Chapter 5

Current Situations of Municipal Solid Waste

5 Current Situations of Municipal Solid Waste Management

5.1 Background of SWM in DSM

5.1.1 History of SWM In DSM from 1987 till 1995

This section describes the history of the SWM collection and transportation systems since 1987.

Procurement of Refuse Collection Equipment

In 1987, the Government of Japan, through JICA, donated thirty 8-tonne refuse collection tipper trucks, 3 skip trucks, 20 cesspit emptying trucks, and 3 supervision pick-ups to the DCC. In November 1991, the government of Italy donated 6 compactor trucks to DCC.

Operation and Maintenance Problems

In 1988, only 20 tipper trucks and 1 skip truck were in operation on average, corresponding to an out of commission time of 36% despite the fact that the trucks were only one year old[1]. This was primarily due to long delays in servicing the trucks at the DCC workshops and the very complex procedure for obtaining spare parts, diesel, lubricant oil, etc. even though the trucks had been supplied together with spare parts, worth 20-26% of the total truck value.

Collapse of the Refuse Collection System

In 1991-92 a number of factors combined to cause a rapid deterioration in SWM service provision and to produce a very serious unsanitary situation in the city. These factors included:

- Rapid population growth of DSM greatly increased the waste generation amount.
- The DCC's fleet of tipper and skip trucks was in very bad condition due to a lack of adequate maintenance so that typically only 4 tipping trucks and none of the skip trucks were operational at any time.
- Only 1 of the compactor trucks, supplied one year previously, was operational due to a shortage of spare parts. Furthermore, the collection costs per tonne of waste collected for these trucks were nearly 70% higher than for the tipper trucks. Hence, they were using up an inordinate amount of DCC's scarce resources.
- The Tabata disposal site was closed due to complaints by local residents of objectionable smells and fires. As a result, wastes were first disposed of at Kunduchi, located about 20 km from the city centre but this was also soon closed. Use of the Vinguguti site then began on a temporary basis. This was

[1] Sustainable Cities Programme Report on Solid Waste Management, Volume One, Solid Waste Collection, Manus Coffey, 1992

located about 10 km from the city centre and had very bad access roads, resulting in increased haulage times.

- Road deterioration and traffic congestion had increased considerably during the intervening period, reducing road speeds with a further increase in haulage time.
- Epidemic diseases such as cholera were breaking out. This posed a big threat to other sectors of the economy, especially tourism.

The overall result was that DCC was able to collect less than 8.1% of the total waste generated by the city and could not even service the central city area adequately.

Towards the end of April 1992, the decision was made to operate the remaining trucks on a three-shift, seven-day per week basis to try and clear up the large waste heaps in the central city area. Four trucks, 1 compactor truck and 1 wheel loader were used in this operation. Under the three shifts, seven days per week operation there was no opportunity for servicing the trucks so that by the fifth week only 3 trucks were operational. By the sixth week, none were operational and the collection system had collapsed completely.

Launch of Emergency Cleanup Campaign

In 1992 the City Council co-operated with the Prime Minister's Office, together with the UN and began an emergency cleanup campaign in which 10 lorries were rehabilitated. Transfer stations were established in the city and wheel loaders were used to load trucks at these places, especially for removing large heaps of waste.

This exercise greatly increased the amount of waste removed to over 400 t/d. Also during this time, work was done to repair roads and to do some maintenance of the Vinguguti dump, following the residents giving permission for the dumping of waste at this location to continue.

Overall, the emergency cleanup campaign exercise was successful because of good participation from the council and residents together with the government motivating and giving orders for the residents to fulfil their responsibilities. However the good results obtained by emergency cleanup campaign have subsequently been eroded since it ended in 1994.

Support by Donors

UNDP provided immediate finance for spare parts in 1992. The government of Japan provided spare parts in 1993 and 1995 and has dispatched an expert for repairing refuse collection equipment since 1993.

Launch of SDP Project

The SDP Project, launched in 1992 by UNCHS (Habitat) and funded by UNDP, prioritised a number of environmental issues to be addressed, including SWM. Working groups were established to tackle these issues. The SWM group proposed five strategies for SWM improvement, four of which are still being worked on. These strategies and SDP's activities are described more in section c.1 of this chapter.

Privatisation - Phase I

Another step taken in 1991 was the writing of a by-law, which would allow individuals/companies to collect refuse on contract to DCC and at the same time, require residents to begin contributing to the costs of refuse collection services. It was agreed that this exercise would be done in phases; the first phase being for 10 wards in the city centre, with its results being taken into account in subsequent phases. The company, Multinet Africa, was successful in winning the contract for these 10 wards.

Then, after the by-law was enacted by the responsible bodies in 1993 and announced in the Government Gazette in April 1994, Multinet began collecting refuse in September 1994. A 'concession' type contract was used, in which the contractor is granted the right to collect refuse collection charges in return for collecting refuse. However this system had many problems and for various reasons, Multinet was forced to withdraw its operation from 5 wards in January 1996.

Operational Equipment between 1987 and 1995

Since 1987, the DCC has procured 30 tipper trucks, 3 skip trucks, 6 compactor trucks, and 3 bulldozers, but the number of these in operation has been decreasing as shown in Table 5-1.

Table 5-1: Acquisition and Operational Status of Waste Management Equipment since 1987

Year	Equipment Procured	Equipment in Operation			
		Tipping truck	Skip truck	Compactor truck	Bulldozer
1987	30 tipper trucks 3 skip trucks	30	3	0	0
1988		30	2	0	0
1991	6 compactor trucks	28	2	6	0
1992		28	1	2	0
1993		26	4	1	0
1994	3 bulldozers	24	1	1	3
1995		20	1	1	1

Source: Dar es Salaam City Council, April 1995

5.1.2 Review of Relevant Studies and Projects

Several studies and reports related to SWM for DSM have been produced over the years although very few have been implemented. The study team reviews major studies and reports relevant to this study as described below. The findings on the relevant studies and projects are included in Annex 4.

a. Relevant Studies

1) DSM Master Plan, Chap. 5 on SWM, Marshall, Macklin and Monaghan Ltd., October 1979

2) Master Plan on SWM for Dar es Salaam, Haskoning and M-Konsult, 1989

3) Sustainable Cities Programme, Report on SWM, Manus Coffey for SDP, 1992

4) Environmental Survey, Proposed Sanitary Landfill, Kinzudi 'B', SDP, S. Mgana, 1992

5) Takagas Biogas for Tanzania, Pre-investment Study, UDSM, Carl Bro. et al., 1993

6) Vingunguti Landfill Study, Dar es Salaam Tanzania, COWIconsult for Habitat, 1994

b. Relevant Projects

1) Sustainable Dar es Salaam Project

2) Channel Diversion Project at the Vingunguti Disposal Site

3) Vingunguti-Mtambani Urban Horticulture and Composting

5.2 Technical System

5.2.1 Discharge and Storage

The present waste collection service rate for DSM is approximately 8%. In the areas having no refuse collection services, more than 65% of people burn their refuse and about 25% of people dispose of refuse outside of their premises according to POS. Of this 25%, a high percentage of people dispose of their refuse in pits dug along the sides of unpaved roads.

Private contractors are using a bell collection method to increase the efficiency of the waste loading process but many people still dispose of their waste at communal points. DCC is using only a communal points collection method due to the irregularity of its collection service. Most communal collection points have no storage facility and people dispose of their waste on the ground at these places. Waste disposed in this manner attracts scavengers, who are often seen at communal collection points, especially in the morning. There are relatively few stray dogs in the city and hence scattering of waste by dogs, which is a problem in many countries, is not really seen in DSM.

Many types of containers are used to carry waste, such as plastic bags, paper bags, buckets, carton boxes, baskets, dust bins and even no container, although the city regulations require people to use a dustbin.

5.2.2 Collection and Transportation

The situation of waste collection and transportation systems in DSM is changing very quickly mainly due to expansion of privatisation. Three major organisations are operating refuse collection services as of 15th August 1996.

DCC

With the expansion of the area serviced by private contractors, DCC has shifted its collection operations to other areas and is mainly collecting waste from 5 transfer stations, 11 markets and public hospitals.

Five transfer stations serviced by DCC are located at Jangwani, Msasani Drive-Inn, Uhuru Girls School, Temeke and Mtoni. Some of these (e.g. Jangwani and Uhuru Girls School) are actually illegal dumping sites. Although private contractors service these wards, some waste is still collected and dumped, mainly by individual handcart operators. Doing this work means that DCC is also clearing illegal dumping.

The markets serviced by DCC are Tandale, Ubungo, Manzese, Kapera, Magomeni, Kinondoni Mtambani, Kinondoni Mkunguni, Tandika, Keko, Mbagala and Mtoni.

DCC is operating nine 8-tonne tipper trucks and two wheel loaders for waste collection services daily on average. As they are using wheel loaders and working a two-shift system (from 0730 to 1530 and from 1530 to 1930), each truck making 5 to 8 trips per day. This situation is a result of recent improvements, due to organisational reform. The fleet collects waste from the service points according to a schedule, which presently takes about one week to complete. However, the completion time is highly dependent on seasonal conditions. In the dry season, the waste generation amount, especially from markets, is less and the working conditions are better, which enables better performance.

The City Health Officer holds a weekly meeting every Tuesday in his office with all 3 District Health Officers and the Chief of the DCC Cleansing unit.

Multinet Africa

Multinet has been operating refuse collection services in 10 wards in the city centre (Kisutu, Kivukoni, Mchafukoge, Upanga East, Upanga West, Kariakoo, Jangwani, Ilala, Gerezani and Mchikichini) since July 1996. Its scope of work includes not only waste collection but also street sweeping. Multinet has fourteen 7-tonne tipper trucks for refuse collection and uses bell collection and curb collection methods. It is employing about 200 workers altogether.

Multinet started operation in 1994 as the city's first official, private refuse collection contractor. Although Multinet was forced to withdraw its operations from 5 wards for some time, it has more financial and technical reliability than other contractors due to its long service experience.

Mazingira

This company was established in 1996 by ex-Multinet staff and officially started a refuse collection service on 12 August 1996 for 6 wards: Kinondoni, Mwananyamala, Msasani, Kawe, Tandale and Manzese. They are using two 7-tonne tipper trucks and one tractor with 2 trailers, and have 20 employees. Currently, they are only concentrating on commercial users as they have just begun operation but are supposed to expand their service to include residents. Its financial and technical stability is still questionable.

5.2.3 Road Sweeping and Drain Cleansing

There are three agencies that are responsible for street and road sweeping and the maintenance of trees and gardens throughout the city.

DCC

DCC is responsible for the sweeping of all non-trunk roads throughout the city. Multinet, under contract to DCC, carries out this work in the 10 wards in the city centre in which it is currently operating. Street sweeping of other non-trunk roads is carried out in some other parts of the city but on an irregular basis. The DCC has a separate gardening section, an office near Karimjee Hall, which is responsible for maintaining the four botanical gardens within DSM.

Multinet

Under the terms of its contract with DCC, Multinet is responsible for street sweeping within the 10 wards from which it presently collects waste. Their policy is to carry out street sweeping on all paved roads within these 10 wards and they employ street sweepers for this work. The refuse collection charge that residents in these wards pay includes a proportion to cover the costs of the street sweeping work.

Ministry of Works

The Regional Engineer/Ministry of Works is responsible for cleaning on all the trunk roads in DSM. They carry out four different types of operation, as described below.

- Activities, such as grass cutting and sand cleaning, have been contracted to 'lengthmen'. All unit rates and allocation of areas has been built up on the basis of practical work and research. For example, with grass cutting, each lengthman has been assigned a daily allocation of 300 m^2 and been given a 0.5 km stretch to take care of permanently. The salary is 30,000 Tsh/month on the condition that the area must be clean. In addition, there are two 'backup units' for sand cleaning who are assigned to clean troublesome areas on an 'as required' basis.
- Tree/flower cutting and pruning has been contracted out to a private company: Klein & Associates Construction.
- The Ministry of Works itself carries out the cleaning of drainage systems. Different parts of the city have different drainage systems. For example, most of the trunk roads within the city centre (Bibititi Mohamed, Samora, Azikiwa, Nkurumah) have a 'gully' system. Outside the city centre some trunk roads have US drains (Ali Hassan Mwinyi Rd); others have open channel drainage (Morogoro) and some have none (parts of Nelson Mandela Rd).

5.2.4 Intermediate Treatment and Recycling

There is currently no formalised treatment of solid wastes in DSM. Some burning and composting on site takes place at many individual properties.

Although there is no formal, organised recovery of materials from the generated waste by DCC or private individuals, informal recycling activities have been observed to be quite active. Quite high proportions of various valuable materials such as paper,

aluminium cans, glass bottles, tins, organic waste, etc. are being recycled. Scavenging is widely practised at communal storage points, illegal dumping sites and at Vinguguti disposal site. There are middlemen and user factories for aluminium, iron/steel, paper, glass, etc. In addition, several materials, such as tins, are used directly by micro-industries for making local products, such as little kerosene lamps ('vibatari' in Swahili).

5.2.5 Final Disposal

There is only one existing, official, waste disposal site for DSM, which is the Vinguguti disposal site, operated by DCC. It is located on the banks of Msimbazi valley, 8.7 km south-west of the city centre. The surrounding area is a densely populated unplanned residential settlement. This site has been used since 1992, in response to the requests of a few residents in the area who wanted to protect their respective properties from seasonal floods[2], and following the closure of Tabata, Mbagala-Kilungule and Kunduchi sites, due to local residents' protests.

The site area is approximately 6 hectares and its reserve volume at the beginning of July 1996 was estimated to be 166,000 m^3 in this Study.

The final disposal operation is under the control of the Cleansing Unit (in the Preventive Section, Health and Social Welfare Department, DCC). There is one D6 type bulldozer that is used for spreading and compacting waste, but it is often out of use due to lack of diesel. Eleven DCC staff work at the disposal site.

A dumping fee of 800 Tsh per tonne is charged and this is collected at the checkpoint at the disposal site entrance. As there is no weighbridge at the site, the dumping fee per vehicle is calculated by visually estimating the total amount of waste carried by each vehicle.

Few environmental protection measures are being taken. Soil cover is hardly applied at present and consequently, offensive odours are emitted, the breeding of flies, mosquitoes and rats is promoted and smoke is sometimes produced.

About 45 scavengers on average are sorting and collecting valuable materials from wastes at the disposal site. Scavengers sell almost all of these materials to middlemen at the entrance to the disposal site or nearby.

The Msimbazi River was diverted in 1995 to increase the capacity of the disposal site. This development was only considered to be a short-term solution and the present disposal site will be full in 1-2 years time. Furthermore, there are concerns about the long term environmental impact and security of the Vinguguti disposal site as it is located in the Msimbazi river flood plain. For this reason, the World Bank has refused funding for its development as a long-term site[3].

5.2.6 Maintenance of Vehicles and Equipment

Mwananyamala Depot is situated in Mwananyamala ward (Kinondoni District) along Mwinyijuma Road just after Mwananyamala District Hospital, some 10 km from the

[2] Management of Solid wastes in Dar es Salaam, NEMC, May 1996
[3] Privatisation of Solid Waste Collection and Road Sweeping Services in DSM, Manus Coffey, Jan. 1996

city centre. It has few buildings and covers a total bounded area of 10,200 m^2. The depot is equipped with very few work tools and facilities, most of which are either damaged or in very poor condition.

Originally, the main function of the depot was to undertake maintenance of the Health Department and Malaria Control Project vehicles and equipment. These included light duty vehicles; light, heavy and special purpose trucks; and construction equipment. In August 1996, it was decided that the depot would undertake maintenance of all vehicles and equipment belonging to DCC.

Repairs undertaken include general servicing, general mechanical maintenance, auto-electrical repairs, tyre repairs and arc welding works, all of which are done by use of physical/manual procedures, without any special tools, machinery or facilities.

The depot has a total of 17 permanent staff, including a mechanical engineer who is also the depot superintendent, a chief mechanic, a stores officer, 2 foremen, 10 mechanics and 2 cleaners. There is also a JICA expert, employed on a two-year renewable contract basis, who has a private secretary.

5.3 Institutional System

Solid waste management in Tanzania, in principle, is the responsibility of the local authorities. However, in DSM, central government also plays an important role in the financing, planning and provision of waste collection and disposal services.

DSM City presently covers 52 wards, under three districts, Ilala, Kinondoni and Temeke. The main governmental institution at local level is the City Council, usually referred to by the acronym "DCC". The Prime Minister's Office (PMO), through the Ministry of Local Government has a major influence on the performance of the DCC as it is responsible for approving the Council's budget (and hence the SWM budget), Council by-laws and appoints senior personnel to the Council.

At the end of July 1996, the City Council was dissolved by the PMO and replaced by a City Commission (also referred to as DCC) which has taken over all the functions of the Council.

Under the City Council (and now the City Commission), solid waste management comes under the Health and Social Welfare Department, but its operation is also strongly affected by other branches of local government, as explained in section a below.

Presently an ad hoc organisation, the Sustainable Dar es Salaam Project (SDP) also has a major influence on SWM in the city. SDP is addressing a number of high priority environmental issues in DSM, including improvement of SWM via four strategies: privatisation, managing disposal sites, encouraging recycling and community collection.

5.3.1 Administration and Organisation

Responsibility for solid waste management lies with three departments of the DCC:

- The Health and Social Welfare Department
- The Works Department
- The Urban Planning Department

The Health and Social Welfare Department has the most immediate executive responsibility through its Preventive Services Section which, in turn, has a cleansing unit which deals with refuse collection and disposal and street sweeping. This unit also deals with liquid waste collection, (i.e. cesspit emptying services) and with stormwater drainage channel maintenance, with the assistance of the city engineer.

The Works Department is responsible for the maintenance of vehicles and equipment and for the non-trunk roads system, including the roads leading to the disposal sites and to the workshops.

The Urban Planning Department is responsible for medium and long-term planning matters, such as setting aside land for the construction of refuse treatment and disposal facilities.

The present organisational chart depicting the overall and Cleansing Services Unit structure is shown in Figure 5-1 and Figure 5-2 respectively.

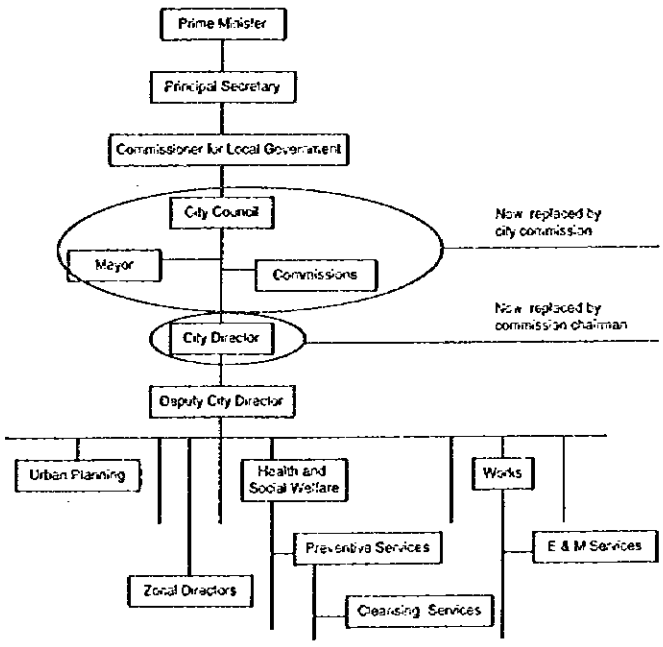


Figure 5-1: Present Organisational Structure of DCC

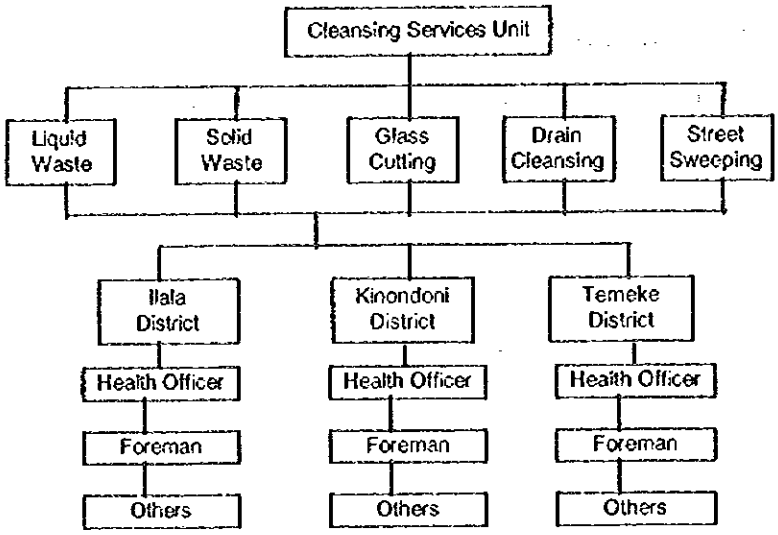


Figure 5-2: Cleansing Services Unit Structure

The organisational charts in Figure 5-2 show that the Cleansing Services Unit, which is the core of the SWM service in DSM, lacks autonomy for planning and for the maintenance of its vehicles. Any proposal from the Cleansing Services Unit must pass through several stages before it is approved, a situation which is directly responsible for the permanent grounding of more than 50% of the collection truck fleet due to long delays in vehicle/equipment maintenance. Any money collected by the Cleansing Services Unit, (e.g. refuse disposal charges, cesspit emptying charges) goes to the DCC Treasury while any financial resources requested by the Cleansing Unit, even for buying fuel, tyres or spare parts are obtained only after a long waiting period (sometimes as long as one year).

5.3.2 Legislation and Enforcement

The oldest known legislation dealing with SWM issues is the Sanitary Rules for the Township of Dar es Salaam (1920), which gave the Medical Officer of Health powers to deal with sanitary nuisances and unsanitary premises. The basic rules of this legislation are still used by the urban authorities to curb the unhygienic behaviour of the population when dealing with solid waste.

On creation of the Municipal Council of Dar es Salaam in 1949, through the promulgation of the Municipalities Ordinance (1946), power and responsibility shifted from the central government to the municipality. The council's powers dealt mainly with urban management, including solid waste management issues.

Current legislation controlling local government's powers and responsibilities is the Local Government (Urban Authorities) Act of 1982. Under this legislation, the central government has much control over urban authorities; appointing senior personnel to run urban affairs and approval through the Minister of Local Government by-laws, budgets, and revenue proposals made by the local authorities. Local authorities therefore have very limited autonomy, a situation which is more pronounced in DSM, being the capital city and where the vast majority of the central government authorities are located.

Concerning SWM, the Local Government Act places on urban authorities the responsibility "to remove refuse and filth from any public or private place" (section 55 g) and to provide and maintain public dustbins and other receptacles for the temporary deposit and collection of rubbish.

These stipulations were followed by the Dar es Salaam City (Disposal of Refuse) by-law of 1989, which requires the occupier or tenant to provide a receptacle for "ashes and non-liquid domestic refuse" and prohibits the throwing of refuse ("dust, refuse, garbage, decaying animal, vegetable, or noxious matter") in any street or public place.

This by-law also established that urban authorities have the power to make residents keep their premises and surroundings clean of any nuisance that shall exist by reason of "domestic or trade refuse produced thereon or proceeding therefrom". It also defines penalties (fines and/or imprisonment) for those found guilty of infringing the by-law.

The most recent piece of legislation related to SWM is the DCC by-law of 1993 dealing with collection and disposal of refuse based on the Local Government (Urban Authorities) Act, Number 8 of 1982 under section 56 and 13. This by-law was enacted on 27 March 1993 and came into effect on 1 September 1993. It was passed in order to enable the privatisation of solid waste collection in some central areas of the city. This by-law is applicable only to the districts of Upanga East, Upanga West, Kivukoni, Kisutu, Mchafukoge, Gerezani, Kariakoo, Jangwani, Mchikichini and Ilala. It also binds the DCC to collect and dispose of wastes generated in the city.

This by-law requires household and commercial waste generators to provide adequate receptacles for refuse storage and states that DCC will direct when and where the refuse should be put for collection. It prohibits the throwing/depositing of waste on streets or open spaces not designated as collection points, empowering the DCC to make the offender remedy the resulting problem. Throwing waste in public places is also prohibited and fines/penalties for such behaviour are specified.

Furthermore, it defines the amounts and means whereby payments by waste generators shall be made, be it to the DCC itself or to any authorised person. The actual refuse collection rates are specified in an annex of the by-law for each area of the city and for different types of waste generators - residential dwellings, hotels, restaurants, shops, construction sites and markets.

Considering the legislation described above, it can be said that there are sufficient by-laws concerning solid waste management in existence for discipline and enforcing public behaviour concerning SWM, although some legislation is now outdated or inappropriate for the actual conditions in the city.

Existing legislation is enforced by City Environmental Health Officers ("EHO"). For the whole city, there are about sixty EHOs and about 90 Health Assistants who assist them. These enforcement officials and assistants are also responsible for all other hygiene and pollution issues, under the jurisdiction of the DCC.

In practice, enforcement is ineffective, as the overall solid waste situation is chaotic, and due to the DCC refuse collection capacity and actual service provision being so poor. This means that it is irrational, for example, to fine someone who lives in an area not provided with a collection service, for throwing refuse in open/public places.

This results in waste being indiscriminately dumped in open spaces, as well as in water drainage channels, along the seashore and in vacant public or private lots and very few people are fined.

This situation is worsened by the inefficiency of court proceedings. Citizens who are fined but fail to comply may be taken to court, but the court procedures are very bureaucratic and lengthy, and the final decision on a case can take more than one year. When the law is broken and nothing happens, it erodes government authority and is bad both from an environmental and psychological viewpoint.

It should also be pointed out that the DCC authorities are aware of the fact that not only should legislation be enforced in order to curb unsanitary behaviour but also that better sanitary behaviour and conditions can be achieved through environmental education. In this respect, every ward health officer is responsible for the education of the residents within his/her area of jurisdiction. Also, the DCC Health Department has a unit responsible for delivering mass education and disseminating information on hygiene practices/methods, which should include material on household waste storage and disposal. These efforts of the DCC however have been implemented only on a very limited scale, due to human and material resource constraints.

5.3.3 Financial Sources and Refuse Collection Charges

d.1 Importance of Financial Management in SWM

Unlike other public utility services such as electricity and water, citizens utilising the SWM services, enjoy the services without contributing towards the costs incurred by the suppliers of the services.

Therefore, a key issue for sustainable SWM is to establish a well-balanced financial management plan that addresses both revenue and expenditure. In terms of expenditure, the most efficient operating system for the provision of SWM services is required in order to minimise total SWM costs while for revenue, the most efficient RCC (Refuse Collection Charge) system is needed to maximise total revenue for SWM by decreasing the number of defaulters thus increasing the RCC collection rate.

In this section, the present financial situation for SWM in DSM will be discussed both in terms of expenditure and revenue, thereby giving a basis from which an optimum financial management framework for SWM in DSM can be proposed.

d.2 Cost Minimisation for SWM

d.2.1 Privatisation of SWM

In an attempt to tackle a wide range of environmental issues including SWM in DSM, SDP started operation in 1992 under the auspices of UNCHS (Habitat) and funded by UNDP. Its activities included organising various multi-institutional working groups, including one for the improvement of SWM. The following five strategies were proposed by the said working group:

- Privatisation of the Collection System;
- Launching of an Emergency Clean-up Campaign;
- Improvement of Disposal Sites Management;

- Establishment of a Community-based Collection System;
- Encouragement of Recycling.

In the context of refuse collection, the working group recognised that the privatisation of refuse collection services on a concession basis was a viable solution for improving SWM in DSM. Accordingly, after passing of the relevant by-laws in 1993 (DSM Collection and Disposal of Refuse by-laws) Multinet, who had been awarded the first contract, started operations in 10 wards in and around the city centre in September 1994. However, a number of disputes arose between DCC and Multinet, resulting in Multinet being forced to withdraw its operations from 5 wards in January 1996. Nevertheless, privatisation was still considered to be a viable option and following amendments to the contract, the privatisation exercise was expanded to cover 25 wards of the city with Multinet resuming its operations in the previously withdrawn 5 wards and other contractors being allocated the remaining wards.

Hence privatisation is seen as being one of the most feasible options for the provision of refuse collection services for SWM in DSM. To provide some justification for this, comparison of the cost effectiveness between the DCC direct operation system and privatisation system will be made by calculating the unit costs for refuse disposal in the same period for the two systems. In the case of private operation, data for Multinet, which has been the sole private operator under the present privatisation scheme to date was examined. The comparison is made using data from 1994.

d.2.2 Unit Disposal Cost for Direct DCC Operation

i) Method and Limitations in the Estimation of the Unit Disposal Cost for the DCC Direct Operation

The unit cost of solid waste disposal for the DCC direct operation can be estimated by dividing the total cost for solid waste disposal incurred by the DCC by the total amount of solid wastes disposed by the DCC. However, there are two main limitations with this approach:

i. The disposal waste amount data is not very accurate. The amount of waste is estimated from the number of trips made by the DCC refuse collection trucks and then using a set tonnage per trip to convert the trip data to tonnage.

ii. The total DCC waste disposal cost is not very accurate, as the magnitude of the administrative cost to be included in the indirect cost for solid waste disposal by the DCC is not known accurately.

ii) Estimation of the Unit Disposal Cost

Table 5-2 and Figure 5-3 show the actual expenditure for refuse disposal by the DCC in 1994. This data illustrates that the personnel and indirect costs accounted for more than 90% of the total expenditure, implying that the DCC could not afford to allocate sufficient funds from its budget for daily operating costs such as for fuel and vehicle maintenance. Furthermore, vehicle depreciation costs are not included in these accounts as all of the operational vehicles were granted to the DCC by the

government of Japan. The table shows that the total actual expenditure for refuse disposal in 1994 was approximately Tsh. 413.8 million, equivalent to USD 808,300[4].

Table 5-2: Actual Expenditure for Refuse Disposal by DCC in 1994

Cost Item	Cost in 1994 (Tsh)
Salaries, Wages and Allowances	232,152,239
Repair and Maintenance	2,066,852
Fuel	27,865,259
Miscellaneous	3,828,686
Direct Cost Subtotal	265,913,036
Salaries, Wages and Allowances	66,636,630
Other General Expenses	81,291,903
Indirect Cost Subtotal	147,928,533
Total Cost (Tsh.)	413,841,569
Total Cost (USD)	808,284

Source: Abstract of Accounts and Statements for the Year Ended 31st December 1994, DCC, 1995
Note 1: The depreciation of vehicles is excluded, since foreign donors donated all the current vehicles
Note 2: For indirect cost, only the administrative cost for the health department is counted.
Note 3: The exchange rate used is Tsh. 512.0 to USD 1, which is the average mean inter-bank rate throughout 1994.

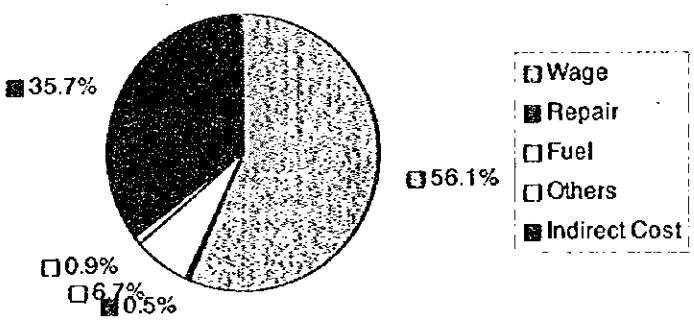


Figure 5-3: Breakdown of Refuse Disposal Cost for DCC in 1994

The estimated total DCC waste disposal amount in 1994, as shown in Table 5-3 and Figure 5-4, is 51,909 tonnes (142 tonnes per day) based on a total number of trips of 13,945.

[4] Economic Bulletin for the Quarter Ended 31st December, 1995, Vol. XXIV No. 4, the Bank of Tanzania, 1996, page 62.

Table 5-3: Amount of Wastes Collected by DCC in 1994

Month	Number of Trips (Trips)	Amount of Waste Collected (Tonne)	Tonnes
Jan	1278	5571	5571
Feb	1318	5755	5755
Mar	1234	5553	5533
Apr	1446	6304	6304
May	1077	4580	4695
Jun	2084	7025	3236
Jul	2913	8748	2925
Aug	597	585	3057
Sep	710	805	3444
Oct	422	2398	2237
Nov	389	2038	2062
Dec	477	2547	2528
Total in 1994	**13945**	**51909 (142 tonne per day)**	**61689**

Source: Assessment of Solid Waste Management for DCC, DCC, 1996
Note: Amount of waste collected is estimated based on the number of trips.

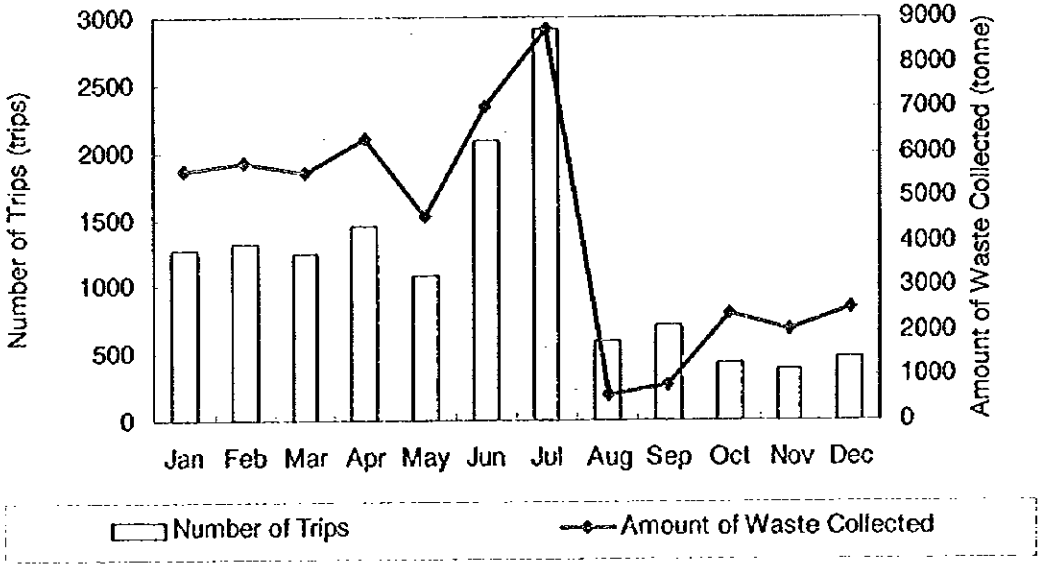


Figure 5-4: Amount of Wastes Collected by DCC in 1994

Table 5-4 and Figure 5-5 show the unit cost of refuse disposal for DCC direct operation is estimated to be approximately Tsh 7,972.5 per tonne, equivalent to USD 15.57 per tonne.

Table 5-4: Unit Cost of Refuse Disposal by DCC in 1994

Cost Item		Unit Cost in 1994 (Tsh. per tonne)
	Salaries, Wages and Allowances	4,472.3
	Repair and Maintenance	39.8
	Fuel	536.8
	Miscellaneous	73.8
Direct Cost Subtotal		5,122.7
	Salaries, Wages and Allowances	1,283.7
	Other General Expenses	1,566.1
Indirect Cost Subtotal		2,849.8
Total Cost (Tsh.)		7,972.5
Total Cost (USD)		15.57

Source: Abstract of Accounts and Statements for the Year Ended 31st December 1994, Dar es Salaam City Council

Note 1: Depreciation of vehicles is excluded, since foreign donors donated all the current vehicles.

Note 2: The indirect cost is estimated by the administrative cost of the health department of DCC.

Note 3: The unit cost per tonne is calculated based on the amount of refuse collected by DCC in 1994 as indicated in Table 6-7.

Note 4: The exchange rate used is Tsh. 512.0 to USD 1, which is the average mean inter-bank rate throughout 1994.

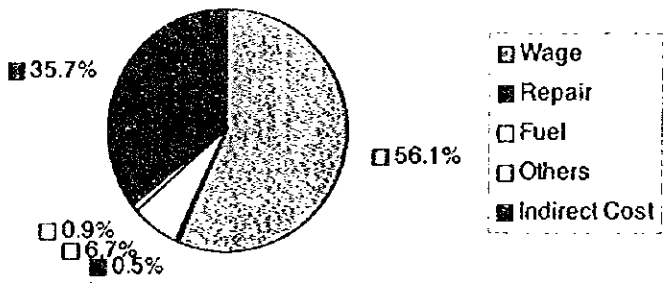


Figure 5-5: Breakdown of the Unit Cost of Refuse Disposal

d.2.3 Unit Disposal Cost for the Privatised Operation conducted by Multinet

i) Method and Limitations in the Estimation of the Unit Disposal Cost in the Privatised Operation conducted by Multinet

An approximate unit cost can be calculated, using data from Multinet's daily accounts.

ii) Estimation of the Unit Disposal Cost

According to Multinet, the unit disposal cost for 1994, as per Table 5-5 and Figure 5-6, including the depreciation of vehicles, relevant government levies, dumping charges and its profit, is estimated to be Tsh. 8,181.3 per tonne equivalent to USD 16.0 per tonne.

Table 5-5: Unit Cost of Refuse Disposal by Multinet in 1994

Cost Item		Unit Cost per tonne in1994 (Tsh. / tonne)
	Salaries, Wages and Allowances	888.9
	Repair and Maintenance	837.8
	Fuel	920.0
	Miscellaneous	95.0
	Direct Cost Subtotal	2,741.7
	Salaries, Wages and Allowances	444.5
	Other General Expenses	645.7
	Indirect Cost Subtotal	1,090.2
	Depreciation	2,094.4
	Government Levy	711.2
	Dumping Charge	800.0
	Profit	743.8
Total Cost (Tsh.)		8,181.3
Total Cost (USD)		16.0

Source: Accounting Manager, Multinet, 1996
Note: The exchange rate used is Tsh. 512.0 to USD 1, which is the average inter-bank rate throughout 1994.

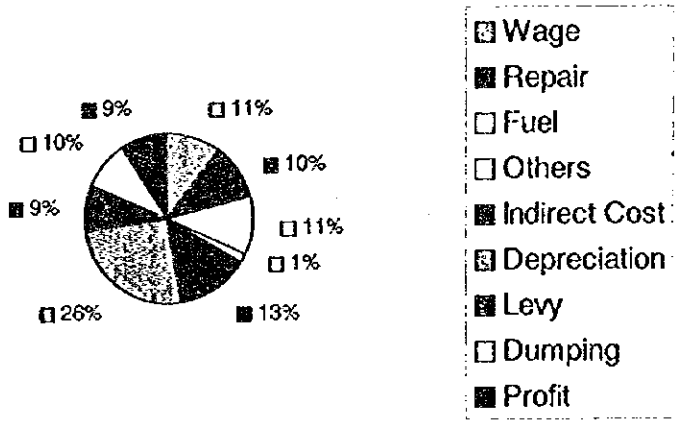


Figure 5-6: Unit Cost of Refuse Disposal by Multinet in 1994

d.2.4 Comparison of Cost Effectiveness between DCC Direct Operation and Operation by Multinet

i) Comparison between DCC Operation and Operation by Multinet

Although approximate unit disposal costs for both the DCC and Multinet have been calculated, there are considerable difficulties in directly comparing these two unit costs due to the limitations already stated above as well as differences in service areas and differences in cost items included in financial records between these two parties.

Concerning differences in cost items, the following adjustments are applied to make a comparison possible.

Vehicle Depreciation

Vehicle depreciation was included in Multinet's accounts but not in those of the DCC. To compensate for this, the same depreciation rate of 31.1% of the total cost was applied to give an assumed depreciation cost for DCC vehicles.

Dumping Fees

As dumping fees (Tsh. 800 per tonne of waste) were included only in Multinet's accounts, a correction of Tsh. 800 per tonne was added to the DCC's unit cost.

Government Levy

As the DCC is exempt from payment of government levies such as sales tax and other relevant licensing fees, the cost of the government levy was deducted from Multinet's account.

Profit

Multinet included profit, 10% of total costs, in its expenditure records. As no similar practice is followed by the DCC, the profit figure was subtracted from Multinet's accounts.

ii) Comparison of the Unit Cost

There are a number of limitations in the unit cost estimations:

- inaccurately known waste disposal amount for the DCC cost estimation;
- inaccurately known administrative expenditure for the DCC cost estimation;
- approximate evaluation of the unit cost for Multinet without actual expenditure and waste disposal amounts being used;
- difficulty in adjustment of unit costs to account for differences in the cost items between the two parties;
- differences in the refuse collection service areas between the two parties making direct comparison of unit costs difficult.

Nevertheless despite these limitations, it can be argued that a comparison of unit costs does provide a reasonable basis on which to compare the two operations. This comparison is made below and shown in Table 5-6 and Figure 5-7, after making the adjustments referred to in the previous section. The unit costs for Multinet and the DCC are estimated to be approximately Tsh. 6,726.3 per tonne (USD 13.14) and Tsh. 12,723.5 per tonne (USD 24.85) respectively. The difference is mainly due to the inefficient salary/wage structure for both direct and indirect employees used by the DCC.

The difference in unit cost is significant with the DCC unit cost being USD 11.7 higher or 1.7 times greater than that of Multinet, indicating that Multinet's privatised refuse collection is more efficient than the present DCC direct operation. This supports the argument that privatisation of the refuse collection services is a feasible option for the effective provision of SWM services.

Table 5-6: Comparison of Unit Cost of Refuse Disposal between DCC Operation and Multinet Operation in 1994

Cost Item		DCC Account			Multinet Account		
		Actual	Adjusted for Comparison	Share in Total	Actual	Adjusted for Comparison	Share in Total
	Salaries and Wages	4,472.3	4,472.3	35.1%	888.9	888.9	13.2%
	Repair and Maintenance	39.8	39.8	0.3%	837.8	837.8	12.5%
	Fuel	536.8	536.8	4.2%	920.0	920.0	13.7%
	Others	73.8	73.8	0.6%	95.0	95.0	1.4%
Direct Cost Subtotal		5,122.7	5,122.7	40.3%	2,741.7	2,741.7	40.8%
	Salaries and Wages	1283.7	1,283.7	10.1%	444.5	444.5	6.6%
	Other General Expenses	1566.1	1,566.1	12.3%	645.7	645.7	9.6%
Indirect Cost Subtotal		2849.8	2,849.8	22.4%	1,090.2	1,090.2	16.2%
A.F. 1	Depreciation	0.0	3,951.0	31.1%	2,094.4	2,094.4	31.1%
A.F. 2	Dumping Fee	0.0	800.0	6.3%	800.0	800.0	11.9%
A.F. 3	Government Levy	0.0	0.0	0.0%	711.2	0.0	0.0%
A.F. 4	Profit	0.0	0.0	0.0%	743.8	0.0	0.0%
A.F. Subtotal		0.0	4,751.0	37.3%	4,349.4	2,894.4	43.0%
Total Cost (Tsh.)		7972.5	12,723.5	100.0%	8,181.3	6,726.3	100.0%
Total Cost (USD)		15.57	24.85	n.r.	15.98	13.14	n.r.

Note 1: Depreciation for DCC is calculated assuming that depreciation accounts for 31.1% of total costs as is true for Multinet.
Note 2: The dumping fee of 800 Tsh. per tonne is added to the DCC account.
Note 3: The government levy and profit are deducted from the Multinet account.
Note 4: The exchange rate used is Tsh. 512.0 to USD 1, which is the average mean inter-bank rate throughout 1994.

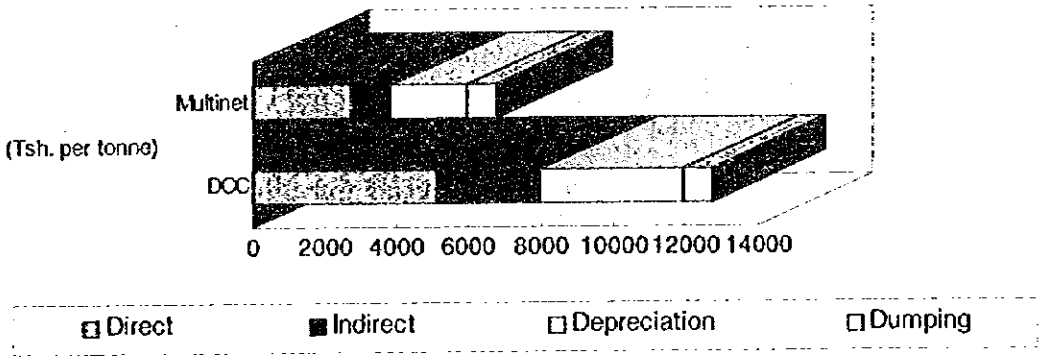


Figure 5-7: Comparison of Unit Cost of Refuse Disposal between DCC Operation and Multinet Operation in 1994

d.3 Present RCC Collection System

In order to provide sufficient refuse collection services, generation of revenue through proper collection of RCCs is one of the most vital issues to be considered. The present RCC collection systems for the DCC and Multinet are as follows.

d.3.1 DCC

The DCC does not charge RCCs to beneficiaries except in the following cases:

- dumping fees collected from Multinet and other private contractors at the rate of Tsh. 800 per tonne of waste;

- RCC on a contract basis with markets at the rate of Tsh 6,000 per trip[5];
- RCC on an ad-hoc basis from hotels, shops, institutions, etc.

Table 5-7 shows the amount of RCC revenue collected by the DCC from January to June, 1995.

Table 5-7: Revenue Collected by DCC from January to June, 1995

Revenue Items	Amount (Tsh.)	(%)
RCC Collected by DCC	455,050	3.1
Dumping Fee from Multinet	10,509,600	71.5
Dumping Fee from Other Companies	3,742,000	25.4
Total Revenue Collected by DCC	14,706,650	100.0

Source: Assessment of Solid Waste Management for Dar es Salaam City, 1996, DCC

This table shows that RCCs collected by the DCC account for only a small proportion (3.1%) of total revenue while the main revenue source is dumping fees collected from Multinet (71.5%). By doubling the above figure to get Tsh. 29,413,300 (= Tsh. 14,706,650 x 2) as a simple estimate of the total RCC revenue for 1995, this amount only covers 66.7% of the fuel/oil consumption cost for the DCC refuse collection services in 1995 (Tsh 44,082,811[6]).

d.3.2 Multinet

In the case of Multinet, it collects RCCs in accordance with the tariffs fixed in the schedule forming part of the 1993 By-Law, as shown in Table 5-8. According to this tariff structure for the 10 wards Multinet was operating in until January 1996, five (relatively middle income) wards were charged at the over-subsidised rate of Tsh. 150 per month per household while the remaining 5 (relatively high income) wards were charged at the under-subsidised rate of Tsh. 900 per month per household.

The RCC collection system for Multinet is described below:

- direct hand billing through collectors;
- payment through several travel agent offices on an application basis by customers;
- payment through a branch of the Stanbic Bank on an application basis by customers.

In relation to penalties and punishment for delayed RCC payment and refusal of RCC payments, clauses 8 and 19 of the by-law state:

- upon failure to pay all or some of RCC or part thereof on time, the person shall be liable to a penalty of 25% of the unpaid RCC
- upon failure to pay all or some of RCC within one month of the due date, the person shall be liable to a penalty of 50% of the unpaid RCC

[5] Kironde, J . M. ; (1995), "The Governance of Waste Management in African Cities: the Case of Dar es Salaam, Tanzania", Ardhi Institute, Dar es Salaam, page 22.
[6] Abstract of Accounts and Statements for the Year Ended 31st December 1995, DCC, 1996

- any person who refuses to pay RCC or part thereof shall be liable on conviction to a fine not exceeding Tsh. 5,000 or for a prison term not exceeding six months or to both

However, these clauses do not actually function in practice, as the majority of customers are not paying RCCs. Although the DCC released a newspaper advertisement demanding payment of RCCs and informing the public of the consequences of non-payment, this was largely ineffective in generating a positive response from the public. A better incentive would be if businesses are issued a RCC certificate of payment, without which they cannot obtain business licenses.

It is reported that Multinet has already prepared a list of about 60 % of all its customers in the 5 wards in which it was operating as of July 1996, claiming that the RCC collection rate is only 12.5% of all customers[7], which means that approximately 20 % of registered customers are paying RCC.

In conclusion, both the DCC and Multinet have failed to collect sufficient RCC charges to cover the costs of SWM. Consequently, the present charge collection system should be improved and possible alternative options may also be considered.

[7] Accounting Manager, Multinet, 1996

Table 5-8: Present Tariff Structure

Category	Area	Description	Rate / Month
Residential	Area 1		900
	Area 2		150
	Area 3		150
Markets	Area 1	Under Trade Licenses	3,500
		Others	300
	Area 2	Under Trade Licenses	1,000
		Others	150
	Area 3	Under Trade Licenses	1,000
		Others	150
Hotels and Guest Houses	Area 1	Rooms 1 - 10	20000
		Rooms 11 - 15	30000
	Area 2	Rooms 1 - 10	5000
		Rooms 11 - 15	20000
	Area 3	Rooms 1 - 10	2500
		Rooms 11 - 15	10000
	All Areas	Rooms 16 - 25	55000
		Rooms 26 - 50	75000
		Rooms 51 - 75	100000
		Rooms 76 - 100	150000
		Rooms 101 and Over	200000
Restaurants and Bars	Area 1		30000
	Area 2		15000
	Area 3		2500
Shops and Institutions	All Areas	Employees 1 - 5	5000
		Employees 6 - 10	7500
		Employees 11 - 15	15000
		Employees 16 - 20	20000
		Employees 21 - 25	30000
		Employees 26 - 50	55000
		Employees 51 - 75	75000
		Employees 76 - 100	100000
		Employees Over 101	150000

Source: Dar es Salaam (Collection and Disposal of Refuse) By-Laws, 1993
Note: Area 1 includes Upanga East, Upanga West, Kivukoni, Kisuts, and Mchafugoge, Area 2 includes Genezani, Kariakoo, Jangwani, and Area 3 includes Mchikichini and Ilala.

5.3.4 Privatisation and Contracting System

Due to the weakness of the public sector and the chronic problems facing the SWM system in Dar es Salaam, formal as well as informal private SWM service providers are flourishing.

Formal privatisation of refuse collection services has already been described in some detail in sections 5.1.1 and 5.4.4. Privatisation of refuse collection services in some wards in the city was initiated as a partial, emergency solution to the complete failure of DCC refuse collection operations in 1992. Originally, refuse collection had been privatised in 10 central city wards but it was planned to have 5 contractors providing refuse collection services in 25 wards. However, due to logistical and political

difficulties, only 2 private contractors are currently collecting refuse in about 6 different wards and several markets in the city.

Waste collection services have been contracted out to a private company, through a "concession" type contract. The concessionaire has a monopoly in providing refuse collection services to a particular area and charges the refuse generators accordingly. No money is paid by the DCC to the service provider. The same type of concession has been used in both phases of privatisation although some amendments to its content were made before phase II began.

Under the phase I contract, as the DCC could not run all its fleet of collection trucks, it was agreed to lease 8 tipper trucks, 6 compactor trucks and a DCC workshop (Temeke) to the concessionaire. The rationale is that with the revenues provided by the lease, the DCC's budget would be sufficiently supplemented to be able to provide refuse collection services in areas of the city not serviced by the concessionaire. However, disagreements between the two parties led to the leased vehicles and workshops being returned to the DCC and at present are idle (vehicles) or not used (workshop).

Also under the formal market but without any regulation by the DCC, some transportation firms or private hauliers[8], provide refuse collection services to several refuse generators. Under this arrangement, these private providers pick up an unknown amount of solid wastes from parastatal institutions (e.g. Telecommunications and government banks), several industrial (e.g. Tanzania Tobacco Co.) and commercial concerns and high-income residential areas without any interference from the DCC.

In the informal sector, there are a large number of small and medium size hauliers, using handcarts, who collect wastes from households, commercial and other enterprises and dispose of it in unauthorised places, as has been recorded in the Public Opinion and Illegal Dumping surveys conducted in this Study. This practice is particularly widespread in Kariakoo ward, where hand drawn carts collect wastes produced from many sources in the area and dump it illegally along Morogoro Road.

5.3.5 Monitoring and Information Management System

There is no control and monitoring system for SWM in DSM and this is one of the main reasons for the poor performance in delivery of SWM services.

Presently, the only form of monitoring is for the amount of waste that is brought to the official dumpsite (Vingunguti) during daytime. Waste amounts are estimated on a volumetric basis and converted to a weight basis, as there is no weighbridge.

There are no records of complaints (except those made to the private contractor), length of streets being swept, number of households being serviced, and other operational indicators.

The contract with the concessionaire states that there would be an "Authorised Supervising Officer" who would be implicitly monitoring the provision of services. However, these duties have not been performed.

[8] In some cases, the company/institution concerned may have their own vehicle(s).

5.3.6 Human Resources Development

At DCC level, there is no institution that can provide human resources development through formal training or any other type of professional capacity building. In DSM city however, there are three high level institutions that provide courses on sanitation related issues:

- University of Dar es Salaam conducts a course on Environmental Engineering at graduate level, which focuses on water and wastewater treatment.
- Muhimbili University College of Health Sciences. This institution, which is under the University of Dar es Salaam structure, provides training, research and public services (the university hospital is a "referral" institution in Tanzania). At this college, a community health course is offered, which covers solid waste management.
- University College of Lands and Architectural Studies, formerly Ardhi Institute, also devoted to training and research with emphasis on land related issues as well as in environmental engineering. At this college, an undergraduate course on environmental engineering is offered, which covers water supply, wastewater collection and treatment, solid waste management and air pollution.

This list shows that the capacity of learning institutions in DSM is quite adequate in matters related to environmental and sanitary engineering and hence there is ample potential for improving the professional skills of solid waste managers and related personnel on site.

It should be pointed out however that there is a need also for the provision of courses at the foreman and worker level, which are not available at this time.

5.3.7 Public Education and Co-operation

a. Education on Sanitation

In the Tanzanian education system, solid waste and sanitation issues are usually covered together. At both primary and secondary schools, sanitation issues are taught in home economics. At primary school, sanitation issues are mainly confined to basic health care. In secondary school, sanitation issues are taught more specifically and include the following topics: health and disease, house cleaning, water closets, water carriage system and refuse management.

In the institutes of technical education, colleges and universities, there are some courses such as nursing and midwifery, medicine, dentistry and pharmacy, which provide training in health education. In the Ministry of Health, the Preventive Section is responsible for education on sanitation and provides education and training on sanitary issues through workshops, seminars and short courses.

At the community level, regional health offices distribute information and advice to people on health and sanitation issues through seminars, demonstrations, posters and booklets. The Ministry of Community Development, Women's Affairs and Children co-operates with international organisations and NGOs in conducting "Education on Sanitation" through small projects such as digging wells, making pit latrine toilets not only in Dar es Salaam but also in regional areas.

b. Present Relevant Approaches to Community Based Organisations (CBO)

The concept of community based development has been actively promoted by the government for many years. Many community-based organisations are well established, while others are relatively new and their numbers are continuing to grow. NGOs, UN agencies and foreign aid often support them. Women's participation in such organisations is growing, increasing their involvement in social and economic fields and building self-confidence.

Some of these CBOs are involved in the improvement of sanitary conditions in different parts of DSM. For example, a CBO in the Hanna Nasifu area has mobilised residents to build drainage channels and has organised a refuse collection system for several streets in the area. In Buguruni, a committee has been formed for building wells and toilets in the area.

5.3.8 Guidelines

There are no clear-cut guidelines concerning SWM in Tanzania. Often seminars and workshops are held by various organisations such as governmental organisations financed by aid agencies, international aid agencies. However, because of a lack of co-ordination materials and methods used in these seminars are invariably different.

5.4 Evaluation of Current MSWM

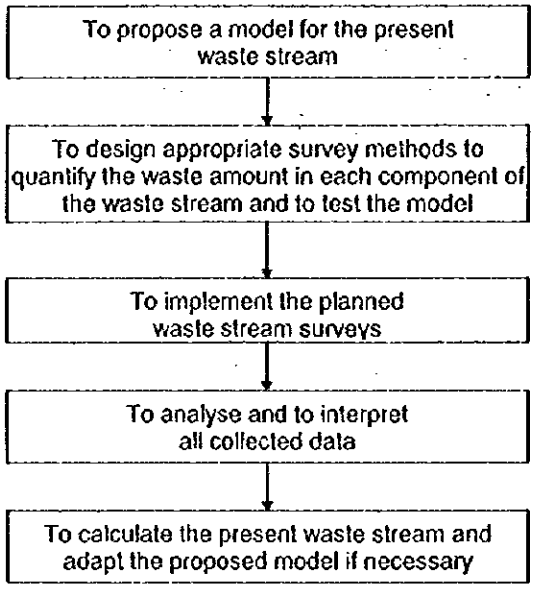
5.4.1 Waste Stream

Determination of the waste stream and waste composition are the most important tasks to be completed in the formulation of an appropriate master plan. The "waste stream" refers to the flow of waste from generation to final disposal. It describes and quantifies the waste generated by different sources within the scope of this Study (see section 3.2) and maps and quantifies the amounts of waste disposed of by different methods such as collection, illegal dumping, recycling, etc., as explained in this section.

Annex 8 elaborates on the methodology for determination of the waste stream, results and further discussion.

a. Proposed Waste Stream Model

The main objective of this section of work is to model the waste stream and to quantify the present waste amount in each component of the waste stream. The procedure adopted in this Study is shown diagrammatically below.



The waste stream varies between towns and countries and therefore the survey methods used have to be adapted to suit the particular characteristics and circumstances of each town/country studied.

Hence, a preliminary survey was conducted in order to enable a waste stream model to be proposed and to design appropriate survey methods. This survey showed that the waste stream in DSM is very complicated as SWM in the city involves many informal parties and activities. A simplified waste stream model was proposed based on this information which contains all the essential elements of the waste stream but avoids undue complication so as to be practically usable. This is illustrated in Figure 5-8.

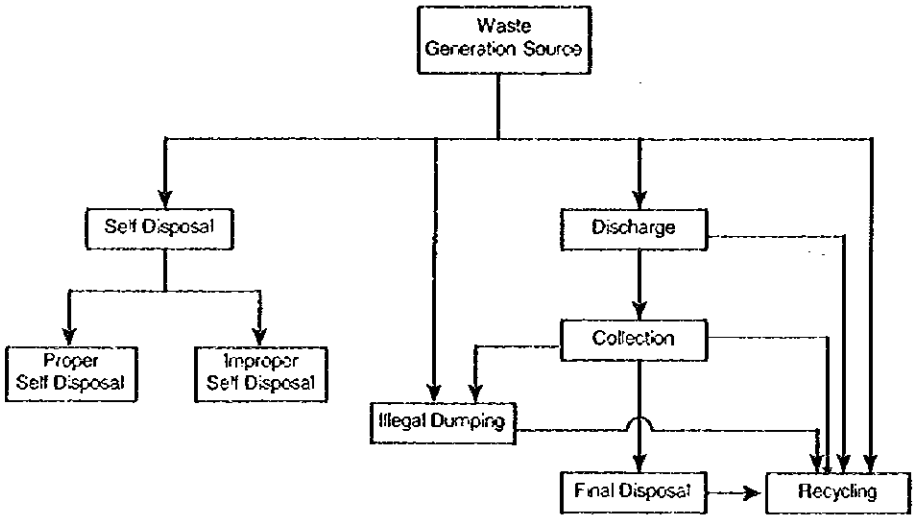


Figure 5-8: Proposed Waste Stream Model for DSM

b. Waste Stream Terminology

Self Disposal: Disposing of waste of on-site. Typically, this involves pit disposal and/or incineration. Self disposal may be classified as proper or improper, depending upon the location. Self disposal by use of an on-site pit is considered proper, while burning waste is proper in sparsely populated areas and the resulting public nuisance and pollution load is small. The opposite applies to improper self disposal.

Illegal Dumping: Dumping waste outside the property in an area where such behaviour is prohibited. Illegal dumping is very common, typically in close proximity to the source; e.g. dumping at the roadside, in open spaces, in drains, in the sea, or valleys.

Discharge: Giving the waste to a waste collector or discharging at a certain place from where it is normally collected by another party. This component includes taking the waste to an approved collection point, placing it in a DCC/Multinet refuse collection truck, dumping it at a market waste collection point, paying a handcart operator to remove the waste, etc.

Recycling: Reusing or selling to a third party (person/shop/company etc.). For example, paper or bottles may be sold and reused, or food and grass waste may be given away for animal feed.

Collection: Collecting of discharged waste by another party and transporting to a final disposal place. Prior to collection, scavengers may sort through the waste and remove recyclable materials.

Final Disposal: Disposing of waste at the official city disposal site at Vingunguti.

c. Waste Stream Surveys Design and Data Collection

The following works were carried out in order to quantify each component of the waste stream:

A. Waste Generation Amount Determination: Data from *WACS* was used in conjunction with statistical and interview data to quantify the waste generation amount for each component of the waste stream as explained in section 3.2.

B. Disposal Interview Survey (DIS): Interviews with a representative of each WACS sampling point and discussions with Tanzanian colleagues were held to determine the methods of disposal used by waste generators and to quantify waste disposed of by different means for each source in accordance with the proposed waste stream model. POS results were also used for this purpose for household waste.

C. Illegal Dumping Survey (IDS): This survey was carried out to quantify the cumulative amount of waste which has been illegally dumped in DSM and to quantify the daily amount of waste disposed in this manner.

D. Recycling Survey (RS) and Scavenger Survey (SS): These surveys were carried out to quantify the amount of waste recycled at different points of the waste stream (i.e. source, discharge, collection, illegal dumping and final disposal).

Multinet, KMC and Vingunguti weighbridge and disposal site records were also used to determine the collection and final disposal amounts.

d. Waste Disposal after Generation

According to the proposed waste stream model there are four methods that generators of waste may use to dispose of their waste; namely, self disposal, discharge, illegal dumping and recycling. The POS and DIS results of June 1996 were used to estimate the amounts disposed by each method as explained below.

d.1 Household Waste

The WACS results, population data (by income) and POS results were used to determine the amounts of household waste disposed of by self disposal, discharge, illegal dumping and recycling as explained fully in Annex 8. The results of these calculations are tabulated below.

Table 5-9: Amounts of Waste Disposed by Different Methods for Households

Unit: t/d

Type of Waste	Self Disposal	Discharge	Illegal dumping	Recycling	Total
Household refuse	485.3	64.3	197.3	35.9	782.7
Garden waste	166.0	108.6	280.8	78.1	633.6
TOTAL	651.3	172.9	478.1	114.0	1416.3

The amount of household waste calculated as being recycled is 8% of the total household waste generation amount. This is considered to be reasonable although no data from other studies was obtained to enable a comparison to be made. A breakdown of household recycling is given in Table 5-10. First, recycling is split into two groups; namely:

- external recycling which refers to the household giving away or selling recyclable materials outside of the house to individual collectors and shops
- internal recycling, which refers to the reuse/recycling of waste within the property as explained more in Annex 8 (primarily composting of garden/kitchen waste and using kitchen waste for animal feed)

Estimated quantities of various items recycled in both these categories are specified in Table 5-10 where possible; these values having been obtained directly from POS results.

Table 5-10: Breakdown of Recycled Household Waste

Recycling Waste Breakdown	Quantity (t/d)	% of Total
External:		
bottles	15.37	13.5
paper/cardboard	1.30	1.1
metal (aluminium tins, metal tins, etc.)	4.17	3.7
kitchen waste	12.36	10.8
garden waste	4.05	3.6
wood/timber	2.29	2.0
other (glass, plastic, textiles, sacks)	0.37	0.3
Internal:		
composting of garden waste	74.1	65.0
recycling of kitchen waste (compost/animal feed)	no POS data	no POS data
TOTAL	114.0	100.0

Table 5-10 shows that 69% of the recycled waste is garden waste with 65% being composted by the household and 4% being given away/sold, presumably for animal feed. Similarly, a high proportion of the recycled waste is kitchen waste (11%) which is given away/sold and probably used for animal feed or composting. The other major item recycled is glass/plastic bottles (14%).

d.2 Commercial Waste

d.2.1 Restaurants

Interviews with restaurant owners conducted during DIS found that normally Multinet collects waste from 4 of the 5 restaurants surveyed. The fifth restaurant owner pays a handcart operator to remove their waste but was unaware of where the waste was subsequently disposed. Scavengers regularly come to collect bottles and cans/tins from one restaurant while another gives away 10-15 kg/day of food remains/vegetable peelings to individuals who collect it for animal feed. Using this data and WACS composition data, it was calculated, as shown in Annex 8, that for these 5 restaurants, 93.1% of their waste is collected for subsequent disposal while approximately 6.9% is recycled (6.7% food waste and 0.2% bottles/cans).

These findings only apply to the 5 central city wards where Multinet was operating at the time WACS was conducted. In the other 34 wards in the Study area, collection of restaurant waste by handcart operators is thought to be common with the waste being dumped relatively close to the area from where it was collected, an idea supported by Tanzanian colleagues. Evidence for this was obtained during IDS as 5 of the 20 handcart operators interviewed stated that they collect some waste from restaurants in the Kariakoo, Gerezani and central city wards, which they subsequently dump at the Jangwani 1 dump site on Morogoro Road. Furthermore, waste is transferred approximately once per week from there to the Vingunguti disposal site, which means that most of the restaurant waste collected by handcart operators in these wards is eventually disposed of at the Vingunguti disposal site.

Although no firm conclusions can be made concerning the quantity of restaurant waste which is finally disposed at Vingunguti disposal site, it is assumed that all restaurant waste is disposed of as for the WACS sampling points; that is, 93% is collected for disposal at Vingunguti and 7% is recycled. This assumption is reasonable as according to DCC data in 1994, 236 restaurants were located in the 10

central city wards, all of which are now serviced by Multinet. The total number of restaurants in DSM in 1996 is 365.

d.2.2 Guesthouses/Hotels

Through interviews with the management of some hotels, Multinet and DCC disposal site staff, it was found that most of the large hotels have their waste collected by DCC, Multinet or by a private contractor. At least one tourist hotel has its own refuse disposal vehicle. For guesthouses, it is thought that the waste is either collected by handcart operators or burned in the immediate vicinity of the guesthouse. In order to calculate the waste stream, it is assumed that 100% of guesthouse/hotel waste is collected for subsequent disposal at Vingunguti.

d.2.3 Other

Normally, Multinet collects waste from the 5 enterprises selected as WACS sampling points in the central city area. Only one of these, a retail clothing store, recycled some waste, giving away some plastic bags, boxes/cardboard and clothes hangers to people requesting them. During the Recycling Survey, 3 out of another 14 shops interviewed stated that they regularly recycle some waste materials; usually boxes/paper, which is logical as paper constitutes 72% of commercial (other) waste by composition. Hence overall, 4 out of 19 shops or approximately 20% of shops recycle some waste materials. Assuming 10% of each shop's waste is recycled, then 98% of the waste produced is collected by Multinet for subsequent disposal at Vingunguti with 2% being recycled.

These findings are used for calculating the waste stream although strictly they only apply to the 5 central city wards in which Multinet is operating. Some other methods of disposal used by shops are summarised below.

In IDS, only one of the 20 handcart operators interviewed collected waste from shops in the Kariakoo and Gerezani wards. Presumably, this is because most shops produce small quantities of waste and it is more profitable for handcart operators to choose clients who produce a lot of waste. Some of the waste observed on the streets in the Kariakoo area appears to come from shops while in other parts of the city, many shop owners have been observed burning small piles of waste early in the morning outside their shops.

d.3 Institutional Waste

Of the 5 institutions selected as WACS sampling points, four were located within the central city area with Multinet collecting their waste while the fifth institution was situated on a larger piece of land in Gerezani and used self disposal (pit/burning). None of these institutions practise any recycling apart from internal reuse of paper. Hence, 80% of these institutions' waste is collected and 20% is self-disposed.

DCC refuse collection vehicles collect some waste from institutions and many of the larger institutions have their own waste disposal vehicle (e.g. NBC, TTCL) or hire a private contractor to dispose of their waste at Vingunguti. Other institutions without their own vehicles and not serviced by either Multinet or the DCC may use self disposal if the size of their premises allows it. Very few institutions are thought to dispose of their waste by illegal dumping.

For the purpose of calculating the waste stream the DIS data is used: 80% of institutional waste is collected for disposal at Vingunguti while the remaining 20% of waste is properly self disposed.

d.4 Market Waste

According to the market survey conducted in May 1996 (see P/R (1)) most of the market waste in the 19 markets surveyed is collected by the DCC at intervals varying from daily to over one month. The exception is Kariakoo market, which hires private contractors to remove its waste for disposal at Vingunguti. Some market waste is recycled. At both Kariakoo and Tandika markets, grass and cabbage leaves are taken for cattle feed while. At Kisutu market, chicken droppings are taken at no cost by people to use as fertiliser, and at Ferry Kivukoni market, offal from the fish gutting process is collected, washed, dried and sold for chicken and pig food. However, relative to the amount of waste produced by the markets the percentage of market wastes that is recycled is negligible. Hence, it is assumed that all market waste is collected for subsequent disposal at Vingunguti.

d.5 Street Sweeping and Trunk Road Maintenance Waste

Multinet has stated that 100% of its street sweeping waste is collected for disposal at Vingunguti. Waste from trunk road maintenance operations is not being included in the present waste stream as explained in section 3.2.

d.6 Informal Sector Waste

It is assumed that 80% of the waste from informal sector operations based outside of the home and considered in this Study is disposed of by illegal dumping. The remaining 20% is assumed to be discharged for subsequent collection, probably at market waste collection points, or removed by handcart operators.

d.7 Summary

Table 5-11 summarises the waste generation amounts for each source and the quantities estimated as being disposed by each method.

Table 5-11: Summary of Amounts of Waste Disposed by Different Methods

Type of Waste	Self Disposal	Discharge	Illegal Dumping	Recycling	Total
Household	651.3	172.9	478.1	114.0	1416.3
Commercial					
* restaurant	0	12.7	0	1.0	13.7
* guesthouse/hotel	0	1.6	0	0	1.6
* other	0	11.8	0	0.2	12.0
Institution	2.1	8.6	0	0	10.7
Market	0	33.9	0	0	33.9
Street Sweeping	0	1.3	0	0	1.3
Informal Sector	0	56.5	226.2	0	282.7
TOTAL	653.4	299.3	704.3	115.2	1772.2

e. Self disposed Waste Amount

The 60 households selected as WACS sampling points were interviewed during DIS. For each household practising self disposal, independent assessments of the self

disposal status (proper and improper) were made by the interviewee and interviewer at the same time. From the data collected, it was estimated that 60% of households are practising proper self disposal as explained in Annex 8. Institutions are the only other source of self disposed waste and it was assumed that all institutions are practising proper self disposal. Table 5-12 summarises the total amounts of waste disposed of by proper and improper self disposal from each source and overall.

Table 5-12: Self Disposal of Waste

Unit: t/d

Method of Self disposal	Household	Institution	Total
Proper	390.8	2.1	392.9
Improper	260.5	0	260.5
TOTAL	651.3	2.1	653.4

f. Final Disposal Amount

f.1 Estimated Final Disposal Amount (Phase 2)

In Phase 2 of this Study, the final waste disposal amount for municipal solid waste (MSW) was estimated from Vingunguti disposal site records for 1996. During 1996, no weighbridge was installed at Vingunguti disposal site. Each day, a record of the number of trips made by the DCC, Multinet, and various categories of direct haulage vehicles was kept. The trip data was subsequently converted to tonnes based on estimates of the tonnage carried by different vehicles. For analysis purposes, all vehicles bringing waste to the disposal site were divided into four categories:

1. DCC
2. Private Contractors: authorised private refuse collection contractors - Multinet, Mazingira, Alyson's Traders and Kimangele.
3. Direct Haulage: all vehicles belonging to the generator or generator's agent which bring waste directly to Vingunguti disposal site. This includes Kariakoo market (KMC), institutions (NBC, TTCL) and other (individuals, office/commercial, unidentified) but industrial direct haulage vehicles are specified separately in (4).
4. Industry: direct haulage vehicles bringing industrial waste such as from THA and TCC. These are specified separately from (3) as industrial waste is outside the scope of this Study and should not be included in the final disposal amount for MSW.

Data was collected for:

1. The six month period from January - June 1996 inclusive.
2. The period when the WACS was carried out: June 19-25, 1996 inclusive.

In both cases, data from industrial vehicles was included but was excluded from calculation of the final disposal amount for MSW.

The average daily number of trips and average daily tonnage of waste were calculated for different periods as set out below using this data:

Table 5-13: Comparison of Average Trip and Tonnage Data for Different Periods

Period	Average Daily Number of Trips (trips/d)	Average Daily Tonnage of Waste (t/d)
Six months (Jan. - Jun. 1996)	40	115.6
June 1996	40	121.4
WACS (June 19-25, 1996)	47	145.1

The six month and June averages are considered to be lower than the true daily average values for several reasons, including the poor performance of Multinet in February 1996 due to management changes and seasonal decreases in the number of trips made during the long rains (April and May). Hence, it was decided to use the WACS average daily tonnage figure of 145.1 t/d as the estimated final disposal amount and the complete WACS data for the period June 19-25, 1996, is reproduced in Table 5-14.

Table 5-14: Disposal Site Data during WACS

Date	DCC		Multinet		Direct Haulage		Industrial		Total (excluding industrial)	
	Trips	wt. (t)	Trips	wt (t.)	Trips	wt (t.)	Trips	wt (t.)	Trips	wt (t.)
Wed, Jun 19	15	60	23	69	7	12	3	12	45	141
Thu, Jun 20	27	108	24	72	14	31	7	16	65	211
Fri, Jun 21	19	76	24	72	12	16	7	19	55	164
Sat, Jun 22	1	4	23	69	5	10	4	13	29	83
Sun, Jun 23	0	0	12	36	2	4	3	9	14	40
Mon, Jun 24	21	84	24	72	12	21	6	18	57	177
Tue, Jun 25	27	108	23	69	11	23	8	26	61	200
Total	110	440	153	459	63	117	38	113	326	1016
Daily Avg.		**62.9**		**65.6**		**16.7**		**16.1**	**47**	**145.1**

This figure was increased by 15%, as explained in Annex 8, to allow for waste disposed outside of official opening hours, giving an estimated final disposal amount for MSW of 166.9 t/d.

The complete data for the six-month period and more detailed explanations are set out in Annex 8.

f.2 Weighbridge Measurement of Final Disposal Amount

Following the installation of a weighbridge beginning operation in February 1997, weighbridge data was obtained for the period 11-28 February 1997 inclusive in order to check the validity of the final disposal amount estimated in section f.1. This data is summarised in Table 5-15.

Currently, the weighbridge is operated from 9am - 4pm by the DCC although refuse collection trucks are able to enter the disposal site 24 hours per day due to the absence of a gate. The measured data was revised as shown in Table 5-15 to take into account waste brought to the disposal site outside weighbridge opening hours as follows:

1. DCC vehicles bring waste for disposal within the official opening hours. No correction is made in this case.

2. Multinet is the main customer bringing waste to the disposal site outside these opening hours as Multinet vehicles are working from 7am - 9pm. The average number of trips made by a single Multinet vehicle recorded by the weighbridge is approximately two per day. It has been assumed that each vehicle makes one extra unrecorded trip on average per day, bringing the total number of trips per vehicle to three. In other words, the actual number of trips and waste amount brought by Multinet vehicles has been increased by 50%.

3. It was also suspected that Kariakoo market (KMC) may be making some unrecorded trips for, as stated in Annex 8, the number of trips per day made by KMC was consistently understated in DCC records for February and June 1996 by 26 and 31% respectively. Following the installation of the weighbridge, the average number of trips made by KMC recorded by the weighbridge is 3.3. According to KMC records, an average of 4 trips/day is made for market waste removal. Hence, the total daily number of trips has been increased to 4, equivalent to an increase of 20%.

4. Table 5-15 shows that the daily amount of waste brought by other vehicles is small. From experience, the majority of these vehicles operate within official opening hours. For these reasons, any extra trips made by other vehicles have been ignored.

These revisions increase the final disposal amount for the 18 day period from 2,344 to 2,645 tonnes, an increase of 13%, which is consistent with the 15% figure used in section f.1 to account for unrecorded waste.

Table 5-15: Weighbridge data for 11-28 February 1997 inclusive

Disposal Site Customers	Measured Data		Revised Data		Revised Average	
	Trips	Tonnes	Trips	Tonnes	Trips/d	Tonnes/d
DCC	418	1,212	418	1,212	23.2	67.3
Private Contractor						
* Multinet Africa	249	543	374	815	20.8	45.3
* Mazingira	39	75	39	75	2.2	4.2
* Alyson's Traders	6	10	6	10	0.3	0.6
* Kimangele	20	27	20	27	1.1	1.5
Direct Haulage						
* KMC	59	146	71	175	3.9	9.7
* NBC	7	9	7	9	0.4	0.5
* TTCL	4	6	4	6	0.2	0.3
* Individual	175	253	175	253	9.7	14.1
Industrial						
* THA	24	42	24	42	1.3	2.3
* TCC	26	21	26	21	1.4	1.2
Total	1,027	2,344	1,164	2,645	64.5	147.0
Final Disposal Amount	(MSW)					143.5

Comparison of the weighbridge measured data with the conversion factors used by the DCC for tonnage of waste for different vehicles (see Annex 8) shows that there are errors in the conversion factors, most of which are higher than the actual tonne/trip values for different vehicles. Hence, the weighbridge final disposal amount will be used in the waste stream as it is based on actual measurements rather than these approximate and erroneous conversion factors.

The revised final disposal amount is 147.0 t/d. Industrial waste of 3.5 t/d has been included in Table 5-15 above but has been subtracted from the final waste disposal amount to get a final disposal amount for MSW of 143.5 t/d.

In section g.3, it is calculated that 2.1 t/d of waste is recycled from the final disposal amount. Hence the final disposal figure after recycling is 143.5 - 2.1 = 141.4 t/d.

g. Recycled Waste Amount

The waste stream model shows five points at which recycling can take place. These are each discussed below with the recycling waste amount being calculated in each case.

g.1 Generation

Table 5-11 lists the quantities of waste recycled at the generation point from various sources. The total amount recycled is 115.2 t/d of which 99.0% is household waste, 0.9% is food waste recycled from restaurants and 0.1% is recycled office waste (mainly paper, boxes).

Of the household waste, Table 5-10 shows that 65% of the recycled household waste is garden waste, which is internally recycled to make compost, and the remaining 35% is household refuse which is recycled externally. For recycled household refuse and shop/restaurant waste, it is usually given away or sold to collectors of recyclable items although a small proportion is sold to other enterprises (market stalls, shops, scrap dealers, etc.).

g.2 Collection

After collection and before subsequent disposal, some of the collected waste is recycled. The handcart operators and dump truck crews have been observed on many occasions sorting the waste as it is loaded into their vehicles/carts with recyclable materials being put to one side. The amount of materials recycled in this manner is small. Furthermore, usually when the vehicle/handcart arrives at the disposal site (Vingunguti in the case of DCC/Multinet trucks; mainly illegal dumping places for handcarts) the sorted materials are given/sold to scavengers/middlemen operating at these places. The amount of waste recycled in this way is considered to be included in the recycled waste amounts for final disposal and for discharge as explained below.

g.3 Final Disposal

The recycled waste amount from Vingunguti disposal site was estimated using three methods as explained in Annex 8 and the results are presented in Table 5-16. The average quantity for each item is calculated and summed to get the total recycling amount of 2.1 t/d (range = 1.1-2.6 t/d).

Table 5-16: Comparison of Estimated Recycled Amounts for Different Items and Calculation of the Recycled Waste Amount

Unit: kg/d

Item	bo	ct	fo	hu	me	pa	pl	pt	sa	ty	wo	oth	Total
SIS	87	132	---	200	162	1,256	62	6	126	15	147	---	2,193
MIS	---	120	83	---	433	1,765	(4)	---	(9)	---	117	41	2,572
SWAS	76	165	5	75	136	233	36	34	17	7	260	29	1,073
Avg.	82	139	44	138	244	1,086	49	20	72	11	175	35	2,095

Note:

1. SIS = Scavenger Interview Survey; MIS = Middleman Interview Survey; SWAS = Scavenger Waste Amount Survey.
2. Items in brackets are excluded from calculation of average amounts.
3. bo = glass bottle; ct = cans/tins; fo = food leftovers; hu = cereal/rice husks; me = other metal; pa = paper; pl = plastic; pt = paint; sa = sack; ty = tyre; wo = wood; oth = other.

2.1 t/d is the amount of waste recycled from all waste brought to the disposal site (143.5 t/d of MSW and 3.5 t/d of industrial waste). For the waste stream determination, it is required to determine the amount of waste recycled from the final disposal amount for MSW alone. This is done on a pro rata basis to give 2.05 t/d, which is reported here as 2.1 t/d.

In Annex 8, estimated maximum amounts of recycled items present in the waste disposed at Vingunguti are tabulated. The average recycled amounts calculated above are much lower than these theoretical maximum amounts. For example, for glass, metal and paper, the quantities calculated above are 0.08, 0.38 (cans/tins and other metal) and 1.1 t/d respectively while the corresponding maximum amounts are 3.2, 2.2 and 11.7 t/d. Thus the recycled quantities for these items constitute 3, 17 and 9% of the maximum amounts respectively.

g.4 Discharge

The collection of recyclable items (scavenging) after discharge does occur before the waste is collected, particularly in the case of waste that is:

- deposited outside of a house for subsequent collection
- deposited at a collection point including those in markets

In these cases, there is usually sufficient time and access for scavengers to examine the waste and collect recyclable materials before it is subsequently collected. In other cases, (e.g. waste generators hand their waste directly to DCC/Multinet/other private contractors or to handcart operators) scavenging is not possible.

While undertaking the scavenging, recycling and illegal dumping surveys, efforts were made to locate and interview scavengers searching for recyclable materials at discharge points. However, although people were seen engaged in such activity on many occasions when passing through the city, particularly in residential areas, only two scavengers were interviewed. Consequently, the recycling waste amount at discharge was estimated by:

- amending the discharge waste amount from 299.3 t/d to 216.8 t/d to take into account the amount of waste which is collected immediately following discharge and can not be scavenged at this point

- assuming that the amount of waste recycled from a point is proportional to the total amount of waste disposed at that point and available for scavenging for discharge, illegal dumping and final disposal points. Thus if 2.1 t/d is recycled at Vingunguti from a total of 143.5 t/d and 216.8 t/d is the discharge waste amount available to scavengers, this gives a recycling waste amount of 3.1 t/d at discharge

g.5 Illegal Dumping

The amount of waste recycled from illegal dumping sites was calculated using the same approach as above based on the total illegal dumping waste amount from generation of 704.3 t/d (i.e. all of the illegally dumped waste at generation is available for scavenging). The amount of recycled materials collected from the collection waste amount which is illegally dumped was ignored as this is considered to be included in the recycled waste amount of 3.1 t/d at discharge calculated in section g.4. Using the final disposal data and on a pro rata basis, this gives a recycling waste amount of 10.1 t/d from illegal dumping points.

g.6 Summary

The recycled waste amounts at different points of the waste stream are summarised below.

Table 5-17: Summary of Recycled Waste Amounts

Component	Type of Scavenger	Recycled Waste Amount (t/d)	Estimated no. of scavengers
Generation	household collector	39.3	843
Discharge	scavenger	3.1	67
Illegal Dumping	dump scavenger	10.1	217
Final Disposal	dump scavenger	2.1	45
Total		54.6	1172

Note: The recycled amount from households (to household collectors and shops) is 39.9 t/d (Table 5-10) of which 95.5% = 38.1 t/d is collected by recycle collectors. From Table 5-11, 0.2 and 1.0 t/d of waste is collected from shops and restaurants respectively by recycled collectors, giving a total of 39.3 t/d collected from generation points as shown above.

A check on the validity of these results can be made by calculating the number of scavengers from the total amount of recycled waste. By 'dividing' the total amount of waste (54.6 t/d) by scavenger productivity, obtained at Vingunguti (46.6 kg of recycled waste/scavenger/day), gives a total of 1172 scavengers.

Kaseva and Gupta (1995) estimated that in 1993-95 there were 600 scavengers in DSM. Kironde (1995) asserted that this number was a gross underestimate. In this Study, it is thought that there are around 1000-1500 scavengers operating in DSM and hence the estimated number of 1172 is reasonable which supports the results obtained for recycling amounts at different points.

h. Collected Waste Amount

The discharged waste amount is 299.3 t/d. Referring to the waste stream model, after discharge the waste may either be collected or recycled. In the previous section, the recycled waste amount at discharge was estimated to be 3.1 t/d. Hence, the collection amount is 296.2 t/d.

i. Illegally Dumped Waste Amount

From the waste stream model, waste is illegally dumped by generation sources or after collection. The illegally dumped waste contributed by generators has been estimated to be 704.3 t/d.

After discharge, waste is usually collected by a vehicle (DCC, Multinet, direct haulage) or a handcart operator for disposal. Reference to the waste stream model shows that the collected waste is either disposed at an illegal dump or at the final disposal site or recycled. However, the quantity, which is recycled here, has been combined with that at the final disposal and illegal dumping sites as explained in section g.2. Hence the amount of waste which is illegally dumped after collection is equal to the waste collection amount less the final disposal amount = 296.2 - 143.5 = 152.7 t/d.

Adding these figures gives a total for illegal dumping of 857.0 t/d.

However, 10.1 t/d of waste is recycled from the illegally dumped waste amount. Hence, the illegally dumped waste amount after recycling is 857.0 - 10.1 = 846.9 t/d.

j. Waste Stream Summary

Table 5-18: Summary of Waste Stream Amounts

Unit: t/d

Waste Stream Component		Daily Generation Amount	
Component	Sub-component	Amount	Total
Generation	Household	1,416.3	
	Commercial	27.3	
	Institutional	10.7	
	Market	33.9	
	Street Sweeping	1.3	
	Informal Sector	282.7	1772.2
Discharge			299.3
Collection			296.2
Self disposal	Proper	392.9	
	Improper	260.5	653.4
Illegal Dumping	from Generation	704.3	
	from Collection	152.7	
	less Recycling	-10.1	846.9
Final Disposal	from Collection	143.5	141.4
	less Recycling	2.1	
Recycling	from Generation	115.2	
	from Discharge	3.1	
	from Illegal Dumping	10.1	
	from Final Disposal	-2.1	130.5

Figure 5-9 shows the current waste stream.

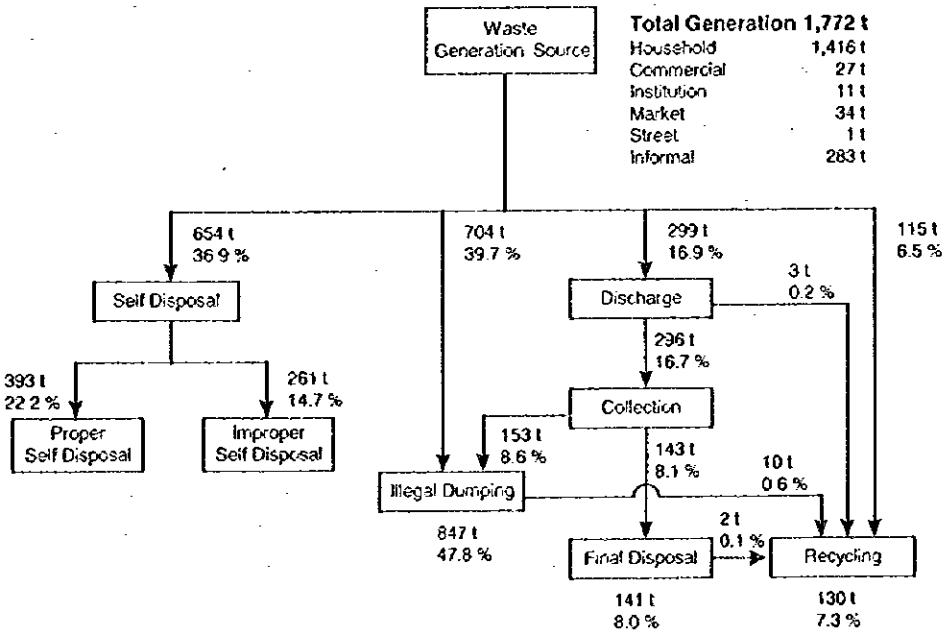


Figure 5-9: Waste Stream in DSM in 1996

5.4.2 Technical System

The present SWM technical system used in DSM is the simplest system, composed only of collection and transportation of waste with 7-8 tonne tipper trucks and landfilling, without any major intermediate treatment or recycling systems. The first priority objective of SWM is always to maintain sanitary conditions in the city by immediately removing waste generated from within the human living space. The present waste collection rate in DSM is however only 8.1% of total waste generation. Therefore, the first priority of the SWM in DSM should be given to the improvement of present collection, transportation and final disposal systems.

Some of the causes for the present low waste collection rate are due to lack of equipment and decrepit equipment, lack of spare parts and fuel. While the population in DSM has increased by 1.6 times and the average waste generation rate per capita per day has increased by 1.85 times from 377 g/cap/day to 698 g/cap/day between 1989-96. The only equipment procured during this period was six compactor trucks donated in 1991 by the Italian government. However, most of these were out of order within six months of their arrival due to their unsuitability for use in DSM.

The number of waste collection trucks operated by the DCC in February 1997 was approximately ten 8-tonne tipper trucks all donated in 1987 by the Japanese government. The fact that about 10 out of 33 trucks (30 tipper trucks and 3 skip trucks), still working after nine years implies that these trucks are appropriate for the inferior road conditions in DSM. Further the existing skills and technology for vehicle/equipment maintenance and repair have reached a satisfactory level.

The accumulation of market waste, caused by the irregularity of collection, is a critical problem. Presently, a wheel loader is used for loading market waste as all 3 skip trucks donated in 1987 are now not working. This is due to excessive use as the number of trips made by skip trucks was about 3 times greater than for tipper trucks and they were in very bad condition nine years after arrival. It was not because the skip trucks were inappropriate for the conditions in DSM.

Few environmental protection measures are being taken at the Vinguguti landfill site even though it is located very close to a densely populated residential area. Therefore, many residents are being forced to suffer from odour and vector (flies, mosquitoes, rats) problems produced by the landfill and also pollution (e.g. vibration, noise and dust) caused by refuse trucks. As the bulldozer at the landfill site is seldom working due to lack of fuel, even the spreading work of waste is not being carried out properly. This produces difficulties for refuse collection trucks when discharging waste at the landfill site.

The reserve volume of the landfill site as of 1st July 1996 was approximately 160,000 m^3, only enough for 1-2 more years use. Therefore, to acquire and to develop a new disposal site is an urgent issue because the World Bank due to associated environmental problems has rejected financing for the expansion of the existing landfill site.

Although recycling activities in DSM are not formally organised at all, the estimated recycling waste amount is about 130 t/d, which constitutes 7.3 % of total waste generation. This figure is deemed to be large and shows that the present recycling activity is in fact active, considering the composition of recyclable wastes is only

12 %. However, the rapid growth in the waste generation amount observed during the last seven years implies that there is a necessity to commence promotion of recycling activities as a control measure for waste generation.

The demand for street sweeping works has increased greatly recently with the improvement of the road network. However, the capacity and organisation related to street sweeping works has not kept pace with the road improvements. It is necessary to improve the street sweeping system to maintain roads and also associated drainage and sewerage systems.

5.4.3 Institutional System

The institutional system of the solid waste management sector in Dar es Salaam city is very weak and outdated. This situation has been identified in previous reports and a great emphasis has been placed on its restructuring. Presently, this institutional system is in a transition phase with the private sector assuming a more important role than before, due mainly to the complete failure of the DCC solid waste management system to carry out its duties.

This transitional situation is also due to changes in the higher levels of the municipal government. It is now in the throes of an important administrative and political transition, following the disbandment of the City Council by the Prime Minister and its replacement with a temporary City Commission that is running the administrative and operational needs of Dar es Salaam. These dramatic changes were not part of any planned process but the government's response to what was perceived to be a crisis.

Although, the involvement of the private sector in solid waste management is increasing, its participation is not framed within a clear set of regulatory and control guidelines under a sound and stable policy. Instead, private sector involvement to date has been subject to misunderstandings and setbacks, but at least some service is being provided to areas of the city, which were either very poorly serviced before or not serviced at all.

The level of human resources in this institutional system is very limited, in terms of knowledge of solid waste management and public administration in general, as frequently is the case in most cities in Africa, not to say in many developing countries.

The final result of this situation is an institutional system in shambles and a very poor provision of SWM services throughout the city.

It should be observed that many studies have been done by foreign aid agencies in order to improve the performance of the solid waste management sector in Dar es Salaam. None, however, have given a clear and strong emphasis on building an adequate and reliable institutional system able to cope with the complexities, constraints and barriers of the situation found in Dar es Salaam.

This issue is being addressed now, since it has been understood that without a strong and sound institutional model any technical improvements will not be sustainable in the long term.

5.4.4 Changes in 1996, During the Study Period

a. Dissolution of DCC and Privatisation - Phase II

In December 1995, the Prime Minister instructed the DCC to clean the city within six months, due to the highly unsanitary conditions in the city, which were mainly due to uncollected waste. The DCC together with SDP and City Council members responded by taking several actions, including expansion of the privatised refuse collection system to cover 25 wards. This was the only feasible option for the DCC to pursue due to its lack of resources.

In May 1996, following revision of the contract, the tendering for refuse collection from 25 wards in DSM, including the 5 wards where Multinet was operating, took place. Two contractors (Multinet and Mazingira) were successful.

However, little real progress had been made in cleaning the city when the 6-month period expired and the DCC was judged to have failed in its mission by the Prime Minister. The Prime Minister pointed out this fact as one of reasons for the dissolution of the City Council and dismissal of all the councillors in late July 1996.

Nevertheless, phase II of privatisation continues and Multinet and Mazingira began operation in July and August 1996 respectively.

b. Changes in the Technical System

There is no significant changes observed in the technical system since August 1996. The minor changes are summarised as follows.

- Since the City Commission took over the former DCC in June 1996, the DCC has been endeavouring to improve its refuse collection capability. The DCC tried to introduce a two sift work system but this trial failed because it led to reckless driving of refuse collection trucks. However, introduction of Sunday collection has being continued since July.
- Another minor change is that a skip container truck, which had been out of order, has been repaired through JICA's financial assistance. Therefore, the skip container collection system has been used in the parts of Kariakoo and Buguruni wards since early February and it makes an average of 5 trips per day.
- A modern computerised weighbridge has been working since 11 February 1997. All refuse collection trucks entering the Vinguguti landfill are being monitored with this system.
- Although the number of private refuse collection companies was increased from one to five in July 1996 with expansion of private collection areas, one of these companies had stopped its operation before February 1997. In addition the area serviced by Multinet Africa which has been working since 1994 was reduced from 10 to 5 wards, which is exactly the same number of wards they had been servicing until July 1996. Therefore, the increase in the waste collection amount achieved by the private refuse collection service expansion plan was found to be only 6 tonnes/day, equivalent to 4 % of the total refuse collection amount and 0.3 % of the total waste generation amount.

c. Changes in the Institutional System

c.1 Privatisation process

The privatisation process for solid waste management has gone another step with the awarding of several wards of the city to 5 other private operators, besides MULTINET AFRICA Ltd. which has been in charge of the central area since 1995.

Therefore, the situation now concerning privatisation of solid waste management services is the following:

Table 5-19: Contractors and Corresponding Wards

Name of Contractor	Wards serviced
Multinet Africa	Mchafukoge, Kivukoni, Kisutu, Upanga East, Upanga West [1]
Mazingira 1994 Environmental Protection Ltd.	Msasani, Kawe, Kinondoni , Mwananyamala, Manzese and Tandale
(Kamp Enterprises)	(Ubungo and Kagera markets)
Allyson Traders	Magomeni, Ndugumbi, Mzimuni
Kimangele Enterprises	Temeke, Magurumbasi and Keko markets.

Wards of Jangwani, Gerezani, Ilala, Kariakoo and Mchikichini were also assigned to Multinet. However, the company abandoned servicing these areas allegedly due to the unwillingness to pay of the residents of these wards.

Kamp Enterprises had stopped operation before February 1997.

Mazingira is presently providing refuse collection services on a point by point basis to the commercial section within three wards.

c.2 Privatisation process outcomes

A brief analysis of the privatisation process shows that, the private sector is not succeeding in the collection of refuse in their assigned areas, nor in collecting the RCCs (refuse collection charges).

From the reports of the private operators and from the report of the new weighbridge installed near Vingunguti, it can be shown that the amount of refuse collected is well below what has been previously expected to be, both by the DCC and by the private operators.

The main reason for this situation is the alleged difficulty in collecting RCCs. The resulting lack of funds makes the operating, maintaining, and improving the system extremely difficult.

Difficulties in collecting RCCs are attributed to:

- Lack of support from the DCC in making the citizens aware of the contracts with the private operators and the DCC, and therefore of their obligation to pay
- Lack of administrative measures from the DCC to attach the RCCs to the issuing of trade license.

- Lack of administrative measures from the DCC to take defaulters to court
- Lack of habit of the population to pay for refuse collection
- Low income of the population

Besides all this, it has been claimed also, by the private operators that the current charge is too low, being insufficient to cover the cost of services, which include refuse collection and sweeping paved roads in each assigned area.

A quick analysis of the payroll presented by the private operators shows that only the medium and large businesses and a few high income residential premises pay the RCCs.

c.3 Establishment of a Task Force on Refuse Collection Charges

In face of the difficulties of either the DCC or the private refuse collection operators to collect the RCCs, the Chairman of the City Commission set up a Task Force to propose ways and means to improve collection of the above mentioned charges.

The ongoing Task Force has already agreed that it should emphasise a simple and easy to implement short-term proposal, in order to improve RCC collection, a basic step to improve solid waste management in the city.

d. Financial Aspect

d.1 Concessionaires' Operations and RCC Collection

In order to provide better services in the future it is very important to learn from the past successes and failures of concessionaire operations, such as Multinet's withdrawal of services from Kariakoo and four other wards.

Experience has proven that the current system is unworkable for generating sufficient revenue to cover the costs of the services. Both Multinet and Mazingila suffer from extremely poor RCC collection rates. These two companies are supposed to periodically submit their operational reports to the DCC. Table 5-20 shows the RCC collection rates of these two companies from 1996. Details are shown in Table 5-21 and Figure 5-11.

Table 5-20: RCC Collection Rates of Multinet and Mazingila

Concessionaire	Invoiced Amount (Tsh.)	Paid Amount (Tsh.)	RCC Collection Rate (%)
Multinet	169,397,200	40,699,731	24.0
Mazingila	50,932,250	2,499,500	4.9

Source: Multinet and Mazingila Operational Report
Note: Multinet data is based on three-month operation from October to December 1996, and Mazingila data is based on three-month operation from August to October 1996.

Table 5-21: RCC Collection Rate of Private Concessionaires

Ward	Area	Concessionaire	Invoiced Amount Tsh.	Paid Amount Tsh.	RCC Collection % %
Mchafukoge	UA	Multinet	59,774,400	16,704,600	27.9
Kisutu	UA	Multinet	39,720,000	11,887,731	29.9
Kivukoni	UA	Multinet	58,750,000	8,499,800	14.5
Upanga East	UA	Multinet	* Note 3	* Note 3	* Note 3
Upanga West	UA	Multinet	11,152,800	3,602,600	32.3
Kawe	SUPA	Mazingila	3,490,000	62,500	1.8
Kinondoni	SUPA	Mazingila	5,567,000	63,500	1.1
Msasani	SUPA	Mazingila	11,640,000	2,080,000	17.9
Mwananymala	SUPA	Mazingila	3,851,000	62,500	1.6
Manzese	SUUA	Mazingila	21,479,250	217,000	1.0
Tandake	SUUA	Mazingila	57,180,050	0	0.0

Source: Multinet and Mazingila Operational Report
Note 1: Multinet reported three-month operation from Oct. 1996 to Dec. 1996
Note 2: Mazingila reported three-month operation from Aug. 1996 to Oct. 1996
Note 3: Upanga East has been reported being included into Upanga West.

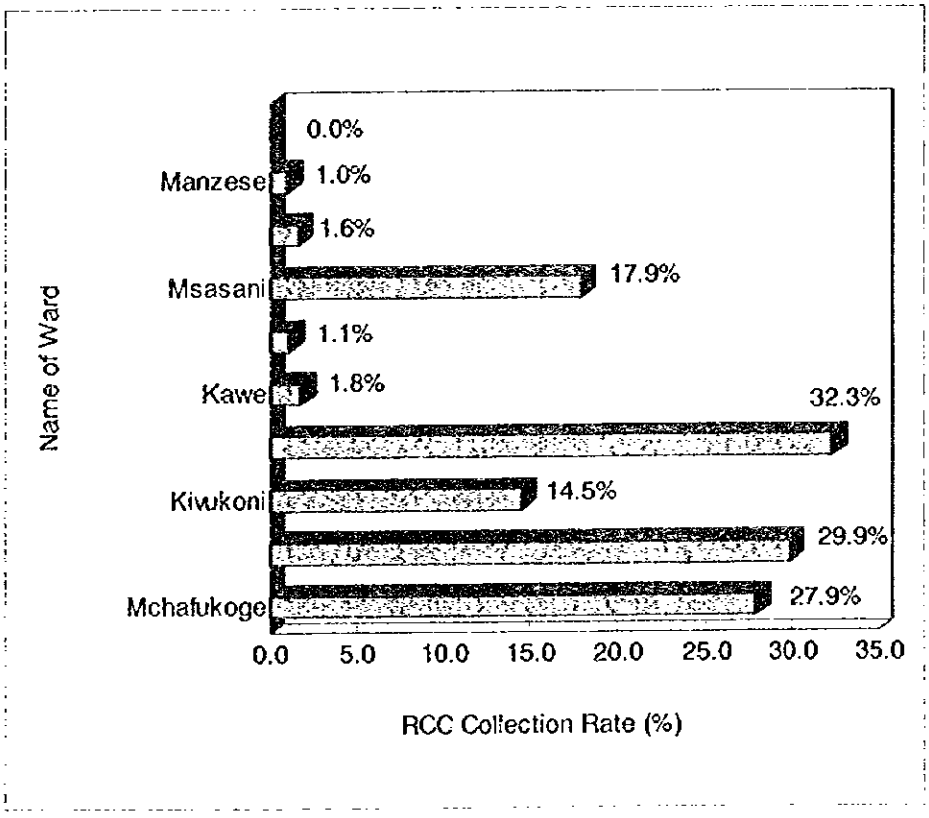


Figure 5-11: Latest RCC Collection Rates of Private Concessionaires

Mazingila's situation is much worse than Multinet's. Mazingila is presently providing services only to the commercial sector, on a spot basis. In fact, recent information from the Vinguguti dumpsite showed that Mazingila disposed only 26.28 tonnes of waste in 15 trips over 10 days from February 11th to February 21st. This is a substantial withdrawal from the concessionaire contract.

The following Table 5-22 clearly shows the reason for this substantial withdrawal by Mazingila. The table indicates that the original profit projection for 1997 was well off the mark and if the current RCC collection rate continues losses will be huge.

Table 5-22: Projection of Profit and Loss Statement of Mazingila

Item	Projected for 1997	Continuation of Status Quo in 1997
Income	388,884,000	11,997,000
Expenditure	356,507,820	356,507,820
Profit	32,376,180	-356,495,823

Source: Mazingila

Although these concessionaires are making efforts to improve RCC collection rates, they complain that, although the present by-law stipulates fines or imprisonment for the defaulters of RCC payment, it does not function without the strong administrative support of the DCC. Efforts by concessionaires include introducing computer management of customers and an incentive system for RCC collectors (See Table 5-23 and Figure 5-12). In summary, as far as the present RCC collection system under the concessionaire contract is concerned, it has been proved to be a failure.

Table 5-23: Incentives for Collectors of RCC

RCC per month	Mazingila	Multinet
0-9999	30000	30000
10000-19999	30000	30000
20000-29999	30000	30000
30000-39999	30000	30000
40000-49999	30500	30500
50000-59999	31000	31000
60000-69999	31500	31500
70000-79999	32000	32000
80000-89999	32500	34000
90000-99999	33000	34800
100000-109999	33500	35600
110000-119999	34000	36400
120000-129999	34500	39000
130000-139999	35000	40000
140000-149999	35500	41000
150000-159999	36000	42000

Source: Multinet and Mazingila

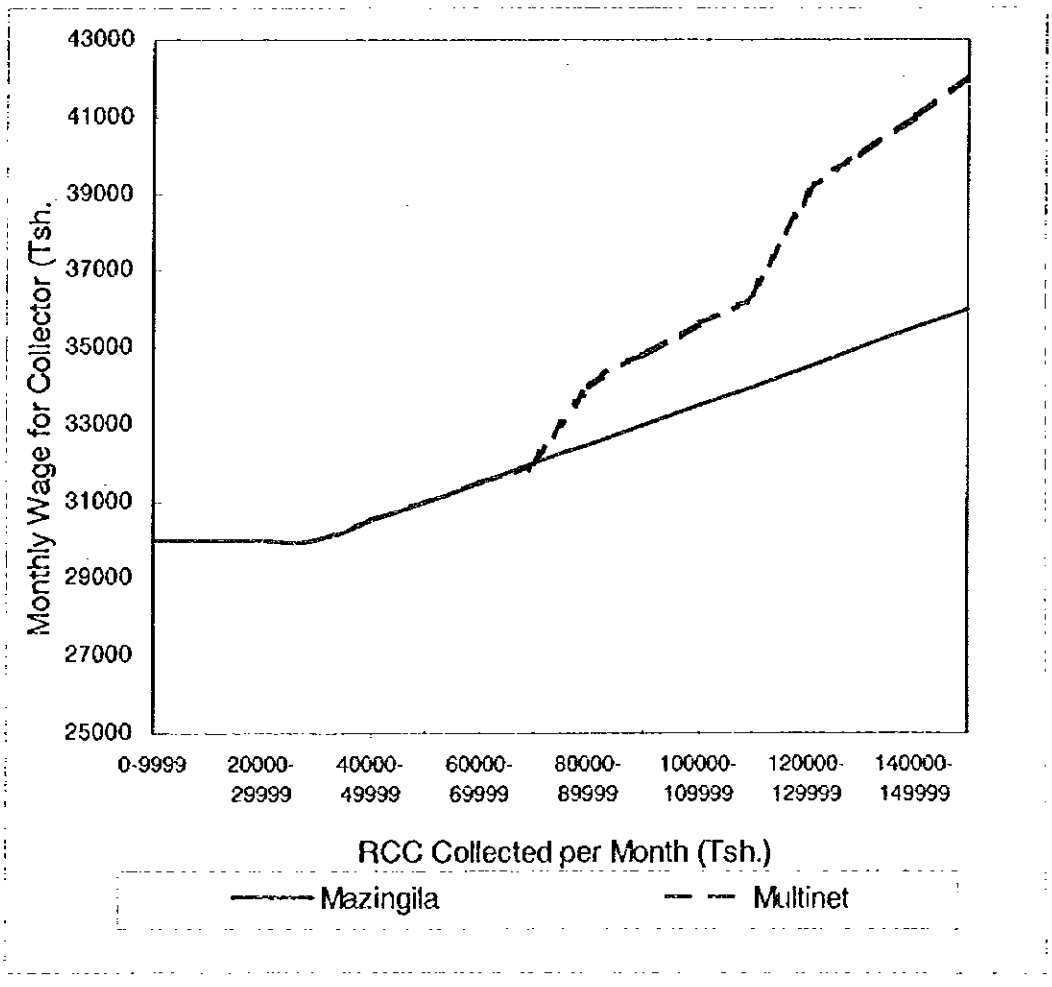


Figure 5-12: Incentive for Collection of RCC

d.2 Counter-Measures by DCC for Improvement of RCC Collection

d.2.1 Setting up the Task Force

In response to the poor collection rate of RCCs by the concessionaires and in an effort to improve the collection rate, the DCC set up the special task force for the improvement of the RCC collection rate. Members of the task force include the secretary to the Chairman, Health Commissioner, Finance Commissioner, Trade and Economy Commissioner, chief health officer, cleansing officer, head of DSSD, zonal directors of three districts, and the secretariat of SDP.

While the JICA Master Plan targets the period up until the year 2005, one of the main purposes of the task force is to cope with the short-term improvement of RCC collection and the shortage of revenue sources for the coming 2 or 3 years. Task force meetings have been held concerning this and the following are the major observations.

i. It is almost impossible to drastically increase the RCC collection rate under the present door-to-door direct billing system by the concessionaires.

ii. In order to cope with the shortage of revenue for solid waste management, some sort of special fund or special account based on the DCC's tax revenue sources, independent from the general account of the DCC, will be necessary. The possible additional revenue sources for the special fund would be from the development levy, property tax, petrol levy, city service levy, hotel levy, business licenses and market dues, all of which are related to the beneficiaries of the refuse collection services.

iii. The range of the special fund to cover the cost for the refuse collection is controversial. There are a couple of possible options for the coverage. The special fund is supposed to cover:

- all commercial and institutional wastes
- all household waste
- only wastes from the relatively poor areas

iv. In order to cope with the short-term plan, the task force proposed the short-term refuse collection improvement program. Table 5-24 and Figure 5-13 illustrate the target under this program, which is almost in line with the target under the initial stage of the Master Plan.

Table 5-24: Short-Term RCC Improvement Programme by SDP

Month/Year	SDP Target of Waste Collection (tonne per day)	JICA Target of Waste Collection (tonne per day)
04/97	300	416
05/97	300	416
06/97	300	416
07/97	400	416
08/97	400	416
09/97	400	416
10/97	400	416
11/97	400	416
12/97	400	416
01/98	500	537
02/98	500	537
03/98	500	537
04/98	500	537
05/98	500	537
06/98	500	537
07/98	600	537
08/98	600	537
09/98	600	537
10/98	600	537
11/98	600	537
12/98	600	537

Source: Estimate by JICA Study Team and SDP Secretariat

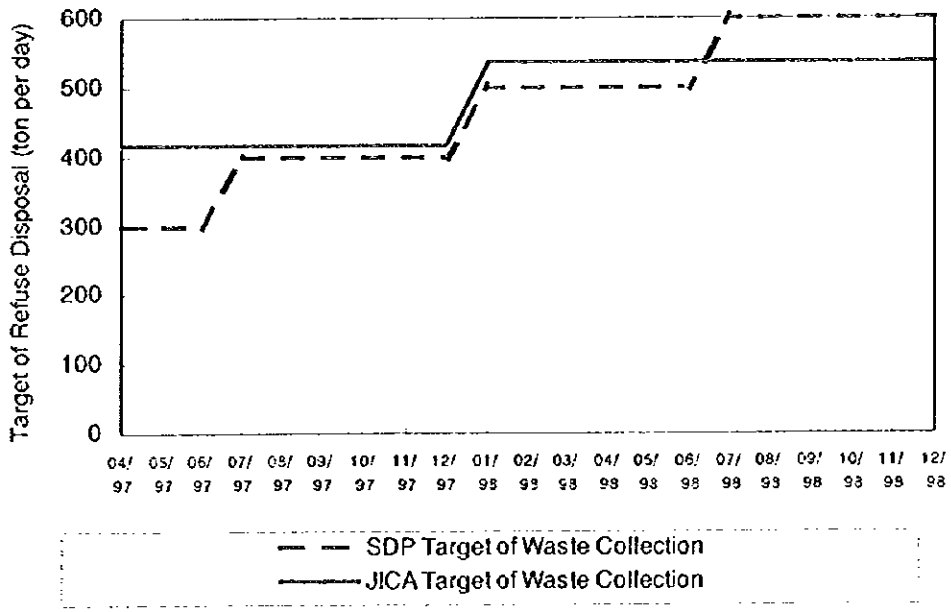


Figure 5-13: Short-Term RCC Improvement Programme by SDP

d.2.2 Revenue Increase Efforts by DCC

Since the task force seriously explores the possibility of the special account for solid waste management, the DCC's budget analysis, especially in terms of revenue sources, will be crucial. It is necessary to briefly overview the latest DCC budget in order to assess the possibility of setting up the special fund.

Table 5-26, Table 5-27 and Table 5-28 indicate the transition of the amount of DCC's revenue, the growth rate to the previous year and the composition share of each revenue sources, respectively.

The major observations from these data are:

a) Although in 1996 the subsidy from the central government was smaller than that of the previous year, in 1996, the tax revenue of the DCC rocketed from Tsh. 1.0 billion in 1995 to Tsh. 2.5 billion in 1996. The major contributors to this increase are development levy and property tax.

b) It is projected in the 1997 budget that the tax revenue will further significantly rise due mainly to increased collection of the development levy, property tax and newly introduced city service levy.

The following, Table 5-25, is a summary of the transition of the major revenue sources of the DCC's budget from 1995 to 1997.

Table 5-25: Transition of Major Revenue Sources from 1995 to 1997

Revenue Sources	1995 (Actual) Million Tsh.	1996 (Provisional) Million Tsh.	1997 (Budget) Million Tsh.	1996 Growth Rate %	1997 Growth Rate %
Development Levy	140.5	556.6	2,500.0	396.2	449.2
Property Tax	60.1	559.5	2,800.0	931.0	500.5
Petrol Levy	100.0	0.0	0.0	0.0	0.0
Service Levy	191.4	353.1	5,000.0	184.5	1416.0
Hotel Levy	80.5	113.7	158.9	141.2	139.8
Business Licenses	137.5	473.1	542.7	344.1	114.7
Market Dues	26.2	165.9	73.0	633.2	44.0

Source: DCC's Abstract of Budget for 1995 and 1996, and DCC's 1997 Budget

Table 5-26: Transition of DCC's Revenues (Amount)

unit : Tshs.

No.	Revenue Source	1993	1994	1995	1996 (Provisional)	1997 (Budget)
1	Development Levy	143,794,144	116,790,802	140,499,102	556,580,747	2,500,000,000
2	Business Licenses	167,926,450	107,465,203	137,493,974	525,695,053	542,720,000
3	Property Tax	128,107,934	111,900,361	60,122,294	559,490,000	2,800,000,000
4	Industrial Cess	27,992,979	78,607,561	191,407,718	353,141,371	5,000,000,000
5	Road License Fees	220,113,788	243,662,144	0	n.a.	n.a
6	Petrol Levy	2,790,660	0	100,000,000	0	100
7	Hotel Levy	76,464,434	68,679,251	80,480,103	113,710,073	158,860,000
8	Cesspit Emptying Fees	2,704,704	2,846,310	49,656,000	14,740,813	44,000,000
9	Taxi, Pick-up & Lorry Fees	22,907,700	9,027,360	27,720,860	n.a.	n.a
10	Advertising Fees	8,697,225	7,360,255	27,649,121	n.a.	n.a.
11	Market Dues	36,788,036	29,783,326	26,247,615	n.a.	n.a.
12	Building Plans Fees	16,699,431	11,322,300	18,914,145	n.a.	n.a.
13	School Fees	16,214,392	15,096,920	15,908,355	n.a.	n.a.
14	Intoxicating Liquor Licenses	12,706,352	13,968,222	15,166,350	n.a.	n.a.
15	Scaffolding Fees	5,827,943	12,956,155	14,217,084	n.a.	n.a.
16	Bus Stand Fees	5,033,000	407,225	13,580,000	n.a.	n.a.
17	Forestry Products Fees	1,549,342	10,362,773	11,914,030	n.a.	n.a.
18	UPE Contributions	12,333,755	6,862,565	11,266,176	n.a.	n.a.
19	Weighs and Measures Fees	6,568,000	12,210,530	11,231,145	n.a.	n.a.
20	Sales of Fish (5% commission)	3,653,700	5,072,678	9,469,943	n.a.	n.a.
21	Refuse Collection Charges	495,100	1,745,200	8,213,928	n.a.	n.a.
22	Motor Vehicle	6,153,380	797,750	6,547,960	n.a.	n.a.
23	By-Law fines	5,335,395	1,454,950	6,193,240	n.a.	n.a.
24	Entertainment Levy	13,310,135	7,928,246	5,016,942	n.a.	n.a.
25	By-Law Permits Charges	2,417,850	2,700,005	3,827,834	n.a.	n.a.
26	Medical Examination Fees	2,739,920	1,682,985	2,918,050	n.a.	n.a.
27	Abattoir Slaughter Fees	2,777,250	1,847,500	2,306,800	n.a.	n.a.
28	Water Pipe Installation Fees	2,710,660	1,737,250	2,252,000	n.a.	n.a.
29	Storm Water Drainage Fees	0	0	2,207,000	n.a.	n.a.
30	Cattle Market Charges	2,166,250	1,573,850	2,140,050	n.a.	n.a.
31	Inoculation/Vaccination Fees	2,284,200	2,384,850	1,896,950	n.a.	n.a.
32	City Building Rent	885,842	1,453,332	1,291,597	n.a.	n.a.
33	NHC Rent	3,078,519	249,607	1,686,641	n.a.	n.a.
34	Taxi Registration Fees	336,450	972,069	1,340,850	n.a.	n.a.
35	Burial Fees	116,400	109,500	1,896,950	n.a.	n.a.
36	Fire Services Fees	667,200	547,000	747,000	n.a.	n.a.
37	Stray Animals Fine	5,917,000	43,000	560,000	n.a.	n.a.
38	Local Liquor Licenses	1,356,550	681,900	531,400	n.a.	n.a.
39	Livestock Licenses	150,950	805,500	369,480	n.a.	n.a.
40	Valuation Fees	386,039	279,738	283,100	n.a.	n.a.
41	Cultural Games Fees	262,850	328,918	274,100	n.a.	n.a.
42	Fisheries Licenses	16,616,745	209,056	140,618	n.a.	n.a
43	Foreign Liquor Licenses	12,706,352	0	0	n.a.	n.a.
44	Playing Grounds Fees	50,000	0	30,500	n.a.	n.a.
45	Blood Drying Activity Fees	18,500	133,800	0	n.a.	n.a.
46	Ambulance Fees	0	0	0	n.a.	n.a.
47	Hunting Licenses	0	0	0	n.a.	n.a.
	Income from Tax Sub-Total	1,001,815,499	894,049,971	1,015,619,000	2,539,523,618	11,830,739,800
48	Bank Interest	0	0	4,422,536	0	400
49	Sales of Assets	11,052,000	1,152,000	1,602,800	0	50,000,300
50	Hire of Plants and Vehicles	507,725	416,000	1,124,500	0	0
51	Sales of Plants and Seeds	900,000	1,447,900	514,779	1,015,088	500,100
52	Repayment for Lost Asset	0	20,000	62,335	0	800
53	Sales of Identity Cards	253,100	258,220	28,000	1,044,493	900,000
54	Recovery of Public Fund	0	45,000	0	0	0
55	Other Incomes	9,620,147	3,712,164	80,488,103	6,851,029	70,200,300
	Other Incomes Sub-Total	22,332,972	7,051,284	88,243,053	8,910,610	121,601,900
56	Subsidies	2,034,115,582	2,095,370,868	4,972,309,853	3,370,386,064	7,893,555,400
57	Grand Total	3,058,264,053	2,996,472,123	6,076,171,906	5,918,820,292	19,845,897,100

Table 5-27: Transition of DCC's Revenue (Growth Rate to the Previous Year)

Unit %

No.	Revenue Source	1993	1994	1995	1996 (Provisional)	1997 (Budget)
1	Development Levy	n.a.	-18.8	20.3	396.1	449.2
2	Business Licenses	n.a.	-36.0	27.9	382.3	103.2
3	Property Tax	n.a.	-12.7	-46.3	930.6	500.5
4	Industrial Cess	n.a.	180.8	143.5	184.5	1415.9
5	Road License Fees	n.a.	10.7	-100.0	n.r.	n.r.
6	Petrol Levy	n.a.	-100.0	n.r	0.0	n.r
7	Hotel Levy	n.a.	-10.2	17.2	141.3	139.7
8	Cesspit Emptying Fees	n.a.	5.2	1644.6	29.7	298.5
9	Taxi, Pick-up & Lorry Fees	n.a.	-60.6	207.1	n.a.	n.a
10	Advertising Fees	n.a.	-15.4	275.7	n.a.	n.a
11	Market Dues	n.a.	-19.0	-11.9	n.a.	n.a
12	Building Plans Fees	n.a.	-32.2	67.1	n.a.	n.a
13	School Fees	n.a.	-6.9	5.4	n.a.	n.a.
14	Intoxicating Liquor Licenses	n.a.	9.9	8.6	n.a.	n.a.
15	Scaffolding Fees	n.a.	122.3	9.7	n.a.	n.a.
16	Bus Stand Fees	n.a.	-91.9	3234.8	n.a.	n.a.
17	Forestry Products Fees	n.a.	568.8	15.0	n.a.	n.a.
18	UPE Contributions	n.a.	-44.4	64.2	n.a.	n.a.
19	Weighs and Measures Fees	n.a.	85.9	-8.0	n.a.	n.a.
20	Sales of Fish (5% Commission)	n.a.	38.8	66.7	n.a.	n.a.
21	Refuse Collection Charges	n.a.	252.5	370.7	n.a.	n.a.
22	Motor Vehicle	n.a.	-87.0	720.8	n.a.	n.a
23	By-Law fines	n.a.	-72.7	325.7	n.a	n.a.
24	Entertainment Levy	n.a.	-40.4	-36.7	n.a.	n.a
25	By-Law Permits Charges	n.a.	11.7	41.8	n.a.	n.a.
26	Medical Examination Fees	n.a.	-38.6	73.4	n.a.	n.a.
27	Abattoir Slaughter Fees	n.a.	-33.5	24.9	n.a.	n.a
28	Water Pipe Installation Fees	n.a.	-35.9	29.6	n.a.	n.a.
29	Storm Water Drainage Fees	n.a.	n.r.	n.r.	n.a.	n.a
30	Cattle Market Charges	n.a.	-27.3	36.0	n.a.	n.a.
31	Inoculation/Vaccination Fees	n.a.	4.4	-20.5	n.a.	n.a.
32	City Building Rent	n.a.	64.1	-11.1	n.a.	n.a.
33	NHC Rent	n.a.	-91.9	575.7	n.a.	n.a.
34	Taxi Registration Fees	n.a.	188 9	37.9	n.a.	n.a.
35	Burial Fees	n.a.	-5.9	1632.4	n.a.	n.a
36	Fire Services Fees	n.a.	-18.0	36.6	n.a.	n.a.
37	Stray Animals Fine	n.a	-99.3	1202.3	n.a	n.a.
38	Local Liquor Licenses	n.a	-49.7	-22.1	n.a	n.a.
39	Livestock Licenses	n.a.	433.6	-54.1	n.a.	n.a.
40	Valuation Fees	n.a.	-27.5	1.2	n.a.	n.a.
41	Cultural Games Fees	n.a.	25.1	-16.7	n.a.	n.a.
42	Fisheries Licenses	n.a.	-98.7	-32.7	n.a	n.a
43	Foreign Liquor Licenses	n.a.	-100.0	n.r.	n.a.	n.a.
44	Playing Grounds Fees	n.a.	-100.0	n.r.	n.a.	n.a.
45	Blood Drying Activity Fees	n.a.	623.2	-100.0	n.a.	n.a.
46	Ambulance Fees	n.a.	n.r	n.r.	n.a.	n.a.
47	Hunting Licenses	n.a.	n.r.	n.r.	n.a	n.a.
	Income from Tax Sub-Total	n.a.	-10.8	13.6	250.0	465.9
48	Bank Interest	n.a.	n.r.	n.r.	n.a	n.a.
49	Sales of Assets	n.a	-89.6	39.1	n.a	n.a.
50	Hire of Plants and Vehicles	n.a.	-18.1	170.3	n.a.	n.a.
51	Sales of Plants and Seeds	n.a.	60.9	-64.4	n.a.	n.a.
52	Repayment for Lost Asset	n.a.	n.r.	211.7	n.a.	n.a
53	Sales of Identity Cards	n.a.	2.0	-89.2	n.a.	n.a
54	Recovery of Public Fund	n.a.	n.r.	-100.0	n.a.	n.a
55	Other Incomes	n.a.	-61.4	2068.2	n.a.	n.a
	Other Incomes Sub-Total	n.a.	-68.4	1151.4	n.a.	n.a.
56	Subsidies	n.a.	3.0	137.3	67.8	234.2
57	Grand Total	n.a.	-2.0	102.8	97.4	335.3

Table 5-28: Transition of DCC's Revenue (Composition Share)

No.	Revenue Source	1993	1994	1995	1996 (Provisional)	1997 (Budget)
1	Development Levy	14.4	13.1	13.8	21.9	21.1
2	Business Licenses	16.8	12.0	13.5	20.7	4.6
3	Property Tax	12.8	12.5	5.9	22.0	23.7
4	Industrial Cess	2.8	8.8	18.8	13.9	42.3
5	Road License Fees	22.0	27.3	0.0	n.a.	n.a
6	Petrol Levy	0.3	0.0	9.8	0.0	0.0
7	Hotel Levy	7.6	7.7	7.9	4.5	1.3
8	Cesspit Emptying Fees	0.3	0.3	4.9	0.6	0.4
9	Taxi, Pick-up & Lorry Fees	2.3	1.0	2.7	n.a.	n.a
10	Advertising Fees	0.9	0.8	2.7	n.a.	n.a
11	Market Dues	3.7	3.3	2.6	n.a	n.a
12	Building Plans Fees	1.7	1.3	1.9	n.a.	n.a
13	School Fees	1.6	1.7	1.6	n.a.	n.a
14	Intoxicating Liquor Licenses	1.3	1.6	1.5	n.a.	n.a
15	Scaffolding Fees	0.6	1.4	1.4	n.a.	n.a
16	Bus Stand Fees	0.5	0.0	1.3	n.a.	n.a
17	Forestry Products Fees	0.2	1.2	1.2	n.a	n.a
18	UPE Contributions	1.2	0.8	1.1	n.a.	n.a
19	Weighs and Measures Fees	0.7	1.4	1.1	n.a	n.a
20	Sales of Fish (5% Commission)	0.4	0.6	0.9	n.a.	n.a
21	Refuse Collection Charges	0.0	0.2	0.8	n.a	n.a
22	Motor Vehicle	0.6	0.1	0.6	n.a	n.a
23	By-Law fines	0.5	0.2	0.6	n.a	n.a
24	Entertainment Levy	1.3	0.9	0.5	n.a	n.a
25	By-Law Permits Charges	0.2	0.3	0.4	n.a	n.a
26	Medical Examination Fees	0.3	0.2	0.3	n.a	n.a
27	Abattoir Slaughter Fees	0.3	0.2	0.2	n.a	n.a
28	Water Pipe Installation Fees	0.3	0.2	0.2	n.a.	n.a
29	Storm Water Drainage Fees	0.0	0.0	0.2	n.a.	n.a
30	Cattle Market Charges	0.2	0.2	0.2	n.a.	n.a
31	Inoculation/Vaccination Fees	0.2	0.3	0.2	n.a.	n.a
32	City Building Rent	0.1	0.2	0.1	n.a.	n.a
33	NHC Rent	0.3	0.0	0.2	n.a.	n.a
34	Taxi Registration Fees	0.0	0.1	0.1	n.a.	n.a
35	Burial Fees	0.0	0.0	0.2	n.a.	n.a
36	Fire Services Fees	0.1	0.1	0.1	n.a.	n.a
37	Stray Animals Fine	0.6	0.0	0.1	n.a.	n.a
38	Local Liquor Licenses	0.1	0.1	0.1	n.a	n.a
39	Livestock Licenses	0.0	0.1	0.0	n.a	n.a
40	Valuation Fees	0.0	0.0	0.0	n.a	n.a
41	Cultural Games Fees	0.0	0.0	0.0	n.a	n.a
42	Fisheries Licenses	1.7	0.0	0.0	n.a.	n.a
43	Foreign Liquor Licenses	1.3	0.0	0.0	n.a.	n.a
44	Playing Grounds Fees	0.0	0.0	0.0	n.a.	n.a
45	Blood Drying Activity Fees	0.0	0.0	0.0	n.a.	n.a
46	Ambulance Fees	0.0	0.0	0.0	n.a	n.a
47	Hunting Licenses	0.0	0.0	0.0	n.a	n.a
	Income from Tax Sub-Total	32.8	29.8	16.7	42.9	59.6
48	Bank Interest	0.0	0.0	5.0	n.a	n.a.
49	Sales of Assets	49.5	16.3	1.8	n.a.	n.a.
50	Hire of Plants and Vehicles	2.3	5.9	1.3	n.a.	n.a.
51	Sales of Plants and Seeds	4.0	20.5	0.6	n.a.	n.a.
52	Repayment for Lost Asset	0.0	0.3	0.1	n.a.	n.a.
53	Sales of Identity Cards	1.1	3.7	0.0	n.a.	n.a.
54	Recovery of Public Fund	0.0	0.6	0.0	n.a.	n.a.
55	Other Incomes	43.1	52.6	91.2	n.a.	n.a.
	Other Incomes Sub-Total	0.7	0.2	1.5	n.a.	n.a.
56	Subsidies	66.5	69.9	81.8	56.9	39.8
57	Grand Total	100.0	100.0	100.0	100.0	100.0