Chapter 13

Financial Transfers and Responsibility in Faecal Sludge Management Chains

Elizabeth Tilley and Pierre-Henri Dodane

Learning Objectives

- Understand how the different stakeholders in a service chain relate to each other from a financing point of view.
- Know which types of financial transfers play a role in faecal sludge management.
- Be able to describe different financial flow models for faecal sludge management.
- Understand the complexity involved in designing, implementing, monitoring and optimising an entire faecal sludge management system that includes all stakeholder and financial interactions.

13.1 INTRODUCTION

One of the reasons that faecal sludge management (FSM) systems have not been widely implemented is because of the financial and political complexity involved. This is not only due to the number of stakeholders who have a financial interest in the system, but also to the diversity of the interests each stakeholder has.

Unlike other types of infrastructure (e.g. electricity) where a single utility is usually responsible for the generation, delivery, operation, maintenance and billing, a faecal sludge (FS) system is more commonly a collection of stakeholders, each of whom is responsible for a different part of the treatment chain. Consequently, payments must be made each time responsibility is transferred from one stakeholder to another. Only a special set of political and financial conditions can foster an environment that allows each essential stakeholder to perform their task and permit a complete treatment chain to take form.

Figure 13.1 Servicing and billing in informal settlements is always difficult; it is exacerbated by a lack of access and tenure (photo: Linda Strande).

This chapter will examine the financial flows within various FSM systems and will illustrate and discuss the critical financial and responsibility transfer points. To understand the complete FS system, this chapter will begin by defining the various stakeholders and their roles within the FSM system. The types of financial transfers will be discussed with particular attention paid to the stakeholders between whom they are transferred. Five different FSM models, i.e. different combinations of stakeholders with various responsibilities and financial transfers are presented and examined. Finally, a short problem is presented using the business model of a small-scale collection and transport entrepreneur in order to illustrate the number and magnitude of financial transfers that affect even a minor element of a FSM system. The chapter concludes with future perspectives.

13.2 FINANCIAL MODELS

13.2.1 Stakeholders involved in financial transfers

Almost every stakeholder in a FS system is involved in some kind of financial interaction. Stakeholders are those people, institutions or enterprises that send or receive payment in exchange for taking responsibility for one or more processes in the FS treatment chain. The stakeholders and their financial responsibilities are summarised (in alphabetical order) in the following paragraphs.

Enduse industries are those stakeholders that make use of the inherent nutrients, energy potential, and bulking properties of treated FS. Enduse industries are a relatively new, but growing sector in the FS process chain. The enduse(s) of FS should be considered when designing the entire FSM service chain to ensure the appropriate design of treatment technologies; i.e. so that the best quality FS can be generated for its specific final use (Diener *et al.*, 2014).

With a growing need for low-cost, locally sourced, sustainable nutrients, the agricultural industry will likely emerge as an important enduse stakeholder. FS is also a promising sustainable energy source. In the future, the financial benefits and environmental necessity of enduse may become drivers for

improved FSM and influence the design of FS systems. The demand for sludge, as well as the legal framework for its application, will have an increasingly powerful impact on how FS is managed through the entire process chain. Refer to Chapter 10 for a full range of industries and products associated with enduse.

Government authorities are responsible for the rules and regulations to which private enterprises and public utilities must adhere. Government authorities may allocate budgets to utilities and outsource work to private enterprises, but may also plan and manage their own FS programs internally. Government authorities are responsible for collecting taxes in order to cover, or partly cover their budgets. Authorities may also be recipients of foreign aid, which may be allocated to the construction, operation or maintenance of public infrastructure.

Household-level toilet users are those people who are responsible for removing FS from property that they own or rent. These people have some type of onsite sanitation technology that requires periodic FS removal. Technologies that require periodic emptying include septic tanks, pit latrines, anaerobic baffled reactors (ABRs) (for clusters of houses) or other similar, water-based storage technologies.

Non-Governmental organisations (NGOs) are enterprises that operate on a not for profit basis and which are not funded or supported directly by government, although they are often sub-contracted by government for specific tasks. NGOs operate in the social-service niches left where governments and private enterprise are unwilling or unable to operate effectively.

Private enterprises are organisations that operate on a for-profit basis by providing goods or services in exchange for payment. Private enterprises are bound by the laws of the state, and may accept contracts to work for the state. However, private enterprises are not wholly or in part, associated with government at any level and do not receive guaranteed government funding (though they may apply for subsidies, loans, etc.).

Public utilities are responsible for operating and maintaining public infrastructure (e.g. water or electricity). They are extensions of government authorities, and as such, are funded by government budgets. Depending on how well the public utility (PU) is run, and how users are billed, the PU may operate at a loss. Public utilities provide a useful service, which may not otherwise exist in a free market (e.g. sludge treatment) but have typically operated as monopolies. Increasingly however, private enterprises have recognised the financial potential of operating within the PU marketplace and as a result, PUs are no longer free from competition.

13.2.2 Financial transfers

Within a FSM system, money is exchanged for different activities (e.g. emptying, transport, processing), at different orders of magnitude (e.g. small service payments, massive construction costs), and with different frequency (e.g. daily transfer frees, annual taxes). To achieve a financially sustainable business model, a prudent selection of the transfer types must be implemented. A brief summary of the most common financial transfers, applicable to FSM, is presented below.

Budget support is the name given to cash transfers between stakeholders to partly or fully cover one stakeholder's operating budget. Typically, a government authority would provide budget support for a public utility, but foreign governments or agencies (e.g. USAID, Asian Development Bank) also provide budget support to different ministries and/or sectors. The duration of the budget support is usually long-term and non-conditional. In other words, it is not related to a specific task or output, but rather, is made to support daily budgetary requirements (conditional cash transfers have become increasingly promising since they reward outcomes and encourage transparency).

Table 13.1 Discharge fees and rates at official discharge sites in 2004 (adapted from Collignon, 2002; Jeuland, 2004)

City	Cost per discharge (€)	Percent of total discharges	Discharges per year	Destination type
Cotonou, Benin	8.6	75%	26,667	Treatment*
Kampala, Uganda	5.6	42%	7,000	Treatment
Dar Es Salaam, Tanzania	3.1	7%	100,000	Treatment
Kumasi, Ghana	2.0	95%	-	Treatment
Dakar, Senegal	1.2	74%	67,525	Discharge only

* Proper treatment cannot be guaranteed since the facility is improperly designed and overloaded

Capital investment costs are those that are paid once, at the beginning of the project to cover all materials, labour and associated expenses needed to build the facilities and associated infrastructure. Examples of capital investments could include the purchase of land for the construction of FS drying beds, the design and build of a treatment plant, the purchase of a vacuum truck for collection and transport, or the installation of a septic tank at the household level. Capital investments can be paid by any of the stakeholders listed in the previous section.

Discharge fee is a fee charged in exchange for permission to discharge FS at some type of facility. The fee is paid with the intention of transferring responsibility to a stakeholder who has the legal and technical ability to safely process and/or transfer FS to another responsible stakeholder. In theory, anyone who owns property could charge a discharge fee and allow FS to be dumped, despite the lack of appropriate safety precautions. Official discharge fees (in conjunction with enforced laws) must therefore be structured so as not to create an incentive for individuals to charge their own, unregulated, discharge fees and compete with the formal discharge fee structure. It has been argued however, that discharge fees do not correlate with illegal discharge, i.e. higher discharge fees do not result in reduced use of authorised facilities as shown in Table 13.1.

Figure 13.2 Collection of discharge fees. Good accounting is essential to understand how any business operates and how it can be improved (photo: Linda Strande).

The most equitable and financially beneficial way to charge a discharge fee is not clear. It may be charged according to the volume of sludge discharged (which may be difficult to measure, and does not take into account the density of the sludge), or per discharge event regardless of the volume (though the entire volume of the truck may be difficult to empty). Both models have consequences for the collection and treatment (C&T) business and the FS treatment plant (FSTP) in terms of how they optimise their finances. Payments based on discharge events, for example, may encourage C&T enterprises to maximise the volume of FS in each truck more efficiently, resulting in the FSTP being faced with more infrequent, highly loaded discharge events.

Discharge incentive is the opposite of a discharge fee. It is a payment used to reward the C&T business for discharge the sludge in a designated location and to disincentivise unregulated, or illegal discharge. Making payments, rather than collecting fees, means that the FSTP would require other means of meeting their costs, likely in the form of a sanitation tax. A discharge incentive of 5 USD per load of sludge was proposed for Ouagadougou, Burkina Faso to prevent illegal discharge, although the long term results of this program have not been published (SANDEC, 2006). Incentives are essentially payments made to people as rewards for performing tasks that they may not otherwise do, but that are socially desirable. Incentives are controversial because, as some argue, people should not be paid for doing what is 'right', but programs to date have been highly effective at achieving their objectives using more of the 'carrot' than the 'stick' approach, and achieving higher returns on public investment than comparable public announcement, social-pressure, or education campaigns (Gertler and Boyce, 2001; Kakwani *et al.*, 2005; Eldridge and Palmer, 2009; Banerjee *et al.*, 2010).

Discharge license is a financial instrument used to control the number and quality of C&T enterprises that are allowed to discharge FS at the FSTP. The license, in theory, is given out depending on proven quality of the service that the stakeholder is able to provide. In practice however it is often a way for the license issuer to generate revenue, and few license applicants are therefore denied. Since 1998, operators in Nairobi have been paying between 260 and 780 USD (for trucks less than $3m^3$ and greater than $7m^3$, respectively) for annual licenses. The license allows C&T enterprises to discharge into the city's sewerage network, thereby reducing their travel time and indiscriminate discharge (Water and Sanitation Program Africa, 2005). However, the licensing system may exclude smaller, less capital-rich stakeholders from operating. This could have the unwanted effect of creating a parallel, black-market system devoid of permits or licenses.

Emptying fee is the fee that is charged at the household level for removing FS from the onsite sanitation technology where it is collected and stored. Typically, the same stakeholder that is responsible for emptying is also responsible for transporting the sludge away (from where it has been emptied), although some independent operators who manually empty tanks/pits are not able to transport the FS and so leave that task to the household. Household members may also assist the C&T company with the emptying to reduce the fee. The emptying fee can be paid once the service is provided, but this type of payment model does not encourage the household to arrange for the emptying until it is absolutely necessary or long overdue. This type of emptying schedule, which may be completely unpredictable, or correlated with the seasons, causes a great deal of uncertainty for both the C&T companies and the FSTP operators. Some poorer households that cannot afford to pay the fee for emptying the entire quantity of FS may opt instead to have a small portion removed (e.g. the top metre of sludge in a pit).

Emptying fees vary depending on country, region, currency, market, volume, road condition and a host of other criteria. For example, within one informal area of Nairobi, known as Kibera, it costs 8 USD to have 0.2 m^3 of sludge emptied manually, or 196 USD for a vacuum truck that removes $3m^3$ of sludge (Water and Sanitation Program Africa, 2005).

Fines are tools used by the government, or other legal authorities to control and discourage undesirable behavior. Fines can be used to prevent the illegal discharge of sludge and provide an incentive for the less-costly behaviour of paying for a discharge license or the discharge fee. This only occurs when the fines are high enough, and enforced often enough, to present a genuine threat to illegal/informal practices. It should be noted however, that fines are only equitable when there is an alternative option available at a reasonable cost; e.g. access to a FSTP with regular hours and affordable discharge fees.

Operation and maintenance (O&M) costs are expenses that must be paid regularly and continually until the service life of the infrastructure/equipment has been reached. Equipment like pumps, trucks, hoses, etc., will wear down with use and the frequency of replacement will depend on the operating conditions and how often the parts are maintained. Although the service life of the equipment will be significantly shortened in the absence of O&M payments, more immediate needs (e.g. fuel) often take precedent. Owners of vacuum or pump trucks used for FS management face high O&M costs because of the wear that foreign material (e.g. sand, garbage) puts on the equipment. Further information on O&M is presented in Chapter 11.

Purchase price is the price paid by one stakeholder to another in exchange for becoming the sole owner of a good. A purchase fee can be paid at any point or with any frequency, as opposed to capital costs, which are only paid at the beginning of a project. The purchase price is dependent on supply, demand, and any subsidies that may be available. The agricultural industry for example, may pay a public utility a purchase price for treated FS to set up a greenhouse, in which case it would be categorised as a capital cost; a brick-making industry may buy FS weekly to use as a fuel source, in which case it would be deemed an O&M cost.

Sanitation tax is a fee collected either once, or at regular intervals, and which is paid in exchange for environmental services such as a water connection, a sewer connection / removal of FS, or any combination of these services. The benefit of a sanitation tax for the government agency is that it provides a steady source of income allowing treatment and upgrade activities to be more easily planned. However, the sanitation tax may be applied to households with no sewer connection, so although it may cover the water connection (or not) the household could still be responsible for paying an additional emptying fee (if they have an onsite technology). In this case, the household may be billed twice for sanitation services; i.e. paying the sanitation tax for a non-existent sewer connection as well as an emptying fee to desludge on onsite sanitation technology. This type of model may have the effect of charging the poor more for lower-quality service, but it may also help to cross-subsidise sanitation services. A summary of the implementation of sanitation taxes in four cities in the Philippines is provided by Robbins *et al.* (2012) and shows how a sanitation tax paid on top of water bills or property taxes was used to improve FSM, by subsidising the collection and transport of sludge from households.

The sanitation tax can however be designed in such a way that it benefits the poor and directly pays for service improvement. For example, flat-rate taxes based on a uniform per-capita FS generation rate (applied to the whole city) or as a function of water consumption, would force those using more water to subsidise those using less water (and probably requiring pit emptying) (Steiner *et al.*, 2003). Fees as low as 1 USD per person per year have been calculated to completely support a sustainable FSM system. Although monthly payments may be preferable to some low-income customers who cannot afford the high, one-time emptying fee, this type of monthly payment model requires a high degree of transparency and organisation to issue, track and receive payments.

Both O&M and capital costs are paid to a large and diverse group of stakeholders (e.g. mechanics, suppliers, banks) all of whom are not, nor could be, listed here. A more detailed list of costs is presented in Section 13.4 where the financial transfers of a small scale C&T enterprise are examined in detail.

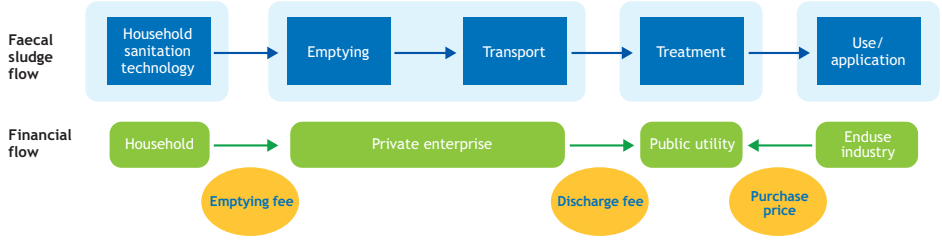

Figure 13.3 Model 1: Discrete collection and treatment model showing the responsibility of each stakeholder and the related financial transfers.

13.3 FINANCIAL FLOW MODELS

There is no single FSM model that has proven to be effective in all situations; indeed, service delivery models are constantly modified and restructured depending on the economic, legal, and environmental conditions. Furthermore, the responsibilities within the system are constantly changing and as such, the financial transfers between stakeholders can take several forms.

Various financial models for the management of FS have been proposed and an extensive list of possible configurations is summarised by Steiner *et al.* (2003). This section presents a representative selection of five different models based on existing case studies and theoretical examples. The models differ in terms of the stakeholders, the stakeholders' responsibilities, and the types of financial transfers that take place.

For the following diagrams (Figures 13.3-7) the different parts of the FSM system are shown on the upper part of the diagram in blue. The associated responsibility is indicated below in green. The type of transfer is indicated by a yellow oval. The direction of the arrow between the stakeholders indicates the direction of the payment. A dashed line indicates that the transfer is optional and may or may not occur.

Figure 13.3 illustrates a simple model of financial transfers. In this example, each of the stakeholders is responsible for a single technology in the FSM chain, and consequently, money is exchanged each time responsibility is handed over (emptying and transport are identified here as a single technology). The household-level toilet user pays a private enterprise (PE) an emptying fee to remove the sludge and the PE is responsible for the emptying and transportation of the sludge. The PE is then charged a discharge fee by the public utility for accepting, and treating the sludge. The utility is also paid a purchase price by an end-use industry in exchange for treated FS or sludge-grown products (e.g. fodder). In this model, the utility operates independently from the government authority and must cover all costs by collecting sufficient discharge and purchase fees.

This type of model has two potentially negative consequences; either, private enterprises are forced to pass the high discharge fee costs on to their customers, and thus exclude the poorest; or, the PE avoids paying the high discharge fee by illegally discharge, free of charge, on land that is not designated for FS discharge or treatment. In an effort to cut costs, and maintain a competitive advantage in the local market, the PE may also attempt to save money on O&M costs (e.g. regular maintenance of truck and pump), and as a result, limit the useful service life of the equipment, effectively putting the company out of business. In addition, because the utility is operating without direct financial support from the government authority, it is less likely to be subjected to administrative supervision and the quality of treatment, and the adherence to regulations may suffer as a result.

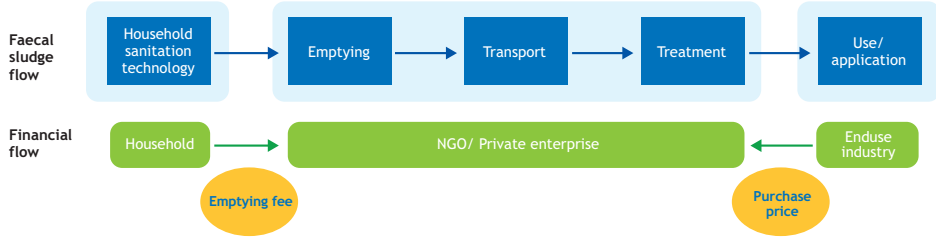

Figure 13.4 Model 2: Integrated c ollection, transport and treatment model.

This model could, however, serve as an entry point for the government authority to initiate budget support to not only strengthen the quality of service, but to reduce the need for discharge fees to cover operating costs, and thus reduce the amount of illegal discharge. Figure 13.4 presents a variation of this model, in which the operator responsible for treatment is not subject to the sludge or payment irregularities of the PE responsible for emptying.

The model depicted in Figure 13.4 appears similar to Figure 13.3, but the financial implications are significantly different. In Figure 13.4, a single private enterprise or non-governmental organisation (NGO) is responsible for the emptying, transport and treatment, thus eliminating the need for a discharge fee between the stakeholder responsible for C&T and the stakeholder responsible for treatment. There are several important financial and operational implications as a result of this difference which are explained below.

The private enterprise is responsible for collecting fees directly from the household-level toilet users. The enterprise receives no income from a discharge fee, but because the PE itself is not being charged a discharge fee, there is no need for cost recovery in the form of extra charges to the toilet user, and the toilet user may benefit from reduced emptying fees.

The market could respond in one of two ways; (i) with an efficient financial model including cross-subsidies between business activities, or by other independent C&T operators being driven out of business or to the margins of the market (e.g. in difficult, or hard to reach areas which are less profitable) or (ii) a non-optimised financial model could see the emergence of new, more competitive C&T operators who are able to undercut the multi-tasking enterprise, especially if the competing business saves costs by discharge without a permit, and if the legal framework does not enforce the proper payment and/or fines.

A variation of this model was documented in Bamako, Mali (Collignon, 2002; Bolomey *et al.*, 2003; Jeuland, 2004). There, IE Sema Saniya, an NGO owned and operated two vacuum trucks and a FSTP. With no discharge fee being charged, there was no incentive for illegal discharge, but the sustainability of the model has been called into question. The emptying fees required to cover the cost of transport and treatment were too high for many households and more cost recovery strategies were needed to ensure the financial sustainability of the system.

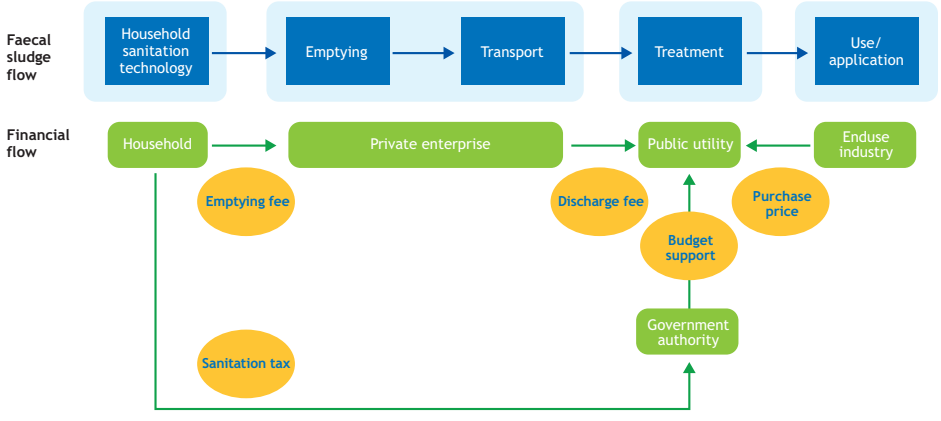

Figure 13.5 Model 3: Parallel tax and discharge fee model.

In the model presented in Figure 13.5, a sanitation tax is paid directly to the government authority by the toilet user, either through water, sewer, or property taxes. The utility is given budget support from the government authority that collects the sanitation tax. The utility therefore does not need to rely entirely on the discharge fee, and could lower it (in comparison to Model 1) thus reducing the total costs of the private enterprise. The discharge fee must therefore be high enough, such that operator can hold the PEs accountable for what they dump, but not so high that the toilet users are unable to afford the high emptying fees passed onto them by the C&T operators, or that the sludge is dumped illegally. This system is prone to corruption and under-servicing if the government authority is not competent or transparent in how it allocates it money. Furthermore, the financial balance is very much dependent on the consistent collection of the sanitation tax. Unstable land tenure, poor record keeping, corruption, transient populations and other features of fast-growing urban centres threaten the collection of a steady stream of user-based revenue. Fee collection is notoriously low in many government authorities and fluctuations in the sanitation fees can significantly affect the ability for the utility to make long-term O&M decisions if there are not reserves available from the authority to buffer the variation.

Case Study 13.1: Cambérène FSTP in Senegal

(Adapted from Mbéguéré *et al.*, 2010 and Dodane *et al.*, 2012)

In Dakar, Senegal, The Cambérène FSTP is operated by the national sanitation utility ONAS. The treatment facility includes settling/thickening tanks and unplanted drying beds, designed for 100 m^3/day of FS; about 41,500 people are serviced. The facilitiy receives sludge from septic tanks that are emptied by vacuum trucks operated by private collection and transport companies. The financial flow model at Cambérène follows the 'Parallel Tax and Discharge Fee' model described above (Figure 13.3).

Households pay 50 USD to private C&T companies to have 10 m^3 of sludge removed; this translates into approximately 5 USD/capita/year. Furthermore, households pay a sanitation tax to ONAS which amounts to about 2 USD/capita/year. The total payment per person, per year (7 USD) corresponds to about 2% of the average household budget of the Dakar population.

The C&T companies made large initial investments in their trucks which must be paid off over time, and this has been estimated as as a 0.3 USD/capita/year expense. The company must also pay a discharge fee to discharge the sludge at the FSTP: the fee amounts about to about 0.4 USD/capita/year. The remainder of the money earned goes towards O&M costs which include staff, fuel, overhead, repairs and maintenance to the truck; this total must be less than 4.3 USD/year in order for the company to make a profit.

ONAS has two main sources of revenue: the sanitation tax paid by households and the discharge fees paid by the C&T companies. To further generate income, and to improve nutrient cycling in the urban area, ONAS sells the dried FS to agricultural industries for use as a soil amendment. They generate about 250 USD/year (which, converted for comparability translates into about 0.007 USD/capita/year).

The daily operation and maintenance of the facility (i.e. electricity, salaries, etc.) costs about 1 USD/capita/year. The capital costs (i.e. the construction of the facility), annuali ed, were estimated to be 1.3 USD/capita/year (41,500 customers). A summary of the financial flows is shown in Figure 13.6.

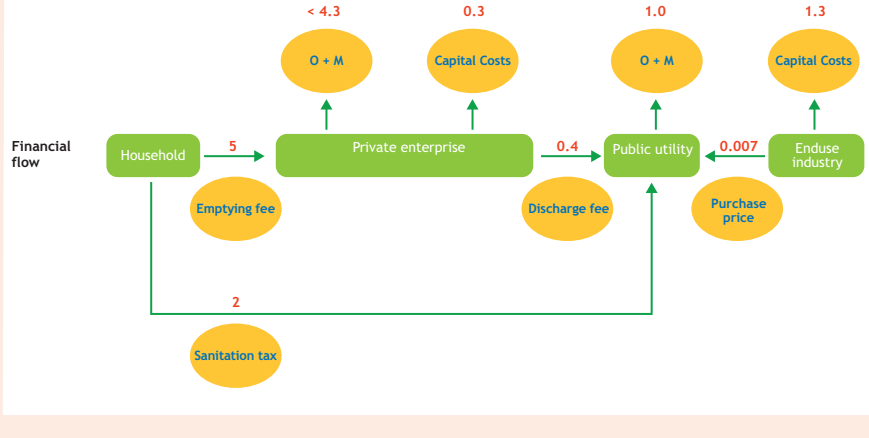

Figure 13.6 Financial flow in USD of the faecal sludge management system in Dakar, Senegal.

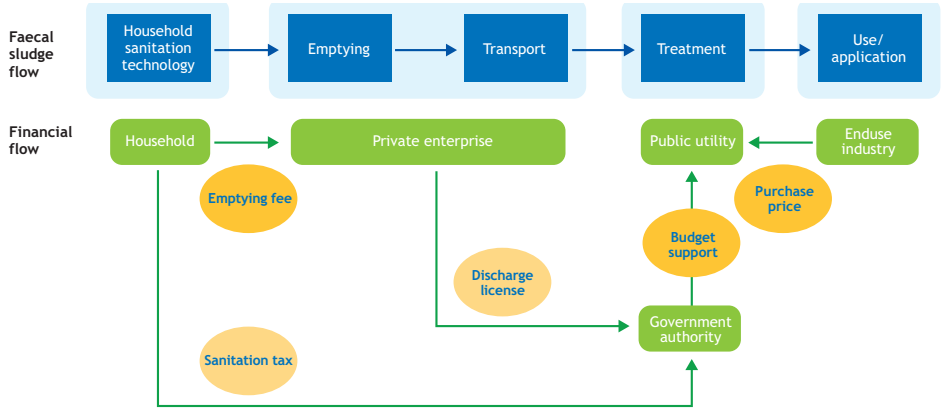

Figure 13.7 Model 4: Dual licensing and sanitation tax model.

In the dual licensing and sanitation tax model, as shown in Figure 13.7, the private entrepreneur who is responsible for C&T is not penalised with a discharge fee for each discharge at the FSTP, but instead is granted unlimited (or semi-limited) access to dump through a discharge license, thus reducing illegal discharge by those C&T operators who may not be able to afford the discharge fee.

Having to pay a discharge license, no matter how nominal, ensures that the government has more administrative control over the industry. Data on the number of operators, the revenue that is generated, the distances travelled etc. can be collected and used to advise policy. Furthermore, the discharge license means that the PE is recognised by the government, and theoretically, should have to pay fewer bribes, fees, or fines during the course of work. This model has been enacted in Kumasi, Ghana where the C&T businesses must obtain a discharge license which can be revoked if the emptier is found discharging anywhere but the official facility (Mensah, 2003; SANDEC, 2006). Discharge licenses have also been implemented in Nairobi's Kibera slum where they were sold yearly (Water and Sanitation Program Africa, 2005) and in Da Nang Vietnam, where they were sold monthly (Steiner *et al.*, 2003).

As explained in Chapter 4, the FS C&T industry has remained largely unrecognised. Its employees are ostracised and are often forced to work clandestinely or at night under threat of persecution or police scrutiny. It's informal nature means that it is beyond the realm of labour and health laws, so workers endure unsafe and humiliating conditions, without the basic rights afforded to other industries (Eales, 2005). Therefore, although obtaining discharge licenses may be costly and prone to corruption, licensing is one of the first steps towards formalising the industry, and potentially opening it to more transparent and effective policy interventions. Licensing is a mechanism that does not exclude the smallest operators (provided they can afford the one time fee, they are not penalised for frequent use of the FSTP), may help improve industry standards, while also improving working conditions for the labourers and service delivery for the toilet users.

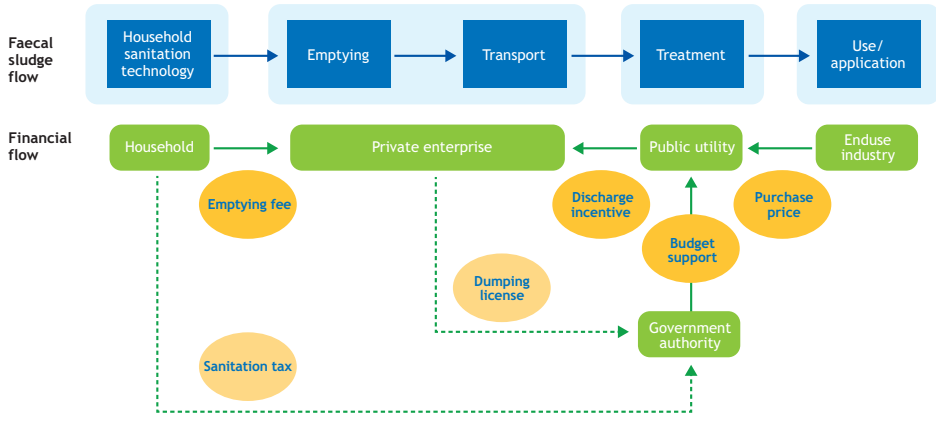

Figure 13.8 Model 5: Incentivised discharge model.

An important feature of the model shown in Figure 13.8 is the direction of the financial transfer from the public utility to the private entrepreneur. In this model, the FSTP operator pays the stakeholder responsible for C&T a discharge incentive to dump sludge at the FSTP. A financial model that includes discharge incentives could take a variety of forms. For this reason, the discharge license and sanitation tax flows in Figure 13.8 are left as dashed lines to indicate that they may or may not exist in this model, depending on the context.

As discussed previously, financial incentives can be used to encourage socially desirable behavior. In the case of discharge incentives, the payment is used to encourage sludge collection and reduce illegal discharge. These types of conditional cash transfers are still relatively new, and although results are promising in health and education programs, there is little data to support their use in sanitation programs (SANDEC, 2006).

This model is built on the theory that C&T stakeholders cannot afford the discharge fees charged by FSTP operators and so dump indiscriminately, causing damage to public and environmental health. Working under this scheme, the C&T operator would only have to recover a portion of the total operating costs from the emptying fee (the other portion would be made up by the discharge incentive). As a result, the collection service would be more affordable for poorer households, more sludge would be collected, less sludge would be discharged to the environment and the community as a whole would benefit.

Unfortunately, this scheme means that the FSTP operator would not receive revenue from discharge fees and yet would also be responsible for paying the discharge incentives. This model could only function with substantial government or donor support, which can be variable and inconsistent, leaving the FSTP operator with budget gaps. To prevent such shortcomings, sanitation taxes would likely have to be raised to cover the increased operating expenses of the treatment plant. The emptying fee could however be reduced, tightly regulated or done away with altogether. The toilet user would still be responsible for the sanitation tax, but would be relieved of the financial burden of paying for access to sanitation twice (i.e. sanitation tax and collection fee).

One concern with this model is the opportunity for C&T stakeholders to take advantage of the financial incentive, and rather than spending time and fuel to actually empty onsite systems, operators may attempt to receive the incentive for watered-down sludge or alternative liquids which could damage the treatment process and its financial viability. To control the type and quality of the sludge emptied at the FSTP, some type of quality assurance or quality control must be in place, such as a manifest program as described in Chapter 11.

A possible variation of the model presented in Figure 13.8 would be to include incentives for toilet owners who have their sludge removed by a certified service provider. This model would prevent homeowners from waiting until the onsite storage technology is overflowing, from dealing with an unlicensed C&T business, or from emptying it directly to the environment during the rainy season. No known examples of this variation have been put into practice. The logistics of administering such a program are complex as it would need to ensure the delivery and acceptance of reverse payments to households, and the subsequent fulfillment of the emptying service promised, would require widespread education and policy enforcement. A concise summary of the pros and cons for each of the models is presented in Table 13.3.

Figure 13.9 Slow moving city traffic can add significantly to the fuel and labour costs associated with collection and transport (photo: Linda Strande).

Table 13.3 Summary of pros and cons for each the financial models presented in this Chapter

Model	Pros	Cons
Model 1: Discrete C&T and Treatment Model	+ Households are free to choose the most competitive price on offer for emptying; + Timing of emptying is flexible and can be done when financially feasible + The household is not committed to a fixed sanitation tax	- The utility's operating expenses must be covered by the discharge fee
Model 2: Integrated C&T and Treatment Model	+ A single operator is able to optimi e the business model and improve efficiency; + Less potential for illegal discharge as the single entity will discharge at the self-run treatment works	- High fees may be passed onto the household
Model 3: Parallel Tax and Discharge Fee Model	+ Low-income households' that are not connected to the sewer may have lower C&T costs from cross-subsidies; + C&T operators may benefit from lower discharge fees + Collection and coverage increases	- C&T businesses may avoid discharge fees by discharge illegally
Model 4: Dual Licensing and Sanitation Tax Model	+ Industry regulation and legitimisation through licensing + Improvement in health and safety conditions; + Unlimited discharges minimises risk of illegal dumping	- The management of too many aspects of the service chain by one entity could prove difficult for a new business or NGO
Model 5: Incentivised Discharge Model	+ Emptying fees for households may be reduced; + Households that are difficult to access, or located far from the treatment plant, may become attractive to C&T operators because of incentives	- Incentives must be corruption-proof (e.g. not given for diluted sludge, seawater, etc.) - FSTP operator requires significant budget support to function budget support to function

13.4 FINANCIAL PERSPECTIVE OF A COLLECTION AND TRANSPORT ENTERPRISE

It is difficult to breakdown the allocation of costs and benefits within a FS system as each stakeholder views each financial transfer from their own, unique perspective. For example, an emptying fee is a cost for a household-level toilet user, while it is a benefit for a C&T operator. It is beyond the scope of this chapter to summarise all of the costs and benefits for each stakeholder operating within each type of model. Dodane *et al.* (2012) illustrate the distribution of costs and payments among household-

level users, businesses, and the public utility in Dakar, Senegal and conclude that the FSM management system is 5 times less expensive than a sewer-based one. However, this study showed that 6% of the annualised cost of the FSM system is inequitably borne by household level users, and that the C&T companies are operating at no net annual profit. An analysis of C&T businesses provide an interesting case study because they serve as a simple, but useful way to illustrate how the various financial transfers described in this chapter affect operational sustainability.

Despite working at the social margins, the C&T business can be very competitive, forcing each entrepreneur to work at the edge of profitability. However, in spite of cutting costs wherever possible, C&T enterprises still cater to a client base that often finds their services too expensive. Furthermore, the business must pay fees to the utility for discharge, taxes to the government, as well as O&M costs to keep the equipment operational. The model that was presented in Figure 13.1 is the simplest example of the financial transactions that a C&T business is responsible for and yet, many of the actual payments (e.g. taxes, O&M) are not shown.

In order to demonstrate the variety and number of costs and payments associated with a small C&T enterprise (one of only several parts in an entire FSM system), an example is provided in Section 13.4.2. On completion of this example one should gain an understanding of the complexity and difficulty of designing, implementing, monitoring and optimising an entire FST system which includes all of the stakeholders and financial interactions will be obtained.

13.4.1 Future perspectives

Much of the financial sustainability of a C&T business depends on government policy and support. The supporting legal structures are essential to any financial policy designed to assist small business operators and household level users (see Chapter 12).

Short-term discharge incentives appear to be one of the most promising ways to strengthen the private sector, help clear the backlog of full pits and septic tanks, and generate steady-state conditions that can be further refined or manipulated through policy and/or financial mechanisms. Businesses need to develop a client base, optimise their routes and pay off their capital costs. Implementing discharge incentives for a short time (e.g. 5 years) could help to sustain small businesses and improve sanitation conditions drastically within a short period of time. Once businesses are established, incentives could be slowly reduced and eventually, discharge fees introduced. Donor-funded incentives could be a short-term, highly effective way of supporting small business generation while strategically addressing sanitation deficiencies. As is demonstrated in the example provided in Section 13.4.1, the removal or reversal of discharge fees could have had a profound impact on the sustainability of the C&T business and financial well-being of the owners.

Sanitation taxes, applied most equitably as a function of water usage, can help cover the cost of FSM. The money collected should be used to support the FSTP O&M, assist in regularly scheduling collection or maintenance of household sanitation technologies, offset the discharge fee or generate a fund for discharge incentives.

Licensing, in combination with genuine rights granted to licensees, and enforcement of fines when rights are abused (i.e. the withdrawal of the permit if the C&T operator is found to discharge illegally) would help to reduce corruption and illegal discharge. Different types of regulations and enforcement are discussed further in Chapter 12. Licensing is also the first step to formalisation of the sector, and would therefore open the businesses up to other policies and subsidies designed to support small businesses; perks which have historically been denied to informal workers.

More efficient trucks (i.e. newer, fuel-efficient vehicles), made available through lower import tariffs would significantly improve fuel consumption and help lower overall costs. More strategically located discharge/treatment facilities would reduce the travel distance, and importantly for the city, reduce time and fuel wasted idling in city traffic.

Discharging into transfer or relay stations, which are then emptied by larger vehicles, would allow small emptying businesses to spend more time emptying, and less time transporting (and in turn, earning more money) (Tilley *et al.*, 2008). If appropriate treatment and transport infrastructure exists, license holders could be permitted to dump into the sewerage system in order to reduce their travel time, and focus instead on emptying onsite technologies. This option is however, dependent on the proper design of the treatment technology to prevent overloading and blockages (refer to Chapter 5 for a summary of appropriate treatment technologies). Licensing revenues should be used to formalise sewer discharge stations and transfer stations.

A range of policies to support larger, multi-truck operators who can serve higher-paying, easier to reach clients as well as smaller- operators who can serve lower-paying, harder to reach clients, must be developed. As discussed in this chapter, there is no single model for efficient FSM, and experimentation and flexibility with novel financial mechanisms must be encouraged.

Areas for further research include understanding the financial flows and business models for existing and successful FSM enterprises. Since the sector is mostly informal, there is very little known in this area. There are currently very few examples of functioning FSM systems. Different business models must be tested and studied under different operating conditions to prove which will be the most robust and sustainable.

Finally, and perhaps most importantly, political will, (i.e. public support and acknowledgement of the FS industry), must be communicated from the highest levels down to traffic controllers. This will assist in reducing corruption, embarrassment and the current financial inefficiencies that exist in a business that is essential to the health and growth of the world's cities.

13.4.2 Case study example

Consider a small C&T business that is run by two brothers in West Africa. The dense urban area where they work includes about 250,000 residents and has a density of about 300 people/ha (UN-Habitat, 2003). By working 20 days a month, 12 months a year, and servicing 3 clients a day the brothers hope they can pay back their truck loan, cover their operating expenses, pay themselves a small salary and hopefully make a profit. The brothers each hope to earn 5 USD per day.

To determine if this is possible, use the information and formulae given below to calculate:

- the annual costs for operating the business by filling in a version of Table 13.4; and
- the minimum cost that they must charge households to cover their expenses.

Table 13.4 Table for summarising yearly operating and capital costs for a small C&T enterprise

Item	Yearly Costs (USD)	Percent of total cost (%)
Truck payments		
Discharge license		
Equipment		
Labour		
Fuel		
Discharge fees		
Maintenance		
Police		
Insurance		
Parking		
Taxes		
Administration		
Total		100

13.4.3 Problem information

Overalls, gloves, boots, shovels, and simple tools for breaking slabs and accessing pits will vary, but basic equipment will cost up to 100 USD/year (Water and Sanitation Program Africa, 2005).

The truck is the largest expenditure. The brothers decide on a used, 8 m^3 trucks that they can purchase for 20,000 USD (Steiner *et al.*, 2002). Because of the harsh working conditions, they expect the truck to last about 10 years before they have to replace it. In the dense urban areas the truck can travel at an average speed of 5 km/h, and it costs about 0.5 USD/km for fuel (assume an interest rate of 5% on their loan).

Equation 13.1:

Equivalent Annual Cost (EAC) = Capital Investment/Annuity factor

$$= \frac{\text{Capital Investment}}{\frac{1-(1+i)^t}{i}}$$

Where i is the interest rate and t is the repayment period

The discharge license has been set at 780 USD/year (for their large 8 m^3 vehicle) based on the Kenyan model (Water and Sanitation Program Africa, 2005).

When the truck arrives at the FSTP, it is charged 2 USD per full discharge (8 m^3)(Steiner *et al.*, 2003), but the operators usually charge the full price regardless of how much is discharged.

Table 13.5 Annual expenses (given in percent of the total, %) from a C&T enterprise operating in Bamako, Mali (adapted from Bolomey *et al.*, 2003; Jeuland, 2004)

Maintenance	Police	Salaries	Insurance	Parking	Tax	Admin.
20	10	15	2	1.5	2	15

To determine the daily transport distances, the following assumptions can be made:

- the area served is round, and that the average transport distance is half the radius;
- the FSTP is located in the centre of the area that they serve, and that the population density is homogenous; and
- the truck must return to the treatment plant after each household visit (i.e. the truck cannot empty more than one house with the same tank).

The remaining annual expenses can be calculated using the information given in Table 13.5.

In Table 13.5, "police" refers to the payment of 'fees' or 'taxes' to the police for transporting what is sometimes called 'dangerous matter' (Jeuland, 2004).

Based on this revised estimate, the average fee to the household would have to be about 22 USD, which is closer to the average rate and the brothers know that the willingness to pay of the toilet user is much less than they will actually be able to charge (Bolomey *et al.*, 2003). After completing their analysis, the brothers start to wonder how, if ever, their business could become profitable (i.e. how much they would have to charge their customers (question b)).

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End of Chapter Study Questions

1. What are discharging incentives in FSM?
2. List three possible financial models for FSM and what the advantages and disadvantages of these models are.
3. Explain the pros and cons of the Dual Licensing and Sanitation Tax model.