



Research Journal of
**Environmental
Sciences**

ISSN 1819-3412



Academic
Journals Inc.

www.academicjournals.com

Access and Management of Drinking Water in Developing Cities: Evidence From Yaoundé (Cameroon)

H.B. Nguendo Yongsî

Laboratory of Sustainability and Urban Dynamics, Department of Geography, Faculty of Sciences, University of Montréal, Canada

ABSTRACT

With an urban population of more than 40% growing at the rate of about 7% per annum in the main cities, the urbanization process in Cameroon is rather uncontrolled and fast-paced. This has led to a major challenge of meeting the potable water needs of city dwellers. Undeniably, the provision of potable or drinking water is increasingly considered as a basic social service and even as a stimulus for economic growth in low-income countries. For many households, having a tap located in the residential courtyard is the best option for accessing potable water. The objective of this study was to analyze the methods of water supply and the ways in which this water is managed in many households in Yaounde. Within the framework of the research programme known as Health, Vulnerable Populations and Environment (PERSAN), we carried out a direct survey of 3,034 households in 20 suburbs in Yaoundé. The survey revealed that in Yaounde, only 20% of households have direct access to pipe-borne water network. The majority of households resort to other sources such as public taps, springs and wells.

Key words: Urbanization, water supply, water management, Yaoundé, Cameroon

INTRODUCTION

Considering the problems linked to climate change and the protection of biodiversity, the availability of safe water constitutes a major concern for the international community. Indeed, access to safe water has become a major challenge for contemporary societies which have experienced a sharp increase in their needs. With a world population which has quadrupled during the 20th century, the need for water has increased and the urgency of this issue, however depends on the geographical area in question. While Western countries invest heavily in the supply of fresh water to their entire population, developing countries are faced with daunting challenges whose severity is linked to the process of urbanization. Since the 19th century, world urbanization population has exploded. In 1950, 29% of the world's population lived in cities. This value is currently estimated at 50% and it is projected to rise to 61% by 2030 (Satterthwaite, 2005). More fascinating than these global figures is the rapid and spectacular urbanization in developing countries, particularly in Africa. Hence, urbanization has become phenomenal and puzzling with a rapid increase from 15% in 1950 to about 41% (Cohen, 2006). It is estimated that by 2030, the continent may attain 54% urbanisation (UNFPA, 2007). This phenomenal growth can be qualified as sudden and wild to express the uncontrolled nature of urban growth and the implications it may have on the well-being of city dwellers.

Equatorial Africa is one of the world's most problematic regions. Some social needs are yet to be satisfied, such as draining of rainwater, collection of households refuse, access to primary

healthcare. It is also confronted with acute water problems (i.e., insufficient water quality and quantity for human water needs) In sub-Saharan Africa, close to 300 million people do not have access to potable water and one out of two people suffer from diseases related to the lack of water or its poor quality (WHO, 2007). Within the context of Cameroonian cities which are witnessing unprecedented growth (Nguendo Yongsu *et al.*, 2008), possessing private water tap is a luxury which only few inhabitants can afford.

Population growth caused by rural exodus, coupled with poor management, corruption and the increase of private housing has contributed to the rapid growth of urban areas in Cameroon. Under such circumstances, a proportionately larger and more expensive network is required for connecting running water throughout the suburbs of a city. This study examines the extent of the accessibility of the population to drinking water in Yaounde. The objectives of the study are threefold:

- To examine patterns of water supply in Yaounde the capital of Cameroon in order to illustrate the complexity of the situation
- To scrutinize the population in their search for drinking water
- To look at households' storage methods

Background: Water, a key issue for developing countries: Water constitutes one of the most important factors of human as well as plant and animal life s. Water has become so common that sometimes we forget its importance, except during the International Water Day. Today, the availability of water is a very important factor for global development. From an economic point of view, namely in developing areas and particularly at the households' level, the availability of drinking water in households saves time that can be allocated for leisure and economic activities and for children's education. This is because, very often, children are called upon to fetch water daily in the household at the expense of the time they should spend in class or studying. From the social point of view, improved access to drinking water shows a good standard of living. From the public health point of view however, studies are contradictory on the beneficial effects of improving water quality on health (WHO, 2003). However, it is known that health risks related to personal hygiene are lessened when water is abundantly available (Allen *et al.*, 2006). Taking into consideration the importance of water and its scarcity, in 1980, governments and international organizations set an objective to provide drinking water to everyone at the end of the 1980 decade, known as the International Decade for Safe Water and Sanitation. However, this target was not achieved, especially in towns where real progress did not keep pace with the rapidly expanding population. For example, in the 90s, public investments remained stable at around 0.4% of the GNP (Serageldin, 1994) and 244 million city dwellers did not have access to drinking water, which was about 30 million more than in 1980 (Evans, 1992). This situation is due to the fact that the urban water utility services are faced with three main challenges:

- **Population growth:** Even though population growth is currently declining, it however remains stable (averagely 4% year⁻¹). Population growth results in urban sprawl evident in the development of vast peripheries where residential land uses are, if not always illegal, at least often precarious (Nguendo Yongsu *et al.*, 2008; Kauffmann, 2007)
- **Poverty:** The second challenge is poverty, which has plagued the world's cities in recent years. In fact, in addition to socio-economic inequalities and to the increase in social polarization, the heterogeneity of households has grown (Mitlin and Satterthwaite, 2001)

Yaoundé in Cameroon

Urbanized area
Watershed threshold
Rivers

0 1,6 km
Projection System: Gauss Krugger
Ellipsoid: Clarke 1880

Source: Topographic map of Yaoundé, NA-32 XXIV, 1962
Designing : H.B. NGUENDO YONGSI, 2008
Labs: "CNRS-UMR5664-Modeling, GIS-Paris
Sustainability and Territorial Dynamic - Montréal"

126

Data and methods: The data presented in this study consists partly of an interdisciplinary study conducted in Yaounde as part of the 'Populations et Espaces à Risques SANitaires' (PERSAN) research programme and the microbiological survey on drinking water in Yaounde in Yaounde conducted by the laboratory of Hygiene and Environment-Centre Pasteur Institute. Although our sampling included all the suburbs and households in Yaounde, we used a stratified random sampling method (two strata), to select targeted suburbs. First, 20 suburbs were selected out of the 105 that make up the city. These suburbs were representative of the six types of quarters that are characteristic of Yaounde (Fig. 2, 3). In the second stage of the survey, we randomly selected 3,034 households. The selection of these households was based on three criteria: those using one or more water sources, residence in the urbanized area, possessing enough information to allow adequate analyses. We were assisted in the survey by a team of qualified researchers from the Institute for Demographic Research (IFORD) in Yaounde. Using standardized questionnaires, the team visited the selected households to collect data relating to the sources and methods of harvesting and storing drinking water. The software used for statistic processing was SPSS 11.1.

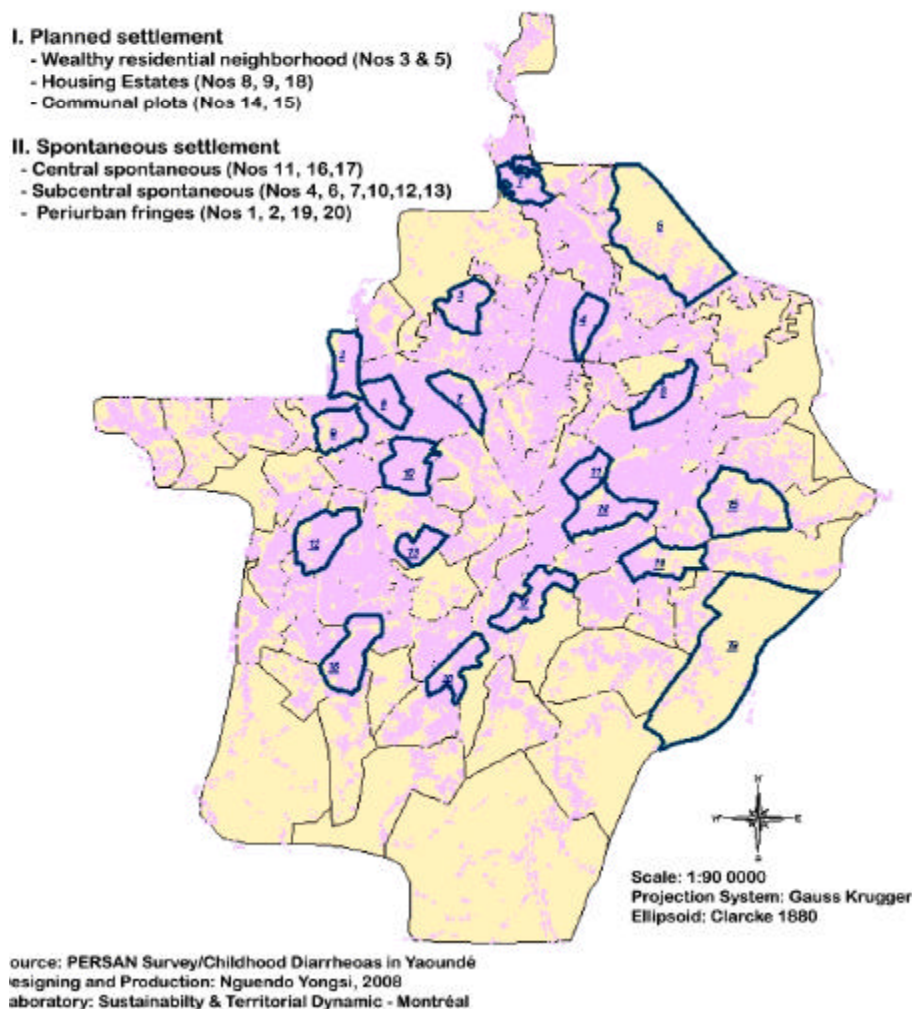


Fig. 2: Sampling sites

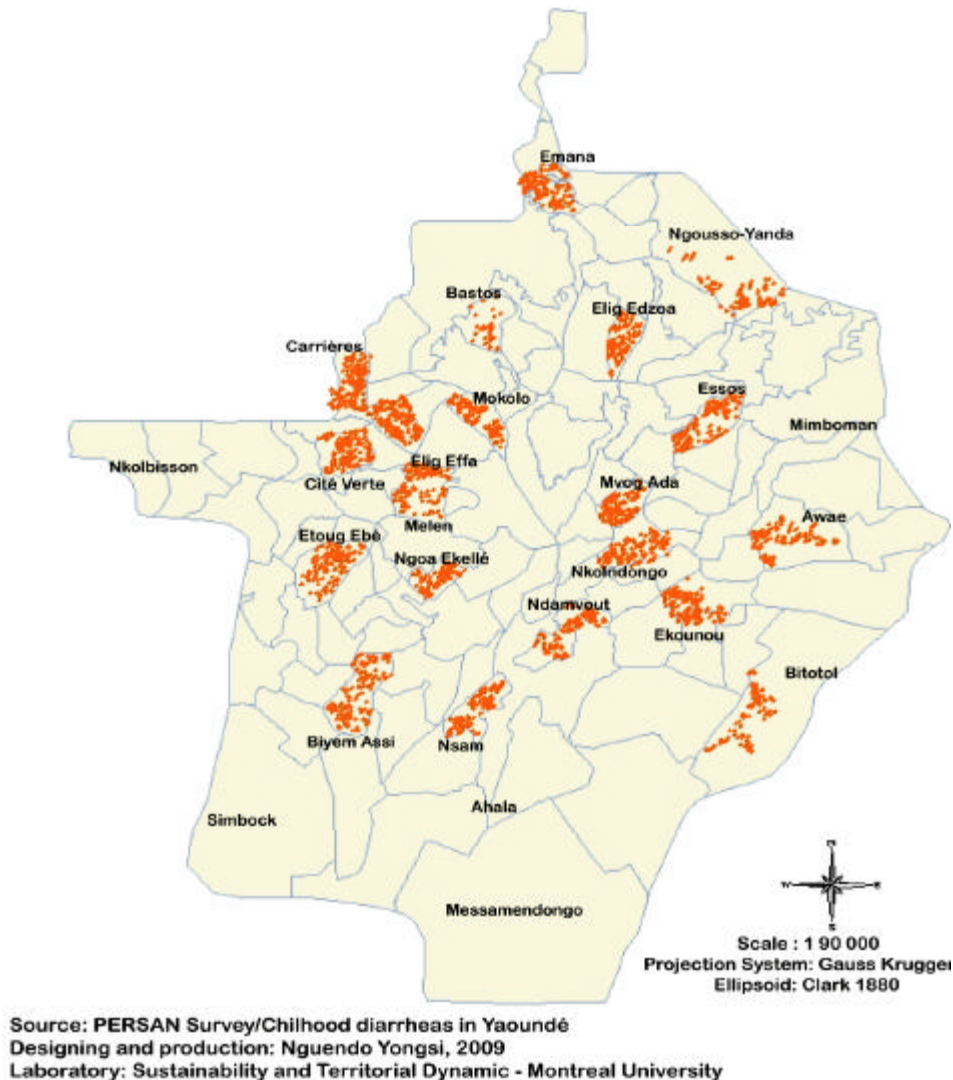


Fig. 3: Selected households

RESULTS AND DISCUSSION

A relatively old drinking water supply method: The first project to supply Yaoundé with drinking water dates back to 1944 with the creation of the Onambélé dam on the Mfoundi River in the current urban site. This project was done by a French colonial company called La Française des Eaux whose priority was to serve the European city. Shortly after independence, private institutions were created to complement the efforts of local authorities in distributing water and electricity in Yaoundé. In 1964, following failures and deficiencies observed in water management in the city, the government reorganized the sector by entrusting the production and management of safe water supply networks to the Cameroon Electricity Company (EDC) and the Provisional water service of Cameroon (SPEC). But this was not only short-lived because in 1967, an audit commissioned by the State found out that these organisations were poorly managed, vis-à-vis the balanced and self-directed development policy that was adopted. A new structure known as Société

Nationale des Eaux du Cameroun (SNEC) was then created and was given the monopoly to supply the entire country with drinking water, according to the agreement signed with the government of Cameroon on November 30, 1968.

Insufficient supply and poor connection rate by households: Since December 1, 1968, SNEC is the only para-statal company in charge of collecting, treating, exploiting and supplying safe water in Yaounde, as well as other urban areas. With the scarcity of groundwater in the city capable of supplying the water needs of the entire population, SNEC turned towards surface water by constructing a dam on the Mefou River, West of the city. Water collected from this dam was treated in the Mopfou station and then distributed in Yaounde from the Messa area via the Djoungolo, Atemengue and Messa tanks. The total production capacity was then 34, 000 m³ day⁻¹. But because of the high demands of the growing population, this dam became incapable of supplying the city which now harbours nearly two million inhabitants. Thus, presently, water supply in Yaounde is done via an ovioduct located at Mbalmayo at about 40 km South of Yaounde. This new solution has enabled SNEC to increase potable water supply to Yaounde. Of all the five categories of water users in Yaounde, households are the best supplied (Fig. 4).

The improvement noticed in water supply in Yaounde remains insufficient, because in spite of its potential production capacity (152,000 m³ day⁻¹), the real production capacity of this dam stands only at 60, 000 m³ day⁻¹. Moreover, several operational problems (devaluation of the CFA currency, poor management, high costs of inputs, etc.) faced by SNEC have made it possible for only 52,498.74 m³ to be distributed daily, i.e., an annual volume of 19, 162, 041 m³. When we consider that these 52 498.74 m³ are distributed to all the five groups that use water in Yaounde, it means that the production quantity is awfully insufficient to meet the needs of everyone. The production level is extremely insufficient to satisfy households' demand because if we agree with Vennetier (1991), when he asserts that a sub Saharan African inhabitant is required to use a minimum of 100 L of water daily for drinking, personal hygiene and sanitation, at least 172,890 m³ would be needed to satisfy the needs of the 1,728,900 Yaounde inhabitants per day. Accordingly, the improvement level of drinking water production is not enough to meet household needs and will perhaps never be enough if greater efforts are employed.

Water production is not only insufficient but most urban households do not have a home connection to the piped water supply system. In 2002, only 50,417 households were connected to

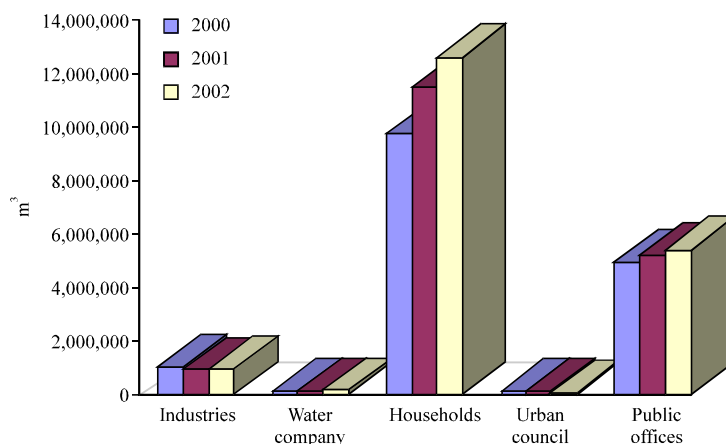


Fig. 4: Evolution of safe water production and supply in Yaounde from 2000 to 2002

the SNEC network, i.e., a connection rate of only 4%. Even with an estimate of 100,000 households presently connected to the SNEC (which seems unlikely), the connection rate would be about 6%: a very low figure compared to the African average (43%) and to the average registered in Latin America or in South East Asia (77%) (WHO/UNICEF, 2000).

Disparities in water supply and consumption in Yaoundé

Supply and consumption of drinking water via the National Water Company

(CAMWATER): The concept of water supply includes access through connection to the National Water Company system or through public taps, both located at most 200 m away from the house. Having drinking water means having water at home or in the courtyard, provided by the National Water Company network. Connection can be private (i.e., the tap is located inside the house), or semi private (i.e., the tap is placed in the courtyard and shared by various households). This designation also includes water supply by the national water company via public taps. Thus, results of our survey show that only 599(19.74%) households have a tap at home, i.e., are directly connected to the National Water Company network. Most of these households live in planned suburbs (Table 1). One third (i.e., 1 097 households) which represents 36.15% share a common tap located in the courtyard. Other households (35%) fetch water out of their premises from public taps. To do so, they have to walk a distance of about 500 m, or more for those living in the outskirts. In fact, public taps are more common in suburbs located in the city centre than in the central spontaneous and urban fringes suburbs. Thus, the average distance covered is between 200 and 400 m in the central spontaneous suburbs and are more than 500 m in the urban fringes.

Four constraints explain the low level of drinking water supply in Yaounde (1) high population growth and development of spontaneous peripheral suburbs on unregistered lands that cannot give legal support to set up water infrastructure; (2) urbanization of poverty, i.e., the high number of poor city dwellers; (3) lack of financial resources from the State which scarcely pay its bills to SNEC, (4) deterioration of water equipment and high prices of inputs since the outbreak of economic crisis. With these constraints, SNEC has failed to ensure reliable and quality services to the entire population. Therefore, the objective to provide drinking water to every inhabitant is far from being reached. A real social discrimination is discernible: wealthy suburbs and housing estates occupied by rich people are better equipped with safe and drinking water structures than municipal plots and informal suburbs (slums) mostly occupied by informal sector (retailing activities) and by the unemployed (Nguendo Yongsu, 2010a).

Table 1: Distribution of households in Yaounde according to drinking water resources and according to suburbs

Parameters	Private/Individual water supply		Semi private water supply		Taps		Wells		Springs	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Housing estates	254	08.5	68	02.3	21	00.7	1	00.03	5	00.2
Communal plots	76	02.5	123	04.1	84	02.8	1	00.03	17	00.6
Wealthy residential suburbs	46	01.5	67	02.2	28	00.9	0	00.00	9	00.3
Central spontaneous suburbs	47	01.6	226	07.6	190	06.3	0	00.00	12	00.4
Sub central spontaneous suburbs	128	04.3	431	14.5	517	17.4	2	00.06	71	02.4
Urban fringes areas	37	01.2	122	04.1	125	04.2	1	00.03	45	01.5
Semi rural suburbs	11	00.4	60	02.0	77	02.6	4	00.1	66	02.2
Total	599	20.15	1 097	36.9	1 042	35.0	9	00.3	225	07.6

p<0.002

Use of wells and springs as alternatives: With galloping population growth, it has been difficult for CAMWATER to offer reliable services to everyone in Yaounde. For their drinking water, many households and not just the poorest resort exclusively to exploiting ground water through wells (03.0%) and springs (7.40%) for their needs. However, when we add households that use ground water as an alternative to avoiding high bills or in the event of prolonged shortage or intermittent supply from the CAMWATER network, the figure increases to 37.35% for households which use water from wells and to 63.18% for households which use water from springs. Most of these households are found in spontaneous suburbs and in the urban fringes where speculation for drinking water is high (Nguendo Yongsi, 2009).

Use of emerging engineering innovations like drilled wells: Due to the imbalance between the needs of the inhabitants and resources or responses of the local government, international organisations like the World bank and the UNDP have encouraged the private sector to intervene in order to supply urban infrastructure, find new funding sources and to provide water related services at affordable cost. As a result, since 2000, water is considered as a commodity and its supply is based on effective request so as to enable the private sector to take part in projects related to the construction, production and maintenance of water supply schemes. It is under these circumstances that boreholes were constructed in some suburbs in Yaounde. In 2002, only 11 households (0.36%) had access to water from the boreholes. This low level is due to the high cost of drilling which requires advanced engineering skills.

Varied and unhealthy methods of management: The term water management' refers to the activities and usage of drinking water. Specifically, it means conditions in which water is fetched, transported and conserved.

- **The fetching procedure:** It has been observed that many households (53.18%) make use of uncovered containers when fetching drinking water. These containers range from buckets to barrels, wide plastics and PVC basins. Fetching procedure consists of placing containers even on the ground and filling them using a plastic pipe held on a leash or in the hands of the user. Seldom cleaned, the plastic pipe is used by everyone and is replaced only in case of loss or damage. These conditions favour the introduction of germs into the water, especially as fetching is done by children (64.90%) who are not very conscious of health risks surrounding them
- **Transportation conditions:** Drinking water is then transported in containers by head load through a weightlifting movement during which doubtfully clean fingers are soaked into water. On the head in an open container, water is directly in contact with the air and is likely to be contaminated with particles and germs present in dust raised by vehicles. Finally, water collected and transported in such conditions turn to a poor quality and is therefore unsafe for human consumption (Nguendo Yongsi, 2010b)
- **Storage conditions:** Many households store their drinking water in usually uncovered devices such as buckets (45.5%), clay pots (33.2%) and barrels (15.4%). This is a less rigorous practice that is conducive to the development of bacteria such as *E. coli*, *Pseudomonas aeruginosa*, *Salmonella* sp. that are associated with diarrheal diseases (Nguendo Yongsi, 2008). In some cases (5.9%) water is transferred into plastic bottles. We have noted that storage duration varies from 1 day (15.70%) to 3 days (47.20%) and even more (22.10%) depending on the size of the household. Water is served using glasses or plastic cups common to household members

- **Water treatment:** Out of the 2989 households that indicated their water treatment practices, 1623 (54.3%) did not routinely treat their water; and of the 1366 (45.7%) households that treated their water, 781 filter (57.2%), 448 boil (32.8%) and 137 (10.0%) bleach their drinking water

CONCLUSIONS

In Yaounde, the production and distribution of drinking water have become strategic issues in relation to population growth and increased economic activities. Its scarcity and unequal distribution generates disparities between several districts and many inhabitants. Whether with a theoretical ratio of 11 m³ (annual production/total population in 2006) per person and per year, or with a concrete ratio of 249.2 m³ per household and per annum in 2002 (quantity distributed to households/connected households), Yaounde is ranked among the most disadvantaged cities. It is faced with a threat of severe water shortage. It is expected that the situation will even get worse given its strong and unrelenting urban growth (Nguendo Yongsu, 2009). How can we then explain such a severe hydrous risk since Yaounde is located in an equatorial zone where rainfall is regular and abundant (>1,500 mm of water/year)? It is evident that water management procedures are responsible for the unavailability of sufficient potable water supply in Yaounde. We believe that the supply of drinking water in Yaounde should not be left to the forces of demand and supply. This implies drawing up sustainable water management procedures through a shared approach involving stakeholders, the population, NGOs and the private sector. Such a shared approach is useful to implementing original and effective policies.

ACKNOWLEDGMENTS

This study was conceived within a cross-sectional survey of health risks factors within African cities. We are grateful to the Yaounde Urban Council and to the laboratory of Hygiene and Environment of the Pasteur Institute for their material and technical support.

REFERENCES

- Allen, A., J.D. Davila and P. Hofmann, 2006. Governance of Water and Sanitation Services for the Peri-Urban Poor: A Framework for Understanding and Action in Metropolitan Regions. University College London, Development Planning Unit, London, UK., ISBN: 1874502609, pp: 126.
- Blomström, M. and M. Lundahl, 1993. Economic Crisis in Africa: Perspectives on Policy Responses. Routledge, New York, ISBN-10: 0415096294, pp: 368.
- Cohen, B., 2006. Urbanization in developing countries: Current trends, future projections and key challenges for sustainability. *Technol. Soc.*, 28: 63-80.
- Evans, P., 1992. Paying the piper: An overview of community financing of water and sanitation. The Hague, IRC International Water and Sanitation Centre, Occasional Paper Series/IRC No. 18. <http://www2.irc.nl/products/publications/online/op18e/index.html>.
- Kauffmann, C., 2007. Access to drinking water and sanitation in Africa. *Policy Insights*, 41: 2-2.
- Kuete, M., 1977. Etude geomorphologique du massif de yaounde. Doctorat Thesis, Universite de Bordeaux III, UER de Geographie, de Geographie.
- Mitlin, D. and D. Satterthwaite, 2001. Urban Poverty: Some Thoughts About its Scale and Nature and About Responses to it. In: *Facets of Globalization: International and Local Dimensions of Development*, Yusuf, S., S. Evenett and W. Wu (Eds.). World Bank, Washington DC., ISBN: 0-8213-4742-X, pp: 278.

- Nguendo Yongs, H.B., 2008. La production de l'habitat dans les villes d'Afrique Centrale: Entre urbanisme segregatif, urbanisme spontane et urbanisme planifie. *Enjeux Revue de Geopolitique d'Afrique Centrale*, 34/35: 16-25.
- Nguendo Yongs, H.B., R.C. Bryant and D.D. Priso, 2008. Ere des Villes, Temps des Metropoles: Le Developpement Urbain au Cameroun. In: *Visages et Defies des Principales Villes Camerounaises*, Yongs, H.B.N. and R.C. Bryant (Eds.). Universite de Montreal: Laboratoire de Developpement Durable et Dynamique Territoriale, France, ISBN: 9782921903011, pp: 175.
- Nguendo Yongs, H.B., 2009. Human settlement, land management and health in Sub-Saharan cities. *Int. J. Soc. Sci.*, 4: 10-17.
- Nguendo Yongs, H.B., 2010a. Microbiological evaluation of drinking water in a sub-saharan urban community (Yaounde). *Am. J. Biochem. Mol. Biol.*, Vol. 1, No. 1.
- Nguendo Yongs, H.B., 2010b. Suffering for water, suffering from water: access to drinking water and associated health risks in Africa. *J. Health Populat. Nutr.*
- Satterthwaite, D., 2005. The scale of urban change worldwide 1950-2000 and its underpinnings. International Institute for Environment and Development, London, ISBN: 1-84369-560-X.
- Serageldin, I., 1994. Water Supply, Sanitation and Environmental Sustainability: The Financing Challenge. World Bank, Washington, ISBN: 0-8213-3022-5, pp: 35.
- Snell, S., 1998. Water and Sanitation Services for the Urban Poor: Small-Scale Providers: Typology and Profiles. UNDP- World Bank Water and Sanitation Program, Washington, D.C., Banco Mundial, pp: 59.
- UNFPA/United Nations Fund for Population Activities, 2007. State of World Population 2007- Unleashing the Potential of Urban Growth. UNFPA, New York, ISBN: 9780897148078, pp: 104.
- Vennetier, P., 1991. Les Villes d'Afrique Tropicale. 2nd Edn., Masson, Paris, ISBN-10: 222582259X, pp: 244.
- WHO, 2003. Emerging Issues in Water and Infectious Disease. World Health Organization, Paris, ISBN-10: 9241590823, pp: 22.
- WHO, 2007. The world health report 2007-A safer future: Global public health security in the 21st century. <http://www.who.int/whr/2007/en/index.html>.
- WHO/UNICEF, 2000. Rapport sur l'evaluation de la situation mondiale de l'approvisionnement en eau et de l'assainissement en 2000. Geneve, Les Publications de l'OMS.