SFD Report

Yaoundé
Cameroon

Final Report

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SFD Report Yaoundé, Cameroon, 2018

Produced by: GFA Consulting Group GmbH

Authors' names: Dr. Roger Feumba, Alejandra Burchard Levine

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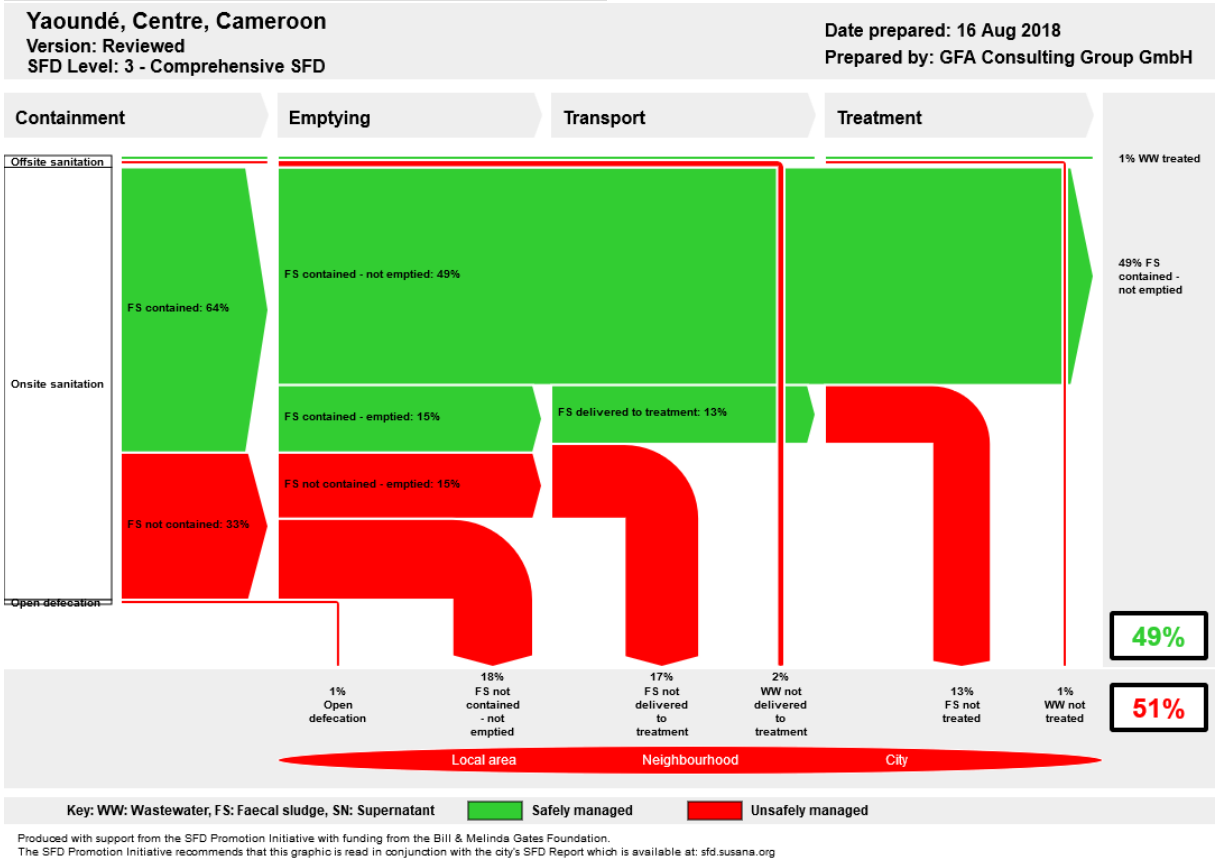
1. The SFD Graphic



Produced with support from the SFD Promotion Initiative with funding from the Bill & Melinda Gates Foundation.
The SFD Promotion Initiative recommends that this graphic is read in conjunction with the city's SFD Report which is available at: sfd.susana.org

2. Diagram information

SFD Level:

This is a Comprehensive level SFD report.

Produced by:

This SFD report was produced by GFA Consulting Group GmbH.

Collaborating partners:

- GIZ
- AfWA
- City Councils of Yaoundé

Status:

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Date of production: 21/09/2018

3. General city information

The political capital of Cameroon, Yaoundé had 3,660,082 inhabitants with 775,911 households in 2017 (updated from RGPH, 2010).

For the elaboration of this SFD, the area of Yaoundé covered is 310km², which is beyond the administrative boundaries as the city developed peripherally in an unregulated manner. Nonetheless, the slums and peripheral area are still under Yaoundé Municipality's control or included in the Mfoundi Department. As for the growth rate of this area, it was nearly 5.3% per year between 2001 and 2015 and 5.7 between 2015 and 2020 (CUY, 2015).

Three types of important housing features exist in Yaoundé, being informal housing arrangements (slums), middle housing arrangements, and high housing arrangements (CUY and RASOP, 2016). The average household size is 4.7 with a cohabitation rate of two households per house.

The city of Yaoundé is called "city of seven steep hillsides". The morphological features consist of hills (>700m and < 1200m) and valleys (<700m and >600m). Almost 20% of its area is flood prone with a geology made up of faulted metamorphic rocks (Tabué Youmbi, 2012).

4. Service outcomes

This section presents an overview of Yaoundé's sanitation systems through the sanitation service chain:

Containment: A decentralised separate sewer covers 0.6% of the population (Mbée, 2011). The rest, more than 90% of sewage, is contained in latrines followed by septic tanks, and public toilets at a marginal proportion (56 public toilets exist in Yaoundé). The city's inhabitants are mostly dependent on VIP, traditional pit latrines and septic tanks. Either the faecal sludge from pit latrines flows to a water body, to open drains or have no outlet or overflow. The effluent from the septic tank flows into a soakpit with low risk of contamination to groundwater. However, according to CUY and RASOP (2016), 0.6% of the population practices open defecation.

Emptying: In Yaoundé, three types of faecal sludge desludging exist:

- Mechanical emptying which represents 60%;
- Directly to open ground which represents 0.6%;
- Manual emptying assumed to be approximately 30%.

A dumping site exists in Mbankomo, a city council located 25km far from Yaoundé.

Transport: According to the Municipality of Yaoundé, about 16 trucks, which are 20 to 40 years old, were operational in July 2017. Sixteen companies exist and created an association called ROCOBY[1] to better manage their activities.

Fig. 1: Private Vacuum on the road to the desludging site in Nomayos (Mbankomo City Council)

Treatment: Among the 13 wastewater treatment stations[2] which existed between 1967 and 1990, almost all are dysfunctional. However, since 2010, the Municipality of Yaoundé with the financial support of the Ministry of Housing and Urban Development restored three of them (Grand Messa, Cité Verte and Biyem-Assi). Nonetheless, these remain poorly constructed. In Yaoundé, there are no treatment plant stations for faecal sludge.

Fig. 2: Current faecal sludge desludging site in Nomayos (Mbankomo City Council)

Disposal/End-use: This is not documented for Yaoundé. However, some people use faecal sludge from manual emptying as manure in farms (MAFADY, 2013).

In summary, the most common sanitation technology used in Yaoundé is on-site sanitation:

- About 98% of households use on-site sanitation systems
- 0.6% use off-site sanitation systems, i.e. decentralised separate sewers
- 0.6% practice open defecation

53.6% use pit latrines meanwhile 29.2% use toilets with septic tank and soakpit. Many types of latrines are found in Yaoundé such as VIP latrine (7.6%), Pit latrines all types (53.6%), latrines with sealed containment and a hole towards water body (8.5%), and toilets with septic tank (29.2%).

Only 36% of wastewater reaches the three wastewater treatment plants restored in 2010, but only 64% are treated.

[1] *Réseau des opérateurs de collecte des boues de vidange à Yaoundé*

[2] *Nsam, Grand Messa, Biyem-Assi, Cité Verte, Hôpital général, hôpital Essos, Lycée technique de Nkolbisson, CHU, Université de Yaoundé 1, Aéroport de Nsimalen, Palais de l'Unité, garde présidentielle et Nlongkak.*

In Yaoundé, the specific challenges according to CUY and RASOP (2016) are, that only 15% of households have direct access to their homes through paved roads, 40% live in slums, about 20% of the population live in steep hillsides and 80% of its area is characterised by low groundwater.

As for groundwater contamination, at least 40% of sanitation systems in Yaoundé have a high risk and 60% a low risk.

5. Service delivery context

In Cameroon, between 2007 and 2009, over 80% of the population lived slums with poor sanitation systems, due to the lack of clear institutional roles between actors and permanent financing.

Between 1967 and 1990 the government built:

- Four (04) treatment stations to equip residential areas in the city centre. However, the network was not built and the station was included in the SCDP[3].
- Six (06) treatment stations for general hospitals, schools, universities and the airport.
- Two (02) administrative sanitation facilities: Presidential House and Presidential Guard.

Most stations used activated sludge. Three of these stations have been rehabilitated in Yaoundé, but they have several dysfunctions and the effluents from these stations do not meet the MINEPDED discharge standards.

Several texts and laws exist for environmental protection, but none effectively frame faecal sludge management. A Sanitation Master Plan was developed in 1994 with three components: wastewater, solid waste and rainwater drainage. However, its implementation is practically inexistent and the wastewater component is being updated.

The sludge sector is managed by the private sector, which negotiated with a dumping site in Nomayos, 25km far from the city of Yaoundé. This dumping site is, however, located upstream Yaoundé's drinking water source.

In order to achieve the MDGs, Cameroon's goal in the field of sanitation is to increase the rate of access to improved sanitation facilities from 15% to 60 % by 2035. The actions carried out by Yaoundé Municipality are:

- Updating in 2015 the wastewater component of the 1995 Sanitation Master Plan;
- Agreement between the Municipality and AfWA[4] on a sanitation diagnosis and performance improvement plan for faecal sludge management followed by an ONAS audit;
- Acceptance of the Ministry of Territorial Administration which allowed the Municipality to sign an MoU with a Norwegian company called INRIGO;
- Preparation of a faecal sludge treatment plant in Etoa with AIMF[5] and the Bill and Melinda Gates Foundation.

The updated master plan has made it possible to develop the following:

- Intervention strategy that proposes a gradual evolution towards an off-site sanitation system by 2035;
- Short-term implementation of two priority programs;
- Two sewage systems: one sewage network for wastewater and one for faecal sludge collection;
- Three faecal sludge treatment plant stations for on-site sanitation systems in the peripheral and slums.

The wastewater and faecal sludge challenges in Yaoundé include management failures, socio-economic constraints, inadequate techniques and lack of maintenance. In order to restore the shortcomings and ensure the development of this sector, the Yaoundé Liquid Sanitation Strategy (2015) proposes a dual system.

The institutional arrangement proposes the clarification of roles and reinforcement of skills for faecal sludge Liquid Sanitation management stakeholders.

The financing mechanism proposes initial investments by the Government or Donors, the application of OBA (Output Based Aid) and Public Private Partnership (PPP) models. PPPs are financing household connections to off-site sanitation systems. Another source is a fee based on the drinking water bills where the households will pay a fee of US$0.58/m^3 of drinking water consumed and a solidarity contribution of US$40/month per subscriber to the drinking water network.

[3] *Société Camerounaise de dépôts pétroliers*

[4] *African Water Association*

[5] *Association Internationale des Maires Francophones*

6. Overview of stakeholders

In 2004, a set of laws on the decentralization department organized the transfer of power to local and regional authorities, including municipalities, urban cities and districts councils. Until 2008, the effects of these laws remained unseen, however, later the adoption of several Decrees allowed the actual transfer of power to municipalities.

The following stakeholders are those responsible for sanitation service delivery in Yaoundé (Cameroon):

Key Stakeholders	Institutions/Organizations
Public Institutions	Ministry of Water Resources and Energy; Ministry of Environment, Protection of Nature and Sustainable Development; Ministry of Housing and Urban Development; Ministry of Public Health and Ministry of Secondary Schools; Ministry of Basic Education; Ministry of Mines, Industry and Technology Development
Non-governmental Organizations	SIC, MAETUR, CAMWATER, CFC, CUY, CA, ERA-Cameroun
Private Sector	Private emptiers such as Meuyou, Victor, Ajiko Emmanuel, Anges Express hygiene et services, DEBA, Amogo Jean joel, Prestige hotel, Kenmegne Laurent, Tango hotel, Talon et fils, Jardin des arts, Fotso, Tchokouako, Vidange réunie, Tchoupe Rostind, Services camerounais d'assainissement, and owner of dumping site of Nomayos
Development Partners, Donors	BAD, FEM, AFD, AIMF, FBMG, INRIGO, European Union
Others	National advanced school of engineering of Yaoundé of the University of Yaoundé I

Tab. 1: Key Stakeholders (RASOP/CUY, 2016)

Different relationships exist between the actors who intervene directly or indirectly in the faecal sludge sector in Yaoundé. These relationships are informal for the most part, as the activity is not totally under the control of the Municipality of Yaoundé. Households provide sludge to private emptying companies, while these companies dump it in the dumping site located in Nomayos. The Municipality of Yaoundé (CUY) controls the private emptying companies, while these pay a tax to the city council of Mbankomo where the dumping site is located.

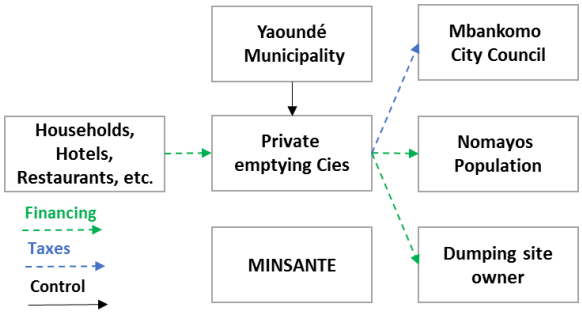

Fig. 3: Actors involved in liquid sanitation management in Yaoundé (ENSP/L3E, 2014)

7. Process of SFD development

Overall, 49% of excreta are safely managed in the city and 51%, are discharged untreated to the environment. This also includes less than 1% practicing open defecation. This reflects the reality in Yaoundé as slums represent 40% of inadequate sanitation systems, and 2/3 of the population use septic tanks, while 20% of population live on hills without access to appropriate sanitation facilities.

Available data were from different years. For example, data on containment was from ENSP/L3E, 2014, and data on emptying and transportation were collected through Key Informant Interviews and focus group discussions conducted in 2014 from the MAFADY project and in 2016-2017 from the RASOP-Africa program. Data on population was used from the 2005 census, however was updated using the estimated population growth of 5.7%.

During the implementation of RASOP-Africa activities in Yaoundé, a SFD training workshop took place in August 2018 where relevant ministries and the municipality of Yaoundé participated. The preliminary results of this Yaoundé SFD were presented and validated by the participants.

Fig. 4: Stakeholder Validation Workshop 23.08.2018, Yaoundé

8. Credibility of data

The main assumptions for preparing the SFD were:

- Data provided by Census 2005 is correct, however, updated for this purpose;
- Latrines without tank/containment were considered as a type of open defecation;

Most of the collected data came from different research reports from MAFADY[6] project, National Strategy on Liquid Sanitation and Liquid Sanitation of Yaoundé and Solid Waste, and PADY2[7].

The collected data was shared and validated with water and sanitation stakeholders such as Yaoundé City Councils of Yaoundé and its surrounding, different ministries in charge of water, environment, health, sanitation and sustainable development in Cameroon, NGO, emptiers, and practitioners.

9. List of data sources

The following sources were used for the production of the SFD for Yaoundé.

- Data source one: Reports and literature (see details in references)
  - All technical and scientific reports of the MAFADY project;
  - CUY 2015. Stratégie de gestion des eaux usées de la ville de Yaoundé.
  - PADY 2 reports (second phase of the sanitation project of Yaoundé);
  - Tabué Youmbi, J.G. 2012. Périmètre de protection et vulnérabilité de la nappe dans un bassin versant urbanisé : cas de la Mingoa à Yaoundé.
  - World Bank reports on the National Strategy on Liquid Sanitation of Cameroon;
  - Yaoundé Municipality reports on the National Strategy on Liquid Sanitation of Yaoundé;
  - RASOP-Africa Yaoundé project report;
  - Yaoundé town master plan.
- Data source two: Key informant interviews in 2014 and 2017
  - Technical services of the seven cities councils of Yaoundé;
  - Hygiene and sanitation services of the seven cities councils of Yaoundé;
  - Technical and hygiene and sanitation service of the municipality of Mbankomo;
  - Technical and hygiene and sanitation department of MINEE, MINHDU, MINEPDED, MINSANTE, and MINEDUB;
  - Heads of sanitation of hygiene enterprises in Yaoundé;
- Data source three: Focus group discussions in 2014, 2016 and 2018
  - Mechanical emptiers (2014, 2016 and 2018);
  - Manual emptiers (2016);
  - Workshop on August, 23, 2018 organised within the framework of RASOP-Africa for stakeholders' validation of the first result of this SFD.

6 Understanding the sanitation sector in the coastal ecosystem of Douala and highly populated neighbourhoods of *Yaoundé in Cameroon*

7 Second phase of the sanitation project of Yaoundé

SFD Yaoundé, Cameroon, 2018

Produced by:

Dr. Roger Feumba, GFA Consulting Group GmbH

Alejandra Burchard Levine, GFA Consulting Group GmbH

Edited by:

Dr. Roger Feumba, GFA Consulting Group GmbH

Alejandra Burchard Levine, GFA Consulting Group GmbH

This Executive Summary and the SFD Report are available from: www.sfd.susana.org

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Abbreviations

CUY	Communauté Urbaine de Yaoundé/Municipality of Yaoundé
AFD / FDA	French Development Agency
AfDB	African Development Bank
AfWA	African Water Association
AIMF	Association Internationale des Maires Francophones
BAD / AfDB	African Development Bank
CA	City Council/Commune d'Arrondissement
CAMWATER	Cameroon Water Utilities Corporation
CDE	Camerounaise Des Eaux
CFC	Crédit Foncier du Cameroun
CHU	Centre Hospitalier Universitaire
CNPS	Caisse Nationale de Prévoyance Sociale
DELVIC SI	Delvic Sanitation Initiative
ERA-Cameroun	Environment Research and Action in Cameroon
FAE	Facilité Africaine de l'Eau/African Water Facility
FBMG/BMGF	Bill and Melinda Gates Foundation
FEM / WEF	World Environment Fund
FS	Faecal Sludge
FSM	Faecal Sludge Management
FSTP	Faecal Sludge Treatment Plant
GFA	GFA Consulting Group GmbH
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
MAETUR	Mission for the Planning and Equipment of Rural and Urban Land/Mission d'Aménagement et d'Equipement des Terrains Urbains et Ruraux

MAFADY	Understanding the sanitation sector in the coastal ecosystem of Douala and highly populated neighbourhoods of Yaoundé in Cameroon
MDG	Millennium Development Goal
MINAT	Ministry of Territorial Administration
MINEDUB	Ministry of Basic Education
MINEE	Ministry of Water Resources and Energy
MINEPDED	Ministry of Environment, Protection of Nature and Sustainable Development
MINESEC	Ministry of Secondary Schools
MINHDU	Ministry of Housing and Urban Development
MINMIDT	Ministry of Mines, Industry and Technology Development
MINSANTE	Ministry of Public Health
NGO	Non-Governmental Organisation
OBA	Output Based Aid
ONAS	Office National de l'Assainissement du Sénégal
PADY2	Second phase of the Sanitation Project of Yaoundé
PDU	Urban Development Plan
PPP	Public Private Partnership
RASOP-Africa	Reinforcing Capacity Building for African Sanitation Operators by Learning Peer-to-peer in Africa
ROCOBY	Réseau des Opérateurs de Collecte des Boues de vidange de Yaoundé
SCDP	Société Camerounaise de Dépôts Pétroliers
SFD	Shit Flow Diagram
SIC	Real Estate Corporation of Cameroun/Société Immobilière du Cameroun
SOPREC	Société de Prestation et de Construction (Sénégal)
UNICEF	United Nations of International Children's Emergency Fund
WW	Wastewater

1 City context

Yaoundé is the political capital of Cameroon located in the centre Region between 3°45'-3°60'N and 11°20'-11°55'E. It is the second elevated city in Cameroon after Douala. The climate is equatorial with two rainy and dry seasons with an average temperature of 23.5°C. An average of 1,600mm of rainfall per year is registered. However, these last years have shown a decrease in rainfall (less than 2.2% decrease per decade since 1960) followed by increase of temperature (+0.7°C from 1960 to 2007)[8]. With an estimated population of 3,660,082 inhabitants in 2017 with 775,911 households (data updated from data of RGPH, 2010), and an area of 310km², there are no diurnal and seasonal variations of its population (Figure 1). As for its economic development, industrial activities are less important in Yaoundé, but found in the southern part of the city.

According to the diagnosis made during the elaboration of the town master plan (PDU, 2002), the spatial development of the city of Yaoundé densified in the central districts (generally covered by the slums) and developed peripheral neighbourhoods. An aerial photography taken in 2011 showed that the urbanized area of Yaoundé covers 310km² instead of 279km²[9], beyond the administrative boundaries. The growth rate in this area was nearly 5.3% per year between 2001 and 2015 and 5.7% between 2015 and 2020. This area developed in an unregulated manner with the setup of unorganized private lands.

In terms of housing arrangements, Yaoundé has three types: Informal housing (slums) with 2.2 households per dwelling, middle housing (middle standing) with 1.8 households per dwelling, and high housing (high standing) with 1.2 households per dwelling (CUY and RASOP-Africa, 2016). The average household size is 4.7 with a cohabitation rate of 2 households per house. The average density of occupation is 106 inhabitants/ha in 2015.

The city of Yaoundé is generally called "city of seven steep hillsides", however, more than seven hills exist in the city. The morphological features consist of hills (>700m and < 1200m) and valleys (<700m and >600m). Almost 20% of its area is flood prone. The geology of Yaoundé is made up of faulted metamorphic rocks. Above these rocks, there are three types of soils depending on the topography: Red and yellow ferralitic soil (uphill and medium) and hydromorphic soil (flooded-areas) (Tabué Youmbi, 2012).

The hydrogeological features of Yaoundé consist of two types of aquifer: the upper aquifer made up of porous alterites (0 to 20m deeper captured by wells) and the lower aquifer (>20m captured by boreholes) found in faulted metamorphic rocks (Tabué and al., 2009).

In terms of sanitation, the main challenges for Yaoundé, according to CUY and RASOP-Africa, 2016, are that only 15% of households have direct access to their home through paved road, 40% live in slums, about 20% of the population live in steep hillsides, and 80% of its area is characterised by low groundwater table. The following map shows the city of Yaoundé and its seven city councils.

[8] *MINEPDED, Plan national d'Adaptation au Changement Climatique (PNACC), 2015*

[9] *[Yaoundé 1 (51.5 km²), Yaoundé 2 (22.5 km²), Yaoundé 3 (67 km²), Yaoundé 4 (58 km²), Yaoundé 5 (26 km²), Yaoundé 6 (22 km²), Yaoundé 7 (32 km²), BUCREP (2005)]*

Figure 1: Yaoundé City map (CUY, 2016)

2 Service Outcomes

The service outcome analysis was based on primary and secondary sources. Many key sources of data were used from the 2005 Census of Cameroon, MAFADY project reports from April 2011 to June 2014, Masters and PhD thesis and Municipality reports (RASOP-Africa, PADY2, PDU, etc.). Data on emptying and transport were collected by key informant interviews (KIIs). The data was crosschecked and updated through KIIs.

2.1 Overview

The following figures present the selection grid technology for the Yaoundé SFD.

List A: Where does the toilet discharge to? (i.e. what type of containment technology, if any?)	List B: What is the containment technology connected to? (i.e. where does the outlet or overflow discharge to, if anything?)									
	to centralised combined sewer	to centralised foul/separate sewer	to decentralised combined sewer	to decentralised foul/separate sewer	to soakpit	to open drain or storm sewer	to water body	to open ground	to 'don't know where'	no outlet or overflow
No onsite container. Toilet discharges directly to destination given in List B				T1A1C4	Significant risk of GW pollution T1A1C5		T1A1C7			Not Applicable
Septic tank					T2A2C5 T1A2C5					
Fully lined tank (sealed)					Significant risk of GW pollution Low risk of GW pollution		T1A3C7			
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution					Significant risk of GW pollution Low risk of GW pollution
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution Low risk of GW pollution
Unlined pit										T2A6C10 T1A6C10
Pit (all types), never emptied but abandoned when full and covered with soil										Significant risk of GW pollution T1B7C10
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil										
User interface failed, damaged, collapsed or flooded										
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable						T1B11 C7 TO C9			Not Applicable

Figure 2 : Selection grid for sanitation facilities in Yaoundé

This section presents the range of sanitation technologies (Figure 2), methods and services designed to support the management of Faecal Sludge and Wastewater (WW) through the sanitation service chain in Yaoundé.

The details on quantitative estimations are presented in the Table 1and in the following sections. When adding together all the percentages of each different type of sanitation system found during the literature review, the total surpasses 100%. This is due to different researchers carrying out studies with different population pools, which can lead to differences. Please refer to Table 1, for final consolidated numbers used to generate the SFD. These percentages were then adjusted to obtain 100% as can be observed in Table 1, showing that in Yaoundé, most of the population uses on-site sanitation systems.

Table 1: Sanitation technologies and contribution of excreta in terms of percentage of population

Sanitation technology and system defined by:			% of population directly from the literature	% to be used for SFD generator	SFD references variables		
Local terms	Referen-ces	SFD Terms					
Latrine sommaire à canon “sealed tank with a pipe”	Zouroumba, 2011; ENSP/L3E (2014)	Fully lined tank (sealed) connected to a water body	11.0	5.5~5	T1A3C7		
Latrine sommaire à fosse perdue “unlined pit, no outlet, no overflow”	Zouroumba, 2011; ENSP/L3E (2014)	Unlined pit, no outlet or overflow Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	38.0	18.9~18	T1A6C10	T2A6C10	
Latrine sommaire sans fosse ‘’latrine without containment /tank”	Zouroumba, 2011; ENSP/L3E (2014)	Open defecation	1.0	0.5~0	T1B11C7T0C9		
Latrine aménagée à canon “sealed tank with a pipe”	Zouroumba, 2011; ENSP/L3E (2014)	Fully lined tank (sealed) connected to a water body	6.0	3.0~3	T1A3C7		
Latrine aménagée à fosse perdue “unlined pit, no outlet, no overflow”	Zouroumba, 2011; ENSP/L3E (2014)	User interface discharges directly to open drain or storm sewer Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	16.0	8.0~8	T1A6C10	T2A6C10	
Latrine à fosse vidangeables “dry latrine”	Zouroumba, 2011; ENSP/L3E (2014)	Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	4.0	2.0~2	T1B7C10		
Toilette à fosse septique “septic tank connected to soakpit”	Zouroumba, 2011; ENSP/L3E (2014)	Septic tank connected to soak pit Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	23.0	11.5~11	T1A2C5	T2A2C5	
Latrine à fosse septique “septic tank connected to soakpit”	Zouroumba, 2011; ENSP/L3E (2014)	Septic tank connected to soak pit Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	1.0	0.5~1	T1A2C5	T2A2C5	
Assainissement collectif ‘’off-site sanitation system”	Mbée, 2011; PADY 2 (2016)	User interface discharges directly to a decentralised foul/separate sewer User interface discharges directly to soak pit User interface discharges directly to water body	0.6	0.3~1	T1A1C4	T1A1C5	T1A1C7
VIP “dry latrine”	PADY 2 (2016)	Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	11.2	5.6~6	T1B7C10		
Toilette à fosse septique “septic tank connected to soakpit”	PADY 2 (2016)	Septic tank connected to soak pit Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	34.6	17.2~17	T1A2C5	T2A2C5	

Sanitation technology and system defined by:			% of population directly from the literature	% to be used for SFD generator	SFD references variables	
Local terms	Referen-ces	SFD Terms				
Latrines à fosse perdue "unlined pit, no outlet, no overflow"	PADY 2 (2016)	User interface discharges directly to open drain or storm sewer Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	31.8	15.9~15	T1A6C10	T2A6C10
Latrine traditionnelles non améliorées "unlined pit, no outlet, no overflow"	PADY 2 (2016)		21.8	10.9~10	T1A6C10	T2A6C10
Rejet dans le milieu naturel "open defecation"	PADY 2 (2016)	Open defecation	0.6	0.3~1	T1B11C7T0C9	
Total			200.6	100.0	-	

2.1.1 Sanitation facilities

This section describes the existing sanitation facilities found in Yaoundé either in institutional and commercial establishments or in households (Figure 3). Data presented in this section are related to percentages found in documents and not the percentage used to generate the SFD.

There are 1809 institutional establishments in Yaoundé[10], which includes schools, universities, hospitals, government offices and private offices. As for commercial establishments, there are 696 in Yaoundé[11] including shops, cinemas, theatres, hotels and restaurants.

Public toilets

According to KIIs with the Municipality of Yaoundé, it is reported that 56 public toilets exist in Yaoundé, mainly located in town, markets and green spaces. Nevertheless, no public toilets are found in slum areas. The inhabitants in slum areas tend to defecate in plastic and discard it into the nearest river or open drain. The public toilets are connected to septic tanks, which fulfil sewerage management and technical system requirements as stipulated in the Urbanism code[12] and the National Association of Town Planners under Ministry of Housing and Urban Development (MINHDU).

In summary, 80% of public toilets are in a good condition, while 20% of the septic tanks are found to be in bad condition, due to poor management. Users are used to throw different types of objects inside the containment, which leads to the malfunction of septic tanks. Citizens usually pay US$0.2 for defecating, US$0.1 for urinating and US$0.4 for bathing in

[10] *INS/RGE (2009)*

[11] *Ibid*

[12] *This Urbanism code is not yet published by MINHDU*

these public toilets. A manager is in charge of each public toilet found in Yaoundé, however; no data is collected by the Municipality related to faecal sludge management.

School sanitation

It is reported by CUY/RASOP-Africa (2016), that three types of sanitation facilities exist in school establishments:

- Septic tanks connected to soak pits were found in 32.9% of school establishments;
- Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow were found in 20.7% of school establishments;
- Unlined pit, no outlet or overflow were found in 46.3% of school establishments.

Less than 1% of school establishments do not have a sanitation facility. This was especially observed in schools located at the peripheral of Yaoundé, while 40.9% of schools do have sanitation facilities abiding to MDGs goals.

Hospital establishments

The same above-mentioned report notes that in hospital establishments exist two types of sanitation facilities:

- Septic tanks connected to soak pits were found in 81.0% of hospital establishments;
- Unlined pit, no outlet or overflow were found in 19.0% hospital establishments where 5% abide to MDGs goals and 14% do not.

There are 15 public hospital establishments in Yaoundé and many private hospitals.

Commercial areas

Commercial areas are made up of shops, complex, hotels, markets, among others, where business activities take place. All the commercial and market places have toilets inside their building. The technology in place is not very clear but the faecal sludge (septage) is emptied from the containment more than three times per year. Most of these toilets discharge their waste into open drains. In markets, 87% discharged wastewater in nature and meanwhile 3% discharged it to a soakpit (PADY2, 2016).

Households

According to CUY/RASOP-Africa (2016), 98% of households used on-site sanitation facilities in Yaoundé. 78% used sanitation facilities abiding to MDGs goals with 35% of them using septic tanks connected to soak pits. About 0.6% practiced open defecation and 0.6% used decentralised separate sewers. In summary, four types of on-site sanitation systems are found in Yaoundé:

- 17 % of fully lined tank (sealed) connected to a water body (ENSP/L3E, 2014);
- 15.2% of pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow, also called VIP latrines (ENSP/L3E, 2014 and CUY/PADY 2, 2016);
- Septic tank connected to soak pit (43.2%) and septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution (15.4%) according to ENSP/L3E, 2014 and CUY/PADY 2, 2016;

- 91.6 % of unlined pit, no outlet or overflow (CUY/PADY 2, 2016) and 16% of unlined pit where there is a 'significant risk' of groundwater pollution (ENSP/L3E, 2014);

In 2015, Yaoundé had 669,546 households with an average of 4.63 persons per household. Due to the lack of data on excreta generated from schools, markets and hospital, these were not taken into consideration for the SFD generation. Only data from households were used. The author also assumed that ‘’latrine without containment/tank’’ is a type of ‘’open defecation’’.

Sanitation system found in a school in Yaoundé

Sanitation system in a school establishment located in the peripheral of Yaoundé

Sanitation system found in hospitals

Final destination (Biyeme River) of wastewater and faecal sludge from the Biyem-Assi network

Final destination (Mefou River) of wastewater and faecal sludge from the Mendong network

Figure 3: On-site sanitation system in Yaoundé and disposal of wastewater and faecal sludge from off-site sanitation systems (CUY/PADY2, 2016)

2.1.2 Containment

Data presented in this section are related to percentages found in documents and not the percentage used to generate the SFD because the total surpasses 100% due to different researchers and different population pools. Please refer to Table 1, for final consolidated numbers used to generate the SFD.

The existing decentralised separate sewer covers 0.6% of the population. Among the five off-site sanitation systems Biyem-Assi (1982), Cité Verte (1980), Grand Messa (1968), Nlongkak (1967) and Mendong (1992) which exist in Yaoundé, only three of them have been restored in 2010: Messa, Biyem-Assi and Cité Verte. Although restored, these are not well functioning (ERA-Cameroun, 2010). According to CUY/PADY 2, 2016, the rest of the city (99.4%) depends either on septic tanks (34.6%) or on pit latrines (64.8%). However, according to ENSP/L3E, 2014, 23% of the population depend on septic tanks and 77% on pit latrines. Among those who used latrines, 77.6% used latrines abiding to MDGs goals (CUY/PADY 2, 2016). More so, 93.2% of households have latrines meanwhile, 6.8% do not have latrines (CUY/RASOP-Africa, 2016). 15.4% of septic tanks are generally not adhering to the design prescribed by the National Association of Town Planners based on the Urbanism Code, which is not yet published by MINHDU. In non-flooded-areas, people built their containments deep at a depth ranging from 10 to 20m.

For the SFD elaboration, these percentages were aggregated to not surpass 100 % (see data on the fifth column in Table 1). The formula used to aggregate data is given by:

% SFD = (%from literature x 100) / (Sum of all % from literature)

2.1.3 Emptying

In Yaoundé, three types of desludging faecal sludge exist: manual (assumed as 30%), mechanical (60%) and nature (0.6%). A dumping site exists in Mbankomo, a municipality located 25km far from Yaoundé. The total production of faecal sludge in Yaoundé varies between 900 and 1,300 m^3/week (Mougoué et al. 2012). Each household paid about US$16/$m^3$ for emptying. There is neither a regulation nor a law that requires households, hotels or restaurants to empty their sanitation facilities. Emptying is arranged privately when necessary.

Specific faecal sludge production with lower value quantification is 0.74±0.71 kg/inhabitant/day in Yaoundé. However, 67% of septic tanks are regularly emptied whereas less than 5% of latrines of all types are regularly emptied. This is only for pit latrines with a tank because the other types discharge faecal sludge either in the nature or in rivers/open drain (Mougoué et al., 2012). Three types of emptying exist in Yaoundé (Ndeuhela, 2012):

- Mechanical emptying: Offered by 16 privates companies. The cost per mechanical emptying for a household varies from 160 to US$200.
- Manual emptying: The city of Yaoundé has manual emptying but we do not have the exact number. The cost of manual emptying varies from 150 to US$160. This activity is practiced most of the time without personal safety equipment.
- Open ground: finally, households along the rivers practice emptying in water body.

2.1.4 Transport

About 20 trucks exist (from 6 to 14m^3 trucks) but only 16 were operational in July 2017. These trucks are 20 to 40 years old. Sixteen private companies exist in Yaoundé which created an association called ROCOBY[13] to better manage their activities. The cost of the trucks when imported to Cameroon varies between 24,000 to US$30,000 and, after buying the trucks, private companies are in the obligation to restore these and spend about US$4,000. About 40% of faecal sludge is not collected and transported to the dumping site located 25km far from the city of Yaoundé. There is no site for parking and no call centre to better manage the activity.

2.1.5 Treatment

In Yaoundé, there is no treatment plant station for faecal sludge. In other words, there is no treatment of faecal sludge discharged in the dumping site of Nomayos[14] even if 60% of faecal sludge collected and transported is discharged there.

Each emptier pays an amount of US$10 sharing between Mbankomo Municipality (60%) and the community of Nomayos (40%) to get access to this site. Added to these fees, each emptier pays every month to the owner of this site an amount of US$150. Despite this, the state of the road is still in a bad condition. However, one treatment plant for faecal sludge will be put in place in the next two years through the intervention of AIMF[15] and RASOP-Africa program with the Bill and Melinda Gate Foundation financial support.

As for the 13 wastewater treatment stations which existed between 1967 and 1990, almost all are dysfunctional. However, since 2010, the Municipality with the financial support of the Ministry of Housing and Urban Development has restored three of them, nevertheless inadequately. Therefore, of the wastewater (WW) delivered (36%) to these treatment plant stations, only 64% of it is actually treated (Mbée, 2011).

2.1.6 Disposal/End-use

This activity is not documented for the city of Yaoundé. However, some people use faecal sludge from manual emptying as manure in farms (MAFADY, 2011-2014).

[13] *Réseau des Opérateurs de Collecte des Boues de vidange à Yaoundé*

[14] *Site belongs to a private and under the authority of the municipality of Mbankomo and not, the municipality of Yaoundé*

[15] *Association Internationale des Maires Francophones*

2.2 SFD Matrix

The final SFD Matrix for the Yaoundé is presented in Figure 4.

Yaoundé, Centre, Cameroon, 16 Aug 2018. SFD Level: 3 - Comprehensive SFD
Population: 3660082
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 100%

System label	Pop	W4b	W5b	F3	F4	F5
System description	Proportion of population using this type of system	Proportion of wastewater in sewer system, which is delivered to decentralised treatment plants	Proportion of wastewater delivered to decentralised treatment plants, which is treated	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated
T1A1C4 User interface discharges directly to a decentralised foul/separate sewer	1.0	36.0	64.0			
T1A1C5 User interface discharges directly to soak pit	1.0					
T1A1C7 User interface discharges directly to water body	1.0					
T2A2C5 Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	9.0			67.0	60.0	0.0
T1A2C5 Septic tank connected to soak pit	20.0			67.0	60.0	0.0
T1A3C7 Fully lined tank (sealed) connected to a water body	8.0			100.0	0.0	0.0
T2A6C10 Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	16.0			5.0	60.0	0.0
T1A6C10 Unlined pit, no outlet or overflow	35.0			5.0	60.0	0.0
T1B7C10 Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	8.0					
T1B11 C7 TO C9 Open defecation	1.0					

Figure 4 : Selection Grid for sanitation facilities in Yaoundé

2.2.1 *SFD Matrix explanation*

Data aggregated and explained in this section are those used for the SFD, consolidated and adjusted from the literature.

According to CUY/RASOP-Africa (2016), approximately 1% of the population is dependent on off-site sanitation systems, i.e. decentralised separate sewers. The user interface discharged directly to a soakpit is 0.5%. The user interface discharged directly to a water body is also less than 0.5%. In order to avoid having zero for this category of off-site sanitation system, which exists, the percentage has been rounded-up to one. However, the user interface discharged directly to storm sewer or open drain or in open ground is less than 0.3 (near zero). 36% of wastewater is delivered to the treatment plant restored in 2010 (Messa, Biyem-Assi and Cité Verte) but only 64 % are treated (Mbee, 2011).

98.9% of the city are dependent on on-site sanitation systems (OSS), out of which 29.2% are dependent on septic tanks. We assume here according to the geology of Yaoundé that about 2/3 of septic tanks abide to the National Association of Town Planners standards. We also assume that around 70% of septic tanks do not present a risk to groundwater, whereas around 30% present a high risk.

For unlined pits, which 53.6% of the population are dependent on, we also assumed that about 2/3 of them do not present a risk to groundwater (35%) and the remaining present a high risk (16%). More than 60% of the areas in Yaoundé are non-flooded areas, meanwhile less than 40%, which represent slum areas, are flooded-areas. According to Mougoué and al. (2012), less than 5% of this type of OSS is emptied. Finally, we also assume that latrines without containment are a type of open defecation which affects approximately 0.6% of citizens.

Table 2: Description of variables used in SFD

Variables	Description
W4b	Wastewater (WW) delivered to decentralised treatment plant
W5b	Wastewater (WW) treated by the decentralised treatment plant
W4c	Wastewater (WW) in open sewer or drain which is delivered to treatment plant
W5c	Wastewater (WW) in open sewer or drain which is treated by treatment plant
F3	Proportion of faecal sludge (FS) emptied from septic tank or from fully lined tank connected to a water body or from unlined pit
F4	Proportion of FS delivered to the dumping site of Nomayos
F5	Proportion of FS delivered to the dumping site of Nomayos and not treated
	No toilet. Open defecation

All the percentages of these variables were collected from reports (Table 2). For instance, according to Mbee (2011), 36% of WW is delivered to treatment plants and only 64% are treated. More so, according to ENSP/L3E (2014), 67% and 5% respectively of septic tanks and latrines are emptied. In addition, according to ENSP/L3E (2014) and CUY/RASOP-Africa (2016), the site of Nomayos received only 60% of FS collected by trucks in Yaoundé. The remaining is discharged in nature.

It can be concluded that the excreta of 49% of the population is managed safely in Yaoundé city and 51% of excreta is discharged unsafely to the environment.

2.2.2 Risk of groundwater contamination

The MAFADY research project carried out field investigations between 2011 and 2014 in order to locate and obtain sanitation system technical characteristics and subsequently assess its significant risks to the groundwater. It was found that people construct pit and soakpits too deep, as it is believed that these would last longer and there would be no need to empty these.

Approximately 60% of Yaoundé's residents rely on groundwater: 26.5% used springs, 49.7% used wells, 18.3% used boreholes, and 5.5% used other sources of water (PADY2, 2016) for drinking purposes (Tabué Youmbi, 2009). More so, according to ENSP/L3E (2014), less than 20% of the area is not suitable for sanitation facilities due to high levels of groundwater as the water table is less than 2m from the topographic ground. In slums, pit latrines are found at a distance less than 30m for 78% of wells, boreholes and springs (Zouroumba, 2011). Data on the relative elevation of groundwater sources to on-site sanitation facilities are available, as well as data on septic tank proximity, water table depth and protection of groundwater sources which were collected.

According to Feumba, 2005; Tabué Youmbi, 2009, two types of aquifer exist in Yaoundé:

- Shallow aquifer from 0 to 20m of depth;
- Lower aquifer or faulted aquifer from more than 20m depth.

The basement is made up of faulted metamorphic rock, which is underlaid by ferralitic soils in non-flooded areas and hydromorphic soils in flooded-areas. Data is also available on faecal coliform contamination. In slum areas, 97% of wells show a high concentration of faecal coliforms and the concentration of faecal coliforms decreases as the distance between sanitation facilities and water points increase to more than 30m (Nganti, 2012).

In conclusion, the risk of groundwater pollution is high when containment of on-site sanitation facilities is in contact with the same aquifer captured by wells/boreholes and when these technologies are built near a water body.

2.2.3 Certainty and uncertainty levels of associated data used for the SFD Matrix

It is important to mention that all data presented in this report come from the same team of researchers.

The first set of data was collected between 2011 and 2014 considering the whole chain of sanitation in the city of Yaoundé.

The second period of this set of data is between 2015 and 2018 considering the whole city of Yaoundé. The population pool at this level included each ward of each city council of Yaoundé. All these data have been at all-time shared with stakeholders and the municipalities.

There certainty level of this data is high for the elaboration of this SFD Matrix. All data presented in this report were also used by other institutions in order to elaborate the National Liquid Sanitation Strategy of Cameroon and for Yaoundé.

2.3 SFD Graphic

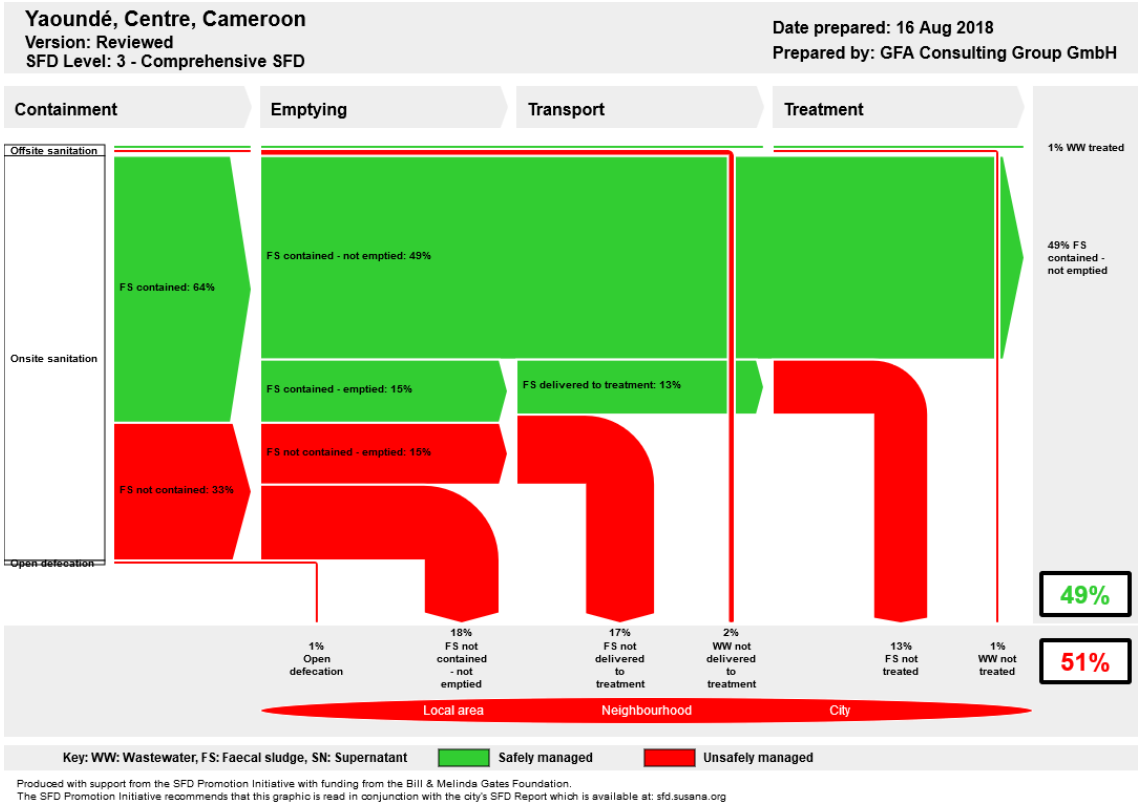

Figure 5 : SFD Graphic for Yaoundé

It is estimated that only 49% of faecal sludge and wastewater is treated and safely managed in Yaoundé (Figure 5). This 49% is composed of sludge that remains in onsite containers (except for 1% from safely managed wastewater in offsite systems). The majority of this 49% is attributable to excreta in the unlined pits (T1A6C10), which are in areas where there is a low risk of groundwater pollution.

Part of the remaining 51% is discharged either directly into a water body or to the soil or is disposed in the dumping site located 25km far from Yaoundé but, upstream to the main river from which water is pumped to supply the city of Yaoundé. This dumping site is called “Nomayos”, a city which belongs the Municipality of Mbankomo. Related to septic tanks which represent about 35% in Yaoundé, approximately 30% of this technology presents a high risk to groundwater pollution and 70%, a low risk to groundwater pollution. Add to this and according to CUY/PADY2, 2016, about 20% of the resident of Yaoundé used unsafe pit latrine which are also in contact with groundwater. According to ENSP/L3E, 2014, 30 to 40% of faecal sludge is not transported by mechanical emptiers to the dumping site of Nomayos. INS, 2008 underlined that in Yaoundé, only 56% has an improved latrine. This percentage according to ENSP/L3E, 2014 is around 40%. The same report underlined that 4% of resident has a VIP latrine. Moreover, according to the same author, 56% of faecal sludge come from household (there are no data related to sanitation technologies of schools, hospital and commercials establishments) and unsafely discharged to “Nomayos”. That is why, we can conclude with regards of recent data collected in 2014 (MAFADY project) and 2016 (RASOP-Africa project) that, the percentage of safely managed faecal sludge is around 49% and the remaining, 51% is not safely managed.

3 Service delivery context

3.1 Policy, legislation and regulation

The Growth and Employment Strategy Document established by the Government in 2009 describes the strengthening of the institutional framework through: improving the regulatory framework, strengthening the Planning - Programming - Budgeting - Monitoring, developing standardization and quality, developing the private sector and finally developing human resources. The analysis of the texts makes it possible to distinguish three main periods[16] in the institutional evolution in Cameroon affecting liquid sanitation management. The main laws concerning water and liquid sanitation management date from the 2000s. These are followed by several decrees specifying institutional roles and responsibilities.

3.1.1 Policy

Cameroon's liquid sanitation policy context has the:

- Act's Framework Law on Environmental Management (Law No. 96/12 of 5 August 1996) which sets out the principles for environmental management;
- Water Law (Law 98/005 of 14 April 1998) which defines the framework for water resource management and protection;
- Urbanism Law (Law No. 2004/003 of 21 April 2004), which sets broad guidelines for urban planning and defines the key operational planning tools;

In 2004, a set of laws on the orientation of decentralization was adopted. These laws organize the transfer of competences to local authorities (municipalities and cities councils):

- Law 2004/017 of 22 July 2004 on the orientation of decentralization clarifies the framework and guiding principles of decentralization in Cameroon;
- Law 2004/018 of 22 July 2004, which clarifies municipalities' roles and responsibilities with regards to services rendered to the population. Liquid sanitation is part of the services transferred;
- Law 2004/019 of 22 July 2004, which clarifies rules applicable to regions. For the moment, the regions are not yet decentralized territorial entities.

Until 2008, the effects of the laws mentioned above remain practically unseen. However, since 2008, the implementation of decentralization becomes more proactive with the adoption of several Decrees relating to the actual transfer of certain powers to municipalities:

- Decrees of January 2008 move from two to fourteen, the number of Urban Cities Council in 2010;
- Decrees of February 2010 transferred the power of nine ministries to decentralized territorial communities including the Ministry of Water Resources and Energy (MINEE). However, capacities or skills transfer were not effective for the ministry in charge of environment, Urban Development or Mines, Industry and Technology Development (MINMIDT) in 2010. In 2011, the Ministry of Housing and Urban Development (MINHDU) transferred the competences for the control and the approval of the tools of operational

16 1996 and 1998 with the law on environment and water resources, 2001 with the law of protection of water resources, 2010 till todays with few laws on sanitation (liquid specially)

planning to the municipalities. Beyond the building permits, the municipalities must approve permit applications and issue planning certificates for any development or construction operation on its territory. These tasks assigned to the Cities Councils give the opportunity to follow the new locations of human settlements and therefore sanitation systems.

The new competences transferred to municipalities date from 2012. Environmental monitoring of settlements is crucial for environmental impact assessment, of which its approval is left to municipalities. This environmental impact notice is required for all local companies.

3.1.2 Institutional roles

In this section, the roles and prerogatives of the various institutional and private actors in charge of sanitation will be presented. The Urban Water Sector Policy Letter signed by the Prime Minister in April 2007 is in line with Law No. 98/005 of 14 April 1998 on Water and the implementing decrees related to the reform of the water sector. With this Letter, the Prime Minister gives the main strategic axes for the development of the liquid sanitation sector in an urban environment. It is about:

- Restoration of existing decentralized separate sewers;
- Promotion of appropriate sanitation techniques at low costs;
- Implementation of liquid wastes management agreements between public authorities and companies delegated with public services of the distribution of drinking water;
- Strengthening of the sector's recovery actions.

The Prime Minister also coordinates the activities of other ministerial departments in the follow-up of the Government's action. The ministerial departments directly involved in sanitation, water and hygiene are:

- Ministry of the Environment, Protection of Nature and Sustainable Development (MINEPDED);
- Ministry of Water Resources and Energy (MINEE);
- Ministry of Housing and Urban Development (MINHDU);
- Ministry of Public Health (MINSANTE);
- Ministry of Basic Education (MINEDUB);
- Ministry of Secondary Schools (MINESEC);
- Ministry of Mines, Industry and Technology Development (MINMIDT).

Added to these Public Institutions, Cameroon also has Non-Governmental Organizations, Private Sector, Development Partners, Donors and Universities. Table 6 in Appendix 2 presents the matrix of roles of different actors involved in sanitation in Cameroon. In addition to these actors, Yaoundé also has donors such as:

- The African Development Bank (AfDB) involved in the second phase of Yaoundé Sanitation Project (PADY2). The second phase of this project, which covers the period from 2014 to 2018, includes investments in the area of rainwater drainage (14km of primary drainage) and an information, education and communication activity for

behavioural change of citizens on flood risk management and climate change adaptation, waste management, hygiene and health. This project does not include sanitation interventions.

- The French Development Agency is also involved in PADY2 in the city of Yaoundé.
- IRINGO, a Norwegian donor is involved in the financing of sanitation in Yaoundé.
- Bill and Melinda Gates Foundation (BMGF) is involved with AIMF17 in the implementation of the first faecal sludge treatment station plant for Yaoundé.

The inter-relationships of various departments play an important role in the quality of services delivered to the community and citizens of Yaoundé.

3.1.3 Service provision

The most striking example of the lack of defined roles and responsibilities in Cameroon was highlighted through the MAFADY project. In Cameroon, there are seven different departments at the national level with a responsibility for the management and remediation of wastewater and excreta, with three departments at the district level. The institutional assessment conducted found that there is little coordination between them and several areas of overlap. For the service provision in liquid sanitation, Yaoundé has:

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

According to Article 88 of Law N° 96/12 of 5 August 1996 on the Framework Law on Environmental Management in Cameroon, MINEPDED is responsible, together with other relevant administrations, for research, recording of offenses and prosecution of offenses against legal and regulatory dispositions. Decree N° 2011/418 of 9 December 2011 on the organization of the Government does not give explicit tasks to MINEPDED in the field of sanitation. This decree states that this department is responsible for drawing up, coordinating and monitoring the implementation of the national environmental policy and the protection of nature for sustainable development.

However, with respect to the definition of the technical requirements, it can be noted that MINEPDED has a role in sanitation. Indeed, according to the same decree of December 2011, MINEPDED is responsible for drawing up sectorial master plans for environmental protection, together with the ministerial departments concerned. MINEPDED is also responsible for defining environmental management measures, coordinating and monitoring the interventions of regional or international cooperation agencies in the field of environment. According to Article 35 of this Decree, the Standards and Control Department is responsible for the development and monitoring of compliance to environmental standards through its directives and standards, environmental inspections and control. This includes the definition of environmental standards and those linked to partners concerned, the issuance of environmental agreements, notices and environmental approvals, the definition of the environmental and nature conservation tax, and the monitoring of environmental revenue collection and nature protection in liaison with the Ministry of Finance.

[17] *Association Internationale des Maires Francophones*

One of the functions of the Regulatory, License and Environmental Agreements Department under this Directorate is "examination of building permit files, in collaboration with the administrations concerned" (Article 38). This attribution also belongs to MINHDU, which reflects the overlapping of some of the attributions of these two ministerial departments. In addition, MINEPDED has included in its national waste management strategy in Cameroon, aspects related to sanitation problems that MINEE, MINHDU, and other ministries listed above. Finally, MINEPDED is involved in the regulation of the sanitation sector.

The Ministry of Water Resources and Energy (MINEE)

The general mission of this ministerial department has been specified and further detailed in Decree No. 2011/408 of 9 December 2011, on the organization of MINEE. Article 1 of this Decree states that the Minister of Water Resources and Energy is responsible for developing, implementing and evaluating the Government's water and energy policy. The MINEE organization chart was adopted by Decree 2012/501 of 7 November 2012. This decree creates within the Directorate the sub-department for liquid sanitation (Article 38) to deal with the protection of water resources. This sub-department is in particular responsible for:

- Participation in the development and implementation of liquid sanitation policies and strategies, in collaboration with relevant administrations and agencies;
- Participation in the development of discharge standards in environment and standards for the construction of liquid sanitation facilities;
- Monitoring of the activities of operators involved in the delegation agreements for public drinking water and liquid sanitation services in urban and peri-urban areas;
- Participation in the control of the execution of the activities of collection, transport, and treatment of wastewater, carried out by means of facilities and public infrastructures within the framework of the delegation agreements of the public services of the drinking water and liquid sanitation in urban and peri-urban areas;
- The updating of the file of sanitation facilities and data of liquid sanitation;
- Control of pollution and water withdrawals, linked with the administrations concerned.

This sub-division comprises three services;

- Liquid Sanitation in Urban and Peri-urban Areas;
- Liquid Sanitation in Rural Areas;
- Monitoring of the Maintenance Service.

The Ministry of Housing and Urban Development (MINHDU)

According to Decree N° 2011/408 of the 9th December 2011 on the organization of the Government, MINHDU is responsible for the development and implementation of the Government's policy on housing and urban development. It intervenes directly in the sanitation sector by:

- monitoring compliance with sanitation, hygiene and drainage standards;
- monitoring removal and/or treatment of household waste.

The MINHDU, through the Urban Operations Department, is the project manager for the sanitation facilities and drainage. The same functions are attributed to the Ministry of Energy

and Water without a framework for consultation between these two departments to be specified. In addition, the MINHDU is responsible to:

- Elaborate standards for sanitation, drainage and monitoring;
- Elaborate standards for hygiene and sanitation, removal and or treatment of household waste, as well as monitoring compliance with these standards;
- Develop and implement habitat improvement plans, both in urban and rural areas;
- Define and control the application of building standards;
- Develop standards for studies, in relation with the administrations concerned;
- Restructure drainage facilities and their control;
- Plan, restore drainage plans for cities and neighbourhoods;
- Monitor the application of hygiene and sanitation rules in the execution of new facilities;
- Participate in elaborating standards for social housing.

With regard to the operation of sanitation facilities, article 25 of the June 2005 decree cited above stipulates that the Urban Development Department is responsible for the implementation of infrastructure management strategies (which should include sanitation networks). MINHDU provided budget support to the Municipality of Yaoundé for the restoration of decentralized separate sewer (Messa, Cité Verte and Biyem Assi).

The Ministry of Public Health (MINSANTE)

The Ministry of Public Health according to Decree 2011/208 of 9 December 2011 on the organization of the Government is responsible for the development and implementation of the Government's public health policy. MINSANTE intervenes in the sanitation and hygiene sector through the Sub-Directorate of Hygiene and Sanitation and the Department of Environmental Hygiene created by Decree N°2002/209 of 19 June 2002, organization of the Ministry of Public Health. According to article 67, paragraph 1 of the mentioned decree, the Sub-Directorate for Hygiene and Sanitation is responsible for:

- Definition of personal and collective hygiene measures;
- Promotion of environmental health, in collaboration with the concerned ministries;
- Certification of water quality standards and the control of their compliance, in collaboration with the concerned ministries;
- Regulation of environmental remediation activities, in collaboration with the concerned ministries;
- Registration of pesticides and disinfectants used in public health;
- Sanitary control of the food and polluting industries;
- Promoting water quality in primary health care activities;
- Approval of technologies used in the treatment of drinking water.

It is clear from Article 68, paragraph 1 of the decree of 19 June 2002 that the Environmental Health Service is responsible for:

- Promotion of environmental health, in collaboration with the relevant technical services;
- Technical support to local and regional authorities in hygiene and environmental health;
- Participation in the drafting of texts on hygiene and sanitation;

- Registration of pesticides and disinfectants used in public health;
- Control and monitoring of radioactive effects and pollutants;
- Definition of personal and collective hygiene measures;
- Sanitary control of the food and polluting industries;
- Monitoring hygiene and sanitation activities.

The Minister of Public Health has issued a decree that specifies the conditions to be met by the mechanical emptying companies in the exercise of their profession. This decree is not really followed in the field.

SIC[18] and MAETUR[19]

These companies, generally called para-public companies, are under MINHDU and are responsible for maintaining off-site sanitation systems built to serve real estate houses since 1952. It receives payment by the tenants for maintenance of the buildings and the decentralised separate sewer system.

CAMWATER[20] and CDE

The Cameroon water utilities corporation was also a para-public company under MINEE, but since 2016 Government took control of this entity. The reform of the drinking water sector started in 2005 and set up an organization for the production and distribution of drinking water for 105 urban areas gathering a total population of 8.7 million inhabitants out of which more than half are concentrated in the cities of Yaoundé and Douala. This reform separated the functions of financing and development of infrastructures, which was given to CAMWATER. It is therefore responsible for technical aspects of the water distribution and commercial exploitation of the service, which comes under the competence of the «Camerounaise des Eaux» (CDE).

Crédit Foncier du Cameroun (CFC)

CFC is also a para-public company under the governance of two ministries: the Ministry of Finance for financial aspects and the MINHDU for technical aspects. The mission of the CFC is to provide financial support for any project to promote housing (article 3 of its creation).

Decentralized Territorial Communities

The competences transferred to the municipalities generally include urban planning, sanitation (mainly solid sanitation), and sanitary police. The competence transferred to the sanitation sector, however, is not clearly defined. Decree N° 2011/0006 / PM of 13 January 2011 transferred by the Government to the municipalities, the creation and maintenance of roads, in Article 6, transfers cleaning of drainage and sanitation systems to municipalities. In the current organization of the Municipality of Yaoundé, the sanitation tasks are divided between three departments within the Technical Services Department: Technical Services Directorate, Environmental and Hygiene Service and Urbanism Department.

[18] *Société Immobilière du Cameroun*

[19] *Mission d'Aménagement et d'Equipement des Terrains Ruraux*

[20] *Cameroon Water Utilities Corporation*

Mechanical and manual emptiers

There are currently about 16 emptying companies and 20 manual emptiers commonly called "scavengers". This activity is commonly practiced without any safety equipment.

Households

Households finance the construction and maintenance of on-site sanitation facilities that largely dominate the city.

Non-Governmental Organisations (NGOs)

NGOs are developing innovative projects in the field of semi-collective sanitation, improvement of autonomous sanitation, hygiene awareness and construction of improved latrines in schools. ERA-Cameroun is an example of NGO that developed VIP latrines in many areas in Yaoundé.

The owners of dumping sites of Nomayos in the Mbankomo Municipality

The owner of the site receives monthly payments of US$150 from the emptiers who deposit faecal sludge. In order to get access to this dumping site, each truck pays a sum of US$10 per rotation, out of which US$6 go to the community of Nomayos and US$4 to the Municipality of Mbankomo. The weekly volumes of dumped sludge vary between 900 and 1350m^3 with average weekly financial flows of US$900.

3.1.4 Service standards

There are no standards for faecal sludge management in Cameroon. Only the Decree N° 0003/A/MSP/SESP/SG/DPS of MINSANTE specifies conditions for faecal sludge exploitation and withdrawal from private companies (article 2).

MINEPDED elaborated a non-official standard for wastewater and it is the only document used to evaluate the performance of restored wastewater stations. It also elaborated a guide for hygiene and environmental control and inspection, and a standard for drinking water.

Law N° 98/005 / of April 14, 1998 on water and the Decree N° 2001/163 / PM of May 8, 2001 regulate the protection around catchments, treatment and storage of drinking water. Decree N° 2001/165 / PM of May 8, 2001 specifies the protection of surface and groundwater pollution.

3.2 Planning

3.2.1 Service targets

In Cameroon, only 14% of customers plan to empty their sanitation containments (ENSP/L3E, 2014). Although, there is a national liquid sanitation strategy, actions on the field are not executed.

The construction of the first treatment plant station for faecal sludge will take place in Yaoundé in Etoa, located in the southern part of the city. More so, within the framework of RASOP-Africa supported by FBMG, the city will benefit from two more treatment plant stations for faecal sludge, one in the eastern part and one in the centre part of Yaoundé. The city will also benefit from an Omni processor version 2 transforming waste into electricity, manure and drinking water.

3.2.2 Investments

In 2010, MINHDU transferred funds to the Municipality of Yaoundé to restore the Grand Messa, Biyem-Assi and Cité Verte Treatment Plant Stations. SOPREC was responsible for the restoration of these three treatment plant stations. Except of this, no other investments were done. The only investments since 2016 related to drainage sanitation were within the framework of PADY 2 with the financial support of BAD, AFD, FEM, and the Republic of Cameroon. However, the feasibility studies to restore the treatment plant for wastewater of Mendong was finished in 2015 and funds for construction will be transferred to the Municipality of Yaoundé by MINHDU in order to achieve the project. In addition, feasibility studies for the construction of treatment plant station for faecal sludge in Etoa (southern part of Yaoundé) are finished. The first workshop for validating the report done by STUDI International[21] was scheduled on September 11, 2018 in the Municipality of Yaoundé. The following table shows investments done in Yaoundé since 2010 by different donors.

Table 3: Sanitation projects in Yaoundé between 2010 and 2018

Project title	Year	Donors	Cost in US$	Responsible	Effectiveness
Restoration of treatment plant of Grand Messa	2010	MINHDU	1,040,000	Municipality of Yaoundé / SOPREC	Achieved but not well functioning
Restoration of treatment plant of Biyem-Assi	2011	MINHDU	920,000	Municipality of Yaoundé / SOPREC	Achieved but not well functioning
Restoration of treatment plant of Cité Verte	2012	MINHDU	640,000	Municipality of Yaoundé / SOPREC	Achieved but not well functioning
PADY 2	2016 – 2018	AFD, FDA, WEF, Republic of Cameroun	155,106,272 where 20% comes from AFD (loan); 3% from WEF (donation); 67% from FDA (loan) and 10% from Government of Cameroon (contribution)	Municipality of Yaoundé	Achieved Information, Education and Communication by Hydroconseil/ERA-Cameroun
Restoration of treatment plant of Mendong	Not yet but feasibility studies ended in 2015	MINHDU	3,200,000	Municipality of Yaoundé	Not yet implemented
Construction of treatment plant station for faecal sludge in Etoa	Not yet but feasibility studies ended in 2017	BMGF/AIMF	Approximately 6,000,000	Municipality of Yaoundé/ AIMF/ STUDI International	Will be implemented in 2019 and DELVIC/ERA-Cameroun will be responsible for management of this FSTP for 3 years
Request for financing the construction of 02 FSTP in Yaoundé	2017	FAE	91,983,108	Municipality of Yaoundé	Submitted to FAE

Other investments are related to water supply, mainly for boreholes. There is a real concern in terms of equity for the access to basic sanitation service.

[21] *A tunisian company specialised in sanitation purposes*

3.3 Equity

Equity is not taken into consideration at the national level. For instance, among the 56 public toilets in Yaoundé, only 70% of them are built considering compartments for women and men, but none of them for disabled people.

More so, in neither the Poverty Reduction Strategy Document (PRSD), the Rural Sector Development Strategy Document, the Livestock and Animal Industries Strategy Document (LAISD) nor the Growth and Employment Strategy Document (GESD), activities related to water and sanitation are mentioned.

With regard to the PRSD, equity is not mentioned. Only paragraphs 154, 297-301 are related to water resources. With regard to the GESD, the extracts from the paragraphs §182-187 are only devoted to water and sanitation.

In addition, the possibility of increasing the role of women, children and even the disabled in the management of boreholes and wells is to be mainstreamed through the gender approach. The implementation of these projects is done most of the time without integrating the concept of Community Lead by Total Sanitation (CLTS). Nevertheless, with the SAN-CAM project implemented in rural areas between January and December 2016 and, led by MINEE, this aspect has been taken into consideration during construction of sanitation facilities. More so, for sanitation facilities in school establishments, there is a separation between women (girls) and men (boys) compartments, but not for disabled children.

An effort has to be done with this concept of equity in sanitation facilities especially for disabled people either at the national or local level. For this purpose, MINEE and UNICEF published three documents in 2017 in order to solve this problem:

- National strategy of promoting water supply, hygiene and sanitation in school;
- National strategy of Community Lead Total Sanitation (CLTS);
- National strategy of Community Lead Total Sanitation (CLTS) in Cameroon: guide for its implementation.

The first document deals with sanitation technologies for disable persons and for young girls and boys who cannot use toilets safely (MINEDUB/UNICEF, 2017).

3.3.1 Current choice of services for the urban poor

During the implementation of MAFADY project in Yaoundé, the team of researchers dealt with this aspect of adapted sanitation technology for the urban poor. For this purpose, the research group proposed to Yaoundé 6 City Council stakeholders three types of technologies adapted to slums. Two types of areas were defined in Yaoundé:

- Zone 1: Areas of good on-site sanitation systems with a water table depth of more than 5m. This area represents isolated wards with less than 85% of the total area.
- Zone 2: Zones of average on-site sanitation systems aptitude, the depth of the water table varies between 2 and 5m. This area represents about 10% of the city's area. These are mainly hydromorphic areas and subject to exceptional floods.

The choice of these on-site sanitation systems for Yaoundé takes into account:

- Urbanistic constraints, particularly the area that can be reserved for sanitation facilities (4 to 8 m²);
- Capacity of households to pay to benefit from improved sanitation facilities (US$254). This funding can only be mobilized gradually by households (for an average of 6 months);
- Type of soil and especially the water table (more than 5m, between 2 and 5m);
- Implementation of the latrine, as well as its use by the households;
- Reduction of operating expenses, including the costs of emptying.

Based on these criteria, two (02) categories of latrines were identified:

- Single or double ventilated pit latrines (prototype 1) for areas with low groundwater;
- Single pit latrine (prototype 2) with an elevated containment where the water table is between 2 and 5m deep.

These technology designs (prototype 1 and 2) are already developed in Yaoundé, including the VIP latrines tested by ERA - Cameroon in the neighbourhoods of Yaoundé for more than 10 years. Prototype 1 and 2 are adopted and more than 60 of these types exist in Melen.

The following picture represents the design of these prototypes of on-site sanitation systems for the urban poor.

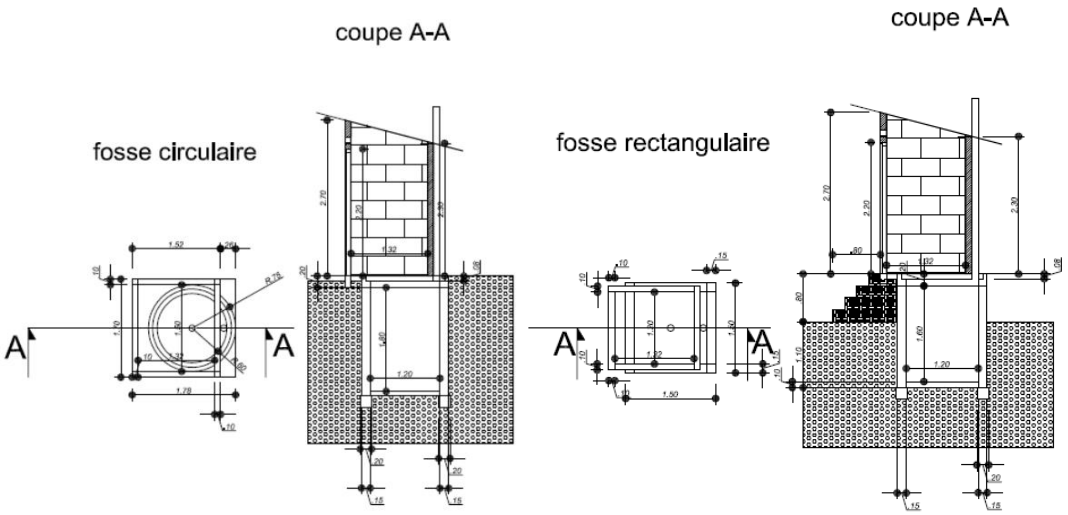

Figure 6 : On-site sanitation system in Yaoundé adopted by urban poor (ENSP/L3E, 2014)

3.3.2 Plans and measures to reduce inequity

Cameroon has not fulfilled the MDG related to water and sanitation. Its efforts were very limited because only 62% used improved sanitation facilities in urban areas and 27% in rural areas (ONU-Femmes, 2016). According to the National Strategy on Liquid Sanitation elaborated in 2011, the target to achieve this MDG was to reach 75% in urban areas and 57% in rural areas. In order to reach this, Cameroon needs to build 1,100,000 improved latrines before 2020 with the half in rural areas.

At the national level, the basic documents where this aspect is taken into consideration and related to sanitation facilities are Poverty Reduction Strategy Document (PRSD, 2009) and

Growth and Employment Strategy Documents (GESD, 2010). Unfortunately, sanitation aspects are not underlined in order to reduce inequity. They mainly deal with implementation of socioeconomic activities in order to reduce poverty.

3.4 Outputs

3.4.1 Capacity to meet service needs, demands and targets

Considering different projects implemented in Yaoundé in the sanitation sector, the main outputs obtained to meet service needs, demands and targets are:

- One diagnostic report on liquid sanitation by CUY/RASOP-Africa, 2016;
- Initial Yaoundé SFD by RASOP-Africa program (January 2018, not yet published);
- One audit report on the performance of the Municipality of Yaoundé in terms of sanitation done by ONAS;
- One Performance Improvement Plan by Municipality of Yaoundé;
- Two relevant staff members from the Municipality trained on FSM toolbox and SFD;
- 14 relevant staff members from the seven cities councils trained on SFD;
- 10 relevant staff members from ministries trained to the use of SFD generator;
- 31 experts trained on faecal sludge treatment technologies;
- Five decision makers carried out various Benchmarking missions in Dakar and Durban;
- One strategic plan for on-site sanitation systems;
- One request for financing submitted to African Water Facility (FAE) through the AfDB;
- A sanitation department was created inside the Municipality of Yaoundé since 2017;
- An authorized association of emptiers exists and operates on the field called ROCOBY.

The feasibility studies for the construction of the first treatment plant station for faecal sludge are finished and in the next coming months, Yaoundé with FBMG funding and the monitoring of AIMF, will implement this technology in the southern part of Yaoundé (Etoa). RASOP-Africa 2 (from 2019 to 2023), aims to construct two more treatment plant stations for faecal sludge and put in place a call centre for customers.

3.4.2 Monitoring and reporting access to services

At the national, regional or local level, each company must have an environmental agreement delivered by MINEPDED. To better follow the activities of each company, a **record sheet** is also delivered by the same institution that is to record information such as waste type, disposal for treatment, quantity collected, discharged and treated by the company or an authorised company if the former has not the required compliance to treat wastes produced or collected. This record sheet is filled by each company every time and a copy of this record sheet is transmitted to MINEPDED. MINEPDED is then in charge of controlling the type and level of treatment of wastes produced by each company. According to KIIs with emptiers of Yaoundé, this document (record sheet) has never been used.

Actually in Yaoundé (local level), there is no formal relationship between Mbankomo Municipality and Municipality of Yaoundé in terms of management of the Nomayos dumping site and there is no equipment for controlling the content of trucks which discharge in

Nomayos. The managers at the entrance gate of this dumping site are just interested in money received by each emptying company.

3.5 Expansion

3.5.1 Stimulating demand for services

Currently, there is no policy or strategy, which encourages households to empty their sanitations facilities or to express the desire to stay or to be connected to an off-site sanitation technology. That is why even for the restored decentralised separate sewers that exist in Yaoundé, the percentage of connected population is very low (0.6%). In addition, most of them have an on-site sanitation system for faecal sludge too, but still discharge wastewater in the network. Due to the dysfunction (badly used by households) and lack of maintenance of these networks by the Government, very few households defecate inside these (Figure 6).

Figure 7 : Household latrines used as ‘’containment’’. The network of Mendong (left) and house constructed above the network (right) (picture from Mbée, 2011)

Considering this lack of stimulating demand for services from households and other entities that exist and produce faecal sludge and wastewater, two training workshops on August 28-31, 2018, were organised in Yaoundé within the framework of the RASOP-Africa Program. Emptiers of Yaoundé, national emptier companies (Douala, Bafoussam, Bangangté...) and relevant ministerial departments participated. During this workshop and with the help of ROCOBY and other emptiers of Cameroon, the Municipality of Yaoundé committed itself to support ROCOBY in the implementation of information communication and education activities in Yaoundé in order to inform citizens. For this purpose, a call centre for customers in need of this service will be created inside the Municipality of Yaoundé. ROCOBY also promised to start elaborating flyers and stickers for the population of Yaoundé. In addition, the radio “Nkul Ongola FM 95.5” of the Municipality of Yaoundé will be used for free at this step to spread messages about activities related to faecal sludge and adequate containment for a better environment (how to build an on-site sanitation system? How to use an on-site sanitation system? What is the frequency of emptying an on-site sanitation system? What is the reasonable depth for the containment in Yaoundé?).

At the end of the above resolutions, a federation of all emptiers in Cameroon was created into one association and called “Fédération des Acteurs de la Chaine de valeur des Boues de Vidange au Cameroun’’. This federation will be responsible to increase visibility through local media of their activities to easily contact them for emptying services at low cost.

3.5.2 Strengthening service provider roles

The need to strengthen service provider roles is summarized in Table 4.

Table 4: Capacity building needs for operational actors of sanitation service chain (RASOP-Africa, 2016)

Operational actors	Capacity building needs
Households	○ Knowledge on building and use on-site sanitation facilities (especially containment); ○ Knowledge and application of operating containment facilities standards.
Municipalities	○ Capacity building on how to develop FSM services (organization of the sector, construction and operation of FSTP and Omni processor version 2, Monitoring of production of FS by-products processing); ○ Mobilization of finances and enhance capacities of human resources; ○ Reinforcement of the material capacities of the municipality; ○ How to create and manage a parking space for trucks; ○ Construction of the favourable environment to the sector; ○ Put in place a FSTP and how to manage it; ○ Inter-municipal cooperation for the realization of a shared faecal sludge treatment plant.
Masons	○ Application of construction standards for sanitation facilities for containment of wastewater and excreta; ○ Knowledge of how sanitation facilities do function;
Manual and mechanical emptiers	○ Elaboration of guide document for emptiers; ○ Knowledge of risks related to activity; ○ Knowledge and application of standards inherent in the collection, transport and disposal of faecal sludge; ○ Knowledge on how to manage a call centre; ○ Access to adapted technologies and suitable equipment for emptying all types of latrines; ○ Knowledge on maintenance of pumps; ○ Knowledge on how to manage a efficient equipment repair services; ○ Knowledge on how to get Access to finance; ○ Restore the road of the dumping site of Nomayos while waiting for the FSTP of Etoa; ○ Financial management of the activity.

4 Stakeholder Engagement

During the implementation of MAFADY project in Yaoundé (April 2011 to June 2014), the relevant departments were contacted through a letter prior field visits explaining the desire to discuss sanitation aspects in Yaoundé. At this step, the notion of SFD was not yet included in the research project. However, all data collected within the framework of this project were done for each step of the sanitation sector (containment, emptying, transport and treatment).

Key Informant Interviews (KIIs) were carried out with emptying companies and the relevant ministerial departments, seven cities councils and Municipality of Yaoundé. All relevant departments in each city council (Yaoundé 1 to Yaoundé 7) were involved in data collection with the team researchers of MAFADY project. All results were shared and updated during workshops organised by the researcher during implementation, a workshop organised every three months and a steering committee every six months. Quantitative and qualitative data on faecal sludge have been collected with the help of the Municipality of Mbankomo, the owner of the dumping site of Nomayos and the mechanical emptiers in order to propose an adapted technology for faecal sludge treatment if funding is ready. The ROCOBY association was then created.

The RASOP-Africa programme started in December 2016 and the notion of SFD was included in the deliverable assigned to the RASOP-Africa Consultant for Yaoundé. Hence, data collected in 2014 during KIIs was updated by other KIIs with the same relevant department and actors involved in sanitation in Yaoundé. Focus groups with mechanical and manual emptiers were done in August 2016 and KIIs in December 2017. During this time, meetings took place with relevant departments of the municipality. Problems encountered by emptiers during their activity in Yaoundé were solved (no parking in centre town, availability of engines from the Municipality of Yaoundé to restore the road of the dumping site of Nomayos …).

More so, a relevant department was created in the Municipality of Yaoundé and only dedicated to liquid sanitation during implementation of RASOP-Africa project. A donor (BMGF) also supported the Municipality financially to build its first treatment plant station for faecal sludge purpose in Etoa. In addition, the Municipality of Yaoundé with the engagement of its Head, submitted to African Development Bank another project in sanitation with the aim to build two more treatment station plants for faecal sludge and put in place in the city of Yaoundé, Omni processor version 2 for end use of wastes.

In August 23, 2018 in Yaoundé, a pre-validation workshop was organised in order to share the first result of this SFD elaborated for the city of Yaoundé by GFA Consulting Group as part of the “GIZ Sector Programme Sustainable Sanitation – Production of 10 SFD reports for cities around the world" funded by GIZ. Coordinators of PADY2, MINSANTE, MINEPDED, MINHDU, Hygiene and Sanitation Department of the Municipality of Yaoundé and of the seven cities councils of Yaoundé, Technical Advisor N°1 of the Municipality of Yaoundé, coordinator of RASOP-Africa Program and the consultant of this program for Yaoundé and the program director of African Water Association took part in this pre-validation workshop.

The list of persons contacted during MAFADY project, RASOP-Africa program and for this GIZ programme is presented in appendix 3.

Figure 8 : Stakeholders engaged during RASOP-Africa workshop in Yaoundé (23.08.2018) and presentation of the first result of SFD for Yaoundé.

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7 Appendix

7.1 Appendix 1: Stakeholder identification

Table 5: Stakeholder identification

N°	Stakeholder group	In Yaoundé context
1.	City council/Municipal authority/Utility	Department of sanitation in the Municipality
2.	Ministry of water and energy	Department of hydrology and hydraulic
3.	Ministry of Housing and Urban Development	Department of Urban development
4.	Ministry of Environment, Protection of Nature and Sustainable development	Department of standards and control (subdivided into three departments: standards and environmental regulations, standards and procedures and regulation of agreement and visa)
5.	Service provider for construction of on-site sanitation technologies	Local masons
6.	Service provider for emptying and transport of faecal sludge	ROCOBY
7.	Service provider for operation and maintenance of treatment plant station of wastewater restored in 2010	SOPREC
8.	External agencies associated with FSM services: e.g. NGOs, academic institutions, donors	ERA-Cameroun, National Advanced School of Engineering of Yaoundé, University of Yaoundé, AIMF, BMGF, IRINGO

7.2 Appendix 2: Stakeholder identification

Table 6: Matrix of responsibilities in liquid sanitation in Cameroon (Adapted from MAFADY project, 2014, updated)

Roles	National and Regional level							Local level							Regional level	
	Public institutions							Municipalities		Privates		Actors of requested services			Others	Overlaps noted
	MINEE	MINHDU	MINSANTE	MINEPDED	MINMIDT	MINESEC	MINEBUD	Municipalities	Cities councils	Small and middle companies	Emptiers	Household	Services (NGO)	Industries	University	
Elaboration of politic and strategy (local or national)	X	X						X	X							There is no national politic but, a strategy on liquid sanitation exist and not applied

Roles	National and Regional level							Local level							Regional level	
	Public institutions							Municipalities		Privates		Actors of requested services			Others	Overlaps noted
	MINEE	MINHDU	MINSANTE	MINEPDED	MINMIDT	MINESEC	MINEBUD	Municipalities	Cities councils	Small and middle companies	Emptiers	Household	Services (NGO)	Industries	University	
Elaboration of standards	X	X		X												There is no standards for buildings but, the strategy fix a minimum for households but not applied

Roles	National and Regional level							Local level							Regional level	
	Public institutions							Municipalities		Privates		Actors of requested services			Others	Overlaps noted
	MINEE	MINHDU	MINSANTE	MINEPDED	MINMIDT	MINESEC	MINEBUD	Municipalities	Cities councils	Small and middle companies	Emptiers	Household	Services (NGO)	Industries	University	
Control of discharge	X		X	X				X	X							There is confusion. The control is not concerted and only effective in companies
Town planning	X	X					X		X							This role is not true. Only few sketches of towns exist but, not followed
Regulation of the sector				X				X								Role not true. Only MINSANTE and MINEPDED tried to monitor this sector

Roles	National and Regional level							Local level							Regional level	
	Public institutions							Municipalities		Privates		Actors of requested services			Others	Overlaps noted
	MINEE	MINHDU	MINSANTE	MINEPDED	MINMIDT	MINESEC	MINEBUD	Municipalities	Cities councils	Small and middle companies	Emptiers	Household	Services (NGO)	Industries	University	
Promoting hygiene and encouraging services of emptying			X					X		X						This activity is only implemented by NGO
Achieving infrastructures	X	X	X			X	X	X	X	X						There is a melting pot of actor without concertation on the field
Developing and financing private infrastructures	X								X			X	X	X		MINEE starts to intervene in this domain with the SANCAM project but, households is the main responsible
Control of building standards		X						X	X							The control is just limited to the document presented for applying to building permit but, no control in field

Roles	National and Regional level							Local level							Regional level	
	Public institutions							Municipalities		Privates		Actors of requested services			Others	Overlaps noted
	MINEE	MINHDU	MINSANTE	MINEPDED	MINMIDT	MINESEC	MINEBUD	Municipalities	Cities councils	Small and middle companies	Emptiers	Household	Services (NGO)	Industries	University	
Exploitation of off-site sanitation systems																No actor for this activity
Exploitation of on-site sanitation systems (OSS)								X	X			X	X	X		Few NGO developed pilot project on public toilets
Financing public sanitation infrastructure	X	X	X			X	X	X	X	X						Many actors intervene with their budget or international donation
Operational research															X	The product of this research is not followed by stakeholders and also not much shared with them

7.3 Appendix 3: Tracking of Engagement

Date of interviews, list and contacts of persons met. The entire interviews have been made in 2014 and December 2017 and updated in August 2018 within the framework of "GIZ Sector Programme Sustainable Sanitation – Production of 10 SFD reports for cities around the world".

Table 7: Tracking of engagement

Name	Function	Structure	Contact
DJIOKO Emmanuel	Owner of truck and mechanical emptier	ROCOBY	670140224
DEBA François	Head of enterprise	ROCOBY	677632783
DJAMBOU	Head of enterprise	ROCOBY	677701367
FEUBI Christian	Head of enterprise (SOCAPA)	ROCOBY	675887855/698187485
FOKOU Guy	Emptier	ROCOBY	677838673
FOTSO CHATUE Martin	Owner of truck and mechanical emptier	ROCOBY	694171813
FOTSO Francis	Owner of truck and mechanical emptier	ROCOBY	699287958
FOTSO Guy	Owner of truck and mechanical emptier	ROCOBY	677555676/656624060
KENMOGNE Laurent	Owner of truck and mechanical emptier	ROCOBY	670267499
NANGA Sandrine	Chief of enterprise in Douala		655782205
PRESTIGE Hôtel	Owner of truck and director	ROCOBY	
TALOM Hubert	Owner of truck and director	ROCOBY	696525918/669655445/675273850
TCHOUNANG Emmanuel	Owner of truck and director	BEBETO & ROCOBY	696018818/677475089
YOS Macasse	Owner of truck and director	YOSA & ROCOBY	677 707 152
ZAMA Eric	Owner of truck	ROCOBY	677560438
ZIBI	Owner of truck	ROCOBY	675381168
KAMGANG Elie	Owner of truck	MEUYOU et Cie Sarl	699931548/673000565
M. Lewis NJONG et M. YUVEN	Head of branch	NFC Bank	
PETO David	Owner of truck and mechanical emptier	ROCOBY	
TALLA	Owner of truck and mechanical emptier	SUD DEPECHE	670403549
TEMME Michel	Owner of truck and director	TANGO Hotel	670496279/222226372
TCHOUPE Rostand	Owner of truck and director	TENE & FRERES	677970043
Mme EBELA	Landlord of the dumping site of Nomayos	Inhabitant of Nomayos	675116099
ATEBA Etienne Roger	Project coordinator of "Grand Yaoundé"	City Council of Yaoundé	677410525
NDZANA Arnauld Philippe	Technical advisor N°1	City Council of Yaoundé	699912926
TOUHE EVINI	Director of technical services	City Council of Yaoundé	
MAHOU	Head of hygiene	City Council of Yaoundé	699878119/661757505
MGUELE ZAMBO René	Head of technical service and hygiene	City Council of Mbankomo	698073753
POTTO Alain	Director of liquid sanitation	MINHDU	694831100/677425211
IDRISS KOUOTOU NJOYA	Vice director of liquid sanitation	MINEE	243231884/677437514
YAKANDJAKO Pierre VII	Environment and hygiene services	City council of Yaoundé 6th	699441623

Name	Function	Structure	Contact
NGAN ATANGANA Athanase	Head of technical service	City council of Yaoundé 6th	694479399
MVONDO Bertrand	Head of hygiene and sanitation services	City council of Yaoundé 7th	676176834
NGONGA Romain	Head of technical service	City council of Yaoundé 2nd	674643343
BERA Salomé Epse AMBOMO	Head of hygiene services	City council of Yaoundé 2nd	677581714/698691371
AWONO Grégoire Alain	Head of technical service	City council of Yaoundé 1st	677972179
BOMBA André Ferdinand	Head of sanitation, hygiene and environment service	City council of Yaoundé 1st	698114662/677005374
NDONGO Raymond	Chief of mobile police hygiene	City council of Yaoundé 1st	677631660
ELLA MENGUE Ferdinand	Technician of sanitation	City council of Yaoundé 1st	699167133/675165523
EMA MANGA	Recovery funds agent	City council of Yaoundé 1st	697688522
EDZOUGOU Claude	Head of technical service	City council of Yaoundé 3rd	696754226
AYISSI Jean Jacques	Coordinator of the technical service	City council of Yaoundé 4th	698317674
OLE Paul	Vice head of hygiene and environment services	City council of Yaoundé 4th	656049123/651188152
EKOBENA Cédric	Head of urbanism service	City council of Yaoundé 4th	694457016
MESSI Dominique	Head of technical service	City council of Yaoundé 5th	699951955
FOUDA Joseph	Head of hygiene and environmental service	City council of Yaoundé 5th	696927015/677611897

Table 8: Focus group with manual emptiers (August, 16, 2016: 11:15 am – 13:15 pm)

Name	Function	Contact
AMANG Guillaume	Manual emptier	696 34 60 36
KUATE Alain	Manual emptier	696 70 73 07
MBUI Moussa	Manual emptier	675 28 64 90
TZAMAYEN TCHINDA Elie	Manual emptier	674 48 62 97

7.4 Appendix 4: Selected pictures of field visit

Workshop of sharing results on initial diagnosis of sanitation in Yaoundé during RASOP-Africa Program (at the Municipality of Yaoundé)

Presentation of performance plan in sanitation to all stakeholders at the Municipality of Yaoundé

Restoration of road to the dumping site of Nomayos through concerted actions between ROCOBY and the Municipality of Yaoundé

Dumping site of Nomayos

Discharge of faecal sludge in Nomayos

Public toilet in a market (3.874285°, 11.502578°

Public toilet in City Council of Yaoundé 6 (3.855185°, 11.482259°)

Public toilet in town road 1.016 (3.866675°, 11.516414°)