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A REVIEW OF URBAN WASTE DISPOSAL SYSTEMS IN TANZANIA

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TANZANIA

1. Abstract

The aim of this paper is to give an overview of the existing sanitary disposal systems in Tanzania including waste waters and solid wastes. A look at the problems facing these services is undertaken and future strategies for Low-Cost Sanitation, Sewerage and Solid Waste Management are given.

2. Introduction

From the colonial days, provision of water was mainly concentrated in the urban areas and large settlements. The Sanitation Sector followed the same trend that, prior to 1961, there were some organised excreta disposal systems in the form of central Sewerage systems, septic tanks and pit latrines.

After independence however, the government shifted its focus to the rural areas, but in so doing, the urban water supply and sewerage schemes in the country received very little attention or no attention at all from the government and as such there has been a period of intense neglect and structural decay due to lack of adequate maintenance. This resulted from inadequate financial allocations for operation and maintenance. External Aid Agencies had also contributed to the maintenance of water supply schemes in the form of soft loans but very little emphasis was given to establish new schemes or replacing the aging ones. On the Sanitation Side, very little funds (sometimes not all) were set aside for operation and maintenance of existing sewerage systems, or new investments, for that matter. This situation was exacerbated by the dissolution of the local governments in 1974. Cholera outbreaks occurred in several towns in Tanzania during 1978 and investigations revealed that the killer

disease was water-borne and the rapid spread greatly accelerated by poor Sanitation in these towns. Even though the urban councils were re-established in the late 70's, it has still been difficult to obtain funds from the government for the development of the Sanitation Sector.

3. Present Situation

3.1. Water Supply

It is generally accepted in waste water pollution control that unless human wastes generated in a household are diluted by proportionally high quantities of water, a sewage system will not function properly and will create major problems. Normally a house with full internal plumbing including a flush toilet will produce sufficient diluted waste for a water-borne sanitation system. Houses with stand pipes or with individual supply but with only partial plumbing which does not include at least a flush toilet, shower or sink are not recommended for sewerage or any other water-borne system such as septic tanks. These houses can only be served by low-cost Sanitation Systems in the form of pit latrines or various forms, depending on soil conditions.

Therefore, a pre-requisite for sewerage of any area is an adequate and reliable water supply. Subject to the availability of water, preference should be given to those areas with high densities and those with high ground water tables. Also, area with soils of low permeability and where there are shallow wells in the vicinity should be given priority.

3.2 Sanitation

3.2.1 Low Cost Sanitation

A study carried out in several towns in Tanzania revealed that a majority of the people living in Urban areas depend on the pit latrine for the disposal of human excreta. The pits vary from the most traditional hand dug with logs and compacted earth forming the squatting slab with thatched super structure to the modern lined pits with blockwork superstructure with a door, a window and cover. The depth of the pits vary from 1.5m to 9m depending on the number of users, ground water tables, depth to bed rock, nature of soil and income level. One important feature which these pits lack is the vent pipe and they have no provision for emptying when they are full.

Since the establishment of the Ministry's Sewerage and Drainage Division, the low Cost Sanitation Unit started in 1980 with the efforts to introduce a cheap but hygienically and environmentally acceptable means of excreta disposal.

In this respect, the Ventilated Improved Pit (VIP) latrines has been designed and 100 demonstration latrines, in Temeke District in Dar es Salaam, have been constructed with assistance from the German Government through Kfw. Special features of the Dar VIP are the vent pipe and ferocement^{! sisal-cement?}squatting slab. The 'Buguruni VIP Kit Plant' has been in operation

producing components for the latrines using locally available materials. The latrine is designed so that it can be emptied when full by pit emptiers, just like septic tanks. Under this exercise, the Division has introduced this technology to other towns and 40 demonstration latrines have already been constructed - 20 in Tanga and 20 in Morogoro, with assistance from GTZ. Also funds have been given to both Tanga and Morogoro Municipal Authorities to set up Plants for Manufacturing Kits for VIP latrines. Intensive health education programmes have been carried out in both municipalities as well as in Moshi and Arusha municipalities where construction of demonstration latrines is underway. Training has also been given to the municipal technicians on the construction of the VIP's, and it is expected that the foundation has been laid for the spread of VIPs in these towns.

Recently, a team from the department was in Dodoma where we plan to introduce this same technology.

Research into various methods of pit latrine emptying is being made with the government cooperation. Currently, planned schemes include research into the use of drums and hand pumps for Dar es Salaam. The so-called Manual Pit Emptying Technology (MAPET) is being carried out with assistance from the Netherlands Government. This research is necessitated by the fact that, the number of pit emptying trucks in the country is much below the required levels.

3.2.2 Sewerage

3.2.2.1 Pollution Sources:

Households, Industries, Institution and Commercial areas generate wastes which contribute to the pollution of surface water bodies as well as groundwater.

In Tanzania Mainland there are seven towns with central sewer systems. These are Dar es Salaam, Tanga, Moshi, Arusha, Dodoma, Mwanza, and Tabora. Construction of the sewerage scheme in Morogoro is still going on. With the exception of the system in Dodoma, the condition of the rest of the systems were far from satisfactory. Apart from the age of the systems and problems of maintenance, at the time of their construction, only the first phases were constructed and with the rapid and uncontrolled urbanization, the system were not capable to handle all the discharges. Even now, there is still indiscriminate disposal of wastes especially from industries which discharge directly into surface water bodies. Examples can be cited for Dar es Salaam industries discharging into Msimbazi creek Mwanza where industries discharge effluents into Lake Victoria, Arusha and Moshi into rivers Themis and Rau respectively. (Appendix I shows the type of systems in Tanzania, their time of completion and the existing performance).

3.2.2.2 Methods of Disposal and Reasons for failure

- (i) In Tanzania, Waste Stabilization Ponds are extensively used in the treatment of liquid wastes, with the exception of Moshi which is equiped with mechanical treatment facility in the form of trickling filters. When properly designed, operated and maintained, WSP's are an efficient, inexpensive, effective and appropriate waste water treatment method in comparison with mechanical methods. They require little maintenance and effluent of high quality in terms of BOD reduction, is obtained. For the case of our systems, due to lack of maintenance, the performance of the ponds were adversely affected and eventually turned into breeding sites for mosquotoes, hence a nuisance to the public. Such maintenance includes, grass cutting, repairing of embankments and most important, periodic desludging.

Through World Bank funding, the existing Sewerage system in Dar es Salaam have been rehabilitated and the project is now on its final stages of completion. The works included rehabilitation of Waste stabilization ponds in the peri-urban areas of the city, the unblocking and cleaning of sewers, reinstatement of damaged manholes and provision of covers where necessary and the rehabilitation of the sea-outfall.

The performance of the rehabilitated ponds at University, Msasani, Vingunguti, Mgulani and Lugalo were monitored and improvements in the purification processes within the pond systems established.

Table 1 below shows the status of the ponds and Performance in terms of BOD removal.

As per attached Table I

- (ii) Also through World Bank funding the government carried out studies for Morogoro, Arusha and Tanga and Morogoro Sewerage scheme is now under construction.
- (iii) The Scheme at Moshi, which is mechanical failed due to unavailability of spare parts for the mechanical components.
- (iv) In the case of the seaoutfalls at Tanga and Dar es Salaam, pipes leading to the sea were broken and had deteriorated due to old age, and needed replacement. The Dar es Salaam seaoutfall have been rehabilitated and with the assistance from the German Government, rehabilitation of the Tanga Sewerage Scheme has just started with the unblocking of Sewers, Eventually the seaoutfall will also be rehabilitated or replaced depending in the extent of damage.

3.2.3 Solid Wastes

When it comes to final disposal of solid wastes, landfills remain the cheapest option for cities in developing countries. High technology alternatives such as incineration and composting are often considered but in practice, however, these solutions are far more expensive than sanitary landfills, which required relatively low investment and operational costs for equipment and covering. Sanitary landfills pose fewer managerial problems than incinerators

Table 1: Status of Waste Stabilization Ponds in Dar Es Salaam

Pond		Operational	Under Construction	Rehabilitated	Design Capacity	Area in Hectare	BOD removal		
No	Name	Yes/No	Yes/No	Yes/No	kg BOD/day	m ³ /day	Facultative Ponds	Maturation Ponds	%
1.	University	Yes	No	Yes	300	478	1.00	0.45	70
2.	Airport/Airwing	No	No	Yes	140	282	0.60	0.20	-
3.	Buguruni	No	No	No	650	1248	1.50	1.75	-
4.	Msasani	Yes	No	Yes	975	1950	3.25	2.0	68
5.	Vingunguti	Yes	No	Yes	1000	2000	2.22	2.24	77
6.	Mgulani	No	Yes	Yes	495	528	1.00	0,50	70
7.	Lugalo Barracks	Yes	No	Yes	1200	1920	3.25	2.00	70
8.	Ukongu Prison	No	No	No	Not	available			-
9.	Ubungo	No	Yes	Yes	1200	2400	2.50	2.50	-

or composting plants. All over the world, sanitary landfills when applied properly, are accepted as an economically feasible and environmentally acceptable method of final disposal.

Sanitary landfills, as already experienced in Tanzania, if not well planned and controlled could turn out to be very crude and not seen as a very attractive method of disposal. Apart from the fact that quite a big area of land is needed, which of course is not a big constraint in Tanzania for the time being, a landfill could lead to the following:-

- (i) Breeding place for insects, rodents, gulls etc.
- (ii) Spontaneous ignition which results in smoke and foul smell (air pollution)
- (iii) Fermentation leading to formation of gases (such AS CO_2 and CH_4) which results to smell and fires.

(iv) Leachates which may cause water pollution. Therefore, Landfill operation becomes SANITARY only when:-

- (i) The waste is ISOLATED from ground and surface waters.
- (ii) The process in and around the fill is MANAGEABLE
- (iii) The process in and around the fill is CONTROLLED by more or less continued monitoring of the protective measures which are taken. Hence, levels of air, ground and surface water pollution are eliminated if these criteria are met.

A study was carried out for Solid Waste Management in Dar es Salaam under the help of the World Bank and Action Plans for reinstatement of Tabata dump were given.

Although we have not experienced serious problems with other towns yet, it is still wise to start controlling our landfills before they turn out to be a nuisance in the next few years, as prevention of Pollution will be much more efficient than curing the effects of pollution.

4.0 Sector Constraints

With all the above being said, we can say that, there are three major constraints which have led to the deterioration of sanitation programmes in the country. These can be classified into Manpower, Financial and Institutional constraints.

4.1 Manpower

Lack of emphasis on manpower development for operation and maintenance. Planning of the manpower requirements to carry out sanitation programmes was not done. Efforts are now being done to train staff and attach them to the urban councils to assist in carrying out sanitation programmes.

4.2 Financial Constraint

Insufficient funds, both local and foreign, has led to deterioration of the systems. The urban councils which are supposed to carry out operation and maintenance of the facilities are not well equipped with adequate plant for better sanitation services. For example, pit emptying trucks and garbage collecting truck are not enough and the few that are available, frequently becomes grounded due to lack of spare parts.

4.3 Institutional Constraint

Lack of efficient institutional build up has also led to deterioration of existing facilities. The sanitation programme is implemented by various institutions in the country and this tends to result in duplication of efforts by the agencies involved. This makes coordination of activities and control of funds from Donor Agencies and Standardization of equipment difficult. Due to lack of coordination, there is no better way of information transfer hence, there is need to streamline and dealienate responsibilities, so as to better utilize the minimum available resources.

5.0 Future Plans

The sanitation programme clearly states that there is a need to spread the construction of sewerage systems to all regional headquarters, but due to lack of resources, the plan at hand is to rehabilitate the existing systems first.

In 1987, the Government approved the Sewerage Policy a document to guide the development of sanitation activities in all urban areas. Coupled with this, the Government has already approved a Water Policy which has considerable guidelines for the Sanitation sector but more on the lines set out in the Sewerage policy.

These documents serve as a guide to the future development of the sector and the main tasks are as highlighted below.

5.1 Low Cost Sanitation

- (i) Introduction of VIP latrines to towns has started with construction of demonstration kits in the areas where cholera outbreaks has been prevalent. Eventually all the towns will be having VIP latrines of one form or another.

- (ii) Seminars in Dodoma have started and this will be followed by health education and construction of demonstration kits at institutions like schools, CCM offices etc.
- (iii) Revolving funds have to be started for setting up VIP kit manufacturing plants in the respective towns which are provided with the facility,
- (iv) Further research and designs are being done intending to come up with still cheaper or very low cost VIP latrine.
- (v) The Manual Pit Emptying Technology (MAPET) is to be introduced to other parts of the country.

5.2 Sewerage

- (i) As mentioned earlier, rehabilitation work has been going on in Dar es Salaam and construction of the sewerage system for Morogoro Municipality is still going on.
- (ii) Tanga Sewerage system rehabilitation had just started and eventually the system will be put back into operation.
- (iii) Plans are underway for Arusha, Moshi and Mwanza sewerage rehabilitation once resources are made available either by the government or donor agencies.
- (iv) Coupled with this rehabilitation will be the efforts to assist the municipal councils/urban councils to set-up Sanitation Departments and adequately equip them with necessary plant and equipment for proper maintenance of the systems. The Initiative had started with

establishment of the Dar es Salaam Sewerage and Sanitation Department (DSSD) which handles the operation and maintenance of the rehabilitated system.

VIP expensive - are not planning revolving fund - must buy components - cannot expect to recover loans.

- v) Enhance collection of revenue based on established Tariffs for sewerage from all served by the services and the rates are to differ depending on the amounts of discharge together with the pollution load generated by the source. (Trade effluent control).
- vi) Industries are to be encouraged to make use of the systems after pretreatment where necessary and where possible, recycling of wastes to be introduced so as to reduce pollution loads. For any new industry to be put up, emphasis is going to be made on the methods of handling, treatment and disposal of the liquid waste and pre-treatment to be done before discharging into the systems. Plans are under way to introduce a system whereby request for planning approval by the prospective industrialists specifying types of wastes to be generated by the new industry and how he intends to dispose them. Sample of the forms is shown in Appendices II, III and IV.

*Min
→ will be asked to provide guidelines on individual solid and liquid wastes
EIA (see App 2,3,4). Is only initial stages.
Role of ~~EIA~~?*

5.3. Solid Wastes:

As mentioned earlier, it is very important for Sanitary landfills to be controlled in order to reduce pollution. A study had already been done for Tabata dump and it was found that the major problems was management of dump. Reinstatement of the dump has been proposed in the study and pending decisions from the City Council, further action is yet to be taken.

In order to avoid cases where landfills in other towns get to the state of Tabata, measures have to be taken such as:-

- (i) Providing a drainage system to divert surface waters as well as run-off water from the dump.

- (ii) Collection of leachate water, if any, in a pond and treated to required standards.
Which standards?
- (iii) Extinguishing of fires to avoid smells and smoke.
- (iv) The site to be fenced to keep away scavengers.
- (v) Hazardous waste[?] to be disposed off at an isolated and controlled section within the dump. *What is hazardous waste in Tuzen?*
- (vi) The waste should be tipped in consecutive layers and covered by soil material to improve sanitary conditions eg. keep away rodents, flies etc.

6.0 Conclusion and Recommendations

Based on past experience involvement of local consultants in Sanitation or water sector activities has been very nominal indeed. Most plans for past projects have been prepared using foreign consultants and in some instances their locally registered companies. In the past few years, there has been a tendency for local consultants to enter into joint ventures with foreign consultants but their level of participation in these arrangements still needs to be assessed. True, some of the local consultants may have, while carrying out their work carried out designs and supervised works for minor sewerage & water schemes, but even in this instance the work involved is very minor and the major input is mostly structural.

It is recommended that, the situation should be improved and more and more local consultants should get involved in water sector activities. Of more importance is the need by the consultants to observe the need to submit

designs involving waste water disposal for industries and other large residential areas to the Ministry for approval before their construction. This will not only ensure that there is adequate pollution control but also will ensure that the Ministry is adequately informed on the sector activities which are being undertaken.

7. **References:**

- (i) Engineering Design Report - Dar es Salaam Foul Sewerage and Sanitation Project by Howard Humphreys (T) Limited, November, 1988.
- (ii) Solid Waste Management Report - By M/S. Haskoning and M. Konsult, March, 1989.

VARIOUS SEWERAGE SYSTEMS IN TANZANIA AND DATES OF COMPLETION.

Name of Sewerage system	Method of Disposal	Completion Date	Present State
1. Dar es salaam Sewerage	Sea-outfall and waste stabilization ponds.	1948-52 Early 50's to late 70's.	working majority of them are now working and Rehabilitation going on of the remaining.
2. Moshi Sewerage	Mechanical (Recolating filters)	1960-67	Out of order due to lack of spaces
3.3. Tanga Sewerage	Sea outfall	Not known	Rehabilitation works started this financial year
4. Afusha Sewerage	Waste stabilization ponds.	1970	Poor performance
5. Mwanza Sewerage	Waste stabilization ponds.	1963-73	Not working
6. Tabora Sewerage	Waste stabilization ponds.	1979-81	Not working
7. Dodoma Sewerage	Waste stabilization ponds.	1977	working but being under utilized.
8. Mofogoro Sewerage	Waste stabilization ponds.	1983	Under Construction

APPLICATION FOR CONSULTANCY SERVICE (TECHNICAL ADVICE) ON WASTE
HANDLING AND DISPOSAL.

TO: THE PRINCIPAL SECRETARY,
MINISTRY OF WATER,
Box 9153,
DAR ES SALAAM.

Attn: The Director,
Drainage and Sewerage Division.

I,.....hereby request your *Technical Advice/
Consultancy services on handling, treatment and disposal of *liquid /solid/
liquid and solid waster generated in the productions processes of the
Industry stuated, at

.....

.....

Date

.....

Signature and stamp.

*Delete whichever is inapplicable.

Questions

Uneconomical to collect rubbish from individual households - what is the alternative? (Mr Mollay - morning paper) (Solid Waste Management in Poor Urban Areas)
 → mayors

- said is uneconomical to recover and recycle household waste
- in reply to paying suggestion - says is to be place in new by-laws to charge for collection: need to be able to provide service profit by building up collection service.

Privatisation in urban sewage?

Maintenance in sanitation - employment intensive - low cost?

- privatisation - pit emptying and garbage collection
 - service is not free of charge now - city council will charge for this
 - so might also ask tariff for solid waste collection.
- ↳ - private collectors? tractors, intermediate dumpers, skips, dumpsters
 - needs pilot study
 - realize can work but need to work at appropriate system
- maintenance - should try and minimize costs
 - maximize employment
 - is also perception and cost - will charge operation and maintenance through training - city council.
- Questioner worries about operations, wages - needs long term sustainability
 - maintenance is not in Tanzanian vocabulary.

Politics, Politics, Politics - whose responsibility - MOW or City Council?

- is some institutional problems in Tanzania but that is the same all over the world - ask for coordination without putting in the effort.
- need to develop strategic plans.

[strategic plans - plans of action

Manual pit emptying technology - how cheap, how safe, how acceptable?

- Neth. Govt. assistant - DSSA - pilot at Morogoro - don't know how much
- needs refinement of technique - where is it disposed of?

VIP - cost 4 years ago 21,000 sh - is now 100,000+ sh - how cheap is it?

VIP components + labor - 17,000 sh - for the M1 drive.

Waste Disposal Plans (Appendices) - don't take into account all other pollutants?