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Potable Water Supply Deficiency in Yaounde (Centre Cameroon): Challenges and Coping Strategies of the Inhabitants

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Abstract

In most cities in developing countries, dwellers continue facing difficulties in adequately accessing potable water in sufficient quantity for their daily needs. These difficulties are perceived by households each time they fetch drinking water or try to get access to potable water for other household activities. This study aims to assess the problem of potable water supply in the Yaounde III Subdivisions' neighbourhoods and the coping strategies developed by citizens to meet their needs. To achieve this objective, 300 households were selected and investigated based on purposive and systematic random sampling, particularly in the most densely populated neighbourhoods. We proceeded by identifying the different water supply sources of households for their various needs, and assessing the difficulties encountered in getting water and how they overcome them. Results reveal that in Yaounde III Subdivision only 34.33% of the households are supplied by the Cameroon Water Utilities Corporation (CAMWATER), while 65.67% rely on alternative water supply sources (wells, drillings and springs) without any pre-treatment. Among those connected to CAMWATER network, 46.6% do not have a regular water flow. Results also revealed that water sources were located at reasonable distances (less than 1 kilometre) and that 70% of households take less than 30 minutes to fetch water. Failure in water supply is mainly caused by the insufficient pumping capacity of the existing potable water treatment plants which lead to rationing and shortages, but also to rapid population growth and city extension not followed by the extension of the potable water distribution network. To fill the gap in water supply, it is imperative for public authorities to quickly achieve the project on water supply from the Sanaga River. Also, CAMWATER should extend its distribution network and improve its maintenance system.

Keywords: Alternative water sources, Challenges, Potable water supply, Water scarcity, Yaounde city.

1. INTRODUCTION

Access to water has always been a major preoccupation to man. Today, the main difficulty faced by human beings is not only the access to water but more precisely access to potable water. Indeed, the problem arises in terms of water quality, quantity and availability resource and it is on these points that attention is focused in Cameroon like every other part of the world. Many people in the world lack access to clean and drinkable water, with women and children in developing countries being more vulnerable (Millennium Development Goals Report 2008). According to the Millennium Development Goals Report (2008), 1.6 billion people in the world live in areas of economic water scarcity, where human habit, institutional weaknesses and financial capitals shortage limit access to water, even though water in nature is available locally to meet human demands.

For many years now, Cameroon is living a situation of urban crisis mainly marked by an accelerated population growth, which has unfortunately resulted in an anarchic occupation of spaces without connection to basic services (Tiafack *et al.*, 2014; Tiafack & Mbon, 2017). It is estimated that almost 70% of the urban population and the totality of the poorest citizens live in areas with poor access to basic services. Collective facilities are insufficient in number and in quality. The cities grow anarchically with the proliferation of traditional buildings to the detriment of public housing estates. Inland lowlands are highly landlocked and densely populated, hindering access to basic services such as drinking water supply and sanitation (Nguendo Yongsi & Bryant, 2008). In the frame of its 2010-2020 Document of Strategies for Growth and Employment (DSGE), the Cameroonian Government's objective was to increase the access rate

to drinking water from 45% (national average in 2010) to 80% and the sanitation access rate from 13.5% (national average) to 60% by 2015. In the city of Yaounde in general and particularly in Yaounde III Subdivision, this goal is far from being achieved.

As a matter of fact, the daily demand for drinking water in the city of Yaounde was estimated at more than 300,000m^3 in 2015; while the Akomnyada pumping station in Mbalmayo produces only 100,000m^3 and that of the Mefou 35,000m^3 to supply Yaounde and the surrounding cities (NIS, 2016). Indeed, with more than 250,000 inhabitants installed in an anarchic way (for the majority) on an area of about 67 km^2 (BUCREP, 2010), Yaounde III Subdivision suffers from serious weaknesses and failures in water supply and basic sanitation services. Very few households are served by CAMWATER network; even some of those connected to this network can last for several days or weeks without water. Moreover, water supply in areas not served by public water network remains a great problem. Therefore, buffer zones within cities, especially dense neighbourhoods of spontaneous settlements, and suburbs are mainly affected by these difficulties. In such conditions, people resort to alternative sources of water; they rush to wells, boreholes, springs and even streams to obtain water for their daily uses (drinking, cooking, laundry, washing-up, etc.), and this in complete ignorance of the quality of these waters. This study therefore aims to assess the problem of potable water supply in the Yaounde III Subdivisions' neighbourhoods and the coping strategies developed by citizens to meet their needs accordingly.

2. MATERIALS AND METHODS

2.1. Conceptual Framework

Population growth in urban areas is maintained by an increase in births, international migrations and rural exodus (UNFPA, 2004). People move towards large cities each day in search for a better living. According to experts of the United Nations Fund for Population Activities (UNFPA, 2004), population growth is one of the main causes of the increase in needs as concerns housing, water, hygiene, energy, healthcare, education, social services, food and difficulties of sustainable sanitation (Keyetat, 2014; Tiafack *et al.*, 2014; Tiafack & Mbon, 2017). According to WHO (2011), the importance of water, sanitation and hygiene for health and development has been reflected in the outcomes of a series of international policy forums, showing the importance of water to human societies. Access to safe drinking-water is essential to health, a basic human right and a component of effective policy for health protection. Water is therefore considered as a necessary element on which relies the development of a civilization. All forms of life are intimately linked to the presence of water (Kenfack, 2018).

The history of water supply is one of a logistical challenge to provide clear water since the dawn of civilization. Major human settlements could initially develop only where fresh surface water was plentiful, such as near rivers or natural springs. Throughout history, people have devised systems to make getting water into their communities and households and disposing (and later also treating) waste water more convenient. Merriam-Webster's Online Dictionary, 2009 defines water supply as a source, means, or process of supplying water (as for a community) usually including reservoirs, tunnels and pipelines. In British, water supply is an arrangement of reservoirs, purification plant, distribution pipes, etc., for providing water to a community. Water supply is also the provision of water by public utilities, commercial Organisations, community endeavours or by individuals, usually via a system of pumps and pipes. Assessing water supply efficiency includes selection and measurement of reliable indicators (Figure 1).

We adopt the World Health Organization (WHO, 2011) definition of potable water which stipulates that it is water that can be used as drinking water, i.e. water that is used in drink, food preparation or personal hygiene without any harmful effect to health over a lifetime of consumption, including different sensitivities that may occur between life stages. It is also evident that each year, unsafe drinking water, poor hygiene and lack of sanitation facilities contribute to the death of millions of the world's poorest people from preventable diseases and particularly waterborne diseases (Pruss *et al.*, 2002; Cairncross *et al.*, 2003; Mara *et al.*, 2007). Waterborne diseases are sickness conditions caused by pathogenic micro-organisms that are transmitted through use or consumption of contaminated water, or by eating food exposed to contaminated water. Waterborne diseases include cholera, dysentery and other diseases that are responsible for diarrheas (Black & Fawcett, 2008; Djaouda *et al.*, 2022). Concerning diarrheal diseases, it is estimated that 1.8 million people die worldwide every year. Amongst them, 90 % are children under 5 mostly in developing countries (WHO, 2011).

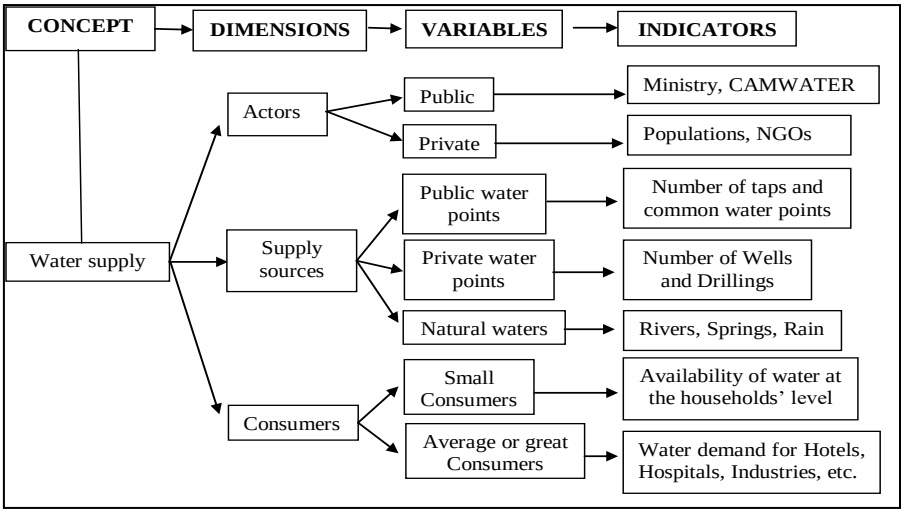

Figure 1: Conceptual scheme on water supply
Source: Conceived by the authors, 2018.

2.2. Study Area

Yaounde III Subdivision is situated in the southern part of Yaounde city, found in the Mfoundi Division, centre Region. It is located between longitude 3°43' & 3°54' East and Latitude 11°29' & 11°31' North (Figure 2). It is limited at the North by Yaounde I, II and V Subdivisions, at the South and East by Yaounde IV Subdivision, and at West by Yaounde VI Subdivision on one part and Mbankomo Subdivision on the other part. It has a surface area of about 67km^2 divided into 26 quarters of which the most populated are Melen 8A and 8B, Nsimeyong I and II, Ngoa Ekele III, Efoulan I and Ahala I. The rugged relief is constituted of many streams and plateau, favourable for urban development, as well as hollows. The highest points (Ngoa Ekele, Mvolye and Ahala) are about 1000m height. Precipitation here is regular and abundant reaching 2000mm per year. The annual temperature is 23°C. The equatorial climate here is of the Guinean type favourable for cultivation in all seasons. It has four seasons: the great rainy season (from September to November), the great dry season (from December to mid-March), the small rainy season (from mid-March to June) and the small dry season (from July to August).

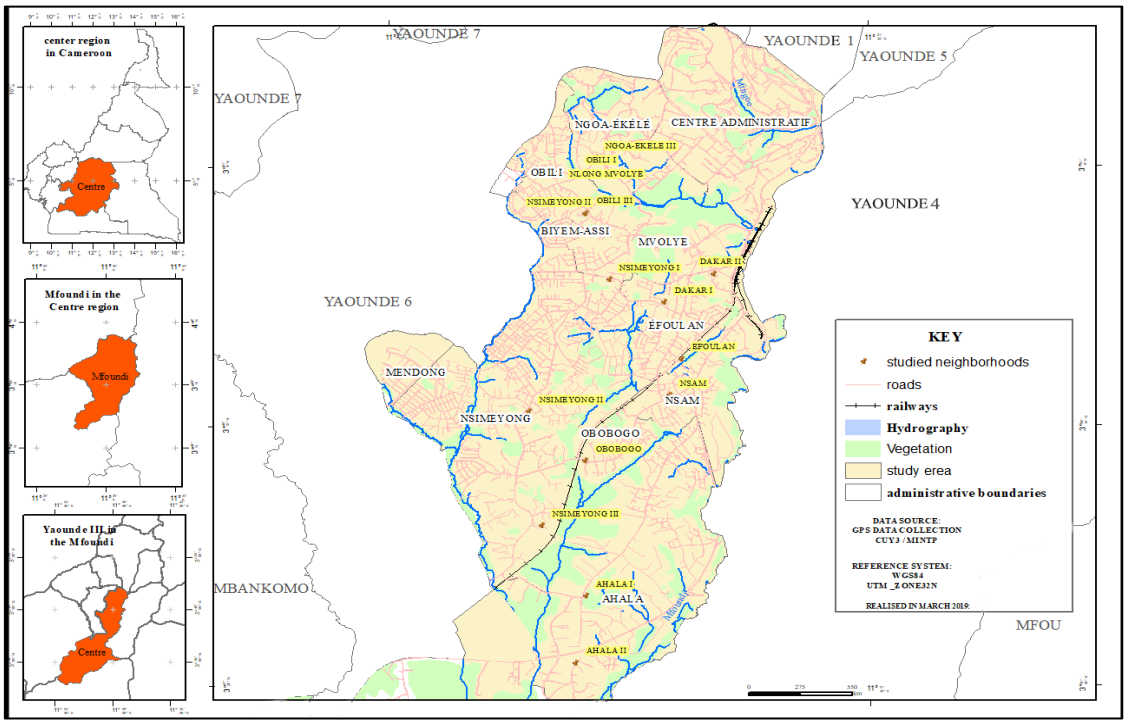

Figure 2: Location map of the study area
Source: National Institute of Cartography and fieldwork data, 2018

2.3. Data and Methods

The completion of this study required the collection and processing of sets of both primary and secondary data from which we obtained the information needed to achieve our objectives. Secondary information and research on existing documents, articles, journals and the internet, and audiovisual sources opened the way for the identification of some key concepts on water supply and basic sanitation rules, as well as statistics on population growth, water demand and water supply. To collect primary data, field surveys were done with a team of researchers. The survey covered neighborhoods and households in Yaounde III Subdivision, and used a purposive and systematic random sampling procedure to select targeted neighbourhoods and households. Free talks and semi-structured interviews were done with some chiefs of neighbourhoods, shareholders and stakeholders involved in water management (NGOs, CMAWATER officials), and policymakers (officials of municipal council, Ministry of Economy, Planning and Regional Development, Ministry of Water and Energy, and Ministry of Housing and Urban Development) to gather information on urban planning and water supply framework and strategies in Yaounde. A total of 300 standardized questionnaires designed were administered primarily to heads of the selected households or their representative. The questionnaire sort to obtain information on water supply sources, availability, quality and quantity; also on the challenges faced having access to potable water and the coping strategies developed.

All data collected were analysed using Microsoft Excel 2013 program, XL-STAT 2007 and SPSS 20.0 softwares. These softwares were used to produce mean scores, frequencies and percentages which are illustrated by bar charts, line graphs and percentage tables accompanied by appropriate explanation and discussions. The Arc GIS and QGIS software were used for mapping. Several plates and photos were used to illustrate the various water supply sources.

3. RESULTS AND COMMENTS

3.1. Planning of potable water supply in Yaounde

Water supplied to Yaounde citizens and inhabitants of the surrounding cities for their daily needs comes from two water treatment centres; the Akomnyada pumping station in Mbalmayo with a daily yield capacity of 100,000m^3 and the Mefou treatment plant with 35,000m^3. Purified water from these treatment plants are transported through pipeline network to storage reservoirs and towers before being distributed to households. Concerning the city of Yaounde, there are 11 great reservoirs and 14 towers holding total capacity storage of 114,000m^3 of water (Table 1). This table clearly shows the gap between water supply (135,000m^3) and daily demand (more than 300,000m^3). The actual deficit in the Yaounde city is partially palliated by the rationing plan carried out by CAMWATER. This is a system whereby there is an interruption of water supply in certain neighbourhoods to supply others and vice versa according to a specific calendar scheduled by the company. Rationing is the artificial control of water distribution in case of scarcity.

Table 1: location and characteristics of the potable water storage infrastructures in Yaounde

Location (quarters)	Storage infrastructure	Capacity (m^3)	Total capacity (m^3)
Ngoa-Ekele	2 Reservoirs	20000 x 2	40000
	Tower	2000	2000
Mvog-Betsi	Tower	3000	3000
Etoug-Ebe Lycée	Tower	1000	1000
Mendong	2 Towers	500 x 2	1000
Mont Febe	2 Tower	1000 x 2	2000
Etoudi	2 Reservoirs	3750 x 2	7500
Nkomo II	Reservoir	4500	4500
Mimboman	Tower	3000	3000
Mbankolo	2 Towers	2000 + 1000	3000
Atemengue	2 Reservoirs	6500 x 2	13000
	2 Towers	3000 x 2	6000
Messa	3 Towers	2500 x 3	7500
	2 Reservoirs	4000 x 2	8000
Nkoayos	2 Reservoirs	6250 x 2	12500

***Source**: Realised by the authors from CAMWATER data base and fieldwork (2018)*

3.2. Challenges in Potable Water Supply in Yaounde

Cameroon is far from achieving its sustainable development goads (SDG) concerning water supply as stated in its strategic document for growth and employment. This sector is constrained by many factors analysed in this section.

3.2.1. Important Demographic Growth

World's population is continuously increasing and was estimated to 7,794,798,739 inhabitants in 2020 (World Population Review, 2020). Africa in general and Cameroon in particular is not left out. According to World Population Review (2020) the total population of Cameroon passed from 5,176,918 inhabitants in 1960 to 26,545,863 inhabitants in 2020, with an urban rate ranging from 13.93% to 56.29% for the same period (Table 2).

According to NIS (2019) the population density for the Mfoundi Division in Yaounde is equally increasing, i.e. on a surface area of 297km^2, the population growth moved from 703,588 inhabitants with a density of 2369 pers./km^2 in 1987 to 1,881,876 inhabitants with a density of 6336 pers./km^2 in 2005. Nowadays, Yaounde is the most populated city of Cameroon with 3,822,000 inhabitants (United Nations population projections, 2020). With this increase in demography, there have not been great changes in water supply system in Cameroon in general and Yaounde III in particular. Since informal urban settler lack technical know-how and assistance, they often develop their areas haphazardly, without allowing adequate space for installing infrastructure lines. They plunk down their houses according to village traditions that is, patterned according to family formation, with houses directly abutting their neighbours on all sides, with no room left for service rights-of-way. Laying pipes under such circumstances conventionally calls for creation of streets and consequent removal and relocation of houses (rather than bending pipes around them).

Table 2: Illustration of the total population growth in Cameroon from 1960 to 2020

Year	Total population	Yearly % Change	Median age	Fertility rate	Density (P/km²)	Rural population	Urban population	Urban rate %
2020	26,545,863	2.59	18.7	4.60	56	11,6043,40	14,941,523	56.29
2019	25,876,380	2.62	18.3	4.88	55	11,455,971	14,420,409	55.73
2018	25,216,267	2.65	18.3	4.88	53	11,304,135	13,912,132	55.17
2017	24,566,073	2.67	18.3	4.88	52	11,149,536	13,416,537	54.61
2016	23,926,551	2.70	18.3	4.88	51	10,993,146	12,933,405	54.05
2015	23,298,368	2.75	18.2	4.95	49	10,835,753	12,462,615	53.49
2010	20,341,241	2.78	17.9	5.25	43	10,044,633	10,296,608	50.62
2000	15,513,945	2.67	17.2	5.75	33	8,557,827	6,956,118	44.84
1990	11,780,088	3.19	16.7	6.60	25	7,134,147	4,645,941	39.44
1980	8,621,406	2.96	17.7	6.50	18	5,870,300	2,751,106	31.91
1970	6,519,762	2.46	19.1	6.09	14	5,194,652	1,325,110	20.32
1960	5,176,918	1.92	20.3	5.53	11	4,455,519	721,399	13.93

Source: *Adapted by the authors from World Population Review, 2020*

3.2.2. Insufficiency of the Pumping Capacity of the Akomnyada (Mbalmayo) and Mefou (Yaounde) Treatment Plants

Daily water demand in Yaounde is estimated at 300.000m^3 whereas the Mefou pumping station has a pumping capacity of only 35.000m^3 and that of Akomnyada only 100.000m^3. Despite all efforts done by the government notably to manage these pumping stations, production is still insufficient to supply the Yaounde city. Households of Yaounde still face serious problems of water shortage. Those of Yaounde III Subdivision still complain of difficulties they face in having access to water. The quantity of water pumped by these two existing treatment plants does not satisfy daily demands of the Yaounde city. This constitutes a constraint to the provision of water supply.

3.2.3. Low wide of CAMWATER Distribution Network in Yaounde III Subdivision

Among the 51,452 households in Yaounde III Subdivision, only 17% have a private connection to CAMWATER network because of lack of infrastructure and the high cost of connection (Kuitcha *et al*., 2008).

Almost all the four blocks in Nsam I are served by CAMWATER network, but not all households have connection to water flow in their homes. These are spontaneous habitats where populations built on difficult access zones with insufficiency in communication routes. These populations get supplied from natural springs beside their homes. Also, others come from almost everywhere to carry water, especially during shortages of CAMWATER network. From the interview with the chief of the quarter, populations of Nsam II equally suffer from water supply deficiency, and it is more than six years now that only few houses (populations of blocs 1 & 2) can get water frequently from their taps; other blocs rely on rain water, wells, spring or water distribution from CAMWATER tankers. In Dakar quarter, populations of the upper blocs are not served by CAMWATER network, unlike those of Dakar I and II which witness regular tap water flow. Populations of upper Dakar thus carry water in private wells at the neighbouring quarter (Mvolye).

In Efoulan neighbourhood, water supply remains a great handicap for the wellbeing of inhabitants, mainly because of timeworn and poor maintenance of the pipes network. The situation is quite similar in Obobogo neighbourhood and exacerbate by the railways haul which is such a constraint to the stretching of water pipe network. These populations then turn to other alternative water supply sources (springs, boreholes and wells) for all their household activities. New quarters such as Ahala II and III and part of Ahala I am not supplied by potable water. More than 95% of these populations are supplied by private wells and boreholes (ERA-Cameroun, 2015). They purchase for drinking water where CAMWATER network is present or from private boreholes.

3.2.4. Low Incomes and Poverty of Populations

Another factor which accounts for the constraints of water provisioning in Yaounde is low incomes and poverty of populations. We observe indicators of monetary poverty to analyse this phenomenon provided by NIS (2016). In Yaounde, the incidence of poverty in 2007 was 5.9 and in 2014 is at 5.4 with variation of -0.6. The depth of poverty was at 1.0 in 2007 and in 2014 it was 1.1. The severity of poverty was at 0.2 in 2007 and 0.3 in 2014 with a variation of 0.1. The principal needs judged essential by households largely exceed those usually retained by economists. Many households remain unsatisfied with their effective consumption in relation to their minimum consumption. The urban poor tend to settle on the most undesirable pieces of land. They do it for clear and rational reasons: the more unbuildable the plot, the less its market value, and therefore the more affordable it is. Sites may be located where no road, water main, or sewer line could ever reach, resulting to a market value of zero.

3.2.5. Mountainous Terrains Unfavourable for the Installation of Hydraulic Infrastructures

Yaounde city is situated between 3°30'-3°58' North Latitude and between 11°20'-11°20' Longitude East, with an average elevation in is 750m above sea level (NIC, 1980). Yaounde is nicknamed “City of Seven Hills”. The relief is globally rugged and the urban zone stretches on many hills as high as 25 to 50 m above the plateau (Santoir, 1995). The Yaounde city is established in a threshold dominated to the East by high hills and to the West by mountains which could go beyond 1000m (Franqueville, 1968). We have mountains like Mount Eloundem (1159m), Mount Mbankolo (1096m), Mount Febe (1073m), Mount Messa (1015m), Mount Akouandoue (870m), amongst others. All these mountains make it difficult for the put in place and installation of hydraulic infrastructures. In Yaounde III Subdivision, there are many hills that hinder access to water supply. Households which are located in high altitudes find it difficult to have water. Even those who have water at home, the pressure is low. We also have high points at Ngoa-Ekele, Ahala and Mvolye attaining about 1000m (Kenfack, 2018).

3.2.6. Predominance of a Lateritic-Ferralitic Soil

On hills and their sides, the cover- whose thickness may reach 50m in the highest points gets progressively thinner towards the lower zones. Over the classic lateritic sequence, a very homogenous sandy-clayey horizon, yellowish to reddish in colour, can be systematically observed (Ndjigui *et al.*, 2013; Ndam Ngoupayou *et al.*, 2019). The origin of this superficial formation is locally very thick (up to 3 m on the hills) and the contact with the underlying ferruginous nodular horizon always appears clearly. In the swampy depression, the lateritic sequence seems to be truncated. The saprolite, or mottled clays, is overlaid by a whitish clayey-sandy horizon, considered as colluvial. It is overlapped by a greyish clearly hydromorphic horizon, 0.5 to 1.5 m thick, essentially constituted by kaolinite and residual quartz grains. At the top of this waterlogged profile, there is a dark 0.2-0.5 m thick fringe. Laterites can be firm and physically resistant (Santoir, 1995; Ndjigui *et al.*, 2013). Laterite has commonly been referred to as a soil type as well as being a rock type rich in iron and aluminium. They develop by intensive and prolonged weathering of the underlying parent rock. This lateritic soil is hard, for it is uneasy when it comes to digging the soil deeply for the installation of pipes. Consequently, most pipes are installed at the ground surface, creating great inconveniences. They are constantly damaged and burst causing wastage of water and more expense (for reparation at all time). This aspect brings out constraint of soil type for access to water in the Yaounde city as a whole and Yaounde III particularly. All these also render access to underground water difficult, the capturing and treatment of underground waters, notwithstanding the transportation of CAMWATER supply.

3.3. Connection Rates of Households to CAMWATER Network

According to the annual activity report for CAMWATER, only about 106000 subscribers (households) are connected in the Yaounde city and its surroundings. Based on the same report, it is estimated that only about 800,000 people use water supply by CAMWATER for drinking in Yaounde. Field investigation reveals that only 34.33% of the households surveyed are branched to the CAMWATER network in Yaounde III Subdivision. Globally, 65.67% of the households are not connected to CAMWATER network with high numbers of unbranched houses observed in Ahala I & II, Dakar II, Nsimeyon I, II & III, and Obobogo (Figure 3). Among the households which are not connected to CAMWATER, 95.94% have not initiated a subscription request and most of them report that it is too expensive and the procedure is

quite long. Also, some could not request a connection to CAMWATER network because they are renting.

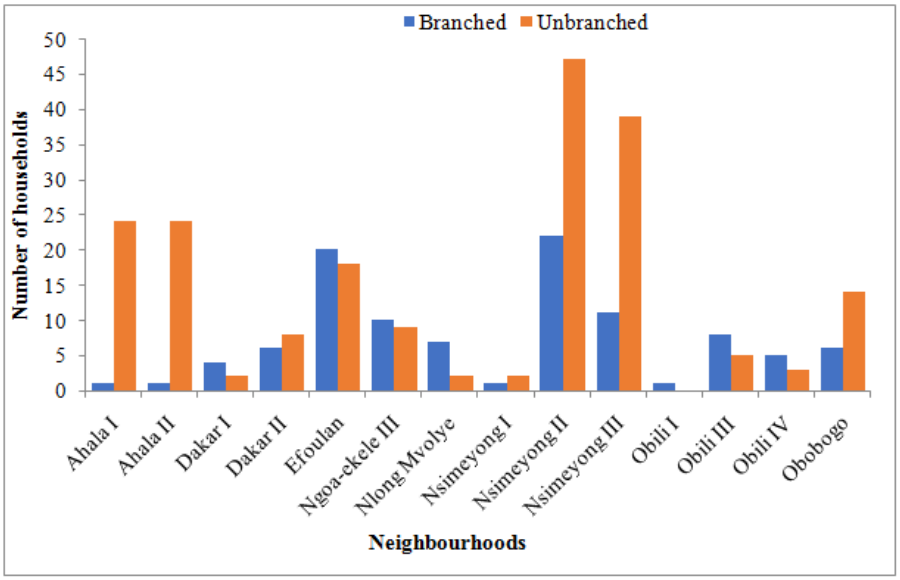

Figure 3: Number of households supplied by CAMWATER network in the different neighbourhoods surveyed
Source: Field survey, 2018

3.4. Availability Frequency of Water Supplied by CAMWATER

This field work equally revealed that 46.60% of the households connected to CAMWATER network do not have a regular water flow. It is observed from figure 4 that 37.50% of these households witness intermittent shortage during the day while the same proportion says to have water just three times per week. Other households representing 14.58% say they spend weeks without water; this is mostly in Nsimeyong II, Nsimeyong III, and Obobogo. Results also reveal that 6.25% of households have water twice per week and 4.17% have water one day out of two.

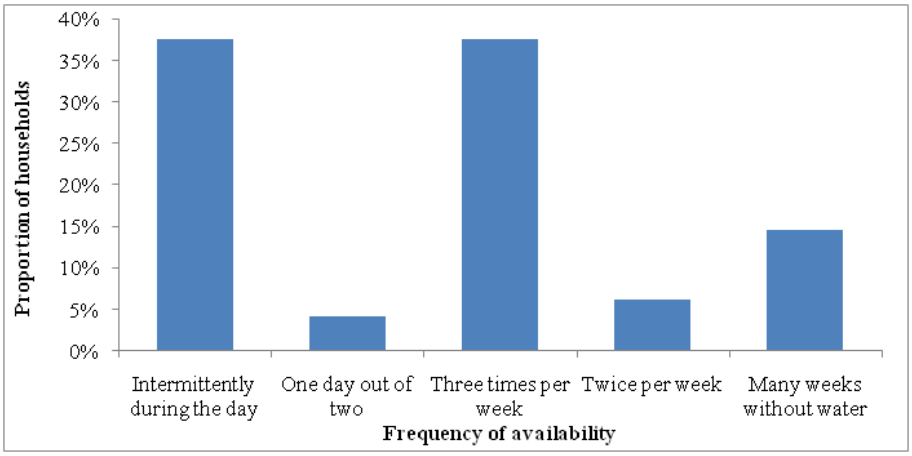

Figure 4: Availability frequency of water supplied by CAMWATER in households
Source: Field survey, 2018

3.5. Alternative Water Supply Sources and Usages in Yaounde III Subdivision

Investigation carried out in neighbourhoods of Yaounde III Subdivision show that 65.67% households are not connected to CAMWATER network and therefore use alternative sources of water for their daily needs (Drinking, cooking, laundry, bathing, etc.). These alternative sources are boreholes, wells, (both protected and unprotected) and springs (Figure 5). A total of 31.43% of households not served by CAMWATER rely on unprotected well while 29.29% use water from a protected well. Other households (27.14%) have a drilling and 11.43% rely on a spring. Only 0.71% household has both a protected well and a drilling. In addition, 28.16% of households served by CAMWATER have alternative sources of water supply to cope with the multiple intermittencies and shortages of CAMWATER network.

Figure 5: Alternative water supply sources in Yaounde III Subdivision. (a) Drilling; (b) Spring; (c) Protected well; (d) Unprotected well
Source: NIMPA Tatiana, 2018

Different uses of water from alternative supply sources by households of Yaounde III Subdivision are shown in figure 6. This survey showed that out of the 197 households not served by CAMWATER, 99 and 55 use drillings and springs for drinking, respectively. In addition, 33 others drink CAMWATER (this is water carried from CAMWATER tankers), 3 reported that they drink mineral water, 3 others drink water from both drillings and springs, 2 households drink unprotected wells and 1 protected well. Concerning water for cooking, 56, 49 and 47 households use water from unprotected wells, drillings and protected wells, respectively. 27 others households use springs, 16 use CAMWATER and 2 obtain water from both protected wells and springs for cooking. Concerning the use of water for other household activities, it results that 56 households use unprotected wells. Then, 48, 47, 27 and 17 households use water from drillings, protected wells, springs and CAMWATER, respectively in Yaounde III Subdivision.

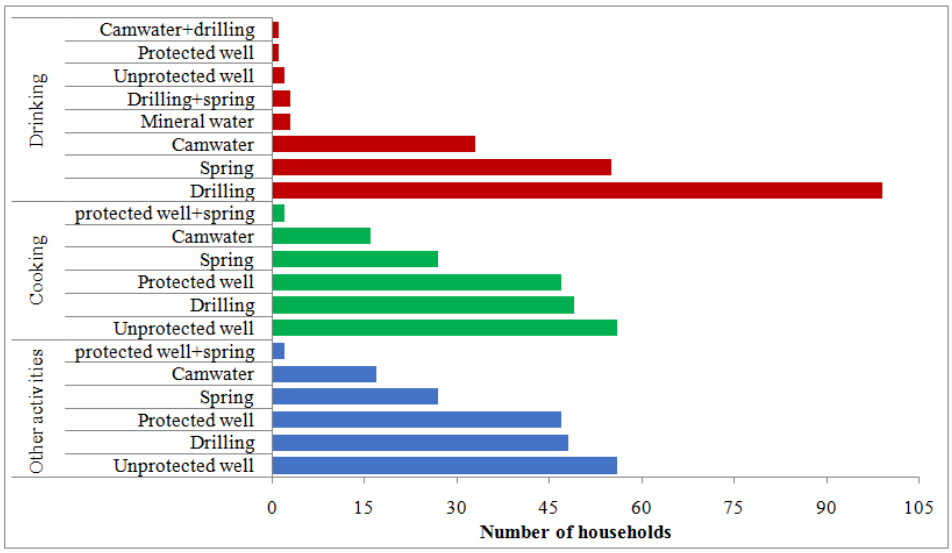

Figure 6: Different uses of water from alternative supply sources by households not connected to CAMWATER
Source: Field survey, 2018

This survey revealed that CAMWATER and drillings are the main supply sources of drinking water in the studied area; though some households use protected and unprotected wells as their source of drinking water. These households do not treat this water before drinking; this is the case noticed in Dakar I neighbourhood (Figure 7).

3.7. Perennity of Alternative Water Supply Sources

Alternative water sources used by inhabitants to cope with the lack of potable water and unplanned outages of CAMWATER supply are also sometimes subject to shortages (Table 3).

Table 3: Perennity of alternative water supply sources in households surveyed

	Alternative source of water supply					
Perennity	**Unprotected well**	**Protected well**	**Borehole**	**Spring**	**Protected well+borehole**	**Total**
Perennial	48	47	34	14	1	144
Available only when the owner is at home	3	3	2	0	1	9
Dried up during dry season	5	3	2	4	0	14
Regular break of the pump	0	0	2	0	0	2
Total	**56**	**53**	**40**	**18**	**2**	**169**

Source: *Fieldwork, 2018.*

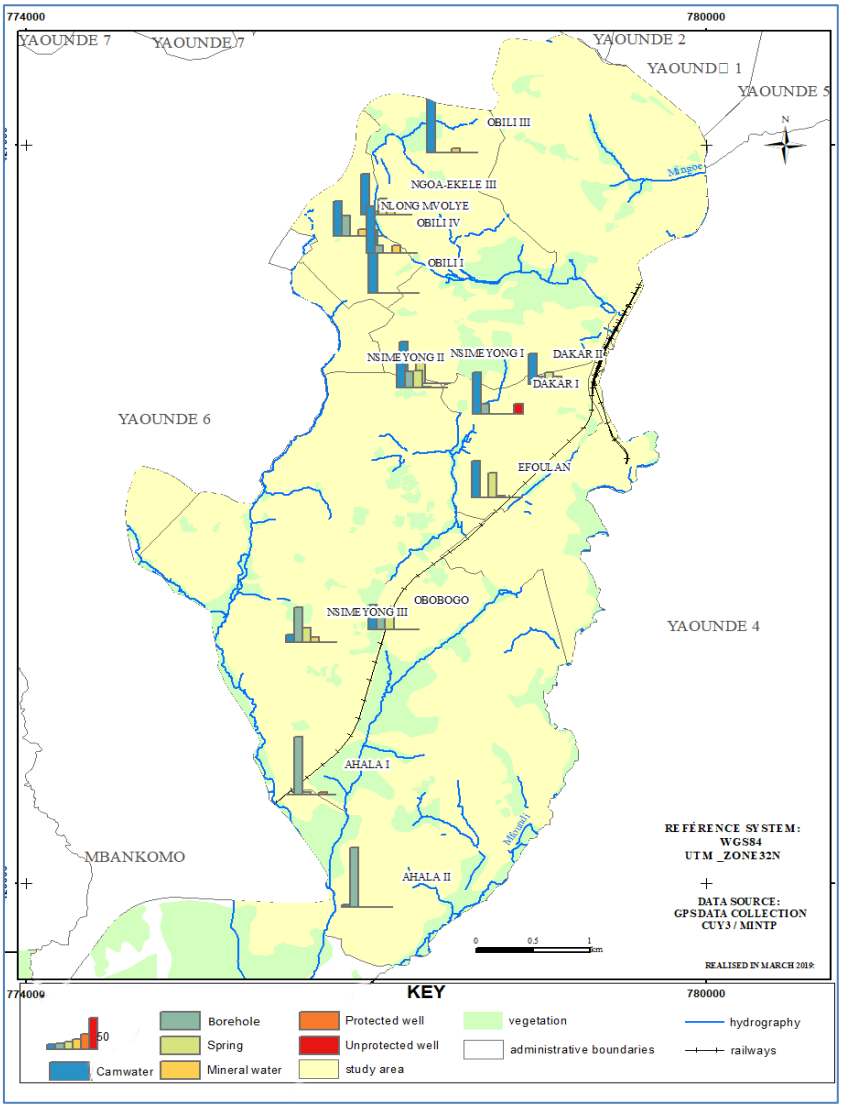

Figure 7: Distribution of drinking water supply sources in neighbourhoods of Yaounde III Subdivision
Source: National Institute of Cartography and fieldwork data, 2018

3.8. Efforts Provided by Inhabitants to have Access to Water

When the water point is too far from households, it becomes a problem for the city dwelling. This is because cities of developing countries are considered as vectors of new dynamics, at the same time as determining actors of economic growth as well as a support for important demographic and social mutations. As reported by inhabitants of this locality, it is difficult to have water in households of Yaounde III Subdivision neighbourhoods nowadays. Indeed, with demographic explosion due to a high natural growth and migrations, the Yaounde III population, which was once dispersed over the territory, becomes tighten and it results to a human piling up. Therefore, populations must provide much effort to be able to carry water, including travelling long distance to carry water (Figure 8).

Figure 8: Containers aligned in front of a drilling at Ahala II (a) and beside a spring at Obobogo (b)
Source: NIMPA Tatiana, 2018

Field work revealed that 102 households trip along a distance less than 100 meters to get water, while 53 others travel between 100-300 meters and 14 a travel 300 to 500 meters to carry water (Figure 9a). Concerning the time taken to get water, results revealed that 210 households take less than 30 minutes to fetch water, while 18 and 30 households take between 30-45 minutes and 45 minutes to 1 hour to get water respectively. Finally, only 1 household reports spending more than 1 hour to get water (Figure 9b).

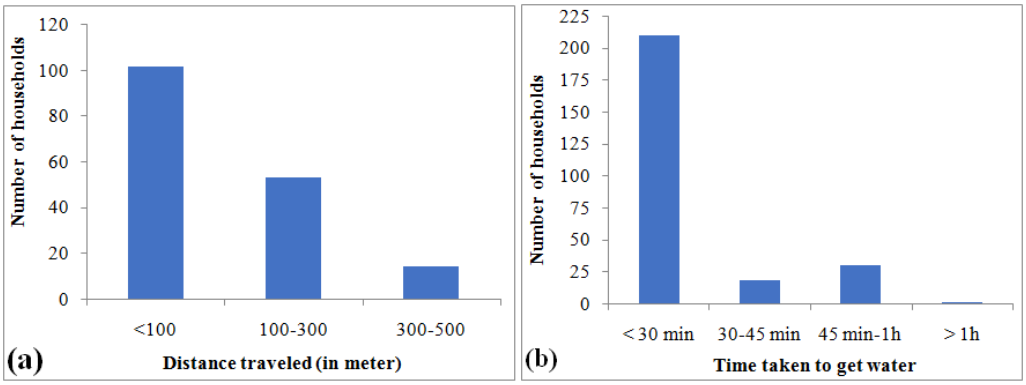

Figure 9: Distance covered to reach the nearest water point (A) and time taken to get water and bring it back home (B)
Source: Field survey, 2018

3.9. Purchase and Appreciation of the Cost of Alternative Water Supply Sources

This analysis does not take into account CAMWATER bills paid by households. Thus, in evaluating water- related expenditures in this study, we considered the 197 households non-subscribed to CAMWATER and the 29 households subscribed to CAMWATER but using alternative water sources. Results showed that 109 households representing 48.23% pay for alternative water supply currently drawn. Among these, 62 households pay only for drinking water and have to struggle to obtain water for other uses. In addition, 13 households say they pay for drinking and cooking waters while 34 households reported to pay for water they use for all their household activities (Figure 10a). Prices for a bucket of 25 litres vary from 25 to 100FCFA (Figure 10b). Among the households surveyed, 3, 35 and 30 said they pay 100, 75 and 50FCFA, respectively for a 25 litres bucket; whereas 5 reported that they pay 25FCFA. Moreover, 10 households reported that they pay monthly contributions of 2000FCFA to the water point owner. Meanwhile, 26 households did not precise their monthly contributions to the water point owners.

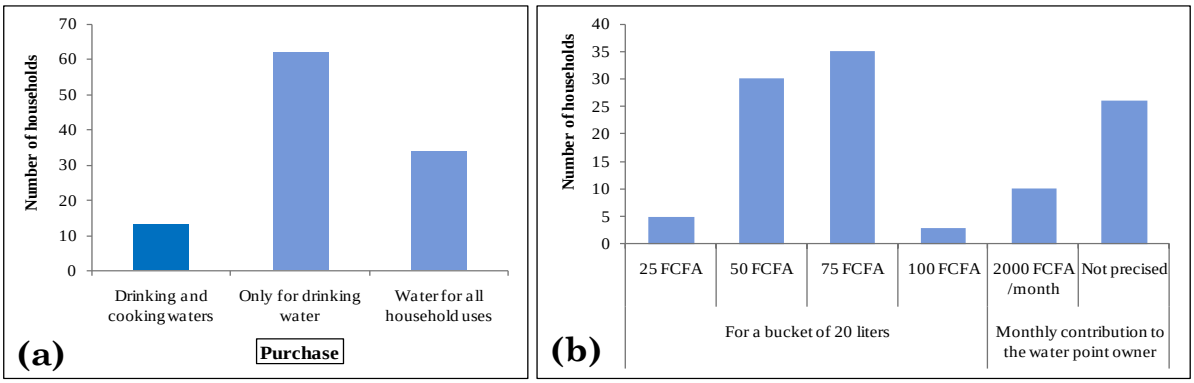

Figure 10: Proportion of households which pay for alternative water supply sources (a) and appreciation of the cost (b)
Source: Field survey, 2018

4. DISCUSSION

In developing countries, access to potable water remains a great issue in the 21st century as stated in the United Nation Development Programme (UNDP, 2016) sustainable development goals number 6 (SDG6: Clean Water and Sanitation). Water scarcity affects more than 40% of people all over the world, an alarming figure that is projected to rise as temperatures do. Therefore, one of the SDG6 targets was to assure adequate access to safe and affordable drinking water for all by 2030. This requires we invest in adequate infrastructure, provide sanitation facilities, and encourage hygiene as well as protection and restoration of water-related ecosystems. Reasonable access to safe drinking water is defined as the availability of at least 20 litres per person per day from an improved source within 1 kilometre of the user's dwelling. Under WHO (2011), access to safe water is measured by the proportion of population with access to an adequate amount of safe drinking water located within a convenient distance from the user's dwelling.

In many developing countries, this goal is far away for being achieved. The water sector in Cameroon has a certain delay as compared to many other countries with the same revenue with irregular progress and finance within the past 15 years (AMCOW, 2011). Despite efforts of CAMWATER to provide water to populations, supply remains lower than the demand. This field survey revealed that a high number of households in Yaounde III subdivision still face difficulties to access potable water adequately. Hence households turn to use alternative water supply sources without any care of their quality and safety. Whereas, Nguendo Yongsi *et al.,* (2009) and Kenfack (2018) documented that most of the alternative water sources in Yaoundé are subjected to health hazards related to the poor sanitation resulting from urban waste coupled with standing waters. Our results are consistent with those of Chukwu (2015) who documented that despite the availability of water; the area of Niger Delta has been struggling with acute potable water shortage due to ineffective water supply management culture. Similar results were obtained in Kenya by Chepyegon & Kamiya (2018) who found that the rate of water supply improvement is unlikely to support the nation's long-term development goals.

According to the strategic document for growth and employment, the level of poverty in Cameroon is residual and the level of revenue per inhabitant makes Cameroon a country with intermediate revenue. In Yaounde, people spend time and money to get water, and most often travel long distance to fetch the precious liquid. In the same vein, Tadesse *et al.,* (2013) reported that in the Adama area of Ethiopia, the water schemes were located at reasonable distances i.e. less than 2 km in most cases and the time taken for round trip to fetch water from source was less than or equal to 30 minutes in most cases, however the queuing time was more than an hour.

5. CONCLUSION

This study highlights that the inadequate access to water in Yaounde is the consequence of the insufficient pumping capacity of the existing potable water treatment plants, timeworn and poor maintenance of the CAMWATER pipes network on the one hand, and on the other hand, to rapid population growth, anarchy urban sprawl with informal urban fronts develop along valleys and slopes. From this observation, several lessons can be drawn. From a conceptual point of view on the urbanization process, we can state that if the current African urbanization is due to many failures in ongoing policies, it is time to articulate urban policies that strike a balance between urban growth and provision of basic urban infrastructure. Moreover, these policies must also extend services in order to supply less equipped neighbourhoods with potable water, and thus reduce waterborne disease risks. To improve the existing water supply services in Yaounde in terms of quality and quantity, fair distribution, reliability and sustainability, measures need to be taken to alleviate existing water supply and consumption problems. Concrete action should be taken with emphasis on the improvement and implementation of urban planning and drinking water supply framework directives, the achievement of the

water treatment plant on the Sanaga River to supply Yaounde and its surroundings with potable water (PAEPYS project), the extension and densification of water supply network, and the decentralization and involvement of municipalities in maintenance of hydraulic structures.

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