Choosing and implementing small-bore sewers for the provision of sanitation services

Country Report

SENEGAL

Jean-Marie Ily, January 2013




AGENCE FRANÇAISE DE DÉVELOPPEMENT

Agence de l'eau eau seine NORMANDIE

SYNDICAT INTERDÉPARTEMENTAL POUR L'ASSAINISSEMENT SIAAP DE L'AGGLOMÉRATION PARISIENNE

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Summary

Of all the countries included in this study, Senegal is the country, along with Brazil, **that has been using small-bore sewers the longest, with experience stretching back over 20 years**. Paradoxically, it is also perhaps the country that has experienced the greatest difficulties.

This report begins with a brief overview of the use of small-bore sewers in Senegal. This is followed by an analysis of around ten in-depth case studies that focuses on the following questions:

How and in which context were small-bore sewers selected?

Physical, economic and urban factors mean that small-bore sewers are used in areas where on-site sanitation is considered too problematic.

However, **those stakeholders ultimately responsible for managing and operating the service are not closely enough involved in the selection process**.

Users are pleased to have a service that removes the need for pit emptying and for which, in reality, they pay no tax. However, it would appear that when it comes to helping manage the small community-based sanitation services or fully covering the cost of their connection, users' willingness to volunteer and willingness to pay are very low.

Small-bore sewer networks are extremely vulnerable to **external forces** (they can be damaged by vehicles or blocked by solid waste and sediment from stormwater intrusion, etc). The development of small-bore sewers should therefore form part of an **integrated approach** that also encompasses the restructuring of land tenure, improvements to housing and the development of all basic services.

What technical options were selected and how were these implemented?

The 'small-bore sewers' in place in Senegal **vary widely** in terms of the technological options used, the size of the sewer networks and the extent to which these are integrated into municipal sanitation services. There is a good level of **local expertise** available in Senegal. However, there are **numerous shortcomings in implementation** that often adversely affect the quality of the infrastructure developed.

Although '**capacity-building**' (for contracting authorities and future operators alike) is consistently requested, it only ever accounts for a very small part of projects and their budgets.

Social engineering: what user-focused activities are developed?

All 'small-bore sewer' projects appear to include elements of **demand stimulation and awareness-raising of 'good practices'**. There is also local know-how available in these areas.

There also appears to be a need for **ongoing awareness-raising** for users throughout the lifetime of the service. However, it would seem that neither this requirement nor that of '**user relations**' is properly taken into account over the long term.

What are the main management and operational issues?

We have identified **four 'levels' of maintenance**; each of these corresponds to a specific skill level and can be carried out by a different person or contractor.

As with any networked service, substantial management skills are required to successfully regulate the technical, financial and social aspects of the 'small-bore sewer' service. However, this management framework is rarely set out in writing. Furthermore, stakeholders' understanding of this framework varies, with some stakeholders allocated responsibilities that have no bearing on either their capacities or desired level of involvement. Thus, roles systematically become blurred during the operation phase.

For the majority of small-bore sewer services in Senegal, it is currently unclear as to who is responsible for operating the service and who is the contracting authority.

What are the costs and how are these costs met?

The financial benefits of investing in 'small-bore sewers' as opposed to other sanitation chains ('on-site + pit emptying' and 'conventional sewerage') are open to debate and likely to remain so due to a lack of reliable, comparable and up-to-date figures. Although small-bore sewers require less initial investment than a conventional sewer system, local public authorities and users are currently **unable to afford the cost of a small-bore sewer** unless this is **highly subsidized by the state and/or ODA**.

As with investment costs, the only **operating cost estimates available are partial and approximate**. Costs are generally under-estimated, which subsequently makes it extremely difficult to recover sufficient costs and deliver a good quality service.

Lastly, although various attempts have been made to develop such a mechanism, small-bore sewers in Senegal are still in need of a sustainable **cost recovery** system.

Introduction: why a study on small-bore sewers and why Senegal?

Review of the study objectives

A technical option under development…and under discussion

The small-bore sewer is a **solution that has been implemented across the world over the last few decades, using diverse technological options and management methods and in a wide range of contexts and on different scales**: from rural towns in India or Egypt to built-up neighborhoods in Pakistan or Brazil, where these networks can cover several hundreds of thousands of inhabitants.

A large number of examples can also be found in sub-Saharan Africa and this solution is attracting **growing interest** from both sanitation stakeholders across Africa and their cooperation partners.

However, **the implementing conditions** required to ensure these small-bore sewers are effective remain open to debate, as do their **real comparative advantages** over other sanitation solutions.

Although there is a wealth of literature and case studies on this topic, there is as yet no **synthesis of the solution's technical, financial, social and management aspects** available to decision-makers or field practitioners, and no **methodological support tool** for local contracting authorities.

Study objectives

The aim of the study is to provide responses to the following three questions:

- *What exactly are the **strengths and weaknesses** of small-bore sewer systems from a technical, financial and management perspective? What have been the **factors of success – or failure – of the different small-bore sewer systems** implemented across the globe? **In which contexts** is this solution appropriate?*
- *What recommendations for **designing, implementing and operating** these systems in African countries can be made?*
- *Is it appropriate to advocate this solution to national and local decision-makers in Africa and their development partners, and what obstacles need to be overcome to do this?*

This information will feed into two main deliverables:

- **An evidence-based study report in which all the results will be consolidated and analyzed;**

- **A reference guide to assist local contracting authorities and their partners** not only **to identify the contexts to which this solution is particularly suited**, but also to **implement the entire small-bore sewer project cycle** once the decision to use this option has been made**.**

Review of the country study objectives

Why a study on Senegal?

Alongside Ghana, Senegal has the most and oldest small-bore sewers in West Africa. This option has been piloted on a large-scale within the metropolitan area of Dakar (PAQPUD and GPOBA programs) and the construction of small-bore sewers is continuing and even increasing in Dakar with the support of development cooperation partners.

Senegal is also a priority country of both pS-Eau network members and the study partners.

Review of the country study objectives

In line with the overall study objectives, and in order to assess the extent to which the small-bore sewer option is appropriate for different contexts, the aim of this country study is to analyze:

- the **implementation contexts** of small-bore sewers in Senegal and the **reasons for selecting this option**;
- the **strengths and weaknesses** of the solutions currently in use.

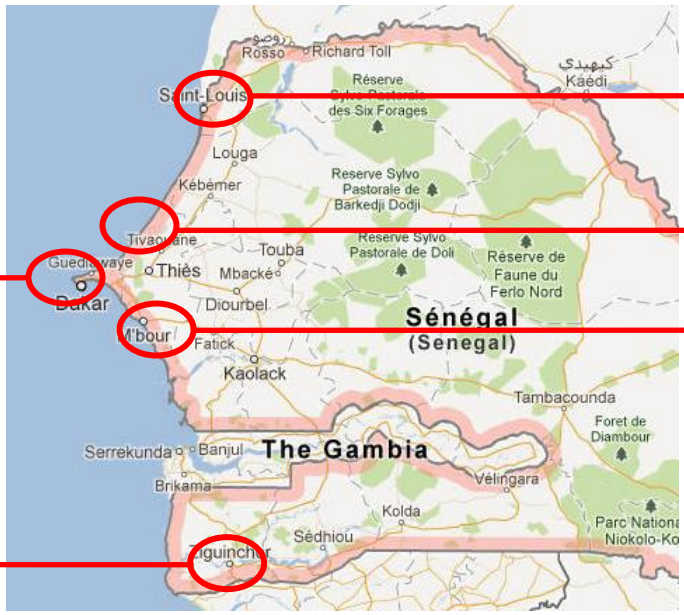
Therefore, although local stakeholders may find the conclusions useful, the aim of the study is not to develop operational recommendations at this stage.

I. Where are Senegal's small-bore sewers located?

Map of Senegal's small-bore sewer systems

Metropolitan Area of Dakar
ENDA 1995, 1999
ONAS 2006, 2013
ONAS –DAV 2013

Bignona
ENDA RUP 2006



Saint-Louis
ENDA RUP 2006
ONAS-CTB 2012
GRET 2014?

Cayar
ENDA EP 2013

Mbour
Droit à la ville
2013

Small-bore sewer systems in Dakar

Cambérène (ONAS)
Thiaroye (ONAS)
Mbao village (ONAS)
Ngor 1 (ONAS)
Yoff –Tonghor (ENDA)
Mbao Cité Ndeye Maire (ONAS)
Ngor 2 (ONAS-Un Habitat)
Petit Mbao (ONAS-Fondation Droit à la Ville)
Bargny (ONAS)
Ouakam (ONAS)
Rufisque Est (ONAS)
Cité Ousmane Fall (ONAS)
Rufisque (ENDA)
Hann Bel Air 2 (ONAS-Fondation Droit à la Ville)
Baraka (ENDA)
Hann Bel Air (ONAS)

Summary table of the small-bore sewer systems identified in Senegal

The systems highlighted in orange were visited as part of this study

Location	Date of Entry into Operation	No. of Connections	Service Status	Entity Responsible for the Service	Operation	Investment Financing
ENDA RUP Rufisque	1995	180 to 200	Operational	?	?	French Decentralized Cooperation
ENDA RUP Yoff	1999	29	Operational (except WWTP)	?	?	French Decentralized Cooperation
ENDA RUP Baraka	1999	Around a hundred	Operational	Users' Association	Users	French Decentralized Cooperation
ONAS Ngor 1	2006	421	Operational	ONAS/ local authority	ONAS/ local authority	Senegalese Government (World Bank loan)
ONAS Yoff	2008	1,100	Operational	ONAS	ONAS (to be transferred)	Senegalese Government (World Bank loan)
ONAS Bargny	2010	299	Operational	ONAS	ONAS (to be transferred)	Senegalese Government (World Bank loan)
ONAS Mbao (village)	2010	647	Operational	ONAS	ONAS (to be transferred)	Senegalese Government (World Bank loan)
ONAS Mbao (Cité Ndeye Maire)	2010		Operational	ONAS	ONAS (to be transferred)	Senegalese Government (World Bank loan)
ONAS Cité OF	2006	174	Operational	ONAS	ONAS (to be transferred)	Senegalese Government (World Bank loan)
ONAS Ouakam	2008	1,021	Operational	ONAS	ONAS (to be transferred)	Senegalese Government (World Bank loan)
ONAS Rufisque-Est	2010	287	Operational	ONAS	ONAS (to be transferred)	Senegalese Government (World Bank loan)
ONAS Hann Bel Air	2010	868	Operational	ONAS	ONAS (to be transferred)	Senegalese Government (World Bank loan)
ONAS Cambérène	2012?	950	Unfinished	ONAS	ONAS (to be transferred)	Senegalese Government (World Bank loan)
ENDA RUP Bignona	2006	?	?	?	?	French Decentralized Cooperation
ENDA RUP Saint-Louis Khor	?	?	Not operational?	?	?	French Decentralized Cooperation
ENDA RUP Saint-Louis Diaminar	?	?	Not operational?	?	?	French Decentralized Cooperation
ONAS-CTB Saint Louis/Darou	2011	500	Operational	ONAS/ local authority /users	ONAS/users	Belgian Development Cooperation
ONAS Thiaroye sur mer (Pikine)	2013	776	Under completion	ONAS	ONAS (to be transferred)	IDA (World Bank)
ENDA EP Cayar	2013?	350	Under construction	Local authority /users	Users/EIG	French Decentralized Cooperation
Droit à la ville 1 Hann Bel-Air	2013?	?	Under construction	ONAS?	?	EU
ONAS Ngor 2	?	?	Not operational (unfinished)	ONAS/ local authority	-	UN Habitat
Droit à la ville 2 Petit Mbao	2013?	?	Under construction	ONAS?	?	EU
Droit à la ville 3 Mbour	2013?	?	Under construction	ONAS?	?	EU
Dagana	?	?	?	?	?	?
GRET Saint Louis	Planned for 2014	-	In search of funding	ONAS/local authority/users	EIG	AESN+CG EURE+?
Approx. 23 systems in total		**7,500 connections[1], i.e. between 50,000 and 75,000 users**				

[1] According to the PEPAM 2012 annual review overview report, there were 11,477 settled sewerage connections identified between 2004 and 2011. This figure has most likely been calculated using the 'official' figures contained in program reviews and occasionally revised as a result of field evaluations, such as the one used to obtain the figures contained in this table.

Systems still in search of a management model… but which are becoming more prevalent

A pioneering initiative from ENDA RUP

At the beginning of the 1990s, the NGO **ENDA Tiers Monde** drew on the initiatives undertaken in Pakistan and Brazil to implement Senegal's first small-bore sewers in the low-income suburbs of Dakar. Although other initiatives were also being carried out in West Africa at this time (notably in Ghana with assistance from UNDP and the World Bank), **ENDA played an important role in expanding the use of this technology throughout Francophone Africa and in undertaking extensive advocacy** with development partners. ENDA is also one of the only organizations in Senegal to focus on the '**very poor**', such as the people living in the informal settlement of Baraka.

ENDA developed its solutions empirically. **ENDA not only designed the systems but also implemented the entire project,** carrying out the majority of tasks itself, including IEC, technical and financial engineering. The systems were then built by small entrepreneurs trained by ENDA.

Several evaluations have been carried out on these 'ENDA projects' (Tha Thu Tuy, 1996, Guene 2002, Michelon 2012). They all confirmed the importance of these initiatives and identified a series of lessons to be drawn from their implementation. They also highlighted certain **technical and organizational weaknesses**: there is still no financial and management model in place for these systems (transferring responsibility to ONAS or to local authorities?) and often a **lack of ownership** on the part of local stakeholders. These same issues have also been encountered in ENDA's recent endeavors to expand/replicate these initiatives in Cameroon and Burkina Faso.

The PAQPUD program: an attempt to scale-up/replicate the system across Dakar

The sanitation program for the peri-urban areas of Dakar (PAQPUD: *Dakar Programme d'Assainissement des Quartiers PériUrbains de Dakar*) was part of an ambitious national sector strategy framework (PEPAM), financed through a US$15 million loan from the World Bank. The aim of PAQPUD was to **pilot several different sanitation options in the low-income districts** of Dakar. At the end of the program, the most appropriate solutions, namely those with the capacity to evolve over time and space, were to be 'scaled-up'. The range of solutions offered mainly included household sanitation facilities for the "access" segment of the sanitation chain (soakaways, sinks, showers, different types of latrines). A 'pit emptying sector improvement component' was also planned, but never implemented at the time[2].

Under the PAQPUD project, **10 'settled' sewerage schemes** were also to be constructed, the design of which was based on both the lessons learned from the experiences of **ENDA in Senegal** and the methods used to develop **condominial sewerage in Brazil** (government management staff and representatives from consultancy firms in Senegal received training in Brazil and Latin-American consultants were brought in). Services were to be run by community-based economic interest groups (EIG), with the users and local authorities sharing responsibility as part of a 'management committee' and receiving technical assistance from ONAS. Upon completion of the 'pilot' phase, the solution was then to be scaled up to **160 systems across the Dakar metropolitan area.**

However, there were **significant issues** encountered during PAQPUD's implementation of this small-bore sewer option. Issues were both **technical** (delays, construction defects, poor monitoring of contractors, work on facilities not completed) and financial (low efficiency). There were also difficulties in ensuring those involved, namely ONAS, the users and local authorities, effectively assumed their responsibilities[3]. Only two management committees are actually active. According to a specialist who has been monitoring the different stages of the project (interview with F. BRIKKE, ex-WSP), there were also fundamental errors made in the initial approach. Thus, in contrast to the Brazilian approach, "the sociologists did not train the technicians".

The GPOBA program and the quest for sustainable management of the ONAS small-bore sewers

In order to address the shortcomings of the PAQPUD program, the World Bank launched an Output-Base Aid program at the end of 2010 known as **GPOBA.** The GPOBA program provided **support not only to enable completion of the**

[2] However, an extremely ambitious and innovative project that focuses on this 'pit emptying sector improvement' component has recently been implemented by the ONAS research team, with funding from the Gates Foundation.
[3] For more information on this, please see the independent program evaluation undertaken by NORMAN, SCOTT, PEDLEY, 2010

construction work and during the final acceptance of work phase (particularly for the pumping stations), but also to **increase the number of connections**. On this occasion, expertise was provided directly by staff from the Senegal office of the World Bank.

ONAS is currently in the process of 'reclaiming responsibility' for the systems and the **national operator is now actually operating the small-bore sewer schemes**, albeit with extremely limited resources.

Lastly, the World Bank has recently issued a call for tenders in which teams of international consultants have been invited to propose **a sustainable management model for the ONAS small-bore sewers** and also **compile an inventory** of all systems constructed in the country 'outside PAQPUD' so that these can be **incorporated into ONAS's assets.**

Development which is being continued by cooperation partners

In spite of the difficulties encountered with past small-bore sewer initiatives, **implementation of this option is ongoing** due notably to the efforts of development partners, such as French bilateral and decentralized cooperation and international organizations:

- **UN Habitat** has funded a system in **Ngor** and donated maintenance equipment (small Vacutug) to some local authorities;
- As part of a joint program with ONAS, the Belgian development cooperation agency, **Coopération Technique Belge (CTB)**, helped finance construction of a (conventional + small-bore sewer) scheme **in Saint-Louis**, which entered into operation in 2011;
- **ENDA** is due to construct a new small-bore sewer system in **Pikine** with AFD FISONG funding;
- The EU is financing projects to **restructure informal settlements in five medium-sized towns**. These projects are being implemented by Fondation Droit à la Ville (a Senegalese semi-public body). Small-bore sewers are to be constructed in three towns: **Hann Bel-Air, Petit Mbao and Mbour**;
- The NGO **GRET** is working in **Saint Louis** (with funding from AESN and CG de l'Eure; other funding sources are being developed);
- The French cities of Lille and Toulouse are also working on sewerage projects in **Saint-Louis.** Studies are underway and no decision on whether to construct small-bore or conventional sewers has yet been made;
- Lastly, ONAS is in the process of completing a final small-bore sewer in **Thiaroye-sur-mer (Pikine)** with World Bank funding.

Small-bore sewers in the regulatory framework and current national strategies

The **national strategy document**[4] includes small-bore sewers as one of the options for sanitation in urban areas.

Although small-bore sewers are currently being constructed by ONAS and as part of national programs (see previous paragraph), it would appear that **ONAS has decided not to pursue this option in its new master plan for Dakar** (however, we were unable to consult this document and received contradictory statements on this topic from the ONAS staff members interviewed).

Who is responsible for urban sanitation in Senegal?

The State

At central level, the **Ministry of Urban Development, Housing, Water and Sanitation** (MUHHA: *Ministère de l'Urbanisme, de l'Habitat, de l'Hydraulique et de l'Assainissement*) defines national policies, undertakes sector planning and the regulation of public services and acts as contracting authority for major infrastructure construction.

MUHHA supervises a number of technical departments: Urban Water Supply (DHU), Sanitation (DAS), Rural Water Supply (DHR), Operation and Maintenance (DEM) and Water Resources Management and Planning (DGPRE).

[4] Republic of Senegal, Ministry of Agriculture and Water, Directorate of Water, Long-Term Water Sector Project for Senegal, Water Supply and Sanitation, 2004, *Elaboration d'un document de stratégie pour la réalisation à l'horizon 2012 des objectifs du millénaire pour le développement, Volume 3 : sous-programme urbain, version définitive.* (Cited by MICHELON, 2012)

The ministries of Health and Education are also involved through their participation in the Hygiene Directorate and the Water and Hygiene in Schools Unit.

National Office of Sanitation in Senegal (ONAS: *Office National de l'Assainissement du Sénégal*)

As the **public operator**, ONAS is the sanitation authority responsible for **urban areas** (113 municipalities compared to 317 rural communities). ONAS is both the **contracting authority** and **in-house sanitation service operator** for these areas.

Although ONAS has competent technicians in place, **it does not have the resources required to address all urban sanitation needs. Its financial resources are very low:** ONAS receives a fee of only 10% levied on the water bill, along with a state grant awarded in accordance with the terms of a performance contract and which is dependent upon available resources. According the ONAS management staff interviewed, this does not even cover the cost of managing existing services. ONAS also suffers from a lack of independent governance, which, according to one donor, means the operator finds itself "*caught between political directives and technical and financial reality*".

However, an EU-financed program is currently underway to **improve ONAS's organizational setup**. In addition, state representatives and donors have also discussed the option of combining urban water, sanitation and even stormwater management services under a single delegation contract.

As far as managing its 9 small-bore sewer assets in Dakar is concerned, ONAS has only a **head of 'on-site sanitation'** (thus not solely focused on small-bore sewers), who is assisted by a **engineer that specializes in small-bore sewers** and has been involved in the project from the outset. They admit to finding it difficult to cope with monitoring the systems, even though they receive support from **ONAS's district operations departments** (who, for a long time, were reluctant to take over management of these systems, unhappy with the extent to which they were consulted during previous phases and the fact that some systems are still in the provisional acceptance of works phase) and from the few **management committees** that have been set up. It would appear that the **municipality of Ngor** is the only local authority to provide ONAS with support in the form of resources.

Local authorities

According to the law, local authorities are **responsible for the management of stormwater and solid waste**, but not wastewater. However, *"Act 96-06 of 22 March 1996 that sets out the Local Government Code establishes the municipality as local authority, a legal entity governed by public law. **The district council is responsible for improving people's living conditions and managing and maintaining all equipment** that directly improves the daily lives of the municipality's inhabitants. These responsibilities are set out in law, including in this act, which covers sanitation: "**routine sanitation and hygiene tasks**" (Article 77)". (Diop B., Michelon B., 2012).*

Local authorities have their **own fiscal resources** (the diligence with which these taxes are collected by the state depends on the local authority's capacity to put pressure on the devolved tax office, however) and receive a grant from the state.

Given ONAS's limitations, certain local authorities, such as Ngor (a district council in Dakar), Cayar and, to a lesser extent, Rufisque and Saint Louis, **have decided to contribute to sanitation** (teams, land and budget – in the "miscellaneous expenditure" budget item in Cayar). For example, sanitation (in its broadest sense: wastewater, stormwater and solid waste) is by far the largest expenditure item in the Ngor council budget and, according to the municipality, employs 80% of its staff.

However, some local authorities (and donors) are petitioning for all responsibilities and, in particular, resources to be fully devolved. A 'Phase 3' of the decentralization process has been announced by the new government.

Implementing agencies

There are a number of implementing agencies that co-exist in Senegal and whose areas of responsibility can be unclear. According to one donor, they have somewhat dispossessed the local authorities of their contracting authority role.

AGETIP (Agence d'Exécution des Travaux d'Intérêt Public contre le sous-emploi) is an implementing agency for public works for employment created by the World Bank to execute infrastructure projects and tackle poverty. AGETIP is deemed to be the quickest and most efficient agency as it uses more flexible procedures. However, it has recently become subject to public procurement legislation, which is rendering its work more cumbersome. **Its credibility has been dented** by its

management of certain programs, particularly PAQPUD in Dakar (poor monitoring of works, heavy financial losses, according to NORMAN, 2O11, in particular).

The municipal development agency, **ADM (Agence de Développement Municipal),** implements projects providing technical support to municipalities and support to investment programs, with financial assistance from donors such as AFD and the World Bank.

The nine systems studied

	ENDA RUP Rufisque	ENDA RUP Baraka	ENDA RUP Yoff	ONAS Ngor	ONAS Yoff	ONAS Ouakam	ONAS Cité Ousmane Fall	ONAS/CTB Saint Louis	ENDA EP Cayar
No. of connections	180-200 according to ENDA	According to ENDA, all 1,200 people are connected, or around 150 households, but some through shared toilets	29 households (according to ENDA)	517 (figures from GPOBA, P Boulenger)	1,795 (figures from GPOBA, P Boulenger)	1,871 (figures from GPOBA, P Boulenger)	174 (figures from GPOBA, P Boulenger)	500	350 planned (in phase 1)
Construction start date	1994	1997?	1999	Work on the small-bore sewers built as part of PAQPUD started around 2006				2008	1999?
Date of entry into service	1995	1999?	2000	Work on the systems was completed around 2009; remedial work on certain defects was being carried out up to the end of 2011 and the systems progressively entered into operation				2011	March 2013?
Current service status	Operational	Operational	System operational but not the WWTP	Operational	Operational	Operational	Operational	Operational	Currently being completed

II. In which context were small-bore sewers selected?

	ENDA RUP Rufisque	ENDA RUP Baraka	ENDA Yoff	ONAS Ngor	ONAS Yoff	ONAS Bargny	ONAS Cité Ousmane Fall	ONAS/CTB Saint Louis	ENDA EP Cayar
Physical context	Near-surface water table High to low gradients	Rocky soil Moderate to high gradients	Near-surface water table Sandy soil Moderate gradients Gradient: 6/1000	Near-surface water table Sandy soil Moderate to high gradients	Near-surface water table Sandy soil Moderate gradients Gradient: 3/1000	Near-surface water table Rocky soil High gradients	Coastal area Near-surface water table Moderate to high gradients	Near-surface water table Low to moderate gradients	Coastal area Sandy soil Moderate gradients Near-surface water table (1 to 10m)
Urban morphology and land tenure context	Formal planned settlements. Occasional 2-storey houses for the wealthiest. Wide and rectilinear streets	Temporarily legalized informal settlement, constructed with salvaged materials Very narrow, winding lanes	Legalized informal settlement Occasional 2-storey housing Narrow lanes in places	Old and legalized informal settlement 2-storey houses are common Medina-type very narrow, winding lanes	Legalized informal settlement Few or no 2-storey houses Narrow lanes in places	Planned, wealthy residential area Wide streets Unpaved roads	Planned settlement	Planned and unplanned 92% are homeowners	Density: 200 inhab/km2 Winding lanes No 2-storey houses Legalized unplanned settlement
Urban and demographic processes	Growth and development	Population increased from 300 to 1,200 in 15 years	?	Widespread population growth and development across the Dakar metropolitan area				High population growth	Growing by 6%/year. High seasonal variations (fishing)
User demand	Upper to lower middle-class. Water consumption not available, but h/holds claim to pay water bills of 20,000 to 50,000 CFA Francs every 2 months (approx. 50l/inhab/day) H/holds satisfied with domestic service. Mgt. Com. less satisfied with system. Poor cost recovery but h/holds & Mgt. Com. adhere to principle of 1,000 CFA Francs/month.	Very poor: 5th quintile Public standpipes 20l/inhab/day High demand: raise considerable funds for connection to conventional sewer outlet Maintenance: payment on a 'piecemeal' basis	Socio-economic level: 5th-4th or 3rd quintile H/hold connections 27-28l/inhab/day Users satisfied but low rates of payment	Lower middle-class: 3rd-4th quintile H/holds satisfied with the service High demand from unconnected residents	4th quintile Water consumption? Demand and willingness-to-pay exists (focus group, connection contributions)	Population in the 2nd quintile High water consumption: 150l/inhab/day (gardens, 4x4s, etc.)	Oil refinery workers: 3rd quintile High demand: users have come together to manage the service	80% of the population of Darou is under the poverty threshold 90% of households have piped water 46% use vacuum trucks, 56% manual pit emptying	Consumption: 20l/ inhab/day ASUFOR h/hold connections +standpipes Low to average income All have on-site sanitation facilities (PEPAM) Demand for this type of service and willingness-to-pay?

Demand from the authority responsible	Mgt. Com.: high Municipality: moderate. Ad hoc involvement: subsidy of 3 million CFA Francs 2 years ago, but continues to consider these systems to be the responsibility of ONAS.	High (Mgt. Committee) Municipality: Low (but no real involvement)	Low for current municipality High for previous municipal team (financed maintenance)	ONAS: moderate Municipalities: low to high (Ngor)	It is difficult to retrospectively analyze the involvement of the municipal team in charge at the time
Financial resources of local stakeholders	Financial resources are low for ONAS and the local authorities, and low to moderate for the users. However, according to all those involved, it would be possible to cover operating costs by combining the small financial resources of each stakeholder.				Limited for the local authority: low fiscal resources

Analytical overview: in which contexts were small-bore sewers selected?

Which physical context?

The stakeholders met stated that the physical context was the main reason for selecting the small-bore sewer option. All agreed on the fact that this option is particularly suited to areas where:

- there is **bedrock** just under the soil, as it becomes difficult to dig pits or trenches and for effluent to infiltrate the soil, which means the small-bore sewer (laid at a very shallow depth or even on the ground) is virtually the only solution;
- the **water table rises to the surface**: due to water infiltration, frequent pit emptying is required (or the use of watertight pits to prevent this) at an additional cost that users can ill afford. However, the presence of these water tables also pose problems for small-bore sewer construction;
- there is high urban population density, as the small-bore sewer is also designed to **prevent pollution** caused by pit effluent saturating the subsoil; however, there are as yet no reliable environmental impact assessments available to confirm this. Nevertheless, it is important not to overlook the pollution risk posed by a small-bore sewer in a state of disrepair.

Another frequently mentioned physical factor was the vulnerability of latrine pits in **areas prone to flooding**. However, there also is a risk that flooding could potentially saturate small-bore sewers (there have been no issues of this type in Senegal, but sewers have been backed up in homes in India), with accumulated sediment causing blockages (a frequent occurrence) and flooding pumping stations further downstream (causing effluent to overflow and damaging electromechanical and other equipment).

The **minimum gradient** required is low: 0.5% is the accepted figure (or lower, at 0.3%, in some ONAS documents) as, with settled systems, the effluent is theoretically solids-free (thus it has low viscosity and flows more easily). The few flow-related issues encountered on these systems have been caused by errors made during the topographical studies (or lack of proper studies) or when transcribing the map readings, rather than by an 'insufficient' gradient.

Which urban context?

The second reason for selecting small-bore sewers is **urban morphology**, which is a particular issue in traditional unplanned neighborhoods (Ngor) where the narrow and winding lanes make pit emptying by vacuum truck impossible. Nevertheless, alternative pit emptying options for these areas are currently in development (semi-mechanized emptying system, mechanized system using long lengths of pipe).

Do these systems meet user demand?

The small-bore sewer systems in place in Senegal cover **virtually all social categories**: from the very poor (Dakar Baraka) to the upper-middle class (Dakar Bargny), with water consumption levels of between **20l/c/d (Dakar Bakara) and 150l/c/d (Dakar Bargny).**

The majority of people connected to the small-bore sewers are **homeowners**; however, some tenants also have connections having come to an arrangement with their landlords (which may include rent adjustments, as is the case in Rufisque).

All users are happy with the improved state of the roads and the impact on public health. Although the system may not be perfect, users are nearly always satisfied with the small-bore sewer because wastewater is taken away from the house for no additional 'effort' and **the operating costs (in any case rarely covered by the users) are considerably lower than the cost of pit emptying.** Should any problems arise, these mainly occur either in public areas (leaks, overflowing inspection chambers due to blockages) or downstream (at the wastewater discharge point) if there is an issue at the treatment plant. Whilst of concern to inhabitants as they want an improved service, these problems do not induce them to reject the project outright.

There have been no large numbers of disconnections (as far as we are aware, there have also been no ad hoc 'waves' of disconnections with people wishing to revert to using on-site facilities). Whenever a lack of resources prevents a small-bore sewer from being extended, the contracting authorities (ONAS, ENDA) ensure that a **waiting list** is drawn up (however, we were unable to view these lists). There have also been a large number of **illegal connections** made to some of the better maintained schemes (Ngor, Yoff).

Studies appear to show that there is **willingness-to-pay** among households for **connections** with users paying 35% of the connection cost in Dakar (GPOBA program) and also contributing to the connection cost in Saint-Louis and Rufisque. Willingness-to-pay can be increased by ensuring there is an adequate IEC demand stimulation phase in place (which seems to have been the case in these three programs). In Baraka, (poor) users have even covered some of the major extension and renewal costs themselves. In Rufisque, however, the connection cost (around 250 euros) is high, which, coupled with failures in the cost recovery system ('FOCAUP' revolving fund), has resulted in very low willingness-to-pay. Low demand for a further system (ENDA in Saint-Louis, not visited as it is not operational) was due to poor institutional setup, which resulted in wholesale rejection of the project.

The tariffs, set at levels to cover operating costs, have also been accepted by the users (as confirmed in a demand assessment study undertaken in 2005 by the firms Focus and EDE in Ngor: *"70% of the people interviewed would agree to pay a monthly amount of between 500 and 1,000 CFA Francs for the service provided. 72% of the people interviewed have opted to pay the sanitation fee via a surcharge added to the water bill."*).

The low levels of sanitation fee recovery are predominantly due to the poor capacities of the entity in charge of fee collection or the lack of a designated recovery agency. There are also major issues in neighborhoods **adjacent to areas with conventional sewerage,** for which the (more affluent) users pay no surcharge (as is the case with Saint-Louis/Darou*). (*See also *Part V. What are the costs and how are these costs met?).*

Carrying out maintenance tasks on household facilities and employing good practices is by no means routine. All stakeholders agree on **the need for ongoing IEC campaigns** (see *Part IV. Social engineering: what user-focused activities are developed?).*

There are only a few, very specific cases where users have demonstrated the willingness to **come together and assume responsibility for sewer pipe maintenance**: tightly-knit, low-income, 'marginalized' communities (Darou in Saint-Louis, Baraka in Dakar). This is mainly due to the fact that the **sewer route runs across public land and thus 'condominial' type arrangements** (among owners) **are not required**. The situation is similar for users' willingness to **volunteer** to help manage the small-bore sewer service over the long-term: all attempts to implement this type of management system have failed (although, this solution continues to be promoted).

III. How and why were small-bore sewers selected and by whom?

<table>
<tr><th></th><th>ENDA RUP Rufisque</th><th>ENDA RUP Baraka</th><th>ENDA Yoff</th><th>ONAS Ngor</th><th>ONAS Yoff</th><th>ONAS Ouakam</th><th>ONAS Cité Ousmane Fall</th><th>ONAS/CTB Saint Louis</th><th>ENDA EP Cayar</th></tr>
<tr><td>Why were small-bore sewers selected?</td><td>Near-surface water table: pit emptying frequency/cost</td><td>Rocky soil: difficult to dig pits and these get full quickly due to impermeable soil
Open defecation (in recently developed nearby areas)</td><td>Near-surface water table: flooded pits (pit emptying =6 to 8,000 CFA Francs/week)
OD
Cholera
Dishwater: women empty this into the sea several times a day. Tiresome.</td><td colspan="4">Near-surface water table: flooded pits
Open defecation
Choice also influenced by a desire to pilot the up-scaling of this solution in Africa</td><td>Greywater discharge: poor state of the roads
Public health issues
Lower investment cost than conventional sewerage
Near-surface water table</td><td>Pit emptying frequency/cost
Urban landscape
Water table pollution
Desire to offer an improved service
Desire to recycle the wastewater
ENDA's understanding of the technology</td></tr>
<tr><td>How were small-bore sewers selected?</td><td colspan="3">ENDA heard about this option from a Belgian researcher, Yves Charbonnet, who had been working on such systems.</td><td colspan="4">One of a range of technological options included in the PAQPUD program. The choice of small-bore sewers was not given to households; instead they were selected for areas with suitable physical layouts.
Aim: pilot the options in context for potential later expansion. However, the final evaluation was only ever quantitative; the expected qualitative outcomes were never achieved.</td><td>Included in the revised 2005 sanitation master plan and program</td><td>Project approach</td></tr>
<tr><td>Who made the choice?</td><td colspan="3">ENDA</td><td colspan="4">PAQPUD unit: BM+AGETIP+ONAS (ONAS seems to have had little involvement)</td><td>Technical unit: ONAS+CTB</td><td>City of Lorient-ENDA EP</td></tr>
<tr><td>Which studies guided the choice?</td><td colspan="3">'Action research', progressive empirical improvement</td><td colspan="4">Topographical and hydro-geological, demand, urban, institutional and tariff-setting studies</td><td>Topographical and hydro-geological, urban and institutional and demand studies</td><td>Topographical and hydro-geological studies
Technical studies</td></tr>
</table>

Analytical overview: the process, reasons and stakeholder behind the choice

Which stakeholders, using which process?

In most cases, the decision to use small-bore sewers was made by a **development partner** (financial sponsor) and the **project manager:** NGO and/or AGETIP. **Those entities with subsequent responsibility for the service (ONAS, local authorities, and users) are not always fully involved** in the decision-making process, which no doubt explains the lack of ownership often seen during the management phase.

Pilots can form part of a **sanitation planning** approach at regional level (PAQPUD, ENDA Cayar, CTB-ONAS in Saint-Louis), although there is **little ownership on the part of local authorities**, who never have the resources to significantly contribute to investment.

The decision by ENDA to develop a small-bore scheme in Baraka was also influenced by a desire to **help empower the community in their fight against eviction**. The system was thus initially put in place in defiance of the public authorities rather than in conjunction with them.

Stakeholders nearly always adopt a **sector-based approach**; one that is kept separate from more general low-income area improvement/regeneration approaches, which also include aspects such as land tenure, solid waste management, roads, stormwater management, etc. (with the exception of ONAS-Fondation Droit à la Ville projects). As a result, there is often a **lack of consistency among actions** and the risks associated with solid waste, stormwater, traffic, road works and the burning of waste, etc. are not taken into account. Land tenure issues and opposition from local residents (and from some public authorities) are common, particularly as regards the construction of treatment plants.

Lastly, in some instances, it would appear that no in-depth studies have been carried out on either the local **socio-economic** (demand assessment and tariff study) or **institutional aspects (responsibilities, capacities, willingness of public bodies to be involved)** (which then means the selected management method and/or cost recovery mechanism has to be reviewed, see *Part IV. What are the main management and operational issues?*).

III. What technical options were selected and how were these implemented?

	ENDA RUP Rufisque	ENDA RUP Baraka	ENDA Yoff	ONAS Ngor	ONAS Yoff	ONAS Bargny	ONAS Cité OF	ONAS/CTB Saint Louis	ENDA EP Cayar
Household facilities	Pour-flush toilets and domestic showers and utility sinks/sinks	Pour-flush toilets and shared or domestic showers, domestic utility sinks/sinks	Pour-flush toilets, domestic utility sinks (with a sieve-like strainer), shared utility sinks (not in service)	Pour-flush toilets, showers and sinks				Pour-flush toilets, showers and sinks	Pour-flush toilets +utility sinks/sinks
Connection system	Grease traps + individual settling tanks +connection manholes	Grease trap? + small pits (for several households) + connection manholes	Grease trap +connection manhole, then shared septic tanks: 3x3.6m, with two chambers	Grease traps (except for the simplified system), settling tanks and connection manholes				Settling tanks (some in pre-fabricated PVC) +connection boxes+underground T-shaped connection (inaccessible). With screen. No grease traps: the floating grease remains in the pit. Settling tank connection manholes located past the pit.	Grease trap+ settling tank manholes
System type	Settled			Settled and simplified	Settled			Settled + conventional	Settled
Pipe diameter	110mm			110, 160, 200mm				63mm minimum 150mm minimum for the conventional system	110mm Collectors between 160 and 215mm
Pipe materials	PVC			PVC				PVC	PVC, HD PVC for roadways
Depth of pipes	?	From 0 to?	From 60cm to?	From 50cm to?				0.8 for the settled, up to 5m for the conventional system	?
System length	?	?	?	6,500m for the 'settled' part (ONAS-PAQPUD)	?	?	2,769m	?	1,800m

Type of manhole	Small, simplified manholes with concrete covers			Simplified and conventional manholes with cast iron covers Inspection points		Simplified manholes with concrete covers, inspection points	Simplified manholes with concrete covers
Outlet-treatment method	WWTP waste stabilization pond: 6 ponds, with a settling tank upstream	Through the ONAS conventional sewer system	WWTP with settling tank +non-operational upflow gravel filter: direct discharge into the sea	Through the ONAS conventional sewer system except for the Ngor simplified scheme, which is discharged directly into the sea without treatment (bypasses the lift station)	Decentralized intensive treatment plan with settling tank + anaerobic filter then discharged into the sea	Large WWTP waste stabilization pond for Saint-Louis	8 waste stabilization ponds with macrophytes+ gravel With screen, oil and grit separators located upstream
Reutilization?	Vegetable crops (irrigation with treated wastewater)	- -	No, discharged into the sea	Small amount of reutilization at the ONAS plant in Cambérène	No	?	Irrigation of vegetable crops with treated wastewater planned

Analytical overview: the technical options chosen

Technical options chosen

The 'access' segment

Individual or shared solutions

Household solutions: these include pour-flush toilets for blackwater, showers and utility sinks or sinks (with a screen to prevent the intrusion of solids) for the collection of greywater.

In some areas (of very high population density and/or in the poorest settlements), the access segment consists of **shared facilities: communal utility sinks and laundry tubs** (in Yoff and Baraka), toilet blocks that contain both toilets and showers (Baraka).

Some of the different solutions used for greywater collection: outside domestic utility sink in Ngor; indoor domestic utility sink with 'sieve' filter in Yoff-Tonghor; communal utility sink in Yoff-Tonghor (not in service)

Types of connection

Household facilities are connected to the sewer system either by a simple connection (see the diagram below) as in Saint-Louis/Darou, or through a small connection box (which can contain several household connections).

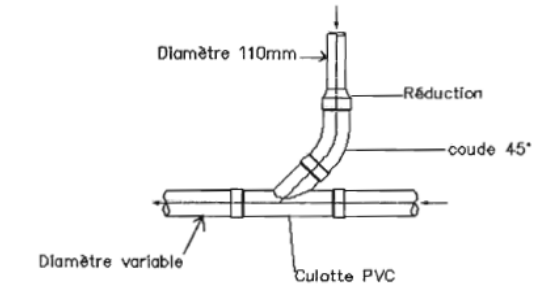


Figure 4 : Connections domiciliaire

Left: 'Y-shaped' connection used on the ONAS sewer systems in Dakar and Saint-Louis/Darou (source: ONAS). Right: connection via a household connection box in Ngor

The grease trap: a solution that is subject to debate

According to some stakeholders (ENDA), it is essential that a grease trap is placed upstream of the settling tank as, in a country whose dietary habits means the cooking water is full of fat, oil and grease block the sewers. (This is also the solution recommended by CREPA for its sewers in West Africa and in France for restaurants). However, others (notably the consultancy firms SEMIS, H2O who worked on designing the ONAS sewers) consider this grease trap to be unnecessary as

the grease does not solidify in such a hot climate (no blockages) and floats on the surface of the pit above the outlet. Some of this grease is then digested and the remainder removed when the pit is emptied.

There have been no reported problems caused by grease in the sewers; instead, issues have been restricted to blocked sinks and screens (upstream from the pit) (see *Part IV. What are the main management and operational issues*?). In contrast, household grease traps are particularly vulnerable to blockages (which can become a breeding ground for infection) if not properly maintained (as is very common).

Settling tanks

Incorrectly known as 'septic tanks' (as, in contrast to the septic tanks used in on-site sanitation, there is no treatment through the soil), these tanks are used to separate solid sludge from the wastewater on settled sewer systems (the most common type of small-bore sewer in Senegal). There are two types of tank: household or common settling tanks.

The ONAS technical guide, developed from lessons learned in Brazil, recommends using a T-pipe at the tank entrance and exit to prevent solids entering the settling tank; however, this recommendation is not always followed.

Left: cross-section of the type of settling tank used in the ONAS sewers (Source: ONAS). Center: settling tank dug into rocky ground in Baraka. Right: ventilation pipe in Ngor.

Observations indicate that some of the settling tanks may be **over-sized**, notably those used in the ONAS settled sewer systems: the settling tank in Ngor has not needed emptying in eight years. In all likelihood, there is a large amount of **anaerobic digestion** taking place in the tank (as seen in Pakistan). Whilst this is a good thing, it can also lead to complacency with the necessary checks and budgeting being overlooked, ultimately increasing investment.

On some of the systems (ONAS, Saint-Louis/Darou), the settling tanks also have **ventilation pipes** (to prevent bad smells).

'Condominial' septic tanks

In Yoff, ENDA has piloted the use of (neighborhood) **condominial septic tanks.** According to ENDA, these tanks require little maintenance and only infrequent emptying (they have not been emptied in 10 years; however, there are only around thirty households connected). Although it is not possible to conduct a price comparison, it is highly likely that the investment cost of these condominial septic tanks is lower than that of individual septic tanks. Furthermore, they are located on public land, which is an advantage in densely populated neighborhoods/small plots. There have been no reports of either bad smells or opposition from local residents.

The evacuation system

The choice of route

In notable contrast to the Latin-American condominial sewer model, **as far as we are aware, the small-bore sewers in Senegal are virtually all routed over public land** (although, in unplanned settlements, the distinction between 'public' and 'private' land can sometimes be unclear).

As a result, **agreements between landowners are not required** and, indeed, there have been no such agreements reported. This no doubt partly explains why people in Senegal tend to view the service in a more 'individualistic' manner than elsewhere, accessing the service through a direct **user-operator relationship**, rather than going through a neighborhood

association, for instance. This may also explain users' reluctance to cover the cost of the daily maintenance required on the upstream sections of the system.

The small-bore sewers do not follow 'traditional' routes, as they have to adapt to the sometimes winding road layout of the unplanned settlements.

Left: Section of the (very winding) layout of the Ngor sewer route, Dakar. Right: Section of the (more regular) layout of the Darou sewer in Saint-Louis

Settled or simplified?

Settled sewerage systems are the most common due to their apparent low water consumption. This is despite the fact that the Brazilian model, upon which the sewer programs are based, nearly always uses simplified sewers. In addition, it has been observed that, compared to the simplified systems studied in Ghana and India, water consumption for settled sewerage is not always lower. A further consideration in the choice of solution is the **gradient** of any slopes.

However, **simplified sewerage has been the option used in the most recent projects**. For the UN Habitat-ONAS system in Ngor, for example, simplified sewerage was selected for areas where the gradient is steeper than on the rest of the system and, according to ONAS, for reasons of cost. ONAS has also chosen the simplified sewerage option for the system currently under construction in Cambérène.

Sizing

The diameters used range from **63mm (Saint-Louis/Darou)** (ONAS technical guides recommend a minimum of 50mm at the connection point) to 100mm and up to 230mm (secondary sewers located downstream from the main sewer line, as seen in Cayar). In comparison, the conventional sewerage systems in Senegal use 150mm to 2 or 3m diameter pipes.

The calculations used to size the systems are not always very specific, with some stakeholders instead preferring a more 'empirical' design method.

According to ONAS, the equations used in the **sewer design calculations** take into account:

- the **type of effluent:** wastewater only or wastewater + solids, and the viscosity of this effluent;
- the **effluent discharge volume** per connection (calculation based on household water consumption and a discharge coefficient of between 0.5 and 0.8), to which a specific coefficient is applied;
- the **number of connections**;
- the **gradient of the slope;**
- the **roughness coefficient of materials** (Manning's coefficient);
- **projected increases** in water consumption (and thus wastewater volume), housing construction and connections.

Left: high pressure PVC pipe used for the primary sewers in Cayar. Right: pipes laid on top of bedrock in Baraka, Dakar.

The depth of the pipes

Depths range from **0cm** (pipes laid on top of the bedrock in Baraka, Dakar) **to several meters** for the downstream sections of certain systems. However, the 'normal' depth is **between 50cm and 1m50cm** (whereas conventional sewer systems are usually laid at a depth of at least 1m50cm).

Maximum number of connections

The largest systems have up to **1,800 connections** (this is the theoretical maximum capacity of the Ouakam and Yoff sewers, but this figure has not yet been reached). This equates to around 15,000 potential users per system (based on the number of people per household in Dakar, i.e. between 5 and 10, with an average of around 8).

Incorporate stormwater - or not?

In theory, the sewers are designed to **'prohibit' stormwater intrusion**. Households and the operator are required to ensure that wastewater and stormwater are kept separate. This is notably because stormwater and sand can clog up manholes and damage lift stations.

In reality, however, stormwater always gets into the sewers, predominantly through the manholes as these are never completely watertight and, moreover, the covers are often damaged or stolen. In addition, local residents themselves also regularly open the manholes and pour stormwater into the sewers.

Ventilation

Ventilation points are mentioned in the ONAS technical guide: *"Devices used to ventilate the sewers and ensure a constant free flow of effluent. Where sewers are installed on slopes of variable gradient, the highest points are to be ventilated".* However, there were no ventilation points seen during field visits.

Inspection chambers

The manholes are often '**simplified**', in that they are smaller than those usually seen on conventional sewerage systems: large enough to enable a cleaning system to be inserted into the sewer but too small to enable access by technicians.

In places, such as Saint-Louis/Darou and probably Dakar (recommended in the ONAS technical guides), these chambers are alternated with **inspection 'tubes':** a bypass outlet with a cap (this solution is also used in South America).

These are placed not only at sufficient intervals to enable cleaning, but also at changes in direction and slope and/or at connection junctions.

Top left: Inspection tube (source: ONAS). Top right: Cast iron manhole cover on an ONAS sewer in Yoff (Dakar). Bottom left: Broken concrete cover in Baraka (Dakar). Bottom right: A manhole clogged up with garbage in Rufisque (the old chamber, which has been removed, is lying on its side in the road).

There are often problems with the manhole covers: **concrete** covers are **vulnerable** to damage (from general handling and the passage of vehicles); however, **cast iron covers are extremely vulnerable to theft** (despite there being penalties in place, including imprisonment).

Users lift off the manhole covers to throw solid waste or stormwater (that contains solids) into the sewer. However, attempting to prevent this by sealing (concrete) or bolting down the covers would only serve to complicate the operator's inspection tasks.

Road paving

In Senegal (unlike in other countries), small-bore sewer projects have never been combined with road paving/resurfacing schemes. Only a few main sewer lines (in Ngor and Yoff, for instance) are protected by paving.

Protection: casings, slabs, cages or underground boxes

As they are laid at shallower depths and use smaller diameter pipes and lower quality materials than conventional systems, small-bore sewers are more vulnerable to damage from the passage of trucks (see *Part IV*. *What are the main management and operational issues*?). Those sections of the sewer system that pass under roads and paths are thus protected by **concrete slabs or casing.**

At changes of direction or slope, cages or underground boxes (inaccessible chambers) are also used.

The disposal/treatment segment

Lift station pumps: a major weakness of the system

Lift stations often contain **two** electromechanical **pumps** (that operate alternately, thus ensuring there is always a back-up to cover breakdowns and maintenance). These pumps are powered by mains electricity and there is a generator on stand-by in case of power cuts.

These pumps are a **major capital expense** that account for around 15-20% of a project's overall investment costs and at least **50% of O&M costs: fuel, caretaking, maintenance.**

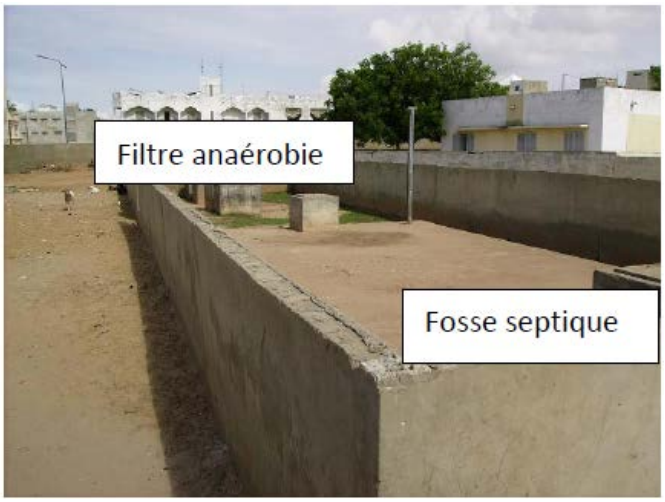
They suffer from poor design, poor implementation and **poor maintenance**. Furthermore, they are highly vulnerable both to the (frequent) infiltration of mud, sand and solid waste and to flooding. In Dakar, procurement of these pumps was hampered by **'vanishing' funds** (pumps were paid for, listed as having been delivered, but in fact never arrived) (NORMAN, SCOTT, PEDLEY, 2011).

Left: Lift station in Saint-Louis (large capacity as also receives effluent from the conventional sewer system). Right: Emptying a broken down lift station in Ngor using a booster pump.

Type of outlet/treatment method

A number of different options have been tested:

- Decentralized treatment through a **waste stabilization pond: a simple and reliable solution,** which does, however require a **large surface area**;
- Decentralized treatment using **intensive solutions** (that require a smaller surface area) **with a settling system** (primary treatment) and a **'DEWATS'-type anaerobic filter** composed of gravel (secondary treatment), with final discharge of the treated wastewater to the sea;
- Direct discharge into the **conventional sewerage system**;
- ENDA is shortly to pilot the use of **UASB reactors** (that produce biogas) in Rufisque.



Intensive decentralized treatment plant located downstream of the ONAS Cité Ousmane Fall sewer system (photo by: Pierre Boulenger, World Bank).

An expert technical review of these treatment plants was not within the scope of this study; nevertheless, according to the stakeholders interviewed, there are number of simple improvements that could be made to:

- Render these treatment plants more effective and safe to operate;
- Better protect them against flooding (raise the level of staff entrances and manholes, by-pass);
- Prevent corrosion (materials);
- Better protect them from sand, mud and other solid matter (using grit separators, i.e. settling tank + screen).

What are the advantages of reutilizing the treated wastewater and sludge?

As is the case elsewhere, wastewater reutilization is fast gaining traction among stakeholders in Senegal, despite the fact that to date there is only one known example of this, which is in Rufisque (ENDA) (and, in fact, this simply involves the water from the waste stabilization pond being used to water the caretaker's garden.)

There are also plans to **reuse treated wastewater** in Cayar, and **biogas production** is shortly due to be piloted both by ENDA and by ONAS at its on-site sanitation sludge disposal plants.

It is to be noted that no market has yet been found for the recycled sludge produced by the treatment plant at Cambérène (which is where the majority of the effluent from Dakar's conventional sewer systems is treated).

Implementation

Main shortcomings

- **Gradients were incorrectly calculated:** in Rufisque, a second sewer system had to be constructed parallel to the first as the initial gradient calculation was incorrect and in Ngor, when transcribing the results of the topographical survey, a ridge and a valley were inverted, leaving part of the area with no service;
- **Work was not finished**, not delivered, or was faulty (ONAS sewer systems). This was particularly the case with the lift stations (see *The disposal/treatment segment* section above);
- **Systems were not properly sealed** (where the small-bore sewer joins the conventional sewerage system and household connections were not watertight).

Site-related issues

If site-related constraints are not anticipated from the outset, these can either lead to spiraling costs and long delays or significantly affect the service quality. Thus, major work is required in areas with **near-surface water tables** (lowering the water table, pumping, casings as in Darou). During construction work, **land disputes** (between the site owners, local residents, etc.) are common.

Sewer system mapping

In Dakar (PAQPUD), Cayar and Saint-Louis/Darou, a detailed map of each small-bore sewer system was produced by taking **GPS readings** of all system installations. However, not all management committees (Rufisque) or contracting authorities (Dakar PAQPUD, Rufisque, Yoff, Baraka) have a full copy of this map available for consultation. This complicates the task of the operator and increases the risk of damage being caused to the sewer during work on other networks or by road works.

The importance of monitoring the construction work/contractors

For most of the stakeholders involved, the small-bore sewer is still a relatively new technology. In addition, there has been a **failure to develop a proper results-based culture and local public works contractors/professionals often fail to uphold their contractual commitments.** Thus, in order to ensure facilities are built to the required quality standards, all contractors require close supervision.

The cost and time implications of these constraints are rarely taken into account, which results in **significant budget overspends and delays**. As a knock-on effect of this, there are then **fewer resources available for 'soft component' activities** (no post-project phase in Saint-Louis/Darou, ENDA struggling to finance ongoing IEC campaigns in Rufisque and Yoff, construction work suspended in Cayar, etc).

User involvement in construction

User involvement in construction activities was piloted in both Baraka (selected for its low financial capacities and 'self-management' culture) and Saint-Louis/Darou with a view to reducing costs, creating local revenue-generating activities and instilling ownership. This involvement was restricted to helping with earth-moving work and the outcome of the pilots was positive in that **users' sense of ownership was improved.**

Local technical design and system construction capacities

There are recognized limitations to the **empirical**, traditional and **'do everything yourself' approaches.**

Senegal has the required **specialist technical capacities,** as these have been developed over the course of the last 20 years through projects and the support of external expertise (particularly from Latin America during PAQPUD). Thus, there are at least half-a-dozen local consultancy firms capable of producing what the experts interviewed deem to be good quality studies (GEAUR, EDE, SEMIS, H20, Hydroconsult, etc.).

However, both ONAS and the consultants agree that there are still improvements to be made on all sewer systems (even those which received most expert support).

During construction of the small-bore sewers in Saint-Louis/Darou (after implementation had been delayed for two years) and Cayar, a highly involved and competent local consultant was employed full-time as **project supervisor.**

IV. Social engineering: what user-focused activities were developed?

	ENDA RUP Rufisque	ENDA RUP Baraka	ENDA Yoff	ONAS Ngor	ONAS Yoff	ONAS Bargny	ONAS Cité OF	ONAS/CTB Saint Louis	ENDA EP Cayar
Startup phase	IEC: PHAST & SARAR methods, workshops, forum theater, door-to-door, activities in schools and with women, etc.	?	IEC, PHAST & SARAR methods, workshops, forum theater, etc.	A large number of IEC activities were conducted during the startup phase of PAQPUD For the GPOBA program: - 23 official community launch ceremonies - 72 TV spots and 51 radio spots - 96,000 door-to-door visits - 51 mobile trucks covering 20 areas - 8 'competitions' - 116 community meetings - 15 management committee meetings - 1,000 t-shirts, 200 posters - 16,500 follow-up visits				Extensive IEC phase ONAS recruited 6 local facilitators (3 men, 3 women) and a supervisor. Household visits, PHAST SARAR and workshops for each area of the neighborhood. Monthly follow-up. People received compensation for any minor damage to their property due to the construction work (collapsed walls, etc.).	10 hygiene and sanitation educational brochures developed for schools (seem very complex for many inhabitants, level of higher education required.) connections An intensive IEC phase is due to be conducted with users during the connection phase
'Ongoing' IEC	New ad hoc IEC phase introduced during a redevelopment campaign as part of the 9 towns project.	Not really required given the strong cohesion/ ownership.	Regular reminders of good practices by a neighborhood 'focal point'	No ongoing IEC due to lack of financial and human resources, except where there is local momentum (Ngor).				Due to project delays, once the operating phase was launched, there was no budget left over for post-project monitoring. However, the IEC facilitators are continuing to work on a voluntary basis. A refresher workshop was held a year after the start of operations to remind people of the need to pay their contributions.	No information on planned ongoing IEC activities.

Analytical overview: User-focused activities

In the startup phase

An extensive **IEC (Information, Education, Communication)** campaign is generally conducted during the project's 'kick-off' phase. The aims of this campaign are as follows:

- **to stimulate user demand** to generate requests for connections;
- **to foster the acquisition of good practices** with regard to using the system (maintenance of household facilities, preventing solid waste and stormwater intrusion, pit emptying, cleaning the sewers and manhole maintenance, if required);
- **to ensure users understand why the sanitation fee is necessary and why they need to pay it** on a regular basis;
- to communicate messages relating to good **household hygiene** practices through the various IEC activities.

IEC campaigns most commonly use the **PHAST-SARAR** approach (a participatory methodology that involves working with communities to identify their main hygiene and sanitation issues and define actions to resolve them: see the box on the following page). In a few instances (Dakar), mass marketing methods and home visits are also used.

Review of the PAQPUD awareness-raising activities undertaken by ONAS

Appointments are generally scheduled for weekday mornings and afternoons. The target groups are mainly young people, community groups composed predominantly of women, children or schoolchildren. However, as the main decision-maker and the person who provides for the family, the primary target should be the head of the household. This means that the appointment days and times need to be changed as, on weekdays, the head of the household is at work (ONAS recommendation – PHAST tools technical note n°4, May 2004).

Lastly, the PHAST approach should not have merely an educational role, but should also generate interest among the community and foster their involvement in the project. Emphasis should therefore be placed on the last stage of the PHAST approach: encouraging people to want to invest in sanitation facilities. This type of 'commercial marketing' is often lacking (ONAS recommendation – PHAST tools technical note, May 2004). Door-to-door marketing is the activity that generates most demand for sanitation facilities. With 45% of the population visited, this activity generated 84% of all requests.

Extract from Toubkiss, 2007

Although, according to project initiators, users are initially very keen to participate in the project, their **involvement soon drops off if there is a lack of follow-up**. Users stop employing good practices, the number of connection requests falls and cost recovery becomes more and more difficult, etc. This phenomenon has been observed on all sewer schemes; however, it is all the more pronounced on those systems where the service quality is low (the management body is not clearly identified or incapable of fulfilling its responsibilities, technical faults).

Ongoing (during the lifetime of the system)

Thus, all stakeholders agree on the need for '**ongoing' user awareness-raising**. To this end, and in order to avoid overly frequent and time-consuming meetings and prevent 'meeting fatigue' (feedback from users in Rufisque and ONAS recommendation – PHAST tools technical note, May 2004)), priority has been given to **door-to-door and site visits**. Although these all too rare 'follow-up reminders' have had an immediate impact in both Rufisque and Saint-Louis/Darou, nearly all the systems studied lack the resources required to carry out these awareness-raising visits on an ongoing basis.

Having **trained customer relations staff from the operating body** available in the field on a daily basis to deal with complaints, handle minor problems, escalate major issues, provide advice and reiterate the initial messages, etc. is also considered essential; however, in practice, the lack of operators makes this difficult.

The PHAST-SARAR methodology

The local community communication method used in the PHAST approach is an adaptation of the SARAR methodology of participatory learning, which builds on people's innate ability to address and resolve their own problems. PHAST sessions in the form of home visits, group meetings and guided tours are held for specific groups (women's groups, local youth association members, community groups, etc.). Extension workers use a variety of participatory tools to carry out community awareness-raising:

- Community mapping in which people draw a map of their local water supply and sanitation facilities; this tool is used to help communities identify and locate all their sanitation-related issues.
- Three-pile sorting and the pocket chart are used to help communities review their current hygiene and sanitation practices and sort them into good and bad.
- Contamination routes and barriers are used to help people identify the main transmission routes of fecal-oral disease and their barriers. Upon completion of this exercise, the community should have a better understanding of how some of their current daily hygiene and sanitation practices can contribute to the transmission of fecal-oral disease. Using this knowledge, they will then be able to identify the most effective barriers for preventing these diseases.
- Gender role analysis involves identifying which tasks are generally carried out by men and women within the community. This tool is used to determine whether it is necessary and possible to reallocate any of these tasks.
- The sanitation ladder involves presenting the community with different sanitation options and asking them to select those that best meet their needs.
- Planning posters are used to help the community develop a plan to implement water and sanitation and hygiene behavior changes. This exercise consists of setting out the current and future situations with regard to water and sanitation facilities and asking the community to identify the strengths and weaknesses of both.

Once they feel at ease with the approach, extension workers assist with implementing this participatory method. Prior to this, they should receive regular visits from their supervisors.

Extract from Toubkiss, 2007

IV. What are the main management and operational issues?

What care and maintenance activities are to be undertaken by the operator and users?

	ENDA RUP Rufisque	ENDA RUP Baraka	ENDA Yoff	ONAS Ngor	ONAS Yoff	ONAS Ouakam	ONAS Cité Ousmane Fall	ONAS/CTB Saint Louis	ENDA EP Cayar
Risks	Solid waste, sand, broken manhole covers	Solid waste, sand, broken manhole covers	Solid waste, sand, broken manhole covers	Solid waste, sand, broken and stolen manhole covers, illegal connections	Solid waste, sand, broken and stolen manhole covers, illegal connections	Solid waste, sand, broken and stolen manhole covers	Solid waste, sand, broken and stolen manhole covers	Solid waste, sand, broken and stolen manhole covers	- -
Maintenance of household facilities	Cleaning grease traps (every 2 weeks in theory) Pit emptying (every 2 yrs in theory)		Cleaning screens + grease traps Pit emptying (not been done in 10 yrs)	Cleaning screens + grease traps Pit emptying (not required in 8 yrs) (for the settled system)	Cleaning screens + grease traps Pit emptying (frequency unknown)			Cleaning screens Pit emptying	Cleaning screens + grease traps Pit emptying
Preventive sewer maintenance	No preventive sewer maintenance recorded								
Corrective sewer maintenance	Manual + hydraulic sewer cleaning	Manual cleaning (buckets, iron rods)	Manual cleaning	Manual + hydraulic sewer cleaning	Manual + hydraulic sewer cleaning			Manual + hydraulic sewer cleaning	Manual + hydraulic sewer cleaning
Treatment plant maintenance	Emptying, cleaning of waste stabilization ponds and settling tank, monitoring discharge quality. In reality: very little maintenance, plant in serious disrepair, no caretaker on site	- -	Cleaning filters + repairing leaks and pump (not carried out)	For lift station maintenance, there needs to be a caretaker permanently on site, capable of monitoring simple technical indicators: how full it is, electrical panel, etc. (which is not always the case: caretakers are absent or lack the required skills). Major maintenance tasks (emptying, repairs to electromechanical equipment) are carried out by specialists from ONAS. WWTP maintenance is the same, with additional monitoring of discharge quality (in theory)				Technical monitoring (discharge quality)+emptying is planned

Operations & Maintenance stakeholders and responsibilities: as initially defined … and in reality

	ENDA RUP Rufisque	ENDA RUP Baraka	ENDA Yoff	ONAS Ngor	ONAS Yoff	ONAS Bargny	ONAS Cité OF	ONAS/CTB Saint Louis	ENDA EP Cayar
Initially defined responsibility for the service (contracting authority)	Mgt. Committee involving the users and municipality	Users	Mgt. Committee involving the users and municipality	Tripartite Mgt. Committee: Users-ONAS-Municipality				Tripartite Mgt. Committee: Users-ONAS-Municipality	Steering Committee: municipality, civil society representatives, state's devolved urban planning dept., ENDA, City of Lorient
In reality…	*ENDA*	*Informal Mgt. Committee +ENDA*	*ENDA*	*ONAS-Municipality*	*ONAS*		*ONAS-Mgt. Committee*	*Tripartite Mgt. Committee: Users-ONAS-Municipality*	- -
O&M, technical monitoring of the system and treatment plant	EIG contracted by the Mgt. Committees			EIG contracted by the Mgt. Committees				EIG contracted by the Mgt. Committees	Mgt. Committee + municipal technical dept. or private entrepreneur (hydraulic cleaning) to be defined. Treatment plant caretaker will be employed by the Mgt. Committee
In reality …	*Piecemeal repairs by users or private contractors when resources are available*			*ONAS-Municipality*	*ONAS (highly deficient)*		*ONAS-Mgt. Committee*	*ONAS-Users*	- -
Cost recovery	Mgt. Committee to charge a monthly fee			Mgt. Committee to charge a monthly fee				Mgt. Committee to charge a monthly fee	Mgt. Committee to charge a monthly fee added to the water bill
In reality …	*No cost recovery*	*Informal Mgt. Committee +contributions in kind (maintenance)*	*No cost recovery*	*Municipality*	*No cost recovery*		*Mgt. Committee*	*Mgt. Committee 'piecemeal' + contributions in kind (maintenance)*	- -
User relations-monitoring of good practices	Mgt. Committee			Mgt. Committee				Mgt. Committee	Mgt. Committee
In reality …	*ENDA*	*Mgt. Committee (informal)*	*A user 'focal point' in contact with ENDA*	*Municipality*	*No real user relations person/body*		*Mgt. Committee*	*Mgt. Committee*	- -

Analytical overview: what capacities are required to operate Senegalese small-bore sewers?

Care and maintenance: delicate systems that require regular monitoring and maintenance at all levels

As the small-bore sewers are mainly self-cleaning, there would appear to be a low risk of clogging (no reported cases in over 20 years). In contrast, as the systems use small diameter pipes, they are more vulnerable to blockages caused by solid objects.

Main identified risks to the sewer system

On a day-to-day basis, **the main risks for the sewer system** include:

- **the intrusion of solid waste** (particularly fabric and 'balls' of plastic bags);
- **stormwater** intrusion and '**flooding'** of the systems and treatment plants/lift stations;
- the intrusion of **sand and other sediment** (transported by stormwater or entering through manholes and leaks in the sewer) that then blocks the manholes and/or builds up around blockages caused by solid waste;
- **erosion** that leaves the sewers exposed to the elements and more vulnerable to damage;
- the **passage of trucks** and heavy vehicles that bend and/or **break the pipes**;
- **non-emptied pits** that, along with their solid waste, overflow into the sewers;
- **illegal connections**, the poor quality of which enables solids to enter the sewers, and the occasional connection with no settling tank;
- **toxic substances** being poured into the sewers (vehicle oil, industrial waste, etc.) as these render wastewater treatment at the treatment plant less effective;
- **electrical and mechanical breakdowns** at the lift stations.

An almost total lack of preventive maintenance

Ideally, **an initial level of preventive maintenance** would consist of:

- **inspecting the sewers and treatment plant/lift stations** and conducting minor repairs;
- monitoring the maintenance of **household facilities**;
- monitoring the **level of effluent in the settling tanks**;
- **preventive cleaning** of the sewers and manholes;
- **leak detection** and identifying **illegal connections**;
- imposing **penalties** for damage caused to the systems (theft of manhole covers, disposing of solid waste and stormwater in the sewers, etc.);
- **cleaning/emptying** the treatment plants/lift stations;
- **preventive maintenance of** the lift stations' **electromechanical equipment**.

However, none of this preventive maintenance is carried out on any of the systems studied. Lack of resources means there is no monitoring on either the ONAS or ENDA sewer systems, although ONAS states it has ordered a camera for sewer inspections and that illegal connection detection campaigns "are being planned".

Highly inadequate corrective maintenance

Corrective maintenance notably involves:

- **cleaning out the pipework** and manholes in the event of 'clogging' ;
- **replacing** damaged pipes and manholes;
- repairing **electrical and mechanical equipment** in the lift stations/treatment plants.

This maintenance is carried out inconsistently, in accordance with the capacities and resources available. During the field visits, numerous problems were noted that had not been rectified: **treatment plants that were out of service** and so had been 'bypassed' (Yoff-Tonghor); **clogged manhole** on the downstream section of the system with large volumes of wastewater overflowing into the street (Rufisque); poorly operating or **non-operational lift stations** due to electrical or mechanical breakdowns or the build-up of solid matter (Ngor), etc.

An almost total lack of cost recovery of operating expenses

As far as we are aware, there is currently no cost recovery system in place in Senegal that ensures the systems' operational financial sustainability (see *Part V: How are these costs met?).* There are therefore not enough, or often no, resources available to finance proper technical monitoring, which partly explains the issues listed above.

Most projects initially included a **monthly fee** that was to be collected by the management committees through 'door-to-door' visits. However, despite there being a willingness to pay among users, this system has a **failure rate of almost 100%**. Two solutions have therefore emerged:

- On the sewer systems operated by ONAS, part of its costs is covered by the **sanitation fee paid by the users through their water bill**;
- Users contribute on an ad hoc basis, when there is a **breakdown**.

However, neither of these solutions enables all operating costs to be recovered (see *Part V: What are the costs and how are these costs met*?).

A third option is being considered in Cayar: levying **a specific 'small-bore sewer' fee on the water bill issued by the association of borehole users** (**ASUFOR**: *Association des Usagers du Forage*).

The capacities required for each level of maintenance

For 'day-to-day' sewer maintenance

'Day-to-day' sewer maintenance and simple cleaning activities require only **low technical capacities** and light equipment (picks, shovels, brushes). To be able to carry out his tasks successfully, the operator also needs a **map of the system**, **user records** and a **service manual**, to have received **training on hygiene regulations and security** and be in a position to provide reminders to households to adhere to **good practices**.

However, in the rare instances where there is a clearly defined stakeholder in charge of this first level of maintenance (in Darou/Saint-Louis, Baraka, Ngor), **the full range of these resources is never available.**

For 'heavy' sewer maintenance

Major blockages need to be cleared using **hydraulic sewer cleaning equipment** (high pressure pumps). Ideally, **inspection cameras** should be used to detect leaks and illegal connections. In order to ensure work is carried out to the proper standard, **specialists** should be employed to replace damaged pipes and manholes.

Lift stations need to be continually monitored by a **technician** capable of reading the information on the control panel, monitoring the operation of the pumps, raising the alert in the event of a problem and carrying out simple maintenance tasks if required. This was **not the case on any of the systems visited (caretakers either absent or with little training).** The operator needs to have specialists (senior technicians, engineers) available to respond to problems on the lift stations and undertake regular preventive maintenance.

Treatment plants also need to be monitored by a technician trained in simple inspection procedures and able to ensure corrective maintenance is carried out within a reasonable timeframe (a few hours). Here again, **these capacities are rarely in place in the field**.

A maintenance manual has been developed by ONAS; however, this is highly theoretical, very long and narrative and not particularly useful.

Cost recovery and financial management: a lack of basic tools

It would appear that, with the exception of the committee in Darou/Saint-Louis, **none of the users' committees in charge of cost recovery** have the full range of 'basic' tools required to manage a networked public service: **operating account, account ledger, user records, payment slips, etc.**

Management committee members receive no training on the basic rules of financial management and **no remuneration** (neither fixed nor in proportion to the sums collected), which inevitably affects their motivation and is no doubt why these 'voluntary' committees systematically fall apart after a few months (with the exception of Baraka and Cité OF).

Monitoring and regulation: contracting authorities' area of weakness

The contracting authorities (ONAS, local authorities) are **unable to identify and monitor simple technical and financial indicators to assess the 'health' of the service**, let alone **regulate**/introduce corrective measures. Due to pressure from one of its donors, ONAS is currently in the process of trying to improve monitoring and regulation on its systems; however, the resources allocated to this remain low. Meanwhile, ENDA undertakes some 'post-project' monitoring, but is unable to propose any real corrective measures.

Furthermore, there are **no plans to enforce penalties** for the non-payment of fees or the improper use of facilities.

Organizational structures that change over the course of the project

Blurred responsibility for the service (contracting authority)

Under the initial 'theoretical' model drawn up by ONAS as part of PAQPUD, responsibility for sanitation services (contracting authority) in the operational phase of the program was to be assigned to **tripartite management committees composed of ONAS, user representatives and the local authorities**. However, this model has never been implemented as:

- the management committees were (seemingly) created during the kick-off phase, but **rarely formally established and never provided with the resources** required to carry out their functions;
- the user representatives were **not remunerated** and received little or **no training**;
- the **local authorities**, citing the Local Government Code (see Part I. 5 *Who is responsible for urban sanitation in Senegal?),* **do not consider domestic wastewater management to be their responsibility**;
- no consideration appears to have been given to developing a **monitoring framework** for these committees. The ONAS 'on-site sanitation' department consists of only two technicians (with no specialized knowledge of social engineering, institutional or financial aspects) and thus does not even have the resources to facilitate or provide back-up support, let alone work to reestablish these committees.

For the ENDA schemes, a number of different service responsibility models were developed:

- **the users are fully responsible** for the service. This model was piloted in Baraka and, after 15 years of service, the users have now fully assumed their responsibility despite having only limited resources. However, this is due to a **very unique set of circumstances**: **strong cohesion** between residents threatened with expulsion; an **extremely high population density**; a **lack of alternative** sanitation options (bedrock); and ENDA's long-standing, close involvement providing capacity-building (although both ENDA and the users regret the fact that this involvement has significantly decreased since the death of Jacques Bugnicourt).
- **responsibility is shared between the local authority and the users:** this is the model developed for Rufisque and Yoff-Tonghor and which has been more difficult to implement due to **lower community involvement**, a lack of formally established users' committees and the **reluctance of local authorities to get involved** (except very occasionally).
- **responsibility is shared between ONAS, the local authority and the users** with ownership of the infrastructure transferred to ONAS: ENDA has proposed this model to ONAS, but given its limited resources, ONAS refuses to take on sewer systems in which it has had no previous involvement and that it considers to be poorly designed.

For most of the stakeholders involved, responsibility for these systems ultimately appears blurred and thus best avoided. **The services' institutional structures are based on false premises** (local stakeholders' demand to be involved in service governance and their actual technical, financial and human capacities). **The division of responsibilities is rarely set out in written contracts** and there is **no regulatory mechanism in place**.

The **lack of adequate 'post-project' accompanying measures** and resources for **capacity-building** (see also *Part III. What technical options were selected and how were these implemented?* and *Part V. What are the costs and how are these costs met?*) also make it more difficult to build effective systems to supervise services.

As a result, transitional (but lasting) **rudimentary solutions are soon developed** in which the national operator takes over sole responsibility for the systems, at least those which were placed under the full responsibility of the users.

A lack of operators to run these services

All the systems studied were initially to be operated by **EIG** (economic interest groups). This type of 'community-based' structure, situated somewhere between the third and private sectors, was to undertake both **operations & maintenance** tasks and, in most cases, cost recovery.

However, our field study revealed that there is **not a single organization of this type** involved in operating urban sanitation services, which suggests that there are not enough of economic interest groups with the ability to fulfill these requirements. Furthermore, as far as we are aware, none of the various small-bore sewer projects in Senegal has included a **component to help structure and consolidate these EIG**. In any case, it is highly likely that this type of organization would only have the technical capacities required for the **first, 'day-to-day' level of maintenance** (see *The capacities required for each level of maintenance* above), but not for major sewer maintenance or for operating the treatment plant and lift stations.

As yet, **no private operator**– such as one of Dakar's 150 pit emptying companies – has been assigned the responsibility of operating a sewer scheme. They would doubtless have the capacity (following basic training) to carry out **maintenance tasks on the system**, but not for operating the treatment plant and lift stations.

There is therefore **no system** on which the body responsible for the service has been able to establish a service operating **contract**.

ONAS has had to take over the de facto operation – reluctantly and without additional resources - of the systems that remain under its responsibility, **sometimes with the support of the local authority** (as in Ngor), or a **users' committee** (Cité Ousmane Fall, Darou/Saint-Louis). **This (informal) users' committee thus acts as both contracting authority and service operator.**

Lastly, some sewer systems currently have **no operator** at all: Rufisque, Yoff-Tonghor. Maintenance is carried out on a **piecemeal** basis whenever there is a problem on the system.

What are the users' responsibilities?

According to the ONAS maintenance guide:

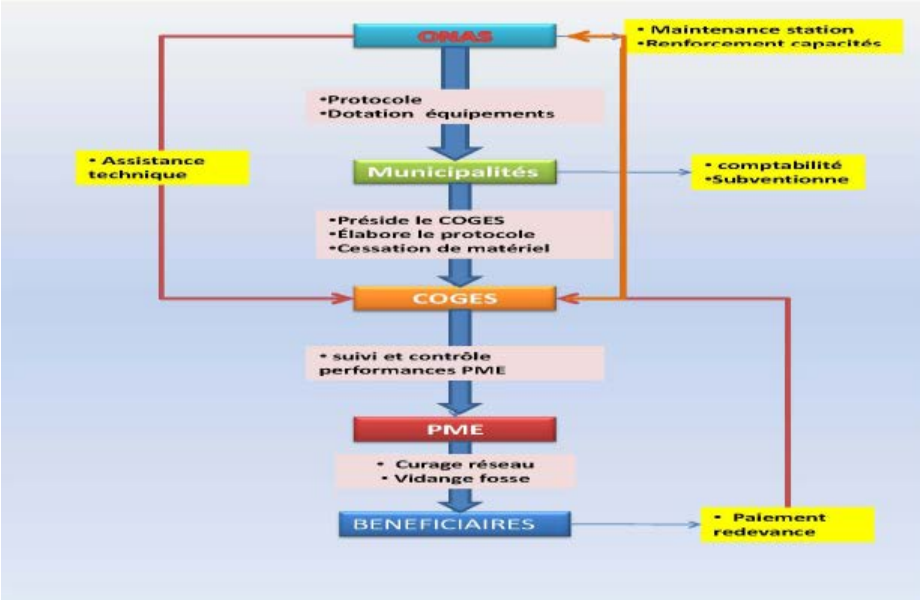
*"Each user has the **duty** and **obligation** to take care of, clean and maintain the base unit's sanitation facilities and domestic sewers. The user's responsibilities are as follows:*

- *Domestic sewer maintenance is to be carried out every three months or sewers are to be cleaned when necessary;*
- *The grease trap and inspection box are to be maintained in good condition and cleaned every two months or as required;*
- *To ensure the sewer system continues to function correctly, foreign objects are not to be disposed of in the sanitation facilities (toilets, inspection boxes, etc.);*
- *To avoid damaging the pipework when undertaking construction work or digging, the sewer construction plans must be consulted to locate all domestic sewer pipes;*
- *All users must ensure that there are no stormwater connections to the sewer system from yards and roofs. Should such connections be detected, users will be subject to penalties as set out in the rules of procedure".*

This approach, based on the 'condominial' model, **places much of the responsibility for maintenance on the users**. Indeed, the majority of the guide was written by a Latin-American consultant. However, **this level of monitoring and maintenance currently bears absolutely no relation to the level of user awareness and involvement in small-bore sewer maintenance in Senegal** (with the possible exception of Baraka and Cité OF).

It should also be noted that, in addition to these 'theoretical' responsibilities, users are also required to participate in service **governance** (management committees) and to either **pay a 'dual' fee** for their sanitation service or raise the funds to cover maintenance costs and the **cost of their connection** themselves.

Lastly, **not all users have signed a written contract** setting out their responsibilities and the tariff level (except in rare cases, such as in Saint-Louis/Darou: see Annex 4: *Saint-Louis/Darou simplified sewerage service contract).* **Users are rarely able to define their responsibilities when asked.**



Division of responsibilities during the operational phase: theoretical initial structure of the PAQPUD program

V. What are the costs and how are these costs met?

Actual investment costs

Overall costs and cost per connection

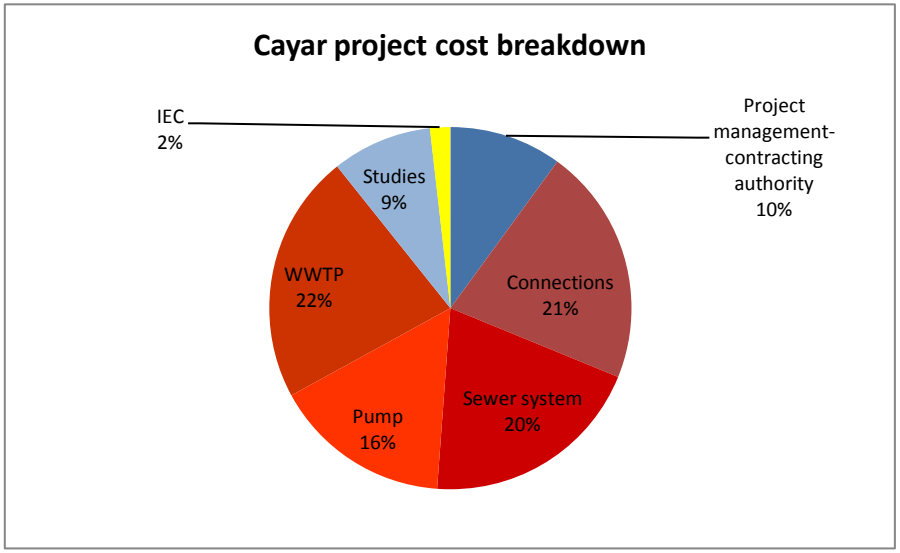
	ENDA RUP Rufisque	ENDA RUP Baraka	ENDA Yoff	ONAS Ngor	ONAS Yoff	ONAS Bargny	ONAS Cité OF	ONAS/CTB Saint Louis	ENDA EP Cayar
Total cost of hard + soft components	Difficult to estimate as projects are regularly subsidized (cash + donations in kind: vacuum trucks/ UN Habitat, etc.)+ ENDA's own funds. However, the most recent 1.5 million euro project covers 9 towns.	?	?	US$14 million, or around 10 million euros for the PAQPUD program's 'small-bore sewers' component. GPOBA included a large number of domestic options (on-site or connected to a small-bore sewer); it is thus not possible to divide the total cost (5.1 million euros) by the number of connections.				4 million euros or 2,624,000,000 CFA Francs	€349,000 + additional costs (due to delays that led to the suspension of the project)
Cost per connection: hard +soft	Difficult to estimate for the reasons given above and because there is some disagreement between ENDA and the evaluators over the number of connections actually completed. In addition, only one part relates to new connections, with a large part involving rehabilitation.	?	?	For the reasons given above, it is difficult to calculate the figure for PAQPUD as the 'soft' component includes both small-bore sewers and on-site facilities. It is highly likely that, by increasing the number of connections per sewer, the GPOBA phase has lowered the unit costs.				Not possible to calculate as includes major rehabilitation work on the main WWTP at St Louis + conventional sewerage	€1,163 per connection (excluding additional costs)

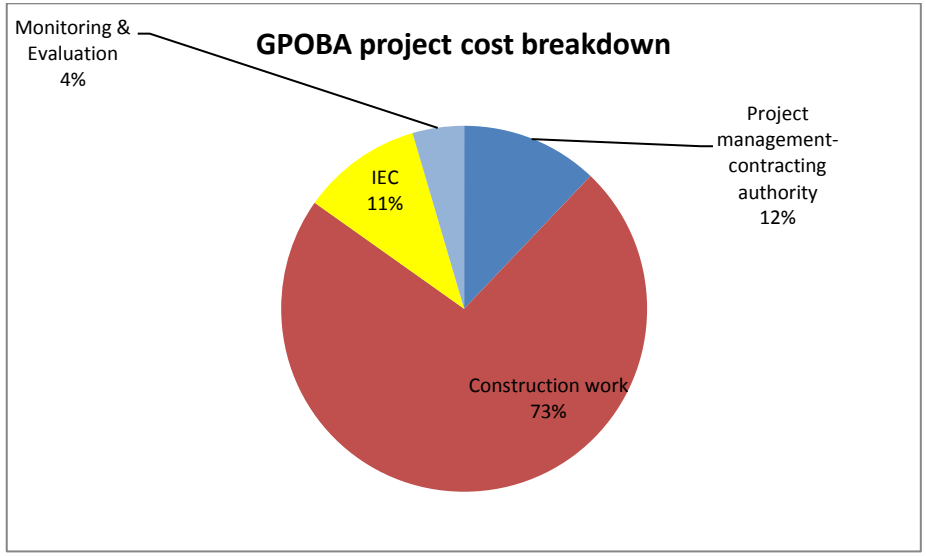
Cost of the 'hard' component

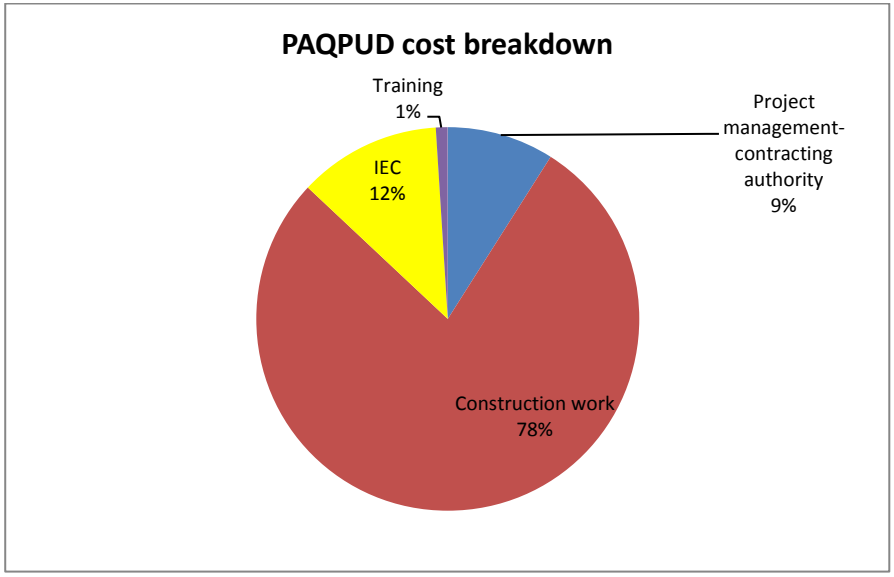
Cost per connection (in euros), hard only	410,000 CFA Francs or 625 euros (source: Michelon evaluation)	?		According to Tounkara (AGETIP), 2009: 500,000 CFA Francs per household connected through PAQPUD; i.e. 762 euros. It is highly likely that, by increasing the number of connections per sewer, the GPOBA phase has lowered these unit costs.				See above	€1,000 (sewer + WWTP, excluding domestic facilities and additional costs)
Total cost of the hard component	?	?		?	?	?	?	71% of the 4 million euros	€305,000 (+additional costs and hydraulic cleaning system), i.e. 87.4%
Household facilities' costs	?	?		?	?	?	?	?	Facilities already in place
Connection costs	?	?					?	?	€73,159; i.e. 24% of total hard component costs
System costs	?	?					?	?	€69,160 (i.e. 22.6% of total hard component costs)
Lift station(s) costs	?	?					?	?	€54,833 (i.e. 18% of total hard component costs)
WWTP costs	?	?					?	?	€76,950 (i.e. 25% of total hard component costs)
Land costs	?	?				?	?	?	In kind (municipality)

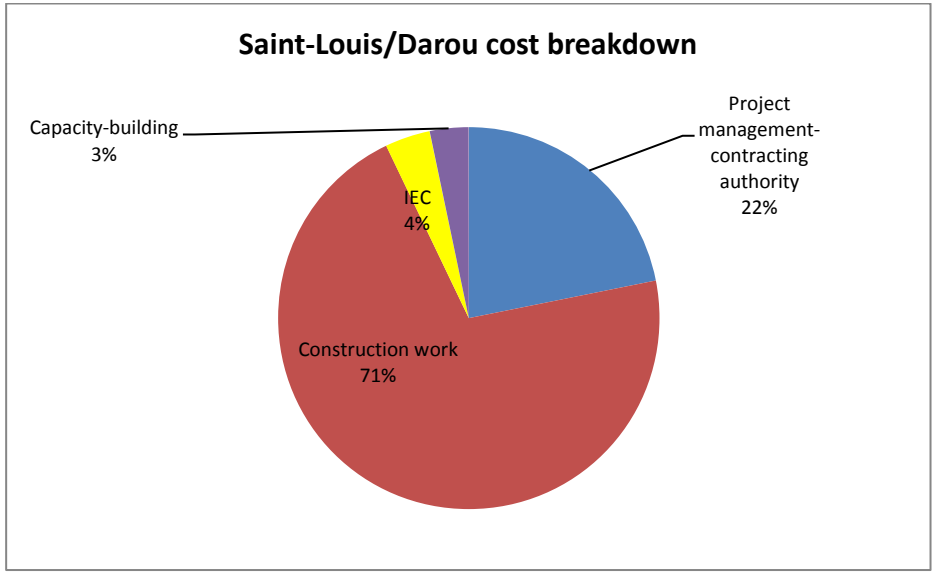
Cost of the 'soft' component

Total cost of the soft component	?	?	?	?	29% of the 4 million euros	€49,882 (excluding studies); i.e. 14.3% of the total
Study costs	?	?	?	?	?	GEAUR invoice =studies+hard Topographic studies+technical design=30,869 euros; i.e. 10% of total hard component costs
IEC costs	?	?	?	11 to 12% (PAQPUD and GPOBA)	95,420 euros, or 4% of the Belgian financial contribution (2.5 million)	€6,250, i.e. 2%
Project management and contracting authority costs	?	?	?	9 to 12% (PAQPUD and GPOBA)	?	€34,732, i.e. 10%


Cayar project cost breakdown
IEC
2%
Project
management-
contracting
authority
10%
Studies
9%
WWTP
22%
Connections
21%
Pump
16%
Sewer system
20%


Monitoring &
Evaluation
4%
GPOBA project cost breakdown
Project
management-
contracting
authority
12%
IEC
11%
Construction work
73%


PAQPUD cost breakdown
Training
1%
Project
management-
contracting
authority
9%
IEC
12%
Construction work
78%

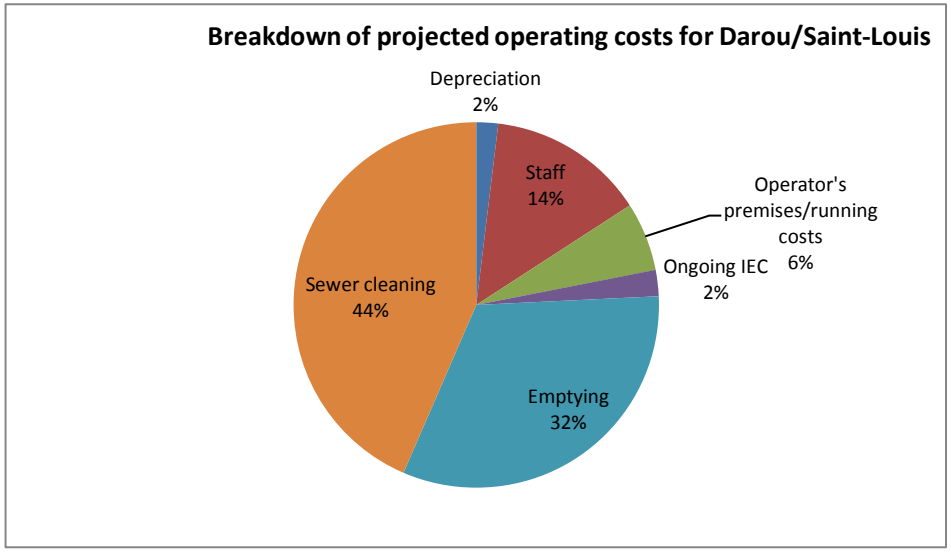

Saint-Louis/Darou cost breakdown
Capacity-building
3%
Project
management-
contracting
authority
22%
IEC
4%
Construction work
71%

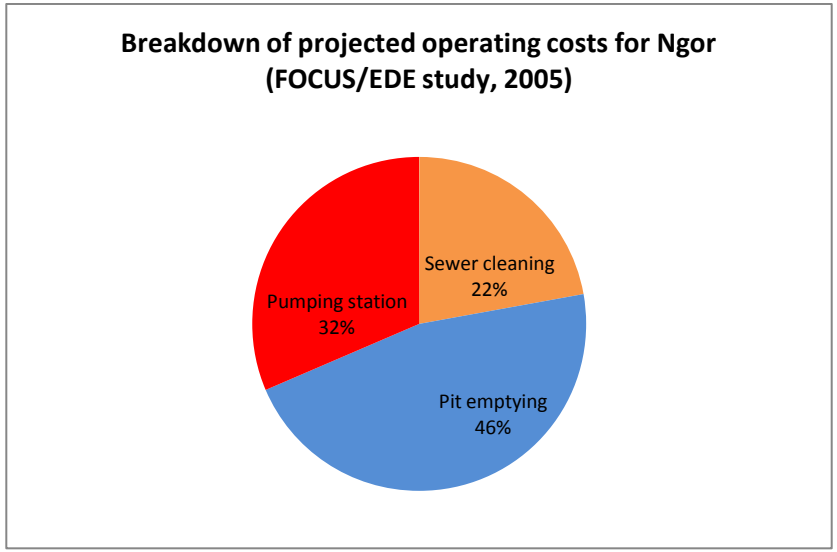
Investment financing

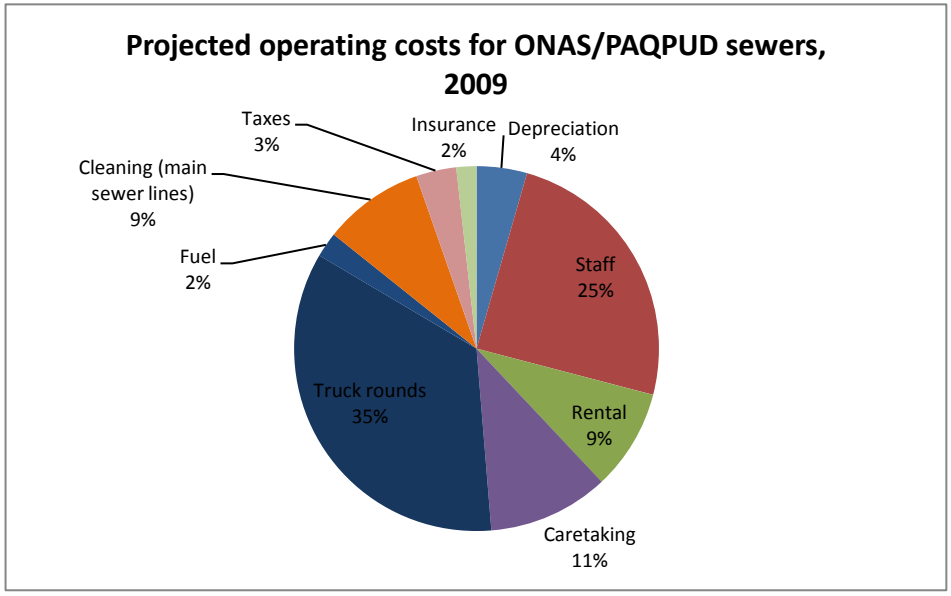
	ENDA RUP Rufisque	ENDA RUP Baraka	ENDA Yoff	ONAS Ngor	ONAS Yoff	ONAS Bargny	ONAS Cité Ousmane Fall	ONAS/CTB Saint Louis	ENDA EP Cayar
Local authority	Land (for the WWTP)	0%	0%?	0%	0%	0%	0%	0%	39,000 CFA Francs, i.e. €59,500 20% of hard costs +WWTP land
Users	Finance domestic facilities, contribute 165,000 CFA Francs (250 euros)to the initial investment (connection) via the FOCAUP; however, there is a very low recovery rate	Finance domestic facilities, contribute to the initial investment (connection) +around 100% of renewal and new investment costs	Finance 50% of household facilities; do not contribute to the connection cost	40,000 CFA Francs per connection as part of GPOBA				?	750,000 CFA Francs, i.e. €11,430 3.75% of hard costs, but not listed in the project budget
State	0%	0%	0%	Nearly 100%, through a World Bank loan +additional subsidy to increase the connection rate				Senegal Ministry of Finance via ONAS: 1.5 million euros	0%
ODA		Initial investment	Initial investment	UN Habitat subsidy for the 'simplified' aspect of the system				CTB: 2.5 million euros	City of Lorient? €50,000 Agence Loire-Br: €50,000 MAEE: €20,000 Region of Brittany: €40,100 i.e. 80% of hard costs

Projected operating costs

	ENDA RUP Rufisque	ENDA RUP Baraka	ENDA Yoff	ONAS Ngor	ONAS Yoff	ONAS Cité OF	ONAS Bargny	ONAS/CTB Saint Louis	ENDA EP Cayar
Total per month per connection	Around 5 million CFA Francs per yr according to ENDA to cover all O&M+soft requirements, i.e. 2,000 CFA Francs per month per connection (ENDA estimate) or around 3 euros per connection per month	?	?	EDE/FOCUS in 2005: 1,796 CFA Francs per household per month, or 2.73 euros (according to the study, costs to be halved if users cover the cost of cleaning the domestic sections of the sewers and emptying). In 2009, ONAS forecasts included a cost of 11,210,000 CFA Francs per year for Ngor, i.e. for 500 connections: 1,868 CFA Francs; 2.85 euros per month.				Estimated at 10,350,000 CFA Francs per year or 2,6 euros per connection per month	€2.5 per connection per month
Operating staff costs	?	?	?	24.6% according to ONAS, 2009				1,440,000 CFA Francs per year or 14%	2 WWTP and lift station managers =€305 per month
Operator's premises/running costs	?	?	?	8.9% (ONAS, 2009)				63,000 CFA Francs per year or 6%	?
Sewer cleaning	?	?	?	17.8% according to the FOCUS/EDE study, 2005 8.9%, ONAS 2009 (only includes the main sewer lines, the first level of sewer maintenance being undertaken "by the users")				450,000 CFA Francs per year or 43.48%	?
WWTP & lift station maintenance	Included	?	?	WWTP not included in the EDE/FOCUS study Pumping station: 25.3% Caretaking of the lift pump (by a technician?) 10.7% (ONAS, 200) Fuel: 23% (ONAS 2009)				Not included	?
Pit emptying	?	?	?	37.3% according to FOCUS/EDE 34.8% according to ONAS, 2009				3,340,000 CFA Francs per year or 32.2%	5 vacuum truck rounds=€457 per month
Ongoing IEC	?	?	?	?	?	?	?	240,000 CFA Francs per year or 2.3%	?
Monitoring WWTP discharge quality	?	?	?	?	?	?	?	?	€3,048 (flat rate, frequency not specified)
Depreciation/provisions for renewal	?	?	?	4.5% (ONAS, 2009) ? ? ?				2%	Not forecast


Breakdown of projected operating costs for Darou/Saint-Louis
Depreciation 2%
Staff 14%
Operator's premises/running costs 6%
Ongoing IEC 2%
Sewer cleaning 44%
Emptying 32%


Breakdown of projected operating costs for Ngor (FOCUS/EDE study, 2005)
Sewer cleaning 22%
Pumping station 32%
Pit emptying 46%


Projected operating costs for ONAS/PAQPUD sewers, 2009
Taxes 3%
Insurance 2%
Depreciation 4%
Cleaning (main sewer lines) 9%
Fuel 2%
Staff 25%
Truck rounds 35%
Rental 9%
Caretaking 11%

Projected versus actual resources

	ENDA RUP Rufisque	ENDA RUP Baraka	ENDA Yoff	ONAS Ngor	ONAS Yoff	ONAS Bargny	ONAS Cité Ousmane Fall	ONAS/CTB Saint Louis	ENDA EP Cayar
User fee	1,000 CFA Francs per month (i.e. 1.5 euros) or 50% of estimated costs	?	?	12,000,000 CFA Francs per year or 2,000 CFA Francs per month, 3 euros per connection per month (ONAS, 2009)				1,250 CFA Francs per household per month	1,000 CFA Francs per month or 1.5 euros (i.e. an operating deficit of 40% according to this model)
In reality…	Piecemeal contribution: each h/hold pays 3,000 to 5,000 CFA Francs, sometimes more when required	Piecemeal contribution when required and depending on the resources available	Piecemeal contribution (rare)	Tax on the water bill (10%) + piecemeal contribution				Low recovery rate	- -
Local authority	To pay part of the operating costs (around 50% of estimated costs)	0%	WWTP maintenance and caretaker (not quantified)	Ngor pilot study, ONAS, 2009: the local authority is "encouraged" to pay 3,000,000 CFA Francs per year or 0.75 euros per connection per month There is an operating profit made (not allocated) (see Annex 2)				Subsidy from the municipality to the Mgt. Com.: 35% of operating costs, or 50% if emptying is considered to be the users' responsibility	Plan to pay a subsidy to the management committee (amount not specified)
In reality…	Ad hoc subsidy to the Users committee	0%	0%	In Ngor, the local authority covers certain operating costs (staff, sewer cleaning, user monitoring); however, it is not possible to quantify these resources. The local authority does not cover costs on any of the other systems				Awaiting a decision from the municipality	
ODA	0%	0%	0%	0%				0%	WWTP discharge monitoring included in the investment financed through ODA
In reality…	ENDA finances projects (monitoring and minor operating tasks) and rehabilitation			0%				0%	
State	ONAS to pay part of the expected operating costs (not quantified)	0%	0%	0%				ONAS to cover some operating ('second level' maintenance) and Mgt. Com. costs (not quantified)	0%
In reality…	Refuses to support this system	Supports the 'downstream' section (the sewer discharges into its conventional sewer system)	Not involved	0%				After one year of operation, ONAS appears to be assuming its responsibilities	
Other	Reuse of wastewater (not quantified)	- -	- -	- -	- -	- -	- -	- -	Reuse of wastewater (not quantified)
In reality…	0%	- -	- -	- -	- -	- -	- -	- -	- -

Analytical overview: what are the costs and how are these costs met?

Investment costs versus local investment capacity

What are the actual reported costs?

It is extremely difficult to conduct comparative studies of small-bore sewers in Senegal following such a short field visit as:

- there are **very few** (or no) good quality and **in-depth ex-post evaluations** available and very little detailed information on actual project costs;
- estimated costs often only include the '**hard'** component (infrastructure).**Costs for the 'soft' component**: IEC, capacity-building, project management and contracting authority activities **are rarely available**. In the few instances where these costs are available, they vary considerably in accordance with the methods used and the efficiency of the project/project stakeholders;
- **these costs often only include the 'sewer system' element (evacuation segment)** or simply the 'cost of the connection' and fail to take the 'access' or 'treatment' segments into account;
- **the low connection rates** distort the unit costs;
- calculating the unit costs by dividing the project costs by the number of connections provides only a very rough estimate as projects very often involve the implementation of more than one sanitation option (GPOBA, Darou/Saint-Louis) or are carried out across more than one country (ENDA 9 towns).

From the figures collated in the table above, it is however possible to estimate that the median investment cost of a small-bore sewer in Senegal (soft + hard, access + evacuation + treatment) **is around 1,000 euros per connection**.

Using the pumping station and treatment plant costs (as these installations for both conventional and small-bore sewers are roughly the same) included in the 2012 Dodane, Mbéguéré, Sow and Strande study, the **cost of the entire sanitation chain for ONAS small-bore sewers in Dakar comes to nearly 2,500 euros**.

As the cost of the pumping station accounts for around 50% of this total, it can be assumed that a gravity sewer system would be half the cost. This is consistent with our median cost of 1,000 euros per connection.

However, it is to be noted that all the projects implemented to date are considered 'pilots'. Thus, **there are a number of factors that could, in the future, help reduce these costs**:

- **an increase in the number of connections per system** (and, potentially, the expansion of these systems), which will 'automatically' lower the unit cost;
- **the development, consolidation and dissemination of** financial, social and technical engineering **know-how** throughout the country;
- **an increase in the efficiency** of certain stakeholders (ONAS, NGOs, implementing agencies);
- an increase in the number of qualified professionals and thus increased **competition** between service providers and contractors;
- changes in energy costs and the cost of raw materials;
- etc.

How small-bore sewer investment costs compare to those of other sanitation solutions

In comparison to conventional sewerage

It is universally recognized that the **investment costs** of small-bore sewers are **lower than conventional sewerage.**

The 2012 Dodane, Mbéguéré, Sow and Strande study reported a **cost per connection of around 4,500 euros for conventional sewerage**, 2 to 4 times higher than for a small-bore sewer. This is consistent with findings from Brazil (where small-bore sewer costs were between 50% and 70% lower than for conventional sewerage) and Ghana (around 45% lower).

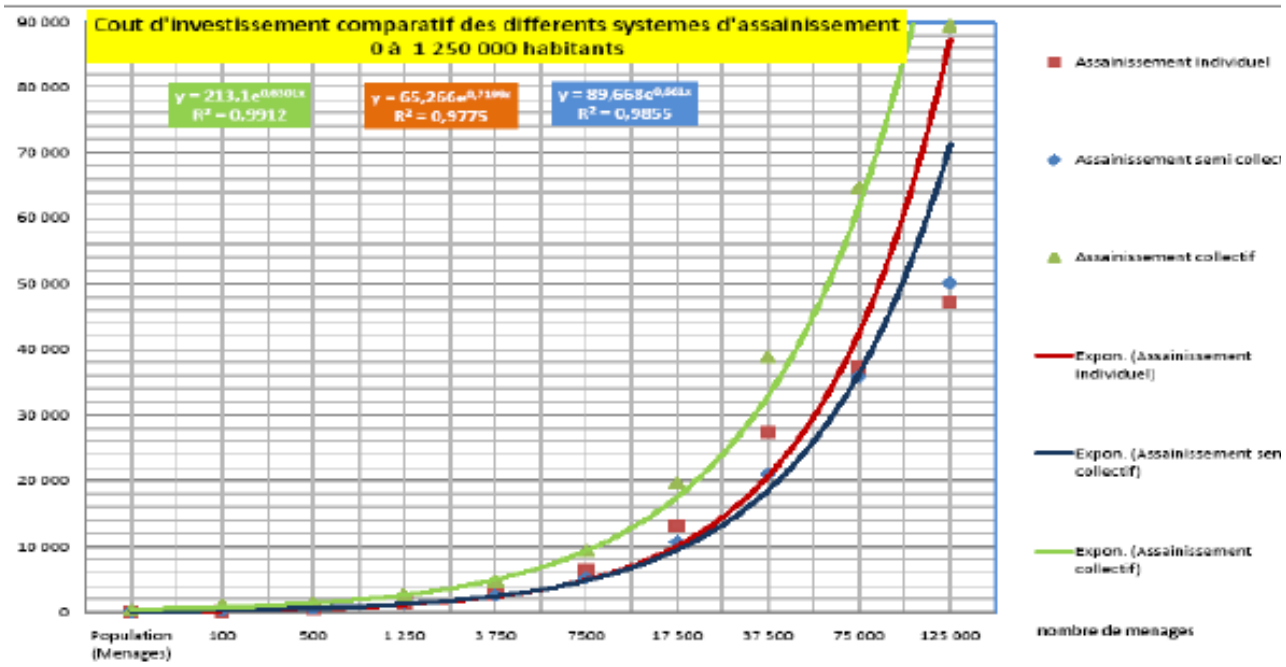
Spread over the lifespan of the equipment (which, perhaps pessimistically, is estimated at 20 years for a connection and 30 years for all other equipment and facilities), Dodane et al. estimates the cost per connection per year for conventional sewerage to equate to around 30 euros.

Given that the investment cost of a small-bore sewer is considered to be 50% lower than that for conventional sewerage, then the cost per connection per year for a small-bore sewer with a lifespan of 30 years equates to between 7.5 and 15 euros (30 years is the lifespan of efficiently operating small-bore sewers in Ghana and Brazil).

However, if the lifespan of conventional sewers is considered to be longer, for instance 60 years (closer to the reported actual lifespan of many systems), then **over the long-term, the investment cost advantage of small-bore sewers is reduced or negated.**

In comparison to on-site sanitation

In the initial PAQPUD models, from a certain level, the **cost of simplified ('semi-collective') sewerage was lower than the cost of on-site sanitation** (see the graph from ONAS below). However, the figures provided need to be updated to include the additional costs incurred by problems encountered during the project.



Nevertheless, here again, it is difficult to **make precise comparisons** as the costs available for both on-site sanitation and small-bore sewers only include the '**hard'** components and often solely for the **access segment** (see the section on *What are the actual reported costs?* above). It is, however, possible to compare the median small-bore sewer investment cost of 1,000 euros per connection with the cost of **350 euros per household for on-site sanitation**: this is the average figure agreed upon by experts for Dakar, but which only includes the 'hard' component and 'access' segment.

Yet it is also necessary to consider the **investment cost of the evacuation segment: vacuum trucks** (purchased by the private sector with the cost passed on to customers through the pit emptying tariff) and the treatment segment: the (rare) **sludge disposal sites and treatment plants** (mainly financed by the GATES Foundation, which is currently working in Dakar). As a result, according to Dodane et al., 2012, the total cost stands at around **450 euros** per household.

Spread over the lifespan of the equipment (according to the same Dodane et al. study, this is 50 years for a pit, 15 years for a second-hand vacuum truck and 30 years for the treatment plant), **on-site sanitation costs approximately five times less than a small-bore sewer.**

(*See the summary table of comparative costs per sanitation chain below).*

Estimated investment costs of the different sanitation chains in use in Dakar: summary table

	On-site + pit emptying	Small-bore sewer	Conventional sewerage	
Estimated lifespan (under theoretical optimal operating conditions)	50 years (pit) 15 years (vacuum truck) 30 years (treatment plant)	30 years (sewer + treatment plant) 20 years (connection)	30 years (sewer + treatment plant) 20 years (connection)	60 years (sewer + treatment plant) 30 years (connection)
Approximate initial investment cost per connection (or household)	450 euros	1,000 euros (gravity sewer system) 2,000 – 2,500 euros (with lift station)	4,500 euros	
Approximate investment cost per connection (or household per year spread over the lifespan of the equipment	3 euros	15 euros	30 euros	15 euros

How do investment costs compare to local stakeholder capacities?

As substantiated by Dodane et al., for the evacuation segment, investment financing for small-bore sewers is completely different to that for on-site sanitation + pit emptying. Whereas, for on-site sanitation, investment is predominantly **(or totally) paid for by the user** through the pit emptying tariff (as the private pit emptying operator passes on this investment cost directly to customers), the majority of small-bore sewer investment costs are covered by the **public authorities or development partners.**

It would appear that the sums required to finance small-bore sewer investment exceed the capacities of **local** stakeholders (local authorities, users' associations or the private sector) meaning **heavy state and/or ODA subsidies** are required. This is partly why there has been **no 'endogenous' expansion** of this option since it was first piloted in Senegal in the 1990s.

Main payer: the Senegalese government

The state funded investment of the PAQPUD program through a US$16 million World Bank loan and then provided US$5 million to fund investment in GPOBA. Thus, it is a **financially sound stakeholder that has included sanitation as one of its priorities** via an ambitious sector policy entitled 'PEPAM' (see *Part I. Who is responsible for urban sanitation in Senegal?).*

International development aid

International aid is the **second largest contributor to small-bore sewer investment**, with **subsidy** levels for 'hard' and 'soft' project investment costs of **between 70 and 100%**.

Local authorities: generally lacking financial capacity

Due to a lack of fiscal revenue, local authorities have **few resources to invest in infrastructure.** Moreover, the municipal paymasters (state employees assigned to local authorities) invoke the **Local Government Code**, which prohibits municipal councils from electing to include a 'sanitation' budget item in the local authority budget (see also Part I.).

Nevertheless, the municipality in **Cayar has voted** in favor of helping to fund investment of small-bore sewer infrastructure. This is being financed through a budget item headed 'miscellaneous expenses' and has been approved by the paymaster; however, the local authority is finding it extremely difficult to uphold its commitment due to a lack of fiscal resources.

The users

There are often **subsidies of between 50 and 100%** available to cover the connection cost, with the balance (if any) to be paid by the user. **In areas with no subsidy available, the number of connections remains extremely low** (as in Yoff-Tonghor).

Cost recovery of user contributions under the PAQPUD program was exceedingly low *(see the following table)*. Subsequently (GPOBA), households were required to pay the full amount prior to receiving the connection and cost recovery was nearly 100%.

Low cost recovery of user contributions for the PAQPUD program (extract from Toubkiss, 2007)

Simplified sewerage contributions	
Total projected amount	*229,000,000 CFA Francs*
Amount collected	*19,553,000 CFA Francs*
Percentage of contributions recovered	*8.5%*

In Rufisque, a **micro-credit mechanism** – a revolving fund entitled FOCAUP – was set up to enable users to spread the cost of their connection (165,000 CFA Francs or 250 euros) over time with the money collected used to finance new connections. However, **cost recovery was extremely low** (less than 30%); this was due to at least three factors:

- the **'balance' to be paid by users (250 euros) is more than poor households can afford, particularly given that on-site sanitation appears to meet their actual demand just as well**;
- connections were installed **prior** to collecting the monies owed. Households were thus no longer under any obligation to pay as there were no penalties in place;
- the **poor quality of the service** (technical issues, no clearly defined manager or operator, etc.) discourages users from continuing to pay long-term;
- As far as ENDA is concerned, the main problem with this system stems from a **lack of effectiveness and involvement on the part of the micro-finance institution** responsible for cost recovery and managing the funds. It was not possible to establish the nature of the contract in place between ENDA and this MFI, nor which type of incentives had been put in place to encourage greater efficiency.

Operating costs: highly flawed economic models

Frequent highly partial assessments of actual operating costs

General lack of projected operating accounts

Whilst there are a few (basic) projected operating account models (see the Projected Operating Account for the ONAS-PAQPUD Schemes in Dakar, EDE/FOCUS, 2005, in Annex 2 and Projected Operating Account for Saint-Louis/Darou in Annex 3.), the cost estimates used are often highly flawed. **Certain expenditure items have been systematically omitted** (notably ongoing IEC or management committee members' remuneration) from the initial models and outstanding debt or additional costs are rarely included.

Provisions for equipment and installation renewal are sometimes included (but never actually recovered).

Actual reported costs

None of the different 'operators' are able to provide a detailed study of actual, experience-based, operating costs. In any case, this information would be highly incomplete as none of the small-bore sewers in Senegal are currently operating effectively. Obtaining this data is, however, one of the objectives of a study recently initiated by WSP.

As part of a consultants' report compiled by EDE/FOCUS in 2005, a study was carried out across five areas connected to a small-bore sewer in Ngor using figures recorded after several months of operation. The estimated operating cost of the small-bore sewer in the five areas studied came to around **80 million CFA Francs a year, which included:**

- 17.8 million for sewer cleaning;
- 37.3 million for pit emptying (which appears to contradict the fact that, in Ngor, small-bore sewer settling tanks only need emptying once every 5 to 10 years);
- 25.3 million for the pumping station.

Thus, given there are potentially 3,731 connections within the five areas, the **cost per connection equates to around 1,796 CFA Francs per month, or 2.7 euros per connection per month** (according to the study, costs are to be halved if the users cover the cost of cleaning the domestic sections of the sewer lines and pit emptying).

A study carried out for ONAS (DABO A.T., 2009) on this same area of Ngor estimates this cost to be **2.85 euros per connection per month** and provides a more precise cost breakdown.

However, in both of these studies, **the costs covered only include the upstream section of the sewer and 'routine' maintenance.** Thus, the following costs are omitted: management, monitoring and regulation costs, expenditure on ongoing awareness-raising, treatment plant running costs, 'heavy' maintenance and equipment renewal expenditure, etc.

According to ENDA, operating costs in Rufisque (under optimum management conditions) should be around **3 euros per connected household per month** (for the entire chain, including the 'soft' components). This system does not have a pumping station; however, pumping station running costs are generally considered to account for around 50% of a sewer system's total operating costs.

It is therefore possible to estimate that the monthly operating costs of the 'small-bore sewer' sanitation chain approximately come to **between 3 and 6 euros per connection per month,** depending on the system.

An **extract from the Cité Ousmane Fall (Dakar) users' association logbook**, although only covering 'first level' day-to-day sewer maintenance (so not including 'heavy' maintenance, operation of a pumping station or ongoing IEC), also provides an insight into the type of operating expenses incurred.

Année 2009			**Total**
Février	2 regards	45,000	
Avril	débouchage	100,000	
Septembre	débouchage réseau	100,000	
Novembre	nettoyage réseau	30,000	**275,000**
Année 2010 (jusqu'au 14 juillet)			
Janvier	entretien réseau	10,000	
Janvier	débouchage réseau	100,000	
Juin	débouchage, désensablement	45,000	
Juin	Réseau	40,000	
Juin	travaux pré-hivernage	300,000	
Juin	refection	50,000	
Juillet	refection	60,000	**605,000**

Source: Report from a visit to Cité OF, P Boulenger, World Bank

Small-bore sewer operating costs compared to those of conventional sewerage

Although operating small-bore sewers may sometimes prove difficult, according to ONAS, their maintenance costs are **lower than for conventional sewerage** (conventional systems also require frequent 'unclogging', but additionally need to be cleansed regularly to reduce the risk of blockages and formation of gases).

Dodane et al., 2012, gives a monthly operating cost per connection of around 7 euros for the conventional sewerage sanitation chain. Costs include all operating expenses along the entire chain.

Thus, the operating costs of a small-bore sewer in Senegal equate to between 50% and 100% of the operating costs of conventional sewerage.

In contrast, operators in Brazil estimate that the operating costs of small-bore sewers and conventional sewerage are virtually the same ("fewer major interventions, but more minor interventions and higher user relations and awareness-raising costs").

Small-bore sewer operating costs compared to those of the on-site + pit emptying sanitation chain

It is also extremely difficult to produce accurate estimates of the **operation and maintenance costs of the on-site sanitation chain** as:

- the **frequency with which households need to empty their latrine pits varies enormously** in accordance with the physical characteristics and development of the area and the type of pit;
- there is no or very little data available on the **amount spent by households on maintaining their on-site sanitation facilities (excluding pit emptying)**;
- in Dakar, **sludge disposal and treatment sites** have only recently been put in place (or are still in the planning stage).

Nevertheless, Dodane et al., 2012 estimates that the monthly operating cost of the 'on-site + pit emptying' sanitation chain is around 5.3 euros per household per month, which is 1.5 times lower than the operating costs for conventional sewerage.

In Dakar, therefore, on-site sanitation is between 1.5 times more expensive and 1.3 times cheaper than a small-bore sewer.

For households, however, the calculation is 'more straightforward':

- the small-bore sewer option costs them between 12,000 CFA Francs per year and 24,000 CFA Francs per year in specific 'small-bore sewer' fees (in the rare instances where these are collected). In reality, and in the majority of cases, it costs **0 CFA Francs per year actually paid + 1 pit emptying at 25,000 CFA Francs every 2 to 10 years;**
- The on-site sanitation option costs them **between 25,000 CFA Francs and 100,000 CFA Francs to have their latrine pit emptied once to four times a year.**

Thus, as things stand, the small-bore sewer remains a **very financially attractive option** for households, which largely explains the high levels of satisfaction reported among those households connected.

Resources are often poorly identified

A chronic operating deficit

The initial financial models used (by ONAS, ENDA) often assumed that the **users would finance between 50 and 80% of the operating costs**, with the local authority making up the remainder.

However, and depending on how the projected costs are calculated, it is not possible to cover the systems' operating costs through the sanitation fee of around 1,000 CFA Francs per month and the subsidies received from the local authorities. All small-bore sewers in Senegal have chronic operating deficits due to a combination of **poorly estimated costs and the extremely poor collection of fees and subsidies.**

The 2005 FOCUS/EDE study estimated that the average monthly household water bill for 'low-income' users (Ngor) came to around 5,000 CFA Francs per month, 10% or about 500 CFA Francs of which constitutes the sanitation fee.

If 100% of a small-bore sewer's estimated 2,000 CFA Francs per month operating costs (conservative estimate) is to be met through the water bill, **the sanitation fee will need to be multiplied by four. This will thereby lead to a 1.4 times increase in the total 'water and sanitation' bill** paid by households. At least 30% of the amount billed would thus be allocated to operating the small-bore sewer.

By way of comparison, **in Brazil, for users of those small-bore sewers run by public operators, the sanitation fee has now been set at 80% of the water bill.**

Local authorities: insufficiently involved in funding small-bore sewer operating costs

With the exception of the few towns that have deeply committed local elected officials (Ngor, Cayar and, occasionally Rufisque and Yoff-Tonghor), **local authorities contribute no more to funding operation of the systems than they do to financing investment.**

The Senegalese government: finances investment, but is unwilling to cover operating costs

There seems to be a huge disproportion between the Senegalese government's financing of operating costs and its funding of investment. Thus, although the state subsidizes ONAS via a performance contract, these subsidies are too low to enable

ONAS to operate the conventional sewer systems effectively. Small-bore sewers are **not covered by the state-ONAS 'performance contract', which is mainly why ONAS is reluctant to commit resources to operating these systems.**

Furthermore, the Senegalese government has always lacked the political willingness to allow ONAS to recover the systems' operating costs **through potentially unpopular measures such as increasing the sanitation fee levied on the water bill.**

'Dual punishment' for the poorest users

At the moment, users in the six towns (partially) served by conventional sewerage (Dakar, Thiès, Saint- Louis, Louga, Saly Portudal, Kaolack) pay a **sanitation 'surcharge'** that is added to the water bill (regardless of whether they are connected to the sewer system or not); this despite the fact that the majority of the people living in these six towns are still using on-site sanitation (EDE/FOCUS, 2005).

As a result, and as outlined in *Part II. Do these systems meet user demand?*, the principle of charging a specific fee to the users of small-bore sewers means they are required to make a '**dual payment**' for the service: both via the sanitation surcharge (added to each customer's water bill) and via the 'small-bore sewer' fee. However, **this dual payment is not required of conventional sewerage users, who tend to live in the wealthier areas.**[5]

What are the prospects for financing the operation of small-bore sewers in Senegal?

The WSP study should provide a viable financial and management model for use on all small-bore sewers in Senegal.

It is to be noted that the 2005 FOCUS-EDE study has already made recommendations that cover three timeframes.

Three scenarios were proposed for the **short-term** (the first two years of operation):

- scenario 1: a **'simplified sewerage' sanitation fee is collected by municipal staff** (even though all taxes are currently collected by government departments);
- scenario 2: a **'simplified sewerage' sanitation fee is collected by a management committee**;
- scenario 3: no change to the sanitation pricing system and **ONAS covers the shortfall** between the total fees collected and the actual simplified sewer operating costs.

Scenario 2 was selected, but **it was scenario 3 that was actually put in place** (with additional funds from the local authority in Ngor and from the users in Cité OF).

In the medium-term (after two years of operation), the model should have evolved to include **a complete overhaul of the sanitation pricing system** (requiring changes to the legal framework), with three categories of **fees levied through the water bill**:

- **a 'basic' tax** to be paid by all households (regardless of the system used: conventional, simplified, on-site);
- **a 'surcharge' for simplified sewerage** (small-bore sewer) **users**, which would require legislation;
- a **'surcharge' for conventional sewerage users** (in accordance with a 2002 ministerial decree that is currently in force).

In theory, this principle combines **equity, financial sustainability and simple and direct cost recovery**. Nevertheless, we were unable to ascertain why this system has not been put in place (although many of the stakeholders interviewed cited political reluctance to increase the cost of the water bill). However, given that some stakeholders are considering the possibility of delegating sanitation services to the private sector in the medium-term, this idea may yet be revived.

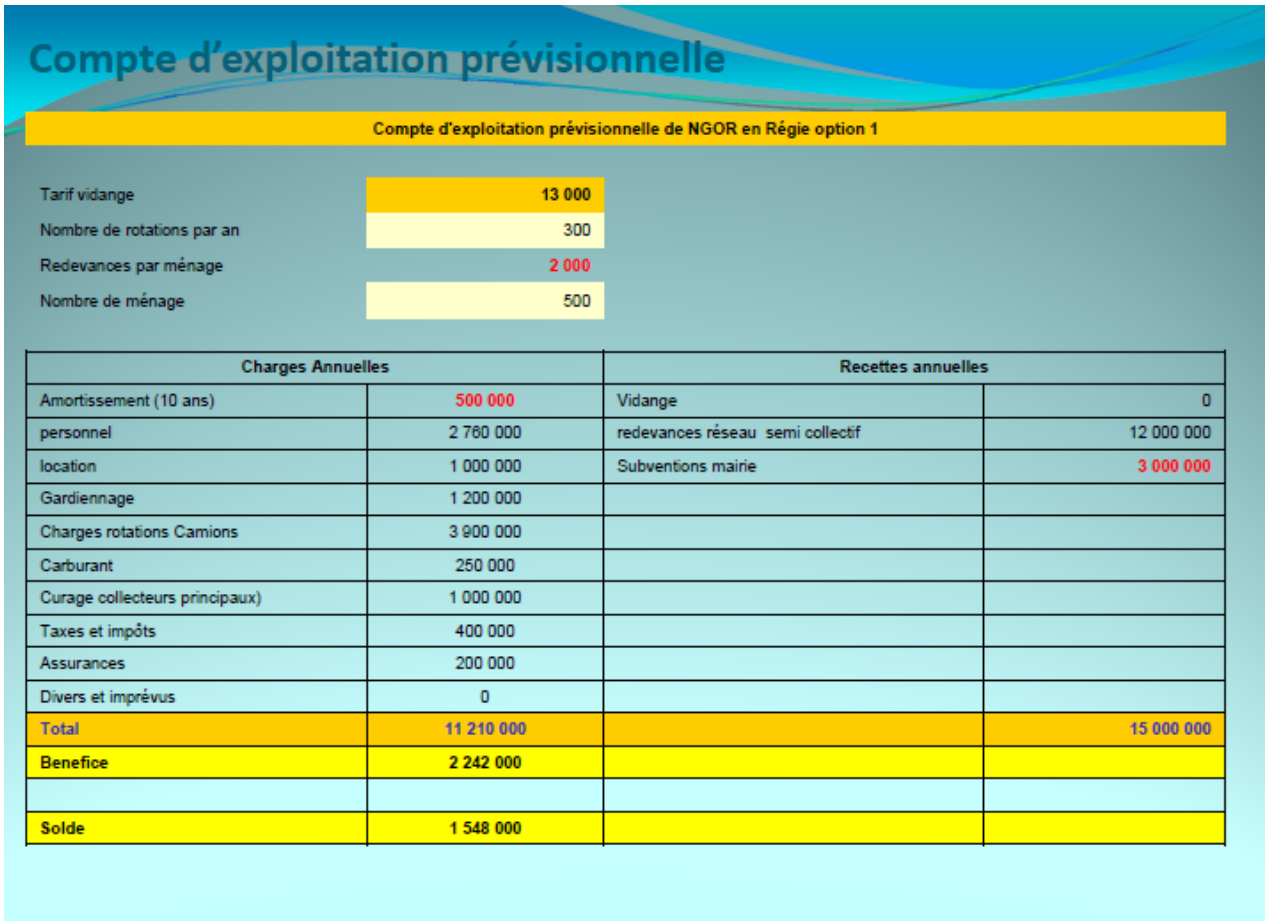
[5] The study currently being launched by WSP should help improve these cost estimates and define both potential resources and the most appropriate operating cost recovery mechanism.

VI. Annexes

Annex 1. List of people interviewed

- SONON, Jacques, ONAS Dakar
- SAUSSE, ONAS Saint-Louis
- BOULENGER Pierre, World Bank Dakar
- DIALLO Oumar, WSP Dakar
- MBEGUERE Mbaye, Sludge Management Project, ONAS/Gates Foundation
- CURE Hélène, AFD Dakar
- SARR Mustapha, ONAS Dakar
- BRIKKE François, ex-WSP Latin America
- NDAO Fallou, Consultant SEMIS
- LAMBRECHT Stef, Consultant
- SENE Seny, ENDA RUP
- BODIAN Ibou, ENDA RUP
- GAYE Malick, ENDA RUP
- DIOP Bécaye Sidi, Consultant H20
- TOURE Malal, ENDA Eau populaire

Annex 2. Projected Operating Account for the ONAS-PAQPUD Schemes in Dakar (source ONAS, 2009)



Compte d'exploitation prévisionnelle

Compte d'exploitation prévisionnelle de NGOR en Régie option 1

Tarif vidange	13 000
Nombre de rotations par an	300
Redevances par ménage	2 000
Nombre de ménage	500

Charges Annuelles		Recettes annuelles	
Amortissement (10 ans)	500 000	Vidange	0
personnel	2 760 000	redevances réseau semi collectif	12 000 000
location	1 000 000	Subventions mairie	3 000 000
Gardiennage	1 200 000		
Charges rotations Camions	3 900 000		
Carburant	250 000		
Curage collecteurs principaux)	1 000 000		
Taxes et impôts	400 000		
Assurances	200 000		
Divers et imprévus	0		
Total	11 210 000		15 000 000
Benefice	2 242 000		
Solde	1 548 000		

Annex 3. Projected Operating Account for Saint-Louis/Darou

Compte d'exploitation prévisionnelle option 1

Tarif vidange	**20 000**
Nombre de vidange par an	167
Redevance par ménage	1 250
Nombre de ménage	500

Charges Annuelles		Recettes annuelles	
Amortissement outils de gestion (5 ans)	200 000	Vidange	0
personnel	1 440 000	redevances réseau semi collectif	6 750 000
Location siège	300 000	Subventions mairie	3 600 000
Frais de fonctionnement siège	240 000		
Fonctionnement IEC	240 000		
Vidange des fosses	3 340 000		
Curage réseau	**4 500 000**		
Taxes et impôts	0		
Assurances	90 000		
Divers et imprévus	0		
Total	10 350 000		10 350 000
Solde	**0**		

Annex 3. Sewer system management committee's statutes and rules of procedure

REPUBLIQUE DU SENEGAL
REGION DE SAINT-LOUIS
COMMUNE DE SAINT LOUIS
****

PROJET D'ASSAINISSEMENT URBAIN DE DAROU
PAUDA.SL

STATUTS

ET

REGLEMENT INTERIEUR

DU

COMITE DE GESTION DU RESEAU D'ASSAINISSEMENT
SEMI-COLLECTIF DE DAROU-MEDINA
(COGES)

Siège : Darou-Médina Tel : 77 645 52 01
77 632 21 88

PREAMBULE

Le Projet d'Assainissement Urbain de Darou (**PAUDA.SL**) est un projet de coopération régi par la convention générale de coopération internationale entre la République du Sénégal et le royaume de Belgique signée en date du **19 Octobre 2001** dans le cadre de la 10eme commission mixte.

Le **PAUDA.SL** a réalisé un réseau semi-collectif fonctionnel qui se jette sur le réseau collectif à Darou, Médina et Ndiolofene.

Le réseau d'assainissement **semi-collectif** est un espace géographique où vivent des populations ayant les mêmes problèmes d'assainissement et surtout d'évacuation des eaux usées et pluviales. Ces populations sont également liées par l'histoire et le voisinage, ont la commune ambition d'assumer leur mieux être environnemental et socio-économique.

Pour assurer une bonne gestion et durabilité des réalisations et équipements une structure en charge de la gestion est mise sur pied à Darou-Médina.

Le **comité de gestion** est mis sur pied pour participer au développement local dans le cadre de la responsabilisation des populations bénéficiaires du réseau d'assainissement et la décentralisation en matière de gestion de l'environnement par le biais du réseau semi-collectif existant.

Il s'agit pour les bénéficiaires de gérer sous leur propre responsabilité et sous les responsabilités des partenaires concernés l'ensemble des missions qui sont dévolues par les statuts et règlement intérieur.

En partenariat,

D'une part avec l'**ONAS**, chargée de la collecte et de la revalorisation, mais aussi de l'évacuation en zone urbaine et périurbaine des eaux usées et pluviales, qui propose la mise en place de structures de gestion dans les quartiers ciblés ;

D'autre part avec la commune, gestionnaire de la voirie et du sous sol utilisé par les réseaux d'assainissement, qui assure en outre un rôle de police de la voirie et de contrôle des infractions d'hygiène en collaboration avec le service d'hygiène ;

Le **COGES** mise en place émane de l'organisation institutionnelle de la commune dans le seul but de régler de manière consensuelle et durable la gestion des ouvrages d'assainissement du réseau semi-collectif existant à Darou-Médina.

Le **COGES** ambitionne d'être un cadre de concertation reposant sur les principes suivants :

- **Equité** : Les mêmes charges et les avantages pour tous les bénéficiaires
- **Participation** : Le cadre de concertation est donc le consensus, il est garant d'un engagement commun par l'appropriation de chacun des objectifs et missions, et des bons comportements.
- **Efficacité** : Se traduit par une utilisation optimale des ressources du **COGES** au regard des actions prioritaires de protection et de gestion du réseau semi-collectif
- **Transparence** : C'est un pouvoir de contrôle effectif des décisions et des ressources par les bénéficiaires et les partenaires concernés avec un pouvoir de sanction.

Les présents statuts et règlement intérieur précisent l'organisation du **COGES**.

STATUTS

Art 1 : Il est créé une structure en charge de la gestion du réseau semi-collectif conformément au cahier de charge de Mars 2011 proposé par l'**ONAS**, dénommé comité de gestion et désignée dans tout ce qui suit sous le vocable «**COGES** ».
Le **COGES** a son siège à Darou-Médina dans la commune de Saint-Louis

Art 2 : **Les responsabilités des partenaires concernés**

1- Les responsabilités de l'ONAS
L'ONAS est chargée de :

- L'encadrement, du suivi et du contrôle en amont et en aval des réalisations du réseau d'assainissement réalisé à Darou-Médina-Ndiolofene.
- La maintenance des stations et fourni les appuis techniques sur le choix des équipements et d'appui en matériel.
- Assurer un volet renforcement de capacité dans les domaines de la gestion du réseau d'assainissement au profit des acteurs locaux et des membres du **COGES**
- L'**ONAS** signera un protocole d'accord avec la commune pour définir clairement les missions de chaque acteur dans la gestion du système d'assainissement réalisé à Darou-Médina .

2- Les responsabilités de la commune

La commune joue un rôle de facilitateur et d'encadrement à travers le **COGES**. Elle doit être activement associée à la mise en œuvre et à la gestion du système d'assainissement réalisé.
Le **COGES** fera l'objet d'un arrêté municipal signé par la mairie.

Art 3 : Le **COGES** a pour objet d'assurer une bonne gestion des ouvrages d'assainissement. Il est composé des populations bénéficiaires du réseau semi- collectif et de représentants des partenaires concernés

- Le **COGES** a en charge le choix des prestataires exploitant pour la gestion /exploitation/entretien des ouvrages en collaboration avec l'**ONAS**
- Le **COGES** définit les critères de performances environnementaux et financières minimum que l'exploitant doit atteindre pour que son contrat puisse être renouvelé.

Art 4 : **Composition du COGES**
Le **COGES** est composé comme suit :

- 02 représentants de la municipalité
- 02 représentants de service d'hygiène
- 01 représentant de la direction de l'environnement
- 01 représentant de l'**ONAS**
- Des délégués (1 délégué pour 20 bénéficiaires)
- Personnes ressources

Art 5 : Les ressources du **COGES**
Les ressources proviennent :

- De la contribution des bénéficiaires à hauteur de 1250F par bénéficiaire par mois

- De la subvention de la Commune
- Des activités génératrices de revenus
- Des donations

Art 6 : Les organes du COGES

- Les organes du **COGES** sont : l'**AG** et le **bureau**
- Les fonctions au sein de ces organes sont gratuites et ne peuvent faire l'objet d'aucune indemnisation, sauf pour certains cas dans les conditions prévues par le règlement intérieur.

Art 7 : L'Assemblée générale

1- Composition de l'Assemblée générale

L'Assemblée générale est formée par tous les membres et par les représentants des structures membres du **COGES**, ainsi par des structures extérieures consultatives spécialement invitées à cet effet. Le nombre de représentants des structures membres est limité à deux (2) par structure

- La désignation des délégués est supervisée par le bureau
- La désignation des délégués des structures est communiquée par écrit au Président du COGES.

2- Fonctionnement de l'AG

- L'AG se réunit au moins 2 fois par an en session ordinaire par convocation du Président
- Elle délibère valablement si la moitié au moins des membres est présente ou représentée. L'ordre du jour est proposé par le bureau
- Elle prend ses décisions à la majorité simple. Les délais de convocation sont prévus et précises par le Règlement intérieur

3-Rôle et attributs de l'Assemblée Générale

C'est l'instance de décision, elle entend, approuve ou rejette les rapports sur la gestion et la situation financière et morale.

Organe de décisions, elle :

- Modifie les statuts
- Dissout le COGES
- Statuer sur toute autre question mettant en péril la vie de l'association
- Fixe les taux des cotisations et les droits d'adhésion
- Approuve les comptes et les budgets annuels du COGES
- Désigne à son sein, par les procédures indiquées au règlement intérieur, les membres du bureau.
- Approuve ou ajourne les propositions faites par le bureau

Art 9 : Le Bureau

L'Assemblée générale élit en son sein un bureau parmi ses membres et à l'exclusion des représentants des structures membres (partenaires concernés) du **COGES**.

La composition du bureau devra autant que possible prendre en compte les spécificités des zones.

1) Composition du bureau

Le bureau est composé de :

- 1 Président
- 1 Secrétaire général (personne permanente)
- 1 Trésorier

- 1 Responsable IEC
- 1 Responsable matériel
- 1 Responsable de la sécurité du réseau.
- 3 collecteurs

Les attributions et le fonctionnement du bureau sont précisés dans le règlement intérieur.
La durée du mandat du bureau est de deux (2) ans renouvelable

Art 8 : L'Assemblée Générale extraordinaire

- L'AG extraordinaire se réunit chaque fois que c'est nécessaire en session extraordinaire, sur convocation du bureau.

Art 9 : Modification des statuts

Les statuts ne peuvent être modifiés que par l'Assemblée générale extraordinaire sur proposition du bureau ou des ¾ des membres.
Cette proposition doit être soumise à l'AG au moins avant la séance. L'AG de modification des statuts doit être composée au moins de trois quart (3/4) des membres. Les statuts ne peuvent être modifiés qu'à la majorité des deux tiers (2/3) des membres présents .Si le Corum n'est pas atteint, une deuxième convocation est effectué dans un délai de quinze (15) jours et dans la même condition de délibération à la troisième convocation, l'Assemblée délibère valablement à la majorité simple des membres.

Art 10 : Missions et objectifs de l'exploitant

L'exploitant de l'ouvrage est recruté par le **COGES**. Il peut être une société privée une association, un GIE résident dans le quartier de préférence.
Le recrutement de l'exploitant se fera de manière transparente sur la base d'un appel d'offre local officiel.
La mission de l'exploitant est de gérer le système d'assainissement mise en place par l'**ONAS** dont le but est de respecter les critères d'un environnement sain et d'une gestion rentable et durable de l'ouvrage. L'exploitant se chargera de l'ouvrage du réseau semi-collectif et de la vidange des fosses septiques.
Les missions et le fonctionnement de l'exploitant seront précisés dans le cadre d'un contrat qui le lie au **COGES** et à la commune.

REGLEMENT INTERIEUR

Art 1 : Condition d'adhésion

Peut être membre toute personne physique ressortissant de la zone d'influence du réseau semi-collectif.

Le candidat doit, pour être agréé comme membre être branché au réseau semi-collectif, s'acquitter des cotisations et faire preuve de sa capacité à la gestion et à la protection du système d'assainissement mise en place.

Art 2 : Cotisation

Le montant de la cotisation mensuel est proposé par le bureau soumis à l'approbation de l'AG.

L'appel à la cotisation se fera au début et au plus tard le 10 de chaque mois.

Lorsque la cotisation n'a pas était libérer dans les délais fixés, le bénéficiaire en faute est frappé d'une amende journalière de 100F par jour jusqu'à paiement de la somme due.

Tout bénéficiaire qui reste deux mois sans honorer ses cotisations mensuelles sera exposé à des sanctions qui sont (à revoir)

Art 3 : Retrait et exclusions

Tout membre est libre de démissionner. La démission doit être faite par une lettre recommandée adressée au Président du bureau avec un préavis de **deux** (2) **mois**.

Un membre peut être exclu par l'**AG** après invitation à fournir des explications dans les cas suivants :

- Absences répétés : une demande d'explication est adressée à tout membre du bureau qui accumule trois absences irrégulières successives. Il peut être frappé de sanctions qui vont jusqu'à l'exclusion du bureau.
- Infraction ou manquement aux statuts et règlement intérieur
- Défaut de payement des cotisations
- Motif jugé grave par l'**AG**

Dans le cas des structures membres, la demande d'explication sera adressée au représentant légal de la structure.

Lorsque l'exclusion est prononcée, le Président doit la notifier dans les meilleurs délais à l'intéressé.

Art 4 : Indemnisation des membres

Les membres de bureau peuvent être remboursés des frais occasionnés par l'exercice de leur fonction, il s'agit du transport, des frais de restauration et d'hébergement suivant les conditions fixés par l'**AG**.

Art 5 : Préparation et exécution des missions

Les missions du **COGES** sont définies chaque année par le bureau selon un programme d'activités élaboré en collaboration avec les partenaires concernés (commune, ONAS).

Ce programme détermine les modalités d'exécution des différentes activités prévues pour une année civile, de même que le rôle dévolu à chaque membre.

Art 6 : Représentation d'un membre en cas d'absence

En cas d'absence, un membre peut se faire représenter par un autre membre qu'il mandate par lettre adressé au Président du bureau sauf pour les cas de modification des statuts et dissolution. Chaque membre présent ne peut porter qu'un seul mandat.
Les membres des structures membres peuvent se faire représenter par un autre membre de leur structure. La structure précisera par lettre adressée au Président du bureau le nom et la fonction du représentant mandaté.

Art 7 : Assemblée Générale extraordinaire

L'**AG** se réunit en session extraordinaire pour les raisons suivantes

- Modification des statuts
- Exclusion ou non d'un membre
- Dissolution du COGES

Le bureau convoque l'**AG** un mois à l'avance

Art 8 : Les membres à titre consultatif

Des membres à titre consultatif peuvent être coptés par l'**AG** parmi les partenaires dont l'expérience et les compétences sont reconnues en matière de formation, de protection et de gestion des ouvrages d'assainissement.

Art 9 : (1) Election du bureau

L'AG élit en son sein un bureau parmi ceux ayant fait acte de candidature. A défaut de consensus, le bureau est élu par bulletin secret. Nul peut se faire représenter lors de ce vote La composition du bureau est précisée dans les statuts.

2 – Attributions du Bureau

Le Président dirige les réunions du Bureau et de l'Assemblée Générale, il représente le **COGES** devant les autorités administratives, les partenaires dans tous les actes de la vie civile. Il ordonne les dépenses, suivant le budget adopté.

Le Bureau reçoit les demandes et tout dossier des bénéficiaires du réseau semi-collectif. Le Bureau prépare et présente les rapports d'étape des activités et des comptes du **COGES** à l'Assemblée Générale et assure le suivi des activités financées par le **COGES**.
Le Secrétaire Général présente à l'Assemblée Générale les rapports d'activités liés à la vie du **COGES** et assure le secrétariat de l'Assemblée Générale et du Bureau.
Le Trésorier présente à l'Assemblée Générale les comptes de l'exercice. Il exécute les dépenses du **COGES** selon les procédures.
Le Bureau peut s'adjoindre toute autre personne pour ses compétences avérées dans certaines matières, parmi les membres à titre consultatif ou en dehors mais avec voix consultative uniquement. Le Bureau soumet à l'Assemblée Générale un programme annuel d'activités et le budget pour le **COGES**. Il présente un rapport annuel à l'Assemblée Générale sur la situation financière et morale du **COGES**, instruit toutes les affaires qui lui sont soumises par l'Assemblée Générale et pourvoit à l'exécution des délibérations. Le Bureau reçoit et contrôle les demandes d'adhésion et les listes des représentants choisis par les bénéficiaires et les partenaires concernés avant soumission du dossier à l'Assemblée Générale.
Le bureau est responsable devant l'Assemblée Générale.

3 – Fonctionnement du Bureau

Le Bureau se réunit au moins une fois par mois sur convocation du Président ou à la demande de la moitié de ses membres. La présence de la majorité des membres est nécessaire pour la validité des délibérations. Il est tenu un procès-verbal des séances de réunions. Les procès-verbaux sont signés par le Président et le rapporteur de séance.

Art 10 : Mission du COGES

Le COGES a essentiellement pour mission :

- le renforcement des capacités de tous les membres à promouvoir leurs activités,
- la synergie avec tous les partenaires et institutions pour une gestion rationnelle et efficace des ressources partagées pour une protection durable du réseau d'assainissement,
- la gestion de la sécurité du réseau,
- la prévention des mauvais comportements sur le réseau par l'information et la sensibilisation des populations bénéficiaires
- la prévention et le règlement des conflits,
- d'appuyer toute activité exercée par les autres structures du quartier qui s'active dans le domaine de la protection de l'environnement (Education, Santé, promotion féminine, etc.).

Art 11 : Audit interne et externe

Le bureau est chargé, en plus du contrôle interne normal, de commanditer un audit annuel pour évaluer les aspects financiers et organisationnels du **COGES**.

Toutefois dans le cadre des financements mis à disposition du **COGES** par des partenaires externes, et après accord de l'Assemblée Générale, un audit externe de la gestion financière et technique du **COGES** peut être effectué par un cabinet indépendant.

Les résultats de l'audit sont soumis à la sanction de l'Assemblée Générale et communiqués aux autorités compétentes.

Art 12 : Diffusion des informations

Le Bureau du **COGES** est tenu de porter à la connaissance des membres du **COGES** toutes informations utiles. Il utilisera les moyens de communication mis à sa disposition.

Les décisions du **COGES** sont l'objet d'une large diffusion par tous les moyens adéquats. Dans ce sens, le Bureau est tenu d'afficher, après chaque Assemblée, les décisions prises par cette dernière.

Art 13 : Litiges et contestations

Tout litige pouvant naître de l'exécution des présents statuts et règlement intérieur sera réglé à l'amiable. En cas de désaccord, le litige sera porté devant les autorités compétentes.

Fait et approuvé à ..... Le.....

L'Assemblée Générale

Annex 4. Saint-Louis/Darou simplified sewerage service contract

RESEAU SEMI COLLECTIF
DAROU-MEDINA
Comité de Gestion
COGES

ONAS

RSC DM COGES

CONTRAT D'ABONNEMENT

Entre les soussignés :
Le comité de gestion du réseau semi collectif Darou-Médina ayant son siège social à..... représenté par Mr Insa NDiaye président dudit comité
D'une part
Et
Monsieur (Madame).....titulaire d'un décanteur branché au réseau géré par le COGES. Carte d'identification nationale N°.....Ci-après dénommé bénéficiaire
D'autre part
Il a été convenu ce qui suit :

Art 1: objet

Ce présent contrat a pour objet de définir les modalités et les conditions d'accès et d'utilisation du réseau d'assainissement semi collectif existant à Darou Médina

Art2: Définition du service

1.1 L'abonnement au réseau semi collectif géré par le COGES permet aux bénéficiaires qui l'acceptent d'accéder au réseau d'assainissement pour évacuer les eaux usées de leurs maisons

1.2 Le réseau semi collectif fonctionne avec des tuyaux à faible diamètre qui ne permettent que l'évacuation des déchets liquides

1.3 Pour la sécurité et la stabilité technique du réseau, il est formellement interdit aux usagers de mettre des déchets solides, d'ouvrir les regards, d'évacuer les eaux de pluies à partir des regards ou des décanteurs

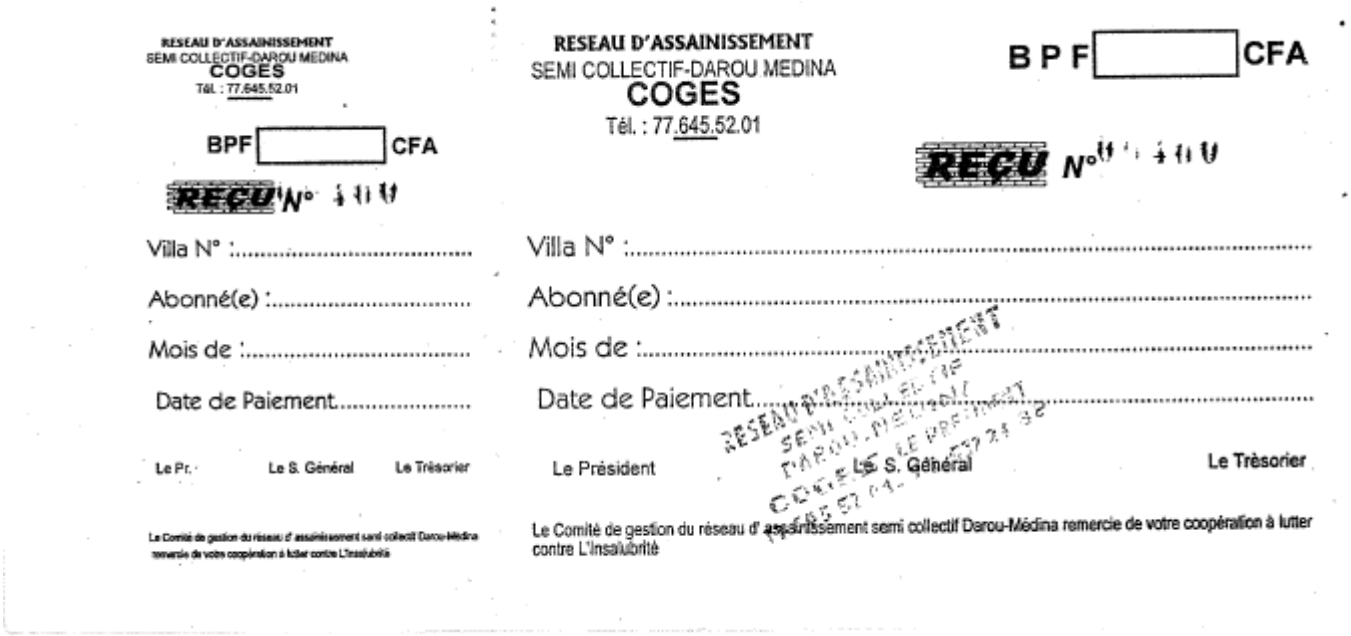
Art3: Accès au service et assistance

3.1 Pour accéder au service du COGES le client doit :
-Etre dans une des zones desservies par le réseau semi collectif Darou-Médina
-Etre branché sur le réseau
- Disposer d'un contrat d'abonnement
-S'acquitter de sa redevance mensuelle

3.2 Le COGES garantit l'accès au réseau, le bon fonctionnement du réseau sauf cas de force majeure ou d'un événement échappant à son contrôle et sous réserve des éventuelles pannes et interventions de maintenance nécessaires au bon fonctionnement du service.

RESEAU D'ASSAINISSEMENT
SEMI COLLECTIF
DAROU-MEDINA
COGES LE PRESIDENT
[illegible]

Annex 5. Receipt of payment issued to users of the Darou/Saint-Louis simplified sewerage system



RESEAU D'ASSAINISSEMENT
SEMI COLLECTIF-DAROU MEDINA
COGES
Tél. : 77.645.52.01

BPF [ ] CFA

REÇU N° 1110

Villa N° :.....

Abonné(e) :.....

Mois de :.....

Date de Paiement.....

Le Pr. Le S. Général Le Trésorier

Le Comité de gestion du réseau d' assainissement semi collectif Darou-Médina remercie de votre coopération à lutter contre L'Insalubrité

RESEAU D'ASSAINISSEMENT
SEMI COLLECTIF-DAROU MEDINA
COGES
Tél. : 77.645.52.01

B P F [ ] CFA

REÇU N° 1110

Villa N° :.....

Abonné(e) :.....

Mois de :.....

Date de Paiement.....

Le Président Le S. Général Le Trésorier

Le Comité de gestion du réseau d' assainissement semi collectif Darou-Médina remercie de votre coopération à lutter contre L'Insalubrité

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