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# Private Sector Management of Fecal Sludge: A Model for the Future?

Focus on an innovative planning experience in Bamako, Mali

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## FOREWORD

Former Peace Corps Volunteer Marc Jeuland wrote this document at the end of two years of service with the GIE Sema Saniya, an independent sanitation service provider in Bamako, Mali. During that time, through their mutual efforts to improve fecal sludge planning in Bamako, the author and GIE developed trust and respect which permitted observation of many valuable insights. This work is co-produced by the Department of Water and Sanitation in Developing Countries (SANDEC), a part of the Swiss Federal Institute EAWAG. The collaboration between the various individuals and organizations which brought about the work herein described may prove helpful to others involved in urban sanitation in the developing world.

Why is the Bamako case interesting? Recently, it has become obvious that existing developed world sanitation models, centered on a strong public sector and large private utilities, cannot address the many constraints of the developing world. As the shortcomings of such models have become apparent, the search for alternative solutions and approaches seems to be gaining momentum (through the work of the World Bank, UNDP and bilateral donors such as the Swiss Development Agency – SDC). This search has led to the discovery of an often vibrant and active private, independent service sector, which is beginning now to receive more attention (studies by *Collignon*, *Bolomey*, *et. al.,* and *Blunier*). This paper documents a recent case of private sector participation (PSP) in urban sanitation, through the regular, diverse work of the GIE Sema Saniya in West Africa. It further demonstrates that private-public partnerships (PPP) are possible in surprising areas, such as the planning, construction and management of a fecal sludge treatment plant serving a large city. The project in question required a mixture of private (company investments) and public sector funding (UNDP and Peace Corps and SANDEC technical assistance); plus, the PPP extended beyond mere financial assistance.

This document is destined for donors and project planners interested by the potential for private sector involvement in their efforts to develop and improve the city sanitation sector. Urban and strategic planners may also find the lessons learned in Bamako interesting. The report attempts to: specifically address some of the issues needing to be considered in planning a treatment project, give detailed analysis of the factors that led to the results obtained, to critically assess those results, to make specific and general recommendations, and to compare the future of fecal sludge management in Bamako with other situations around the world.

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## GLOSSARY, ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| Exchange Rates | 656 F. CFA = € 1 (fixed)<br>530 F. CFA = $ 1 (July 14, 2004) |
| Fecal sludge (FS) | Sludges of variable consistency collected from so-called on-site sanitation systems, such as latrines, public toilets not connected to sewers, septic tanks and aqua privies. The fecal sludge comprises varying concentrations of settleable or settled solids as well as other, non-fecal matter (*Heinss et al*., 1998) |
| OSS | On-site sanitation |
| Traditional latrines | |
| Improved latrines | |
| FSTP | Fecal sludge treatment plant |
| GIE | Groupement d'Intérêt Economique; literally economic interest group; a small profit-seeking enterprise |
| CREPA | Centre Regional pour l'Eau Potable et l'Assainissement à Faible Coût; CREPA is a West African organization operating in French-speaking countries, and CREPA-Mali is the associative branch located in Mali. |
| DNACPN | Direction Nationale d'Assainissement, de Contrôle de Pollution et des Nuisances; DRACPN is the regional equivalent |
| Voirie | Municipal sanitation services |
| Mairie | Literally city hall; these municipal administration centers are present at the commune level in Mali (rural as well as urban) |
| Commune | The basic local government administration area; Bamako has six because it is such a large city |
| SIBEAU | Société Industrielle d'Equipement et d'Aménagement Urbain; the fecal sludge treatment plant serving Cotonou, Bénin |
| USV | Union des Structures de Vidange; the syndicate of pit-emptying operators in Cotonou |
| PSP | Private sector participation; this term is most often used in domains that are traditionally dominated by the public sector |
| PPP | Private-public partnership, a term applying to a wide spectrum of initiatives in which the public and private sectors work together or side-by- |

| | |
|---|---|
| | side to achieve a given objective; the term often refers to sanitation and water supply problems |
| UNDP | United Nations Development Program |
| GEF | Global Environmental Facility, a UNDP funding program promoting environmental projects |
| SDC | Swiss Agency for Development and Cooperation |
| SIDA | Swedish International Development Agency |
| ACDI | Agence Canadienne pour le Développement International, the Canadian foreign aid agency |
| USAID | United States Agency for International Development |
| PCV | Peace Corps Volunteer; American volunteers working in foreign countries in various areas, such as promotion of health, sanitation and small business development |
| PCPP | Peace Corps Partnership, a funding program that allows volunteers to seek funding for their Peace Corps projects with private donors in the United States |
| UWEP | Urban Waste Expertise Program, an NGO supported by the Dutch government working on sanitation problems throughout the world |
| WASTE | |

## I. THE CONTEXT

Bamako's Commune VI (one of six city sub-districts) is a fast-growing grouping of urban and peri-urban neighborhoods in Mali's capital city. This commune contains the largest land area of the city's six political units. Since construction of a second, four-lane bridge over the Niger River in the mid 1990's, the population of Communes V and VI in particular has mushroomed, as people from the crowded, older sections of the city (Communes I-IV) have moved to more open space and people from suddenly better connected rural areas have moved closer to the city looking for employment. Commune VI, predominantly residential, has itself come to include over 300,000 inhabitants in a city of greater than 1.5 million. Its own growth rate exceeds the already high urbanization trend observed in the remainder of the District (6.4% growth per year – UNDP, 1999).

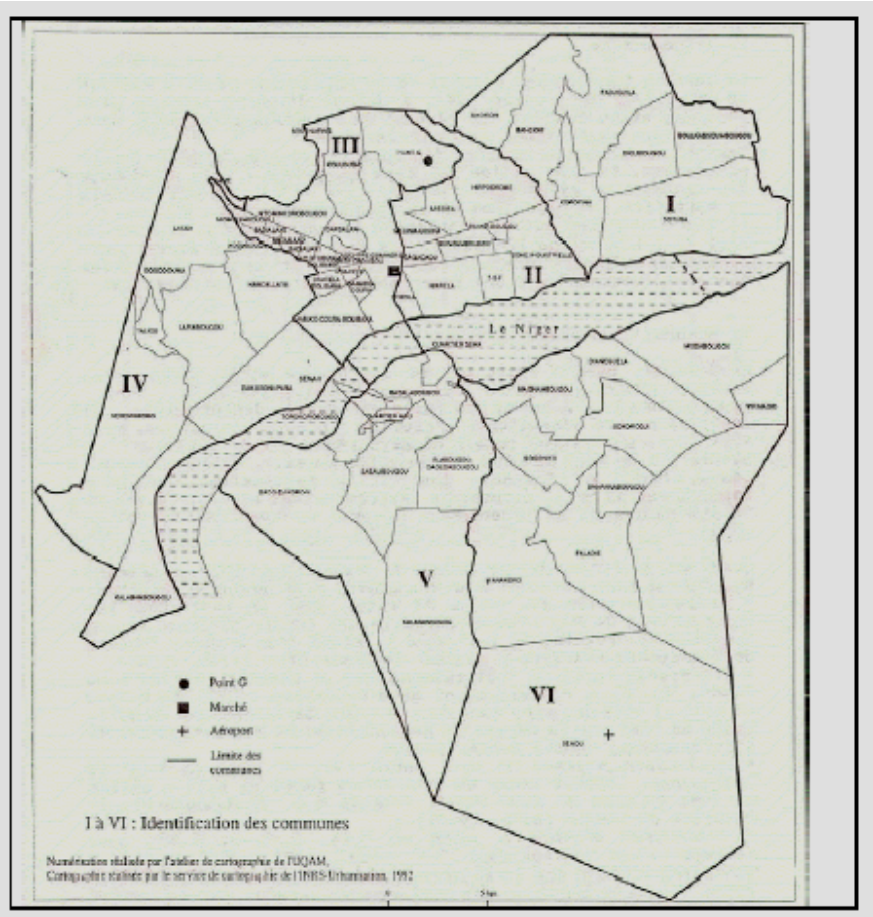


*Figure I-1: Map of the six Communes of Bamako, and their neighborhoods*

Commune VI also contains people from a variety of socio-economic backgrounds. In a small-scale socio-economic study conducted in 2003, these differences are apparent (*Bolomey et. al*, 2003a). Far out neighborhoods such as Sénou, Missabougou and Yirimadio are peri-urban; the urban neighborhoods range from zoned and well-established (Faladie, Magnambougou and parts of Niamakoro) to much less well-off and unzoned (Magnambougou village and Sokorodji).

## II. HISTORY AND CURRENT PRACTICE IN FECAL SLUDGE MANAGEMENT IN BAMAKO

### 2.1 Commune VI: Conditions of free competition

The increase in population and density of Commune VI, coupled with the prevalence of on-site sanitation structures for wastewater disposal, has encouraged the growth and widespread use of a sanitation installation emptying service. In Bamako, as in nearly all of sub-Saharan African cities and towns (*Strauss, et. al*, 2000), the majority of households use on-site sanitation (OSS) installations such as traditional and improved latrines. The wealthiest families – 10-20% in non-zoned and mixed neighborhoods and 70% in wealthy areas (*Bolomey, et. al*, 2002, p.13) - have septic tanks. The percentage of households served by OSS systems in Bamako exceeds 98%, and in Commune VI it is 100%.

These installations periodically fill up. Given the constraints on land use and availability in the city, it is not possible to simply dig new pits, as is traditional practice in some rural areas. Over the years, the emptying service for fecal sludge (FS) has evolved from an exclusively manual operation to a split manual-mechanized service. The first pump truck to be parked in the commune was purchased by the *Groupement d'Intérêt Economique Sema Saniya* (Faladie-Sema is the name of the principal neighborhood served and *saniya* is the Bambara term for sanitation or cleanliness) in 1995 with the aid of a subsidy from the French Development Organization ACCT. Before this, inhabitants of Commune VI had to rely on manual labor to empty pits, or call trucks parked further, 10 km away on the other side of the river.

Today, there are four pump truck-operating entrepreneurs in Commune VI. The *GIE Sema Saniya* owns two of these trucks (the second was purchased from company profits in 1997), and there are a total of 11 in the zone (*Bolomey*, *et. al*, 2003). Typical fees for emptying range from 10.000-12.500 F. CFA/trip, depending on variables such as pit distance from the street or driving distance for the trucks from their parking location. Free competition exists between the enterprises, yet they will seek to mutually assist one another in case of need. Bakary Doumbia, *Sema Saniya*'s manager of operations, states that the GIE sometimes rents trucks from other companies for a marginal fee in case of breakdowns, and that the entrepreneurs are willing to sell and exchange parts with one another if necessary. Plus, in the event of excessive client demand, the company recommends callers to contact one of its competitors (*Doumbia*, 2003).

The sanitation activity of these entrepreneurs is small-scale but offers broad coverage to city inhabitants and responds to an unmet need, They fall into Solo's categorization of "the other private sector," referring to water and sanitation service providers that are independent of large foreign water utilities now in widespread existence throughout developing countries. These small enterprises are estimated to provide 90% of sanitation services in urban settings in Africa (*Solo*, 04/99, Pp. 118-120) and are characterized as skilled in creating "appropriate models to fill every circumstance and need" (*Solo*, p.121).

As in the rest of Bamako and in many other large cities of the developing world, these pump trucks and manual pit emptyers dump FS in an unregulated manner on empty plots of land on the city outskirts (Figure II-1), and occasionally in surface waters of the Niger River or other small seasonal streams or drainage ditches. Commune VI being relatively sparsely inhabited, trucks do not need to travel far to find such dumping grounds.

*Figure II-1: The historic, unregulated fecal sludge disposal situation in Bamako has trucks dumping untreated waste on or near agricultural fields (shown above), in surface waters and on empty land*

The *GIE Sema Saniya* has invested considerable resources since 1999 to plan and construct the first fecal sludge processing treatment plant in Mali. This plant, with co-funding from public donors (UNDP GEF and Peace Corps Partnership) and private company funds, was inaugurated in March, 2004 and will be receiving fecal sludge imminently. The private sector initiative leading to the construction of this plant is a promising new development in the field of FS management, but one which must be evaluated and considered in detail to judge its level of appropriateness in the Bamako context as well as others. One aim of this paper is to begin that evaluation. There is another private FS treatment plant in West Africa, at *SIBEAU* in Cotonou, Benin, but the model there is slightly different. A comparative study of those two cases, along with public sector models for Bamako and in other countries follows in Chapter IX and X of this paper.

To date, communal authorities play a minimal role in the FS management picture in Commune VI. While it is true that the *mairie* (see glossary) there specifies dumping locations for individual entrepreneurs and attempts to discipline the ones who bother the population, (an improvement since 1999, when apparently no controls existed - *Collignon*, 1999, p.25) such regulatory enforcement is both erratic and subject to bribes and financial manipulation. Nonetheless, the *mairie* seems to be evolving towards a more active role as its competence in sanitation improves and the sector becomes more defined.

### 2.2 Elsewhere in the District of Bamako: "Distorted" market conditions

The FS management situation in Commune VI is generally similar to that in the rest of the District of Bamako. Both manual and truck-emptying practices are common throughout the city. Households unable to pay for mechanical emptying seek out emptying by manual laborers. Over the years, the municipality and public involvement in this activity has remained marginal. In 1999, 80% of the trucks were owned by entrepreneurs (*Collignon*, 1999, p.34), today only 3 of more than 30 trucks are non-private sector (and 2 of those 3 trucks are typically out of service). This trend reflects a greater one throughout West African cities, where municipal sanitation services have not yet been heavily involved in fecal sludge management. Hence, as in solid waste collection, the private sector has organized itself to make fecal sludge collection and haulage a profitable business.

Still, some notable differences do exist between Commune VI and the others in Bamako. In Commune IV, for instance, the entrepreneurs owning trucks have organized themselves into a fairly powerful syndicate which fixes prices at a much higher level (at least 25.000 F. CFA/trip[1]) than those charged in the more competitive Commune VI. In fact, these high prices sometimes enable trucks from as far as Commune VI – 20 km away - to gain contracts in their zone (see map on previous page). Thanks to extensive work by the Dutch-financed NGO UWEP, this syndicate is in close contact with the communal authorities to regulate dumping practices. In addition, Commune IV is the site of another pilot FS treatment initiative, spearheaded by UWEP and supported with funding from the Government of the Netherlands through WASTE. Their communally-owned treatment plant is now open and has received discharged FS, but negotiations with the truck syndicate have in the past proven difficult. The major obstacle to the operation of this plant remains the distance to the plant over notoriously bad roads.

Commune II also presents an interesting situation. Its mayor recently banned private entrepreneurs from operating pump trucks and acquired one for the *mairie* with public funds in order to regulate the market and dumping practices. However, the Commune's control over this situation has slipped considerably due to the fact that the one truck cannot meet the demand for emptying, and breakdowns paralyze the entire system. Still, the involvement of this truck does limit the ability of competitors to charge excessively high fees.

[1] Or about $ 47 (€ 38), at an exchange rate of 530 F. CFA = $ 1 (July 14, 2004)

## III. STAKEHOLDERS: STRENGTHS, WEAKNESSES, AND ROLES

### 3.1 Households

In Bamako, households are generally organized into one-family concessions, grouping together large numbers of relatives (often > 10 people) in one or several buildings around one central courtyard. For those able to pay for them, internal bathrooms tend to be connected to septic tanks by flush systems, but most families also have outside latrines or flush systems as well, to be used by children or household servants. Over 99% of the population uses on-site sanitation (OSS) installations, with only the major hotels and a few places in the center of the city connected to sewer-type systems.

A study of 306 concessions in Commune VI (*Bolomey, S. et al.*, 2003a) revealed the distribution of experiences shown in Figure III-1 for emptying of OSS installations:

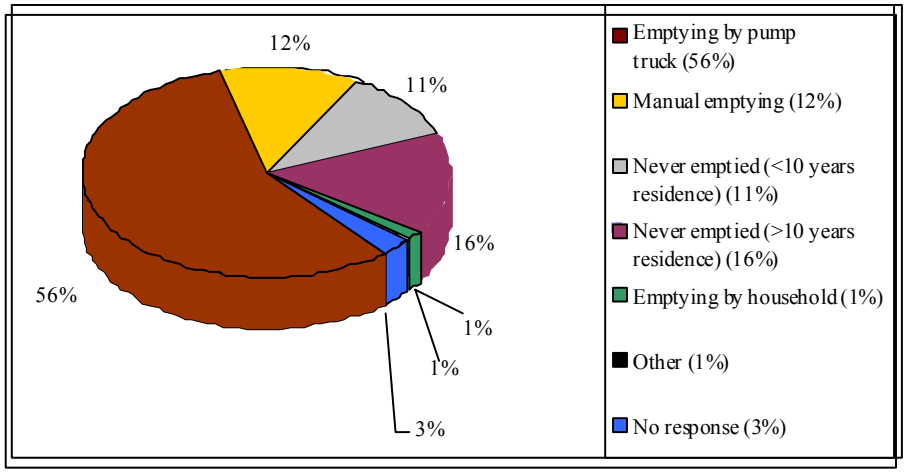


*Figure III-1: Emptying practices used in Commune VI of the District de Bamako (Bolomey, et. al, 2003a).*

In viewing this graph, it is important to note that mechanical emptying by pump truck is the dominant method selected by the population, despite the relatively high price charged for the service. Among those households which have emptied their sanitation installations, about 81% choose to call one of the truck-operating entrepreneurs.

This choice is bewildering because of the fact that the "willingness-to-pay" measured in that survey seems to be much lower than the average 12,450 F. CFA/voyage (roughly $20) fee (see Table 1).

*Table 1: Willingness-to-pay of survey respondents compared to actual fees*

| | **Price** (F. CFA/trip) | **Standard deviation** (σ) |
|---|---|---|
| Average emptying fee | 12,450 | 2,200 |
| Willingness-to-pay | 7,000 | 2,300 |

The great discrepancy between fees actually paid and "willingness-to-pay" can be explained by several factors. First, one must consider convenience and relations between community members. The truck-emptying service really is much more clean and rapid for households and their neighbors. Among clients who call upon the truck-owning entrepreneurs to empty their sanitation installations, a strong majority list availability or convenience as a vital criterion in their choice. Figure III-2 reveals why and how clients of the mechanical service make their choice:

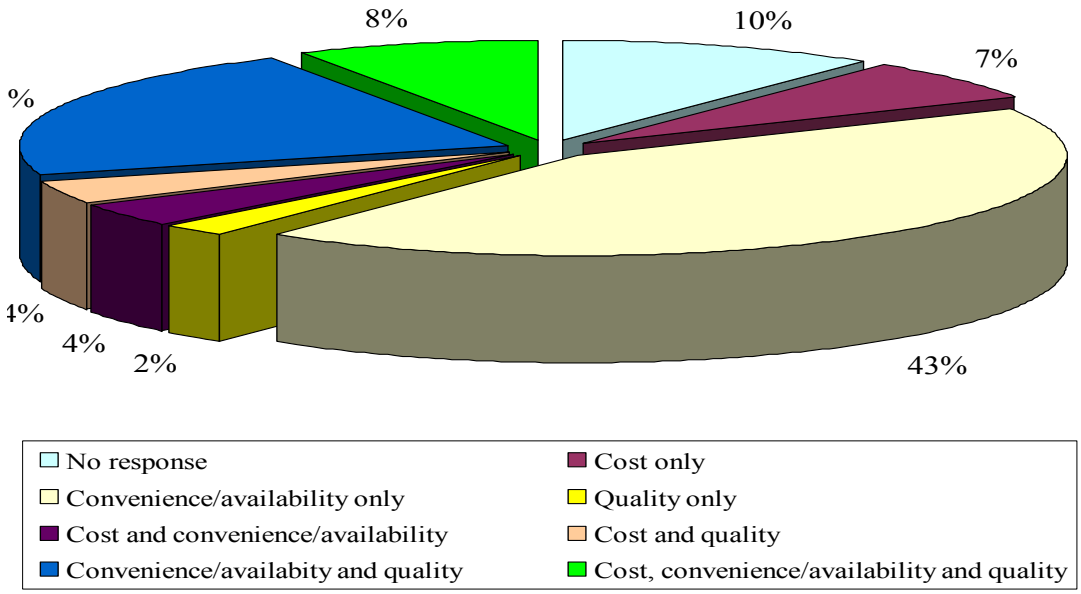


*Figure III-2: Factors households consider in choosing the mechanical pit emptying service*

The importance of convenience is further demonstrated by the failed attempt to introduce a more "appropriate" mechanical technology in Bamako, and other places in West Africa. An NGO-private enterprise partnership in Mali developed a prototype with a 200 L cistern mounted on a little motorized vehicle, but the idea never got off the ground because of the population's lack of confidence in the technology.

In addition, people in Bamako appear to understate their willingness-to-pay as if bargaining with the individual doing the questionnaire. Thus, a differentiation should be made between "willingness-to-pay" and "ability-to-pay." The fact that there is little correlation between the willingness-to-pay and relative wealth of respondents (*Bolomey, et. al*, 2003a, p.16) further lends support to the fact that emphasis should be placed on this distinction.

Still, the high price almost certainly helps to explain why households tend to wait until their installations are nearly overflowing to call for the service. When identifying the combination of criteria that determine when they call the emptying service, the distribution shown in Figure III-3 is found, showing that only full pits really bring about cleaning actions. After those conditions are reached, 98% of those surveyed call the

service in the following days, lending credibility to the idea that households are "able-to-pay" when they need to.

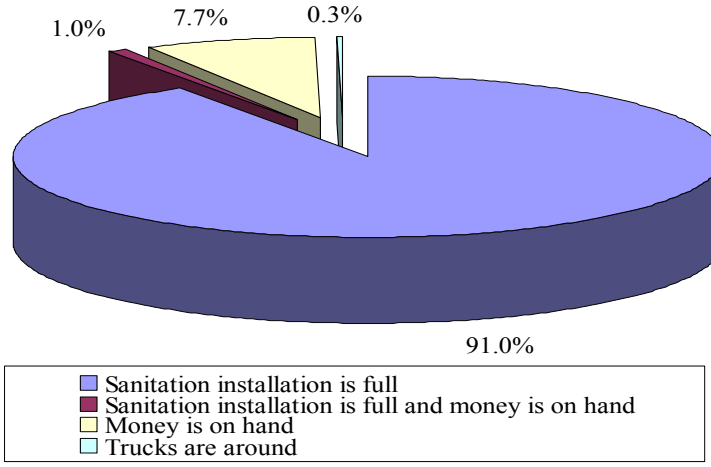


*Figure III-3: Criteria on which households base their decision to empty filled installations*

Strengths: Cleanliness in the concession is important
Can demand (with their money) convenience and quality from sanitation service providers

Weaknesses: Not very knowledgeable about FS (see Chapter VI)
Emptying fees are high for many households (*Bolomey, et. al*, 2003a)
Wait until the last minute to empty OSS installations

### 3.2 The Private Sector

The private sector is the dominant actor involved in FS management beyond the household concessions. Entrepreneurs owning pump trucks (81% of service calls), or self-employed manual emptying agents (18% of service calls) are the two major types of operators encountered. As mentioned in section 3.1, there are 4 entrepreneurs owning 11 trucks operating in the Commune. The smallest such entrepreneur owns and runs one truck himself. The largest one owns four trucks. Though barriers to entry exist (high capital cost of pump trucks) and start-up loans are usually not accessible to these promoters (lack of collateral), the growth of the sector remains high, which is indicative of the business opportunity that FS collection represents.

While these various entrepreneurs may be personally invested in diverse activities, only the *GIE Sema Saniya* is considered a formal sanitation service provider because of its work in solid waste management. There is no formal licensing of the FS collection entrepreneurs. More information about the *GIE Sema Saniya* (stability, financial viability, activities, role in the community) is provided in Chapter V. In addition, Chapter VIII considers the organization's work to bring FS treatment to the Commune.

*Figure III-4: Mechanical emptying of a septic tank in Commune VI of Bamako. Because of the long distances often found between the street and the pits emptied, a series of tubes must be connected together before pumping can begin.*

It is much more difficult to determine the number of manual emptying agents in the Commune. These individuals tend to also work other types of jobs (often as farmers or vegetable gardeners) but respond to the demand of concessions in peri-urban zones unable to pay for the mechanical emptying service. In the case of gardeners, households report that gardeners sometimes seek to empty latrines at times when they need some fertilizer for their crops.

Also related to FS management, but in a different sense, is the work done by operators of communal or public latrines. These operators can be formal organizations like GIEs and associations or individual entrepreneurs. They charge fees for access to sanitation installations in busy traffic areas such as bus stations or markets. Commune VI is the site of the major bus station in Bamako, and so contains a number of these toilets. They fill up quickly and depend heavily on the mechanical emptying service to remain useable.

Strengths: Responds well to market demand
Creates jobs locally
FS collection is profitable

Weaknesses: Profit seeking leads to bad practices
Lack of capital and replacement equipment
Inability to access financing grants and loans
Lack of collaboration with municipal authorities
Lack of organization

## 3.3 Non-governmental organizations or associations

### *3.3.1 CREPA-Mali*

CREPA-Mali is the national branch of the Centre Régionale Pour l'Eau Potable et l'Assainissement à Faible Coût, a West African organization based in Ouagadougou, Burkina Faso. This not-for-profit organization works as a resource center to develop and promote appropriate sanitation technologies for countries in francophone West Africa through training, applied research and consultancy. It assembles teams of engineers, sociologists and planners together to solve current problems. The center is partly self-sufficient, but receives significant co-funding from SDC (Swiss Agency for Development and Cooperation and SIDA (Swedish International Development Agency).

In 2001, CREPA developed a regional research program (PROGEBOUE) to address the technical, institutional and socio-economic challenges present in FS treatment and management in five coutries: Sénégal, Bénin, Côte d'Ivoire, Burkina Faso and Mali. Mali was not originally included in the program, but the creation of the *GIE Sema Saniya* - CREPA partnership there and plans to construct two treatment stations in Bamako led to its inclusion in the program in 2002. The GIE is interested in practical operation, while CREPA is intrigued by possibilities for research, monitoring, technological improvement, and recommendation of "best" practices.

Strengths: Has diversified technical expertise (engineers, sociologists, etc.)
Associative structure allows more access to funding
Currently prioritizes improving FS management in West Africa
Well-connected to national government and authorities

Weaknesses: Lack of financial independence
Low demand for expertise in sanitation issues
Too small to wield strong influence over sanitation sector

### *3.3.2 Other associations*

Two consumer protection associations (REDECOMA and ASCOMA) are based in Commune VI and serve as a conduit for households and private individuals to have their concerns addressed at a higher level. In the past, these associations have not heavily participated in the FS management picture in Bamako, but they do remain interested and often critical of the activities of some sanitation service providers similar to the *GIE Sema Saniya*.

Strengths: Well connected to populations and households
Wield a fair amount of influence politically

Weaknesses: Like households, not really involved or informed of current FS management picture
Overstretched by innumerable concerns
Do not have sufficient means or personnel to intervene in large-scale awareness-raising

## 3.4 Government

### *3.4.1 Communal and municipal authorities and technical services*

The authorities in Commune VI and in the broader District of Bamako have not played a very important role in FS management to date, but this is shifting as local capacities improve (decentralization of the government is only very recent) and the responsibilities of the specific agents are gradually clarified. The local government of Commune VI does specify to individual operators where discharging is supposed to occur. However, enforcement remains generally weak, and illicit dumping dominates.

Technical services play a slightly different role. At times, the technical sanitation service, or *voirie*, actually runs a pump truck. In practice, this truck often suffers from breakdowns, and so is not dependable.

Strengths: Presence of some skilled personnel
Sanitation and FS management in particular are gaining attention
Punctual actions to clean up the District of Bamako are frequent

Weaknesses: Sanitation activities depend on political climate
Enforcement is weak
Insufficient personnel and capacity

### *3.4.2 Police*

The police is generally considered to be the enforcement arm of the municipality, but in Bamako its role is often complex. At times, these agents do prevent illicit dumping of FS. Frequently, though, they act individually and/or collectively to extract profit from the FS management chain. In practice, this means that they occupy strategic intersections where they can stop trucks carrying FS and charge them for passage. The fees collected are difficult to trace. In general, trucks in clear violation of the law (trucks failing or ignoring technical visits, having mechanical problems, not licensed as municipal vehicles, etc.) are subject to more frequent fines, but even operators holding official passes giving them right of circulation (there is no official licensing, so these passes are rather informally issued) end up paying “tolls” to the police cartel. This practice burdens entrepreneurs budgets and indirectly raises emptying fees, which in turn is reflected in higher prices charged households.

Strengths: Has power and mandate to enforce regulations

Weaknesses: Numerous police structures make regulation difficult
Low salaries
Lack of licensing of FS collection trucks
Governance and corruption are problems
Like households, generally uninformed about the dangers of current FS management

### *3.4.3 National authorities and technical services*

The major roles of the national authorities and technical services in Mali are to set environmental policy, advocate for legislative change as it pertains to sanitation and promote enforcement at the local level. In this sense, a new governing body called the DNACPN (Direction Nationale de l'Assainissement, de Contrôle de Pollution et des Nuisances) was formed in 1999 and encourages its local agents (placed at the level of each Commune to favor decentralization) to advocate for enforcement of the law against illicit dumping. This regulating agency is still carving out its role; previously sanitation was under the jurisdiction of the *Service d'Hygiène* in the Health Ministry. Now it falls under the Environmental Ministry.

Strengths: Some technical expertise and experience
Involved in improved strategic sanitation planning
Elaborating regulatory texts

Weaknesses: Full enforcement of regulations demands reform
Confusion exists about "how to do" sanitation (i.e. follow the developed world regulations or create new ones)
Problems with Health Ministry over sphere of influence
Lack of sufficient personnel
National policy sometimes does not translate into local action

## 3.5 Farmers

The participation of farmers in the FS management chain is irregular and dependent on whether or not individual FS collection operators decide to obey or ignore the law and directives provided to guide their discharge practices. In Commune VI, the municipal authorities, in principle, do not allow dumping on crops; however, enforcement of the law is erratic. As a result, many operators augment their revenues by dumping untreated FS on fields at the demand of farmers for a small fee.

Since farmers are willing to pay for untreated FS in Bamako, they represent a potential market for treated and composted FS if production can be assured cheaply enough.

Strengths: Local demand for FS

Long experience with harvesting and exportation of grain (especially millet and corn)

Weaknesses: Heavily-farmed soils are depleted
Dependent on unsustainable farming with chemical fertilizers
Use untreated FS

### 3.6 Summary of roles and importance of stakeholders

The various stakeholders and their roles are then summarized in Table 2.

*Table 2: Tabular summary of stakeholders in FS management in Commune VI*

| **Stakeholder** | | **Role(s)** |
|---|---|---|
| Households | | • Own OSS installations in which FS accumulates<br>• Use FS pit-emptying service |
| Private sector | | • Provides pit-emptying service<br>• Operates public latrines<br>• Sells FS to gardeners or reuses FS in fields<br>• Will provide treatment of FS (see Chapter VIII) |
| Associations | CREPA-Mali | • Helps plan FS treatment<br>• Will monitor FSTP (see Chapter VIII) |
| | ASCOMA<br>REDECOMA | • Sometimes criticize municipal sanitation situation |
| Government | Communal authorities | • Specify dumping locations<br>• Occasionally operate pit-emptying trucks |
| | Police | • Charge passage "tolls" to trucks<br>• Sometimes enforce dumping regulations |
| | National authorities | • Pressure local authorities to enforce legislation on dumping |
| Farmers/Gardeners | | • Purchase untreated FS<br>• Will purchase treated FS |

For the purposes of illustration, a subjective spectrum (Figure III-5) rating the influence and importance of each of these stakeholders in FS management is included. *Influence* is the power held over the sector and practices, whether used or not. *Importance* was the extent to which the stakeholder played an active role in FS management at the beginning of planning for an improved situation around 1999.

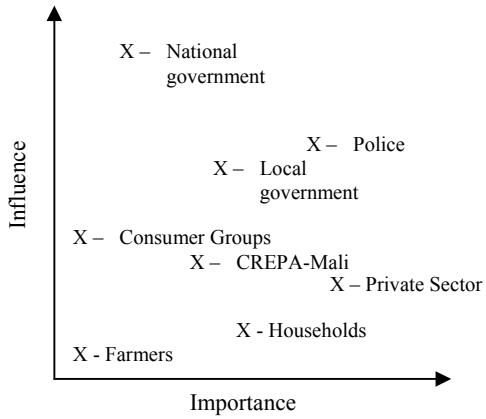


*Figure III-5: Diagram depicting the relative influence and importance of various stakeholders over current FS practices in Commune VI*

## IV. THE CASE OF THE GIE SEMA SANIYA

### 4.1 What is a GIE, and what is Sema Saniya?

GIE stands for *Groupement d'Intérêt Economique*, literally "economic interest group." These organizations tend to be very small businesses that do not begin with much capital but in the past received start-up subsidies from the government or from NGOs or other donors. As is implicit in their name, they are geared towards generating revenues, making profits and creating employment. GIEs can be involved in diverse pursuits.

The *GIE Sema Saniya* was one of a few path-breaking organizations which become involved in sanitation work in Bamako, Mali. The three founders initially chose GIE status over Non-Governmental Organization (NGO) status because they wanted to pursue a profit-based goal. The idea of the GIE founders was to get involved in the realm of solid waste collection. They had no prior experience in that area, but were motivated by a "responsible citizen" desire to keep their neighborhood clean at a time of rapid urbanization. A small government subsidy for basic equipment helped the private enterprise get started in the neighborhood of Faladie-Sema. The company's status was formally approved on October 30, 1991.

Though its beginnings were humble and its range minimal compared to the need of the large city, the experience of the *GIE Sema Saniya*, along with a few other similar organizations, served to inspire the government to formally encourage the development of similar enterprises through the *Lettre Circulaire 0010*, written on March 9, 1993. Through that letter, the municipal authorities (at the level of the District of Bamako) agreed to provide certain types of assistance – technical advice, search for and provision of subsidies – to the GIEs (*Diarre, et. al*, 1997, Pp.8-9), conscious of the fact that those small businesses were operating in a market they could not serve because of the local government's limited means. After Bamako, many other cities in Mali followed suit and GIEs are present today throughout the country in towns and cities.

### 4.2 The GIE Sema Saniya's founding idea

The three founders of the *GIE Sema Saniya* had an innovative, original idea: to make solid waste collection a sustainable and profitable private enterprise. They were two young women and one man (the latter has since left to direct the municipal sanitation service).

*Figure IV-1: The two current directors of the GIE Sema Saniya: President Mme. Sidibé (left) and Treasurer Mme. N'Diaye (right)*

The founders lived in a relatively new neighborhood in Bamako, unfettered by all of the sanitation problems of the old city, where municipal services had long failed to deal with trash accumulation. Not wanting to observe the same degradation of their own living environment, these founders set out to enlist neighborhood households to subscribe to a solid waste collection service. They would charge monthly fees and go from door-to-door as collection agents. They petitioned the local government in 1991 for initial equipment and were subsidized with a donkey cart and enough money to purchase one donkey, and their idea became reality, initially serving 95 households.

The company's mission is tripartite, and is one around which other private sector sanitation initiatives can also be organized:

- to assure a better living environment to the general population by implicating it in the daily management of sanitation and environmental problems;
- to contribute to develop private initiative in sanitation and city beautification through the use of appropriate technologies;
- to develop a more conscientious citizenry for solving environmental problems.

### 4.3 Organization of the enterprise

The *GIE Sema Saniya* is a small company that rests upon a compact management structure. In time, as services continue to expand, the Board of Directors may consider revising its organization. For the time being, two office administrators and two activity managers supervise its more than thirty employees.

The **Board of Directors** is composed of the three founding members and meets to decide on major initiatives or discuss significant problems formally or informally as the need arises. These promoters maintain the most important administrative duties of the *Groupement*. These three members roles are described below:

The **president** manages the organization. She represents the GIE in its discussions with political authorities and is responsible for cooperation with partner organizations.

The **treasurer** is responsible for the financial status of the GIE and makes most payments.

Formerly**, a director of operations** managed personnel and was responsible for the all technical work done by the GIE. However, since departing to direct the municipal sanitation service, he has been replaced by a pair of managers (but remains himself on the Board of Directors), one of whom assures customer relations and personnel in the realm of solid waste management, and the other assuming responsibility for managing the other activities.

## 4.4 The expansion of solid waste management

Benefiting from its small initial subsidy, the GIE quickly expanded service to concessions throughout Faladie-Sema, and became a model of private sector sanitation intervention, leading to the creation of similar organizations across the District of Bamako and in medium-sized towns in Mali as well. In 2003, the company boasted over 2300 subscribed households in its zone, representing roughly 20,000 people – a coverage rate higher than 60% (*Sidibé, A.,* 2003). The volume of solid waste collected daily is about 75 $m^3$. The local government specifies the zone of intervention for a particular GIE in the domain of solid waste management, assuring GIEs monopolies over their respective zones, but not requiring households to subscribe to their services.

In order to develop and improve its solid waste collection program, the GIE has found several innovations essential for gaining credibility among its local customer base and for improving collection of subscription fees. These innovations are described below:

### *4.4.1 The purchase of mechanical equipment*

The economically questionable decision to move away from donkey cart solid waste collection to a tractor-based service was taken in the late 1990's. This decision was problematic because the costs of mechanical collection are much higher and thus require an increase in prices. However, in taking this approach, the GIE was acting in an image-conscious manner, because the District of Bamako issued a ban on collection by animal-pulled carts (which of course is not enforced), but more importantly because customers demanded it; they were more apt to take the company seriously if it used such equipment. In spite of the increase in monthly fees over the years (from 500 to 1.500 F. CFA/month, and 1.000 to 1.500 F. CFA since the equipment change), few customers have been lost due to this decision. The important point to note is that the change was not sudden and was made only after much discussion and warning to customers in addition to a formal survey.

*Figure IV-2: The decision to move to a mechanized solid waste collection fleet did not make economic sense for the GIE Sema Saniya, but was taken to boost its image and give it credibility among clients. The effet of this decision was to raise prices from 1.000 to 1.500 F. CFA/month, yet did not lead to the loss of many clients.*

### *4.4.2 The decision to suspend service for non-payment*

Another decision which could have upset the GIE's clientele but which has quickly been understood was that specifying and then enforcing the consequences of non-payment of subscription fees for solid waste collection. If clients are over three months behind in the payment schedule, their service is suspended. This company policy has largely cut down on late payments and non-payments.

### *4.4.3 The employment of collection agents and creation of a commission system*

Initially, when clients were few, the president and treasurer collected most subscription fees personally. As the company expanded, though, the management responsibilities increased and other collection agents had to be hired. Many of these agents were not particularly effective at recovering fees because their salaries did not depend on how much money they brought back to the company. That all changed when the GIE introduced a commission based system. All collection agents have the same number of clients (230), and now must reach a 90% recovery rate to receive 10% of those fees recovered as a supplement to a meager monthly salary.

### *4.4.4 Non-commission as a reason for termination of employment*

Finally, another recent policy change (2003) is aiming at cracking down on still ineffective collection agents (who sometimes work other jobs at the expense of collecting fees). This policy specifies that any agent who goes three consecutive months without commission will lose his/her employment with the company.

Since the institution of this policy, three of ten agents has been fired, and collection rates have climbed to around 85% in any given month.

## 4.5 The diversification of activities

As the GIE grew throughout the mid and late 1990's, it also found it productive and profitable to diversify its activities. This diversification in turn made the GIE more stable by allowing it to take calculated risks in uncertain areas in an attempt to determine their market potential, and by eliminating the enterprise's dependence on one particular activity. Over the years, the GIE tried and succeeded in mounting sustainable operations in many areas, employing about 35 full-time employees at 10-15 more part-time. It is important to note that the activities offer services to diverse types of clients: private households, large businesses or organizations and even the municipality.

### *4.5.1 Sale of garbage cans*

To complement solid waste collection service, the GIE also sells garbage cans to its clients. These sturdy and dependable metal receptacles are sold to at very low profit because the company acknowledges that they:

- make collection work easier;
- keep animals and insects out of garbage, thus improving neighborhood cleanliness and the health of its citizens;
- help to minimize the amount of dust and sand that gets mixed with trash (the proportion of dust averaging about 34%);
- limit unpleasant rotting odors.

Approximately 30 garbage cans are sold each month. They are made from old, cleaned oil drums.


*Figure IV-3: Trash cans sold for 5.000 F. CFA to interested customers are designed to enable easy handling by collection crews and are painted with the GIE name to increase publicity. These old oil drums are sold at zero profit because they serve these multiple purposes.*

### *4.5.2 Construction of sanitation infrastructures (soak pits, improved latrines)*

The GIE builds soak pits and latrines for subsidized programs in Commune VI such as those sponsored by UNICEF to provide families with sanitation infrastructures at 30% true market cost. The families pay the 30% and aid organizations help complete the investment. The GIE has been inactive in this domain since 2002, when UNICEF's program in Commune VI ended.

### *4.5.3 Public latrine management*

The GIE constructed a block of six latrines, two showers and three urinals with the help of a subsidy from the Dutch Development Organization at the train station in downtown Bamako (Commune I). Those facilities receive about 250 entries each day. In addition, 32 bathrooms and showers rented from the District of Bamako are managed at the main city bus station in Commune VI. Fees for the toilets are 25 F. CFA and the showers cost 100 F. CFA/entry.


*Figure IV-4: Outside and inside of public latrines in Bamako*

### *4.5.4 Cleaning of clogged storm sewers*

Each year, before the start of rainy season, the District of Bamako offers contracts to the best bidders for the cleaning out of storm sewers and drains. The sewers are usually clogged with trash by this time of year, and not removing it creates serious flood risks. This work is large-scale and very lucrative, and is done beginning in late April until early June. At this time, sanitation GIEs and other entrepreneurs scramble to try to obtain the contracts.

### *4.5.5 Contractual removal of solid waste from municipal transit dumps*

Also extremely lucrative (but prone to error) are the contracts for removal of solid waste from intermediate transit dumps throughout the city. This work is irregular and depends upon the availability of government funds. The problem with these contracts is that the government tends to underestimate the volume of waste that is present at a dump, which in turn puts pressure on the bidders to determine the true amount to be removed. In the past, this service has been very controversial and a source of frustration between the private sector and the municipal authorities.

### *4.5.6 Mechanical emptying of on-site sanitation installations such as septic tanks and latrines*

As mentioned in the beginning of this paper, the *GIE Sema Saniya* is one of many "entrepreneurs" active in the emptying of septic tanks and latrines. Its two trucks each have a capacity of 8 $m^3$. The first was acquired with a subsidy in 1995, and the second purchased from profits in 1997.

*Figure IV-5: A GIE Sema Saniya septic system emptying crew works on household unit. In the foreground, the pick-axe used to break open the tank is visible across the ground. Then, a number of large hoses and extensions are connected together and strapped together using old strips of rubber. In the background, another section of the tank is open and will be pumped as well in order to assure complete cleaning.*

### *4.5.7 Street sweeping of paved thoroughfares*

Street sweeping of paved roads in the center of Bamako is a nightly activity for crews of part-time workers. The sweeping happens at night so as not to bother too may pedestrians and the salespeople who line the streets during the day. It keeps roads relatively free of dust so that the heavy traffic during the day is not as bothersome for the city's inhabitants.

Contracts for sweeping are signed directly with the municipal government of the District of Bamako, awarded to the lowest bidder and split among different providers. A typical *Sema Saniya* contract for one four month lot is roughly 830,000 F. CFA. The *GIE Sema Saniya* holds three such lots. Payment tends to be slow, which can cause problems when paying temporary workers.

#### *4.5.8 Planting and sanitation of recreational zones, called "green" areas*

This is an irregular and contractual service offered by the GIE. Several recreational areas have been improved by *Sema Saniya* in the neighborhood, in response to specific requests and community fund-raising by the general population. No such activities have happened since 2002.

#### *4.5.9 Contractual cleaning*

Like the preceding service, this one is also irregular. None of these activities occurred in 2003.

#### *4.5.10 Composting and production of low grade dirt fertilizer (terreau)*

Though this activity was dormant during 2002-2003 because of planning for the FS treatment plant, two types of "fertilizer" were previously produced and sold to people growing trees and flowering plants for gardens and street beautification. The first was a sort of *terreau*, meaning that small bits of solid waste and dust were mixed together through a sieving process and watered periodically until maturation. The second, a higher quality product, was made through anaerobic composting (in deep holes) of biodegradable trash watered periodically with untreated FS over a period of about 6 months. Both products sold well, though transport to customers and packaging could be problematic.

In addition, the GIE helped spawn an independent construction company, called Diabeso Constructions, which build schools and other public-sector buildings and infrastructures. That company is governed by the same Board of Directors as the *GIE Sema Saniya*.

### 4.6 The question of GIE service reliability

A complaint often heard from citizens in Bamako is that GIEs do not do high quality work. Before attempting to pursue the idea of creating a privately-managed treatment plant, it was deemed necessary to evaluate client perception of the *GIE Sema Saniya*. To this end, a random sample of clients of the solid waste service were asked to rate the quality and frequency of the GIE's work in that area and to judge whether the service improved or deteriorated since the beginning of their subscription.

Figure IV-6 shows the distribution of survey responses rating the quality of the GIE's work. In it, we see that 70% of concessions consider the service good and only 4% rate it worse than fair, an encouraging sign of customer satisfaction. Furthermore, in response to

another question about change in service quality, only about 12% rated the service as having degraded, and a t-test showed the average evaluation of change of quality was not significantly different than "improved." Finally, the most important source of frustration was that pick-up was too infrequent (46%) considering that there are three collections per week.

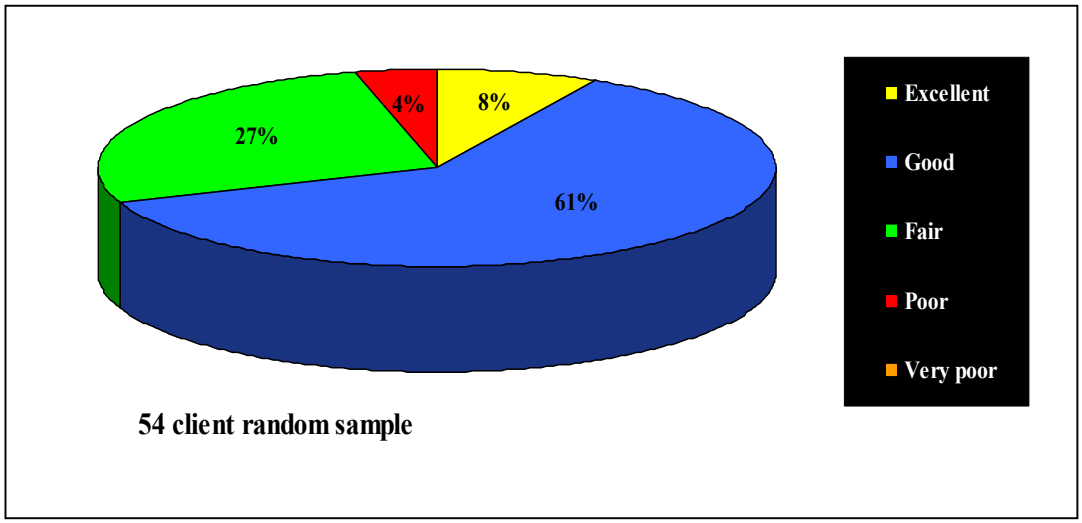


*Figure IV-6: Client responses to the question: How would you rate the GIE Sema Saniya's solid waste collection service?*

An interesting result of this client survey was that cluster analysis revealed the presence of three distinct groups of clients, who can be called in order of size: 1) older (> 5 years) and loyal but merely satisfied (26 respondents), 2) new and happy (23 respondents) and 3) new and unhappy (5 respondents). The GIE interprets the lower happiness of the first group to be the result of short memories not extending to the time when there was no solid waste management service in the area.

### 4.7 Comparative advantages over municipal services

In speaking generally of the "other private sector," into which the *GIE Sema Saniya* can be classified, Solo mentions six comparative advantages (*Solo*, Pp. 124-126) that serve to solidify its position in the sanitation market. These advantages are:

- *Customer service quality*. We have seen above that the GIE has a satisfied and loyal clientele. Despite the totally voluntary situation of client subscription to solid waste services, for instance, most people in the zone opt for this situation rather than dealing with the waste themselves. In addition, it is much easier for clients to meet with the company's administrative officials than with municipal service personnel.

- *Lower rates*. While this advantage is not applicable in solid waste management because of the absence of viable competitors, it can be listed in considering pit-

emptying, street sweeping, and cleaning of storm sewers and transit dumps for solid waste. The latter three are granted to the lowest bidder, and the former is characterized by the lowest rates in the District of Bamako.

- *Varied services*. A look at the number of activities of the GIE is enough to show that it is quite innovative and efficient in this sense.

- *Capacity to grow with demand*. In closer contact with their particular zone of operation than municipal services, the GIE is more responsive to growth and demographic changes. The company promotes its solid waste collection service in these new areas soon after their development.

- *Capacity to reach the poor*. The *GIE Sema Saniya* serves a predominantly wealthy area of Bamako, however, ironically, its poorest customers (in a zone called Faladie Sokoro) are more timely in their payments. The two collection agents serving that area have consistently outperformed the others over the past two years, almost always reaching the 90% payment recovery level, even before some recent innovations. Ability to pay, then, does not seem restricted.

- *Flexible technologies and management systems*. Some of the innovations described in the previous section (pricing, choice of technology and policies) are easy for a company like the *GIE Sema Saniya* to develop. Larger utilities and municipal services have a hard time implementing those types of changes.

### 4.8 Sema Saniya's constraints/problems

As a small, private entrepreneur, promoting what is generally seen as a public good, the *GIE Sema Saniya* faces a number of constraints and problems in its routine operation. It is important to note that these problems are universal to all GIEs, but vary in severity depending on local relationships and conditions.

A number of these problems arise from an imperfect relationship with the local municipality. Even those GIEs which have achieved financial stability and self-reliance remain vulnerable to opposing political whims. The problems can be summarized by the following points:

- There is talk in many high-level meetings of abolishing GIEs because many of them are ineffective, and NGOs and bilateral or multilateral aid organizations sometimes support these discussions;

- The selection process for municipal contracts is not always transparent, and requires much time and paperwork (*Collignon*, 1999, p.25);

- Sanitation GIE pre-tax profits are taxed as highly as those of other private companies (30%), despite the fact that the market is not always lucrative;

- Households are not required to subscribe to the local service, resulting in the creation of many spontaneous dumps, for which the GIEs are subsequently blamed;

- There is little control of police agents who use their powerful position to extract "fees" from the operators or hassle them extensively.

Beyond the problems resulting from imperfect collaboration between the private and public sector, the GIEs face the following constraints as well:

- The inability or unwillingness to pay for services to which households have subscribed, and the lateness of certain concessions to pay. The *GIE Sema Saniya* is one of the best such organizations at collecting payments, now recovering over 80% of monthly fees through the use of innovative collection mechanisms;

- The poor quality of urban sanitation infrastructures, which makes cleaning storm drains difficult. Likewise, degraded roads are hard to sweep and shorten the lifespan of trucks and other mechanized equipment and result in more frequent maintenance needs;

- The lack of cooperation of households with the GIE is apparent in some areas. Citizens use inappropriate containers as trash receptacles at times, making collection of solid waste more time-consuming, or block sweeping crews or maintenance crews when they are sitting outside rather than moving;

- Popular misconceptions about GIE service quality encouraged by municipal authorities, who seek to denigrate the independent operators.

### 4.9 Summary of GIE Sema Saniya's activities, strengths and weaknesses

The analysis presented in Table 3 is a summary of the GIE activities in its various areas of intervention, with some attention given to these comparative advantages, as well as constraints:

*Table 3: Summary of GIE activities and assessment of strengths and weaknesses in each area*

| **Activity** | **Description** | **Advantages/ Positives** | **Constraints/ Negatives** |
|---|---|---|---|
| *Solid waste management – concession level* | Solid waste is collected by three rotating crews for households subscribed to the monthly service at a frequency of three times per week. | • Solid client base<br>• Everyday work<br>• Flexible management system<br>• Steady revenues | • Mechanical equipment not economically efficient<br>• Unsubscribed households problematic<br>• No really appropriate dump |
| *Sale of garbage cans* | Old oil drums are converted into garbage cans and lids are made. The receptacles are painted blue and inscribed with the GIE name. | • Better trash condition, fewer odors and contact with people<br>• Appropriate technology<br>• Increased name recognition | • Zero profits<br>• Some customers unwilling to buy |
| *Construction of sanitation infrastructures* | Soak pits and improved latrines are built for households or other office buildings | • Improved neighborhood sanitation<br>• Appropriate technology | • Usually requires outside funding<br>• Selection process lacks transparency |
| *Public latrine management* | Public toilets are managed in public areas such as the bus and train station. | • Regular, dependable demand<br>• Steady income<br>• Appropriate technology | • Very dirty<br>• Pits fill quickly and traffic makes pump truck access slow |
| *Cleaning of storm sewers* | Storm sewers are cleaned out to remove clogging waste and enhance drainage before rainy season | • Very lucrative | • Dirty, unhygienic work<br>• Work bothers populace<br>• Selection process lacks transparency |
| *Contractual solid waste removal* | Solid waste in transit dumps is removed when municipal authorities approve the transfer | • Very lucrative | • Removal equipment rented<br>• City underestimates quantities<br>• Selection process lacks transparency |
| *Emptying of filled sanitation installations* | A mechanical pit emptying service responds to calls from households and workplaces whose septic tanks or latrine pits have filled | • Can be lucrative<br>• Contracts with big customers (embassies) possible<br>• Large geographic area covered | • Noxious waste untreated<br>• Crews and work not well seen by ordinary citizens<br>• Truck breakdowns<br>• Investments are high<br>• Police hassling |
| *Street sweeping* | Major streets are swept nightly to remove dust and facilitate traffic flow | • Regular work<br>• Helps keep roads free of dust | • Only creates part-time jobs<br>• Sweeper-citizen relations can be testy<br>• Large streets are dangerous<br>• Selection process lacks transparency |
| *Improvement of recreational areas* | Citizens who have raised funds sometimes pay the GIE to improve recreational areas through planting of trees or shrubs and other sanitation work | • Beautifies the neighborhood | • Rare and undependable work |
| *Contractual cleaning* | Cleaning contracts for offices or other places are sometimes offered to the GIE | • Establishes new contacts and clients | • Rare and undependable work |
| *Composting and terreau production* | Solid waste is anaerobically composted or sieved to make *terreau* | • Meets a real need and demand<br>• Inexpensive to produce | • Composting zone is in transit dump and becomes clogged with trash quickly<br>• Irregular demand<br>• Difficult to package |

# V. FINANCIAL VIABILITY OF GIE SEMA SANIYA SERVICES: A TYPICAL YEAR

## 5.1 Solid waste collection service

*Bolomey, et. al* (2003) carried out a financial analysis of this activity for parts of 2002 and 2003 and found that solid waste management brings in a total pre-tax profit of about 40,000 F. CFA per day. This is a significant gain and shows that the efficient structure developed over the years through the previously-described innovations has proven effective.

On a monthly basis, *Bolomey et. al* cite the revenues and costs shown in Table 4 for this service. Costs are made up of salaries of crews and fee collection agents, fuel and maintenance for tractors and administrative costs, but not equipment depreciation.

*Table 4: Financial situation for solid waste collection service*

| **Description** | **Value** (F. CFA) |
|---|---|
| Monthly costs | 1,543,900 |
| Monthly revenues* | 3,225,000 |
| Pre-tax profit | 1,681,100 |
| Taxes (30%) | 504,350 |
| Monthly profit | 1,176,800 |
| **Yearly profit** | **14,121,600** |

*Note: Revenues are calculated based on minimum amount collection agents must bring in; therefore real revenues are probably higher

The analysis conducted by *Bolomey et. al* reveals clearly that solid waste collection is a **very lucrative** endeavor for the *GIE Sema Saniya*, even if it might behave in its marketing rhetoric as though this were not the case.

## 5.2 4.5.1 Sale of garbage cans

In 2003, approximately 240 garbage cans were sold. These are sold for only small net profit in order to encourage customers and clients to invest in them. The cost to the GIE of procuring a trash can is 4,000 F. CFA/unit, and they are sold for 5,000 F. CFA/unit. The cost of painting is low and can probably be estimated at 500 F. CFA/unit. Thus, pre-tax profits from this service were roughly 120,000 F. CFA (*Doumbia, et al.*, July 2004). This activity can be judged as **not lucrative**.

## 5.3 4.5.3 Public latrine management

An average of 250 entries/day paying 25 F. CFA each gives a yearly revenue of 2,250,000 F. CFA. Costs for salaries and cleaning are about 720,000 F. CFA/month. The yearly pre-tax profit is then 1,530,000 F. CFA, which is **marginally lucrative**. One other benefit of this service is the fact that it gives the GIE a prominent position in the busy thoroughfares of the train station in Bamako.

## 5.4 4.5.5 Contractual removal of solid waste from municipal transit dumps

As part of a Bamako-wide campaign to clean out transit dumps conducted in the middle of 2003, the *GIE Sema Saniya* worked at three sites. The contracts were obtained at a total bid of 18,000,000 F. CFA and the cost to the GIE for rental of heavy machinery, fuel and salaries was 15,454,400 F. CFA. Pre-tax profits were then 2,545,600 F. CFA, but payment from the municipality was long delayed; the cash flow problem disrupted some of the GIE's routine activities. Given these problems, the activity in 2003 was judged as **not lucrative**.

## 5.5 4.5.6 Mechanical emptying of on-site sanitation installations such as septic tanks and latrines

The emergence of a multitude of private operators working in the pit-emptying sector suggests that these companies have comparative advantages over public management. In Bamako, municipal trucks no longer operate effectively, in Ouahigouya, Burkina Faso, a municipal truck is now rented to a private operator since the public service was losing money (*Blunier*, 2004, p.8), and the situation is similar throughout West Africa and many other places around the world. A detailed and significant financial analysis of the GIE Sema Saniya's participation in this sector (without treatment) was carried out recently (*Bolomey, S. et al*., June 2003). This work was considered an integral component of the FS treatment plant (FSTP) planning and realization process. Bolomey's financial sustainability analysis was coupled with the socio-economic surveying mentioned previously in this document.

In assessing the viability of pit-emptying, Bolomey noted the breakdown of costs shown in Figure V-1:

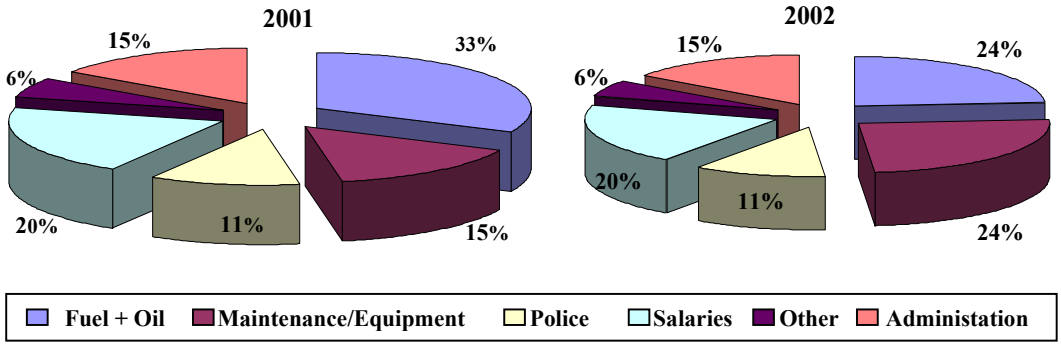


*Figure V-1: Cost structure of Sema Saniya's FS mechanical pit-emptying service (Bolomey, 2003, p.24)*

On a per-voyage basis, the costs (not including amortization of equipment) are highly variable and dependent on the condition of equipment, as shown in Table 5. The high operating cost measured in 2002 in Bamako was the result of a major breakdown of one of the trucks. Results from Ouahigouya compare well with the results in Bamako, and so are included.

*Table 5: Cost/trip of pit-emptying and net profit in Bamako and Ouahigouya*

| Locality | Year | Operating Cost (F. CFA/trip) | Revenue (F. CFA/trip) | Profit (F. CFA/day) | Assessment of year |
|---|---|---|---|---|---|
| Bamako | 2001 | 6,850 | 10,834 | 26,000 | Normal |
| | 2002 | 8,900 | 10,269 | 15,000 | Major truck breakdown |
| | 2003 | 6,450 | 11,200 | 28,940 | Normal |
| Ouahigouya* | | 7,000 | | - | - |

* *Blunier*, 2004, p. vii

The years analyzed show that there is a healthy profit margin per trip. Despite the fact that the activity is **lucrative**, the big drop in profit from one year to another demonstrates that the service remains vulnerable to truck breakdowns, and lack of rigorous management means that it can be quite difficult to replace trucks (*Bolomey*, 2003, Pp.25, 30). Used trucks in fairly good condition now require an investment cost of at least 20,000,000 CFA (*Sidibé*, 2003), which represents 3-5 years of constant operation, depending on whether profit levels from 2001 or 2002 are assumed.

Given the recent profit levels, why has *Sema Saniya* not replaced at least some of its fleet? In 2003, revenues averaged 11,200 CFA/trip (*Soumaré, A*., 2003), so that the profit margin was again substantial (28,950/day from an average of 5.85 trips/day). It must be noted that the company introduced an important innovation that affected both its solid waste management service and its FS pumping service: the creation of a contract with a local fueling station to eliminate internal corruption. However, despite high profits, the GIE has given priority to FS treatment rather than replacing its FS collection fleet; it has invested significant sums into the construction of the new treatment station and dealt with other internal governance problems.

### 5.6 4.5.7 Street sweeping of paved thoroughfares

Finally, street sweeping revenues were 7,998,000 F. CFA in 2003 for three busy street segments. The cost in salaries was 3,150,000 F. CFA, yielding a pre-tax profit of 4,848,000 F. CFA for the year. The activity is rated as only **marginally lucrative**, though, because payments can be quite slow.

### 5.7 Summary of revenues, costs and profits

The financial situation of *Sema Saniya* is summarized in Table 6. It reveals that sanitation activities are fairly profitable for the private sector in Bamako. It should be noted, however, that certain activities by themselves are not very profitable, which means that the other activities can compensate. Herein lies the greatest advantage in diversified activities. This kind of compensation may become important especially if the pit-emptying service becomes a losing endeavor when treatment of FS is added (see Chapter IX, especially Pp.64-65). The extra profit which comes out of diverse activities must also be used to replace old equipment, as depreciation is not included in the analysis.

*Table 6: Financial summary for a typical year* of GIE Sema Saniya operations*

| **Activity** | **Revenues** (F. CFA) | **Costs** (F. CFA) | **Pre-tax profit** (F. CFA) | **Tax** - 30% of pre-tax profit (F. CFA) | **Total Profit** (F. CFA) |
|---|---|---|---|---|---|
| Solid waste collection[&] | 38,700,000 | 18,526,800 | 20,173,200 | 6,051,960 | 14,121,240 |
| Sale of trash cans[#] | 1,200,000 | 1,080,000 | 120,000 | 36,000 | 84,000 |
| Public latrine management[#] | 2,250,000 | 720,000 | 1,530,000 | 459,000 | 1,071,000 |
| Transit dump cleaning[#] | 18,000,000 | 15,454,400 | 2,545,600 | 763,680 | 1,781,920 |
| Pit-emptying[^] | 19,213,738 | 8,716,764 | 10,496,974 | 3,149,092 | 7,347,882 |
| Street sweeping[#] | 7,998,000 | 3,150,000 | 4,848,000 | 1,454,400 | 3,393,600 |
| **Total** | **87,361,738** | **47,647,964** | **39,713,774** | **11,914,132** | **27,799,642** |

*By "typical year," we mean that the activities herein included are routine for the GIE, but the numbers actually correspond to different years (results from incomplete years are extrapolated)

[#] 2003 [&] Jun 2002-Feb 2003 [^] Jan-Nov.13, 2003

# VI. POLITICAL AND SOCIO-CULTURAL CONTEXT IMPACTING FS MANAGEMENT

## 6.1 Gradual formulation of a municipal strategy

In Bamako, little has been done to date to plan and regulate the pit-emptying service sector, despite the fact that the number of operators and practices continues to increase. Municipal authorities have tended to ignore the work of manual operators, and pump trucks dump the untreated waste on fields and in surface waters. Recently, however, there has been increased condemnation by powerful officials of the unregulated dumping, so that communal mayors and sanitation officials have moved to create informal agreements allowing dumping in certain restricted areas. Enforcement of these agreements remains erratic and there are yet to be real, well-integrated management plans.

In effect, due to lack of means and clear political vision, the government has been slow to act to control environmental pollution. Only in the past few years has there even been creation of environmental legislation, notably through the instauration of a national direction of sanitation and pollution control. This department now mandates and reviews environmental impact statements (and approved the GIE treatment plant design). It also has plans to open a treatment station for wastes from the industrial zone in Commune I co-financed by the government of the Netherlands. Thus, for the time being, it has bigger problems to deal with than FS, but is watching carefully as private operators work in its management and as the *GIE Sema Saniya* plans the opening of a treatment plant.

## 6.2 The relationship among stakeholders prior to FS treatment plant initiative

Figure VI-1 serves to illustrate relationships between stakeholders (defined previously in this paper) as they relate to FS, before the GIE began work in 1999.

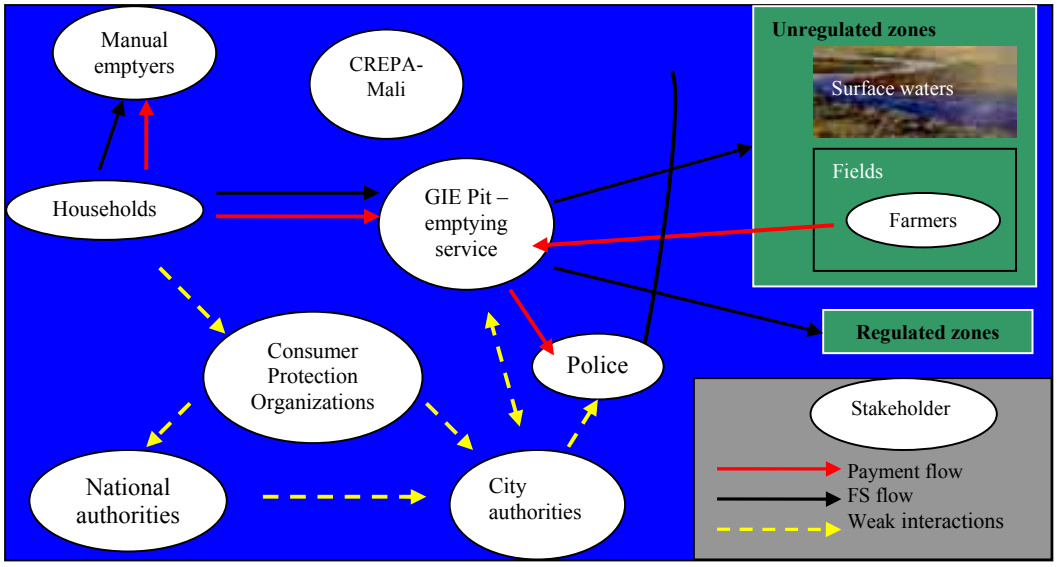


*Figure VI-1: Stakeholder interactions before FSTP construction in Commune VI*

As is shown in Figure VI-1, in the realm of FS management:

- The interactions between national and municipal authorities, including police, were generally quite weak. It would be incorrect to say that those relationships did not exist, considering two simultaneous trends – 1) the local move to specify appropriate dumping grounds and 2) the beginning of consideration of environmental pollution on a national level - but they certainly were not very effective. Note: police represented a barrier to both unregulated and regulated dumping.

- The weak interaction between municipal authorities and the collection company, the *GIE Sema Saniya*, indicates that there had been specification of an appropriate dumping ground but little more action to regulate the sector. It also explains why the treatment initiative to improve FS management came from the collection company rather than the municipality.

- The pit-emptying companies had a financial incentive to continue unregulated dumping if they could find farmers willing to pay for untreated sludge (which happens frequently in Bamako).

- There was no interaction between the FS collection company (*GIE Sema Saniya*) and CREPA-Mali, in spite of the fact that the latter's parent organization (CREPA) was conducting a research program on FS management throughout West Africa.

As FS planning progressed in Commune VI, the situation depicted in Figure VI-1 evolved to that of Figure VII-21, shown in Chapter VIII on p.50. In the chapter on the treatment initiative (VIII), it will be shown how these links were strengthened little-by-little, and how new actors appeared in the diagram.

### 6.3 Household opinions on FS management practices (*Bolomey*, 2003a, Pp. 23-24)

It would be quite difficult to make statements about household opinions in 1999, before the GIE worked on improvements to FS management for Commune VI, because no surveying was done at the time. However, some questions were asked during *Bolomey, et. al's* socio-economic study in early 2003, which probably are not far from the historic view. The data is mixed and difficult to analyze (many people did not respond to those particular questions, for unknown reasons), but a few trends are observable.

The question: "Do you know what happens to the fecal sludge collected by pit-emptying services?," received the distribution of responses shown in Figure VI-2:

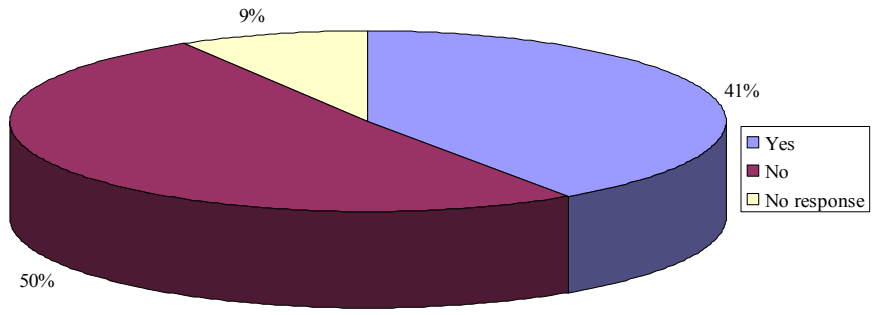


*Figure VI-2: Household responses to the question: "Do you know what happens to FS collected by pit-emptying services?"*

A follow-up question (Figure VI-3) then considered what people thought was done with the untreated FS:

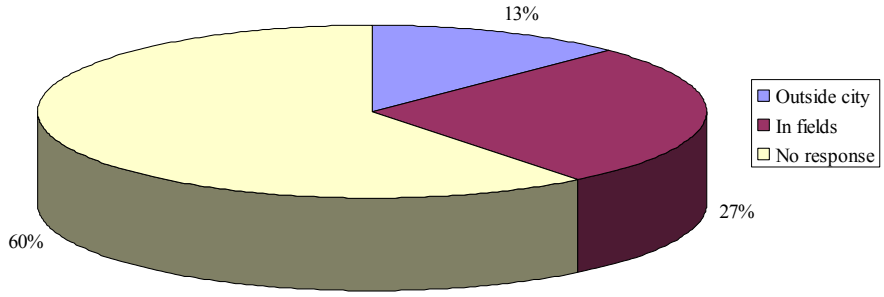


*Figure VI-3: Household responses to the question: "What is done with the FS collected by pit-emptying services?"*

The 60% of surveyed individuals who did not respond to the question matches pretty well the number of people who do not know what is done with FS plus those who did not respond to the first question (leading one to believe that perhaps the two groups are the same). An interesting result of this question is that most people who claim to know the fate of FS say that it is dumped directly on fields (the question was open-ended to allow for diverse responses), but they are only partially correct since FS typically can end up on fields or other available locations outside the city). A majority of respondents also do not answer about whether FS dumping practices bother them (Figure VI-4):

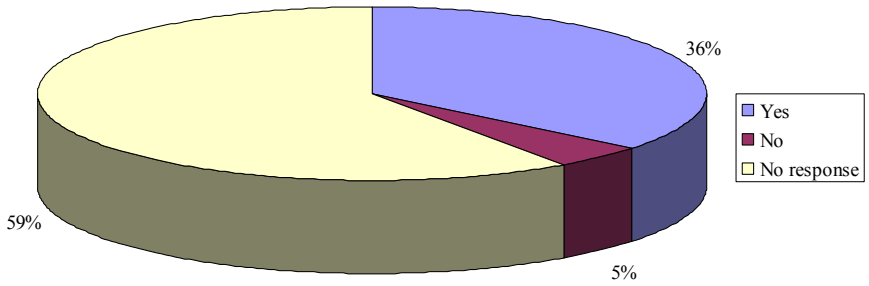


*Figure VI-4: Household responses to the question: "Are you disturbed by current FS dumping practices?"*

Again, the percentage of people not responding to this question matches well those who do not claim to know what is done with FS. Only 36% of households surveyed know what is done with untreated FS and are disturbed by it. This demonstrates a real need for awareness-raising about the practices in the Commune. It also suggests that people are probably not opposed to the reuse of human waste as agricultural fertilizer.

Following this question, all interviewed households were informed about current practices, that FS is often used untreated on agricultural parcels or is dumped on empty parcels and in surface waters around and outside the city. They were then asked if they would favor initiation of a treatment program, with the results shown in Figure VI-5:

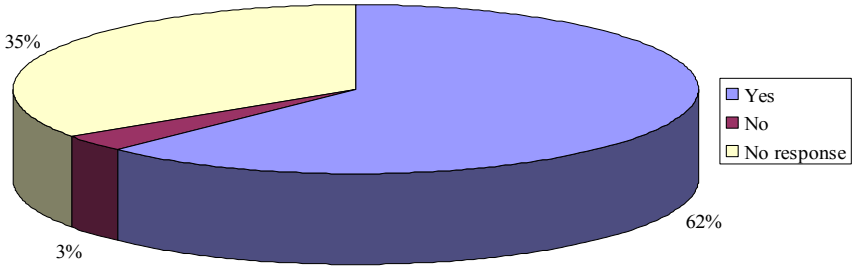


*Figure VI-5: Household responses to the question: "Would you be influenced in your choice of collection services if treatment were offered?"*[2]

The responses indicate that there is a clear majority of households that is aware that disposing of untreated FS may not be good for individual or collective health. Still, it is hard to know what prompted 35% of those surveyed to not answer this question. Several explanations seem possible:

- Many people do not understand the health and environmental value of treating FS, but are unwilling to say they would not favor collection and treatment together since they speculate that treatment may have positive effects;
- People are unwilling to answer "yes" because they are afraid of the financial ramification, notably that collection fees will increase with treatment;
- People do not want to answer "no" because they do not want to displease the person conducting the survey;
- The question was poorly written, because it does not imply that only one or a few companies were offering treatment. In the language of the survey, it would seem that this question could suggest treatment by all companies (*Bolomey*, 2003a, Annex p.34).[1]

It is not surprising to see that people are less positive about FS treatment if it requires payment of higher fees. However, the fact that over one quarter of people seem willing to pay more without any advertising or awareness-raising having been done is somewhat positive (Figure VI-6):

[2] Some people (10) in the 310 person sample did not answer this question but answered the subsequent one positively, saying they would be willing to pay more for collection with treatment. In addition, some answered "no" and then "yes" (6). As a result, they are included in the "yes" group on this question.

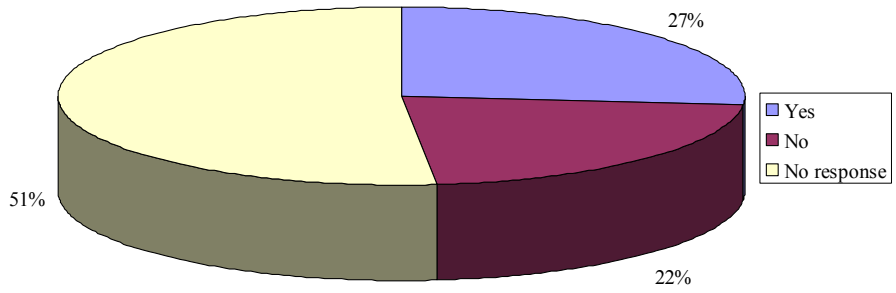


*Figure VI-6: Household responses to the question: "Would you pay extra for collection if treatment were offered as well?"*

Finally, of people saying that treatment would affect their preference of collection service, slightly less than a majority are willing to pay extra for it. The non-responses to the second question probably indicate uncertainty on the part of the households interviewed (Figure VI-7):

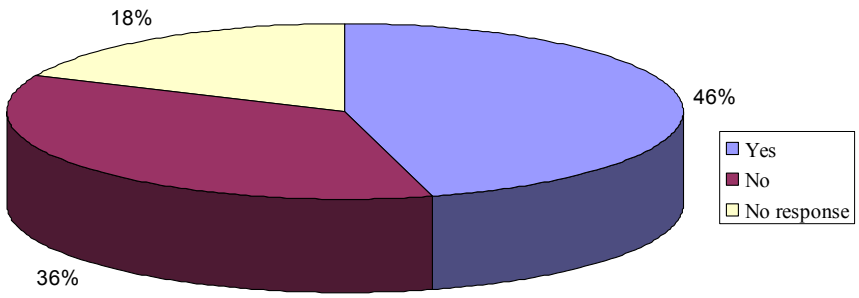


*Figure VI-7: Sub sample of people favoring treatment with collection asked the question: "Would you pay extra for collection if treatment were offered as well?"*

*Bolomey et. al* points out that people in the poorer neighborhoods sampled are much less likely to say they will pay for treatment – about 11%, compared to 37% in mixed and wealthier neighborhoods (*Bolomey*, *et. al*, 2003a, p.24). This position makes sense in light of the fact that higher charges are harder to bear for them.

Finally, *Bolomey et al.* shows a correlation between willingness to pay higher fees and knowledge of what happens to untreated FS in Bamako. His tabular result (*Bolomey*, *et al*., 2003a, p.24) is reproduced in Table 7:

*Table 7: Correlation of responses to questions about knowing where FS goes and willingness to pay extra for a combined collection and treatment service in Commune VI*

| | | **Willingness to pay higher price for collection service** | | | |
|---|---|---|---|---|---|
| | | Yes (%) | No (%) | No response (%) | Total (%) |
| **Knowledge of where FS goes** | Yes | 50.8 | 31.7 | 17.5 | 100 |
| | No | 19.9 | 19.2 | 60.9 | 100 |
| | No response | 16.7 | 4.2 | 79.2 | 100 |

This final result suggests that awareness-raising activities in Commune VI may enhance public enthusiasm for a collection and treatment scheme, which the surveyors did note in their rounds as they discussed the possibilities with households after the interviews.

## VII. THE TREATMENT PLANT INITIATIVE

### 7.1 The origin of the treatment plant initiative

Not long after purchasing its first mechanical emptying truck, the *GIE Sema Saniya* began to consider the need for an FS treatment plant (FSTP) in the city and the possibility of valorization of biosolids or other products of the treatment (effluent). A first attempt to improve the management situation through a grant from the Canadian Development Organization (ACDI) demanded local government involvement, but it failed when the GIE was unable to interest the authorities in the scheme (Figure VII-1). In retrospect, however, this first failure may have been a blessing because there was no real technical capacity-building aspect to the project in its first formulation.

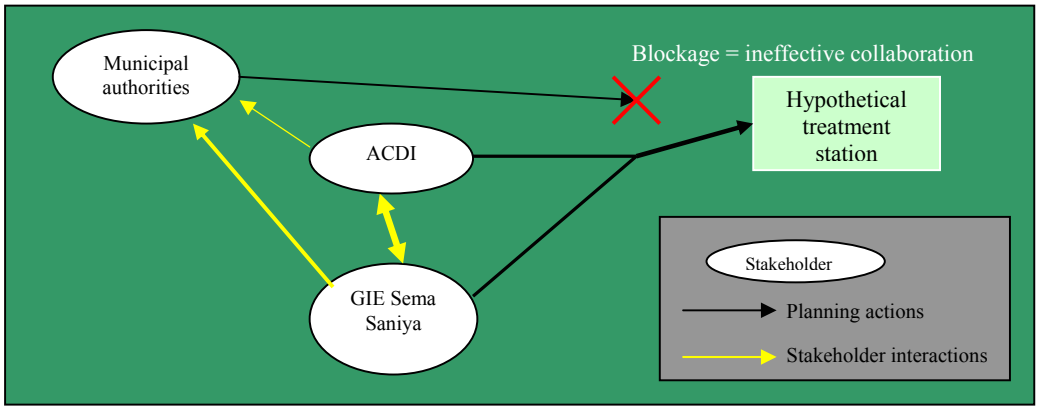


*Figure VII-1:The GIE Sema Saniya's first attempt at planning FS treatment in Commune VI ended in failure because of lack of collaborative spirit between stakeholders*

Undeterred by this first failure, the GIE continued to search for ways to make treatment of FS a reality in Bamako. In 1998, it decided to attempt a partnership with the Peace Corps, for technical assistance and project planning help. This collaboration was not a typical Peace Corps assignment, but both organizations agreed to attempt the work, and the first Volunteer was sent to Faladie-Sema in late 1999.

### 7.2 The engagement of outside actors and assistance

Collaboration with the Peace Corps began as a technical support provided to guide planning for improved FS management. One of the first steps in this planning was to identify local and regional organizations active in thinking about FS. This search brought the GIE into contact with CREPA-Mali (Center Régionale Pour l'Eau Potable et l'Assainissement) in Bamako and SANDEC (Sanitation in Developing Countries) in Switzerland. With the aid in planning from Peace Corps Volunteers (PCVs) and regular interactions with these other technical experts, the GIE moved to planning for fecal sludge treatment and then to FSTP construction.

At the same time, the PCVs worked daily to empower the GIE to realize the project. They developed the first design and discussed it with SANDEC and CREPA in order to refine and ameliorate it. They then led fundraising efforts in collaboration with the GIE

president, identifying potential donors and initiating contact with them. Finally, they provided the technical expertise necessary to do an environmental impact assessment of the proposed FSTP.

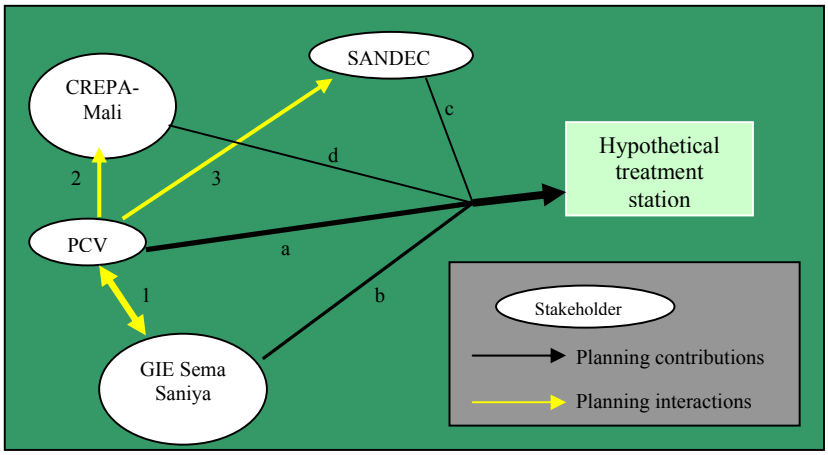


*Figure VII-2: The second GIE attempt at planning FS treatment employed a different pathway, beginning with collaborations with technical advisors rather than immediately seeking funding. Line thickness aims to show the relative contribution of each participant, and the numbers refer to relationships created and letters to actions undertaken in Figure VII-4 to Figure VII-9*

## 7.3 Project implementation strategy

The planning and design of FS management and treatment requires attention in numerous areas. The process should be composed of the steps shown in Figure VII-3, but it is important to emphasize its iterative dimension. For instance, the development of solutions usually requires a return to information collection.

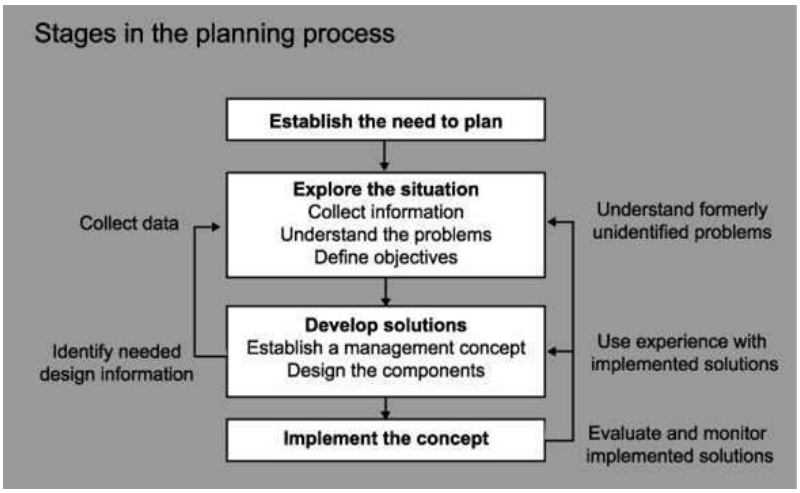


*Figure VII-3: Stages of the planning process (Klingel, 04/02, p.4)*

For the purpose of illustrating how this mechanism can work, the Bamako case (in which planning was by no means perfect) is addressed in detail in Figure VII-4 to Figure VII-9. As the planning and implementation progress, the iterations become smaller and blend

together into a dynamic and evolving management concept (shown by two-sided arrows), but general trends in the system evolution can still be documented with flowcharts.

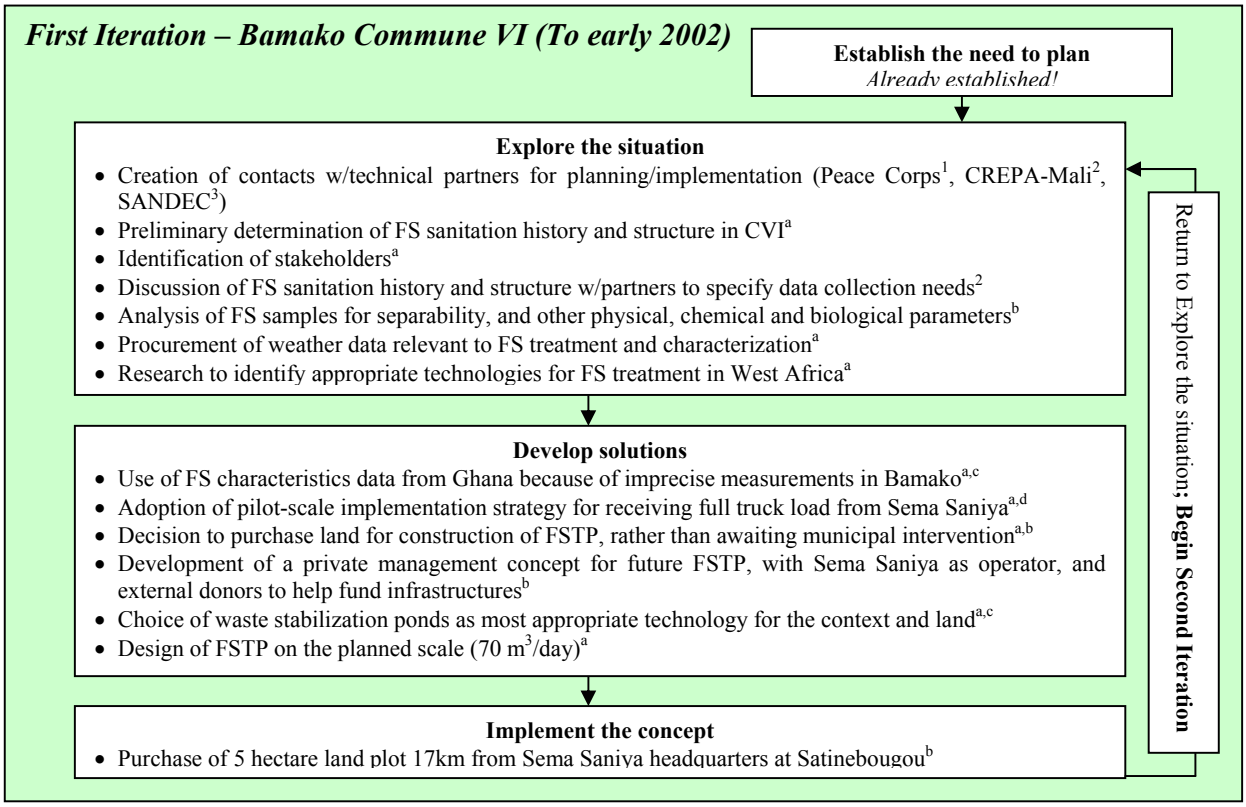


*Figure VII-4: Flow chart representation of the first iteration of planning and implementation for GIE Sema Saniya-led improved FS management in Commune VI*

The first iteration of planning (see especially **Develop solutions** in Figure VII-4) for FS treatment in Bamako probably appears very technical, but it should be noted that the beginning stages of **Exploring the Situation** took a few years. Furthermore, the technical approach to planning was followed partly as a response to the failure of the GIE's first planning experience, in which the governing approach was to seek money and then create stakeholder relationships and draft solutions. The second planning initiative favored creating technical plans and then approaching stakeholders and funding agencies with a specific objective already in mind.

To note once more the actors involved in this first iteration, the reader should consult Figure VII-2 on p.38. The tasks which appear in the planning diagram Figure VII-4 are labeled with letter superscripts corresponding to those in Figure VII-2 to identify which actors participated in them.

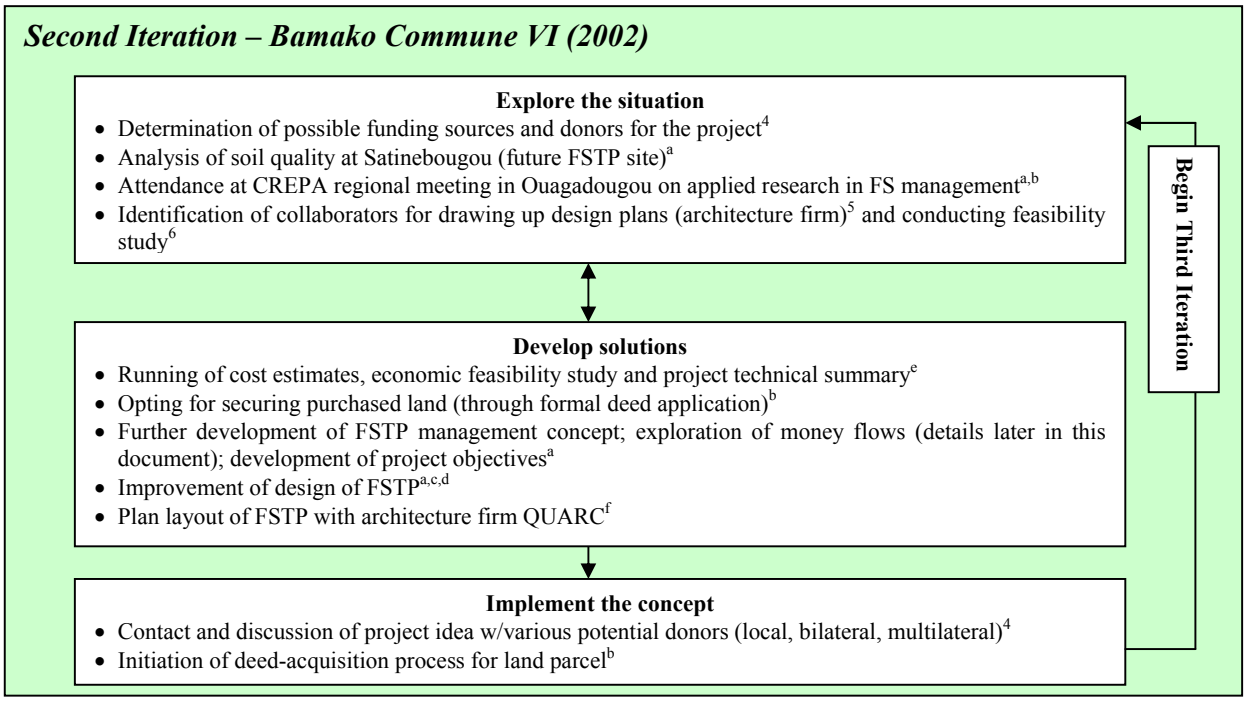


*Figure VII-5: Flow chart representation of the second iteration of planning and implementation for GIE Sema Saniya-led improved FS management in Commune VI*

In iteration 2 of FS treatment planning in Bamako, some new actors appear. They are shown in Figure VII-6. The GIE and PCV together engaged in discussions with many potential donors (the major leads that were pursued are included in the diagram) in an attempt to measure their interest in the project and their funding requirements.

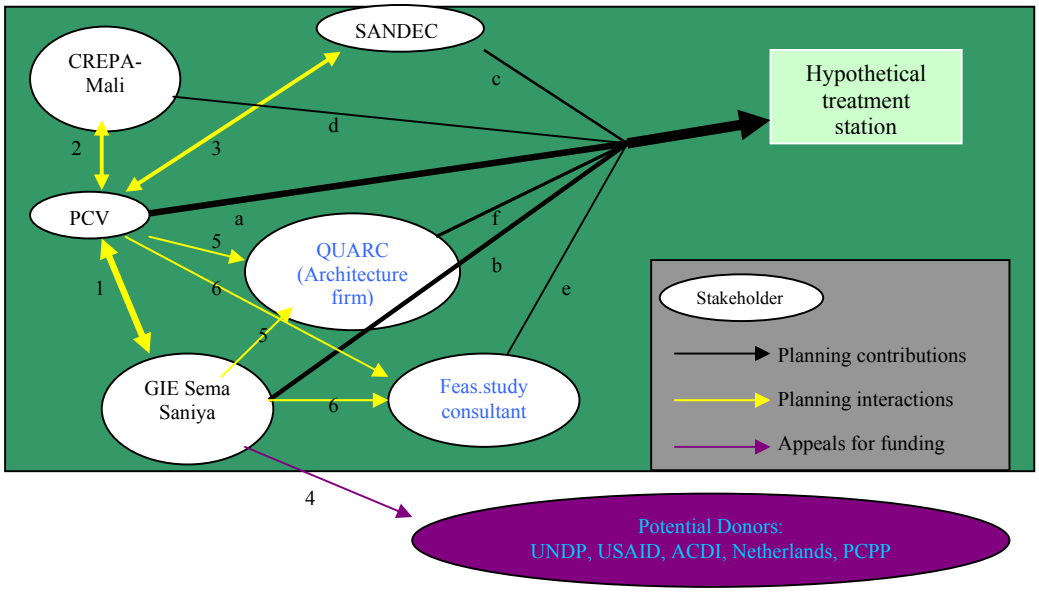


*Figure VII-6: The evolving planning team for FS treatment in Commune VI. New actors: QUARC, consultant for feasibility study, potential donors*

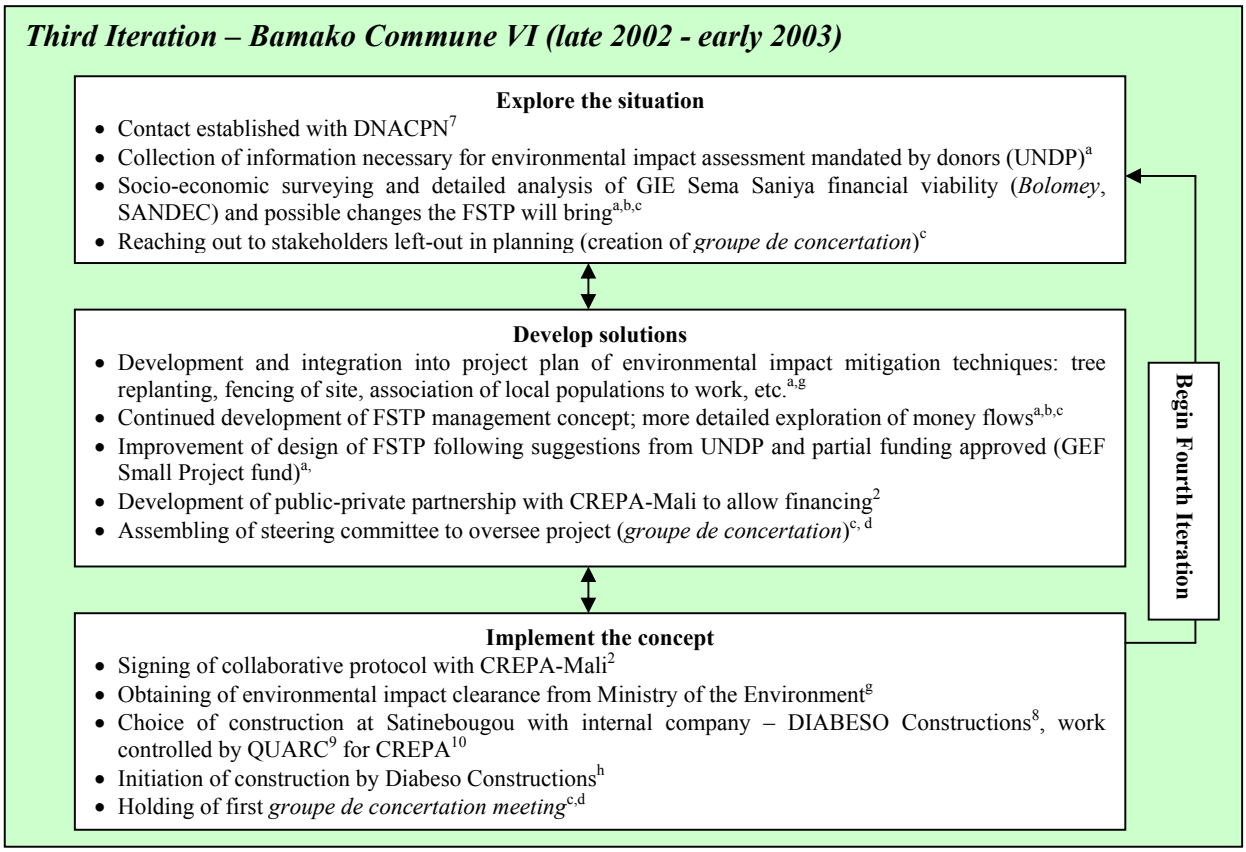


*Figure VII-7: Flow chart representation of the third iteration of planning and implementation for GIE Sema Saniya-led improved FS management in Commune VI*

By the third iteration, the number of actors had greatly multiplied; this fact and the beginning of construction dually served to motivate the creation of the steering committee, or *groupe de concertation* for the treatment station project. Figure VII-8 shows clearly that the picture has become much more complicated.

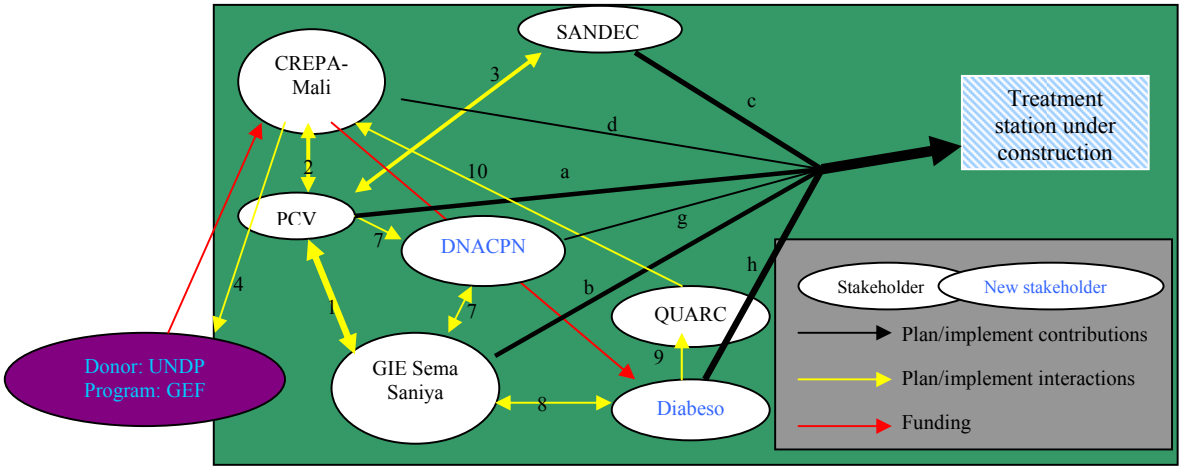


*Figure VII-8: Schematic for planning and project implementation in iteration 3.*
*New actors: GEF, DNACPN, Diabeso Constructions*

Finding funding for a privately-led fecal sludge treatment scheme was not easy in Bamako, and it probably would not be elsewhere as well. Donors are rightfully cautious about upsetting competitive balance with subsidies given to the private sector. Plus, the GIE system now existing in Mali, despite its difficulties and frequent inability to provide sanitation services effectively, is one that has been lauded for its self-sufficiency and competition, although it actually functions by giving entrepreneurs monopolies over their small collection zones. In other activities, the competition is more open.

Eventually, a willing donor was identified (the GEF program of the UNDP, created to protect the environment). This donor required that the money pass through an NGO or association. Since CREPA-Mali had been involved in the design and planning process from the beginning, it was not very difficult for the three organizations to agree that CREPA-Mali would be responsible for managing the funding of the project. As in many private-public partnerships, there were some mutual suspicions between all three, but the partnership and collaboration protocols also created a highly-effective internal control system, which cut down the risk of internal corruption. CREPA-Mali demanded results of the GIE and construction contractor (*Diabeso Constructions*), and both had to answer to the donor.

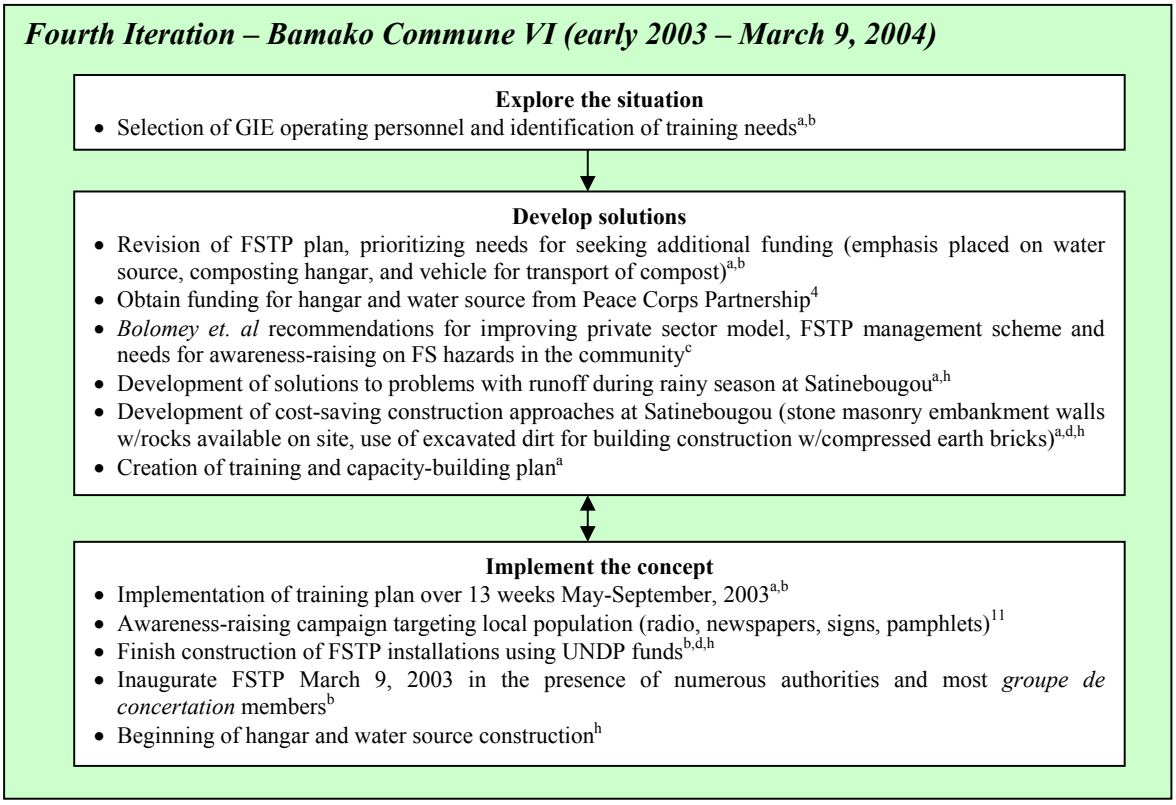


*Figure VII-9: Flow chart representation of the fourth iteration of planning and implementation for GIE Sema Saniya-led improved FS management in Commune VI*

The *groupe de concertation* merits some attention. Having met in iteration 3 just as construction was beginning, the members of the steering committee were nearly all present at its conclusion. CREPA-Mali presides over the group and moderates

interactions between various stakeholders. In the planning diagrams, one might note that some stakeholders are conspicuously absent, for example local government authorities, households, farmers and the police. The *groupe de concertation* was created to allow these stakeholders to stay abreast of the project developments as well. Households are represented by two consumer protection groups, the local *mairie* by two agents (one technical state worker and one elected alderman) and the police is represented by District officials. Farmers are not yet included, but may be added to the group later if it proves effective.

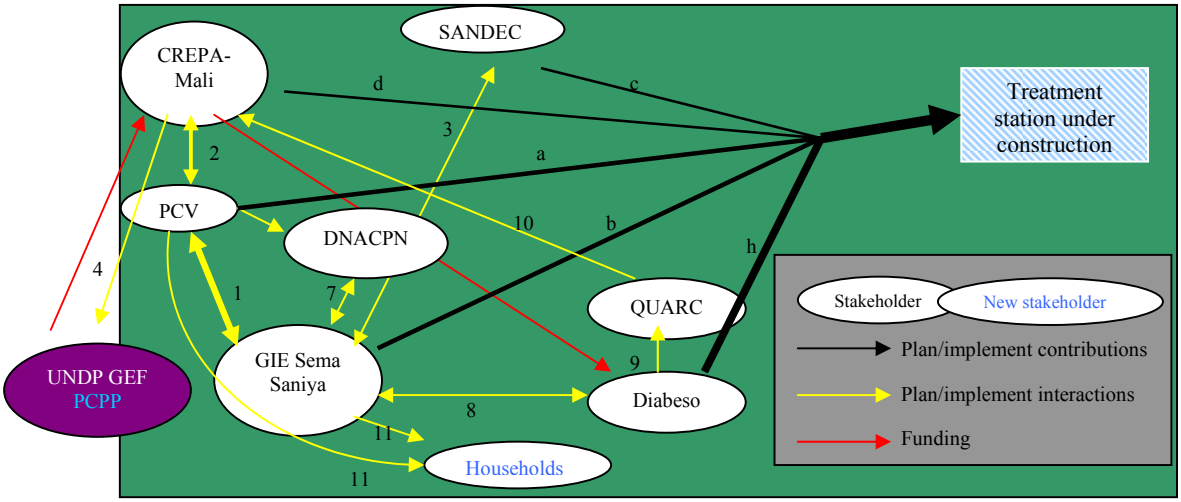


*Figure VII-10: Schematic for planning and project implementation in iteration 4.*
*New actors: PCPP*

## 7.4 Remaining steps

The FSTP is not yet in use because it was inaugurated without a completed water source (deep, large diameter well) and composting installations. So, much work remains to assure the transition to the operational and monitoring phase. This work will continue through 2004 and into the future. The goal of this pilot project is to attempt to implement an innovative FS management concept using an appropriate treatment technology. Thus, there will necessarily be a return to the **Explore the Situation** step in order to adapt the management and operation of the plant, as well as determine the appropriateness of widespread application of this particular model throughout Bamako, and perhaps in other countries and contexts as well.

## 7.5 Technical solution

### *7.5.1 Design Characteristics*

The FSTP in Bamako follows a design developed and recommended by SANDEC and implemented at Achimoto, in Ghana. This design contains two alternatively-loaded pre-treatment settling tanks, in which 80% of solids are estimated to settle. After exiting the settling tanks, effluent proceeds through a series of anaerobic, facultative and maturation ponds. While there have been problems with such

ponds in Ghana, most notably the tendency of the entire system to become anaerobic due to ammonia toxicity, it is uncertain whether this behavior is due to consistent overloading of the system or technological ineffectiveness. Furthermore, the waste stabilization pond systems remain a simple and easily maintained choice, and certainly represent an improvement over unregulated and untreated dumping practices. Given the low level of locally available technical expertise, this simple technology was judged to be most promising despite its technical drawbacks.

Much greater detail concerning this particular FSTP design can be obtained in the FSTP feasibility study (*Jeuland*, Oct. 2002), but a brief summary is also presented here.

A major constraint to the technical design, and one faced also in Commune IV, is the lack of significant data on FS characteristics in Bamako and the rest of Mali. This lack of data is not a result of bad planning on the part of the two design teams but rather linked to the incapacity of laboratories in Bamako to do the type of testing necessary. FS is difficult to analyze and requires experience as well as adapted techniques, which have unsurprisingly not been developed in Bamako. A small number of samples (10) were collected in 2000 and sent to the best wastewater laboratory in Bamako, at the *Direction Nationale d'Hydraulique*. The results showed impossibly low suspended solids counts and BOD levels, and serious inconsistencies with very high standard deviations.

*Table 8: Influent characteristics for FS dumped at Commune VI treatment plant, based on measured characteristics of untreated FS in Ghana*

| Parameter | Bamako $\mu_C$ | Bamako $\sigma_C$ | Calculated design Concentration[#] |
|---|---|---|---|
| Suspended solids (SS) – g/L | 4.44* | 5.59 | 22.25 |
| Biochemical Oxygen Demand (BOD) – mg/L | 1118.0 | 1223.9 | 2562.5 |
| Fecal Coliform Organisms/100 mL | 980.56 | 1327.74 | $10^8$ |

*No data for 4 of 10 samples (reason unknown)

[#]Based on an FS Type A:B ratio of 7:1 (*Heinss, et.al,* 1998, Annex 2, Page A6)

Because of the questionable data obtained in 2000 and the expense of further analyses without real evidence that results would be any more plausible, the PCV engineer decided in consultation with technical experts at SANDEC that it would be best to use dependable data from tropical Ghana in spite of its differences in context and climate. A very important result of the investigation there emerges from the table above: the distinction between Type A and Type B fecal sludge. Type A is not as fresh, and typically is called *septage*, but is can also be present in private, household latrines that do not fill up rapidly. Type B FS is fresh and unstable, from public latrines, and is much more concentrated with BOD and ammonia. Furthermore, despite its high solids content, the separability of Type B

sludge (into solid and liquid fractions) is low and so can cause settling tank malfunction.

For the Bamako case, though there was not formal analysis of either of these types of sludge to be able to certainly say that they existed, the same public/private sanitation installation distinction exists. Fortunately, the *GIE Sema Saniya* also kept a detailed customer log, and so was able to determine the public/private ratio to be about 1:7.

In the Commune IV design, it is important to note that sample analyses were also attempted, without giving reliable results. Furthermore, the public/private ratio could not be determined because the syndicate that was to use the treatment plant did not keep such records even if individual operators sometimes may have (*Von Leeuwen*, March 2002).

Based upon the FS characteristics from Ghana, the FSTP was designed with the characteristics shown in Table 9 (layout is shown in
Figure VII-11 and Figure VII-12). A pond-only design was chosen, in contrast to the drying beds and stabilization pond design used for Commune IV.

*Table 9: FSTP design summary*

| | **Station** | **Settling** | **Anaerobic** | **Facultative** | **Maturation** |
|---|---|---|---|---|---|
| **Capacity** | 70 $m^3$ | 33,6 kg SS/ month | 300 g DBO /$m^3$*day | 350 kg DBO/ ha*day | < 100 mg/L DBO |
| **Retention time** | ~ 34 days | 5-6 heures* | > 5 jours | > 19 jours | 8 jours |
| **Loading cycle** | Continual | 1 mois | 3-4 mois | Continual | Continual |
| **SS Settling** | 99,9% | 80% | 19,9% | 0% | 0% |
| **Pond dimensions** | - | l = 36 m<br>w = 4 m<br>d = 3 m | l = 28,7 m<br>w = 13 m<br>d = 2,5 m | l = 60,1 m<br>w = 13,5 m<br>d = 1,5 m | l = 30,1 m<br>w= 12,6 m<br>d = 1,5 m |
| **# of ponds** | 8 | 2 | 2 | 2 | 2 |
| **Total volume** | ~ 3400 $m^3$ | 740 $m^3$ | ~ 720 $m^3$ | ~ 1380 $m^3$ | ~ 560 $m^3$ |
| **Estimated Lifespan** | > 10 ans | Concrete | Masonry embankment | Masonry embankment | Masonry embankment |
| **Freeboard** | - | 50 cm | 20 cm | 10 cm | 20 cm |

*When pond is full of settled solids, at the end of a loading cycle

### *7.5.2 FSTP Layout*

The FSTP occupies less than 2 hectares of a 5 hectare plot of land 17 km from the *GIE Sema Saniya* headquarters in Bamako, about 5 kilometers beyond the edge of the map shown on page 2 of this paper. The following plan shows its general layout. Note that the land slopes downward from north to south.

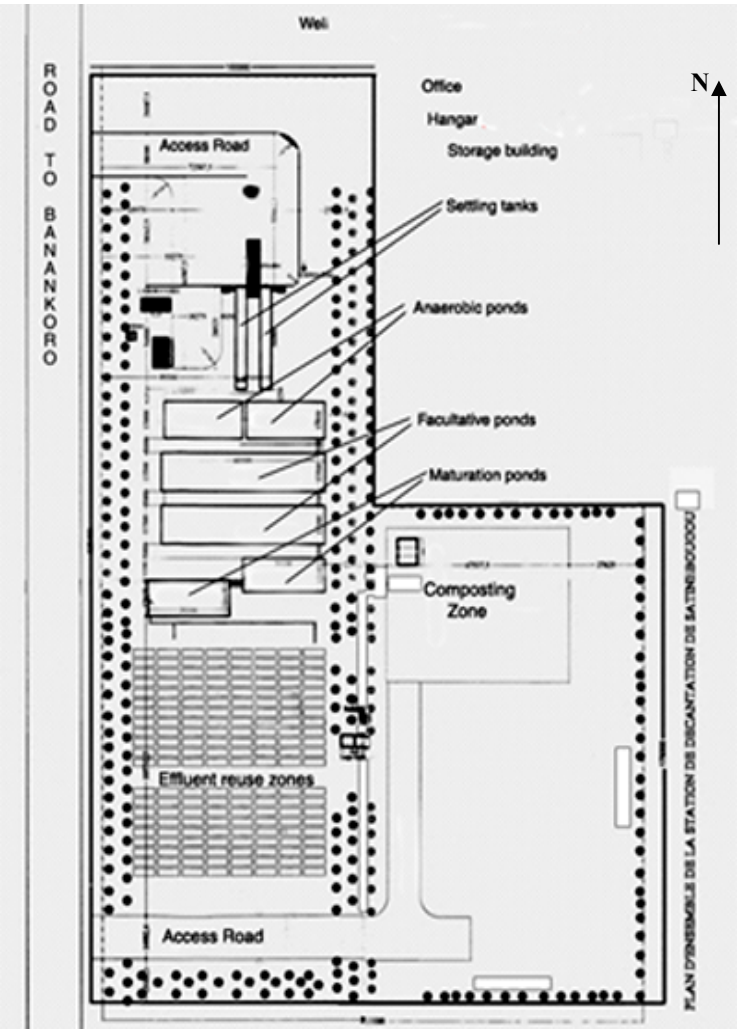


*Figure VII-11: Layout of the FS treatment plant, in the rural Commune of Sanankoroba, on five hectare plot of land 17 km from GIE headquarters*

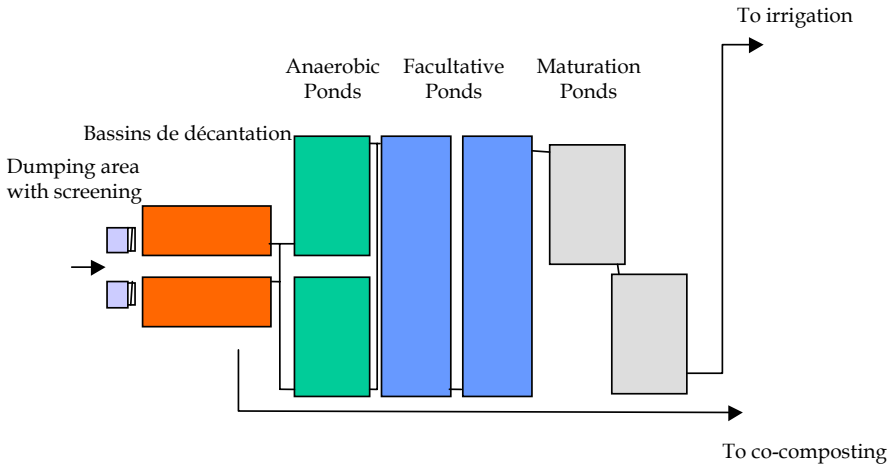


*Figure VII-12: Pond schematic diagram (Bolomey, 2003c, p.33)*

### *7.5.3 FSTP Funding*

Due to the large scope of this project and budgetary needs, the *GIE Sema Saniya* could not assure full funding of the project implementation even if it were willing to assume the entire risk. The planners thus had to find interested donor organizations and submit proposals. As discussed on p.42, the pursuit of funding was not easy, but the fact that significant partial funding eventually was secured shows that the private sector can seek to establish technical and financial partnerships with the public sector. It should be clear, however, that technical assistance is also needed to help promising enterprises create good proposals that are likely to be funded. Even with such help, it is very difficult to convince donors to fund private sector initiatives. In Bamako, besides offering technical advice and a plant design, the Peace Corps Volunteer spearheaded the search for funding, in effect providing credibility to the project by his presence and ability to answer technical concerns. In Commune IV, similarly, the NGO UWEP and consultants served in this role in aiding the communal government to hold on to valuable bilateral funding from the government of the Netherlands.

*Table 10: Breakdown of funding for the GIE Sema Saniya FSTP*

| **Funding source** | **Amount** (F.CFA) | **Installations** |
|---|---|---|
| Global Environmental Facility (GEF) of UNDP | 32,725,745 | Ponds, fencing, 2 buildings |
| GIE investment | 62,950,336 | Salaries, operating costs, land, deed, trucks, unexpected costs |
| Peace Corps Partnership | 7,059,645 | Water source (well), composting hangar |
| USAID | Not monetary | Truck for carrying solid waste for composting |
| Unsecured | 58,244,926 | Other installations, roads, equipment, seminars, monitoring, etc. |
| **Total** | **160,980,652** | **Completely functional FSTP*** |

*Without the unsecured funding, the FSTP can probably open, but revenue-generating activities will not be easy to implement.

### *7.5.4 The construction process*

As mentioned in the section on the *GIE Sema Saniya*, the board of directors also own a construction company which is officially separate from the GIE that is involved in public sector building contracts (for example: markets and schools). A cost-saving decision was made in early 2003 to have this company carry out the excavation and construction of the FSTP. This company had no previous experience in building these types of installations; however, in Mali, no such installations exist, so looking for an experienced contractor would have required asking for bids from foreign corporations, which would have been very expensive. Furthermore, such an approach would not have enabled local companies to gain valuable experience in the domain. The decision was high risk;

Diabeso Constructions could have failed technically in carrying out construction. Still, this risk seems justifiable, especially in light of the fact that the installations were completed successfully.

Still, construction of the FSTP was not easy. Mistakes were made, unexpected problems occurred and the cost was much higher than originally estimated and budgeted (*Jeuland, M; Sanogo, S.*, Nov, 2003).

*Figure VII-13: A major problem during construction was the fact that the pouring of concrete walls of the settling tanks took much longer than expected. Rainy season arrived, and unsecured walls (the gap between the hole and the walls was not filled in) buckled under the pressure from runoff. This happened in the left tank.*

*Figure VII-14 (top) and Figure VII-15 (bottom): Another effect of the rainy season: runoff from surrounding land (the ponds sit right on the runoff slope) filled the facultative ponds in June, 2003, necessitating the supplemental building of a reinforced dike wall with bags of compacted dirt*

Only the GIE devotion (stakeholder involvement) to the project kept things going. The ability to overcome challenging difficulties shows the vital importance of community involvement. Many times in developing countries, projects fail because of lack of interest and participation from local populations. The greatest advantage in Bamako was the fact that the project was locally initiated, and that managers and entrepreneurs felt responsible for its successful completion.

The pictures in Figure VII-16 to Figure VII-20 show some views of the FSTP at Satinebougou near or after completion.

*Figure VII-16 and Figure VII-17: (Left) Long view of one settling tank nearing completion, with the second parallel tank visible to the left side. A baffle across the width of the tank prevents short circuiting. (Right) One of two equally sized facultative ponds, with foundation bank stabilization near completion.*

*Figure VII-18: View from the downhill side of the FSTP layout. The wall foundation for the maturation ponds is put together by masons, who have finished settling tanks, anaerobic and facultative ponds.*

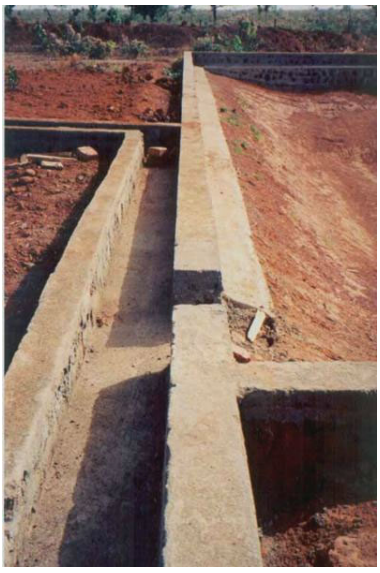

*Figure VII-19 and Figure VII-20: The connections between ponds are open to enable easy maintenance and cleaning (left) and two buildings are present on site, one for storage, the other for the technician's office and guardian lodging (right). These buildings were constructed with dirt excavated during construction.*

## 7.6 The relationship among stakeholders following FS treatment plant initiative

Over the course of project implementation, stakeholder relations evolved dramatically from the situation charted on p.32 (Figure VI-1) to the situation depicted in Figure VII-21.

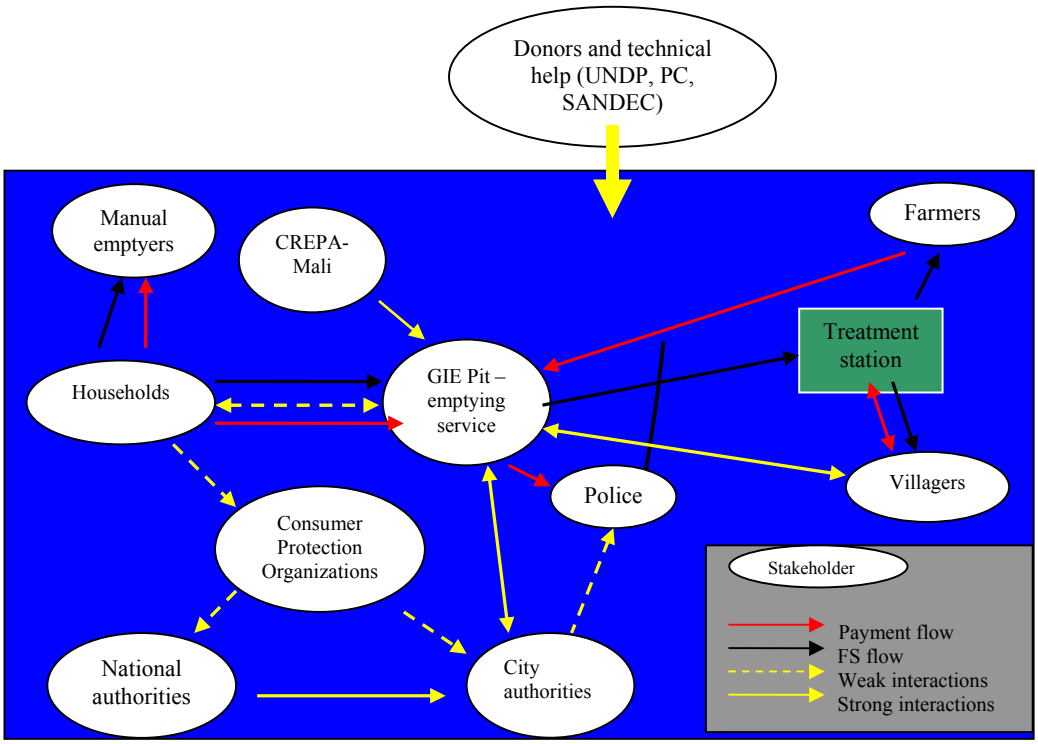


*Figure VII-21: Stakeholder relations and interactions after FSTP design and construction in Commune VI*

The changes can be summarized in the following manner:

- **A link between CREPA-Mali and the *GIE Sema Saniya*** was created and strengthened, with signing of a formal collaborative protocol, creation of public-private partnership to allow funding of the project from a multilateral source and establishment of a FSTP "steering committee" (*groupe de concertation*) presided by the CREPA-Mali.

- **A national authority – municipal authority – collection company link was reinforced** and dynamic exchange between the parties increased**.**

    - National authorities were involved in approving the FSTP design and allowing construction through environmental impact assessment procedures;

- The *groupe de concertation* grew to include the DRACPN (Direction Régionale d'Assainissement, de Contrôle des Pollutions et des Nuisances), municipal sanitation service (DSUVA) and Commune VI *Mairie*;
- The increased interest in FS management in Commune VI provides evidence of reinforced links between national and municipal authorities;
- The authorities present in the *groupe de concertation* were all supportive at the FSTP inauguration ceremony.

*Figure VII-22: A Malian national cabinet member, the Minister for Development of the Private Sector and Investments, gave a speech at the inauguration ceremony, demonstrating the interest of the government in this new initiative, and improved stakeholder relations following the project implementation. Also present were GIE and CREPA-Mali personnel, community representatives, local government officials, and villagers living nearby.*

- **A weak link was established** between households and the *GIE Sema Saniya* through surveying and awareness-raising activities.

- **A new stakeholder (villagers from Satinebougou) entered the diagram.** These were the people employed at the construction site by Diabeso. They were recruited locally so that they could simultaneously be educated about the FSTP and how it would impact the village, which is 2 kilometers away. An informal arrangement already exists between villagers and the GIE specifying that they will be able to purchase biosolids first if interested, and that they will be hired for maintenance jobs at the FSTP.

*Figure VII-23: A new stakeholder group – the villagers from Satinebougou, 2km from the new treatment plant – participates in the inauguration ceremony with dancing and drumming.*

## 7.7 The role of outside actors

An important factor to consider when studying the Bamako case and its applicability or possible extension to other places is the role of external advising groups. One could not expect a small-scale enterprise such as the *GIE Sema Saniya* to have the capability to mount an improved FS management system on its own. Indeed, the planning of such systems requires engineers, technicians and architects and, quite often, sociological experts. Small companies in developing countries simply do not have the personnel for these tasks. In addition, they do not have the financial resources or the quality control mechanisms necessary for paying highly-skilled consultants to work for them. They are thus dependent upon benevolent assistance, or technical and institutional partnerships.

While this situation by itself might seem discouraging in light of the difficulty of finding good public-private partnerships, it should be noted that bilateral public-public relationships share many of the same challenges. While planning and work on FS progressed in Commune VI, another initiative was pursued in Commune IV, under very different conditions. Table 11 compares the situations.

*Table 11: Comparison of project implementation methods in Communes IV and VI*

| ***Location of FS treatment initiative*** | **Commune IV** | **Commune VI** |
|---|---|---|
| *Who initiated the project?* | Local government | GIE Sema Saniya (private enterprise) |
| *How did the idea originate?* | Needs assessment and community action plan workshop | Desire to gain advantage from its own FS dumping practices |
| *When did planning begin?* | 1998 | 1999 |
| *Were technical skills available internally for planning?* | No | No |
| *Who facilitated and motivated planning work?* | UWEP (NGO with Dutch funding) | Itself |
| *What was the source of technical assistance?* | Consultants paid by NGO<br>NGO personnel | Peace Corps Volunteers<br>CREPA-Mali (local associative structure working in sanitation) |
| *Was land available?* | None, NGO had to go outside Commune IV | None, GIE purchased 5 hectares outside Commune VI |
| *Is there a land deed?* | None | Being purchased |
| *Who did construction?* | Entrepreneur | Internal company* |
| *Who owns FSTP?* | Commune IV | GIE Sema Saniya |
| *Who operates FSTP?* | Uncertain | GIE Sema Saniya |
| *Who uses the FSTP?* | Commune IV syndicate | GIE Sema Saniya |
| *Who monitors FSTP?* | Outside consultants | CREPA-Mali |
| *What local resources are committed?* | None currently | Purchase of land, training, operating costs, 2 trucks (roughly 62 million F.CFA over 3 years) |
| *When was FSTP construction finished?* | October 2003 | March 2004 |
| *Has dumping begun?* | Yes, recently | No |

*The internal construction company is probably not a common case in the private sanitation sector

The two management structures and technologies are engaged in a sort of competition to offer the best model to the city of Bamako. Through this tabular comparison, it is unclear whether the public planning model (Commune IV) is preferential to the private-public planning model (Commune VI). If the Commune VI model inaugurated in Mali can be extended to other experiences and environments, it may become obvious that treatment initiatives need not originate in the public sector at all, as long as they receive consistent institutional support from local and non-local agencies.

## VIII. ORGANIZATIONAL SET-UP OF FECAL SLUDGE TREATMENT: GENERAL FACTORS AND BAMAKO-SPECIFIC CONSIDERATIONS

### 8.1 Is there a role for government?

In Chapter VIII, we conclude that improved FS management planning need not be pursued primarily by local governments, at least not initially. However, to expect the private sector alone to fully remedy sanitation problems arising from unsanitary and disorganized dumping remains a stretch. In fact, a recent SANDEC-published paper affirms that an "array of [accompanying] measures is required, comprising:

- Institutional and regulatory measures;
- Financial/economic measures;
- Technical measures. (*Strauss, et. al*, 2003, p.2)."

Such measures require the attention and commitment of local authorities and governments.

That challenge to local governments is again taken up in "Sanitation is a Business," a document recently produced by the Swiss Agency for Development and Cooperation (*Heierli, et. al*, 2004, p. 33), which emphasizes that governments should become involved in:

- Sector planning;
- Building disposal sites;
- Treating sludge adequately;
- Accessing the poorest neighborhoods, where roads are inadequate;
- Licensing of private entrepreneurs;
- Guaranteeing competition between service providers;
- Creating incentives and sanctions.

While one focus of the analysis performed in "Sanitation is a Business" is on public sector involvement in the realm of fecal sludge management, that focus appears a bit limited or simplified in light of what has been observed in Bamako. Truly, the roles listed above are important for municipal governments, but it is not always realistic to expect political authorities to take the initiative to act upon them. In fact, *Strauss et. al* (2003) affirms that "entrepreneurial bodies" can also take up the mantle of ameliorated FS planning. In Bamako's Commune VI, consistent with this observation, the private sector initiative of *Sema Saniya* aims to satisfy demand for FS collection, but it goes further, actually building a discharge and treatment station (two of the elements on the list above). There is evidence (as demonstrated in the socio-economic survey *Bolomey, et. al*, 2003a) that household demand for and interest in treatment exists, again without the government. The private sector is responding to this demand.

Furthermore, there have been some efforts by the company to encourage the commune to license operators and better plan or organize the sector (*Bolomey*, *et. al*, 2003c, Pp.29-

31). Most recently, as work to regulate the sector at the communal level has stalled, the GIE has itself drawn up plans to group pit-emptying entrepreneurs in Communes V and VI into a formal syndicate. While these efforts have yet to bear fruit, this action in turn fosters increased discussion of pit-emptying on the communal level and between the different operators. The private sector can serve to catalyze government involvement in FS management.

In the long term, then, there is a definite role for government in FS management. A look at the cases of Nam Dinh and Danang in Vietnam confirms this conclusion. Two institutional options are considered for Nam Dinh: the first is creation of a household-demand driven model in which a private sector emptying service is promoted and provides the service for a fee, and the second requires government regulation to introduce regular, scheduled pit-emptying to all households, financed through a surcharge on water bills (*Klingel et. al*, 2001, Pp.20-22). At the time of Klingel's work, a challenge was posed to local government to get involved. Now, the second institutional scheme, with such involvement, will be attempted on a small scale starting in mid July if the surcharge is approved, but this FS management system still requires some political discussion. In contrast to this, Danang has already approved surcharges and is already going ahead with the small-scale scheduled emptying (*Barreiro*, 2004). More detailed presentation of the promising efforts underway in Danang follows in Chapter X in the section entitled: "*Towards a more systematic neighborhood approach*."

Still, planners, sanitation workers and the private sector should not wait for local authorities to assert this role. They should keep the authorities abreast of the work happening and involve them if possible so that their efforts are not sabotaged and equipment/capital confiscated. Eventually, if there is enough activity in FS management, the government will regulate, license, ensure free competition and, quite possibly, think of incentive structures that might work in the local context. The experience in Commune VI gives evidence that the private sector can be proactive. The *GIE Sema Saniya* has taken this approach in numerous areas over the years: diversification of activities, construction of the treatment plant and, in a way, with its very own founding idea to collect solid waste.

## 8.2 Comparison of public and private models

In the previous chapter, it was argued that from a practical standpoint, lending support to the private sector for the creation of fecal sludge treatment plants is not very different from aiding municipal authorities and governments for the same purpose; i.e that:

a) Often, the idea of treatment can originate in the private sector as readily as or more readily than in the public sector;
b) The planning process takes a comparable amount of time in both cases, with private sector efficiencies observable in some areas and public sector efficiencies visible in others;
c) There is a need in both situations for significant outside technical expertise;

d) Acquisition of land, ironically, is at least as difficult for the municipality as it is for a private company (in Bamako it was harder for Commune IV);
e) Both require substantial problem-solving and cooperation to ensure that all collection companies discharge at designated sites or treatment facilities.

Two questions immediately arise from this analysis:

i. Is the Bamako case representative of FS treatment planning in other places?
ii. Can the relatively imperfect private sector model be ameliorated through a strategic change in FS planning to give it clear advantages over the public sector planning approach?

This section will attempt to offer a few insights relative to these questions.

### *8.2.1 Is the Bamako case representative of FS treatment planning elsewhere?*

Looking at points a-e listed above, then, we can further analyze.

a) The treatment idea can be pursued initially by the private sector, as in Bamako and in Cotonou (*SIBEAU*). The Bamako case having been examined earlier in this paper, the Bénin case also deserves some attention. In Cotonou, the decision to begin treatment was much less organic, but came as a result of a ban on some other previously specified dumping sites after local inhabitants protested their use. The government tried to mandate that the *voirie* build a more appropriate treatment station, but the municipal sanitation service did not have the proper means. *SIBEAU*, called the first private enterprise of urban waste management in the county, then took on the task in a project entitled "Cotonou Clean City" and built one site far from the city (about 30km away). This site was never used, and eventually a second had to be set-up, again by *SIBEAU*, at 12km from the city (*CREPA-Bénin*, 2002, Pp.11, 25).

   However, the absence of many such instances of private sector initiative indicates that there is a perception that such activities are not profitable, either because of the barriers to entry (high treatment infrastructure costs) or because of problems with sustainability (high maintenance costs, inability to reuse products, depreciation of installations). In Bamako, in fact, the *GIE Sema Saniya* simply did not have the means to fund the construction of the plant, but partnership with international donors enabled its realization.

   The planned expansion of the treatment works in Cotonou will be externally funded with a loan on concessional terms (see Section 8.4 for a description of this type of private-public partnership) from a bilateral donor (*Collignon*, 2000, p.48). In that case, risk of cost recovery is much lower than in Bamako due to the high profits enabled by cartelization (see Section 9.2).

Given the lack of municipal involvement in many places, there probably need to be more public, foreign aid-funded initiatives to allow for an increase in the number of these types of FS treatment initiatives.

b) The efficiency of the planner in the FS treatment planning process is the next consideration. In Bamako, the private and public initiatives both took about 5 years from initiation to construction completion, in spite of the fact that the public sector model is much more common and streamlined. Both benefited from a great deal of organizational and technical assistance to make possible and expedite this process.

   However, the fact that these two projects took roughly the same amount of time is probably coincidental, and it is very difficult to say definitively that one or the other (public or private) approaches is more efficient. The planning process depends on too many factors, and can often be stalled by relatively minor considerations. The private sector is probably better at certain aspects - financially efficient planning, because it can less afford to waste money, marketing, mobilization of personnel and internal resources - but this type of efficiency can hardly be considered to translate into a shorter project planning window. Similarly, the public planning process has advantages of its own – mobilization of donors and involvement of multiple stakeholder groups in decision-making, among others.

   Judging from the experiences in Bamako and Cotonou, however, it appears true that the private sector can help to speed the process of FS planning in general through a sort of competition with the public sector, encouraging the latter to think about the problems and get involved much more than it would originally. In Cotonou, the *voirie* service was charged with reforming dumping practices long ago, but nothing happened until *SIBEAU* developed a plan for treatment. Since then, the municipal authorities have become arguably the most engaged West African government for policing of the fecal sludge management situation. In Mali, the *GIE Sema Saniya*'s initiative similarly spurred authorities in Commune IV to try to realize the first treatment facility for Bamako.

c) The need for significant outside technical expertise in public-based and private-based situations is clear and consistent around the world in the field of FS treatment. The wide coverage of SANDEC's (and other foreign organizations such as WASTE) activities in FS planning and treatment shows this need. SANDEC is active in projects in Ghana, Vietnam, Thailand and has worked in South America in the past as well. It advises CREPA's work in PROGEBOUE throughout West Africa, and receives daily inquiries from many other places.

   Outside of the developed world, there is little evidence of purely locally-planned FS treatment schemes. Some OSS treatment (through biogas

production) exists in India and Rwanda, but it is only partial. Local engineers in Togo have designed an FSTP which may soon be constructed. In Thailand, as a consequence of the capacity-building work done by SANDEC, a treatment station is being designed and planned by AIT (Asian Institute of Technology). Only in Indonesia has extensive local planning and construction of full FS treatment occurred. So, while local planning is possible, it usually requires capacity-building or improvement and advising.

d) Ironically, the acquisition of land tends to be a problem both for the public and private sector, in places besides Bamako. Sometimes, municipalities get involved in improved FS planning because the money is available from donors and not because they are truly involved from a stakeholder point of view. A result of this participation can be an agonizing amount of time for the acquisition of land on which to build. Other times, a rushed land choice is made and nearby inhabitants are not informed or consulted before plant construction. The UWEP project described in Table 8 in the previous chapter was originally planned to have treatment plants in Commune IV and VI. Construction first began on a parcel in Commune VI designated by the *mairie*, but citizens nearby caught word of its future use and barred its completion. For the private sector, land acquisition is difficult because it is a large investment to obtain the proper zoning clearances.

   Related to the speed of land acquisition is the choice of where to seek land. The closer a proposed FS treatment project moves to the city, the more difficult the land is to find. In public planning, municipalities are not likely to give away high-value land for the purpose of waste treatment. In private planning, high-value land is often too expensive for a private company. The end result of these difficulties is the large distance typically found between cities and their respective FS treatment plants (see Table 12).

*Table 12: Distances to FS treatment plants in various cities*

| City | Location | Average distance from collection | Roads |
|---|---|---|---|
| Bamako CIV (Mali) | Samanko II | 15 km | 5 km paved |
| Bamako CVI (Mali) | Satinebougou | 17 km | 15 km paved |
| Kumasi (Ghana) | Buobai*<br>Dompoase* | 12 km<br>8 km | 75% paved<br>All paved |
| Accra (Ghana) | Achimota<br>Teshie | 10 km<br>10-15 km | Paved<br>90% paved |
| Cotonou (Benin) | Ekpé | 12 km | Mostly paved |
| Dakar (Sénégal) | City center | 10 km | Good |

* Information on these plants from Tony Mensah, Ghana.

e) Ensuring dumping by multiple collection companies appears to be a widespread problem with both public and private models. Discussion of this problem follows in Section 9.2.

*8.2.2 Can the relatively, imperfect private sector implementation approach be ameliorated through a strategic change in FS planning to give it clear advantages over the public sector planning approach?*

This question is central to the choice between a public and private sector planning approach. If private development of treatment technologies cannot be improved to make it relatively advantageous, it would be unlikely to win the favor of large bilateral and multilateral aid organizations because of the risk involved in upsetting free and competitive markets and the potential loss of complete stakeholder involvement. Unfortunately, at this point, any reflection would be speculative, as there are simply not enough analyses of private sector experiences. Thus, this document cannot pronounce itself on question 8.2.2. However, it can serve to guide similar future initiatives, and these may in turn allow the private sector planning picture to become more focused.

## 8.3 Improving stakeholder relations

Furthermore, there remains significant work to be done in Bamako before any official pronouncement of "success" or "failure" is made. Earlier in this report, the improvement in stakeholder relations in the area of FS management was shown in the form of Figure VII-21 on p.50. In that figure (reproduced below), we see that there are still many weak interactions (perhaps most alarmingly the insufficient connections involving households) and that the role played by police in the management chain remains counterproductive and subject to a dangerous lack of transparency.

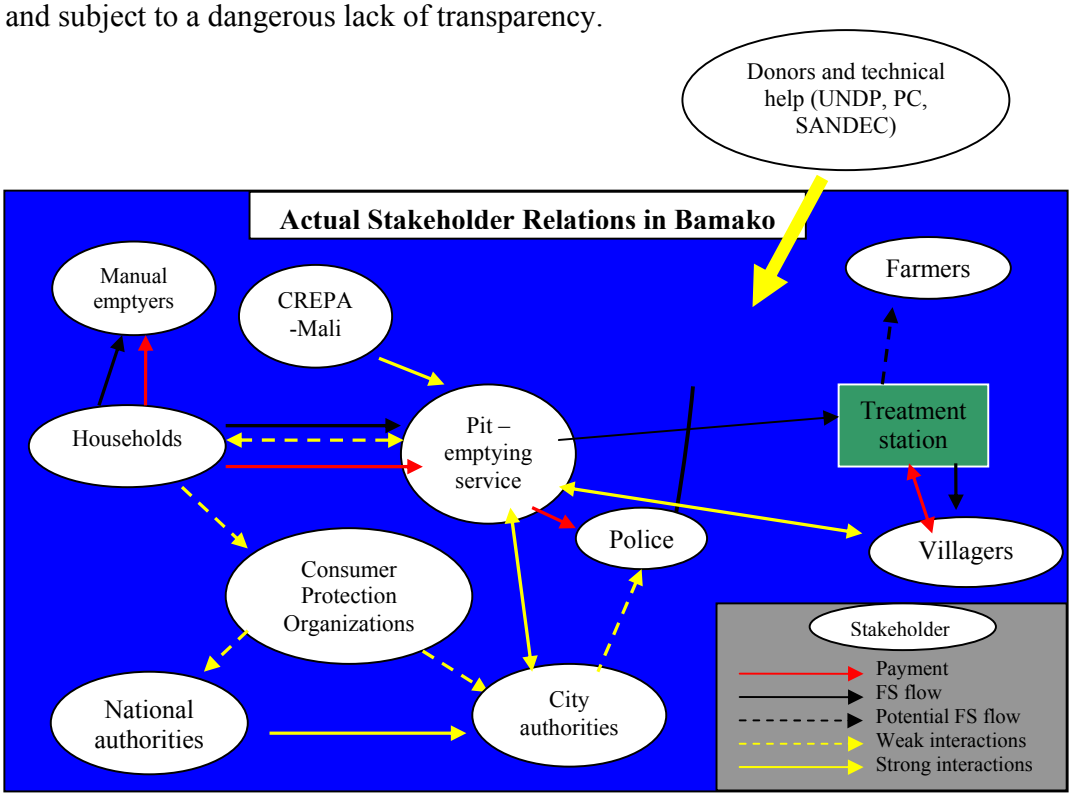


*Figure VIII-1: Actual stakeholder interactions in Commune VI*

These weaknesses in stakeholder relations will continue to be problematic in the quest to improve FS management in Bamako. We can imagine that an ideal relational scheme would be the one shown in Figure VIII-2.

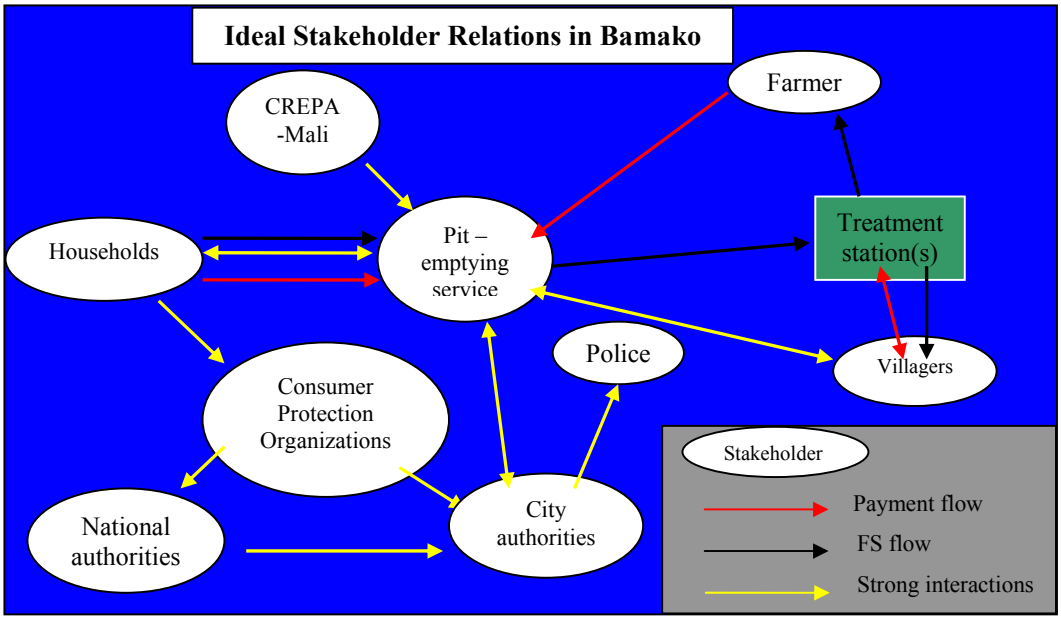


*Figure VIII-2: Ideal stakeholder interactions in Commune VI*

One specific objective of ideal FS management should be the removal of the manual OSS installation emptying service. This service is high-risk and creates new contamination pathways. Only rigorous legal enforcement and awareness-raising among households can combat this form of work.

The greatest obstacle to evolving from current to ideal stakeholder relationships is that much of the required work is not at all in the context of FS management. For instance, the interactions grouped around the consumer protection organizations are weak, both in FS management and otherwise. Strengthening these organizations and making them more responsive to the needs of the population requires separate capacity-building exercises. As the fecal sludge collection companies gain power and begin to organize themselves into syndicates and cartels, these consumer organizations will need to be more assertive to protect households from price-gouging and collusion. Pathways for achieving this type of change are beyond the scope of this paper.

Another area that directly hurts households in the FS management system present in Bamako today is the behavior of the police, whose agents and high administrators attempt to benefit from the revenue chain and exact personal profit in a number of ways. The existence of several types of police corps (some under orders from the Commune, some under the national government, some under the transportation agency) makes this situation even more complex. Noting that the involvement of political authorities is necessary for attaining them, some possible approaches to eliminating unfair police hassling are the following:

- Create **checks and balances** on police power. These external controls can come from improved:
    - Judicial governance;
    - Controls created by national authorities and implemented by local governments (in the context of decentralization).

- Convince high-level police officials that the current FS management situation is unacceptable using awareness-raising so that they create internal controls.

Interactions between national and local government authorities, while strengthened throughout the five years of development of the FSTP, need to be enhanced as well. Local governments need to take responsibility for improving communal sanitation while not necessarily directly providing the services themselves. National authorities need to help and encourage local governments to develop approaches to achieve these improvements as well, instead of simply legislating change without creating the tools necessary for achieving that change.

Improving the links between households and the pit-emptying companies can be achieved with broad awareness-raising about what services customers should be supporting. As shown from survey results (Section VII), many people do not know the fate and negative effects caused by FS. People are also aware that no viable treatment exists and so request it. This combination of socio-economic factors should be targeted with greater awareness-raising activities to strengthen the household position. Improving the role played by consumer protection associations may be challenging but certainly passes by a more thoroughly educated populace regarding FS.

### 8.4 Public-private partnerships: Are they possible and desirable?

The context of rapid urbanization is one which has received some attention in the literature as a domain ripe for public-private partnerships because of the incapacity of many governments to provide basic needs to their citizens (water, sanitation and energy). Tax revenues are not sufficient for expansion of services, and development assistance "does not fill the gap." The "essential ingredient" in these partnerships is "some degree of participation in the delivery of traditionally public-domain services," and they usually respond to some form of crisis (*Bennett*, 1999, p. 4). The idea behind the collaboration is to combine the comparative advantages of the private sector described previously in this document, with the advantages of the public sector (social responsibility, environmental awareness and local knowledge). In the Bamako case, it is also striking that the private sector can contribute with respect to the latter three advantages.

Public-private partnerships have been shown to be useful and efficient in the following areas throughout the world:

- **Operation, maintenance and service contracts**, through which the public sector hires a private organization to carry out specific tasks or services over a set period of time;

- **Build-operate-transfer contracts**, in which private investments finance the construction of new infrastructure and the public sector pays for the services;

- **Concessions**, under which a private operator gains full responsibility for delivery of infrastructure services and collection of service fees, and the government plays a role in regulation;

- **Joint ventures**, which give public and private actors co-responsibility for the delivery of infrastructure services; and

- **Community-based service** provision, when financial limitations prevent the government from providing waste and water services, forcing resident groups or micro-enterprises to fill the gap (*Bennett*, Pp. 6-14).

The extensive number of alternatives available for successful partnerships requires flexible planning and careful attention to the context of the activity in question. In Bamako, the activities and role of the *GIE Sema Saniya* falls under several categories, notably 1) operation, maintenance and service contracts for street sweeping and cleaning of storm sewers, 2) concessions for public latrines, and 3) community-based provision of services for solid waste management and the latrine emptying service. The varying structure of activities allows for achievement of better effectiveness and optimal efficiency.

Bennett acknowledges that "often the best PPP option does not fall neatly into one of the categories described above, but combines components from various approaches" (p.16). This is in fact the case for the treatment plant initiative started in Bamako. This initiative contains components of the organizational approaches as shown in Table 13:

*Table 13: Private-public partnership elements in the management structure for the Bamako FS treatment plant*

| PPP Strategy | Description |
|---|---|
| *Concession* | Environmental performance standards are approved and monitored by the public sector, private sector concessionaire builds infrastructures and is in charge of operation of the station |
| *Joint venture* | The funding for the treatment infrastructures comes from private (GIE Sema Saniya) and public sources (multilateral aid, bilateral aid). All public moneys are managed by a local, not-for-profit association. This association also holds responsibility for creating a management and self-monitoring scheme. |
| *Community-based provision* | The government is unwilling and unable to finance the infrastructures and planning of wastewater treatment. A private, neighborhood-based entrepreneur steps up to fill the void, and aims primarily to treat wastes generated within its zone of intervention. This company owns the built infrastructures. |

When evaluating this tripartite organizational scheme, certain strengths and weaknesses can be underlined:

*Table 14: Strengths and weaknesses of the Bamako FS treatment plant PPP*

| Strengths | Weaknesses |
|---|---|
| • Scheme effectively attracts investment for substantial infrastructures from a community-based entrepreneur<br>• The private entrepreneur has an incentive to build infrastructures well and innovatively since it depends on successful operation for revenues<br>• The operator remains the same whether or not political changes occur<br>• The participation of the public sector in funding and monitoring guarantees some level of social responsibility<br>• The partial funding from foreign aid is essential for the construction of expensive infrastructures<br>• The private sector planning and building of the project cuts out contractors seeking a share of profits and charging excess fees<br>• Close contact between the enterprise and the community lowers risk of making misguided investments<br>• Initial investment costs are lowered through integration of local resources into the project (labor, local materials, guarding)<br>• Funding is returned in large part to the community through salaries | • Current regulatory capacity of the government is insufficient for this project<br>• It is difficult to predict whether the private company will be able to operate the "concession" profitably<br>• Public and private sector are very suspicious of one another<br>• Free competition in the FS treatment sector will be limited because of the aid subsidy provided to the GIE Sema Saniya, which essentially gives that company a monopoly over the sector<br>• Though corruption is not an issue yet, the public and private sector collaboration could turn to collusion and mutual profiting at the expense of the population served<br>• Coverage is limited to the GIE Sema Saniya's clientele, at least in the short term<br>• Expansion of the project model may require significant capacity-building and time<br>• Community-based service providers in Bamako are seen as unstable and risky; they remain vulnerable to hostile government intervention |

## 8.5 Other organizational schemes

There has not been a great deal of research on the functionality of various types of organizational schemes for planning of fecal sludge treatment. In fact, this is a great need today to supplement a fairly well-developed technical expertise. If so-called "appropriate technologies" are integrated into a weak planning and organizational scheme, their use will not be successful.

# IX. COST IMPLICATIONS OF FECAL SLUDGE TREATMENT IN BAMAKO AND ALTERNATIVES FOR SUSTAINABLE FECAL SLUDGE MANAGEMENT

## 9.1 Costs of treatment in Bamako

### *9.1.1 Change in pit-emptying service cost structure if treatment is added*

In light of the increased distance to the FSTP, located 17 km from the company headquarters in Commune VI, it is logical to assume that the trucks will burn more fuel, require more maintenance and pay more police fines than previously. In the *Bolomey*, *et. al*, financial study (2003c, p. 36) , the authors have estimated the potential increase in prices under two scenarios, assuming 50% more maintenance - Scenario 1 and 100% - Scenario 2 (necessary due to the 4 km round trip off of the paved road to the treatment station). To summarize, the changes estimated are:

- A fuel surcharge of 3,200 F.CFA/trip, for the 34 km extra total distance;
- 50% increase in maintenance costs in Scenario I and 100% in Scenario II;
- Additional 1,000 F.CFA /day fines to police at the edge of the District of Bamako.

The calculations for Scenario I are shown in Table 15:

*Table 15: Changed cost of pit-emptying on a per-trip basis*

| | **Average cost/trip by FS collection truck*** (F. CFA) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Fuel/oil* | *Maintenance* | *Police* | *Salaries* | *Insurance* | *Parking* | *Tax* | *Admin* | *Total* |
| ***Historical record*** | | | | | | | | | |
| **2001** | 2200 | 1050 | 800 | 1400 | 150 | 90 | 150 | 1050 | **6850** |
| **2002** | 2150 | 2200 | 1000 | 1750 | 200 | 100 | 175 | 1350 | **8900** |
| ***Scenario I*** *(Extra 3200/trip of fuel, 50% additional maintenance, additional police fines)* | | | | | | | | | |
| **2001** | 5400 | 1550 | 1100 | 1375 | 150 | 90 | 150 | 1050 | **10900** |
| **2002** | 5350 | 3300 | 1400 | 1750 | 200 | 100 | 175 | 1350 | **13600** |

*Values are rounded for ease of reference.

The most obvious impact of increased costs for transport of fecal sludge to the treatment station is that the current revenue level will have to be increased (charging customers higher rates to have their pits pumped) for the activity to remain sustainable. This will mean increased costs to households unless some other arrangement can be made with the Commune, which appears unlikely at this time. The problem now for the *GIE Sema Saniya* is that covering these long distances will make the company less competitive in the free market. Entrepreneurs who continue to dump FS in an unregulated manner will have lower costs. This serious concern threatens the future of the treatment plant and this particular area of the GIE's business. If *Sema Saniya* decides to charge 15,000 CFA/trip instead of current rates, will they lose customers in spite of the better management scheme they offer?

Alternatively, one might consider that the GIE could divert funds from its more profitable activities to fund the treatment aspect of FS management. In order to determine just how much the other diverse activities can subsidize FS treatment, more detailed financial analyses of each of those is required; still, the analysis of company profitability presented in Chapter V suggests that significant internal subsidizing should be possible.

### *9.1.2 Operational and capital cost of FSTP*

At SANDEC, much attention has been devoted recently to the costs of building and operating fecal sludge treatment plants in a variety of different contexts. A notable and thorough analysis considers data from multiple countries (*Steiner et. al*, Oct. 2002). This analysis reveals that economies of scale are important for large processing plants, but that the haulage costs can quickly become prohibitive as large plants tend to be constructed further away from urban dwellers. The problem of coordinating and optimizing decentralized schemes is one requiring much further attention.

For the plant constructed in Bamako (capital cost is essentially 100% funded with public grants from the UNDP and other agencies), Steiner estimates that the operation and maintenance cost will be roughly 3000 CFA/trip. This cost, however, includes driver salaries already included in the collection calculations. Readjusted, the O + M cost taken directly from the GIE project budget is 1630 F. CFA/trip.

We then have an evolution in costs as demonstrated in Figure IX-1, where both truck maintenance scenarios (I and II) are included:

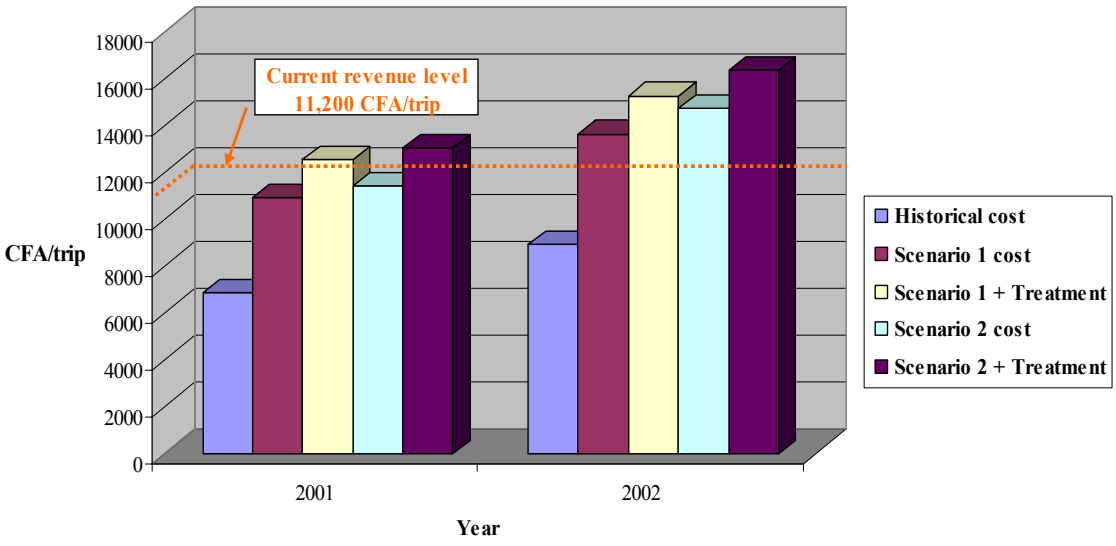


*Figure IX-1: Historical cost per trip of fecal sludge collection and dumping compared with cost scenarios representing longer haulage distance and operation and maintenance of FSTP*

Again, it is obvious from Figure IX-1 that two possible scenarios exist for the *GIE Sema Saniya* for the time being:

- The company increase prices of the pit-emptying service and somehow finds sufficient demand to remain active in the domain;
- The company operates its FS collection and treatment scheme at a loss, subsidizing it with revenues from other activities.

With regard to the first point, there appears to be some flexibility to raise prices. The socio-economic survey conducted in 2003 revealed that households in Commune VI pay an average of 12,500 CFA/trip; the *GIE Sema Saniya* average price is only 11,200. If an increase to this average charge is instituted, Figure IX-1 evolves to Figure IX-2. In that case, in a good year, there is likely still some profit possible, though it certainly would not be enough to cover depreciation of trucks.

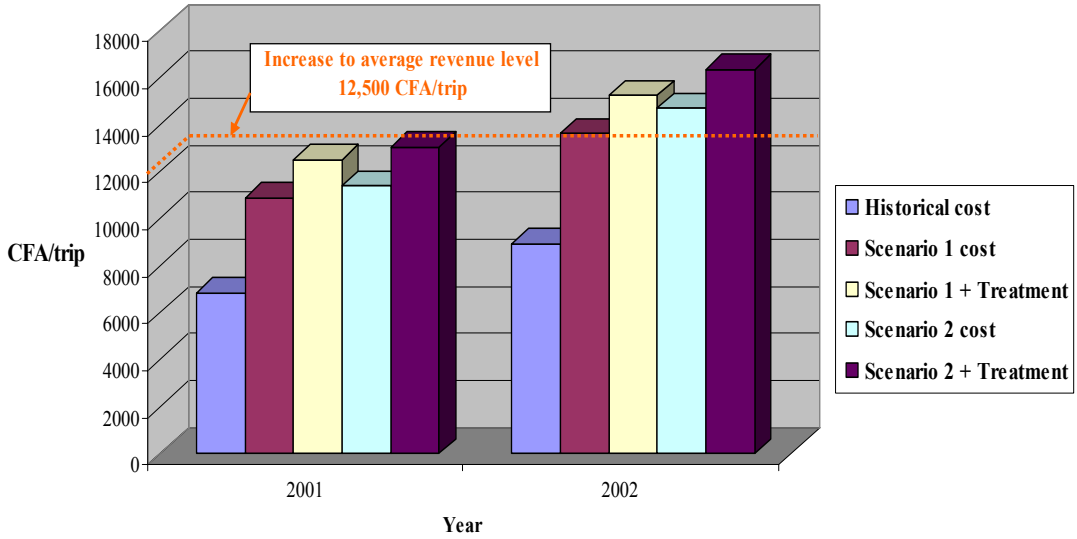


*Figure IX-2: Cost/trip of fecal sludge collection and treatment scenarios from Figure IX-1 relative to an increased average revenue level of 12,500 F. CFA/trip*

Considering that the *GIE Sema Saniya* is fairly robust, the second solution may be possible in the short term; however, it would be imprudent for the company continue in the treatment activity if the economics of the operation do not change. Part of the company's reason for taking the risk is its impression that FS management cannot continue as is in Bamako. If it finds a solution to the problem that could be replicated, the GIE will be in a privileged position in the context of further FS treatment planning and implementation. The following section discusses models that represent the thinking about sustainable FS collection and treatment.

## 9.2 FSTP sustainability and integrated financial analysis

Three organization models for FS treatment adopted from *Steiner et. al* (2002) are discussed in this section.

- FS collection and treatment owned and managed by separate entities (Figure IX-3);
- FS collection and treatment owned and managed by one entity (Figure IX-4);
- Remunerative FS discharging with multiple collection companies (Figure IX-5).

Monetary values of flows are removed from the general figures in order to allow simple qualitative comparison.

### *9.2.1 FS collection and treatment owned and managed by separate entities*

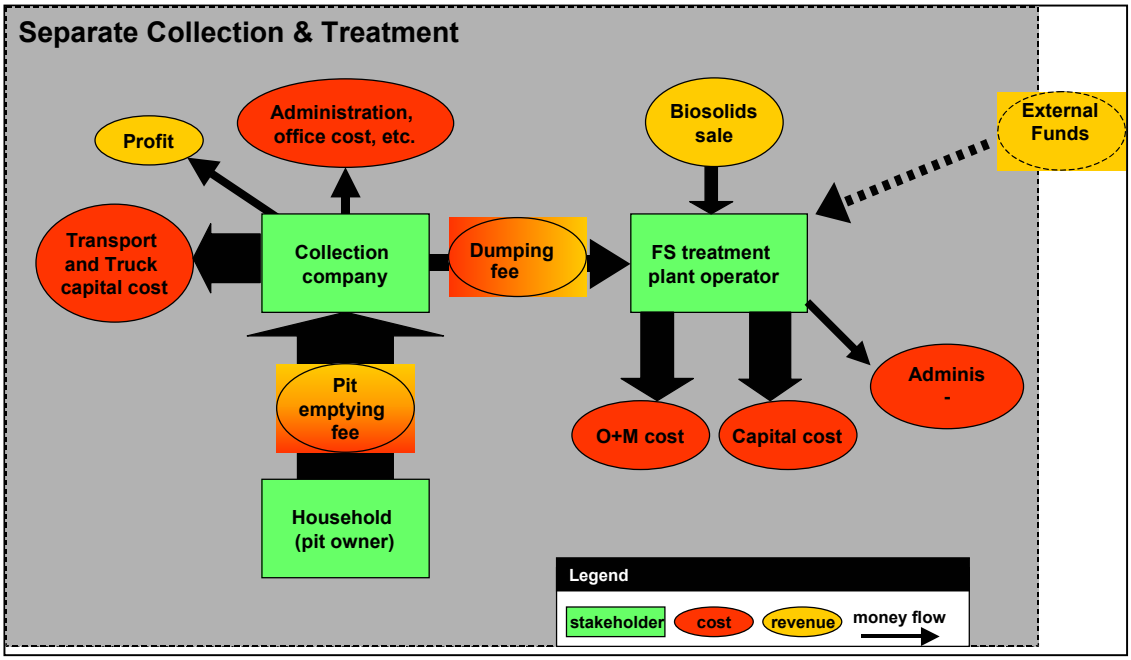


*Figure IX-3: Money fluxes for separate collection & treatment schemes, requiring a functional interface between the collection company and the FSTP (adapted from Steiner, et. al, 2002, p. 12)*

Figure IX-3 closely models a vast number of FS management systems around the world (with the exception of biosolids sale, which is not yet implemented in most schemes). In these schemes, the FSTP operator need not be a private entity; in fact, in most cases it is rather linked to municipal sanitation services (as in Kumasi, Ghana or Kampala, Uganda). These systems do not usually run very well, because of the difficulty of assuring the relationship between the collection

companies and the FSTP. Usually, the privately-operated collection companies are required to pay a fee to discharge their waste and help pay for the costs of treatment. Unfortunately, in practice, the operators prefer to limit their costs and choose not to discharge at the FSTP to avoid paying these extra fees.

A study by *Collignon* (*2003*, Pp. 40-42) suggests the contrary, i.e., that there is no relation between the cost of disposal to the pit-emptying companies and the degree of respect of prescribed disposal sites. Table 16 is offered as evidence of this:

*Table 16: Extent of dumping in "official" dumping site in four cities in Africa (in percentage of trips) and fee paid by operators for its use (Collignon, 2002, p. 40)*

| City | FS collected (Trips/year) | % trips ending at dumping grounds | Charge for discharge (€) | Type of destination |
|---|---|---|---|---|
| Dar Es Salam | 100,000 | 7% | 3.1 | Treatment |
| Dakar | 67,525 | 74% | 0.9-1.5[%] | Dumping only |
| Cotonou | 26,667 | 75% | 8.6 | Treatment* |
| Kampala | 7,000 | 42% | 5.6 | Treatment |
| Kumasi[$] | - | 95% | ~ 2 | Treatment |

[%] The fee charged is about 0.15€/$m^3$, trucks have a capacity 6-10 $m^3$.
* Note: Cotonou FSTP does not assure treatment because it is overloaded and improperly designed.
[$] From Tony Mensah, 2004.

However, it would not make sense to treat these results as evidence that enforced discharging regulations are possible, or even that they represent an ideal solution for which to strive. A closer analysis of each situation reveals why. A fairly successful plant in terms of compliance for discharging is that in Cotonou (75% of FS ends up at the FSTP). For *Collignon*, this plant's situation is the main support offered for the argument that high dumping fees can be charged without affecting the willingness of the collection companies to cover long distances to use the plant. There, private businessmen built a $200,000 fecal sludge treatment plant capable of accepting much less waste than it receives. As a result, plans are underway to improve and expand the plant. The system works, however, to the disadvantage of local populations, because:

- The payment of a discharge fee to the station by pump trucks requires them to raise their service prices - a benign effect;

- Uncooperative entrepreneurs who refuse to dump in the station are then eliminated through the creation of a syndicate called the USV (Union des Structures de Vidange) in 1995, and strong municipal policing - also benign;

- This syndicate and the treatment plant operate more like a cartel, engaging in price-fixing that much of the population cannot pay (a flat rate of 35,000 F. CFA/trip, over 3 times the average price currently charged by *Sema Saniya* in Bamako, where fuel and trucks are more expensive) and

restricting entry of new operators through harassment (*Collignon*, 1999, p.41) or otherwise limiting competition and innovation (*CREPA-Bénin*, 2002, p.40) – no longer so benign;

- An alternative, clandestine manual pit-emptying service develops, with all of its inconveniences and health risks.

The cases of Kampala and Dar Es Salam are much more representative. Limited information is available on these treatment plants, but they can be characterized in the following way:

- The FSTP receives a small number of discharges from collection companies;

- The fee charged for dumping seems to discourage use, especially in Dar Es Salam, where it is not terribly high but only 7% of collected FS ends up in the FSTP (In Uganda it is 42%).

Actually, local sources say that Kampala's treatment works must be considered a bit differently as well, because there a conventional sewage treatment plant accepts discharges from vacuum trucks. It was not designed strictly for FS. In order to prevent shocking of the system, the concentrated pit latrine and septage is first stabilized for three days in separate ponds. Apparently, trucks avoid the treatment station by dumping at night in order to elude the $5 fee, and enforcement of proper discharging depends upon community involvement (*Bategeka, M.*, 2004).

Of course, it should be noted that for the Dar Es Salam plant, no information is available at this time on whether the low level of discharging is caused by the discharging fees or by:

- The plants already being at full capacity,

- The plants being inconveniently located,

- The access roads not being in good condition.

In contrast, Kumasi, Ghana, is one of the few cities where authorities have been successful in making private FS collectors discharge their loads at designated treatment plants. *Mensah* (2004) affirms that compliance with the regulations is roughly 95%. One should note that the discharge fee is farily low. In the past, KMA (Kumasi Metropolitan Authority) provided the collection service, but has now moved towards licensing of the private sector and operation of the discharge sites (*Strauss, et. al*, 2003, p.4). Plans are underway to also privatize the latter in the near future, through a franchising system (*Mensah*, 2004).

Finally, in Dakar, the dumping ground is not an FSTP, and the fee is again minimal, so it would not be expected to have a huge influence on willingness to use the site. However, there has been an investigation on the state of FS management in Dakar (*CREPA-Senegal*, Avril 2002), which indicates that 90% of entrepreneurs emptying on-site sanitation installations dump the FS on seven unauthorized dumping grounds (p.10), contrary to the results suggested by Collignon's study, which measure 74% emptying at the station. In the CREPA report, the combination of distance, traffic (p.129), lost time and the existence of discharging fees are cited as four reasons for the prominence of illegal dumping, even though the entrepreneurs themselves do not consider the fee excessive (p.105). Since that investigation, Niang says that dumping at the Hann station has improved with more effective policing (in his words, the "majority" of trucks now dump there) but no rigorous analyses have been done to determine the percentage (*Niang*, June 2004). As in Kumasi, improved policing may be yielding favorable results.

*Integrated collection and treatment scheme*

A positively innovative aspect of the *GIE Sema Saniya*'s integrated collection and treatment model (Figure IX-4) is the fact that the two domains are put under the combined jurisdiction of one operating enterprise, which is likely to reduce inefficiencies.

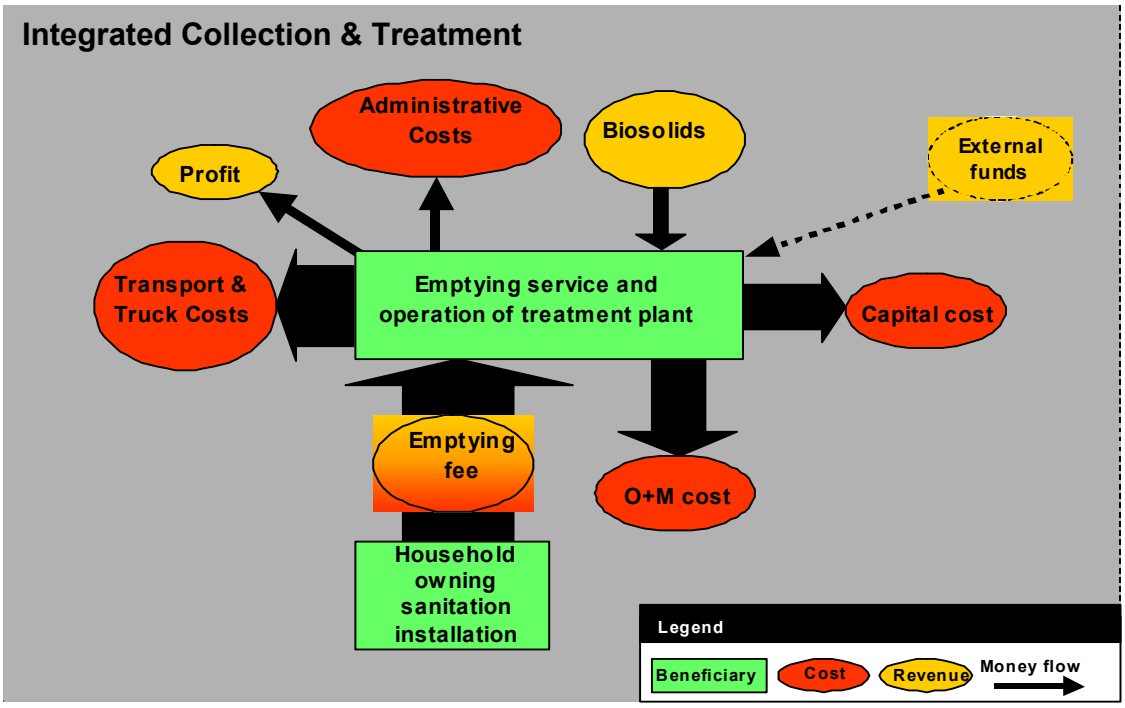


*Figure IX-4: Money fluxes for integrated collection and treatment schemes, not requiring an interface between the collection company and the FSTP (adapted from Steiner et al., 2002, p. 13)*

In the integrated model, the same company runs the treatment plant and the collection service, thereby eliminating the need to pay a fee from one to the other. The company could still choose to dump elsewhere if the costs of such dumping were significantly lower, but it would make much less sense for them to avoid the FSTP. In addition, administration of the two services can be combined in order to reduce inefficiency. The integrated model could be particularly interesting if it were planned around a decentralized FS management scheme, because each truck operator could be linked to its local plant in a private partnership or collective.

In the scheme presented in Figure IX-4, a problem nonetheless remains with collection companies not involved in the FSTP in any way. This is a situation that warrants attention from local government which should normalize the sector, perhaps mandating participation in a collection and treatment collective once the proper facilities exist.

## 9.3 Towards a more systematic neighborhood sanitation approach

The case of Nam Dinh FS management planning, described earlier in the "Is there a role for government?" section, operates based on the idea of engaging local government and institutions to contribute to a fundamental shift in attitudes about the best way to empty on-site sanitation installations. That shift consists of creation of a privately-operated, regular installation-cleaning program, as opposed to one centered on punctual emptying of filled pits. The strategy is motivated by the desire to empty septic tanks and latrines before they quit functioning as designed and back up. It also aims to regularize demand and ensure efficient use of pit-emptying equipment by making service continuous over time and not as vulnerable to peaks and troughs in demand. The regulated emptying service is no longer paid upon service, but rather as part of the monthly water and sanitation fees that the municipality collects, and those fees also help to finance treatment. Characteristics of this organizational scheme follow (*Barreiro*; July 8, 2004), though a more thorough report is promised soon:

- The regular service was funded through a low, 10% sanitation surcharge on the water tariff (VND – Vietnamese Dong 140/$m^3$, or about \$0.01/$m^3$). This surcharge is now being increased as the pricing is analyzed and the septic cleaning service expanded. The most recent figures are 300, 400 and 500 VND/$m^3$ for domestic, industrial and commercial users.

- Preliminary discussions with officials, customers, and private operators indicate satisfaction with the development of the program. Both sides of the private/public partnership were skeptical at first but improvement of the pricing structure and licensing of operators helped resolve conflicts. A People's Committee (local government) regulates pricing.

- In Danang, the pit-emptying service is provided exclusively by the private sector, and operators are slowly replacing old equipment.

- The schedule system functions on "demand management." Streets apply for cleaning during an advertised 3-month window each year. If cleaning is required outside this time, the client pays full price, which incites people to sign up at the free time.

- There will be remuneration of the septic tank cleaning company at the treatment site in order to incite treatment. For now, discharging still occurs at a drying/dewatering area without treatment; the construction of 4 treatment stations is in long term planning.

The last point above is a very important one, because it represents a very innovative departure from the money flux scheme presented in Figure IX-4. In that scheme, unauthorized dumping by private operators is common because they seek to minimize their costs and so avoid the treatment facility. Before now, this was also the case in Danang, where such payments were made monthly to the FSTP, and though there is no data measuring the extent of illicit dumping, we are told that "it is not unlikely that…service providers are discharging collected sludge into the city's drainage system or natural water bodies" (*Barreiro,* 2002, p.2). The financing now being attempted in Danang can be represented as shown in Figure IX-5.

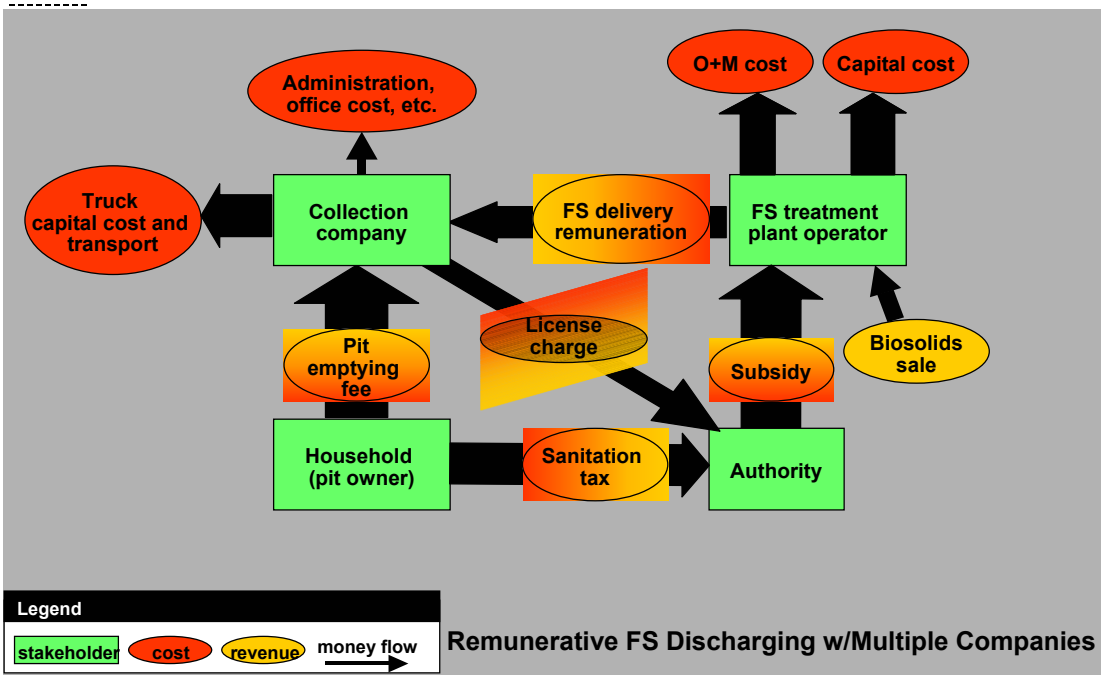


*Figure IX-5: Innovative money flow model for sustainable FSM financing (Steiner, p. 16), with absolute numbers removed*

In a different "neighborhood contract" scheme, the *GIE Sema Saniya* has also considered initiating a fully private integrated service to its clients, combining the subscription to solid waste collection with a scheduled septic tank emptying service (*Bolomey*, 2003b,

Pp. 31-35), and calling it a sanitation contract. In fact, the GIE carried out some market research on the subject through the socio-economic survey (*Bolomey, et. al,* 2003a), asking households if they would consider subscribing to such a dual service, though not specifying costs. The results are presented in Figure IX-6:

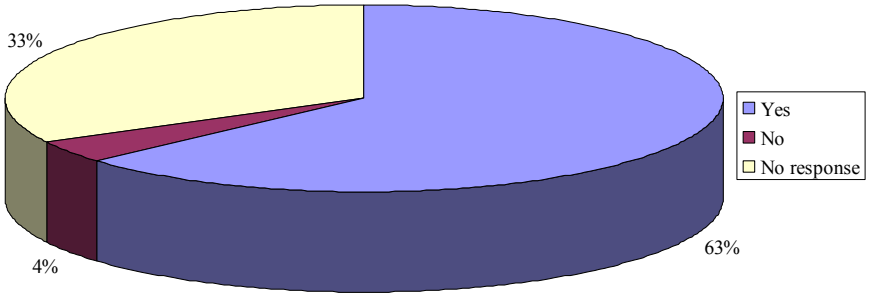


*Figure IX-6: Households open to considering signing integrated solid/liquid waste management contracts with the GIE Sema Saniya*

In the specific zone served by *Sema Saniya* (Figure IX-6 shows responses across the whole Commune), 53% of people answered yes, and 43% did not respond. The high non-response rate is probably related to the lack of a concrete proposal about how much such contracts would cost. It is important to note that these survey results preceded any of the awareness-raising activities initiated in 2004 by the *GIE Sema Saniya* and PCV to educate households and the general public about the health and environmental threat posed by untreated fecal sludge and current management practices. Given the predisposition of households to accept sanitation contracts, the idea is promising, especially when one considers that demand for it in Bamako is so strong. In Danang, Vietnam where one form of regular, contractual emptying is already successfully being implemented, 90% of the population preferred paying directly rather than as a monthly charge for the service (*Barreiro*, 2002, p.3). Perhaps such a model is an appropriate long-term solution.

# X. CONCLUSIONS AND RECOMMENDATIONS (SPECIFIC AND GENERAL)

## 10.1 Lessons learned through work conducted in Bamako

The innovative planning experience for improved FS management in Mali and the comparative study conducted in this report provide many valuable lessons. These lessons can be grouped into technical, socio-cultural, economic and institutional. A summary and discussion follows.

### *10.1.1 Technical lessons learned*

While the treatment facility has yet to be put into operation, there are already clearly relevant technical lessons, related to local capacities and design considerations:

1) GIEs in Mali often find appropriate technical solutions for solving local sanitation problems (*i.e.* design of trash cans, choice of solid waste collection equipment).

2) There is a technical problem with fully emptying filled OSS installations. Mechanical methods leave solid deposits in the bottom of the pits, and manual emptying is a sanitary risk. Other services also experience technical problems (*i.e.* dealing with badly conditioned trash).

3) Despite the fact that low-cost solutions exist for fecal sludge treatment, there remain important technological problems with these, notably:

    a) Ammonia toxicity to algae in waste stabilization ponds;
    b) Low-cost, practical de-sludging of sedimentation tanks;
    c) The problem of system shocks from concentrated public latrine (Type B) waste.

4) Local planning and design of treatment facilities is rendered very difficult by the lack of local capacities in testing samples. In Bamako, this problem forced the PCV to conceive of a design based upon FS characteristics from Ghana (see Table 8), where testing capacities were built up over time through technical assistance from foreign partners.

5) While technical personnel (engineers, sociologists, etc.) capable of planning design schemes and writing proposals may exist in less developed nations, their services are not accessible to small enterprises.

6) The question of whether or not co-composting on a large scale is technically feasible remains unanswered today. Attempts will be made in Bamako.

### *10.1.2 Socio-cultural lessons learned*

1) Households in Bamako are not very well informed about the fate and problems of fecal sludge (*Bolomey, et. al*, 2003).

2) Households in the *GIE Sema Saniya*'s zone of intervention appear generally satisfied with the services offered (Figure IV-6) despite the presence of sometimes vocal, unsatisfied clients.

3) It is challenging to maintain stakeholder relations and keep all parties abreast of planning.

### *10.1.3 Economic lessons learned*

1) Surveying (*Bolomey, et. al,* 2003a) reveals that even basic information-sharing with citizens raises willingness-to-pay for responsible management of FS.

2) Sanitation services can be quite lucrative, even in poor countries, as demonstrated in the viability analysis of the *GIE Sema Saniya*. GIEs generally find innovative ways to make a variety of activities profitable (incentives to collection agents, suspension of services, etc.).

3) There are unnecessary costs in the FS management ladder, most notably high taxes on profits and police tolls for passage of trucks (see Table 15).

4) Even if there is no cost for discharging at a treatment plant, creation of FSTPs can make FS collection unprofitable because of longer distances covered to the discharge site.

5) Most FSTPs that charge entrepreneurs to discharge waste are unable to attract even 50% of trucks. The exceptions are Kumasi, Ghana and Dakar, Sénégal, where the fees are relatively low and police enforcement strong, and Cotonou, Benin, where cartelization defines the sector.

6) Finding land for FS treatment stations is very difficult, because:

    a) Urbanization is faster than urban planning,
    b) Land near the city is relatively expensive,
    c) Zoning regulations and neighboring citizens may render certain sites ineligible.

7) Co-financing of large projects (as in Bamako, see Table 10) is sometimes possible, but demands coordination and prioritizing within the project plan.

8) Price fixing by pit-emptying cartels (USV in Benin and syndicate in Commune IV) and even informal operators occurs fairly quickly due to the sector's relatively high barriers of entry.

9) Creating FS management systems that integrate collection and treatment under one operator are probably economically more efficient than separated schemes, so that they reduce overall costs.

10) Sanitation taxes or indirect financing schemes which allow remunerated FS discharging are promising solutions which are not yet appropriate for places like Bamako (and much of West Africa), but may be for locales where local government is strong, like Vietnam (Chapter 9.3).

### *10.1.4 Institutional lessons learned*

1) National regulative structures intervening in FS management in countries in the South sometimes suffer from wanting to institute unrealistic legislation for environmental control, modeled on the developed world. In Bamako, the environmental impact assessment for building the FSTP was occasionally tedious due to stringent regulations even though the initiative was clearly proposing an improvement.

2) Many institutional weaknesses that impact FS management are so complex and deeply buried that only concerted efforts from external aid agencies or internal government structures can address them. Most of the time, bilateral and multilateral aid agencies act individually.

3) The diverse types and behaviors of operators working in FS collection demands public licensing and regulation if improved FS management is the aim. Otherwise, these agents are flexible enough that some will always find ways to avoid proposed changes, which often raise their costs.

4) Private sector work in sanitation can push weak public institutions to get more involved, as in Bamako's solid waste collection and FS management.

5) In parallel, donors can wield their influence to help jumpstart political involvement. In Commune VI, the GEF program brought the DNACPN into the planning picture.

6) The urgency of immediate planning for improved FS management is clear when one considers its long time scale and the fact that urbanization continues to be very high in less developed countries.

7) Local and national authorities should not be treated as one and the same. They may have entirely different goals:

a) It is always important to keep local authorities informed even when they are unable to contribute technically/financially. Otherwise, they can block good projects, or weaken the private sector which they deem overly assertive.

b) It is counterproductive for local governments to take draconic measures to reform sanitation, such as banning entrepreneurial initiatives (as in Commune II FS management, see Section 2.2), thus creating a crisis in which demand could no longer be met.

c) If the project is innovative, as much work in FS management is today, it is also important to keep higher, national authorities informed as well so that they do not feel impotent and ignored.

8) The institutional organization of small enterprises prohibits them from contributing much personnel to FS planning; they require significant assistance in human resources (PCVs worked 5 years with the *GIE Sema Saniya*, for instance). Aid organizations intent on becoming involved in this work should be conscious of how intensive the requirements can be. Assistance is needed in the following areas (also see Section 7.7):

   a) Proposal writing and project development,

   b) FSTP design and environmental impact assessment,

   c) FSTP construction guidance,

   d) Training of operating personnel, and

   e) Monitoring and post-construction management.

9) Encouraging local companies and agencies in FS planning is the best way to successfully to capacity-building (In Bamako, the *GIE, Diabeso, QUARC and CREPA-Mali* were all local).

10) A dilemma presents itself when considering public sector FS planning:

   a) Institutions such as government and NGOs are more capable of paying skilled personnel to design treatment plants and have more easy access to capital funding sources than the private sector.

   b) However, public institutions are not necessarily the best ones to get involved in FS treatment since they have few competitive advantages once construction is complete.

*Table 17: Recap of lessons learned through the FS planning experience in Bamako and comparative study*

| Technical | Socio-cultural | Economic | Institutional |
|---|---|---|---|
| - GIEs are remarkably innovative in developing appropriate solutions<br>- Complete OSS installation emptying is difficult<br>- Sample testing capacities are often low<br>- Technical problems with low-cost FS treatment remain<br>- Co-composting is not a guaranteed endeavor<br>- Services of technical personnel not accessible to small entrepreneurs | - Households are uninformed about FS dangers and fate<br>- Many households appear willing to pay for FS treatment in Bamako<br>- Maintaining and fostering strong stakeholder interactions is a challenge | - Sharing information about FS with clients raises willingness to pay<br>- Small enterprises are very adept at making sanitation profitable<br>- Unnecessary costs exist in FS management in Bamako<br>- Inclusion of treatment in FS management lowers sector profitability unless fees are increased<br>- FSTPs that charge for discharging rarely attract 50% of trucks, unless there is strong regulatory enforcement<br>- There are many issues with finding land for FSTPs<br>- Funding for private-led FSTP construction is hard<br>- Cartelization of operators can happen quickly when regulation begins<br>- Linking treatment w/collection limits economic inefficiencies<br>- Sanitation taxes which allow remunerated FS discharging are promising solutions which are not yet appropriate for many places | - National regulation not always appropriate<br>- Aid organizations do not often act in concert<br>- Licensing is needed if improved FS management is desired<br>- Private sector FS planning can bring public sector involvement<br>- Donors can also bring public sector involvement<br>- Better FS management should be an urgent priority<br>- Local and national authorities often do not have the same objectives<br>- Small enterprises need various forms of assistance for successful FS planning<br>- Encouraging local actors helps build capacities<br>- Public institutions have easier access to funding but are less effective operationally than the private sector |

## 10.2 Bamako-specific recommendations

### *10.2.1 Raise the GIE Sema Saniya's OSS installation emptying fee*

One of the ways through which the *GIE Sema Saniya* attracts customers is by charging low fees (11,200 on average compared to the market average of 12,500 F.CFA/trip). The initiation of the treatment scheme, with additional costs for fuel to reach the discharge site and maintenance of works, requires an increase in the price of the service at least to the average level. Even then, the long-term sustainability of the venture needs to be enhanced otherwise.

*10.2.2 Conduct extensive awareness-raising among households*

*Bolomey, et. al* (2003) suggest that awareness raising is one of the most urgent needs in improving the FS management picture in Bamako. Households are not well informed about fecal sludge, but when they learn of the risks, they appear responsive to the initiation of treatment, even if it costs them more money. After conducting a preliminary campaign on the issue, and seeing the response of stakeholders at the inauguration for the Commune VI treatment works, this author shares that opinion. Awareness-raising should be an ongoing commitment of the *GIE Sema Saniya* and the other members of the *groupe de concertation* if the really want to see improvements in the city.

*10.2.3 Encourage local authorities in Commune VI to begin licensing the emptying operators*

The *GIE Sema Saniya* realizes that inciting trucks to discharge FS at its treatment works requires a more normalized market, with licensed operators and concerted policies. However, to this day, the local government has not been able to intervene on this issue. Stakeholders and planners must pursue licensing and truck certification if they want to see the days of illicit dumping come to an end in Bamako. The police should be involved in these discussions to ensure future enforcement.

*10.2.4 Work for legislative reform that eases the financial burden on the FS treatment sector*

Promoting tax breaks or reducing police tolls for entrepreneurs who assure treatment would be a good way to make responsible FS management more sustainable. The *GIE Sema Saniya*, for instance, pays the equivalent of about 1,000 F. CFA/trip for these two costs, which are in turn reflected in higher prices for households.

*10.2.2 Require households to subscribe to solid waste management services*

One action that would go a long way to promoting improved sanitation, by increasing the profitability of the base solid waste collection service, would be to require all households to subscribe to it. Currently voluntary, concessions and families that are not signed up create problems for the community, disposing of their trash in unregulated zones and degrading neighborhood cleanliness. GIEs in turn get blamed for these dumps and suffer from degraded image and political capital.

*10.2.3 Develop FSTP monitoring capacities at the FSTPs in Bamako*

A great problem when designing the FSTPs for Communes IV and VI was the inability to test samples locally to determine the characteristics of the waste that would be treated. These capacities must be developed in the near future in order to allow successful evaluation of the treatment works and plan future ones. Given the fact that current technologies are not perfect, this monitoring is even more essential.

#### *10.2.4 Encourage CREPA-Mali to fill its role more assertively*

CREPA-Mali is one probably the only local organization that has the capacities to evaluate FS management in Bamako. Furthermore, it holds the presidency of the stakeholder group, the *groupe de concertation*. Still, today it plays its role timidly. A PCV is now placed with them rather than at the *GIE Sema Saniya* in order to encourage CREPA to play a more active role and facilitate stakeholder interactions.

#### *10.2.5 Begin proposing sanitation contracts to GIE Sema Saniya clientele*

The *GIE Sema Saniya* has developed the idea of creating sanitation contracts for its clientele which would combine solid waste management with FS management to regulate demand in the latter area. The implementation of such contracts poses a few challenges, most notably how to properly calculate demand from its clients, especially considering the effects of rainy season. Therefore, the contract idea should be promoted in small, pilot zones to determine its potential.

#### *10.2.6 Encourage national authorities and foreign aid organizations to better work together for common goals*

As pointed out above, a huge problem in Mali and many other developing countries receiving foreign aid is the fact that the multiple donors do not really work together. It is easy to say that this situation should be improved, but in practice, the challenges are great. This paper does not attempt to make suggestions about how the aid picture can be improved.

### 10.3 Recommendations for further study

The number of different models for FS management, and the particular position of treatment in those models, is multiplying in developing countries today. However, until now, few detailed studies evaluating and comparing the different cases have been conducted. Hence, it is difficult to issue recommendations on “best” FS management models applicable in a variety of settings. There is a real need for studies which critically analyze current or newly-developed management approaches, and try to assess the factors which contribute to successes or failures of the selected approaches. The few organizations that have the capacity to conduct such wide-spanning studies should mobilize the resources needed to address this problem of critical importance around the world today.

These studies should consider the following questions (among others) about FS management structures:

- How does treatment affects the pricing of emptying services?
- What types of public-private partnerships seem particularly successful and why? What are necessary characteristics of public institutions and private enterprises involved in these partnerships, and how can they be encouraged to get involved in FS treatment?
- How can illicit dumping best be reduced when treatment facilities exist? Through incentives? Rigorous enforcement? Other means?
- Does it make economic sense to integrate collection and treatment under one common operating structure if possible?
- How are treatment plant efficiencies optimized? How can demand for pit-emptying services be regularized?
- Can regular, community-scheduling approaches work in places like Vietnam, where the local government is relatively strong? How about in places where local government is less strong? Does the idea of community contracts hold promise for the future of urban sanitation?
- How can planning for decentralized treatment be improved so that decisions to build are concerted and not politically troublesome?
- Is there really economic potential in the reuse of sludge for co-composting?

There has been much improvement in development of appropriate technologies for FS treatment, but work remains to be done to address some of the technical problems mentioned in Section 10.1.1.

Another area needing additional study is what effect awareness-raising activities and campaigns can have on the demand for proper FS management and treatment. In Bamako, there was reason to believe that awareness-raising would give positive results in this sense, but attempts to collect extensive data of that sort following distribution of pamphlets in a community was rushed and inconclusive.

## 10.4 General recommendations

Moving from the case study of Bamako to more general recommendations is a bit ambitious, but it is the view of the author that some guidance can still be given based on this limited experience and the other information collected for the writing of this

document. As in the lessons learned section, these recommendations can be divided into technical, socio-cultural, economic and institutional.

### *10.4.1 Technical recommendations*

#### Continue work to understand and improve FS treatment technologies

As pointed out previously in the lessons learned part of this report, there is still work to be done to improve low-cost treatment technologies. One positive aspect of this work is that it is now being done locally in some places like Thailand where capacity-building has been effective. It is also steadily becoming possible in the less developed nations of West Africa. Though foreign partnerships should continue to enrich the search for appropriate solution, it is probably best for the long-term sustainability of sanitation work if local expertise can continue to be refined alongside as well.

***Recommendation 1:*** *Maintain support for technical research projects which evaluate existing technologies and evaluate new ones. Also help facilitate transfer of skills in monitoring and sample analysis to underserved places.*

#### Develop larger-scale co-composting plants for the treatment of sludge with solid waste

The technical feasibility of co-composting biosolids with solid waste has been demonstrated by SANDEC in Ghana through various small scale studies, but there remains a great need to determine is large-scale production is economically feasible while maintaining technical quality.

***Recommendation 2:*** *Develop larger scale co-composting projects and evaluate quality.*

#### Establish new technical partnerships with small enterprises

Having been the dominant implementers for FS treatment initiatives in the past, research institutions and public treatment works have received extensive technical assistance. Now, as small, private sector operators emerge in the sanitation business, they also need help to improve the quality of their work. Yet, they are less likely to receive it because of the small scale of their operations.

***Recommendation 3***: *Identify vibrant private sector entrepreneurs who themselves are interested in improved FS management, and assist them in achieving it.*

### *10.4.2 Socio-cultural recommendation*

#### Develop awareness-raising tools and programs addressing fecal sludge

It is a mistake to assume that households and the general population are well-informed about the risks associated with current fecal sludge management practices in many places. In effect, even among people who know that fecal contamination can lead to disease, there are many who do not know what actually happens to FS when it is pumped out of OSS installations or how illicit dumping might indirectly affect them. In Bamako, remember that *Bolomey, et. al* showed that only 36% of the population was bothered by the unregulated dumping of FS in fields and on empty land. This lack of understanding and concern demands significant awareness-raising. Plus, the hope that awareness-raising might raise willingness-to-pay is not negligible.

***Recommendation 4****: Implement awareness-raising activities concerning FS targeted towards the general population.*

#### Choose participants for improved FS planning

The choice of public and private partners for improved FS planning is not a simple matter. In general, organizations should not be hand-picked; rather, only interested groups should be aided, since real, dedicated involvement is a key to success. Technical recommendation 3 suggests that vibrant and effective private enterprises need to be identified to promote better sanitation in urban centers, but they should commit to planning and dedicate necessary resources themselves. In Bamako, the *GIE Sema Saniya* assumed project ownership early on, and assumed responsibility of all planning costs until funding for actual FSTP construction was secured. Such good-faith commitments are necessary. The assistants then helping the private operators should emphasize stakeholder involvement; indeed, even the most socially-conscious private business will not make that a priority very often.

***Recommendation 5****: Technical assistance and capacity-building should also make stakeholder involvement a priority to better ensure successful planning.*

#### Develop schemes or models which encourage full stakeholder involvement

A related need is the creation of models for seeking stakeholder empowerment. The *groupe de concertation* idea implemented in Bamako has not been as effective as could be desired.

***Recommendation 6****: Focus on formal and informal ways to bring all stakeholders into schemes for improved FS planning. Provide guidance documents applicable to other contexts.*

### *10.4.3 Economic recommendations*

#### Guide FSTP placement

The problem of FSTP placement is delicate. On the one hand, municipalities and citizens want the dumping and treatment to take place far away from their homes. On the other hand, truck operators want to dump the waste at a place that limits the distance they need to cover and the fuel they need to burn. Consider the solutions and alternatives presented in Table 18.

*Table 18: Aspects to consider for choosing FSTP locations*

| | **Number of FSTPs** | | | | | |
|---|---|---|---|---|---|---|
| | *One* | | | *Several* | | |
| **Placement** | **Total capital cost** | **Distance** | **Proximity to homes** | **Total capital cost** | **Distance** | **Proximity to homes** |
| Within city | Medium to high | Low to medium | High | Very High | Low | High |
| At city outskirts | Low to medium | Low to high | Low | Medium to high | Low to medium | Low |
| Far outside city | Low | Medium to high | Very low | Medium | Medium | Very low |

Decentralized schemes are certainly better in reducing distances covered by trucks, but they also cost more because of inability to use economies of scale. A balance between these two factors must be found, but it is highly contingent on more rigorous urban planning by local authorities. Eventually, one could envision that operations research methods could be applied to optimize some combination of low cost and low proximity to homes, but that time has not yet arrived.

***Recommendation 7:*** *For now, favor decentralized treatment schemes that minimize distances trucks must cover to legally discharge FS, but do not site such plants too close to local inhabitants.*

#### Foster innovation in FS management, especially with regard to FS treatment

It is clear from the brief comparative study conducted in this paper that conventional FS treatment schemes suffer from serious management problems above and beyond their technical challenges. Plants which receive 7%, 42% and even 75% of truck loads can hardly be considered exemplary. Innovative models that remunerate truck operators for discharging or combine collection and treatment should be encouraged to determine if they can be made sustainable. Finally, schemes which aim to produce large amounts of co-compost should also be aided in their beginning stages.

***Recommendation 8:*** *Temporarily subsidize innovative FS treatment structures that hold potential for increasing discharging percentages (or instance money flux inversion, integrated collection and treatment) or for generating revenues from treatment products.*

**Inform the private sector how to more easily obtain funding for improved FS management**

As was eventually achieved in Bamako, the private sector can obtain funding for construction of treatment works, even if the financing comes indirectly through a controlling NGO or public institution. Strong, viable enterprises doted with a social mission should be encouraged in this sense by the donor community. More often than not, the enterprises give up because the search is so difficult.

***Recommendation 9****: Allow vibrant entrepreneurs to seek funding for sanitation projects, particularly in neglected areas like FS treatment, and employ the necessary controls to prevent upsetting competitive balance.*

**Involve local and national government in planning**

The involvement of the local government in FS planning is essential to avoid disrupting market balance (rendering responsible operators less competitive because they have higher costs) or creating cartels that take advantage of households through price-fixing.

***Recommendation 10****: Get local government and police involved in regulating the FS collection market so that such abuses or imbalances are less likely to occur.*

### *10.4.4 Institutional recommendations*

**Encourage private-public partnerships for FS management, especially for financing and technical assistance to private initiative**

The number of private-public partnerships in sanitation in developing countries remains minimal, to the detriment of the populations served. While it is true that financing schemes by/for private operators need to be carefully evaluated and controlled to ensure that fair competition is maintained, we have seen that the dominant role they play in providing affordable sanitation (they are especially present in solid waste management today) warrants further aid and investment.

In 1999, the Water and Sanitation Program (WSP) World Bank ten-country study investigation revealed that only two cases of successful outside funding for FS management projects had been found (*Collignon*, 1999, p.51).. After the treatment plant design experience in Commune VI, Bamako, we can add a third:

- Construction of the *SIBEAU* fecal sludge treatment plant in Cotonou,
- The *GIE Sema Saniya*'s purchase of a pit-emptying truck
- Construction of the FSTP serving Commune VI (details of the PPP are given in Table 13 and Table 14).

Private entrepreneurs working in sanitation need to have access to bilateral and non-profit donor sources, because they cannot assume the high risks and costs of building treatment works themselves.

***Recommendation 11****: Improve financing pathways (different from Recommendation 9) for improved FS management working with the private sector.*

***Recommendation 12****: Encourage and finance skilled technical assistance for small sanitation enterprises, whose budgets generally do not permit their hiring.*

**Provide national governments with assistance in creating national sanitation strategies and seek to better communication between various donors**

The lack of collaboration among many foreign funding agencies is a really pressing problem for achieving efficient development. It should somehow be addressed. In Commune VI, two pilot FSTP projects were nearly funded at the same time.

***Recommendation 13****: Avoid donor redundancy or conflicting development projects through greater collaboration in the realm of sanitation.*

## 10.5 Conclusion

The numerous lessons learned from the Bamako case of fecal sludge planning and the partial comparative study conducted in this report, plus the many recommendations drawn from those lessons, show that a great deal of work remains to be done in the field. As the forces of urbanization continue to draw more and more people into cities where space is limited and on-site sanitation prevails, improving low-cost fecal sludge treatment schemes and finding ways to manage them effectively will only become more urgent. It is the hope of this author that the necessary work will continue to dictate the attention of researchers, planners and policy-makers around the globe.

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