SFD Report

Commune of Yopougon (Autonomous District of Abidjan)

Côte d'Ivoire

Final Report

This SFD Report - SFD comprehensive - was prepared by UFHB/CSRS

Date of production: 01/10/2023

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SFD Report Municipality of Yopougon, Autonomous District of Abidjan, Côte d'Ivoire, 2025

Produced by:

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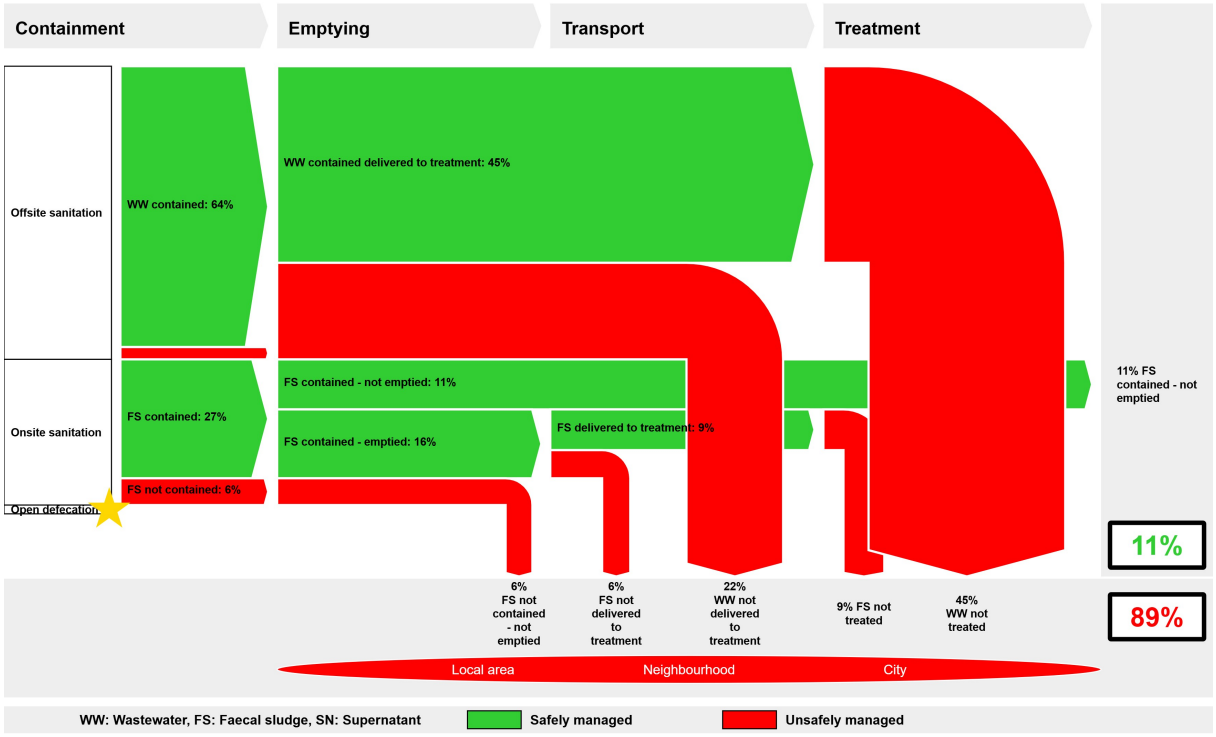
1. The SFD Graphic

Commune of Yopougon, Abidjan, Côte d'Ivoire
Version: Reviewed
SFD Level: 3 Comprehensive SFD

Date prepared: 29 Oct 2024
Prepared by: UFHB/CSRS



The SFD Promotion Initiative recommends preparation of a report on the city context the analysis carried out and data sources used to produce this graphic.
Full details on how to create an SFD Report are available at sfd.susana.org

2. Diagram information

SFD Level:

This is a Comprehensive - level 3 - SFD report.

Produced by:

This SFD report was produced by Lou Tinan Ange-Laetitia TRA and Kouassi DONGO. Université Félix HOUPHOUET-BOIGNY and Centre Suisse de Recherches Scientifiques en Côte d'Ivoire (UFHB/CSRS).

Collaborating partners:

- ONAD
- EAA
- SODECI Assainissement
- Federation of pit emptiers
- Yopougon Town Hall

Status: This is a final SFD report.

Date de production: 01/10/2023

3. General city information

Yopougon is the most densely populated commune of the Abidjan autonomous district. It is home to 1,571,065 inhabitants (INS, 2021) and 349,480 households over on an area of 164.2km². This density, which represents a quarter a quarter of Abidjan's population, is explained by its strategic geographical location as the main gateway to the north of Abidjan and its status as a working class district offering affordable living conditions (Kouamé, 2013).

Yopougon has a diverse urban landscape, ranging from high-standard housing to informal housing (ONU-Habitat, 2012). In 2014, there were 26 informal settlements and sites in need of restructuring (Kra Kouadio, 2014). The commune belongs to the sedimentary basin, characterized by sandy-clay formations (Roose et al., 1966), and receives abundant rainfall, averaging 2,000 mm per year (Danumah et al., 2016).

4. Service outcomes

From a value chain perspective, this section provides an overview of the sanitation systems used in Yopougon.

Containment: A decentralized sewerage system covers 64% of the population's wastewater (BRL, 2021). The remaining 36% use on-site sanitation, of which 27% of the sludge is contained (5% in septic tanks, 20% in sealed tanks other than septic tanks and 2% in pit latrines). Of the 9% of unconfined sludges, 6% comes from pits that drain into a water body, canal or open space, and 3% from pitiless toilets.

Septic tank effluent flows into an infiltration tank, with little risk of groundwater contamination. According to the 2022 survey results, only 0.1% of households in Yopougon practice open defecation.

Flush toilets are used by almost the entire population (81.2%), compared to 6.1% for traditional and VIP latrines. 92.1% have pits with:

- 17% of connected pits whose contents are discharged directly into water bodies and open channels.
- 12.7% septic tanks ;
- 62.4% other types of tanks.

Emptying: Three types of sludge emptying are practiced in Yopougon:

- Mechanical emptying, which accounts for 54%.
- Direct open-air emptying into the natural environment, through anarchic connections, which accounts for 37%.
- Manual emptying accounts for 9%.

In the northern part of the commune, there is an authorized site for the disposal of faecal sludge into the sewerage system, managed by ONAD[1] (Figure 1).

Transport: According to the information gathered during our investigations at the dumping site, there are about 43 operational trucks in Yopougon, at least 24 years old, of which 10 are hydro-cleaners and 33 are single trucks (survey, July 2023). There are about 22 private operators in the commune, most of them members of a national association called FENAVICI[2].

[1] Office National de l'Assainissement et du Drainage (State delegated project manager).
[2] National Federation of Emptiers of Côte d'Ivoire.

In terms of the off-site sanitation, Yopougon is served by a decentralized system on which a recent study found to have numerous failures (Ouattara et al., 2023). This leads to sewage leakage during transport (Figure 2).

Figure 1: Current fecal sludge dumping site in Yopougon (Source: TRA, 2023)

Figure 2: Sewer in poor condition leaking sewage into the street in Yopougon "nouveau quartier" (Source: OUATTARA, 2022).

Treatment: To date, according to the Yopougon commune authorities, all wastewater and sludge collected in the commune is discharged untreated into the Ebrié lagoon. In the Abidjan metropolitan area, the only facility providing pre-treatment plant (sand removal, oil removal, degreasing and primary sedimentation) is the Koumassi-Digue pre-treatment plant located in the Koumassi commune. This commune has the only faecal sludge treatment plant, a compact plant with a treatment capacity of 100 m^3/d. However, these plants do not cover the Yopougon area, which has a decentralized system. As a result, all wastewater and faecal sludge remain untreated.

Disposal/end-use: This is not documented for Yopougon. However, during the interviews, some mechanical dumpers revealed that fecal sludge was used as a fertilizer by some vegetable growers before the restructuring of the dumping area in 2015.

In summary, there are two sanitation systems in Yopougon:

- On-site sanitation, which is the most widely used at 64% (BRL, 2021) about 30% of which is thought to be lost along the way due to network malfunctions;
- Off-site sanitation, which covers nearly 36% of the population.

Currently, in Yopougon, the major challenges in terms of sanitation (Yopougon town hall, ONAD, 2023) are the very poor condition of most roads, making access difficult for some households for emptying operations, anarchy in pit construction (Figure 3), due to a lack of information on current construction standards, and a high level of anti-social behavior on the part of the population, who are increasingly engaging in risky practices, even in formal neighborhoods (open-air emptying via anarchic connections).

Figure 3: A non-compliant pit leaking fecal matter into the environment in Yopougon ''Andokoi'' (Source: TRA, 2022).

5. Service delivery context

In the autonomous district of Abidjan, 60% of the population is covered by non-sewerage sanitation (NSS). However, there is no safe emptying of pits with wastewater treatment, except in the commune of Koumassi, which has a fecal sludge treatment plant (FSTP). In the northern part of the district, a 350 m^3/d FSTP is under construction in Anyama commune. Three landfill sites (Abobo, Treichville and Yopougon) have also been rehabilitated and put into operation.

All these infrastructures were created thanks to the creation and operationalization of ONAD by decree in December 2011, for better and more efficient management of the water sector.

All these infrastructures were created thanks to the creation and operationalization of ONAD by decree in December 2011, for a better management of sanitation and drainage, including specifically the management of NSS in Côte d'Ivoire. In addition, 19 Sanitation and Drainage Master Plans (SDAD) were completed in regional and district capitals (Abidjan, Korhogo, Abengourou, Bouaké, Yamoussoukro, Daloa, San-Pédro, Dimbokro, Grand-Bassam, Gagnoa, Man, Odienné, Daoukro, Bondoukou, Séguela, Soubré, Ferkessédougou, Boundiali, Touba) and 10 others are underway (Agboville, Béoumi, Tiassalé, Dabou, Issia, Divo, Duékoué, Bouaflé, Guiglo, Katiola).

Over the years, several legal texts have been adopted over the years to provide a framework for the sanitation sector in Côte d'Ivoire. However, this legal framework does not sufficiently cover all the links in the value chain of the NSS subsector. These include:

- Law No. 96-766 3 October 1996, 1996, on the Environmental Code.
- Law No98-755 23 December 1998, on the Water Code.
- Law No. 2003-208 07 July 2003, on the transfer and distribution of State powers to local authorities.
- Law No. 2019-576 26 June2019, establishing the Construction and Housing Code
- Decree No. 2012-1047 24 October 2012, setting the terms of application for the polluter-pays principle as defined by the Environmental Code.
- Order No. 0009/MCLAU/CAB/ 3 March2015, granting approval for waste disposal services.

6. Overview of stakeholders

At the institutional level, the NSS sub-sector is managed by MINHAS through ONAD (delegated contracting authority/project manager for programs and projects), and the related departments, notably DGHA3 (delegate of the sector policy mission), DAUD4 (for urban areas) and DAR5 (for rural areas). The decentralized structures of MINHAS (Regional Sanitation Departments) and the Ministries related to the sanitation sector are also responsible for the NSS (Regional Construction Departments for the containment link).

Decentralized administrative bodies (districts, regions and communes) also play an important role in NSS management. This is particularly the case in the commune of Yopougon, which is the subject of this report, through the monitoring of construction standards for on-site sanitation facilities and their operation.

The wastewater and fecal sludge sector are also managed by the private sector, namely SODECI,

[3] General Directorate of Hydraulics and Sanitation
[4] Department of Sanitation and Drainage
[5] Department of Rural Sanitation Direction

which has signed a delegation agreement with the State for the provision of public sewerage and drainage services (for off-site sewerage), and the sludge dumping companies, which have signed an agreement with the competent Ministry (for the dumping, transport and disposal of sludge).The table below shows the main parties involved in the provision of sanitation services in Yopougon.

Table 1: The main actors involved in sanitation in Yopougon (ONAD/Commune de Yopougon, 2023).

Principal stakeholders	Institutions / Organizations
Public institutions	Ministry of Hydraulics, Sanitation and Health; Ministry of the Environment and Sustainable Development; Ministry of Health, Public Hygiene and Universal Health Coverage; Ministry of Construction, Housing and Urban Planning; National Office of Sanitation and Drainage; National Office of Civil Protection; Engineering and Design Departments; Commune of Yopougon.
Non-governmental organizations	ASAPSU ; Eau Vie ; PSI ; AAEA ; EAA ; USAID
Private sector	Private emptiers (manual and mechanized); SODECI assainissement; Masons; Plumbers
Development partners & donors	BAD; BMGF; BID; AFD; USAID; UNICEF, BM, BOAD
Others	Côte d'Ivoire public universities, research centers

All these stakeholders directly or indirectly involved in the wastewater sector in Yopougon work together to ensure the efficient management of NSS in community (Figure 4).

7. Process of SFD development

In Yopougon only 11% of Faecal Sludge (FS) is safely managed, and up to 89% corresponds to wastewater and faecal sludge discharged untreated into the environment, particularly in the Ebrié lagoon. The safely managed FS generated by this 11% of the population is temporary since those systems will require emptying services in the short and medium term as they fill up.

This reflects the reality in Yopougon, where there is currently no treatment plant for either wastewater or faecal sludge.

The data used in the preparation of this SFD graphic comes mainly from primary data collected through surveys and interviews, but also from recent literature. For example:

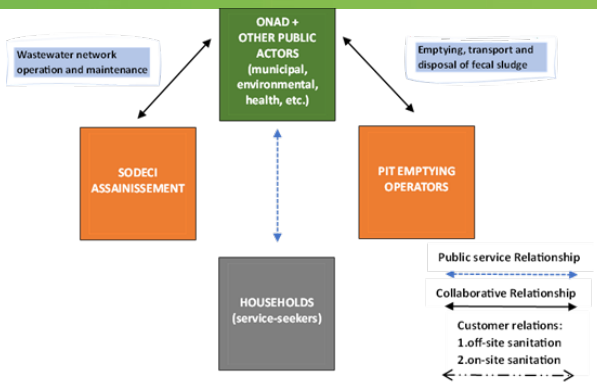


Figure 4: Relationships between actors involved in sanitation in Yopougon (Source: TRA, 2023).

- Population data are taken from the latest Census of Population and Housing (2021).
- Data on containment and transport for off-site sanitation are taken from the diagnostic report by BRL Ingénierie Côte d'Ivoire (2021) and the article by Ouattara et al. published in 2022.
- Data on containment and emptying for the on-site system were collected during a household survey carried out in Yopougon in December 2022.
- Data on emptying trucks and operators present in Yopougon were collected during 2 months of immersion at the emptying site (March and June 2023, dry and rainy seasons respectively).

Subsequently, interviews were also conducted with other key players such as: ONAD, SODECI Assainissement[6], Yopougon town council and the emptiers for the collection of additional data.

Following data collection and analysis for the design of the SFD graphic, a validation workshop was held on January 18, 2024, at The Technical Services Department of the Yopougon City Hall, with the participation of stakeholders.

The preliminary results of this SFD graphic were presented and validated by the participants.

[6]Private company under public law, in charge of operating sewerage and drainage networks and facilities in Abidjan.

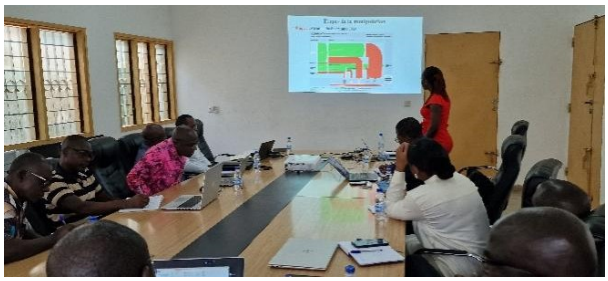


Figure 5: Workshop to validate the SFD with stakeholders (Source: TRA_UFHB/CSRS, 2024)

8. Credibility of data

The key assumptions used in the design of the SFD were as follows:

- 30% of the sludge collected by the trucks is not transported to the official dumping site, but to the ''Kouté village'' site (located south of Yopougon, almost 100 m from the lagoon), as observed in the field.
- A 30% leakage of effluent from the sewerage network into the lagoon, due to the malfunction of the latter.

Most of the data collected comes from field surveys conducted after 2020. The data have been shared and validated with sanitation stakeholders such as the various ministries and state structures in charge of sanitation, the environment and health, the Autonomous District of Abidjan, the Yopougon City Hall, SODECI assainissement, emptiers, NGOs and practitioners.

9. List of data sources

The following sources were used to produce the SFD graphic for Yopougon:

- **Source of data 1:** Reports and literature (see details in the references).
- **Data source 2:** Surveys (household, disposal site) and interviews with key sanitation players in the commune.
- **Data source 3 :** Focus group

Workshop on January 18, 2024, organized for stakeholder validation of the preliminary results of this SFD graphic.

The list of data sources used to produce this executive summary is as follows:

- BRL, 2021. Stratégie de l'Assainissement Non Collectif en milieu urbain en Côte d'Ivoire. (Rapport de diagnostic No. A00882). BRL Ingénierie, Côte d'Ivoire.
- Danumah, J.H., Odai, S.N., Saley, B.M., Szarzynski, J., Thiel, M., Kwaku, A., Kouame, F.K., Akpa, L.Y., 2016. Flood risk assessment and mapping in Abidjan district using multi-criteria analysis (AHP) model and geoinformation techniques, (Côte d'Ivoire). Geoenvironmental Disasters 3, 1–13.
- INS, 2021. Recensement Général de la Population et de l'Habitat (RGPH) [WWW Document]. URL https://www.ins.ci/ (accessed 10.2.23).
- Kra Kouadio, E., 2014. Elections et développement local, de l'espoir a l'illusion : l'exemple des quartiers précaires de Yopougon.
- Kouamé, K.A., 2013. Développement économiques et gestion de l'environnement : cas du commerce informel dans la commune de Yopougon. (Thèse de Doctorat d'État en géographie). Université Félix Houphouët-Boigny, Institut de Géographie Tropicale, Abidjan, Cote d'Ivoire.
- ONU-Habitat, 2012. Côte d'Ivoire : Profil Urbain d'Abidjan. [WWW Document]. URL https://unhabitat.org/cote-divoire-profil-urbain-dabidjan-french (accessed 10.3.23).
- Ouattara, Z.A., Kabo-Bah, A.T., Dongo, K., Akpoti, K., Siabi, E.K., Kablan, M.K.A., Kangah, K.M., 2023. Operational and structural diagnosis of sewerage and drainage networks in Côte d'Ivoire, West Africa. Frontiers in Sustainable Cities 5, 1032459.
- Roose, E., Chéroux, M., Humbel, F.-X. (collab), Perraud, A. (collab), 1966. Les sols du bassin sédimentaire de Côte d'Ivoire.

SFD Yopougon, Abidjan, Côte d'Ivoire, 2025

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Abbreviations

AFD	French Development Agency
APAA	Pan-African Association of Sanitation Actors
BAD	African Development Bank
BID	Islamic Development Bank
BM	World Bank
BOAD	West African Development Bank
CIAPOL	Ivorian Anti-Pollution Center
CWIS	Citywide Inclusive Sanitation
DAA	Autonomous District of Abidjan
DAUD	Urban Sanitation and Drainage Department
DAR	Rural Sanitation Department
DGHA	Directorate General of Hydraulics and Sanitation
EAA	Water & Sanitation Agency for Africa
FCFA	Franc de la communauté financière africaine
FENAVICI	National Federation of Emptiers of Côte d'Ivoire
FS	Faecal Sludge
FSM	Faecal Sludge Management
FSTP	Faecal Sludge Treatment Plant
INHP	National Institute of Public Hygiene
MCLU	Ministry of Construction, Housing and Urban Development
MEPD	Ministry of Economy, Planning and Development
MFB	Ministry of Finance and Budget
MINEDDTE	Ministry of the Environment, Sustainable Development and Ecological Transition
MINHAS	Ministry of Hydraulics, Sanitation and Hygiene
MIS	Ministry of the Interior and Security
MSHPCMU	Ministry of Health, Public Hygiene and Universal Health Coverage
NGO	Non-governmental organizations
NSS	Non-Sewerage Sanitation
ONAD	National Sanitation and Drainage Office
PND	National Development Plan
PPP	Public-Private Partnership
SFD	Shit Flow Diagram
SODECI	Côte d'Ivoire Water Distribution Company
SSD	Sanitation Service Delivery
TFP	Technical and Financial Partners
UCLTS	Urban Community-Led Total Sanitation
WW	Wastewater

1 City context

The commune of Yopougon is the largest of the 14 communes of the Autonomous District of Abidjan (DAA), whose capital, Abidjan, is the economic capital of Côte d'Ivoire. The commune is located to the west of the city of Abidjan and is bordered to the north by the Banco Forest, to the south by the Ebrié lagoon, to the east by the commune of Attécoubé and to the west by the commune of Songon. It covers an area of 153.06 km² and lies between latitudes 5°18'00" and 5°24'00" north and longitudes 4°3'00" and 4°8'60" west (Figure 1).

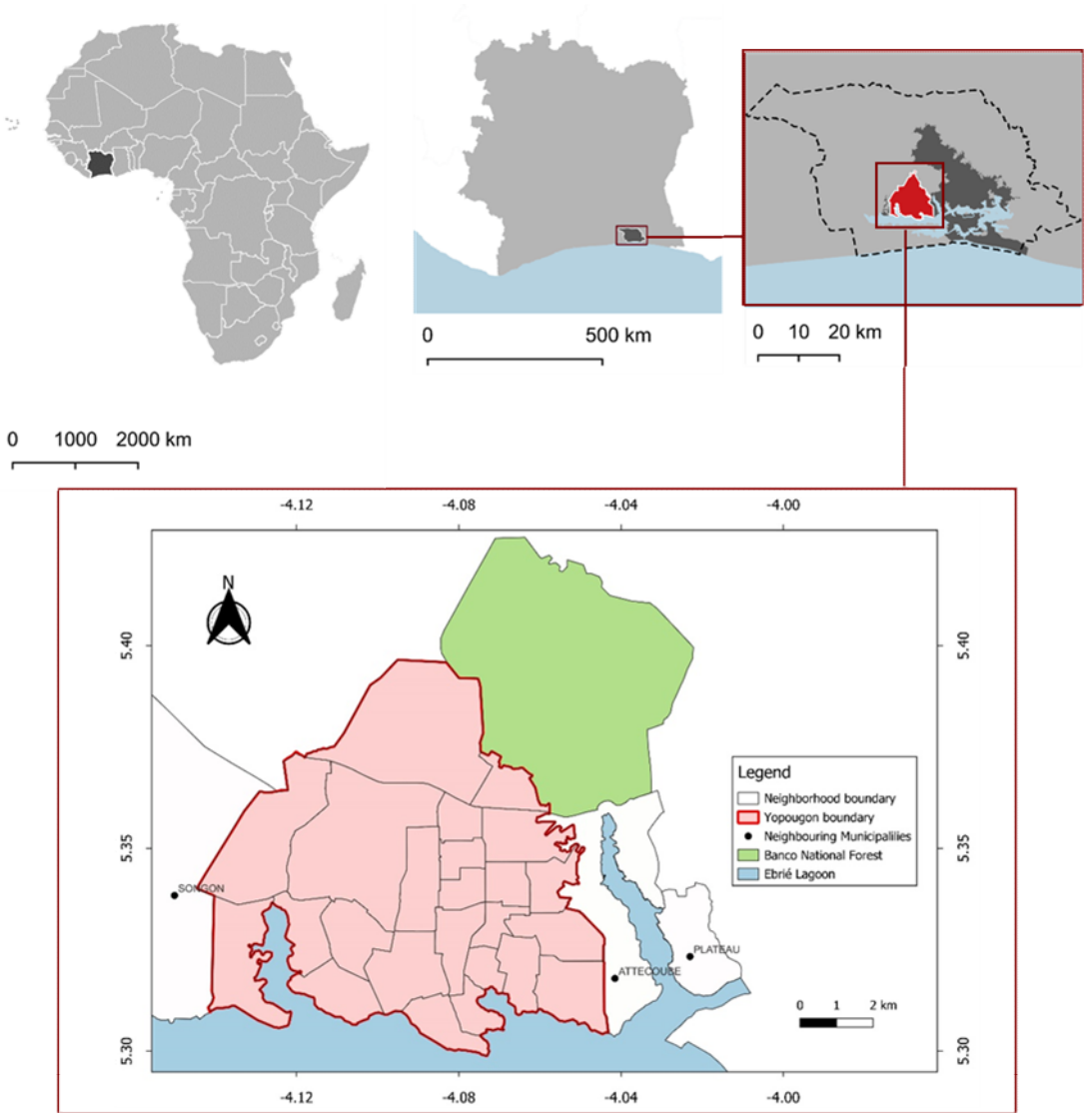


Figure 1: Map of Yopougon municipality with ward boundaries (TRA, UFHB/CSRS, 2024).

1.1 Population and urbanization

With a population density of 9,568 inhabitants/km^2, Yopougon is the most densely populated commune in the DAA. There are no diurnal or seasonal variations in its population. It is home to 349,480 households, with an estimated population of 1,571,065, representing 24.9% of the DAA's total population (INS, 2021). The high population of Yopougon is due to two key factors: (i) its strategic geographic location as the main gateway to the north of Abidjan, and (ii) its status as a working-class district offering affordable living conditions that attract large numbers of migrants. This situation has led to rapid urban expansion, characterized not only by the expansion of existing formal neighborhoods, but also by the proliferation of unplanned, informal settlements. Yopougon thus presents a diversified urban landscape, with four types of housing: informal or deprived housing, progressive housing (low standard), economic housing (medium standard) and high-end housing (high standard) (ONU-Habitat, 2012). In 2014, Yopougon had 26 precarious neighborhoods and sites in need of restructuring (Kra Kouadio, 2014).

1.2 Climate and rainfall

Rainfall in the study area is similar to that of the Abidjan metropolitan area, which is characterized by high rainfall, with an estimated annual average of 2,000 mm (Danumah et al., 2016). Yopougon is influenced by a transitional equatorial climate characterized by four seasons in the annual cycle: (i) a long dry season from December to April; (ii) a long rainy season from May to July; (iii) a short dry season from July to September and, (iv) a short rainy season from October to November. The average temperature in Yopougon is 25.8°C, with averages generally ranging from24.1°C (in August, the coldest month) to 27.2°C (in March, the hottest month) throughout the year (Climate Data, n.d.). However, it is important to note that in recent years, this department has experienced disturbances that could be linked to the global warming phenomenon.

1.3 Geology and hydrogeology

The commune of Yopougon belongs to the sedimentary basin in the south of the country. This area includes various formations of different ages, including Quaternary, Terminal Continental and ancient Upper Cretaceous, Paleocene and Eocene (Pothin et al., 2000; Tagini, 1971). Depending on the lithology, there are three types of soils in Yopougon. These are ferruginous sands, clays and sandstones (Oga et al., 2011).

From a hydrogeological point of view, three different aquifer types are found in the study area. These are:

i) the 80 m thick Quaternary aquifer (consisting of a water table with a piezometric level is very close to the ground surface).

ii) ii) the 160 m thick continental terminal aquifer (composed of various strata such as gravelly sands, coarse fluvial sands and clayey sands) rests uncomfortably overlies the Maastrichtian aquifer.

iii) the Maastrichtian aquifer (composed of slightly fractured sandstone-limestone beds containing large, rounded quartz grains), which lies at a depth of 200 m in the Maastrichtian limestone formations.

2 Service Outcomes

The development of this SFD graphic required the collection of both primary and secondary data. Primary data was collected both through household and field surveys, and through interviews with key informants. All these investigations were carried out between October 2022 and August 2023. A total of 559 households and 11 keys informant were interviewed (KIIs). Other (secondary) data sources included scientific articles, dissertations, master's and doctoral theses, and activity reports from the commune and sanitation facilities.

Specifically, variables F3 (the proportion of this type of system from which faecal sludge is emptied) et F4 (the proportion of faecal sludge emptied, which is delivered to treatment plants) used to build the SFD matrix were estimated from survey data. The F5 (the proportion of faecal sludge delivered to treatment plants, which is treated), W4c (percentages of ww transported to treatment) and W5b (WW treated) for system T1A1C6, were estimated based on interviews. The percentages of Supernatant (SN) transported to the treatment plant (S4e) and SN treated (S5e) for system T1A3C6 also come from KIIs data.

2.1 Overview

In the commune of Yopougon, two sanitation systems are used to manage wastewater (WW) and faecal sludge (FS). These are on-site sanitation, which accounts for 36%, and off-site sanitation, which covers about 64% of the territory (BRL, 2021). In this commune, several sanitation technologies, methods and services are used along the value chain. Figure 2 shows the range of technologies used in Yopougon.

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 Low risk of GW pollution	T1A1C6	T1A1C7	T1A1C8		Not Applicable
Septic tank					Significant risk of GW pollution T1A2C5					
Fully lined tank (sealed)					Significant risk of GW pollution T1A3C5	T1A3C6	T1A3C7	T1A3C8		
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										Significant risk of GW pollution 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										
Toilet failed, damaged, collapsed or flooded										
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable									Not Applicable

Figure 2: Technologies used to manage sanitation in Yopougon.

2.1.1 Sanitation facilities

This section describes the sanitation technologies used in Yopougon. The data presented here are linked to the data used to generate the SFD graphic and only concern the sanitation technologies used by households in the commune of Yopougon.

Offsite sanitation technologies

According to Côte d'Ivoire Water Distribution Company (SODECI) in terms of external sanitation, Yopougon has a decentralized separate sewerage network that currently discharges directly into the Ebrié lagoon without prior treatment of the wastewater it collects and transports. According to previous studies, Yopougon's sewerage system has a number of deficiencies (Ouattara et al., 2023; WAYOU, 2010). Figure 3 shows the spatial distribution of failures identified on certain secondary networks in Yopougon. Most of these malfunctions are obstructions, cracks or breaks, with the result that a significant proportion of wastewater leaks out along the way and is not transported through the network to the final outlet. Therefore, we assumed that a proportion of 30% of the wastewater transported to the final disposal site is not conveyed.

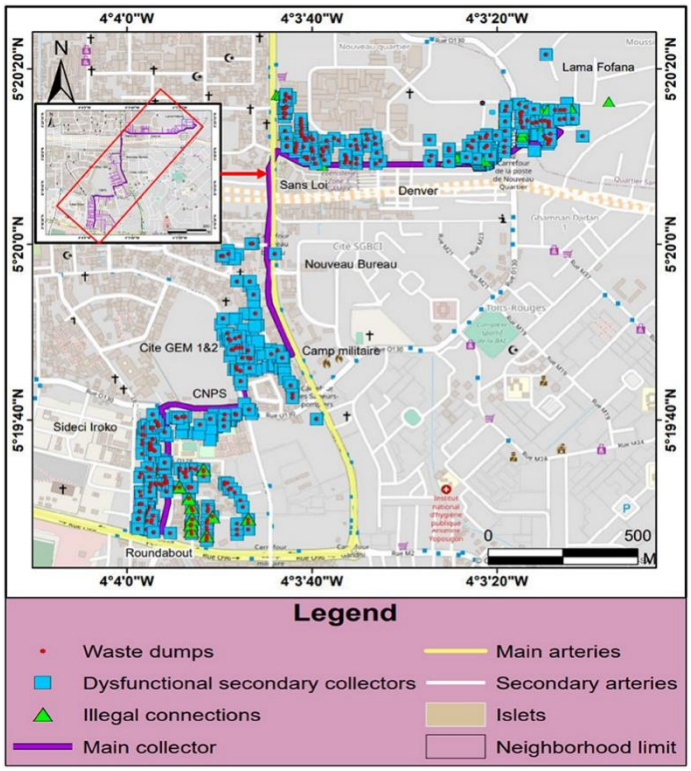


Figure 3: Spatial distribution of malfunctions on Yopougon collector 21/22 (Ouattara et al., 2023).

Onsite sanitation technologies

The survey results showed that all households surveyed had toilets. Of the 36% of households using on-site sanitation facilities in Yopougon, 29.2% had flush toilets, 4.6% had Turkish toilets and 2.2% had traditional latrines (Figure 4). In terms of containment, 27% of households use facilities that contain sludge. These include:

- 20.5% watertight pits connected to septic tanks.
- 4.6% septic tanks connected to cesspits.1.9% non-watertight tanks with a low risk of groundwater pollution.

However, almost 9% of households out of the 36% of households discharged the contents of their toilets directly into the natural environment through anarchic connections. These included:

- 2.8% of households did not have a pit.
- 2.7% of pits were connected to an open rainwater drain (gutter).
- 2.1% of the pits were connected to a water body.
- 1.3% of the pits were discharged directly into an open space.

Figure 4: On-site sanitation technologies used by households in Yopougon: A, B) traditional latrines; C, D) Turkish toilets; E) flush toilets; F) anarchic pit connection (Source: TRA, UFHB/CSRS, 2022).

Table 1 includes a summary of the systems encounter in the city and their equivalence according to the SFD-PI methodology.

Table 1: Sanitation technologies and corresponding containment according to the SFD-PI methodology, including percentages of population using the technology in areas of low and significant risk of groundwater pollution.

System	where it discharges to	Risk	%	Connection	Variable	%	SFD variable description	%
Flush toilet	*Sewer system*	*NA*	*64.0%*	*-*	*T1A1C4*	*-*	*Toilet discharges directly to a decentralised foul/separate sewer*	*64.0%*
No pit	*Open drain, Water body, Open ground*	*NA*	*2.9%*	*Open drain,*	*T1A1C6*	*1.3%*	*Toilet discharges directly to open drain or storm sewer*	*1.3%*
				Water body	*T1A1C7*	*0.6%*	*Toilet discharges directly to water body*	*0.6%*
				Open ground	*T1A1C8*	*0.9%*	*Toilet discharges directly to open ground*	*0.9%*
Septic tank	*Soak pit*	*Low*	*4.6%*	*Soak pit*	*T1A2C5*	*-*	*Septic tank connected to soak pit*	*4.6%*
Watertight pits	*Septic tanks*	*Low*	*20.5%*	*Soak pit*	*T1A3C5*	*-*	*Fully lined tank (sealed) connected to a soak pit*	*20.5%*
Pit	*Open rainwater drain (gutter).*	*NA*	*2.7%*	*NA*	*T1A3C6*	*-*	*Fully lined tank (sealed) connected to an open drain or storm sewer*	*2.7%*
Pit	*Water body.*	*NA*	*2.1%*	*NA*	*T1A3C7*	*-*	*Fully lined tank (sealed) connected to a water body*	*2.1%*
Pit	*Open space*	*NA*	*1.3%*	*NA*	*T1A3C8*	*-*	*Fully lined tank (sealed) connected to open ground*	*1.3%*
Non-watertight tank	*No outlet*	*Low*	*1.9%*	*Low*	*T1A6C10*	*-*	*Unlined pit, no outlet or overflow*	*1.9%*
Pit	*Never emptied*	*Low*	*0.1%*	*Low*	*T1B7C10*	*-*	*Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow*	*0.1%*
TOTAL	**-**	**-**	***100.0%***	**-**	**-**	**-**	**-**	***100.0%***

2.1.2 Emptying service

In Côte d'Ivoire, the emptying activity is carried out by the private sector under the supervision of the public authorities in charge of sanitation. In 2015, as part of the policy of organizing and structuring the emptying sector, the State has issued a decree approving the emptying activity (cf. decree n° 0009/MCLAU/CAB/ of 03 / March / 2015). This policy instrument defines the conditions to be met to be authorized to carry out the activity. In addition, there are regulatory texts both at the central level (law n°98-755, December 23, 1998) and at the local level (deliberation N2014-02/C-Yop/SG, March 20, 2014) that prohibit unhygienic emptying practices such as manual emptying and anarchic connections.

The surveys showed that 68% of the households surveyed had already emptied their pits. Three types of emptying are used to collect and dispose of excreta:

- 54% use mechanical emptying.
- 9% use manual emptying and
- direct open-air discharge into the natural environment, via uncontrolled connections, which accounts for 37%.

Most of the mechanically emptied sludge in Yopougon is transported to the commune's official dumping site. This dumping site was built by the Office National de l'Assainissement et du Drainage (ONAD) and is connected to the commune's sewage network, so that all the FS injected into it ends up in the network and follows the same route as the wastewater before being discharged into the lagoon without prior treatment for the time being.

The site, located in the north of the commune, receives sludge from Yopougon as well as from other neighboring communes. The average quantity of sludge deposited at this site is estimated at 483 m^3/day, broken down as follows:

- 267 m^3/day on average from households in Yopougon.
- 97 m^3/day on average from households in neighboring municipalities
- 119 m^3/day on average from other sources (businesses, public establishments, industries).

In addition, some of the sludge emptied is not taken to the official disposal site in Yopougon, but to illegal sites operated by private individuals. This amount is estimated at 30% of the total sludge emptied.

In Yopougon, households pay between FCFA14,000 (USD 23) and FCFA 75,000 (USD 125) per trip for the emptying and mechanical transport of their sludge. Manual emptying costs are between FCFA10,000 (USD 17) and FCFA 60,000 (USD 100). This activity is essentially carried out without personal protective equipment, using either rudimentary tools (buckets, shovels, etc.) or a motor pump. In general, the sludge is emptied manually (with buckets or a motor pump) not transported and is or buried near homes without prior treatment. This type of emptying poses enormous pollution risks and is therefore not encouraged by the Ivorian government. Similarly, emptying through anarchic connections is prohibited.

2.1.3 Transport

Regarding the vacuum truck fleet, surveys conducted at the FS dumping site indicated that there are approximately 43 trucks in operation in Yopougon. These trucks are composed of 23% hydro-cleaners and 77% simple pump trucks, with capacities ranging from 6.5 m^3 to 15 m^3 (survey, July 2023). The minimum age of these trucks is 24 years. Most of these empty vehicles are purchased new. To enable emptier companies to renew their fleets, ONAD, in partnership with a local bank, has set up a financing program with a total budget of 200 million FCFA (USD 333,988), which constitutes a guarantee fund. However, it is extremely difficult for oil changers to meet the conditions required to access this fund, and it is therefore under-utilized. In Côte d'Ivoire, the cost of simple emptying trucks, assembled and assembled informally at the local level, varies between 20 million FCFA (USD 33,398) and 25 million FCFA (USD 41,748). For hydro-cleaner trucks, which are mostly used (second hand) and imported, the acquisition cost (purchase, transport, taxes and maintenance) varies between 40 million FCFA (USD 66,797) and 70 million FCFA (USD 116,895). In this commune, there is a parking area for emptying trucks, but no call center to better manage the emptying activity.

In the commune of Yopougon there are about 22 private operators, organized into a local association of emptying contractors. Most of these operators are also members of the Côte d'Ivoire section of the Pan-African Association of Sanitation Actors (APAA).

2.1.4 Treatment

To date, there is no Fecal Sludge Treatment Plant (FSTP) in Yopougon, and all wastewater and sludge collected in the commune is discharged untreated into the Ebrié lagoon. The only wastewater treatment plant in Abidjan is the pre-treatment plant located in the commune of Koumassi. This commune is also home to only FSTP, which is a compact plant. However, these various plants do not cover the Yopougon area, which has a decentralized system. In other words, although 70% of the mechanically emptied sludge is transported and deposited in the Yopougon sewer system, none of it is treated before being discharged into the receiving environment (Ebrié Lagoon). To gain access to the authorized dumping site, which is connected to the sewer system, each emptier pays a dumping fee of 1,000 FCFA (USD 1,6) per trip to ONAD, which manages and maintains the site.

2.1.5 Disposal/end use

This is not sufficiently documented for Yopougon. However, during the interviews, some mechanical emptyers revealed that faecal sludge was used as a soil conditioner by some vegetable growers before the restructuring of the emptying sector by ONAD. In 2015

2.2 SFD Matrix

Figure 5 shows the SFD selection grid and Figure 6 shows the SFD matrix used to select sanitary facilities in the commune of Yopougon.

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 Low risk of GW pollution	T1A1C6	T1A1C7	T1A1C8		Not Applicable
Septic tank					Significant risk of GW pollution T1A2C5					
Fully lined tank (sealed)					Significant risk of GW pollution T1A3C5	T1A3C6	T1A3C7	T1A3C8		
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										Significant risk of GW pollution 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										
Toilet failed, damaged, collapsed or flooded										
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable									Not Applicable

Figure 5: SFD selection grid.

Commune of Yopougon, ABIDJAN, Côte d'Ivoire, 29 Oct 2024. SFD Level: 3 - Comprehensive SFD
Population: 1571065
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 100%

Containment										
System type	Population	WW transport	WW treatment	WW transport	WW treatment	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	W4b	W5b	W4c	W5c	F3	F4	F5	S4e	S5e
System label and description	Proportion of population using this type of system (p)	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 wastewater in open sewer or storm drain system, which is delivered to treatment plants	Proportion of wastewater delivered to 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	Proportion of supernatant in open drain or storm sewer system, which is delivered to treatment plants	Proportion of supernatant in open drain or storm sewer system that is delivered to treatment plants, which is treated
T1A1C4 Toilet discharges directly to a decentralised foul/separate sewer	64.0	70.0	0.0							
T1A1C6 Toilet discharges directly to open drain or storm sewer	1.3			0.0	0.0					
T1A1C7 Toilet discharges directly to water body	0.6									
T1A1C8 Toilet discharges directly to open ground	0.9									
T1A2C5 Septic tank connected to soak pit	4.6					59.0	67.0	0.0		
T1A3C5 Fully lined tank (sealed) connected to a soak pit	20.5					59.0	58.0	0.0		
T1A3C6 Fully lined tank (sealed) connected to an open drain or storm sewer	2.7					0.0	0.0	0.0	0.0	0.0
T1A3C7 Fully lined tank (sealed) connected to a water body	2.1					0.0	0.0	0.0		
T1A3C8 Fully lined tank (sealed) connected to open ground	1.3					0.0	0.0	0.0		
T1A6C10 Unlined pit, no outlet or overflow	1.9					47.0	50.0	0.0		
T1B7C10 Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	0.1									

Figure 6: SFD matrix.

2.2.1 SFD Matrix explanation

According to BRL (BRL, 2021), nearly 64% of the population of Yopougon relies on off-site sewage systems, more precisely decentralized separate sewer systems. There is no wastewater treatment plant In Yopougon, and all wastewater collected and conveyed through the network is discharged directly into the Ebrié Lagoon. However, we estimate that 30% of this water does not follow this route but is instead lost along the way due to leaks caused by malfunctioning sewers. Approximately 36% of the population has on-site sanitation facilities (BRL, 2021). The results of the survey conducted in 2022 showed that 33.2% of households were connected to a pit. However, almost 8% (1/4) of these pits did not comply with national sanitation standards. These standards do not allow leaky pits or those connected to anarchic connections. In addition, 2.8% of these households had no pit at all. Wastewater and excreta from the user interface were discharged directly into (i) an open drain or storm drain (1.3%), (ii) a water body (0.6%) and (iii) open ground (0.9%).

Regarding emptying, the surveys showed that 68% of the pits in the study area were emptied. Three types of emptying were used (see details in section 2.1.2): mechanical emptying (54%), manual emptying (9%) and emptying by anarchic connection (37%). Regarding transport, we have assumed that the official dumping site receives only 70% of the FS collected by trucks in Yopougon. The remaining 30% is dumped in the open or at unsuitable illegal sites.

2.2.2 Groundwater pollution risk assessment

Like the other communes of Abidjan, Yopougon is mainly supplied by groundwater from the Continental Terminal aquifer, commonly known as the “Abidjan aquifer”, which accounts for 68% of national drinking water production (DHH, 2001). In terms of hydrogeology, the conceptual east-west and north-south models used show that the Continental Terminal is an aquifer composed of two main layers, n3 and n4. These layers are 90 m thick of coarse sands and 80 m thick of fine to medium sands, respectively with permeability varying between 0.001 and 0.01 m/s (Kouassi et al., 2014). Groundwater is collected exclusively from boreholes grouped together in catchment areas. However, the proximity of some of these boreholes to dwellings or human activities can be a major source of pollution, increasing the risk of groundwater contamination. Indeed, several cases of pollution (faecal, chemical) have been recorded in several catchment areas, leading to the abandonment of some boreholes. This was the case for wells in the Plateau, Adjamé and Abidjan South communes (Koumassi, Port-Bouët etc.) (Assoumou, 2021).

In Yopougon, no information was found on the risk of groundwater contamination. There are a few wells in this commune, but most of them are used for domestic purposes and not for human consumption. In addition, the most common sanitation facilities in Yopougon are flush toilets connected to watertight or non-watertight pits. However, no quantitative data were available on the lateral separation between these sanitary facilities and groundwater sources Therefore, with respect to the risk of groundwater contamination from sanitation facilities, we have therefore assumed that flush toilets and Turkish toilets connected to watertight pits pose a low risk of contamination, in contrast to traditional latrines and modern toilets connected to non-watertight pits or anarchic connections.

2.2.3 Certainty and Uncertainty Levels of Associated Data Used for the SFD Matrix

The main uncertainty in the data used to produce this SFD graphic lies in the estimation of the percentage of sanitation facilities that pose a significant or low risk of groundwater pollution. While we had information on the types of sanitation facilities and the drinking water sources used by the population, we did not have quantitative data on the lateral separation between these facilities and groundwater sources. We have therefore assumed that all pits pose a low risk of groundwater contamination.

2.3 Summary of Assumptions

Offsite sanitation System:

- ✓ For toilets discharging directly to a decentralised foul/separate sewer (T1A1C4), the proportion of wastewater in sewer system, which is delivered to centralised treatment plants is set to 70% (W4b = 90%) and the proportion of wastewater delivered to decentralised treatment plants, which is treated is set to 0% (W5a = 0%).

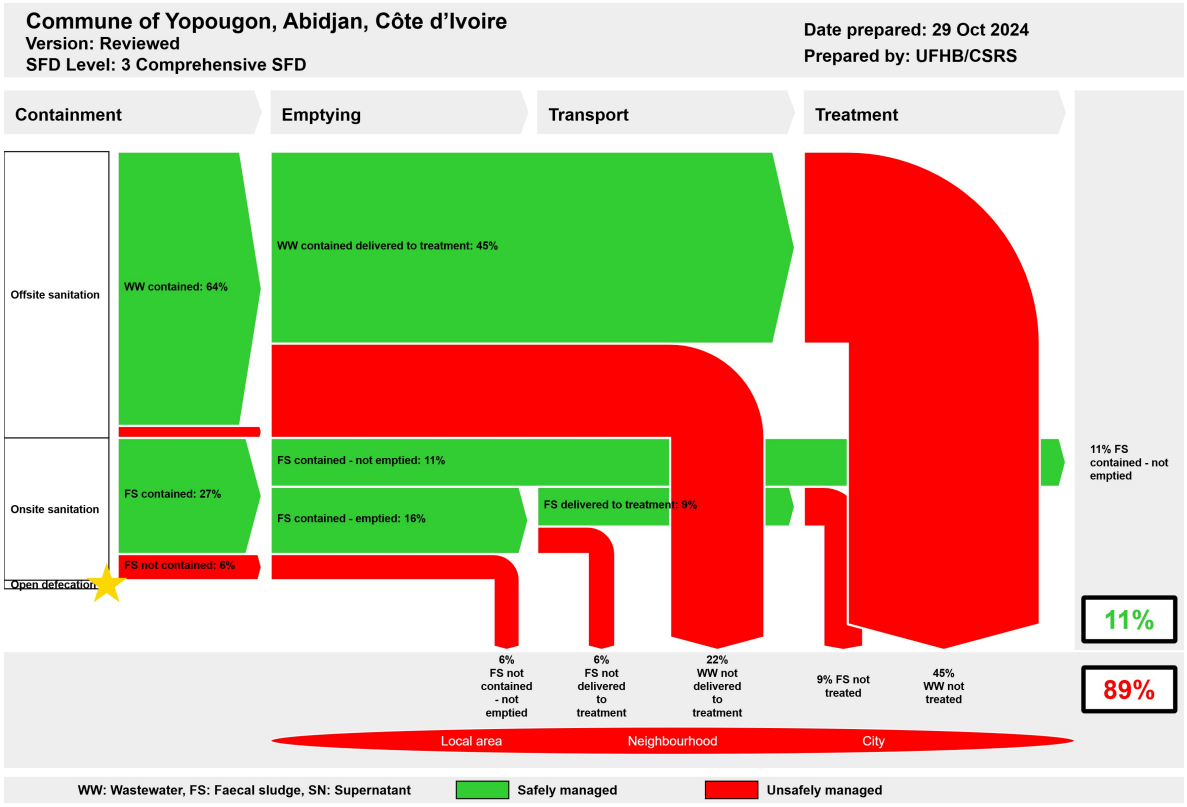
Onsite Sanitation Systems

- ✓ The proportion of FS in septic tanks, fully lined tanks, lined tanks with impermeable walls and open bottom and all types of pits was set to 100%, 100% and 100%, respectively according to the relative proportions of the systems in the municipality, as per the guidance given in the Frequently Asked Question (FAQs) in the sustainable Sanitation Alliance (SuSanA) website.
- ✓ Variables F3, F4 and F5 for all onsite sanitation systems were derived from survey and cross-checked with key informant interviews (KIIs) conducted.
- ✓ The percentages of FS emptied (F3) for systems T1A2C5, T1A3C5, T1A3C6, T1A3C7, T1A3C8 and T1A6C10 are set to 59%, 59%, 0%, 0%, 0% and 47%, respectively.
- ✓ The percentages of FS transported to the treatment plant (F4) for systems T1A2C5, T1A3C5, T1A3C6, T1A3C7, T1A3C8 and T1A6C10 are set to 67%, 58%, 0%, 0%, 0% and 50%, respectively.
- ✓ The percentages of wastewater transported to treatment (W4c) and wastewater treated (W5b) for system T1A1C6 are both set to 0% according to KIIs.
- ✓ The percentages of Supernatant (SN) transported to the treatment plant (S4e) and SN treated (S5e) for system T1A3C6 are both set to 0% according interviews with key informants.
- ✓ The percentages of FS treated (F5) were set to 0% for all sanitation systems and derived from KIIs.

2.4 SFD Graphic

The SFD graph in Figure 7 shows that only 11% of liquid waste generated in the municipality of Yopougon is safely managed. This percentage (11%) mainly concerns FS, which is confined to on-site sanitation facilities that have not yet been emptied. However, the safely managed FS generated by this 11% of the population is temporary since those systems will require emptying services in the short and medium term as they fill up.

The remaining 89%, made up of FS and WW, is inadequately managed and is discharged untreated either directly into the lagoon via the sewerage network, or into the environment (soil, gutters, water bodies, ravines, etc.) close the houses. The latter case is generally due to: (i) network malfunction and uncontrolled dumping of sewage and/or (ii) the bad practices of certain households that do not use t facilities to contain for their sewage (6% unconfined sewage). All these corresponds to: 45% of WW not treated, 22% of WW not delivered to treatment, 9% of FS not treated, 6% of FS not delivered to treatment and 6% of FS not contained - not emptied.



The SFD Promotion Initiative recommends preparation of a report on the city context the analysis carried out and data sources used to produce this graphic.
Full details on how to create an SFD Report are available at sfd.susana.org

Figure 7: SFD graphic for the commune of Yopougon.

3 Service delivery context

Improving people's quality of life is increasingly becoming a priority in Côte d'Ivoire's urban development policy. The government's vision for sanitation and hygiene is to improve people's living environment. This commitment is expressed through modern, sustainable interventions in the living environment sector. According to the National Development Plan (PND 2021-2025), several actions have been taken in the sanitation and drainage sector. These include: (i) updating the inter-ministerial decree of the Water-Hygiene-Sanitation Group; (ii) preparing 15 sanitation and drainage master plans; (iii) improving the management of fecal sludge, adopting the Water Code, adopting the Hygiene and Sanitation Code, preparing the draft Sanitation and Drainage Code; and (iv) preparing the National Rural Sanitation Strategy.

In Côte d'Ivoire, the central government is administered by ministries. At the local level, powers are delegated to the decentralized administrations (communes, regions and districts) in accordance with Law No2003-208 of 7 July 2003, on the transfer and distribution of powers from the State to local authorities. In communes such as Yopougon, sanitation management is governed by the same central laws and institutions. These communes act through municipal by-laws.

3.1 Policy, legislation, and regulation

Côte d'Ivoire has detailed environmental legislation, based on the 2023 Environment, Water, Hygiene and Health Code which is hierarchically structured. The regulatory framework includes laws, decrees, and regulations. Waste management (solid and liquid) in Côte d'Ivoire is governed by these laws and regulations, as well as by international conventions ratified by Côte d'Ivoire. The main texts defining the sectoral policy in the field of urban liquid sanitation are national strategies and policies, laws (Water Code, Hygiene and Sanitation Code, etc.), decrees and orders.

3.1.1 Policy

In Côte d'Ivoire, sanitation policy is the responsibility of the Ministry of Hydraulics, Sanitation and Hygiene (MINHAS), through the General Directorate of Hydraulics and Sanitation (DGHA) and two central departments: the Department of Urban Sanitation and Drainage (DAUD) and the Department of Rural Sanitation (DAR). These departments develop and oversee the implementation of national sanitation and drainage policies and strategies in the field. The overall aim is to contribute to sustainable development by providing appropriate solutions to sanitation-related problems. In urban areas, sanitation initiatives include the following:

- Developing strategic sanitation plan through a sanitation master plan.
- Promoting urbanization policies.
- Opening large storm water collection systems.

In addition, there is a “Sewerage and drainage sector policy letter”, adopted in 2016. This policy letter sets out the main directions that the Government intends to give to the sanitation and drainage sector, and the strategy to be implemented by 2030. In terms of infrastructure, the new national policy provides, among other things, for the urban environment:

- both districts (DAA and Yamoussoukro) and regional capitals will be equipped with FSTPs by 2030. Four FSTPs have been built and are operational.
- two more are under construction and 14 more are planned by 2025.

The development of sanitation master plans for the districts and major cities in the interior, including the town of Bouaké, which already has its own strategic document.

3.1.2 Institutional roles

The main institutions involved in the sanitation sector and their responsibilities are shown in Table 2.

Table 2: Roles and responsibilities of sanitation stakeholders in Côte d'Ivoire.

Types	Stakeholders	Roles and responsibilities
Ministerial departments	Ministry of Hydraulics, Sanitation and Health (MINHAS)	MINHAS is responsible for developing, implementing and monitoring government policy in the areas of water supply, protection, improvement and sanitation of the living and working environment.
	Ministry of Construction, Housing and Urban Development (MCLU)	MCLU is responsible for the implementation and monitoring government policy on construction, housing and urban planning. Among other things, it is responsible for enforcing regulations on building standards, particularly for sanitation facilities.
	Ministry of Economy, Planning and Development (MEPD)/Ministry of Finance and Budget (MFB)	MEPD aligns sanitation investment projects with the NDP and ensures consistency between them. It also supports sector ministries in their search for financing, in collaboration with the MFB.
	Ministry of Health, Public Hygiene and Universal Health Coverage (MSHPCMU)	MSHPCMU is responsible for implementing and monitoring the government's policy on health, public hygiene and national social protection against the risk of disease.
	Ministry of the Interior and Security (MIS)	The local authorities that fall under this Ministry work with the State to: -the economic, social and health development, and in general, the continuous improvement of their living environment, in terms of sanitation, -the development, support and implementation of regional sanitation plans in accordance with the national plan.
	Ministry of the Environment, Sustainable Development and Ecological Transition (MINEDDTE)	This ministry is responsible for implementing and monitoring government policy on the environment, sustainable development and ecological transition. Among other things, it is responsible for the implementation of the Environmental Code and environmental protection legislation.
Delegated services of ministerial departments	National Sanitation and Drainage Office (ONAD)	Under the technical supervision of MINHAS, ONAD's corporate purpose is to ensure access to sanitation and drainage facilities for the entire national population, on a sustainable basis and a competitive cost. The Office is the only national player operating under a public service mission delegation agreement with the State

		of Côte d'Ivoire. ONAD's missions are to: • support the Ministry in charge of sanitation and local authorities. • delegate project management for sanitation and drainage projects. • Supervise of operating contracts.
	Ivorian Anti-Pollution Center (CIAPOL)	Under the supervision of MINEDDTE, CIAPOL is responsible for waste management, monitoring air, soil and water quality, and supervising and conducting pollution assessments.
	National Institute of Public Hygiene (INHP)	Under the supervision of the MSHPCMU, the functions of the INHP are as follows: • Application of health policy in terms of general hygiene. • Prophylaxis and control of transmissible bacterial, viral and parasitic endemics. • National technical management of the Expanded Program on Immunization (P.E.V). • Teaching and research activities.
Autonomous institutions and the private sector	Non-governmental organizations	They participate in the financing of sanitation and faecal sludge management at the local level as part of the implementation of their respective programs, while at the same time promoting hygiene and assessing health risks in an intervention area.
	Côte d'Ivoire water distribution company (SODECI)	Under the terms of the lease, SODECI is responsible for managing the sewage, rainwater and water sectors of the Abidjan District.
	Private emptying service providers and builders of sanitation facilities	Participate in the management of faecal sludge by collecting, transporting and disposing of sludge. Participation in the manufacture of prefabricated sanitation facilities or the construction of household sanitation facilities.

3.1.3 Service provision

In Yopougon, sanitation service providers include SODECI, emptying companies, and tradesmen (masons, plumbers).

The city of Yopougon coordinates these public and private services in collaboration with ONAD. SODECI, which is bound by a lease agreement with the Ivorian state, is responsible for organizing wastewater collection in Abidjan, including Yopougon. In addition to SODECI, there are about 22 mechanical emptying companies in Yopougon, 11 of which have received a permit (valid for 2 years, renewable) to operate until 2022 (ONAD, 2024).

3.1.4 Service standards

In Côte d'Ivoire, the sanitation sector, and more specifically Non-Sewerage Sanitation (NSS), does not benefit from a specific legal framework. The texts applicable to the environment, water, and hygiene and housing serve as indirect references for sanitation activities. These include:

- **For the containment link**

This link is subject to the provisions of Law 2019-576 of June 26, 2019, on the Construction and Housing Code. This text requires construction projects to comply with environmental sanitary and drainage standards. Article 14 of this law recommends the integration of sanitation facilities in construction plans for 'the sound collection of domestic wastewater and faecal sludge'. Failure to comply with this obligation may justify the denial of a building permit (Article 19). This illegal requirement is considered by local authorities through the adoption of municipal bylaws governing sanitation in the commune. In Yopougon, municipal Decree no. 04/MYOP/SG of 25 February 2019, prohibits, inter alia, the construction of independent sanitation facilities (septic tanks, cesspools, etc.) on the public land, uncontrolled dumping and connection, unauthorized emptying and manual emptying. The decree also prohibits the enclosure of collective sanitation facilities and/or the colonization of their easements. The decree establishes penalties for non-compliance with the above requirements. However, surveys conducted during this study revealed that most people are not aware of the decree and do not fully comply with it.

- **For the Emptying/Transportation link**

The Ministry of Public Health has issued a permit to regulate emptying activities. Order no. 0009/MCLAU/CAB/ of March 03, 2015, requires a permit for the collection, transport and disposal of organic and biodegradable FS from non-sewered sanitary facilities. The permit is issued for a renewable period of two years. It also comes with a set of specifications that the operator must scrupulously respect. About the sewerage sanitation, the Ivorian authorities have entrusted SODECI with the management of the sanitation network, through the Lease Contract for the Maintenance of the Sewerage and Drainage Networks and Works in the City of Abidjan, approved by decree n°99-257 of March 25, 1999. The legal term of this contract expired a few years ago, but it is still under review.

- **For the treatment link**

Some provisions of law 2023-900 of November 23, 2023, on the Environmental Code wastewater before its discharge into the receiving environment (articles 25 and 77). This information is supported by the provisions of Law Lo. 2023-902 of November 23, 2023, on the Water Code, which stipulates that all wastewater discharges must comply with current standards (Article 51). There are also discharge standards for facilities classified for environmental protection. However, these standards are not specific to FS. In Côte d'Ivoire, no standards have yet been set at the national level for WW and FS discharges. In this respect, we use the WHO standards or those of neighboring countries that do have them.

- **For sludge recovery**

Articles 60, 61, 62 and 63 of the Water Code of 23 November 2023 clearly define the conditions for the reclamation, recycling and reuse of treated wastewater. These articles provide a framework for the reclamation of treated wastewater in Côte d'Ivoire. However, FS reclamation is an operation that is not currently regulated by specific legislation.

However, a draft law on the sanitation and drainage code has been prepared, which was adopted by the Council of Ministers in 2024.

3.1.5 Investments

Since the reform of 2012, following the post-election crisis, the financing of the sanitation and drainage sector in Côte d'Ivoire has come from several sources:

- the share of the property tax (tax table), which represents 10% of the tax on landed property.

- the sanitation fee (Decree No. 99-258 of March 25, 1999, on the sanitation fee), which is paid only for the city of Abidjan, and covers three categories of subscribers: those who are connected, those who can be connected and those who cannot be connected. The fee is estimated at an average of 35 FCFA (USD 0.05) per m^3 of drinking water consumed.

- delegated project management and project management costs (agreements with project owners).

- loans to finance sewage and drainage works (financing agreements between the State and lenders).

- State subsidies to the sewerage and drainage sectors.

The financing mechanism for sewage and drainage is based on the 3-T system: Tariff (sanitation fee), Tax (Para fiscal levy, State subsidy/budgetary support) and Transfer (loans mobilized by the State to finance sanitation and drainage works).

The portion of the tax allocated to the sanitation sector is used to finance the construction, rehabilitation and maintenance of storm water drainage networks and facilities.

The sanitation tax, which covers only the 10 communes of Abidjan that make up the leased perimeter, finances the maintenance and operation of wastewater networks and facilities.

The State also grants loans to donors (World Bank, IDB, ADB, BOAD, AFD, etc.) to finance the construction of sewerage and drainage networks and facilities.

To balance the sector, the government provides one-time grants for construction, rehabilitation, maintenance and operations.

In 2023, the total financing for sewerage and drainage amounted to more than 815 billion FCFA (USD 1.36 billion), mainly from fees, property taxes and donors, broken down as follows: 2.3 billion FCFA (USD 0,003 billion) from the payment of sanitation fees by households, 12.45 billion FCFA from the sanitation share of property taxes (10%) and 8.6 billion FCFA (USD 0.01 billion) from the contribution of all donors.

3.2 Equity

In Côte d'Ivoire, inclusive sanitation is still in its infancy and is not generally reflected in policy. It should be noted that there is no code specifically dedicated to sanitation that would allow relationship with gender to be examined. As a result, actors in the sector have a confused perception of it.

In the analysis of policy texts related to sanitation in Côte d'Ivoire, the gender dimension does not appear clearly. This weakness is illustrated in the Côte d'Ivoire's sanitation and drainage sector policy letter of February 24, 2016, and subsequent decrees. In fact, the letter focuses more on the establishment and transfer of responsibilities to local authorities. It emphasizes the integration of public health, water resources protection, urbanization, solid waste management, protection of aquatic and marine ecosystems, and biodiversity initiatives. The only element vaguely related to gender is the regulation that establishes minimum technical requirements to be met at the local level, considering population density and the sensitivity of the receiving environment. If we look at Decree No. 2011-482 of 28 December, 2011 on the creation and organization of the national company called the Office National de l'Assainissement et du Drainage (ONAD), we find that it's only in Article 2, which states that its mission is to ensure access to sanitation and drainage facilities on a sustainable basis and at competitive costs for the entire national population that there seems to be any consideration or interest in gender.

3.2.1 Current service choices for the urban poor

In the commune of Yopougon, the population is served by both on-site (almost 60%) and off-site (40%) sanitation (BRL, 2021). Common sanitation facilities in the area include flush toilets connected to a sewer network; flush toilets and Turkish WCs connected to pits; and traditional latrines.

In poor households, which are essentially dependent on autonomous sanitation, surveys have shown that all urban dwellers have their own toilets. However, these poor households face two major problems: the sharing of toilets by two or more households, and the lack of means to regularly empty the pits. The result is overflowing pits and open defecation (less than 0.1% and hence not included in the SFD graphic), which increases the risk of faecal contamination. The situation in poor households is difficult to improve, as the investment for access to (autonomous) sanitation is still borne by the owners or occupants and represents a major burden for this category of the population. However, initiatives and interventions led by technical and financial partners and development NGOs are being used to bridge the financing gap for poor urban households. This is the case, for example, of the MuniWASH-USAID program, whose activities include the municipality of Yopougon. Estimates for improving the situation in this commune indicate that 6, 7039 toilets will be built by 2025, at a total cost of 36,871,515,289 FCFA (USD 61,573,280). These estimates also include the purchase of 17 empty trucks at a cost of 750,000,000 FCFA (USD 1,252,456). The NGO PSI-Côte d'Ivoire, through its Sanitation Service Delivery (SSD) initiative, has tested a strategy to provide sanitation products and services to poor households in Yopougon. The project aims to provide a range of facilities and an emptying service tailored to the income of poor households. To achieve this, local artisans (masons, plumbers, etc.) with experience in construction and other building trades were identified and trained to design, manufacture and

install the structures. A total of 48 artisans were mobilized to implement the project. The use of local materials was encouraged to reduce the cost of the work. However, this initiative did not achieve the expected results for two main reasons: (i) the model of pits to be promoted required much more space, which was a challenge in the target populations' neighborhoods; (ii) the cost of the products was ultimately high and inaccessible to poor populations. Future initiatives should consider the lessons learned from these different projects.

3.2.2 Plans and measures to reduce inequity

The interviews revealed that Côte d'Ivoire's sanitation plans and strategies do not include subsidy mechanisms for poor households. In addition, the existing mechanisms in place do not provide for the categorization of different social classes and vulnerable groups (elderly, disabled, children, etc.) in terms of access to sanitation services. Furthermore, the cost of sanitation services (construction of toilets, emptying of pits, etc.) is negotiated between the applicant and the service provider, without any intervention by the Ministry of Sanitation.

With regard to urban sanitation, national policy favors the off-site sanitation option (connection to the public wastewater sewerage network) (MCLAU, 2012) so that this option benefits from substantial funding compared to on-site sanitation. This situation remains unfavorable for the poor, who are generally located in areas not served by the collective network. The Affermage Contract between the State of Côte d'Ivoire and SODECI is a delegation of public services to the private sector to improve the provision of sanitation services. However, this contract does not provide specific solutions to the inequalities between the rich and the poor, since its implementation is limited to collective networks. Only a policy of promoting independent sanitation and improving faecal sludge management (FSM), considering the poor and vulnerable, would have a significant impact on the poor. The involvement of technical and financial partners (ADB, WB, BMGF, IDB, etc.) in financing the FSM sector in recent years, with a focus on an inclusive approach (CWIS: Citywide Inclusive Sanitation) in the implementation of interventions, is a welcome step towards meeting this challenge.

3.3 Outputs

3.3.1 Capacity to Meet Service Needs, Demands and Goals

Côte d'Ivoire has demonstrated its capacity to provide sanitation services, given to the various sanitation initiatives implemented over the past decade by technical and financial partners (TFPs) under the leadership of the State of Côte d'Ivoire. These initiatives include:

- the Sanitation Services Delivery (SSD)/USAID-PSI project, (2014 to 2021), which made improved sanitation products and services available to households, including those in Yopougon, by developing a market through the commissioning of 50 micro-enterprises.
- the RASOP-Africa/AAE project (2016 to 2018), which promoted the implementation of faecal sludge management strategies by identifying non-sewage sanitation projects in five African cities, including Yamoussoukro in Côte d'Ivoire.

- the PATER/CARE International project (2017-2021), which promotes household access to sanitation facilities through a subsidy system and the construction of STBVs in beneficiary cities.
- the Eau et Vie project (2019), which has enabled us to diagnose the needs in terms of access to sanitation in the commune of Yopougon.
- the MuniWASH/USAID project (underway since 2019), which aims to provide technical assistance to municipal goverments, including that of Yopougon.
- the ISC-Hub (Inclusive Sanitation Capacity-Hub) project (underway since 2020) was initiated by the Université Félix Houphouët-Boigny with financial funding from the Bill & Melinda Gates Foundation, which aims to overcome the weakness or lack of capacity of stakeholders to address urban sanitation management challenges in beneficiary cities in French-speaking West and Central Africa.
- the Projet d'Assainissement de la Commune de Yopougon (PACY)/AFD (underway since 2022), which will eventually collect and evacuate at least 70% of the wastewater from the central area of Yopougon. It will also help improve the biological state of the current receiving environment, the Ebrié Lagoon, and protect the water table.

In addition, between 2016 and 2018, several benchmarking missions were carried out in Dakar and Durban by decision-makers and other actors in the sanitation sector. This is in addition to other initiatives implemented by the State, such as:

- programs to raise household awareness of the need to build individual facilities in accordance with standards and to practice mechanical emptying.
- programs to identify, organize, license and strengthen the technical, logistical and managerial capacity of emptying operators.
- establishment of a guarantee fund to support the activities of landfill operators.
- planning for the construction and commissioning of faecal sludge treatment plants in Côte d'Ivoire.

3.3.2 Monitoring and reporting on access to services

Within the framework of actions in the sanitation sector, management mechanisms have varied according to the scale of action of the actors under the supervision of an inter-ministerial committee. Since 2016, the State of Côte d'Ivoire has initiated the implementation of a performance contract as part of the monitoring and evaluation of the various initiatives in the sanitation sector. This 3-year renewable contract was signed by MINHAS, the Ministry of the Budget in charge of the State portfolio, and ONAD as the delegated project owner for sanitation and drainage. As part of this performance contract, a quarterly evaluation will be carried out to monitor the implementation of the various activities, and reports will be prepared. At the local level, there are mechanisms whereby the municipal council decides on financial allocations for the development of sanitation services in the commune. At this level, monitoring and evaluation consists of verifying that the implementation of the strategic sanitation plan is carried out in accordance with the municipal planning, and that the actions implemented lead to the expected results.

About emptying services, all operators involved in this activity, including those in Yopougon, are listed in a database managed by ONAD. To better monitor all FS emptying operations at the 3 authorized sites in Abidjan (Abobo, Treichville and Yopougon), arrangements have been made for daily data recording of this activity. The information collected is stored in a database by ONAD and used for decision-making purposes. However, observations in the field have revealed limitations in terms of monitoring the sludge collection (emptying) operations within households to assess performance.

3.4 Expansion

3.4.1 Stimulating demand for services

Demand creation for sanitation services in Yopougon, in the district of Abidjan, was mainly led by NGOs and researchers working in this commune. Demand creation approaches such as sanitation marketing and Urban Community-Led Total Sanitation (UCLTS) were implemented by the Centre Suisse de Recherches Scientifiques en Côte d'Ivoire (CSRS) in collaboration with the NGO FAIRMED Cote d'Ivoire to stimulate demand for sanitation services. The NGO FAIRMED engaged and trained hygiene managers and natural leaders from the target communities (Gesco, An 2000, Beyaté, Sikasso, etc.) for demand creation activities. The trained resource persons were responsible for promoting sanitation and good hygiene practices, including the collection and disposal of household solid waste, in their communities. Accessible toilet models were presented to the local population to stimulate demand for toilets.

3.4.2 Strengthening the role of service providers

At the national level, the African Water and Sanitation Association (AAEA), has contributed to the training and capacity building of sanitation stakeholders through the RASOP project funded by the Bill & Melinda Gates Foundation. Sanitation service providers (emptying companies, SODECI, etc.) and managers of technical services in the various municipalities, including Yopougon, were the priority targets for this training. The training content was divided into three modules:

- The first module focused on the development of a faecal matter flow diagram. Participants were able to discover the usefulness of such a tool, especially for decision-making in sanitation planning.
- The second training module focused on capacity building for emptying companies. Discussions were held on the types of problems likely to arise within an association. The goal was to strengthen association of emptying companies in Côte d'Ivoire so that it can play an active role in the country's booming sanitation market.
- The third training module focused on the delegation of non-collective sanitation services to the private sector through a public-private partnership (PPP) model, and the development of a business plan for the creation of a small enterprise to manage faecal sludge.

As part of the Inclusive Sanitation Capacity-HUB (ISC-HUB) project piloted by the Université Félix Houphouët-Boigny (UFHB) and implemented by CSRS in the Abidjan district, several

training sessions were organized for actors in the independent sanitation sector. These included training on

- The importance of formalization for an emptying company.
- Improving knowledge of the rules and laws governing emptying and transport.
- Initiatives for the use of by-products from the treatment of Faecal Sludge (FS).
- Hygiene, safety and health in pit-emptying activities.
- Promotion of gender and social inclusion in sanitation, and particularly in the recovery of sludge.

4 Stakeholder Engagement

4.1 Stakeholder mobilization and involvement workshop

The completion of this SFD graphic required prior involvement and commitment of all stakeholders, from whom most of the data was collected. To this end, a stakeholder workshop was held on September 13, 2022, prior to the project's implementation, to launch the study activities. The Office National de l'Assainissement et du Drainage (ONAD), Société de Distribution de l'Eau en Côte d'Ivoire (SODECI), Yopougon City Council, service providers (emptier, plumber, mason, etc.) and the target population were all involved and present at this launch workshop (Figure 8). During this meeting, the project and study objectives, as well as the methodology, were presented to all participants, to gather their feedback and ensure full buy-in.

Figure 8: Family photo at the project launch workshop (Source: TRA_UFHB/CSRS, 2022).

4.2 Household survey

To obtain information on the types of toilets used and current emptying practices, a random household survey was conducted in Yopougon from October to December 2022. The household survey was conducted by six research assistants who were recruited and trained to become familiar with the questionnaire and the Kobo Collect mobile application used for data collection.

The sample size for the survey was determined using equation 1:

$$n = \frac{t^2 P\,(1-P)\,x\,N}{(t^2 P\,(1-P)+(N-1)\,x\,Y^2)} \qquad (Equation\ 1)$$

where n is the minimum sample size required; N is the size of the target population (in this case, counted in number of households, here N= 349,480 households); t is the desired confidence level (for a confidence level of 95% as considered in this study, t = 1.96); Y is the tolerated margin of error corresponding to the statistical risk (here, 5%); P is the expected proportion of the outcome of interest in the target population (P= 50% if no prior information is available, as was the case in this study). Applying equation (1) with a 5% margin of error and 95% precision resulted in a minimum size of 384 households covering the entire study

area. Therefore, a percentage of 80% of respondents was considered sufficient for each interviewer, hence:

$$n' = \frac{n}{r} \qquad (Equation\ 2)$$

Where “r” is the expected percentage of respondents; “n” is the size of the population to be interviewed and, “n”, the minimum size of the population to be interviewed. Thus, considering the percentage of non-response (or "wastage"), the total number of households to be interviewed should be 480. However, to strengthen the representativeness of the sample (quality control) and depending on available resources, additional households (n=79 households) were interviewed, and the final sample size was 559 households.

4.3 Direct observations

According to (Gabert, 2018), although complementary to questionnaire surveys, direct observations are more informative because they allow concrete observation of the reality of behavior and thus obtaining more reliable data through triangulation. In this study, direct observations were made at each stage of the sanitation value chain, i.e. from access to toilets and sludge containment, to emptying and transportation, to dumping (the links developed in Yopougon). These studies were conducted through household surveys and field visits to the authorized dumping site (Figure 9). They allowed us to (i) to assess the state of the existing sanitary facilities, (ii) to understand the operation of the dumping site, to observe the appearance and inventory of the emptying trucks operating in the study area, (iii) to observe the various stages of emptying and working conditions of the operators.

Figure 9: Data collection session during direct observations at the authorized BV dumping site (Source: TRA_UFHB/CSRS, 2023).

4.4 Stakeholders' validation workshop

On January 18, 2024, a pre-validation workshop was held at the Yopougon Technical Town Hall to share the initial results of the SFD graphic developed for the commune of Yopougon. Stakeholders present at the workshop included representatives from ONAD, SODECI, the EAA agency, emptying companies, NGOs and practitioners, the Technical Director of the City Hall, agents from the Technical Directorate and researchers (Figure 10).

Figure 10: Pre-validation workshop for the Yopougon SFD (Source: TRA_UFHB/CSRS, 2024).

5 Acknowledgements

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6 References

Assoumou, M.B.L., 2021. Pollution des eaux souterraines de la nappe d'Abidjan en Côte d'Ivoire : cas des forages alimentant l'usine de traitement du champ captant zone nord. Abidjan, Cote d'Ivoire.

BRL, 2021. Stratégie de l'Assainissement Non Collectif en milieu urbain en Côte d'Ivoire. (Rapport de diagnostic No. A00882). BRL Ingénierie, Côte d'Ivoire.

Climate Data, n.d. Climat Yopougon : Température de l'eau à, Température moyenne Yopougon, Pluviométrie, diagramme ombrothermique pour Yopougon [WWW Document]. URL https://fr.climate-data.org/afrique/cote-d-ivoire/abidjan/yopougon-883881/#climate-table (accessed 5.21.24).

Danumah, J.H., Odai, S.N., Saley, B.M., Szarzynski, J., Thiel, M., Kwaku, A., Kouame, F.K., Akpa, L.Y., 2016. Flood risk assessment and mapping in Abidjan district using multi-criteria analysis (AHP) model and geoinformation techniques, (Côte d'Ivoire). Geoenvironmental Disasters 3, 1–13.

DHH, 2001. Hydraulique Humaine en Côte d'Ivoire. Ministère des Infrastructures Economiques, Direction de l'Hydraulique Humaine. Abidjan, Cote d'Ivoire.

Gabert, J., 2018. Mémento de l'assainissement. Éditions Quae. https://doi.org/10.35690/978-2-7592-2737-2

INS, 2021. Recensement Général de la Population et de l'Habitat (RGPH) [WWW Document]. URL https://www.ins.ci/ (accessed 10.2.23).

Kouamé, K.A., 2013. Développement économiques et gestion de l'environnement : cas du commerce informel dans la commune de Yopougon. (Thèse de Doctorat d'État en géographie). Université Félix Houphouët-Boigny, Institut de Géographie Tropicale, Abidjan, Cote d'Ivoire.

Kouassi, A.K., Kouassi, F.W., Mangoua, J.O.M., Savane, I., 2014. Modèle conceptuel de l'aquifère du Continental Terminal d'Abidjan.

Kra Kouadio, E., 2014. Elections et développement local, de l'espoir a l'illusion : l'exemple des quartiers précaires de Yopougon.

MCLAU, 2012. Lettre de politique sectorielle (Assainissement et Drainage) Décrets de création et d'organisation de l'ONAD. [WWW Document]. URL https://finances.gouv.ci/publications?download=427:table-ronde-schema-directeur-assainissement-lettre-de-politique-sectorielle-1 (accessed 11.7.24).

Oga, Y.M.S., Lasm, T., Massault, M., Baka, D., Ake, G., Marlin, C., Biemi, J., Hillaire-Marcel, C., 2011. Caractérisation et suivi isotopique des eaux de la nappe semi-captive du Maestrichtien de la Côte d'Ivoire. International Journal of Biological and Chemical Sciences 5. https://doi.org/10.4314/ijbcs.v5i3.72195

ONU-Habitat, 2012. Côte d'Ivoire : Profil Urbain d'Abidjan. [WWW Document]. URL https://unhabitat.org/cote-divoire-profil-urbain-dabidjan-french (accessed 10.3.23).

Ouattara, Z.A., Kabo-Bah, A.T., Dongo, K., Akpoti, K., Siabi, E.K., Kablan, M.K.A., Kangah, K.M., 2023. Operational and structural diagnosis of sewerage and drainage networks in Côte d'Ivoire, West Africa. Frontiers in Sustainable Cities 5, 1032459.

Pothin, K.B., Gion, P., Groayes, C.C., 2000. Bilan géochronologique du socle précambrien de Côte d'Ivoire. Presse Université de Côte d'Ivoire. 1, 36–47.

Roose, E., Chéroux, M., Humbel, F.-X. (collab), Perraud, A. (collab), 1966. Les sols du bassin sédimentaire de Côte d'Ivoire.

Tagini, B., 1971. Esquisse structurale de la Côte-d'Ivoire. Essai de Géotectonique régionale. SODEMI, Abidjan.

WAYOU, T.P., 2010. Diagnostic du fonctionnement du réseau d'assainissement de la commune de Yopougon : cas du quartier Niangon en Côte d'Ivoire. [WWW Document]. Memoire Online. URL https://www.memoireonline.com/09/13/7371/Diagnostic-du-fonctionnement-du-reseau-dassainissement-de-la-commune-de-Yopougon-cas-du-quartie.html (accessed 6.27.24).

7. Appendix

Appendix 1: Stakeholder identification

Table 3: Stakeholder identification.

N	Names	Organization	Service	Contact
1	M. Konin Assemien	ONAD	Head of Monitoring and Evaluation Department for the Promotion of Non-Sewerage Sanitation	a.konin@onad.ci 0708857081
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5	M. Gogo Hyppolite	SODECI	Director SODECI Sanitation	ghgogo@sodeci.ci 0709029796
6	M. Sery Gbada C.	SODECI	Deputy Director, Sewerage Maintenance and Operations	cgbadasery@sodeci.ci 0707500889
7	M. Kouamé Martin	EAA/CI	Resident Representative	martin_kouame@yahoo.fr 0707648924
8	M. Fakorede Safaa	TETRATECH	Program Director MuniWash/USAID	safaa.Fakorede@tetratech.com 0769780379
9	M. Degoga	Mechanical emptier	President of the national emptiers	0707003867
10	M. Gana Moussa	Mechanical emptier	President of the Yopougon emptying company	0505780105
11	M. Traoré Mamadou	Mechanical emptier	Emptying company owner	0709059080

Appendix 2: Tracking Stakeholder Engagement

Stakeholders were contacted by e-mail, telephone and in person, depending on their availability. Discussions with them provided a better understanding of the institutional and regulatory framework related to the sanitation sector in Côte d'Ivoire in general, and in Yopougon in particular.

Appendix 3: Selected pictures of field visit

Figure 11: Selected pictures of field visit.

SFD Yopougon, Abidjan, Côte d'Ivoire, 2025

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