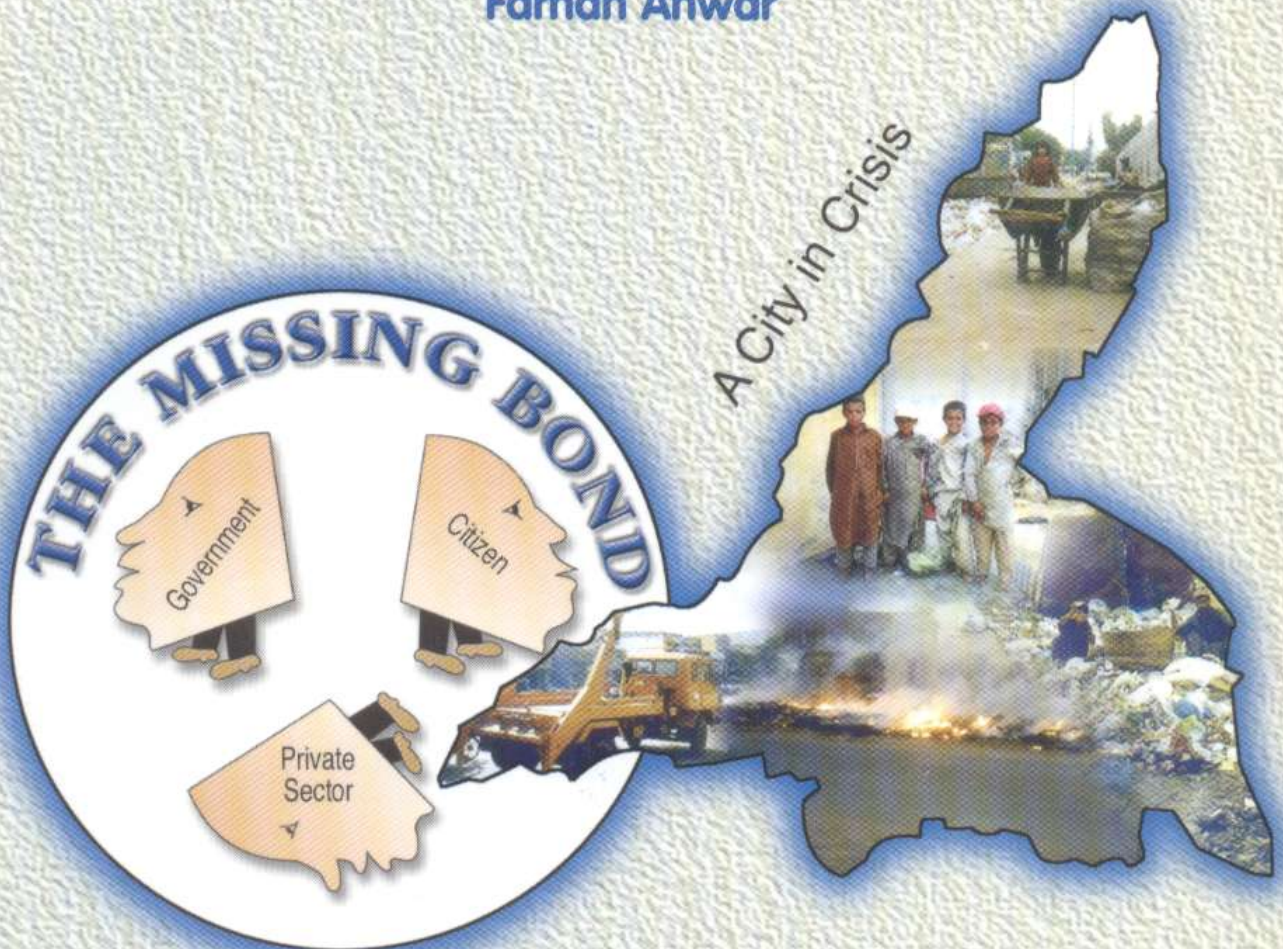


Institutional Assessment & Evaluation of Public Facilities Management Practices in Local Government

Solid Waste Management Sector of Karachi
A Case Study

by
Farhan Anwar



Shehri-CBE

FNST



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PREFACE

It would be unfair to state that the institutions of public service never worked in Pakistan. There was a time, not too long ago, when public officials from East Asian and other regional countries sought help and advice from their Pakistani counterparts on ways and means to establish their public service infrastructure and institutions. About thirty years ago, within a space of ten years, the two huge water reservoirs of Tarbela and Mangla were constructed. Our national airline played an instrumental role in establishing a number of national airlines all over the world. Such achievements were a source of pride and fulfillment for our people and administrations.

Since then, the institutions of national governance and public service, instead of aspiring and working for even greater levels of perfection, have instead witnessed an unfortunate process of decline in institutional mechanisms and delivery systems.

During the past 10-15 years, the downward dive of the performance curve has assumed the dimensions of a free-fall. All institutions and tiers of governance and administration seem similarly afflicted. So, what went wrong?

Today, even the most basic of public services like provision of clean drinking water and collection and disposal of waste are not adequately available to a large section of the populace. To compound the problems even further, this deterioration in the capacity of public service institutions to deliver efficiently, has coincided with a phenomenal rise in the level of urbanization in the country. The rural to urban ratio is witnessing a rapid transformation, setting in motion, a whole new range of social, economic and administrative configurations within the national development dynamics.

It has been seen all over the world that urban settlements demand a higher level of services and exert far greater pressure on resources, thereby necessitating an enhanced level of management and administrative efficiency on the part of the institutions of governance and public service. Development, management and rehabilitation of urban infrastructure and utilities system is an area of prime concern.

In our country, urban infrastructure facilities are facing a major crisis. This crisis has political, administrative, technical, social and financial undertones. The crisis gets manifested in the inability of the institutions and departments, responsible for public service delivery, to perform in a manner commensurate with the requirements of the time.

It has also been observed that the inherent administrative and technical shortcomings within our institutions, are also making it difficult to introduce within the system, new and alternative mechanisms of service delivery, like privatization of services or public private partnerships. The shortcomings include among other things, lack of performance standards, regulatory frameworks and transparency in operations.

The major losers and sufferers of course are the people of the country. Within the present system of governance, their capacity to initiate a positive and meaningful process of reform is also limited. It has been observed that the citizens, who are the users of services, for which they

also pay, are seldom consulted or actively involved in a meaningful process of participation while planning, developing and managing major public facilities projects. This is an issue of great concern. So, how can one bring about institutional reforms?

A beginning can be made by assessing the causes of this institutional decay and offer recommendations for change, based on the assessment and analysis. This is what Shehri-CBE aims to do in this study. As a test case study, an important element of urban services i.e. the solid waste management system of Karachi city has been selected. It is an issue close to the heart of the people and also an area where room for initiating a meaningful process of public participation in managing their own affairs is available.

It has to be clarified, that this is not primarily a study in solid waste management. On the contrary, it is basically an effort to analyze the functioning of an important institution of local administration, its interaction with other sectors of the civil society, to identify causes of system failures and suggest measures for improvement. The purpose is to render the system responsive to the needs of the public in a manner that also ensures the greatest level of public participation.

The morals, landmarks and inferences drawn from this study can also be applied to other institutions and areas of public service, for proposing a more wider and co-ordinated plan of public empowerment and efficient delivery of services. It is a pressing need of the time to bring real power at the doorstep of the people.

For this to happen, our institutions, particularly at the level of local government, are required to adapt themselves to the requirements of the present age and times.

I am grateful to the Shehri-CBE management for providing me with the opportunity to undertake this important study. The financial support provided by the Friedrich Naumann Foundation is greatly appreciated. Of great value was the help and assistance extended by Mr. Saif-ur-Rehman Grami, Director, Social Welfare, Culture & Sports, Karachi Metropolitan Corporation (KMC) in facilitating access of the project team in the relevant departments of KMC. The technical collaboration, advice and support made available by the Environmental and Civil Engineering Departments of the NED University of Engineering and Technology, Karachi proved of significant importance during the course of this project. The expert help and input of Mr. Muhammad Arshad in the composing and layout of the study report proved invaluable.

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April 2000.

CONTENTS

Preface

Introduction	1
The System	3
The Agencies	3
Primary Storage/Collection	3
Secondary Storage/Collection/Transport	3
Ultimate Disposal	5
The Administration	6
Solid Waste Management	6
District Municipal Corporations.....	6
Department of Solid Waste Management (KMC)	6
The Finances	6
Evaluation of Management Practices	9
The Projects	12
A. Garbage Train Project	12
The Concept.....	12
The Objectives	13
The Operation	13
<i>Development of Garbage</i>	
<i>Transfer Station</i>	16
<i>Transporting The Waste</i>	17
<i>Loading/Unloading of Waste</i>	17
<i>Sanitary Landfill Site</i>	18
Positive Impacts	18
Negative Impacts	18
Evaluation of Management Practices	19
B. Privatization of Solid Waste Management System	20
The Task	20
The Operation	21
<i>The Crisis</i>	22
<i>Why the Crisis?</i>	23
<i>The End</i>	25
Positive Impacts	25
Negative Impacts	25
Evaluation of Management Practices	25
C. Development of Sanitary	
Landfill Sites	26
North Karachi Landfill Site	27
Mehran Town Landfill Site	27

Jam Chakro Landfill Site	27
Gond Pass Landfill Site	27
Impacts	28
Evaluation of Management Practices	28
A System that Works!	29
The Issues & Recommendations	31
Frame Collaborative Mechanisms	31
Citizen is the Centrepiece of all Planning & Management Systems	31
Build Technical Capacity	34
Financial Empowerment.....	34
The Model	35
How an Expert System Works	35
Expert System in Solid Waste Management	35
Expert System Help	37
Help for Each Windows	37
CHARTS	
Existing Solid Waste Management System of Karachi (Chart 2a)	4
Organizational Chart of District Municipal Corporation (Chart 3a).....	7
Existing Workshops of KMC and DMC's (Chart 3b)	8
Vehicles in the Custody of DMC's (Chart 3c)	8
Assessment of Operational Performance (Chart 3d)	10
Vehicle/Trip Comparison (Chart 4a)	15
Comparison of Daily Equipment Cost for Alternatives #1 & #2 (Chart 4b)	15
Reasons for Failure (Chart 4c)	24
Management Model for Solid Waste Management System in Karachi (Chart 5a)....	32
Building Blocks for Efficient Local Governance (Chart 5b)	33
Logic Diagram of Expert System for Solid Waste Management (Chart 6a).....	36

Piles of garbage, dumped and openly burnt on roadsides, in parks, open drains and along rivers beds, offer the clearest manifestation of a severe crisis being faced by the agencies and departments responsible for collecting, managing and disposing the solid waste generated in Karachi city.

Although most of the activities and plans adopted by the relevant agencies have been characterized by an intent to focus on short term and ad-hoc natured initiatives, some efforts have been made in the recent past to undertake long term projects. These efforts, mostly un-coordinated, have nevertheless exhibited a desire on the part of the agencies to reform their policy making and planning mechanisms. How successful have such efforts been and what has been gained or lost in the process?

This study assesses the nature; capacity and requirements of the relevant government departments to handle the solid waste management system of the city in the light of the experiences gained during the planning and implementation of three separate projects.

To begin with, the Garbage Train Project was an effort to improve the garbage collection and disposal capabilities of the agencies, making optimum use of the existing technical and manpower resources, while at the same time augmenting certain aspects of the whole operation on modern, state-of-the-art waste management guidelines, technology, and procedures. The project involved a huge shift in governments policy, management and implementation methodologies and provided the potential of much greater interaction and participation with other concerned sectors of the society.

The second project considered in this study is an initiative, launched to privatize the solid waste collection and transportation systems of certain sectors of Karachi city, with the aim of reducing the load from the ailing government sector, improve efficiency in operations and reduce costs. Also envisioned was the incorporation of an enhanced level of public participation, transparency and accountability of services. It was hoped that the project would serve as a pilot initiative, with the experiences gained during the process, providing the guidelines and landmarks which could stimulate and better facilitate the process of private sector involvement in the urban basic services system.

In order to reduce the instances and need for dumping of garbage within populated sections of the city, a number of sites along the periphery of the city were identified to be developed as sanitary landfill disposal sites. This was a commendable and much needed initiative, and provides the focus of the third analytical study. In the end is discussed briefly, a system that works!

These projects have been analyzed in the study to understand the processes at work both within and outside the official system, which shape the contours of their development dynamics. How decisions are taken and policies made? What are the planning mechanisms at work? How do the various actors interact with each other? Is the need for meaningful public participation ever given priority consideration? These are some of the questions, which have been addressed. During the course of this work, consultations were held with the relevant stakeholder groups including government officials, private entrepreneurs and the general public.

An effort has been made to understand the causes of system defects. The issue of public participation in local affairs has received particular importance. Since the main objective is the improvement in the working efficiency of the system, a computer aided expert management model for urban solid waste management has been prepared for

the benefit of planners and managers. This is a pioneering effort of its kind in Pakistan.

The study should serve as a useful reference tool for our urban planners in their efforts to improve the working efficiency of the public service institutions in the country.

In Karachi city, home to over 13 million inhabitants, the main components of urban solid waste management i.e. neighbourhood level disposal/collection, transfer and ultimate disposal are all faced with a major crisis, characterized by technical and managerial/administrative system defects and deficiencies. The overriding concern is a serious lack of long term plans, which results in the increasing dependence on a number of disjointed and often counter productive ad-hoc policies, plans and administrative frameworks.

The Agencies

The Karachi Metropolitan Corporation (KMC), is supposed to collect and dispose about 80% of the solid waste generated in the city (*out of a total of 6000 tons/day, official figure*). However, the collection capacity of KMC is only about 40% and the disposal capacity, even lesser. The KMC is further divided into five District Municipal Corporations (DMC's), corresponding to the five administrative divisions of Karachi (*Districts South, Central, East, West and Malir*). The DMC's in various capacities, work almost independent of KMC control.

Solid waste collection / transfer and disposal from the city limits under KMC's jurisdictional control, is more or less the responsibility of the respective DMC's.

Primary Storage / Collection

Sweepers employed with the municipal agencies or hired by residents, provide door to door garbage collection service. A trolley (*which is actually a "wheelbarrow", used in construction activities*) serves mostly as the mode of collection and subsequent transport



The process begins

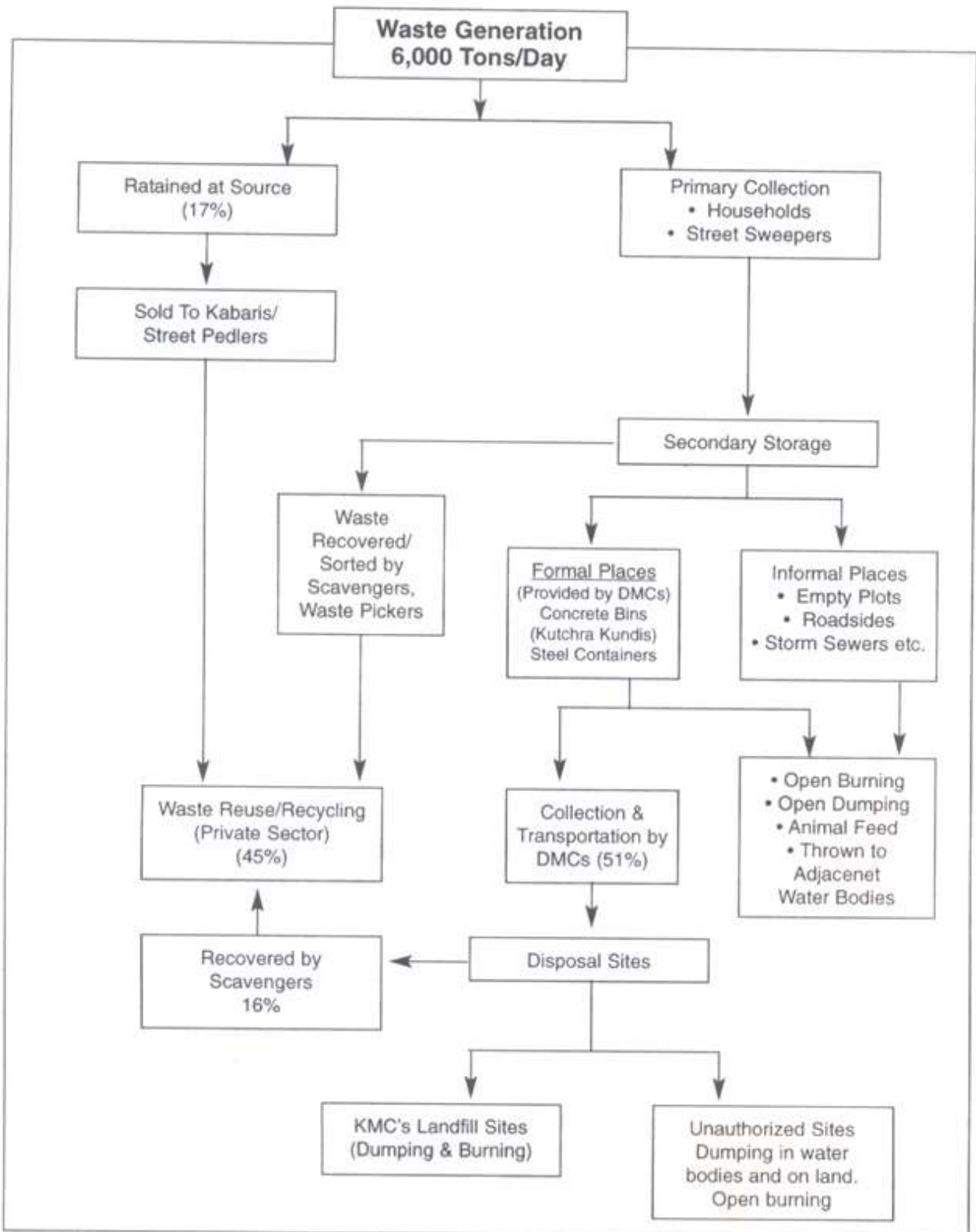
to a garbage collection point. The service is not provided by the city district municipal agencies themselves, rather the sweepers, who are entrusted with the job of cleaning/sweeping the streets, put in extra time to perform the door to door collection service and charge the individual households for the service. Also, of late, some private entrepreneurs, mostly of Afghan origin, (*better described as the informal sector*) have entered into this field of work.

Secondary Storage / Collection / Transport

From the households, the waste is taken to neighbourhood collection points (*concrete/steel bins*) stationed at roadsides, on pathways, in parks, playgrounds. The garbage may also be dumped openly in storm drains, parks / playgrounds, back lanes etc. In such places, the garbage is either burnt or is collected by the municipal agencies refuse vans and transported to various landfill sites (*non-engineered sites*,

Chart 2a

EXISTING SOLID WASTE MANAGEMENT SYSTEM OF KARACHI



Source: Solid Waste Management Dept. KMC

where garbage is dumped and openly burnt) located on the outskirts of the city. In the absence of any officially provided service in the recycle/reuse of solid waste, the informal sector has filled this gap to a



The official system at work!

great extent. The informal sector, comprises of an organized chain of actors, starting from the rag pickers on the streets to the recycling factory owners. It is a flourishing business, which at a conservative estimate, accounts for 15-20% of the total generated waste of the city.

Ultimate Disposal

Final disposal destination for household / commercial waste are a number of landfill sites (*discussed in detail later*) on the outskirts of the city, where the waste is

dumped and burnt in a non-engineered fashion. For disposing of hospital waste, some private and government run hospitals have installed imported/locally developed waste incinerators. Recently, two waste incinerators for disposing hospital waste have been imported and installed by KMC, and are being operated.

Note: For greater details on the basic routine functioning of the solid waste management system in Karachi, two previous reports of Shehri-CBE, "A Citizens Guide to Solid Waste Management" and "Neighbourhood Level Solid Waste Management in Karachi: Issues and Solutions", by the same author can be consulted.



Open drains: A favourite dumping site

THE ADMINISTRATION

3

Municipal affairs are a provincial subject under the Department of Local Government of the Government of Sindh (GOS). The Karachi Metropolitan Corporation and the 5 District Municipal Corporations function under the Sindh Local Government Ordinance (SLGO) of 1979.

The administrative heads of KMC and DMCs are either elected public representatives or un-elected appointees of the government. Since 1992, there is no direct public representation in KMC and DMCs. Government of Sindh appoints members of the District Management Group (DMG) of the civil services of Pakistan as administrators.

Solid Waste Management

Management of general refuse is one of the prime responsibilities of the five DMCs. Development and maintenance of landfill sites for city refuse is with KMC. Since 1998, the collection and transportation of hospital waste is exclusively with KMC.

District Municipal Corporations

Each DMC has an independent Health and Sanitation Department (H&S) with a medical doctor as the head. A Chief Sanitary Inspector leads the field staff of the department. Staff includes local sanitary inspectors and muqqadms who supervise the sanitary workers. The metropolitan area is divided into units called KMC units with a designated number. Depending on the number of units in each district, local sanitary inspectors are assigned units and sanitary staff according to the area and

population. the DMCs finance their H & S departments directly.

Department of Solid Waste Management (KMC)

KMC has a separate Department of Solid Waste Management, under a director general. The department has been established to facilitate planning and monitoring of activities under the Asian Development Bank (ADB) loan facility and the procurement of equipment and facilities. The team of the director general includes a chief engineer of electrical and mechanical systems, a director, deputy director and 3 assistant directors.

The Finances

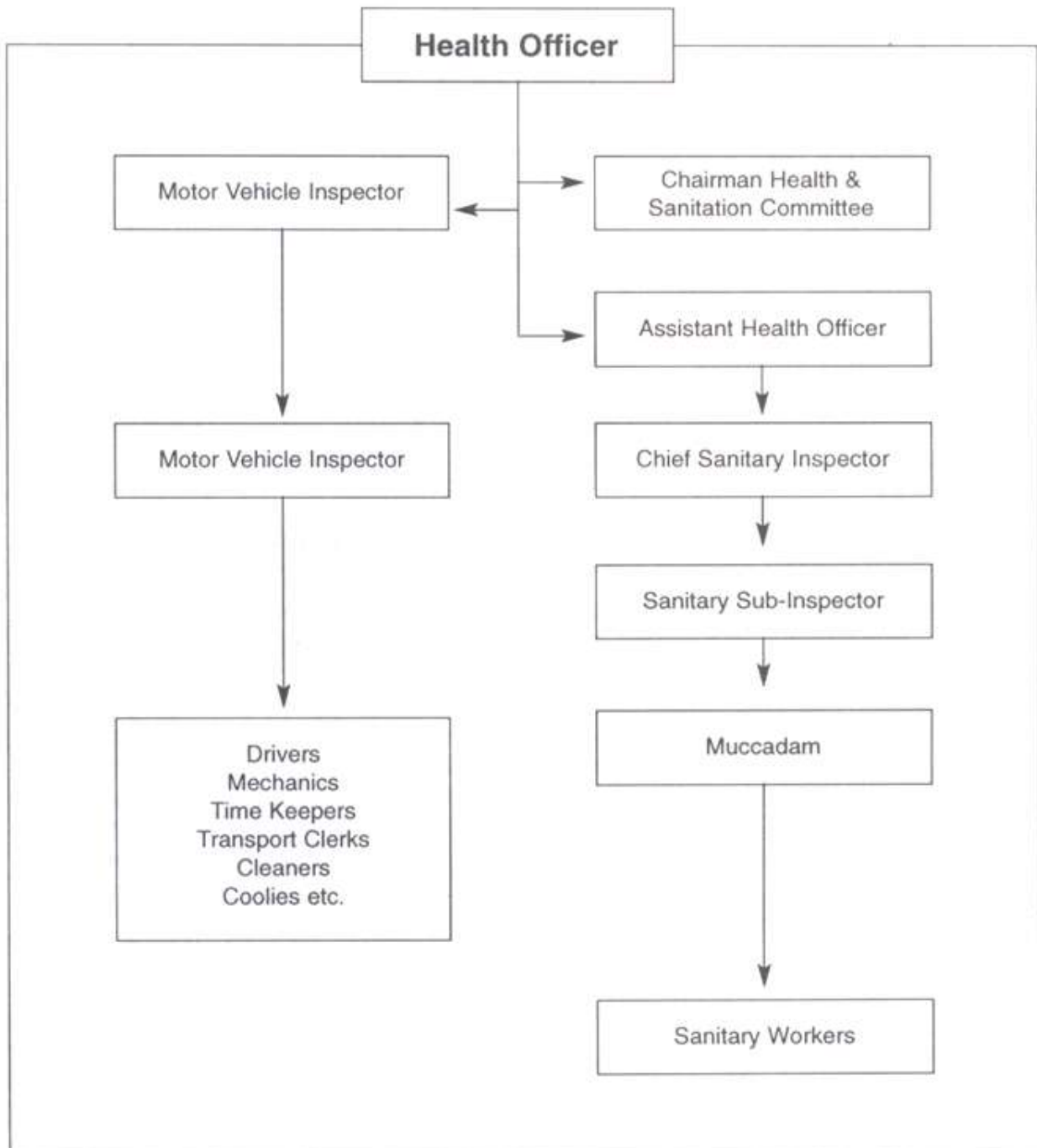
Revenues generated by the solid waste management sector originate from two sources. The revenues from sales of recyclable waste which are recovered at any stage. These revenues are captured by the informal recycling sector, in which KMC takes no part. The second source of revenue stems from the conservancy rate, which is collected from the users of the municipal service.



Vehicle procurement is the most favoured expense head of KMC

Chart 3a

ORGANIZATIONAL CHART OF DISTRICT MUNICIPAL CORPORTION (DMC)



Source: National Testing & Consultancy Services, Karachi-Pakistan

Chart 3b

EXISTING WORKSHOPS OF KMC & DMCs	
Nishter Road Workshop - 1	KMC
Nishter Road Workshop - 2	DMC South
Mehmoodabad Workshop - 1	KMC
Mehmoodabad Workshop - 2	DMC East
Landhi Workshop	DMC East
Sohrab Goth Workshop	DMC Central
Sewerage Farm Workshop	DMC West

Chart 3c

VEHICLES IN THE CUSTODY OF DMCs		
Vehicles	No.	Refuse Carrying Capacity
Refuse Vans	218	3.50 Tons
Tractor Trolley	54	1.25 Tons
Compactor	30	7.00 Tons
Arm Roll Truck	135	4.00 Tons
Refuse Collector	42	7.00 Tons
Total	479	-

In Karachi, the conservancy rate is joined with the sewerage rate into one integrated tariff, the *sewerage / conservancy* rate. The revenues collected are split on a fifty-fifty percentage basis between the two rates. Neither the tariff levels, nor the percentage split, are based on the unit cost made by KMC for solid waste management.

The Karachi Water & Sewerage Board (KWSB), which combines the revenue collection with the collection of the water supply tariff, does the collection of the revenues.

At a broader level, the four provinces of the country are financially dependent on the federal government. Revenues collected by each province go into a "divisible pool of revenues" between the provinces and the federal government. The share of each province is determined by the National Finance Commission, based mainly on population figures.

At present, the 5 DMCs under the administrative control of the deputy commissioners, are financially dependent on KMC. KMC distributes about 67% of its income amongst the five DMCs according to an agreed formula: Central, 16.93%, East 16.15%, Malir, 5.9%, South 14.98% and West 12.98%. On an average, the five DMCs spend about 25% of the annual budget on public health and sanitation (PH & S). A major portion of this is spent on solid waste management (SEM) which is a prime function under public health and sanitation.

So far there is no separate budget head for solid waste management in the DMCs. KMC invests about 6% on the public health and sanitation. This includes collection and transportation of hospital waste, and development and maintenance of landfill sites by KMC.

The DMC's are financially dependent on the distribution of funds made by KMC which are then administered by the area deputy commissioners through the government appointed administrators of the DMCs. This indicates dual control of civic agencies.

District wise expenditure on public health and sanitation services during fiscal year 1999-2000

Area	Total Budget (million Rs.)	Money spent on health and sanitation (million Rs.)	% of total budget
DMC West	671.20	114.860	17.1
DMC East	780.00	192.440	24.67
DMC Central	751.479	218.575	29.09
DMC South	673.882	239.319	35.51
DMC Malir	245.050	63.667	25.97
Total	3121.611	828.861	Avg. 26.55
KMC	4718	346.840	7.25

Evaluation of Management Practices

A dual control and management system exists. The administrator of KMC and the administrators of the respective DMC's reporting directly to the commissioner and deputy commissioner respectively. Lack of public representation (*non-elected bodies*) in the KMC and DMC's renders a totally bureaucratic shape to these institutions of public service. These two parallel tiers of governance (*municipal bodies/ Federal DMG Service*) often work at cross purposes and represent different interest groups. This issue further hinders the process of efficient management within the overall system of administration.

Chart 3d

ASSESSMENT OF OPERATIONAL PERFORMANCE	
Performance Indicator	Value
Collection Performance	
Primary collection as a proportion of net generation at source	90%
Secondary collection as a proportion of net generation at source	51%
Secondary collection and recovery as proportion of net generation at source	54%
Waste collection per sweeper (m ³ /day)	1.2
Waste collected per vehicle (m ³ /day)	11.4
Disposal Performance	
Disposal at formal site as a proportion of net generation at source	26%
Disposal at formal sites as a proportion of non-received waste	39%
Waste Recovery Performance	
Recovered organic waste as a proportion of gross generation	
• During primary collection and secondary storage	0%
• At formal and informal disposal sites	12%
• Total	12%
Recovered recyclable as a proportion of gross generation	
• At households	
• During primary collection and secondary storage	17%
• At formal and informal disposal sites	12%
• Total	4
	33%

Source: Solid Waste Management Department, KMC

(Note: % values of indicators are based on measurement in weight)

Within this bureaucratic setup, mechanisms for citizen participation are extremely limited and are mostly restricted to the practice of registration of complaints and their subsequent follow-up. Channels for meaningful communication with civic officials and active citizen involvement in the affairs of the civic bodies do not exist. Planning, development and management of projects, more often than not, are devoid of the basic requirements of citizen participation. Transparency in operation, thus cannot be safeguarded and ensured.

Due to a lack of effective coordination both within a department and at the inter-departmental levels, decision making processes are seldom clearly defined and management lapses occur.

For an important public health and sanitation sector like urban solid waste management, no proper performance standards exist. As a consequence, the role of the regulatory bodies like the Sindh Environmental Protection Agency (SEPA) is severely curtailed.

Effective revenue generating mechanisms do not exist. The conservancy charges cater to only 10-20% of the total budgetary requirements of the solid waste management sector.

The inherent technical and managerial incapacity of the KMC/DMC staff is another inhibitory factor. Low salary and benefit packages make it unlikely, the introduction of qualified staff within these bodies.

A. Garbage Train Project

In 1994, the Karachi Metropolitan Corporation, initiated a project in which it was proposed that the inner city circular railway system (presently catering to local transport) be integrated with the existing trucking service, for the transfer of solid waste to a site 50 Kilometers away from the city limits (5000 acres of land acquired for the purpose in the Dhabeji area on the National Highway). The ultimate disposal mechanism was to be sanitary landfilling.

The project promised a radical shift in KMC's policies based on short term and vaguely defined objective setting and ad-hocism to a multipurpose, long term agenda for change in the sector of urban solid waste management. The project, popularly known as the 'Garbage Train' project, got underway in co-ordination between KMC and Pakistan Railways (PR). The trucks were to transfer the waste from neighbourhoods to specially designed 'Garbage Transfer Stations' (GTS's) in selected sites built along the inner city railway network, from where the rail was to transport it to the landfill site.

Prior to final transfer, the garbage was to undergo sorting, bailing and compacting at the garbage transfer stations. This project of multifaced nature was ultimately abandoned, when just a few months into the operation phase. This analysis looks into the compulsions which forced KMC into opting for the project, the planning and management procedures adopted, overall impact on the system and causes of failure in implementation.

The Concept

The concept for this project was first developed in 1992, in a Final Year Civil Engineering project 'A Feasibility Study of the Railway Trucking Integrated Network for Solid Waste Management in Karachi', of NED University of Engineering & Technology, Karachi. In this report, the basic concept for the transportation and waste management model for the project was developed. The project got good publicity in the local press and the idea was picked up by KMC. In the last quarter of 1994, the project was given the go-ahead by the then Administrator of KMC, Mr. Fahim-uz-Zaman.

Although proposals previously existed to develop landfill sites for the city, the option of availing the rail service as a mode of solid waste transportation and its integration with the existing trucking service was never considered or discussed by any foreign / local consultants, govt. officials or NGO's prior to the N.E.D. report.

The decision to initiate this project was taken internally within the KMC and the project was not opened to any kind of public debate, nor was the idea discussed with other players in this sector. It is also interesting to note that subsequently, most of the project related work, particularly at the decision making level was handled by a small staff of engineers, hand picked by the then Administrator and was not routed through the normal KMC official hierarchy. This was apparently done to facilitate the progress of the project, which was considered to be on the high priority list of

the Administrator KMC. The Department of Solid Waste Management, KMC, managed this project.

The Objectives

The new scheme appeared to have several advantages over extending the existing system. Acquiring a large centralized disposal site, was considered a better option as compared to acquiring several smaller disposal sites later. Not only was it felt more practical to opt for one site in terms of availability of land, rising costs, minimising environmental degradation in the surrounding area, but it was also considered more cost effective. A related benefit was that apart from providing an effective solid waste management system for Karachi, the garbage train project was also expected to make a much better and more profitable use of the circular railway system, which since long had been running at a heavy loss.

According to KMC's own findings, it was apparent that ultimate disposal was not effective, owing to long travelling distances of refuse vehicles, conditions of roads, traffic congestion and shortage of manpower. KMC also felt that the wear and tear, breakdown, repairs and overhauling / maintenance of refuse vehicles due to excessive transportation caused serious deficiencies to occur in garbage collection / disposal system.

The envisaged process can be explained through the following line diagram.

Existing System

*Household » Commercial Bins » Primary Refuse Vehicles » Disposal Site.
(Non-engineered)*

Proposed System

Household » Commercial Bins » Primary

Refuse Vehicles » Transfer Station » Secondary Refuse Vehicle (Railway) » Disposal Site (Engineered)

Since the project did not propose any abandonment in any of the existing garbage management services i.e. role of road sweepers, door to door collection service, role of informal (*recycling*) sector, trucking services, rather it suggested better integration between them, it was felt that the project would not evoke any negative responses and resistance from these concerned actors.

The Operation

The sponsoring, execution and operation/maintenance of the 'Garbage Train' project was to be the responsibility of KMC. The project was expected to be completed in a period of twelve months (*starting in the last quarter of 1994*).

The capital cost for the construction of Garbage Transfer Stations was worked out to be Rs. 140 million per station (*with the allied transport and loading / unloading vehicles*). The annual recurring expenditure was estimated to be Rs. 14 million.

The contract for loading of solid waste on to the train wagons at the GTS and unloading of the waste at the landfill site was awarded to a private contractor (*discussed in detail later*).

An amount of Rs. 15 million was released to Pakistan Railways by KMC for the construction of railway track sidings and link roads with the allied infrastructure, leading from the main railway track to the landfill site at Dhabeji.

The operations planned to be performed at the GTS included:

EXPECTED BENEFITS

- Encouragement to private sector in future for collection of garbage and operation of garbage transfer stations.
- Source of respectable income / jobs to be provided at garbage transfer stations for the people currently engaged in the collection of paper, bones, wood, metal, glass, etc.
- Retrievable material from the garbage to contribute towards the economic growth of the city, and enhanced reuse / recycling activities to cause significant reduction in overall waste volume.
- Increased number of trips of refuse vehicles from collection points, thereby doubling the collection frequency.
- Compaction of waste at garbage transfer station to result in reduced volume to be transported and disposed at the landfill site.
- Overall reduction in environmental degradation, resulting in improved quality of life of the citizens.

- Dumping of garbage from primary refuse vehicles.
- Conveyers for movement.
- Compaction of garbage into 20 feet container for onward transportation upto railway yard.

From inception to the end stage, the whole process generally consisted of the following steps:

- Collection and transportation through primary refuse vehicles upto GTS.
- Processing of garbage at GTS.
- Bulk transportation upto landfill site.
- Disposal at landfill site.

It had been proposed in the original KMC project document that any of the project activities could be given over to a private party.

As discussed earlier, the main compulsion driving KMC towards this option was the expectation that by locating garbage transfer stations at appropriate locations in the city would yield a substantial increase in garbage collection efficiencies.

Increased efficiency would come due to increased number of trips that could be made between the communal bins /



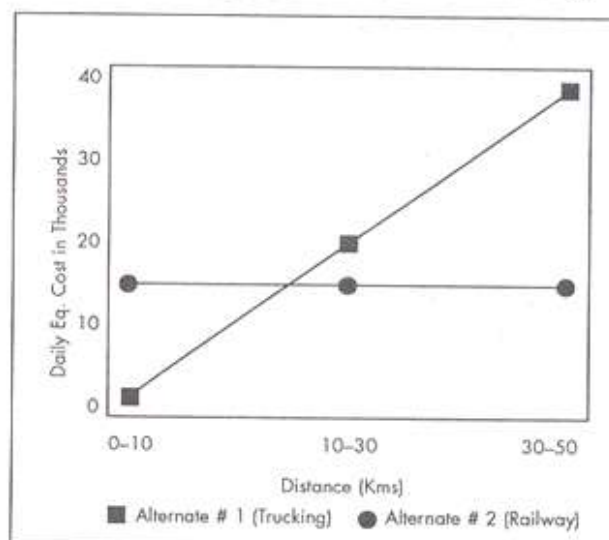
The work begins

collection points and the transfer station. The projected estimates of KMC are shown in Chart 4a.

It was also assessed that when the cost of transporting waste was equated with distance covered, after a certain point the option of transfer of waste via railway for long distances became much cheaper as compared to transport by trucks. (see Chart 4b).

The decision to transfer solid waste via railway was also influenced by the scarcity as well as the inadequacy of existing and planned landfill sites. At the time when this project was started, KMC was in the process of developing landfill sites at Gond Pass (*Baldia*) Jam Chakro (*Orangi Hills*) and at Mehran Town (*Korangi*) under a donor funded program.

Chart 4b
Comparison of Daily Equipment Cost for Alternatives # 1 & # 2



There was some concern about the feasibility of these sites as the 50 years land use projections for Karachi showed that these proposed sites could soon be surrounded by new human settlements, thus

Chart 4a

Vehicle/Trip Comparison

S. No.	Vehicle Type	Capacity/Trip (Tons)	No. of Trips*	No. of Trips**
1.	Refuse Van	3.0	3.0	6.0
2.	Tractor/Trolley	2.0	3.0	5.0
3.	Compactor	5.0	2.0	4.0
4.	Arm Roll	3.0	3.0	6.0
5.	Multiloader	3.0	3.0	6.0

* Without Transfer Station

** With Transfer Station

reducing their desirability of use as sanitary landfill sites. The proposed site at Dhabeji, it was felt, offered no such problem.

Three main areas of work were identified for the 'Garbage Train' project:

- 1) Development of 'Garbage Transfer Station' (with the import of related machinery / equipment / system).
- 2) Connection of main railway line with the 'Sanitary Landfill Site', at Dhabeji (construction of sidings, link roads, etc.)
- 3) Development of 'Sanitary Landfill'.

Paper work for the project started in the last quarter of 1994.

Development of Garbage Transfer Station

Five transfer stations were proposed to be constructed for each of the five administrative districts of Karachi (i.e. District Central, District East, District West, District South and District Malir).

It was decided by KMC to develop the first of these five stations alongside the Wazir Mansion Railway Station, in Lyari, District South.

This decision was taken because the waste hauling / transport distance from the city to the existing landfill sites is maximum from District South, as such, it faced the maximum problems vis-a-vis uncollected and randomly dumped waste and was therefore considered a priority concern area.

Only the very basic of development activities took place at the Wazir Mansion site. A boundary wall was constructed. A link road leading from the main road to the loading point was also laid out. At the point of loading of garbage into the wagons, a

loading platform was constructed.

In the planning stage (as has been mentioned earlier) it was decided to import compactors, conveyers, sorting equipment and provide these facilities at the garbage transfer stations. However, during the implementation stage, and after visits to the city of London, UK, it was decided to start off at the very elementary level and gradually improve the level of technology at the transfer station sites. Two main reasons



Infrastructure development at Dhabeji

for this change in plans have been identified.

- It was established that the priority should be to first get the maximum load of waste out of the city limits, rather than spend time and money on the processing of waste - a segment of the waste management plan which could easily be incorporated later.
- Due to the continuing political uncertainty in the country and city, a sooner than desired change in the KMC management team could not have been ruled out. A change in leadership usually in this part of the world leads to abandonment of previous governments plans and projects. Hence the management team of the project was initially cautious in investing too much in specific machinery and equipment

earlier on. (A fear that proved right in the end!). However, negotiations had started with a few foreign companies for the import of waste handling and processing equipment and offers were being received.

Transporting The Waste

It was agreed with the Pakistan Railways that they were to provide 72 specially designed bogies / wagons on a daily basis, which were to be used to transfer the waste from the transfer station to the Dhabeji landfill site.

However, this component of the project soon ran into trouble and according to most of the project officials of KMC and independent experts and observers, proved a decisive factor in the ultimate closure of the project.

From the very beginning, the behaviour of Railways had been at best that of a reluctant partner. Although they co-operated to some extent in the provision of required infrastructure at the landfill site (*to be discussed later*) they failed to honour their commitments vis-a-vis the provision of railway wagons for transportation.

The process of transporting solid waste from the Wazir Mansion Railway Station to Dhabeji Landfill site continued for about three months. At an average, only about 25 - 30 wagons were provided by Pakistan Railways instead of the committed figure of 72. At times even the locomotive engine failed to turn up, thus putting at halt the entire operation!

Even the wagons that were provided were defective, in extremely run down condition and totally unsuitable for the required job. The wagons were not always the same and kept changing due to which KMC's efforts to rectify and re-design them for the required purpose failed to bear fruit.



Scene from one of the few trips made

The on going corruption, related with the practice of renting out of railway wagons for purposes such as transport of fertiliser, edible items upcountry, can be cited as one reason. The railway officials obviously felt that there was not enough financial incentive in transporting garbage!

Another problem encountered was that no effort had been made to improve the garbage collection mechanism at the neighbourhood level. Garbage was still being scattered and burnt in the neighbourhood garbage dumps. It was in this condition that it was brought to the GTS. This burning garbage was loaded on to the wagons in extremely hazardous conditions, and the possibility of a major accident (*e.g. fire*) was never far from hand.

Loading/Unloading of Waste

A private contractor (*Jammy Constructors (Pvt) Ltd.*) were awarded the contract of loading waste into the wagons at the Wazir Mansion Transfer station and unloading the same at the Dhabeji Station and also transporting it to the actual landfill site.

The contractor was to provide all the machinery needed for job. They were to be paid an amount of Rs. 25,000/- for the loading of upto 72 wagons, and Rs. 85,000/- for the unloading and subsequent transport to the actual landfill site of the waste from the 72 wagons.

Certain clauses in the contract like payment on a daily basis and payment even when the train failed to make a trip caused problems for KMC later on, as the contractor had to be paid on quite a few occasions for idle hours.

Sanitary Landfill Site

As the proposed sanitary landfill site was at a distance from the main railway line at Dhabeji, the first requirement at site was the laying out of siding / railway tracks leading from the main railway line and also a link road. This task was given by KMC to Pakistan Railways and an amount of Rs. 15 million (*from the own funds of KMC*) was released to Pakistan Railways for the purpose. This task was almost completed by Pakistan Railways engineers and in addition, KMC also constructed an unloading platform at the site.

KMC also submitted a preliminary Environmental Impact Study (EIS) for the operation of the landfill site to the Sindh Environmental Protection Agency (SEPA) and obtained a No Objection Certificate (NOC) for the project. Work on the preparation of a detailed Environmental Impact Assessment (EIA) was also underway at the time of closure of the project.

However, as far as actual detailed engineering design for the sanitary landfill site is concerned, no real progress was made. The garbage being taken to the site during the operation of the project was dumped and openly burnt.

The 'Garbage Train', project was officially closed during the caretaker government's rule in Sindh Province in the fall of 1996, when only in the preliminary stages of implementation.

Positive Impacts

- Launching of an initiative which addressed the long term needs of the city by putting forward an integrated planning mechanism.
- Inputs of important segments of civil society, like the academic institutions were taken into consideration (*though on a less than desired scale*).
- Alternative systems of management, like privatisation of services were explored.
- Some base level training of KMC staff into new modern techniques of solid waste management.
- Acquisition of substantial land by KMC, which could be put to beneficial use in the future.
- Increase in public awareness on the existence of alternative systems and models of solid waste management.

Negative Impacts

- Although some basic level of information about the project was made available to the general public, the required level of public support was not gathered, with the result that when the project was ultimately abandoned, no real public outcry was witnessed. This minimal level of public involvement in a big city-wide project was a negative aspect, as a good opportunity of public debate on the alternatives for change was lost, setting a bad precedent for the future.
- As the project could never be fully implemented, new models of management (*privatisation, public sector-informal sector interaction*),

systems (*Garbage Transfer Stations railway transportation of garbage, landfill site development / operation*) and factors such as enhanced staff training and development could not be adequately and effectively tested.

- Growth of a feeling among the KMC staff that the existing system is incapable of effectively responding to the long term needs of the city or tackling new challenges. Subsequently, also further cementing of public opinion that KMC does not possess the capability (*or will?*) to address the challenges of the day.

Evaluation of Management Practices

Since the project was never fully implemented, it is difficult to assess the impact of change in measurable, tangible and concrete terms. However, some critical areas related to policy, planning and implementation effected by the project can be identified. More than the process of change itself, an assessment of this project would help in identifying the inherent and outside factors which resist major change in our system.

The project generated much public interest as it offered a radical shift in KMC's priorities. In the overall context, it was well received among the local NGO's, experts and academics. Some concerns raised about the safety of environmental control measures at the disposal site and selection of GTS sites, mainly stemmed from the fact that KMC initially had failed to prepare a proper Environmental Impact Assessment (EIA) for the project (*A short coming which was later partially addressed*) and also due to the fact that the project was not opened to public scrutiny and enough information was not forthcoming. This can be attributed to

the fact that there is no tradition of public involvement and debate on such city projects in the country.

The local inhabitants at Dhabeji landfill site were initially apprehensive about the prospects of the city garbage being dumped in their backyard. However, the KMC officials involved the locals in a meaningful dialogue, in which their fears were mostly removed. At the local political level, support was also obtained for the project and local inhabitants were offered jobs at the site. This strategy contributed significantly towards gaining local support for the project. However, despite a positive response from the public, and apparent operational feasibility of the plan, the '*Garbage Train*', came to a grinding halt, just a few months into operation. Why did this happen?

During discussion with the technical and administrative staff involved with this project, it became obvious that the project was spread over a canvas much larger than the KMC officials had ever handled in the past. For them it was more a matter of fits and starts, trial and error, rather than following a comprehensive plan of action. The finer details of the project were not adequately looked into, due to which operational difficulties arose, which required day to day mitigation and corrective measures. The operation of the Wazir Mansion GTS is a fine example. The contractual arrangements of the loading/unloading contract is another case in point.

The serious lack of technical expertise within KMC was another bottleneck. At that time, the Technical advisor to Administrator KMC, Prof. Muhammad Nauman, was a person of sound academic background, who was a professor of Electrical Engineering at a local engineering university. He was able to get some outside help and advise from academics and independent experts which

proved of much value in the gradual improvement of project performance levels during later stages. It can be said, that left to its own means, KMC would have found it difficult to manage even the little progress that the project achieved.

Then there was the crucial issue of inter agency coordination between KMC and Pakistan Railways. Due to the non-existence of such collaborative mechanisms, a smooth coordination was never achieved, and the project suffered significantly as a consequence.

B. Privatization of Solid Waste Management System

In the past few years, the national government, at all tiers of governance i.e. federal, provincial and local, has taken to the idea of privatization. In addition to the privatization of the industrial and service sectors, (such as banking institutions), the process of privatization of municipal services has also been initiated.

The reasons forwarded include, growing corruption, politicization and lack of transparency in functions, both administrative and financial, steady and continuous decline in levels of professionalism of the staff in the technical and managerial fields and lack of any long term vision. Also, the extremely low salary scales of staff and supporting funds prohibit the introduction of skilled technical staff, needed to boost the efficiency levels of the organizations. It has been argued, that all these factors have led to significant deterioration in service delivery capacity of the civic organizations, leading to continuous system defects, breakdowns and malfunctions.

In the solid waste management sector, it was the District Municipal Corporation of District Central of Karachi city (generating according to official figures, about 1327 tons/day refuse), which took the lead in going for the option of privatization of services, with the announced objective of introducing in their area, as a result of

private sector involvement, better and more professional level of services. It had also been one of the recommendations of outside consultants hired by KMC earlier, to go for privatization of various segments of the system.

The Task

Subsequently, tenders were floated by DMC Central and a contract was signed with the lowest bidder, Al-Khalid Agencies for Waste Management on 26th September 1998. The service area included 12 KP's (144 to 155) in F. B. Area, comprising of 25,000 housing units and 4 KP's in North Karachi (KP's 133 to 137) comprising of 47,000 housing units.

The total value of the contract was Rs. 4,35,00,000 /- and the contract duration was one year, with the provision of further renewal on the successful completion of the first stage.

Payment was according to weight of refuse lifted, at Rs. 284 per ton (exclusive). Estimated quantity of waste to be lifted was 420 tons per day / 153, 300 tons per annum.

The tasks identified in the contract included, door to door collection of garbage and sweeping in all said zones (residential, commercial, industrial) hospitals, clinics,

laboratories, schools, markets, marriage halls, restaurants or any other type of establishment and sweeping of all roads, streets, footpaths, service roads, central islands, removal of debris, building material waste, dead animals, birds, cleaning of storm water drains, nallahs and removal of offal and related wastes, etc. generated there at.

The garbage after collection was supposed to be transported and disposed on a daily basis to the newly developed landfill site at Deh Jam Chakro.

Al-Khalid Agencies were authorized to use the existing garbage collection facilities at the neighbourhood level and also arrange for new places as and when required. They were also required to carry out anti-mosquito drives, at least once a month.

Al-Khalid were prohibited from burning the garbage, both allowing or indulging themselves in scavenging activities and their sanitary staff were bound by the contract to wear distinctive uniforms.

The private contractors were not allowed to employ or hire full or part time services of sanitary workers and any other staff, in the service of DMC Central or any other local body, and they were bound by the contract to both acquire and maintain from their own resources, all the required equipment and machinery such as dumpers/loaders, refuse vans, etc.

Imparting of public education through information leaflets was also part of the contract agreement.

Subject to satisfactory performance, payment was to be made on a weekly basis. Funds for the project were made available from the existing expense head for similar service, previously carried out by the DMC

staff themselves and the sanitary staff made redundant as result of the privatization was to be adjusted elsewhere in the system.

The Operation

The project actually got underway in the month of October, 1998. Al-Khalid Agencies employed their own staff for the project on a monthly payment basis. Garbage collection vehicles like tricycles, Suzuki vans and dumper/loaders, refuse trucks were also hired by the contractors. For example, the Suzuki vans (40 nos.) used for transporting garbage from neighbourhoods to intermediate garbage collection points, were hired for Rs. 1,100/- per day.

However, the tricycles were specially designed by the contractors themselves for the project (*based on a Chinese model*) and were given great importance by them in the overall scheme of things. They felt that the use of tricycles was imperative, since the project area was densely populated with a large number of narrow lanes and by lanes in which larger sized refuse collection vehicles could not enter. This was also a new experiment, since the DMC sanitary staff had not used such vehicles during their operations in the past.

The Team

Supervisors	16
Drivers	20
Sweepers	550
Night Sweepers	15
Mechanics	4
Helpers	10

A total number of 100 tricycles, 60 for F. B. Area and 40 for North Karachi, each having a load carrying capacity of 300 Kg were designated for the purpose. Garbage

collection through these tricycles was to take place every day in F. B. Areas and on every alternate day in North Karachi. Two persons operated one tricycle at a time.

The sanitary workers on tricycles, collected garbage from each household and transported the same to intermediate garbage collection points like steel / concrete bins (*Katchra Kundis*).

Suzuki vans also performed this task in areas with wider more spacious streets, while for apartment blocks, commercial sites (*for whom special garbage collection containers were provided by the private contractors*) refuse trucks were sent to collect the waste directly.

From the intermediate garbage collection points, refuse trucks transported the waste to the landfill site at Deh Jam Chakro in the Surjani town area of Karachi.

Project offices were set up in the project areas, from where the office co-ordination staff kept in touch with the field staff through wireless receivers for better organization, while public complaints were also received at these offices by the Al-Khalid Staff.

It had been decided that the process of door-to-door collection and onward transfer of waste to the intermediate garbage collection points would be undertaken from 8 a.m. to 11 a.m., while from 11 a.m. to 6 p.m., the transfer of garbage from intermediate points to the landfill site would take place during various round trips.

However, in actual process, adherence to this time schedule became difficult, which caused tensions to develop between the residents and the Al-Khalid staff on regular basis.

The Crisis

The project was started with much zeal and enthusiasm by the Al-Khalid staff. However, a few months into the project and it was quite apparent that the project status was far from satisfactory.

Initially, problems were faced by the Al-Khalid staff in getting their bills cleared in the stipulated time period. This, they attributed to the routine delays any contractor might face while dealing with civic agencies in Karachi. However, by the month of May, 1999, it was clear that the future progress of the project was in serious jeopardy. How did this happen?

It seems to be quite evident, that there was a continuous drop in the efficiency levels of the Al-Khalid agencies as the project progressed. The first major crisis, however, occurred immediately following the Eid-ul-Azha celebrations and the religious month of Muharram.

On the occasion of Eid-ul-Azha, animal sacrifice is made in Pakistan, it being a Muslim country. On such occasions, in addition to increased waste generation in general, animal offal are generated in large quantities, the timely collection and disposal of which becomes a problem for the local sanitation staff.

In the month of Muharram, when a great number of religious meetings are held, the waste generation levels also register an incline.

Al-Khalid management claimed that they simply failed to cope with this additional load and while they tried unsuccessfully, to meet the demands of this abnormal load, their normal services and schedules suffered. As a result, according to their own estimates, their service efficiency dropped drastically to just about 40-50%.

Al-Khalid also attributed this decreased efficiency to the fact that instead of the normal door-to-door garbage collection service, most of their time and efforts were being assigned to cleaning storm-drains (which in Karachi, also service as unofficial garbage disposal points). This, they termed as "extra work".

As a result of this crisis, DMC Central made it quite clear, that they were seriously considering a review of the project status. DMC central also said that public complaints, expressing disapproval with the performance of Al-Khalid staff were reaching their offices with ever increasing frequency.

If one considers the arguments put forward on record by the Al-Khalid management to explain their case, then it becomes quite apparent that these do not hold much water. As far as the issue of the Eid Celebrations and subsequent rise in waste generation levels is concerned, it is clearly stated in Clause 4 of the Contract agreement that removal of offal is part of the job responsibility of Al-Khalid.

Similarly, again referring to Clause 4, it is found that cleaning of storm drains, is also part of the contract.

Why the Crisis?

A more detailed assessment of the project suggests, that there was an inherent flaw in the project planning methodology. It is usually the case, that whenever a 'pilot project', of any kind is undertaken, it is on a small and easily manageable scale. The basic purpose of the project being identification of problem areas, possible reasons and testing of alternative mitigation plans and strategies followed by continuous monitoring. This methodology of work ensures that when the scale and scope of the

experiment is enhanced, such problems are not faced, which would otherwise prove disastrous.

In the case of this project, which was a pioneering project of its kind in Karachi and can be considered as a pilot project, we find that probably the most densely populated pockets of Karachi, spread over vast areas are selected. F. B. Area even contains within itself a full fledged industrial sector!.

It seems that the reason for selecting such a large and thickly populated area for a project which required extensive logistical commitments could be based in simple economics. The DMC Central officials probably felt that since no resource recovery (usually the money making segment of a private sector solid waste management project) was involved in this exercise, the only way of attracting private parties and ensuring for them a feasible profit margin was to enhance the scope of the project.

Also, it is felt that not much base line surveys/research had been carried out by Al-Khalid prior to entering their bid. This is evident from the fact that they had not visualized or catered to the contingencies they were likely to encounter during the course of the project. Work items such as the cleaning of storm drains and occasional increase in waste generation levels, despite being part of the project, in their totality were not adequately assessed prior to the assumption of work, hence the breakdown.

The fact that they were short on equipment and staff is also borne out by the fact that residents regularly complained that garbage was not being collected and removed according to the announced time schedules.

It was also found that at times the refuse trucks of Al-Khalid failed to dispose (dump) the garbage in the landfill site, rather

Chart 4c

REASONS FOR FAILURE	
<p>The Administration</p> <p>Supervisor and staff management of the contractors team was inadequate.</p> <p>Public complaints were not properly and timely attended.</p> <p>Garbage from roadsides was never effeciently collected.</p> <p>No plans were in place to attend to emergency situation like Eid-ul-Azha.</p> <p>The contractor despite being obliged by the contract, did not participale in killing stray dogs and antimosquito spraying programs.</p> <p>The vehicles and allied equipment employed on the project were not in good working condition.</p>	<p>The Contractor</p> <p>A huge backlog of work left by the municipality, including building debris. This slowed progress. Also, delays were made in handing over waste, and in the payment of bills.</p> <p>Unions and local mafia hindered progress.</p> <p>High expectations of the municipality and public.</p> <p>Municipal sweepers still operated in the area. Many had long-established private arrangements with households for the removal of their waste and some had continued even after they were officially redeployed.</p> <p>Machinery provided by DMC was seldom found in working condition</p> <p>Fulfillment of tasks outside contractual obligations</p> <p>Waste from outside the limits of privatization project boundaries dumped by DMC.</p>

dumping it along the road on the Super Highway. This practice might have been due to security concerns or in an effort to increase the number of trips. Whatever be the reason, a planning/management lapse can be identified.

The fate of displaced municipal staff was another concern. The DMC planned to relocate them but many were found still working in the area. It appeared that in planning the privatisation, neither the DMC nor the contractor had paid due regard to the strong customary ties between municipal sweepers and households.

Due to this aspect, the process of door to door collection of waste, instead of being managed by the contractor, as stated in the contract, was still mostly handled by the DMC sweepers. This issue was also a cause of conflict.

The End

Finally at the end of November 1999, the contract was terminated on completion of its first year. The KMC not only abolished the contract, but they also levied a fine of Rs. 5 million on the contractor and the amount was deducted from the payment bills.

Positive Impacts

- The impact of the project is not entirely negative. Despite planning flaws, manifested in managerial drawbacks, the project has managed to introduce a new concept, with a fairly advanced level of management, going by our standards.
- The project has also led to capacity building among the DMC staff and the private contractors and problem areas and bottlenecks have been identified.

Negative Impacts

- However, extremely minimal public involvement (*only one press conference was held prior to the start of the project*) in the project management process, right from the inception to the implementation stage can be considered as a negative development.
- Also, the fact that recycling / resource recovery, instead of being part of the project, has actually been discouraged is also a negative development. Reference can be made to the Clause 12 of the contract, where the private contractor is prohibited from either allowing or himself taking part in scavenging activities and 100% garbage is required to be dumped in the landfill site.
- Consequently, no efforts were made on the part of project partners to educate the public in various options of waste management at the household level. It was just a *collect - transport - dump* project. Wider aspects of the issue were not considered. So, it seems a very good opportunity of carrying out various useful experiments, which could even have made the project more manageable, people friendly, participatory and cost effective, has been missed.

Evaluation of Management Practices

Whether it be on a large scale or on a lower threshold, we seem to have jumped on to the privatisation band wagon with no clear idea as to what are the prerequisites for this change.

The market for change is never fully assessed. Public interest is seldom a priority as the public is never *(unless forced)* involved in the process in a participatory manner. It is not clear what roles/functions and responsibilities will the partners to the change bear in the new scheme of things. This could be because we fail to develop proper regulatory mechanisms to facilitate and monitor the change.

In this project also, no public involvement was sought, no performance standards of any kind were put in place, against which the work of the private contractor could be judged and regularly monitored. Thus, room for conflict and dispute was always present. Enough data and documentation does not exist, based on which proper planning for such a project can be made. For example, since the last ten years, KMC is sticking to the figure of 6,000 tons/day to quantify the waste generation levels in the city.

It is no hidden fact that during this time period, the population of the city has increased by a minor figure of a few millions!! This is just one example.

Consequently, the private contractor, going on KMC figures had no idea what he was getting into. The officially quoted garbage generation figure in District Central is 1327 tons/day.

It was claimed by Al-Khalid management that in the initial stages of the project, they collected 1800 tons garbage in one day from just one block of F. B. Area. No wonder, their efficiency levels dropped by 50% in a few months! The vaguely framed and generalized terms of the contract bear testament to this observation.

Cost Benefit studies and alternate financing mechanisms were not part of the project planning exercise. No efforts were made of raising additional revenues by charging the residents extra for better service.

There is sufficient reason to believe that this would have been possible. This could have led to better financing of the project and greater involvement of the public.

C. Development of Sanitary Landfill Sites

LANDFILL SITES	STATUS
North Karachi	Officially closed
Mehran Town (Korangi)	Officially closed
Jam Chakro (Surjani Town)	Dumping has started
Gond Pass (Hub)	Dumping has started
Dhabaji (outside the city)	Feasible only if garbage train operates

North Karachi Landfill Site

The official land-dumping site at North Karachi measures around 26 acres. In 1985, 18 acres of land was allotted to the "Farooq Compost Plant" for establishing composting facilities at the site. The rest of the land has been utilized for dumping of garbage.

The land has been completely saturated and officially closed by KMC. However, it was observed during field survey that the land is still being used for open dumping and burning of garbage. The site is also used by the potters who utilize garbage for firing/baking purposes. Waste pickers and sorters also continue with their activities.

Connecting and internal roads are not present, thus making access to the site very difficult. The land feature adjacent to this area is the riverbed of Lyari River and has been used for garbage dumping and burning. Insanitary and unhygienic conditions prevail at the site.

No infrastructure facilities like water, sanitation and electricity were provided at the dumping site.

Mehran Town Landfill Site

Approximately 100 acres of land had been demarcated in Mehran Town in Korangi for setting up of a sanitary landfill site. The site had been developed making use of ADB loan facility.

Multiple approaches have been provided to give better access to the garbage collection vehicles. Internal roads are providing connection to the main approach road. Ramps are provided to accommodate movement of the trucks to the existing depressions.

Fencing is provided to restrict the passage of stray animals and passers by. Guardhouse for watchman, office for site staff and covered parking has been provided.

Water tank for storage of water has been constructed to supply potable water to the staff. Sanitation system, septic tanks and soakage pit for disposal of wastewater is provided.

However, proper engineered landfilling operation was never performed. Open dumping and burning of garbage is the commonly used mode of disposal.

Jam Chakro Landfill Site

Approximately 1600 acres of land has been demarcated at Jam Chakro near Surjani Town in District West. This site is planned to accommodate the garbage from district west and central. An approach road has been constructed to cater for traffic of heavy vehicles in all weather conditions. The land fill site is also planned through the ADB loan facility.

Construction of approach road has been completed. Recently a Weighbridge has been installed to weigh the incoming quantity of garbage as a mean to determine the quantity of waste disposed off. By doing so, the volume of waste disposed off at illegal spots along the routes can be determined.

The landfill site does not fulfill the requirements of a sanitary landfill, as again garbage is randomly dumped and compacted. Burning of waste also takes place.

Gond Pass Landfill Site

Approximately 500 acres of land has been allocated at Gond Pass near Orangi Town



Landfill site at Jam Chakro

for the development of a landfill site. But the landfill is being used for dumping of garbage.

For information on Dhabeji Landfill Site, see relevant section on Garbage Train Project.

Impacts

On the positive side, it can be said that a policy decision has finally been made to shift the garbage from within the city to outside it. However, the non-conformity of the sites with standard criteria for selection of a sanitary landfill site and the non-engineered operation practices on site are a negative development.



Gond Pass landfill site: Infrastructure development?

Evaluation of Management Practice

A typical definition of a sanitary landfill is as follows:

A sanitary landfill is a land disposal site at which an engineering method of disposing solid wastes is utilized in a manner through which environmental hazards are minimized by spreading of solid wastes to the smallest practical volume, and applying the compacting cover material at the end of each operating day.

The planning and development priorities adopted while managing these site clearly indicate that presently the onus is more on finding a suitable site to dump and burn the waste rather than to dispose it in an engineered and efficient manner. As such the term 'Sanitary Landfills' being associated with these waste disposal sites is a misnomer and the present operation practices, not in the loosest of terms find any relevance to the definition of a sanitary landfill site.

These projects again expose, in no uncertain terms, the technical and managerial incapacity of the KMC officials to think and plan on a long term basis. A properly functioning sanitary landfill site offers many more waste management options other than just the disposal of waste. If planned efficiently, other waste management options like recycling of waste can be better integrated within the overall system, via the provision of the required facilities and infrastructure at the sanitary landfill sites.

At best, the present arrangement can be defined as a dump and burn operation, with some level of compacting. Most of the landfill sites lack the very basic infrastructure like access roads, parking facilities, power,

water, accident control / safety measures etc. Mechanisms for proper record and documentation of the activities taking place are mostly missing. It is being observed that the refuse carrying vehicles still prefer to dump the waste along the way to the sites, rather than actually depositing their cargo in the landfill sites.

Karachi, both in the geographical and demographic sense is growing faster and

further than any other city or town in Pakistan. Many experts also believe that apart from the landfill site at Dhabeji, all the other sites are located at places which could soon become a part of the urban sprawl of Karachi. This issue brings into serious doubt the sustainability and long term functioning viability of these landfill sites.

A System that works!

A residential locality called the KDA Officers Cooperative Housing Society, was developed in the late 1970's by the Karachi Development Authority (KDA) for providing residential and small commercial plots for its employees.

Housing two sectors (*Block A & B*), the locality has residences built on 600 square yards, 400 square yards and 240 square yards.

The Residents Association of the Society, collects a nominal amount of Rs. 500/- per month, which is then utilized for cleanliness work (*including waste disposal*) and provision of safety measures in the society.

The Residents Association monitors the cleanliness work in the society and interacts with the relevant government offices.

A system which puts the citizens at the centre of their affairs, produces spotlessly



Where is the garbage ?

clean roads / pavements, properly developed and maintained parks and a safe, secure and pollution free living environment. The process has proved sustainable, since it is in the interest of the people to make it work.

The experience provides an important lesson. *Bring the power and responsibility to the people.*



breathing in a pollution free environment

Over the past few years, the performance graph of Karachi's civic organisations has registered a sharp decline. This is obvious from the steady decline in service delivery capacity, whether it be the sector of solid waste management, waste and wastewater, transportation etc. KMC is no exception.

The institutions are faced with a crisis of governance, manifested in a continuous reduction in service delivery capacity and capability and are rapidly losing the trust of the public, they are supposed to serve. General public reluctance to involve themselves in civic affairs, while at the same time expressing their discontent is good proof of this serious concern. So, what can be done to improve the situation ?

Frame Collaborative Mechanisms

A major cause of the inefficient functioning of systems is the inherent lack of collaborative mechanisms. These missing bonds are both vertical and horizontal and can be witnessed at the inter-departmental, inter-agency levels and also at the levels of public private partnerships.

The series of unfortunate mishaps encountered during the course of the Garbage Train project, while trying to forge a vitally important working relationship between the KMC and Pakistan Railways, offer a good account of this managerial shortcoming.

In this project, even within the KMC system, the planning and decision making processes remained confined to a limited few, and the chain of command and management did not

adequately filter through the relevant departments.

There is much talk these days of decentralisation and of developing models of public-private partnerships, where the organised private sector, big business and citizen bodies, NGO's etc. can forge mutually beneficial relationships for the good of the city.

Both the Garbage Train project and the Privatization project, provided our city managers with just such an opportunity. KMC/DMC could not make the desired level of progress in this direction simply because of the reason that our government organisations are presently not served with the required policies, frameworks and regulatory mechanisms which can facilitate this transition from the traditional modes of governance to the new governance models on offer, particularly for basic services.

In these projects, questions like, what role could the informal sector play in the project? How can contracts and agreements be drawn which ensure transparency in functions? What kind of regulatory instruments be prepared which can ensure performance standards and protect public interest? remained unanswered.

Citizen is the Centerpiece of all Planning & Management Systems

The assessment and evaluation of each project have shown that the most important missing link is a meaningful process of citizen participation. In all the projects, the citizens were never involved in the planning of the projects. In the Garbage Train Project,

Chart 5a

MANAGEMENT MODEL FOR SOLID WASTE MANAGEMENT IN KARACHI

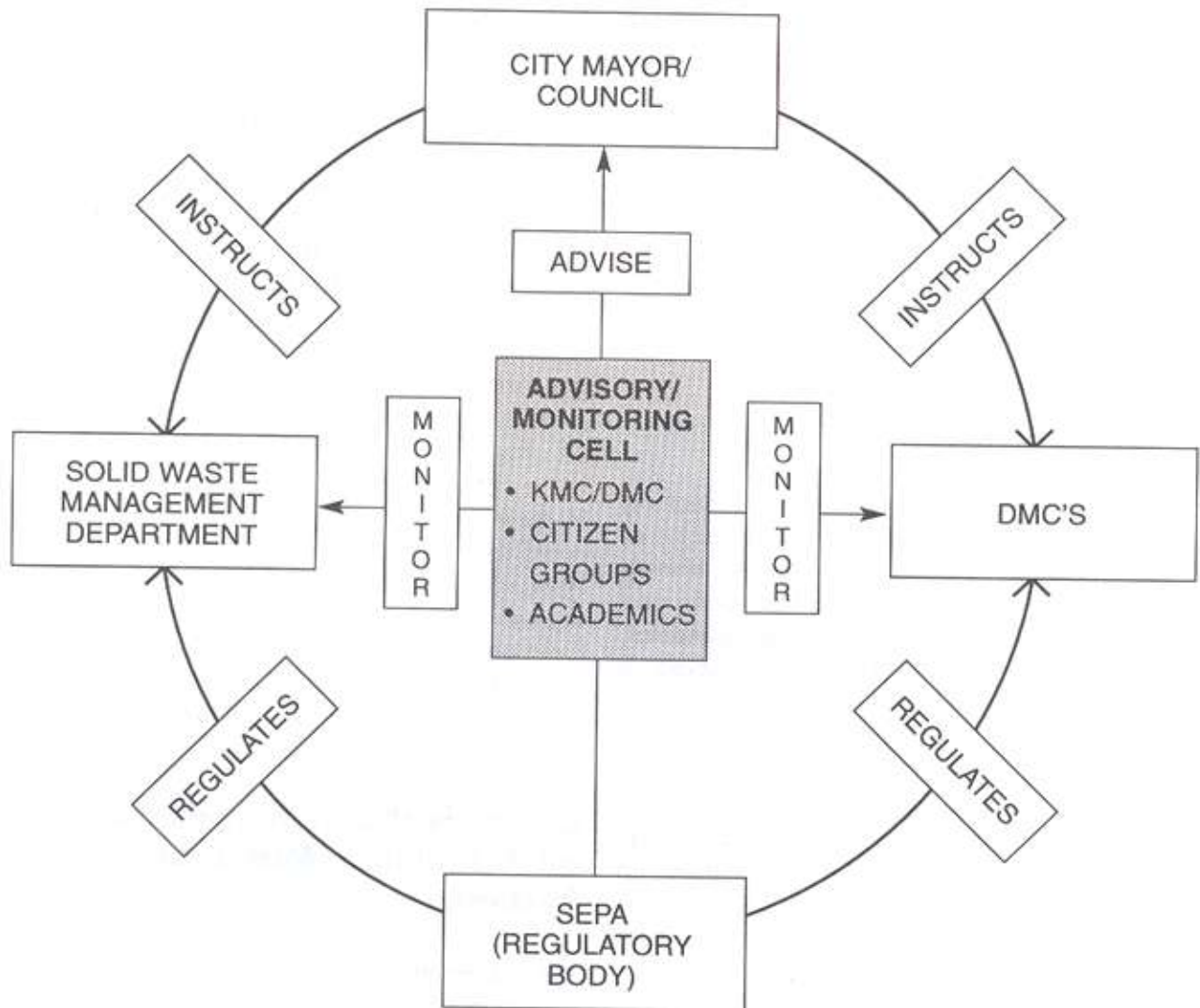
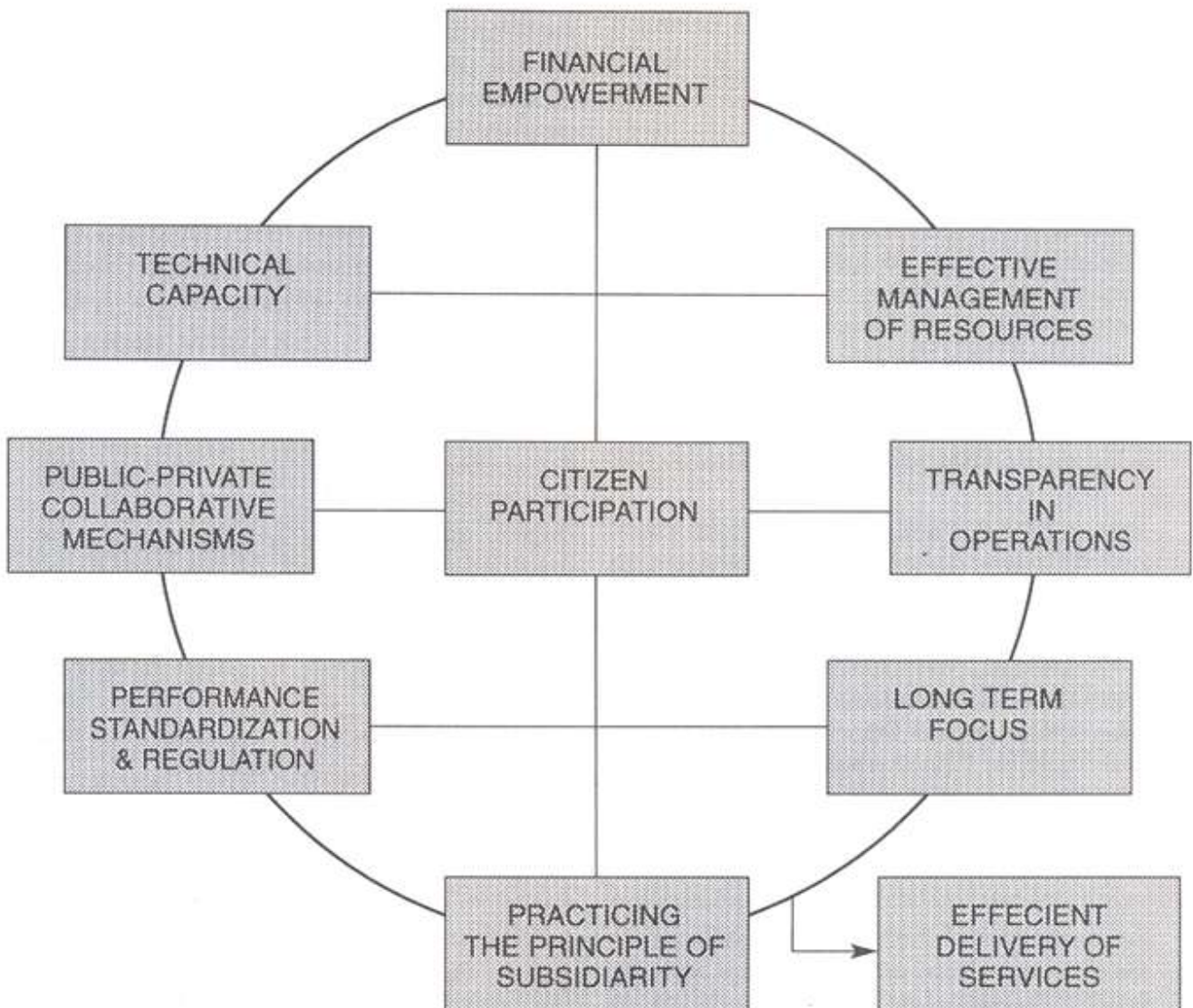


Chart 5b

BUILDING BLOCKS FOR EFFICIENT LOCAL GOVERNANCE



even at the operation phase, citizens were never involved by the government, and only came to know of the project progress from the news that filtered through via the print press (*that too at irregular intervals*).

In the privatization project, as is the norm, the relationship never got further from the registration of complaints. It is ironic, that here the blame lies not only on the government but is shared with the private sector group, contracted for managing the project. No effort was made to involve the area residents or citizen groups in at least a monitoring role which could have drastically improved the level of transparency in operations.

On the contrary, the KDA Cooperative Housing Society Project shows that when the people participate in managing their own affairs, better efficiency and long term sustainability of operations can be guaranteed. This, for the simple reason that these are the problems of the citizens and they have the most at stake for improving the living environment of their localities.

They are the users of services and the major beneficiaries of a properly functioning system. The people will have to be brought at the centre of any planning and management mechanism that is to be developed at the local government level. If we want to ensure the viability of services and facilities, then there is no other way of tackling this issue.

Build Technical Capacity

An evaluation of these projects, particularly the Garbage Train project and the Sanitary Landfill Development projects, indicates a serious lack of technical expertise within the

administrating bodies to both understand and subsequently plan projects of technical and multidimensional nature. Issues which make it difficult for technically qualified people to be inducted in the KMC/DMC workforce can be addressed by giving serious thought to framing and devising the proper mechanisms for privatisation of services.

Financial Empowerment

Financial empowerment of local government institutions is a must. It has been discussed that the revenues generated for the purpose of solid waste management fall far short of meeting the required needs. The same can be said for the financial arrangement for other such services. The local governments should be empowered to raise the required revenues by legislation through proper adjustment of taxes and user fees.

The basic pre-requisites for good governance within local bodies include show of political will, sound administration, transparency in functions and a well orchestrated show of continued commitment, resolve and sense of belonging with the area and people served. All this leads to the establishment of public trust with the organisation. An organisation which exhibits the capability to adapt to change within society and systems further strengthens its capacity to deliver well and that too on a sustained basis.

The models (Chart 5a & 5b) further illustrate the adjustments that are required to be made in our local government system in general and the solid waste management system in particular, to make them truly responsive to the challenges of the time.

Expert Systems are a class of computer hardware and software, that can help, advise, diagnose, analyze, consult and categorize. They are capable of solving problems that are unstructured and poorly defined.

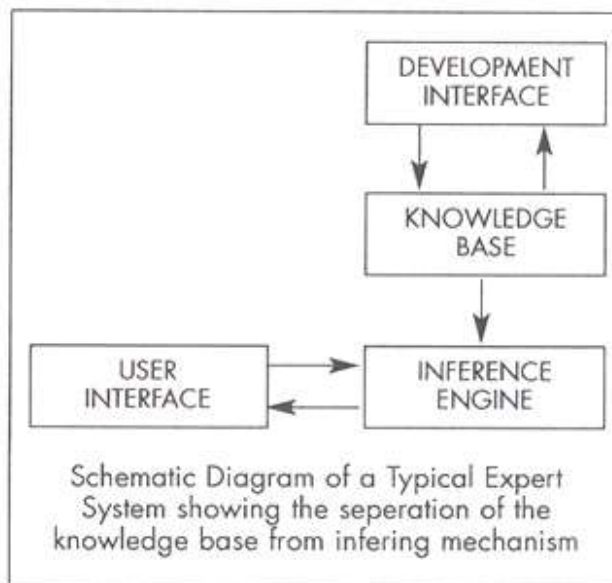
Expert system uses knowledge and inference procedure to solve problems that are difficult enough to require significant human expertise for their solution and are always designed to solve problems in a single discipline topical area or region of knowledge. This is referred to as the domain of the expert system.

How an Expert System works?

Expert systems can be applied to problems that are primarily solved using reasoning and have no defined procedure. Problems are solved through a diagnoses or consultation with the expert system. In a simple expert system, each question is answered by 'yes' or 'no' or 'why'.

Expert System has no defined procedure that is stored as part of the program. Instead of calculating an answer using predefined procedure, the expert system tries to use what it knows about the domain to define a procedure to achieve the specified goal, a process the human experts call formal reasoning.

The most common type of expert system is the 'Production System'. In a production system, the knowledge is rule based and stored as a collection of *IF-THEN-ELSE* rules. Each rule is said to be a production rule. The rule expressess relationship between facts.



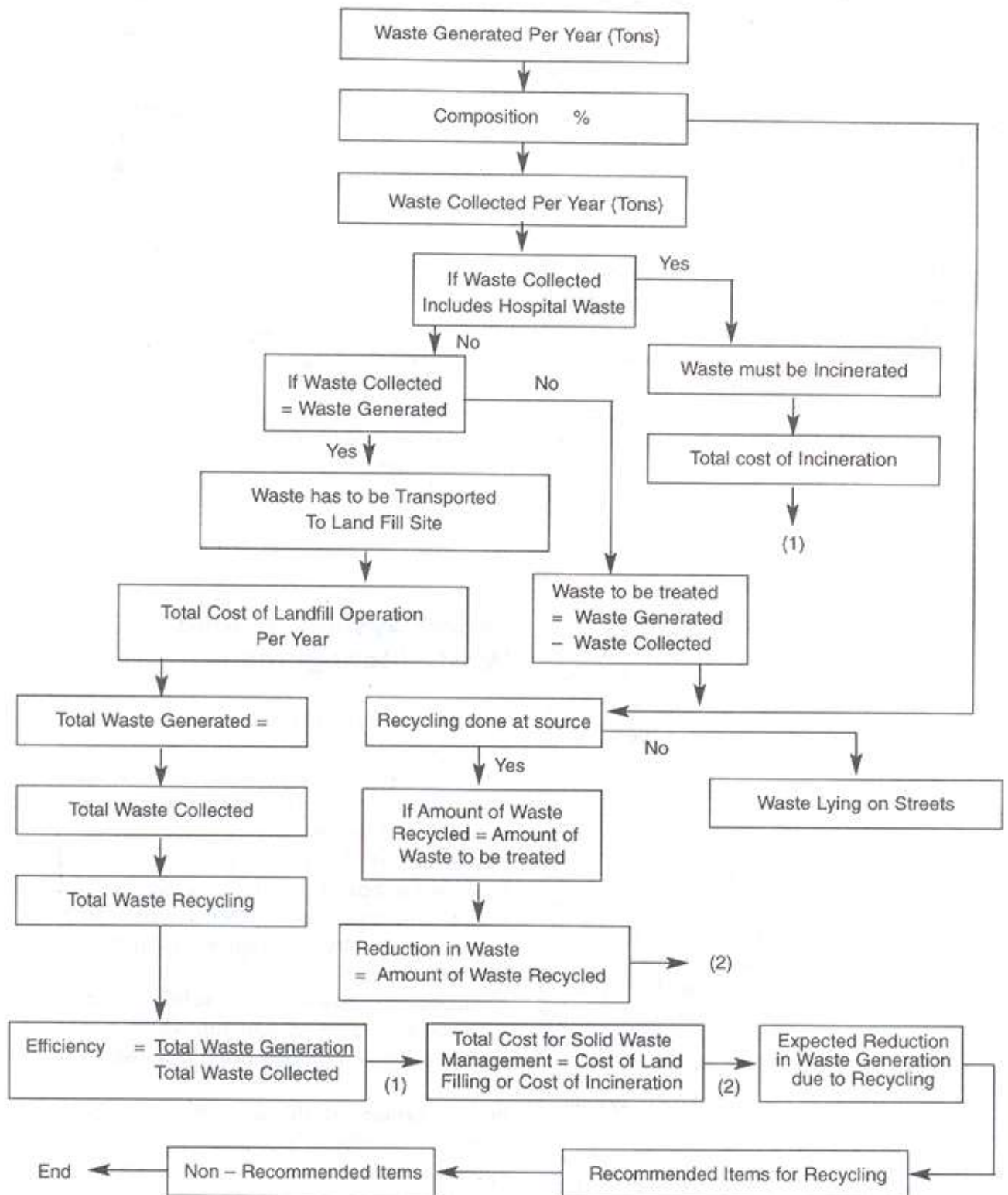
Expert System in Solid Waste Management

The use of expert systems in solid waste management has developed in recent years and the development is in initial stages. Solid waste management is a diversified discipline of environmental engineering. It requires a list of knowledge acquisition and experience based conclusions. Since solid waste management systems vary from country to country and region to region, the design and application of the expert system changes. However, solid waste management is one discipline, where expert system usage can make a big difference.

In this project study, an effort has been made to develop a computer aided expert system for solid waste management, capable of working out the efficiency of a typical urban solid waste management system.

Chart 6a

Logic Diagram of Expert System for Solid Waste Management



The software that has been developed is data intensive and can evaluate various variables at a time, such as amount of waste generated, composition of waste and cost of waste disposal. Waste disposal options such as disposal by land filling, recycling and incineration can be considered, both separately and simultaneously, while evaluating the efficiency and cost of the solid waste management system.

While the software is not intended to serve as a simulation model, it nevertheless offers a valuable tool for our solid waste managers to assess the efficiency of their systems, identify problem areas and formulate strategies for improving and enhancing the working efficiency of their operations by making better use of the various waste management and disposal options on offer.

Also aided could be the departments efforts for improved financial management and budgeting of operations. This model could help to identify as to what impact, enhancing and enlarging the range of operations of certain disposal options could have on the productivity and delivery capacity of the overall system.

To cite an example, KMC/DMC do not presently employ the use of recycling practices. As such, the possible impact, the availing of this disposal option could have on bettering the range of the urban waste disposal operations is hitherto unspecified. This model could help in addressing this problem.

Another area where this expert model could be put to good use is better documentation of department records.

It has to be emphasized, that this is a pioneering effort of its kind in this country

and rather than offering solutions to all future planning and projections of the solid waste management systems, provides a good launching pad for modernizing and streamlining the related systems and operations.

Expert System Help

This expert system is a user friendly, easy to use software in which the user has to select appropriate options. Since it is an expert system, so the values inserted as default values have some distinctive features and are based on expert opinions and assumptions to make the software design simple.

The user-defined values are to be inserted in their respective order. Since an expert system works even if the data or information is incomplete or false, so if the user input values, which are not correct such as alphabets in lieu of numeric values, then the expert system will use default values. It will also use default values if the user-defined option is selected and no value is inserted.

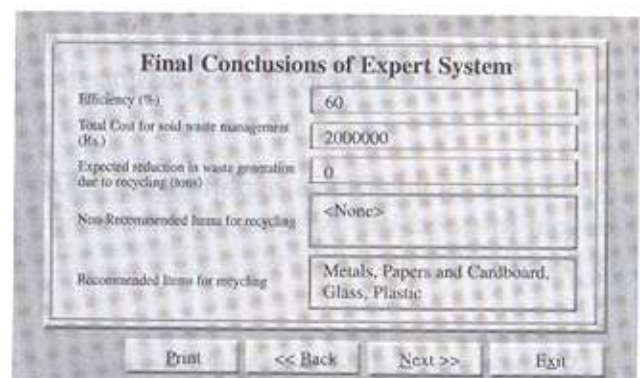
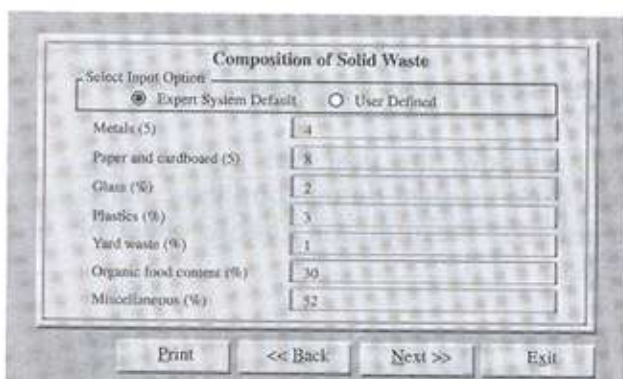
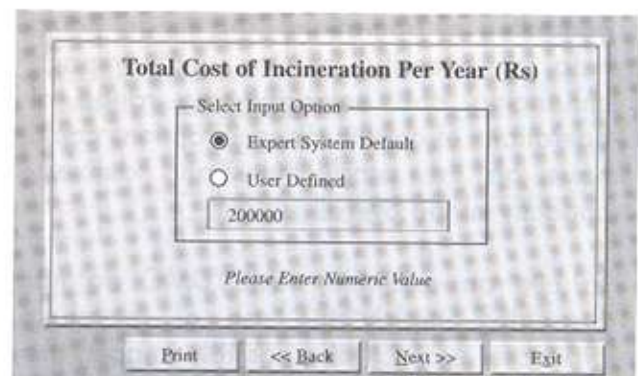
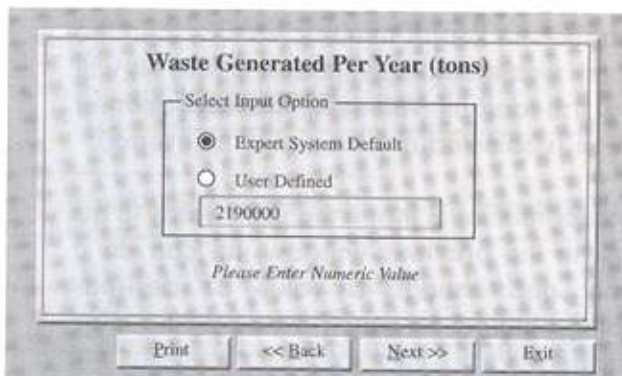
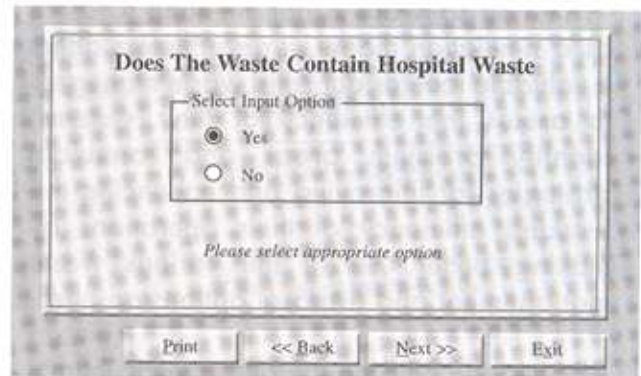
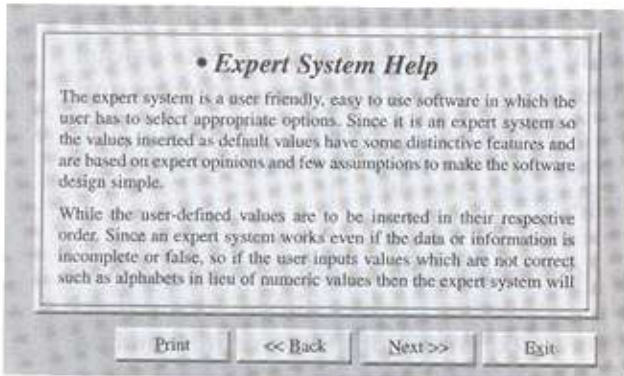
Another feature is that if the user wants to go back to the previous window, he can do it easily and change a value as desired. Printing option for each window is also provided.

Help for each window

Waste Generated Per Year

In this window, the user has two options, one is expert system default and the other is user-defined. The user can choose either of the two.

If the users select expert system default, then the expert value of waste generated is 2190000 tons per year is adopted. This



value is the expert value of generated waste of Karachi, taking 6000 tons per day value with 0% growth rate i.e., $6000 \times 365 = 2190000$.

If the user selects user-defined option, then the users have to input their own numeric value of waste generated in one year. If no value or value other than numeric value is inserted, then expert system will use its default value. Note that the waste generated value should be in tons per year.

Composition of Solid Waste

This window also has two options

- Expert System Default
- User-defined

If the user selects expert system default option, the default values which are also visible in the form are taken. The default values of the composition are also the criteria for the waste to be recommended as recyclable or not. If the user-defined values are less than these values, then the system will recommend all items to be non-recyclable. Note that this decision is based on individual percentage of waste components.

If the user wants to change the composition of solid waste, it can be done by easily by selecting user-defined option and inserting the values in %. Note that the sum of compositions must be equal to 100.

Waste Collected per year

This window also has two options

- Expert System Default
- User-defined

The default value of waste collected per year is based on the expert opinion and local conditions of Karachi. This value is the current value of waste collected by KMC i.e., 3600 tons per day or 13140000 tons per year.

After input of waste collected per year, the system asks whether the waste contains hospital waste or not? Since hospital waste cannot be transported to landfill site so if the waste contains hospital waste, then the only option is of incineration. In such case, the software asks the total cost of incineration process (*operational and maintenance cost*) for one year in rupees.

If the waste does not contain hospital waste, then the other available option i.e., land filling is adopted. Again for land filling, the total cost (*operational*) is to be inserted for one year in rupees. Alternatively the user can select the expert system default value.

After landfill cost, the system asks about recycling. Experience has shown that if recycling is done at source or household level, then it can be very much effective in reducing the total waste generated per year and cost of solid waste management.

If the user selects the option that recycling is done at source, then the user has to input the total waste recycled at the source for one year in tons. Else, the user can use the default value. This default value is based on the expert opinion that 25% of the total waste generated is recycled.

In the end, the expert system calculates efficiency based on waste collected and waste generated per year, gives the value of waste reduction due to recycling and recommends on the basis of composition, the recyclable and non-recyclable items.

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Farhan Anwar, (IEG-2) & Water Engineering & Development Centre, Loughborough University, U.K.

Shehri-CBE

"Never doubt that a small group of thoughtful, committed citizens can change the world, indeed, it's the only thing that ever has".

– Margaret Mead

Shehri is an NGO, involved in various projects related with protection and conservation of the natural and built environment of our country. Over the years, Shehri has built for itself a sound reputation in the field of environmental advocacy and the development and management of participatory approaches for solving regional issues. Whether they be issues of land use and zoning, solid waste management, nature conservation or policy debates, we can proudly claim to have made a significant contribution. We are also engaged in research work and preparation of environmental impact studies on several issues of environmental concern. Shehri also specializes in managing dialogues and interaction between local people and government agencies on issues and concerns which require joint action and participation.



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