

Karachi Solid Waste Management

September 2006

Karachi Master Plan 2020

**EXISTING SOLID WASTE
GENERATION AND
STRENGTH IN KARACHI**

Total Garbage (Town wise)	6858.00 tons/day
Estimated Garbage 2005	9009.43 tons/day
CDGK	80% Area (only 40% capacity)
DHA, CD, SITE.	20% Area
Vehicles	567
Cost of Disposal at Landfill	Rs. 92.00 per ton
Cost of Collection and Transportation	Rs. 294.00 per ton
Community Bin	4085 nos
Manpower	4170

**Available information regarding manpower and Distbins
(Table-1)**

S.No.	TOWNS	MANPOWER	NUMBER OF DUSTBINS
1.	Kaemari	449	76
2.	SITE	-	200
3.	Baldia	292	586
4.	Orangi	51	187
5.	Lyari	173	210
6.	Saddar	155	108
7.	Jamshed	866	230
8.	Gulshan-e-Iqbal	-	-
9.	Shah Faisal	9	-
10.	Landhi	89	-
11.	Korangi	-	-
12.	North Nazimabad	194	-
13.	New Karachi	470	874
14.	Gulberg	25	24
15.	Liaquatabad	110	-
16.	Malir	44	-
17.	Bin Qasim	11	-
18.	Gadap	272	-
	TOTAL	4170	4085

GARBAGE GENERATION

PART I: EXISTING SITUATION

COMPOSITION OF WASTE

The types of wastes or garbage generated are: household, commercial, institutional and street sweepings. Sanitary workers sweep streets and provide a primary waste collection service.

Major markets where organic waste is generated are:

Vegetable market: 100 tones per day (TPD) and

Empress market: 70 TPD

High-income localities generate garbage:

Organic Waste: 60%

Garden Waste: 12%

Recyclable 8%

Low-income localities generate garbage:

Garden Waste: maximum 5%

Organic Waste: 40%

The composition of garbage generated in Karachi is given in the Table 1 below.

Recyclable: 15%

Table 1: Composition of garbage generated in Karachi.

Components of solid waste	%	Total Quantity Tons/day	Recoverable Tons/day	Rate Rs / Ton	Amount Rs (mil) / day	Amount Rs mil/yr
Paper	6.00	480	240	2000	0.48	175.2
Metal	0.30	24	12	24000	0.288	105.12
Plastic	6.00	450	240	15000	3.60	1314.00
Bone	2.00	160	100	6000	0.60	219.00
Glass	0.70	56	28	1000	0.028	10.22
Textile	6.50	360	0	0	0	0
Bio Waste	30.00	2400	0	0	0	0
Others	50.00	4040	0	0	0	0
Total	99.50	8000	520	11000	4996	1823.5

In addition to the above-mentioned amount, another few millions can be added from the sale of bones, leather, rubber, etc and composing of Bio-waste

Generation rate – per person

According to survey carried out in 1005:
Waste generation rate: 300 grams/person/day

At another place the rate is given as: 0.5 kg / capita / day

It is also given that garbage generation ranges from 0.2 to 18 kg / capita / day in various Town Municipalities (TMAs). This variation in generation rates data poses an anomalous situation.

Also given is:
300 grams in document

Another approach is to have garbage generation rate per capita as:
Generation rate, g/person/day for: (1) Average and (2) low-mid-high income groups
Then population has to be found for: (1) low-mid-high income groups and (2) total population

Population Data

The population data of Karachi is as given in Table 2 below. Also population figures from various sources are given.

1	14 million	
2	15.12 million	ECIL, KMP team, 2006
3	15 million	Jawed K, 2005
Population	14 million	
Annual Population growth rate	4.5 %	

Table 2 tentative Population Projections of Towns of Karachi – Scenario – B (Provincial)

S.No.	Towns	Population in 1998	Unaccounted/ Adjusted (7%)	Adjusted Population of 1998	Population Projection for 2005 at 5.00% AAGR.
1	Keamari	384,378	26,906	411,284	583,640
2	SITE	467,560	32,729	500,289	709,944
3	Baldia	406,165	28,432	434,597	616,722
4	Orangi	723,694	50,659	774,353	1,098,859
5	Lyari	607,992	42,559	650,551	923,176
6	Saddar	607,992	43,131	659,282	935,565
7	Jamshed	733,821	51,367	785,188	1,114,235
8	Gulshan-e-Iqbal	625,230	43,766	668,996	949,351
9	Shah Faisal	355,823	23,508	359,331	509,914
10	Landhi	666,748	46,672	713,420	1,012,392
11	Korangi	546,504	38,255	584,759	829,813
12	North Nazimabad	496,194	34,734	530,928	753,422
13	North Karachi	684,183	47,893	732,076	1,038,865
14	Gulberg	453,490	31,744	485,234	688,580
15	Liaquatabad	649,091	45,436	694,527	985,581
16	Malir	398,289	27,880	426,169	604,763
17	Bin Qasim	316,684	22,168	338,852	480,854

18	Gadap	289,564	20,269	309,833	439,675
19	Cantonment	306,165	21,432	427,597	464,882
20	Defence	250,000	17,500	267,500	379,601
TOTAL (IN MILLION)		9.96	0.70	10.65	15.12

Garbage generation rate – tons/day and tons/year

Total household waste generated: 4500 TPD
 Total City waste generated: 7259 TPD
 Total city lifting capacity: 1880 TPD/450 vehicle/ 3 trips
 Amount of Solid Waste Generated, (Present) 9000 tons/day
 Number of Towns 18
 Number of UCs 178
 Average Solid Waste Generation / Town 400 tons/day
 Average Solid Waste Generation / UC 40 tons / day
 Solid Waste generation excluding industrial and Biological SW
 Based on 6113 TPD
 6113 TPD

Generated / lifted	SW Generated	=	6113 TPD
6113 / 5057 TPD	SW lifted	=	5157 TPD
8000 TPD	City Household Waste	=	4500 TPD
7250 TPD			
2.70 TPD			

Table-3: Solid waste generation in Karachi – 2006 at household level

S. No.	Town	Garbage Generation per day in Tons	Actual Lifting per day / ton	Backlog per day
1	Keamari	220	180	40
2	SITE	167	153	14
3	Baldia	400	302	99
4	Orangi	346	240	106
5	Lyari	350	300	50
6	Saddar	500	454	46
7	Jamshed	330	525	78
8	Gulshan-e-Iqbal	400	318	82
9	Shah Faisal	105	105	-
10	Landhi	370	324	46
11	Korangi	360	272	88
12	North Nazimabad	375	336	39
13	North Karachi	365	280	85
14	Gulberg	330	330	0
15	Liaquatabad	800	594	206
16	Malir	280	270	10
17	Bin Qasim	65	27	38
18	Gadap	350	320	30
	TOTAL	6113	5057	1057

Source: SWM CDGK

Waste source-reduction and segregation

No information is available on this subject. It is unlikely that this activity is done here as a normal practice by wide section of the population in Karachi.

There are three types of wastes: domestic, industrial and Hospital commercial Garden wastes.

Waste primarily falls into two categories: hazardous waste and non-hazardous waste (for municipal solid waste – MSW). Waste that does not fall into these two categories is called special or other waste.

The Waste Hierarchy

Waste hierarchy means classification, according to the facet of 'desirability', of waste management strategies. The strategies could be to reduce waste or to reuse recovery waste or inaheration to recycle waste, the '3 Rs' of waste management. Another recent strategy is to 'Re-think' or review the present system for an improved system. Whatever the classification, the main and sole object of waste management is to treat and dispose waste completely or minimize if from the environment, to safeguard the health of the community.

Concurrently, the supplementary object is to extract maximum benefits from the waste by turning it in to a useful product.

COMPOSITION OF WASTE

In future, there will be increasing quantities of plastic, non-disposal waste and toxic waste in our households, which will require new and much more expensive ways of disposal. Waste generation industries, i.e. industries that make non-degradable products are a problem of SWM.

Waste type-quality: Use of urban waste could decline due to the contamination in it, particularly of plastics. Research to be conducted on the quality of waste as soil amendment, generation and on recovery and treatment of solid waste.

Take the case of UK.

The composition of house waste (8% of total) is given in the figure below, which shows: Kitchen waste 17%, garden waste 21%, paper waste 18%, i.e., 56% of total.

Types of wastes

The various types of wastes, which are generated, are: 'Municipal waste' includes: household waste, street litter, municipal parks and gardens waste, offices waste and some commercial and industrial wastes. The originators, to separate 'recyclable or compositing' wastes, sometimes sort out municipal waste. The remaining waste, called 'residual waste', is collected in special containers, provided by the local authority.

Table – Household waste

S.No.	Type of waste	Percent
1	Kitchen waste	17%
2	Soil and other organics	3%
3	Fines	3%
4	Paper and board	18%
5	Dense plastic	4%
6	Plastic film	3%
7	Textiles	3%
8	Glass	7%
9	Wood	5%
10	Nappies	2%
11	Misc. non-combustibles	5%
12	Metal packaging	3%
13	Scrap metal /white goods	5%
14	Garden waste	21%
15	Other combustibles	1%

B. Population

The population projections are as follows:

EXISTING AND TENTATIVE POPULATION PROJECTION FOR THE TOWNS OF KARACHI FOR THE YEAR 2005, 2010, 2015 & 2020 (SCENARIO – D)

Declining Average Annual Growth Rate from 5.0% to 3.5% (Table-4)

S.No.	Towns	Population Projection for 2005 at 5.00% AAGR.	Population Projection for 2010 at 4.5% AAGR.	Population Projection for 2015 at 4.5% AAGR.	Population Projection for 2020 at 3.50% AAGR
1	Keamari	583,640	730,905	892,730	1,063,461
2	SITE	709,944	889,079	1,085,923	1,293,602
3	Baldia	616,722	772,336	943,333	1,123,742
4	Orangi	1,098,859	1,376,126	1,680,805	2,002,252
5	Lyari	923,176	1,156,114	1,412,081	1,682,136
6	Saddar	935,565	1,171,630	1,431,032	1,704,712
7	Jamshed	1,114,235	1,395,382	1,704,323	2,030,268
8	Gulshan-e-Iqbal	949,351	1,188,893	1,452,117	1,729,829
9	Shah Faisal	509,914	638,578	779,961	929,126
10	Landhi	1,012,392	1,267,840	1,548,544	1,844,697
11	Korangi	829,813	1,039,193	1,269,273	1,512,017
12	North Nazimabad	753,422	943,528	1,152,428	1,372,826
13	North Karachi	1,038,865	1,300,995	1,589,038	1,892,936
14	Gulberg	688,580	862,324	1,053,245	1,254,674
15	Liaquatabad	985,581	1,234,265	1,507,535	1,795,845
16	Malir	604,763	757,358	925,039	1,101,949
17	Bin Qasim	480,854	602,184	735,509	876,173
18	Gadap	439,675	550,614	672,521	801,138
19	Cantonment	464,882	582,183	711,079	847,071
20	Defence	379,601	475,382	580,633	691,766
TOTAL (IN MILLION)		15.12	18.93	23.13	27.55

C. Waste generation rates GPD/person, TPD/zone & TPY/zone

Waste type – Quantity: Waste generation is related with consumption and consumption is related with income. Rural consumers consume less so lesser waste is generated than urban consumers.

Composition of solid waste and generation is shown in this report.

Solid Waste generation is calculated on the basis of population projection.

1. Declining Average Annual growth rate scenario – D

2. Estimate gross population capacity
3. combination of annual growth rate and gross population capacity for the new towns.

Amount of waste

Solid Waste Management and Disposal has been design on the basis of population projection option – II AS shown in this report however the calculation are shown of all the three options for comparison purpose.

In advance countries the amount of waste generated is enormous. We cannot emulate them because of our backwardness. But, it is useful to know a bit about how their waste is dealt with. We could try to establish basic systems, as in advance countries, for our future generations to come.

Take the case of UK. 'It is estimated that nearly 36 million tones / yr of municipal waste was generated in the UK in 2002/03. A total of 30 million tones/yr of this waste was collected from households. That's about 500 kg/yr or half a tonne of household waste per person! (2003)'. It is important to note that in Karachi 200 kg per year of solid waste can not be dealt.

Garbage collection

PART I **EXISTING SITUATION**

The population of Karachi is 15.15 million in 2005 and it has an area of 425,529 acres. The number of agencies involved with solid waste management (SWM) are a total of 210, the break up being as follows:

Town Municipal Administration (TMA): 18

Union Councils (UCs): 178

City District Government Karachi (CDGK): 1

Cantonment Boards: 11

Karachi Port Trust: 1

Pakistan Steel Mills: 1

Port Qasim: 1

Sindh Industrial Trading Estate: 1

Export Processing Zone: 1

A. Garbage collection services

In Karachi, in 18 towns, 2006:

(refer Table 2)

estimated garbage collected: 5057 TPD (tons per day)

estimated garbage not collected: 1057 TPD

- Annual Expenditure Rs 800 million
- Lifting Capacity 50%

In each Town and UC,

B. Garbage collection – primary collection

One stage collection

Primary stage collection of garbage is from house hold to dust bin sites, ('kachra kundi').

This is done in the following ways:

Garbage is collected in stages, which ultimately lead to its collection at one point for a fixed zone. From this point, garbage is disposed to landfill sites. But this may not be case for all cities. For instance, in Karachi, the garbage collection system is as follows:

Stage 1: From house → resident travels to dispose garbage → to dust bins

Stage 2: From dust bins → municipality vehicles dispose of garbage → to landfill sites OR → to unofficial dumping ground (Primary transportation, 2-3 trips a day, long trips)

This is the most uneconomical way of SWM because the distance to landfill site is long and several vehicles have to make this long trips several times a day. Considering the large amount of waste and the cost of fuel and O&M, not all waste is disposed of.

Table 2: Details of garbage collection

The following problems arise in Karachi in primary collection:

Poor attendance of sanitary workers.

Gradual decrease in number of dust bins, as a large number of garbage containers (Katchra Kundi) are in the workshop for repairs.

Haphazard accumulation of garbage on streets, in open spaces and in drains.

Primary stage collection, from house hold to dust bin sites, involves the following problems:

It may be mentioned that the uncollected waste usually finds it way in sewers, is eaten by the cattle, or left to rot in the open, or burnt on roadsides. These are harmful practices.

Two stage collection

Garbage collection-record

Garbage collection equipment

Vehicles 550

Garbage collection manpower

Staff 15188

Poor attendance of sanitary workers.

Privatized transport system

Benefits of privatization:

Regarding a successful contract in Shah Faisal Town, the contractor has performed well and lifted 100% garbage. He used less than 50% of TMA's garbage vehicles, which were rented to him. He ensured a minimum of three trips daily by each vehicle

to the landfill. There was no intervention of labor unions. Prompt redresses of public complaints were undertaken.

Short Comings:

The tonnage rate of Rs 269 /ton is on the higher side as compared to some of the other TMAs. The contractor dumped garbage at undesignated and un-monitored landfill sites.

TMA, Gulshan-e-Iqbal awarded a contract in 2006 for transportation of garbage from a temporary garbage transfer station to landfill site. This contract is still in force.

HOSPITAL WASTE MANAGEMENT

For hospitals:

Generation rate is : 3 to 4 kg/bed/day in document.

900 beds at one place it is given 900. At another place, total beds = 4367 in 143 hospitals and 1094 HCUs = 1237. Which is correct? Needs investigation.

Hospital waste:

The handling of hospital waste, or 'Bio-Medical Waste;', has assumed importance because of spreading such dangerous disease as AIDS. On way to manage this important issue is to make the hospital personnel aware of the dangers and the need for seriously taking the management of this waste for safe handling and disposal. Internet could be used very effectively for this purpose. A web site could be established to disseminate information for the doctors and hospital staff to read it at any time at their convenience.

2. HOSPITAL WASTE

Ref. CDGK SWM Expert, "Presentation on Karachi's solid waste system", 2006.

Total no. of hospitals in Karachi	200
Total no. of beds	900
Waste generation rate of hospital	3-4 kg/bed/day
Approximately generation of hospital waste	2700 kg/day
Hazardous waste component	540 kg/day
Non hazardous waste component	2160 kg/day
Health care units (HCU) identified by TMAs	1379

The table-1 below gives the details of HCUs.

Only 140 HCU dispose off their waste through incineration plants run by City Government (CG). The remaining HCU dispose off their waste along with the municipal waste. This poses a health hazard.

The reasons of health hazards are –a- Non-registration of HCUs either with Health Department Government of Sindh or with City Govt. and –b- Non-presence of Environment Protection Agency of Sindh at grassroot level.

Incinerators

The CD installed two incineration plants at Mewa Shah in 1996. Each has a capacity of 1000 kg/hour. Incineration take place at 800 °C in 10 minutes. At present 140 hospitals/clinics are incinerating their waste through these incinerators.

A contractor, M/s Abaseen International, operates both the plants for 2 years. Their responsibilities include collection of waste from hospital and clinics, transport and incinerate the waste, operate and maintain the plants. They are running only at 12-15% capacity due to non-registration of all HCUs.

Service charges for incineration and transportation are collected from registered HCUs and deposited in the CG account. Services charges component of 22.2% is retained by CG and the balance is paid to the contractor. The table-2 below gives the services charges rates.

Table-1: HCU details in Karachi Towns – 2006

S.No.	Towns	No. of HCU (3)	No. of Hospitals (4)	No. of Beds	Total 3&4
1	Keamari	184	27	0	211
3	Baldia	0	4	0	4
4	Orangi	211	9	167	220
7	Jamshed	256	26	564	282
10	Landhi	14	0	10	14
11	Korangi	71	10	540	81
13	North Karachi	54	15	260	69
14	Gulberg	66	20	507	86
15	Liaquatabad	10	4	850	14
16	Malir	110	17	502	127
17	Bin Qasim	39	01	50	40
18	Gadap	79	10	917	89
TOTAL		1094	143	4367	1237

Not listed: 2-Site, 5-Lyari, 6-Saddar, 8-Gulshan, 9-Shah Faisal, 12-N.Nazimabad