

Farmers and households orientation, and effective decentralization to make Faecal Sludge Management integrated part of ecosan approach in Kumasi, Ghana.

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Abstract: Sanitation services provision in Africa needs to go beyond technologies and focus more on appropriate financial and institutional arrangements to reach systems' sustainability irrespective of Donors financial supports. Adapt ecosan concept to Faecal Sludge Management (FSM) in West African context is the direct aim of this case study. In Kumasi where FSM issues are institutionally better tackled in West-Africa, the system sustainability is still a problem because of the high Government subsidy. Improved financial and institutional arrangements can be found for an economical and ecological sustainability like would like the holistic approach of ecosan. The case study shows how the FSM system of the city, can be independent from Donors financial support if the potentiality in both households and farmers are brought out.

Keywords: *FSM, ecosan, financial, institutional, sustainable, on-site sanitation, stakeholders.*

1. Introduction

There is nowadays a strong push for sanitation programmes in developing countries to solve the problems of the approximately 2.6 billion people without access to basic sanitation. The aim is to find more viable and sustainable solutions to sanitation in order to meet the Millennium Development Goal (MDG) Number 7, target number 10 ("Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation" (UNDP, 2005)). A new approach to sanitation is ecological sanitation (ecosan), which has been proven in many pilot projects to provide benefits such as: protect the environment, save water and money, provide barriers to water pollution and water-related diseases, and recycle water and nutrients for reuse in agriculture. Ecosan is a new paradigm in sanitation provision, which is not limited to a specific technology but encompasses all sanitation systems that lead to sustainable systems.

In West African cities today, the sanitation reality is that thousands of tons of faecal sludge from conventional on-site sanitation systems (i.e. mostly septic tanks, pit latrines; private and public toilets; wet or dry sanitation but without urine diversion) are disposed off untreated and indiscriminately into lanes, drainage ditches, inland waters, estuaries and the sea. The existing financial and institutional arrangements in most cities are not allowing the success of faecal sludge management (FSM) programmes.

Many sanitation experts regard ecosan and FSM programmes as two separate entities. It is our view however that FSM should be considered as an integrated part of ecosan to solve developing cities' sanitation problems. In this paper we describe how to overcome financial and institutional challenges so that FSM can be part of an ecosan approach to deal with West African cities' sanitation problems in a sustainable manner.

2. Drivers to consider FSM part of ecosan

Our reasoning to place FSM under the "umbrella" of ecosan is based on two premises: (i) More than 75% of houses in large cities and up to 100 % of houses in towns in sub-Saharan Africa are served by conventional on-site sanitation facilities (Strauss et al., 2004). These facilities produce thousand of tons of faecal sludge, which is very often indiscriminately dumped into the environment; (ii) Ecosan aims to close the loop of human waste of which faecal sludge is an important part. The divergence between the two concepts is that while one - FSM- focuses on the collection and treatment processes of the large amount of wet excreta, the other -ecosan- is focusing on the human excreta generation process (e.g. producing dry excreta separated from urine) and the reuse process.

We argue that if FSM could be operated in a manner that it is also sustainable (in all aspects) and especially if it enables and promotes reuse of human excreta, then it could be seen to be part of the holistic approach of ecosan. Hence, it should be possible to "close the loop" of human waste even with the conventional on-site sanitation systems, which produce the faecal sludge, rather than attempting to convert all toilets to the (possibly more ideal) "ecosan compatible" toilet types (for example urine-diversion dehydrating toilets, a toilet type often wrongly equated to "ecosan toilets").

Ecosan as ISFSM: a theoretical view

What is ecosan?

Ecological sanitation called ecosan is based on the idea that urine, faeces and water are resources in an ecological loop. It is an approach that seeks to protect public health, prevent pollution and at the same time

return valuable nutrients and humus to the soil. This recycling of nutrients helps to ensure food security (WASTE, 2005). Many consider ecosan as dry sanitation or urine diversion toilets. These are only toilets (ecological toilets or ecosan toilets) responding to ecosan principles because the waste from them is easy to handle and safe for the reuse without high-tech treatment. (Schmitt, 2003) states “The term Ecological Sanitation stands for ecologically and economically sustainable sanitation systems. It does not refer to a specific technology. We use it rather to describe a whole range of technologies and institutional arrangements, which address both the issue of water scarcity and better sanitation.

What is FSM?

The faecal sludge management is the adequate management of the produced sludge to avoid the FS crisis (*indiscriminate dumping, overflow of not regularly de-sludged septic tanks or community toilets, unhygienic use of FS in agriculture, etc...*) by providing proper FM management system, which include adequate de-sludging of sanitation facilities, safe handling and transport of sludge, treatment of sludge, and safe disposal or reuse, where closing the loop (reuse) is not necessary the main focus.

The convergence...

Based on ISWM concepts in (Klundert and Anschutz, 2001), a new approach for FSM in which *integrated* and *sustainability* are the key elements (Figure 1), has been developed.

- An Integrated-FSM is a FSM in which all the stakeholders’ needs, perceptions and capabilities along the FSM processes are taken into account, as well as the interaction and relationship with others services such as solid waste association for co-composting, and farmers consideration for the treated FS reuse in agriculture.

- A sustainable-FSM is an FSM in which all aspects of sustainability are ensured, mostly the financial and institutional sustainability where there is a full cost recovery of the FSM system irrespective of Donors’ financial support, and the environmental sustainability where there is no longer FS crisis.

From these concepts, integrated-FSM and sustainable-FSM can jointly formed a way for ecological (and economical) sanitation as would like the holistic approach of ecosan. That’s why ISFSM must be considered as ecosan. But it is only a part since ecosan cover also wastewater and solid waste management.

INTEGRATED SUSTAINABLE FAECAL SLUDGE MANAGEMENT AS ECOSAN

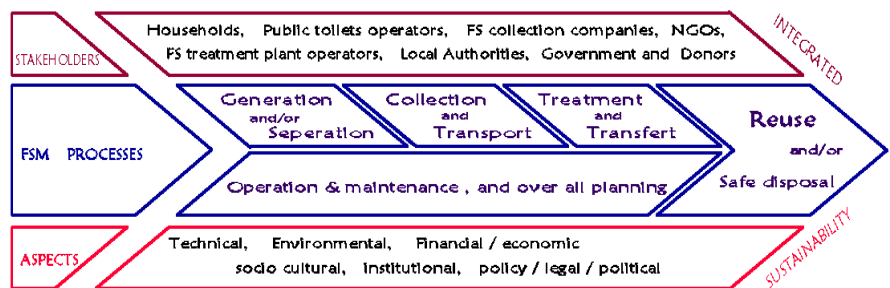


Figure 1 : The ISFSM approach developed based on ISWM concepts in (Klundert and Anschutz, 2001)

3. The Kumasi case

3-1 Kumasi city

Kumasi is the second largest city in Ghana, an African country located in the West Africa’s Gulf of Guinea with an area of 238,540 km². Ghana is subdivided in ten administrative regions and its capital city is Accra, located in the Greater Accra region in the southern part of the country. Kumasi is the capital city of Ashanti region. Located 300 km Northwest of Accra, it covers 150 km² and counts in 2000 (GLSS4, 2000), about 1,201,280 inhabitants.

Living conditions in many parts of Kumasi are very crowded. About 95 percent of all households live in apartment buildings with other households, and 90 percent of all households live in a single room. The average size of a household in Kumasi is 4.6 persons, and the average number of people in an apartment building is about 50. Over 55 percent of households in Kumasi live in buildings with more than ten households, and more than one quarter of the households in Kumasi live in buildings with more than 60 people (Wiftintn et al., 1992). Urban and peri-urban agriculture in Kumasi has an important socio-economic impact. It contributes to food security and increases the income of the urban poor. In a recent material flow study conducted in the City of Kumasi, Ghana, it was found that urban and peri-urban agricultural soils are greatly depleted of organic matter and nutrients -N and P- (IWMI and SANDEC, 2002). On approximately 120 hectares of land in urban and peri-urban Kumasi vegetables are cultivated intensively (Moser, 2004).

In sanitation, the total daily generation of solid waste in Kumasi is estimated at 1000 metric tons. About 70% of this daily generation is presently collected. Currently, the bulk of the solid waste generated in the metropolis is collected by the private sector based on a mixture of contract and franchise arrangements. The main collection methods employed are House-to-house and Communal Container Collection systems (Mensah, 2005). The case study's findings will tell more about the faecal sludge management.

3-2 The case study approach and methodology

The approach and methodology used aimed at:

- Describing the existing situation in Faecal Sludge (FS) management along all its management processes (from the production to the reuse or safe disposal) based on the amount of FS handled at each step. As outcomes, the environment FS load of the city can be known from the FS flow, as well as the FS collection services coverage and all the proactive stakeholders in FSM of Kumasi.

The related methodology is based on *literature review* (Kumasi Waste Management Department - WMD- reports and FS Treatment Plant operator's worksheets). *Key informants interviews* (WMD Director and officers), *direct observation and discussion* with some actors in FSM (collections companies managers and temporary manholes¹ managers) were also necessary to crosscheck and validate some data.

- Analyzing the existing financial and institutional arrangements by determining the actual money flow for the overall system, based on direct stakeholders' financial and institutional situation. The study tries to evaluate stakeholders (mainly households, collection companies, and authorities) capabilities and potentialities for better financial and institutional situation.

- At households' level, the study evaluated and compared the current expenditures of households in sanitation services to their income. The main assumption made in the study is that households can spend 0.5% of their income in the FS emptying service. This assumption is based on a reasonable self-repartition of the WHO's standard of 5% of the income that households can spent on water and sanitation services. The remaining of the 5% can be spent on other watsan services as shown in Figure 2.

As well the households' satisfaction on the sanitation services received and their opinion about current expenditures in the emptying services has been known.

This has been achieved through *Households interview surveys* on a sample of 20 households selected randomly per income areas (5 in high income areas, 5 in medium income areas, 10 in low income areas).

- At the FS collection companies' level, *structured interviews* have also been used to evaluate their operational and financial performance, their internal and external institutional environments. Five mains companies have been selected for the interview, of which one is public. The data on the amount of sludge discharged by all the companies operating in the city have been found at the treatment plant.

- Through *open discussions* with the directly involved authorities which are the Waste Management Department (WMD), responsible for the sanitation services provision, and the Environmental Protection Agency (EPA), the regulatory body, the current institutional arrangements has been known

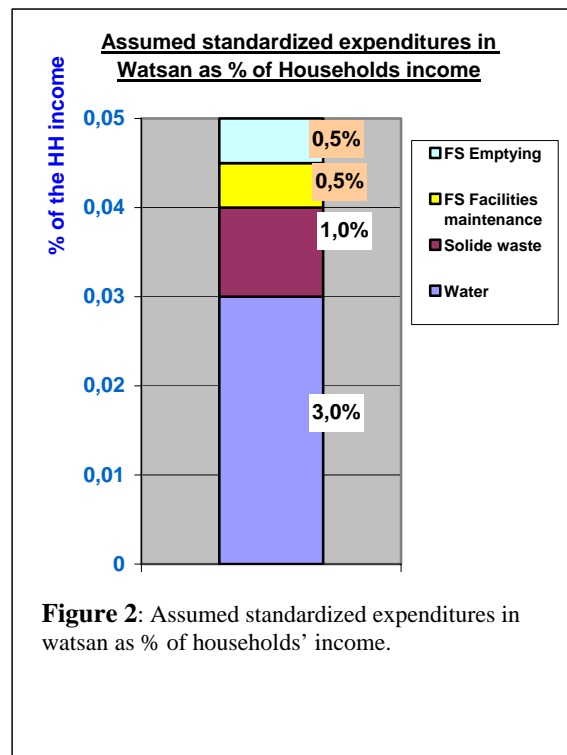


Figure 2: Assumed standardized expenditures in watsan as % of households' income.

¹ These service providers are the intermediary between bucket latrine owners and FS collection companies. They build manholes in which they store the FS collected from the households using bucket latrines. These manholes are emptied by the FS collection companies.

and the institutional structure built. The discussions also helped to identify the actual financial and institutional problems that hamper FSM to be ecosan in the city.

In the way forwards better financial and institutional situation to make FSM under the umbrella of ecosan in Kumasi (where the treated FS reuse must be compulsory to close nutrient loop), farmers and households orientation would be a milestone for financial sustainability (households must pay what they are capable to pay for the services they are benefiting) and for the integrated FSM and environmental sustainability (co-composting and incentives for farmers for compost reuse). For that, the potential revenues from households (based on the assumed 0.5% of the income and the city's emptying service coverage) and from farmers (estimated based the data from Kumasi farmers' WTP study done by IWMI²) have been estimated to determine how reliable is the CTP-approach to close FS loop in Kumasi without Government or Donors' subsidy.

Due to the limited number of the sample, statistical data on the population income level has been found (data of 1996) and processed with Kumasi Statistical Service Officers (who know well all the events that have been occurred in the city from 1996 to 2004) to be updated.

3-3 The case study findings

3-3-1 Current situation in FSM

The city's population of 2004 has been estimated by (KMA, 2003) at 1,482,480 inhabitants of which (Mensah, 2005), 38% are using public toilets, 30% use household water closet facility connected to a septic tank, 8% use the unhygienic bucket latrines system, 8% use KVIP³ and 2% use traditional pit latrines. The population relying on the city's five small scale sewerage systems which are Asafo, KNUST, Ahinsan, KATH and Chirapatre Housing Estates, is 10%, and the bush provides for the remaining 4% of the population.

| | |
|----------------------|---------------------|
| City Population 2004 | 1 482 480 |
| Septic tank | 1 l/ca/day |
| Heavy sludge | 0,2 l/ca/day |

| Toilets facilities | Coverage | Population | FS production (that can be collected) | | FS collection | FS Treatment | FS Reuse |
|--|----------|------------|---------------------------------------|---------------|---|---|--------------------------------------|
| | | | m3/d | m3/month | | | |
| Public toilet | 38% | 563 342 | 113 | 3 380 | On average 1255 trips per month are collected from the city i.e. (in m3/month) | Dompose solid waste landfill site including FS treatment ponds system of 9 ponds. Currently receiving all the collected FS from the city. There is no longer illegal dumping | No reuse at the moment |
| WCs | 30% | 444 744 | 445 | 13 342 | | | |
| Bucket | 8% | 118 598 | 24 | 712 | | | |
| KVIP | 8% | 118 598 | 24 | 712 | | | |
| Pit latrine | 2% | 29 650 | 6 | 178 | | | |
| Total for FS | 86% | 1 274 933 | 611 | 18 323 | 6 275 | | |
| 34% <i>of the FS produced is collected</i> | | | | | | | |
| WCs sewer | 10% | 148 248 | 148 | 4 447 | Connected to 5 small scale sewerage systems which are Asafo, KNUST, Ahinsan, KATH and Chirapatre Housing Estates. | | |
| Bush | 4% | 59 299 | 12 | 356 | | | |
| Total for FS | 100% | 1 482 480 | 771 | 23 127 | | | |

Table 1 : Faecal Sludge flow estimation for Kumasi city.

² International Water Management Institute (office of West Africa based in Accra, Ghana)

³ Kumasi Ventilated Improved Pits: improved pit latrines introduced in the population since 1989.

Based on the specific FS production of 1l/ca/day for septic tank and 0,2l/ca/day for heavy sludge (Heinss *et al.*, 1998), the total FS production of the city has been estimated (in Table 1) at 23,127 m³ per month of which 18,323 m³ go the toilets that can be emptied. The remaining 4,447 and 356 m³, go respectively to the sewerage system and to the bush.

The FS collection from households and utilities is assured presently by 22 collection companies in which five are public. All of the companies use pumping tankers of a capacity of 5 to 8 m³ (most of them are of 5 m³), for the service provision. They provide the mechanical emptying service for any type of toilet facility except bucket latrines and traditional pits latrines in some case. The Waste Management Department is also involved in the emptying service provision (one of the five public companies) and is the only company providing the manual emptying service to help some traditional pits owners to benefit from the emptying services (Figure 3).



Figure 3 : Manual emptying service provision by KMA/WMD in a house at Zongo, Kumasi (Photo : anselme vodounhessi)

Another type of direct (but informal⁴) stakeholders is Manhole Managers, who take care of the buckets latrines owners' service provision. They provide the emptying services via conservancy workers⁵. The FS collected from households (see Figure 4) is stored in a manhole, which is emptied by truck collection companies at the same price as for households' service.



Figure 4 : Bucket latrines at Adoum sudurb.

(Photo : anselme vodounhessi)

The surprising fact is that all the collection companies discharge the collected FS at the treatment plant and there is no longer an illegal FS dumping in the city. This has been successful through the strictness of the District Assembly rules and the community participation in denouncing defaulters. The deposit site currently used is Dompouse landfill site, a sanitary landfill facility of 15-years life, which encompasses the solid waste landfill and FS treatment. The FS treatment plant is a 9-stabilisation ponds system which became operational in January 2004. The former FSTP, Buobai pond system which had been operating for two years (2001-2003), is now abandoned because the sedimentation ponds are full and there is at the moment no mean to empty them. The other reason given is that the community surroundings the plants are not happy with the quality of the effluents discharged in the neighboring river.

On average 1255 trips of faecal sludge are monthly discharged at the Dompouse FSTP, which amount to 6,275 m³ of FS collected monthly from the city. As regard to the collectable FS amount of

⁴ The District Assembly does not allow bucket latrines emptying service provision, despite that it is vital for buckets latrine owners. It is a way to discourage the use this particular type of latrines.

⁵ Bucket (of bucket latrines) conveyers working in the night time.

18, 323 m³ produced monthly in the various emptyable toilets, the FS collection service coverage of the city has been estimated at 34%. From the FS flow shown in Figure 5, the total environment FS load of the city, has been estimated at about 12,400 m³ per month, which is about 54% of the total FS produced in the city.

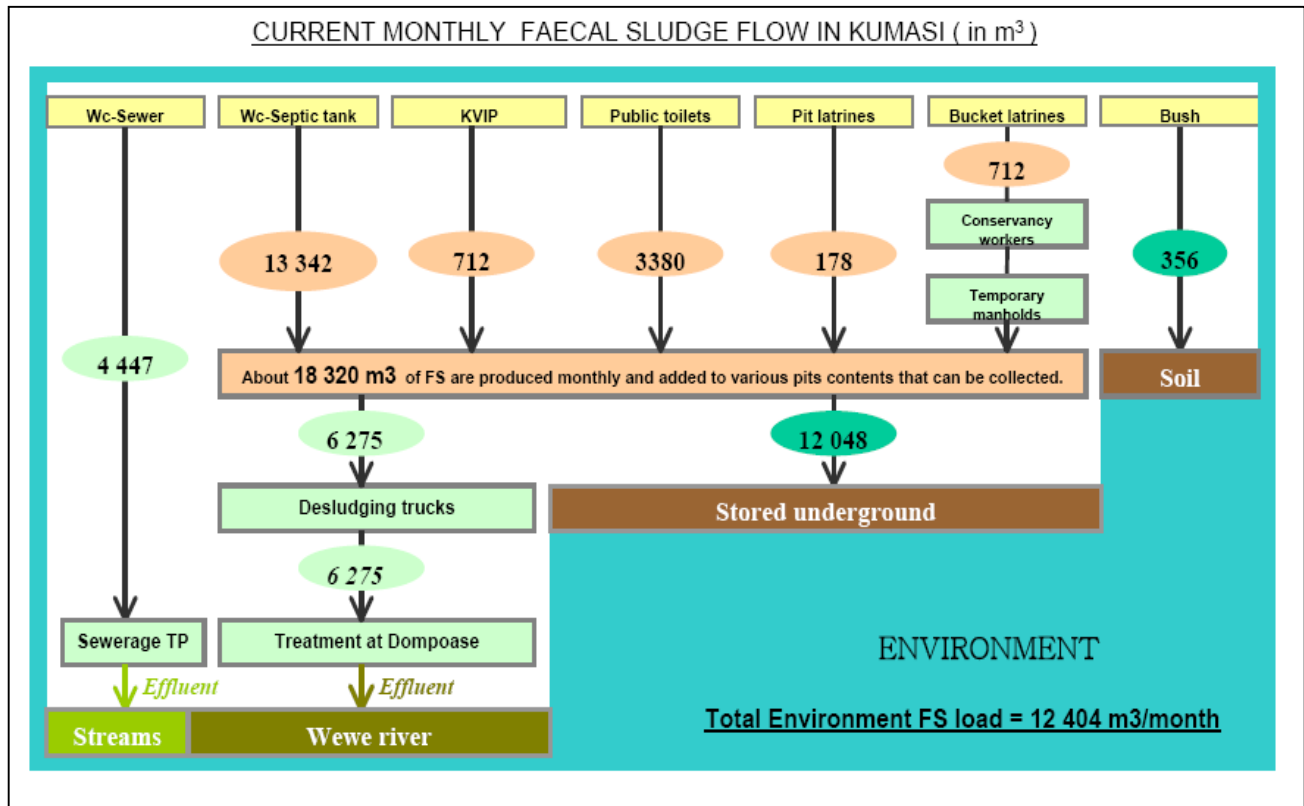


Figure 5 : Monthly Faecal Sludge flow in Kumasi

The environmental FS load represents the FS stored underground due to the high full frequency of toilets pits, and the FS directly made on soil. The average full frequency of toilets pits in Kumasi, has been estimated at 4.2 years, meaning that it can take on average 4.2 years before a household empties its toilet. This value strongly linked to the pit volume and the number of person using it, reaches 10 years (can even be more) in high income areas, and 3 month in low income areas.

The 6,275 m³ of FS monthly discharged at Dompouse are treated in the ponds system in combination with the leakage from landfilled solid waste. The treatment process is through a serial of 5 anaerobic ponds, 1 facultative pond and 2 maturation ponds. But unfortunately the quality of the effluent mixed with the underground drainage from the solid waste landfill site, to be rejected into Wewe River, is not desirable. The mixed effluent (see Figure 6) is of black color and foamy, showing that the environment protection is still questionable.



Figure 6 : Foamy effluent from Dompouse Treatment Plant discharged into the Wewe River. (photo: Anselme Vodounhessi)

There is currently, no treated FS reuse in agriculture, but the potential for reuse is that (Cofie, 2003) all actual compost users and 83% of the non-compost users perceived municipal co-compost as positive or 'good' material for soil amelioration and crop growth, and 70% of them are willing to pay for it; and those farmers who did not express WTP argued e.g. that they first have to test the product to know its effectiveness (in terms of yield and returns).

3-3-2 Existing institutional arrangements

In Ghana, the waste management services provision is in the hands of District Assemblies⁶. According to (Mensah, 2005), one of the major functions of the Kumasi Metropolitan Assembly (KMA) is the provision of environmental sanitation services including the collection and disposal of both solid and liquid wastes.

The institutions/stakeholders directly involved in FSM the city are:

- At national level:
 - The *Government of Ghana* (GoG), which main role is the budget provision for all KMA's activities;
 - Donors, mainly the *World bank*, which provides a financial support for any initiative;
 - The *Environmental Protection Agency* (EPA), which is the regulatory body.
- At local level:
 - Local authorities, which are *Kumasi Metropolitan Assembly* (KMA) and its decentralized office, the *Waste Management Department* (WMD);
 - Direct providers, which are mostly private partners such as *FS collection companies*, the *Private Contractor of the Dompouse treatment plant* and *publics toilets Managers*.
 - The beneficiaries of the FS services, which are mainly the *households*.

Good Private Sector Participation for the sanitation services provision to the city...

The institutional arrangement in FSM in Kumasi is highly characterized by the private sector involvement at all level of the services provision. KMA is the owner of the sanitation services provision and has mandated the WMD to be responsible for the service provision. The overall organization of the service as shown in Figure 7, can be described as follow:

- At the FS production level, the WMD provides financial assistance (50% subsidy) to the poor in accessing to households' facilities, under UESP-II⁷, as well as replacement and construction of new public toilets in some areas such as markets and other commercial locations where full cost can be recovered. The public toilets services provision are in the hands of sub-metro councils and under *Management contract* for public built facilities, and *BOT*⁸ *contract* for the private built ones.
- At the FS collection level, there is a *liberalization* of the services provision where 17 private companies are currently competing. Between the further five public companies -the Police, the Army, Prisons, TELECOM and KMA/WMD- also operating, only KMA/WMD provides the service to households in competition with private companies. The private companies need license from KMA to operate and pay a dumping fee for each discharge at the Treatment plant, but the public companies do not. Only TELECOM is paying the dumping fee.
- At the FS treatment level, the sanitary landfill facility of Dompouse, built under UESP-I, has been put under *Management Contract* under UESP-II. A single private Contractor has been operating both the solid waste landfill and FS treatment ponds system since January 2004. Technical monitoring of the contract is assured by the WMD and the financial affairs by KMA.

Good but not enough for stakeholders' institutional actions...

The KMA initiatives of creating a decentralized office (WMD) for the sanitation services provision and involving private sectors at many levels is as good example in West Africa. But the decentralization is not effective and more needs to be done to improve the stakeholders' autonomy in playing their role.

The WMD has limited autonomy in the execution of its activities, mostly the ones related to the financial issues. It has no decision making power in any investment, nor in the financial

⁶ The domination and power of the District Assembly depends on the settlements population. The assembly is a Metropolitan Assembly when the settlement has more than 250,000 inhabitants, Municipal Assembly when it is more than 100,000 inhabitants, and simply District Assembly when it is less, according to (Drechsel, 2004). Kumasi District Assembly is a Metropolitan Assembly: The *Kumasi Metropolitan Assembly* (KMA).

⁷ Urban Environmental Sanitation Programme- phase 2: A World Bank financial support programme.

⁸ Built Operate and Transfer.

management of contracts. The actual role of the department is limited to the facilitation and coordination of the services provision. Its internal organization is not results oriented since there is any clear strategy for staff incentive and effective internal accountability. It is also difficult to make the department accountable for result because there are no performance targets due to the lack of resources to meet them. The department is thus working based its own-set targets.

The multi-role of KMA – *Owner, Provider, Regulator and Supporter of the services*- do not allow the regulatory body to fully play its role. EPA is an autonomous regulatory body operating under the mandate *Act 490 of 1994/Legislative instrument of 1999*, to ensure sound environmental management by regulating any environmental activity. But despite its credibility, capability, transparency, accountability and power for enforcement and sanctions, the EPA can only work on collaboration basis with the KMA because of the context of local power. It has actually little power as regards to the local authorities. The action is limited to advices provision instead of enforcement, because there is not enough resources available for the authorities to do right things.

About the private partners involved, mostly the private collection companies, they have, despite the low educational level of their managers (ranging from primary to secondary school, with no background in sanitation):

- *Good operation performance*: 100% demand satisfaction; quick response for the service provision; 0.07 to 0.2 staff per monthly population served; no longer illegal dumping;
- *Good internal organization*: efficient billing and collection system (beneficiaries pay before the service provision); good staff motivation (financial rewards); 100% customers complains coverage; 100% revenue dependent of customers.

They are thus maintaining a good competitive environment which is a key factor of good service provision. However they are not free in the service tariff setting. The tariff is set by KMA. Their external environment is favorable since they benefit for a capacity building programme from the authorities and for a good perception of their activities from the community.

| REVENUE FROM COLLECTION COMPANIES | | | | | | | | | | | | | |
|---|---------------|--------|--------|---------------------------|--------|--------|--------|--------|-------------|--------|-------------|----------|----------|
| Dumping fee at the FSTP= | 20 000 cedis | | | Currency rate of 1 US\$ = | | | | | 9 000 cedis | | FSTP cost = | | \$10 000 |
| MONTHS | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | AVERAGE | |
| TOTAL MONTHLY INCOME (US\$) | 3 027 | 2 656 | 2 767 | 2 498 | 2 649 | 2 722 | 2 836 | 3 044 | 2 702 | 2 967 | 2 820 | \$2 790 | |
| MONTHLY INCOME PAID (US\$) | 2 844 | 2 491 | 2 633 | 2 276 | 2 460 | 2 469 | 2 576 | 2 760 | 2 491 | 2 747 | 2 587 | \$2 576 | |
| MONTHLY INCOME PAID as % OF THE COST | 28% | 25% | 26% | 23% | 25% | 25% | 26% | 28% | 25% | 27% | 26% | 26% | |
| PART OF THE MONTHLY PAID FROM HH (US\$) | 2831 | 2473 | 2587 | 2258 | 2429 | 2460 | 2560 | 2749 | 2478 | 2747 | 2560 | \$2 557 | |
| PART PAID FROM UTILITIES (US\$) | 13 | 18 | 47 | 18 | 31 | 9 | 16 | 11 | 13 | 0 | 27 | \$18 | |
| MONTHLY INCOME UMPAID (US\$) | 182 | 164 | 133 | 222 | 189 | 253 | 260 | 284 | 211 | 220 | 233 | \$214 | |
| MONTHLY REVENUE FROM HOUSEHOLDS IN THE SYSTEM | | | | | | | | | | | | | |
| Mean collection fee = | 400 000 cedis | | | Currency rate of 1 US\$ = | | | | | 9 000 cedis | | | | |
| MONTHS | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | AVERAGE | |
| TOTAL MONTHLY REVENUE FROM HH (US\$) | 57 511 | 50 756 | 52 800 | 46 356 | 49 022 | 50 400 | 52 044 | 56 889 | 50 356 | 56 133 | 52 133 | \$52 218 | |
| MONTHLY GOVERNEMENT SUBSIDY | | | | | | | | | | | | | |
| Current monthly FS treatment cost = | \$10 000 | | | | | | | | | | | | |
| MONTHS | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | AVERAGE | |
| MONTHLY SUSIDY (US\$) | 7 156 | 7 509 | 7 367 | 7 724 | 7 540 | 7 531 | 7 424 | 7 240 | 7 509 | 7 253 | 7 413 | \$7 424 | |
| TOTAL MONTHLY REVENUE FROM HH (US\$) | 72% | 75% | 74% | 77% | 75% | 75% | 74% | 72% | 75% | 73% | 74% | 74% | |

Table 2 : Overall FSM money flow estimation based on 2005 data of FS discharge at Dompouse FSTP (used for Figure 8)

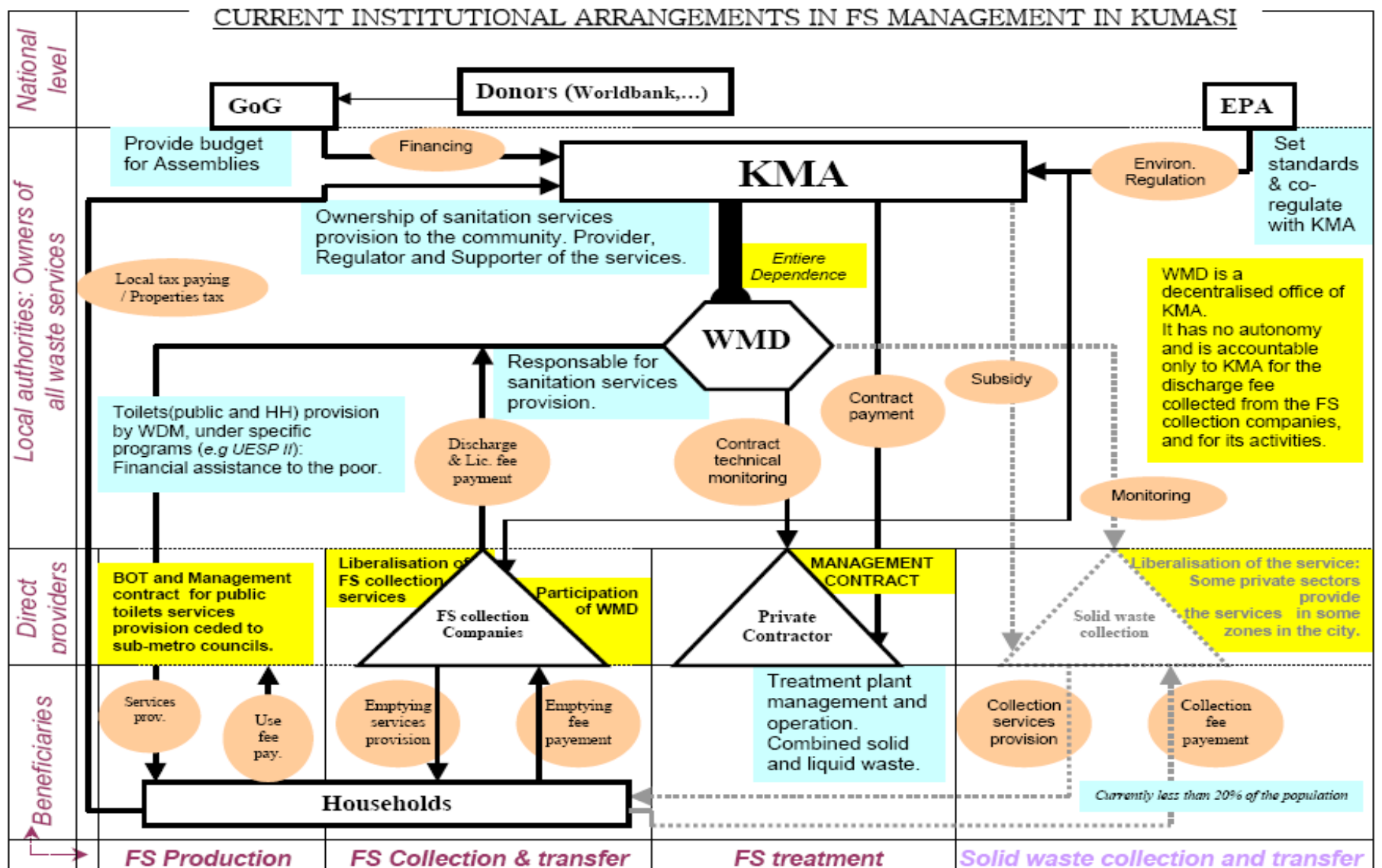


Figure 7: Current institutional arrangement in Faecal Sludge Management in Kumasi, Ghana.

3-3-3 Existing financial arrangements and stakeholders' capability

The direct actors currently involved in the overall financial management of Faecal Sludge in the city are: Households (HH), collection companies and local authorities through Government subsidy. As shown in Figure 8, the central point of the financial issue is the FSTP (faecal sludge treatment plant) operation. The collection companies are doing good business: the net profit margin of the four private companies studied, range from 11 to 28% (see Table 3). The tariff for the service provision to the households, actually range from 300,000 to 600,000 cedis⁹. With the average tariff of 400,000 cedis (used in most of the case by the companies), it has been estimated that US\$ 52,218 come from households of which 95% (US\$ 49,661) are retained by collection companies and 5% (US\$ 2,576) go to the FSTP as discharge fee, which is the only revenue of the FSTP management. The cost of the overall FSTP management is estimated at US\$ 10,000, and thus the cost recovery at 26%, requiring 74% for Government.

| 1. Income statement | | | | | | |
|---|----------------|-----------------------|----------------------------|-------------------------|--------------|----------------|
| COMPANIES NAME | BABDAKO | AFRANIE | ALBERT J. | KMA/WMD | PLANET G | BILAN |
| <i>Daily statement per trip (in cs)</i> | | | | | | |
| Emptying tariff (+) | 400 000 | 400 000 | 350 000 | 3 /600 000 ¹ | 400 000 | |
| Fuel (-) | 100 000 | 80 000 | 100 000 | | | 75 000 |
| Shop money ² (-) | 100 000 | 90 000 | 70 000 | 100 000 | | 150 000 |
| Oil (-) | 20 000 | 20 000 | 10 000 | | | 10 000 |
| Discharge fe (-) | 20 000 | 20 000 | 20 000 | | | 20 000 |
| <u>Daily net Revenu per trip</u> | <u>160 000</u> | <u>190 000</u> | <u>150 000</u> | | | <u>145 000</u> |
| <i>Monthly NOPAT (in '000 cs)</i> | | | | | | |
| Av number of trip / month | 369 | 165 | 29 | 24 | 59 | |
| Turnover | 147 418 | 65 855 | 10 023 | 9 636 | 23 491 | |
| Monthly net renevu | 58 967 | 31 281 | 4 295 | 8 833 | 8 515 | |
| Remaining Staff cost | 11 000 | 6 800 | 2 600 | | 1 000 | |
| Maintenance cost | 5 000 | 2 000 | 500 | | 500 | |
| Profit before tax | 42 967 | 22 481 | 1 195 | | 7 015 | |
| Tax | 3 223 | 1 686 | 90 | | 526 | |
| <u>Monthly Net Operation Profit After Tax</u> | <u>39 745</u> | <u>20 795</u> | <u>1 106</u> | | <u>6 489</u> | |
| Net profit margin | 27% | 32% | 11% | | 28% | |
| Use of the profit | New invest. | Invest. in other act. | Take care of owner' family | | Storage | |
| Impact on the profit accepted | < 5% | < 5% | < 5% | | < 5% | |

Table 3 : Financial statement of the five collection companies interviewed.

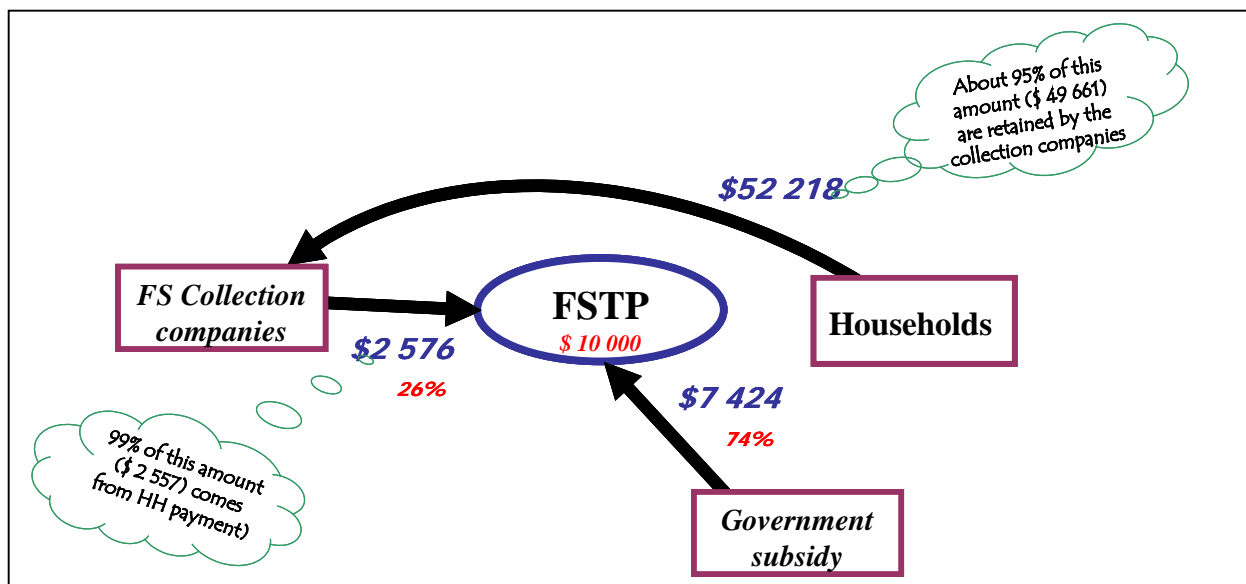


Figure 8 : Current money flow in the overall Faecal Sludge Management in Kumasi.

⁹ Local currency, which rate is currently about 9,000 cedis for 1 US\$.

Households are the main source of revenue of the system since they are the only direct beneficiaries. From the households interview survey, the Figure 9 shows the average monthly income per income area, of which the capacity to pay (CPT) for the emptying service (based on the assumed 0.5%) is estimated in Figure 10 and compared with the actual expenditures in emptying services. It can be seen that low income areas are currently paying 3.5 times their CPT, while high income areas are paying the same rate less.

The overall expenditure of the households in water and sanitation (watsan) according to the survey is presented in Figure 11 in comparison to WHO standards of 5% of the HH income. The figure shows that middle income areas have passed the standards, while the high income areas are still far away. Despite this fact, no household is willing to pay more what they are currently paying to benefit from service: only 5% of households (all in low income areas) think that their expenditure in the emptying service is low. The Table 4 shows more about the households' perception on their current expenditures in emptying service.

But based on the households capability estimated in the Figure 10, more money can be expected from households to cover the overall cost of the system, if good strategy is found for the effective collection of this money. And more the target of the environmental sustainability can be assured if the FS treatment ends up with biosolids production for reuse in agriculture like would like ecosan approach.

| Income areas | Sample size | Perception on Current expenditure in emptying service | | |
|--------------------|-------------|---|------------|------|
| | | Low | Acceptable | High |
| Low income area | 10 | 10% | 30% | 60% |
| Medium income area | 5 | 0% | 0% | 100% |
| High income area | 5 | 0% | 60% | 40% |
| Total / Average | 20 | 5% | 30% | 65% |

Table 4 : Households' perception on current expenditures in the emptying service.

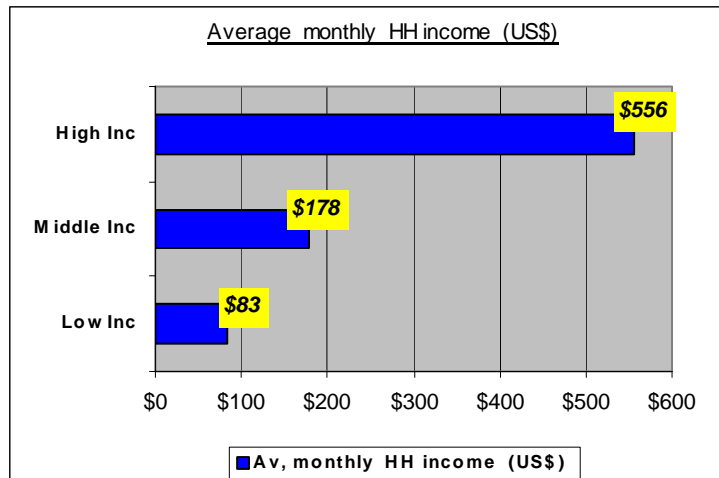


Figure 9 : Average monthly HH income per area in Kumasi.

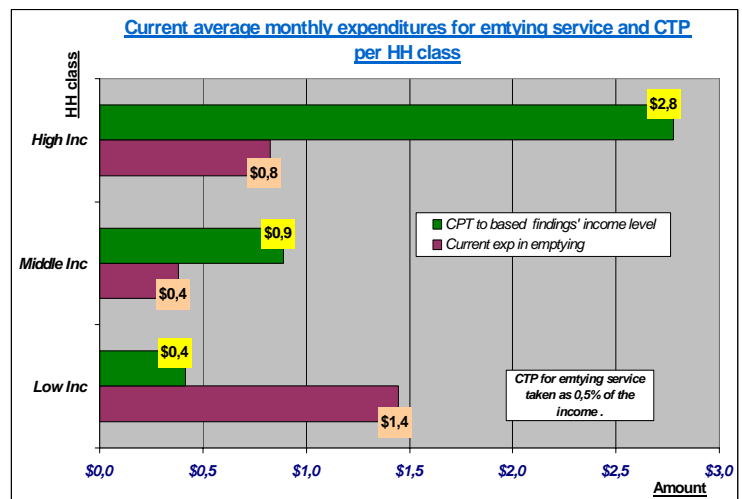


Figure 10 : HH expenditures in emptying services and CTP

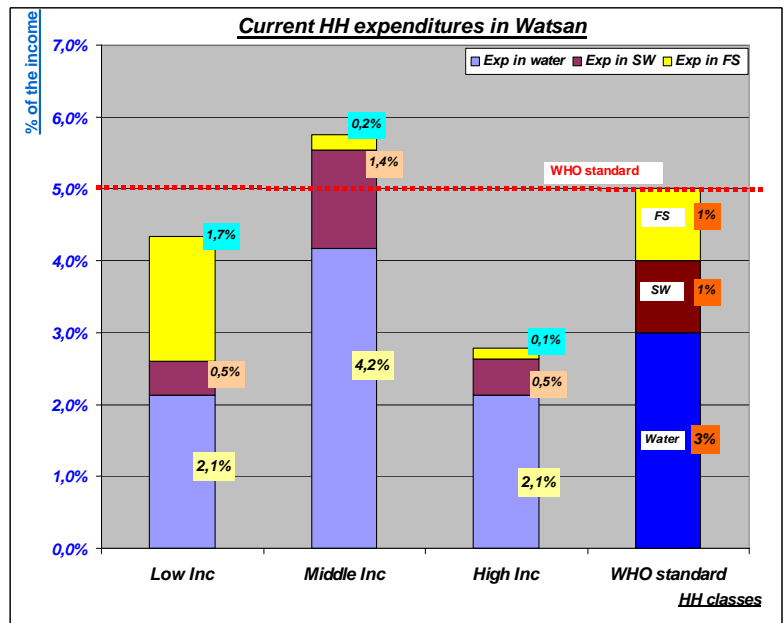


Figure 11 : HH expenditures in watsan

3-3-4 Institutional and financial problems which hamper FSM to be ecosan

The institutional and financial problems that hamper Faecal Sludge Management, to be under the umbrella of ecosan in Kumasi, can be summarized in the 10 following points:

1. Strong Government and Donors orientation instead of Households orientation;
2. High political interference in the management: the decentralisation of the Waste Management Department (WMD) is not effective;
3. Accumulation of roles by the District Assembly : KMA is Owner, Provider, Regulator, Financial Manager and Decision maker of the sanitation services;
4. Low autonomy for the WMD who is responsible for the service provision;
5. No powerful regulatory body: the action is collaboration-oriented, which make hard the effectiveness of the regulation;
6. Low cost recovery of the system (the FSTP);
7. Political fear (election) to charge the FS services at its right cost;
8. No trigger for waste reuse in agriculture;
9. Farmers are not among the direct stakeholders;
10. No Information System for better FSM planning: the FSM-IS is limited to trucks trips counting at the FSTP, no information on where the waste comes from (type of toilets facilities, areas, etc...).

3-4 A way forwards better situation: *Farmers and households' orientation and effective decentralization...*

To make FSM under the umbrella of ecosan in Kumasi, more need to be done as regards to the financial and institutional situation.

Starting from the FSTP, the current system needs to be extended to associate facilities of biosolids production to transform the FS into compost ready to be used in agriculture. The existing combined site (Dompoase site) for both faecal sludge (FS) and solid waste (SW) discharge, offers a good opportunity for the Integrated-FSM for the city. A composting plant of both FS and SW can be effective, using the outcomes of the current co-composting pilot plant managed conjointly by SANDEC¹⁰ and IWMI at Buobai, the former FS discharge site of Kumasi. Obviously, the FSTP cost will increase, but farmers will be another source of revenue in the system, even if the revenue from them doesn't cover the extra imposed by the compost production.

Effective decentralization on the way...

A SWOT analysis carried out by (Drechsel *et al.*, 2004) show a good potential for the WMD to take care of the waste management service provision: potential knowledge and for data base on waste management, as strengths. But the lack of autonomy hampers the effective accountability of the WMD through the lack of clear performance targets. The department needs to be assigned full responsibility and clear roles need as well to be assigned to every stakeholder.

The role of KMA must be limited to the community interest saving and facilitation of the over all activities with little interference in WMD activities.

The EPA must fully and independently play the regulatory roles with any interference from other stakeholders, mostly with regards to the environment protection issues.

A stakeholder's platform composed of EPA, KMA, Community members, collection companies and WMD must exist to deal with tariffs regulation and performance targets setting for the WMD, for better participation and transparency in FSM for the city.

The WMD roles must be more oriented to contracts monitoring (technical and financial), FS information Management for better planning, social affairs care like building new facilities to increase access to sanitation. Full autonomy must be given to the department mostly the financial autonomy for better internal organization and overall management of the services. Clear performances targets must be set to held the department for accountability for results.

¹⁰ SANitation for DEveloping Countries: Research Organisation based in Switzerland.

Farmers' orientation as the way to an Integrated-FSM

Institutionally, farmers need to be associated as direct stakeholders as well as the Ministry Of Food and Agriculture (MOFA) and Research Institutes like IMWI and SANDEC, which are already in place. Unfortunately, there is currently a huge use of poultry manure by farmers in Kumasi. The farmers' implication in the use of biosolid from faecal sludge, will therefore not be an easy task since the poultry manure is free and has quick (but not sustainable) effect. However a previous study carried out by IWMI, has shown that there is some potential is FS compost use in agriculture. The results of previous study on Kumasi' farmers Willingness To Pay (WTP) for FS compost is presented in the Table 5.

| Potential Clients | Estimated number of farming households and around the city (total) | Average farm size per farmer (ha) | Number of farmers willing to pay (extrapolated from sample size) | Average WTP (US\$) | Qty/ year in 50kg bags per farming household | Total theoretical demand of compost in tons per year |
|---------------------------|--|-----------------------------------|--|--------------------|--|--|
| Vegetable (urban) | 200 | 0,1 | 126 | 0,1 | 214 | 1348,2 |
| Vegetable (peri-urban) | 280 | 0,8 | 260 | 3 | 28 | 364 |
| Staple crops (urban) | 115 | 0,2 | 67 | 2 | 5 | 16,75 |
| Staple crops (peri-urban) | 15000 | 0,8 | 5550 | 2,7 | 14 | 3885 |
| Urban backyards | 85000 | 0,04 | 71000 | 1,4 | 3 | 10650 |
| Urban ornamentals | 50 | 0,04 | 40 | 0,6 | 33 | 66 |
| Total | 100645 | | 77043 | 9,8 | 297 | 16329,95 |

Table 5 : Farmers Willing To Pay for compost. Source: (Cofie. 2003)

From this study, we estimate in Figure 12, the highest revenue that can come from farmers and the corresponding compost demand.

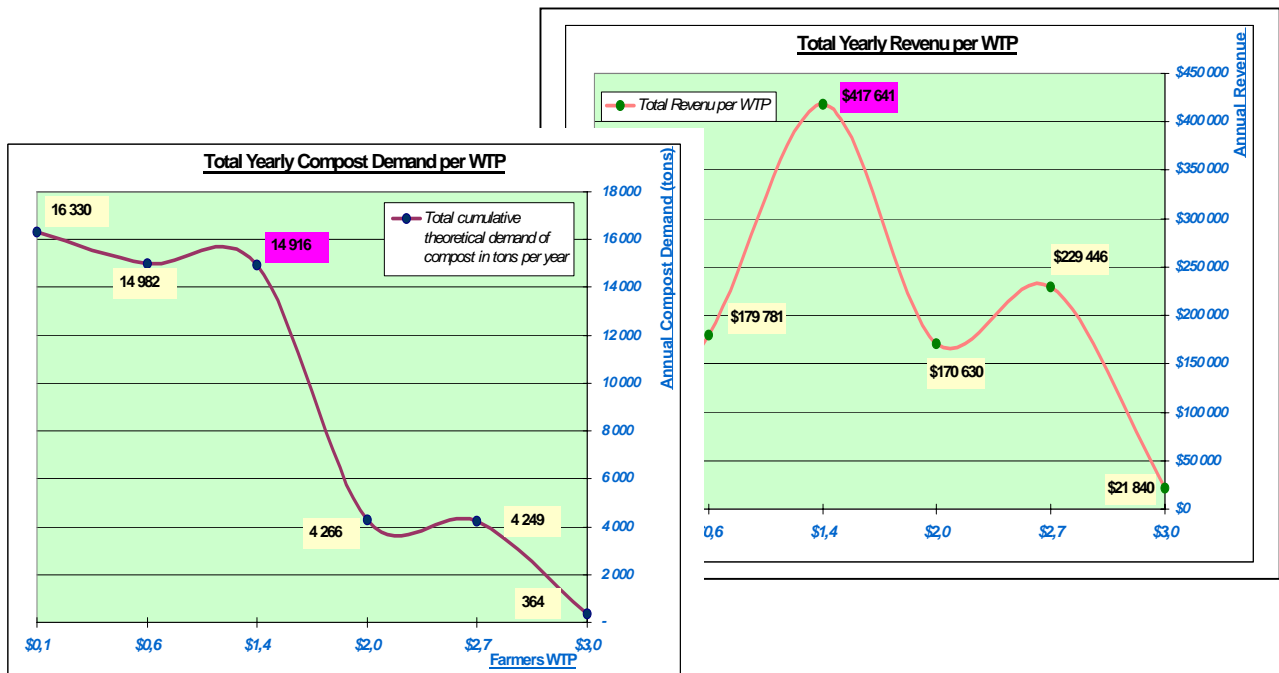


Figure 12 : Yearly revenue from farmers and compost demand as function of farmers' WTP

At a WTP of US\$1.4, the higher revenue of US\$ 417,641 can be expected from farmers with corresponding compost yearly demand of 14,916 tons. The transport cost for the compost delivery to farmers and the extra capital and running cost of the treatment plant must be evaluated and balance with this revenue (high enough). But reach separately the farmers services cost recovery must not be a component of the approach, since the treated FS reuse in agriculture provides some indirect benefits such as food security through agricultural soil recovery and land saving form avoiding treated FS and solid landfill, in case of co-composting. The main point showed here by the approach is that associating farmers as potential stakeholders in the FSM system and continuously struggle for their positive perception will not be a heavy wage to the system but rather building a reliable source of revenue.

Households' orientation as the way to a Sustainable-FSM

Households are the only beneficiaries of the sanitation services. Unfortunately they do not consider the services as important as electricity or water services. A good strategy needs to be developed to make them pay what they are capable to pay for the service provision and not necessary what they are willing to pay. Due to the different income level in the population, the emptying service tariff must be set on a cross-subsidy basis using the CTP to define the appropriate tariff for each income area.

| Areas (Surburbs) covered | CLASS | 1996 | | | | | 2004 | | | | |
|--|-------|------------|--------------|------------------|---|---------------------------------|----------------------|--------------|------------------|---|---------------------------------|
| | | Population | Number of HH | Number of Houses | Av. monthly head of HH income (c 000's) | Av. monthly HH income (c 000's) | Population estimated | Number of HH | Number of Houses | Av. monthly head of HH income (c 000's) | Av. monthly HH income (c 000's) |
| Central Market CBD) | M | 11.328 | 2.266 | 378 | 225 | 330 | 25.890 | 5.178 | 863 | 1.634 | 2.397 |
| Adum (CBD) | M | 13.675 | 2.735 | 456 | 250 | 325 | 31.254 | 6.251 | 1.042 | 1.816 | 2.361 |
| Bompata (CBD) | M | 9.685 | 1.937 | 323 | 195 | 240 | 22.135 | 4.427 | 738 | 1.416 | 1.743 |
| Cultural Centre, Doctors' Flats, Zoo (CBD) | H | 3.425 | 856 | 856 | 155 | 290 | 7.828 | 1.957 | 1.957 | 1.126 | 2.107 |
| 4 Battalion, Kmfo Anokye Hospital | M | 17.500 | 3.500 | 583 | 183 | 258 | 39.996 | 7.999 | 1.333 | 1.329 | 1.874 |
| Kwadaso Estates | H | 7.950 | 1.988 | 1.988 | 305 | 450 | 18.170 | 4.542 | 4.542 | 2.215 | 3.269 |
| Bantama | M | 45.168 | 9.034 | 1.506 | 235 | 300 | 103.231 | 20.646 | 3.441 | 1.707 | 2.179 |
| Ashanti New Town | M | 36.491 | 7.298 | 1.216 | 85 | 180 | 83.400 | 16.680 | 2.780 | 617 | 1.308 |
| Akwatia Line | L | 25.779 | 4.297 | 358 | 155 | 220 | 58.918 | 9.820 | 818 | 1.126 | 1.598 |
| New Amakom, Asokwa | H | 19.131 | 4.783 | 4.783 | 305 | 510 | 43.724 | 10.931 | 10.931 | 2.215 | 3.705 |
| Ridge, Danyame | H | 11.342 | 2.836 | 2.836 | 413 | 568 | 25.922 | 6.481 | 6.481 | 3.000 | 4.126 |
| Angola | L | 61.248 | 10.208 | 851 | 355 | 490 | 139.982 | 23.330 | 1.944 | 2.579 | 3.559 |
| Asawasi, Aboabo | L | 33.919 | 5.653 | 471 | 75 | 190 | 77.522 | 12.920 | 1.077 | 545 | 1.380 |
| Dichemso, Krofofrom | M | 94.248 | 18.850 | 3.142 | 115 | 210 | 215.404 | 43.081 | 7.180 | 835 | 1.525 |
| Bomso, Sisanso | L | 5.829 | 972 | 81 | 300 | 392 | 13.322 | 2.220 | 185 | 2.179 | 2.847 |
| Ayigya West | L | 6.478 | 1.080 | 90 | 260 | 345 | 14.805 | 2.468 | 206 | 1.889 | 2.506 |
| Old Ayigya | L | 17.010 | 2.835 | 236 | 242 | 325 | 38.876 | 6.479 | 540 | 1.758 | 2.361 |
| Akrom | L | 26.572 | 4.429 | 369 | 85 | 210 | 60.730 | 10.122 | 843 | 617 | 1.525 |
| Asokore Mampong | L | 9.008 | 1.501 | 125 | 155 | 210 | 20.588 | 3.431 | 286 | 1.126 | 1.525 |
| Moshie Zongo, Sepe | L | 16.700 | 2.783 | 232 | 59 | 125 | 38.168 | 6.361 | 530 | 429 | 908 |
| Buokrom Estates | M | 9.056 | 1.811 | 302 | 158 | 258 | 20.697 | 4.139 | 690 | 1.148 | 1.874 |
| Ahinsan Estate | M | 5.821 | 1.164 | 194 | 180 | 285 | 13.304 | 2.661 | 443 | 1.308 | 2.070 |
| Adiebeba | H | 10.449 | 2.612 | 2.612 | 65 | 220 | 23.881 | 5.970 | 5.970 | 472 | 1.598 |
| Chirapatre, Chirapatre Estates | M | 6.560 | 1.312 | 219 | 110 | 165 | 14.993 | 2.999 | 500 | 799 | 1.199 |
| Nhyiaso, Ahodwo | H | 8.526 | 2.132 | 2.132 | 300 | 465 | 19.486 | 4.872 | 4.872 | 2.179 | 3.378 |
| Fankyenebra Santasi | M | 8.680 | 1.736 | 289 | 275 | 530 | 19.838 | 3.968 | 661 | 1.998 | 3.850 |
| Kwadaso | M | 10.508 | 2.102 | 350 | 265 | 310 | 24.016 | 4.803 | 801 | 1.925 | 2.252 |
| Kwadaso extension, Asuoeyboa, Brigade, F | M | 7.863 | 1.573 | 262 | 185 | 350 | 17.971 | 3.594 | 599 | 1.344 | 2.542 |
| Suame, Abrepo, Anumanye, Maakro | L | 25.034 | 4.172 | 348 | 195 | 280 | 57.215 | 9.536 | 795 | 1.416 | 2.034 |
| Old Tafo | L | 64.225 | 10.704 | 892 | 255 | 290 | 146.786 | 24.464 | 2.039 | 1.852 | 2.107 |
| UST | H | 7.428 | 1.857 | 1.857 | 231 | 282 | 16.977 | 4.244 | 4.244 | 1.678 | 2.048 |
| Boadi | L | 5.960 | 993 | 83 | 105 | 310 | 13.622 | 2.270 | 189 | 763 | 2.252 |
| Kentinkrono, Nsenie, Oduom | L | 3.200 | 533 | 44 | 145 | 260 | 7.314 | 1.219 | 102 | 1.053 | 1.889 |
| Asuoeyboa SSNIT Flats | H | 2.850 | 713 | 713 | 388 | 538 | 6.514 | 1.628 | 1.628 | 2.818 | 3.908 |
| total | | 648,646 | | | | | 1,482,480 | | | | |

Table 6 : Actualization of 1996's statistical data to 2004 for Kumasi city. Initial data from (GoG/MoLGRD, 1996)

In order to know how potential the CPT-approach for cost recovery is, a quick estimation of the potential revenue from households has been done. The estimation was deep enough considering all the suburbs of the city, the updated number of households in each suburb and their income level. The whole statistical data used presented in Table 6, is the updated data from 1996 data found in (GoG/MoLGRD, 1996). From a statistical repartition of the updated data into quintiles, and then into income classes (Table 7), the total potential revenue from the HH, has been estimated at US\$ 321,175 for a 100% service coverage based on the assumed CPT. With the actual coverage of 34% of the collection service, the potential revenue from HH is US\$ 109,200.

| | CLASS | Number of HH | Total monthly HH income (c 000's) | Av. monthly HH income per class (c 000's) | Av. monthly CTP per class (c 000's) | Total monthly CTP per class (c 000's) |
|-------|--------|--------------|-----------------------------------|---|-------------------------------------|---------------------------------------|
| Q1 | HIGH | 51 209 | 188 366 743 | 3 678 | 18 | 941 834 |
| Q2 | MIDDLE | 133 538 | 278 615 220 | 2 086 | 10 | 1 393 076 |
| Q3 | | | | | | |
| Q4 | | | | | | |
| Q5 | LOW | 79 042 | 111 133 545 | 1 406 | 7 | 555 668 |
| TOTAL | | 263 790 | | | | 2 890 578 |
| | | | | | cedis | |
| | | | | | US\$ | 321 175 |

Table 7 : Repartition of the updated statistical data into quintiles and income classes.

And as shown in Table 8, there is US\$ 49,539 remaining for the capital expenditure and profit for the FSTP in the current situation: huge amount, being about 5 times the current running cost or 500% cost recovery. What is a nice theoretical approach.

But in practice, the issue is how to convert the theoretical monthly CTP into the practical emptying fee (paid after the service provision), which is strongly dependent on the pit full frequency also function of the toilet pit volume. The other issue is the effectiveness of the collection of the cumulated CPT, mainly in poor areas, where households earn and expend their money on daily basis. They will not thus be able to pay a huge amount of the emptying fee determined from the monthly CTP. Is a micro-finance system needed for the emptying service provision?

The final and main issue is how to collect the extra money (difference of the CTP to the current expenditure) from households to the FSTP, in a system where households do not benefit directly the services from the FSTP. Will collection companies accept to reverse a big part of the money collected from HH at the discharge site? Like would like the new financial flow showed in Figure 13, how can households pay the two-parts money?

A lot of questions still need to be answered to make effective the implementation of this new CTP-approach. And when these questions find their answers, the waste management for the city could be done without any external financial support. External financial aids could be used for public awareness and capacity building programmes.

| <i>THEORETICAL FIGURES BASED ON THE HH CTP</i> | |
|--|--------------|
| Potential money available for emptying for 100% coverage | US\$ 321 175 |
| Potential money with the current coverage of 34% | US\$ 109 200 |
| Average currently retained by collection companies | US\$ 49 661 |
| Remaining for the FSTP | US\$ 59 539 |
| Current OPEX of the FSTP | US\$ 10 000 |
| Remaining for CAPEX and profit for the FSTP | US\$ 49 539 |

Table 8 : Quick evaluation of the potentiality of the revenue from HH for the FSM cost recovery.

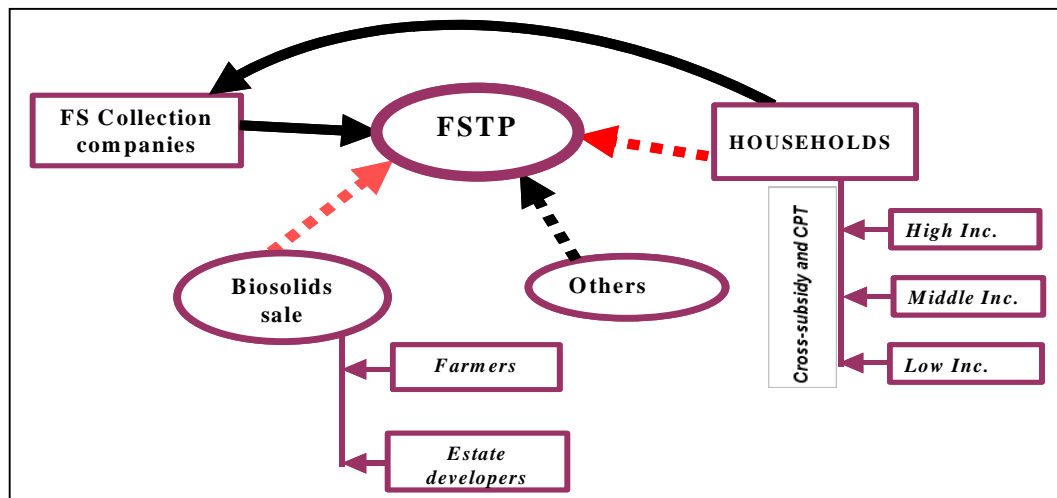


Figure 13 : New money flow for the way forwards better financial situation in FSM in Kumasi

4. Conclusion

The approach developed in the study must be taken as a new tool for decision makers to deal with sanitation issues if the sustainability is actually their target. Any new system must not only focus on technologies but also on the stakeholders' capability to manage it and to pay for services provided from it. So that we no longer fall in a pitfall where we choose a high-tech system which performs well at the beginning, and becomes financially a heavy wage some years later to be get rid of.

The CPT-approach used to address faecal sludge management financial issues, must be taken as a model and accompanying institutional arrangements must be found for the effective implementation, as well as good

incentives or motivation for all stakeholders to play their financial role. The final point of the treated FS reuse in agriculture must be taken as the essential element for decision making in waste management in West Africa, where food security need to be assured through agricultural soil recovery.

In the case of Kumasi however, where we find that farmers and households orientation could provide better solution for a sustainable FSM, a lot of questions still need to be answered for the effective implementation of the approach. These questions can quickly find their answers if there is a strong political will to give to the waste management services, sufficient importance as for water and electricity services.

This new approach could be taken as the beginning of the long struggle for the sustainable waste management in the developing world.

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