



19th WEDC Conference

ACCRA, Ghana 1993

WATER, SANITATION, ENVIRONMENT and DEVELOPMENT

An alternative pit latrine emptying system



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Introduction

This paper addresses the development of an appropriate pit emptying service, including the design of suitable equipment, in Dar es Salaam, Tanzania. The basic perspectives which guided the project partners are presented as well as some information on how the Manual Pit Latrine Emptying Technology (MAPET) service is functioning. MAPET is community based, but will provide better service if integrated in the city-wide service system of Dar es Salaam. Project partners for this pilot project (1988 - 1992) were WASTE Consultants and the Dar es Salaam Sewerage and Sanitation Department.

Situation in Dar es Salaam

In Dar es Salaam, as in other large Third World cities, the great majority of houses have on-site sewage disposal, i.e. mostly pit latrines, some septic tanks. Pit latrines are used by 80% of the households. On the 1992 population of over two million inhabitants or 450,000 households, this means that Dar es Salaam has about 170,000 pit latrines. Obviously, when the pits are full, they must be emptied¹. It is estimated that yearly about 50,000 m³ of sludge from latrine pits need to be emptied. Add to this the demand for the desludging of septic tanks, and one realises that any pit emptying service agency faces a formidable task. Are the authorities in Dar es Salaam able to respond to this demand?

The Dar es Salaam City Council operates, through the Dar es Salaam Sewerage and Sanitation Department (DSSD) and the Health Department, its own vacuum tanker services with about five cesspit tankers in continuous operation each.

Apart from the formal system, there are informal, self-employed, pit emptiers who practise the traditional method². Characteristic of this method is that, next to the full latrine pit a shallow hole is dug on the resident's plot, and that the sludge is scooped into this new hole by manual labour. Another characteristic is that, the pit emptier and the house owner deal with each other personally, without the interference of a (bureaucratic) organisation. In a process of face to face negotiations they agree on the price to be paid and the day of starting the work, and on the location of the hole for burying the sludge.

The existing services together do not have sufficient capacity to handle the rising need for pit emptying. A major

shortcoming is that the voluminous size and weight of the vacuum tankers is unsuitable for narrow and unpaved roads in the densely built, unplanned areas. Especially the low-income areas lack adequate services because of the unsuitability of the vacuum tankers. The main requirement was, therefore, to design equipment appropriate for the densely settled areas; equipment that is manufactured and maintained locally. However, technical innovation alone is not enough to improve service delivery.

An alternative service

The new equipment and service is called MAPET (Manual Pit Emptying Technology). DSSD took responsibility for introducing MAPET through its own organization in Dar es Salaam, while WASTE Consultants acted as the advisor. The equipment is manually operated and is sufficiently small to be manoeuvred through narrow roads. Using local materials and components and widely known construction techniques, the equipment can be locally produced and repaired in small workshops. The operation of the equipment requires team work of three men, who - as experience bears out - stay voluntarily together for several years. As MAPET can function to a large extent independently from a centralized administrative organization and workshop, it is possible to decentralize its service to the neighbourhood level.

MAPET technical features and operation

A MAPET team consists of three men. One is the leader. In order to be allowed to rent the MAPET equipment he needs a certificate from DSSD. For this certificate the team must first do a training at DSSD. If a pit emptier is found dumping the sludge somewhere behind the bushes, he loses his certificate.

The MAPET team goes with two hand carts (one pump cart and a tank cart of 80 cm width) from the community centre to the customer. They can cover a distance of a couple of kilometres. They first negotiate with the customer where to dig a hole to bury the sludge. They then insert the hose-pipe into the squatting hole and connect it to the tank cart. The tank cart is connected to the hand pump with an air hose. The air is pumped out of the tank and the resulting vacuum causes the sludge to be sucked into the tank. The full tank is emptied into the hole.

Digging the hole constitutes most of the work and takes more than one hour. The 200 litre tank is full within five minutes. With heavy sludge it takes longer. Water is mixed into the sludge. By draining the hose-pipe out at full vacuum ('plug and gulp') the sucking can be intensified. Customers generally ask for 4 to 10 tanks to be taken out of their latrines. The pit emptiers earn about 2,000 to 5,000 shilling which they share among themselves. In order to make a living of the MAPET pit emptyings they should have at least one customer per day.

The process of MAPET introduction

The following points of view have guided the development of MAPET:

First, pit emptying is a service consisting of several components, of which the equipment is only one element. Other components are e.g. training to operate the equipment, repair facilities, the capacity to find customers, economic and financial aspects of the service organisation, and facilities for sludge disposal. All these components of the MAPET service have subsequently been addressed during the pilot project. Project experience has confirmed the importance of appropriate and locally constructed equipment. It has also confirmed the notion that a service can only be performed satisfactorily if all other components function properly.

Secondly, the introduction of new equipment, even more so of a whole new service, requires a step-by-step approach. This allows the innovations to be adjusted to local conditions at the appropriate time. This entailed e.g. that the basic MAPET equipment was constructed as a prototype in a few months' time, but that serious adjustments were made in response to the experiences of the immediate users, i.e. the pit emptiers, over a period of 3 years. Similarly, training of the mechanics took place over a number of years, as they carried out the improvements in the MAPET equipment in the DSSD's own workshop. A step-by-step approach also implied that other components of the MAPET service were developed only when the need arose. For example, when the pit emptiers found it difficult to generate a regular demand from customers, a system of informing and motivating customers and community leaders was developed.

Thirdly, the new service, including the equipment, should be based on the most appropriate elements of the existing pit emptying methods. That is, building upon what exists, on what is known and familiar to people and organisations. In this way MAPET is not a strange element, as it combines e.g. the modern vacuum technology of the cesspit tankers with the traditional system of on-site sludge disposal by manual labour. It also strengthens the so-called traditional element of personal interaction between pit emptiers and customers, which is an important feature of modern small-scale, informal business contacts.

Fourthly, a form of public-private cooperation was envisaged between the DSSD and the informal sector. The

public authorities have ultimate responsibility for sanitation services as they concern public health. It was also recognised that the demand for employment is tremendous. In times of structural adjustment programmes, MAPET could not generate new employment opportunities in DSSD, a government institution, but only in the private, informal sector. The solution adopted was that the DSSD would be the owner of the MAPET equipment and lease it to the pit emptiers. The DSSD provides essential support services, such as performing large repairs, promotion of MAPET in new neighbourhoods, and training and supervision, while the pit emptiers are self-employed workers, responsible for earning their own income. They do not receive a basic salary from DSSD. In this cooperation DSSD has a position to control irregular sludge disposal by private emptiers.

Different forms of organisation and management are conceivable, with a different balance between public and private responsibilities. Several options are being tried out in Tanzania.

The resulting MAPET service has both advantages and disadvantages. Some of the advantages are that:

- The MAPET equipment can reach the most inaccessible houses.
- The service can be performed almost immediately, while the vacuum tanker service requires a long waiting time.
- And the possibility of regular social contact between residents and emptiers, which enables community influence and supervision.
- MAPET can offer 'service to size': small volumes suiting the customer's household budget.

Some of the disadvantages are that:

- The MAPET service is expensive per unit of volume (m³) compared with that of the vacuum tankers.
- The method of sludge disposal (burying on the plot) is not suitable for areas with a high ground water table and very densely populated areas.
- Cash flows between the DSSD and the private pit emptiers are difficult to control in practice.

MAPET service as part of a city-wide system

The pilot project has shown that MAPET can function satisfactorily in local communities. The emptiers can identify their customers and earn a low but steady income, informal mechanics in the neighbourhood carry out minor repairs, a certain amount of sludge disposal takes place within the community, and in a general sense MAPET enjoys social acceptance in those communities where it is already working. Leaders in other areas that came to know about MAPET are eager to bring it into their neighbourhood as a solution to the public health problems. Some NGO community initiatives have identified MAPET as a

first priority to start a neighbourhood improvement campaign. On the other hand, residents and leaders would like to have more influence on the MAPET service, as they observe the potential for integration within the economic and health service system of the local community. Also they see the potential for income generation by the community.

However, MAPET is not an independent alternative to the tanker service. The size of the population requires the volume and hauling capacity of pit emptying as performed by the DSSD vacuum tankers³. In addition, MAPET should be operationally linked to the DSSD regarding sludge disposal. In areas with a high ground water table, MAPET cannot operate at present because of the absence of disposal facilities. Sludge must be removed from these areas and transported to central dumping stations of the city. The DSSD is the most likely organisation to use its vacuum tankers for this purpose. The aim is to combine the advantages of a community based service with the advantages of a strong organisation able to haul sludge through the city for final disposal. The required institutional arrangements (technical, financial, and operational) between the DSSD as a bureaucratic, government controlled organisation, the independently operating MAPET pit emptiers, and local communities are quite complicated. This is a formidable task, not less than the first introduction of MAPET.

The next phase of the MAPET project will include the development of an institutional framework for a neighbourhood based service, as well as the development of a sludge transfer system. The sludge transfer will initially be directed towards locally manufactured transfer stations as well as options for sludge treatment at neighbourhood level.

As in the first stage of the project, progress will be directed by the problems experienced by the organizations and operators directly involved at the city-wide and at the neighbourhood level. Solutions will be reached through a unique combination of the potential of these organizations in the public, private and community sectors.

References

- 1 Comparative Study on Pit Emptying Technologies, draft Final Report, WASTE Consultants, Gouda, The Netherlands, 1993
- 2 MAPET Progress Report 2, WASTE Consultants, Gouda, The Netherlands, 1988
- 3 The COMPET study has recommended to separate urban areas with pit latrines into typical large tanker, mini tanker and MAPET areas. The typical MAPET areas are those where even mini tankers do not have access. Large tankers appear to be the most economic (if adequately managed, which is often not the case) for hauling sludge to sludge disposal stations over distances more than 5 km from the pit.