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Chapter – III

SOLID WASTE MANAGEMENT PRACTICES IN BELGAUM CITY

3.1 Introduction

In the previous chapter we studied the growth and composition of solid waste in the area of Belgaum Municipal Corporation. The objective of the present study would be to examine conventional system of solid waste management.

The present study mainly focuses on collection, transportation and disposal of solid waste. An attempt is made to study whether existing solid waste management is efficient or not.

3.2 Definition of Solid Waste

'Solid Waste' is the term used to describe non-liquid waste materials arriving from domestic, trade, commercial, agricultural and industrial activities and public services. In Indian cities, it is combination of various heterogeneous waste materials. It is commonly known as garbage, refuse, rubbish or trash etc.

A waste is viewed as a discarded material which has no consumer value to the person abandoning it. Urban solid waste is defined as; material for which the primary generator or user abandoning the material within the urban are requires no compensation

upon abandonment. It is generally perceived by society as being within the responsibilities of the municipality to collect and disposed off.[1]

According to Reddy S. Sudhakar and Gulab[2] solid waste includes refusal items from households, on hazardous solid, waste from industrial and commercial establishment, refusal from institutions (including non pathogenic waste from hospital, market yards and street sweepings). The construction and demolition (debris) is not included in solid waste.[3]

Waste which is just thrown in the open space in the city which show the negligence of Belgaum Municipal Corporation

Meaning of Solid Waste Management

The term 'solid waste management' implies storage, collection, transportation, processing and final disposal of solid waste in a manner that is accordance wit principles of economics, public health, engineering, conservation, aesthetics and other environmental considerations and that is also responsive to public attitude.[4]

The preparation and management of a good solid waste management system needs inputs from a range of disciplines, and careful consideration of local conditions.[5] Amongst them are –

- The waste itself : Domestic from industrialised countries has a low density.
- Access to waste collection places : Many sources of wastes may be inaccessible to certain methods of transport.
- Public awareness and attitudes to wastes.
- Selection of equipment : The selection of waste collection vehicles should be influenced by the type of vehicles and maintenance expertise availability.

3.3 Formal Solid Waste Management System of Belgaum Municipal Corporation

Solid waste management is divided into two parts, first is solid waste management in formal sector and second is solid waste management in informal sector. The formal solid waste management

is made by Belgaum Municipal Corporation. And the informal solid waste management is made by rag pickers, waste pickers, intinert buyers and waste recycling industries. Some households and individuals are also involving into it.

Belgaum has been operating on a conventional system of solid waste management. The waste generators put the waste into primary collection receptacles consisting of round RCC bins and masonry bins sweeping is undertaken and sweeping are also transferred to the bins. There are manually emptied into the trucks, then transport the wastes to the khasbag disposal site and dump them there. The cantonment board has its own collection and transport facility, which is outside the purview of the city corporation.

There are the RCC Bins which are kept in each street of the Belgaum City

New Dust Bins which are kept by Belgaum Municipal Corporation in each corner of the city

Attarwala (1986) in the manual of solid waste management, All India Institute of Local Self Government, Mumbai stated that an indirect method adopted by many cities by a sample weighing of vehicle, and then calculating the total by multiplying it with the total numbers of refuse trips made per day.[6]

The details of the various components of solid waste management system are presented. The table No. 3.1 gives the details of wardwise distribution of RCC bins and 16 masonry bins. The road sweeping is undertaken by about 300 sweepers. The supervisors and sanitary inspectors supervise them. There is planning undertaken at level of sanitary inspector and the details are not recorded. The table No. 3.2 gives the details about the road sweeping plans.

Community bin system is commonly used and the residents brings and deport the waste in the community bins located at street corners. For example, in ranges which are thickly populated, one waste bin served by one waste bin can be below 300. This means that in certain localities sweepers and residents have to traverse longer distance than in other localities. This system leads to the creation of unauthorised open collection points (Haysman, 1994).[7] The problem of inadequacy of waste bins is also reported from Nairobi (Karanja, 19096)[8], regarding the maintenance of waste bins, the authorities carry out checks at regular intervals and spray gammaxine powder. It was also stated that about 500 to 600 waste bins are replaced every year in Bangalore (Haysman, 1994).[9]

Table No. 3.1

Details of Dust Bins

Ward No.	No. of RCC Bins	No. of Masonry Bins	Ward No.	No. of RCC Bins	No. of Masonry Bins
1	4	-	30	15	3
2	52	-	31	18	1
3	15	-	32	9	1
4	10	-	33	6	2
5	15	-	34	2	1
6	38	-	35	6	-
7	37	-	36	5	-
8	32	-	37	8	-
9	20	-	38	8	1
10	13	-	39	3	3
11	25	-	40	8	1
12	21	-	41	6	1
13	23	-	42	22	3
14	23	-	43	55	-

Ward No.	No. of RCC Bins	No. of Masonry Bins	Ward No.	No. of RCC Bins	No. of Masonry Bins
15	62	-	44	45	-
16	46	-	45	43	-
17	47	-	46	42	-
18	25	-	47	40	-
19	13	-	48	31	-
20	18	-	49	31	-
21	22	-	50	16	-
22	14	-	51	19	-
23	13	-	52	16	-
24	15	-	53	564	-
25	10	-	54	52	-
26	10	-	55	12	-
27	6	-	56	7	-
28	11	-	57	9	-
29	6	1	58	3	-
Total			1237		16

Source : Action Plan Reports of BMC (2006)

Table No. 3.2

Data on Road Sweeping

Sr. No.	Activity	Details
A	Road Sweeping	The activity is done by typically about 300 sweepers daily. The health inspector manages the programme on day to day basis.
B	Drainage Cleaning	The smaller drains are cleaned only with street sweeping and demand basis. The deeper drains are cleaned 2 times in a year. The health department manages small drain cleaning. While large drains are the responsibility of engineering department.

Source : Action Plan Reports of Belgaum Municipal Corporation (2006)

The table No. 3.3 gives the details of the vehicles with the city corporation. There are 14 vehicles of which 5 under major repairs. The balance 9 are available. These vehicles are also under periodic repairs and its proposed that only 7 vehicles be taken as available and balance 2 being available as backup.

Table No. 3.3
List of Vehicles and Vehicle No.

Vehicle Type	Vehicle Number
TATA 709	KA 22 6379 KA 22 6380
TATA 407	KA 22 8958 KA 22 8961 KA 22 8962 KA 22 8953
TATA 7093E	KA 22 8959 KA 22 8960
TATA 1613	KA 22 8957 KA 22 8966
TATA 1210 SE	MEH 4292
Eicher Canter	KA 22 G 50
Ashok Leyland	KA 22 Z 1009

Source : Solid Waste Action Plan, 2006

3.4 Solid Waste Management Staffing

The staffing pattern for solid waste management for the city corporation is presented in Table No. 3.4. There are 375 sweepers of whom 309 are deployed for sweeping and other works and 66 are involved in lifting garbage to trucks. The typical absenteeism in sweepers is between 10-20%. There are 15 drivers available. There are totally 22 supervisors and 14 health/sanitary inspectors. An environmental engineer has been appointed as part of Nirmal

Nagar Programme. One health office manages programme. There is adequate staff in the city corporation for solid waste management and it is proposed that the existing staff be re-deployed along with new systems and no external contract for any service are proposed.

It is reported that in the many municipal corporations in India, owning to ban on recruitment since 1970, there is gross understanding, infact, the National Environmental Engineering Institute, Nagpur (NEERI)[10] has estimated that at least 3 sweepers are required to clean the garbage generated, per 1000 people. However, the existing staff is grossly inadequate.

In Mumbai, the total staff working is 26,239 which is 2.57 worker per 1000 residents normally observed in Indian cities.[11]

Table No. 3.4

Deployment of Staff in Solid Waste Management Department

Sr. No.	Staff	Deployed
1	Pourakarmikas (Sweeping etc.)	309 (12%)
2	Helpers as loaders	66 (15%)
3	Drivers	15 (3.5%)
4	Supervisors	22 (5%)
5	Junior Health Inspector	04 (0.93%)
6	Senior Health Inspector	10 (2%)
7	Environmental Engineer	01 (0.2%)
8	Health Officer	01 (0.2%)
	Total	428 (100%)

Source : Action Plan of Solid Waste, 2006

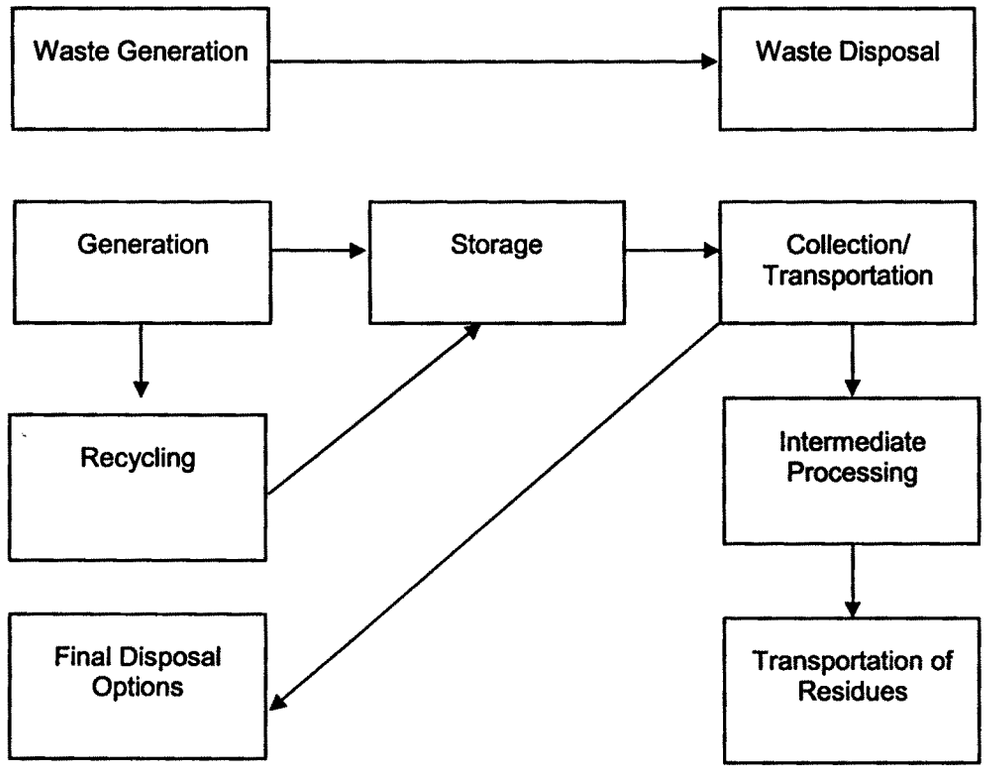
3.5 Privatisation of Solid Waste Management

In Belgaum city, there are 58 wards out of that 30 wards have been given out on contract. The contract is full service contract, which includes sweeping, collection, transport and maintaining the area clean. The total budget for the contract is about Rs. 16 lakh per month.

Status in Solid Waste Management System

Solid waste in cities goes through a series of processes such as waste generation, storage, collection, transportation, intermediate processing and treatment and the final waste disposal.

Flow Chart : Stages in Solid Waste Management



Source : AIILSG, 2000, 'Manual on Solid Waste Management' published by All India Institute of Local Self Government, Mumbai, p. 19.

A careful analysis of the present status of solid waste management in Indian cities would lead to inevitable conclusion that special efforts should be made to tackle the problem of solid waste management in all cities. As stated by Cointreau (1982), the management, organizational capability and to establish a financially viable institution capable to planning ahead, adopting to change and handling wastes in an appropriate and environment friendly manner.

3.6 Current Solid Waste Management Practices by Belgaum Municipal Corporation

1. Biomedical and Industrial Wastes

The Association of Hospitals and Nursing Homes Belgaum has setup a hospital wastes management facility and operating the same. The government hospital has its own facility. The biomedical wastes donot enter the municipal system. The comprehensive disposal of biomedical waste generated by Belgaum Municipal Corruption and the association of doctors and nursing homes, Belgaum. This initiative had a motto of achieving common objective and safe disposal of medical waste in a legally prescribed manner. This workout to be the cheapest service on such a large scale, involving medical establishments, spread over a distance of 10 kms. and covering population of 7 lakh people and catering to more than 250 establishments.

2. Industrial Waste

Industrial waste is required to be stored properly and disposed by the industry following the standards laid down by the pollution control boards at sites that pollution control boards at sites that may be designed for that purpose. The city corporation has provided land to the foundry industry to setup a facility to manage their wastes. The Indian Aluminium has its own facility. Only the minor industries non hazard wastes are transferred to the municipal system. Most industrial solid waste is being disposed on in an unscientific manner on open plots or on the road site or in water bodies in Belgaum city, which creates environmental pollution and sub soil contamination.

3. Activities Undertaken under Nirmal Nagar Programme

As part of the Nirmal Nagar Programme the classification of dust bins for the routine collection of waste has been taken up. Detailed data collection and planning is in progress. Identification of self help groups has been undertaken. Identification of disposal sites has also been undertaken.

3.7 Processing and Disposal

The waste collected at present is being dumped at Khasbag. There is processing or scientific disposal facility in operation. The Indian Aluminium has got a vermi composting system in operation. Part of the market wastes from the cantonment area is being

composed by the private agency. The cantonment is also disposing off its wastes at Khasbag.

All the Indian cities (Bangalore, Chennai, Mumbai, Kolkatta and Hyderabad) do have designated dump sites. In same of the cities like Hyderabad, apart from official garbage disposal sites, there are innumerable unauthorised garbage disposal sites.[12] Some of the methods used to dispose of waste in Nairobi include tipping, burning. They dump in neighbouring low income densely inhabitated residential areas. The risk of contamination, spread of diseases as well as pollution of water and air is therefore, high as special precautions are not taken to ensure that dangerous pieces of waste donot get mixed up in the waste streams.[13]

Table No. 3.5

Analysis of Present Situation

Sr. No.	Item	Presentation	Comments
1	Storage at Source	Storage at source is not insisted upon and throwing wastes on road open space is common practice.	The current practice is in complete contravention to the requirement of SWM rules 2000 and SC Committee report.
2	Primary Collection	The waste collection from generators is based on a bin based system. RCC cylinders and masonry are used as bins.	The use of RCC bins is not allowed as per SWM rules. Segregation should also be introduced over time.
3	Sweeping	The sweeping is done based on adhoc plans.	Proper plans have to be made for sweeping. This should be based on a set of standards which have to be put into practice.
4	Secondary Storage	This is not there. The primary collection receptacles are also the secondary collection equipment.	This system would become relevant once the door to door collection is put into practice.

Sr. No.	Item	Presentation	Comments
5	Transport	Tipping trucks are used as transport equipment. But loading is manual.	There is need to upgrade the transport system. The trucks can be used for in organic wastes.
6	Processing	There is no processing of wastes undertaken.	This is not acceptable as only non bidegrable wastes can be land filled. A processing facility has to be established.
7	Disposal	Wastes are being dumped at Khasbag. Dumping of waste is practiced.	The existing disposal sites are not suitable for proper disposal of wastes. New sites have been identified proper land fill has to be put into place.

Source : Solid Waste Action Plan Report, 2000

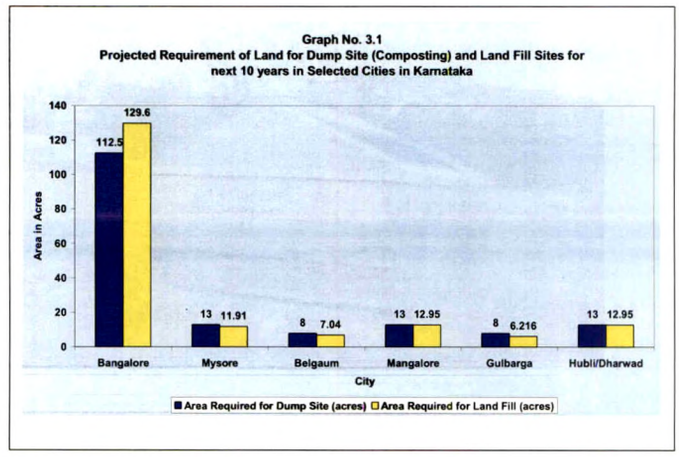
The table analyses the current solid waste management situation and municipal solid waste rules of 2000.

Table No. 3.6

Projected Requirement of Land for Dump Site (Composting) and Land Fill Sites for next 10 years in Selected Cities in Karnataka

Sr. No.	Name of the City Corporation	Area Required for Dump Site (acres)	Area Required for Land Fill (acres)
1	Bangalore	112.5	129.600
2	Mysore	13.0	11.910
3	Belgaum	8.0	7.040
4	Mangalore	13.0	12.950
5	Gulbarga	8.0	6.216
6	Hubli/Dharwad	13.0	12.95

Source : Solid Waste Action Plan Report 2000



Bin – Population Ratio

We can calculate the 'Bin – Population Ration' for Belgaum city on the basis of data presented in Table No. 3.1. The population of Belgaum city is 399600 (2001 census) and the total bins provided by the Belgaum Municipal Corporation were 1237. RCC bins and 16 masonry bins means total 1253 bins. The 'Bin – Population Ratio' for Belgaum city was 1:318. It means that there is one bin that serves 318 people in Belgaum city. Though the bin – population ratio seems to be very low, the people are asking for more and more bins because of shortage of bins.

Segregation at Source

In Belgaum city, by and large people do salvage reusable or saleable material from waste and sell it for a price such as newspaper, glass bottles, empty bins, old cloths etc. and to that extent

such reusable waste material is not thrown out for disposal. However, lot of recyclable dry waste is not segregated and is thrown on the streets by people along with domestic or trade or other waste such waste is picked up by poor waste pickers for their livelihood. By throwing such recyclable material on the streets or into a common dust bin, the recyclable material get deteriorated by west waste, which often contains hazardous waste. So, segregation of recyclable waste at source is thus not seriously practiced, by households and establishment. At least 15 to 20% of the total waste can conveniently be segregated at source for recycling.

3.8 Waste Estimates

a) Waste Generation Pattern and Projections

it is estimated that Belgaum generates about 140 tonnes of wastes per day. Out of this about 80% is collected and transported out daily. The details and the basis of the estimates are provided. Based on these estimates the design capacity of various facilities is also given.

b) Waste Transported Per Trip

The estimate of waste transported per day is presented in Table No. 3.7. A weighing of the waste carried per trip has been made for each of the vehicles. The number of trip of each of the vehicles has been taken and quantity estimated. The waste transported per day is estimated at 108 tonnes.

Transportation of refuse implies convergence from the point of collection to the point of disposal.[14]

Table No. 3.7

Waste Transported Per Trip

Vehicle	Number	Average Trip	Waste/Trip in	Total Waste Transported Kg
TATA 709	KA 22 6379	0	2640	0
	KA 22 6380	0	2560	0
TATA 407	KA 22 8958	2	3270	6540
	KA 22 8961	0	3270	0
	KA 22 8962	2	3270	6540
	KA 22 8963	2	3270	6540
TATA 709	KA 22 8959	2	1660	3320
	KA 22 8960	0	160	0
TATA 1310	KA 22 8957	2	2213	4426
	KA 22 8966	0	6200	0
TATA 1210 SE	MEH 4292	2	2360	4720
Eicher Canter	KA 22 G 50	2	1769	3358
TATA Hitech	MEH 5520	2	5040	10080
Ashok Leyland	KA 22 1009	2	2736	5472
Tractors	NA	30	1900	57000

Source : Same as of Table No. 3.6

3.9 Assessment based on Normative Standards

Belgaum is developed city with a limited number of low income settlements accounting for less than 10% of population. Based on it is estimated that the typical waste generation per capita would be 350 grams. Using this as the basis the generation of waste in Belgaum is estimated out 140 tonnes per day.

3.10 Design Capacities of Various Facilities

The design capacity of the various facilities is presented in table No. 3.8. The requirements have been assessed for the design year 2005 for the collection and transport and for 2015 for processing and disposal. When the segregation is in practice, for the collection and transport it is proposed that we start with a lower requirement and build up as the demand build up.

Table No. 3.8

Design Capacities of Various Facilities

Sr. No.	Item	Design Year	Basis	Capacity
1	Collection & Transport	2005	This designed based on 80% of present capacity.	120 tpd.
2	Processing	2015	At present 80% of waste accumulate fro source segregation.	145 tpd.
3	Land Fill	2015	At maximum of 30% of waste is estimated as land fill.	45 tpd.

Source : Same as of Table No. 3.6.

3.11 Strategy for Solid Waste Management for Belgaum

Principles

The principles are enunciated in the Karnataka state policy for solid waste management has been adopted in the preparation of the detailed action plan. Table No. 3.9 gives the standards used for calculation, secondary storage and equipment requirement.

Table No. 3.9

Standards Used for Calculation, Secondary Storage and Equipment Requirement

Sr. No.	Item	Standard
1	Handcraft for primary collection	160 houses per day or 160 kg. per day
2	Tricycle for primary collection	240 houses per day or 240 kg. per day
3	Auto tipper for primary collection	1000 houses per day or 1000 kg. per day
4	Handcart for street sweeping	1 for every sweeper
5	Container for secondary collection	3 m 3 for 1200 kg. collection
6	Twin Dumper Placer	10 bins transported per day
7	Truck	3 tonnes per trip or 35 km of travel per day
8	Sweeping standards	1 km/day/sweeper

Source : Solid Waste Action Plan Report of BMC, 2006

3.12 Collection of Solid Waste

a) Primary Collection of Waste

this is the most important component of solid waste management. the waste generators have been classified into five groups of households, small generators, large generators, road based generators, generators not covered by Belgaum Municipal Corporation. each of these groups has been further sub classified and a primary collection strategy for each of them is presented in Table No. 3.10.

Table No. 3.10

Classification of Waste Generators and Primary Collection Strategy

Sr. No.	Waste Generator	Primary Collection Strategy
1	Household which can pay	Self help group/collection on payment basis 81 groups are proposed. The choice of equipment would be with the agency performing the work.
	Low income cannot pay	The corporation would organise payments for the low income household.
	Slum households	The waste collection by placing 40 liter bins and collection by corporations staff.
2	Small generators shops, offices, temples generating less than 20 kg of waste per day	Collection by corporation which the generators are present by purchased equipments.
3	Large generators hostels, institutions and others generating 20 kg per day	By corporation staff using existing tipper truck. A fee is collected for it.
4	Road based generators road sweeping and shallow drain cleaning, road side shops,	All collection by the corporation staff
	Deep drain cleaning	Engineering department to handle
	Open plot cleaning, parks and green wastes from road side trees	Corporation staff to handle as part of task.
5	Waste generators not covered by BMC, institutions managing their wastes	Cantonment areas, Aluminium APMC areas
	Hospitals	Being collected by hospital associations
	Large industries of industries generating hazardous waste	To be handled on their own.

Source : Same as of Table No. 3.9

For the paying households and small generators specific work areas have been identified and presented in map. Self help groups for each of these work areas have also been identified and discussions held with them.

Table No. 3.11

Details of Primary Collection Equipments Requirements

Sr. No.	Equipment	Number of groups	Number per group	Total
1	Auto Tipper	21	1	21
2	Tricycle	15	4	60
3	Handcart	45	6	270
	Total	81	11	351

Source : Solid Waste Action Plan Report, 2006

Solid Waste is collected from each house from this vehicle

b) Plan for Secondary Collection and Transport of Wastes

The requirements of the secondary storage container and dumper placers have been presented in Table No. 3.12.

Table No. 3.12

Requirements of the Secondary Storage Container and Dumper Placers

Sr. No	Details	Quantity
1	Total waste collected per day	120 tonnes
2	Density of waste	400 kg.
3	Volume of wastes to be collected per day	373 m
4	Assuming 25% excess capacity	375 m
5	Number of $3m^3$ container required	38
6	Dumper placer required	07
7	Number of $4m^3$ container required	38
8	Number of replacement container	14

Source : Same as of Table No. 3.11

It is proposed to produce 7 twin bin dumper placers for linking with the door to door collection system. Of the existing vehicles 9 numbers are considered good and usable. It is proposed that 5 of these vehicles be deployed for road sweeping activity and two of them for collection of wastes from bulk generators.

c) Plan for Sweeping and Debris Collection

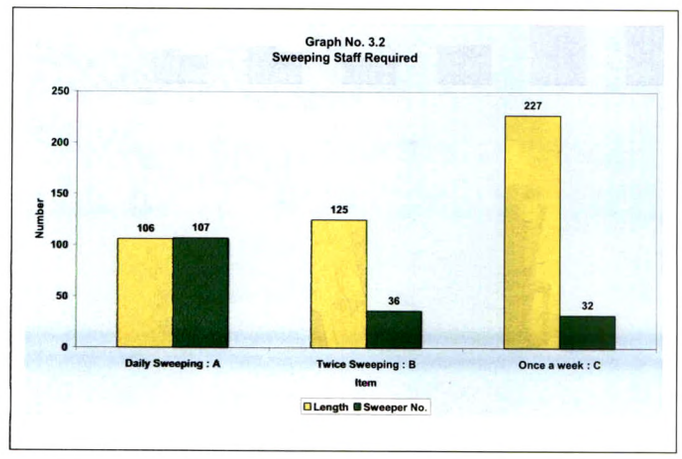
it is proposed to undertake the complete sweeping and debris collection with the available municipal staff. The staff requirement for sweeping is given in Table No. 3.13. All the roads in the city have been classified into daily, twice a week and once a week collection areas. A plan for sweeping has been prepared for each of the ward providing complete details of the name of sweepers.

Table No. 3.13

Sweeping Staff Required

Sr. No.	Type	Length	Sweeper No.
1	Daily Sweeping : A	106	107
2	Twice Sweeping : B	125	36
3	Once a week : C	227	32

Source : Solid Waste Action Plan Report, 2006



3.13 Concluding Remarks

In this chapter an attempt is made to study the existing solid waste management practices in the area of Belgaum Municipal Corporation. There is no separate solid waste management department. It works under the Health and Sanitation Department of Belgium Municipal Corporation. It consists of two wings : a) Transport Wing and b) Conservancy Wing.

The transport wing is providing vehicles to lifting of solid waste in Belgaum city. There is no co-ordination between these two wings. There is gross under staffing in BMC. There are 375 sweepers of whom 309 are deployed for sweeping and other worked and 66 are involved in lifting garbage to trucks. There are totally 22 supervisors and 14 health & sanitary inspectors and one environmental engineer has been appointed. One health officer manages the whole system. The disposal of solid waste is not eco-friendly. The waste collected is being dumped at Khasbag and another near Bhutaramnatte place.

The Association of Hospitals and Nursing Homes, Belgaum has setup hospital wastes management facility. The government hospitals has its own facility.

The main source of solid waste generation is residential area 140 tonnes solid waste is generated per day in Belgaum city. The per capita generation is 0.20 to 0.50 kg per day. The overall framework needed for the effective solid waste management to overcome from the operational problems namely collection, transportation disposal etc.

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