



(RESEARCH ARTICLE)



Household waste management system: The new of SGDS facing the challenges of sanitation in Cotonou (Republic of Benin)

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Abstract

The growth of household waste is noticeable in several cities in Africa due to rampant urbanization and population explosion. This state of affairs creates many management problems. The city of Cotonou, the country's main economic hub, is no exception to this reality. The inadequacies of DMS management by the COGEDA (Coordination of NGOs for the Management of Household Solid Waste and Sanitation in Cotonou) and the DST (Technical Services Directorate) of the town hall of Cotonou led to the establishment of the SGDS (Waste and Sanitation Management Company). However, there are still challenges in terms of sanitation in Cotonou. This work aims to describe the novelty in the current system of household waste management in Cotonou and the challenges it faces. Documentary research, direct observations in the field, survey by questionnaires and interviews with institutional stakeholders in the management of DMS in Cotonou constitute the methodology adopted. At the end of the field work, we note on the one hand several innovations in the current DSM management system in Cotonou and also some challenges to be taken up in order to make the system sustainable on the other hand.

Keywords: Cotonou; Household waste; Management system; COGEDA / DST; SGDS

1. Introduction

The population of Cotonou estimated in 2012 at 868,143 inhabitants will reach 1,257,330 inhabitants in 2027. This population increase influences the production of household waste in the city. In reality, the city of Cotonou is an economic hub which drains a very high population during the day from neighboring peripheral towns such as Sèmè-Kpodji and Porto-Novo to the east then Ouidah and Abomey-Calavi to the west. It is expected that the total production of DSM in Cotonou estimated in 2012 at 180,617 tonnes per year will reach 302,820 tonnes in 2027 [1]. According to [2] Biaou I. (2014, P.83), the results of the study conducted by the UNDP in 2011 on the diagnosis of waste in Benin, estimated the average quantity of household solid waste produced at 0.56 kg per living per day in Cotonou, that is to say a production of 498 837.36 kg. This reality has completely changed. For [3] Hounkponou, N.E.P. (2020, P.114), the production of DSML is 0.94Kg per capita per day in Cotonou, and the approximate mass of DSM is 654.69 tons / day and 238,961.85 Tons / year.

Since the era of Democratic Renewal, the urban face has been deeply affected by a proliferation of garbage and domestic wastewater. Despite the management of the DSMs by the COGEDA / DST, the situation remained distressing with the presence of illegal deposits all over the city. Currently, DSM management has been under the direction of the Waste and

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Sanitation Management Company (SGDS) since 2020. With the SGDS there are many innovations that are signs of an improvement in the DSM management system in Cotonou. However, management constraints remain and constitute challenges to be taken up in order to perpetuate the management system under the SGDS.

2. Material framework and study methods

2.1. Study framework

The city of Cotonou is located on the coastal strip from which it takes its name from the Littoral department, resulting from the last administrative division of Benin on January 15, 1999. It is located between 6° 20' and 6° 23' north latitude and 2° 22' and 2° 30' east longitude. It represents the only Municipality of the Littoral Department and is limited to the North by the Municipality of Sô-Ava and Lake Nokoué, to the South by the Atlantic Ocean, to the East by the municipality of Sèmè-Kpodji and to the West by that of Abomey-Calavi (figure 1). It covers an area of 79 km² (0.07% of the national territory), 70% of which is located to the west of the channel (Monograph of the Municipality of Cotonou, 2006: P.9). It is the only department in the country with a single municipality, with 13 districts and 143 city districts. Cotonou is the economic capital of Benin and alone concentrates almost all the administrative and political functions of the country. The city of Cotonou benefits from important infrastructures and several socio-economic activities are developed there. It has a road network which includes a fairly dense road network which has more than 600 km of tracks and a currently not very functional rail network.

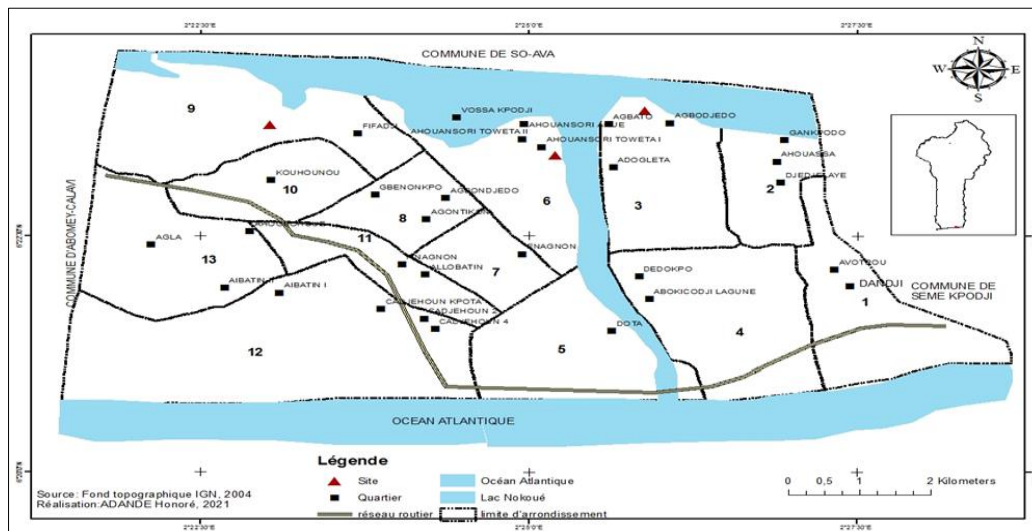


Figure 1 Geographical location of the city of Cotonou

The city of Cotonou does not have a watercourse, but Lake Nokoué (85 km²) and some swamps constitute the city's water reservoirs. During the flood due to the descent of water from the north and especially the great rainy season, the city is threatened by serious flooding (low level, strongly influenced by variations in the level of water bodies; maximum flood level: 1, 50 meters). The geographical location of the city of Cotonou, which does not have a large area, is a constraint in the management of household waste, where the swamps and the banks of Lake Nokoué constitute the places of waste dumps for the populations and certain waste pre-collection structures. Solid household.

2.2. Study materials and methods

2.2.1. Type of study

This is a descriptive and cross-sectional and retrospective study that took place from October 2019 to July 2021. It aims to describe the household waste management system in the city of Cotonou in Benin.

2.2.2. Study populations

In the context of this study, the targets are made up of all the players in the household waste sector. These are households, SMEs and political and administrative authorities involved in the household waste management sector.

2.2.3. Study data

The data collected within the framework of this research are those relating to the types of household waste produced by households, the methods of household waste management, the structuring and organization of the household waste management system of the era. From COGEDA / DST to the era of SGDS.

2.2.4. Data collection techniques and tools

The research was carried out along the following three axes: documentary research, interview survey and direct observation. The Garmin Map 60 Cx GPS was used to record the geographical coordinates of the DSM regrouping points in Cotonou.

Documentary research

It concerns research which has made it possible to compile information available in reports and studies on waste management in general and household waste in particular. Articles and comments posted on the Internet are also among the main sources of documentation used, as are DEA and thesis papers on the subject. This research made it possible to synthesize knowledge on the subject. Documents on waste management in Cotonou such as, legislative and regulatory texts relating to hygiene and sanitation, and environmental protection were also consulted nationally and internationally.

Field work

Regarding field surveys. They took place in two phases:

The first phase to take stock of household waste management in Cotonou in the COGEDA / DST era was carried out in December 2019. The surveys concerned 754 households in the 13 districts of the city of Cotonou. All players in the household waste management sector have been affected. These are households, the NGOs of the time which took care of the pre-collection of household waste, local elected officials, officials from the Cotonou town hall and the technical and financial partners who intervene in the management of waste from households. Household.

The second phase took place in July 2021, one year after the establishment of the SGDS, which deals with the management of household waste in Grand Nokoué, of which the city of Cotonou is a part. This phase also covers the management of household waste and the state of sanitation of the city of Cotonou. As in the first phase, 754 households were surveyed on their waste management methods after the implementation of new reforms on household waste management in Grand Nokoué. In addition to households, the SMEs which take care of the pre-collection of waste and sanitation in the city of Cotonou as well as the managers of the SGDS were interviewed on the methods of household waste management in the city. From Cotonou.

Direct observation

According to Massonat (1987), "direct observation is a process of knowledge serving multiple purposes which is part of a global human project to describe and understand his environment and the events that take place there.". This method was used to collect qualitative data in addition to the interviews. The aim is to collect data on the basis of observations made in the field regarding the methods of household waste management. Direct field observations made it possible to assess the effectiveness of each of the two household waste management systems in the city of Cotonou.

2.2.5. Data processing and analysis of results

The processing of the data and the analysis of the results constitute the last part of the methodological approach used in this study.

After the data was collected, they were entered in the Excel 2013 spreadsheet. The data was processed under SPSS for the calculation of averages, frequencies and the production of some graphs. The Arcgis software was used to project the geographic coordinates on a base map. Qualitative data was subject to content analysis and synthesis.

3. Results and discussion

3.1. The novelty factors in the DSM management system in Cotonou

3.1.1. Coordination of the stages of management of DSMs in Cotonou from the era of COGEDA / DST to SGDS

Table 1 summarizes the structure of DSM management in Cotonou in the era of COGEDA / DST.

Table 1 Order of DSM management in the era of COGEDA / DST

Characteristics Management level	Nature of the structure involved	Global coordination	Type of partnership
Pre-collection	ONG/PME	COGEDA	Private public partnership
Collection / Transport	PME	DST/Mairie	Service provision
Processing	PME	DST/Mairie	Service provision

Source: Fieldwork, Cotonou, Adandé, 2020

From Table 1, we note the three management levels of the DSMs in Cotonou at the time of COGEDA / DST. These three levels vary according to the nature of the structure involved, the overall coordination of activities and the type of partnership between the actors. In general, management responsibilities do not fall to a single body: the pre-collection is the responsibility of NGOs / SMEs whose coordinating body is COGEDA, while the collection and treatment of waste are managed by the City of Cotonou. via its Technical Services Department (DST). With the advent of SGDS, the new structure is presented in Table II.

Table 2 Structuring of the DSM management system in Cotonou

Characteristics Management level	Nature of the structure involved	Global coordination	Type of partnership
Pre-collection	PME	SGDS	Service provision
Collection	SGDS	SGDS	Direct
Processing	PME	SGDS	Service provision

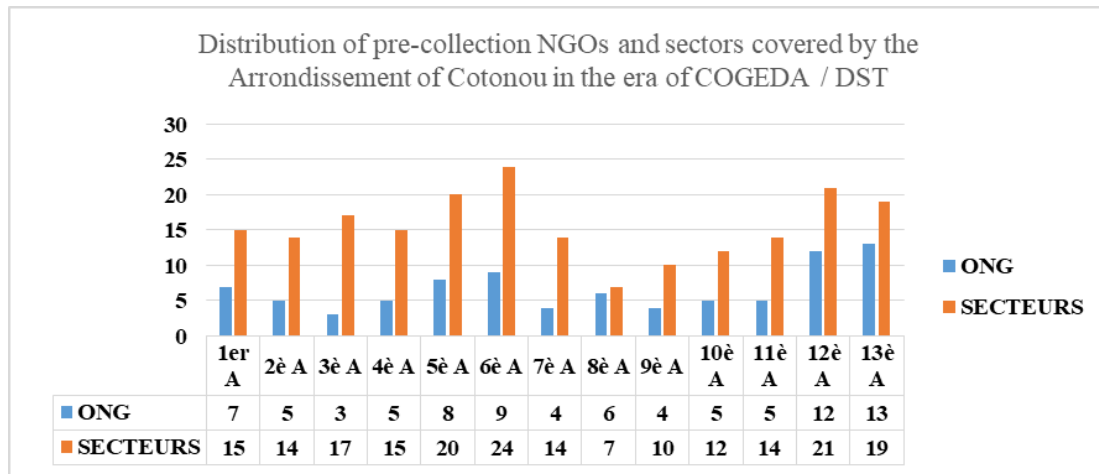
Source: Fieldwork, Cotonou, Adandé, 2020

On reading this table 2, we note that all the structures currently involved in the management of DSMs in Cotonou are SMEs, but in the past the pre-collection was carried out by NGOs. These NGOs did not have the adequate legal status to contact financial loans in order to cope with the increasing demands of material resources for pre-collection operations. This state of affairs makes the pre-collection work painful for carters and garbage collectors. While with the current status, SMEs have an easier time acquiring equipment suitable for pre-collection operations such as where applicable where SGDS has allocated motorized tricycles to all SMEs under service contract with SGDS against reimbursement. Progressive. As regards the collection of DSMs, management is no longer interposed as was the case with the DST in partnership with GLASSEM SA. The SGDS directly collects and transports the DSMs from the regrouping points and the Transfer Center through its more or less suitable means to the LES. In terms of processing, SGDS remains in partnership with AGETURE via a service provision. It should be noted that the control mechanism, which was faulty or even non-existent at the time of COGEDA / DST, is currently much better defined at all levels of DSM management by the SGDS.

3.1.2. Zoning plan for the DSM pre-collection in Cotonou from the COGEDA / DST era to the SGDS

Zoning plan for pre-collection in Cotonou in the era of COGEDA / DST

At the time of COGEDA / DST, there was a sectorization of pre-collection. In fact, the city of Cotonou was divided into 95 waste pre-collection sectors which were covered by 77 NGOs in 2007 than 93 sectors covered by 86 NGOs in 2019. The result is an average theoretical coverage rate of 81.05% in 2007 against an average theoretical coverage rate of 92.47% in 2019. This suggests that all the districts of Cotonou were well covered in terms of the presence of pre-collection NGOs. However, this rate conceals a disparity at the level of the arrondissements: 17.64% for the third arrondissement against 64.42% for the thirteenth arrondissement (figure 2).



Source: DST, Cotonou, 2020

Figure 2 Distribution of pre-collection NGOs according to their workforce and the sectors covered by the Cotonou city district in 2019

Zoning plan for pre-collection in Cotonou in the era of SGDS

Currently the zoning plan has undergone a reform with the new DSM management structure in Cotonou. Thus the SGDS divided Cotonou into twenty (20) pre-collection lots to be covered by twenty (20) SMEs. Two (2) direct collection areas have been selected to be provided by the SGDS itself through itinerant collection. Thus, there are currently 20 pre-collection SMEs in Cotonou divided into twenty (20) cover lots. The investigations carried out on the ground revealed the existence of a repair of SMEs by regrouping point and by District. So to cope with the insufficiency of PRs, SGDS combined some SMEs by PR while ensuring the operating arrangements for each SME (Table 3).

According to Table 3, it should be noted that all the Cotonou districts now have a DSM grouping point.

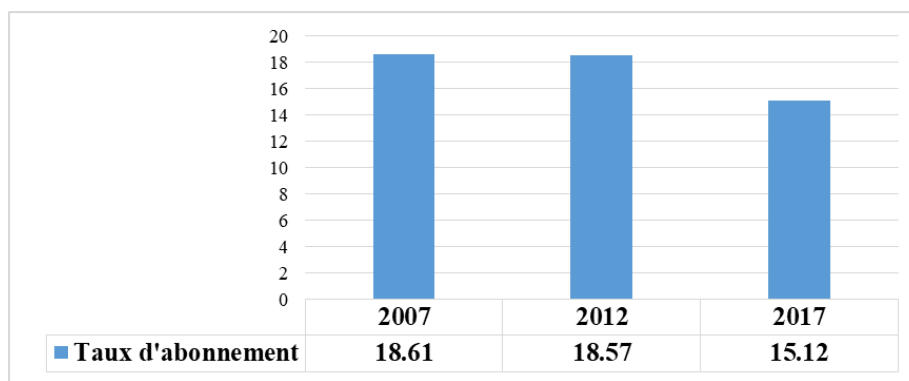
3.1.3. Garbage collection regime in Cotonou from the era of COGEDA / DST to SGDS

The DSM removal regime in Cotonou in the era of COGEDA / DST

In the era of COGEDA / DST, household waste collection is provided by NGOs for a subscription. Indeed, the services have a monthly cost for the household. Generally, households individually opt for the collection of their solid waste, for which they pay regularly. It is noted that the subscription fees vary from one provider to another and sometimes also vary depending on the client's head; but above all do not take into account the quality of the waste to be removed. The service provision of pre-collection NGOs is evaluated between 1500F and 3000F while it was of the order of 1000f to 1500f according to the work of PUGEMU (2012). It is also important to note that not all households are able to meet their obligations with respect to pre-collection services. Figure 2 shows the change in subscriptions between 2007 and 2017. It shows a decline in the DSM pre-collection rate in Cotonou during the COGEDA / DST era. From 2012 to 2017 this rate fell from 18.61% to 15.12%. This is justified by the insufficient subscriptions to the pre-collection in Cotonou at the time of COGEDA / DST.

Table 3 Distribution of SMEs according to grouping points and by District

GROUPING POINTS	PME exploitants du PR		N° de lot ou de zone	Arrondissement de Cotonou
	Dénomination du PME	Effectif PME		
Site de TOKPLEGBE	PARA POYEL SARL	1	1	1er
Site d'AVOTRU	VIPE INTER SARL	2	2	1er
	SAGIBEL		3	1er
Site de MINONTCHOU	SIBI AE	1	4	2ème
Site d'AGBODJEDO	OMEGA VILLE PROPRE	1	5	3ème
Site de KPANKPAN	HYSAA SA	1	6	3ème
Site d'ABOKI KODJI	LE PHARAON	1	7	4ème
Site de MEDEDJRO	ATIWIB GROUPE	2	9	6ème
	ECA COBENAT SARL		10	6ème
Site de ST MICHEL	BENIN ECO CENTER	1	8	7ème
Site de TONATO	ODASER BETHESDA	1	11	8ème
Site de MENONTIN	CTM	1	12	9ème
Site de ZEZOUNME/ FIFADJI	NEC BTP	2	13	9ème
	ETS TOHOUIME		14	10ème
Site de GBEGAMEY/CAMP GUEZO (Centre de Transfert)	CISE AFRIQUE	2	15	11ème
	RHEMA DIVINE		16	12ème
Site de HOUENOUSSOU	B BLESSED	1	17	12ème
Site de HLAZOUNTO	NED SARL	1	18	13ème
Site d'AGLA "LES PYLONES"	BIFPOM	1	19	13ème
Site de "CITE HOUEYIHO"	BALEM	1	20	13ème
TOTAL	20		20	13

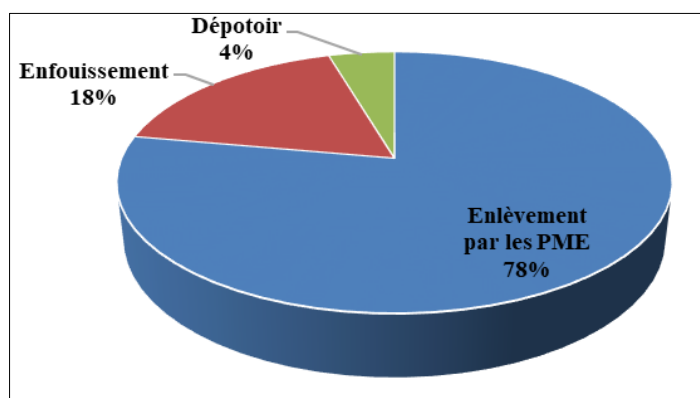


Source: PUGEMU, 2013 and COGEDA, 2019

Figure 3 Evolution of the pre-collection subscription rate in Cotonou from 2007 to 2017 in the era of COGEDA / DST

DSM removal regime in the SGDS era: Temporary free pre-collection in Cotonou

For the moment, households in Cotonou are no longer subject to subscription fees for the removal of their household solid waste. The Government of Benin has declared pre-collection operations free until further notice in Grand-Nokoué to which the city of Cotonou belongs. SGDS-GN is responsible for carrying out this provision while discussions continue for a subsequent decision. With the current organization, SMEs systematically remove household garbage, which requires them to take out their waste for disposal by garbage collectors. The investigations carried out among households in the city of Cotonou give the results shown in Figure 3.



Source: Fieldwork, Cotonou, Adandé, 2020

Figure 4 Waste disposal method in households in Cotonou during the SGDS era

Figure 5 reveals that 78% of households in Cotonou have their garbage removed by NGOs that have become SMEs. This is justified by the provisional free provision of the DSM pre-collection currently in force. However, 18% of households surveyed continue to bury their garbage and 4% still use the dump.

3.1.4. Transport equipment for the pre-collection of DSMs from the COGEDA / DST era to the SGDS

Rolling stock for the pre-collection of DMS in Cotonou in the era of COGEDA / DST

In the era of COGEDA / DST, the transport of waste to the collection points is done using human-powered carts, using motorized tricycles, or using vans which make it more difficult the work of the carters who have to travel great distances before reaching the regrouping points created for this purpose (figure 5)

One of the characteristics of the pre-collection system which constituted a difficulty for the NGOs involved with the quality of the transport materials available to these structures. Before the advent of the SGDS, the use of these transport materials by NGOs was still relevant. Even with the SGDS, the new pre-collection structures initiated by it temporarily used them before the reception of the new forms of tricycles.



Shooting: Adande, January 2020

Figure 5 Ordinary tricycles without cab for the driver at the PR of Abokicodji in the 4th Arrondissement of Cotonou

Mechanization completes the pre-collection of DMS in Cotonou in the era of SGDS

With the current system, DSM pre-collection is fully mechanized. To cope with this operation, SGDS has acquired two categories of machinery that are more competitive and better suited to pre-collection than in the past: these are motorized tricycles and tamping skips. Thus, the SGDS allocated to the SMEs selected after a call for tenders uniform motorized tricycles in green colors to ensure the pre-collection in their respective area. The acquisition of tricycles is part of the SGDS clauses with SMEs. As for BOMs, they are used for direct collection in certain areas and to replace tricycles in certain areas in the event of failure. The tricycles acquired by SGDS and made available to SMEs for pre-collection have several characteristics that distinguish them from those used by pre-collection NGOs in the era of COGEDA / DST:

- They are all motorized to promote the speed of garbage removal operations and unloading transactions at collection points. This allows some tricycles to make several laps in the same day to dump the DSMs collected from households in the household garbage bins at the collection point. According to our investigations with the managers of SMEs, current tricycles make an average of three to four trips per day depending on the collection areas. It should be noted that for areas with a nearby PR, some SMEs go up to six tricycle trips per day.
- They have a very interesting removal system that is used to send the trash into the bin automatically without unduly disturbing the garbage collectors who without this device were deploying enough energy to empty the bins (figure 6)



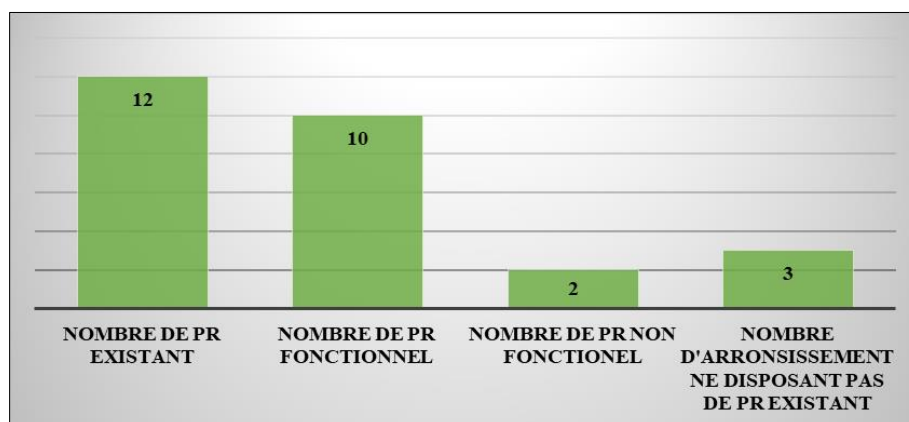
Shooting: Adandé, July 2021

Figure 6 A tricycle showing a bin emptied by the automatic collection system at ST Michel in the 7th Arrondissement of Cotonou

3.1.5. Inventory of regrouping points from the COGEDA / DST era at the SGDS

Number of DSM regrouping points in Cotonou in the era of COGEDA / DST

At that time of COGEDA / DST, most of the districts of the city of Cotonou had at least one PR except for the 2nd, 7th and 13th districts which did not have at all at least an infrastructure of reception of solid household waste. Of the twelve (12) PRs available in Cotonou at the time, two were non-functional. Figure 7 shows the functional status of these PRs in 2012



Source: PUGEMU, 2013

Figure 7 Inventory of PRs in Cotonou in 2012 in the era of COGEDA / DST before PUGEMU

With the PUGEMU, all the existing PRs were fitted out and made available to the Cotonou Town Hall in order to promote the pre-collection and the collection of DSMs. Plate 2 below shows the PRs refurbished by PUGEMU to support the DSM management system at the time of COGEDA / DST



Shooting: Adande, August, 2020

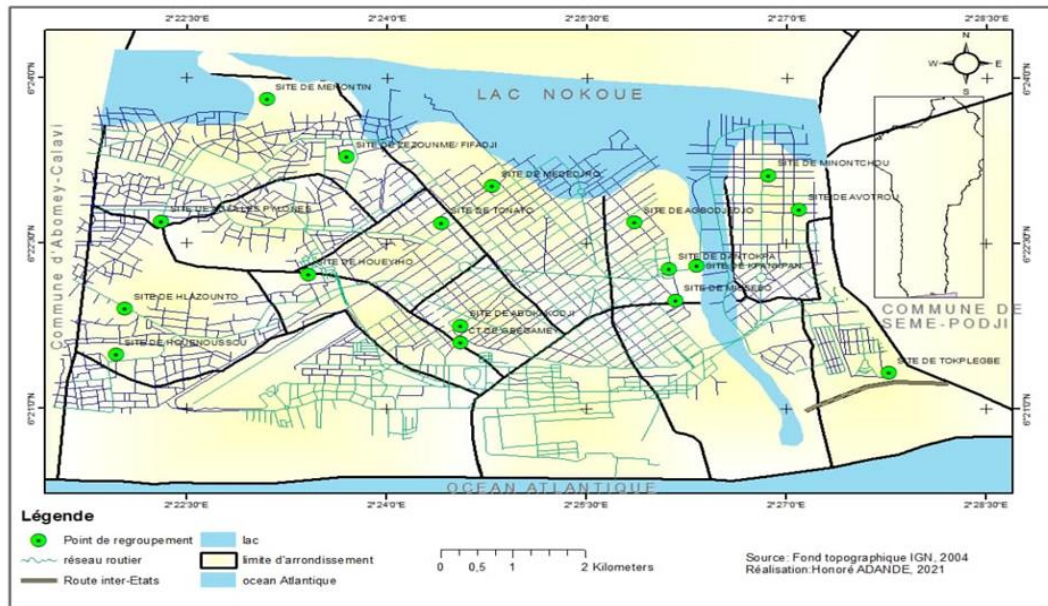
Figure 8 DSM regrouping points (a: MEDEDJRO site in the 8th Arrondissement and Menontin site in the 9th Arrondissement of Cotonou)

Before the SGDS, the city of Cotonou has twelve (12) fully equipped and functional PRs.

Strengthening of DSM regrouping points in Cotonou in the SGDS era

With the new system managed by SGDS, not only have the old PRs been fitted out and made all functional, new regrouping points have been built. Fieldwork has currently revealed sixteen (16) PRs of DSM in Cotonou and one (01) Transfer Center (CT) which also serves as PR point for two SMEs. It should be mentioned that some of these PRs are mobile, that is to say temporarily installed without a definitive arrangement. These measures taken by the SGDS reinforce those of the DST and greatly promote the collection of DSM in the thirteen (13) arrondissements of the city of Cotonou. Because at the time of COGEDA / DST, there were Arrondissements in Cotonou without a PR and even among those that did, there were some non-functional PRs; a situation which adds to the sorrows experienced by those

involved in the management of DSMs in Cotonou. Figure 9 below is the map of the city of Cotonou which highlights the current points of DSM regrouping.



Source: Field data, July 2021

Figure 9 Distribution map of DSM regrouping points in Cotonou

3.2. Sanitation challenges in Cotonou in the era of SGDS

Currently, the DSM management system in Cotonou is encountering some difficulties relating to all the links in the DSM management process: pre-collection, collection / transport and treatment of DSM.

3.2.1. Difficulties related to DSM pre-collection activities in the SGDS era

They are numerous and are summarized around the following axes:

- Instability of certain garbage collectors in places in search of well-being;
- resistance of rolling stock (tricycles): most SMEs (more than 50% of those responsible for SMEs surveyed complained about the quality of the tricycles allocated to them by the SGDS, which frequently break down;
- Methods of remuneration for SMEs: some SMEs are not satisfied with the method of payment by tonnage instituted by the SGDS. The managers of SMEs surveyed complain about the imbalance in terms of the allocation of lots and the inadequacy of the financial index in terms of tonnage,
- the incivism of certain households which complicate the task of garbage collectors by lack of possession of garbage cans, by mixing excreta with garbage;
- refusal to provide garbage in places in order to fill the bottomlands
- non-compliance with zoning by certain SMEs which encroach on the territory of other SMEs
- Weak collaboration from some households who do not prepare the garbage on the days when the garbage collectors pass.

3.2.2. Major difficulties related to DSM collection activities in the SGDS era

At the present time, the difficulties related to collection activities in Cotonou are as follows:

- Delay in the removal of garbage bins at the PR during the rainy season

3.2.3. Difficulties related to the treatment of MSD in the era of SGDS

- Lack of formal sorting in PR / CT / LES.
- Accessibility: About 5 km long, the access road to the site, after 35 km of motorable road, is an impassable dirt track and closed to traffic after the heavy rains. This closure can last several days, thus preventing carriers from

emptying the containers and carters from lifting the bins. The pre-collection transfer chain is broken and creates a great inconvenience to the population.

3.2.4. Difficulties related to the sanitation of wastewater and excreta in Cotonou

- No sewer network
- Insufficient public latrines
- Lack of public latrines in some areas of the city
- Incivism of some citizens who build their homes in swampy areas
- Lack of domestic wastewater treatment plant
- Lack of an excreta recovery site
- Lack of visibility in wastewater and excreta management structures
- Lack of reliable data in the management of domestic wastewater and excreta

4. Discussion

The SWOT analysis of the waste management system in Cotonou during the COGEDA / DST era showed the limits of the DSM management system and the non-existence of the domestic wastewater and excreta management system. In the African context, [4] Nogo Edondo BO and Tchoukoua LB (2021, P.42) obtained the same results in the study on the Univism of populations, laxity of public authorities and urban disorder in the city of Yagoua (Extreme North Cameroon). These authors have thus shown that institutional and organizational limits have engendered urban disorder and consequently the deterioration of living conditions. In the context of the sub-region, [5] Kondoh E. et al (2019, P.2207) obtained similar results in the study on the state of affairs on the management of household waste in Grand Lomé. These authors identified three main actors in charge of waste management: the public sector, the private sector and the informal sector. In addition, the organization of waste management is the prerogative of Lomé City Hall. Unfortunately, there is no mechanism for monitoring and supporting this sector in Lomé. Thus the management of waste in the greater Lomé is confronted with constraints which hamper its development. These constraints are noted at the institutional, organizational, technical, financial and behavioral level. The major constraints are financial: the foreseeable financial resources are not up to the present needs. This observation is similar to the reality of household waste management in the city of Cotonou at the time of COGEDA / DST where the weakness of financial resources devoted to the DSM management institution justifies the insufficient management of DSMs. The constraints of the household waste management system in the SGDS era pose a threat to the sustainability of the household waste management system in Cotonou in this new era. In fact, several waste management practices within households do not comply with ecological standards and contribute to unsanitary conditions in the city, a source of contamination of water resources and therefore the health of populations. Thus, the management of household waste in Cotonou challenges all stakeholders and even civil society because the existence of several categories of households in correlation with the categories of sanitation space makes this management more complex. [6] Nguéma, PF (2021, P.8) in the study called Implementation of the participatory pre-collection in the sustainable management of household solid waste: case of the district of Douala V in Cameroon, showed that the methods of waste disposal are linked to the standing of households. Thus he concluded that the most appropriate conservation tools (covered buckets and plastic bag) are the most used in high standing households and little used for low standing households. And this is because low-end households have low incomes and don't care about buying a compliant bin. This confirms the reluctance observed within households regarding the acquisition of approved bins despite the recommendations of the SGDS. After the study relating to the inventory of household waste management in Grand Lomé, [5] E. Kondoh et al (2019) proposed that a real restructuring of the waste sector with the establishment of a sanitation director in the city of Lomé will make this sector efficient. These authors recommended the protection and social inclusion of informal waste workers on aspects of law, labor regulations, formalization, occupational health and safety. For the city of Cotonou, there is already a sanitation master plan. Unfortunately, this is just in name. [7] Saker S. and Alkama D. (2020), in the study entitled: The management of household waste in Oum El Bouaghi: state of play, challenges and development prospects, proposed to involve civil society, which is a key player urban and ecological development. Because for these authors, the success of household waste management in the city depends greatly on the maturity and awareness of users as managers, at the local level, and influential members in terms of financing their one-off projects in the city.

5. Conclusion

In the era of COGEDA / DST, one of the weaknesses of the DSM management system was related to the insufficiency of regrouping points. Which obviously caused a lot of uncontrolled dumping or illegal dumping. Several NGO officials involved in the pre-collection reported that they often resorted to underground dumps and dumpsites to unload pre-

collected DSMs. The reasons given are multiple and relate on the one hand to the quality of the few existing PRs and on the other hand to the nonchalance of removing the garbage bins placed in the PRs. The DSM management system in the SGDS era in Cotonou is markedly different from that existing during the COGEDA / DST era. We note a complete mechanization of the pre-collection, a higher collection rate and a quantification of the waste collected. This is the start of modernization of waste management in Cotonou. It is urgent to deal effectively with the weaknesses of the system in order to meet the current challenges on a lasting basis.

Compliance with ethical standards

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Disclosure of conflict of interest

The writing of this manuscript is without conflict of interest. Each of the authors contributed to the success of this manuscript.

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