

# The use of transfer stations for faecal sludge management in Accra, Ghana

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*Efforts to increase sanitation coverage in the developing world have largely concentrated on on-site sanitation. Rising population densities mean that the standard practice of relocating the latrine, once full, is not possible and the faecal sludge must be removed. Transfer stations are widely accepted as a possible addition to infrastructure, providing a facility for safe disposal of faecal sludge, but they rarely exist. Accra, Ghana, has been explored as a case study because of the widespread usage of underground holding tanks (UHTs) to store collected night-soil (waste collected from pan (bucket) latrines). The problems that remain in Accra, despite the presence of these tanks, provide valuable considerations for future developments of similar technologies elsewhere.*

**Keywords:** faecal sludge management, on-site sanitation, Ghana.

ON-SITE SANITATION SYSTEMS have been adopted in many urban areas of the developing world to increase sanitation coverage. Once on-site systems are full, however, there is a necessity to collect and dispose of this human waste, and if this process falters at any stage environmental contamination is likely to occur. One possibility for this contamination is where manual workers, often emptying latrines, have nowhere to safely dispose of excreta, resulting in indiscriminate dumping of faecal sludge. The process of collecting, transporting, disposal and treating this human waste is known as faecal sludge management (FSM).

Transfer of faecal sludge from household level can take place by discharging into: (1) a larger tanker for further haulage (Strauss and Montangero, 2002); (2) permanent or semi-permanent structures (Sugden, 2005; Macleod, n.d.); or (3) into the sewerage network (GHK, 2005). It is rare for large numbers of transfer stations to exist (Schaub-Jones, 2005), which means that haulage distances for machines specifically designed for access in densely populated areas are long, costly and increase the likelihood of accidents (Sugden, 2005). For manual emptiers often the only option is to bury the exc-

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The absence of transfer stations means that small emptying machines have to travel frequently to the treatment works

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reta, dump it somewhere dry or pour it into a stream (Bongi and Morel, 2005).

Experience is fraught with difficulties. In Dar es Salaam, Tanzania, in the early 1990s the inability to acquire land from government prevented the construction of transfer points to assist the Manual Pit Emptying Technology (MAPET) (Muller and Rijnsburger, 1994). In Maputo, Mozambique, lack of responsiveness of the municipality in emptying transfer stations resulted in small machines making the long journey to the treatment works, which is uneconomical when carrying a smaller load (Sugden, 2005). High volume vacuum tankers do not generally require transfer points because (apart from sewerage systems) they are the most economic means of carrying large volumes of waste to point of treatment.

### Case study methodology

The case study was conducted using a series of semi-structured, structured and focus group interviews. Findings were triangulated where possible through observations, literature or by verification of data via calculations or interviews with additional stakeholders.

### Transfer stations in Accra: background

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The decision was taken to privatize emptying services and begin phasing out pan latrines

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Pan latrines utilize a pan set below a seat within a household (often termed bucket latrines): a door opens to the outside street to facilitate the collection of the pan by a night-soil collector. This system is not classed as an adequate form of sanitation for meeting the Millennium Development Goals (JMP, 2006). In Accra, the night-soil collectors work as private contractors and are licensed by the Accra Metropolitan Assembly (AMA) Waste Management Department (WMD). Previous publicly run operations had been inefficient and the decision was taken in 1987 to privatize emptying services and begin phasing out pan latrines (Gordon, 1997).

Accra's underground holding tanks (UHTs) were constructed in 1997/8 as one part of a larger waste management infrastructure project. The largest element of the project was the construction of a wastewater treatment works to serve Accra's limited sewerage network. The WMD originally used six UK Department for International Development (DFID)-purchased vacuum tankers to empty the UHTs. A gradual process of breakdowns meant that only one was still in use in 2007. This remaining tanker services government buildings whilst the private sector has unofficially taken over the role of emptying the UHTs.



Top of an underground holding tank, showing a chain to lock the lid, a vent pipe and a wall to prevent overflowing excreta travelling onto the road'

Before the introduction of the UHTs the pan latrine contractors used adapted solid waste skips to dispose of the faecal sludge. These were problematic as contractors often spilled waste, causing a smell and fly nuisance (Nat Armah, formerly head of AMA Waste Management Department, personal communication, 2007).

### Technical problems

The UHTs aimed to reduce odour and facilitate access, both of which have largely been achieved. However problems have emerged because night-soil is inherently dry and causes siltation of the UHTs if it sits too long. This results in the gradual reduction of the UHT volume over time (starting from a volume of 23 m<sup>3</sup>). A costly desilting procedure must then be performed on the UHT (using a crane to remove the concrete lid). The problem is exacerbated by the introduction of solid wastes used for anal cleansing.

Of the original 60 UHTs that were constructed in the 1990s only 33 (according to the WMD) are still in operation today, 10 years after their installation. Some of them have been converted into tanks for communal toilets whilst others simply lie dormant.

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The tanks are difficult to empty and are gradually silting up

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Tanks are also difficult to empty (again due to the dry nature of the waste). This strains vacuum tanker pumps, increasing maintenance costs.

### Stakeholder involvement

Several stakeholders are involved in the operation of the UHTs: pan latrine contractors, the WMD, illegal operators, private vacuum tanker companies and householders.

*Official pan latrine contractors.* Nine pan latrine contractors were appointed in 1987. This number has since been reduced to five; four had their licences revoked because of unsanitary practices (Nat Armah, personal communication, 2007).

One company utilizes purposely designed Dung Beetle machines to empty the pans and dispose of contents at the UHTs. The others simply carry pans manually, emptying them into a larger container and subsequently taking this to the UHTs. Charges for services must be below 10 Ghana cedis (the currency in Ghana recently changed from the cedi to the Ghana cedi; 10,000 cedis = 1 Ghana cedi; 1 Ghana cedi = US\$1.09) per month for each pan latrine (US\$11 per month). This price is set by the WMD. The Government of Ghana's environmental sanitation policy states that these tariffs should be

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The charge for emptying pan latrines is as much as US\$11 per month

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Dung Beetle machines owned by Larsen Ghana are small enough to enter the narrow lanes

set using private sector involvement, enable the cost recovery of operations and not discourage the use of facilities by members of the public (Government of Ghana, 2007).

The cost to private pan latrine contractors for emptying the UHTs is 46 Ghana cedis (US\$50) per 7,000 litre tanker. Pan latrine contractors interviewed indicated the UHTs would fill every 2–3 days. The frequency of UHT emptying is a critical monetary consideration to a contractor (especially considering some contractors will operate more than one UHT). The filling rate can vary due to the inclusion of solid waste used for anal cleansing, the number of householders using a pan and the number of illegal workers emptying into a UHT.

This emptying used to be carried out by the public sector, although it was not ascertained whether this tariff was also charged. There have been attempts to charge for emptying on a different basis: at one stage it was based on the number of pans the contractors serviced; however, under-declaration became a problem (Nat Armah, personal communication, 2007).

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Private contractors compete with illegal operators who empty pan latrines at a lower cost to householders

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*The illegal sector.* One of the biggest problems faced by the private contractors is competition from illegal operators who empty pan latrines at a lower cost to householders (6–7 Ghana cedis (US\$7–8)). They are able to do this for two reasons: 1) they do not run the risk of losing a licence through the unsanitary practice of indiscriminate dumping (because they do not have one to lose); and 2) they do not have to pay for the UHTs to be emptied.

The punishment for an illegal worker can be a fine of up to 50 Ghana cedis and three months in prison. It was not ascertained whether anyone had ever received such punishments. The apparent inability to prosecute makes the illegal status ineffective, and simply means that workers cannot legally use the UHTs. Perhaps the practice should be accepted rather than condemned.

The smaller of the two pan latrine contractors interviewed said that they sometimes had to lower their prices in order to get customers. The larger operator attempted to stop illegal operators by using chains and trialling a method to replace pans altogether.

*Waste management department.* The AMA built the UHTs and the WMD has ownership of them but it has nothing to do with the operation of the facilities. The process of privatization has reduced its role to that of facilitator. Its main functions include the enforcement of by-laws, the most important of which is to prohibit the illegal sector from operating. The policing of such activities is difficult simply because night-soil is traditionally collected at night-time, and the social stigma attached to the work makes it unlikely that operations will ever take place during the day. Other roles of the WMD include monitoring the official contractors to ensure that best practice is being followed and setting tariffs.

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It is difficult to police illegal dumping of waste because this happens at night

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The costs incurred by the WMD are in the operation of its head office and employment of officers to monitor activities. Its income arises from the tipping fees paid at the Korle Gonno and Teshie tipping points. Fees for tipping are 12 Ghana cedis per tanker (US\$13). At Korle Gonno there is an average of approximately 100 tankers per day, therefore the WMD receives approximately US\$1,300 per day for providing this service. It was not ascertained during the research trip how much control the WMD has over this financial resource.

*Private vacuum tanker companies.* Vacuum tanker companies emptying UHTs must recover the cost of salaries, capital cost of equipment, make a provision for maintenance, fuel, and the tipping fee at either Korle Gonno or Teshie. During a focus group discussion with three private contractors the two largest costs were agreed to be the fuel and the tipping fee (accounting for approximately 75 per cent of the total cost of a trip).

### Further haulage and disposal

Once emptied, the waste from the UHTs must be transported to a disposal point. In Accra there does not appear to be a high incidence of illicit dumping of sludge from vacuum tankers; the ability of the WMD to revoke licences may assist this.



A vacuum tanker disposes of waste at Korle Gonno – the tipping fee is a major cost for these companies.

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Treatment at the official tipping points is ineffective

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This high level of control is almost irrelevant considering the condition of official tipping points. At Korle Gonno (south-west Accra) faecal sludge is currently tipped into the ocean without treatment while at Teshie in the south-east, the waste stabilization ponds have allegedly silted up and do not operate effectively. This results in contamination of the ocean and surrounding area.

There used to be treatment facilities in the north of the city; these have recently closed, increasing the haulage distances for vacuum tankers. Furthermore the wastewater treatment works (WWTW) for the central sewerage system has been non-operational, owing to faulty motors on intake pumps, for approximately two-and-a-half years. This waste is also going into the ocean without treatment.

### Discussion and analysis

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Holding tanks can assist in bringing about improvements in the urban environment

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The findings from the Accra case study show that holding tanks can assist in bringing about improvements in the urban environment. Without them small pan latrine contractors would not have a safe place to dispose of faecal sludge, and to manually carry the faecal sludge all the way to tipping points is unpractical. The following discussion focuses on the continuing challenge (apart from the need for treatment facilities) of preventing the illegal pan latrine emptiers from contaminating the urban environment.

#### *The cost to householders*

The official maximum tariff for emptying a pan latrine is US\$11 per month, translating to US\$132 per annum; this is a large cost for a householder to be paying for a service that is not considered acceptable as an adequate level of sanitation. According to Trades Union Congress, Ghana (2004), the mean average annual income of a household from the poorest 20 per cent of Ghanaian households was US\$409 per annum in 1999 (the effect of comparing 1999 incomes with 2007 charges is likely to skew these percentages; further investigation would be required to get an exact value). For the city of Accra as a whole the mean average income in 1999 was US\$1,462 per annum. It is assumed that pan latrine owners are within the poorest 20 per cent of the country.

Vodounhessi (2006) assessed willingness to pay for faecal sludge management services and suggests that an appropriate level (taking into consideration the WHO standard of 5 per cent of household income going on water and sanitation services) would be 0.5 per cent of household income. Considering this figure, the cost of US\$132 per annum would equate to 0.5 per cent of US\$26,400 (much greater

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Clearly the cost of latrine emptying is too much for the householder

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than both US\$409 and US\$1,462 per annum). Even if several houses share the same sanitation facility (therefore sharing the emptying cost) this is still likely to be a large financial burden. Clearly the cost is too much for the householder. It must be decided how this can be reduced.

### *Passing on the cost*

In Accra, householders are not only paying to cover the cost of the operation of pan latrine contractors but also of vacuum tankers and WMD officials. One of the pan latrine contractors' biggest expenditures is the emptying and maintenance of the UHTs. Because illegal contractors sometimes dump into the UHTs, but do not contribute to the cost of emptying, householders using legal services are in effect subsidizing those householders who use illegal services. The cost of emptying UHTs depends on the tariff of vacuum tanker operators. Their tariff, in turn, depends on the cost/amount of fuel used and the tipping fee charged by the WMD, whose officers and overheads must also be paid. These costs are passed on to the householder. The difference between this system and emptying of pits directly by vacuum tanker is that effectively an extra layer of service has been included (Figure 1). So the use of UHTs may unfortunately increase end user costs.

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The use of UHTs may unfortunately increase end user costs

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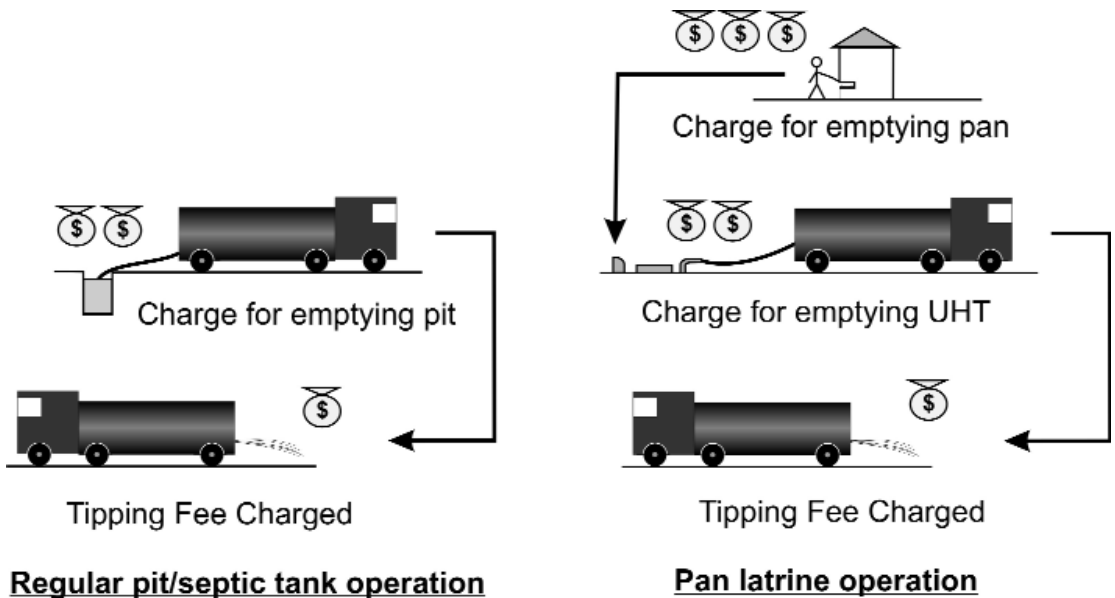


Figure 1. Extra charges being passed along the FSM chain



There is relatively little one can do about this addition to cost without taking on sewerage systems. Even if pit latrines were to replace the pans, the density of housing would still require a small machine to perform emptying operations, resulting in the continuing necessity for localized transfer stations. Thus, the only foreseeable improvements could be brought about by reducing the costs to the stakeholders involved.

### *The allocation of responsibility*

There appears to be a problem regarding responsibility for the UHTs. The private pan latrine contractors do not have an obligation to care about urban environmental pollution whereas the public sector does. If the UHTs were publicly operated, the pan latrine contractors and illegal sector would both have somewhere to dispose of faecal sludge safely. The payment for these services could come from government subsidies, or could simply operate 'at cost'. A further possibility would be dropping the necessity for a tipping fee for such vacuum tankers.

The policy of phasing out the pan latrines of Accra by 2010 is potentially a hindering factor. The WMD appears to consider this as highly likely to occur and consequently found questions surrounding the pan latrine system irrelevant. There are numerous potential problems facing pan latrine conversions, including the following:

- if proposed septic tanks/latrines are constructed, vacuum tanker access will be extremely problematic;
- residents will have difficulty meeting material costs as proposed by the WMD;
- in some areas there is not enough room to construct sanitation facilities; and
- high real estate costs mean householders or landlords may use extra space to build extra bedrooms and utilize communal sanitation facilities instead.

Until successful conversions are achieved, the holding tanks need to be available for use by all stakeholders.

### **Conclusion and recommendations**

The UHTs are a very useful piece of infrastructure and an improvement on their predecessors. Without them the pan latrine contractors would struggle to dispose of their waste safely. However, very big challenges remain (notably the provision of adequate treatment, reduction of illegal activity and conversion of pan latrines), showing

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In some areas there is not enough room to construct sanitation facilities

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that the construction of transfer stations alone cannot solve the entire problem. There will always be concerns surrounding who pays for them to be emptied, how many different operators use them, and what happens to the waste once it is removed from the tanks.

In order to ensure that householders in Accra use the legal services, costs must be affordable. Reduction in costs for contractors will bring about a reduction in cost for users, and could assist in reducing the levels of illegal activity by allowing official contractors to compete. The following are recommendations for reducing costs:

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Responsibility for emptying the UHTs might return to the public sector

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- responsibility for emptying the UHTs placed back with the public sector;
- reduce the haulage distances for vacuum tankers;
- further research into the possible value of by-products, giving waste a value; and
- phase out pan latrines with a sensible alternative making illegal activity more difficult.

A further activity could be the education of communities about the need for safe faecal sludge management. Education in Accra could focus on why households should use official contractors, and how this distributes the financial burden of emptying the UHTs more fairly.

The public sector has many responsibilities remaining. The process of privatization has worked to an extent, but the WMD should improve its facilitating role, not just to the private sector, but also to the illegal sector whose current status is ineffective. Furthermore, Accra has a distinct opportunity to try an alternative to current sanitation solutions with well-planned pan latrine conversions. Such a move, in combination with rehabilitation of treatment processes, could potentially result in a sustainable FSM service.

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