



## Water and Sanitation Program

An international partnership to help the poor gain sustained access to improved water supply and sanitation services

**Field Note**

Draft for Discussion

# Scaling Up: Lessons Learned

## The Ouagadougou, Burkina Faso Strategic Sanitation Program

West and Central  
Africa Region  
(WSP-WCA)



**March 2000**

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The reports, interpretations and conclusions expressed here are entirely those of the authors. They may not be attributed to the World Bank or any other affiliated organization.

## **The Ouagadougou Strategic Sanitation Program: Summary**

Since 1990 the Water and Sanitation Program (WSP) has given support to the Government of Burkina Faso in defining and putting into action a sanitation policy for the city of Ouagadougou. With the financial assistance of UNDP, the Water and Sanitation Program for West and Central Africa (WSP-WCA) collaborated with the Government of Burkina Faso for the development of the Strategic Sanitation Plan in Ouagadougou (PSAO) from 1990 to 1992. The Plan was approved by the government in 1995.

In 1991, the population of the city of Ouagadougou numbered around 700 000 inhabitants, and represented 60% of the urban population of Burkina Faso. In 1991, around 40% of the population of Ouagadougou were connected to the potable water network. 70% of the dwellings were equipped with traditional latrines. 18% of the dwellings were equipped with soakaways and 5% with septic tanks. 7% of the population did not have any sanitary arrangements. Wastewater from collective facilities (central market, hospital) was conveyed to non-functional water treatment plants or pre-treatment works.

The Ouagadougou Strategic Sanitation Plan proposed a plan based on the demand of the communities instead of simply on the number of works to construct; on varied technology options adapted to the urban context, on households' practices and resources, and on solutions that can develop over time towards more sophisticated systems. In view of this approach, the

aspects of social intermediation become important, particularly in understanding the informational and training needs of the community. This institutional plan recommended entrusting sanitation to an institution capable of generating revenue (with a sanitation surcharge for the price of water) and recouping the costs from the beneficiaries of the sanitation measures. On-site sanitation options were recommended for around 80% of the city and in an initial phase, conventional sewerage was recommended only for the city center and the industrial zone.

The recommendations of the Strategic Plan relating to on-site sanitation were tested in a demonstration project in 1993 and 1994, still in the context of a technical assistance program provided by the Water and Sanitation Program, and with the financial support of the UNDP. Since 1995 the Government of Burkina Faso and the National Office of Water and Sanitation (ONEA) have developed a sanitation program covering the entire city. Since that date, almost 20,000 sanitation facilities (latrines, soakaways, bathrooms) have been constructed, and around 15% of the households are now equipped with improved sanitary facilities (latrines, soakaways, bathrooms).

The objective of this study is to draw lessons from the scaling up of the program since 1995, and to consider the technical, economic, and financial aspects, the social intermediation, as well as the environmental aspects of this program.

***Question: will this approach that has been developed be sustainable?***

- (a) How have the financial incentives performed and what is their impact on the access to sanitation services for the disadvantaged population?
- (b) How have the institutional arrangements performed and how has the collaboration with the municipalities worked, in the context of decentralization?
- (c) What has been the performance of the social development intermediation activities (i.e., usage of ONG, social marketing)?
- (d) Do the proposed technology options correspond with the demands of the communities and do they provide solutions to the environmental problems at the city level and plot level?

# **Making Sanitation Investments Last : Institutional Grounding, The Pillar For Scaling Up The Ouagadougou On-Site Sanitation Program<sup>1</sup>**

## **Context**

Ouagadougou, the capital city of Burkina Faso, has an estimated population of 900,000 which represents 60% of the total urban population. The annual growth rate has been quite high the past 25 years : 9.1% from 1975 to 1985, 6.4% from 1985 to 1990 and 4.4% from 1990 to 2000.

In 1991, 70% of the population were using traditional pit latrines, 18% some improved latrines, 5% septic tanks and 7% were without facilities. Limited number of water connections (38%) compounded with poor sanitation services resulted in deteriorated health conditions, with one of every four medical visits attributed to water and excreta-related diseases.

ONEA, an autonomous public water and sanitation utility, created in 1985, has the mandate to provide water, sanitation and drainage services to all urban centers. ONEA prepared (from 1990 to 1992) a strategic sanitation plan, aimed at developing a medium term strategy to improve access and increase coverage for sanitation services in Ouagadougou. The strategy includes (i) the development of demand-based on-site sanitation for the majority of households, (ii) the construction of a limited sewerage system for commercial, administrative and industrial

areas, and (iii) the treatment of effluents and septage collected from vault latrines and septic tanks in natural stabilization lagoons. Main recommendations of the strategy were (i) to grant full responsibility to ONEA for sanitation and have municipalities deal with drainage, and (ii) to use resources generated by the sanitation surcharge on water bills to finance the development of sanitation services.

## **Pilot phase and institutional arrangement**

A pilot phase of the strategy took place (from 1992 to 1994) with the aim of testing (i) the demand-based approach to improve sanitation services, (ii) the adequacy of technologies proposed, and (iii) the ability of small-scale private sector to provide sanitation services.

ONEA contracted out extension activities to a local NGO and social marketing to a professional communication specialist. Slab casting was carried out by trained artisans (which is a continuation of their traditional business). Households were responsible for choosing the facilities they wanted, hiring and paying masons from a pool of trained artisans. Qualifying households who hired trained artisans to build their facilities received free slabs, water seal pans and vent bricks.

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<sup>1</sup> This section was written by Eustache Ouayoro, AFTU2, the World Bank

## **Some achievements of the full-scale program**

At the end of the pilot phase in 1994, ONEA started implementing a full-scale program covering the entire city. By December 1999, about 20,000 facilities were built, 206 artisans were trained and most of them are still active. About 15% of the plots in Ouagadougou were equipped with improved sanitation facilities. Facilities were divided between soakaways (43%), bathrooms (19%), rehabilitation of traditional latrines (22%), VIP latrines (16%) and pour flush latrines (1%). All public primary schools have sanitation facilities financed by ONEA, benefiting about 100,000 children. Ouagadougou is one of the rare capital city in Sub Sahara Africa to be in this position. The institutional arrangement was by far the pillar of these achievements.

## **Key features of the institutional set up**

### ***Long term vision, defined objectives and political commitment***

The Strategic Sanitation Plan was officially approved by the Government in 1995. This was a clear commitment from the Government to raise the sanitation agenda. ONEA was then forced to achieved the objectives spelled out in the strategy which it prepared. The multi-year performance agreement between ONEA and the Government with defined targets related to sanitation services was also a powerful framework for ONEA to perform.

### ***Leading agency and coordination***

Managing sanitation services has always involved many players, for example health, education, environment, social affairs, finances and decentralization departments with each trying to exercise some form of control. In the case of Ouagadougou,

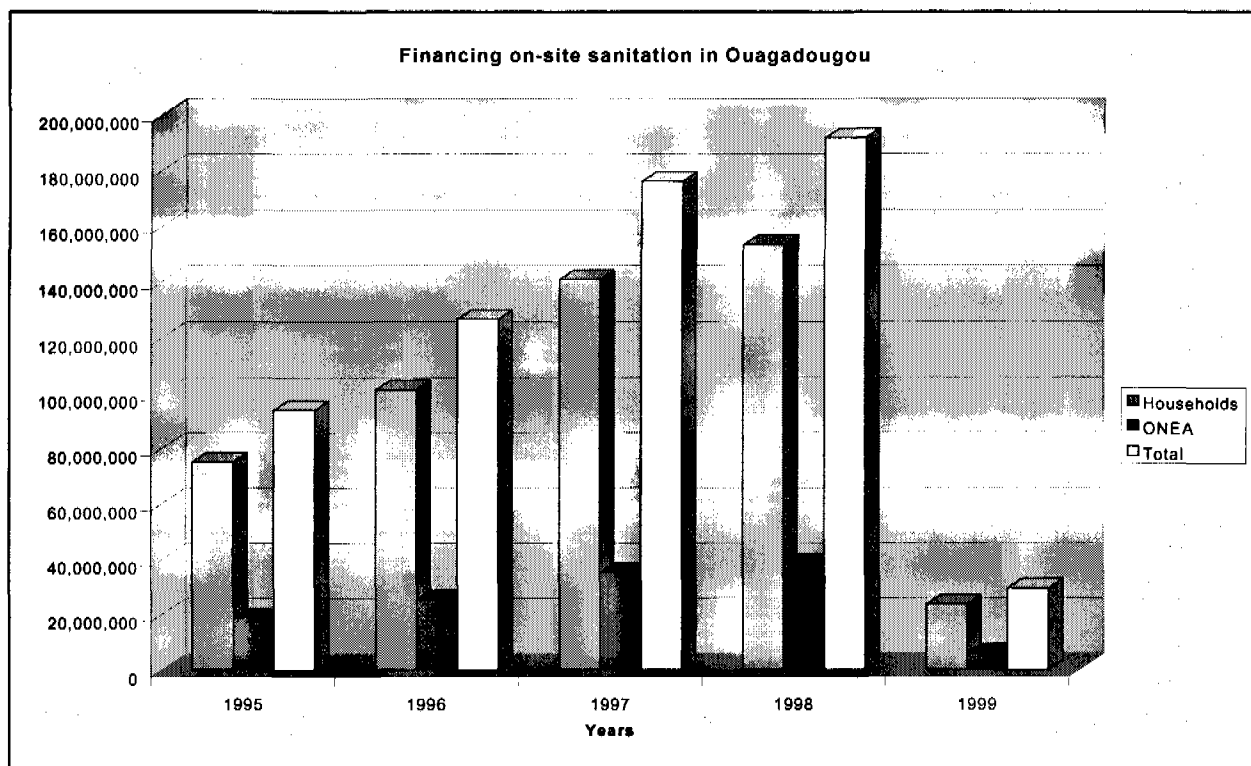
experience has shown that real progress in improving sanitation conditions cannot be achieved without a leading agency, which should have full management and financial responsibilities for the sub-sector. Leadership should be devoted to the institution able to generate resources for the sub-sector. This institution should have flexible administrative arrangements to efficiently run sanitation programs dealing with multiple service providers. Water and sanitation utilities are in that respect, natural leading agencies, if sanitation conditions have to be rapidly improved in the short term. Moving away from the traditional approach of water and sanitation utility devoting their activities to sewerage systems, ONEA realized that progress on sanitation coverage could only happen if it focuses its core business to reach about 70 to 80% of the city's population.

### ***Institutional stability and team continuity***

ONEA has been, since the inception of the SSP in 1990, responsible for preparing the strategy, implementing the pilot operation and then the full-scale program. The same core team has been in place since the beginning and has refined the approach and increased its knowledge of the sanitation issues over the years. Stability of the team has been possible because of better employment and benefit packages (provided by ONEA) that cannot be found within line departments of ministries. In addition to the stability of ONEA's core team, the same NGO has been in charge of conducting the extension activities since the pilot operation.

### ***Financial capability and locally generated sustained flow of funds***

The greatest achievement of the sanitation program in Ouagadougou was that it was entirely financed by local resources. This was only possible because ONEA was able to generate funds from the sanitation surcharge (2 cents/m<sup>3</sup>, representing 4% of the average water tariff) on water bills, in



place since 1985. Collected sanitation surcharge has amounted to 308 millions CFA in 1999 (US\$0.5 million). A dedicated sanitation fund receiving the sanitation surcharge has been in place since 1995 and all proceeds are exclusively used for sanitation activities. On the average, 25% of the proceeds have been used to finance extension activities and more than US\$0.2 million was used to subsidize slabs and vent bricks.

***Private sector participation in service provision and capacity building***

The program in Ouagadougou has set in motion the principle of unbundling of functions. Planning remains with ONEA, construction with masons and slab casters and extension activities are being conducted by a local NGO. Contracting out operational activities to private entities has increased efficiency, capacity of small scale service

providers and accountability of all stakeholders.

***Demand, market expansion and proper targeting***

A market for sanitation exist and is larger than the average yearly US\$0.2 million revealed by the on-site sanitation program. Since 80% of the households will not be connected to any sewer systems, opportunities to improve access and increase coverage lies with on-site sanitation services. Use of a variety of technological options, including incremental improvements to existing facilities, social marketing and IEC activities, hygiene education and training of a larger pool of artisans are essential to expanding the market.



## **Challenges ahead**

### ***Strategic monitoring of coverage and impact***

ONEA has focused on following closely the number of facilities built under the program and has been paid little attention to monitoring overall coverage and evolution of the district by district coverage. Little attention has also been paid to the appropriate upkeep of facilities due to the lack of systematic supervision. Impact of a massive on-site sanitation program (as the one developed in Ouagadougou) will require groundwater monitoring.

### ***Cost reduction and reaching the poorest***

The program should modify the actual arrangement and devise a specific approach for the poorest segment of the population. A poverty profile was prepared as part of the "poverty reduction strategy paper" and should be used to specifically target the poor. These households can be reached by reducing costs, increasing their labor input and eventually the subsidy level.

### ***Regulation and low-cost technologies***

Existing regulations related to building permits have relied on costly schemes, like septic tanks. This approach has limited choice, forcing households out of the formal approval system and favored the development of traditional latrines. ONEA, together with municipalities, should support the Ministry in charge of Housing to change the regulations and allow for more choices and implement a more aggressive training program for contractors.

### ***Decentralization and utility management***

The decentralized nature of on-site sanitation requires the full involvement of the municipalities in addition to their responsibilities in promoting hygiene and sanitary conditions. Their weak capacity had precluded them from playing a more active role than expected, ONEA should find ways to establish with them a strategic partnership to monitor land and housing development and sanitation coverage.

## The Sanitation Program and Social Intermediation<sup>2</sup>

The role of social intermediation is to provide information and to help a community and the households to make informed choices. These choices engage the community and the households in terms of mobilizing resources and making them accountable for the maintenance of the sanitation facilities, which implies the setup of a management system. To promote sanitation systems the ONEA engaged an ONG (ADRA)<sup>3</sup> under the form of an annual renewable contract, to recruit and manage a team of 30 extension agents and 5 supervisors who would interact in 30 sectors of the city of Ouagadougou. The role of the extension agents would be to raise awareness in the households of improving their immediate sanitary environment, inform the households of the requirements and the conditions of participation in the sanitation program, establish relations between them and the sanitation artisans, and initiate maintenance of the constructed sanitation facilities. Simultaneously, TV and national radio spots were conceived to support and legitimize the work of the extension agents on the ground.

Additional methods were developed by the sanitation agents to work with the households:

- Gathering information on how to improve the sanitary environment, with the support of visual aids such as cards, photos, and presentations of mock-ups of different types of facilities.

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<sup>2</sup> This section was written by Annie Manou-Savina, Water and Sanitation Program, West and Central Africa region

<sup>3</sup> Adventist Agency for Aid and Development

- Home visits to present different types of facilities and financial requirements for participation in the program. These visits were started in the plots where the need for hygiene is visible (e.g., soakaways overflowing).
- Guided visits to allow households to interact and become promoters of the program.

### The Impact Of Social Intermediation

#### *The Circulation of Information*

The circulation of information was done in the following manner:

- 58% of the households that have constructed sanitation facilities had been informed by the extension agents and of them, 62% had encountered the extension agents several times. The number of visits made by the extension agents seemed to have played a key role in the decision of the households to install the sanitation facilities.
- 29% of the women questioned had been informed by neighbors, parents and friends.
- 23% of the women questioned were informed by the radio and the TV, even though the spots had not been aired very regularly. This tends to prove the efficacy of this method of providing information.

- 44% of the women questioned claimed to have been informed by the extension agents. The women thought that the best method to inform the female population would be through visits to the home (41%), and meetings in the neighborhood (39%). They also proposed community meetings (7%).

### ***The construction of sanitation facilities***

- The extension agents assisted in the construction of almost 20,000 sanitary facilities in about 15% of the approximately 73,000 residential plots that can be equipped with on-site sanitation systems in the city of Ouagadougou. The number of constructed latrines is quite low (2,300 latrines in 5 years in 30 sectors of Ouagadougou with 30 (then 37) extension agents) compared to the results of the pilot project (200 latrines in 2 sectors of Ouagadougou with 8 extension agents). The figures seem to indicate that the rate of construction of the latrines diminished between 1998 and 1999<sup>4</sup>
- Soakaways represent the largest group of sanitation facilities followed by rehabilitation of latrines as the second largest group.. These types of facilities require the least amount of investment for the households.
- Between 1992 and 1999, the majority of the extension agents assisted an average construction of 100 facilities per year, the best extension agents went up to 200 facilities per year. The female extension agents had the best results (75% of the female extension agents put into place more than 100 facilities per year). The performance of the extension agents also

<sup>4</sup> See data in section on economic and financial aspects

depends on their seniority.

### ***The improvement of the sanitary environment in the plots***

- Only 20% of the latrines<sup>5</sup> in the plots visited were well used, 52% were in an acceptable condition and 28% were in a bad condition. In 79% of the cases, the latrines were cleaned by the women and the servants of the house, and only by the children in 12% of the cases.
- In the majority of cases, ONEA latrines did not have to be emptied yet; on the other hand 40% of traditional latrines were emptied once at least (see details in Annex). 30% of households still empty their latrines manually.
- Only 15% of the households said they had problems with their soakaway. The majority (54%) of the households did not know how to maintain the soakaway.
- 75% of the households that had constructed a sanitary work (in particular the soakaway) claim to have a better image in the neighborhood and to have improved their relations with the neighbors through better wastewater management. 6% felt they had a better understanding between the households living in the plot, and 21% affirmed that this had facilitated their cleaning tasks.

### ***The improvement of the sanitary environment in primary schools***

In spite of a significant latrine construction program (80 blocks of latrines of 7 posts each) the results in the majority of the schools are not satisfactory. A parallel hygiene education program (training of 40

<sup>5</sup> Survey included both ONEA (15%) and non-ONEA latrines (85%). ONEA latrines tended to be better maintained

teachers) had been developed but remained in a very limited geographic area. The latrines are not very well maintained, and the management committee and the parents association as well as the inspectors' follow-up committee are only partially functional.

### *Improvements in the practice of hygiene*

- The results of the household survey show that salubrity problems still remain in the plots: the majority of the dishwashing water and the laundry water were rejected onto the street, only the majority of the bathing water was emptied in a soakaway.<sup>6</sup>
- 89% of children use the latrines (the improved and the traditional latrines). In 93% of the cases where the children do not use the latrines, it is the parents who have denied access to them.
- To the question "what represents hygiene to you", 70% of the households questioned responded the cleanliness of the body, versus only 3% who responded the cleanliness of the toilets.

### *The cost of social intermediation*

The cost can be calculated in the following way (this does not take into account training costs for the extension agents, or the cost of the production and airing of the publicity spots):

<sup>6</sup> Mode of removal of water in the plots (1999 household survey)

	Dishwashing water	Laundry water	Bathing water	AVERAGE
Soakaway	9%	9%	52%	23%
Street	60%	64%	3%	42%
Yard	26%	21%	-	23%
Latrines	1%	3%	27%	10%
Other	3%	3%	11%	6%

Number of sanitation facilities constructed in 1998	4,100
Amount of the last ONG contract/year	61.6 millions FCFA
Cost of social intermediation activities per sanitation work constructed	15,000 FCFA US \$ 23
Total average cost of the facilities	44,000 FCFA
% of social intermediation costs relative to average cost of the facilities (44,000 FCFA for all types of facilities)	34%
% of social intermediation costs relative to average financial incentive (8,000 FCFA for all types of facilities)	188%

## **Partnerships And Activities**

### *Actors within the partnership*

Several participants contributed to the scaling-up of the PSAO: the communities of Ouagadougou, the ONEA, the NGO ADRA and the extension agents, the CREPA, the sanitation artisans, private enterprises, and the municipalities.

- The communities are the primary users and have contributed a considerable amount of financing of the sanitation facilities (around 80% of the cost of the facilities); they negotiated the construction with the sanitation artisans through the intermediation of the extension agents. They were also responsible for the maintenance of the facilities.
- The ONEA is leading the implementation of the program.

Originally created in 1985, today the ONEA, through the intermediary of its Sanitation Department (DASS), is in charge of the conception and the definition of implementation strategies for the activities commissioned to their partners in the framework of the PSAO. ONEA is notably responsible for the quality of public sanitation services and coordinates the financing of sanitation works.

- The sanitation artisans are the operational partners of the PSAO. They include the masons (206 artisans), and the manufacturers of the pre-fabricated concrete slabs and vent bricks (57 artisans). At present the sanitation artisans have formed an association with the aim of improving their work conditions and their margin of benefits by pooling together their financial resources, storage facilities, and using credit for bulk purchases of cement
- The ONG ADRA and the extension agents are responsible for intermediation activities dealing directly with the communities and the households, and are based on an annual contract signed with ONEA. ADRA is presently carrying out its sixth contract lasting 5 months.
- For sanitation program activities, CREPA (Regional Center for Low Cost Water Supply and Sanitation) is in charge of implementing a pilot hygiene promotion program, training of private contractors, and development of manuals (e.g., technical manual on the sanitation facilities, and pedagogical guide to hygiene education).
- Private enterprises: the contract with the enterprises was established recently. There are five enterprises, in charge of training and extension courses for the

sanitation artisans (both masons and slab casters), monitoring and evaluating the newly trained artisans (two visits per month), and providing an annual program of training and supervision and the production of annual reports.

- The municipalities: their role remains minimal despite the recommendations of the PSAO. One collaboration with them had been initiated: designation of a representative at the city hall (city and boroughs), opening municipal council meetings to the ONEA to discussion of the sanitation program, joint production of texts relating to sanitation (ONEA community, Urbanisme), and putting offices for public information, and meeting rooms for the extension teams at the disposition of the ONEA in various neighborhoods.

### *The Partnerships*

The PSAO has placed an emphasis on the importance of the multi-disciplinary approach and the horizontal relations between the participants, for the successful outcome of program implementation.

The assessment of the partnerships is as follows:

- A partnership with the private sector was successful: sanitation artisans, public works enterprises, ONG, other training groups such as the CREPA, GRAAP, etc. were involved. All the partnerships were engaged under a form of subcontract for a specific duration, a set budget, and had specific terms of reference.
- There was a difficult partnership with the other public services, one of the main causes being the exclusive use of the sanitation tax for sanitation activities, and

the lack of clarity within the institutional framework of the respective roles of all the institutions in charge of the different aspects of sanitation. Since 1998, the decentralization laws have planned to give municipalities the responsibility for the provision of sanitation services

The sanitation program has had an impact on the establishment of a private network of sanitation artisans. One can notice a professionalisation of the sanitation sector: several activities were delegated to the private sector or NGOs :

- The sanitation artisans were trained in the use of different technological options firstly by the ONEA and then by private enterprises (trainers in sanitation) which assured the training, the follow-up, and the supervision of the artisans.
- The extension agents, some of whom have accumulated long years of experience in providing extension services in the field of urban sanitation. Pioneers of urban intermediation, with valuable field experience, they contribute to the development of a new level of professionalism in urban sanitation.

The coordination between different partners working in the field of sanitation (the NGO Water Agriculture and Health in the Tropics, EAST, CREPA, UNICEF, the sub-component on community participation of the Project to Improve Living Conditions in Urban Areas (PACVU)) is to be reinforced. This coordination role could also be carried out by the municipalities within a new framework of decentralization. This coordination would also entail the setup of a network of sanitation professionals and a strengthening of these professions.

### *The Transfer of Competence and Delegation of Tasks to the Municipalities*

The new texts on decentralization clearly indicate that municipalities should gradually take over the responsibility for sanitation in the city. This eventual integration was included in the PSAO plan. The ONEA was supposed "to associate as much as possible with the local authorities in the planning process in order to assure a level of continuity in the approach, the reinforcement of capacity and a better suitability of strategies founded on the real demands of the communities."

The ONEA management of the sanitation tax is a stumbling point at the moment, however the ONEA has a plan that extends until 2010. A reinforcement of the capabilities of the municipalities is also important for the management of sanitation at the arrondissement (borough) level. The ONEA needs to play a role in this area of decentralization in order to educate local elected officials on sanitation themes.

The technical services of the city (DAS<sup>7</sup> and DSTM<sup>8</sup>) are ill-equipped to take charge of sanitation and wastewater activities, and spend most of their time on other activities (road maintenance, solid waste management, refuse collection, socio-economic development). The texts, worked out jointly by the ONEA and the city are still awaiting ratification, and the municipal agents solicited within the plan of the PSAO are weakly mobilized.

A progressive transfer of sanitation action to the municipalities could be carried out with the following tasks:

- Produce a text regulating construction in the city of Ouagadougou. It will be

<sup>7</sup> Direction de l'Action Sanitaire

<sup>8</sup> Direction des Services Techniques Municipaux

necessary to prepare the texts and follow up on their application.

- Monitor the sanitary conditions of the plots through the hygiene service.
- Establish the status of overall sanitary conditions in the city in terms of the number of plots with improved sanitation facilities with urban services (Urbanisme), in order to allow the PSAO teams to have reference points.
- The arrondissements must be accounted for within the framework of the progressive transfer of competencies, and positive actions that have already been carried out at this level must be maintained and reinforced. The mayors of the arrondissements could solicit the recruitment of 2 extension agents per neighborhood, with the profile of a sanitation technician.
- Tools such as contracts between the town, the public services, or the private sector could be envisaged (delegation of the sanitation tax, contract for the control of works).

## **Lessons Learned**

***Take into account in the social intermediation activities, and the quantitative and qualitative objectives in order to attain a sustainable coverage rate.***

The timing for the qualitative evaluations should be considered in the schedule of the extension workers so that it allows for the treating of hygiene questions and the importance of maintaining the household sanitation facilities. Monitoring and evaluation tools aiming at improving the

quality of qualitative data should be applied in a systematic fashion. The qualitative evaluation may consist of the following four criteria: the usage of the sanitation facilities, the quality of the construction, the maintenance of the sanitation facilities, and the hygiene and cleanliness of the plot.

### ***Reinforce the information dissemination activities by involving different partners in accordance with well-defined sequences***

The media campaign must reinforce the work of the extension agents in a systematic fashion. Actors such as the sanitation artisans, schools, local leaders and municipalities could also play a very important role in the diffusion of information and can orient the households towards the extension agents and information offices provided by the municipalities to the extension agents. Publicity measures (i.e., posters and brochures) could also be more systematically used. A separation between the information/sensibilization function and the sales function could also be envisaged.

### ***Delegate the social intermediation activities in accordance with well-defined terms of references***

This would allow for better supervision of the extension agents and also improved work conditions, which would also make it possible to have a smaller turnover for the extension agents and better qualitative results. The Sanitation Department (DASS) must monitor compliance in light of the terms of reference and no longer concern itself with the management of the team.

### ***Develop competition between different ONG and private consulting firms to improve the quality of work***

A static partnership explains the mixed results observed, and one of the important criteria in the selection of the NGOs is the ability to supervise effectively, to monitor

and evaluate, and create new and relevant methods of social marketing.

*Facilitate decentralization by transferring competency and responsibilities to municipalities through training and technical assistance*

The ONEA should facilitate the transfer of competency in sanitation to the municipalities by developing partnerships, and assisting the municipalities in delegating the implementation of sanitation activities.



# Economic and Financial Aspects of the Ouagadougou Strategic Sanitation Program<sup>9</sup>

DRAFT

## Introduction

The Ouagadougou Strategic Sanitation Program is perhaps in a class of its own in terms of the quantity and quality of economic and financial data generated. Quantitative information provided by the Program's tracking and monitoring system was supplemented with the results of a household survey and studies of more than a dozen focus groups, all carried out during a field mission in October and November 1999.

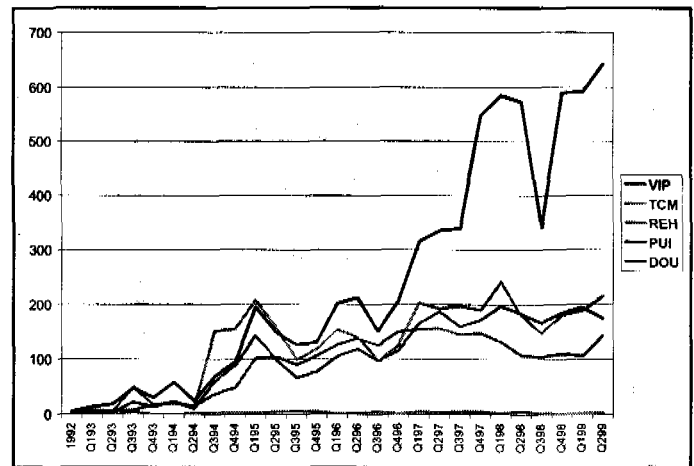
A representative sample of about 600 households was selected in each of the 5 arrondissements (boroughs) of the city, yielding a wealth of information from both beneficiaries and non-beneficiaries of the Program. About 18% of the plots surveyed had an ONEA facility, which is very close to the overall 15% coverage rate provided by the tracking system; an indicator of the quality of the sample.

## Overview

As shown in Figure 1, the scaled-up program initiated in Q2 94 – expanding program scope from two pilot sectors to all 30 sectors of the city – resulted in a substantial growth in the pace of construction. From Q2 94 to Q1 97, all systems, (except pour-flush latrines which never became successful for reasons that will be presented later)

increased to around 100-200 new constructions per quarter. A more recent and interesting development is the tremendous popularity of soakaways since Q1 97, compared to the number of rehabilitations, VIP latrines and bathrooms constructed, which have remained fairly constant.

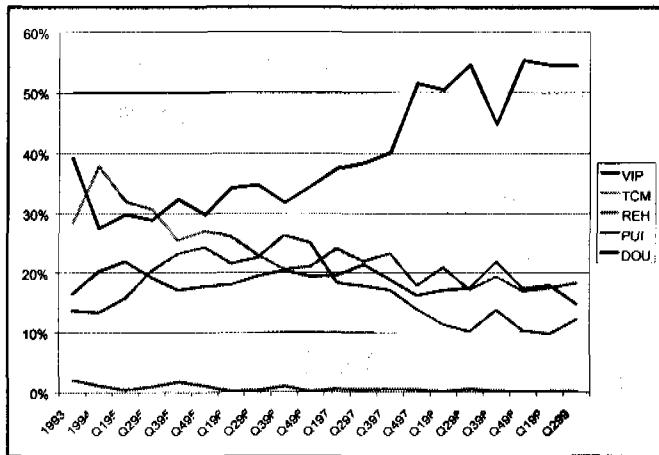
Figure 1 – Progression of ONEA Constructions, 1993-1999 (per Quarter)



In terms of market share, *considering only ONEA-type constructions* (see below for results of the non-ONEA sector), the share of soakaways grew constantly, jumping from 30% in 1995 to 55% in 1999 (see Figure 2). Market share for all other systems gradually declined during the scale-up phase.

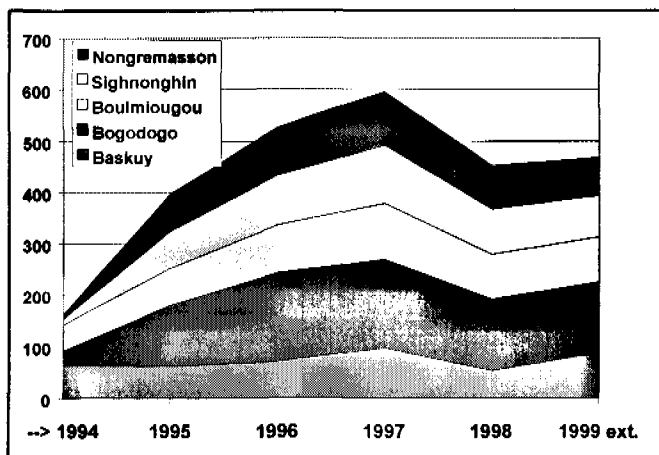
<sup>9</sup> This section was written by Christophe Bösch, INFWS, The World Bank

**Figure 2 – Relative Market Share for ONEA Constructions (per Quarter)**



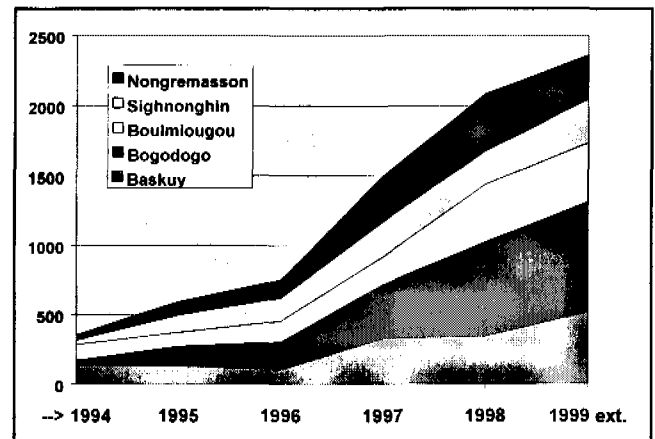
Distribution and development of constructions was uneven in the city's arrondissements, as it was influenced by factors such as strength of promotional activities, and housing and population characteristics (see Figures 3 and 4). For instance, the difference in construction between the arrondissements of Bogodogo and Baskuy can be explained by the fact that Baskuy is a central, high density area with few new housing developments, while Bogodogo is a booming suburban area.

**Figure 3 –Progression of VIP Constructions in the Arrondissements (per Year, ONEA Type)**



The rate of construction of soakaways seems to keep growing, while VIPs seem to have hit a "saturation" point, possibly reflecting physical and financial constraints and also the keen competition the VIP faces from other types of sanitation systems (traditional latrines, toilets and septic tanks) that are promoted by the small private sector.

**Figure 4 –Progression of Soakaway Constructions in the Arrondissements (per Year, ONEA-type)**



## Findings and Lessons Learned

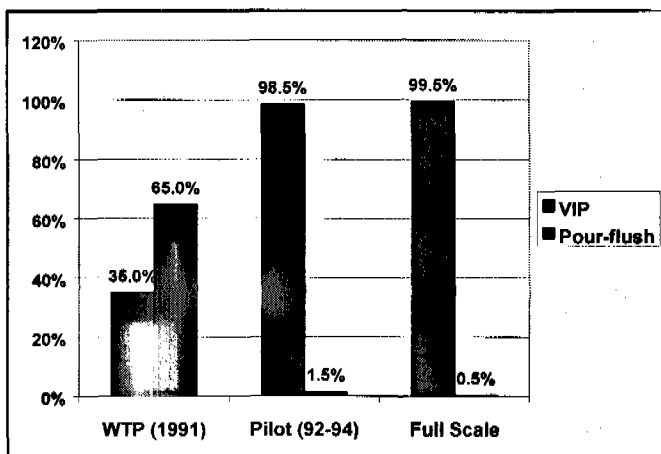
### *Assessing and predicting demand for sanitation*

Comparison of demand data between the 1991 willingness-to-pay survey, the 1992-94 pilot program and the full scale program provides an answer to the question: "Did households behave as they stated during the household survey?" The results are mixed. On the one hand, the WTP survey did not correctly predict the technical option that households would prefer. While the 1991 survey forecasted that almost two-thirds of the households that would invest in an ONEA-type latrine would choose the pour-flush system, in 1999 less than 1% had chosen this option (see

Figure 5). While the quality of the WTP is not in question, this observation underlines a standard issue with WTP surveys as to the accuracy of hypothetical choices.

A possible reason for this discrepancy is that households did not factor in the water constraint at the time of the survey. The majority of households in Ouagadougou rely on water vendors for their potable water needs, and only small quantities of water are available (20 to 30 liters per capita per day, and much less during the dry season). Because pour-flush toilets require significant quantities of water for operation and maintenance, it seems likely that it later became apparent to households that the operation of such latrines would be more complicated than for VIPs, hence the shift in preference.

**Figure 5 – Comparison of Distribution of VIP and Pour-Flush Latrines (WTP Survey, Pilot and Full Scale, ONEA-type)**

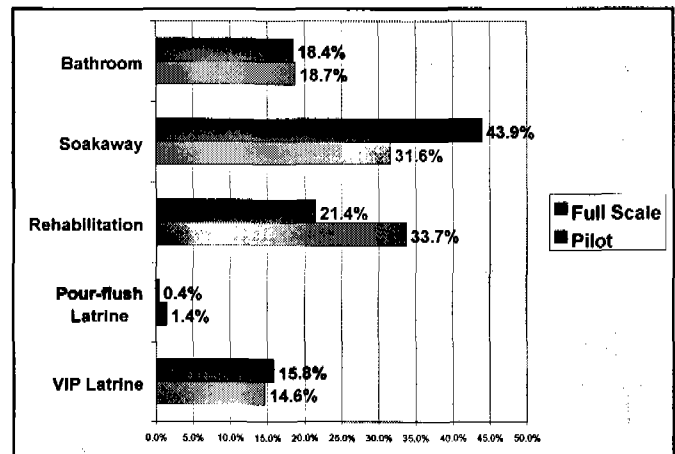


However, the WTP survey has accurately predicted that few households would choose to borrow (either from banks, micro-credit institutions or relatives) to finance new sanitation systems (see Figure 13 in para. 3.5.).

What the survey showed is that the demand indicated during the pilot program was a particularly good predictor of household choice for the full-scale program. This observation leads to a possible conclusion that pilot programs are

much more effective than willingness-to-pay surveys in predicting demand for sanitation. Pilot programs may be a more accurate tool to predict demand, especially when dealing with new and unknown technologies.

**Figure 6 – Comparison between Pilot and Full Scale (all Types of ONEA Systems)**



**Lesson:** Particularly in the case of sanitation, predicting demand based on stated preference methods (e.g. willingness-to-pay surveys) can yield uncertain results. Pilot programs have the potential to offer more powerful and accurate tools to forecast demand.

### *The determinants and dynamics of demand*

As shown in the charts above, demand for sanitation is a dynamic element that responds to a host of endogenous and exogenous factors. It is therefore important to set up appropriate monitoring tools to determine whether the progression of demand is in line with long-term urban development strategy, to understand what are the key determinants of demand, and most importantly, which of these can be controlled and influenced.

Some exogenous factors are housing characteristics and population density. For instance, as shown in Figures 3 and 4 above, it is clear that one cannot expect the same construction potential of new facilities in densely built-up areas (such as the Baskuy arrondissement), as in new housing developments in suburban areas. Also, competition can constrain the development potential of certain types of constructions. For instance, the slow growth of the VIP latrine can be partly explained by crowding out effects resulting from competition from a much cheaper type of latrine: the traditional latrine, that still holds the largest market share (see Figure 7 in para. 3.4.).

Endogenous factors, that is, factors that can be influenced by policy, include promotion, subsidy policy, and public perception. Legislation (if enforced) is another such factor. The explosive growth of the soakaway in recent years can be explained by such factors:

- The higher subsidy (30% vs. an average 18% for all construction types), which gives it a competitive edge over the competition.
- Promotional activities with built-in incentives (soakaways are weighted equally with VIP latrines in terms of performance objectives for the extension workers),
- Public perception - there is more community peer pressure to build soakaways rather than latrines because gray waters are visible to the public, and spill over into the street – while the condition of latrines remains hidden from public view, and therefore from criticism.

The Ouagadougou Strategic Sanitation Program has shown the potency of promotional tools (marketing-mix: door-to-door visits, media, subsidies) to influence demand for sanitation and orient demand in a direction that supports long-term sanitation and urban development strategies.

**Lesson:** Demand is not static, but responds to complex dynamics. Determinants are related to endogenous and exogenous factors. It is vital to understand the determinants of demand in order to be able to monitor the effectiveness of sanitation strategies, and adapt them if demand begins to drift away from overall urban development objectives.

### *Coverage Objectives*

As shown in Tables 1 and 2, sanitation coverage in Ouagadougou has significantly improved during the last decade. While the ONEA program was not the only contributor to the expansion of coverage, it made an important impact, particularly in the expansion of soakaways.

While ONEA constructions still represent a relatively small share of all sanitation facilities, it may be the case that the Strategic Program actually induced the construction of competing systems. This would be an example of the well-known spillover effect in marketing.

**Table 1 – Availability of Sanitation Facilities (1999 Household Survey, N=563)**

	ONEA	Other	Total	%
Latrine	81	410	491	87%
Soakaway	71	178	249	44%
Septic tank	n.a.	100	100	18%
Bathroom	55	386	441	78%

As shown in Table 2 below, comparison of coverage data for 1991 and 1999 shows significant progress in all indicators. While in 1991, 6% of households did not have access to excreta disposal facilities, this number dropped to 2% in 1999. Not surprisingly, more households had septic tanks in 1999 as well. This is probably a reflection of an overall improvement in living standards over the past decade.

**Table 2 – Availability of Sanitation Facilities – Comparison of 1991 and 1999 Situation**

	1991 Survey	1991 WTP	1999 Survey
Latrine (All Types)	88%	81%	87%
Septic Tank	5%	12%	18%
No Latrine	7%	6%	2%
Soakaway	12%	n.a.	44%

A significant development is the spectacular growth of soakaway coverage, jumping from 12% in 1991 to 44% in 1999. While the ONEA VIP latrine program has only been partially successful (hampered firstly by the higher cost of latrines compared to competing alternatives, and secondly by reaching the saturation point in some older neighborhoods), the soakaway program is an unqualified success. Possible explanations include the higher subsidy level, affordability and greater public awareness as to the proper management of sillage.

In terms of sanitation coverage this is arguably a most important contribution of the Strategic Sanitation Program. Provision of soakaways not only reduces spills and the presence of stagnant waters, but more importantly, enables households to *separate* liquid from solid wastes. The separation principle is key to mitigating fecal contamination, both above and under ground.

Soakaways overflows have been shown to pose particular health risks when they are a mixture of fecal matters and sillage. Also, shallow aquifers are more susceptible to these large pollution loads. Another benefit of waste separation is a longer life and lower maintenance costs for latrines because only fecal matters (excreta and urine) are deposited, and they quickly mineralize. This point is substantiated by the observation that latrines filled up much less quickly than anticipated<sup>10</sup>. Notably, not a single ONEA VIP latrine has had to be emptied since the beginning

<sup>10</sup> Other possible explanations include (i) VIP latrines pits were oversized, and/or (ii) composting of fecal matters was quicker and more effective than initially thought

of the program (fact mentioned by ONEA and confirmed by the household survey).

While few ONEA soakaways were reported to have operation and maintenance problems, a risk of pipe obstruction and/or clogging of pits by premature lining of walls does exist. As shown in the survey, households are not sufficiently aware of potential O&M issues or of ways to mitigate them; a public awareness campaign would be recommended to promote a problem-free and sustainable use of soakaways.

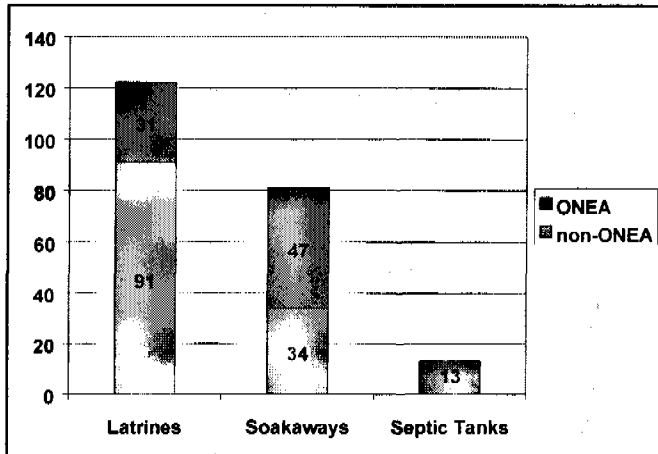
**Lesson:** All indicators point towards a significant increase of sanitation coverage over recent years. Soakaways in particular showed impressive growth, with positive effects. There is a need to more closely define the meaning of sanitation coverage, to decide what is the optimal mix of sanitation systems, and to improve strategies accordingly.

### *The Other Actors In The Sanitation Sector*

The study has shown that the ONEA is not the only actor in the on-site sanitation sector. This is not surprising considering the dynamic nature of the small-scale private sector in Ouagadougou.

The 1999 survey quantified the number of sanitation facilities built by households since 1994 and the start of the full-scale program. As shown in Figure 7, substantial private sanitation activity took place in tandem with the “official” ONEA program.

**Figure 7 – Sanitation Systems Built From 1994 Through 1999 in the Survey Areas (Household Survey, N=583)**



While ONEA latrines (including VIP, pour-flush and rehabilitations) represented only a quarter of the total number of new latrines constructed, the “penetration” rate reached 60% for soakaways. Those figures are probably a reflection of the relative competitiveness of the different systems.

It is important to note that on-site sanitation programs do not operate in isolation. As shown in recent studies<sup>11</sup>, there is typically a lot of pre-existing activity carried out by the informal private sector. Therefore, an important element of any on-site sanitation strategy would be to seek ways to integrate this pre-existing and competing activity, capitalize on its strengths, and allay its weaknesses.

While in principle, competition should be welcomed (even though competition may benefit from spillover effects from the “official” promotion and public awareness programs), it is important to create a level playing field by enforcing minimum technical standards. This raises an important issue - namely, can the (cheap) traditional latrines promoted by non-ONEA masons meet an appropriate standard? If not, are there alternatives midway between the traditional and the VIP latrine?

<sup>11</sup> Collignon, Bernard, and Marc Vézina, *Independent Water and Sanitation Providers in African Cities*, Water and Sanitation Program, April 2000

Enforcement of a minimum technical standards policy could be done either through legislation (although it has generally proven to be ineffective), or preferably through a more aggressive mix of promotion and subsidies for those latrine options that are considered to be more appropriate. Indeed, the soakaway case has shown that a combination of promotion and subsidies can be instrumental in securing larger market shares and simultaneously expanding overall business.

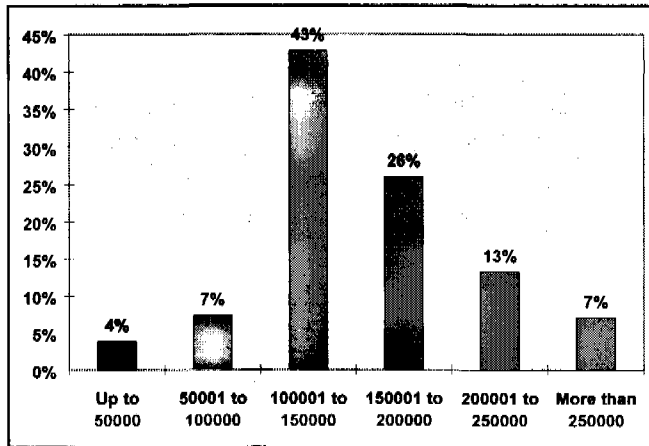
According to the ONEA database, about 15% of plots in Ouagadougou have been equipped with ONEA systems, which would lead to the conclusion that 85% remain to be covered. For the reasons revealed above, this figure may be overestimated as private competition will also target this market, leaving the ONEA with a smaller potential for additional coverage.

**Lesson:** On-site sanitation programs never operate in a vacuum, particularly in urban areas. Sanitation strategies should therefore account for competition, not disregard it but rather, build on its strengths and seek ways to address issues such as inappropriate technology standards.

### *Cost Of Facilities And Households' Strategies To Reduce Cost*

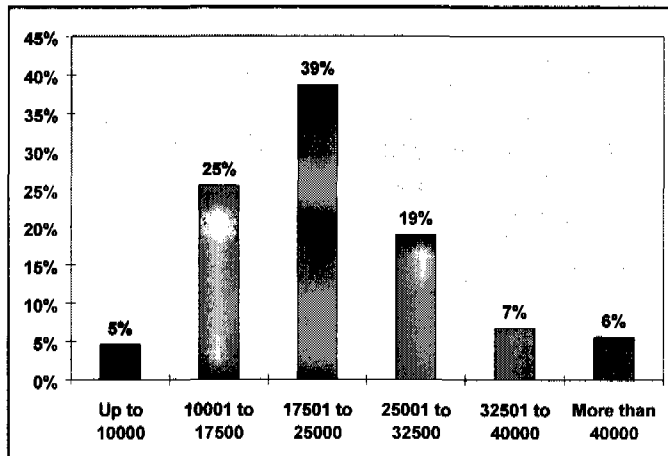
It is generally thought that on-site systems of similar types should all have the same cost, with minor variations. However, the analysis of the ONEA database revealed that costs vary widely, leading to a bell-shaped cost curve. For instance the cost of a VIP latrine can vary by a factor of more than five (Figure 8).

**Figure 8 – Cost Curve of a VIP Latrine (CFA Francs, ONEA-type)<sup>12</sup> (ONEA Database)**



Even for soakaways, which are much cheaper than VIP latrines, a large dispersion in cost was observed (Figure 9).

**Figure 9 – Cost Curve of a Soakaway (CFA Francs, ONEA-type) (ONEA Database)**



Determinants of cost may include:

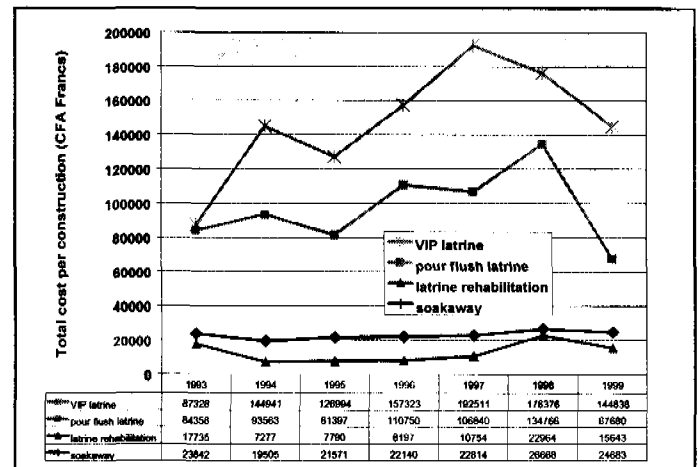
- Degree of provision of labor by the household, for instance digging the pit, gathering recycled materials and sand for construction.

<sup>12</sup> Cost data have not been deflated. The resulting error should is not significant as most facilities were built in the past 2-3 years, and annual inflation rate in Burkina-Faso in recent years has stood at a few percentage points.

- Pressure from private competition.
- Ability of household to negotiate with the artisan.
- Household's awareness of typical prices - information that may be provided by extension workers, relatives, etc.
- Household's willingness to pay.
- Add-ons to standard construction, such as lining with tiles, etc.

As expected, the poor (defined on the basis of proxy indicators such as means of transportation, and housing characteristics) tended to take the cheapest option, typically by providing in kind contributions such as labor. In this way, households were given the opportunity to adjust construction cost to their ability to make cash contributions to the project. However, this adjustment was feasible only within certain bounds, which explains why it was difficult for the more expensive VIP latrine to increase its market share. A VIP latrine containing only the essential parts is still about 2-3 times more expensive (even accounting for the approximately 20% subsidy) than its direct competitor, the traditional latrine, which cost about CFA Francs 30000-40000 (excluding in kind contributions - see household survey results in Annex).

**Figure 10 –Progression of Construction Cost Over Time (CFA Francs, ONEA-type)**



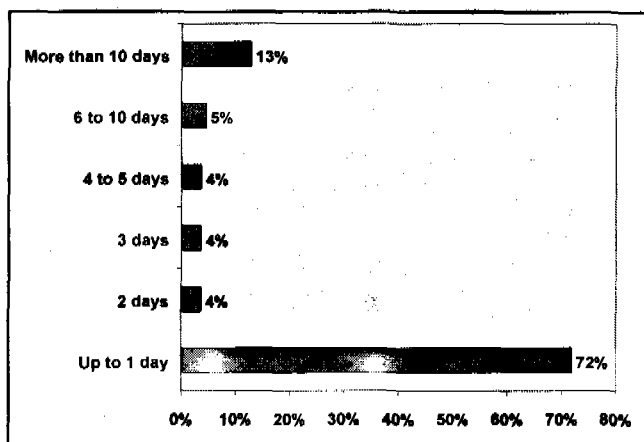
Analysis of average costs over time also shows some interesting developments. Figure 10 above

shows that the cost of latrines increased regularly until 1997-1998<sup>13</sup>, when competition pressure led to a decrease in nominal terms. On the other hand, cost of soakaways has been remarkably stable at around 20000-23000 CFA.

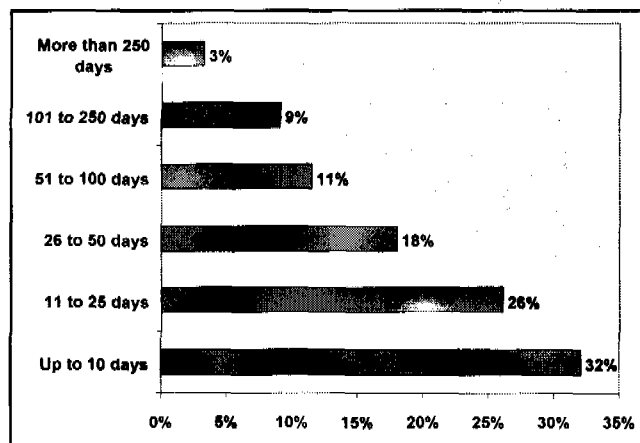
Another strategy used by those households that do not want or cannot afford to borrow is to build facilities in stages over a significant period of time, thus spreading out payments.

As one could expect, most rehabilitations could be completed within a day. VIP latrines, however, took much longer to complete<sup>14</sup> (see Figures 11 and 12).

**Figure 11 – Time Needed to Rehabilitate a Traditional Latrine (Days, ONEA-type) (ONEA Database)**



**Figure 12 - Time Needed to Build a VIP Latrine (Days, ONEA-type) (ONEA Database)**



**Table 3 – Average Construction Time (All Types of ONEA Facilities, Days)**

	average	std deviation
VIP	46.5	74.3
Pour-flush	36.5	71.8
Rehabilitation	9.2	39.5
Soakaway	26.2	72.8
Bathroom	36.9	58.8

Households had extremely limited recourse to credit, which can be explained by a number of factors, in particular the many dimensions of transaction costs.

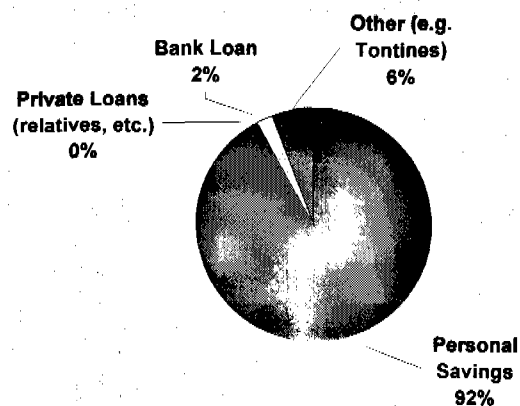
Clearly however, another explanation is that the apportioning of construction and costs acted as a substitute for credit (Figure 13).

<sup>13</sup> Probably due to substantial increases in the cost of cement

<sup>14</sup> Of course, it takes longer to build a VIP latrine (10-15 days, typically) than to rehabilitate an existing facility. However, this fact alone cannot explain the large variations observed.



**Figure 13 – Financing of ONEA Constructions (1999 Household Survey, N=583)**



A possible strategy to decrease costs and enable more households to build sanitation facilities would be to facilitate the artisans access to credit.

**Lesson:** There is no standard cost for an on-site sanitation system. Because households use a variety of mechanisms to reduce cost, the effective construction cost varies widely, enabling households to more closely match expenditure with their cash income.

### *Distributional Analysis And Profile Of Beneficiaries*

Both the ONEA database and the household survey shows that the Program achieved its objectives in that it benefited low- to middle income groups, with a few exceptions. However, the survey showed that within these income groups, small differences were observed between those that invested in ONEA on-site systems and those that did not.

Using means of transportation as a proxy for disposable income, Table 4 shows that in general, wealthy households were slightly more likely to

have built an ONEA facility. For example, only 8% of households owning a bicycle built an ONEA system compared to 29% of households owning a car.

**Table 4 – Relationship between Transportation Means of the Head of Household and Availability of ONEA-Type Facility (1999 Household Survey, N=563)**

Transportation Means	Built ONEA-type	Sample	%
Car	26	90	29%
Motorcycle	15	58	26%
Moped	41	207	20%
Bicycle	7	83	8%
On foot	6	69	9%
Not specified	9	56	16%
<b>Total</b>	<b>104</b>	<b>563</b>	<b>18%</b>

Using occupation of the head of the household as another proxy for income, showed a similar pattern (Table 5). None of the laborers surveyed had invested in any of the ONEA on-site sanitation systems, while 23% of the civil servants surveyed had built a system. On the other hand, however, 15-20% of farmers, unemployed and retired people built ONEA systems.

**Table 5 – Relationship between Profession of the Head of Household and Availability of ONEA-Type Facility (1999 Household Survey)**

Profession	Built ONEA-type	Sample	%
Civil servant	21	92	23%
Agent du privé	13	65	20%
Shop keeper	11	55	20%
Informal sector	5	61	8%
Farmer	8	46	17%
Laborer	0	21	0%
Unemployed	3	23	13%
Retired	6	26	23%
Other	11	49	22%
Not specified	26	125	21%
<b>Total</b>	<b>104</b>	<b>563</b>	<b>18%</b>

Analysis of the ONEA database records show that among the options offered, poorer households tended to choose soakaways while wealthier households (defined on the basis of availability of a water connection, and quality of housing) chose VIP latrines. Also, not surprisingly, owners of pour-flush latrines had the highest rate of connection to the tap water system. Admittedly however, these differences are not very significant.

**Table 6 – Relationship between Housing Characteristics and Type of ONEA Facility (ONEA Database)**

Households owns...	Maison en dur	Water Connection
VIP Latrine	82%	28%
Pour-flush latrine	72%	51%
Rehabilitation	85%	43%
Soakaway	62%	23%
Bathroom	85%	28%
<b>TOTAL</b>	<b>67%</b>	<b>28%</b>

Results of the household survey (see annex) have been categorized by beneficiary type (owner/non-owner of ONEA on-site-system). A comparison of the answers to the questions yields further insights into the profile and the preferences of both groups.

**Lesson:** The program achieved its objective of improving sanitation services for low-income groups. However, analysis of the beneficiaries profiles show that, while the poor were able to build ONEA-type facilities, beneficiaries tended to be somewhat more educated and belong to a slightly wealthier income group. An improved provision and subsidy targeting mechanism may be necessary for the poorest households, particularly in regard to the provision of latrines.

### *Transaction Costs*

Transaction costs (social intermediation costs) were significant as they made up more than 30% of average total construction cost of on-site systems, almost double the amount allocated for subsidies. Options to reduce transaction costs would include:

1. Altering the marketing-mix and achieving a better balance between promotional expenditure and subsidies, with the aim of maximizing the marginal productivity of financial incentives.
2. Foster competition and the role of the private sector in promotional activities, whilst reinforcing the role of ONEA (or in the future, the municipalities, once their capacity has been built up to sufficient levels) in the management of planning and strategic tools:
  - Strategic monitoring and evaluation in accordance with large-scale sanitation and urban development objectives
  - Large-scale promotion (advocacy, media)
  - Allocation and targeting of subsidies
  - Legislation and quality control

**Lesson:** Transactions costs are significant, and their effectiveness in achieving global sanitation objectives should be reassessed. In particular, altering the marketing-mix as well as the option of increasing the role of the private sector in promotional activities should be investigated.

### *Impact Of Subsidies*

As shown in Figure 14, the level of subsidies<sup>15</sup> provided by ONEA has been fairly stable over time, remaining at a modest 18% of total costs. The slight fluctuations are due to changes in

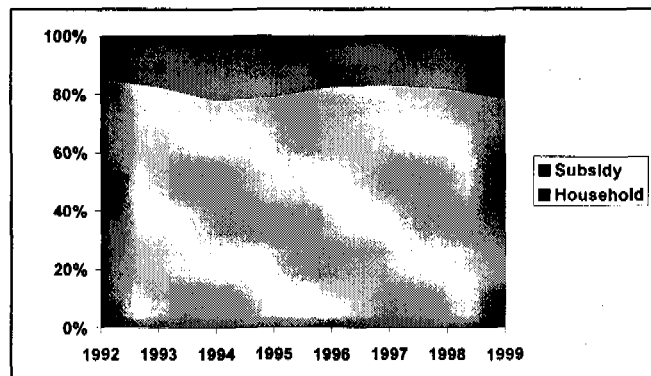
<sup>15</sup> In kind: slabs, water seal pans and vent bricks

product mix and household contributions, and have not been a result of policy changes.

However, the average figures do not give a clear picture of the significant differences between constructions types. While latrines receive an 18% financial incentive (in kind), soakaways are subsidized up to 30% (see Tables 8 and 9). This difference has an important impact on the relative demand for latrines and soakaways, and can partly explain the reasons why:

- Soakaways have substantially increased their market share within ONEA-type constructions (see Figure 1 above).
- Soakaways have fared much better against private competition than have latrines (see Figure 7 above).

**Figure 14 – Progression Over Time of Subsidy and Household Contribution**



**Table 7 – Average Cost of Constructions, Household Contribution and ONEA Subsidy**

TYPE		HH cont.	Subsidy	Total
VIP	average	130813	29072	159885
	std dev	82556	19501	83769
Pour-flush	average	84183	15060	99243
	std dev	51561	12599	52513
Rehab-ilitation	average	12031	2558	14589
	std dev	22897	2582	23490
Soakaway	average	17238	7349	24588
	std dev	22357	3594	22685
Bathroom	average	50610	663	51273
	std dev	53411	4483	54756

**Table 8 – Range and Frequency of Subsidy per Construction Type<sup>16</sup> (ONEA Database)**

Subsidy	VIP Latrine	Pour-flush	Rehab-ilitation	Soak-away
0 to 20%	45%	51%	29%	14%
21 to 40%	51%	41%	36%	49%
41 to 60%	1%	8%	32%	27%
61 to 80%	2%	0%	1%	7%
81 to 100%	1%	0%	1%	3%
<b>Average</b>	<b>18%</b>	<b>15%</b>	<b>18%</b>	<b>30%</b>

**Lesson:** When appropriately allocated and targeted, subsidies have the potential to become a major tool in supporting global sanitation coverage and urban development objectives. However, they should not be used to crowd out the private sector unless there is compelling public good rationale supporting their use (e.g. presence of negative externalities, poverty alleviation).

### *The Use Of Policy Instruments: The Sanitation Tax*

Institutions need to create competence, ability, and sustainable financing mechanisms in order to implement and sustain policies. In this respect the ONEA displayed foresight in institutionalizing the sanitation tax<sup>17</sup> in the late 1980s. Furthermore, the recent decision to keep water and sanitation accounts separate was appropriate. Sustainability of sanitation tax revenue generation will be key for the ONEA to be able to alleviate the growing external impacts of increased population and water consumption, particularly in areas that cannot be addressed privately, e.g. at the household or neighborhood level.

<sup>16</sup> Bathrooms are not meant to be subsidized

<sup>17</sup> Levied on all water bills (about 4 % of water tariff)

## Conclusions

A number of lessons can be drawn from the scaling-up of the Ouagadougou Strategic Sanitation Program. From both economic and financial perspectives, lessons learned include the following:

*1. Particularly in the case of sanitation, predicting demand based on stated preference methods (e.g. willingness-to-pay surveys) can yield uncertain results. Pilot programs have the potential to offer more powerful and accurate tools to forecast demand.*

*2. Demand is not static, but responds to complex dynamics. Determinants are related to endogenous and exogenous factors. It is vital to understand the determinants of demand in order to be able to monitor the effectiveness of sanitation strategies, and adapt them if demand begins to drift away from overall urban development objectives.*

*3. All indicators point towards a significant increase of sanitation coverage over recent years. Soakaways in particular showed impressive growth, with positive effects. There is a need to more closely define the meaning of sanitation coverage, to decide what is the optimal mix of sanitation systems, and to improve strategies accordingly.*

*4. On-site sanitation programs never operate in isolation, particularly in urban areas. Sanitation strategies should therefore account for competition - not disregard it but rather, build on its strengths and seek ways to address issues such as inappropriate technology standards.*

*5. There is no standard cost for an on-site sanitation system. Because households use a variety of mechanisms to reduce cost, the effective construction cost varies widely, enabling households to more closely match expenditure with their cash income.*

*6. The program achieved its objective of improving sanitation services for low-income groups. However, analysis of the beneficiaries profiles show that while the poor were able to build ONEA-type facilities, the main beneficiaries tended to belong to a more educated and slightly wealthier income group. An improved provision and subsidy targeting mechanism may be necessary for the poorest households, particularly in regard to the provision of latrines.*

*7. Transaction costs are significant, and their effectiveness in achieving global sanitation objectives should be reassessed. In particular, altering the marketing-mix as well as the option of increasing the role of the private sector in promotional activities should be investigated.*

*8. When appropriately allocated and targeted, subsidies have the potential to become a major tool in supporting global sanitation coverage and urban development objectives. However, they should not be used to crowd out the private sector unless there is compelling public good rationale supporting their use (e.g. presence of negative externalities, poverty alleviation).*

The Program has demonstrated its overall sustainability, with one of the main reasons being the sustainability of the financial setup. However, this factor, together with other aspects of the program, notably institutional arrangements, social intermediation, and technical options, will need to be carefully examined in the future.

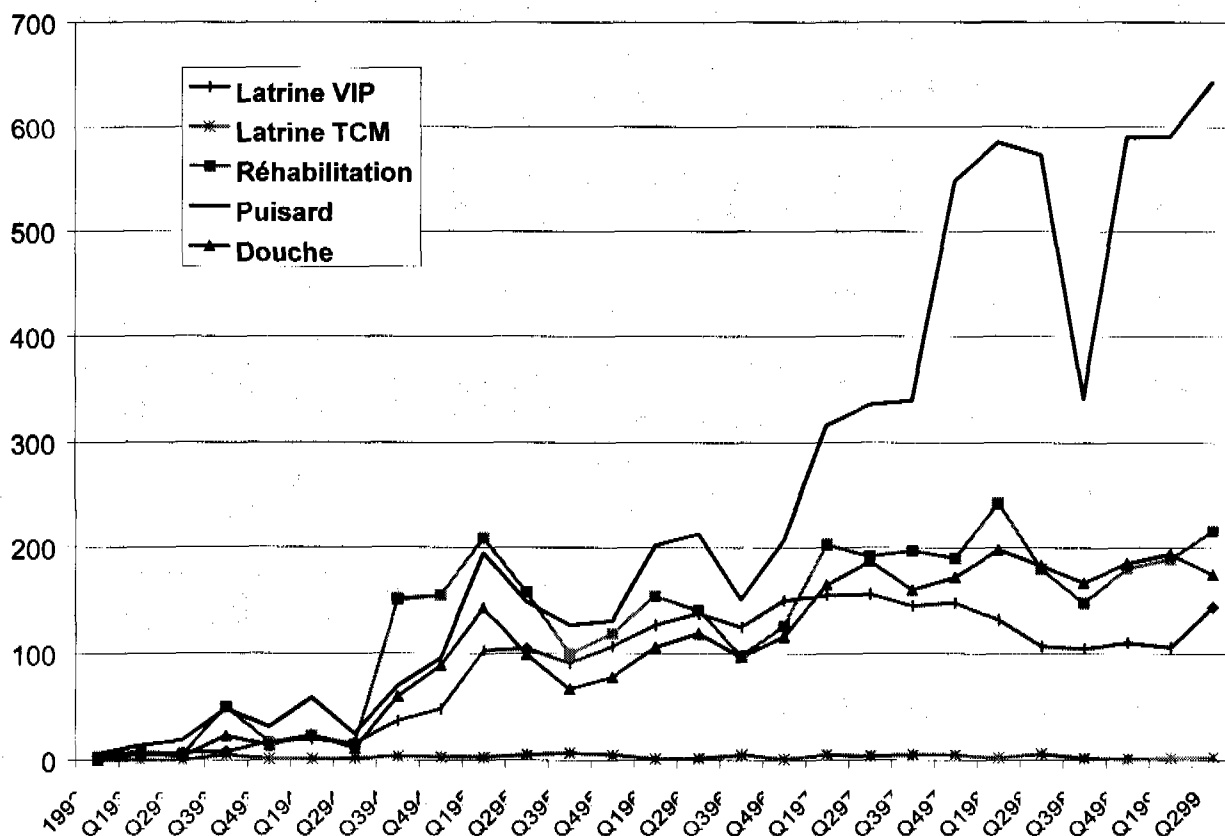
The immediate challenges for the ONEA will be to assess the 5 years of experience with the full scale program, to reconcile competing demands for financing of both on-site systems and sewerage, and most importantly, to reassess the targeting ability and the effectiveness of the subsidy policy, both in terms of coverage rate as well as poverty alleviation objectives.

# ANNEX: ONEA DATABASE

Consolidation as of June 30, 1999 (12287 fiches processed)

		Moyenne	%
Investissement (CFA)	Coût ménage	45882	81.4%
	Subvention ONEA	10499	18.6%
	Total	56381	
Type de l'habitat	Dur		72.5%
	Semidur		4.8%
	Banco		22.1%
	Pierre		0.5%
Alimentation en eau	branchement en eau		29.1%
	bornes fontaines		22.7%
	revendeur		45.6%
	voisin		0.2%
	puits traditionnel		2.4%
	autre		0.0%
Participation énoise	oui		50.1%
	non		49.9%
Ouvrages ONEA	latrine VIP	2477	15.8%
	TCM	81	0.5%
	réhabilitation	3490	22.3%
	puisard	6726	42.9%
	douche	2891	18.5%
	<b>TOTAL</b>	<b>15665</b>	
Electricité	oui		42.8%
	non		57.2%

## Constructions of ONEA-type facilities, per quarter, 1992-1999



## ANNEX : HOUSEHOLD SURVEY RESULTS (in French)

I. INTRODUCTION		ONEA <sup>18</sup>	Autre	Total
ECHANTILLON		104	459	563
1.2. Identité de l'interrogé				
1.2.1. Sexe	Femme	43%	56%	53%
	Homme	57%	44%	47%
1.2.2. Religion	Musulman	40%	52%	50%
	Chrétien	58%	47%	49%
	Autre	2%	0%	1%
1.2.3. Age	(moyenne)	39.3	37.2	37.8
1.2.4. Niveau d'instruction	primaire	21%	16%	17%
	secondaire	43%	27%	30%
	supérieur	15%	11%	12%
	n'a pas fréquenté	19%	42%	38%
	autre	3%	4%	4%
1.2.5. Niveau d'instruction de la conjointe	primaire	19%	20%	20%
	secondaire	33%	25%	27%
	supérieur	10%	6%	7%
	n'a pas fréquenté	37%	45%	43%
	autre	2%	3%	3%
1.2.6. Principales activités exercées	fonctionnaire	24%	8%	12%
	agent du privé	16%	10%	11%
	commerçant	10%	14%	13%
	secteur informel	5%	14%	12%
	agriculteur	5%	6%	6%
	manœuvre	2%	4%	3%
	menagere	4%	5%	5%
	retraite	4%	3%	3%
	sans emploi	17%	24%	23%
	autre	11%	13%	12%
1.2.7. A Ouaga depuis quand ?	(moyenne, ans)	22.7	22.0	22.3
1.2.8. Dans cette maison depuis quand ?	(moyenne, ans)	12.4	12.7	12.7
1.3. Statut de l'interrogé				
1.3.1. Locataire/Propriétaire	Locataire	19%	17%	18%
	Propriétaire	81%	83%	82%
1.3.2. Chef de ménage?	Chef de ménage	45%	30%	34%
	L'épouse du chef	40%	47%	45%
	Un(e) parent(e)	15%	22%	21%
1.4. Nombre de ménages dans la concession	(moyenne)	1.5	1.6	1.6
1.5. Nombre d'enfants de bas âge (0 – 5 ans) dans la concession	(moyenne)	1.3	1.6	1.6
1.6. Nombre total de personnes dans la concession	(moyenne)	10.1	9.7	9.7

<sup>18</sup> Bénéficiaires d'ouvrages ONEA (tous types)

		ONEA <sup>19</sup>	Autre	Total
1.6. Nombre total de personnes dans le ménage	(moyenne)	7.7	6.9	7.0
1.7. Nombre d'enfants du ménage	(moyenne)	4.4	4.0	4.1
1.8. Profession du chef du ménage	fonctionnaire	30%	21%	23%
	agent du privé	19%	16%	16%
	commerçant	16%	13%	14%
	secteur informel	7%	17%	15%
	agriculteur	11%	11%	11%
	manceuvre	0%	6%	5%
	sans emploi	4%	6%	6%
	autre	13%	10%	10%
1.9. Nombre de personnes travaillant dans le ménage à part le chef de ménage	(moyenne)	0.8	0.6	0.7
1.10. Moyens de déplacement du chef de ménage	voiture	27%	16%	17%
	moto	16%	10%	11%
	mobylette	43%	40%	42%
	vélo	7%	18%	16%
	pieds	6%	15%	13%
1.11. Faites vous partie d'une association	de quartier	1%	7%	9%
	religieuse	2%	6%	9%
	professionnelle	1%	3%	4%
	autre	2%	3%	6%
<b>2. HABITAT ET APPROVISIONNEMENT EN EAU</b>				
2.1. Le standing de l'habitat	Briques de banco	5%	12%	11%
	Briques de banco avec enduit ciment	10%	26%	22%
	Briques de banco et ciment	2%	6%	6%
	Briques de ciment	83%	56%	61%
	autre	0%	0%	0%
2.2. Branchement d'électricité	oui	81%	53%	59%
	non	19%	47%	41%
2.3. Mode d'alimentation en eau potable	BP interne en service	9%	4%	5%
	BP interne hors service	0%	0%	1%
	BP avec robinet dans la cour en service	42%	25%	29%
	BP avec robinet dans la cour hors service	3%	1%	1%
	borne fontaine	35%	54%	50%
	puits artisanal	1%	3%	2%
	revendeur	11%	11%	12%
	robinet du voisin	0%	1%	1%
	autre	0%	0%	0%
2.4. Avez-vous un puits ?	oui	14%	14%	13%
	non	86%	86%	87%

<sup>19</sup> Bénéficiaires d'ouvrages ONEA (tous types)

		ONEA <sup>20</sup>	Autre	Total
2.4. Si oui, à quoi l'utilisez vous ?	inutilisé	0%	12%	9%
	boisson	14%	15%	15%
	animaux	7%	12%	11%
	lavage linge	50%	63%	60%
	lavage vaisselle	29%	58%	52%
	jardinage	36%	18%	21%
	autre	0%	3%	3%
<b>3. ASSAINISSEMENT</b>				
3.1. Avez-vous un ouvrage sanitaire type ONEA dans votre cour ?	Oui	100%	0%	18%
	Non	0%	100%	82%
3.2. Equipements sanitaires type ONEA Par type d'ouvrage (latrine réhabilitée, VIP, TCM, puisard, douche, complexe, bac à laver)	Nombre	VOIR TABLEAUX A LA FIN DE L'ANNEXE		
	Depuis combien de temps?			
	Main d'oeuvre ménage			
	Main d'oeuvre artisan			
3.3. Equipements sanitaires type AUTRE Par type d'ouvrage (latrine traditionnelle, VIP, TCM, puisard, douche, fosse septique, autre)	Matériaux (type et cout)			
	Nombre			
	Depuis combien de temps?			
	Main d'oeuvre artisan			
3.4. Modes d'évacuation des déchets dans la concession	Apport ménage			
	Apport extérieur			
	Source de l'apport extérieur			
3.4.1. Où vont les eaux de la douche ?	Exterieur par une rigole	1%	9%	8%
	Dans la rue	0%	3%	3%
	Fosse de la latrine	8%	32%	27%
	Puisard	88%	43%	52%
	Autre	3%	12%	11%
3.4.2. Où vont les eaux de lessive ?	Jetées dans la rue	60%	66%	64%
	Jetées dans la cour	14%	22%	21%
	Jetées dans le caniveau	3%	0%	1%
	Exterieur par une rigole	1%	2%	2%
	Fosse de la latrine	4%	3%	3%
	Puisard	18%	7%	9%
3.4.3. Où vont les eaux de la vaisselle ?	Jetées dans la rue	56%	62%	61%
	Jetées dans la cour	20%	28%	26%
	Jetées dans le caniveau	2%	0%	1%
	Exterieur par une rigole	1%	1%	1%
	Fosse de la latrine	2%	1%	1%
	Puisard	18%	8%	10%
3.4.4. Où sont rejetées les ordures ?	bac dépotoir	35%	32%	32%
	trou	7%	7%	7%
	rue	8%	21%	18%
	ramassage à domicile	38%	27%	30%
	autre	11%	13%	13%

<sup>20</sup> Bénéficiaires d'ouvrages ONEA (tous types)



		ONEA <sup>21</sup>	Autre	Total
3.4.5. Si ramassage à domicile, périodicité du ramassage (jours)	(moyenne)	6.6	7.2	6.9
3.5. Utilisation des latrines				
3.5.1. Méthode de nettoyage anal pratiqué ?	Eau	61%	60%	60%
	Papier	10%	15%	14%
	Eau et papier	29%	25%	26%
	Autre	0%	0%	0%
3.5.2. Est ce que les enfants de plus de 5 ans utilisent les latrines?	Oui	91%	89%	89%
	Non	9%	11%	11%
3.5.3. Si non, pourquoi ils n'y vont pas ?	On le leur a interdit	89%	93%	93%
	ils ne nous écoutent pas	0%	2%	2%
	autre	11%	5%	5%
3.5.4. Mode d'évacuation des excréta des enfants de 0 à 5 ans ?	Dans la latrine	90%	90%	90%
	Dans la nature	2%	4%	4%
	autre	9%	6%	6%
3.5.5. Combien de personnes utilisent par jour ces latrines ?	(moyenne)	9.2	9.3	9.2
3.6. Entretien des latrines				
3.6.1. Etat de propreté des latrines	bon	38%	14%	20%
	acceptable	50%	54%	52%
	mauvais	13%	32%	28%
3.6.2. Qui nettoie les latrines?	femme	60%	68%	66%
	enfants	18%	10%	12%
	employé de maison	14%	12%	13%
	autre	8%	9%	9%
3.6.3. Tous les combien?	Plusieurs fois par jour	0%	2%	3%
	Tous les jours	6%	44%	85%
	tous les _ jours (moy)	94%	55%	11%
3.6.4. Avez-vous déjà vidangé au moins une fois votre latrine ?	oui	30%	42%	40%
	non	70%	58%	60%
3.6.5. Si oui : Après combien de temps d'utilisation ?	(moyenne, ans)	5.1	7.2	7.1
3.6.5. Si oui: Plus d'une fois, avec quelle fréquence ?	(moyenne, ans)	2.4	3.2	3.0
3.6.6. Mode de vidange?	Manuel	11%	33%	30%
	Mécanique	89%	66%	69%
	Autre	0%	1%	0%
3.6.7. Coût de vidange? (Francs CFA)	(moyenne)	8227.3	8204.9	8174.5
3.7. Les problèmes rencontrés				
3.7.1. Les latrines ont-elles des problèmes de fonctionnement ?	oui	27%	30%	30%
	non	73%	67%	68%
	pas de latrine	0%	3%	2%

<sup>21</sup> Bénéficiaires d'ouvrages ONEA (tous types)

<sup>22</sup> Comprend aussi des latrines traditionnelles (p. ex., ménages n'ayant construit qu'un puisard ONEA)

		ONEA <sup>23</sup>	Autre	Total
3.7.1. Si oui, pour quels types de latrines :	VIP (ONEA) TCM (ONEA) Réhabilitée (ONEA) Traditionnelle (non ONEA) autre			
3.7.2. Si oui, nature des problèmes rencontrés les plus importants	Problème No 1 Odeurs Mouches Entretien difficile Rupture de la dalle Manque d'intimité Pas pratique à l'usage Stagnation d'eau sur la dalle Autre	40% 16% 0% 4% 0% 0% 12% 28%	43% 13% 5% 16% 1% 2% 8% 14%	43% 13% 4% 13% 1% 1% 8% 16%
3.7.3. En cas de problème, à qui l'avez-vous signalé (latrines) ?	Aux animateurs de l'ONEA Aux artisans Au propriétaire A personne	4% 0% 12% 84%	1% 3% 24% 73%	1% 2% 23% 74%
3.7.4. Existe-t-il des problèmes de fonctionnement du puisard?	oui non	11% 89%	15% 85%	15% 85%
3.7.4. Si oui, pour quels types de puisard	ONEA autre Ne possède pas de puisard			
3.7.5. Si oui, nature de problèmes rencontrés les plus importants	Obstruction Rupture de la dalle Remplissage	56% 22% 22%	10% 14% 76%	22% 15% 63%
3.7.6. Comment comptez-vous entretenir votre puisard?	Je ne sais pas Grille contre les obstructions Régénération des pierres	61% 10% 29%	49% 3% 47%	54% 6% 40%
3.8. Intention de construire de nouveaux ouvrages				
3.8.1. Avez vous l'intention de construire: d'autres ouvrages ou d'aménager votre cour	oui non	52% 48%	63% 37%	61% 39%
3.8.2. Si oui, lesquels	une latrine VIP une douche un puisard une réhabilitation des arbres un bac à laver cimenter le sol latrine améliorée autres	16% 13% 13% 10% 6% 23% 3% 0% 16%	28% 15% 15% 13% 1% 7% 3% 9% 9%	27% 14% 15% 12% 2% 9% 3% 8% 10%

<sup>23</sup> Bénéficiaires d'ouvrages ONEA (tous types)

<sup>24</sup> Comprend aussi des puisards qui ne sont pas de type ONEA (p. ex., ménages n'ayant construit qu'une latrine type ONEA)

		ONEA <sup>25</sup>	Autre	Total
3.8.3. Si non, raison évoquée				
3.8.4. Les raisons de votre choix				
3.8.5. Comment vous allez les financer ?	Economies personnelles	83%	88%	87%
	Emprunts (amis, parents,...)	0%	2%	2%
	Crédit bancaire	11%	9%	9%
	Tontines, caisse de solidarité	6%	1%	2%
	Autre	0%	0%	0%
3.8.6. Est ce que les femmes vont participer à la réalisation des ouvrages?	oui	65%	68%	68%
	non	35%	32%	32%
3.8.7. Si oui, comment ?	Participation financière	65%	48%	49%
	Investissement humain	30%	46%	43%
	Autre	5%	6%	8%
<b>4. QUESTIONS POUR CEUX QUI ONT BENEFICIE DES OUVRAGES ONEA</b>				
4.1. Comment avez vous connu les ouvrages de l' ONEA ?	radio ou TV	15%	n.a.	n.a.
	voisin ou parent	18%		
	visite d'animateurs	58%		
	autre	9%		
4.2. Combien de visites des animateurs avez vous reçu ?	une	25%		
	deux	13%		
	plusieurs	62%		
4.3. Comment vous appréciez la visite des animateurs ?	efficace	32%		
	enrichissant	63%		
	pas assez fourni	2%		
	autre	3%		
4.4. Quels sont les problèmes qui vous ont amené à choisir le nouveau système ?	pas de latrines	3%	1er probleme	
	odeurs	65%		
	pas pratique	10%		
	entretien difficile	1%		
	cafards	0%		
	vidange fréquente	4%		
	manque d'intimité	1%		
	peu fiable	0%		
	difficile à vidanger	3%		
	mouches	4%		
	coût	0%		
	autre	9%		
4.5. Qu'est ce qui vous a motivé pour construire un ouvrage ?	J'en ai vu chez le voisin	8%		
	Augmenter le prix de la maison	0%		
	Santé des enfants	7%		
	Avoir une concession propre	65%		
	Autre	20%		

<sup>25</sup> Bénéficiaires d'ouvrages ONEA (tous types)

		ONEA <sup>26</sup>	Autre	Total
4.6. Qui a influencé la décision de réaliser cet ouvrage chez vous ?	votre épouse	9%		
	les enfants	1%		
	vous même	71%		
	autre	19%		
4.7. Financement des ouvrages				
4.7.1. Qui a financé les ouvrages ?	Le propriétaire	98%		
	Les locataires	2%		
	Les deux	0%		
4.7.2. Comment ils ont financé ?...	Fonds propres	92%		
	Emprunt (familial, voisin, employeur)	0%		
	Crédit bancaire	3%		
	Autres	5%		
4.7.3. Combien de temps avez-vous mis pour accumuler la somme nécessaire ?	(jours, moyenne)	243.6		
4.7.4. La femme a-t-elle participé au financement ?	oui	18%		
	non	82%		
4.7.5. Si oui, combien ? (francs CFA)	(moyenne)	22000.0		
4.8. Relation avec les artisans				
4.8.1. Comment vous avez choisi l'artisan maçon ?	par les animateurs	72%		
	un voisin	8%		
	autre	20%		
4.8.2. Et l'artisan pré-fabricant ?	par les animateurs	75%		
	un voisin	8%		
	autre	17%		
4.8.3. Etes vous content(e) du travail des artisans ?	oui	84%		
	non	16%		
4.8.4. Si non, pourquoi ?	trop long	7%		
	trop cher	7%		
	malfaçon	71%		
	autre	14%		
4.8.5. Sont-ils assez compétents ou à votre avis ont-ils besoin de formation ?	oui	85%		
	non	15%		
4.8.6. Avez-vous eu une proposition par d'autres artisans (non ONEA) ?	oui	11%		
	non	89%		
4.9. Relation avec ONEA				
4.9.1. Est ce que vous êtes satisfaits de la participation de l'ONEA ?	oui	62%		
	moyennement	34%		
	non	4%		
4.9.2. Pourquoi ?				
4.9.3. Auriez-vous des suggestions concernant la participation financière				
4.9.3. Auriez-vous des suggestions concernant la publicité de l'ONEA				

<sup>26</sup> Bénéficiaires d'ouvrages ONEA (tous types)

		ONEA <sup>27</sup>	Autre	Total
<b>5. QUESTIONS SUPPLEMENTAIRES POUR LES NON BENEFICIAIRES DES OUVRAGES</b>				
<b>ONEA</b>				
5.1. Avez vous déjà rencontré les animateurs de l'ONEA pour l'assainissement ?	oui non sans réponse	n.a.	27% 72% 1%	n.a.
5.2. Si oui, comment avez vous apprécié leur rencontre ?	Bon Moyen Mauvais		78% 19% 4%	
5.3. Etes vous au courant des incitations financières de l'ONEA pour l'assainissement	oui non sans réponse		36% 62% 2%	
5.4. Si vous étiez au courant pourquoi vous n'avez pas voulu construire	Manque de place Manque de moyens D'autres priorités ne sait pas Autre		4% 56% 8% 8% 24%	
5.5. Qu'est ce que vous pensez de la qualité de service de l'ONEA ?	Ils travaillent pour notre intérêt ils cherchent seulement à gagner de l'argent indifférent Autre		63% 3% 16% 17%	
5.6. Quelles solutions vous voyez pour réunir les moyens pour construire des ouvrages ?	caisse populaire tontines autres		4% 6% 90%	
<b>6. QUESTIONS AUX FEMMES</b>				
6.1. Avez-vous entendu parler des ouvrages d'assainissement de l'ONEA et des incitations financières qu'elle offre ?	oui non	80% 20%	42% 58%	48% 52%
6.2. Comment avez vous été informée ?	Visite d'animateurs de l'ONEA Les voisins La radio ou la TV Les parents ou amis Autre	51% 12% 16% 15% 6%	43% 16% 26% 12% 3%	44% 16% 23% 13% 4%
6.3. Quelle est la voie la plus appropriée pour informer les femmes sur les ouvrages de l'ONEA ?	manifestations tontine réunions de quartier lieux de culte visite domiciliaire autre	3% 4% 32% 0% 46% 15%	7% 0% 40% 2% 40% 11%	7% 1% 39% 1% 41% 11%
6.4. A votre avis, quelles actions peut-on mener au niveau du quartier pour l'assainissement ?				
6.5. Faites-vous partie d'une association ou d'un groupement ?	oui non	31% 69%	24% 76%	25% 75%

<sup>27</sup> Bénéficiaires d'ouvrages ONEA (tous types)

		ONEA <sup>28</sup>	Autre	Total
6.5. Dans quel domaine?	assainissement	10%	10%	9%
	tontine	30%	48%	45%
	autre	60%	43%	45%
6.6. Quels sont les avantages des ouvrages d'assainissement pour votre famille (en dehors de la santé) ?		Avantage No 1		
	amélioration des comportements	41%	42%	41%
	économie d'argent	12%	6%	7%
	moins de conflits dans la cour	1%	1%	1%
	moins de conflits avec les voisins	11%	11%	11%
	plus de respect	34%	34%	34%
	autre	1%	6%	5%
6.7. Que représente pour vous l'hygiène ?		Aspect No 1		
	propreté du corps	75%	69%	70%
	ordre	4%	3%	3%
	propreté de vaisselle	5%	12%	11%
	propreté latrines	3%	4%	3%
	autre	13%	13%	12%
6.8. Et pour vous, qu'est-ce qu'un ouvrage d'assainissement change dans la vie quotidienne ?				
	meilleure image dans le quartier	45%	47%	47%
	facilité les tâches domestiques	25%	20%	21%
	meilleure relation dans la cour	7%	6%	6%
	meilleur rapport avec les voisins	24%	26%	26%
6.9. Quelles améliorations vous souhaitez encore pour votre habitat ?				
6.10. Allez vous participer au financement ?				
	oui	70%	69%	69%
	non	30%	31%	31%
6.10. Comment ?				
<b>7. OBSERVATIONS PAR L'ENQUÊTEUR</b>				
7.1. Etat de propreté de la rue				
	Propre	10%	5%	6%
	Moyen	51%	60%	59%
	Mauvais	39%	35%	35%
7.2. Etat de propreté de la concession				
	Propre	45%	28%	31%
	Moyen	43%	54%	52%
	Mauvais	12%	18%	17%
7.3. Etat de propreté des latrines				
	Propre	38%	17%	22%
	Moyen	51%	47%	47%
	Mauvais	12%	35%	31%
7.4. Impression de l'enquêteur sur le niveau de vie du ménage				
	aisé	23%	6%	9%
	statut moyen	62%	60%	60%
	pauvre	15%	34%	31%

<sup>28</sup> Bénéficiaires d'ouvrages ONEA (tous types)

		ONEA <sup>29</sup>	Autre	Total
7.5. Langue de l'entretien	Mooré	39%	54%	51%
	Français	55%	43%	45%
	Autre	6%	4%	4%
7.5. Qualité de l'entretien/discussion et observations				

### 3.2, 3.3., Questions sur les équipements sanitaires (type ONEA et AUTRE)

#### 3.2. Equipements sanitaires type ONEA

##### 3.2. (a) Nombre

NOMBRE	Rehabilitatio	VIP	TCM	Puisard	Douche	Complexe
n						
0	62	62	104	33	49	96
1	36	40	0	71	52	8
2 et plus	3	2	0	0	3	0
0	61.4%	59.6%	100.0%	31.7%	47.1%	92.3%
1	35.6%	38.5%	0.0%	68.3%	50.0%	7.7%
2 et plus	3.0%	1.9%	0.0%	0.0%	2.9%	0.0%

##### 3.2. (b) Depuis combien de temps ?

AGE	Rehabilitatio	VIP	TCM	Puisard	Douche	Complexe
n						
1 an et moins	7	7	0	15	9	0
2 ans	7	5	0	8	7	2
3 ans	8	7	0	9	8	1
4 ans	3	6	0	10	9	0
5 ans et plus	8	9	0	13	10	2
1 an et moins	21%	21%		27%	21%	0%
2 ans	21%	15%		15%	16%	40%
3 ans	24%	21%		16%	19%	20%
4 ans	9%	18%		18%	21%	0%
5 ans et plus	24%	26%		24%	23%	40%
Moyenne (ans)	3.2	4.0		3.7	3.8	

<sup>29</sup> Bénéficiaires d'ouvrages ONEA (tous types)

### 3.3. Equipements sanitaires type AUTRE

#### 3.3. (a) Nombre

NOMBRE	Tradition- nelle	VIP	TCM	Puisard	Douche	Fosse septique	Autre
0	48	457	457	280	71	359	415
1	399	2	2	167	359	88	40
2 et plus	11	0	0	11	27	12	4
0	10.5%	99.6%	99.6%	61.1%	15.5%	78.2%	90.4%
1	87.1%	0.4%	0.4%	36.5%	78.6%	19.2%	8.7%
2 et plus	2.4%	0.0%	0.0%	2.4%	5.9%	2.6%	0.9%

#### 3.3. (b) Depuis combien de temps ?

AGE	Tradition- nelle	VIP	TCM	Puisard	Douche	Fosse septique	Autre
1 an et moins	12	1	0	8	12	3	1
2 a 5 ans	79	0	0	26	55	10	8
6 a 10 ans	116	0	0	39	73	20	10
11 a 20 ans	76	1	1	35	96	18	6
21 ans et plus	34	1	1	21	40	14	3
1 an et moins	4%	33%	0%	6%	4%	5%	4%
2 a 5 ans	25%	0%	0%	20%	20%	15%	29%
6 a 10 ans	37%	0%	0%	30%	26%	31%	36%
11 a 20 ans	24%	33%	50%	27%	35%	28%	21%
21 ans et plus	11%	33%	50%	16%	14%	22%	11%
Moyenne (ans)	11.3	19.5	40.0	11.0	10.8	12.7	9.9