Chapter 6

Pre-conditions for a Master Plan

6 Pre-conditions for a Master Plan

6.1 Siting the Future Disposal Sites

a. Background of Siting the Future Disposal Sites

There is only one existing official waste disposal site for DSM city, which is the Vingunguti disposal site operated by DCC. As it is only 10 km from the city centre, it is a convenient site in terms of waste transportation. However, nearby residents' complaints have been numerous since its opening, as it has produced many environmental problems such as public nuisance, odour, smoke, dust, vibration and traffic congestion due to the current crude dumping nature of operation and it being close to a densely populated residential area. Vingunguti road, which is used by refuse trucks access to the disposal site, is also used as a main community road for Vingunguti ward. Refuse trucks are increasing the congestion of this road which is narrow, unsealed and always very busy with pedestrians and vehicles.

As the reserve capacity of Vingunguti is very limited, the plan for funding for the extension of the site were rejected by the World Bank and it is very unlikely that any other donors will provide funds following this rejection[1]. Thus Vingunguti can be a cost effective and expedient solution but will not comply with long term environmental requirements. The development of new landfill sites is, therefore, a crucial and urgent issue.

The study team was informed of the six candidate sites, as shown in Table 6-1 and Figure 6-2, for final disposal by the DCC.

As for Kunduchi Mtongani Quarries, its indication was general and ambiguous. Therefore this site was regarded as two sites, Kunduchi Old MECCO quarry site and Kunduchi New MECCO[2] quarry site based on field reconnaissance.

Table 6-1: List of Candidate Sites

District	Candidate sites informed	Candidate sites studied	
Kinondoni	Kinzudi "B"	A-1	Kinzudi "B"
	Kunduchi Mtongani Quarries	A-2	Kunduchi Old MECCO quarry
		A-3	Kunduchi New MECCO quarry
Temeke	Mbagala behind St. Anthony (Mbagala) Sec. School	B-1	Mbagala behind St. Anthony (Mbagala) Sec. School
	Mbagala Kilungule	B-2	Mbagala Kilungule
	Mbagala Zakhem Sand Quarry	B-3	Mbagala Zakhem Sand Quarry
Ilala	Pugu Kajiungeni at the old ADUCO quarry	C-1	Pugu Kajiungeni at the old ADUCO quarry

[1] Privatisation of Solid Waste Collection and Road Sweeping Services in DSM, Manus Coffey, Jan. 1996
[2] MECCO: Mwananchi Engineering and Construction Company

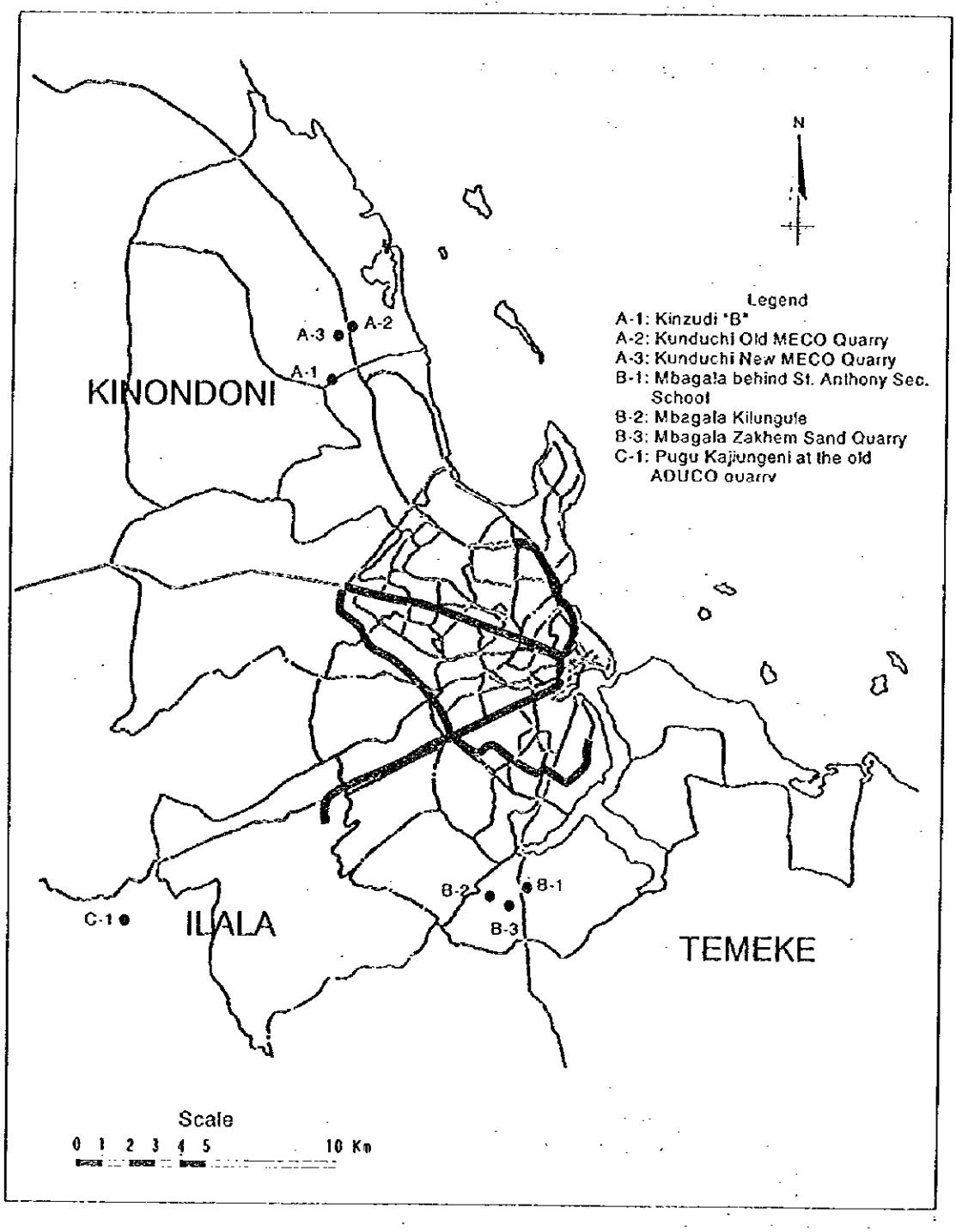


Figure 6-1: Location of Candidate Sites for Final Disposal

b. Proposed Sites for Future Disposal Sites

Seven candidate sites were investigated and evaluated for their possibilities and applicability for future disposal sites for DSM.

In the Kinondoni district, it was found that all three sites are more or less suitable for new disposal sites because three of them satisfied the critical requirements. However, as the result of overall evaluation, site A-3 , Kunduchi New MECCO quarry site, is concluded to be the most appropriate site for a new disposal site in terms of social, environmental, technical and financial aspects. Site A-3 is, therefore, recommended for the new disposal site for the Kinondoni district.

As for the Temeke district, none of the three candidate sites were found to be suitable for future disposal sites because none of them could satisfy the required capacity. In addition, all of them are not suitable from social and environmental aspects. Although Mbagala Kilungule was proposed as a disposal sites by the Master Plan in 1979, it was found from the field reconnaissance that Mbagala has little potential as a future disposal site at present because the situation has changed completely since 1979 due to an increase in inhabitants. It is, therefore, recommended that DCC continues to look for appropriate sites for the south district in Charambe, Toangoma, and Kipawa wards instead of Mbagala ward.

In the Ilala district, only site C-1 , Pugu Kajungeni site at the old ADUCO quarry was investigated. Although this site was rejected due to its small capacity, it was realised during the field reconnaissance that Pugu ward has a high potential for future disposal sites. It is recommended that DCC should continue to look for suitable disposal sites in Pugu ward for the west district.

It was concluded that only site A-3 , Kunduchi New MECCO quarry site, was recommended as the new disposal site examined in the feasibility study conducted in the third phase in this study. This recommendation was officially adopted by DCC at the Interim Report meeting on 20th December 1996.

However, the existing consensus that each district should have a disposal site shall be respected for the SWM Master Plan because its concept is very reasonable and appropriate.

6.2 Forecast of Future Waste Amount and Composition

6.2.1 Population Forecast

Because of the absence of official population estimates, the Study Team conducted an independent forecast of the DSM population based on the following assumptions:

- The average annual population growth rate of each ward in DSM until the year 2005 is assumed to remain at the level it was for the 1978-88 period, based on two relevant studies: Environmental Profile of the Metropolitan Area, 1992 (SDP), and Urban and Housing Indicators Study for DSM City, 1995 (Centre for Human Settlements Studies, Ardhi Institute), and as recommended by several knowledgeable people consulted in the course of this study.

- The population density of each ward shall not exceed 40,000 persons per km^2. This assumption was based on the accuracy of the projection for Jangwani. Jangwani was projected to have a population density of at least 40,000 persons per km^2. The surveyed population density in 1988 was over 30,000 persons/km^2.

Figure 6-2 and Table 6-2 show the population forecast until the year 2005 based on the above assumptions.

Table 6-2: Population Forecast for the Study Area

Category	Name	District	Area (km^2)	1996	1999	2,002	2005
	Kariakoo	Ilala	0.7	13,396	13,720	14,052	14,392
	Kisutu	Ilala	0.6	8,698	8,829	8,962	9,098
	Kivukoni	Ilala	1.7	5,502	5,552	5,602	5,653
UA	Mchafukoge	Ilala	0.6	7,037	6,543	6,083	5,655
	Upanga East	Ilala	1.3	11,048	11,552	12,080	12,632
	Upanga West	Ilala	1.0	11,199	11,266	11,334	11,402
	Sub-total		**5.9**	**56,880**	**57,463**	**58,113**	**58,831**
	Gerezani	Ilala	0.9	7,309	7,244	7,179	7,114
	Ilala	Ilala	3.6	38,863	40,399	41,995	43,654
	Jangwani	Ilala	0.4	13,554	14,047	14,559	15,090
	Kawe	Kinondoni	22.4	92,458	122,057	161,133	212,718
	Kinondoni	Kinondoni	3.1	59,362	67,353	76,421	86,709
	Kurasini	Temeke	8.3	39,560	45,796	53,015	61,371
SUPA	Magomeni	Kinondoni	1.4	19,603	20,681	21,818	23,018
	Mchikichini	Ilala	0.6	17,347	18,301	19,307	20,369
	Miburani	Temeke	4.2	76,465	77,850	79,260	80,695
	Msasani	Kinondoni	17.5	88,792	109,079	134,002	164,619
	Mwananyamala	Kinondoni	6.0	107,127	124,013	143,561	166,190
	Tabata	Ilala	19.1	106,587	205,690	396,936	764,000
	Temeke 14	Temeke	4.8	109,328	117,047	125,310	134,157
	Sub-total		**92.3**	**776,356**	**969,557**	**1,274,494**	**1,779,702**
	Buguruni	Ilala	2.4	66,029	74,274	83,548	93,980
	Keko	Temeke	3.2	50,622	53,879	57,345	61,034
	Kigogo	Kinondoni	1.6	26,059	28,145	30,398	32,832
	Kipawa	Ilala	10.1	70,890	90,546	115,654	147,724
	Mabibo	Kinondoni	11.1	67,903	78,612	91,004	105,348
	Makurumula	Kinondoni	3.3	88,021	105,727	126,995	132,000
	Manzese	Kinondoni	3.5	91,560	111,224	135,111	164,128
SUUA	Mbagala	Temeke	26.0	115,758	171,050	252,752	373,478
	Mtoni	Temeke	2.3	94,841	92,000	92,000	92,000
	Mzimuni	Kinondoni	1.5	27,664	29,185	30,790	32,483
	Ndugumbi	Kinondoni	1.1	41,792	44,000	44,000	44,000
	Tandale	Kinondoni	3.0	116,392	120,000	120,000	120,000
	Vingunguti	Ilala	8.5	53,697	63,954	76,170	90,720
	Yombo Vituka	Temeke	17.1	51,782	85,947	142,655	236,779
	Sub-total		**94.7**	**963,016**	**1,148,544**	**1,398,422**	**1,726,505**
	Goba	Kinondoni	44.3	2,177	1,624	1,212	904
	Kigamboni	Temeke	28.0	35,965	40,573	45,770	51,634
	Kunduchi	Kinondoni	53.6	38,785	47,381	57,881	70,708
RA	Ubungo	Kinondoni	63.2	80,720	98,886	121,140	148,401
	Ukonga	Ilala	42.2	73,141	87,607	104,933	125,685
	Vijibweni	Temeke	15.7	3,189	3,465	3,764	4,089
	Sub-total		**247.0**	**233,978**	**279,535**	**334,699**	**401,422**
Total			439.9	2,030,231	2,455,099	3,065,729	3,966,460

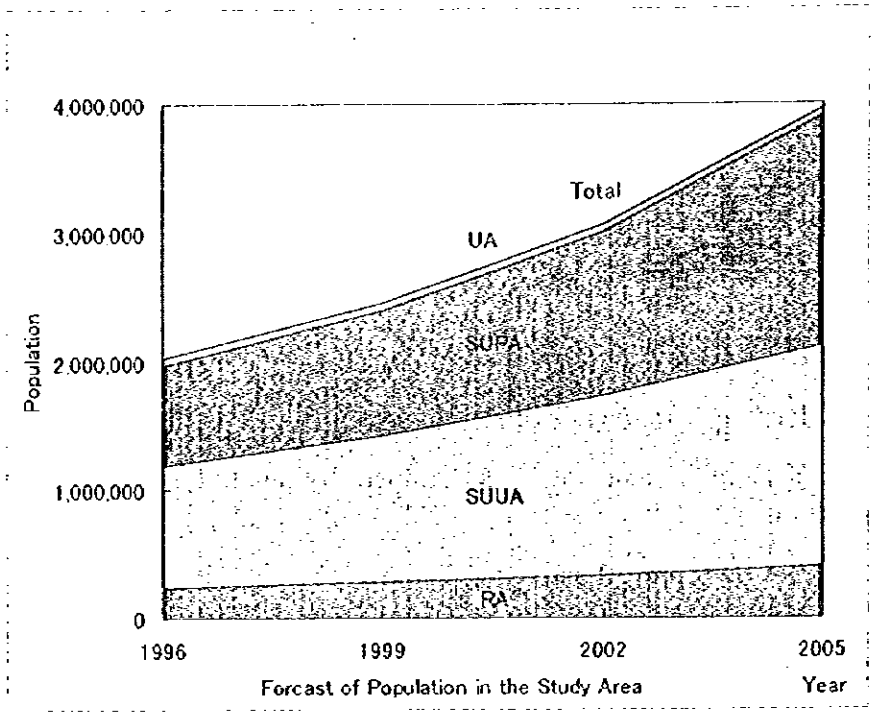


Figure 6-2: Population Forecast for the Study Area

6.2.2 Waste Amount Forecast

a. Household Waste

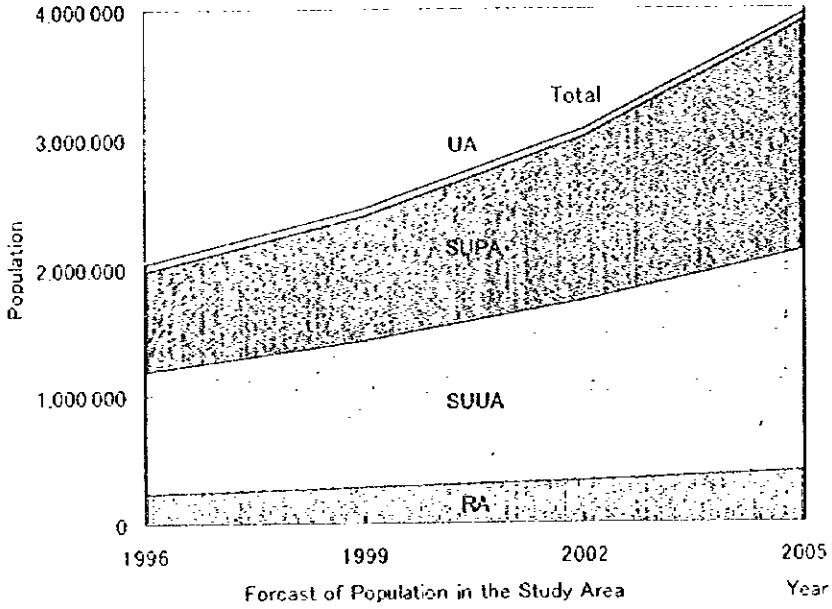
The growth of average annual generation rate of household waste is 8% from 1988 to 1996. This rapid increase was attributed to the drastic socio-economic changes in Tanzania during this period.

It is generally said that waste generation rate increases along with the growth in GDP per capita . However, the study was unable to determine the relationship between the changes in GDP per capita and waste generation rate in DSM because of disparities in economic data caused by the introduction of structural adjustment. It is, therefore, unreliable to forecast the waste generation rate in DSM based on changes in GDP per capita .

There are two factors to be considered in the forecast of waste generation rate. One is that the household waste generation rate of 698 g/cap/d established based on the survey results of DSM is higher than that of African and developing countries. The other factor is inaccuracy in data because the samples and sampling frequency conducted by WACS were insufficient. Therefore, the actual household waste generation rate may be higher than the established rate.

In addition, the generation rate of the garden waste and house cleaning waste, i.e. grass and others (mainly soils), which make up 44.7 % of the household waste, is also forecast to decrease due to urbanisation and changes in housing style.

Consequently, to avoid overestimating future waste generation rates, the study assumes that the household waste generation rate until 2005 shall remain at 698 kg/cap/d. The waste generation amount is determined by multiplying the generation rate by population.



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b. Commercial, Institutional and Market Wastes

The generation rates of commercial, institutional and market wastes until 2005 are presumed to remain the same. It is assumed, however, that the decrease in the generation of informal waste will be evenly distributed between the commercial and market wastes. The waste generation rate of commercial and market wastes are therefore calculated as follows:

$$CG_n = CG_{n-1} + (IG_{n-1} - IG_n) / 2$$

CG_n = generation rate of commercial waste in the year of "n"

IG_n = generation rate of informal sector waste in the year of "n"

Waste generation amount is determined by multiplying the generation rate by population.

c. Street Sweeping Waste

The present street sweeping generation rate is forecast to be maintained until 2005. Waste amount is determined by multiplying waste generation rate by the length of the streets swept.

d. Informal Sector Waste

Various measures to reduce the number of petty traders and the informal sector's activities are being implemented in DSM. The generation rate of waste from the informal sector is, therefore, forecast to gradually decrease by 5 % per annum.

e. Waste Amount Forecast

The waste amount forecasts are summarised below.

Table 6-3: Waste Amount Forecast for DSM

Type of Waste	Unit	Generation Rate				Generation Amount (tons/day)			
		1996	1999	2002	2005	1996	1999	2002	2005
Household	kg/cap/d	0.698	0.698	0.698	0.698	1,416	1,714	2,140	2,767
Commercial	kg/cap/d	0.013	0.023	0.032	0.039	27	57	98	155
Institution	kg/cap/d	0.005	0.005	0.005	0.005	11	12	15	20
Market	kg/cap/d	0.017	0.027	0.035	0.042	34	65	108	168
Street Sweeping	kg/km/d	40.000	40.000	40.000	40.000	1	3	3	4
Informal Sector	kg/cap/d	0.139	0.119	0.102	0.088	283	293	314	348
Total						1,772	2,144	2,678	3,464

6.2.3 Waste Composition Forecast

Changes in the composition of waste are mainly due to the introduction of new products in the market and a different consumption pattern.

Table 6-4 compares the household waste composition (weighted average basis) of DSM during this study with other countries and studies in DSM. The composition of the waste is particularly typical of developing countries. Assuming that the 62.5% figure for vegetable/putrescible waste (classified as kitchen waste in the table) reported by Haskoning includes both food and grass/wood waste, the waste composition in

DSM has not significantly changed[3]. Furthermore, the table also shows that wastes in both studies were surveyed to have identical density and significantly different moisture content.

Table 6-4: Comparison of Waste Composition Data

unit: %

Constituent	DSM, Tanzania (1996)[a]	DSM, Tanzania (1988)[b]	Penang, Malaysia (1987)[c]	Asuncion, Paraquay (1993)[d]	5 towns in Uganda (1990)[e]	United States (1990)[f]
Kitchen waste	42.0	62.5[g]	32.8	37.4	92.2[j]	9.0
Paper	3.1	6.2	25.5	10.2	1.8	40.0
Textile	1.2	1.2	3.4	1.2	0.6	2.0
Plastic	2.2	1.8[h]	11.2	4.2	1.7[k]	7.0
Grass and Wood	25.3	--	14.4	19.2	0.5	20.5
Leather and Rubber	0.9	--	0.8	0.6	--	1.0
Metal	2.0	1.2	2.6	3.1	0.4	9.5
Glass	3.5	0.3	1.4	2.2	0.4	8.0
Ceramic and Stone	0.4	--	0.2	0.4	--	--
Others(sand/ash/soil/etc)	19.4	27.6[i]	7.8	14.7	2.3	3.0
Total (%)	100	100	100	100	100	100.0
Density (kg/m^3)	390	390	190	215	450	
Moisture Content (%)	31	58	--	--	rel. high[l]	

Note:
[a] This Study.
[b] "Master plan on SWM for Dar-es-Salaam"; Haskoning and M-Konsult Ltd; Mar. 1989
[c] "SWM Study for Pulau Pinang and Seberang Perai Municipalities"; JICA; Aug. 1989
[d] "The Study on SWM for the Metropolitan Area of Asuncion"; JICA; Aug. 1994
[e] "GTZ/World Bank Seven Towns Project" Reports; ERL; 1990. Average composition data for the five towns: Jinja, Tororo, Masaka, Mbarara and Mbale is stated here using data from the ERL report.
[f] "Integrated Solid Waste Management, Engineering Principles and Management Issues", Tchobanoglous et.al, McGraw Hill, 1993
[g] Kitchen waste refers to vegetable and putrescible waste in Haskoning's Study.
[h] Plastic and rubber were grouped together in Haskoning's Study.
[i] Others refer to sand, ash, bone, stones and pottery in Haskoning's Study.
[j] In the ERL Study, the very high kitchen waste percentage is mainly due to significant quantities of matoke (plaintain) skins, peelings and leaves.
[k] Rubber was only stated for one town and is included with plastic in the ERL Study.
[l] rel. high = relatively high.

The analysis focuses on the comparison of the data provided by the WACS and other countries, assuming that changes in waste composition would generally result in the waste characteristics of a developed economy shown below:

- Less kitchen waste and more paper and plastic.
- Less grass and wood and more metal and glass.
- Reduced apparent specific gravity.

The waste composition forecast for 2002 and 2005 is as shown in Table 6-5

[3] This can not be verified however as the exact breakdown of the 62.5% figure into food and grass/wood waste is not known.

Table 6-5: Waste Composition Forecast

	1996	2002	2005
Kitchen	45.03 %	42 %	42 %
Paper	4.07 %	7 %	8 %
Textile	1.10 %	1 %	1 %
Plastic	2.01 %	4 %	5 %
Grass/Wood	25.11 %	23 %	22 %
Leather/Rubber	0.71 %	1 %	1 %
Metal	1.65 %	2 %	2 %
Glass	2.90 %	3 %	3 %
Ceramic/Stone	0.33 %	1 %	1 %
Others	17.09 %	16 %	15 %
Total	100.00 %	100 %	100 %

Kitchen waste

As the generation of other kinds of waste will increase due to economic growth and improved lifestyles, the ratio of kitchen waste is forecast to decrease from 45 % to 42 %.

Paper waste

The ratio of paper waste is forecast to increase from 4 % to 8 % due mainly to increase in use of wrapping paper and in business activities.

Textile waste

The ratio of textile waste will remain at 1 % until 2005.

Plastic waste

The ratio of plastic waste will increase from 2 % to 5 % due mainly to increase in imported plastic goods.

Grass/Wood waste

The ratio of grass and wood wastes will decrease from 25 % to 22 % due to reduction in vegetation resulting from population increase and town developments.

Leather/Rubber, Metal, and Glass waste

The ratio of leather and rubber waste, metal waste, glass waste, and ceramics/stone waste will remain at 1 %, 2 %, 3 %, and 3 %, respectively, until 2005.

Others

The ratio of other wastes will decrease from 17 % to 15 %: sand will decrease due to an increase in paved roads, and ash will decrease with improved electrification.

6.3 Other Pre-conditions

6.3.1 Financial Conditions

The following financial parameters will be employed for the evaluation of the financial viability of the master plan.

a. Tariff

a.1 Willingness to Pay for Refuse Disposal

In the early stages of this Study, a Public Opinion Survey (POS) was conducted to assess the beneficiaries' willingness to pay for refuse collection services. The number of samples was 501 and Table 6-6 and Figure 6-3 show a statistical summary of the willingness to pay based on the POS.

From these results, sample means for the proposed Areas A and B were calculated to be Tsh. 1,445.6 and Tsh. 1,016.1 per month per household respectively. Corresponding 95% confidence intervals were Tsh. 232.8 and Tsh. 234.3, respectively.

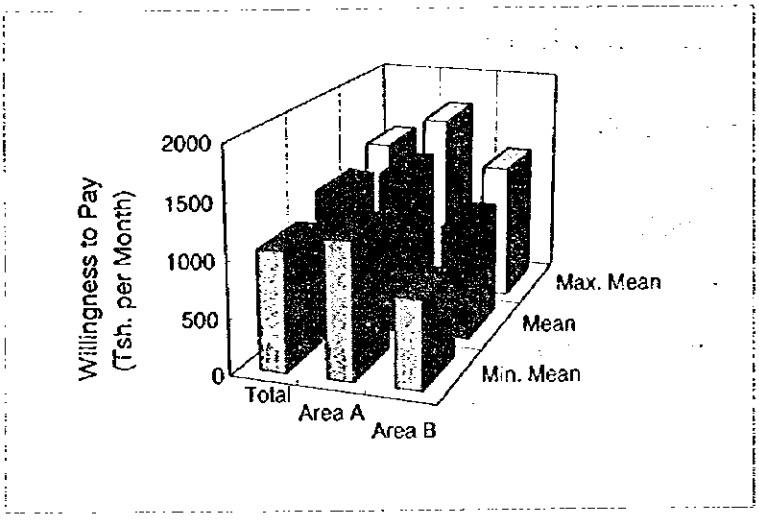
Hence for Area A, it is approximately 95% probable that the willingness to pay exists at a certain level between Tsh. 1,212.8 (minimum) - 1,678,4 (maximum) per month per household. However, for Area B, the corresponding willingness to pay interval is much lower at Tsh. 781.8 - 1,250.4 per month per household. In other words, the results indicate that on average, RCCs of Tsh. 1,210 and Tsh. 780 represent affordable charge levels for Areas A and B respectively.

Table 6-6: Statistical Summary for Willingness to Pay

Unit: Tsh. per month per household

Basic Statistical Value	Total	Urban	Semi-urban Planned	Semi-urban Unplanned	Rural	Area A	Area B
Mean	1230.4	2610.0	1154.5	1145.2	509.9	1445.6	1016.1
Standard Error	84.3	306.5	118.1	146.8	75.2	118.2	119.0
Median	500	2500	550	500	500	1000	500
Mode	500	2500	500	500	500	500	500
Standard Deviation	1887.3	2167.2	1669.6	2075.8	537.0	1868.8	1885.0
Range	15000	10000	15000	10000	2500	15000	10000
Minimum	0	0	0	0	0	0	0
Maximum	15000	10000	15000	10000	2500	15000	10000
Sum	616443	130500	230900	229040	26003	361400	255043
Number of Samples	501	50	200	200	51	250	251
Confidence Interval	165.7	615.9	232.8	289.4	151.0	232.8	234.3

Source: Public Opinion Survey Conducted by the Study Team in 1996
Note: The above confidence intervals are based on 95%.



Note: Based on 95 % confidence intervals

Figure 6-3: Estimated Range of the Population Mean of Willingness to Pay by Type of Area

a.2 Marginal Cost for Refuse Disposal

A simple numerical expression for the marginal cost (MC) for a unit supply of the refuse disposal service is:

MC = TC x CRF(i,n) + Annual Recurrent Cost,

where TC denotes the total capital investment cost, while CRF (Capital Recovery Factor) is a function of the cut-off rate (denoted by i) and the project life (denoted by n) and is calculated as:

$$CRF = i(1+i)^n / \{(1+i)^n - 1\}$$ [4]

In the project evaluation, the precise MC will be calculated after the exact figures for the total capital investment cost and the annual recurrent cost of the project are known.

b. Prices

According to the National Consumer Price Index released by the Bureau of Statistics, the annual rate of inflation has declined from 16.2 percent in November to 15.4 percent in December 1996. The decline of the inflation rate was chiefly due to the relatively low rate of inflation registered in the food group index, which accounts for 71.2 percent of the total weight in the consumer basket.

Although the rate of inflation in December 1996 represents an improvement by 6.4 percent when compared with the rate of 21.8 percent recorded in the same month of 1995, this latest inflation rate is equivalent to 1.28 percent on a monthly basis. Taking into account the duration of 9 months between the Phase I study and the Phase II study, the cost estimate for the master plan and the feasibility study shall be based on the latest price level as of the end of February 1997.

[4] CRF can be defined as a summation of depreciation (represented by a sinking fund factor) and opportunity cost of capital.

c. Cut-off Rate

In the Phase I study, a cut-off rate, the most critical parameter to judge the financial viability of a project, was estimated at 13.2 percent per annum, taking into account the weighted average of real interest rates of both the Bank of Tanzania and commercial banks calculated from nominal interest rates minus the rate of inflation. Table 6-7 and Figure 6-4 indicates and illustrates the review on inflation rates, interest rates and estimated cut-off rates, adding the latest information from 1996. According to these information, the latest cut-off rate stood at 11.6 percent per annum. The downward trends of both the lending rate and the inflation rate in Tanzania is due to the relatively tight monetary policy. Figure 6-5 shows that the weighted average yields of the treasury bills, which decide the discount rate of the Bank of Tanzania, has been gradually declining during the Phase I - Phase II study period.

d. Foreign Exchange Rate

The foreign exchange rate of Tsh. against USD is required to convert the foreign portion of the project cost; Table 6-8 and Figure 6-6 indicates and illustrates the review on the foreign exchange rate during the Phase I - Phase II period. In January 1997, it witnessed a fairly stable shilling, which fluctuated only slightly from 600.4 to USD 601.7 and stabilise around Tsh. 601.4 per USD. The current exchange rate of Tsh. against USD at the inter-bank mean rate among commercial banks is Tsh. 597.8 to USD 1, as of the end of February 1997, which shall be employed as the foreign exchange rate for the conversion of the project cost.

Table 6-7: Review on Transition of Inflation Rates, Interest Rates and Estimated Cut-off Rates

Year	A Inflation Rate %/year	B Discount Rate %/year	C Lending Rate %/year	D=B-A Cut-off Rate (D.R - I.R.) %/year	E=C-A Cut-off Rate (L.R.- I.R.) %/year	F Rate of M3 in BOT %	G Rate of M3 in CB %	H Weighted Cut-off rate %
1988	31.2	27.0	29.0	-4.2	-2.2	26.8	73.2	-2.7
1989	25.8	27.0	31.0	1.2	5.2	28.2	71.8	4.1
1990	19.7	27.0	31.0	7.3	11.3	31.9	68.1	10.0
1991	22.3	27.0	31.0	4.7	8.7	34.0	66.0	7.3
1992	22.1	27.0	31.0	4.9	8.9	34.8	65.2	7.5
1993	25.4	27.0	31.0	1.6	5.6	32.7	67.3	4.3
1994	37.0	61.0	39.0	24.0	2.0	32.2	67.8	9.1
1995	26.9	45.1	37.9	18.2	11.0	30.0	70.0	13.2
1996	**15.4**	**24.7**	**28.0**	**9.3**	**12.6**	**28.8**	**71.2**	**11.6**
Ave.	25.1	32.5	32.1	7.4	7.0	31.0	69.0	7.2

Source: Economic Bulletin for the quarter ended 30th September, 1996, Vol. XXIV No. 3, BOT
Note 1: "Discount rate" means primary lending rate of the Bank of Tanzania to commercial banks, and "lending rate" means the average lending rates of commercial banks.
Note 2: D.R and I.R. symbolise Discount Rate and Inflation Rate, respectively.
Note 3: BOT" and "CB" symbolise the Bank of Tanzania and Commercial Banks, respectively.
Note 4: M3 means the extended broad money including foreign currency deposits.
Note 5: The weighted cut-off rate is calculated as follows: H = (D*F/100) + (E*G/100).
Note 6: The weighted cut-off rate in 1995 was adopted for the cut-off rate, since the weighted cut-off rates before 1995 do not reflect the scarcity of capitals in Tanzania.

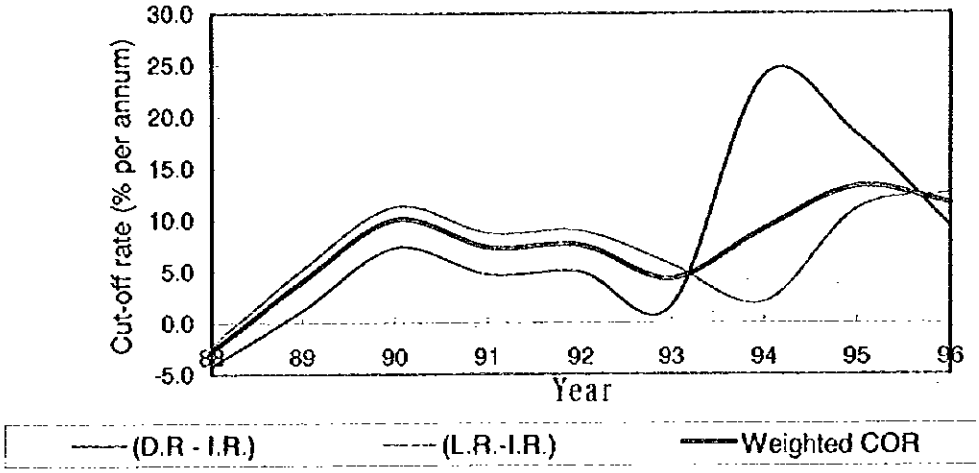
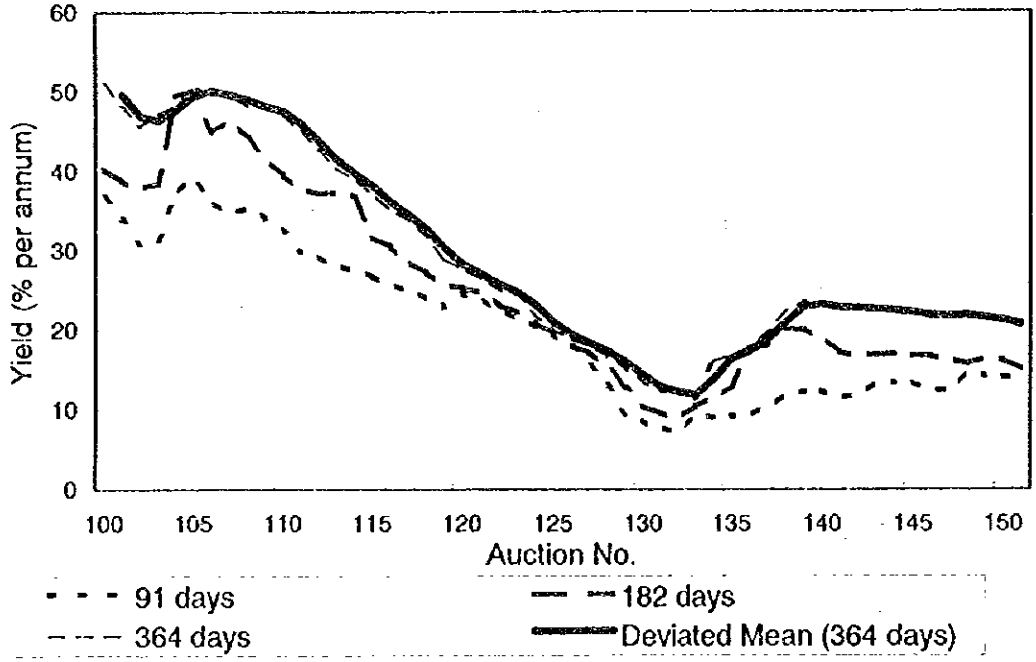


Figure 6-4: review on Transition of estimated cut-off Rates



Source: Economic Bulletin for the quarter ended 30th September, 1996, Vol. XXIV No.3, The Bank of Tanzania, 1997

Note 1: The auction number 61 is on January 4, 1995, and the auction number 112 is on December 27, 1995.

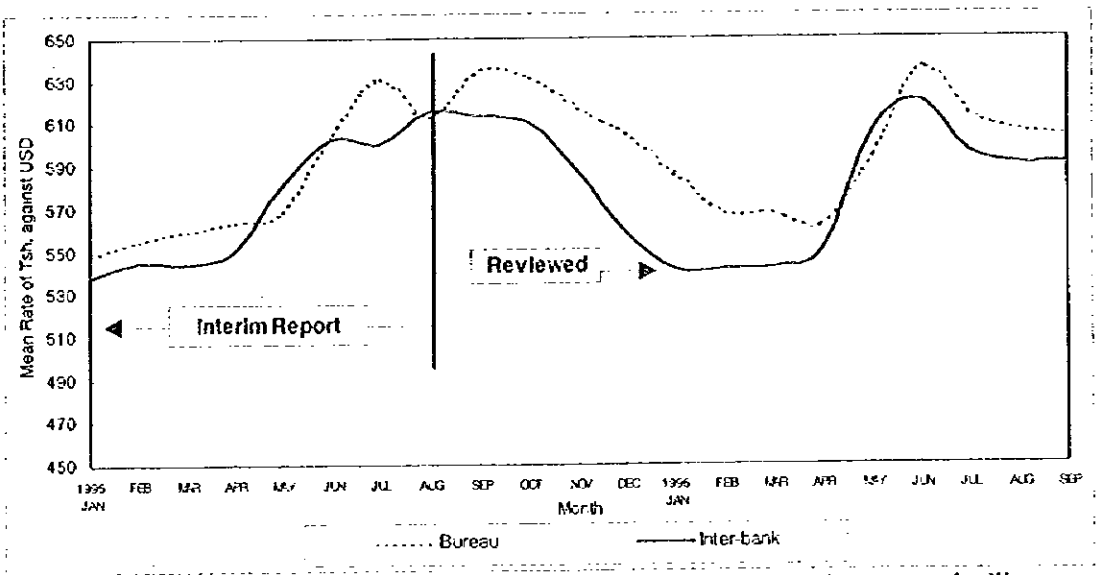
Note 2: The number of days indicated means the length of maturity for each treasury bill.

Figure 6-5: Review on Transition of weighted Average Yields during Treasury Bill Actions

Table 6-8: Review on Transition of Exchange Rate

Month	Bureau	Inter-bank
1995 JAN	548.25	538.37
FEB	554.75	544.67
MAR	560.00	544.54
APR	563.75	550.65
MAY	568.75	581.15
JUN	604.75	602.91
JUL	631.00	600.67
AUG	613.20	615.93
SEP	635.00	613.80
OCT	632.00	610.34
NOV	617.20	586.42
DEC	605.00	558.18
1996 JAN	586.00	541.58
FEB	568.00	541.53
MAR	568.00	542.03
APR	561.50	550.37
MAY	594.00	606.47
JUN	636.00	620.19
JUL	614.00	595.88
AUG	606.50	590.74
SEP	604.50	590.49

Source: Economic Bulletin for the quarter ended 30th September, 1996, Vol. XXIV No. 3, The Bank of Tanzania, 1997



Note 1: "Bureau" means the average of the mean exchange rates between buying rates and selling rates in the tradings of commercial foreign exchangers.

Note 2: "Inter-bank" means the average of the mean exchange rates between buying rates and selling rates among the tradings of commercial banks.

Source: Economic Bulletin for the quarter ended 30th September, 1996, Vol. XXIV No. 3, The Bank of Tanzania, 1997

Figure 6-6: Review on Transition of Exchange Rate

6.3.2 Economic Conditions

In addition to the number of population and households which was discussed in the previous section, the following economic parameters was employed in the economic evaluation of the master plan.

a. Tax

Taxes such as the 10.0% sales tax levied on services and the 7.5% income tax for unskilled labour, both of which are related to this Project, will be deducted from the project financial cost, since these taxes represent a transfer of income to the national economy.

b. Economic Parameters

b.1 Standard Conversion Factor (SCF)

In the Phase I study, the standard conversion factor, which converts locally-traded goods and services into internationally-competitive real economic prices, was estimated at 0.9358 based on the trade statistics from 1991 to 1995. Since the provisional trade statistics provides the data for 1996, the SCF was reviewed based on the trade statistics up to 1996. As a result, the factor was slightly revised from 0.9358 to 0.9347.

b.2 Consumption Conversion Factor (CCF)

In the same manner as the standard conversion factor, the consumption conversion factor, which mainly converts wages for unskilled labour force into real economic prices, was estimated at 0.9201 based on the trade statistics of consumption goods from 1991 to 1995. Since the provisional trade statistics provides the data for 1996, the SCF was reviewed based on the trade statistics up to 1996. Accordingly, the factor remained the same level i.e. 0.9201.

b.3 Shadow Wage Coefficient (SWC)

The shadow wage coefficient is a conversion factor used to modify the cost of unskilled labour. Since the supply of unskilled labour is much higher than the demand for skilled labour, the prevailing salary which is forced to maintain the minimum wage level is frequently overvalued in developing countries.

The shadow wage coefficient is estimated at 0.611, taking into account the minimum wage rate for unskilled labour and the common wage in the informal sector. In 1995, the minimum official wage was Tsh. 17,500 and the unofficial wage in the informal sector was Tsh. 10,700 per month[5], indicating that in this year the minimum wage overestimated the cost of unskilled labour force by approximately 63.4 %. Accordingly, the shadow wage coefficient was calculated at 0.611 (Tsh. 10,700 divided by Tsh. 17,500). It should be noted that in July 1996, the official minimum wage for government employees was increased to Tsh. 30,000 per month although some difficulties are being experienced in implementing the new wage structure.

[5] Information from an acting economist, DCC, 1996

6.3.3 Conditions for Cost Estimate

In order to estimate the operation and maintenance cost for the refuse disposal services, the following information was collected.

a. Personnel Cost

In 1995, for DCC employees the wage rates ranged from a minimum of Tsh. 10,700 per month in the case of workers for operational services (OS1: Operational Service 1) to a maximum of Tsh. 45,000 per month in the case of the most high-ranked staff (SS5 (I): Super Scale 5 (I)). It is also reported that in 1996, the wage rates have been increased by 15 %.

For the employees of Multinet, it is reported that Multinet was paying the minimum wage rate of Tsh. 17,500 per month in 1995, and that the wage rates have recently been revised in accordance with the increase in the minimum wage rate.

b. Maintenance and Repair Cost

Table 4-8 indicates the various unit costs for the operation and maintenance of vehicles as of July 1996, which was taken as the main financial cost for SWM.

c. Leasing Fee

The project would include the leasing of DCC vehicles to private contractors. The current market leasing fee of a tipper truck as of July, 1996 is reported to be Tsh. 30,000 per day including maintenance services.

6.3.4 Conditions for Cost Estimation

In order to estimate the operation and maintenance cost for the refuse disposal services, the following price information were collected:

a. Personnel Cost

The monthly wages of DCC employees as of 1995 ranged from a minimum of Tsh. 10,700 for workers assigned for operational services (OS1: Operational Service 1) to a maximum of Tsh. 45,000 for the administrative staff (SS5 (I): Upper Scale 5 (I)). In 1996, the wage rates have been reportedly increased by 15 %.

On the other hand, Multinet paid its employees with a monthly minimum of Tsh. 17,500 in 1995. At present, the wage rates have been revised in accordance with the increase in the minimum wage rate.

b. Rental Fee

The project would include leasing DCC vehicles to private contractors, and the current rental fee for a tipper in the market as of July, 1996 is reported at Tsh. 30,000 per day, including maintenance services.

c. General conditions

The prices and foreign exchange rate are based on the rates established in 28 February 1997. US$ 1.00 = 597.8 Tanzanian Shilling = 120.85 Japanese Yen

Table 6-9: List of Unit Rates

Code	Description	Unit	Unit Rate (Tsh)
100	**Salary**		
101	Manager	m.m	300,000
102	Engineer, Site Maneger	m.m	100,000
103	Driver, Operator, Mechanic	m.m	60,000
104	Collection worker, Watchman	m.m	40,000
200	**Earthworks**		
201	Excavation of soil, 200 m transport, and construction of embankment that is well compacted	m^3	15,500
202	Excavation of soil and 200 m transport to storage heap	m^3	3,500
203	Excavate gravel/sand, 200 m transport and place in thick layer	m^2	3,100
300	**Drainage work**		
301	Provide stones/course gravel and place in stone drain (0.5 m^3 stone/course gravel per metre drain)	m	29,000
302	Provide 100 mm PVC-drainage pipe (earthwork is not included)	m	18,000
303	Provide materials and construct 2 m deep manhole, diameter = 1.2 m	no.	500,000
304	Provide materials and construct 4 m deep manhole, diameter = 1.2 m	no.	700,000
305	Provide materials and earthworks for construction of 200 mm PVC-pipe line. Depth of excavation 1.5 m	m	40,000
400	**Road works**		
401	Provide materials and earthworks and construct gravel road, including 0.3 m gravel layer	m^2	8,100
402	Provide materials and earthworks and construct asphalt road, including 0.1 m asphalt, 0.2 m gravel, and 0.3 m stones/course gravel	m^2	30,000
300	**Concrete Works**		
301	Provide concrete, reinforcement, and form work to construct a concrete wall	m^3	150,000
302	Provide concrete, reinforcement, and form work to construct floor on the ground	m^3	130,000
303	Provide concrete and form work for foundation	m^3	90,000
400	**Others**		
401	Provide transport of soil. Renting of truck, driver and diesel to be included. (1 transport 2 x 10 km each 7 tonnes soil)	day	150,000
402	Provide galvanised wire mesh/steel posts and construct 2 m fence	m	15,000
403	Provide materials and earthworks for power cable, 4 x 95 mm^2	m	4,800
500	**Materials**		
501	Diesel oil	litre	275
502	Gasoline	litre	345
503	Crushed stone for base course (Ex. quarry)	m^3	16,500
504	Course aggregate for concrete (Ex. quarry)	m^3	18,000
505	Fine aggregate for concrete (Ex. quarry)	m^3	23,400
506	Sand (Ex. quarry)	m^3	6,200
507	Cement	ton	76,000
508	Premixed concrete: 180 kg/cm^2	m^3	63,000
509	Premixed concrete: 240 kg/cm^2	m^3	68,000
510	Reinforced bar	ton	418,000
511	Timber	m^3	220,000
512	Hot mixed asphalt	ton	58,000
513	Reinforced concrete pipe (D=300mm)	m	18,000
514	Reinforced concrete pipe (D=600mm)	m	32,000
515	Reinforced concrete pipe (D=800mm)	m	44,000
516	Reinforced concrete pipe (D=1000mm)	m	55,000

Chapter 7

Institutional System

7 Institutional System

Solid waste management includes all administrative, financial, legal, planning, and engineering functions involved in solving all solid waste problems. These relevant aspects are aggregated into two subsystems for Dar es Salaam.

The evaluation of the current solid waste management system concluded that present institutional problems in Dar es Salaam are more serious than technical problems. In particular, the existing technical problems are rooted in the existing institutional problems. Hence, any technical systems proposed cannot be perpetuated without the provision of a proper institutional system. Therefore, priority must be given to the formulation of an institutional system for the future from which the formulation of a future technical system shall be based upon.

Consequently, the institutional requirements are discussed in this chapter, followed by the optimum technical system in Chapter 8.

7.1 Administration and Organisation

7.1.1 Integration of Functions

Taking into account that the present solid waste management system in Dar es Salaam possesses several weaknesses and deficiencies, the implementation of a new institutional model is proposed. This model gives autonomy to the government agency in charge of solid waste management, enabling it to effectively accommodate the service providers in the private sector. This new institutional organization model proposes an agency to be formed. It will be fully responsible for all municipal solid waste management services in Dar es Salaam, integrating the functions dispersed in the departments of Health, Works and Planning.

The main reason for this proposal is rooted in the acknowledgement that the present institutional arrangement of the DCC does not enable financial or administrative autonomy to the existing organisation in charge of solid waste. This situation is understandable in the case of small cities, but it poses many problems for the day to day running of solid waste management services in a large city such as Dar es Salaam.

It is common for other municipal departments to place a lower priority on solid waste management, in terms of appropriation of funds and political privileges. Scarcity of funding is a deep and permanent problem especially in Dar es Salaam. Consequently, the solid waste sector constantly lacks funds, even for the basic necessities to run the services.

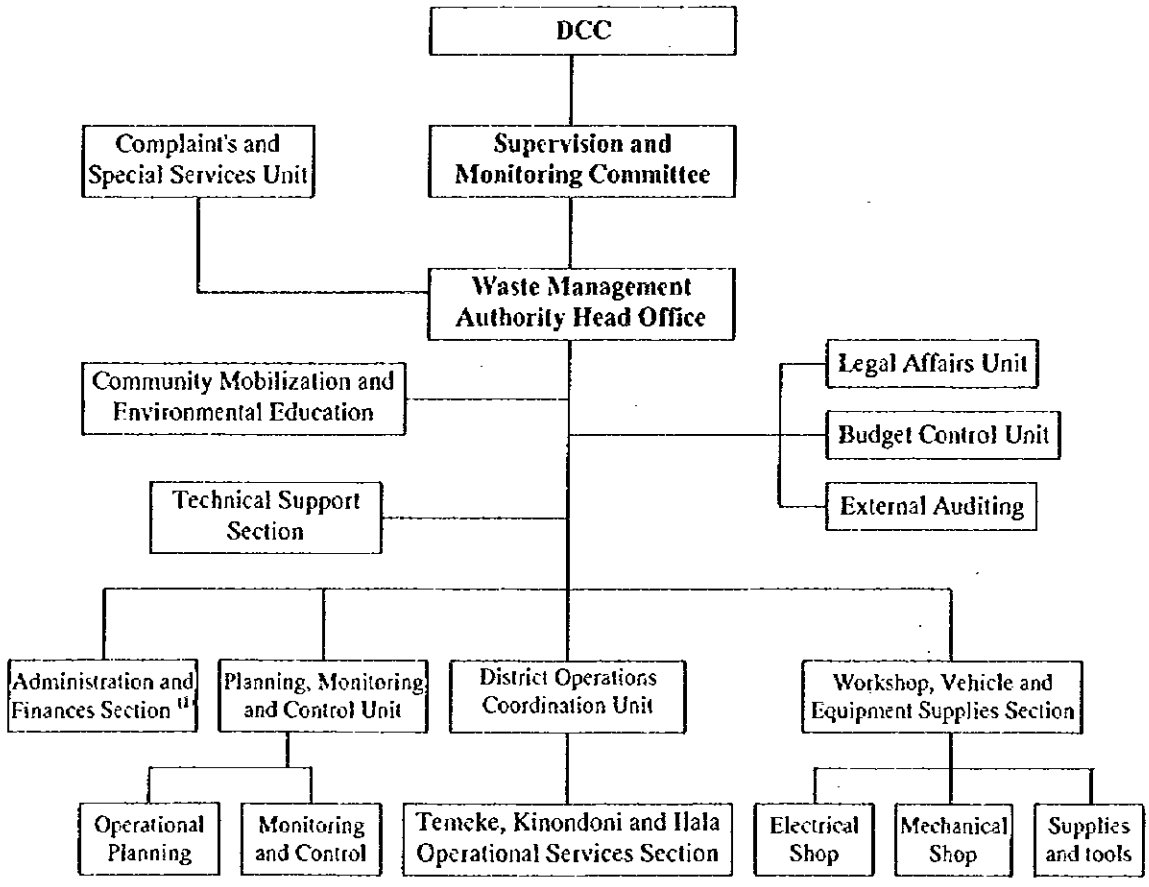
The maintenance and repair of vehicles and equipment are the responsibility of another department of DCC, as is the procurement of goods and supplies necessary to run the services. The dispersed relegation of solid waste management functions also hampers the efficiency of the maintenance of these vehicles and equipment which are critical to the effective conduct of services.

7.1.2 Guidelines for the new administrative and organisation model

- Implementation of a new institutional model through the creation of an independant organisation within the DCC to deal with solid waste management (including night soil collection) in Dar es Salaam.
- The embodiment of all solid waste management responsibilities by the new autonomous organisation, regardless of who is providing the services, be it the private concessionaires or the DCC itself.
- Establishment of a Supervision and Monitoring Committee directly accountable to the DCC chairman. This committee will supervise, monitor and control the operations, finances and administration of solid waste management in Dar es Salaam.

7.2 Proposed Waste Management Authority

The administrative structure of the proposed new Waste Management Authority is illustrated in Figure 7-1.



Note: (1) The administration and financial Section is detailed in succeeding sections.

Figure 7-1: Proposed Basic Organisational Structure of Waste Management Authority

This structure will be set up to extend the necessary technical and administrative support to all solid waste management services in Dar es Salaam, as well the co-ordinating the services for the three districts.

Vehicles and equipment will be managed and maintained at a central level, and dispatched to the districts as instructed by the planning section.

7.2.1 Administration and Financial Section

An administration and financial unit should be realised according to the new Waste Management Authority's degree of independence and autonomy.

Since the proposed authority will be set up an organization similar to a private company (e.g. parastatal), it should contain the following sub-units:

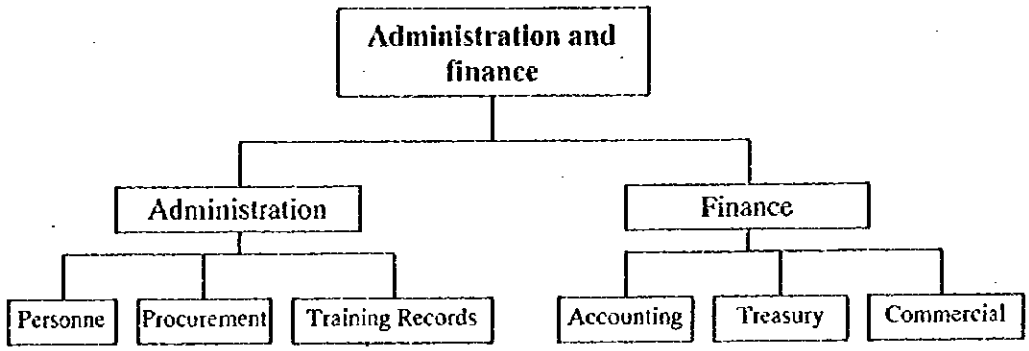


Figure 7-2: Proposed Administration and Financial Unit

7.2.2 District Operational Structure

The three districts in Dar es Salaam shall have the following operational services and structure:

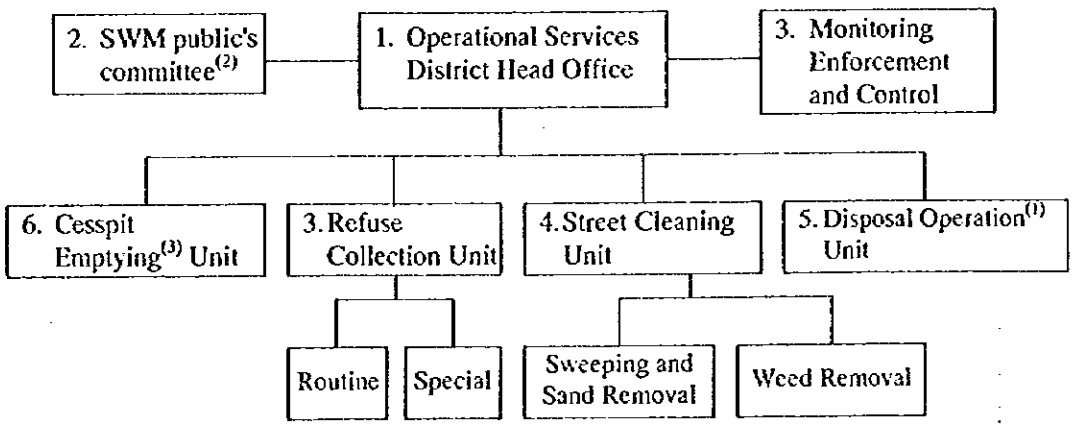


Figure 7-3: Proposed Districts Operational Services Section

Notes:

(1) The present disposal site is located in Vingunguti, therefore, it will be managed by the operational services unit of the Ilala district. However, it shall also receive wastes from

other districts. The construction of landfills in each of the new municipalities is also proposed, and these municipalities shall be responsible for their respective landfill.

(2) The Public Committee on solid waste management will provide a forum for neighbourhood environmental committees of the several wards in each district and the operational service units.

These committees shall also interact with the community mobilisation and environmental education sub-units at the central level, so that their needs and complaints can be channelled to the Supervision and Monitoring Committee

(3) The transfer of cesspit emptying services to the Waste Management Authority shall depend on the DCC authorities.

7.3 Staff Specification and Number of Personnel

The responsibilities, number of staff and their qualifications, for the proposed administrative structure are summarised in Table 7-1 and Table 7-2. The responsibilities of the key offices of this new structure are detailed in the following sections.

Table 7-1: Waste Management Authority

Position	Role	Responsibility	No.	Qualification
1. Supervision and Monitoring Committee				
Head of the Committee	• Chairing the Supervision and Monitoring Committee	• Call the meetings • Chair the meetings • Represent the committee	1	Designed and nominated by the DCC chairman among the 5 commissioners
Committee Member	• Advisory • Supervision • Monitoring	• Attend the meetings • Approve decisions • Decide on controversies, etc.	6	5 commissioners 1 executive secretary
2. Complaint's and Special Services Unit	• Attendance for the public • Monitor operations	• Forward complaints to the Supervision and Monitoring Committee • Forward special services request to Waste Management Authority Head Office	2	2 telephone operatores
3. Head Office of SWM Organization	• Coordination • Supervision • Implementation	• Manage all solid and liquid waste activities in DSM • Submit questions and advice to the Supervision and Monitoring Committee • Approve procurement procedures and disbursement	1	Appointed by the DCC with approval from the Supervision and Monitoring Committee
4. Community Mobilization and Environmental Education Unit	• Formulation and design • Implementation • Evaluation	• Develop environmental educational activities • Develop mobilization campaigns • Evaluate results of activities and campaigns	4	1 Public relations Officer 3 assistants (Activities coordinated with the Health Commission and the Education Commission)
5. Legal Affairs Unit	• Legal representation • Propose legal procedures • Assistance to Head Office	• Represent and provide defense in court • Follow up all the cases taken to court • Produce draft of contracts • To propose appropriate by-laws concerning liquid and solid waste	1	1 - lawyer
6. Accounts Section	• Control • Advisory	• Analyze income and expenditures • Advise the head office on the state of the budget	1	1- Economist/accountant
7. Technical Support Unit	• Engineering	• To elaborate and develop new operational methodologies • To assist planning design procedures	2	1 - engineer 1 - assistant Note: 1 foreign expert

Position	Role	Responsibility	No.	Qualification
		• to assist the Supervision and Monitoring Committee on technical matters • To assist and guide the district's operational services on technical matters		
8. Planning, Monitoring and Control Unit				
Chief of Unit	• Data gathering on privatized and non-privatized areas • Operation design at city level • Operation evaluation at city level	• Provide information to the Supervision and Monitoring Committee • Advise the Head Office • Evaluate correct use of vehicles • Monitor operations in privatized areas	1	1 - Engineer Note: 1 foreign expert
Operational Planning	• Overall operational planning at city level	• Design and evaluate collection routes • Design and evaluate street sweeping routes • Plan special tasks - weeding, sand removal, etc..	1	Technician
Operations Monitoring and Control	• Monitor and control operations at city level	• Make a primary analysis on the development of services at city level • Make recommendations about weakness and problems at district level • Gather data from enforcement and control sections at district level in the areas managed by DCC and by private operators	1	Technician
9. Districts Operations Coordination Unit	• Coordination • Supervision • Assignment of resources	• Coordinate with the three District Operational Services • Coordinate with the Workshops & Supplies on needs of the "District Operational Services" • Assign vehicles and equipment to the "District Operational Services" • Propose changes in the allocation of resources for the three districts	2	1 - Engineer 1 - Assistant
10.Workshops, Vehicle and Equipment Supplies Section				
Chief of the Section	• Maintenance • Repair • Supply parts, tools	• To keep the DCC's fleet of vehicle and equipment in good condition for solid waste management and cesspit emptying services • To advise the operations coordination head of any problems not being solved at this level • To propose the procurement of parts and supplies for vehicle and equipment in advance • To supervise the appropriate use of tools and the applying of parts	2	1 - Mechanical engineer 1 - Assistant note - 1 foreign expert
Electrical Shop	• Maintenance • Repair	• To maintain and repair electrical parts of the vehicle and equipment	1	1 - Technician 1 - Helper
Mechanical Shop	• Maintenance • Repair	• To maintain and repair mechanical parts of the vehicle and equipment	4	1 - technician 3 - helpers
Supplies and Tools	• Supplies • Control	• To furnish the necessary tools and parts to the electrical and mechanical shops • To control, at a primary level, the correct use of tools and parts	2	1- technician 1 - helper
11.Administration and Finance Section				
Administration Unit	• Management • Control • Support	• To carry out all the administrative matters concerned with personnel, revenues, expenditures, disbursements, etc..	6	2- administrator 2- secretary 2- assistant
Finance Unit	• Accounting • Treasury • Commercial	• To carry out all financial matters concerning waste management authority	3	1- accountant 1- secretary 1- assistant

Table 7-2: District Operational Services Sections

Position	Role	Responsibility	No	Qualification
1. District Operational Services Head Office				
Chef of the Office	• Implementation of the operational procedures based on planned routines • Implementation of special tasks, as requested	• Execute collection and street cleaning tasks in the areas assigned to DCC • To report all the problems with the vehicle and equipment to the maintenance workshops • To furnish operational data to the planning section	2	1- Chief engineer 1 - assistant
District Planning	• Planning at district level • Evaluate operational planning	• Evaluate and adjust planning made at central level • To transfer operational information and data at district level to central level	2	1 - technician 1 - helper
2. SWM Public Committee	• Complain • Advise • Evaluate	• To maintain the necessary liaison between the neighborhood associations, the wards committees and the District Operational Services Head Office • To feed information to the Community mobilization and environmental education section at central level		members would belong to the community organizations, i.e. CBOs and NGOs.
3. Monitoring, Enforcement and Control	• Monitoring operations • Control outputs • Enforcement of legislation	• To gather information and data on the operations developed by the Waste Management Authority or by private operators • Feed information to central planning, monitoring and control unit • To enforce applicable legislation on environmental control and on solid waste management	2	1 - technician 1 - assistant
4. Collection Refuse Unit	• Management • Operation	• To carry out and manage refuse collection operations in its area • To furnish operational data to the planning section	2	1 - technician 1 - assistant
5. Street Sweeping Unit	• Management • Operation	• To carry out and manage street sweeping and cleaning (including weed removal and sand removal) operations in its area • To furnish operational data to the planning section	2	1 - technician 1 - assistant
6. Disposal Operations	• Management • Operation	• To operate the disposal site, according to technical support guidance • To gather and keep records on the disposal operations • To ensure that maintenance of disposal equipment is carried out	2	1 - technician 1 - assistant Remark - Same as above
7. Cesspit Emptying Unit	• Management • Operation	• To carry out and manage the cesspit emptying operation in this area • To furnish operational data to the planning section	2	1- technician 1- assistant

7.3.1 Rules and Organisational Structure of the Supervision and Monitoring Committee

a. Organisational Structure

As proposed in the I/R (Interim Report), the Supervision and Monitoring Committee will be composed of 6 committee members, one of which shall be the chairman of the committee .

The members of the Supervision and Monitoring Committee shall represent several government organisations that in one way or another influence the performance and development of solid waste management in Dar es Salaam and also have a representative from the community.

According to these criteria, the Supervision and Monitoring Committee shall constitute the following:

Representatives from the government (DCC)

- One representative from the City Health and Welfare Department
- One representative from the City Engineering Department
- One representative from the City Planning Department
- One representative from the City Finance Department

Representatives from the community

- One representative from the academic area, to be choosen among the leading Tanzanian academic institutions (University of Dar es Salaam, University College of Lands and Architectural Studies, formerly known as the Ardhi Institute, and Muhimbili University College of Health Sciences)
- One representative to be chosen from the NGOs involved in environmental or sanitation affairs.

Each member shall have a substitute, to take his or her place in meetings when they are indisposed or unavailable.

The Supervision and Monitoring Commission members must have an outstanding profile in terms of public service, or in the university or the NGO, and shall be appointed by the Prime Minister's Office for a service period of six years.

The Supervision and Monitoring Committee members shall select a Chairman from among them, with the approval of the Prime Minister's Office. The period of chairmanship shall be one year.

b. Functions and Duties

b.1 Duties

The main duty of the Supervision and Monitoring Committee members is to be present at the scheduled and special committee meetings called by the chairman. Also they have to sign all documents that fall under their responsibilities, according to their functions.

Aside from the general duties to which all the members are subject to fulfil, the Chairman of the Supervision and Monitoring Committee also has the function of calling and chairing sessions based on a schedule previously approved.

The Chairman shall represent the Supervision and Monitoring Committee in official functions and other public meetings and festivities.

b.2 Functions

The main functions to be performed by the Supervision and Monitoring Committee are the following:

b.2.1 General Functions

- To define the goals and objectives of the solid waste management services in Dar es Salaam.
- To supervise the overall administrative, financial and operational activities of the Waste Management Authority.
- To supervise the services provided by the private sector.
- To advise the Prime Minister's Office and the DCC Chairman's Office on the overall policy for the solid waste management services in Dar es Salaam.
- To promote mechanisms for monitoring and controlling solid waste management services performed either by the Solid Waste Management Authority of DCC or the private contractors.
- To co-ordinate with top officials of other public agencies involved in sanitation services and environmental control, such as those in charge of water distribution, sewage collection and treatment, and the National Environmental Council, in order to attain the best overall results for the services in Dar es Salaam.
- To propose and guide public hearings on important issues affecting the population as a whole or specific groups.
- To define the rules and guidelines in the contracts with private contractors that shall be followed.
- To define the policies to be followed by the Agency managers related to the services rendered.

b.2.2 Specific Functions

- To approve or veto the general annual budget proposed to DCC and to follow up monthly disbursements.
- To approve or veto contracts and agreements proposed by the Authoruty's managers.
- To report to the DCC the developments and achievements of the Waste Management Authority.
- To fix the number of employees, and their qualifications, of the Waste Management Authority.

- To monitor the operational achievements and the financial status of the Waste Management Authority through monthly reports and periodic visits to service areas.
- To analyse the nature of complaints from the public and from the media (newspaper and radio) about the services provided by the Waste Management Authority and by the private sector, and to propose relevant countermeasures.
- To propose actions to be taken in order to improve the state of cleanliness of the city.
- To settle operational or legal disagreements or controversies that may arise between the DCC and the private contractors.
- To establish and approve the value of the RCCs for the different waste producers in Dar es Salaam.
- To establish and approve the ordinances and regulations related to solid waste management services in Dar es Salaam.
- To establish, monitor and control the contract rules to which the private contractors are subject to regarding service standards, routines and levels of service operations.
- To control the payments made to private contractors, with the assistance of independent auditors.
- To approve decisions made by the Head of the Waste Management Authority of DCC.
- To provide guidance to the Waste Management Authority of DCC regarding policies, guidelines and rules to be followed in order to improve the solid waste management services in Dar es Salaam.

c. Executive Secretary to the Supervision and Monitoring Committee

The committee will have also an Executive Secretary with the following responsibilities:

- assisting commissioners during their meetings and interim meetings.
- typing and filing the proceedings of the committee meetings.
- keeping all the files, pertaining to the committee's work, updated and organised.
- preparing, filing and storing all the information requested by the commissioners.
- informing the commissioner of the agenda and schedule of their meetings.
- sending and receiving all the administrative correspondence related to the committee.
- performing other tasks requested by the chairman of the committee.

d. External Auditing

Financial and administrative auditing shall be conducted annually by an independent auditing company. The auditors will be responsible for:

- examinations and investigations of all the financial and economic activities and affairs of the Waste Management Authority managers.
- ensuring the submission of Waste Management Authority managers to the rules governing the public service
- presenting the annual auditing report to the Supervision and Monitoring Committee.

7.3.2 Head Office of the Waste Management Authority

The Head Office of the Waste Management Authority is responsible for:

- implementing the policies and decisions issued by the DCC and by the Supervision and Monitoring committee.
- representing the Waste Management Authority in public, in court and in government activities.
- making decisions on procurement procedures and related disbursements.
- making decisions on the hiring and dismissal of the Authority's employees.
- submitting the annual budget proposal and related changes to the Supervision and Monitoring committee.
- hiring and dismissing the Authority's managers.
- co-ordinating all the Authority's annual plans and other matters according to the city council and the supervision and monitoring committee determinations.

7.3.3 Planning and Control Unit

The Planning and Control Unit is responsible for:

- elaborating and developing methodologies for the operational plan by the Waste Management Authority.
- defining methods and criteria for the operational control of the Authority's financial, auxiliary and operational sectors.
- determining the operational guidelines to be followed by the operational sectors.
- conducting the making or contracting out of the design projects related to solid waste collection, street sweeping and disposal activities.
- monitoring and controlling activities of the private sector, as concessionaires or as contractors.

- promoting and supervising the training and professional development of the Authority's personnel.
- supervising and co-ordinating the contracting out or providing concessionary contracts with the private sector.
- recording and producing reports related to the operational activities of the Waste Management Authority.
- following up the operational activities with the aim of improving it and reduce expenditures.
- producing reports about the overall work done by the Waste Management Authority to be submitted to the President (or chairman) and the Supervision and Monitoring commission.

7.3.4 Public Relations (and Environmental Education) Section

The Public Relations Section is responsible for:

- promoting public awareness on the issues related to the activities of the Waste Management agency and the proper behaviour concerning solid waste management in general; littering in particular.
- producing public education campaigns, expositions and related media material concerning solid waste management to be presented in schools, public meetings, clubs, churches and other public assemblies.
- dealing with and remedying consumer complaints on the services provided by the Waste Management agency.
- promoting the participation of the Waste Management agency in fairs, expositions and other related events.
- co-ordinating relations with the press, specially with the daily newspaper and the local television channel.
- receiving visitors and external consultants.
- developing photographic and written documentation of the activities and facilities of the Waste Management Authority.
- producing educational materials such as videos, slides, films and booklets concerning solid waste management.

7.3.5 Legal Affairs Unit

The Legal Affairs Unit is responsible for:

- representing and defending of the Waste Management Authority's interests in court.
- proposing legal procedures necessary for the running of the Waste Management Authority

- following up all the cases taken to the court, both in favour or against the Waste Management Authority.
- providing technical advise on procedures to be taken by the Authority managers.
- producing the draft forms of contracts, agreements and other legal documents to be signed by the Authority officials.
- assisting and supporting the procurement section.
- supervising all the activities related to the control of the authority.
- monitoring personnel discipline.

7.4 Legislation and Enforcement

7.4.1 Guidelines for Legislation and Enforcement

- The solid waste by-law shall be simple and objective, in harmony with the local economy and social habits, and seeking attainable results with fines and punishment for transgressors being clearly defined and easily enforceable.
- The general public should be required to comply with the by-law only after solid waste management services are improved to a level which demonstrates that the DCC is meeting its duties and responsibilities.

7.4.2 Procedures to be followed

In Tanzania, and in particular Dar es Salaam, there are several specific legislation (national laws, by-laws and ordinances) dealing with solid waste management issues.

Although some of these legislation are outdated and/or not realistic in light of local culture and practices, they should be sufficient to guide the public so to comply with sound waste handling and disposal practices and to curb poor solid waste management practices to which they are accustomed.

However, the problem in enforcing the legislation is that the refuse collection services provided by DCC are so poor and erratic that it is impossible to guarantee the support of the population in collaborating with better solid waste management practices.

Nevertheless, DCC has a large group (around 100 people) of health officers and health assistants who are in charge, amongst other things, of enforcing the by-laws related to solid waste management. Some of them could be trained and motivated to enforce the legislation.

A sound procedure in this case would be to consolidate the present various legislation into one sanitary code and, at the same time, update it to take into account present habits and customs. Also, the guidelines should be reviewed together with provisions and demands in order to make it more simple and compatible with local standards and level of services usually provided.

The improvement of the present legislation and its effective enforcement shall, however, be interrelated with to the improvement of the collection and disposal

services; without reliable and adequate services the population will not be motivated to comply with the proper rules and guidelines.

Therefore in conjunction with reshaping the administration and organisation of the solid waste management system, a consolidated sanitary code shall be prepared, discussed and subsequently enacted. The timing of it coming into effect and its enforcement should be considered carefully so as to guarantee a successful outcome.

7.5 Financial Sources and Refuse Collection Charges

The majority of the citizens are not willing or can not afford to pay for the refuse collection services and the RCC (Refuse Collection Charge) should not exceed the financial capabilities of the people. Taking these into consideration the allocation of a special fund for cleansing services (SWM) from DCC's tax revenues shall be through the enhancement of the city's tax collection capability.

Although the fund shall be a main financial source for cleansing services, the RCC system shall be maintained in order to establish a "**Beneficiary Pay Principle**" in the future. At first the Team recommends a joint billing system for the RCC with water/sewerage charged by the newly established DAWASA (Dar es Salaam Water and Sewerage Authority). If joint billing is not feasible due to certain hindrances, DCC shall collect the RCC for commercial waste when businesses apply for licenses and for special services such as door to door collection services to the high income households.

7.6 Role of Private Sector

The private sector is beginning to play an important role in the solid waste management of Dar es Salaam, mainly due to inefficiencies of the DCC in providing regular and adequate refuse collection and street sweeping services.

In order to discuss "privatisation" options for Dar es Salaam, a brief analysis of several privatisation models, currently used in different cities of the world, is presented here.

7.6.1 Type of Operation System

The most common ways to provide refuse collection, street cleaning services and refuse disposal services can be categorised into six main groups, arranged in descending order of government involvement:

i. Direct Municipal Operation

ii. Independent City Authority Operation

iii. Municipal - Private Contractor Operation

iv. Private Concessionaire Operation

v. Community Organisation (CBO or NGO) Operation

vi. Private, Formal and Informal Providers (free market) Operation

a. Direct Municipal Management

This is the traditional method of SWM service provision in most cities in underdeveloped countries. Operation is conducted only by the municipality, with it's own personnel, vehicles and equipment. The municipal unit providing solid waste management services might be part of a centralised municipal administrative structure, which itself is part of the municipal organisational structure.

The size of the city determines the size of the solid waste management unit and whether administration and support are placed in the same government unit. If the SWM administration and support are not in the same unit, this means that, personnel, equipment and vehicle maintenance, procurement of materials and equipment, legal advice, public communication and other solid waste management support services might be part of other municipal departments.

Financial funding for the solid waste management operation in this case comes directly from the Municipal treasury, through the regular budget. The municipality, in turn, charges the refuse generators through the local tax system, which bills the generators directly or through coupling with property tax or any other utility tax or tariff, such as water or electricity.

Direct bill collection by the municipality is rare because of the lack of mechanisms to avoid defaulters, since the service can not be withdrawn like water supply or electricity. In Dar es Salaam, it has been shown that the amount of the RCC collected directly was short of covering even the most basic SWM operational costs such as salaries, fuel, tires, batteries and other spare parts.

b. Independent City Authority

During the 1970's, municipal governments in the rapidly growing cities of the developing countries found it increasingly difficult to efficiently manage the large structures necessary to provide solid waste services through municipal management only (i.e. institutional model a).

One of the solutions for this problem was to contract out some of the services to private enterprises. Another solution was to set up an independent and autonomous agency, with administrative independence and financially self sustainable.

The objective in the latter, was to find a way to by-pass the rules and burdens of the municipal government, but keeping the solid waste management services fully in the hands of the municipal authorities.

These independent, autonomous agencies or authorities, have been set up using many different concepts, such as public corporations, public foundation, paraestatal authority, and even public companies. These are arrangements whereby the agency is organised as a private enterprise with all the shares belonging to the government. In all cases, these arrangements were designed to remove or at least reduce the unavoidable red tape inherent in public administration.

The degree of freedom and autonomy of these entities are highly variable, but they always have an exclusive body of employees and financial autonomy, with income from direct billing of customers.

In this system, a political dependence on the municipal government always persists, since appointment of the Board of Directors and sometimes other ranks, such as managers and foremen, are directed by the municipal government.

An organisation along these lines but with a strong participation of private service providers as explained in the next item (c). is the one being proposed to handle the solid wastes in Dar es Salaam.

c. Municipal - Private Contractor Operation

The most frequently employed alternative today to the traditional direct municipal management system is the contracting out of solid waste management services to private companies, with usually all or some collection services and street sweeping being contracted out. The collection services may include household, commercial, light industrial and hospital wastes while the street sweeping services sometimes include cleaning and maintenance of parks and public gardens. More recently, as environmental concerns are gaining ground, treatment and disposal operations are also being contracted out, i.e. the operation of sanitary landfills and treatment plants (composting and incineration).

In this case, the SWM service is contracted out by the municipal government, usually through a competitive bidding process, in the same way that public works are contracted out. The contractor is usually paid monthly, by the municipality according to the amount of refuse collected, measured in weight or in volume, or according to a fixed amount defined in the contract.

A variation of this arrangement is when public assets are operated by a private contractor. The most common situation being use of garages, workshops, vehicles and requipment that belong to the municipality by the private contractor.

The value of these assets may be paid to the municipality as a lease or can be deducted from the value that the municipality has to pay the contractor for the services to the city.

The main advantage of this system is that the government remains in control over the solid waste management system, since the government is paying monthly for it and therefore can easily enforce the contract rules.

Also, the government is the one which defines the refuse tax structure and also it can impose a cross-subsidy policy.

It is easier for the government to take over the service or to pass it to another enterprise, if the operating contractor does not fulfil the contract or goes bankrupt.

The main disadvantage lies when the government is not able to collect taxes or is short of money and therefore can not pay the contractor on time. Due to the inherent constraints of the government, sometimes it is easier for the private contractor to collect the taxes themselves.

If the payments are long overdue, services may be abandoned resulting in chaos, because the government no longer has the operational capacity to collect the refuse. Also, other private contractor would not want to replace the original contractor, due to lack of trust in the government payments.

Another disadvantage is related to the strong political influence over the private contractors. Political pressure often leads to "favours" being asked of the private company in admitting political allies or change operational plans often to appease constituents or strong political allies.

d. Private Concessionaire

A private concessionaire model is where solid waste collection and related services are provided by one or several private firms working as a concessionaire. Usually in this case, the municipality exercises control and supervision over the services being rendered and the private firm bills serviced households and other refuse generators directly.

Solid waste management services in this case is provided usually, but not necessarily, by only one company assigned to a defined area. The most important difference to the other types of private service operation is that payment for the services is made directly by the refuse generators to the service provider, and not to the municipal treasury.

The municipal government's role in this case is basically limited to definition of the area(s), period of the concession granted, the billing system, tariff structure, price and the quality level of the services. The municipal government also usually set up a technical and administrative structure to control and monitor all the concession rules and standards, because it is typically not carried out.

Competition in this case is limited to when the bidding process is carried out and each private provider sets its conditions of operation and prices. From them on, it is the municipality's responsibility to exercise its control and monitoring powers.

When only one company is awarded a specific area, a temporary monopoly is established, and the municipality shall therefore monitor the conditions of service (and billing) closely, since there is no competition during the time of the contract.

This type of arrangement bears higher accountability and risk to the private enterprise. However, on the other hand it gives more freedom from the municipal treasury and therefore more independence from political affairs and other interference.

Another version of this model is when public assets such as garages, workshops, vehicles and equipment that belong to the municipality are operated by the private concessionaire.

The value of the assets may be paid to the municipality as a lease or can be deducted from the value that the municipality has to pay to the contractor for the services provided to the municipal installations and institutions such as city halls, schools, hospitals, etc.

This is the system that has been introduced in the central area of Dar es Salaam city but has failed in many aspects, in particular the relationship between the contractors and the DCC has been very fragile and full of reciprocal misunderstandings.

e. Community Organisation

This model employs community based organisations (CBOs) and Non-Governmental Organisations (NGOs), which may or may not be associated amongst themselves. The

CBO may be set up as a micro-enterprise or as a co-operative or even simply as a neighbourhood association.

They generally operate in areas of the city with poor service or is not serviced at all; the slums and squatter areas.

In general, the areas serviced by these organisations have very limited access for regular, traditional trucks not only refuse compactor trucks, but also tipper or dump trucks. This situation hampers the possibility of door-to-door collection and often, even a block collection system.

In these cases, the only way to collect refuse is to use labour intensive methods; carrying out the refuse manually to a suitable place where it can then be picked up by collection trucks.

The first phase of this collection method is known as "primary collection" and these organisations are the ones which have been best at conducting this task, using non-conventional equipment and methods.

These organisations usually employ workers (normally women) living in the same area and use appropriate technologies (simple tools, equipment and vehicles). The workers are paid either by the municipal government or by the community itself where the services are being conducted.

Municipal government intervention, in this situation, varies considerably, from financing or subsidising the primary collection to not supporting or interfering with the operation or the funding of the system. Alternatively, these systems may be financed directly by the service receivers, alone or together with the municipality, sometimes with the aid of NGO's or foreign aid agencies.

Selection of recyclable materials for selling and funding the project makes it economically viable and is often seen in this type of service provision.

f. Private, Formal and Informal Providers

This model can also be understood as a **"free market"** concept, in which solid waste management services are provided by different service providers without an exclusive area definition and with prices defined by the market itself.

This system (which can also be seen as a lack of system) occurs when the municipal government has no influence on the provision and financing of the collection, although in some cases it may exercise some control and monitoring. In this case, the SWM service provider(s) contract out the collection operation directly to the refuse generators.

Municipal government interference, if any, in this case is limited to setting environmental and sanitary guidelines and ordinances and to enforce it. These ordinances and guidelines refer basically to the type of trucks to be used for collection, and proper disposal of collected wastes.

This system is almost a free market system, and is very frequently used when dealing with industrial wastes and for some large commercial waste generators, such as hotels, supermarkets and shopping centres.

One of the problems with this system is a lower quality of the services provided, especially in the disposal stage, because there is a tendency to put profit before environmental standards by making prices more attractive and competitive.

In Dar es Salaam, this type of service provision is becoming more common due to the lack of services provided either by the concessionaire or the DCC. This applies to some independent private truck hauliers who are contracted out by hotels, restaurants and industries to collect their refuse as well as the hand cart operators who are paid by the number of bags they carry from people living in non serviced areas.

7.6.2 Conclusion

a. Conclusion

Based on the models already experienced in Dar es Salaam and from records of other similar cities world wide, a "mixed" or "combined" institutional model, where government and private operators, each working in different areas of the city, is the most appropriate for the present conditions prevalent in Tanzania.

The contracting system shall have the following objectives.

- Reduce the government's burden on services that can be provided by the private sector.
- Provide competition among the several solid waste management service providers with several private firms working in different wards.
- Provide the means for DCC to compare the efficiency and operational procedures of the different service providers, which include not only the private contractors but also the services under the Waste Management Authority of DCC.
- Improve the overall solid waste management service provision in Dar es Salaam.

In this model, the DCC will contract services out to private companies in the same way that public works contractors are hired in general, i.e., through a competitive bidding process where the winner bidder or tenderer is the one who proposes the least cost or the best offer to the government agency.

In this case, the municipality, under the terms of the contract, will pay the contractor on time. In Dar es Salaam this will happen only when the DCC achieves the capacity to do so and until then the private companies will keep working as concessionaires, charging the RCCs directly to the waste producers. According to the scheme proposed, the DCC will hire the private companies as contractors, pay them directly and collect charges (which supplement cleansing service cost) from the public from the year 2002 onwards.

The terms of contract will set the payment on a monthly schedule, according to an amount defined at the time of the bidding.

The contracts shall be awarded for a period of 5 to 8 years which is the approximate economic life of the collection trucks and related equipment.

b. Summary of Proposed Scheme of Privatisation

As agreed with the DCC, the planning frameworks of the M/P for Dar es Salaam regarding the institutional component will therefore be as follows.

i. Establishment of a mixed system, with some wards being serviced by DCC and others by the private sector with regard to garbage collection and street sweeping.

ii. Disposal operations by the DCC.

iii. The present concession system in which the private collectors collect the RCCs should be replaced with a system in which DCC would contract out services and pay the contractor according to the contract.

iv. Setting up a method for collection of the RCC by the government, which would ensure compulsory payment, the most promising one, at this moment, being the joint billing with the water bill issued by DAWASA or collection by DCC when business licenses are issued or renewed, or when special collection services (i.e. bulky waste, garden waste collection, etc.) are requested.

In this model the private sector will be operating in the UA's as concessionaires first and later as contractors while the DCC will provide services to the SUPA's, SUUA's and RA's together with the private operators.

The set up and transition of these systems will be made according to a scheme presented in the table below.

Table 7-3: Proposed Scheme for Privatization

Year / Area of the city	1997 - 1999	2000 - 2002	2003 - 2005
UA	Concessionaire	DCC (contractors)	DCC (contractors)
SUPA	Concessionaire and DCC	DCC (direct and contractors	DCC (contractors)
SUUA	Concessionaire and DCC	DCC (direct)	DCC (direct and contractors
RA	No service	Self disposal	DCC

7.7 Rules and Guidelines for Contracting out

Based on the conclusions presented above a more detailed description of the proposed system as well as the guidelines and rules to implement it are given below.

7.7.1 Guidelines, Specifications Payment Method

a. Contracting out Guidelines

i. Open competition

Competition, in any type of service delivery, is a key factor in reducing the cost and in introducing better technologies and procedures to please the clients. In the case of Dar es Salaam being the institutional system based on contracting out private firms, the main client is the DCC, the organization that pays the bill. However the waste producers shall also be regarded as clients since they are paying the city taxes and RCC to the DCC and are also the main recipients of the services

ii. Diversity of bidders

The contracting out process shall be as such to assign several contractors to several areas in the city. This can be attained by awarding contracts of a ward or groups of wards making up a collection of zones hindering the winners of one zone from proposing to provide services in another zone.

iii. Contract specifications

A key factor to foster competition and to provide the means for subsequent control and monitoring is to have an appropriate tender document, which shall include the draft contract to be signed with the winner of the bid.

iv. Pre-qualification

A tender system where the proponents are pre-qualified will help to select the best bidder. In the case of Dar es Salaam, the prequalification requirements shall take into consideration the capabilities and limitations of private contractors in Tanzania, and at the same time ensure that the bidders have some technical knowledge and enough financial support to carry out its duties proposed during in the tender process.

v. Selection process

The commission of DCC officials shall finally select out of those selected by the Supervision and Monitoring Committee and advised by solid waste management experts. The process shall be transparent so that there are no ambiguities about the final result raised by the tenders, other government officials, the commissioners or by the citizens. All the process must be fully publicised in the press and all the documents provided for the bidders or by the bidders shall be open to the public.

b. Key Specifications

The services to be provided by the contracted company will comprise the collection of refuse in designated areas and the corresponding street sweeping services and weeding.

Collection will include household wastes, light industrial and commercial refuse and inert hospital wastes (i.e. not infectious or hazardous), and the street sweeping activities will include, the sweeping of streets, avenues and squares as well as cleaning and maintenance of parks and public gardens.

The way the services will be presented by the contractors and controlled by the DCC administration shall follow the Service Standards, presented in section 7.2.2.

c. Payment for the Services

The monthly payments to the private contractors in charge of service delivery can be made according to performance and measured in terms of weight or volume or for a lump sum, regardless of the amount collected.

Payment by the ton is today the most practised method in large cities where services are contracted out, provided that weighing equipment is available. Otherwise payment may be made by estimated volume or by a lump sum.

For Dar es Salaam the recommendation is to use the lump sum method due to the following reasons:

i. Limited experience of DCC in processing somewhat complex monthly payment methods, as in the case of payments by amount, be it weight or volume.

ii. Budgeting for the lump sum payment is simple, once the values to be paid are fixed by the value proposed in the tender process.

iii. Anticipation of the amount to be paid. If the amounts collected far exceed the predicted amount, there will be an investigation to find the reasons and, if the increase is consistent and is exceeding the amount previously fixed, re-negotiation of contract values can be discussed.

iv. There is no need to wait for the assessment of amount of refuse collected in order to invoice and process payments.

v. Eliminating the possibility of cheating and defrauding the system.

vi. Collection of "non-waste" materials such as dirt and sand is discouraged, which will increase the amount of the monthly bill.

In order to avoid problems arising from the contract control however, this method shall be used taking into account these matters (i to iv):

i. The main disadvantage of the lump sum system is that operational performance control, in this case, tends to be more complex. This happens because, in the lump sum contract the private contractor does not have an incentive to collect all the waste produced in the service area because the amount paid is independent of the amount collected.

To avoid this, the following precautions can be made:

- precise operational planning before the bidding process to be followed by the contractor using the waste amount forecasts in order to predict, with reasonable accuracy, the amount of waste to be collected
- setting up a control and monitoring structure to supervise the services and to receive complaints from the citizens in each serviced area.

The Waste Management Authority will be accountable to the Supervision and Monitoring Committee through the technical, operational planning, control and monitoring sections.

i. Strict control shall also be enforced in the sanitary landfills when admitting wastes, if disposal fees are not paid by the contractors for their designated area . The reason for this is that the private contractors may also be providing service to private customers, such as hotels, embassies, commercial institutes, and in these cases the disposal fees are to be paid separately.

ii. Control at the landfill gate shall also be enforced in order to monitor amounts of refuse brought in monthly so that if it fluctuates by more than 20 % when compared to the same month the previous year, the reasons shall be investigated carefully. If the difference is not due to errors in computation or

in changes in the operational procedures and if the variations are consistent, then the lump sum contract has to be re-negotiated. Procedures for re-negotiation shall be also be written in the service contract.

iii. Re-negotiation would apply also if the costs affecting the solid waste collection services increases by more than 20%. This circumstance has to be demonstrated through a method set in the contract, such as using official economical and financial indices or as adjudicated by an independent financial accountant accepted by DCC.

7.7.2 Service Standards

In order to ensure that the private sector will provide an adequate service, it is fundamental to define service standards which has to be disclosed during the tendering process and followed subsequently during the contract.

The service standards can be adjusted for the different situations of the city with regard to urbanization and economic level, such as:

- Garbage collection and transport
- Cleaning and sweeping
- Treatment and final disposal
- Enforcement and Monitoring

Standards for on site-storage and preparation for collection shall be imposed on the waste producers (the public in general) and enforced by public health officials while the standards on collection and transport, street cleaning and disposal shall be followed by the contractors, and by the DCC's solid waste authority. In the case of private contractors, these standards shall be part of the contract with the DCC.

Monitoring and enforcing these standards shall be one of the main tasks of the supervision and monitoring committee.

a. On-site Storage and Preparation for Collection

The following standards shall apply only to the areas where there will be curb side collection. They are not applicable to the areas using skipper trucks.

i. Refuse shall be stored and presented for collection either in a returnable container or in disposable bags or sacks.

ii. If placed in a returnable container, the container shall have the following characteristics:

- Maximum capacity of 100 liters, to ease manual handling
- If the collection truck is provided with a lifting device, the container shall have wheels and its maximum capacity shall follow the lifting equipment design specifications.
- Made of non-corrosive material, or adequately painted with non-corrosive paint
- Provided with handles and a lid.

iii. If the refuse is placed in a disposable container (plastic bag, cardboard box, paper sack) the maximum capacity of the bag, box or sack shall be 50 litres and it shall be leak proof. Piercing and sharp objects shall be prevented from tearing the bag by being wrapped in paper or in any other protective material before disposal.

b. Refuse Collection

b.1 Collection Frequency

Collection shall be made preferably three times a week. The minimum frequency shall be twice a week in residential areas, while in the Central Business District it shall be daily except on Sundays i.e. six times a week.

For the areas serviced with containers handled by the skip trucks, the container servicing shall be made according to how full the container is.

b.2 Vehicles[1]

Garbage collection shall be done using appropriate vehicles so to ensure sanitary and environmental conditions as well as easing the task of the collection workers.

This means that the preference in this case should be for compactor type vehicles with a size adequate for the street layout. In Dar es Salaam however, the poor condition of most roads in the collection area and the routes to the disposal sites, coupled with the difficulties in maintenance of sophisticated hydraulic equipment which are used in these trucks, should allow the use of less complicated trucks such as regular tipper trucks as well as the skip trucks

In the table below, the minimum and the desirable operational standards of the vehicles are presented taking into account that the desirable standards are for only when the roads are improved and when there is adequate capacity, in the public sector as well as in the private sector, to maintain and repair the more sophisticated equipment.

Items	Minimum standard	Desirable standard
Enclosure of waste	Canvas	Enclosed metallic body
Discharge of waste	Hydraulic tipper	Hydraulic plate
Compaction equipment	Not applicable	Hydraulic plate

The vehicles shall also be kept in good operating conditions, which means:

- Good appearance and painting.
- No excessive emission of fumes.
- No noise production above the normal engine and hydraulic equipment operation.
- Brakes, lights, tires and windshields in good condition.

b.3 Refuse Collectors

For the workers responsible for refuse collection the following minimum standards shall be attained:

- Adequate gear for personal protection - gloves, shoes, caps, uniform

[1] Vehicle standards are also applicable to the areas using skipper trucks

- Adequate utensils for doing their work - shovel, forks, brooms etc..

c. Street Sweeping

The frequency of street sweeping is normally as follows:

- Once a day - Paved streets in the central business area
- Once a week - Paved streets in residential areas
- Occasionally, or upon request – Unpaved streets

d. Final Disposal

Standards shall follow environmental legislation of Tanzania issued by the National Environmental Management Council and specific rules and guidelines as proposed in this report.

e. Consumer Queries

Complaints from the population related basically to failures in collection or street sweeping shall be handled by the Complaints and Special Services Unit.

Response to the complaints, which means the correction of the failure or deficit, shall be attained within a 24 hour period maximum.

7.8 Monitoring and Information Management System

An information system for monitoring and control is a very important tool for the achievement of improved solid waste management in Dar es Salaam.

Solid waste management deals with many repetitive tasks and a few other occasional ones and special activities on request. Planning and design of both tasks as well as the evaluation of the final results of the services shall rely on a continuous monitoring system.

The institutional framework required to exercise monitoring and control over solid waste management activities starts with the definition of clear and sound guidelines to the general public, the private sector and the DCC organisation in charge of solid waste.

In Dar es Salaam, environmental and physical parameters for monitoring shall be established in order to allow for the quality and cost of services to be evaluated. For example, the design of a collection route can be monitored and evaluated through the following parameters:

- Amount collected (kg)
- Distance of collection routes (km)
- Time spent on collection (h)

With these parameters, indicators such as amount of refuse collected per kilo or per hour can be calculated at regular intervals. Comparison and analyses of these indicators can be made in order to adjust collection through appropriate control measures.

The monitoring system will provide information for the Supervision and Monitoring Committee , which, in turn will be continuously controlling the quality and costs of the service provided by the DCC as well as by the private concessionaires.

7.9 Human Resources Development

7.9.1 Needs of Human Resources Development

Human resources development is basic and fundamental to any solid waste management improvement proposal, especially if the scarcity of professionals available in Tanzania is taken into account.

It is important to note that, even if private contractors took an important share of providing solid waste management service, the technical and administrative capacity of the public sector dealing with solid waste management has to be enhanced, in order to fulfil its public duties and responsibilities. This is because the solid waste management organisation will also be controlling and monitoring the private concessionaires' activities.

Furthermore, if a failure occurs with the private service providers the DCC has to be in a position to take over the collection, street sweeping and disposal activities in full, at least for a brief period, until replaced by another contractor.

Human resources development in the Dar es Salaam solid waste management system shall cover the whole spectrum of professionals and employees, from management to operational levels, including those responsible for supporting activities.

In accordance with these requirements, a training programme shall be developed under two different concepts: internal short courses and on-the-job training. These two strategies may be complemented by technical exchange programs to other African nations or other countries similar to Tanzania where successful solid waste management systems have been implemented.

In line with the needs for human development, the recruitment of three foreign experts is being proposed to work for a beginning few years with Tanzanians counterparts in the areas of Planning, Maintenance and Technical Support. These experts could well be supplied by external co-operation agencies without cost to the DCC.

Basic guidelines or a human development program is presented ahead.

7.9.2 Human Development Program

a. Rational of the Program

One of the main constraints for the proper management of solid waste in Dar es Salaam is the lack of skilled human resources to operate the various components of the operational system as well as the necessary planning and monitoring that would guide the operations be it by the DCC or by the private operators.

Several attempts to improve the city's solid waste management system with foreign aid in the form of equipment and vehicles have failed and the efforts of the city council in pursuit of providing a better service on a sustainable basis has shown little success. This

has happened, in part, due to the lack of technical and operational capacity of the DCC personnel to operate and maintain the donated or acquired equipment assigned to collect and dispose the refuse generated in the city.

Currently, a privatization policy for solid waste management is being implemented in Dar es Salaam, and by no means this policy should be understood as a withdrawal of the government from the ultimate responsibility of providing solid waste management services. It should remain within the public sector. On the contrary, this privatization process should be tied with the strengthening of the public sector, so that it could perform better planning, monitoring and control and therefore able to guide the private sector to fulfill not only their business goals but also the public's interests and needs.

This is particularly important once solid waste management is provided by private contractors. Usually, some form of monopoly of these services, while although temporary, tends to appear. SWM should be regarded as providing and benefiting all of society uniformly.

It should also be stressed that the private contractors so far dealing with solid waste management, do not have either a tradition in this field or any opportunity of technical training. Also it is not linked to any specialized international solid waste services company which could transfer technology to them.

These are basically the reasons why it is necessary to develop a training program leading to capacity building of professionals, dealing with operational and technical aspects of solid waste management in Dar es Salaam, and later extended to the rest of Tanzania.

b. Objectives of the Human Development Program

The main objective of the human development program for solid waste management is to provide technical and operational skills to the government as well as to individuals in charge of handling solid waste management activities in Dar es Salaam, specifically in the fields of:

- Collection of refuse
- Street sweeping
- Treatment and disposal
- Sanitary landfill operation
- Operational planning
- Operational monitoring and control
- Community involvement and environmental education

c. Components of the program for human development

The human development program will be divided into the following three types of capacity building and learning methods:

- Short courses on site
- Field visits to other related institutions
- Seminars and workshops

c.1 Short courses

Short training courses shall be conducted in Dar es Salaam, at a convenient learning institution. The total number of people to be involved in the solid waste management works in 2005 is estimated to be approximately 900 including people to be engaged in administrative, collection and transport, final disposal, maintenance of equipment, etc. This figure also include all people in DCC and private sectors. The short courses should be given to approximately 20% of total number of people, whichever they are in DCC or private enterprise. Therefore the short courses should be given to approximately 30 trainees every year after the year 1998. The duration of each course shall be of around 20 hours and the subjects to be covered shall be:

Course 1 - Collection of domestic solid waste

- Characteristics of domestic solid waste: types, composition, physical properties: volume and weight, specific density, water content, calorific value.
- Public health and environmental implications: recycling and potential re-use of SW. Characteristics of the waste produced in Dar es Salaam.
- Origin of solid waste, amount per capita, influence of people's income, level of urbanization, daily migration, climate, etc. Present situation in Dar es Salaam.
- Collection and pre-collection - methods, equipment, manpower - efficiency and productivity; frequency and time of collection; the effect of different storage methods; collection; design of collection routes; uniformity of routes. Practical exercise.

Course 2 - Street sweeping and public spaces maintenance

- Street sweeping: characteristics of litter and other residues from public spaces - nature, physical properties, nuisances; cleaning methods, equipment and tools; public behavior and cooperation; planning street sweeping activities.
- Urban drainage system: maintenance and cleaning of gutters, channels, open ditches; equipment and tools; coordination between street sweeping and drainage maintenance.
- Practical exercise: design a cleaning plan for a public area in Dar es Salaam.

Course 3 - Treatment and disposal methods and facilities

- The concept of treatment and final disposal; waste minimization and recycling. Rationale for treatment.
- Incineration, composting and recycling - methods, facilities and associated costs
- Sanitary Landfill: basic concept; methods and equipment used; design and planning; hazards caused by pollution

Course 4 - Planning and control of solid waste management activities

- Concept of planning and control: objectives and goals; planning and control at different levels; what to control and why.

- Operational planning: routine and non-routine operations; short term and long term planning
- Planing and controlling personnel, supplies, procurement; budget planning and control.
- Guidelines, regulations and by-laws on solid waste management: existing regulations in Tanzania. Enforcement procedures and practices.
- Coordination of solid waste management and other government activities; the role of CBOs and NGOs in the delivery of services and in its monitoring and control.
- Planning and control analysis and evaluation. Feedback actions and techniques.

Course 5 - Support services

A wide array of support services, not exclusive to solid waste management, should also be considered for improving the knowledge and operational capacity of the personnel in charge of solid waste management in Dar es Salaam.

Some of the subjects to be thought out, among others, that could be later identified are:

- Vehicle and equipment maintenance and repair
- Safe driving techniques
- Workers' health and safety requirements
- Computerized data base operation
- General accounting
- Supplies administration
- Tax collection and administration
- Others

Professionals from other cities in Tanzania (and even from neighboring countries) shall also be admitted to the courses if spaces are available.

Other interested professionals, students or even non-professional individuals, for example those from NGO's and CBO's concerned with this subject, should also be admitted to the training courses and related capacity building programs.

c.2 Field Visits and Operational Training

A limited number of professionals attending the short courses shall have the opportunity to make field visits and attend internship programs to neighboring solid waste institutions and operators, in order to get acquainted with other methods, equipment and systems in use elsewhere in African nations.

The field visits and internships shall be arranged by international technical assistance agencies working in Tanzania (SDP for example), planned in detail, in advance, and the recipients of these visits shall have an exemplary record in the short courses attended.

Each visit should not last less than one week and not more than one month. The countries where these visits would probably take place include Kenya and the Republic of South Africa.

During the visits and internships trainees shall have a full time instructor to guide them to gain practical experience.

c.3 Seminar and Workshops

Seminars and/or workshops shall be organized after each series of training courses in order to disseminate the knowledge gained to improve the solid waste management in Dar es Salaam. The course attendants and other individuals from the government, private and other non-government bodies shall be present.

The theme of these "objective seminars" shall deal with subjects covered in the short courses but on a wider scope, exploring also the possibilities of setting up precise and objective actions to implement the learning and findings from the seminars and short courses.

Alongside with the objective seminars, other meetings on policy, politics, financing, could also be organized, under themes such as:

- Financial and political implications of solid waste management
- Constraints for solid waste management development in developing countries
- Barriers to overcome public indifference towards public cleansing
- Importance of public cleansing to encourage tourism

d. Public Attendance

The attendants for the training courses and seminars shall be, primarily in the government ranks as well as in private sector contractors of solid waste management services.

Concerning the government and private sector, priority shall be given to the managers and operation personnel of DCC and the private operators but people from other areas of government such as, the National Environmental Planning Commission, the Prime Minister's Office and the City Commission Office are also welcome.

e. Media, Materials and Methods

Courses will be presented in class rooms at a convenient institution in Dar es Salaam, equipped with the regular teaching aid (blackboard, overhead projector, slide projector, etc.).

All the classes shall be accompanied by handouts and other printed materials which should guide the students and supplement the information given in the classes

After each series of courses, field visits, internships an evaluation seminars shall be held; results and achievements from the students shall be presented.

The presentation shall be made through speeches and/or an exhibition of drawings, photos and plans, so that a broader audience can benefit from the experience of one.

All the courses and field visits/internships shall be evaluated and documented, in terms of learning achievement and instructor performance to guide future training and to measure the effectiveness of the training program.

f. Instructors

Teachers, instructors and lecturers shall be well acquainted not only with the subject of learning but also the actual situation of solid waste management in Tanzania.

The program shall also benefit from the support of foreign experts who will possibly be working in the Waste Management Authority. These professionals shall work towards providing technology transfer to its Tanzanian counterparts and also to assist in setting up the courses and seminars .

Ideally the courses offered shall have an even mixture of foreign and domestic instructors so that both international and national experiences can be incorporated to the course.

7.10 Public Education and Co-operation

Better public co-operation is fundamental to an improved solid waste management in Dar es Salaam. Three essential issues need to be addressed in a public cooperation programme.

- Demonstrating actual, tangible improvements in refuse collection and disposal services to the public.
- Public education on solid waste management.
- Informing the public and gaining their acceptance for the proposed institutional, administrative and legislative changes.

7.10.1 Improvements in Refuse Collection and Disposal

For some time, the general consensus of the public has been that DCC was incompetent in performing its duties, including the provision of refuse collection and disposal services. Public discontent can be sensed from many articles in newspapers such as: 'Stinking Garbage Litters City Streets'[2], 'Dar es Salaam Residents Face Epidemic Risk'[3] and "From a Haven of Peace to a Haven of Garbage"[4]. The Prime Minister's decision to dissolve the DCC at the end of the largely unsuccessful 6 month "Dar es Salaam City Clean-up" campaign was widely supported by the general public.

These widespread negative attitudes of the public towards city management must be countered and reversed if public co-operation in solid waste management is to be improved. In this respect, action will speak much louder than words. There is little point in any public education programme, publicity campaigns, etc. if they are not accompanied by an improvement in the refuse collection and disposal services. If the public see that their refuse is being collected on a regular basis, their neighbourhood is cleaner and there is less garbage in the drains, then gaining their support and cooperation concerning solid waste management will be much easier.

[2] Daily News, 6/12/95
[3] Daily News, 18/5/96
[4] Guardian, 13/6/96

7.10.2 Public Education

The lack of cleanliness in the city can not be blamed entirely on the DCC. The central city area is a classic example. Although Multinet has been providing a reliable refuse collection service in 5 central city wards for some time, many people refuse to pay for this service, while others dumped their refuse on the streets or in vacant lots. The latter practice typifies an "out of sight, out of mind" attitude towards the cleanliness of the city which is quite common. Solid waste management is seen as a low priority by many people, especially in poorer areas.

Public education is required to counter such attitudes and practices. A public education programme should cover certain basic issues such as solid waste and disease, good and bad household refuse management practices, etc.. There are a large number of related issues that can be explored as well (e.g. recycling). It should aim to increase understanding, foster a sense of personal responsibility towards solid waste management and the environment and build a sense of pride and duty amongst residents of their environs and city.

A number of different types of public education programmes will be considered for implementation.

- Public education through the mass media; e.g. newspapers, radio, television, etc.
- Education programmes for school pupils.
- Clean-up campaigns including sanitation parades, pro-cleanliness poster competitions, annual clean-up day.
- Education programmes with local groups and through existing structures; e.g. 10 cell units, street chairmen, CBOs, Church groups, etc.

7.10.3 Informing of Proposed Institutional, Administrative and Legislative Solid Waste Management Changes

The public should be fully informed of the proposed institutional, administrative and legislative solid waste management changes, using simple language for laypersons where feasible and other appropriate forms of communication. These issues could be addressed as part of the public education programme. Important points to communicate to the public include:

- the new solid waste management organisational structure and the responsibilities and powers of this organisation. The existence of a supervision and monitoring committee and its role should be emphasised.
- a simple explanation of the new solid waste management legislation with fines and punishments for transgressors clearly defined and the enforcement procedure outlined.
- the duties and responsibilities of citizens by category (residents, businesses, restaurants, etc.) including refuse collection charges and methods of payment and complaints procedure.

The public should also be informed that they will be required to comply with by-laws only after solid waste management services have improved to a level that proves the DCC is meeting its duties and responsibilities. However, once this level has been reached and the public has been informed of this, enforcement of the by-laws should be swift and decisive. This will show the public that DCC has fulfilled its responsibilities, and now the public are also required to fulfil theirs.

7.10.4 Conclusion

A public co-operation programme based on these three issues will require some financial investment and human resources. However, the actual investment required is relatively small while potential benefits are high. The programme must be carefully planned and should be conducted together with a publicity/information campaign using the mass media (radio, newspapers, TV) which will inform the public of relevant issues, particularly achievements of the programme, thus helping further to convince the public of the DCC's new found competence in solid waste management.