Net Journal of Social Sciences
Vol. 5(4), pp. 55-67, October 2017
ISSN: 2315-9774
Full Length Research Paper

Weak links in the chain: Diagnosis of the faecal sludge management chain in Nkobikok, Yaoundé, Cameroon

I. Noumba[1]*, E. Ngnikam[2], B. Mougoue[3], A. Wanko[4] and B. Berteigne[4]

[1]University of Yaoundé II-Soa, Faculty of Economics and Management, and L3E, National Higher Polytechnic School, Cameroon.
[2]National Higher Polytechnic School (L3E), University of Yaoundé I, Cameroon.
[3]Faculty of Arts, Letters, and Human Sciences, and L3E, University of Yaoundé I, Cameroon.
[4]University of Strasbourg, Engess, France.

Accepted 25 September, 2017

ABSTRACT

The main objectif of this article is to take stock of the faecal sludge management chain in Nkolbikok, Yaoundé (political capital of Cameroon). The paper was prepared on the basis of information collected during the implementation of the MAFADY project founded by a consortium of European and American organizations. The authors used a non technical approach to analysing the data collected out on a representative sample of households settled in this poor quarter of the town. The conceptual underpinning is the scientific management theory. The field observations, namely the photos snapped with a camera were also utilized to sustain the argument. Through a documentary analysis, the authors were able to cover the related literature and critically describe the institutional framework that governs the sanitation chain and environment in Cameroon. Implementing this methodoly led to three main findings. Firstly, the institutional framework governing the sanitation chain is inconsistent. Many institutions are implicated in the regulation of the sanitation chain, without a formal central organ in charge of coordinating them. Secondly, the Faecal Sludge (FS) is poorly managed in the households. Thirdly, haulage is inadequate and the disposal is chaotic, as a major consequence, the sludges are disposed off into the nature without treatment.

Keywords: Sanitation chain, management, Nkolbikok, Yaoundé, institutional framework.

*Corresponding author. E-mail: tonfeu_yombi2009@yahoo.com.

INTRODUCTION

Effective management of FS is a challenge that public authorities, private enterprises, and households have to meet in most cities of the world. In fact, 2.3 billion people in the world lack access to basic sanitation services, such as toilets or latrines (WHO/UNICEF, 2017). Let us recall that Montangero and Strauss (2002) define FS as a mixture of faeces and urine collected from different sanitation systems not connected to the sewer networks (latrines, public toilets, septic tanks, etc). This mixture most be adequately collected, carefully stored and safely transported to appropriate sites in order to avoid undesirable effetcs on human and environmental health. In fact, managing FS means their safe storage in the households' compounds and public sanitation facilities, emptying the pits and transportation of FS to the treatment site for reuse or disposal (Bolomey, 2003). As Opel (2012:4) noticed, if these three aspects are not dealt properly, it is not possible to get the full benefits of achieving increased access to safe sanitation.

Towns in developing countries keep facing tremendous problems of solid and liquid wastes sanitation. Around 50 percent of the sub-Saharan African population do not have access to improved sanitation facilities (UNICEF/WHO, 2015). The problem becomes more cumbersome with regard to the high population growth rate and rapid spatial extension of African cities. Newcomers contribute extensively to the development of unorganized quarters in the absence of an urban master plan and characterized by a lack of domestic grey water sewer networks. On-site sanitation systems like septic

tanks or pits latrines that prevail in these settings need regular draining and FS collected is dumped everywhere and even near dwelling-houses, in the streams and conduits, and on waste grounds. Whereas, inadequate disposal of FS could be the origin of infectious diseases that neighbouring populations suffer from (Montangero et al., 2002).

Around 54 percent of populatin of Cameroon live in urban areas (African Development Bank, 2016). Yaoundé, the political capital had a population of 2.2 milion inhabtiants in 2010. The annual population growth rate of the city stands at 5.6 percent and the poor quarters occupy 40 percent of its total area (Ngnikam et al., 2011). The collective sanitation network covers only 1 percent of the population (Ngnikam, 2013).

The situation that prevails in the zone of the present study is even more acute since 80 percent of households use unimproved sanitation equipement to evacuate domestic liquid wastes and human excreta (Ngnikam et al., 2011).

But, ensuring an easy access to safe water and improved sanitation systems for all, the Sustainable Development Goals (SDGs) No. 6, will depend on the mobilization of all the actors intervening (even indirectly) in the FS sanitation chain management. Cooperation between these actors is a necessary condition to effectiveness. In effect, the rules governing the smooth functionning of the chain must be set, made known, enforced, and respected by all stakeholders.

In the empical literature, management of FS chain has been widely studied in different settings. Papers published in Issue 13 of the 2012 *Sustainable Sanitation in Practice*, *EcoSan Club* journal, neglected the institutional aspects of the problem as well as FS management within the households. For example, Opel (2012) delt with the subject in three cities of Bangladesh. His preoccupation was the safe emptying, transportation, dumping and treatment mechanism of FS. No word is said about the institutional arragements of the FS chain management. Harrison and Wilson (2012) *discuss the technology, its environmental benefits, and the challenges it addresses, and provides an overview of the procurement model that complies with standard Supply Chain Management requirements*. These last two authors particularly stressed on the technical management of the pit latrines in Durban, South Africa. Tsinda *et al*., (2013) dedicated their work to *challenges to achieving sustainable sanitation in informal sttlements of Kigali, Rwanda*. According to these authors, *lack of information and difficulties in obtaining permit were among the constraints to building sanitation facilities,* the most important one being lack of money.

Mougoué et al. (2012) did not go deptly in the institutional aspects of FS management and insisted only on the taxes that the central government and local councils collect on the scanvengers' activities. The authors also quicly signaled, without any particular comment, the convention signed between HONDAE, a private Common Interest Group, and the Urban Council arround the management of the dumping site of FS. By the same token, Defo et al. (2015) *describe the system of collection and evacuation of faecal sludge in Bafoussam (Cameroon), to raise the insufficiencies in order to propose a method for a better management. The actors and their roles in the chain of management of faecal sludge were identified*. Public actors intervening in the system were indentified. Unfortunately, nothing is said on these actor's inefficiencies. Many other recent studies contain the same flaws because they insist mainly on the technical aspects of FS management (Joshi and Patil, 2016; Kale and Nagarnaik, 2016).

Conscious of the role that a consistent institutional framework can play in the effective FS management chain, Bassan et al. (2012) described the activities conducted *to develop an adequate institutional framework for FS management in Ouagadougou, and strengthen the capacities of the collection and transport companies*. The study adopted a prospective approach in reflecting on institutions that needs to be put in place in order to ease the FS management. But Ekane et al. (2016), accounted also for the institutional aspects of FS management in their comparative assessment of the sanitation and hygiene policies in three African countries. This assessment finds that the policies in Rwanda, Uganda, and Tanzania are still lacking key aspects to adequately cater for sustainability of services and functionality of facilities. Further, policies should reflect the needs and preferences of people. This is usually not the case because policies are very ambitious and hard to fully translate to action. Despite the existence of policies, the implementation process is flawed in many ways, and two key gaps are the lack or inadequate financing for sanitation, and serious lack of technical capacity, especially at the district level. Anyhow, some authors contend that many sub-Saharan African countries missed the Millenium Development Goal on sanitation because of poor coordination of actors intervening in the sanitation chain (Ekane et al., 2014).

In this context, the ultimate objective of the paper is to draw attention of both the national stakeholders and the foreign donors ready to give a hand, on the weaknesses appearing in the management of the sanitation chain in Yaoundé, Cameroon. These weaknesses are put forward at three levels: (i) the institutional framework governing the faecal sludge management, (ii) the production and storage of faeces in the compounds, and (iii) FS haulage and disposal.

MATERIALS AND METHODS

The data used in this study were collected by

''Laboratoire Eau–Environnement–Énergie (L3E)'', National Advanced School of Engineering (Polytechnique), under the project titled: *Mastering the sanitation chain from the households level in the coastal zone of Douala, and in the informal urban settlements of Yaoundé, Cameroon* (MAFADY, the French acronym). The project was realized within the SPLASH Sanitation Research Programme, jointly financed by ADA (Austria), DFID (UK), MAEE (France), SDC (Switzerland), SIDA (Sweden) and BMGF (Bill and Melinda Gates Foundation), and funded under the European Water Initiative Research Area Network. Within the fremework of the MAFADY project, the research team carried out a survey in Nkolbikok, one unplanned quarter of Yaoundé. The research zone (Nkolbikok), with 10,500 inhabitants, is made up of a set of 5 wards: Melen 6, Melen 7A, Melen 7B, Melen 9, and Nkolbikok II. The zone was devided into three strata: structured habitat, unorganized habitat, and the readily flooded stratum. From the ''Google Earth'' map, we identified the number of houses in each ward and stratum. A representative sample of 360 households were selected and interviewed using a semi-structured questionnaire. The team also used cameras to take significant pictures necessary to illustrate the demonstration, and GPS to position the housholds interviewed.

The conceptual framework that guides the present paper is the scientific management theory applied essentially to big industrial firms. In effect, referring to Robbins and DeCenzo (2008), scientific management is the utilisation of scientific methodology to define the optimal way of carrying out a task. The theory rests on four consistent principles. The first one consists of substituting the scientific knowledge of different aspects of a collective task for empirism. The second one takes into account the necessity to select, train, educate and scientifically make each stakeholder more skilful. The third principle of scientific management is to establish a frank collaboration between all stakeholders in view of making sure that the collective task will be perfomed in respect of the initial scientific prescriptions. The fourth principle is the equitable distribution of tasks and responsibilities among all links of the chain that contribute to attain the final goal. Definitely, sanitation of FS is a chain whose links may be compared to individuals who contribute to making a specific product in an industrial firm.

RESULTS AND DISCUSSION

Inconsistent institutional arrangements

It is well known that managing FS starts at home with its production and storage. Next, the faeces emptied from the pits or septic tanks are carried to the treatment stations. Out of the treatment stations, the "the new product" could join the economic circuit if it is used to fertilize agricultural land or turned into energy through further biodegradation into methane gas. Each link of the chain is a potential source of negative externalities. In effect, when faecal sludge is not properly managed whithin the coumpound, it will generate olfactive nuisances and create health risks. In particular, growing quantities of faecal sludge in on-site household sanitation facilities can become a vector of diarrhoeal diseases. Whereas, today, it is widely acknowledged that collected, hauled and kept in unsecured conditions, faecal sludge becomes a serious health risk, since it is highly concentrated in pathogens.

The negative or positive externalities stemming from the FS sanitation chain need to be addressed by the central or local public authorities. As Evans and Trémolet (2009) put it, *sanitation potentially delivers benefits at three levels: to the user, to the society and to the wider community through the environment*. On the contrary, inefficient FS sanitation chain produces the reverse impact.

The neoclassical economic theory asserts that the government has to involve in economic activies at any time that the situation at hand is not Pareto optimal (Guerrien, 2003). The government may intervene in editing and ensuring compliance of laws and regulations or building infrastructure necessary for FS treatment, for example. The demand for sanitation is built in part upon the governmental coercion. More so, good institutions create an enabling environment for strengthening an effective cooperation between all stakeholders.

Unfortunately, the government, a key actor for all public goods management, often fails to correct the externalities resulting from imperfect markets and externalities, very frequently because the institutional framework lacks credibility. Institutions are understood in the sense of North (2007), as *the rules of the game in a society*. But the concept extends also to the organizations that make those rules. In fact, clear and easy to follow rules may be due to coherent organizations and vice versa.

Here, we present the weaknesses of the public authorities mandated to regulate the management of sanitation chain and the environment in Cameroon.

Weak public organisations

In Cameroon like in many developing countries, sanitation has been accorded very low priority by the central government. Yet, in Cameroon, many public organizations are supposed to take care of the regulation of the sanitation chain and tne environment. These organisations are: the central authorities, the ministries departments, local and regional organisations. Households are the FS producers, and private

entreprises collect and convey FS to the only existing disposal site. Weaknesses of these stakholders are presented below.

Soft commitment of central authorities: By central authorities, we mean the presidency of the Republic and the Prime Minister's Office. The Cameroon Constitution of January 1996 states that the President of the Republic defines the general policy of the nation (Article 5, section 1). He has the regulatory power when he creates and organizes public services (Article 8, section 1). According to article 3 of the law No. 96/12 of 5th August 1996, relating to the management of environment, the President of the Republic defines the national environmental policy.

The implementation of that policy falls on the government that enforces it in concert with regional and local authorities, the basic communities and associations dealing with environmental matters. As far as sanitation, water and hygiene are concerned, the Prime Minister is involved in elaboration of pertinent regulation. More specifically, the Prime Minister draws the main strategic axes for the development of sewerage sector in urban areas. About the strategies include:

i. Rehabilitating the existing sewer networks;
ii. Promoting low cost and suitable sanitation technologies;
iii. Implementing agreements reached with respect to the management of sewerage between the state authorities and the public utilities delegated the mandate of the distribution of potable water;
iv. Reinforcing actions aimed at recovering resources expected from the water and sanitation sectors.

The Prime Minister Decree No. 2001/165 of 8 May 2001 outlines the modalities of protecting surface waters and underground waters against pollution. The Prime Minister also determines the modalities of designating sworn-in public agents in charge of supervising and controlling the quality of waters. The problem raised here is that of poor enforcement mechanism of these regulations. The number of the sworn-in agents operating so far is not adequate both in quantity and quality for systematic and effective control and follow-up.

Furthermore, within his activities, the Prime Minister is also in charge of coordinating the activities of other ministerial agencies. Unfortunately, many links are missing in this chain. Firstly, separation at the central state authorities favours a top down ineffective administrative structure. Secondly, there is not yet a specific instance created at the Prime Minister office to permanently reflect on how to tackle the accute problems plaguing the sanitation sector in urban and rural areas, and particularly FS management. Thirdly, FS has never been on the agenda of the government councils indicating that it is not a priority of the Government. A central institution in charge especially of water and sanitation, like the National Office of Water and Sanitation (ONEA) in Burkina Faso, is still awaited. The problems of coordination appear also at the level of other ministerial agencies involved in the regulation of the sanitation chain.

Hyperthrophy of unco-ordinated ministerial departments: It is the ministerial departments, the executive part of the Government that is in charge of implementing the national policy as defined by the President of the Republic (Article 11, section 1 of the Constitution). Seven ministries are directly or indirectly involved in the organization of the sanitation chain, water and hygiene! Those minitries are:

i. Ministry of Environment, Nature Protection and Sustainable Development;
ii. Ministry of Energy and Water;
iii. Ministry of Housing and Town Planning;
iv. Ministry of Public Health;
v. Ministry of Secondary Education;
vi. Ministry of Basic Education;
vii. Ministry of Industry, Mines and Technological Development.

i) Ministry of Environment, Nature Protection and Sustainable Development (MINEPDED)

Planning, a key function of the scientific management, is an important point of the sanitation chain management. In fact, according to article 15 of the law No. 96/12 of 5 August 1996, outlining the general principles of the environmental management, the administrative agency in charge of environmental problems, the MINEPDED in the present case, has to plan and take care of rational management of environment. The MINEPDED makes sure that the environmental standards or norms are respected. Technical prescriptions in the domain of sanitation are defined by the MINEPDED.

The presidential Decree No. 2011/ 408 of 9 December 2011 states expressly that the MINEPDED carries out many of its duties in relation with other ministerial departments and governmental agencies. For example, the study of the demand for the building licence is conducted in connection with other administrations concerned. It should be noticed that the technical sanitation standards have to be abide in order to obtain the building licence. Furthermore, the MINEPDED has included the sanitation problems in his national strategy of managing solid wastes that is also a legal preoccupation of both the Ministry of Water and Energy and the Ministry of Housing and Urban Development.

All told, the above three ministerial departments are responsible for the sanitation management so, their

attributions may overlap. In that condition, inexistence of a formal cooperation scheme between these state agencies could become a potential source of ineffectiveness of the sanitation system.

ii) Ministry of Water and Energy (MINWE)

The MINWE plays an important role in the network of water and energy production and distribution. General missions are assigned to the MINWE by the preseidential Decree No. 2011 of 9 December 2011, organizing the government. According to article 1 of that Decree, the MINWE is in charge of elaborating, implementing and evaluating the governmental water and energy policy. The Minister of Water and Energy is the president of the National Water Committee. The Committee shall make to the Government any recommendation or proposition that can concur to formulating and implementing sustainable development plans or projects related to water and sanitation (Decree of Prime Minister No. 2001/161/PM of 8 May 2001).

In spite of all these regulations, the wastewater sector remains poorly managed with a negative impact on the sanitation of faecal sludges. The National Water Committee is not yet operational to date and accessing to the drinking water network is a nightmare for more than 75 percent of Cameroonian households.

iii) Ministry of Housing and Town Planning (MINHTP)

According to the presidential Decree No. 2011/408 of 9 December 2011 to organize the government, the MINHTP shall be responsible for elaborating and implementing the government policy of housing and urban planning. The MINHTP is directly involved in the sanitation chain through the following actions:

a) Monitoring the enforcement of the sanitation and drainage standards;
b) Following up of the hygiene and salubrity, cleaning away and/or treatment of household refuse standards;
c) Preparing the regional development, sanitation and drainage plans in towns and quarters.

The attributions of the MINHTP had been widened with the presidential Decree No. 2005/190 of 3 June 2005, organizing that ministry. By vertue of article 25 of the said Decree, the MINHTP, through its Division for urban planning, is in charge of the mastership of the fitting up and monitoring works related to sanitation and drainage. The same missions are assigned to the ministry of Water and Energy and no framework has been defined in order to indicate the way these two ministries must collaborate on the subject.

iv) Ministry of Public Health (MINPH)

The MINPH is in charge of regulating the sanitation of the milieu and the hygiene activities in relation with other ministries concerned. The MINPH's missions are directely in relation with the FS management. In particular, the ministerial order No. 0003/A/MSP/SESP/SG/DPS of 3 January 2005 fixes the conditions to fulfil before creating, exploiting, renewing the approval of an hygiene and/or sanitation enterprise. That regulatory act fixes the conditions of issuing an agreement to a private operator intended to intervene namely in emptying septic tanks.

According to that ministerial order, every enterprise requesting the agreement must constitute a costly file comprising 15 papers. The complete file is deposited to the regional delegation of the public health. The regional delegate has 15 days to transmit the file to the minister of public health who has 45 days to come to a conclusion on the file. If the conclusion is posisive, the minister of public health requires the opinion of the ministerial commission in charge of the examination of the agreement file of the concerned candidates. If that opinion is favourable, then the minister of public health will issue a decision according the agreement to the applicant. What a long administrative procedure! In the context of Cameroon characterized by a climate of general corruption, the procedure may also be very costly. For example, Cameroon was ranked as the must corrupted nation in the world in 1998 and 1999 by Transparency International. By the same token, the National Anti-Corruption Commission, a governemental agency, put forth the same phenomenon in many domains in Cameroon of which the extractive industries sector in its 2012 annual report (CONAC, 2012).

The aggreement needs to be renewed every 3 years. In fact, the economic theory teaches that long and complicated administrative procedures lead to opportunistic behaviours which translate into corruption and gratuities.

v) Ministry of Secondary Education (MINSED)

That institutional actor is concerned with the problems relating to the school health, hygiene and prophylaxis. With regard to sanitation, through the school health, hygiene and prophylaxis Service, the MINSED is in charge of:

a) The promotion of hygiene and salubrity in schools;
b) The follow-up of transmittable diseases prophylaxis and health education in the school milieu;
c) The systematic organization of medical examinations and hygiene campaigns in the schools within the jurisdiction of MINSED (Decree No. 2005/139 of 25 April

2005, article 74).

The MINSED is also concerned with the promotion and protecion of the environment in the school milieu. That is done through the Service of post and extracurricular activities, in relation with other ministries concerned (article 76 of Decree No. 2005/139 of 25 April 2005).

vi) Ministry of Basic Education (MINBE)

The presidential Decree No. 2005/140 of 25 April 2005 organizing the MINBE includes the health preoccupations in the basic education missions. As far as the sanitation chain is concerned, the MINBE has the same attributions that those of the ministry of Secondary education presented above, but at the level of the basic education (post-primary and primary education).

vii) Ministry of Industry, Mines and Technological Development (MINIMITD)

The MINIMITD plays an important role in the domaine of sanitation. In view of the presidential Decree No. 2004/320 of 8 December 2004 organizing the Government, the MINIMITD is in charge of the normalization of the liquid sanitation and water in relation with other ministerial departments concerned. The risks of overlapping attributions –due to the lack of coordination body– constitute the main dysfunction that threatens the credibility of institutions put in place to regulate the sanitation chain in Cameroon.

Weak commitment of the local and regional institutions: By virtue of the law No. 2004/ 017/ of 22 July 2004 to guide the decentralization scheme in Cameroon, these authorities are the councils, the city councils and the regions.

i) The councils

With regard to Article 3 (1) of the law No. 2004/018 of 22 July 2004 regulating the councils, the decentralized authorities have a general mission of local development and improvement of the living conditions of populations. Under the pertinent statutory provisions, the central government has assigned a wide range of competences in relation to the sanitation chain to the councils, namely:

a) Article 16: (i) provision of potable water; (ii) monitoring and controlling the industrial waste management; (iii) fighting against insalubrity, pollutants and nuisances; (iv) protecting surface and underground water resources;
b) Article 17: (v) issuing of building licences; (vi) preparing and laying on of services to spaces fit for habitation;
c) Article 19: (vii) controlling the sanitary facilities of treatment of liquid wastes produced by individuals or enterprises.

Later on, a Decree issued by the Prime Minister (Decree No. 2011/0006/PM of 13 January 2011, Article 6) assigned also the flushing of drainage and sanitation systems to councils. Henceforth, councils shall exercise the mastership on and utilization of the equipments of production and distribution of water.

To meet their general development assignments, Law No. 2009/019 of 15 December 2009 on Local Fiscal System lays down the taxes, levies and royalties collected for decentralized structures. The proceeds from Councils taxes are collected by the State. These are: (i) business licences, (ii) liquor licences, (iii) discharge tax, (iv) property tax on land assets, (v) gambling and entertainment levy, (vi) immovable property conveyance fee, (vii) automobile stamp duty, and (viii) forest royalty.

Two issues can be raised at this level. Firstly, the financial resources collected by the State are not always transfered to the councils. In fact, according to Article 5 of the Law No. 2009/019 indicated above, the central Administration can keep some revenue collected for solidarity purpose (equalyzing system). Secondly, the low level of economic activities means that taxes and levies collected by many councils are not enough to finance the basic facilities and services provided to the populations like the sanitation of liquid and solid wastes. The contribution to their recurent budget expected by the city councils is not also regular. Over and above the financial problems, most councils lack qualified human resources required to carry out urban planning and follow-up on sanitation activities. These are some of the fundamental failures that prevent the local authorities (the city councils and the regions) from meeting their local development goals in general, and the effective mangement of the FS in particular.

ii) The city councils

With regard to Article 110 of the Law No. 2004/018 of 22 July 2004, the city councils are concerned with: (i) monitoring and controlling the industrial wastes management; (ii) creation, arrangement, maintenance, exploitation and management of community facilities of sanitation, wastewater and rain waters ; (iii) construction, equipment, management, and keeping in good conditions of community marketable facilities, namely markets places, passengers stations and slaughter-houses, urban planning, schemes and master plans; (iv) coordination of the urban networks and all actors intervening in the public community ways. The city councils are endowed with some human and financial resources, but management of the sanitation chain is not yet their main priority as it

comes out of a sampling of two local councils of Douala and Yaoundé (Ndeuhela, 2013).

iii) The regions

In the domain of sanitation, no specific competence has been transfered to the regions by the Law No. 2004/019 of 22 July 2004 fixing the rules applicable to the regions. However, these public organizations could have a word to say as far as the prevention, hygiene, and the proctection of nature are concerned. Unfortunately, the regions understood to have autonomous and organized institutions are still awaited more than 20 years after their creation by the Cameroonian constitution of January 1996 to fulfill their mandates!

To sum up, because of many weaknesses observed in the regulation of the sanitation chain, it is easy to question the credibility and consistency of the related institutional framework. Laws and regulations supposed to govern the domain of sanitation and positively change behaviours are not effectively enforced. This lack of credibility and consistency of the institutional framework results in a calamitous technical management of solid and liquid waste all over the national territory, hence a disastrous FS management in the study area.

Poor management of FS within the households

Poor management of FS within the households is appreciated through the quality and use of existing facilities, and inadequate sanitation of wastewater.

Poor quality of existing facilities

A general description and the presentation of main characteristics of the facilities shall reveal the very weak link of the faecal sludge management chain at the level of households. We present also some inadequacies observed in practices of maintenance of the facilities used by these households. The data collected show that, in the study zone, 81.2 percent of the households surveyed use latrines whereas 18.2 percent use toilets equiped with septic tanks. Figure 1 presents the classification of the types of facilities generally encountered in the zone.

Figure 1 shows that, in Nkolbikok, only 4 percent of the facilities used by the households is improved, whereas 72 percent is sketchy and 21 percent is provided with drainage channel. Very often, the external aspect of the superstructure of these facilities leaves so much to be desired as indicated in Figure 2.

These sketchy sanitation facilities exhibit a pitiful external aspect that confers neither privacy, intimacy, comfort nor dignity to their users (Figure 3). In fact, 50 percent of latrines lack an appropriate door that can be closed. Facilities provided with drainage channel are shown in Figure 4.

The characteristic of latrines provided with channel is that they do not have a real pit and the FS is directly thrown in nearby drainage ditches, gutters or streams, through the channel (Figure 5). The potential damages caused to the environment and human health by this practice, not really very different from open defecation, are really huge. Besides, we found that 2.4 percent of the households surveyed use open defecation. In many cases, the floor of the structure leaves much to be desired as illustrated by Figures 6 and 7.

In conclusion, we can say that the on-site sanitation facilities used by the dwellers in the project zone (Nkolbikok) are not adequate for the safe and secure storage of FS in the households' compound. Furthermore, these facilities are not always adequately maintained.

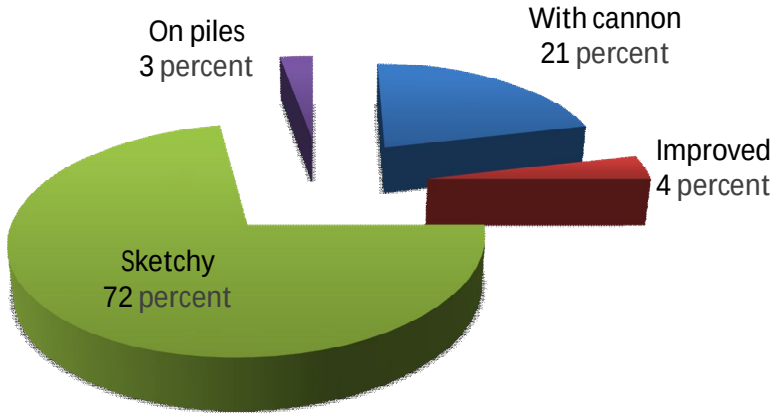

Figure 1. Types of on-site facilities. Source: Authors.

Figure 2. On piles facility without roof.

Figure 3. Walls and roof in old sheet iron.

Figure 4. PVC channel.

Figure 5: Open channel.

Figure 6. A wooden floor.

Figure 7. Concrete floor, without chape.

Poor use and approximate maintenance of existing facilities

Two main methods are used when the households are in need of emptying the pits in Nkolbikok: manual and mechanical emptying. Data collected on the field show that 73.3 percent of the households use mechanical emptying services, whereas 7.7 percent use the family manpower to manually empty their pits and 19 percent releases the FS to flow into the nearest streams and gutters.

Regular maintenance of the on-site installations and emptying of the pits containing sludges are some of the important practices with regard to hygiene and health of the milieu. Regular and correct maintenance should be depending in turn upon the availability of water.

Even in the households where modern facilities (pits, draining well, W. C.) are found, due to the scarcity of water (intermittent water supply services), the on-site installations are not always cleaned up. 25.2 percent of households clean their installations once a week and 52.8 percent do it once a day. Besides, 77 percent of the households spend less than 2 US dollars daily to keep in good condiditon, the on-site sanitation facilities. For cleaning purposes, 42 percent use plain water while 58 percent use some disinfectant.

Another hot issue encountered in Nkolbikok is the high rate of household members that share sanitation facilities. In fact, the authors found that 98 percent of sketchy on-site facilities are shared by many households living in the same coumpound. This common utilization may negatively impact on the maintenance of facities in the absence of a credible arrangement of how people cooperate, that is “working together, achieving goals through collective actions” (Heywood, 2002).

Similarly, we found from the survey that 60 percent of the households have already emptied their pits at least once (manual or mechanical emptying). We also found that only 75 percent of the FS produced by the households in septic tanks are evacuated to the dumping-site, meaning that 25 percent is not removed.

The time span between two drainings is generally very long. The longest time span that we found in the field is 28 years! This can be explained by the configuration of the plots occupied. Access to the plots by the trucks is not always possible because of very narrow and inadequate paths. In this case, even if the pit emptying fees are affordable, mechanical emptying services cannot be used, because pits are not accessible for emptying. Finally, practices and behaviours in sewerage sanitation also leave much to be desired.

Inadequate management of wastewater

To some extend, the way that wastewater is managed can be for a great importance to the faecal sludge management. In Nkolbikok, the survey showed that 6.7 percent of the households drain their wastewater into the latrines, draining wells or into drainage ditches. Figure 8 shows the practices in the wastewater sanitation.

When we know that faecal sludges from many sketchy on-site sanitation facilities are also dumped in the drainage ditches, one can imagine the damages caused to the environment and threat to human health posed by such practices.

Inadequate haulage and chaotic disposal of FS

As Montangero et al. (2002) noticed, collection and haulage of faecal sludge are associated with huge problems. But in Yaoundé, like in many sub-sarahan cities, safe and secure disposal of the sludges constitute also a real chinese puzzle for all stakeholders. Subsequently, we show to what extent the FS haulage is inadequate, and the chaotic disposal at the amont link of the FS chain.

Inadequate haulage

The mechanical emptying services are supplied by private operators who own the trucks that they use for transporting the sludges. The emptying fees depend upon many variables: the volume of the truck, the distance from the collecting point to the disposal point, the difficulties or ease of access to the family compound, and the type of facility to be emptied. As an indication, the cost of emptying a truck of 7 to 10 m^3 ranges from 240 to 350 US dollars.

We also found that the price demanded by the emptying service providers is closely related to many administrative bottle-necks. These are the costs of complying with a complicated regulatory framework, obligatory undue and unofficial fees or bribes paid to the police and the gendarme. Furthermore, the site where the FS is disposed is situated at Nomayos[1]. The road leading there is not paved; it is bumpy and muddy during the rainy period. Hence the situation leaves much to be desired as illustrated by Figures 9 and 10.

The disastrous state of the road has many negative consequences. In one hand, it contributes to increasing the operating costs of the emptying service providers, by shortening the absorption of depreciation amounts which are written off. On the other hand, it makes some truck drivers change their behaviour when, very often, they do not hesitate to illicitly dump the sludges downtown in gutters or drainage ditches. They also dump the sludges not far from the road leading to the FS dumping-ground as shown in Figure 11.

[1] Nomayos is a large village situated at around 15 km south of Yaoundé.

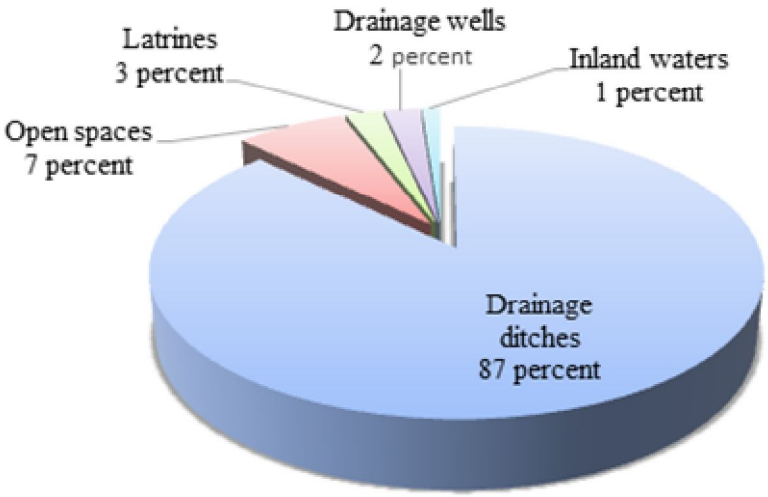

Figure 8. Wastewater sanitation systems. Source: Authors.

Figure 9. A muddy section of the road.

Figure 10. A slough section of the road. Source: Mougoué et al. (2012).

Figure 11. Two emptying trucks: the first is dumping very close to the road while the second is ready to do the same.

The dumped FS flows and stagnates on the road. This illegal and anarchic dumping of the FS is very frequent during the rainy season.

The field observations showed that those in charge of handling the faeces do not take any precaution while working. They do not wear personal protective gear: neither gloves and muffler, nor wellington boots and workwear. The risks of contamination by the sludges that these workers face are high! Furthermore, emptying operators lend their services to other users whose products have nothing to do with FS. That is why the content of the trucks dumped at the emptying site is generally a mixture of non homogeneous products from various origins (waste from the oil stations and solid wastes of which plastic is dominant). The more dramatic inadequacies come from the downstream link of the chain; the dumping-site.

Chaotic disposal

Faecal sludges produced in Yaoundé as a whole is supposed to be disposed in Nomayos as we previously saw, but there is a wild dumping out of this site. Let us notice that the FS dumping-ground of Nomayos has an area of around 300 square metres. The site belongs to a private individual who accepted that the space be used for the dumping the FS. A sum equivalent to 10 US dollars is paid by the emptying actors each time that they use the site. This amount is shared among the local council that receives 4 US dollars and the private owner of the site who gets 6 US dollars.

Nomayos has a population estimated at about 1,500 persons engaged in agricultural activities. Some years ago, four concrete decanting tanks were built on the site in view of treating the FS by an emptying private operator. Today, this equipment is occupied by a green vegetation and then out of use (Figures 12 and 13).

The site has not been fit out and the sludges are thrown anyhow and anywhere, without treatment (Figures 14 and 15).

The consequences of this anarchic dumping of FS are catastrophic. (i) Not far from the dumping-site, in the dowstream, is found a small stream called Avo'o into which the dumped FS flow. (ii) Small scale agricultural activities are carried out around the site and people complain about unpleasant smelling. (iii) Untreated thrown FS constitue a serious threat to the human and environmental health. In fact, the fauna, the flora, the soil, the sub-soil, the surface water and the groundwater are polluted by local transfer of contaminants from untreated faeces sludge. All around the site, many vegetables are cultivated and harvested for the human consumption! Hence the consequences of this sanitary disaster on the public health could be much larger than we could imagine. What an ugly and irresponsible mess!

Figure 13. Late decanting tank.

Figure 14. Emptying truck in action.

Figure 12. Green vegetation.

Figure 15. Flowing of the FS into the environment.

CONCLUSION AND RECOMMENDATIONS

The purpose of the present paper was to take stock of the faecal sludge management chain in Yaoundé. Documentary analysis, namely the exposition of laws and regulations enacted by the public authorities to shape the sanitation chain, was done. Field studies were undertaken and data collected on Nkolbikok, a poor settlement of Yaounde where a survey of a representative group of households was carried out. We used cameras to snap significant photographs necessary to sustain the discussion. Combining these documentary and field studies yielded three interesting results.

Firstly, the institutional framework of the sanitation chain lacks credibility and consistency. Many institutions are implicated in the regulation of the sanitation chain without a formal central organ in charge of their coordination. The main issue raised here is the risk of overlapping responsibilities capable of provoking inefficiencies in terms of poor enforcement mechanisms for enforcement of laws and regulations.

Secondly, the technical management of the FS chain leaves much to be desired. Upstream, on-site facilities are sketchy and generally not adequately kept in good condition. Haulage to and disposal of the FS at the dumping-site are quite chaotic and dangerous both to human and environment health. Truck drivers frequently dump the FS that they carry anywhere possible (in lanes and gutters, drainage dicthes downtown, onto open spaces, etc.). This finding is consistent with the results obtained in many developing countries by Steiner et al. (2002). The main problem at stake in the case of Yaoundé is the bad state of the road that leads to the dumping-site. This non tarred road is quasi motorable, especially during the rainy seasons.

Thirdly, the management of the place where the FS is disposed, the dumping-site, is dangerously chaotic. The dumping-site is not maintained and, as a major consequence, the sludges are disposed off without any treatment into the environment. More dramatically, the untreated sludges flow into a stream where local population, from time to time, does not hesitate to fetch drinking water. Moreover, agricultural activities are carried out near the dumping-site. The health risks incurred by the neighbourhood populations are unimaginable!

Incontestably, all the links of the faecal sludges management chain in Yaoundé are weak. The management of the whole sanitation chain is not efficient. However, it is interesting to be aware of the fact that the faecal sludges are tradable products. A treasure may be hidden there, since, as Imhasly et al. (2004) put it, “sanitation is a business”.

At the upstream of the chain, the households are ready to pay for the improvement of their on-site facilties (more than 70 percent). Haulage and disposal are economic activities that are being carried out irrespective of many difficulties faced by the profession. Emptying services providers are ready to pay for the disposal fees at the end of the chain. These fees are an important source of income for the local authorities and the owner of the dumping-site.

Therefore, three main recommendations may be formulated for better management of the chain. Firstly, institutions seem to matter much, so we think that it is necessary to create a unique public office in charge of the sanitation regulation in urban and rural zones. The responsibility of building/constructing the treatment facilities for the faecal sludges should be attributed to the councils which are closer to the households and the emptying operators. The disposal fees and access to the dumping-site should be attractive for the nightmen in order to make them desist from illicit practices like dumping the faecal sludges into drainage ditches, for example. Besides, the construction of the dumping-site should be liberalized in view of allowing the private operators to engage in the treatment, safe disposal/ reuse of the faecal sludges. The office to be created will have to define the construction and treatment standards/norms that will be supervised by the councils.

Secondly, it is time to enforce the laws and regulations governing the building licence in the urban area of Cameroon. In fact, to make the FS chain actually effective, the councils should have to care more about the urban road works. Fortunately, henceforth town planning, the creation and maintenance of non tarred urban roads are committed to the care of the councils (Prime Minister Decree No. 2011/0006/PM of 13 January 2011).

Thirdly, while waiting for the implementation of the new institutional rarrangements recommended above, it is important to get the awareness and commitment of households. For this purpose, the carrot and stick strategy may be suggested. Using the carrot will consist of informing the households on the good or bad effects of good or bad practices in the domain of sanitation in general (regular maintenance of the on-site facilities, adequate management of liquid and solid wastes, etc.). As says a popular adage, an informed person is worth two.

The stick aspect of the strategy will consist of bringing the households to implement all laws and regulations governing the sanitation chain, fulfilling all legal conditions before building new houses, for example. For sure, if all these recommendations are implemented, one can hope for organized towns, effective sanitation strategies and better environment and human health at the medium or long term.

REFERENCES

African Development Bank (AfDB), (**2016**). Statistical Yearbook of Africa. 360 p.

Bassan, M. T., Tchonda, T., Mbéguéré, M., and Strande, L., (**2012**).

Optimizing the faecal sludge management scheme in Ouagadougou, Burkina Faso. Sustainable Sanitation Practice, 13: 22–24.

Bolomey, S. (**2003**). Améliorer la gestion des boues de vidange par le renforcement du secteur privé : cas de la Commune VI du District de Bamako. EAWAG/SANDEC, Juin, 55 pages.

Commission Nationale Anti-Corruption (**CONAC**), (**2012**). Rapport annuel 2012, 335 p.

Defo, C., Fonkou, T., Mabou, P. B., Nana, P., and Manjeli, Y. (**2015**). Collecte et évacuation des boues de vidange dans la ville de Bafoussam, Cameroun (Afrique centrale)? Revue électronique en sciences de l'environnement, Vol. 15, No. 1.

Ekane, N., Nykvist, B., Kjellén, M., Noel, S., and Weitz, N. (**2014**). Multi-level Sanitation Governance: An Approach to understanding and overcoming the challenges in the sanitation sector in sub-Saharan Africa. Waterlines Journal. Pratical Action, pp. 242 – 256.

Ekane, N., Weitz, N., Nykvist, B., Nordqvist, P., and Noel, S. (**2016**). Comparative Assessment of Sanitation and Hygiene Policies and Institutional Framework in Rwanda, Uganda and Tanzania. Sthockolm Environment Institute Working Paper 2016-05, 34 p.

Evans, B., and **Trémolet**, S. (**2009**). Targeting the Poor With Facilities and Improved Services. Paper prepared for the kfw Water Symposium 2009, "Financing Sanitation", Frankfurt, 8th and 9th October.

Guerrien, B., (**2003**). Dictionnaire d'analyse économique : Microéconomie, macroéconomie, théorie des jeux, etc. Repères, La découverte, Paris, 568 p.

Harrison, J., and **Wilson**, D. (**2012**). Towards sustainable pit latrines management through LaDePa. Sustainable Sanitation Practice, 13: 25–32.

Heywood, A. (**2002**). Politics. Second edition, Palgrave Foundation, Great Britain, 453 p.

Imhasly, B. Florez, R., Iyer, P., and Cardosi, J. (**2004**). Sanitation is a Business: Approach for Demand-oriented Policies. Swiss Agency for Development and Cooperation (SDC), Geneva, 40 p.

Joshi, S., and **Patil**, P. (**2016**). Treatment of contaminated Ambril stream water and reuse in Indradhanushya. Environment and Education Centre, Pane, SSP 25, pp. 42 – 47.

Kale, S., and **Nagarnaik**, P. (**2016**). NaWaTech Community of Practice (CoP). Sustainable Sanitation Practice, 25: 84–90.

Montangero, A., Koné, D., and Strauss, M. (**2002**). Planning Towards Improved Excreta Management. In: Prooceedings, 5th IWA Conference on Water and Wastewater Teatment Systems, Istanbul, Turkey, Sept., pp. 24 – 26.

Montangero, A., and **Strauss**, M. (**2002**). Faecal Sludge Treatment. Lecture Notes, IHE, Delft, February, SANDEC.

Mougoué, B., Ngnikam, E., Wanko, A., Feumba, R., and Noumba, I. (**2012**). Analysis of faecal sludge management in the cities of Douala and Yaoundé in Cameroon. Sustainable Sanitation Practice, 13: 11–21.

Ndeuhela, N. (**2013**). Organisation de la filière de gestion des boues de vidange dans la ville de Yaoundé. Mémoire Master professionnel, Université de Yaoundé I, (juillet).

Ngnikam, E. (2013). Maîtrise de la filière assainissement dans un écosystème côtier à Douala et les quartiers précaires de Yaoundé (MAFADY). Research report submitted to the SPLASH Consortium.

Ngnikam, E., Mougoué, B., Feumba, R., Noumba, I., Tabue, G., Meli, J. (**2011**). Water, Wastes and Children's Health in Low-Income Neighbourhoods of Yaoundé. In: Charron, (Eds.), EcoHealth Research in Practice: Innovative Applications of an Ecosystem Approach to Health. Springer, New York, USA and IRCD, Ottawa, Canada, pp. 215 – 226.

North, D. C. (**2007**). Institutions, Institutional Change and Economic Performance. Political Economy of Institutions and Decisions, Cambridge University Press, UK, 152 p.

Opel, A. (**2012**). Absence of faecal sludge management shatters the gains of improved sanitation coverage in Bangladesh. Sustainable, Sanitation Practice, 13: 4–9.

Robbins, S., and **DeCenzo**, D. (**2008**). Management : l'Essentiel des concepts et des pratiques. 6ème édition, Nouveaux Horizons, Paris, 523 p.

Steiner, M., Montangero, A., Koné, D., Strauss, M. (**2002**). Economic Aspects of Low-Cost Faecal Sludge Management. Estimation of Collection, Haulage, Treatment, and Disposal - Reuse Cost. Swiss Federal Institute for Environmental Science and Technology (EAWAG), Department of Water and Sanitation in Developing Countries (SANDEC).

Tsinda, A., Tsinda, A., Abbott, P., Pedley, S., Charles, K., Adogo, J., Okurut, K., and Chenoweth, J. (**2013**). Challenges to achieving sustainable sanitation in informal settlements of Kigali, Rwanda. International Journal of Environmental Research and Public Health, 10: 6939–6054.

UNICEF/WHO (**2015**). Progress on Sanitation and Drinking Water: 2015 update. Joint Monitoring Programme for Water Supply and Sanitation.

WHO/UNICEF (**2017**). Progress on Sanitation and Drinking Water: 2017 update. Joint Monitoring Programme for Water Supply and Sanitation, 60 p.

Citation: Noumba, I., Ngnikam, E., Mougoue, B., Wanko, A., and Berteigne, B. (2017). Weak links in the chain: Diagnosis of the faecal sludge management chain in Nkobikok, Yaoundé, Cameroon. Net Journal of Social Sciences, 5(4): 55-67.