

# Solid Waste Management

## **1.1 Introduction**

Rapid urbanization of Kochi and suburbs are leading to pollution and ecological imbalance. The pressure on infrastructural facilities and core sector services is severely felt not only in Kochi but also in the nearby Municipalities and Panchayats. Urban poor are the worst hit.

*Solid Waste Management (SWM), which is an obligatory function of the Urban Local Body (ULB), is in a pathetic state resulting in problems of flood, water logging, mosquito menace, sanitation and environmental and health related problems.*

A feed back survey conducted among the residents in the central Kochi, known as Karikkamuri through a Data study, identified some of the major problem areas as under:

## **1.2 Areas of Concern**

1. Improper Solid Waste management;
2. Water Logging;
3. Mosquito Menace;
4. Environmental Pollution;
5. Waste duping by a vast number of daily commuters;
6. Poor state of drains;
7. Plying of heavy vehicles through narrow roads;
8. Activities of anti-social elements;
9. Inadequate Sewage system;
10. Open Drains;
11. Unattended Vacant lands;
12. Poor condition of Roads;
13. Lack of proper pedestrian Pathway;
14. Corroded drinking water pipe lines and contaminated drinking water;
15. Frequent interruptions in Power supply;
16. Absence of quality services;
17. Availability of labour; and
18. Poor coordination and institutional mechanisms for implementing development work.

## **1.3 Solid Waste Management-A Thrust Area**

Stake holders identified Solid Waste Management as a thrust area, as it is found to be the **ROOTCAUSE** for many other problem areas like Water Logging, Mosquito Menace, Environmental Pollution etc.

Urban poor, who live in small houses, suffer due to flooding of their dwelling places as the drainage system is clogged by solid wastes especially non-degradable waste. They are also the main victims of various kinds of diseases. Most of them cannot afford to spend their meager income on Mosquito repellants, mosquito curtains/nets, mosquito screens etc. Rat menace is also rampant in such areas.

## **1.4 Present Situation**

The present pathetic conditions can be, understood from the Photographs below taken from various places of Kochi.

**Figure 1.8:** Photographs showing unorganized dumping of solid waste

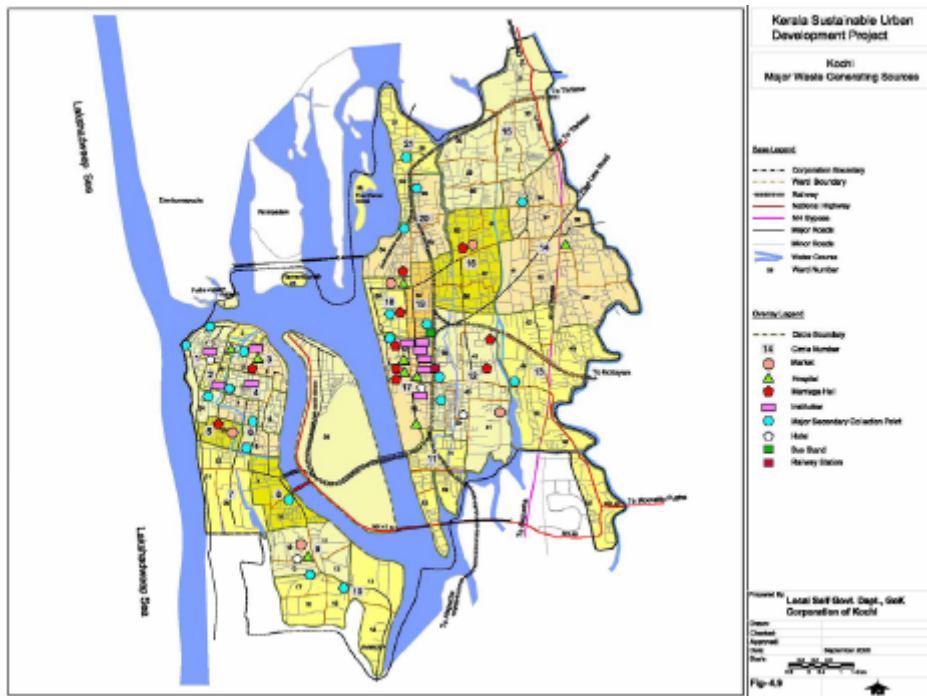


**A. Solid Waste Management System in Kochi Corporation.** Health Department (HD) of the Corporation is responsible for sanitation facilities, solid waste management and other public health functions. A Corporation Health Officer (CHO), a medical doctor by qualification, heads the HD. The collection, transportation, disposal of MSW is the responsibility of the Health Department while the Engineering Department assists them in planning, formulation of programs and in procurement of vehicles, equipment and developing the landfill site. The Project Engineer is responsible for engineering components of SWM and vehicle procurement and maintenance.

Kochi MC presently has a network of community collection points, a significant number of which are open points. The generators, either through door step waste collection system or through bring system deposit the waste in secondary collection points or throw waste into open spaces / drains / water bodies. Subsequently, the waste from collection points is collected by manual / mechanical loading into fleet of vehicles and finally disposed in an environmentally fragile site at WellingtonIsland close to Vembanad Lake.

For the purpose of solid waste management, the entire municipal corporation is divided into 21 circles. Each circle comprises 1 to 5 wards and is managed by a Health Inspector Grade 2 who is assisted by Junior Health Inspectors. Deployment of vehicles for transportation is managed by the Vehicle Section (Circle 22) headed by a senior HI. This section is also responsible for direct collection of waste from hotels and hospitals in Eastern Zone of the city. Salient features of solid waste management in Kochi are indicated in. The location of major waste generating sources in Kochi are indicated in **Figure 5.9**.

**Figure 1.9: Major Waste Generating Sources**



**Table 1.11: Salient Features of Solid Waste Management**

<b>Functional element</b>	<b>Present Scenario</b>
Waste generation	KMC estimation is around 420 tons at a per capita of 0.707 kg/day
Segregation at source	Generally absent .In Division 61 (Panampilly Nagar), waste segregation is practiced by 3,158 households.
Storage at source	Around 35% of domestic sources store mixed waste in plastic buckets, cartons, bags. 50% of large hotels store in gunny bags and plastic containers, while only about 20% of other non-domestic generators store waste at source.
Primary Collection	Community participated door step collection in about 28% of residential areas. 40-45% of the waste is directly deposited in the community bins and open collection points while the rest thrown to streets, drains and canals and the rest dispose within the premises.
Street sweeping	Daily coverage is less than 10% of the roads (around 50% of major roads). Occasional sweeping done to the tune of 30% and no sweeping in 60% of the roads/public places. Box type cart/wheel barrows (inadequate –only 50% of the requirement) are used resulting in Multiple handling.
Secondary Storage	Container facility only to store about 5% of the city waste. Other storage facilities are, metallic bins, Concrete cylindrical rings and largely in open sites. Collection points are characterized by overflowing waste, invasion of cattle, rats, rodents. Transfer is mainly manual.
Transportation	Largely manual loading, open transport in trucks- Dumper placers operate in few markets and in bulk waste generating areas. On an average 169 tons of waste is transported to disposal site daily.
Frequency of removal	Irregular – only city center is attended regularly. Limited operation during Sundays and holidays.
Processing	Decentralized Treatment –Home, colony level and ward level – coverage is marginal. No city level processing.
Disposal	No sanitary landfill. Dumping of mixed waste at Wellington island close to backwater – daily covering done, No environment protection measures. Construction waste is indiscriminately dumped in low lying areas/Road margins.
Vehicle ,tools, equipment	Primary collection and street sweeping – box type carts, Short range transfer – tractor trailer with open trailers, Transportation – open trucks, dumper placer – Except dumper placer the vehicles used require multiple handling of waste. Landfill equipments used are excavator loaders to unload, push waste and level.
Workshop and repair facility	No MC facility – depend on private workshops – no annual contracts – vehicle availability is only 50%.

Functional element	Present Scenario
Man Power	The day-to-day operation is carried out by 647 workers and 210 CLR workers (Substitute workers).
O & M costs	Rs.1, 887 /ton – 62% salaries, 38% Vehicle operating cost, equipment maintenance/tools, landfill and other costs.
Cost recovery	No User fee is collected for door step collection done by KMC. The private and Kudumbasree units collect user fee (Rs.25-40/ household) directly. The O& M costs are met from the revenue income (taxes).
Community Partnership	250 resident associations are involved in door step collection. Non-domestic generators have no participation in SWM activity. 300 households do home composting.
Recycling activity	Significant informal activity. About 18 tons of recyclable fractions are separated daily. No recycling industry with in the City.
NGO/CBO Partnership	Exnora, an NGO involved door step collection/segregation and home level composting during 2002-2004. Sahridaya Welfare Society - in promoting home composting & bio-gas. Kudumbasree units - in door step collection.
Private partnership	Transportation - Private contractors supply trucks (30 trucks/ day) on hire. Landfill operation - Provision of daily cover at landfill site is contracted.
Management	The day-to-day operation is decentralized – Managed by Health circles. Three departments are involved in SWM – Health, Engineering and accounts department.
Planning & management	No annual, midterm and long term integrated SWM plans done. MIS is not available. The current plan covers for procurement 26 ha land for centralized processing and landfill, setting up a windrow compost plant for 200 tons/day, Vermi compost plant of 50 tons/day and landfill in 1.00 ha area.
Regulatory aspects	The compliance of SWM Rules 2000 is minimal.

**B. Solid Waste Management in other CDP areas:** Similar or still poorer situation exists in the Municipalities and Panchayats of the Kochi CDP Area. For areas other than KMC included in CDP, the problem is similar but to a lesser magnitude. Methods of wormi composting and biogas generation are practiced in the outlying areas where household land extent is comparatively more. The waste generated from the Panchayats and Municipal areas are also considered for treatment at the proposed Brahmapuram treatment plant.

In the 2 Municipal areas and the Thrikkakkara Panchayat, the District headquarters, door to door collection is done from the central area of the local body. The O & M cost is being recovered from the beneficiaries. Thripunithura has 4 units of collection mechanism- 3 from households and one from market/hotel. A dumping yard / land fill site is available. But they are also interested in participating in the proposal for waste processing at Brahmapuram.

The present data on waste generation are given in **Table 1.9**.

**Table 1.12:** Present Data on Solid Waste Generation

	Type of Waste	Quantity in MT per day	% of Total
1	House hold Domestic	330	55
2	Hotels/Eateries	36	6
3	Markets/Slaughter houses	30	5
4	Shops & Commercial Establishments	90	15
5	Building construction waste	30	5
6	Garden trimmings/plantain/tree cuttings	24	4
7	Institutional waste	30	5
8	Industrial waste (non-hazardous)	18	3
9	Hospitals / clinics	12	2
	<b>Total Waste Generated Per Day</b>	<b>600</b>	<b>100%</b>
	Waste collected per day	240	
	Collection efficiency	40%	

### Primary Collection

The “door to door” collection of domestic waste is done by various agencies (mainly by Kudumbasree & private agencies) at a nominal charge of Rs.25/ to Rs.30/.It is purely optional for the residents to take advantage of these agencies.

The data collected during Jan-May 2006, from Karikkamuri area, given in the following table, was used as a sample to cross check the collection efficiency.

**Table 1.13:** Sample Data to Cross Check Primary Collection

Road Name	Total Houses	Contacted Houses	JAN	FEB	MAR	APR	MAY
1. Carrier Station Road	41	29	17	14	13	12	13
2. Chavara Centre Road	37	31	19	11	9	8	8
3. Karakkat Road	76	71	33	19	20	20	22
4. Chittoor Road	88	74	26	40	41	40	42
5. Monastery Road-South	41	41	15	14	14	15	12
6. Monastery Road-North	69	69	32	34	36	36	39
7. Karikkamuri Cross Road-(South)	53	43	19	20	20	19	22
8. Karikkamuri Cross Road-(North)	50	31	22	17	16	15	16
9. Mahakavi G Road-East	63	55	40	38	39	36	35
10. Mahakavi G Road-West	29	19	15	13	14	13	14
11. Asari Lane	50	42	22	19	18	16	17
<b>Total</b>	<b>597</b>	<b>505</b>	<b>260</b>	<b>239</b>	<b>240</b>	<b>230</b>	<b>240</b>

Out of the 597 collection units in the area, only about 40% were found to be giving domestic

waste to “door to door” collection agency. Rest are disposing the waste anywhere they please –on the road side, in the drains, in the canals, even outside the Bins where the bins are available.

The domestic waste collected from door to door by the collection agencies is presently transported to certain temporarily identified transfer locations near Bus stand, under bridges etc. in tricycles provided by the ULB. ULB trucks/trailor containers collect waste from these locations and take it to a temporary Dumping yard.

ULB trucks/trailor containers collect waste dumped in major nuisance spots and take it to temporary Dumping yard.

ULB is removing the waste without any stringent time schedule due to several constraints. Because of this irregularity in lifting waste residents resist placing of waste Bins near their houses.

The collection frequency, which is grossly inadequate, is shown in **Table 1.11**.

**Table 1.14:** Collection Frequency

Category	Once a Day	Once in Two Days	Once in 3 days	Once in 7 days	Uncertain
Bio-degradable	40%	25%	15%	10%	10%
Non Bio-degradable	40%	15%	15%	10%	20%

### 1.5 Cost of Poor Solid Waste Management System

A major fall out of the present inadequate Waste Management is that, ULB spend large amount of money towards cleaning the drains/canals. Since the drains/canals are not fully covered in most of the places, such cleaning process has only a temporary impact. Water stagnation in drains due to the waste dumping, lead to Mosquito menace, for which ULB is spending large sum of money for Larvicide spraying, fumigation etc.

Currently, ULB is not having a permanent place to process the large amount of waste. In a densely populated state like Kerala, vacant land for waste dumping is either not available or if available is at a high premium price. After decades long marathon efforts, ULB has almost zeroed in a place known as “Brahmapuram”.

*For whatever reason discussed above, waste management in Kochi CDP area today is grossly ineffective, leading to very high cost of poor quality (COPQ) both directly and indirectly.*

***Kochi and suburban areas ,which together is poised for massive investment in various sectors including tourism- needs to embark on an economically productive and effective waste management for better environment , sustainable development, employment, poverty alleviation and economic growth.***

#### Key Issues

- Poor level of waste collection;
- No segregation at source;

- No planned reuse/recycle;
- Poor frequency of waste collection;
- Inefficient collection and disposal at temporary transfer locations;
- Obsolete waste handling and transportation system;
- Street cleaning utterly inadequate;
- No scientific and modern waste processing at any stage;
- Water logging due to choking of drains with waste;
- Mosquito menace due to stagnation of water in drains;
- Filthy Environment not congenial to a tourists' destination;
- Misery to the poor who are the worst affected due to poor waste management; and
- No shared vision for solid waste management.

### **1.6 To-Be Scenario- Where Do We Go?**

Considering the “as-is” condition and the related key issues, “to-be” scenario has been envisioned in a medium term perspective.

A “shared vision” has been evolved for the core service of Waste Management” in consultation with stakeholder representatives and voluntary technical experts.

### **1.7 Shared Vision for Solid Waste Management**

“To implement economically productive and effective Solid Waste Management with accountability and transparency to transform Kochi and suburbs to one of the cleanest places in the world by the year 2010.

### **1.8 Gap Analysis**

Where the Kochi and suburbs are today and where it wants to reach, there exists a big gap to be bridged?

The Strategies, programmes and projects for waste management in a medium term perspective is drawn out by the “SOLID WASTE MANAGEMENT TASK FORCE” consisting of various convergent departments, community based organizations, civil society organizations, voluntary technical experts. Highlights are as under:

#### **1. A well structured comprehensive Solid Waste Management Plan.**

##### **i. Awareness Criteria:**

- Starting from educational institutions. 100% of the students will be covered in a phased manner. This will also be part of the environment training;
- Other stake holders like house holds, institutions, trading, Industries, ULB etc will be covered in batches with the help of NGOSs;
- Course design will be done by competent agencies;
- Legal programmes to be conducted by experts in the field;
- ULB shall issue notice to Public;
- Citizen rights/duties/responsibilities on SWM will be published along with vigorous campaign;
- Public warning to be issued by ULB and Police Commissioner; and
- Monitoring, review and modification mechanism.

ii. Live model demonstration. Demonstration of live models of solid waste management in schools. Besides the canteen waste and other normal solid waste produced in the school and surroundings, night soil waste is also a fine input to the biogas plants planned. About 400 such units are planned to cover about 4 lakhs of students. Efforts will be made for sponsorship by the community/companies/commercial business units.

iii. Institution level solid waste processing will be encouraged in Hotels/Hostels/Multistoreyed Buildings etc. About 200 such initiatives are expected .Till such time they put up the solid waste processing units, waste will be collected at applicable rates fixed by ULB. Like Rain water harvesting, car parking etc. solid waste processing will also be made mandatory in future.

iv. Residents' Association/Community Public Comfort kiosks attached with solid waste processing will be implemented. 103 Nos .Bio-gas Generation units are planned.71 in Kochi City,10 in two Municipalities, 26 in thirteen Panchayats.

v. Community Biogas based Power Generation unit utilizing community waste and comfort station waste. One number is planned between Ernakulam South railway station and KSRTC Bus Stand to light up the pedestrian path way along the Vivekananda road and to operate the water pump for watering the proposed public garden in the area.

vi. Waste from KSRTC Bus Stand and South Railway stations can also be processed here.

vii. Efforts will be made for sponsorship by the community/companies/ commercial business units. Advertisement revenue will also be available on recurring basis from this strategic area.

viii. Sludge Extraction and transport equipment for 1.3 to 1.5

## 2. Segregation of Solid Waste At Source

- Domestic Waste Bins: It is planned to get the domestic waste segregated at source itself using two containers –one for biodegradable and other for non-bio-degradable. Containers will be specially designed and standardized to prevent misuse. About 2,60,000 sets are estimated. Sponsors will be found to supply the same. Giving advertisement rights will also be considered. BPL people will be given at nominal cost.

- Domestic Vermi-composting units: These will be supplied at attractive rates to house holds to encourage waste processing at home itself. To begin with 8000units - 7150 units in Kochi, 200 units in two Municipalities and 650 numbers in thirteen Panchayats are planned.

- Door to door primary collection: Kudumbasree/Residents Associations/Self Help Groups will be empowered to collect the domestic solid waste. Every domestic unit shall declare their mode of disposal of solid waste.In any case, all residents shall pay the “betterment levies” to the collecting agency in their respective areas. *This will*

*generate employment opportunities for urban poor, including rag pickers.*

*In other words, dumping of any kind of waste on the road side or some one else's vacant land will not be allowed. IN FACT, IT WILL BE A PUNISHABLE OFFENCE.*

3. Special Purpose Vehicles (SPVS) for door to door primary waste collection:

- 3.1) Special Purpose Vehicles (SPVs) for door to door waste collection will be encouraged with initial fund from ULB and to be returned in installments.

Maintenance/running expenses will be borne by the Kudumasree units/residents' association/Self Help Groups, as the case may be. 260 such SPVs are estimated.

- 3.2) Cleaning Service for SPVs: After delivering the solid waste at the identified transfer locations, it will be thoroughly cleaned. About 27 such transfer stations (10 in Kochi city, 4 in two Municipalities and 13 in thirteen Panchayats) are planned. Private participation will be encouraged with initial fund from ULB and to be returned in instalments. Maintenance/running expenses will be borne by the private party.

4. Secondary collection:

- Secondary Collection of solid waste: Secondary transport vehicles, mostly tractor / trailer container type, will be deployed at secondary collection centres. The peculiarity of these stations are that the primary solid waste will be directly transferred to vehicles carrying them to the main processing plant at Brahmapuram. 6 Tractors and 32 Trailer containers are estimated Private participation will be encouraged with initial fund from ULB and to be returned in installments. Maintenance/running expenses will be borne by the private party. Private participation will be encouraged with payments based on actual tonnage of solid waste transported at predetermined rates.

- Waste from institutions/Markets/Hotels/Hostels /Lodges etc will be collected directly by ULB. Till such time they put up the solid waste processing units, waste will be collected at applicable rates fixed by ULB. These wastes will be directly transported to the main processing plant at Brahmapuram. The vehicles currently available with ULB will be used. Private participation will be encouraged with payments based on actual tonnage of solid waste transported at predetermined rates.

5. Slaughter House /Main Market Solid Waste. These will be collected and directly transported to main processing plant at Brahmapuram. Specially designed covered vehicles will be deployed to reduce foul smell. 4 such vehicles are planned.

Till such time they put up the solid waste processing units, waste will be collected at applicable rates fixed by ULB. Private participation will be encouraged with payments based on actual tonnage of solid waste transported at predetermined rates.

6. Litter Bins. Litter Bins will be standardized and sponsors will be found to supply the same with their advertisements. This will be installed by ULB and contents will be removed by ULB. Only small paper pieces/ paper wrappers are expected to be put in these. Other than Litter Bins, no other Bins/Containers are envisaged on the road sides. This will also make pedestrian path neat and clean. In other words, dumping of any kind of waste on the road side

will not be allowed. IN FACT, IT WILL BE A PUNISHABLE OFFENCE.

7. Incineration Units. Incineration units: Hopstals/cluster of hospitals will be forced to install incinerators Incinerators have to be employed for treating bio-medical waste. Initial fund can be given by ULB, to be returned in instalments. About 10 such incinerators are planned for installation.

8. Main Solid Waste Processing Site at Brahmapuram:

a. Weighing Mechanism with Utility. Weighing mechanism with utility building, security etc. is planned at Brahmapuram main sold waste processing site

b. Sorting of Non-Biodegradable Waste. Sorting of Bio-degradable waste into components like plastic, glass, rubber porcelain, metals etc. by mechanical means is envisaged at Brahmapuram main sold waste processing site.

c. Composting. Composting being slow process and require a lot of space is planned to be done only in small units of (about 5mt/day capacity) at Brahmapuram main sold waste processing site. 6 units are planned initially. The manure will be mainly used for the gardens planned in Brahmapuram campus.

d. Bio-Methanation Plant. Bio-Methanation Plant using Slaughter house waste and market waste is planned at Brahmapuram main sold waste processing site. Power will be generated from this mainly to light up the locality. 3 nos 20mt/day capacity biomethanation plant cum power generation units are planned initially.

e. Secure Land Filling Facility. Secure Land Filling Facility at Brahmapuram main solid waste processing site: About 4 to 5 Cubic Metres of Hazardous waste will have to be buried every year. Aprox. 10 cents of land will be required to be prepared every year going upto 20 years atleast. We are planning for 2 nos excavators also.

f. Effluent Treatment Plant. Effluent Treatment plant, Monitoring cell with laboratory etc are planned at Brahmapuram main sold waste processing site.

g. Drinking Water Facility. Drinking water facility at Brahmapuram main solid waste processing site is envisaged.

h. Green Belt. Green Belt at Brahmapuram main solid waste processing site: The vacant areas will be converted into a beautiful picnic spot with Land scaping, wide roads, gardens with fragrant flowering plants like Jasmines, medicinal plants, vegetation (special bamboo etc), vegetable farms, integrated farming with diary, piggery etc, water park, Fish ponds, entertainment facilities, conference cum recreation halls, Library with reference books etc. All concerned stakeholders and experts will be consulted before finalizing the facilities at Brahmapuram. *It will be one of the best solid waste processing sites in the world.*

9. Enhancing the Role of ULB Staff. Accountability and responsibility with appropriate authority to ULB staff is also envisaged to improve their motivation and effectiveness to ensure cleanliness of the designated areas of each team. The team shall consist of the ULB staff as well as representatives of **Residents Association.**

High incentives are recommended to the team members who score highest ratings in a thorough audit, conducted by external specialist auditors. They shall be honoured in a befitting way every year.

Effective sweeping /scraping of roads as well as path ways and removal of debris is expected to be done daily. Main streets shall be swept in the night. Sweeping shall be followed by water sprinkling (during summer) to minimize dust.

Spraying of larvicide, fumigation /fogging shall be as per strict schedule. ULB staff will be made conversant with user-friendly software system for the convenience of the stake holders and also to improve transparency. Four Mechanical sweeping Units & water sprayer units are also envisaged. Implementation of a software system is envisaged to improve the effectiveness of the system as well as better customer interaction.

10. Building waste for Land Filling /Road Construction. ULB will render help to transfer the above on special request. The collection and transportation rates will be decided by ULB. Private participation will be encouraged. 4 Dumpers are estimated for this.

11. Waste of the Immediate Future: We reckon the danger of fast increasing waste of old computers /TV. Sets /Fridges/Mobile Phones/Kitchen utensils/ small automobile worn out parts and other gadgets. An appropriate technology will be considered to deal with such solid wastes in 2012. Cost estimation is difficult at this stage. An appropriate technology will be considered to deal with such solid wastes in 2015. Cost estimation is difficult at this stage.

12. Hospitals will be forced to manage the bio medical waste themselves. Hospital / cluster hospitals will be forced to install incinerators according to Pollution Control Board regulations. Bio medical waste disposal is mandatory according to bio medical waste handling procedures. Management of solid waste after segregation will be collected by the ULBs & cost will be recovered based on the number of inpatient beds. Regarding segregation of hospital waste "protocol for management and handling of hospital waste" will be ensured at the time of preparing DPR.

### **1.9 Financial Strategy and Economic Viability**

With Private Participation and community involvement we envisage no problem in the operation and maintenance of the assets created.

*Performance Indicators.* We recognize that the projected growth in population in the fast developing Kochi City and Suburbs will bring a lot of pressure on the Solid Waste Management. We also recognize that Solid Waste Management is one of the most critical sectors to be attended on war footing. At the same time, it is planned to achieve the following performance parameters.

**Table 1.15: Performance Indicators**

Components	Current	2011	2016	2021
Collection efficiency %	40	95	98	100
Segregation %	0	95	98	100
Door to door %	40	95	100	100
Vehicle capacity %	60	90	95	100
Processing of waste %	0	90	95	100
Disposal %	0	90	95	100

*Resistance to Change.* Resistance to change can mostly be overcome by Awareness cum Live Demonstration. The participation of all the school children will make the task easier for the future. A few “quick hits” will bring confidence in all stakeholders. In the long run, when they see the accrued benefits, an attitudinal shift will take place, which will make the waste management programme sustainable, and initiatives irreversible.

### **The Gains**

- Involvement of all stakeholders including children;
- Comprehensive solid waste awareness cum live model demonstrations;
- Present condition and diagnostic analysis with live data samples;
- A clear vision for the Solid Waste Management;
- Remedial solutions proposed considering all the present shortcomings, with the involvement of stakeholders including experts in the field;
- Root cause for water stagnation/mosquito menace resolved;
- Benefits to Urban Poor directly and indirectly;
- Segregation at source with stakeholder involvement;
- Smooth collection and transportation system;
- Processing at domestic/institutional/community level encouraged;
- An ambitious main processing unit at Brahmapuram;
- A programme to make Brahmapuram waste processing area a picnic spot cum knowledge centre on environmental aspects;
- A scheme to motivate the ULB staff and make them more effective;
- A well-planned investment strategy with community/corporate/public participation;
- Strengthening revenues and recovery systems to make the plan sustainable;
- Measurable Performance parameters and IT system for up-to-date monitoring; and
- Vision to transform Kochi and Suburbs to one of the cleanest places in the world by the year 2010.

*Conclusion.* The main issue identified is that there is no proper system of collection, processing and management of solid waste. The problem is acute in the Corporation and Municipal areas with waste thrown into canals, drains and road side. Collection efficiency is only 40%. The proposal is to create a solid waste management taskforce, create awareness among the public by live demonstration of using the waste for biogas generation, encouraging segregation of solid waste involving public participation, acquisition of modern environment friendly vehicles to carry the waste and development of proper processing system at Brahmapuram. The whole programme of Solid Waste Management is proposed to be taken up with Public Private Participation at different stages i.e, in creation awareness, segregation at source and in collection methods. The role of residential associations is also considered crucial in this. The details of partnerships will be spelt out in the detailed project.

Community contributions through user charges, privatization of certain components in the whole system are intended.

The total project cost is **estimated** to be **Rs.152.40 crores** and the proposal is to get back the money by beneficiary contribution and through sponsorship programmes.