in multi-brand cylinder distribution (instead of dealing with just one-cylinder brand), thereby disrupting the process by which an empty cylinder, when exchanged for a filled one, should always go back to the marketer for safety checking.

The summary of investments needed to achieve the LPG Master Plan policy target include:

- i) Increase the rate of investment in cylinders to bring the stock from 2.3 million cylinders in 2016 to nearly 9 million cylinders by 2030;
- ii) Increase filling capacity from 104,000 tons / year in 2015 to 373,000 tons / year in 2030;

- iii) Multiply the number of retail points of sale in order to increase access to LPG refills and make it more easily available to households;

Key recommendations for improvement included:

- i) A review of the LPG legal framework to improve the LPG distribution model and agreements within agents of the distribution network;
- ii) Strengthening LPG filling operations and expansion of LPG storage capacities with the establishment of a new importation terminal;
- iii) A review the LPG pricing structure and taxes on LPG equipment to ensure a uniform sale price and promote transportation equalization in order to benefit the end-users and avoid disparity in price spent by rural vs. urban consumers.

Based on interviews with MINEE LPG Directorate representatives it is clear that use of LPG for cooking should be prioritized in the next decade over electricity due to challenges in scaling distribution and adoption of electricity for cooking:

“Electricity for cooking is good but compared to gas there is still a lot of limitations. The electrical cooking appliances and equipment are costly, electricity is not readily available and it’s expensive; security in terms of cooking with electricity is not assured as the population is yet to be well sensitized and educated on security measures. The department of electricity in our ministry is trying to sensitize some commercial food vendors (restaurants) but for domestic usage, it’s still a long way to go.” (KII with MINEE).

To promote the use of LPG, a series of measures are being taken by the Government to expand and improve the gas distribution network, such as the exemption of license fees’ collection for retail distributors, and LPG price stabilization to the consumer.

When asked if the target of 58% of households using LPG by 2030 is achievable, the MINEE respondent highlighted the increase achieved between 2011 (at 8%) to 2018 (with 25% of households reporting using LPG as a primary fuel) indicating significant progress with an expectation one third of Cameroon’s population would be using LPG for cooking in 2021. Overall, there is optimism that it will be possible to approach the national target by 2030.

As of 2021, Cameroon has 13 LPG marketing companies and three new gas filling plants (two in Yaoundé and one in Bafoussam). There is also a plan to rebuild the facilities at SONARA in the Southwest region of the country, (the national refinery which was damaged by fire following an explosion to one of the tankers in 2019) (73) and to extract more LPG gas from the refinery under a new project led by the British New Age gas exploration and production company.

In parallel, it was reported that the government is working with municipalities to create additional LPG

sales points in their communities, (i.e., engage a gas marketer and create an economic activity for the municipality). Considering that 80% of the LPG supply is imported exclusively from Equatorial Guinea and is tax-free since both countries are part of the CEMAC, the government decided to halve VAT of LPG products in 2018 as an incentive to encourage cylinder importation, bypassing the difficulties encountered by not being able to make large-scale purchases of cylinders to reduce costs. In that year, the quantity of imported cylinders exceeded the target for that year.

“[...] As a result, the government decided to reduce the custom duty/ VAT by half in 2018 to encourage importation of cylinders by the different marketers. This led to about 600,000 new cylinders being imported which exceeded the target for that year which was 400,000. However, in 2019 this measure wasn’t applicable as the government realised that some of the new cylinders were still in circulation in the market and marketers did not need to import.” (KII with MINEE).

In terms of arrangement for importation of LPG stoves, it was explained that this is left to the private sector and no special subsidies are applied. In rural areas the emphasis is still on supporting the use of kerosene through subsidies for both cooking and lighting since the supply of LPG and electricity is not sufficiently expanded to meet the energy needs of the sector and faces considerable logistic difficulties for transport and distribution. In any case, the use of firewood and other biomass fuels for cooking is discouraged and improved biomass cookstoves are currently being promoted, especially in the North and Far North regions of the country.

4.1. BARRIERS AND ENABLERS OF LPG ADOPTION IN CAMEROON: SUMMARY OF THE EVIDENCE

Since 2015, the University of Liverpool and Douala General Hospital have partnered to provide community-based research evidence to inform national policy in scaling adoption of clean cooking with LPG according to the 2016 Cameroon national LPG Master plan and the country’s ambition to achieve 58% national LPG adoption by 2030. Accordingly, comprehensive mixed-methods research has been undertaken exploring barriers and facilitators to achieving population transition to clean cooking with LPG in Cameroon.

The ‘**LPG Adoption in Cameroon Evaluation**’ (**LACE**) studies were conducted in rural and peri-urban communities from the Southwest region, to (i) determine enablers and barriers to adoption and greater use of LPG for cooking, (ii) identify and test interventions to facilitate transition from wood to LPG for cooking and (iii) measure and document the impacts on exposure to health damaging household air pollution from switching to clean cooking with LPG (65, 74, 75).

Research focused on 1334 peri urban homes (with good access to LPG cylinders for cooking) identified wood as the exclusive fuel for 38.5% of the sample and LPG as the primary fuel for 57.6%(75). Despite

more than half of the households cooking with LPG, only 9.5% reporting doing so for all cooking needs, with a large amount of concurrent use of polluting biomass fuel so called fuel ‘stacking’. For 243 rural homes (where there was considerably less access to LPG with limited retail points), 81.1% of households reported exclusive use of wood for cooking with only 15.6% reporting LPG as a primary cooking fuel.

Three-quarters (74%) of peri-urban households indicated that they felt the cost of purchasing LPG refills was expensive or very expensive; 82% of rural households indicated concerns over cost. Not surprisingly, an inverse relationship was observed between the distance needed to be travelled to obtain LPG refills and reported use of LPG for cooking (a major barrier to use being having to travel more than 5 km to obtain refills).

In relation to the potential positive impacts health from switching to LPG for clean cooking, levels of household air pollution (objectively measured health damaging particulate matter (PM_{2.5})) were found to be substantially lower (both in kitchen concentrations and exposures for cooks) in households using LPG as a primary cook fuel than those exclusively using wood (48, 74). LACE research identified key barriers to (i) adoption of LPG for cooking (and its sustained use) including the prohibitive cost of purchasing equipment needed to use the fuel (in addition to refills) and (ii) sustained or exclusive use of LPG for cooking for food stuffs with a long cooking duration, perceived to waste LPG fuel (e.g. beans and stews) (65). In response to this the LACE studies tested two innovative interventions – the first was a managed loan scheme to buy LPG cooking equipment (paid off in installments over 6 months period) and the second was a reasonably priced locally sourced gas pressure cooker to facilitate cooking of long duration foods with LPG. Both interventions were found to be successful in addressing these barriers.

The **Bottled Gas for a Better Life Initiative**² managed by the Global LPG Partnership found that 97% of invested capital was paid off for the loan and the LACE studies identified significant reductions in burns, headaches and acute respiratory symptoms, as well as levels of PM_{2.5}, once households had started to use LPG thanks to the loan. A randomized controlled trial demonstrated the time and fuel savings from the pressure cooker intervention and qualitative research identified a high enthusiasm for wider community adoption of pressure cookers. In fact, the team linked the supplier from Douala to the research community to supply other households after a request from community leaders.

The LACE studies highlighted important information on the potential barrier to national scale of LPG in the country relating to concerns over safety. Almost two thirds of respondents to the survey research (including amongst users) reported concerns over the safety of using the fuel (64%). Indeed, the research found that positive perceptions over LPG safety significantly increased the likelihood of using the fuel exclusively (OR=2.49; 95% CI 2.04, 3.05) (75). Public education programmes on the health and safety risks from cooking with solid fuels on open fires and plans to raise public awareness of the

² See <http://glpgp.org/bottled-gas-for-better-life>

immediate and future health benefits of using clean cooking fuels should be put in place and provide guidelines to regional public health departments. In addition, provision of health education and training on safe use of LPG cylinders for cooking should be a priority.

Lessons learned from the LACE research provide important insights for policies in relation to the national scale of LPG in Cameroon to the country's aspirational target of 58% adoption by 2030. The perceived affordability of LPG, particularly in relation to the start-up costs for using the fuel, is a crucial barrier for many households and microfinance to provide equipment through short-term loans have potential utility in addressing this barrier. Engagement between marketers, loan organisations, the national bank with oversight responsibilities for community loans in Cameroon, the national government and especially the communities themselves (with representation from their leaders) can facilitate scale of this initiative to encourage adoption. The *Bottled Gas for Better Life* microfinance initiative has been further expanded to other communities across five regions of the country and its sustainability and larger scale up is linked to microfinance/lending institutions ability and willingness to advance and manage the loan repayments on a large scale.

4.2. PROSPECTS FOR BIOLPG IN CAMEROON

Production of fully renewable LPG (bioLPG or green LPG) has been a reality for western markets such as Europe and the USA for a number of years (76). BioLPG is chemically identical to LPG produced from the petroleum industry and can be blended with conventional LPG (76). Recent evidence suggests that there are now concrete possibilities for bioLPG production on an economically viable basis from renewable feedstocks widely available in Sub-Saharan African countries (57, 64). Cameroon one such country and an in-depth analysis of the potential for bioLPG to support the clean cooking sector is warranted. The country has two operational landfill facilities in its major cities (Nkolofoulou-Yaoundé and Douala), where municipal solid waste (MSW) is assembled and could be used as a feedstock for bioLPG generation through the Cool LPG technology (a new chemical process developed by the Gas Technology Institute where biogas produced from anaerobic digestion of MSW / agricultural residues is converted into LPG as the primary product) (57, 77).

The Government of Cameroon has indeed expressed interest in collaborating with leading LPG sector experts including The Global LPG Partnership (GLPGP) in conducting pre-feasibility studies for bioLPG production from MSW. This has included the establishment of a technical working group chaired by the Ministry of Environment. The government is particularly interested in seeking promotion of circular economy, development of “green” jobs and expansion of clean household energy.

5. CONCLUSIONS AND RECOMMENDATIONS

In recent years, Cameroon has been taken serious actions in promoting access to clean and modern domestic energy solutions for both cooking and lighting for its population, as demonstrated by the publication of three inter-sectorial energy Master Plans and the establishment of clear goals and targets under Sustainable Energy for All Action Agenda. However, a favourable policy environment towards Modern Energy Cooking Solutions including electrification need to continue to be present in order to support project implementation and foster private sector investment.

The country has hydroelectric projects underway which could support reliable and large-scale production of electricity to be used locally other than for export.

Barriers to adoption of electricity for clean cooking in Cameroon include both ensuring a reliable and cost-effective supply and stimulating demand (improving perceptions of cooking with electricity). With investment in generation of electricity (e.g. hydroelectricity) and infrastructure, focus should be on addressing demand-related barriers.

Priorities for the expansion of modern energy cooking services in the country (gas and electricity) should include:

- Stable political environment in support of promotion of clean forms of energy;
- Fully implement the actions and recommendations set out by each of the energy master plans;
- Expansion of the country's hydropower potential and allocation of surplus electricity for local use, including for household needs;
- Creation of more decentralized electrification opportunities and priorities, including definition of operating, financing and pricing modes;
- Adoption of rural electrification standards with the aim of reducing initial investment costs;
- Development of standards and regulations concerning electricity metering, particularly in rural areas;
- Increase of LPG cylinder inventory and distribution in peri-urban and rural areas, ensuring price equalization and modalities of payments to foster adoption and sustained use of LPG;
- Create user awareness and education of the safe and correct use of modern energy cooking services (gas and electricity).

To ensure progress can be monitored and tracked, it is crucial that the country secures collection of up-to-date information on (i) supply/availability of energy sources and (ii) use of domestic and institutional energy sources with disaggregated data from both urban and rural settings. The establishment of monitoring and evaluation mechanisms for projects and programs will be key in supporting tracking against Government/ SEforALL goals by 2030.

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