

**AN
ACTION PLAN OF MUNICIPAL SOLID WASTE
MANAGEMENT FOR SHIMOGA CITY**

Submitted to :

**Directorate of Municipal Administration Government of
Karnataka
BANGALORE**

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**CITY MUNICIPAL COUNCIL, SHIMOGA
Phone : 08182 222414, Fax : 08182 226565
e-mail : comm_cmshimoga@yahoo.com**

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PART I: STATUS REPORT

1. INTRODUCTION:

Shimoga district is located in the southern part of Karnataka state. The district is famous for its art, culture and natural resources. Towards west is the Western ghats, one of the 18 global hotspots of biodiversity. The country's famous Jog falls is quite known. Shimoga taluk is the headquarters of Shimoga district in Karnataka State. The city has mainly developed as a trading center for the agricultural products, which are predominantly grown in the district. The location of the industrial estate in Machenalli triggered the industrial growth.

The city is an administrative center. It is also the center for trade and commerce, education and industries. The rapid expansion of the city has resulted in the rural – urban dichotomy.

The economic base of the city is agriculture based trade and commerce. The region is possessed with fertile agricultural land irrigated by the Thunaga and Bhadra irrigation projects. The major crops in the hinterland are paddy, arecanut, sugarcane, ragi and coconut. The Nirmala Nagara Programme has also emphasized on solid waste management for the town. A programme for improvement of solid waste management system is proposed for Shimoga on the lines of State Policy for solid waste management. The table 1 gives a list of the recommendations and implications of the National and State policy documents.

Table 1
Recommendation and Implication of National and State policies

Recommendation / Requirement	Implication
Daily clearance of waste, daily sweeping, bin or door step collection	Needs strengthening of the municipal system
Multiple handling of wastes to be avoided, well designed collection system and covered transport	This requirement necessitates complete overhaul of the present collection and transport equipment. The RCC bins and masonry bins are not acceptable
No burning of wastes, segregated collection to be promoted	Public awareness, creation and change in knowledge, attitude and practices of the public is essential. Has implication on collection, transport and disposal systems.
No open dumping, processing of biodegradable waste, inert and non-biodegradable to be land filled	Need for major initiative for establishing of the waste processing and disposal facility.
Biomedical and industrial hazardous waste to be handled separately	Requires incorporation of these facilities.

This document gives the action plan for implementation of improved solid management system in Shimoga, along with an overview of the existing system of solid waste management at Shimoga. The details of the existing staff, equipment,

contracts and budgets are provided to give a backdrop to the proposed changes. The Action plan for each of the components of solid waste management has been detailed. The overall strategy, equipment and manpower requirement and mode of execution are presented. The investments involved and strengthening of the municipal staff is also proposed.

2. REPORT OBJECTIVES AND METHODOLOGY

This report gives the action plan for solid waste management for Shimoga with a ten – year prospective. The objective of the report is as follows:

- a. To consolidate the information on the existing system of solid waste management.
- b. To detail the action plan for solid waste management in conformity with the State Policy on solid waste management and the MSW Rules 2000.
- c. To provide a document which would be used for immediate procurement of equipment and services for implementation of the solid waste management system and provide a baseline for all future plans for solid waste management for the city.

The methodology used for formulating the report is given below:

- a. An initial plan for the solid waste management was prepared based on the standards proposed in the state policy of solid waste management.
- b. The supporting collateral data for implementation of the plan has been collected. An extensive survey and data collection has been undertaken in the city about the various waste generators. Ward wise data has been collected and used for the analysis. Cost estimates have also been obtained for different equipment.

- c. Waste collection quantification has been carried to provide a baseline for waste generation estimates.
- d. Identification of the disposal sites has been carried out.
- e. Extensive discussions have been held with the municipal corporators to socialize the concepts proposed and obtain acceptance for the same.
- f. Discussions have been held with the waste generators and the Self-Help Groups to assess their interest and acceptability to the proposals. The suggestions received have been incorporated into the plans.
- g. There is a wealth of experience within the health department staff and the revenue department staff of the municipality about the various facets of waste management, people acceptability and the profile of the city. This has been tapped in collecting, understanding and interpreting the data.
- h. This document gives detailed plans for the waste management in Shimoga. The understanding and knowledge in the municipality has been used to draw up the details. But there are many imponderables, which would get known as the plan gets implemented. Consequently although the plan goes into specifics there is still scope provided for corrections that may be required at the field level during implementation.

The table 2 gives the section and page numbers where the report objectives are covered in the report.

Table 2
Report objectives and section where it is covered in the report

Objectives	Coverage in report
Collect all relevant data and assess all the existing solid waste management practices	Under points 3, 4, 5

Detailed plan for various aspects of waste management	Under points 6, 7
Financials of the solid waste services	Under points 8

3. PROFILE OF SHIMOGA

Shimoga district is located in the southern part of Karnataka state. The district is famous for its art, culture and natural resources. Towards west is the Western ghats, one of the 18 global hotspots of biodiversity. The country's famous Jog falls is quite known. Shimoga taluk is the headquarters of Shimoga district in Karnataka State.

3.1 Overall data about the City:

3.1.1 Educational Institutions:

There are 46 Lower primary schools, 53 higher primary schools, 24 higher secondary schools, 8 Junior colleges, 5 first grade colleges, 8 professional colleges, 2 polytechnics and 2 technical training institutions in the city.

3.1 .2 Industries:

The industrial scenario has also shown growth. There is one large-scale industry, located on the N.T Road, The Pearlite Company that manufactures spare parts for I.C Engines.

There are 244 medium scale industries, and 1222 small-scale industries (as per the survey in 1997). The medium scale industries are distributed in industrial estates of KIADB in Machenahalli, Mandli-Kallur and on the Sagar Road. The Machenahalli industrial estate covers an area of 300 acres and has 107 units. The Madli Kallur estate covers 38 acres and has 30units. The Industrial estate along Sagar road covers an area of about 100 acres and accommodates 93 units.

The small-scale industries are partly located in the industrial estates and few are distributed in various parts of the city. Rice Mills are predominantly located in the Thirthahalli Road and Harihar Road.

(Source: As per the 1997 data of the District Industries Center, Shimoga)

3.2 Features of Shimoga City:

Table 3
Features of Shimoga City

Name of the City		SHIMOGA
District		Shimoga
Geographical Location		13° 56'N & 75° 38'E
Area of the City		50 Sq. Kms (as per 2001 survey)
Population (In 2001, as provided by Municipal Body)		2,74,105
NO. of Municipal WARDS and Elected councilors		35
Households	Non – Slums	40,928
	Slums	12,796
Soil Type		Red Soil and Sand mixed red Soil .
Connectivity		Air: Bangalore (305 Kms) Road: Bangalore (305 Kms) Rail: Shimoga: Banglore (305)
Height		571m (above MSL)
Annual Rain fall (mm)		1812
Main Industries in the City		3(Bharat Foundry, Perfect Alloys, Pearlite)
Markets		There are 2 vegetable and fruit market and 1 meat and fish market 93 large and medium scale markets.
Hotels and restaurants		There are 236 hotels and restaurants in the city.
Shops, marriage Halls		There are 1793 shops and 28 marriage halls
No. of Hoblis		8
Hospitals		7
Nursing Homes		44

Veterinary Hospitals	2
Total Length of Municipal roads (Kms)	529 Kms
Participation of Stake Holders	41 SHG's
Development Potential	-Administrative status as district headquarters. - Potential for improvement of tertiary sector of the economy.
Budget of the CMC	The Estimated budget provision for MSWM in 2003 – 2004 is 361.85 Lakhs

3.3 Land use Patterns:

The administrative limits of Shimoga municipal council encompass an area of 50 sq.km. The Population density is 5482 persons per sq km (as per the 2001 census provide by the City Municipal authorities).

The city of Shimoga has been divided into 35 Municipal Wards for better administration. Ward wise data analysis would be apt for planning, since these form well defined structural and functional units with the municipal boundaries attached to them.

Table 4
Land use patterns in Shimoga City (1997)

Category	Existing		Proposed	
	Area (Hectares)	% age to Total	Area (Hectares)	% age to Total
Residential	874.41	38.88	1946.3	49.04
Commercial	143.26	6.37	213.75	5.38
Industrial	101.57	4.51	165.3	4.16
Public and Semipublic	210.86	9.38	292.74	7.38
Traffic and transportation	733.85	32.62	870.10	21.93
Parks playgrounds and open spaces	130.30	5.79	419.92	10.54
Utilities and Services	55.08	2.45	76.92	1.93
Total developed area	2249.33	100	3985.26	100

(Source: SUDA, Shimoga)

3.4 Population Growth and Density:

Shimoga had a population of 2,74,105 (in 2001). The population growth patterns of the city is as follows:

Table 5
Population growth of the City

Census Year	Population	Decadal variation
1951	46524	40.43%
1961	63764	27.03%
1971	102709	37.91%
1981	151783	15.04%
1991	193028	21.36%
2001	274105	29.5%
2004	295181	25.43% (Exp)
2009	333970	27.46% (Exp)
2011	350877	26.44% (Exp)
2014	377856	26.45% (Exp)

(Source: Shimoga district statistics 2001-2002, published by District Statistics office, Govt of Karnataka and the rest is calculated using geometrical progression and the decadal value is the average of the old case)

Density:

The administrative limits of Shimoga municipality encompasses an area of 50 sq.km. The Population density is 5482 persons per sq.km (worked out as per the 2001 census provided by the Municipal authorities)The city of Shimoga has been divided into 35 municipal WARDS for better administration. **Ward no. 20** named **Gandhi Bazaar (East) stood highest with density of 51.7** and **Ward no. 1** named **Sahyadri Nagar** with density of **10 stood least** as shown in the table 6.

3.5 Ward Population :

The detail ward wise population profile of Shimoga City is as in the table 6(a) and House holds in the table 6(b), below:

Table 6 (a)
Shimoga City Ward Population Profile

WARD NO.	WARD NAME	AREA Sq. Kms.	POPULATION		Total population	DENSITY (Per Sq. km.)	% to Total Population
			Non-slum	Slum			
1	Sahyadri nagar	7.61	4983	2912	7895	1037	2.88
2	J.P.N. extension	3.00	4783	692	5475	1700	2.0
3	Ravindranagar	0.19	5330	560	5890	31000	2.15
4	Gandhinagar	0.26	6253	925	7178	27607	2.62
5	Tilak Nagar	0.36	3032	0	3032	8422	1.10
6	Jayanagar	0.45	3040	2316	5356	11902	1.95
7	Basavanagudi	0.35	4502	1643	6145	17557	2.24
8	Tavarchainahalli	5.7	5169	8355	13524	2372	4.94
9	Sheshadripuram	0.54	4481	0	4481	8298	1.63
10	Tank mohalla	0.4	2085	2200	4285	10712	1.56
11	Bapoojinagar	0.33	4428	2425	6853	20766	2.50
12	Siddeshwara nagar	2.6	8052	1602	9654	3713	3.52
13	Malavagoppa (North)	2.01	6600	0	6699	3332	2.44
14	Malavagoppa (South)	1.7	5526	600	6126	3603	2.23
15	Suley byle	3.6	6974	0	6974	1937	2.54
16	Urgadoor	1.8	5900	1235	7135	3963	2.60
17	Vidyanagar	0.48	658	5384	6042	12587	2.20
18	Bekkinakalmatha	0.11	3956	0	3956	3596	1.44
19	Shivappa nayaka palace	0.14	6994	0	6994	49957	2.55
20	Gandhi bazaar (East)	0.14	7239	0	7239	51707	2.64
21	Gandhi bazaar (West)	0.18	3675	2785	6460	35888	2.36
22	Bharmappa nagar	0.28	6180	0	6180	22071	2.25
23	Seegehatti	0.18	7736	0	7736	41127	2.70

24	Bharathi colony	0.15	5393	0	5393	35953	1.97
25	Mandli	3.24	3377	12871	16248	5014	5.93
26	Gopala	2.2	12278	6949	19227	8739	7.02
27	J.C.Nagara	0.88	6130	8600	14730	16738	5.38
28	Azad Nagara	0.22	5561	300	5861	26640	2.14
29	Durgigudi	0.28	3722	1867	5589	19960	2.04
30	Ashoknagar	0.2	5854	1446	7300	36500	2.66
31	Sharavathi nagar	0.58	8749	0	8749	15084	3.19
32	Banashankari	0.12	6131	0	6131	51091	2.24
33	Hosamane	0.19	5758	2705	8463	44542	3.09
34	Vinobanagara	1.12	17725	210	17935	16013	6.55
35	Gaadi koppa	4.73	6607	405	7012	1482	2.56
TOTAL		50	204960	67,752	2,74,105		

From the table above it is evident that there is uneven population density across the wards. Gopala (ward no. 26) has highest population of 19227, and Thilaknagar (ward no. 05) with lowest population of 3032 population.

Table 6 (b)
Shimoga City Ward House Holds Profile

WARD NO.	WARD NAME	AREA Sq. Kms.	House Holds		Total House Holds
			Non-slum	Slum	
1	Sahyadri nagar	7.61	997	582	1579
2	J.P.N. extension	3.00	957	138	1095
3	Ravindranagar	0.19	1066	112	1178
4	Gandhinagar	0.26	1251	185	1436
5	Tilak Nagar	0.36	606	0	606
6	Jayanagar	0.45	608	463	1071
7	Basavanagudi	0.35	900	329	1229
8	Tavarchainahalli	5.7	1034	1671	2705
9	Sheshadripuram	0.54	896	0	896
10	Tank mohalla	0.4	417	440	857
11	Bapoojinagar	0.33	886	485	1371
12	Siddeshwara nagar	2.6	1610	320	1930
13	Malavagoppa (North)	2.01	1320	0	1320
14	Malavagoppa (South)	1.7	1105	120	1225

15	Suley byle	3.6	1395	0	1395
16	Urgadoor	1.8	1380	247	1627
17	Vidyanagar	0.48	132	1077	1209
18	Bekkinakalmatha	0.11	791	0	791
19	Shivappa nayaka palace	0.14	1399	0	1399
20	Gandhi bazaar (East)	0.14	1448	0	1448
21	Gandhi bazaar (West)	0.18	735	557	1292
22	Bharmappa nagar	0.28	1236	0	1236
23	Seegehatti	0.18	1547	0	1547
24	Bharathi colony	0.15	1079	0	1079
25	Mandli	3.24	675	2574	3249
26	Gopala	2.2	2456	1390	3846
27	J.C.Nagara	0.88	1226	1720	2946
28	Azad Nagara	0.22	1112	60	1172
29	Durgigudi	0.28	744	373	1117
30	Ashoknagar	0.2	1171	289	1460
31	Sharavathi nagar	0.58	1750	0	1750
32	Banashankari	0.12	1226	0	1226
33	Hosamane	0.19	1152	541	1693
34	Vinobanagara	1.12	3545	42	3587
35	Gaadi koppa	4.73	1321	81	1402
TOTAL		50	40,928	12,796	53,724

Slums:

About 54 Slum pockets exist in the city, and the total slum population is estimated at 69145persons (2001 census). The detail is shown in table7.

Table 7
Slum Details of Shimoga City

Ward nos.	Slum Location	Area Acres. guntas	Ownership	Declared /Identified	Population
1	Venkatapur Bovi colony	-		Declared	
1	Chikkamati 1 st stage		Government	Declared	900
1	Seva lal nagar		Government	Declared	225

1	Chikkamaddi 2 nd stage		Government	Declared	964
1	Bomman katte		Nagarasabha	Identified	823
2	Nagendra colony	1-05		Declared	692
3	Nirmala hospital	-		Identified	560
4	Venkatesh nagar channel	-	Private	Declared	925
6	Tamilian colony	2-00	Private	Declared	540
6	Hanumantha nagar	1-25	Government	Declared	1346
6	Vinayaka nagar	-	Private	Declared	430
7	Ameer Ahmed colony	5-20	Private	Declared	1285
7	Basavanagudi	-		Identified	358
8	Chwdeshwari colony	0-33	Government	Declared	345
8	Mallikarjuna nagar	2-32	Nagarasabha	Declared	1490
8	Gundappa shed	-	Private	Declared	810
8	Shanti nagar	-		Identified	5710
10	Tank Mohalla V.K. colony	0-06	Nagarasabha	Declared	2200
11	Angalayana kerri	16-00		Declared	2425
12	Indira nagar	-	Government	Declared	850
12	Indira extension guddekallu	-		Identified	752
14	MRS opposite	1-03	Private	Declared	600
16	Madaripalya	-		Identified	1235
17	Vidya nagar	3-20	Nagarasabha	Declared	740
17	Rajiv Gandhi extension	-	Nagarasabha	Declared	1179
17	New Bhovi colony	3-26	Nagarasabha	Declared	1040
17	Ganeshbhavan oposite Vidyanagar	-		Identified	840
17	Mahadevi talkies	-		Identified	350
21	Bayala kumbara kerri	1-06	Private	Declared	1540
21	Kumbara gundi	-		Identified	1245
25	Left side of Tippunagar	7-05	Private	Declared	2085
25	Ambedkar Nagar	-	Government	Declared	1079
25	New mandli	1-26	Private	Declared	1490
25	Ambedkar nagar colony	-	Government	Declared	607
25	Upper Tunga nagar	-	Private	Declared	2330
25	Lower Tunga nagar	-	Private	Declared	560
25	Tippu nagar kerri frontyard	-	Government	Declared	3850
25	Halemandi	-		Identified	870
26	Gutyappa Colony	2-10	Private	Declared	784
26	J.P. Nagar	6-04	Private	Declared	2815
26	Vishveshwaraya nagar	-	Government	Declared	980

26	Gopala survey no 10	-	Government	Declared	480
26	Mallikarjuna nagar	-	Government	Declared	935
26	Gopala	-		Identified	955
27	Millaghatta	-	Nagarasabha	Declared	8600
27	Manjunatha extension	-		Identified	
28	Panchvatti	0-11	Court – private	Declared	300
29	Saparline road Meghana hospital	0-29	Nagarasabha	Declared	1025
29	Kanch kamakshi nagara	-		Identified	842
30	Ashok nagar	-		Identified	1446
33	Right side of Sharavathi nagar	3-10	Government	Declared	1385
33	Handi jogara Hatti	0-30	Private	Declared	1320
34	Kallahalli	-	Government	Declared	210
35	Kashipura Tamil colony	-	Government	Declared	405
TOTAL					67752

Table 8

Ward Wise Data on different Waste generating Establishments

Ward No	Marriage Halls	Hotels & Restaurants	No. of Vegetable and fruit Markets	No. of Meat and Fish Markets	No. of Shops	No. of Hospitals	No. of Nursing Homes
1		1			19	1	
2	1	1			17		
3		8			45		4
4		25			137		11
5	4	14			1085		10
6	1	15			61	1	2
7					61		1
8	1	4			121		
9	1	7			108		
10	2	13			96		
11	1	14			145		
12					40		
13					54		
14					46		
15					23	1	3
16					65		

17					53		
18		1			34		
19		3		1	68	1	2
20	3	6			318		
21	1	8	1		286		
22	1	3			251		1
23					184		
24		11			84	1	
25		20			181		
26		7			171		
27	2	28			232		
28	2	4			329		2
29	1	5	1		2367		6
30	2	7			108		1
31	2	7			94	1	2
32	1	7			86		
33		7			135		
34	1	10			65		1
35	1				16		
TOTAL	28	236	2	1	7193	7	44

3.4 Salient Data about the City :

Table 9

Ward wise details on Road Infrastructure

Ward No.	Ward area in Sq.Kms (ref: RAMKY Engg's report)	Type of Road			Drain Length			Total length in kms.
		A	B	C	Surface drains (kms)	Kaccha drains (kms)	Box drains (kms)	
1	7.61	-	-	36.50	16.5	9.45	1.1	36.50
2	3.22	1.60	15.00	-	22.9	0.28	3.45	16.60

3	0.19	-	12.60	-	10.8	0.25	0.3	12.60
4	0.26	-	16.20	-	10.07	0	0.5	16.20
5	0.36	-	11.30	-	11.12	4.52	0	11.30
6	0.45	-	8.20	4.80	9.33	2.44	0.82	13
7	0.35	-	10.40	-	10.7	0.5	0.6	10.40
8	5.70	-	-	28.80	19.3	21.5	1.2	28.80
9	0.54	-	8.03	-	6.05	2.3	0.75	8.03
10	0.40	5.62	5.625	-	6.7	0.45	2.35	11.25
11	0.33	5.57	5.57	-	1.14	0.2	1.4	11.14
12	2.60	-	11.30	4.50	11.38	8.81	0	15.80
13	2.01	-	-	10.00	4.71	3.32	0	10.00
14	1.70	-	-	11.00	7.46	1.59	0	11.00
15	3.60	-	-	11.55	2.73	9.38	0	11.55
16	1.80	-	-	14.90	5.96	3.25	1.08	14.90
17	0.48	-	-	12.50	10.06	4.34	0.57	12.50
18	0.11	-	6.05	-	5.063	0	0.82	6.05
19	0.14	-	6.59	-	9.47	0	1.45	6.59
20	0.14	7.60	-	2.30	14.2	0	1.1	9.90
21	0.18	5.16	-	1.10	8.82	0	1.4	6.26
22	0.28	5.60	-	1.48	8.48	0	1.24	7.08
23	0.18	1.00	2.40	2.00	5.79	0	6.71	5.40
24	0.15	1.00	5.57	-	6.11	0	1.41	6.57
25	3.24	-	16.00	2.80	16	0	2.8	18.80
26	2.20	5.10	46.20	-	56.1	5.2	2.25	51.30
27	0.88	2.00	16.35	2.80	23.5	0	1.7	21.15
28	0.22	3.18	5.26	-	8.85	0	1.07	8.44
29	0.28	9.30	5.88	-	10.89	0	4.69	15.18
30	0.2	2.40	8.75	-	22.8	0	1.8	11.15

31	0.58	-	8.47	-	11.85	14.25	1.1	8.47
32	0.12	5.52	2.22	-	9.2	0	0.7	7.72
33	0.19	7.80	2.90	-	16.92	1.6	1.3	10.70
34	1.12	3.10	45.00	-	31.72	9.48	2.7	48.10
35	4.73	-	-	28.27	11.2	5.4	1.85	28.27
TOTAL	50	71.56	281.87	175.3	443.881	108.51	50.471	529

(Source: RAMKY Report)

❖ From the above table:

- ◆ "A" Type Roads: Daily Sweeping roads.
- ◆ "B" Type Roads: Twice in a week Sweeping roads.
- ◆ "C" Type Roads : Once in a week Sweeping roads.

The estimate of waste is based on generated data is presented in table 10. The data is presented ward wise. The product of waste generation and the number of generators in the ward give the waste quantity of waste generation of that ward. The data for each generator and ward is calculated and presented. The total waste generation is estimated at 83.50 tones per day. The waste generator for per ward is also available.

4.CURRENT SOLID WASTE MANANAGEMENT PRACTICE

The Shimoga CMC is responsible for solid waste management of the City. It has its own staff and equipment and hired out staff and equipment to undertake the solid waste management for the city. The details are given in this section.

4.1 Overview

The solid waste management system of the town consists of round RCC bins as the primary collection receptacles. In addition there open storage sites where waste is disposed by the waste generators. The number of such location ward wise is given in table 11. The dustbins are classified as A which are cleared daily, B which are cleared twice weekly and C which are cleared once a week. The waste generators throw the unsegregated wastes into these bins. The Pourakarmikas sweep the wastes from the road and transfer them to these bins. The bins are emptied into tractors manually by loaders. The tractors then transfer to waste to different locations outside the city. At Shivappa market the waste is put into the container and lifted manually into the lorry. The Shimoga Municipality has 50 containers and they are placed at market & other locations for collection of waste. The waste in the containers are lifted daily & disposed off.

Table 11
Details of Dustbins

Ward No.	Dust bins	Black Spots
1	7	10
2	21	15
3	15	2
4	22	3
5	17	9
6	18	2
7	10	5

8	7	10
9	9	5
10	4	6
11	5	6
12	9	15
13	14	15
14	5	10
15	12	10
16	12	15
17	9	12
18	22	10
19	11	10
20	6	6
21	7	5
22	11	10
23	15	12
24	7	10
25	23	10
26	41	15
27	23	12
28	5	10
29	19	8
30	5	5
31	16	5
32	26	10
33	13	10
34	35	5
35	2	4
Total	483	307

The road sweeping activity is carried by Pourakarmikas. There is no standard for length covered by a Pourakarmikas. The Pourakarmikas using conventional long handle brooms, wheelbarrow, and baskets for sweeping. All roads & streets are swept on daily basis & the street sweeping is done only once a day during morning. The details of sweeping are given in table 12

Table 12
Data on road Sweeping

Sl. No.	Activity	Details
1	Road Sweeping	The activity is divided ward wise & its managed by 4 health inspectors. There is no recorded particular sweeping beat and the health inspectors manage the programme on day to day basis required.
2	Drain Cleaning	The smaller drains are cleaned along with street sweeping & on demand basis. The deeper drains are cleaned 2 times in a year. The health department manages all drain cleaning

There are five tractors, provided with mesh, two lorries, one tiller owned by CMC. All these vehicles are used for solid waste management. Additionally 6 lorries were taken on hire for two month to clear historical deposits and stopped the list of vehicles owned and operated for solid waste management is given in Table 13. The tractors are provided with mesh.

Table 13
List of Vehicles

Sl. No.	Vehicle Type	Vehicle No.	Owner	Use
1	Tractor	CNS 3790	Municipal	MSW
2	Tractor	CNS 3791	Municipal	MSW
3	Tractor	MYS 4013	Municipal	MSW
4	Tractor	CNS 5004	Municipal	MSW
5	Tractor	CNS 3056	Municipal	MSW
6	Lorry	KA14 - 0762	Municipal	MSW
7	Lorry	CTC 9376	Municipal	MSW

8	Tiller	KA14 -27	Municipal	MSW
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4.2 SWM Staffing :

The Municipality has its permanent and staff contract. The permanent staff of the CMC includes 334 PKs (At present there are 349 PK's but very shortly (with in a 2/3 months) 15 PK's will be retired so it is mentioned 334PK's), 7 Drivers, 6 Supervisors, 1 Senior Health Inspectors, and 2 Junior Health Inspectors. There is a minimum 15% absenteeism (most percentage of PK's are aged and usual unhealthy ness) among the Pourakarmikas & the effective strength is 284. The contract staff includes about 78 Pourakarmikas. The CMC has been provided with an Environmental Engineer on contract.

Table 14
List of Human Resource available

Sl. No.	Staff	Deployed	
		Permanent	Temporary / Contract
1	Pourakarmikas including loaders	334	78
2	Drivers	7	0
3	Supervisors	6	0
4	Sr. Health Inspectors	1	0
5	Jr. Health Inspectors	2	0
6	Environmental Engineer	0	1

4.3 Privatisation:

The CMC had provided collection and transportation for some of its wards. This will be suspended, in the near future the Pourakarmikas will be scheduled properly under each Junior Health Inspectors.

4.4 Financial Aspects:

Previous Budget Analysis:

Table 15
Briefing the annual expenditure of Shimoga CMC for the years 2001-2002, 2002-2003 and 2003 – 2004

Particulars	2001-2002		2002-2003		2003-04	
	Provision (Rupees in Lakhs)	Expenditure (Rupees in Lakhs)	Provision (Rupees in Lakhs)	Expenditure (Rupees in Lakhs)	Provision (Rupees in Lakhs)	Expenditure (Rupees in Lakhs)
Dustbins and pushcarts (Repair and Purchasing)	2.60	2.42	2.45	--	1.50	6.47
Transportation of Solid Waste Charges for Contractor	60.00	53.63	75.00	61.55	65.00	68.18
Equipments	1.75	0.23	2.00	1.17	00.60	00.73
Salary for SWM Staff	260.00	249.98	252.00	240.00	262.25	169.72
Pensionary Contribution	--	--	--	--	--	--
Vehicle repairs, insurance and fuel(for all vehicles)	23.50	20.08	35.00	28.41	32.5	24.8
Total	347.85	326.34	366.45	331.13	361.85	269.9

Cost per Ton/day $\longrightarrow 361.85 / 83 / 365 = \text{Rs. } 1194$

4.5 Biomedical and industrial wastes:

There is a separate arrangement from each hospital for Biomedical waste and its treatment. There is Biomedical treatment plant at 31/C Machenahalli industrial area about 11kms away from the city. It is under the control of Indian Medical Association. Explained in table 16.

Table 16
Details of Biomedical waste is as bellow

1. Location of Site	31/Construction Machenahalli Industrial area
2. Extent of Land	1 acre
3. Whether land purchased / under lease	Lease/sale, KIDB land
4. If purchased, what extend of Land	Purchased (3.47 Lakhs)
5. Number of Hospitals in ward	Shimoga 52, Bhadravathi 14
6. Total waste generated	250 kgs per day
7. Cost per bed involved	Rs.3/- per bed, per day
8. Type of treatment	Incineration, Chemical disinfections with 1% & 10% hypoclorid solutions
9. Number of Vehicles in ward	1 Omni vehicle.
10. Time schedule of collection of waste	9.30 AM to 2.00PM Shimoga 3.00PM to 5.00PM Bhadravathi

4.6 Activities undertaken under Nirmala Nagara Programme:

As part of the Nirmala Nagara Programme the classification of dustbins for routine collection of waste has been taken up. Identification of self-help groups has been undertaken. Disposal site has already been identified and possession has been taken.

4.7 Processing and Disposal:

At present there is no processing of waste has been undertaken. Construction of compound wall and development of roads at the landfill site has been tendered out and work order has to give.

Table 17

Analysis table of current SWM situation and MSW rules 2000

Sl. No.	Item	Present Situation	Comments
1	Storage at Source	Storage of stores is not instead upon & it is not regular practice. Throwing of waste on roads, drains & open space is a common practice.	The current practice is in complete contravention to requirements of SWM rules 2000.
2	Primary Collection	The waste collection from the generators is based on a bin-based system. RCC cylinders are used as bins.	The use of RCC bins is not allowed as per SWM rules. There is a need to change the basis of primary collection with a focus on door-to-door collection. The initial experiments have to be strengthened and new systems put into place. Sagregation should also be introduced overtime.
3	Sweeping	Sweeping is done based on adhoc plans.	A proper plan has to be made for sweeping & put into practice. This should be based on a set of standards, which have to be put into place.

4	Secondary Storage	The concept of secondary storage is not there. The primary collection receptacles are also the secondary collection equipment.	Secondary storage system would become relevant. Once the door-to-door collection is put into practice. The new system should restrict at the point generation.
5	Transport	Tractor-Trailers and lorries are used as transfer equipments. But loading is manual covering of waste is practiced.	The transport system should not have manual handling of waste. There is a need to upgrade the transport system. For the land fill site identified out side the city it would be more economic to transport using dumper placers in place of lorries.
6	Processing	There is no processing of wastes undertaken. An 27acres 11/4 Gunta private land has been purchased for this purpose. Construction of compound wall and Tar road at the site has been tendered out and work order has to be issued.	This is not acceptable, only non-bio degradable wastes can be land filled. A processing facility has to be established.
7	Disposal	Wastes is dumped at different locations. Dumping of waste is practiced.	The existing sites of dumping sites are not suitable for proper disposal of waste. New site has been identified. Proper land filling has to

			be put into place.
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5. WASTE ESTIMATES

5.1 Waste generation pattern and projections

It is estimated that Shimoga generates about 83.50 tones of waste per day. Out of this about 85% is collected and transported daily. The details and basis of estimates are provided based on these estimates the design capacity of the various facilities is also given.

5.2 Waste transported per day

There are 5 tractor-trailers, 2 Municipal lorries and one tiller operating in Shimoga. Weighing of waste transported per trip has been done for all the vehicles. The average number of trip has been undertaken by each of the vehicles has been taken from the records and based on the data the waste transported has been estimated in table 18. A total of 40tons is transported by tractor-trailers and lorries transports 28 tons per day. The total waste generated per day is estimated has 83.50 tons per day. Since there is problem of disposal of waste only about 60 to 70 tones of waste is transported daily.

Table 18
Waste Transported per trip

Sl. No.	Vehicle	Number	Average trip/day	Waste/trip in Kg.	Total Waste transported in Kg.
1	Lorries (Municipal)	2	4	3500	28000
2	Tractor tailors	5	4	2000	40000
3	Tiller	1	2	1000	2000

Total	8	10	6500	70000
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(Note: The services of 6 private lorries have been disconnected and the ULB's vehicles are making four trips per day.)

5.3 Waste generator based assessment

The estimate of waste is based on generated data is presented in table 20. The data is presented ward wise. The product of waste generation and the number of generators in the ward give the waste quantity of waste generation of that ward. The data for each generator and ward is calculated and presented. The total waste generation is estimated at 83.50 tones per day. The waste generated per ward is also available.

5.4 Assessment based on normative standards

The Supreme court committee report suggest the normative number of 275 gms per capita is the waste generation in towns size of Shimoga, based on the 2001 census population. Of about 2.75 lakh the waste generation estimated at 75.6 tons per day.

5.5 Waste generation per day and quality of wastes

The waste collected is estimated at about in 60 to 70 tones. The estimate based on the waste generator is 83.50 tones per day. And as per normative standards is about 75.6 tons. Based on these 3 estimates and the assessment of CMC the waste generation is estimated at 83.50 tons per day.

Table 19
Waste Characterization for Shimoga

Population range	No. of Cities	Paper	Rubber, Leather &	Glass	Metal	Compost able	Inert materi	Total
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(in Lakhs)	surveyed		Synthetics			Material	al	
1-5	12	2.91	0.78	0.56	0.33	44.57	43.59	100
5-10	15	2.95	0.73	0.56	0.32	40.04	48.38	100
10-20	9	4.71	0.71	0.46	0.49	38.95	44.73	100
20-50	3	3.18	0.48	0.48	0.59	56.67	40.07	100
50 and above	4	6.43	0.28	0.94	0.80	30.84	53.90	100

5.6 Projection of Waste Generation

A planning period of 10 years has been taken for the design of the equipment and services. The growth of waste over the next decade has been projected in the table 20. The waste projected has been done to accommodate the increase in population and a 1% increase in waste generation rate per annum. Shimoga city would still retain a large area, which is not completely urban in character in the next decade, and 1% growth rate of waste generation is deemed adequate.

Table 20
Growth rate of waste generation in Shimoga

Year	Population in lakh	Quantity of waste in tons / day
2001	274105	82.00
2004	295181	83.50
2009	333970	94.50
2011	350877	99.28
2014	377856	106.91

5.6 Design capacities of various facilities

Based on the assessed character of the waste and the projection of waste generation the design capacity of the various facility is presented in table 21. The basis is also explained in the table. The design capacity for collection transport would be 60 to 70 tones per day. For processing would be 80 to 100 tones per day.

The landfill sizing would be based on the capacity of the landfill site. It is estimated that 30% of the incoming waste would have to be landfilled.

Table 21
Design Capacities of various facilities

Sl. No.	Item	Design Year	Basis	Capacity
1	Collection & transport	2004	This is designed based on 80% of the recent capacity. The same can be upgraded as required.	60 to 70 tons/day
2	Processing	2014	At 80% of projected waste generation to accommodate for source segregation.	80 to 100 tons/day
3	Landfill	2014	A maximum of 30% of waste is estimated as landfill. The balance would be recycled as compost.	30% of generation per day

PART II: DETAILED ACTION PLAN

6. STRATEGY OF SWM FOR SHIMOGA CITY

6.1 Principles

The principles as enunciated in the Karnataka State policy for solid waste management has been adopted in the preparation of the detailed action plan.

Table 22 gives the standards used for calculation of the primary collection, secondary storage and equipment requirements.

Table 22

Standards used for calculation of primary collection & secondary storage and equipment requirements

Sl. No.	Item	Standard
1	Handcraft for primary collection	160 houses per day or 160 kg/day
2	Tricycle for primary collection	240 houses per day or 240 kg/day
3	Auto tipper for primary collection	1000 houses per day or 1000 kg/day
4	Handcart for street sweeping	1 for every 2 PK
5	Container for secondary collection	3 m ³ for 1200 kg collection and 4.5 m ³ for 1800 kg collection
6	Twin dumper placer	10 bins transported per day
7	Tractor trailer	Transport 2 ton/trip from bulk generators or 4 tons of debris

		collection / trip. Maximum 2 trips per day.
8	Sweeping standards	1 km/day/Pourakarmikas

7. DETAILED PLANS

7.1 Primary collection and secondary storage

The waste generators have been classified into 5 groups. Which includes households, small generators, large generators, and road based generators covered by CMC. Each of these groups has been further sub classified and a primary collection strategy for each of them is presented in table 23.

Table 23

Classification of waste generators and primary collection strategy

Sl. No.	Waste Generation	Primary collection strategy
1.	House hold	
	Which can Pay	Self help group/RWA to collection payment basis. The boundaries for each group are demarcated. 41 groups are proposed. The choice of equipment would be with the agency performing the work.
	Slum households	The waste collection by placing 40 litre bins and collection by CMC staff using tricycles. Declared and identified slums included.
2.	Small generators	
	Shops, Offices, Eateries, temples and other establishments generating less than 20 kg of waste per day	Collection by SHG within which the generators are present using the equipment purchased.
	Small shops can not pay	Collection by municipal staff using Pushcart.
	Large generators	

3.	Hotels, institutions and other generating more than 20 kg / day	Collection by a Private agency based on tender. Tractor-trailer to be used.
	Choultries, fairs and occasional generators	Collection by the above agency based on per use charges either through a container on hire or with tractor-trailer.
4. Road based generators		
4.	Road sweepings & shallow drain (45 cm depth) cleaning	To be done by Municipal staff.
	Road side shops	To be included as part of litter collection.
	Litter from road users	Provision of litterbins at major commercial center. Collection as part of road sweeping contract.
	Debris	Municipal crew with tractor-trailer to handle as part of task based grouping to be created.
	Dead animals	Municipal crew with tractor-trailer to handle as part of task based grouping to be created.
	Deep drain cleaning	Municipal crew with tractor-trailer to handle as part of task based grouping to be created.
	Open plot cleaning, parks and green wastes from road side trees	Municipal crew with tractor-trailer to handle as part of task based grouping to be created.
5. Waste generators not covered by CMC		
5.	Institutions managing their wastes	Industries
	Hospitals	Being collected by a Shushrutha (IMA) a private operator for handling as per biomedical waste rules. Need for government hospital to be included. Vigilance to ensure compliance to be put in place.
	Large industries or industries generating hazardous wastes	To be handled on their own

For the paying household and the small generators specific work areas have been identified and presented in map. Self-help groups for each of this work areas have also been identified and discussions held with them. These agencies are ready to initiate the door-to-door collection. The details of the grouping are provided in table 24.

Table 24
Requirement of primary collection groups

Ward No.	No. of House Holds	Command Area	Vehicle Allotted		Other generators	Name of Collecting SHG Group
			Auto Tipper	Push Cart		
1	997	997	1	--	18	SHG1
2	957	957 } 66 } 1023	1	--	18	SHG2
3	1066					
		1000	1	--	110	SHG3
4	1251	1000	1	--	137	SHG4
		251 } 606 } 143 } 1000	1	--	1146	SHG5
5	606					
6	608					
		465 } 535 } 1000	1	--	91	SHG6
7	900					
		365 } 635 } 1000	1	--	204	SHG7
8	1034					
		399 }				

9	896	601	1000	1	--	145	SHG8
		295					
		417	1000				
10	417	288		1	--	175	SHG9
11	886	598	1000	1	--	140	SHG10
		402					
12	1610	1000		1	--	35	SHG11
		298	1000	1	--	34	SHG12
792							
13	1340	548	1000	1	-	81	SHG13
		452					
14	1105						

15	1395	653	} 1000	1	--	147	SHG14
		347					
		1048		1			SHG 15
16	1180	1000		1	--	51	SHG16
		180	} 1000	1	--	51	SHG17
		132					
17	132	791					
18	791						
19	1400	1000		1	--	318	SHG18
20	1448	400	} 1000	1	--	286	SHG19
		600					
21	735	848	} 1000	1	--	259	SHG20
		152					
22	1236	583	} 1000	1	--	184	SHG21
		417					
23	1481	819	} 1000	1	--	96	SHG22
		181					
		1000		1	--	96	SHG23
24	1079	300	} 1000	1	--	91	SHG24
		700					
25	675	379	} 1000	1	--	90	SHG25
		621					
26	2456	54	} 1000	1	--	86	SHG26
		946					
		1000		1	--	85	SHG27

		510	} 1000	1	--	77	SHG28
27	1226	490					
		736	} 1000	1	--	77	SHG29
	1112	264					
28							
		848	} 1000	1	--	78	SHG30
29	744	152					
		592	} 1000	1	--	36	SHG31
30	1171	408					
		763	} 1000	1	--	36	SHG32
31	1750	237					
		1000		1	--	36	SHG33
		513	} 1000	1	--	36	SHG34
32	1226	487					
		739	} 1000	1	--	36	SHG35
33	1152	261					
		891	} 1000	1	--	36	SHG36
34	3545	109					
		1000		1	--	36	SHG37
		1000		1	--	36	SHG38
		1000		1	--	36	SHG39
		436	}				

35	1321	442	878	1	--	1183	SHG40
		879		--	06	1184	SHG41
TOTAL		40928		40	06	7193	41 SHG'S

For the slum collection, street sweeping, Malaria and task force work the CMC Staff would manage. The deployment of the staff and equipment for these works is presented in table 25. The existing staff of the CMC would be re-deployed for this activity. The staff deployment plan of the municipality is presented below. The tractor-trailers are available for these purposes.

Table 25
Deployment of Existing Municipal staff

Sl. No.	Cadre / Equipment	Number	Deployment
1	Pourakarmikas	280	For Street Sweeping and loaders
2	Pourakarmikas	24	For Water supply & UGD
3	Pourakarmikas	23	For Office
4	Pourakarmikas	10	For Box drain
5	Pourakarmikas	12	For Malaria
6	Supervisors	2	Task force
		1	For Slum Collection
		3	For Street Sweeping
6	Driver	1	For Task Force
		4	For Street Sweeping
7	Tractor Trailer	1	For Task Force
		4	For Street Sweeping

Based on the estimate of the ward wise waste generation the deployment of the secondary storage container has been proposed. The same is presented in table 26. The location of the containers have also been identified and shown on the maps. The total 25 of 3.00 Cum and 25 No. of 4.50 Cum has been proposed. In addition 5 container of each for change with dumper plaser are proposed.

Table 26
Deployment of Secondary storage containers

Sr. No.	Container Location	Container Capacity in Cubic Meter
1	Behind Navule Temple	4.50
2	Near Nagendra colony	4.50
3	Near P&T colony gate	3.00
4	Near Park	4.50
5	Near channel, behind bus stand	3.00
6	Near Park	4.50
7	Near Dutt hospital	3.00
8	Near Old Taluk office(Market)	4.50
9	Near Rajgopal office	3.00
10	Front of Sarvodaya school	4.50
11	Near ward office	4.50
12	Near Mandara school	3.00
13	Ameer Ahemed colony	4.50
14	Basaveshwar nagar	4.50
15	Shanker mutt road, Near railway track	4.50
16	Near Government employees Bhavan	3.00
17	Joseph nagar	4.50
18	Tank mohalla	3.00
19	Near B.E.O office	4.50
20	Behind gurupura school	4.50
21	Harige	3.00
22	Malavagoppa left side	3.00
23	Vaddinkoppa	4.50

24	Indira nagar	4.50
25	Soolay bail	3.00
26	Madhari playa	4.50
27	Vidya nagara right side	4.50
28	Vidya nagara	3.00
29	Lal Bahaddur Shastry nagar	4.50
30	Appaji rao compound	3.00
31	Bar line road	4.50
32	Lashker Mohall	4.50
33	Ashok road	3.00
34	Lashker Mohall	4.50
35	Double road	4.50
36	Near market	3.00
37	Harlenne kerri	3.00
38	Behind Satyapramoda kalyana mantap	4.50
39	Bharmappa nagar	4.50
40	Near post office	4.50
41	Bharathi colony	3.00
42	New Mandli	3.00
43	KHB colony	3.00
44	Vijay nagar	3.00
45	Marnavami bailu	3.00
46	Budda Nagar	3.00
47	Gujjri Line	3.00
48	Double Road	3.00
49	Front of Kasturaba College	3.00
50	Murder Conservancy	3.00

7.2 Plan for Sweeping & debris collection

It is to be done by the Municipal crewmembers. The Shimoga town has been divided into 35 wards & detailed road wise lifting for each of the ward has been done along with the road width & land use of the road.

7.3 Plan for transport of wastes

The transport of waste would be done by using dumper placer. 6-dumper placer is required to transfer the 60 containers. The map gives the details of the container & wards covered by each of the dumper placer.

7.4 Biomedical and industrial waste collection

This collection would not be done by the municipality.

7.5 Processing and disposal plan

It is proposed to have BOT based composting & landfill facility is setup in Shimoga.

7.6 Private sector participation

A significant role for private sector participation has been identified, transportation of waste with dumper placer and bulk waste management is proposed to be privatized. Table 27 gives the list of agreements and tender to be floated along with the terms of the tender. It is proposed that 3tenders and 41 agreements with SHG's.

Table 27

List of agreements and tenders to be floated

Sl. No.	Name of tender	Detail
1.	Equipment procurement tender	<p>a. Price fixation tender for push carts & Auto tippers</p> <p>b. Purchase tender for pushcart (131 numbers) & Auto tippers (41 numbers) for Municipal staff collection</p> <p>c. Purchase of dumper placer (6) & containers (60)</p>
2.	Door to door collection agreements	41 agreements with the SHG to be signed.
3.	Transportation using dumper placer	Equipments supply by CMC, operation and routine maintenance including providing one driver plus one helper from contract. 1 set of contracts for 6-dumper placer.
4.	Bulk generators both regular & occasional contract.	Contract between CMC & service provide to collect on daily basis from identified generators on an occasional basis based on demand. Municipality in term will

		charge the bulk generator.
5.	Processing and disposal	Built operate & transfer operation on long-term concession.

7.7 Deployment of Existing CMC Staff and vehicles

Table 28 gives the details of deployment of plan for the existing staff. The deployment plan for vehicles is given in table 29. The table gives the information of the numbers available and the deployment location and roles.

Table 28

Re-Deployment plan for existing staff

Sl. No.	Cadre	Total Number	Number Deployed	Deployment
1	Pourakarmikas	284*	71	For daily sweeping
2	Pourakarmikas	213*(284-71)	94	For twice a week
3	Pourakarmikas	119*(213-94)	29	For once a week
4	Pourakarmikas	90*(119-29)	50	For slum
5	Pourakarmikas	40*(90-50)	20	Task force 1 & 2
6	Pourakarmikas	20*(40-20)	20	Malaria work
	Total		284	
5	Supervisors	6	1	For slum collection
7	Supervisors	6	2	Malaria work & Task force
8	Supervisors	6	3	For street sweeping
9	Driver Tractor trailer & lorries	7	7	For task force, street sweeping
10	Environmental Engineer	1	1	Manage SWM, Malaria activities.
11	Sr. health inspector	1	1	To manage solid waste management activities
12	Junior Health Inspector	2	2	To manage solid waste management activities

* Total 334 of which typical absenteeism is about 15%. 284available on daily basis.

Table 29
Deployment plan for existing vehicles

Sl. No.	Equipment	Total Number	Number Deployed	Deployment
1	Tractor trailer	5	1	For task force
2	Tractor trailer	5	4	For road sweeping
3	Lorries	2	1	For debris
4	Lorries	2	1	To transport MSW at the time of functions and festivals. Also to transport dead animals.

8. FINANCIAL ASPECTS

The financial aspect of solid waste management plan are given in this section. With the change in system of solid waste management we do not expect any significant cost saving immediately with the inclusion of waste processing and disposal the cost would increase. But in long run experience is gained we expect that the total cost of solid waste management would stagnant not grow at the current rates.

8.1 Total investments required

The immediate investment required on the equipment are presented in the table 30. Total immediate investment required is **Rs. 1.53 Crores**. The equipment procurement budget has been estimated at Rs. **1.10 Crores** & the subsidy for primary collection would be **Rs.0.42 Crores** The choice of primary collection equipment would be left to the self-help groups budgeting purpose we have been taken auto tipper and pushcarts. & it would be used by all agency.

Table 30
The proposed capital cost for 5-year period

Sr.No.	Particulars	Quantity	Rate (in Rs)/Unit	Amount (in Rs)
I	Street Sweeping			
1.1	Push Cart	100	5,000	5,00,000
1.2	Brooms	4 X 195X 5 = 3900	148.07	5,77,473
1.3	Metal Plates	2 X 195X 5 = 1950	150	2,92,500
1.4	Metal Tray	2 X 195X 5 = 1950	1000	19,50,000
1.5	Gamella	1 X 195X 5 = 975	5	4,875
II	Primary Collection			
2.1	Auto tipper (for SHG's)	40	1,05,000	42,00,000
2.2	Push Carts (for Slums-CMC)	25	6,500	1,62,500
2.3	Push Carts (for SHG's)	6	3,250	19,500
III	Secondary Storage			
3.1	Litter Bins of 40 Liter capacity	680	304	2,06,720
3.2	Litter Bins of 170 Liter capacity	50	3319.45	1,65,972.5
3.3	Containers of 3.00 Cubic meter capacity	30	31,000	9,30,000
3.4	Containers of 4.50 Cubic meter capacity	30	35,000	10,50,000
3.5	Construction of PCC Platform of 2.5X4X0.45 mts	To be Tendered out		
IV	Transportation			
4.1	Twin Container Dumper Placer	06	08,48,429	50,90,574
V	Sprayer Equipments			
5.1	Mechanized Malaria equipment	100000	1	100000
VI	Processing & Dumping	To be Tendered out		
VII	Purchasing of Land (27 acres 1¼ Gunta)	Purchased and Position is also taken		
Grand total		1,52,50,114.5		

(Reference: CMAK estimates)

The tender value of the contracts for dumper placer transport and bulk waste generator collection has been presented in table 31 & table 32. This would be used as a basis for calling the tenders. The transport contract would be **Rs. 616687.50** per vehicle per annum at **Rs. 114.20** per ton of waste transported. The bulk generator contract would be **Rs. 458505** per vehicle per annum at **Rs 143.10** per bulk generator.

Table 31
Engineer estimate per annum per dumper placer

Average Distance per trip up & down	38		
Number of trips per day	5		
Total distance per day	190		
Fuel economy	8	Km/l	
Fuel used	23.75		
Cost per litre	31		Cost/month
Total cost of fuel	736.25		22087.5
Driver			6000
Helper			2100
Routine maintenance at 0.25% / month			2500
Cost of renting vehicle from ULB			12000
Profit @ 15%			6703.125
Cost per vehicle per month			51390.625
Cost per vehicle per year			616687.50
Cost Rs/ton transported			114.20
Cost Rs/container transported			171.30

Table 32
Engineer estimate per annum for bulk generator

Number of bulk generator	267		
Average waste per generator	42	Kg	
Total waste per day	11110	Kg	
Average waste per trip by tractor	2000		
Average Distance per trip up & down	50	Km	

Number of trips per day	2		
Total distance per day	100	Km	
Fuel economy	4	km/l	
Fuel used	25	Lit	
Cost per litre	31	Rs	Cost/month
Total cost of fuel	775	Rs * 30 days =	23250
Driver			4000
Helper			2100
Routine maintenance at .25% / month			1375
Cost of renting vehicle from ULB			2500
Profit @ 15%			4983.75
Cost per vehicle per month			38208.75
Cost per vehicle per year			458505
Cost Rs/ton transported			318.41
Average charge per generator / month			143.10

8.2 Cost Analysis for Municipal Solid Waste Management

As depicted in table 33. The CMC Shimoga has spent Rs. 2.699 Crores for the year 2003-2004. Based on the proposed system the costs for the various components have been estimated and presented along with the current year data. If the proposed system was adopted the estimated cost would be Rs. 2.53 Crores per year at present prices. The value of the contracting would be Rs 65 Lakhs which was provisioned and Rs. 68.18 Lakhs was spent in 2003-2004, Rs 75.00 Lakhs which was provisioned and Rs. 61.55 Lakhs was spent in 2002-2003 and 60 Lakhs which was provisioned and Rs. 53.63 Lakhs was spent in 2001-2002. The new system would be comparable in costs to the present system and will be **4% less** compare to previous budget. In the long run as the efficiencies improve and high cost manpower retires the projected costs would be lower than the present system. In the Long run the efficiencies improve and high cost manpower retires the projected cost would be lower than the present system.

Annexure –I

Ward No.	Slum Location	Population	Total Population	House Holds	No. of 40 Lit Bins	Push Carts	PK's Deployed	Remarks
1	Venkatapur Bovi colony		2912	582	29	2	4	The distance between slums found to be more than 1 Km.
1	Chikkamati 1 st stage	900						
1	Seva lal nagar	225						
1	Chikkamaddi 2 nd stage	964						
1	Bomman katte	823						
2	Nagendra colony	692	2177	435	22	2	4	The distance between slums found to be more than 1 Km.
3	Nirmala hospital	560						
4	Venkatesh nagar channel	925						
6	Tamilian colony	540						
6	Hanumantha nagar	1346	2316	463	23	2	4	The distance between slums found to be more than 1 Km.
6	Vinayaka nagar	430						
7	Ameer Ahmed colony	1285						
7	Basavanagudi	358	1643	329	16	1	2	The distance between slums found to be more than 1 Km.
8	Chwdeshwari colony	345						
8	Mallikarjuna nagar	1490	8355	1671	84	1	2	The distance between slums found to be more than 1 Km.
8	Gundappa shed	810						
8	Shanti nagar	5710						
10	Tank Mohalla V.K. colony	2200						
			4625	925	46	1	2	The distance between slums found to be more than 1 Km.

PRIMARY COLLECTION:**Table I: Showing Calculation Sheet for Slums**

11	Angalayana keru	2425						
12	Indira nagar	850	2202	440	22	1	2	The distance between slums found to be more than 1 Km.
12	Indira extension guddekallu	752						
14	MRS opposite	600						
16	Madaripalya	1235	5384	1077	54	1	2	The distance between slums found to be more than 1 Km.
17	Vidya nagar	740						
17	Rajiv Gandhi extension	1179						
17	New Bhovi colony	1040						
17	Ganeshbhavan oposite Vidyanagar	840						
17	Mahadevi talkies	350						
21	Bayala kumbara keru	1540	2785	557	28	1	2	The distance between slums found to be more than 1 Km.

21	Kumbara gundi	1245						
25	Left side of Tippunagar	2085	12871	2574	129	3	6	The distance between slums found to be more than 1 Km.
25	Ambedkar Nagar	1079						
25	New mandli	1490						
25	Ambedkar nagar colony	607						
25	Upper Tunga nagar	2330						
25	Lower Tunga nagar	560						
25	Tippu nagar kerri frontyard	3850						
25	Halemandi	870						
26	Gutyappa Colony	784	6949	1390	70	2	4	The distance between slums found to be more than 1 Km.
26	J.P. Nagar	2815						
26	Vishveshwara ya nagar	980						
26	Gopala survey no 10	480						
26	Mallikarjuna nagar	935						
26	Gopala	955						
27	Millaghatta	8600	8600	1720	86	2	4	The distance between slums found to be more than 1 Km.
27	Manjunatha extension							
28	Panchvatti	300	3613	723	36	1	2	The distance between slums found to be more than 1 Km.
29	Saparline road Meghana hospital	1025						
29	Kanch kamakshi nagara	842						The distance between slums found to be more than 1 Km.
30	Ashok nagar	1446						The distance between slums found to be more than 1 Km.
33	Right side of Sharavathi nagar	1385	3320	664	33	2	4	The distance between slums found to be more than 1 Km.
33	Handi jogara Hatti	1320						
34	Kallahalli	210						
35	Kashipura Tamil colony	405						
Total		67,752	13490	680	23	46		

➤ **Details:**

- **Population** : 67,752
- **For 100 Population** : One 40 Lit. Bin
- **2 PK's** : 1 Pushcart

Hence for **46 Pk's 23 Pushcarts** are required.

Table II: Showing Calculation Sheet for Non- Slums in 25::75 ratio

Ward No.	No. of House Holds	Command Area	Vehicle Allotted		Other generators	Name of Collecting SHG Group
			Auto Tipper	Push Cart		
1	997	997	1	--	18	SHG1
2	957	957 } 66 } 1023	1	--	18	SHG2
3	1066		1	--		
		1000			110	SHG3
4	1251	1000	1	--	137	SHG4
		251 } 606 } 143 } 1000	1	--	1146	SHG5
5	606					
6	608					

7	900	465	} 1000		6	91	SHG6
		535					
8	1034	365	} 1000		6	204	SHG7
		635					
9	896	399	} 1000		6	145	SHG8
		601					
		295	} 1000		6	175	SHG9
		417					
10	417	288					
11	886	598	} 1000	1	--	140	SHG10
		402					
12	1610	1000		--	6	35	SHG11

13	1340	298	1000	--	6	34	SHG12
		792					
14	1105	548	1000	--	6	81	SHG13
		452					
15	1395	653	1000	--	6	147	SHG14
		347					
		1048					SHG 15
16	1180	1000		--	6	51	SHG16
		180	1000	--	7	51	SHG17
17	132						
18	791	791					
19	1400	1000		--	6	318	SHG18
		400	1000	--	6	286	SHG19
20	600						
21	735	848	1000	--	6	259	SHG20
		152					
22	1236	583	1000	--	6	184	SHG21
		417					
23	1481	819	1000	--	6	96	SHG22
		181					
		1000		--	6	96	SHG23
		300		--	6	91	SHG24

}

24	1079	1000				
		700 379 } 1000	--	6	90	SHG25
25	675	621				
		54 946 } 1000	1	--	86	SHG26
26	2456	1000	--	6	85	SHG27
		510 490 } 1000	1	--	77	SHG28
		736 264 } 1000	--	6	77	SHG29
27	1226					
	1112	848 152 } 1000	1	--	78	SHG30
28		744	592 408 } 1000	1	--	36
	763 237 } 1000		--	6	36	SHG32
30	1171	1000	--	6	36	SHG33
		513 487 } 1000	--	6	36	SHG34
		1000	--	6	36	SHG34
31	1750					
		1000	--	6	36	SHG34
32	1226					
		1000	--	6	36	SHG34

		739	} 1000	--	6	36	SHG35
33	1152	261					
		891	} 1000	--	6	36	SHG36
34	3545	109					
		1000		--	6	36	SHG37
		1000		--	6	36	SHG38
		1000		--	6	36	SHG39
		436	} 878	--	6	1183	SHG40
35	1321	442					
		879		--	6	1184	SHG41
TOTAL		40928		10	175	7193	41 SHG'S

➤ **Details:**

- **House Holds** : 40,928
- **For 1000 House Holds** : One Auto tipper
- **For 160 House Holds** : One Push Cart

Hence **10** Auto tippers and **175** Pushcarts are required as per **25 :: 75 ratio**.

Table III: The proposed capital cost for 5-year period in 25::75 ratio basis

Sr.No.	Particulars	Quantity	Rate (in Rs)/Unit	Amount (in Rs)
I	Street Sweeping			
1.1	Push Cart	100	5,000	5,00,000
1.2	Brooms	4 X 195X 5 = 3900	148.07	5,77,473
1.3	Metal Plates	2 X 195X 5 = 1950	150	2,92,500
1.4	Metal Tray	2 X 195X 5 = 1950	1000	19,50,000
1.5	Gamella	1 X 195X 5 = 975	5	4,875
II	Primary Collection			
2.1	Auto tipper (for SHG's)	10	1,05,000	10,50,000
2.2	Push Carts (for Slums-CMC)	25	6,500	1,62,500
2.3	Push Carts (for SHG's)	175	3,250	5,68,750
III	Secondary Storage			
3.1	Litter Bins of 40 Liter capacity	680	304	2,06,720
3.2	Litter Bins of 170 Liter capacity	50	3319.45	1,65,972.5
3.3	Containers of 3.00 Cubic meter capacity	30	31,000	9,30,000
3.4	Containers of 4.50 Cubic meter capacity	30	35,000	10,50,000
3.5	Construction of PCC Platform of 2.5X4X0.45 mts	To be Tendered out		
IV	Transportation			
4.1	Twin Container Dumper Placer	06	08,48,429	50,90,574

V	Sprayer Equipments			
5.1	Mechanized Malaria equipment	100000	1	100000
VI	Processing & Dumping	To be Tendered out		
VII	Purchasing of Land (27 acres 1¼ Gunta)	Purchased and Position is also taken		
Grand total		1,26,49,364.5		

(Reference: CMAK estimates)

- **Note:**
The actual requirement for the CMC with respect to Capital cost for 5 years is shown in table 30 and this table shows only 25 :: 75 ratio of the actual requirement.

Annexure –II

STREET SWEEPING:

Table IV: Showing Calculation for Street Sweeping

Sr. No.	Detail	Total Kms.	Total PK's Required
1	Daily Sweeping	72	72
2	Twice in a Week	282	94
3	Once in a Week	175	30
TOTAL		529	196

➤ **Details:**

- **Total Kms** : 529
- **1 PK** : 1 Km.

Hence for **529Kms 196 PK'S** are required.

Table V: Showing Calculation for Tools and Equipments required for Street Sweeping

Sr. No.	Tools/ Equipments	Calculation	Total Numbers (rounded off)

1	Brooms	196 X 4 X 5	4000
2	Metal Plates	196 X 2 X 5	2000
3	Metal Tray	196 X 2 X 5	2000
4	Gamellas	196 X 1 X 5	1000
5	Pushcart	196 / 2	100
TOTAL			9100

➤ **Details:**

- **Total Pushcarts** : 100
- **2 PK's** : 1 Pushcart

Hence for 196 Pk's 100 (rounded off) Pushcarts are required.

Annexure –III

SECONDARY CONTAINERS AND DUMPER PLACERS CALCULATION:

Table VI: Showing Calculation for Secondary Containers

Total Waste Generation			83.5 Tons
Other Waste (30%) (Nursing Home & Bulk generators waste)	25Tons		
Market Waste		10 Tons	
Total Waste round off			50 Tons
Total No. of 3 m ³ & 4.5 m ³ container required	$50 / ((1.0+1.5)/2) = 40$	40 Container + 10 Container(Extra) = 50	
For Market	$10 / ((1.0+1.5)/2) = 8$	8 Container + 2 Container (Extra) =10	
Total No. of Container required			60 Containers

➤ **Details:**

- **Total Waste generation** : 50 Tons
- **Total No. of 3 m³ & 4.5 m³ container required** : 30 + 30 = 60 Containers

Hence for **50 Tons (rounded off) 60 Containers** are required.

Table VII: Showing Calculation for Dumper Placers

One Dumper Placers has		2 Containers	
One Dumper Placer Can make	5 Trips		
One Dumper Placer Can Transport		10 Containers	
For 60 Containers to transport	$60 / (5 \times 2)$		6 Dumper placer required

➤ **Details:**

- **Total Container available** : 60 Containers
- **Total Dumper Placer required** : $60/10 = 6$

Hence to transfer **60 Containers 6 Dumper Placers** are required.

