



# "SOLID WASTE MANAGEMENT SYSTEM" in KARACHI



A Presentation for the  
Governor Sindh  
by ACS (LG)

February 26, 2005

## Karachi Population Statistics

Year	Population 1950 - 2015	Percentage of urban population (%) 1950 - 2015	Percentage of total population (%) 1950 - 2015
1950	1 028 000	14.8	2.6
1955	1 378 000	16.0	3.2
1960	1 848 000	17.1	3.8
1965	2 405 000	18.7	4.4
1970	3 119 000	20.3	5.0
1975	3 990 000	21.5	5.7
1980	5 048 000	22.1	6.2
1985	6 033 000	21.6	6.3
1990	7 147 000	21.3	6.5
1995	1 468 000	21.5	6.8
2000	10 032 000	21.5	7.1
<b>2005</b>	<b>11 830 000</b>	<b>21.2</b>	<b>7.4</b>
2010	13 871 000	20.7	7.6
2015	16 197 000	20.1	7.9
Source: UN 2001			

Idle Public Sector  
Standing Bulldozers  
at Landfill Site



Active Private Sector  
Recycling Operation  
at Landfill Site



# Presentation Format

- ❑ Introduction to Solid Waste Management System
- ❑ Solid Waste Management System in Karachi
- ❑ Problems in the existing SWM System
- ❑ Efforts made in the Past
- ❑ Why Garbage Transfer Stations?
- ❑ Case Study (*Privatization of Transportation of Solid Waste in Shah Faisal Town*)
- ❑ Hospital Waste Management
- ❑ Recommendations

# SOLID WASTE

**Municipal Waste**  
**Hospital Waste**  
**Industrial Waste**



## Hazardous Waste

contaminated by patients:  
syringes, bandages,  
clothing, lab cultures  
surgical waste



## Non-Hazardous Waste

includes papers, card  
boards, packaging and  
food waste.

# Stages of Solid Waste Management

1. **Primary collection:** from house hold to dust bin sites done manually .
2. **Secondary Collection:** from dust bin sites to landfill sites done mechanically.
3. **Final Disposal:** at landfill sites



# **PRESENT SWM SYSTEM IN KARACHI** *(BASIC FACTS)*

<b>Total No. of Towns</b>	<b>18</b>
<b>Total No. of garbage vehicles</b>	<b>543</b>
<b>No. of garbage vehicles in use</b>	<b>453</b>
<b>Estimated Garbage generation per day in tons</b>	<b>6113</b>
<b>Actual garbage lifting per day in tons</b>	<b>5057</b>
<b>Un lifted garbage per day in tons</b>	<b>1057</b>
<b>Cost of garbage transportation per day</b>	<b>Rs.1.08</b>
<b>Average per ton cost on transportation</b>	Million <b>Rs.233</b>

# Cost on Garbage Transportation

## *As Reported by TMAs*

<b>S.#</b>	<b>Town</b>	<b>Garbage Generation per day in Tons</b>	<b>Actual Lifting per day / ton</b>	<b>Backlog per day</b>	<b>Transportation Cost per day in Rs.</b>	<b>Cost /Ton/ day Rs.</b>
1	Gadap	350	320	30	17000	55
2	Landhi	370	324	46	61392	201
3	Korangi	360	272	88	33693	124
4	Baldia	400	302	99	55432	184
5	Keamari	220	180	40	48128	220
6	Gulberg	330	330	0	47010	143
7	Malir	280	270	10	36192	134
8	Orangi	346	240	106	66017	275

# Cost on Garbage Transportation (Cont:)

S.#	Town	Garbage Generation per day in Tons	Actual Lifting per day/ton	Backlog	Transportation Cost per day in Rs.	Cost /Ton/ day Rs.
9	Liaqatabad	800	594	206	94777	160
10	Jamshed	330	252	78	100800	400
11	Bin Qasim	65	27	38	2816	289
12	N.Karachi	365	280	85	60683	217
13	N.Nazimabad	375	336	39	51582	154
14	Lyari	350	300	50	125390	358
15	Saddar	500	454	46	209408	461
16	G-e-Iqbal	400	318	82	38631	282
17	Shah Faisal	105	105	-	-	345
18	Site	167	153	14	28249	185
	<b>TOTAL:</b>	<b>6113</b>	<b>5057</b>	<b>1057</b>	<b>1.08 (Million)</b>	<b>233</b>

# Problems in the existing SWM System

## Primary Stage

*(from house hold to dust bin sites)*

- Poor attendance of sanitary workers.
- Gradual decrease in number of dust bins: haphazard accumulation of garbage on streets, in open spaces and drains
- A large number of garbage containers (dumpers) lying in workshop for repair.

## Secondary Stage

*(Transportation from dustbins to Landfill sites)*

- 15 to 20% garbage vans remain out of order
- Landfill sites situated at long distances ranging from 10 to 70 km (up & down)
- Hardly 300 to 400 trips of garbage vehicles are off loaded daily at landfill sites out of 1500 trips (rest off-loaded at various places).

Per capita garbage generation ranges from 0.2KG to 1.8 KG in various TMAs which poses anomalous situation.

Per Kilometer fuel cost ranges from Rs.4 per KM to Rs. 43 per KM in TMAs which reflects the level of pilferages.

Per vehicle maintenance cost ranges from Rs.143 per day to Rs.804 per day.

Per ton cost of garbage transportation varies from Rs.55 to Rs.460.

# Final Stage

*(disposal at Land fill sites)*

- ❑ Only two official landfill sites are available in the city
  - Jam chakro near Surjani Town
  - Gondpass near hub river road
- ❑ These sites are about 30 to 35 KM from City Center
- ❑ Two unofficial sites one at Rehri and other at Ibrahim Hyderi are being used unofficially
- ❑ Improper management and supervision at land fill sites
- ❑ No system of recording the trips of garbage vans exists.

# PROBLEMS IN THE EXISTING SWM SYSTEM

## Primary Stage

(from house hold to dust bin sites)

- Poor attendance of sanitary workers.
- Gradual decrease in the number of dust bins resulting in haphazard collection of garbage on the roads, streets, open spaces and nullahs etc.
- Most of the containers are lying in workshop for repair.

# Secondary Stage

(Transportation from dustbins to Landfill sites)

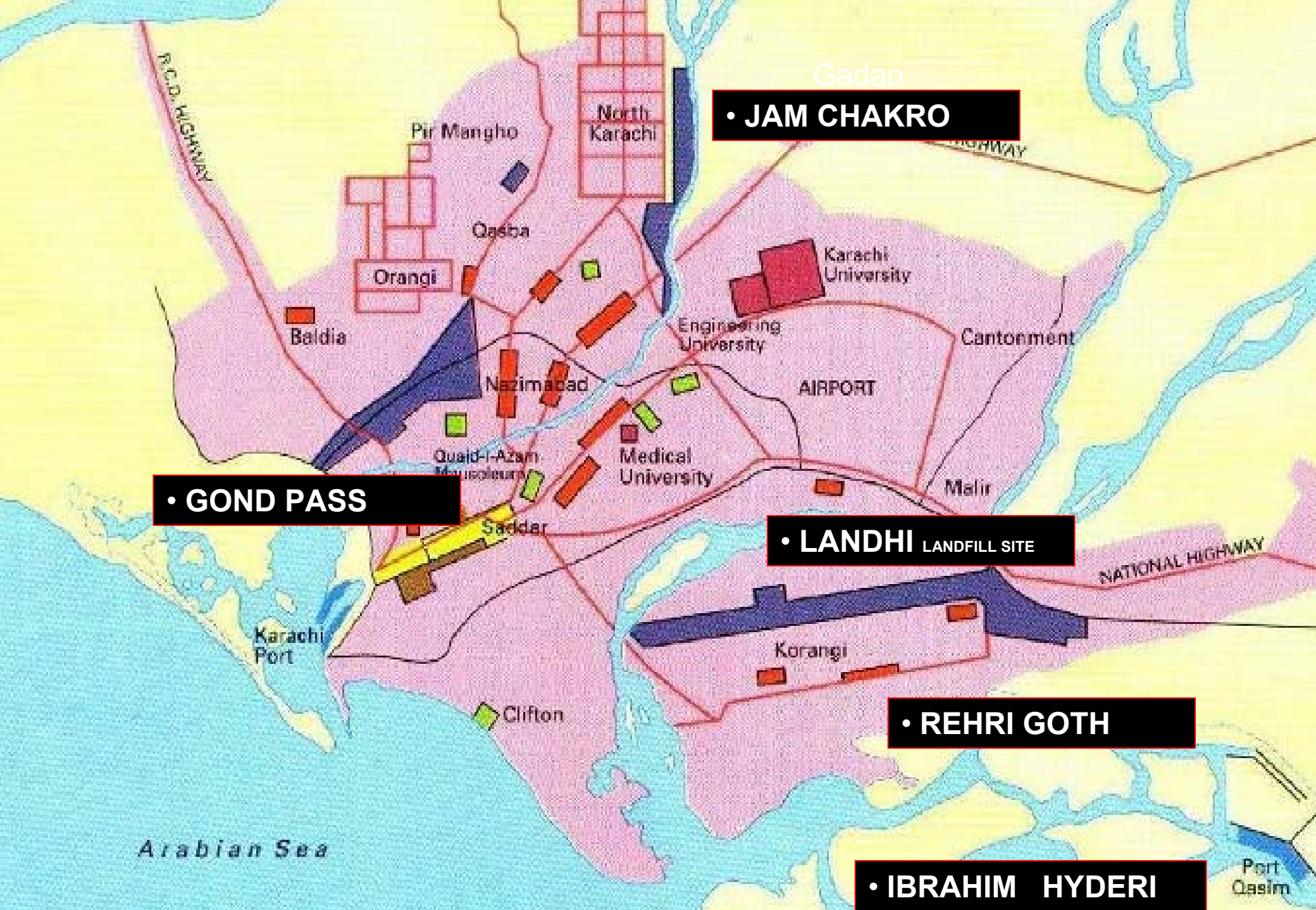
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# **Final Stage**

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Gadap  
• JAM CHAKRO

• GOND PASS

• LANDHI LANDFILL SITE

• REHRI GOTH

• IBRAHIM HYDERI

Arabian Sea

Port Qasim

R.C.D. HIGHWAY

ROADWAY

NATIONAL HIGHWAY

Karachi Port

North Karachi

Pir Mangho

Qasba

Orangi

Baldia

Karachi University

Engineering University

Cantonment

AIRPORT

Nazimabad

Quaid-i-Azam  
Mausoleum

Medical University

Malir

Saddar

Korangi

Clifton

# Efforts made in the past

## 1. Establishment of Farooq Compost Plant.

- Established in the early 80's by a private contractor M/S Farooq Composts in North Karachi near Saba Cinema.
- Remained operative for a short period and then was closed down due to following reasons:-
  - a) Supply of non-segregated refuse, gradually damaged the plant.

## Past Efforts

- b) Heavy operational losses.**
- c) Gained favour during import of plant machinery and also acquisition of land for installation of the plant, as such there was not much financial stake of the contractor was involved.**
- d) Deployment of untrained and unskilled staff.**

## Past Efforts

# GARBAGE TRAIN

- This project was launched by defunct KMC in 1995-1996.
- Garbage from Saddar, Lyari and other adjacent areas was brought to Wazir Mansion Railway station for onward transportation to Dhabeji through railway Wagons.
- The system ran for about 4 to 5 months.
- Rs 27 Million were spent on the project.

## Past Efforts

**The system failed due to:-**

- **High charges levied by railway authorities**
- **wagons provided by the railway authorities were obsolete**
- **Proper infrastructure for loading & unloading of garbage could not be developed.**

## **PAST EFFORTS**

- a) A contract was awarded by DMC Central to a private contractor in 1998-99 for sweeping and garbage transportation from F.B. Area and part of North Karachi to landfill site.**
  - This contract ran for one year only, and failed due to flaw in contract.**
  
- b) A contract was awarded by DMC East in the year 2000 for lifting and transportation of garbage on tonnage basis. The contract continued for 2 months and suspended on account of litigations between the contractor and DMC East.**

**c) Presently, a contract for the lifting and transportation of garbage from dustbins to landfill site has been awarded by Shah Faisal Town. The contract is still operational.**

**d) TMA, Gulshan-e-Iqbal has awarded a contract for transportation of garbage from temporary garbage transfer station to landfill site.**

# **EXPLORING THE POSSIBILITIES FOR IMPROVEMENT**

- **Filling the resource gap by incurring heavy expenditure**
- **Privatisation**
- **Investing in infrastructure-Garbage Transfer Station & Landfill sites**

# Resource gap

	Existing	Required
<b>Manpower</b>	<b>11000</b>	<b>28000</b> 1 sanitation staff per 500 population
<b>Cost of manpower</b>	<b>675 Million per year</b>	<b>1344 million per year</b>
<b>Waste collection capacity</b>	<b>5050 tons per day</b>	<b>6100 tons per day</b>
<b>Garbage Vehicles</b>	<b>453</b> <b>(169 are 10 yrs old and 284 are more than 10 yrs old)</b>	<b>Required: 548</b> <b>Replacement: 284</b> <b>Addition: <u>95</u></b> <b>Total new: 379</b> <b>Old: 169</b> <b>Cost : around 1.9bn</b>
<b>POL</b>	<b>200mn per year</b>	<b>242mn per year</b>

# **CASE OF PRIVATISATION OF TRANSPORTATION OF SOLID WASTE IN SHAH FAISAL TOWN**

**Shah Faisal Town has awarded contract to private party for the lifting and transportation of garbage from dust bins to the landfill sites.**

## **Reasons for awarding the contract**

- 1) Shortage of Garbage vehicles.**
- 2) The Public and Public representatives were not satisfied with the performance of the staff of the Town.**
- 3) Poor management of the logistics.**
- 4) Avoid unnecessary intervention of the staff union.**

## Award of Contract

M/S Al-Khalid was awarded for a period of one year at the rate of Rs.345/ton for lifting and transportation from Kutchra Kundies to Landfill sites.

## Salient features of the contract

- Contract amount.....Rs.1,34,55,000
- Repair, maintenance, POL, salaries and overtime of the staff is the responsibility of the contractor.
- Payments to the contractor is made on the basis of tonnage.
- Daily generation of garbage in Shah Faisal Town is 105 tons and all is being lifted by the Contractor daily.

## Benefits of privatization.

- The contractor has managed to lift the 100% garbage.
- Less than 50% of TMA's garbage vehicles are being used on rent and maintenance basis by the contractor
- The contractor has ensured the minimum three trips daily by each vehicle
- No intervention of labor unions
- Prompt redressal of public complaints

## Short Comings.

- Per tonnage cost of transportation is at higher side as compare to some of the TMAs
- Garbage is being dumped at undesignated and un-monitored landfill site

# WHY GARBAGE TRANSFER STATION?

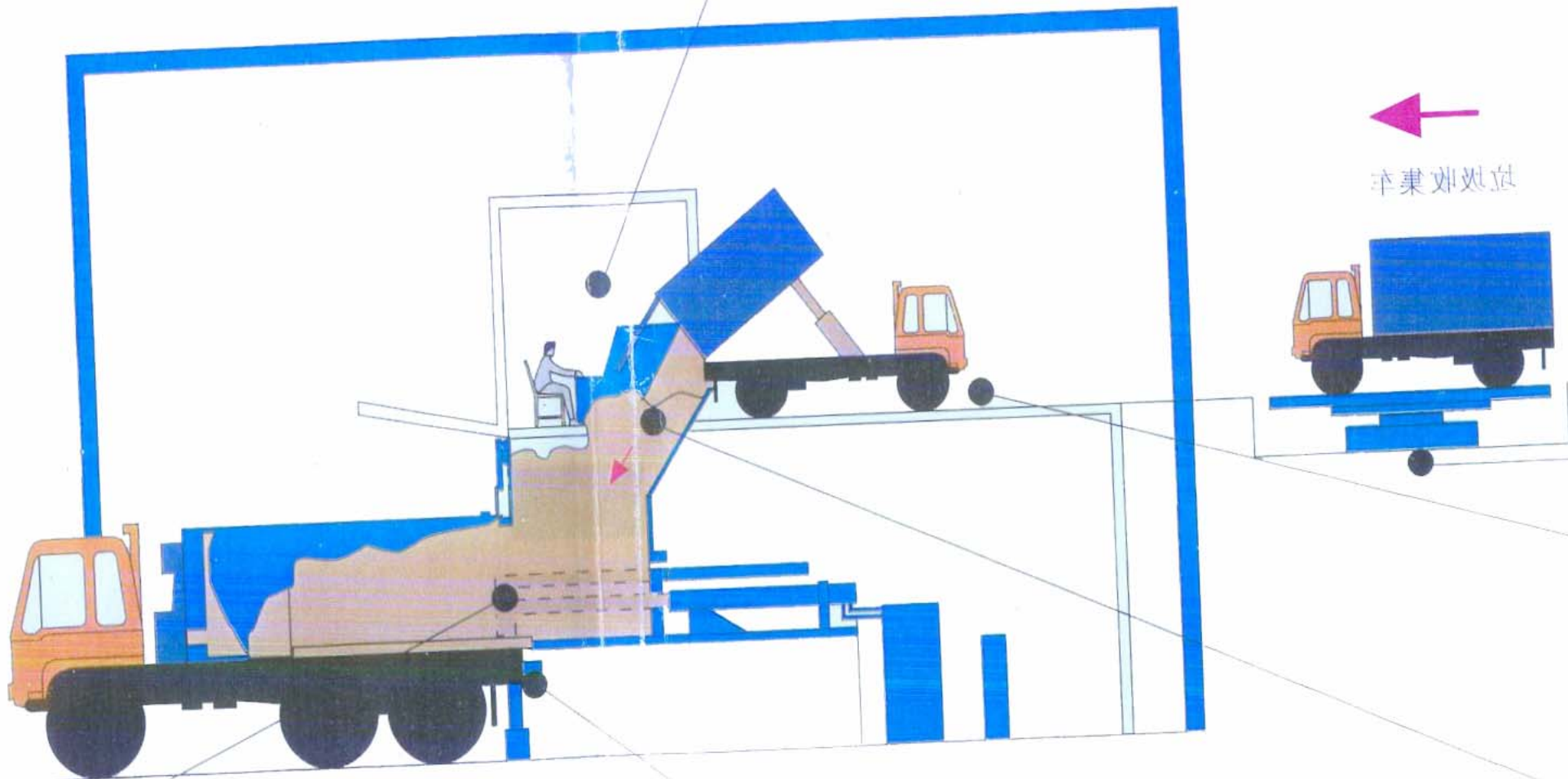
- ❑ Existing vehicle capacity varies from 1.5 to 5 tons.
- ❑ The hauling trip (Up & Down) ranges from 10km to 70km to landfill sites. (average 36km)
- ❑ Direct transportation of more than 6000 tons of garbage daily from generation point to landfill sites is neither possible nor economical
- ❑ Two stages transportation of garbage is being practiced in all the mega cities of the developed countries and being followed by developing countries

# Two stages transportation system

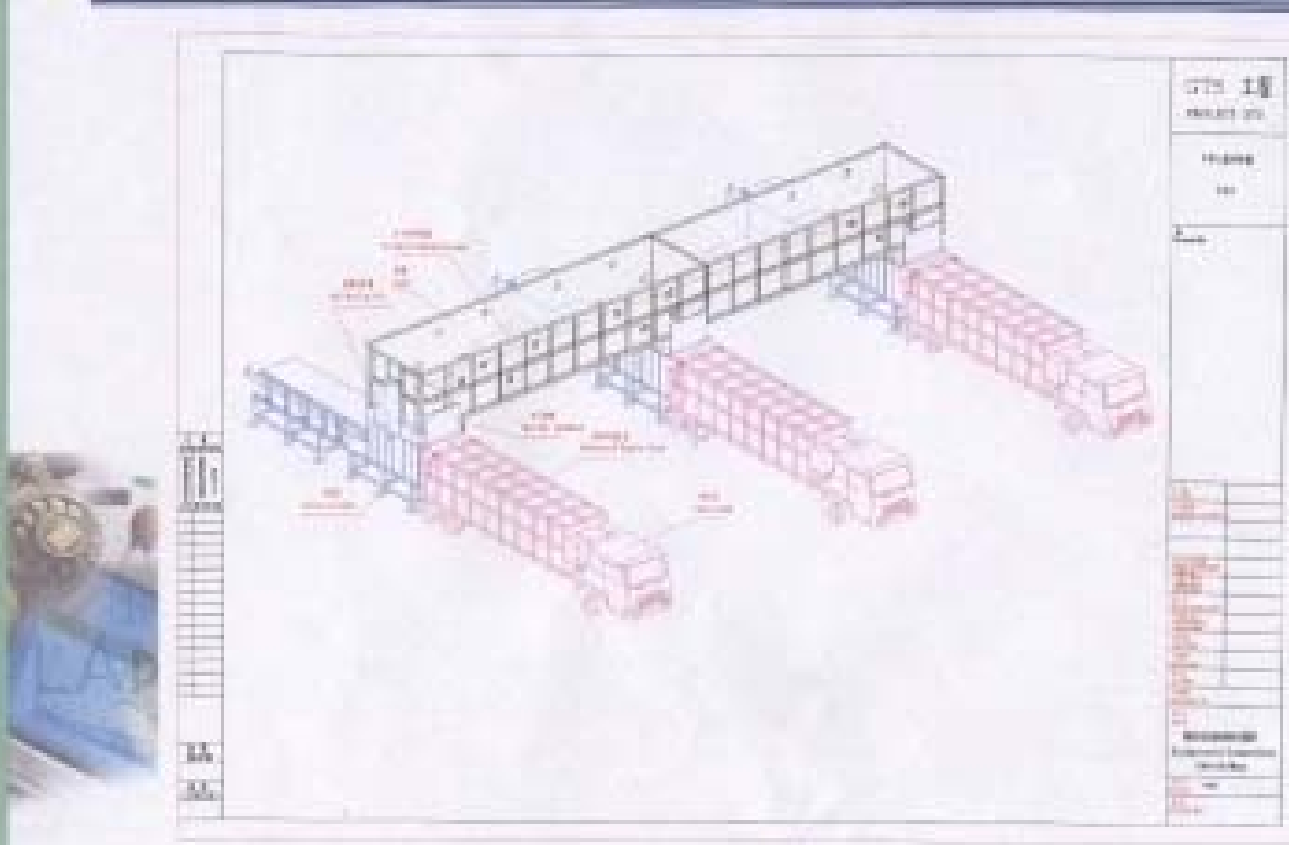
- ❑ **Garbage transfer stations (GTS) are installed at different locations in the city**
- ❑ **Maximum distance of the primary collection points to GTS is envisaged 3-4 KM**
- ❑ **The primary vehicles transport the garbage from primary collection point to GTS**
- ❑ **The garbage is weighed and relevant information are recorded under computerized system**

- The recyclable items are collected and sold (Optional)**
- The remaining garbage is compacted to reduce the volume**
- The compacted garbage is filled in long volume containers having capacity varies  $35-56\text{m}^3$**

# GARBAGE TRANSFER STATION



# PROPOSED SKETCH OF GTS



7

TRANSPORTING VEHICLES ATTACHED TO COMPACTING UNITS

# Result after installation of GTS

- One secondary vehicle will transport the garbage equivalent to the load of 6-10 primary vehicles
- Primary vehicles will move only 3-4 KM in radius
- The number of trips of primary vehicles will increase to 5-6 trips from existing 2-3 trips per day
- The primary lifting capacity will enhance from 50% to 100%

## Continue....Result after installation of GTS

- The long chassis secondary vehicle have no option except to unload the garbage at landfill site
- This will eliminate the informal dumping of garbage with in the city
- Efficient refuse disposal with environmental protection
- Monitoring of performance of primary refuse carrier
- Recovery of cost by sale of recyclable material (Optional)

# Involvement of Private Sector

- ❑ Private sector can be involved in any or all of the following activities:-
  - Primary transportation of garbage from primary collection point to GTS
  - Maintenance and operation of GTS
  - Secondary transportation of garbage from GTS to landfill site
  - By ensuring maximum garbage dumping at landfill sites, private sector may be entrusted to install any plant related to garbage

# Initiatives taken by CDGK

- CDGK has appointed consultant to design the environment friendly GTS
- CDGK has invited tender for establishment of one model GTS on turn key basis
- Concept clearance proposal (CCP) for establishment of 5 Nos of GTS at the cost of Rs 1091.50M is cleared by Sindh Government

- CDWP Islamabad meeting held on 30<sup>th</sup> Sept, 04 has linked the above CCP with the establishment of waste to energy plant**
- CDGK has invited letter of interest from private sector for waste to power plant on BOT basis**
- 3 firms have submitted their proposals**
- In coordination with Private Power Investment Board (PPIB) Islamabad CDGK is working to install 500 Mega Watts plant in Karachi by private sector BOT basis**

# Location of GTS

- ❑ **10 Nos of GTS will be required in the city**
- ❑ **Following four sites have been selected**
  - **Mewa Shah,**
  - **Gulshan Iqbal Behind Aziz Bhati Park**
  - **North Karachi**
  - **Korangi**

# Why GTS should not be linked with energy plant

- Private sector need confirmation of availability of garbage at landfill site by CDGK
- Segregated garbage can not be ensured
- Combustible segments are less in the waste
- The scheme of transportation of garbage upto landfill site has to be completed first then only private sector will be interested for installation of any plant

## Continued .....Why GTS should not be linked with energy plant

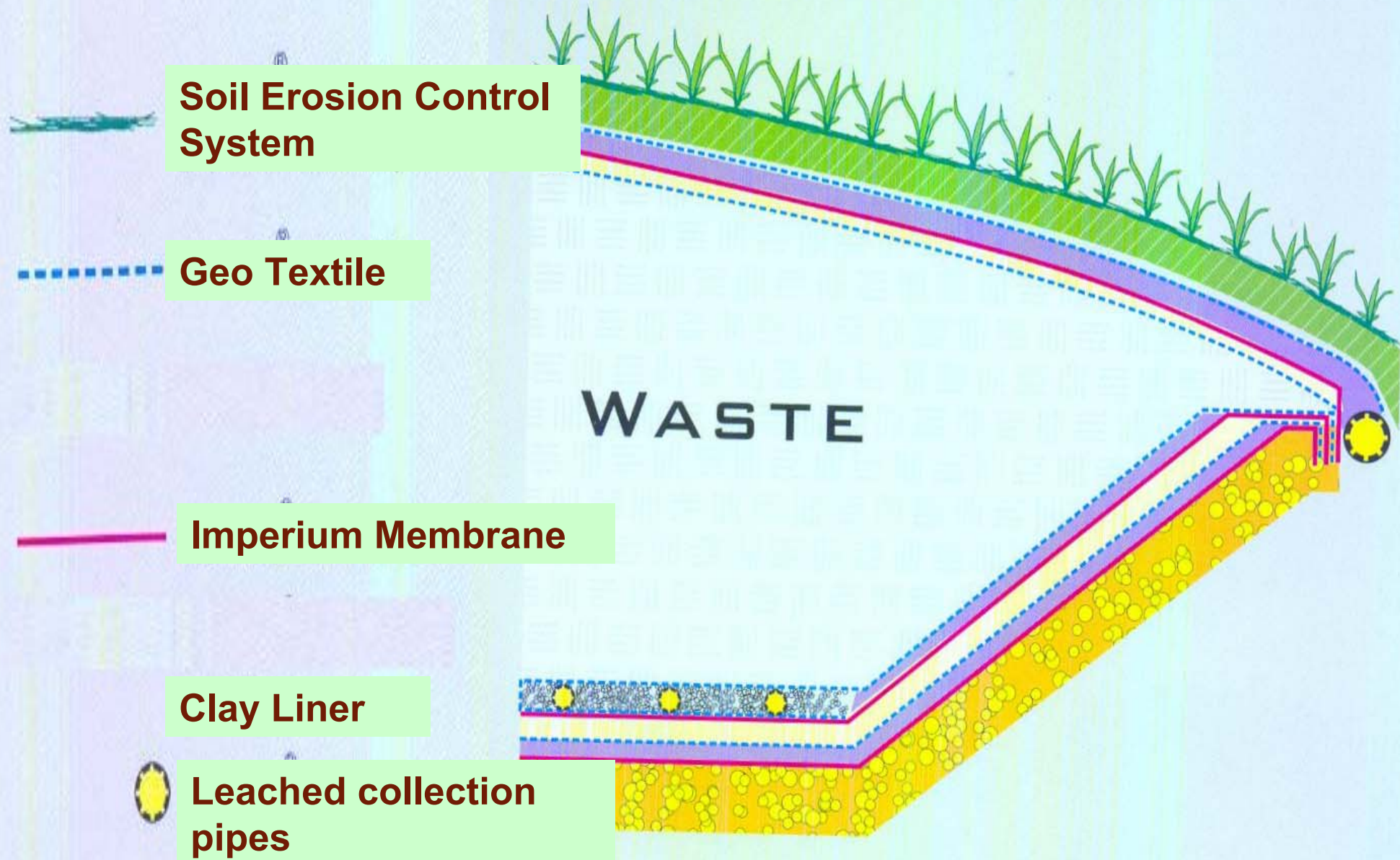
- The capital investment of waste energy plant is about 1.00 to 1.50 M USD per Mega Watts
- The capital investment of 100 MW plant will be 100-150 M USD (Rs.6.00-9.00 Billion )
- CDGK is responsible to provide clean city not electricity to the citizens.

# Development of Scientific landfill sites

- **A scientific landfill site comprises following components:-**
  - **Leveling the entire area required for dumping of garbage for specific period**
  - **Providing lining to protect the underground water table from leached produced by garbage**
  - **Leached treatment plant to treat the leached before discharging into main sewerage line**

- **Providing Hazardous gas escaping system especially methane gas**
- **Dumping of garbage is made in stages and each stage is covered with soil**
- **Detail designing of landfill site is necessary to minimize the environment pollution**

# HUITEX<sup>®</sup> Geomembrane for landfill lining solution



# HOSPITAL WASTE

<input type="checkbox"/>	Total No of Hospitals in Karachi	200
<input type="checkbox"/>	Total No of Beds	9000
<input type="checkbox"/>	Approximate generation of Hospital Waste in the City per day	2.7 tons
<input type="checkbox"/>	Per bed generation of Hospital per day	3-4 kg
<input type="checkbox"/>	Hazardous Waste	540 kg
<input type="checkbox"/>	Non hazardous Waste	2160 kg

Source: (EPA Sindh)

- ❑ **Health Care Units identified by TMAs 1379**
- ❑ **In all 140 Health Care Units are disposing off their waste through incineration plants run by CDGK**
- ❑ **Remaining Health Care Units are disposing off their waste along with the municipal waste posing health hazard in the city which goes unchecked due to :-**
  - **Non registration of HCUs either with Health Department Government of Sindh or with CDGK Karachi**
  - **Inactive role of EPA Sindh**

- CDGK has installed two incineration plants at Mewa Shah each with the capacity of 1000KG per hour in the year 1995-96**
- Incinerations take place at 800°c in 10 minutes.**
- Both the plants are now operated by private contractor M/s Abaseen International.**
- The plants are running at 12-15% capacity due to non-cooperation of health care units.**

❑ **Charges of incineration and transportation are collected from health care units (HCU) & deposited in CDGK account.**

❑ **22.2% charges are retained by CDGK & remaining disbursed to the contractor.**

❑ **M/S Abaseen's responsibilities are:-**

➤ **Collection**

➤ **Transportation**

➤ **Incineration**

➤ **Disposal of residue to a designated place at land fill site**

➤ **Maintenance of plants and vehicles.**

# Hospitals which are operating their own incinerators

- **Civil Hospital, Karachi**
- **JPMC, Karachi**
- **Liaquat National Hospital, Karachi**
- **Agha Khan Hospital, Karachi**



❑ **Incinerator Plant at Mewa Shah**

❑ **Two plants at Mewa Shah incinerate 2000KG per hour**

❑ **Running on 12 to 15% capacity & catering 140 Health Units**



# **PROBLEMS OF HOSPITAL WASTE MANAGEMENT**

- 140 Hospitals / Health care units are incinerating hazardous waste**
- Other health care units are neither identified nor complying EPA guidelines for disposal of waste**
- An estimated 3- 4 KG Hospital waste is generated per bed per day which if not incinerated may cause the other garbage hazardous**

# RECOMMENDATIONS FOR IMPROVEMENT OF S.W.M. IN THE CITY

## Short Term

- Supervision and monitoring should be made effective in order to ensure 100% attendance of the sanitary workers.
- Preparation of directory of sanitation staff with their photographs showing their area beat.
- Proper dustbins, their numbering and clearance time schedule be marked.

- ❑ **Early repair of under defect containers**
- ❑ **Timely repair of all garbage vehicles which are under defect**
- ❑ **All TMAs should strengthen the system of issuing notices and filing of prosecution to those creating insanitation as was being done previously.**
- ❑ **TMAs should ensure that the garbage vehicles are covered while carrying garbage.**

### Long Term

- ❑ TMA's which are not able to remove 100% garbage and have a resource gap may Privatize lifting & transportation of garbage.
- ❑ CDGK may draft a model contract document for out sourcing the garbage lifting and transportation to be adopted by TMA's.

- ❑ **TMAAs may select UCs for privatization of sweeping so that shortage of staff be overcome.**
- ❑ **Mechanical sweeper may be inducted by CDGK and TMAAs for sweeping on main roads.**
- ❑ **New landfill site at Razzakabad which is under consideration at CDGK may be expedited, for catering garbage from Malir, Landhi, Shah Faisal, Jamshed and Bin Qasim Town.**

- ❑ Placement of Staff by CDGK at the landfill sites to record the arrival of garbage vehicles and submission of that report to concerned TMA on daily basis.
- ❑ CDGK in coordination with the TMAs may conduct a survey of the health units in the city and their waste generation so that they are brought under the ambit of EPA guidelines
- ❑ CDGK should take necessary measures for registration of all healthcare units operating in the city.

- ❑ **EPA may ensure compliance of its guidelines by the delinquent hospitals.**
- ❑ **Establishment of Garbage transfer stations at the following sites as proposed by CDGK**
  - **Mewa Shah,**
  - **Behind Aziz Bhati Park Gulshan Iqbal**
  - **North Karachi**
  - **Korangi**
- ❑ **CDGK and the provincial government may approach the competent forum for early clearance of concept paper for GTS, waiving off the condition of establishment of garbage to energy plant**

- **At least two GTs may be established by CDGK from its own resources under Taamir-e-Karachi Programme on priority basis.**



**Thanks**