

Population Dynamics and Water Resource Needs in Bui Division, North West Region of Cameroon

By

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Abstract

Population growth affects every aspect of the environment and in most cases determines man-environment relationships. One of the main domains impacted by population dynamics is water resource management. This is because a change in any population variable has a concomitant change in the supply and demand of water. This paper therefore examines population dynamics in Bui Division in relation to water provision and management. It aims at bringing out a demand-supply assessment of water uses and requirements so as to ascertain the interrelationships between the supply and demand for water resources. The study relied on field observations as the main primary data collection technique and secondary data predominantly from the various Council Development Plan Reports. Findings revealed that the population of Bui Division has witnessed tremendous growth from 1987 to present, thereby exerting pressure on land, and expanding human activities beyond their limits of sustainability into marginal lands such as watersheds and catchments. As such, the alternative hypothesis was retained meaning that there is a relationship between population dynamics and trends of water supply and demand in Bui Division. There is a need for extension of potable water services to all the sub divisions of Bui Division. This will increase the proportion of the population that is served with potable water.

Key words: *Population Dynamics, Water Resources, Water Supply and Demand*

Introduction

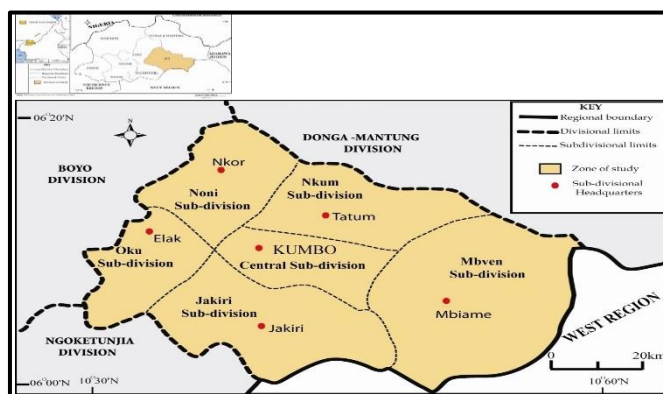
Everyone in a community uses water irrespective of the source. It has always been the responsibility of communities or members to explore sources of potable water, either through the use of naturally flowing streams and springs, or harnessed water (Njilla, 2010; 2015). Whatever the sources of water used, the basic reality is that human populations are increasing, thereby leading to a corresponding increase in the demand for water, which in most cases, surpasses the supply of water (UNFPA, 1991 a & b; Hugo, 2008). Also, water could be available, but at great distances, meaning that the time which otherwise could

have been used for other productive ventures is used in collecting or fetching water (Lambi, 2010; Lambi & Ndencho, 2010). This therefore means that communities must assess their population trends in relation to their water demand, and correlate this to the resources available in that community. This paper focuses on population trend in terms of the evolution over the years, for the entire division, and then per sub-divisions so as to ascertain the fact that the population is increasing. It also looks at population dynamics in terms of the age and sex composition, while relating it to water resource needs. The main aim of this paper is to examine population dynamics and water resource needs in the urban and rural settlements of Bui Division, in terms of water supply and demand.

The Study Area

This study was conducted in Bui Division, North West Region of Cameroon. Bui Division is situated about 109km from Bamenda Town, the headquarters of the North West Region of Cameroon and lies between latitudes 6°00" to 6°20" North of the Equator and longitudes 10°30" to 10°60" East of the Greenwich Meridian (Map 1). It has six sub-divisions namely, Kumbo Central (630km²), Jakiri (675km²), Nkum (375.3km²), Nkor-Noni (307.7km²), Mbiame (575km²) and Elak-Oku (232km²) (Figure 1). Bui Division is bordered to the north by Donga and Mantung Division, north east by Boyo, south west by Ngoketunjia, and the south and south east by Noun Division in the Western Region of Cameroon.

Figure 1: Location of Bui Division



Source: Adapted from the Kumbo Council Monographic Study (2009)

Data Collecting and Analysis Techniques

Data for this study were collected using primary and secondary sources. Primary data were collected mainly through field observations using an observation checklist. An inventory of various community water supply schemes in Bui Division was made, and field observations conducted to these

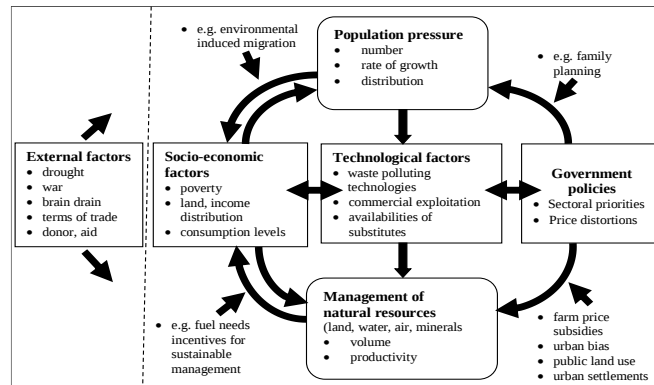
communities to collect information concerning their location, physical attributes and installations. In order to appropriately describe water catchment and water distribution facilities and their coverage, the observation guide proved to be invaluable. Primary data were collected using interviews, observation guides and questionnaires from 121 villages out of 140 in Bui Division. Major communities in all the sub-divisions of Bui Division were visited during this study. Some problems such as leakages of water, inhabitants fetching water from distant sources, conflicting land use activities within catchments and watersheds were observed using the observation guide. This guide consisted of a list of all elements that needed to be observed on the field, and their contribution in attaining the objectives of this study. Secondary data were collected from published and unpublished materials in journals, articles, textbooks, manuscripts, and reports from government and non-governmental organisations involved in water management in Bui Division. The Community Development Department and Council Development Plans of all the councils in Bui Division were very instrumental as these were charged with the responsibility of collecting data on development variables including water in their municipalities. The end of project reports thus constituted one of the major sources of data for analysis. The Pearson Product Correlation Coefficient was used in this study to establish the relationship between the total population of Bui Division and the population served with potable water. This was to vividly bring out the impact of population dynamics on water supply and demand in Bui Division.

Theoretical Considerations

This study is anchored on the theory of Population and Water Use postulated by the Population Reference Bureau of the United Nations Environmental Programme in 1997. Also related to the interrelationships between population and the environment, there is a strong link between demographics (population pressure in terms of numbers, rate of growth and distribution) and natural resource issues (Figure 2). The framework shows clearly that demographics such as external factors, socio-economic factors, technological factors and government policies all have significant implications on natural resource issues especially water resources management and vice versa.

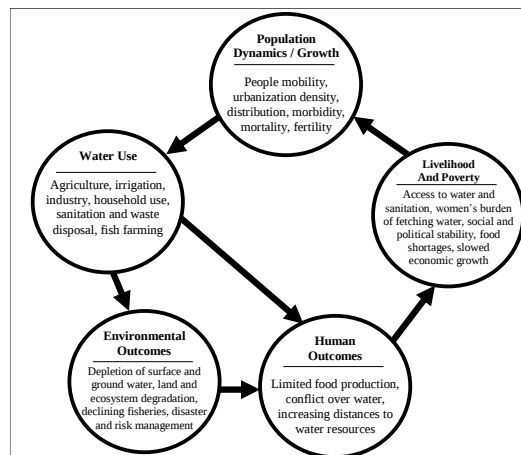
The relationship between population and the water use includes population dynamics / growth, livelihood and poverty, human outcomes, environmental outcomes and water use. This shows that the interplay of various activities such as agriculture, irrigation, industry, household use, sanitation and waste disposal and to a lesser extent fish farming. Since this is happening against the backdrop of increasing population, it brings to focus the concepts of carrying capacity and resource depletion (Figure 3).

Figure 2: The Links between Demographic and Natural Resource Issues



Source: UNFPA (1991).

Figure 3: The Relationship between Population and Water Use



Source: Adapted from Population Reference Bureau et al., 1997

Findings

The Population Dynamics of Bui Division

Bui Division is the second most populated division in the North West Region of Cameroon with an estimated population of over 432,465 inhabitants and a population density of about 250 persons per km² (National Institute of Statistics, 2005). This population trend presents a progressive structure characterised by a more youthful population due to an increase in birth rate and the decrease in infant mortality precipitated by the presence of two efficient hospitals in the area – the Banso Baptist Hospital (B.B.H) and St. Elizabeth Catholic General Hospital Shisong, as well as a couple of health centres and dispensaries in rural areas. In relation to the trend, the population of Bui

Division has been experiencing a rapid growth since the 1960s (Divisional Delegation of Town Planning, Bui, 2015).

The population of Bui Division presents a progressive increase from 1976 to 2015 projections. There are also variations in the rural and urban populations. The rural population grew from 1976 to 1998 due to the fact that there was a general population explosion in the division. This population became stagnant up to 2005, and recent trends show a decrease in the rural population. On the other hand, the urban population has been increasing tremendously over the years, and this increase has several far-reaching consequences on land use dynamics in general and community water resources in particular, as there is the conversion from one land use type to the other as well as changes in the rural economic base, leading to a high competition for land. Kumbo town, which doubles as the headquarters of Kumbo Central Sub-division and Bui Division, has witnessed a tremendous growth in population over the years. This has led to the sporadic and uncontrolled spatial expansion of the population.

Bui-Division covers a land surface area of 2,352km² and in the 1987 National Population Census, had a population of 218,064 people with a population density of 92.7 persons per km². In the 2005 Population Census, the population stood at 321,969 with a population density of 136.85 persons per km². The population increased by 103,905 people between 1987 and 2005 (18 years) with a population density change of 44.18 persons per km² (Table 1). The 2010 National Population Census results show that the population of Bui Division stood at 464,200 with a population density of 201.8 persons per km² (Table 2).

Table 1: The Evolution of the Population of Bui Division between 1987 and 2005.

* Kumbo Central Sub-division, has been divided into 2 Sub-divisions; Kumbo Central Sub-Division and Nkum Sub-Division. However, their population figures, for comparative purposes shall be considered as Kumbo Central Sub-Division.

Sub-Division	Population 1987	Population 2005	Surface area km ²	Population density 1987	Population density 2005	Density change	Remarks
Jakiri	36,615	47,022	470.45	77.19	99.95	22.76	Fast
Kumbo Central & Nkum*	93,884	127,538	486.42	193.01	262.19	69.18	Fast
Mbven	11,952	20,289	702.85	17.01	28.87	11.86	Moderate
Noni	20,331	39,400	319.78	63.58	123.21	59.63	Fast
Oku	55,582	87,720	372.50	149.21	235.49	86.28	Fast
Sub-total	218,064	321,969	2352.00	92.71	136.89	44.18	Generally fast

Source: North West Provincial Service of Statistics 1987 and Bureau Central de Recensement et de Etudes de population 2005.

Table 2: Dynamics of Population in Bui Division from 1970 to 2012

Sub-Divisions	1970	1976	1987 Census	1998 projections	2005 Census	2012 from CDPs
Kumbo Central & Nkum*	/	/	93 884	153 995	210 994	234,859
Mbven	/	/	11 952	16 927	21 123	48,680
Noni	/	/	20 331	23 691	26 112	63,492
Jakiri (Dzekwa)	/	/	36 315	57 738	77 555	62,302
Oku	/	/	55 582	78 049	96 870	144,800
Total	118,000	151,821	218,064	330,400	431,664	554,133

Source: National Institute of Statistics Cameroon and Etude Socio-économiques Régionales au Cameroun, Nord-Ouest.

In 2012, thanks to the introduction of the National Community Driven Development Programme (PNDP), the various councils of Bui Division conducted Participatory Village Diagnostic Surveys, which were presented in the Council Development Plan documents. These documents detailed the population for the entire division which stands at 554,133 inhabitants, with a population density of 235.6 persons per km². Considering that the surface area of the division is finite and with the growing demand for land resources, there is a considerable stress on the watersheds, the catchments and the water resources in general.

Furthermore, the population growth rate is higher in the rural areas (193,545) than in urban areas (128,424) (Table 3), and this trend had been increasing up to 2005 before it started decreasing in favour of the urban population (Table 4).

Table 3: The Rural and Urban Population Figures of Bui Division in 2005

Sub-Divisions	Population of Males in rural area	Population of Females in rural area	Total population of males and females in rural area	Population of males in urban area	Population of females in urban area	Total population of males and females in urban area
Jakiri	17,634	19,429	37,063	4,712	5,247	9,957
Kumbo Central & Nkum *	22,402	24,924	47,326	39,184	41,028	80,212
Mbven	7,616	7,603	15,219	2,457	2,613	5,070
Noni	16,884	17,824	34,708	2,322	2,370	4,692
Oku	28,600	30,629	59,229	13,866	14,625	28,491
Sub-total	93,136	100,409	193,545	62,541	65,883	128,424

Source: Bureau Central de Recensement et de Etudes de population (2005).

Table 4: The Evolution of Rural and Urban Populations in Bui Division

Division	Status	1976	1987	1998	2005	2015
Bui	Rural	136 736	179 995	234 353	234 490	177 464
	Urban	15 085	38 069	96 047	197 174	454 964
Total		151,821	218,064	330,400	431664	632,428

Source: National Institute of Statistics Cameroon and Etude Socio-économiques Régionales au Cameroun, Nord-Ouest

This shows that more pressure is being exerted on the soil since over 80% of the rural population is involved in farming as a major livelihood activity. Also, the female population in the rural areas (100,409) dominates that of the male population (93,136). This also indicates that more pressure is exerted on the land resources since women, even though not land owners, are the major land users. The rapid population growth rates presented in Tables 2 and 4 will continue to exert pressure on the land and hence will continue to expand the human activities beyond their limits of sustainability into the marginal lands such as the watersheds and catchments.

The population figures are based on past National Population and Housing Census results of Cameroon. However, in order to obtain an in-depth population situation for the various sub-divisions of Bui Division, the statistics presented in the Council Development Plans following the Participatory Village Diagnostic Surveys conducted by the PNDP programme are presented herein.

Evolution of Population for the Sub Divisions

The Population of Kumbo Central Sub-Division

The estimated total population of Kumbo Central Sub-Division is 127,919 inhabitants distributed over 43 villages. There is a marked dominance of the female population over the male, that is, 42,956 representing 53% to 30,030 representing 47%). Out of the total population of Kumbo Central, about 30% are kids of ten years or below, mostly attending the nursery and primary schools; about 40% are youths in secondary schools, high schools, specialized institutions, graduates (adults and youths in the job market), apprentices and traders. This is the sector that is most affected by rural exodus; and about 30% are full adults and the aging (CDP, Kumbo Council, 2012). This population is concentrated in three main zones, namely, the Tobin zone with its growing satellites, the Mbveh-Ndzenji-Kiyan zone, and the Kimbo-Shisong-Njavnyuy zone. There are significant secondary nodes such as Bamkika-ay-Kikaikelaki, Kikoo-Kikaikom and Meluf areas. Kumbo Central is the predominant urban area and therefore has a proliferation of economic activities such as hotels, restaurants, schools and other businesses which are all demanding and competing for more potable water. The urban space of the Kumbo Council is

characterised by population concentration in Mbveh, Tobin, Kimbo Squares and Shisong with expansion into the empty lands in between. Each population concentration has its own peculiarity which is as follows: Tobin is the government residential area with many offices and residences; the population of Shisong was attracted by the existence of the early Catholic Church followed by the St. Elisabeth Catholic General Hospital; Mbveh is the main commercial area with the main market. This is also the main centre of the predominantly Muslim population. Finally, the population of Kimbo Squares is influenced by the presence of the prestigious Catholic Cathedral, the uphill Bishop's House, the main Presbyterian Church, the Bansa Baptist Hospital and the Nso Fon's Palace. There is also a market and the proliferation of other economic activities. The population decreases as one moves away from these core areas.

The Population of Nkum Sub-Division

Following the statistics published in the 2005 General Population and Housing Census of Cameroon, the Nkum Council area did not have any figures because this administrative unit was later created on the 23rd of April 2007 by Presidential Decree No. 2007/115. It is therefore obvious that they were counted under the then Kumbo Central Sub-Division which used to host the Kumbo Rural and Kumbo Urban Councils. The Nkum Council area is made up of 32 villages, namely, Kuvlu, Nseh, Tatum, Buh, Dzeng, Memfu, Ndzevru, Ngondzen, Kifem, Mbamsong, Kovifem, Mbiim, Ngondzen, Nkeng, Takijah, Kishong, Mah, Ndzenso, Banten, Sahnyar, Ngaan, Kuintar, Saan, Takui, Kaiy, Yangkitari, Mbuiy-Wailai, Dyri, Semdzeng, Basse, Beshi and Mbosha (CDP, Nkum Council, 2012). However, the principal clan is Nso. The study by the PNDP in 2012 estimates the population of Nkum at 106,940 inhabitants, that is, 57,236 (53.3%) females and 49,704 (46.5%) males. Being a former part of Kumbo Central Sub-division, there are many villages that host a huge population. Also, the fact that this area has favourable agricultural and grazing fields makes it a safe haven for the agriculturalists and animal lovers. As such, there are major concentrations of the population in Nseh, Kuvlu, Tatum, Buh, Takijah, Banten and Ngondzen.

The population of the Nkum Council area indicates that it is not evenly distributed. Thus, three distinct population patterns are identified as follows: densely, moderately and sparsely populated areas. High density results from the fact that these areas are more accessible with some concentration of administrative, economic, health and educational institutions as well as important tourist sites (for eco and agro-tourism) and socio-cultural and traditional institutions. These include; Tatum (the administrative headquarters), Nseh, Kuvlu, Dzeng, Takijah, Tadu, Ngondzen, Mbiim, Buh and Banten (CDP, Nkum Council, 2011). The lifestyles and living conditions of the inhabitants of these areas are said to be high and improved compared to other localities around the Council area. The moderately and sparsely populated areas are more rural

and sometimes enclaved with less concentration of businesses and economic activities but showing a considerable increase as far as population growth is concerned. In effect, more than 50% of the total population of Nkum Sub-division resides in the predominantly rural areas. Their major occupations are agriculture and small-scale livestock rearing which therefore constitute the mainstay of their local (rural) economies.

The Population of Mbven (Mbiame) Sub-Division

According to the National Population Census of 2005, the council had a population of approximately 20,289 inhabitants. From projections based on a 3% growth rate and estimates during the Participatory Village Diagnostic Surveys conducted by the Mbven Council under the auspices of the PNDP programme in 2012, the population is estimated at 48,684 distributed as follows: 13,093 (27%) males, 17,289 (35%) females, 11,650 (24%) youths between 16-35 years, and 6,652 (14%) are children less than five years. Mbven Sub-division being a predominantly farming and rural area has population concentrations in Sancho, Rifem, Njanawa, Mbonchari and Lip. There are also significant populations in Shuken, Lam, Mbohnso, Mboshong and Kitsem (CDP, Mbven Council, 2012). It should be recalled that the actual population of Mbiame cannot be accurately ascertained since this sub-division is a hollow frontier zone with seasonal migrants who migrate for agricultural purposes in the fertile low-lying regions of the sub-division.

The Population of Jakiri Sub-Division

According to the 2005 National Population Census, the Jakiri Municipality had an estimated population of 47,022 inhabitants covering a surface area of 470km² and a population density of 99.95 persons per km². However, following the Participatory Village Diagnostic Surveys conducted by the Jakiri Council, under the supervision of the PNDP programme in 2012, the population of Dzekwa Sub-division stood at 62,302 inhabitants. The major population concentrations are found in Jakiri, Kifom, Ber, Nsom, Shukai, Wainamah and Shiy areas. In terms of sex composition, the population of Jakiri follows the national trend with the females dominating (32,857 representing 52.7%) as against 29,445 (47.3%) for the males. Also, in terms of age structure, the population is dominated by the children of less than 10 years and the youths between 15 to 38 years of age. This reflects the general population pyramid of Cameroon which is broad at the base and narrow at the top. Dzekwa Sub-Division over the past 15 years has witnessed remarkable horizontal expansion of more than 40% in its surface areal coverage by settlements (CDP, Jakiri Council, 2012). As such, areas such as Kitsenjam, Vekovi, Ntoh-Nkar, Tashem, Shukov, Fakui, Tavirer and Mvem to the north of Jakiri; Nkuh, Lip-Mbokam, Mbokam, Barare and Tan to the east; Ber, Wasi, Mbokijah, Mbo-ongé and Noi to the south and Wainamah, Limbo, Kwanso, Anseh, Tsenkov and Ndzerem-Nyam to the west have increased in their population and areal coverage. Being

a region with a great endowment of watersheds and water resources, such a horizontal expansion of the settlements has severe underpinnings on the water resources in general and the watersheds / catchments in particular. This is why the sub-division is reputed for numerous water-related conflicts such as that between CAMWATER in Jakiri and the population of Nkar-Kisenjam-Vekovi area which harbours their catchment, and Tavirer where water sources were destroyed by the neighbouring village.

The Population of Oku Sub-Division

The Elak Council was created by Presidential Decree No 91/COR/28 of 1st October 1977. It is located about 25km to the north west of Kumbo Town. It has the same territorial boundary as Oku Sub-Division and the Oku Fandom. The council has 35 villages headed by chiefs. The villages have a total estimated population of 144,800 inhabitants, as per the Participatory Village Diagnostic Surveys that were conducted by the Council. This is almost doubled the figures of the Population Census of 2005 which stood at 87,720. There are 32,543 (22%) men, 42,933 (29%) women, 53,184 (36%) youths between 18 to 35 years and 20,130 (13%) children less than five years.

There are fifteen (15) villages in Oku with population figures above 5,000 inhabitants. The major concentrations are found in Ichim, Jikijem (Tolon), Ngashie, Mboh, Elak, Jiyane, Lang, Mbochevu, Ngvunkei I, Ibal-Oku, Manchok, Mbam, IkalLui, Mbokjikijem and Ibalichim. The moderately populated areas include Ngemsiba I, Kfem, Mbochnghas, Kesotin, Keyong, Ntowel and Ngham. These areas are growing rapidly as the predominant agricultural population is now expanding settlements in these areas. The predominantly sparsely populated areas include Ndum, Chak, Lum, Mbochemlung, Ibal-Ardorate, Simonkov, Bow, Tankiy, Fekeng and Ngvunkei II. These are areas with huge expanses of agricultural fields which are cultivated.

The Population of Nkor-Noni Sub-Division

The Nkor Council area according to the 2005 National Population Census results had a population of 39,400 inhabitants distributed over a surface area of 319.78km² with a population density of 123.21 inhabitants per km² (CNC, 2005). Following the Participatory Village Diagnostic Surveys conducted by the Nkor Council in 2012, the population stood at 63,492 inhabitants distributed over the same surface area with a population density of 198.5 persons per km², representing an increase of 24,092 inhabitants (38.0%) and an increase in population density of 75.3 persons per km². The population is distributed into seven major clans, namely, Dom, Din, Djottin, Nkor, Mbinon, Lassin, Banti and Ngeptang. The areas of high population concentrations include Nkali, Banti, Nchini, Asha, Ebwuewe, Ntfum, Ngeptang, Mee, Nyalin and Ngai. The sparsely populated areas include Nsusry, Mbam, Kicha, Nganganbe, Muntale,

Kibaruke, amongst others. These are predominantly agricultural areas which surround the main clans and are characterised by dispersed farm settlements.

Following from the above tables and analyses, the total population of Bui Division as at 2012 based on the Participatory Village Diagnostic Surveys conducted by the various councils through the financial and technical assistance of the PNDP programme and presented in the Council Development Plans of all the councils in the division is 554,137. With the paucity of the population data in terms of the age-sex composition, it was difficult to draw the population pyramids showing the age-sex composition / structure of the population of Bui Division. However, the population figures are in conformity with the general population pyramid of Cameroon which is broad at the base and narrow at the top depicting the youthful nature of the population of the division (National Census Result of Cameroon, 2010). After assessing the population structure and composition of Bui Division, the focus of the study now shifts to examining the relationship between population dynamics and water resources in terms of the demand and supply of water.

Population Growth and Water Resources

Demographic pressure is one of the crucial causes of land pressure in Bui Division. The increase in population has accelerated human activities thereby exerting more pressure on the land resources (water, forests and soils). The increasing population of Bui Division like that of the world (Lambi, 2010; Nana, 2012) goes together with the need for food, water and other resources, thereby resulting to their degradation. The degradation of these land resources is accounted for seriously by the current increase in population and its unplanned and tumultuous occupation of space. There are however a number of reasons that account for this rapid population increase. These include tradition, religion, absence of family planning methods in villages, illiteracy, low death rate due to improvements and access to health and medical care, increase in fertility and in-migration.

The impacts of increasing population on water demand and supply are enormous and culminate in the severe water shortages witnessed in the entire division. This shows that not all communities are capable of providing potable (pipe-borne) water to their populations.

Total Population of Bui Division as at 2012 = **554,133 inhabitants**

Total population served with spring water (community water) excluding KWA = **110,704**

Population not served with water = **443,429 inhabitants**

Percentage of population served with spring / community water for Bui Division = **20.0%**

Total population of Bui Division served with CAMWATER = **16,950 people.**

Total percentage of population in Bui Division served with CAMWATER = **3.1%**

Total population of Bui Division served by Kumbo Water Authority = **28,923 subscribers.**

Total percentage of population in Bui Division served by KWA = **5.2%**

Total proportion of population served by community water schemes / springs, CAMWATER and KWA = **20.0 + 3.1 + 5.2 = 28.3%**

Table 5 presents a summary of the population and potable water situation of Bui Division based on projections and participatory surveys presented in the various Council Development Plans. These figures in conjunction with the potable water situation for Bui Division obtained from the Divisional Delegation of Energy and Water Resources for Bui Division were used to establish the relationship between population dynamics and potable water supply in Bui Division.

Table 5: Population and Potable Water Situation of Bui Division

Sub-Divisions	Total Population [^]	Population served with pipe borne water #	% of Population served per sub division	% of Population served per division
Kumbo Central	127,919	33,780	26.4	6.1
Nkum (Tatum)	106,940	24,100	22.5	4.3
Mbven (Mbiame)	48,680	9,200	18.9	1.7
Jakiri (Dzekwa)	62,302	37,164	59.7	6.7
Oku-Elak	144,800	12,010	8.3	2.2
Noni-Nkor	63,492	9,200	14.5	1.7
Total	554,133	125,454		22.7%

Source: Council Development Plans of all the six councils of Bui Division, 2011-2012) Divisional Delegation of Energy and Water Resources for Bui (2014).

The findings of this study are in line with those of the study conducted by the United Nations Development Programme (UNDP) (2004) on the importance of being able to assess water supply and demand. According to this study, water demand assessment studies can improve prospects of system sustainability by facilitating decision making, particularly on service quality and water provision, and cost recovery policy, which reflect the preferences of the population concerning water supply and demand. Therefore, in assessing water demand emphasis must not only be laid on the quantity of water demanded by the population, but also on aspects related to how much the population is willing to pay for water, the quantity and the mode / duration of payment, the trade-off and compromises that could be made in order to have sufficient water quantity.

Furthermore, Michelle (1979) and Ayoade (1988), opine that water resource evaluation is done with the primary objective of attaining the demand for water for various uses and by various users. Thus, the evaluation of water resources takes into consideration the quantity and quality of the available water resources and the possibility of their development within the existing technological, cultural, political and socio-economic systems. The evaluation of water is therefore not complete without a consideration of the demand for water which is controlled by socio-economic factors. The major abstractive uses of water are for irrigation and water supply for domestic and industrial uses. The water requirements for these purposes now and in the future must be known in order to facilitate rational planning and optimum utilisation of the available water resources.

In the same light, Gleick (1996; 1998) estimated that every human being needs five litres per capita per day (Lpcd) for drinking water, 20 Lpcd for sanitation and hygiene, 15 Lpcd for bathing and 10 Lpcd for cooking, or approximately 50 Lpcd for domestic use. This is about 13 gallons per capita per day (gal/pc-d) or 4,750 gallons per capita per year (gal/pc-yr) as a basic minimum. This estimate is considered to be a true minimum to sustain life in a moderate daily activity. This minimum estimate does not include water needed for food production. In the United States of America, currently about 54,000 gal/pc-yr of water are used for domestic purposes. Canada and Mexico use about 41,000 and 12,000 gal/pc-yr respectively (Gleick, 2000). Increasing population therefore means increasing litres per capita per day of water required by the population. This reflects the situation of Bui Division.

Finally, the WHO (1984) and the WHO and UNICEF (2000) posit that, water supply analysis are conducted taking into consideration the population of the locality, its projected rate of increase (trend) based on the growth rate, and correlating this to the actual demand for water for a period under study. The population, trends and water demanded are then correlated with the quantity of water available (this could be harnessed or non-harnessed water sources). Another aspect of considerable importance in conducting water supply analysis is the use to which water is put. This is because particular uses demand specific quality and quantity requirements. For example, water intended for domestic purposes must be pure, and its organoleptic, physico-chemical and microbial properties must meet those of the World Health Organisation (WHO) or the Cameroon Government Standards for drinking water and sanitation. However, water for irrigation may not necessarily be pure, but must not also contain heavy metals. These aspects are therefore of paramount importance to the situation of water demand and provision in Bui Division.

Conclusion and Recommendations

An increase in population leads to a corresponding increase in the uses and the demand for water, a decrease in the supply of water which necessitates the exploitation of new and alternative sources of water in order to upset the increase in demand for water and the growing scarcity of water. As the population is increasing, the carrying capacity of the available water resources as well as the existing infrastructures is surpassed leading to a scarcity of water. Following from the above, the increase in population of Bui Division does not only affect the ability of the authorities that be to provide sufficient quantities of potable water to the population, but also affects the ability of the watersheds and the catchments to provide enough water. This was justified by the favourable response of the population to the comment that “reducing the impact of population increase on community water catchments and watersheds is important in ensuring the overall sustainability of water resources”. The impacts of such population increase are visible in the uncontrolled land use activities within and around the watersheds / catchments which have deleterious effects on water resources.

Also, worthy of note are the changes in the uses of water. Water demand assessment is not only based on the trend of population increase but most importantly on the uses to which water is put, as specific uses demand more water than others. The proliferation of the recreational and catering services, as well as an increase in hotel and restaurant services has placed more demand for water resources, and since these sectors are involved in food business, there is a need for potable water to maintain hygiene and sanitation. This is empirically verified by the high proportion of the population who use water for food businesses.

The population of Bui Division should be aware that water, while being a social good, is also an economic good which demands a lot of investment in service delivery, monitoring, evaluation and maintenance of water-related infrastructures. As such, the population should address their perceptions of water to reflect water as an economic good, and should devote their finances in paying for water. This will bridge the gap between the total population and those supplied with potable water in the Division

There is a huge need for extension of potable water services to all the sub divisions of Bui Division. This will increase the proportion of the population that is served with potable water.

There should be a high level of sensitisation and awareness raising campaigns on the local population to determine what their perceptions are, since some problems faced today could be tied to the way the local population perceive water.

Also, there should be strict implementation of payment schemes for water. According to one of Barry Commoner's Laws of Ecology "There is no such thing as free lunch". In the same light, "There is no such thing as free water". Those who cannot pay for their maintenance levies, either in cash or kind, should be fined using the various means at the disposal of the water management committees. By so doing, enough finances could be raised to aid in extending water services to the entire division and to serve the entire population.

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