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Review

Current Status of Renewable Energy in Cameroon

Djouedjom Talla Francine Gaellé^{1*}, Zhao Xicang¹

¹School of Finance and Economics, Jiangsu University, PR China

***Corresponding Author:**

Djouedjom Talla Francine Gaelle

Email: fdjouedom@yahoo.fr

Phone no: +8618282724989

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Abstract: The main energy source used in Cameroon is still biomass. For cooking and heating purposes, the majority of Cameroonians still rely on biomass, which is abundant and to certain extends renewable and affordable. Electricity and gas are still very lowly used, mostly because of non-availability and non-accessibility, especially in the rural areas. According to the Cameroon Energy Situation (SEC) in 2011, the energy consumption mix was 73% biomass, 20% oil and gas products and 7% electricity totaling around 6000ktoe (Kilo tons of oil equivalent) for the whole country and converted to about 0.3toe (tons of oil equivalent) per capita. A quick comparison with the world average per capita consumption of about 2toe shows that access to energy in Cameroon is still extremely low. This clear divide between the urban and rural areas is socially and ecologically alarming as a widening of this gap could be a very realistic future scenario.

Keywords : Cameroon, Renewable energy, Electricity, Wind

Introduction

Cameroon is a politically stable sub-Saharan African country that has seen an average annual economic growth rate of 3.7% over the last decade. Its political stability stems from its powerful government, which is the main actor in all major power generation projects. Nevertheless, the energy sector was one of the first in Africa opened to privatisation and in

2015 it further unbundled with the creation of a national transmission and system operation company. However, the legal framework governing the electricity sector now needs significant review, which will likely take until 2018 (1,2,3).

The country has a relatively weak electrification rate of 48% nationally and rural electrification remains low, at 24%. The government aims to increase electrification to 50% nationally by 2022, reaching 3GW of overall power capacity by 2020 in the process, mainly through the commissioning of new hydropower plants, and off-grid solar mini-grids in rural areas.

Effectively, Cameroon has the third largest hydropower potential on the continent (20GW) of which 732 MW has been developed, accounting for 58% of power generation (with a further 1,430MW planned). Thermal capacity accounts for the rest, including a 216MW gas power plant. As part of its nationally determined contribution (NDC), the government has committed to 25% electricity generation from renewable sources by 2035 but their development has been limited to date. The development of hydro resources is being prioritised, however, growing concerns over the impact of dry seasons on hydropower availability have resulted in the government considering alternatives including some demand-response in Douala (with 200MW of load reduction potential identified among steel and cement companies)(4,5).

This renewable energy target is likely to be transcribed into law in the renewable energy law that is being drafted. The law will also likely mandate an auction or tendering process be implemented by the government, as well as set renewable electricity purchase tariffs and clarify the rules around purchase of renewable electricity. Currently, grid operators are obliged to buy excess production from renewable energy installations, though no price is specified and grid operators are also not allowed to buy electricity at above-market rates, causing conflict and rendering the policy ineffective. Consequently, the only effective support measure is that renewable energy equipment benefits from VAT exemptions. Other fiscal incentives are not well implemented in practice.

Cameroon was one of the first countries in Africa to open the energy sector to private investment. The Electricity Law of 1998 resulted in the entry of AES as a majority shareholder of Sonel, the national utility, in 2001. The company obtained a 20-year transmission and distribution concession and owns most of the existing generation capacity. In 2014 it was acquired by Actis, the private equity fund, and rebranded as Eneo. The law also made possible the involvement of independent power producers, which are legally allowed to sell power to clients with industrial loads. Two are currently active and operate the

country's two main thermal power plants: the gas plant at Kribi and the fuel oil plant at Dibamba. Independent power producers will also operate a solar plant expected to be commissioned in the next year, and a large hydro plant.

A new phase of reform in the power sector started in 2011, with the promulgation of a new Electricity Law which paves the way for unbundling generation, transmission and distribution. A December 2015 decree split out the transmission and system operation components of Eneo to create the state-owned SONATREL. By the end of 2017, Sonatrel is expected to take over the management of the transmission grid from Eneo, deciding on dispatch and acting as a single buyer for all grid-connected wholesale power generation. New concessions are expected to be issued to SONATREL and Eneo by the end of the year(6,7).

Also under the law, a number of agencies were created in 2013, including the Rural Electrification Agency (AER) and the Electric Sector Regulation Agency (ARSEL) which sets electricity tariffs. The Electricity Development Corporation (EDC), was created in 2006 with the mandate to develop, own and operate hydro storage (but not power generation) assets. EDC now also manages water distribution (formerly under the responsibility of Eneo). The 2011 law also opened the door to independent power generators and distributors in rural areas outside the concession of Eneo, but only one independent power generation and distribution license has been awarded: to GFDEE, a small company running a 0.6MW thermal power plant in Yoyo and serving about 160 customers. However, this project was developed outside of the regulator's awareness together with the local population and ex-post granted an official concession. The Rural Electrification Master Plan, currently in its second phase, aims to electrify 10,000 locations by 2035, securing 50,000 connections per year for a 20 year period(8,9). The government is also preparing a new framework to govern the installation of private off-grid renewable energy projects, although it is unclear if this will be transcribed into national legislation, or rather simply serve as guidelines for prospective developers.

Table 1 : Cameroon In A Nutshell

AREA	475 440 KM ²
POPULATION (2016)	23.5 MILLION
GDP/CAPITA (US\$ 2016)	1 032
ENERGY CONSUMPTION PER CAPITA PER YEAR (2010)	0.30 TOE
TOTAL INSTALLED ELECTRICITY CAPACITY (2016)	1 600 MW
ELECTRICITY CONSUMPTION PER CAPITA PER YEAR (2016)	281KWH
PART OF RENEWABLE ENERGY IN THE ELECTRICITY MIX (2015)	<1%
ELECTRIFICATION RATE (2016)	54% (NATIONAL) 88% (URBAN) 17% (RURAL)

State of Energy sector (supply/demand)

Major sources of commercial energy in Cameroon are petroleum, hydropower and coal. 90 % of population use traditional solid fuels in residential sector for heating, light and cooking. According to different estimations between 65% and 88% of the urban population has access to electricity(10.11). Only about 14% of rural population has access to electricity. Electricity supply is unevenly distributed within the country with no connection to neighbouring countries. There three separate grids: the Northern Interconnected Grid (NIG), the Eastern Isolated Grid (EIG) and the Southern Interconnected Grid (SIG). Cameroon is a net exporter of energy due to its oil reserves.

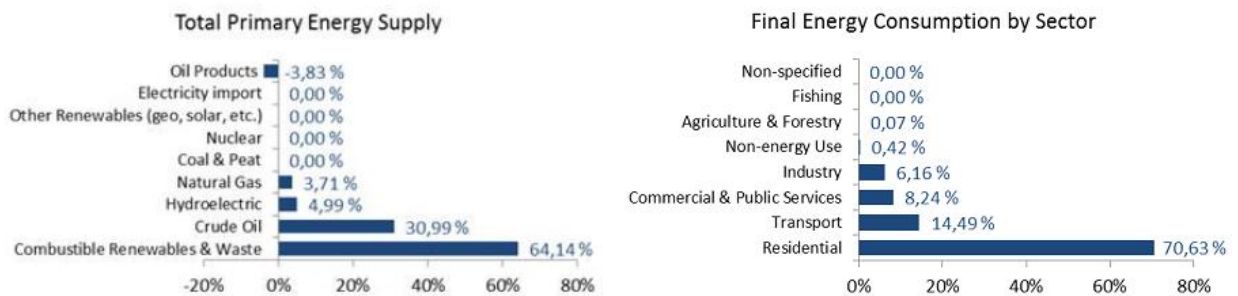


Fig 1 : Energy source and consumption

Renewable Energy Potential

Physical Potential

Cameroon has a significant and mostly untapped potential for renewable energy, this includes hydro, solar, geothermal, biomass and wind. To date only a small fraction of the hydro potential has been utilised and initial developments of commercial solar ventures are being supported and undertaken.

Solar Potential

There is good solar radiation in the northern part of the country (5.8 kWh/day/m^2) and to a lesser extent in the more humid southern part of the country (4.5 kWh/day/m^2). Solar technology will see growing opportunities, as there are currently only 50 PV installations across the country, mostly through distributed generation systems. In 2015, Cameroon signed a Memorandum of Understanding with its first renewable energy IPP, Greenquest Solar Corporation, to develop a 500 MW solar photovoltaic installation. This project (Cameroon 2020 Photovoltaic Power Project) will be located the northern region of Cameroon and will pilot with a 72 MW first-stage PV plant(12). Global Horizontal Irradiation in Cameroon (kWh/m^2)

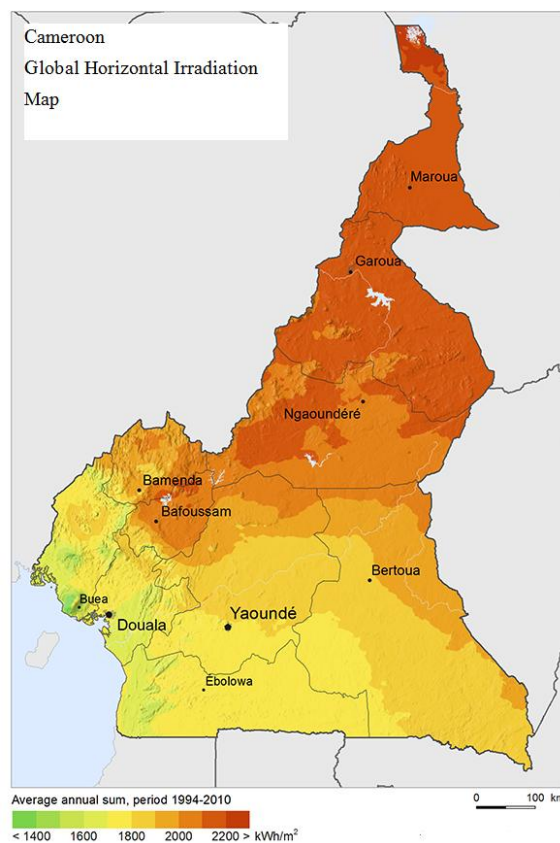


Fig 2 : HORIZONTAL Irradiation in Cameroon

Wind Potential

Wind energy potential exists in the northern part of Cameroon and coastal areas with an average wind speed of 5-7 m/s at some favourable sites. In most regions, however, the average wind speed is only about 2-4 m/s at a height of 100 meters. Currently, two rapid wind turbines are installed in Douala and some feasibility studies for a 42 MW (extendable to 80 MW) wind energy project are under way in the Bamboutos Mountains in Eastern Cameroon. Wind potential map of Cameroon.

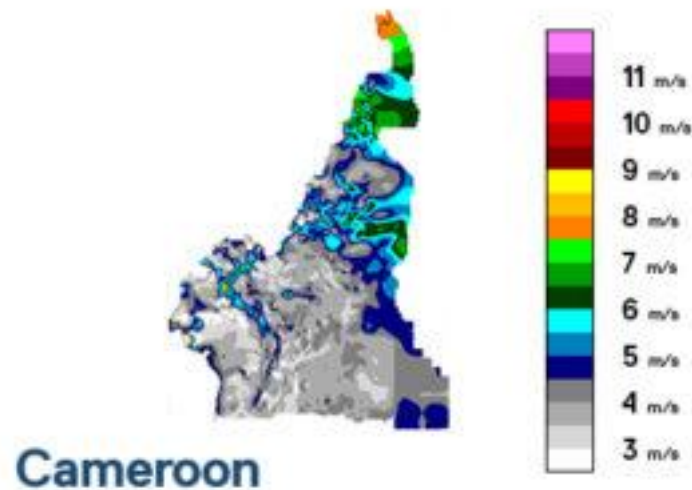


Fig 3 : Wind potential map of Cameroon

Hydro Potential

Cameroon has the third largest hydropower potential in Africa (after Democratic Republic of Congo and Ethiopia). To date, less than 5% has been utilised out of the technically feasible exploitable potential of around 23 GW, equivalent to the generating capacity of 115 TWh/year, located principally in the Sanaga basin. Cameroon's government plans to add capacity of at least 450 MW by 2017(13,14). Three large scale hydropower projects are currently in various stages of development: Lom Pangar (30 MW), Memeve'ele (210 MW), Nachtigal (420 MW).

Bioenergy Potential

Cameroon's enormous forest area covers almost 50% of the country and represents the 3rd largest biomass potential in sub-Saharan Africa. Evaluated at ~25 million hectares, it is the most abundantly used energy source for lighting and heating of households, especially in

rural zones. Cameroon's potential to produce electricity from biomass residues is estimated at ~1 GWh. A recent study of the Rural Electrification Agency identified 37 sites in 9 regions where energy can be produced using biomass. At present, Cameroon is not taking part in any commercial production of biofuels; only a few isolated trials have been undertaken.

Geothermal Potential

To date no detailed assessment for the geothermal potential within Cameroon has been conducted, although the presence of an active volcanic line alongside Cameroon's Western border, emphasised by thermal springs and the frequent eruptions of Mount Cameroon, points towards favourable conditions. Hot springs are found in Ngaoundéré, Mt Cameroon and Manengoumba area, Lake Moundou.

Cameroon as energy exporter to neighboring countries

Despite the huge potential, Cameroon is still struggling to meet the fast - increasing demand of electricity that will power its path to become an emerging economy by 2035 as envisioned by the country. The key to meeting this demand is to put in place a functioning legal and institutional framework, whereby investors can clearly see how they can secure their investments. ³ There is no other way to attract local and foreign investors into the "juicy" business of energy. But then, Cameroon is surrounded by countries like Nigeria that do not have the same energy potential and have a huge population. Cameroon could export energy and make good revenue from it. Also, Cameroon is part of the Central African Power Pool (CAPP), a pool of the Economic Community of Central African States (ECCAS) working to implement a common energy policy and monitor studies and construction of infrastructures while organizing the transfer of electricity and related services throughout these states where the total electrification has not yet reached 20%. CAPP was created in 2003 and is headquartered in the Republic of Congo. Once fully interconnected and operational, Cameroon can through CAPP commercialize electricity exports to the other 9 ECCAS countries of the pool(15,16).

Hindrances to sustainable power source and proficient vitality execution

There are huge obstructions to the further usage of sustainable power source that need to be tended to. The key issues incorporate the accompanying:

- Biomass, hydro, sun oriented and wind vitality advances stay costly (high capital costs), contrasted with kindling, charcoal, oil and gas vitality supplies,
- Poor significant lot support of sustainable power source ventures (till achieving gainfulness)
- Lack of shopper mindfulness on advantages and chances of sustainable power source arrangements.
- Poor decentralized answers for vitality administrations (age, dissemination...)
- Financial, legitimate, administrative and authoritative hindrances should be defeated keeping in mind the end goal to actualize sustainable power source advancements and create markets.
- Lack of particular access to key vitality framework, for example, the national power matrix,
- Poor accessibility of assets for advancement of sustainable power source
- Poor association and division establishments

Conclusion

This paper goes for talking about the sustainable power source possibilities in conveying parts of the vitality needs in Cameroon. The nation has a gigantic sustainable power source potential. The absence of clear sustainable power source strategy in the blend is an issue that should be tended to earnestly by the Cameroonian government arrangement creators. The nonattendance of responsibility and eagerness from the administration is debilitating the division possibility to be produced either by private part ventures and furthermore outside financial specialists. Sun powered, wind and warm vitality plants are fundamental to meet the charge of Cameroon.

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